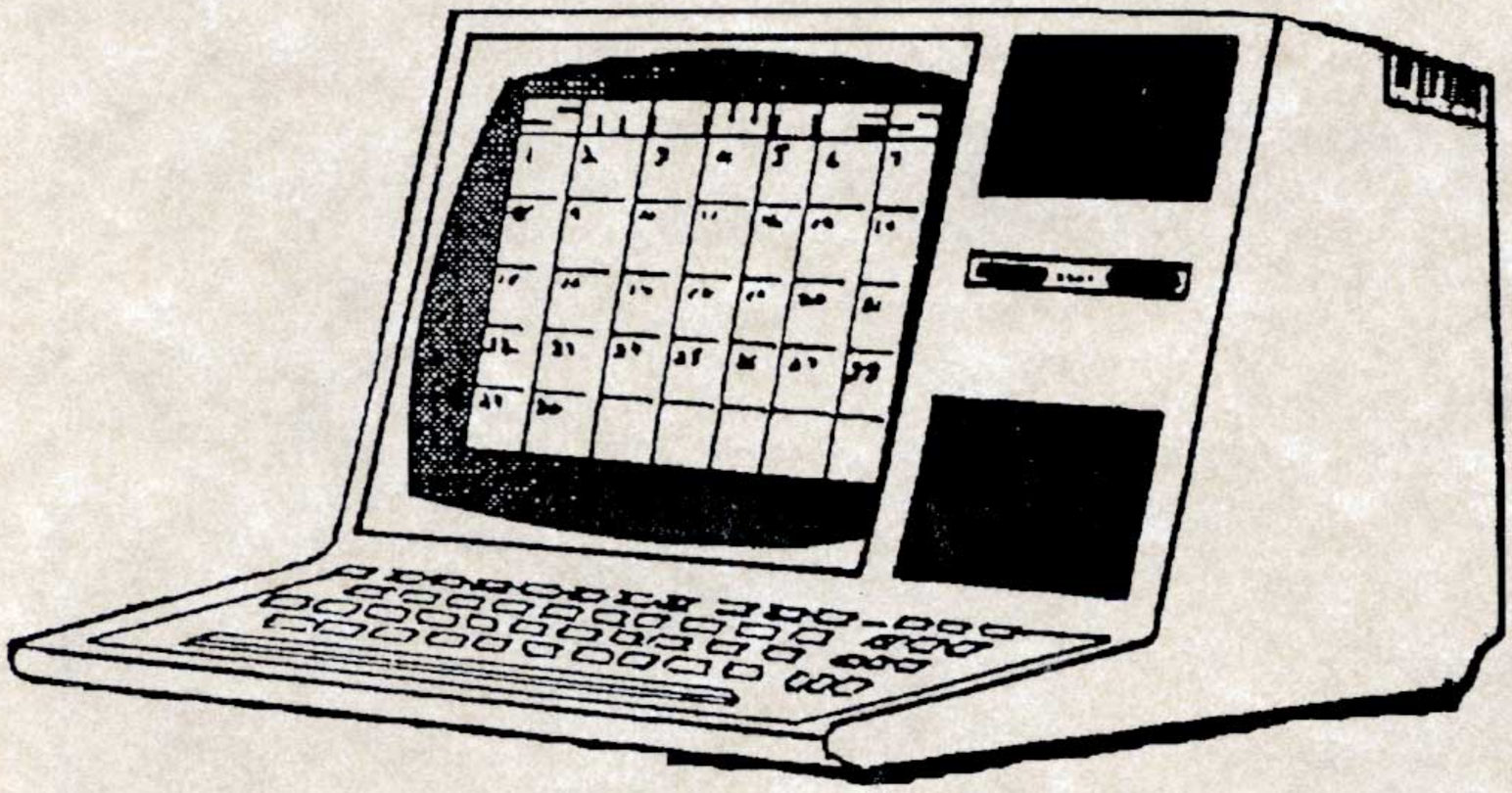
TRSTimes

Volume 8. No. 6 - Nov/Dec 1995 - $4.00



DR. PATCH

UTILITY FOR TRS-80 MODEL 4 AND LS-DOS 6.3.1

A *'MUST HAVE'* FOR ALL LS-DOS 6.3.1 OWNERS.

DR. PATCH MODIFIES LS-DOS 6.3.1 TO DO THINGS THAT WERE NEVER BEFORE POSSIBLE.

COMPLETELY SELF-CONTAINED - MENU-DRIVEN FOR MAXIMUM USER CONVENIENCE.

FAST & SAFE - EACH MODIFICATION IS EASILY REVERSED TO NORMAL DOS OPERATION.

DISABLE PASSWORD CHECK IN FORMAT/CMD
FORMAT DOUBLE-SIDED AS DEFAULT
FORMAT 80 TRACKS AS DEFAULT
DISABLE VERIFY AFTER FORMAT
CHANGE 'DIR' TO 'D'
CHANGE 'CAT' TO 'C'
DIR/CAT WITH (I) PARAMETER AS DEFAULT
DIR/CAT WITH (S,I) PARAMETERS AS DEFAULT
CHANGE 'REMOVE' TO 'DEL'
CHANGE 'RENAME' TO 'REN'
CHANGE 'MEMORY' TO 'MEM'
CHANGE 'DEVICE' TO 'DEV'
DISABLE THE BOOT 'DATE' PROMPT
DISABLE THE BOOT 'TIME' PROMPT
DISABLE FILE PASSWORD PROTECTION
ENABLE EXTENDED ERROR MESSAGES

DISABLE PASSWORD CHECK IN BACKUP/CMD
BACKUP WITH (I) PARAMETER AS DEFAULT
BACKUP WITH VERIFY DISABLED
DISABLE BACKUP 'LIMIT' PROTECTION
DISABLE PASSWORD CHECK IN PURGE
PURGE WITH (I) PARAMETER AS DEFAULT
PURGE WITH (S,I) PARAMETERS AS DEFAULT
PURGE WITH (Q=N) PARAMETER AS DEFAULT
IMPLEMENT THE DOS 'KILL' COMMAND
CHANGE DOS PROMPT TO CUSTOM PROMPT
TURN 'AUTO BREAK DISABLE' OFF
TURN 'SYSGEN' MESSAGE OFF
BOOT WITH NON-BLINKING CURSOR
BOOT WITH CUSTOM CURSOR
BOOT WITH CLOCK ON
BOOT WITH FAST KEY-REPEAT

DR. PATCH IS THE ONLY PROGRAM OF ITS TYPE EVER WRITTEN FOR THE TRS-80 MODEL 4 AND LS-DOS 6.3.1.

DISTRIBUTED EXCLUSIVELY BY TRSTIMES MAGAZINE ON A STANDARD LS-DOS 6.3.1 DATA DISKETTE, ALONG WITH WRITTEN DOCUMENTATION.

DR. PATCH $14.95

NO SHIPPING & HANDLING TO U.S & CANADA. ELSEWHERE PLEASE ADD $4.00 (U.S CURRENCY ONLY, PLEASE)

TRSTimes magazine - dept. DP
5721 Topanga Canyon Blvd. #4
Woodland Hills, CA 91367

DON'T LET YOUR LS-DOS 6.3.1 BE WITHOUT IT!

TRSTimes magazine

Volume 8. No. 6 - Nov/Dec 1995 - $4.00

PUBLISHER-EDITOR
Lance Wolstrup
CONTRIBUTING EDITORS
Roy T. Beck
Dr. Allen Jacobs
TECHNICAL ASSISTANCE
San Gabriel Tandy Users Group
Valley TRS-80 Users Group
Valley Hackers' TRS-80 Users Group

TRSTimes is published bi-monthly by TRSTimes Publications. 5721 Topanga Canyon Blvd., Suite 4. Woodland Hills, CA 91367. U.S.A. (818) 716-7154.

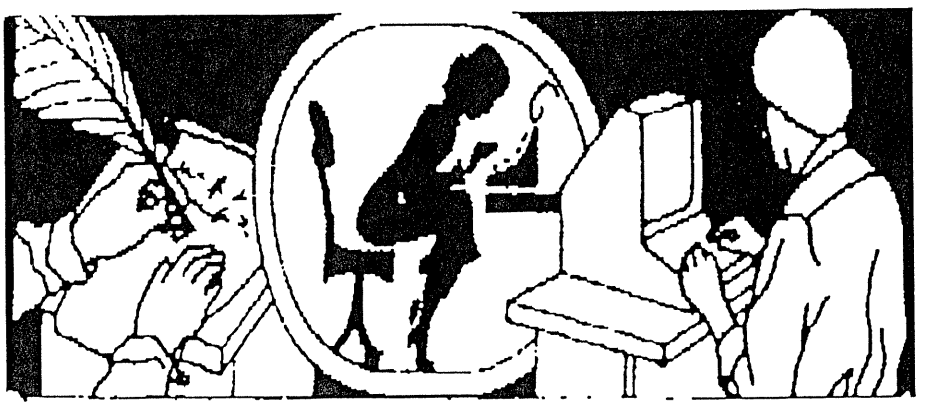
Publication months are January, March, May, July, September and November.

1995 subscription rates (6 issues):
UNITED STATES $21.00
CANADA $22.00 (U.S.)

EUROPE, CENTRAL & SOUTH AMERICA:
$26.00 for surface mail or $34.00 for air mail. (U.S. currency only)

ASIA, AUSTRALIA & NEW ZEALAND:
$28.00 for surface mail or $36.00 for air mail. (U.S. currency only)

Article submissions from our readers are welcomed and encouraged. Anything pertaining to the TRS-80 will be evaluated for possible publication. Please send hardcopy and, if at all possible a disk with the material saved in ASCII format. Any disk format is acceptable, but please note on label which format is used.



A Hard Drive on a Model I?

by Roy T. Beck

As you all probably know, the Radio Shack hard drives for the TRS series became available when the Model III was state of the art. The price tag, initially, was $2500 for a master drive (5 megs) and $2000 for each slave, (also 5 megs), of which three could be attached to the master, for a grand total of 20 megs! Them was the days!

Not long after, R/S began scaling the prices down to something a little more reasonable, but they remained pricey. Then the Model 4 came along, and for purposes of upward compatibility, it had the same 50 line interface as the Model III, allowing the hard drives to be operated on the Models III or 4. But what about the poor, lonely, obsolete Model I?

To provide some surcease for the Model I owners, R/S began scratching its collective head to see what could be done for the Model I. Bear in mind that the Model I did not have a 50 line interface; it had an external bus connection of 40 lines, which had to be the focal point for any attachment beyond the printer port and floppy drive port, both of which were 34 lines.

The solution, as engineered by R/S was an adapter box with a short cable out of each end, one with 40 lines to connect to the Model I "screen printer connection", which was in reality the bus of the computer and the other with 50 lines to connect to the hard drive cable. Actually the 34 line cable lacked a couple of lines, which is another story for another day, but it had the essentials for the hard drives. Being a nosy type, I have dissected and analyzed the adapter, Cat No 26-1103. Mostly, it just interconnects the appropriate lines from the Model I to those in the 50 line cable. The only quirk is the presence of two transistors and two resistors in the little box, which contains a card measuring about 2" by 2".

The 26-1103 kit contains, besides the adapter, a set of 3 disks containing a version of LDOS, V 5.1.3, I believe, plus the necessary driver, and some utility programs. In addition, there is a supplement to the manual which you received when you bought the Model III master hard drive. This supplementary manual was supposed to include all the additional information necessary to allow you to run the hard drive under LDOS for the Model I. (One crucial piece of information was omitted; more on that later). Another limitation was that the Model I kit was limited to the use of 5 meg drives only; Considering how many Model I programs could fit into a 5 meg drive, this probably was not a real restriction.

Note that this setup required LDOS V 5.1.3 for the Model I. TRS-DOS V 2.3 was not provided for. Note also the Model III DOS never provided for hard drive operation. Not that it couldn't have been done, it just was never provided for. Another useful piece of history is that NEWDOS 80 V2.5 (note the version number) also could operate the hard drive, but only the version of the hard drive with the large controller board. R/S being R/S, when they came out with the later, smaller controller board, didn't quite attain full compatibility with the earlier board. (Of course, they didn't announce this fact)!

I stumbled over this discrepancy when hard drives were quite popular. I sold a package with the later, small controller board to a dentist for his office system. He came back to me right away with a squawk that he couldn't get the thing to format under NEWDOS 80 V 2.5. I struggled with it also, and found that it worked just fine with the old controller board, which I supplied to him in place of the later controller. But what was the difference? I published a note in CN-80 about this problem, and shortly a letter came to me from Australia! Some one there had been bitten by this same bug some time before, and fortunately had published it in a newsletter down under. The person who wrote to me had seen the earlier note, and passed it along to me. Newsletters and their readers are great! Even better, the patch for the NEWDOS 80 Formatter code was only one byte. That is really elegant patching.

All of this history came back to me recently when a local club member inherited a Model I from his father, and after getting acquainted with the machine, decided he would like to add a hard drive

to it. Of course, I had all the hardware plus the 26-1103 adapter kit. I rashly promised he could pick up the whole hard drive system at a certain club meeting. A few days before, I decided I had better get the package together and also test it out for proper operation. I planned to use a drive which had previously been operating on a Model 4, and which of course had various files on the drive.

The disks provided with the Model I adapter package include LDOS V5.1.3 and a couple of auxiliary disks; all well and good. However, R/S tried to simplify everything by providing a JCL file which would both partition and format the drive in one sequence, with no further action required by the user. For a beginner with no previous hard drive experience, this is a fine idea. Of course, it does not allow the user to arrange his own paritioning, but with only 5 megs available, there really isn't much space to do any cute partitioning.

If the drive being used is unformatted, all is well and good. The DO file will proceed to place 4 partitions on the drive, one on each of the four heads. The gotcha is if the drive has been previously formatted, and you don't know the password previously used. In this case, the formatter requires you to supply the password of the previous setup before it will reformat the drive.!!!!!

After connecting up all the cables via the adapter, I attempted to reformat the drive. The formatter appeared to format OK, but when it tried to verify, it completely failed. What the heck? I tried everything I knew, but the software just would not reformat that drive.

I realized I had a password problem, but what could I do about it? One tedious way would have been to install that 5 meg drive on a Model 4, format it there with a known password, and then go back to the Mod I. But this situation could not be unique, so there had to be a way around it. I went back to my RSHARD documentation, and rediscovered the solution for the corresponding situation for either the Mod III or 4. Since Roy Soltoff of MISOSYS wrote all these driver programs, it seemed logical that the missing parameter in the Mod I was probably similar, maybe the same as the Mods III and 4. Sure enough, the RSHARD manual noted the parameter ABS to be added to the FORMAT command when dealing with a previously formatted Mod III or 4. Since the Mod I documentation showed the DO command for the Mod I also accepted various parameters, I reasoned the override parameter had to go in the DO command string. I tried ,ABS as an add-on to the DO command, and sure enough, it worked. The problem was that the supplementary pamphlet did not include this crucial element. I now had the 5 meg drive up and running and working correctly. And I still had about 6 hours before the promised delivery time. Whew! I made it! As someone once remarked, "The devil is in the details", and this seems to apply in many fields of endeavor.

Anyway, we now have a new user of a Model I operating very happily with a 5 meg hard drive, and he is rapidly becoming computer literate. I am sure he will be moving to more advanced hardware (a Model 4?) before long, but for now he is learning his way around disc BASIC and the operating system at a great rate.

Several years ago, I received a phone call from a fellow in Virginia who had been steered to me by another party. He told me he also wanted to run a Model I with a hard drive, but didn't have the necessary adapter. However, he did have the internal circuitry of the adapter, and intended to build it up from components on a piece of perf-board. I asked him where he had gotten the adapter schematic diagram, and he said some one in the midwest had sent him a copy from some other source. Out of curiosity, I asked him to read me the heading on the pieces of paper. To our mutual surprise, it was a Xerox copy of the schematic I had drawn up several years before! I have no idea how it got to him, but it did, and he was able to build it up. All he needed then was the driver files to make it work! A perfect example of good communication between user group members.

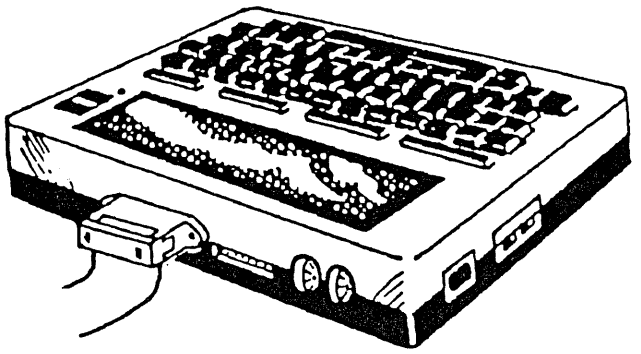
I realize all of this is just history now, as hard drives are being built in the gigabyte-plus size range now, with anything less than 540 megs being treated with disdain. However, there is still interest in our antiques, and Lance and I try to provide something for everyone.

I should note that use of hard drives on Models III and 4 is a little simpler, and Lance published an excellent article on this subject in the May/June issue of TRSTimes, Vol. 8, No 3. I recommend it to you.

In case anyone is interested, I still have a couple of the Mod I adapter kits which I will make available for a reasonable price. Of course, you need a Mod I and a R/S 5 meg drive to go with it, (I still have drives available, also) but you could have some fun with all of this. I don't really expect many of you to want to connect a 5 meg hard drive to a Model I, but I hope this story may be of interest to you afficionados of the TRS machines.

XREF FOR MODEL 100

from the TRSTimes Vault



XREF.BA is an interesting and useful utility for programmers, byte fyters, and other kooky types. The program works on a .DO version of any BASIC program, to produce two lists:

1) All variables used in the program, and the line numbers in which they appear.

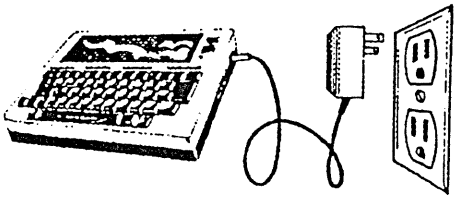
2) Line references... lines to which execution branches, and a list of the lines which send it there (through GOTO, GOSUB, etc.)

All output is contained in a file named 'VARLST.DO'. Be aware an intermediate file 'OUTPUT.DO' is created and killed.

The program is just under 3900 bytes in .BA form. It requires a fair amount of free space. I've XREF'ed 4 and 5K programs easily. Run it... type in program name to be XREF'ed, and sit back and watch.

```
1 GOTO10
2 'XREF.BA
7 IFLEN(A$)<3THENQF=0:GOTO9
8 FORX=1TOLEN(A$):IFMID$(A$,X,1)<>" "THEN
QF=1:GOTO9ELSENEXTX
9 RETURN
10 CLS:MAXFILES=2:CLEAR5500:
XN$=CHR$(27)+"p":XF$=CHR$(27)+"q"
15 DIMV$(200),L$(150),R$(150),VA$(50):
V$(0)="  ":L$(0)="  ":CR$=CHR$(13)+CHR$(10)
20 FILES:PRINT@250,".DO File to XREF?";:
INPUTF$
25 TS$=TIME$:OPENF$FORINPUTAS1:
OPEN"OUTPUT"FOR OUTPUTAS2
30 IFEOF(1)THEN400
35 LINEINPUT#1,A$
40 GOSUB165
45 PRINT:PRINTLN$;A$
50 GOSUB115
60 GOSUB7:IFQF=1THENQF=0ELSE30
62 GOSUB185
70 GOSUB7:IFQF=1THENQF=0ELSE30
72 GOSUB340
80 GOSUB7:IFQF=1THENQF=0ELSE30
82 GOSUB280
85 PRINT"  ";XN$;A$;XF$
100 PRINT#2,LN$;A$
105 GOTO30
115 C=INSTR(A$,"DATA"):
IFCTHENA$=MID$(A$,1,C-1)
120 C=INSTR(A$,CHR$(34)):IFC=0THENGOTO145
125 C1=INSTR(MID$(A$,C+1),CHR$(34)):
IFC1=0THENC1=LEN(A$)
130 IFC=0ANDC1=0THEN145
135 A$=LEFT$(A$,C-1)+MID$(A$,C+C1+1):
GOTO120
140 C=INSTR(A$," "):
IFCTHENA$=LEFT$(A$,C-1)+MID$(A$,C+1):
GOTO140ELSEA$=" "+A$
145 C=INSTR(A$,""):
IFC>0THENA$=LEFT$(A$,C-1)
150 C=INSTR(A$,"REM"):
IFC>0THENA$=LEFT$(A$,C-1)
155 RETURN
165 C=INSTR(A$," "):A1$=LEFT$(A$,C-1)
170 A$=MID$(A$,C)
175 LN$=SPACE$(5-LEN(A1$))+A1$:RETURN
185 RESTORE:FORX=1TO6:READT$
190 C=INSTR(A$,T$):IFC=0THEN230
195 MID$(A$,C,LEN(T$))=SPACE$(LEN(T$))
200 LF$="":FORX1=C+LEN(T$)TOLEN(A$)
205 X1$=MID$(A$,X1,1):IFX1$=" "THEN220
ELSEIF(VAL(LF$)=0ANDASC(X1$)>58)THEN230
ELSEIFASC(X1$)>58THEN225
210 IFX1$=":"THEN225ELSEIFX1$=","
THENGOSUB245:GOTO220
215 LF$=LF$+X1$:MID$(A$,X1,1)=" "
220 NEXTX1
225 IFVAL(LF$)=0THEN230ELSEGOSUB245
230 IFC=0THENNEXTXELSE190
231 U$=".:;,)@+-*/\^=<>":A1$="":
FORX=1TOLEN(A$)
232 B$=MID$(A$,X,1)
234 IFINSTR(U$,B$)THENB$=" "
235 A1$=A1$+B$:NEXTX
```

```
239 A$=A1$:RETURN
245 LX$=STR$(VAL(LN$)):
LF$=SPACE$(5-LEN(LF$))+LF$
250 FORZ=1TOL:IFLF$=LEFT$(L$(Z),5)THEN
IFRIGHT$(L$(Z),LEN(LX$))=LX$THEN265
ELSEL$(Z)=L$(Z)+","+LX$:GOTO275ELSENEXTZ
255 FORZ=LTO0STEP-1:
IFLEFT$(L$(Z),5)>LF$THENL$(Z+1)=L$(Z):
GOTO265
260 L$(Z+1)=LF$+"-"+STR$(VAL(LN$)):GOTO270
265 NEXTZ:GOTO275
270 L=L+1
275 LF$="":RETURN
280 FORX=1TO50:VA$(X)="":NEXTX
282 Y=1:A1$="":FORX=1TOLEN(A$):
B$=MID$(A$,X,1):B=ASC(B$)
290 IFB=32 THENSF=1:GOTO326
300 IFSFTHEN320
310 IFINSTR("%#!$1234567890",B$)THEN325
315 IFB=40THENSF=1:GOTO325
320 IFB>64ANDB<91THENSF=0ELSE330
325 VA$(Y)=VA$(Y)+B$:
IFX=LEN(A$)THEN326ELSEIFSF=0THEN330
326 FORZ=0TOY-1
327 IFVA$(Y)=VA$(Z)THENVA$(Y)="":
GOTO330ELSENEXTZ
328 A1$=A1$+" "+VA$(Y):Y=Y+1
330 NEXTX:A$=MID$(A1$,1):RETURN
340 IFRF=1THEN345ELSEFORJ=1TO150:
READR$(J):IFR$(J)="XXX"THENRF=1:GOTO345
ELSENEXTJ
345 FORX=1TOJ-1
350 C=INSTR(A$,R$(X)):IFC=0THEN360
355 A$=LEFT$(A$,C-1)+SPACE$(LEN(R$(X)))+
MID$(A$,(C+LEN(R$(X)))):GOTO350
360 NEXTX:RETURN
400 V=0:CLS:PRINT@160,"Compiling List"
405 CLOSE:OPEN"OUTPUT"FORINPUTAS1
410 ONERRORGOTO465:LINEINPUT#1,A$
415 LN$=""+LEFT$(A$,5):A$=MID$(A$,7)
420 C=INSTR(A$," "):
IFCTHENV1$=LEFT$(A$,C-1):
A$=MID$(A$,C+1):GOTO430
425 IFLEN(A$)THENV1$=A$:A$="":
GOTO430ELSE410
429 ONERRORGOTO570
430 V1$=V1$+SPACE$(5-LEN(V1$))
432 LX$=STR$(VAL(LN$))
435 FORY=0TOV:
IFV1$<>LEFT$(V$(Y),5)THENNEXTY:
GOTO450
440 IFRIGHT$(V$(Y),LEN(LX$))=LX$THEN420
445 V$(Y)=V$(Y)+","+LX$:GOTO420
450 FORZ=VTO0STEP-1:
IFLEFT$(V$(Z),5)>V1$THENV$(Z+1)=V$(Z):
GOTO460
455 V$(Z+1)=V1$+"-"+LX$:V=V+1:GOTO420
460 NEXTZ
465 IFERR<>54THEN
PRINT"Error ";ERR;" in line ";ERL:STOP
ELSEKILL"OUTPUT.DO"
475 CLS:OPEN"VARLST.DO"FOROUTPUTAS2
480 PRINT#2,"Variable List for: ";F$;CR$;DAY$;" ";
DATE$;" ";TS$;CR$
485 PRINT#2,"Var. - found in lines:"
490 FORJ=1TOV:PRINT#2,V$(J):NEXTJ:
PRINT#2,CR$;CHR$(128);CR$
495 PRINT#2," Line References for: ";F$
500 PRINT#2," Goto- from lines:",CR$
505 FORJ=1TOL:PRINT#2,L$(J):NEXTJ
510 PRINT#2,CR$;CR$;"TIME= ";TIME$
515 CLOSE:MENU
525  DATA"THEN","GOTO","GOSUB","RESUME",
"ELSE","RESTORE"
530 DATA"STOP","LPRINT","PRINT#","PRINT",
"ABS","ASC","ATN","CDBL","CINT","COS",
"CSRLIN","CSNG","EOF"
535 DATA"ERL","ERROR","EXP","FIX","FRE",
"HIMEM","MEM","INSTR","LEN","LOG","LPOS",
"MAX","RAM","PEEK","USING"
540 DATA"LCOPY","POS","RND","SGN","SQR",
"TAB","VAL","VARPTR","CHR$","INKEY$",
"INPUT$","LEFT$","MID$"
545 DATA"RIGHT$","SPACE$","STR$","STRING$",
"CLEAR","LINE","INPUT#","WIDTH","DSKI$",
"DSKO$"
550 DATA"AND","MOTOR","XOR","EQV","IMP",
"NOT","FOR","NEXT","STEP","CALL","COM",
"ERR","KEY","MDM"
555 DATA"EDIT","LOC","SOUND","LOF","POKE",
"PRESET","PSET","CLOAD","CSAVEM","CLOSE",
"STOP","DEFDBL"
560 DATA"DEFINT","DEFSNG","DEFSTR","DIM",
"APPEND","IF","INPUT","LINE","CSAVE","INP",
"IPL","KILL"
565 DATA"LFILES","COPY","LET","LOAD",
"FILES","MENU","MERGE","NAME","AS","NEW",
"ONTIME$","OPEN"
570 DATA"OUTPUT","END","POWER","CONT",
"READ","RUNM","RUN","SAVEM","SAVE",
"SCREEN","TAN","TIME$ON"
575 DATA"TIME$OFF","TIME$STOP","TO","OR",
"OFF","INT","SIN","ON","OUT","RETURN","CLS",
"BEEP","MOD","XXX"
580 PRINT#2,"VARIABLE NAME ERROR IN
LINE "LN$;:RESUME432
```



TRSCHORD

Model 4 - Editor Assembler (EDAS)

by Lance Wolstrup

Some years ago, before I got hooked on computers and the TRS-80 in particular, I made my living by playing music. By profession I was a bass player (electric bass), but I also doubled on trumpet, trombone and fluegelhorn, and from time to time I would serve as the resident guitar player. Though I was not particularly good at it, the guitar was always my favorite instrument and I spent more time practicing on it than any of the others. But when I got out of music to join the businessworld, they were all put away and, for the most part, stayed out of sight for better than 15 years.

Now, a generation later, the guitar is again in vogue at my house. My two sons, one by one, found my old Fender in the garage and visions of becoming rock stars inspires them to practice long and loud (they also found my 200 watts per channel Fender Bassman amp - darn it!). Alan, my oldest, has played for a while and is now trying to get a band together. Steven is taking lessons from me - I guess that I must be cheaper than a real guitar teacher.

Like other kids his age (15), he likes heavy metal rock with the loud, screaming guitars. Though I am not crazy about this kind of music, I must admit that some of the guitar players are very good. Steven is frustrated that he cannot play the fast licks immediately. He is in a hurry, but I keep telling him that the secret is knowing and being able to play the chords. I think he believes me, because he is actually practicing what I tell him.

No question about it, knowing chords is the secret to improvisation on, not only guitar, but any string instrument as well as keyboards. Therefore, to help Steven learn and remember the different types of chords available, I fired up my Model 4 and began to write a program that would display 4 guitarnecks and the fingering for 4 inversions of the selected chord. I wrote the initial graphics routines in Basic, but gave up almost immediately — it was just too slow. I decided to write the entire program in assembler, so I got out EDAS from Misosys and started to code.

TRSCHORD/CMD begins by displaying two menus. The first asks the user to select a chord (C through B, including all sharps and flats), and the second prompts for the type of chord to display (major, minor, 7th, etc). If Esc (Shift-Up Arrow) is pressed at either of these prompts, the program will move back one step; that is, from the second menu prompt back to the first menu prompt, and from the first menu prompt back to DOS. Assuming that a chord is selected, TRSCHORD will display four different ways of playing it. The user is then prompted to press ENTER to return to the menus. That's all there is to it, but it has proved to be of great value to, not only Steven, but also myself. As I mentioned earlier, I haven't played seriously for many years, so naturally I had forgotten much. Having to do the research for this program brought back much, and now I have it all available on my TRS-80.

```
;trschord/asm
;for TRS-80 Model 4
;copyright 1995 by Lance Wolstrup
;all rights reserved
;
        ORG     3000H
START   LD      C,15            ;cursor off
        CALL    DSP
        LD      A,105           ;@cls
        RST     40
;
        CALL    NAME            ;display program name
START1  CALL    MENU            ;display menu choices
;
LMENU   LD      HL,0F14H        ;height=15,width=20
        LD      (WIDTH),HL      ;store values in buffer
        LD      HL,050CH        ;cursor @(5,12)
        LD      DE,BXDAT1       ;point to box
        CALL    BOX             ;display box
LMENU1  LD      HL,140FH        ;cursor@(20,15)
        CALL    LOCATE          ;position cursor
        LD      HL,ASKCRD       ;point to text
        LD      A,10            ;@dsply
        RST     40              ;display line of text
        LD      HL,141DH        ;cursor@(20,29)
        LD      C,2             ;max chrs allowed
        LD      DE,CHRBUF       ;point to chrbuf
        CALL    ASK             ;get keystrokes
        CP      27              ;is it esc
        JR      Z,EXIT          ;exit if yes
        CALL    FNDNUM          ;conv keystrokes to
                                ;number
        CP      13              ;is it = > 13
        JR      NC,LMENU1       ;if so - bad input
        LD      (SELECT),A      ;save chord in buffer
        LD      HL,050CH        ;vert=5,horiz=12
        LD      DE,BXDAT2       ;data to erase box
        CALL    BOX             ;erase box
;
RMENU   LD      HL,0C18H        ;height=12,width=24
```

```
        LD      (WIDTH),HL      ;store in buffer
        LD      HL,0526H        ;cursor@(5,38)
        LD      DE,BXDAT1       ;box data
        CALL    BOX             ;draw box
        LD      HL,1129H        ;cursor@(17,41)
        CALL    LOCATE          ;position cursor
        LD      HL,ASKTYP       ;point to text
        LD      A,10            ;@dsply
        RST     40              ;display line of text
        LD      HL,113CH        ;cursor@(17,60)
        LD      C,1             ;max=1 chr
        LD      DE,CHRBUF       ;point to receive buffer
        CALL    ASK             ;go get keystroke
        CP      27              ;is it escape
        JR      NZ,GETCRD       ;no - so continue
        LD      HL,113CH        ;cursor@(17,60)
        CALL    LOCATE          ;position cursor
        LD      C,46            ;chr is a period
        CALL    DSP             ;display it
        LD      HL,0526H        ;cursor@(5,38)
        LD      DE,BXDAT2       ;erase box data
        CALL    BOX             ;erase box
        JR      LMENU           ;go back to left menu
;
EXIT    LD      A,105           ;@cls
        RST     40              ;clear screen
        RET                     ;return to dos
;
GETCRD LD       HL,0400H        ;cursor@(4,0)
        CALL    LOCATE          ;position cursor
        LD      C,31            ;erase from cursor
        CALL    DSP             ;to end of display
        LD      A,(CHRBUF)      ;get number input
        SBC     A,30H           ;strip ascii
        LD      (SELECT+1),A    ;and store it
        LD      HL,CMAJ         ;point to first chord
        LD      IX,TYPLEN       ;point to chord length
        LD      A,(SELECT)      ;check if
        DEC     A               ;input is 1
        OR      A               ;is it?
        JR      Z,GETTYP        ;yes, so figure type
        LD      B,A             ;get loop counter
        LD      C,9             ;9 chord types
        XOR     A               ;a=0
CLOOP1 ADD      A,C             ;figure
        DJNZ    CLOOP1          ;the offset
        LD      B,A             ;use it as loop counter
CLOOP2 LD       D,0             ;DE will hold 8-bit
                                ;number
        LD      E,(IX)          ;get chord length
        ADD     HL,DE           ;and add it to offset
        INC     IX              ;get next length
        DJNZ    CLOOP2          ;and repeat
;
GETTYP LD       A,(SELECT+1)    ;get 2nd input
        DEC     A               ;check to see
        OR      A               ;if it is 1
        JR      Z,GTYP1         ;if so, jump
        LD      B,A             ;get loop counter
CLOOP3 LD       E,(IX)          ;get lsb
        LD      D,0             ;msb is always 0
        ADD     HL,DE           ;add to offset
        INC     IX              ;point to next type
        DJNZ    CLOOP3          ;and repeat
;
GTYP1  EX       DE,HL           ;xfer offset to DE
        PUSH    DE              ;and save it
;
        CALL    FRETS           ;go draw guitar necks
        POP     DE              ;restore offset
        CALL    DGIT            ;go draw chords
        LD      HL,0400H        ;cursor @(4,0)
        CALL    LOCATE          ;position cursor
        LD      C,31            ;erase to eod
        CALL    DSP             ;display it
        JP      START1          ;and start over
;
ASKCRD DB       'Select chord: ',14,3
ASKTYP DB       'Select chord type: ',14,3
;
NAME   LD       HL,0024H        ;cursor @(0,36)
        CALL    LOCATE          ;position cursor
        LD      HL,HEAD1        ;point to prog name
        LD      A,10            ;and display it
        RST     40
        LD      HL,0111H        ;cursor @(1,17)
        CALL    LOCATE          ;position cursor
        LD      HL,HEAD2        ;point to head2
        LD      A,10            ;and display it
        RST     40
        LD      HL,020BH        ;cursor @(2,11)
        CALL    LOCATE          ;position cursor
        LD      HL,HEAD3        ;point to head3
        LD      A,10            ;and display it
        RST     40
        LD      B,80            ;loop counter is 80
NAME1  LD       C,140           ;chr$(140)
        CALL    DSP             ;draw line across
        DJNZ    NAME1           ;entire screen
        RET
;
HEAD1  DB       'TrsChord',13
HEAD2  DB       'a simple guitar chord reference '
        DB      'for the TRS-80',13
HEAD3  DB       'Copyright (c) 1995 by Lance '
        DB      'Wolstrup - All rights reserved',13
;
MENU   LD       HL,0400H        ;cursor @(4,0)
        CALL    LOCATE          ;position cursor
        LD      C,31            ;erase to eod
        CALL    DSP             ;display it
        LD      DE,MMSG1        ;point to 1st menu
        LD      HL,0712H        ;cursor @(7,18)
        LD      B,12            ;12 menu items
        CALL    MDSP            ;go display 1st menu
        LD      HL,072BH        ;cursor @(7,43)
        LD      B,9             ;9 menu items
        CALL    MDSP            ;go display 2nd menu
        RET
;
MDSP   CALL     LOCATE          ;position cursor
MDSP1  LD       A,(DE)          ;get chr
        CP      3               ;is it terminator
        JR      NZ,MDSP2        ;no - jump
        INC     DE              ;yes - next menu item
        INC     H               ;and next vertical line
        DJNZ    MDSP            ;do it again
        RET
;
MDSP2  LD       C,A             ;copy chr to C
```

```
        CALL    DSP             ;and display it
        INC     DE              ;point to next chr
        JR      MDSP1           ;and do it again
;
MMSG1 DB      ' 1. C',3
        DB      ' 2. Db',3
        DB      ' 3. D',3
        DB      ' 4. Eb',3
        DB      ' 5. E',3
        DB      ' 6. F',3
        DB      ' 7. Gb',3
        DB      ' 8. G',3
        DB      ' 9. Ab',3
        DB      '10. A',3
        DB      '11. Bb',3
        DB      '12. B',3
MMSG2 DB      ' 1. Major',3
        DB      ' 2. Minor',3
        DB      ' 3. 6th',3
        DB      ' 4. Minor 6th',3
        DB      ' 5. 7th',3
        DB      ' 6. Minor 7th',3
        DB      ' 7. Major 7th',3
        DB      ' 8. 9th',3
        DB      ' 9. Minor 9th',3
;
DGIT    LD      HL,0605H        ;cursor @(6,5)
        CALL    LOCATE          ;position cursor
DG0     LD      A,(DE)          ;get chr in chord name
        INC     DE              ;point to next chr
        CP      13              ;is it terminator
        JR      Z,DG1           ;yes - jump
        LD      C,A             ;no - copy chr to C
        CALL    DSP             ;and display it
        JR      DG0             ;repeat
DG1     LD      B,4             ;4 guitars
        LD      HL,0A3EH        ;cursor @(10,62)
DGIT1   LD      A,(DE)          ;get guitar number
        CP      B               ;is it last guitar
        JR      Z,FRNUM         ;jump if yes
DGIT2   LD      A,L             ;get horiz cursor
                                ;position to A
        LD      C,19            ;19 pos to previous
        SBC     A,C             ;calculate new cursor
        LD      L,A             ;position - xfer to L
        DJNZ    DGIT1
;
FRNUM   INC     DE              ;get fret number
        PUSH    HL              ;save cursor pos
        LD      A,(DE)          ;number to A
        LD      C,A             ;xfer fret# to C
        LD      B,4             ;need to display 4 frets
FRNUM1  CALLLOCATE              ;position cursor
        PUSH    BC              ;save loop & fret#
        CALL    GETNUM          ;go convert number
                                ;to ascii
        LD      A,(NUMBUF)      ;get 10s digit in ascii
        LD      C,A             ;copy it to C
        CALL    DSP             ;and display it
        LD      A,(NUMBUF+1)    ;get 1s digit in ascii
        LD      C,A             ;copy it to C
        CALL    DSP             ;and display it
        POP     BC              ;restore loop & fret#
        INC     H               ;move cursor down
        INC     H               ;2 lines
        INC     C               ;increment fret#
        DJNZ    FRNUM1          ;repeat for 4 frets
        POP     HL              ;restore cursor pos
        LD      B,14            ;move cursor
FIND1   INC     L               ;horizontally to the
        DJNZ    FIND1           ;right 14 positions
        CALL    LOCATE          ;position cursor
        LD      (ST1BUF),HL     ;save cursor position
                                ;in buffer
FIND2   INC     DE              ;point to next data
        LD      A,(DE)          ;get data to A
        CP      255             ;is it terminator
        JR      Z,ENTER         ;yes - jump
        CP      254             ;is it next guitar
        JR      NZ,NXTFRT       ;no - jump
        INC     DE              ;point to next data
        JR      DG1             ;and go do it again
;
NXTFRT CP       253             ;is it next fret
        JR      NZ,FIND3        ;no - jump
        LD      HL,(ST1BUF)     ;get cursor position
        INC     H               ;move cursor
        INC     H               ;down 2 lines
        LD      (ST1BUF),HL     ;save new cursor pos
        JR      FIND2           ;and repeat
;
FIND3   CP      252             ;is it x
        JR      NZ,FIND4        ;no - jump
PUTX    LD      HL,(ST1BUF)     ;get cursor position
        LD      H,8             ;cursor to line 8
        INC     DE              ;next data
        LD      A,(DE)          ;xfer to A
        CP      255             ;is it guitar end
        JR      Z,ENTER         ;yes - jump
        CP      254             ;is it next guitar
        JR      NZ,X1           ;no - jump
        INC     DE              ;yes - so point to
                                ;next data
        JP      DG1             ;and repeat
;
X1      LD      B,A             ;data to loop counter
X2      DEC     L               ;move cusor 2 spaces
        DEC     L               ;to the left
        DJNZ    X2              ;repeat
        INC     L               ;move cursor 1 space
                                ;to the right
        CALL    LOCATE          ;and position cursor
        LD      C,120           ;display 'x'
        CALL    DSP
        JR      PUTX            ;and repeat
;
FIND4   LD      HL,(ST1BUF)     ;get cursor position
        LD      B,A             ;data to loop counter
FIND5   DEC     L               ;move cursor 2 spaces
        DEC     L               ;to the left
        DJNZ    FIND5           ;repeat
;
        CALL    LOCATE          ;position cursor
        LD      C,130           ;finger position is
        CALL    DSP             ;diplayed by using
        LD      C,151           ;chr(130) & chr(151)
        CALL    DSP
        JR      FIND2           ;and repeat
;
ENTER   LD      HL,141CH        ;cursor @(20,28)
```

```
        CALL    LOCATE          ;position cursor
        LD      HL,ENTMSG       ;point to message
        LD      A,10            ;and display it
        RST     40
ENT1    LD      A,1             ;get keystroke
        RST     40
        CP      13              ;is it enter
        JR      NZ,ENT1         ;no - jump
        LD      C,15            ;yes - turn off cursor
        CALL    DSP
        RET
;
ENTMSG  DB      'Press ENTER for menu ',14,03
;
GETNUM  LD      A,C             ;copy number to A
        CP      10              ;is it 10
        JR      NC,GETNM1       ;jump if smaller
        LD      A,32            ;store a space
        LD      (NUMBUF),A      ;in buffer
        LD      A,C             ;copy number to A
        ADD     A,30H           ;make it ascii
GETNM0  LD      (NUMBUF+1),A    ;and store it
        RET
;
GETNM1  LD      A,31H           ;ascii '1'
        LD      (NUMBUF),A      ;store in buffer
        LD      A,C             ;copy number to A
        SBC     A,10            ;find 1s digit
        ADD     A,30H           ;and make it ascii
        JR      GETNM0          ;go store it
;
FRETS   LD      HL,0905H        ;cursor @(9,5)
        LD      B,2             ;loop counter
FRETS1  PUSH    BC              ;save loop counter
        PUSH    HL              ;save cursor position
        LD      B,4             ;loop 4 guitars necks
FRETS2  PUSH    BC              ;save loop counter
        PUSH    HL              ;save cursor position
        CALL    LOCATE          ;position cursor
        CALL    FRETS3          ;go draw guitar necks
        POP     HL              ;restore cursor position
        LD      A,L             ;horizontal cursor
                                ;position to A
        LD      B,20            ;move cursor
        ADD     A,B             ;20 positions to
        LD      L,A             ;the right
        POP     BC              ;restore loop counter
        DJNZ    FRETS2          ;repeat
        POP     HL              ;restore cursor position
        POP     BC              ;restore loop counter
        DJNZ    FRETS1          ;repeat
        RET
;
FRETS3  LD      B,4             ;loop counter
FRETS4  PUSH    BC              ;save loop counter
        LD      B,5             ;new loop counter
FRETS5  LD      C,151           ;draw
        CALL    DSP             ;E,A,D,G,B
        LD      C,131           ;guitar
        CALL    DSP             ;strings
        DJNZ    FRETS5          ;in one fret
        LD      C,149           ;draw E string
        CALL    DSP
        INC     H               ;next fret
        CALL    LOCATE          ;position cursor
        LD      B,6             ;loop counter
FRETS6  LD      C,149           ;draw the
        CALL    DSP             ;2nd half
        LD      C,32            ;of the
        CALL    DSP             ;fret
        DJNZ    FRETS6
        POP     BC              ;restore loop counter
        INC     H               ;move cursor
        CALL    LOCATE          ;down one line
        DJNZ    FRETS4          ;and repeat
        RET
;
BOX     PUSH    DE
        PUSH    BC
        CALL    LOCATE          ;position cursor
        LD      A,(DE)          ;get top left chr
        LD      C,A             ;copy to C
        CALL    DSP             ;display it
        LD      A,(WIDTH)       ;get box width
        LD      B,A             ;xfer to B
        INC     DE              ;next chr
        LD      A,(DE)          ;get top chr
        LD      C,A             ;copy to C
BOX1    CALL    DSP             ;display chr
        DJNZ    BOX1            ;repeat top width
        INC     DE              ;point to next chr
        LD      A,(DE)          ;get top right chr
        LD      C,A             ;copy to C
        CALL    DSP             ;display it
        LD      A,(HEIGTH)      ;get vertical loop
        LD      B,A             ;xfer to B
        INC     DE              ;next chr
        LD      A,(DE)          ;get vertical left chr
        LD      C,A             ;copy to C
BOX2    INC     H               ;next vert cursor pos
        CALL    LOCATE          ;position cursor
        CALL    DSP             ;display chr
        DJNZ    BOX2            ;repeat for height
        INC     DE              ;point to next chr
        LD      A,(DE)          ;get bottom left chr
        LD      C,A             ;copy to C
        INC     H               ;next vert cursor pos
        CALL    LOCATE          position cursor
        CALL    DSP             ;display chr
        LD      A,(WIDTH)       ;get box width
        LD      B,A             ;xfer to B
        INC     DE              ;next chr
        LD      A,(DE)          ;get bottom chr
        LD      C,A             ;xfer to C
BOX3    INC     L               ;next cursor pos
        CALL    LOCATE          ;position cursor
        CALL    DSP             ;display chr
        DJNZ    BOX3            ;repeat for width
        INC     L               ;next cursor pos
        CALL    LOCATE          ;position cursor
        INC     DE              ;next chr
        LD      A,(DE)          ;get bottom right chr
        LD      C,A             ;xfer to C
        CALL    DSP             ;display chr
        LD      A,(HEIGTH)      ;get box heigth
        LD      B,A             ;xfer to B
        INC     DE              ;next chr
        LD      A,(DE)          ;get right chr
        LD      C,A             ;xfer to C
BOX4    DEC     H               ;dec vertical cursor pos
```

```
        CALL    LOCATE          ;position cursor
        CALL    DSP             ;display chr
        DJNZ    BOX4            ;repeat for heigth
        POP     BC
        POP     DE
        RET
;
BXDAT1 DB       151,131,171,149,181,176,186,170
BXDAT2 DB       32,32,32,32,32,32,32,32
WIDTH  DB       0
HEIGTH  DB      0
;
ASK     CALL    LOCATE          ;position cursor
        LD      B,0             ;chr count is 0
        PUSH    BC              ;save it
        LD      B,C             ;get max chr count
        LD      C,46            ;chr is period
DSPMAX  CALL DSP                ;display
        DJNZ    DSPMAX          ;periods
        POP     BC              ;restore chr count
ASK0    CALL    LOCATE          ;position cursor
        CALL    INKEY           ;get chr
        CP      27              ;is it esc?
        RET     Z               ;yes - return
        CP      13              ;no - is it enter?
        JR      NZ,ASK1         ;no - jump
        LD      A,B             ;chr count to a
        OR      A               ;is it 0
        RET     NZ              ;return if not 0
        JR      ASK0            ;must have input
ASK1    CP      8               ;is it backspace
        JR      NZ,ASK2         ;no-jump
        LD      A,B             ;get chr counter
        OR      A               ;is it 0
        JR      Z,ASK0          ;no backspace if 0 chrs
        DEC     L               ;previous cursor pos
        CALL    LOCATE          ;position cursor
        PUSH    BC              ;save chr count
        LD      C,46            ;replace chr with
        CALL    DSP             ;a period
        POP     BC              ;restore chr count
        DEC     B               ;sub from chr counter
        DEC     DE              ;dec chrbuf
        JR      ASK0            ;repeat
;
ASK2    PUSH    DE              ;save chrbuf
        LD      E,A             ;save chr in E
        LD      A,B             ;get chr count
        CP      C               ;have we reached max
        LD      A,E             ;chr back to A
        POP     DE              ;restore chrbuf
        JR      NC,ASK0         ;already at max
        CP      30H             ;is it 0
        JR      C,ASK0          ;jump if smaller
        CP      3AH             ;is 9+1
        JR      NC,ASK0         ;jump if = or >
        PUSH    BC              ;save chr count
                                ;& max count
        LD      C,A             ;xfer chr to C
        CALL    DSP             ;display it
        POP     BC              ;restore chr count
        INC     L               ;move cursor
        INC     B               ;bump chr count
        LD      (DE),A          ;store keystroke in
                                ;chrbuf
        INC     DE              ;point to next
                                ;address in chrbuf
        JR      ASK0            ;repeat
;
FNDNUM  LD      A,B             ;get number
                                ;of digits
        CP      1               ;is it 1?
        LD      B,0             ;assume 10s digit is 0
        LD      DE,CHRBUF       ;point to chrbuf
        JR      Z,FNUM1         ;jump if only
                                ;1 keystroke
        LD      A,(DE)          ;get chr input
        SBC     A,30H           ;and strip ascii
        ADD     A,A             ;multiply by 2
        LD      B,A             ;save result
        ADD     A,A             ; now multiplied 4x
        ADD     A,A             ;now multiplied 8x
        ADD     A,B             ;now 10x
        LD      B,A             ;copy to B
        INC     DE              ;point to next input
FNUM1   LD      A,(DE)          ;get 1s digit
        SBC     A,30H           ;strip ascii
        ADD     A,B             ;and add 10s
        RET
;
INKEY   PUSH    DE
        LD      A,1             ;@key - get keystroke
        RST     40              ;get chr
        POP     DE
        RET
;
DSP     PUSH    DE
        LD      A,2             ;@dsp - display chr
        RST     40
        POP     DE
        RET
;
LOCATE  PUSH BC
        PUSH    DE
        PUSH    HL
        LD      A,15            ;@vdctl
        LD      B,3             ;position cursor
        RST     40
        POP     HL
        POP     DE
        POP     BC
        RET
;
CMAJ    DB      'C',13
        DB      1,1,2,253,4,253,5,254
        DB      2,3,1,2,3,4,5,6,253,253,2,3,4,254
        DB      3,5,2,3,4,253,253,5,253,6,252,1,254
        DB      4,8,1,2,3,4,5,6,253,3,253,4,5,255
;
CMIN    DB      'Cm',13
        DB      1,3,1,2,3,4,5,6,253,2,253,3,4,254
        DB      2,8,1,2,3,4,5,6,253,253,4,5,254
        DB      3,3,5,253,2,253,3,4,252,1,6,254
        DB      4,5,3,4,253,5,253,253,6,252,1,2,255
;
C6      DB      'C6',13
        DB      1,1,2,253,3,4,253,5,254
        DB      2,2,3,253,5,253,253,2,4,254
        DB      3,8,1,2,3,4,5,6,253,3,253,2,5,254
        DB      4,9,3,253,2,4,5,252,1,6,255
```

```
;
CMIN6 DB      'Cm6',13
      DB      1,1,2,4,253,3,253,6,252,5,254
      DB      2,4,2,253,3,4,6,252,5,254
      DB      3,7,4,253,2,3,6,252,5,254
      DB      4,10,2,4,253,6,253,3,252,5,255
;
C7    DB      'C7',13
      DB      1,1,2,253,4,253,3,5,254
      DB      2,5,2,3,4,253,1,252,5,6,254
      DB      3,5,2,3,4,253,6,252,5,254
      DB      4,8,1,2,3,4,5,6,253,3,253,5,255
;
CMIN7 DB      'Cm7',13
      DB      1,1,1,2,3,4,253,253,1,3,252,5,6,254
      DB      2,3,1,3,5,253,2,252,4,6,254
      DB      3,5,3,253,5,253,253,2,4,252,1,6,254
      DB      4,8,1,2,3,4,5,6,253,253,5,255
;
CMAJ7 DB      'Cmaj7',13
      DB      1,1,253,4,253,5,254
      DB      2,3,1,2,3,4,5,253,3,253,2,4,254
      DB      3,5,2,3,4,253,253,1,252,5,6,254
      DB      4,7,1,253,2,253,3,253,4,252,5,6,255
;
C9    DB      'C9',13
      DB      1,2,4,253,1,2,3,5,6,254
      DB      2,5,2,3,4,253,6,253,3,252,5,254
      DB      3,7,3,5,253,2,4,254
      DB      4,9,3,253,1,5,253,2,252,4,255
;
CMIN9 DB      'Cm9',13
      DB      1,1,4,253,253,1,2,3,5,6,254
      DB      2,4,2,253,4,253,1,253,3,252,5,254
      DB      3,6,1,2,3,4,5,6,253,3,253,2,4,254
      DB      4,8,2,3,4,253,253,6,252,5,255
;
DBMAJ DB      'Db',13
      DB      1,1,1,2,3,253,2,253,4,254
      DB      2,4,1,253,2,3,4,254
      DB      3,6,2,3,4,253,253,5,253,6,254
      DB      4,9,1,2,3,4,5,6,253,3,253,4,5,255
;
DBMIN DB      'Dbm',13
      DB      1,1,3,253,2,4,253,253,1,254
      DB      2,4,1,2,3,4,5,6,253,2,253,3,4,254
      DB      3,6,3,4,253,5,253,253,6,254
      DB      4,9,1,2,3,4,5,6,253,253,4,5,255
;
DB6   DB      'Db6',13
      DB      1,1,1,3,5,253,2,252,4,254
      DB      2,2,2,253,3,4,253,1,254
      DB      3,6,1,2,3,4,254
      DB      4,9,1,2,3,4,5,6,253,3,253,2,5,255
;
DBMIN6        DB      'Dbm6',13
      DB      1,1,3,5,253,2,4,254
      DB      2,3,3,253,1,5,253,2,252,4,254
      DB      3,5,2,253,3,4,6,252,5,254
      DB      4,8,4,253,2,3,6,252,5,255
;
DB7   DB      'Db7',13
      DB      1,1,3,253,2,5,253,4,254
      DB      2,4,3,4,5,253,253,2,4,254
      DB      3,6,2,3,4,253,6,252,5,254
      DB      4,9,1,2,3,4,5,6,253,3,253,5,255
;
DBMIN7 DB     'Dbm7',13
      DB      1,1,3,253,2,4,5,254
      DB      2,2,2,3,4,253,253,3,6,252,5,254
      DB      3,5,2,253,3,4,253,6,252,5,254
      DB      4,9,1,2,3,4,5,6,253,253,5,255
;
DBMAJ7 DB     'Dbmaj7',13
      DB      1,1,1,2,3,253,253,4,253,5,254
      DB      2,4,1,2,3,4,5,253,3,253,2,4,254
      DB      3,6,2,3,4,253,253,6,252,5,254
      DB      4,8,1,253,2,253,3,253,4,255
;
DB9   DB      'Db9',13
      DB      1,3,4,253,1,2,3,6,252,5,254
      DB      2,6,2,3,4,253,6,253,3,252,5,254
      DB      3,6,2,253,253,3,253,4,6,252,5,254
      DB      4,8,3,5,253,2,4,255
;
DBMIN9 DB     'Dbm9',13
      DB      1,1,3,4,253,2,5,254
      DB      2,2,4,253,253,2,3,5,254
      DB      3,4,2,3,253,253,4,253,5,254
      DB      4,9,2,3,4,253,253,6,252,5,255
;
DMAJ  DB      'D',13
      DB      1,2,1,3,253,2,254
      DB      2,2,3,253,2,253,4,253,5,254
      DB      3,7,2,3,4,253,253,5,253,6,254
      DB      4,10,1,2,3,4,5,6,253,3,253,4,5,255
;
DMIN  DB      'Dm',13
      DB      1,1,1,253,3,253,2,4,254
      DB      2,2,3,253,2,4,253,253,5,254
      DB      3,5,1,2,3,4,5,6,253,2,253,3,4,254
      DB      4,10,1,2,3,4,5,6,253,253,4,5,255
;
D6    DB      'D6',13
      DB      1,3,2,253,3,4,253,1,254
      DB      2,2,3,4,5,253,2,253,4,254
      DB      3,7,2,3,4,6,252,5,254
      DB      4,10,1,2,3,4,5,6,253,3,253,2,5,255
;
DMIN6 DB      'Dm6',13
      DB      1,2,3,5,253,2,4,254
      DB      2,3,2,3,4,253,3,253,6,252,5,254
      DB      3,7,4,253,2,3,6,252,5,254
      DB      4,10,3,253,253,2,4,5,255
;
D7    DB      'D7',13
      DB      1,1,2,253,1,3,254
      DB      2,3,2,253,4,253,3,5,254
      DB      3,7,2,3,4,253,6,252,5,254
      DB      4,10,1,2,3,4,5,6,253,3,253,5,255
;
DMIN7 DB      'Dm7',13
      DB      1,2,3,253,2,4,5,254
      DB      2,3,2,3,4,253,1,3,254
      DB      3,5,1,3,5,253,2,252,4,254
      DB      4,10,1,2,3,4,5,6,253,253,5,255
;
DMAJ7 DB      'Dmaj7',13
      DB      1,2,1,2,3,253,253,4,253,5,254
      DB      2,5,1,2,3,4,5,6,253,3,253,2,4,254
```

```
        DB      3,7,2,3,4,253,253,6,252,5,254
        DB      4,9,253,1,253,2,253,3,253,4,255
;
D9      DB      'D9',13
        DB      1,1,2,253,3,4,6,252,5,254
        DB      2,4,4,253,1,2,3,6,252,5,254
        DB      3,7,2,3,4,253,6,253,3,252,5,254
        DB      4,9,3,5,253,2,4,255
;
DMIN9   DB      'Dm9',13
        DB      1,1,2,6,253,3,4,252,5,254
        DB      2,3,4,253,253,2,3,5,254
        DB      3,5,2,3,253,253,4,253,5,254
        DB      4,10,2,3,4,253,253,6,252,5,255
;
EBMAJ   DB      'Eb',13
        DB      1,3,2,253,2,253,4,253,5,254
        DB      2,6,1,2,3,4,5,6,253,253,2,3,4,254
        DB      3,8,2,3,4,253,253,5,253,6,254
        DB      4,11,1,2,3,4,5,6,253,3,253,4,5,255
;
EBMIN   DB      'Ebm',13
        DB      1,2,1,253,3,253,2,4,254
        DB      2,3,3,253,2,4,253,253,5,254
        DB      3,6,1,2,3,4,5,6,253,2,253,3,4,254
        DB      4,11,1,2,3,4,5,6,253,253,4,5,255
;
EB6     DB      'Eb6',13
        DB      1,1,2,3,4,253,253,3,6,252,5,254
        DB      2,4,2,253,3,4,253,6,252,5,254
        DB      3,8,2,3,4,6,252,5,254
        DB      4,10,4,253,2,6,253,3,255
;
EBMIN6  DB      'Ebm6',13
        DB      1,1,2,3,4,253,6,253,3,252,5,254
        DB      2,3,3,5,253,2,4,254
        DB      3,4,2,3,4,253,3,253,6,252,5,254
        DB      4,10,4,253,2,3,6,252,5,255
;
EB7     DB      'Eb7',13
        DB      1,1,4,253,2,253,3,6,252,5,254
        DB      2,4,2,253,4,253,3,5,254
        DB      3,8,2,3,4,253,6,252,5,254
        DB      4,11,1,2,3,4,5,6,253,3,253,5,255
;
EBMIN7  DB      'Ebm7',13
        DB      1,1,4,253,2,6,253,3,252,5,254
        DB      2,4,2,3,4,253,253,3,6,252,5,254
        DB      3,6,3,4,5,253,2,253,4,254
        DB      4,11,1,2,3,4,5,6,253,253,5,255
;
EBMAJ7  DB      'Ebmaj7',13
        DB      1,3,1,2,3,253,253,4,253,5,254
        DB      2,6,1,2,3,4,5,6,253,3,253,2,4,254
        DB      3,8,2,3,4,253,253,5,6,254
        DB      4,11,2,3,6,253,4,252,5,255
;
EB9     DB      'Eb9',13
        DB      1,2,1,253,2,253,3,253,4,254
        DB      2,3,2,6,253,3,4,252,5,254
        DB      3,5,4,253,253,2,3,6,252,5,254
        DB      4,7,2,3,253,253,4,253,5,255
;
EBMIN9  DB      'Ebm9',13
        DB      1,1,1,253,2,253,3,253,4,254
        DB      2,2,2,6,253,3,4,252,5,254
        DB      3,4,4,253,253,2,3,5,254
        DB      4,6,2,3,253,253,4,253,5,255
;
EMAJ    DB      'E',13
        DB      1,1,3,253,4,5,254
        DB      2,4,3,253,2,253,4,253,5,254
        DB      3,7,1,2,3,4,5,6,253,253,2,3,4,254
        DB      4,9,2,3,4,253,253,5,253,6,255
;
EMIN    DB      'Em',13
        DB      1,1,253,4,5,254
        DB      2,3,1,253,3,253,2,4,254
        DB      3,4,3,253,2,4,253,253,5,254
        DB      4,7,1,2,3,4,5,6,253,2,253,3,4,255
;
E6      DB      'E6',13
        DB      1,1,3,253,2,4,5,254
        DB      2,2,2,3,4,253,253,3,6,252,5,254
        DB      3,5,2,253,3,4,253,6,252,5,254
        DB      4,9,1,2,3,4,255
;
EMIN6   DB      'Em6',13
        DB      1,1,253,2,4,5,254
        DB      2,2,2,3,4,253,6,253,3,254
        DB      3,4,3,5,253,2,4,254
        DB      4,5,2,3,4,253,3,253,6,252,5,255
;
E7      DB      'E7',13
        DB      1,1,3,253,5,254
        DB      2,2,4,253,2,253,3,6,252,5,254
        DB      3,5,2,253,4,253,3,5,254
        DB      4,9,2,3,4,253,6,252,5,255
;
EMIN7   DB      'Em7',13
        DB      1,1,253,4,5,253,2,254
        DB      2,4,3,253,2,4,5,254
        DB      3,5,2,3,4,253,253,3,6,252,5,254
        DB      4,7,3,4,5,253,2,253,4,255
;
EMAJ7   DB      'Emaj7',13
        DB      1,1,3,4,254
        DB      2,2,4,253,253,2,3,6,252,5,254
        DB      3,4,2,3,253,253,4,253,5,254
        DB      4,7,1,2,3,4,5,6,253,3,253,2,4,255
;
E9      DB      'E9',13
        DB      1,1,3,253,1,5,253,2,252,4,254
        DB      2,3,2,253,3,4,6,252,5,254
        DB      3,6,4,253,1,2,3,6,252,5,254
        DB      4,9,2,3,4,253,6,253,3,252,5,255
;
EMIN9   DB      'Em9',13
        DB      1,2,1,253,2,253,3,253,4,254
        DB      2,3,2,6,253,3,4,252,5,254
        DB      3,5,4,253,253,2,3,5,254
        DB      4,7,2,3,253,253,4,253,5,255
;
FMAJ    DB      'F',13
        DB      1,1,1,2,3,4,5,6,253,3,253,4,5,254
        DB      2,5,3,253,2,253,4,253,5,254
        DB      3,8,1,2,3,4,5,6,253,253,2,3,4,254
        DB      4,10,2,3,4,253,253,5,253,6,255
;
FMIN    DB      'Fm',13
```

```
        DB      1,1,1,2,3,4,5,6,253,253,4,5,254
        DB      2,4,1,253,3,253,2,4,254
        DB      3,5,3,253,2,4,253,253,5,254
        DB      4,8,1,2,3,4,5,6,253,2,253,3,4,255
;
F6      DB      'F6',13
        DB      1,1,1,2,3,4,5,6,253,2,3,253,2,5,254
        DB      2,3,2,3,4,253,253,3,6,252,5,254
        DB      3,2,3,253,2,4,5,254
        DB      4,6,2,253,3,4,253,6,252,5,255
;
FMIN6   DB      'Fm6',13
        DB      1,1,4,253,253,2,3,5,254
        DB      2,3,2,3,4,253,6,253,3,252,5,254
        DB      3,6,2,3,4,253,3,253,6,252,5,254
        DB      4,5,3,5,253,2,4,255
;
F7      DB      'F7',13
        DB      1,1,1,2,3,4,5,6,253,3,253,5,254
        DB      2,3,4,253,2,4,253,4,252,5,254
        DB      3,6,2,253,4,253,3,5,254
        DB      4,10,2,3,4,253,6,252,5,255
;
FMIN7   DB      'Fm7',13
        DB      1,1,1,2,3,4,5,6,253,253,5,254
        DB      2,3,4,253,2,6,253,3,252,5,254
        DB      3,6,2,3,4,253,253,3,6,252,5,254
        DB      4,9,2,253,3,4,253,6,252,5,255
;
FMAJ7   DB      'Fmaj7',13
        DB      1,1,2,253,3,253,4,254
        DB      2,5,1,2,3,253,4,253,5,254
        DB      3,8,1,2,3,4,5,6,253,3,253,2,4,254
        DB      4,10,2,3,4,253,253,6,252,5,255
;
F9      DB      'F9',13
        DB      1,2,3,253,1,5,253,2,252,5,254
        DB      2,1,2,3,4,253,3,253,6,252,5,254
        DB      3,4,2,253,1,3,4,254
        DB      4,7,4,253,1,2,3,253,6,252,5,255
;
FMIN9   DB      'Fm9',13
        DB      1,3,1,253,2,253,3,253,4,254
        DB      2,8,1,2,3,253,253,4,253,5,254
        DB      3,4,2,6,253,3,4,252,5,254
        DB      4,6,4,253,253,2,3,6,252,5,255
;
GBMAJ   DB      'Db',13
        DB      1,2,1,2,3,4,5,6,253,3,253,4,5,254
        DB      2,6,3,253,2,253,4,253,5,254
        DB      3,9,1,2,3,4,5,6,253,253,2,3,4,254
        DB      4,4,4,253,253,3,6,253,2,252,5,255
;
GBMIN   DB      'Gbm',13
        DB      1,2,1,2,3,4,5,6,253,253,4,5,254
        DB      2,5,1,253,3,253,2,4,254
        DB      3,9,1,2,3,4,5,6,253,2,253,3,4,254
        DB      4,6,3,253,2,4,253,253,5,255
;
GB6     DB      'Gb6',13
        DB      1,2,1,2,3,4,5,6,253,3,253,2,5,254
        DB      2,4,2,3,4,253,253,3,6,252,5,254
        DB      3,7,2,253,3,4,253,6,252,5,254
        DB      4,11,2,3,4,6,252,5,255
;
```



```
GBMIN6  DB      'Gbm6',13
        DB      1,4,2,3,4,253,1,253,3,254
        DB      2,2,3,253,253,2,4,5,254
        DB      3,6,3,5,253,2,4,254
        DB      4,1,4,253,2,3,6,252,5,255
;
GB7     DB      'Gb7',13
        DB      1,2,1,2,3,4,5,6,253,3,253,5,254
        DB      2,7,2,253,4,253,3,5,254
        DB      3,11,2,3,4,253,6,252,5,254
        DB      4,6,3,253,2,5,253,4,255
;
GBMIN7  DB      'Gbm7',13
        DB      1,2,1,2,3,4,5,6,253,253,5,254
        DB      2,6,3,253,2,4,5,254
        DB      3,7,2,3,4,253,253,3,6,252,5,254
        DB      4,4,4,253,2,6,253,3,255
;
GBMAJ7  DB      'Gbmaj7',13
        DB      1,1,1,253,2,253,3,253,4,254
        DB      2,2,2,6,253,3,4,252,5,254
        DB      3,6,1,2,3,253,253,4,253,5,254
        DB      4,9,1,2,3,4,5,6,253,3,253,2,4,255
;
GB9     DB      'Gb9',13
        DB      1,1,3,5,253,1,2,4,254
        DB      2,3,3,253,1,5,253,2,252,4,254
        DB      3,5,2,253,3,4,6,252,5,254
        DB      4,8,3,253,1,2,3,6,252,5,255
;
GBMIN9  DB      'Gbm9',13
        DB      1,4,1,253,2,253,3,253,4,254
        DB      2,2,3,253,253,1,5,253,2,252,4,254
        DB      3,7,4,253,253,2,3,6,252,5,254
        DB      4,9,2,3,253,253,4,253,5,255
;
GMAJ    DB      'G',13
        DB      1,2,5,253,1,6,254
        DB      2,3,1,2,3,4,5,6,253,3,253,4,5,254
        DB      3,7,3,253,2,253,4,253,5,254
        DB      4,10,1,2,3,4,5,6,253,253,2,3,4,255
;
GMIN    DB      'Gm',13
        DB      1,3,1,2,3,4,5,6,253,253,4,5,254
        DB      2,6,1,253,3,253,2,4,254
        DB      3,10,1,2,3,4,5,6,253,2,253,3,4,254
        DB      4,5,4,253,6,253,3,253,2,252,5,255
;
G6      DB      'G6',13
        DB      1,3,1,2,3,4,5,6,253,3,253,2,5,254
        DB      2,5,2,3,4,253,253,1,3,254
        DB      3,4,3,253,2,4,5,254
        DB      4,7,3,4,5,253,2,253,4,255
;
GMIN6   DB      'Gm6',13
        DB      1,3,3,253,253,2,4,5,254
        DB      2,7,3,5,253,2,4,254
        DB      3,2,3,253,2,3,6,252,5,254
        DB      4,8,2,3,4,253,3,253,6,255
;
G7      DB      'G7',13
        DB      1,1,1,253,5,253,6,254
        DB      2,3,1,2,3,4,5,6,253,3,253,5,254
        DB      3,8,2,253,4,253,3,5,254
        DB      4,5,4,253,2,253,3,6,252,5,255
```

```
;
GMIN7   DB      'Gm7',13
        DB      1,3,1,2,3,4,5,6,253,253,5,254
        DB      2,5,4,253,2,6,253,3,252,5,254
        DB      3,8,2,3,4,253,253,3,6,252,5,254
        DB      4,10,1,2,3,4,5,6,253,2,253,4,255
;
GMAJ7   DB      'Gmaj7',13
        DB      1,2,1,253,2,253,3,253,4,254
        DB      2,3,2,6,253,3,4,252,5,254
        DB      3,5,4,253,253,2,3,6,252,5,254
        DB      4,7,1,2,3,253,4,253,5,255
;
G9      DB      'G9',13
        DB      1,2,3,5,253,2,4,254
        DB      2,3,2,3,4,253,3,253,6,252,5,254
        DB      3,6,2,253,3,4,6,252,5,254
        DB      4,9,4,253,2,3,6,252,5,255
;
GMIN9   DB      'Gm9',13
        DB      1,1,5,253,3,253,2,4,254
        DB      2,5,1,253,2,253,3,253,4,254
        DB      3,6,2,6,253,3,4,252,5,254
        DB      4,8,4,253,253,2,3,6,252,5,255
;
ABMAJ   DB      'Ab',13
        DB      1,4,1,2,3,4,5,6,253,3,253,4,5,254
        DB      2,1,2,3,4,253,253,5,253,6,254
        DB      3,8,3,253,2,253,4,253,5,254
        DB      4,6,4,253,253,3,5,253,2,252,5,255
;
ABMIN   DB      'Abm',13
        DB      1,4,1,2,3,4,5,6,253,253,4,5,254
        DB      2,7,1,253,3,253,2,4,254
        DB      3,8,3,253,2,4,253,253,5,254
        DB      4,1,2,3,4,5,6,253,2,253,3,4,255
;
AB6     DB      'Ab6',13
        DB      1,5,3,253,2,4,5,254
        DB      2,3,4,253,2,6,253,3,252,5,254
        DB      3,6,2,3,4,253,253,3,6,252,5,254
        DB      4,9,2,253,3,4,253,6,252,5,255
;
ABMIN6  DB      'Abm6',13
        DB      1,3,4,253,2,3,6,252,5,254
        DB      2,4,3,253,253,2,3,6,252,5,254
        DB      3,8,3,5,253,2,4,254
        DB      4,9,2,3,4,253,3,253,6,252,5,255
;
AB7     DB      'Ab7',13
        DB      1,1,2,3,4,253,6,252,5,254
        DB      2,4,1,2,3,4,5,6,253,3,253,5,254
        DB      3,8,3,253,2,5,253,4,254
        DB      4,9,253,4,253,3,5,255
;
ABMIN7  DB      'Abm7',13
        DB      1,4,1,2,3,4,5,6,253,253,5,254
        DB      2,6,4,253,2,6,253,3,252,5,254
        DB      3,9,2,3,4,253,253,3,6,252,5,254
        DB      4,8,3,253,2,4,5,255
;
ABMAJ7  DB      'Abmaj7',13
        DB      1,3,1,253,2,253,3,253,4,254
        DB      2,1,2,3,4,253,253,6,252,5,254
        DB      3,4,2,6,253,3,4,252,5,254
        DB      4,8,1,2,3,253,253,4,253,5,255
;
AB9     DB      'Ab9',13
        DB      1,3,3,5,253,2,4,254
        DB      2,1,2,3,4,253,6,253,3,252,5,254
        DB      3,7,2,253,3,4,6,252,5,254
        DB      4,10,4,253,2,3,6,252,5,255
;
ABMIN9  DB      'Abm9',13
        DB      1,6,1,253,2,253,3,253,4,254
        DB      2,7,2,6,253,3,4,252,5,254
        DB      3,9,4,253,253,2,3,6,252,5,254
        DB      4,2,5,253,3,253,2,4,255
;
AMAJ    DB      'A',13
        DB      1,2,2,3,4,253,253,5,253,6,254
        DB      2,5,1,2,3,4,5,6,253,3,253,4,5,254
        DB      3,9,3,253,2,253,4,253,5,254
        DB      4,7,4,253,253,3,6,253,2,252,5,255
;
AMIN    DB      'Am',13
        DB      1,1,2,253,3,4,254
        DB      2,5,1,2,3,4,5,6,253,253,4,5,254
        DB      3,8,1,253,3,253,2,4,254
        DB      4,7,4,253,6,253,3,253,2,252,5,255
;
A6      DB      'A6',13
        DB      1,4,4,253,2,6,253,3,252,5,254
        DB      2,6,3,253,2,4,5,254
        DB      3,7,2,3,4,253,253,3,6,252,5,254
        DB      4,10,2,253,3,4,253,6,252,5,255
;
AMIN6   DB      'Am6',13
        DB      1,1,2,253,1,3,4,254
        DB      2,5,3,253,253,2,4,5,254
        DB      3,9,3,5,253,2,4,254
        DB      4,4,4,253,2,3,6,252,5,255
;
A7      DB      'A7',13
        DB      1,2,2,3,4,253,6,254
        DB      2,5,1,2,3,4,5,6,253,3,253,5,254
        DB      3,10,2,253,4,253,3,5,254
        DB      4,7,4,253,2,253,3,6,252,5,255
;
AMIN7   DB      'Am7',13
        DB      1,1,2,253,4,254
        DB      2,5,1,2,3,4,5,6,253,253,5,254
        DB      3,9,3,253,2,4,5,254
        DB      4,10,2,3,4,253,253,3,6,252,5,255
;
AMAJ7   DB      'Amaj7',13
        DB      1,1,3,253,2,4,254
        DB      2,2,2,3,4,253,253,6,252,5,254
        DB      3,4,1,253,2,253,3,253,4,254
        DB      4,7,4,253,253,2,3,6,252,5,255
;
A9      DB      'A9',13
        DB      1,2,2,3,4,253,6,253,3,252,5,254
        DB      2,4,3,5,253,2,4,254
        DB      3,8,2,253,3,4,6,252,5,254
        DB      4,11,4,253,2,3,6,252,5,255
;
AMIN9   DB      'Am9',13
        DB      1,3,5,253,3,253,2,4,254
        DB      2,5,3,253,253,1,5,253,2,252,4,254
```

```
        DB      3,8,2,6,253,3,4,252,5,254
        DB      4,10,4,253,253,2,3,6,252,5,255
;
BBMAJ DB        'Bb',13
        DB      1,1,1,2,3,4,5,6,253,253,2,3,4,254
        DB      2,3,2,3,4,253,253,5,253,6,254
        DB      3,6,1,2,3,4,5,6,253,3,253,4,5,254
        DB      4,10,3,253,2,253,4,253,5,255
BBMIN DB        'Bbm',13
        DB      1,1,1,2,3,4,5,6,1,253,2,253,3,4,254
        DB      2,6,1,2,3,4,5,6,253,253,4,5,254
        DB      3,9,1,253,3,253,2,4,254
        DB      4,8,4,253,6,253,3,253,2,252,5,255
;
BB6     DB      'Bb6',13
        DB      1,3,2,3,4,6,252,5,254
        DB      2,5,4,253,2,6,253,3,252,5,254
        DB      3,8,2,3,4,253,253,3,6,252,5,254
        DB      4,7,3,253,2,4,5,255
;
BBMIN6 DB       'Bbm6',13
        DB      1,2,2,253,3,4,6,252,5,254
        DB      2,5,4,253,2,3,6,252,5,254
        DB      3,8,2,3,4,253,6,253,3,252,5,254
        DB      4,10,3,5,253,2,4,255
;
BB7     DB      'Bb7',13
        DB      1,1,1,2,3,4,5,6,253,2,4,254
        DB      2,3,2,3,4,253,6,252,5,254
        DB      3,6,1,2,3,4,5,6,253,3,253,5,254
        DB      4,8,4,253,2,253,3,6,252,5,255
;
BBMIN7 DB       'Bbm7',13
        DB      1,1,3,4,5,253,2,253,4,254
        DB      2,6,1,2,3,4,5,6,253,253,5,254
        DB      3,10,3,253,2,4,5,254
        DB      4,11,2,3,4,253,253,3,6,252,5,255
;
BBMAJ7 DB       'Bbmaj7',13
        DB      1,1,1,2,3,4,5,253,3,253,2,4,254
        DB      2,3,2,3,4,253,253,6,252,5,254
        DB      3,5,1,253,2,253,3,253,4,253,254
        DB      4,6,2,6,253,3,4,252,5,255
;
BB9     DB      'Bb9',13
        DB      1,1,1,2,3,5,254
        DB      2,3,2,3,4,253,6,253,3,252,5,254
        DB      3,5,3,5,253,2,4,254
        DB      4,7,3,253,1,5,253,2,252,4,255
;
BBMIN9 DB       'Bbm9',13
        DB      1,1,1,2,5,253,3,254
        DB      2,2,3,253,2,4,5,254
        DB      3,5,3,4,5,253,2,253,4,254
        DB      4,3,2,3,4,253,3,6,252,5,255
;
BMAJ    DB      'B',13
        DB      1,2,1,2,3,4,5,6,253,253,2,3,4,254
        DB      2,4,2,3,4,253,253,5,253,6,254
        DB      3,7,1,2,3,4,5,6,253,3,253,4,5,254
        DB      4,11,3,253,2,253,4,253,5,255
;
BMIN    DB      'Bm',13
        DB      1,2,1,2,3,4,5,6,253,2,253,3,4,254
        DB      2,7,1,2,3,4,5,6,253,253,4,5,254
        DB      3,10,1,253,3,253,2,4,254
        DB      4,9,4,253,6,253,3,253,2,252,5,255
;
B6      DB      'B6',13
        DB      1,4,2,3,4,6,252,5,254
        DB      2,6,4,253,2,6,253,3,252,5,254
        DB      3,7,6,253,3,253,2,5,252,4,254
        DB      4,9,2,3,4,253,253,3,6,252,5,255
;
BMIN6 DB        'Bm6',13
        DB      1,3,2,253,3,4,6,252,5,254
        DB      2,6,4,253,2,3,6,252,5,254
        DB      3,9,2,3,4,253,6,253,3,252,5,254
        DB      4,11,3,5,253,2,4,255
;
B7      DB      'B7',13
        DB      1,1,4,253,1,3,5,254
        DB      2,2,1,2,3,4,5,253,253,2,4,254
        DB      3,4,2,3,4,253,6,252,5,254
        DB      4,7,1,2,3,4,5,6,253,3,253,5,255
;
BMIN7 DB        'Bm7',13
        DB      1,2,1,3,5,254
        DB      2,3,2,253,3,4,253,6,252,5,254
        DB      3,7,1,2,3,4,5,6,253,253,5,254
        DB      4,11,3,253,2,4,5,255
;
BMAJ7 DB        'Bmaj7',13
        DB      1,2,1,2,3,4,5,253,3,253,2,4,254
        DB      2,4,2,3,4,253,253,6,252,5,254
        DB      3,6,1,253,2,253,3,253,4,254
        DB      4,9,4,253,253,2,3,6,252,5,255
;
B9      DB      'B9',13
        DB      1,1,4,253,1,2,3,6,252,5,254
        DB      2,4,2,3,4,253,6,253,3,252,5,254
        DB      3,6,3,5,253,2,4,254
        DB      4,8,3,253,1,5,253,2,252,4,255
;
BMIN9 DB        'Bm9',13
        DB      1,2,1,2,3,253,253,4,253,5,254
        DB      2,5,5,253,3,253,2,4,254
        DB      3,7,3,253,253,1,5,253,2,252,4,254
        DB      4,10,2,6,253,3,4,252,5,255
;
TYPLEN DB       51,55,47,46,46,54,51,44,52  ;C-Cm9
        DB      46,51,44,44,46,48,52,47,43  ;Db-Dbm9
        DB      44,49,45,43,42,43,53,44,44  ;D-Dm9
        DB      52,50,45,47,47,50,52,45,44  ;Eb-Ebm9
        DB      44,42,41,41,39,42,46,47,43  ;E-Em9
        DB      51,49,49,45,46,50,49,46,46  ;F-Fm9
        DB      53,50,50,42,45,46,52,45,48  ;Gb-Gbm9
        DB      47,51,45,41,44,52,47,43,44  ;G-gm9
        DB      50,49,46,46,44,48,49,44,45  ;Ab-Abm9
        DB      49,44,45,39,44,42,45,43,46  ;A-Am9
        DB      52,53,44,45,50,47,52,42,42  ;Bb-Bbm9
        DB      51,51,46,44,46,41,51,45,46  ;B-Bm9
;
NUMBUF DB       0,0
ST1BUF  DB      0,0
CHRBUF DB       0,0,13
SELECT DB       0,0
;
        END     START
```

BEAT THE GAME

By Daniel Myers

Sorcerer
An Infocom Adventure

Well, you took care of Krill and returned to the Guild Hall in triumph, but things don't look good for you at the moment. Not when you're standing there facing the slavering jaws of a vicious hellhound! Fortunately for you, this time, it's only a dream, so just wait, and you will wake up in your room in the Guild Hall. Whew!

However, it's a bit dark in here, so Frotz your spellbook, get up, and head West into the hallway. Read the note on your door if you like, although it's not all that important. It just lets you know you are here alone. Now's a good a time as any to tell you that not all the spells you know will be useful in the game, nor all the potions you will find. So unless you're told specifically to take an item, you can safely ignore it.

Now, head along South down the hall until you reach the Lobby. Go West into the Store Room, and pick up the Ochre Vial and the matchbook. Open the vial and drink the potion, which will prevent you from becoming hungry and thirsty. Drop the now-empty vial. Read the matchbook if you like, then return East and place the matchbook in the receptacle.

Moving North twice, and West once, brings you to Belboz's quarters. Listen to the bird as you lift the wall hanging, revealing a key. Now examine the desk and open the drawer. Inside are several items, but the only useful one is the journal. Use the key to unlock the journal, then read it. Make **careful** note of the day's code!!

Go East to the hall again, South once, and West into Helistar's room. Here you will find a scroll of Gaspar. Take and Gnusto the scroll, then head back to the hall, and South to the Lobby. By this time, you've probably heard the doorbell chime, which means the mail's in. Open the receptacle, and inside is an issue of Popular Enchanting and an Orange Vial. Get the vial, then go East into the Library.

There is a scroll of Meef here. Get and Gnusto that one. Now, it's time to leave this place. If you've played the game before, you know that if you try going out the main entrance, you will be stopped. You may also know that if you DON'T get out, you will eventually fall asleep and find yourself in the Room of Living Death, which is MOST unpleasant, and from which there is no escape.

So, now's the time to get a move on! Head down into the Cellar, where the trunk is. There are five buttons on the trunk, and each one is a different color. The sequence to open the trunk is keyed to the code of the day in the journal, and will change with each game. The code itself is the colors of a monster from the Infotater. Whatever monster was noted in the journal, look it up on the Infotater, and make note of its colors, and what order they are in. Save the game (just in case, because if you make even one little error, you will not be able to open the trunk!!), then press the buttons in the proper order as given in the Infotater. If you've done it right, the trunk lid will spring open by itself after you push the last button. If the trunk does not open, restore the game and try again.

Ok, so now you have the moldy scroll of Aimfiz,

which is one of those complex ones that you can only use once. Actually, you only need to use it once, so that's no problem. All you have to do is figure out which person you want to exchange places with. Since there aren't too many choices, it won't take you long to discover it's none other than Belboz himself. So, Aimfiz Belboz, and you're out of the Hall and on your way to visiting Jeear!

Ok, so now you're out of the Hall, but look where the spell took you: to the same forest you were dreaming of at the start of the game. And there's the Hellhound, too! And this time, it's no dream! You better not wait around this time, so immediately head Northeast to the Forest Edge.

Here you will find a Snake Hole, as well as paths North and East. The North path is mined with magical mines. This is a red herring in the game, as there is no way to go safely along the path. You can ignore it without fear of missing something important. The Snake Hole is another matter, so climb down into it, and then down again to the Slimy Room, and South from there into the Crater.

Go West to the Chasm's Edge. You can't jump across the chasm, but flying over is no problem. Learn Izyuk twice, cast it on yourself once. Now just go West twice and you will be on the other side. Go North, and you will be in a room with what appears to be a tree of coins. However, that's an illusion, and you will only be able to get one coin. Take it, return to the Chasm Edge, then Izyuk and fly back across.

Now go back the way you came, all the way to the Forest Edge. This time, go East to the Meadow (don't stop to admire scenery; those are MEAN locusts on the horizon!), then Northeast to the Riverbank. Learn the Pulver spell, then Pulver the river. It will dry up, and you can move East into the river, where you will see a small cave to the Northeast. Go there.

Inside, you will find several items. Get the scroll with the Fweep spell, and Gnusto it. Then get the bat guano, but leave the vial; it has no use in the game. Now go down the hole, and you will be at the Pit of Bones. If you go South, you will find the Torture Chamber, which has another useless potion, so go Southwest into the Dungeon instead. From here, go up into the Ruins.

Learn Izyuk again, then go West across the drawbridge (careful, don't fall in!!), then West again to the Meadow, where you now cast Izyuk on yourself. You have time to do that and move before the locusts arrive. Once you're flying, go Northeast to the Riverbank, and this time, Southeast to the Fort Entrance. You need to use Izyuk because the river bank has a distressing tendency to crumble after the first visit.

Around about now, you're probably feeling sleepy. Don't worry about it, just lie down and sack out for awhile. You may or may not have a strange dream. Ignore any dreams, as they are just "for show", and have no important clues to the game. When you waken again, go East into the Parade Ground. There is a flag at the top of a tall flagpole; lower the flag and search it. You will find an Aqua Vial. Take that, it will come in handy later.

Now, go East again, and you will be at the cannon. If you look inside, you will see what appears to be a pile of scrolls. Actually, they are not scrolls at all, but a group of Yipples, peacefully sleeping in the barrel. However, there IS one real scroll in there, and you will need it later. So, drop the bat guano into the barrel, and the Yipples will take off, leaving the real scroll, with the Yonk spell for you to take.

You are now just about finished above ground. Return to the entrance, learn Izyuk twice, and fly Northwest to the River Bank, and SouthWest to the meadow. Here you should Izyuk again (the drawbridge is like the river bank) and go East twice to the Ruins.

From the Ruins, go down into the Dungeon, down again to the Highway, and then East to the Toll Gate and the sleeping Gnome. Wake him up and give him your Zorkmid. He'll open the gate, then promptly fall asleep again. Go East through the gate.

Ignore the store; that's another red herring in the game. Continue East to the End of the Highway. There's a hut here, but we won't be looking in there just now. Instead, go North to the Entrance Hall, and then North again to the Glass Arch. You are about to enter the infamous Glass Maze.

Getting through it the first time is quite easy; getting out again is quite another matter. There are two ways back, the long and hard way, or the quick and dirty way. If you want to go the easy route, learn Gaspar once and Fweep once, then Gaspar yourself right now. If you want do to it the hard way, learn Fweep three times.

Ok, drop everything here, go East into the Maze, and Fweep yourself. Now fly along the following route: North, East, South, South, West, Down, East, East, North, North, Up, Up, South, East and you're

now at the Hollow. Here you will find the Swanzp scroll, but you can't do much until Fweep wears off. So wait around until you're human again.

As soon as you pick up the scroll, the maze layout will change. Oops! Now what? Well, first, drop the scroll down the hole (it's the chimney of the little hut). Now what you do next depends on how you decided to get back out. If you opted for quick and dirty, walk West, West, South, East, and you will fall through the Maze and splatter. However, the Gaspar spell will activate, and your Guardian Angel will restore you to life at the spot the spell was cast, which in this case was the Glass Arch.

However, if you want to do it the hard way, then here's how: Fweep yourself, then fly the following route: West, West, South, Down, Down, West, West, Up, Up, North, North, Down, East. At about this point, the spell will wear off. Fweep again, and continue: South, East, North, Down, West, South, West, Up, West, and you're back at the Arch again. Whew!!

Again, wait around till the spell wears off, then pick up everything and go to the hut. In the fireplace, you will see the Swanzo scroll. Gnusto the spell, and then take a nap, because by now you're tired again.

Awakening refreshed, leave the hut and head on back to the Toll Gate. The Gnome is still here, and still asleep, so now's your chance: search him, and you will find your Zorkmid! All right! Now, keep going West until you come to the Bend, where you head Southwest to the Edge of the Crater, then Down into the crater itself. From there, move along South into the North/South tunnel, and the Southwest to the Amusement Park Entrance.

Try to go West, and a Gnome will appear and demand a Zorkmid. Give him your coin, and then proceed West into the park. Of all the places here, only one is important: the Arcade. Everything else is pretty much for show. So, keep on West until you reach the end of the Midway, and then go South into the Arcade.

Open the Aqua Vial, drink the potion, then drop the vial. You are now dexterous enough to win a prize, so take the ball and throw it at a bunny. POW! Direct hit! As the bunny goes flying, the hawker will give you a glittering scroll of Malyon. You don't need to Gnusto this one, as it will be used only once, and very soon.

Now leave the park, and once back in the tunnel, go south and you will be in the Carving Room. One carving looks like a dragon, and that's the one you want. First, Yonk Malyon. Then, learn Malyon. Finally, Malyon Dragon. The souped-up spell brings the Dragon to life! Good thing for you it's not permanent, or you might have been fried to a crisp! In any case, there is now a passage South through the wall. Take that into the Sooty Room.

Now you're about to enter the most bizarre part of the game. Open the Orange Vial. Frotz yourself. Go East into the Coal Bin room. There will be a cave-in behind you, so you can't go back now. In addition, you're having some some trouble breathing, so drink the orange potion and drop the vial. Suddenly, your Older Self appears, sliding down from the Upper Chute! Listen carefully, and your twin will tell you a number. Make careful note of it! Now, hand your spellbook to your Twin, who will take it and dive down the Lower Chute.

Go East to the Dial Room. There is a dial on the door, which can be set to any number from 0-873. Set it to the number your Twin just gave you. This is also a variable number and will change from game to game. Then open the door, and go into the Shaft Bottom. Get the rope. Make sure that you have nothing with you now but that rope. If you have anything else, drop it.

Climb up to the Shaft Top. Go Southwest into the mine. A timber is here (doesn't that bring back fond memories of Zork?). Tie the rope to the timber, then continue on Northwest and West. You are now at the top of the Upper Chute. Put the beam across the chute, then drop the rope down the chute. Finally, climb down the rope, and you will be in the Slanted Room.

There is a scroll here, and also an opened lantern. Get the scroll, and Golmac yourself back in time. Now open the lantern, and get the Vardik spell. Time is running short, so go East down the chute into the Coal Bin room, where you will see....your Younger Self!

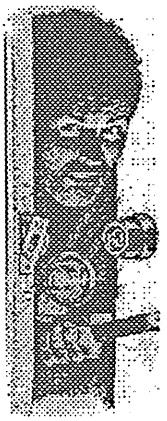
Now, most important: you must do as your twin did before! Tell your Twin the combination to the Dial Room door. Now your Twin will give you the spell book, just as you did earlier (really one of the neater parts of this game!). As soon as you have the book, go down the Lower Chute to the Lagoon.

Ah, air again! Take a deep breath, then sleep awhile, because you're probbaly tired again. Now learn Meef twice, Swanzo, once drop the spellbook, and go East into the Lagoon. Dive down to the bottom, and Meef the Spenseweeds, revealing a crate. Get the crate and return to shore.

Drop and open the crate. Inside, among other things, is a can of grue repellant. Get that, and walk Northeast along the Ocean Shore and North to the Mouth of the River. There is a cave to the West, it's entrance covered by nasty-looking vines. Meef the vines, and Vardik yourself.

Now, spray the repellant on yourself and enter the cave. Wow! Grues are everwhere, and they don't fear the light!! Fortunately though, the repellant still works. However, I wouldn't advise staying around! So, move along West and you will come to three doors. Two of them lead to VERY unpleasant circumstances. You don't want those, so open the white door.

Inside the room is Belboz, who is possessed by the demon Jeear. Swanzo Belboz, and the demon will leave him, and attempt to enter YOUR mind! But the Vardik spell will keep him out, and, with no host available, he will vanish! Belboz will now regain his senses, and will magic the both of you back to the Guild Hall. Here Belboz announces his retirement, and names you as the new head of the Circle! Congratulations, Sorcerer!



Suspect
An Infocom Adventure

"Suspect" is a little different from the previous two Infocom mysteries. In both "Deadline" and "Witness", you were the police, gathering evidence, questioning suspects, and making the arrest. This time around, however, you're on the other side of the fence: YOU are the suspect, and the police are gathering evidence against you, for a crime you didn't commit. The game is thus a race against time, as you desperately attempt to collect the real evidence before you're arrested.

The adventure is centered on a critical point; until you realize that point, you really don't know what you're looking for, and much evidence can be overlooked or spoiled. The critical point is the fact that Veronica is murdered before the game begins. That elaborate fairy costume, with its over-the-head mask, allows someone else to impersonate her, and thus provide an alibi for the real murderer.

Also, you will notice that this is by far the busiest Infocom ever; people move around a lot in the game, and you're almost always running into, or seeing, someone or other. Most of the time, you don't have to worry about that (I think they just put that that in there to confuse you a little, and make you waste time following harmless people around).

It is also necessary to collect ever last bit of evidence. Overlook one thing, and you'll never be able to get a conviction, no matter how sure you are of who is guilty. So, with all that in mind, let's get started.

So there you are in the plush Ashcroft manor on Halloween night, enjoying a costume ball being hosted by Veronica Ashcroft, and wondering what sort of story you can work up for your newspaper. As the game begins, you're invited to join Michael, dressed as a sheik, and a small group of people.

You might as well go over there, and marvel at the performance given by the woman in the fairy costume, supposedly, but not really, Veronica. Having made sure she creates a fuss by spilling a drink on herself, she promptly leaves. Don't bother following her, you have better things to do. Go East to the bar, then North to the French Doors.

Unlock the doors, then open them and go East. Wow, it sure is pouring out there, isn't it? This is one of the crucial points of evidence in the game; you must note the rainfall now, and again in a little while. In the meantime, you can drop your costume receipt, pen, and notebook here; they are merely excess baggage, and you won't need them for anything.

Ok, now it's time to head for the front door, to let in a late arrival who is on her way. Go West to re-enter the Ballroom, South to the Bar, then straight West until you reach the Long Hall South. Go South from there to where the Long Hall Begins, and West again until you come to the Front Hall.

Now it's South to the Entry Hall. Anytime now, the front doorbell will ring. When that happens, unlock the front door and open it. Alicia will come sashaying in. After she does that, step outside South, and observe the rain. Hmmmmm, looks like it's let up a little, only a drizzle is falling now.

Having gained your first piece of evidence, you now go get some more, by heading to the office, where Veronica sits, strangled with your cowboy lariat. Go North to the Front Hall, West to the Hallway Intersection, South to the Corner, West, and then North.

And here you are in a very messy office. Whoever did this sure did a good job! But there's no time to worry about the papers and other items strewn about. First, get the manila folder from the desk and the fairy mask from the floor. Look in the waste basket and get the business card. Finally, unpleasant though it may be, search the body.

Aha! A silver bullet. In fact, it's a bullet from your gunbelt, thoughtfully placed on the scene as additional evidence against you. Take the bullet and put it back in your belt. Under no circumstances remove the rope; if you do that, you will never get a conviction against the real killer.

Since there is some time yet before the murder is discovered and the police arrive, you can go pick up another vital piece of evidence, in the kitchen. Make your way back to Long Hall South, then straight North to the Dining Room and from there East into the Kitchen.

Here is a trashbasket with the remains of the broken glass that "Veronica" dropped. Careful now; don't get the glass (or you'll spoil the fingerprints on it!), get the whole basket (you may feel a bit odd running around with the trashbasket, but it's necessary!). Now it's time to play hide and seek.

So, trashbasket in hand, you now make your way to the garage. Go North at the Hallway Intersection (you should know how to get there by now!), until you come to the door to the walkway. The door is locked, but fortunately, being on the inside, you can unlock it, and open the door. Go North onto the walkway, then West to the garage.

The first thing you notice is a tool chest. Open that, and get the crowbar. Now you can take a moment to admire the BMW and the Mercedes, but don't take too long. Someone will be coming soon. So, hide behind the Mercedes and wait. In fact, you can wait for Michael.

The reason you are waiting is that, while you've been busily collecting evidence, a carefully-faked argument has taken place in the Ballroom. This will lead to the discovery of the body by Michael, Colonel Marston, and Cochrane. And as soon as Michael leaves the office, he will head straight for the garage (if you've played this part before, you may have been suspicious of his doing something so odd, but following him won't help you to find out what he's up to).

And yes, here he comes. From your vantage point, you can see him open the trunk of the BMW, although what he's doing there isn't clear...yet! Keep waiting until he leaves (by that time, the police will have arrived), then open the BMW trunk with the crowbar. Well, look at that, there's a Trust Folder in the trunk!

Drop the crowbar and get the folder. The next part is crucial, and you have very little time to spare. You must get back to the Fireplace in the Ballroom as soon as you can. You have to be there when Marston arrives, or you'll lose an important piece of evidence.

While you've been breaking into the car trunk, Michael and Marston have been meeting briefly in the library, where Michael hands over a piece of paper to Marston. You could hide in the library, and watch the transaction (instead of first going to the garage and hiding there), but still you have to go the garage later anyway. Either way, you must get to the Fireplace quickly.

So high-tail it directly back to the Ballroom. Don't take any time to do sight-seeing. Once at the Fireplace, just wait. You won't have to wait very long. Marston will come in, and try to burn something in the Fireplace. Grab the paper before it's reduced to ashes. Whew! That was a close one.

At this point, you have two ways to go. You can try spooking the guilty parties, or you can just go about giving your evidence to the detective, and let it go at that. If you want to try shaking up Michael and Alicia (you probably guessed that by now), you need to show your evidence to them. Show everything that concerns Michael to Michael, and everything that concerns Alicia to Alicia (don't forget the analysis reports later on). This is tricky, since you must also give the detective some of your evidence, before he decides to arrest you, so watch your timing if you want to go about doing this (I won't tell you what happens; try it and see for yourself).

Speaking of the detective, it's time to go find him and begin presenting some of the items you've been collecting. He's usually in the vicinty of the office, checking out the various rooms, after which he heads to the Ballroom and stays there. You don't want to wait for that, since he'll probably arrest you for the crime. It's better to go after him, and give him a few other things to think about.

Once you've located the detective, and he stays in one place long enough, you can begin to hand over some ofyour little treasures. First, have him get the glass analyzed for fingerprints (and now, at last, you can drop the trashbasket!).

While Duffy is on his way to the lab, give the detective the two folders and the paper. Hey, that sure got him interested, didn't it? However, hang on to the mask and the card, because it's not yet time for those (by the way, have you looked inside the mask yet? You'll need to get that hair analyzed too, and Duffy isn't here to do that).

You still need some more evidence to wrap up the case, so head back once more to the Ballroom. Along the way, stop off in the East Coat Closet, and pick up the wet overcoat. A quick glance at the label tells you that it belongs to Alicia. Hmmmm, suspicious that it's so soaked, and it was only drizzling when she arrived!

When you get to the Ballroom, locate Cochrane (dressed as an astronaut). You'll most likely find him at the Bar. Show him the card, and he will give you some important (verbal) evidence. Now go back to the Fireplace, and hang out until the detective arrives.

When he does get there, show him the coat. He doesn't seem too impressed, so tell him about the rain (NOTE: There is a variance among the different computer versions. Save the game first, and then try: TELL DETECTIVE ABOUT RAIN. If that doesn't work, restore and try: TELL DETECTIVE ABOUT WEATHER. One or the other of these should do the trick).

Somewhere along the line, the detective will get the fingerprint analysis and show it to you (actually, he gives it to you). You aren't surprised to find that it's not Veronica's prints on the glass. Now, have the dark hair analyzed (did you ever look at Veronica's hair? She is (or was) a blonde).

While you wait for the hair analysis, give the business card to the detective (you don't have to tell him about Cochrane). Then just wait again until the hair analysis comes back. All right, this is the big moment! Tell the detective to arrest Michael and Alicia.

TA-DA! Your evidence makes an air-tight case, and both Michael and Alicia will be in prison for a long, long time! For a journalist, you're a pretty good detective (of course, there was a small incentive involved!).

ATTENTION TRSDOS 1.3 USERS!

ANNOUNCING "SYSTEM 1.5.", THE MOST COMPREHENSIVE 1.3. UPGRADE EVER OFFERED!

MORE SPEED!! MORE POWER!! NEW LOW PRICE!!

While maintaining 100% compatibility to TRSDOS 1.3., this upgrade advances DOS into the 90's!
SYSTEM 1.5. supports 16k-32k bank data storage and 4MGHZ clock speed (4/4P/4D).
DOUBLE SIDED DRIVES ARE NOW 100% UTILIZED! (all models).

config=y/n	creates config boot up
time=y/n	time boot up prompt on/off
blink=y/n	set cursor boot up default
line='xx'	set *pr lines boot up
alive=y/n	graphic monitor on/off
tron=y/n	add an improved tron
type=b/h/y/n	high/bank type ahead on/off
slow	2 mghz speed (model 3)
cpy (parm,parm)	copy/list/cat ldos type disks
sysres=y/n	disable/enable sysres
spool=h/b.size	spool is high or bank memory
spool=n	temporarily disable spooler
spool=reset	reset (nil) spool buffer
spool=close	closes spool disk file
filter *pr.iglf	ignores 'extra' line feeds
filter *pr.filter	adds 256 byte printer filter
filter *pr.find	translate printer byte to chng
filter *pr.lines	define number of lines per page
filter *pr.tmarg	adds top margin to printouts
filter *pr.page	number pages, set page number
filter *pr.tof	moves paper to top of form
filter *ki.echo	echo keys to the printer
attrib :d password	change master password
filedate=y.n	date boot up prompt on/off
cursor='xx'	define boot up cursor character
caps=y/n	set key caps boot up default
wp=d.y/n	write protect any or all drives
trace=y/n	turn sp monitor on/off
memory=y/n	basic free memory display monitor
fast	4 mghz speed (model 4)
basic2	enter rom basic (non-disk)
sysres=h/b/'xx'	move/sys overlay(s) to hi/bank mem
macro	define any key to macro
spool=d.size='xx'	link mem spooling to disk file
spool=y	reactivate disabled spooler
spool=open	opens, reactivates disk spooling
filter *pr.adlf=y/n	add line feed before printing0dh
filter *pr.hard=y/n	send 0ch to printer (fastest tof)
filter *pr.orig	translate printer byte to chng
filter *pr.reset	reset printer filter table
filter *pr.width	define printer line width
filter *pr.bmarg	adds bottom margin to printout
filter *pr.route	sets printer routing on/off
filter *pr.newpg	set dcb line count to 1
filter *pr.macro	turn macro keys on/off
device	displays current config

All parms above are installed using the new LIBRARY command SYSTEM (parm,parm): Other new LIB options include DBSIDE (enables double sided drive by treating the "other side" as a new independent drive, drives 0-7 supported) and SWAP (swap drive code table #s). Dump (CONFIG) all current high and/or bank memory data/routines and other current config to a disk data file. If your type ahead is active, you can (optional) store text in the type buffer, which is saved. During a boot, the config file is loaded back into high/bank memory and interrupts are recognized. After executing any active auto command, any stored type ahead data will be output. FANTASTIC! Convert your QWERTY keyboard to a DVORAK! Route printer output to the screen or your RS-232. Macro any key,even F1, F2 or F3. Load *01-*15 overlay(s) into high/bank memory for a memory only DOS! Enter data faster with the 256 byte type ahead option. Run 4MGHZ error free as clock, disk I/O routines are properly corrected! Spool printing to high/bank memory. Link spooling to disk (spooling updates DCB upon entering storage). Install up to 4 different debugging monitors. Print MS-DOS text files, ignoring those unwanted line feeds. Copy, Lprint, List or CATalog DOSPLUS, LS-DOS, LDOS or TRSDOS 6.x.x. files and disks. Add top/bottom margins and/or page numbers to your hard copy. Rename/Redate disks. Use special printer codes eg: LPRINT CHR$(3); toggles printer output to the ROUTE device. Special keyboard codes add even more versatility. This upgrade improves date file stamping MM/DD/YY instead of just MM/YY. Adds optional verify on/off formatting, enables users to examine *01-*15, DIR, and BOOT sectors using DEBUG, and corrects all known TRSDOS 1.3. DOS errors. Upgrade includes LIBDVR, a /CMD driver that enables LIBRARY commands, such as DIR, COPY, DEBUG, FREE, PURGE, or even small /CMD programs to be used within a running Basic program, without variable or data loss.

SYSTEM 1.5. is now distributed exclusively by TRSTimes magazine.
ORDER YOUR COPY TODAY!

NEW LOW PRICE $15.95

TRSTimes - SYSTEM 1.5.
5721 Topanga Canyon Blvd., Suite 4
Woodland Hills, CA. 91367

SOME THOUGHTS ON RADIO SHACK PRINTERS

by Roy T. Beck

Every so often you will see one of the old "battleship-gray" R/S printers at a swap meet or salvage store, and you wonder what kind of a bargain it might be. How do you know what its characteristics are? You could write to Ft. Worth for a manual, but that's a bummer, considering the cost and delay.

I recently got to thinking about the wide variety of printers and printer-like devices Radio Shack has produced over the years. I have most of the catalogs in the RSC- series, running from RSC-2 through RSC-22A. (I am missing RSC-1 and RSC-13). This library is very useful in searching out data about various R/S products. Since this covers the period from 1978 to 1991, (the TRS era), I decided to tabulate all of the printers by their characteristics. As you read the table, you will notice a number of "holes". I am sorry about these, but the catalog listing of some of the machines doesn't always provide all the expected information. Also, I have to insert the usual legal escape clause. I'm not responsible for any errors you may find in the article. I have done the best I can, but I'm only human and I do make errors. (R/S is also known to make occasional errors!).

You may not even recognize some of these printers, but, yes, Radio Shack did produce all of them. Before tabulating them, I would like to describe the types of printers R/S has produced. Taking them in order, I will give a thumb-nail sketch of each type so you will be familiar with them. These are:

1. Electrostatic Printers

The electrostatic type is (fortunately) an obsolete type originally offered in the Model I era. The earliest one was called the Screen Printer, and it was for this printer that the Model I had a 40 line bus connection on the left side of the expansion interface labeled "screen printer". This is where you would plug in the screen printer or any other bus device you might own. When you pushed a button on the printer, the image on the screen of the computer at that moment was printed. Actually, the Screen Printer design was closely integrated with the operation of the computer. When the screen printer was actuated, it seized control of the computer, HALTed the Z-80 CPU, and did a DMA transfer of the screen image by scanning the video ROM (at 2200 CPS!). While this was a technological tour de force, it also made the Screen Printer essentially incompatible with everything that was not a Model I, Level I computer. The Screen Printer used an electric arc to burn a thin film of aluminum off of a paper substrate, leaving black letters on an aluminum foil surface of a sheet of paper.

The Quick Printer (I) and Quick Printer II used the same printing technique, but much slower because it did not do DMA. The results of all three printers were uniformly poor. The letter size and shape was fixed in the design of each printer, could not be altered, was very small, and produced a bad smell in the process of printing. Yes, they worked, but not well, and we are well rid of them.

2. Pen Plotters

R/S produced several pen plotter devices. Most of them used a small ball point or felt tip pen to scribe letters onto paper, which was very limited in size. These were really intended to produce graphic images, but I am including them because they could operate as printers when desired.

3. Ink Jet Printers

R/S also produced an ink-jet printer, the CGP-220 which was really a plotter.

4. Thermal Printers

Thermal printers were offered for the PC-3 and PC-4 pocket computers. Thermal printers are quiet, but suffer from the need for special paper, usually rather narrow, and worse, the image will fade with time, especially when exposed to sunlight. The TP-10 and TRP-100 units were intended for use with desk top computers. The TRP-100 was especially clever; it could operate on batteries or AC power, and could use either thermal paper or a thermal ribbon to place images on plain paper.

5. Daisy Wheel Printers

Many different daisy wheel printers were offered at various times. All but one of these are identified with model names beginning with "DWP-", meaning "daisy wheel printer" The odd one was named "DW-II", which also meant daisy wheel. I am not sure if there ever was a DW-I printer; the II on DW-II

would seem to imply this, but I haven't found any solid evidence of such. Possibly a "DW-I" was planned but never got into production. Bill Barden, another author, indicates the DW-1 existed but I can't find it in the catalogs I have. See Table 5. Table 5A lists the wheels for some of the printers. There are inconsistencies in the catalogs, especially regarding the wheels for the DW-II and the DW-410; if the same wheel fits both, as for example, the Pica 10, then why should there be different wheels for certain other fonts, as for example Courier 10? This doesn't make good sense, but it is what I found in the catalogs.

6. Impact Dot Matrix

R/S produced a great multitude of Impact type dot matrix machines, numbering at least 38 different models. Wow! I suspect they ordered each batch of printers to a specification, and when that batch was sold out and more were needed, a *new* specification was developed. Seems like a silly way to operate, but the evidence is in the catalogs. See Table 6.

Naming these printers was a problem. Initially, they produced a dot matrix model called simply the "Line Printer". After this one, there came a series of eight machines named LP-I through LP-VIII. After these, Radio Shack decided to use descriptive letter prefixes, and the letters DMP for dot matrix printer were used for most of the later machines. There was a PC-1 printer which was a dot matrix printer for use with the original pocket computer. There is also a machine identified as LMP-2150, which is also a dot matrix printer.

Some printers may not have existed. Certain R/S catalogs refer to ribbons for printers which apparently were never in the catalogs. Examples are the DMP-133 and DMP-300, which are listed for replacement ribbons, but which were not themselves listed in the RSC catalogs. I am sure the DMP-300 was a typo, and should have been DMP-302. I can't account for the DMP-133, probably another typo when the catalogs were prepared.

7. Laser Printers

Finally, R/S produced at least two laser printers, under the descriptors LP-950 and LP-1000. Evidently LP in this case meant laser printer, as opposed to LP-roman numeral which was the original dot matrix impact series. See Table 7. Both of these printed six pages per minute (PPM) and had a resolution of 300 dots per inch (DPI).

There you have it, seven major types of machines, totaling about 60 machines all told.

Miscellaneous Comments

I have included the ribbon catalog numbers for two reasons; one is to allow you to identify similar print mechanisms, and the other for the sake of assisting you to order the correct ribbon for your machine. Based upon the commonality of ribbons among the dot matrix machines, it is reasonable to assume the corresponding machines are by the same manufacturer, with similar internal parts.

I have also included my available information on print wheels for the daisy wheel machines.

The catalog prices are shown for information only. Knowing the relative original prices of the various machines will give you some information about the relative quality of printers you may see at swap meets. Usually, R/S introduced its products at some price, and then later reduced the price. In a few cases, they actually raised printer prices in later catalogs. The tables also show which catalogs listed each printer. Table 8 shows the date of each RSC catalog. By noting which catalogs listed a particular printer, and then checking Table 8, you can determine the initial and final offering date of each printer, and thus can determine the approximate age of any particular machine you may see at a swap meet, etc.

Where possible, I have listed the print speed in characters per second (CPS) and the maximum paper width in inches which can be accommodated. Note that tractor feed paper is about one inch wider than the final product because of the tear-off edges. Several of the printers use narrower than 8.5 inch paper. Beware of these. The standard paper sizes you might expect to see are 8.5 and 9.5 inch wide, where the extra inch represents the tearoff edge containing sprocketed holes. Similarly, 14.875 inch paper is available, which has 14 inches of useable width, whether the edges tear off or not. I have rounded this paper to 15 inches in the table. Most of the wide carriage printers will work just fine with 8.5 or 9.5 inch paper, some much less, down to as small as 4 inches. I have listed the maximum quoted capacity of each machine. The Line Printer and the two versions of LP-1 were upper case only; avoid them.

As you all know, I am sure, R/S computers are designed to send only a carriage return (CR) to the printer at the end of each line. R/S printers are designed to interpret this command as meaning the

printer should execute both a CR and a line feed (LF). But other computers are designed to send a separate CR and LF under the same circumstances. Most R/S printers can be set up to recognize both these circumstances, but there is no consistent standard for how you program them to do this. Some printers have a DIP switch to enable the CR+LF response, some will accept software commands, and some will accept both. I do not have any overall data for this, I can only comment upon the situation. Since you really ought to have the manual for whatever printer you have, you can find this info for your printer in your manual. R/S is pretty good about making manuals available for old equipment, so do order one from them.

Table 1
Electrostatic Printer

Model	Cat. No.	Speed CPS	Dots	Max Paper	Orig. Price $	Listed in Cat RSC-	Paper No.
Quick Printer (I)	26-1153	100	7	4.75	499	2 to 3	26-1405
Quick Printer II	26-1155	64	7	2.375	219	3 to 5	26-1412
Screen Printer	26-1151	2200	7	4.75	599	1	26-1405

Table 2
Pen Plotters

Model	Cat. No.	Max Paper	Orig. Price $	Listed in Cat RSC-.
CGP-115	26-1192	4.5	250 to 200	8 to 11
FP-215	26-1193	10	995	8 to 14
Multi-Pen Plotter	26-1191	8.5	1995	6 to 9
PC-2	26-3605	2.25	240	8
Plotter/Printer	26-1190	9	1460	4 to 7

Table 3
Ink Jet Printers

Model	Cat. No.	Speed CPS	Pins	Max Paper	Orig. Price $	Listed in Cat RSC-	Ribbon No.
CGP-220	26-1268	37	7	8.5	699 to 599	10 to 16	26-1281 26-1282

Table 4
Thermal Printers

Model	Cat. No.	Speed CPS	Dots	Max Paper	Orig. Price $	Listed in Cat RSC-	Paper No.
PC-3	26-3591	24	7	2.25	120	14	26-3592
PC-4	26-3652	20	7	1.5	80	9 to 14	26-????
PC-8	26-3591	24	7	2.25	120	19	26-3592
TP-10	26-1261	30	7	4	100	12 to 15	
TRP-100	26-1275	50	7	8.5	300	12 to 16	26-1297

Table 5
Daisy Wheel Printers

Model	Cat. No.	Speed Char/Sec	Max Paper	Orig. Price $	Listed in Cat RSC-	Ribbon No.
DW-II	26-1158	43	16"	1960 to 1995	4 to 11	26-1419 26-1449
DW-IIB	26-	This printer is a slight upgrade of DW-II				
DWP-210	26-1257	18	13	799 to 599	10 to 14	26-1445 26-1458
DWP-220	26-1278	20	16	599	15 to 16	26-1299
DWP-230	26-2812	20	16	400 to 460	17 to 20A	26-1445 26-1458
DWP-410	26-1250	25	16	1495 to 1295	8 to 11	26-1419 26-1449
DWP-510	26-1270	43	16	1495	12 to 16	26-1419 26-1449
DWP-520	26-2800	43	16	995	17 to 19	26-1445 26-1458

Table 5A
Wheels for Table 5

Name of Wheel	DW-II	DWP-210	DWP-220	DWP-410
Courier 10	26-1420	26-1467	26-1230	26-1430
Prestige Elite 12	26-1421	26-1468		26-1431
Madeleine PS	26-1422			26-1432
Cubic PS	26-1425			26-1433
Title Italic 12	26-1426			26-1434
OCR B	26-1484			26-1435
Letter Gothic 12	26-1485		26-1231	26-1436
Cubic 15	26-1487			26-1438
Bold PS	26-1488			26-1439
Venezia PS		26-1469	26-1232	
Scientific A/N	26-1486			26-1486
Pica 10	26-1290			26-1290
Narrator	26-1291			26-1291
OCR-A	26-1292			26-1292
Elite 12	26-1293			26-1293

Table 6
Impact Dot Matrix Printers

Model	Cat. No.	Speed CPS	Pins	Max Paper	Orig. Price $	Listed in Cat RSC-	Ribbon No.
Line Printer	26-1150	60	7	9.8	1300	2	
LP-I	26-1152	60	7	12.1	1559	2 to 3	26-1413
LP-II	26-1154	100	7	9.5	970 to 799	3 to 5	26-1413
LP-III	26-1156	120	9	15	1960	3 to 4	26-1414
LP-IV	26-1159	50	9	9.5	999	4 to 5	26-1413
LP-V	26-1165	160	9	15	1860	5 to 7	26-1414
LP-VI	26-1166	100	7	15	1160	4 to 7	26-1418
LP-VII	26-1167	30	7	9.5	399	6 to 7	26-1424
LP-VIII	26-1168	100	9	9.5	799	6 to 7	26-1418
DMP-100	26-1253	50	7	9.5	399	8 to 10	26-1424
DMP-105	26-1276	80	9	9.5	200	12 to 17B	26-1288
DMP-106	26-2802	80	9	9.5	220	19 to 20A	26-1288
DMP-107	26-2821	100	9	10	280	22 to 22A	26-1235 26-1236
DMP-110	26-1271	50	9	10	400	11 to 14	26-1283
DMP-120	26-1255	120	9	9.5	500	10 to 14	26-1483
DMP-130	26-1280	100	28	10	350	15 to 17B	26-1235 26-1236 26-1238
DMP-130A	26-1280A	120	28	10	360	19	26-1235 26-1236 26-1238
DMP-132	26-2814	120		10	380	20A	26-1235 26-1236 26-1238
DMP-134	26-2848	160	9	10	360	22 to 22A	26-1235 26-1236
DMP-200	26-1254	120	9	9.5	799 to 699	8 to 11	26-1483
DMP-240	26-2839	192	24	10	550	22 to 22A	26-2824 26-2826
DMP-302	26-2849	270	24	10	599	22 to 22A	26-2819
DMP-400	26-1251	140	9	15	1195	8 to 9	26-1418
DMP-420	26-1267	140	9	15	999	10 to 11	26-1418
DMP-430	26-1277	180	18	15	899 to 699	12 to 17B	26-1296
DMP-440	26-2808	300	9	15	699	19 to 20A	26-2809 26-2827
DMP-442	26-2822	300	9	16	699	21A to 22A	26-2823
DMP-500	26-1252	220	9	15	1795 to 999	8 to 11	26-1482
DMP-2100	26-1256	160	24	15	1995	9 to 11	26-1442
DMP-2100P	26-1274	160	24	15	1995 to 1495	12 to 16	26-1442
DMP-2102	26-2817	270	24	16	999	21A	26-2819
DMP-2103	26-2850	270	24	16	899	22 to 22A	26-2819

DMP-2110	26-2810	240	24	15	1295	17 to 17B	26-1442
DMP-2120	26-2811	240	24	16.5	1599	19 to 21A	26-2834
							26-2835
							26-2836
DMP-2130	26-2845	480	28	16.5	1199	22 to 22A	26-2846
LMP-2150	26-1272	290	9	16	3995	12 to 14	26-1287
DMP-2200	26-1279	380		16	1695	15 to 17B	26-2825
PC-1	26-3505	16	7	1.75	150 to 128	6 to 7	26-3507

Table 7
Laser Printers

Model	Cat. No.	Speed PPM	DPI	Max Paper	Orig. Price $	Listed in Cat RSC-
LP-950	26-2838	6	300	8.5	1599	22 to 22A
LP-1000	26-2804	6	300	8.5	2199 to 2599	19 to 21A

Table 8
RSC Catalogs

RSC-	Date	RSC-	Date	RSC-	Date	RSC-	Date
1	1978	8	1983	15	1986	19E	1988
2	1978	9	1983	16	1986	20	1989
3	1979	10	1984	17	1987	20A	1989
4	1981	11	1984	17B	1987	21	1990
5	1981	12	1985	18	1987	21A	1990
6	1982	13	1985	18E	1987	22	1991
7	1982	14	1985	19	1988	22A	1991

LITTLE ORPHAN EIGHTY

There is no question that the TRS-80 is my favorite machine. It always has been. My first Model I was a study in frustration, but nevertheless, still a joy. My Model III was my return to the 'real' TRS-80's, after a brief stint with the Color Computers. It felt good to be back with a DOS machine again. I also messed around with the Model II/12/16 machines, but due to technical difficulties with the 8-inch drives, I ended up giving them away to a friend. My Model 100's are still around - my wife is the prime user. But, my TRS-80 all-time favorite, as you might guess, is the Model 4. It has been my steady companion for more than 10 years.

It was because of the Model 4 that TRSTimes saw the light of day. My favorite computer magazine, 80 Micro, was going out of the TRS-80 business and I happened to learn about it early, as several of my articles had been accepted and then, for no apparent reason, rejected. I made some phonecalls, pressing real hard for answers, and was finally told that they were ceasing to support the TRS-80 series of computers as of the 1988 January issue. Instead, the entire magazine would be devoted to the MS-DOS machines.

Hmmm. Here I sat with a bunch of TRS-80 material and nowhere to publish it. It occurred to me that maybe I ought to just start my own magazine. I consulted with Eric Bagai, Tim Sewell and Roy Beck, all influential and knowledgeable members of the Valley TRS-80 Hackers Group here in Los Angeles. They promised to help, as did other friends and relatives, so TRSTimes was conceived and the birth was scheduled for January 1, 1988.

The next months were busy with rewriting my articles, lining up new ones, learning to do desktop publishing and, most importantly, getting the news out to the TRS-80 world. We sent postcards to every TRS user and user group that we were aware of; we posted messages on individual BBSes across the country and, thanks to Tim's position as TRS-80 sysop on GEnie, we reached a large number of users there.

The response was overwhelming. I had no idea that there were that many people still interested in the TRS-80 machines, but the subscriptions and letters came rolling in and TRSTimes was in business.

I really had not thought about continuing TRSTimes past the initial year. All I wanted to do was to produce 6 good issues as I had promised. 1988 flew by and, though at times it was hectic around here, we made it.

I was having so much fun that I agreed to do another six issues in 1989. The subscription base grew, as did the number of contributors and, while our machines were getting older, we were producing new and useful information. We also began collecting all the public domain software we could get our hands on. Many hours were spend testing the programs, as well as formatting, copying and labeling the disks we passed on to the TRSTimes readers.

Since response was good, we decided to continue publishing in 1990. This, in turn, kept us involved in 1991, 1992, 1993 and 1994, each individual year producing 6 issues. I wrote several of the articles myself and I thoroughly enjoyed the research and the programming. Though I prefer programming in assembler, my favorite TRSTimes program is probably LABEL4/BAS, a Basic program from issue 1.6. There were so many tricks used in that one that I still refer to it when writing new programs.

Each year about this time, I've had to make the decision of whether or not to continue publishing TRSTimes. We are now at the end of 1995 and the magazine has lasted for 8 full years — or to put it another way, we have covered the TRS-80 as long as did 80 Micro. I think that is enough. We have kept information for our favorite machines flowing longer than anyone could have imagined and each and every one of our 48 issues were mailed on time — something that I take pride in. But, as is to be expected, interest in TRSTimes is dwindling — the subscriber base has declined steadily since 1993 and frankly, I think that I've run out of things to write about. Therefore, it is with some sadness that I declare this to be the very last issue of TRSTimes. I hope that the readers have benefitted from reading our publication. My appreciation goes out to all the many people who, over the years, shared their knowledge with us, especially my good friend, Roy Beck, without whose articles TRSTimes would not have lasted past the first year.

Goodbye.....and thanks.

Lance W.