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MAY 1987

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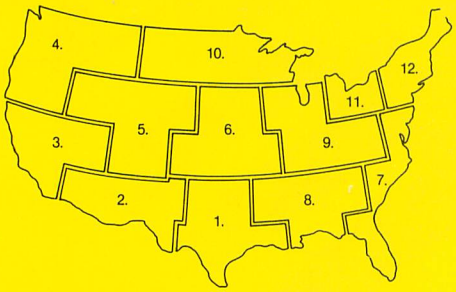

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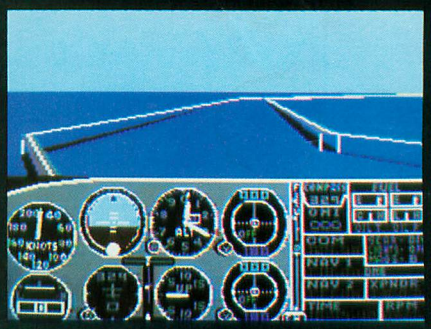

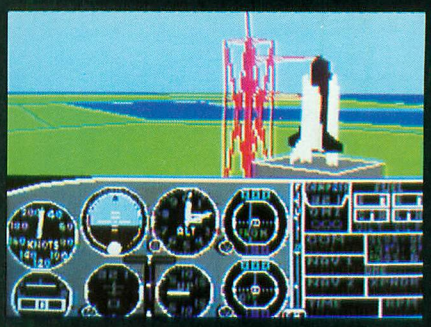

CIRCLE #101 ON READER SERVICE CARD

ISSUE 54
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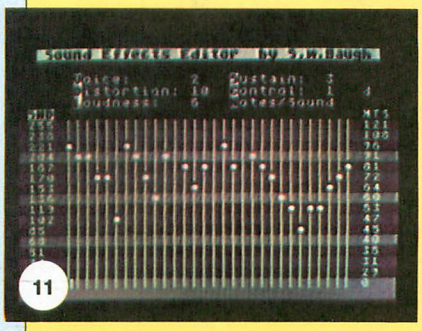

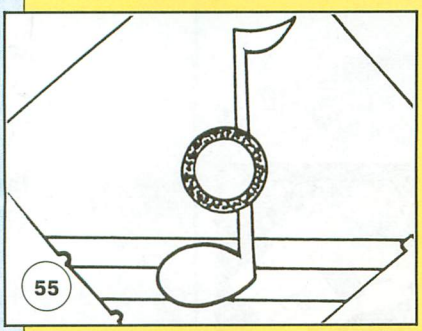

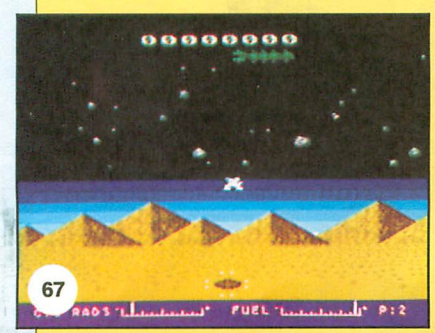

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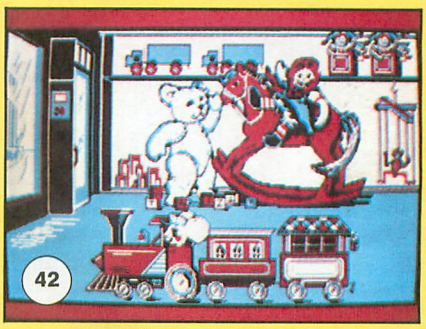

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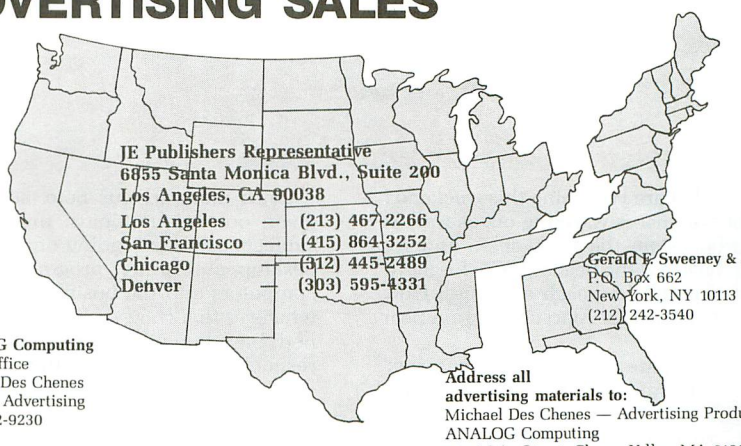

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Due, however, to many requests from Atari club libraries and bulletin board systems, our new policy allows club libraries or individually-run BBSs to make certain programs from **ANALOG Computing** available during the month printed on that issue's cover. For example, software from the July issue can be made available July 1.

This does not apply to programs which specifically state that they are *not* public domain and, thus, are not for public distribution.

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Editorial

So. . .what are *you* doing this weekend? Yes, the weather is warming up, as well as the barbecue on the back deck, and it's time to head for the beach. Well, forget it! (You can go to the beach anytime.) How about attending that Atari convention near you?

These fairs are sponsored by the users' groups in the area where the conventions are held, and they're also supported by Atari Corp. itself. As a matter of fact, Atari can usually be found as the center exhibit, and frequently has the largest display.

What's there to do at an Atari fair? Well, that depends on what the planners want, on an individual basis. You can count on your local Atari dealers—as well as dealers from outside the area—showing their wares. Manufacturers from all over the U.S. (and Canada), who produce both hardware and software, also attend. They demonstrate and explain their products, both those for 8-bits and for STs.

As a matter of fact, there is quite a flurry of activity and enthusiasm surrounding 8-bit machines at these events. Many companies utilize these shows as a good time to announce and release new products.

A popular exhibit—which often times turns out to be the greatest attention grabber —is the MIDI setup. Hybrid Arts, Electronic Music Publishing, and others turn the convention hall into an electronic music wonderland with their synthesizers blasting out remarkable tunes. Recently, Hybrid Arts has also been holding a competition involving their new **Midi Maze** game, where up to sixteen players battle it out on just as many STs. . .all at the same time!

On a more serious note, seminars are given on various topics, including such subjects as: what's going on inside Atari, desktop publishing, programming, Atari computers and the business market, and whatever that show's committee has planned, based on what companies with their respective participants attend.

Thus far, we've attended user shows in Glendale (in the Los Angeles area) and San Jose, California; Pittsburgh and Allentown, Pennsylvania; as well as Buffalo, Dallas and Seattle. (Whew!)

I find these shows a golden opportunity to speak to our readers first hand and learn what they're doing with their machines. This keeps us in touch with the real Atari community and gives us the opportunity to discover what they want out of our publications. I personally attend most of the shows, usually accompanied by one of our technical or editorial staff members.

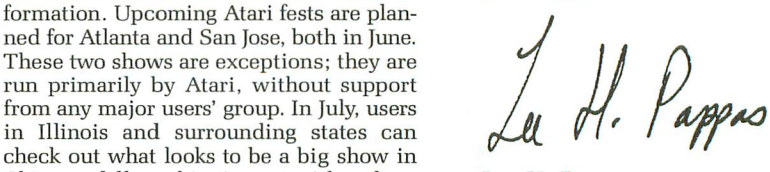
Every month we list the Atari fairs, their location and where to obtain additional information. Upcoming Atari fests are planned for Atlanta and San Jose, both in June. These two shows are exceptions; they are run primarily by Atari, without support from any major users' group. In July, users in Illinois and surrounding states can check out what looks to be a big show in Chicago, followed in August with a show in the Detroit area.

The first Atari fair was held in Glendale, California in September of 1986. That successful event will be repeated in September of this year, again at the Glendale Civic Center. And October will see the first Northeast Atari Computer Fair, to be held Columbus Day weekend in Worcester, Massachusetts. This show is in conjunction with the Boston Atari users' groups, via the Boston Computer Society. Local support will also come from one of the largest Atari distributers in North America, CSS East (formerly APEX Resources), and your favorite Atari magazines, **ANALOG Computing** and **ST-Log**.

Later this year, look for a show in Palm Beach, Florida. . .contrary to what I said earlier, make this a time to catch a show and some rays. Into 1988, new shows in the works are: Honolulu, Hawaii; St. Louis, Missouri; and New York City.

So make this *your* golden opportunity to meet those who produce and support the Atari computer line, face to face. They value your input on their current product lines, and are interested in what Atari owners would *like* to see for their machines.

And, beyond all of that, you'll find this an educational experience, coupled with lots of fun!



Lee H. Pappas
Publisher
ANALOG Computing

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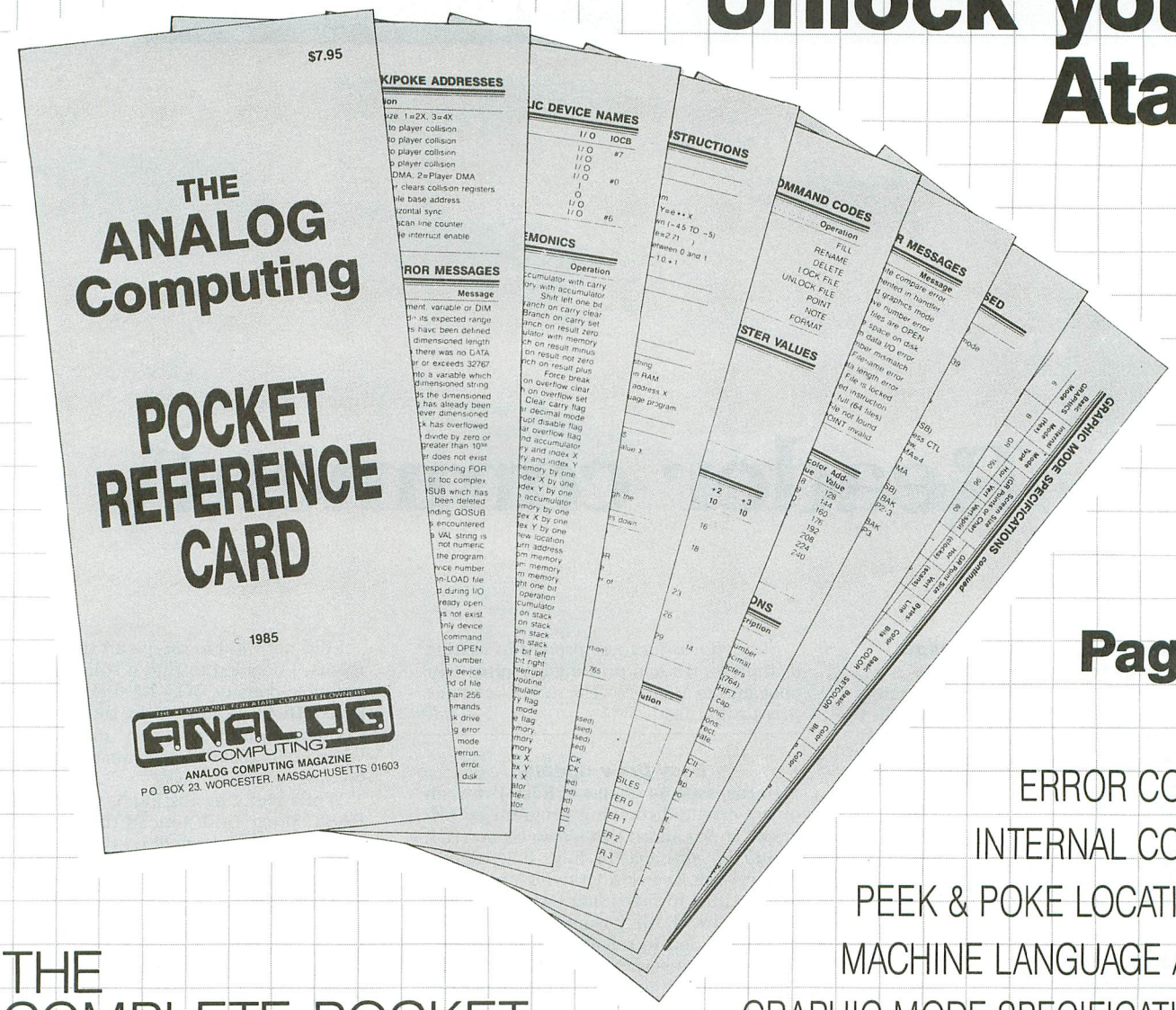

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Reader comment

Better Late Than Never Dept.: a note from Micro-Novels.

First, let me thank you for reviewing Micro-Novels (**Panak strikes!**, issue 40). I appreciated your kind words about the theme and text. I agree that there are drawbacks in adventures residing in RAM, such as limited vocabulary.

However, let me point out that **Star Voyages** was not intended to be "room oriented," but "story oriented." Hence its originality. Also, nothing was mentioned about the vocabulary in **Casebook of Hemlock Soames**, and yet this series relies heavily on the Infocom mystery series for its vocabulary, which is limited.

My main beef about your review is the statement, "You're flying blind unless you know someone who's already ordered one." Without additional clarification, it would seem you are encouraging piracy! Furthermore, I don't know anyone in the software industry who offers a "money-back guarantee"! Instead, Micro-Novels offers a customer protection plan.

With the return of a signed license agreement, the purchaser may make a copy of the adventure purchased, for use on his system only. Also, registered owners can request help in solving the adventures. Hints, word lists, or personal help will be given to registered owners, when a self-addressed, stamped envelope is included with such a request.

All things said and done, I appreciate the interest you've shown us.

Thank you,
Frank S. Eva
Micro-Novels
Milwaukee, WI 53215

We hope none of our readers took the above-quoted statement to be supportive of piracy. It was meant to encourage use of the Atarian network of information and advice.

Mr. Eva was far more prompt in writing us than we were in printing his letter. Our apologies to Micro-Novels; this column just fills up too fast! —*Ed.*

Easy-Draw update.

In the issue 44 review of **Easy-Draw**, an object-oriented drawing program by Migraph, it was stated that a new version (1.1) would be available in July, 1987. Rather than releasing version 1.1 (which saves and loads .GEM format files) last summer as discussed with Mr. Leyenberger, we at Migraph decided to release 1.1 last fall.

There were several reasons for this decision. At the time, it was more expedient for us to include several enhancements to **Easy-Draw**, rather than add them one at a time. To achieve that end, we sent a survey to all registered owners and implemented the top ten requested enhancements. We feel that in this manner we have better served our registered owners. As updates become available, all *registered* **Easy-Draw** owners will receive a notice from Migraph.

Version 2.1 is now current, available to registered owners. To obtain an upgrade, they need only send their master disk and $3.00 to Migraph.

Thanks very much.
Kevin C. Mitchell
President, Migraph, Inc.
720 South 333rd Street, Suite 201
Federal Way, WA 98003

This is another letter that's better late than never. Now that we've caught up, onward! —*Ed.*

Disktooling around.

Last week, while using **Speedscript** on a DOS 2.5 formatted disk, somehow six files got scrambled. As I had duplicated the disk, my backup was scrambled, also.

I did not want to retype all those documents. I decided to find a solution to fix a double-density DOS 2.5 disk. I remembered **Disktool Rev. 3**, in the **ANALOG Compendium**. I was very disappointed when I read that this program worked only on single-density disks.

While studying Listing 5, the **Disktool** BASIC program, I noticed that all sector number limits were set by that program. Since DOS 2.5 is compatible with DOS 2, I surmised that if I changed the high limit to 1010 and there were no limits set in Listing 1, the M/L loader program, this new version could work with DOS 2.5.

I changed all 720 references to 1010 in the following lines: 460, 475, 530, 550, 570 and 590.

I was relieved to find out that it worked perfectly with the new DOS 2.5. Having found the link error, I fixed it with option M. Fixing that one file also fixed all the others.

Please pass on this information to your readers, who could recover scrambled files enclosed in brackets on a DOS 2.5 disk. I would like to thank you again for your great magazine.

J.C. Lemieux
Sherbrooke, P.Q., Canada

More magic for *Magic Spell.*

Congratulations for your fine magazine and your ability to provide the Atari community with excellent news and programs. This letter is in regard to Angelo Giambra's excellent programs, SPELLER and SPMAINT, from issue 46's **Magic Spell**.

The January issue of **ANALOG Computing** contained, in the **Reader comment**, a fix which would allow SPELLER and SPMAINT to be run on a XL/XE computer without a translator disk. The fix works for SPMAINT, but doesn't go far enough for SPELLER, in that it produces a document

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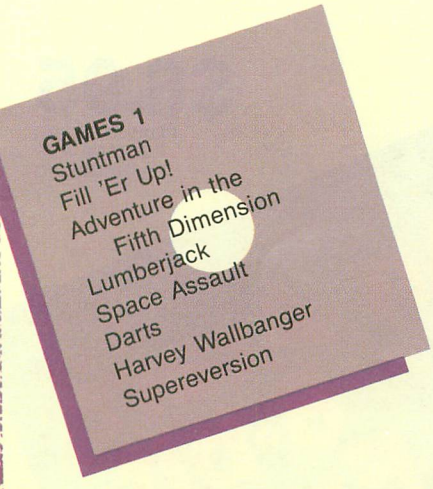

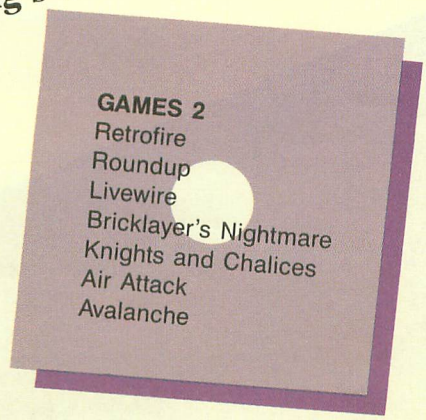

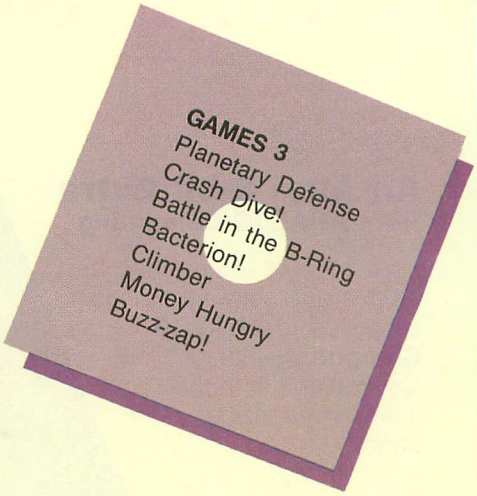

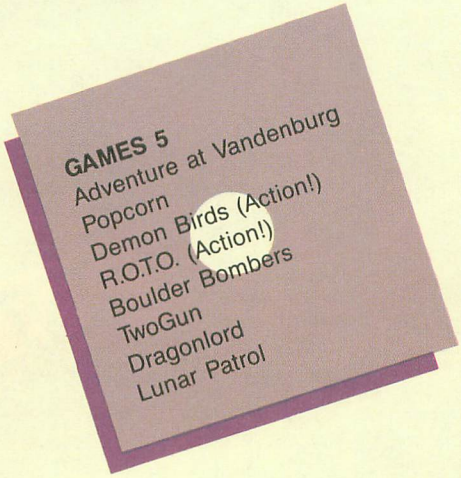

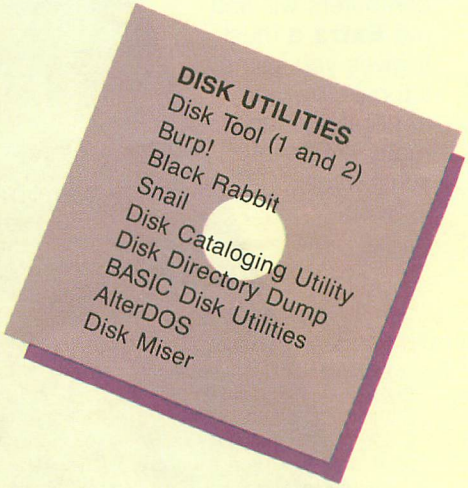

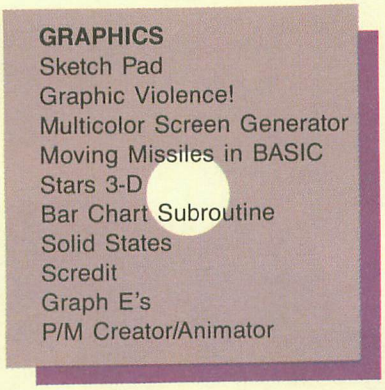

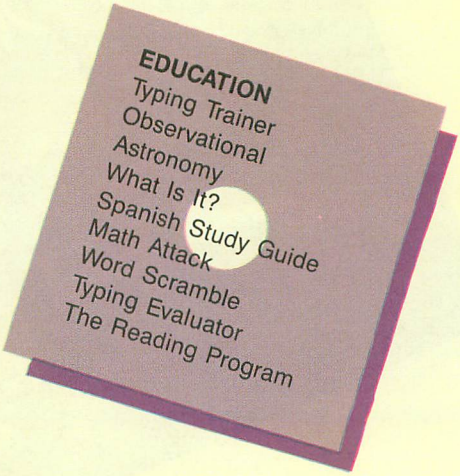

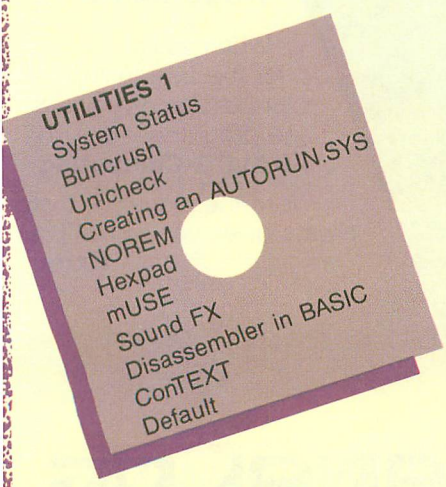

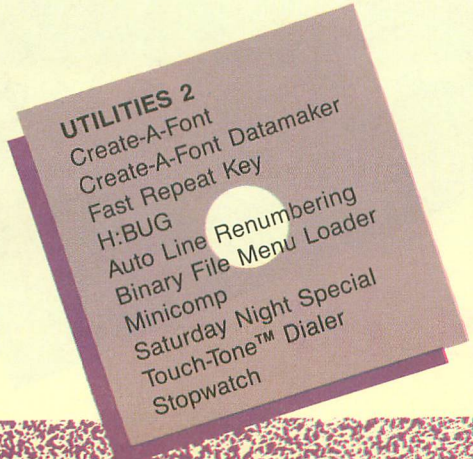

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with a carriage return after each word entered into the dictionary. The following additional changes will correct this.

First, the problem stems from a difference in operating systems between the 400/800 and the XL/XE. In this case, a single-byte "get text" command would return the first character entered, while the XL/XE system will return the last character entered. The two places in SPELLER where the program asks for user response (requiring a *N*/*Y* followed by a carriage return) were originally set at 1 byte. This works fine in the 400/800, but results in a carriage return in the memory location that's supposed to contain an *N* or *Y* in XL/XEs. Your solution was to make the response 2 bytes long, which allowed the carriage return to go harmlessly into the subsequent byte.

Oops, not so! Now every word added to the dictionary has a carriage return appended to it in the new document. This is because the next byte is used as a temporary storage for the last character read, which denoted the end of a word (space, comma, etc.) Since agreeing to put the word into the dictionary required a *Y* plus a carriage return, the end-of-word character became a carriage return, and was subsequently added to the new document.

One fix for this is to store the end-of-word character in the second byte of an immediate mode LDA instruction, thereby eliminating the need to find another safe place for it. The temporary storage location used originally had no other use, so doing this doesn't cripple some other part of the program. Type in the following program and run it. Make sure the filename you use agrees with the filename in Line 10. If you've already put the January **Reader comment** patch in, delete Line 70.

```
10 OPEN #1,9,0,"D:SPELLER"
20 TRAP 50
30 READ A:PUT #1,A
40 GOTO 30
50 CLOSE #1
60 END
70 DATA 56,70,57,70,169,2,
101,75,102,75,169,2
80 DATA 77,72,91,72,141,19
6,35,153,11,4,32,31,36,32,
130,40,169,32,234
90 DATA 224,2,225,2,0,64
```

Sincerely,
Thomas Houston
Marcola, OR

M/L Editor

For use in machine language entry

by Clayton Walnum

M/L Editor provides an easy method to enter our machine language listings. It won't allow you to skip lines or enter bad data. For convenience, you may enter listings in multiple sittings. When you're through typing a listing with **M/L Editor**, you'll have a complete, runnable object file on your disk.

There is one hitch: it's for disk users only. My apologies to those with cassette systems.

Listing 1 is **M/L Editor**'s BASIC listing. Type it in and, when it's free of typos, save a copy to disk, then run it.

On a first run, you'll be asked if you're starting a new listing or continuing from a previously saved point. Press *S* to start, or *C* to continue.

You'll then be asked for a filename. If you're starting a new listing, type in the filename you want to save the program under, then press RETURN. If there's already a file by that name on the disk, you'll be asked if you wish to delete it. Press *Y* to delete the file, or *N* to enter a new filename.

If you're continuing a file, type in the name you gave the file when you started it. If the program can't find the file, you'll get an error message and be prompted for another filename. Otherwise, **M/L Editor** will calculate where you left off, then go on to the data entry screen.

Each machine language program in **ANALOG Computing** is represented by a list of BASIC data statements. Every line contains 16 bytes, plus a checksum. Only the numbers following the word *DATA* need be considered.

M/L Editor will display, at the top of the screen, the number of the line you're currently working on. As you go through the line, you'll be prompted for each entry. Simply type the number and press RETURN. If you press RETURN without a number, the default is the last value entered.

This feature provides a quick way to type in lines with repetitions of the same number. As an added convenience, the editor will not respond to the letter keys (except *Q*, for "quit"). You must either enter a number or press RETURN.

When you finish a line, **M/L Editor** will compare the entries' checksum with the magazine's checksum. If they match, the screen will clear, and you may go on to the next line.

If the checksums *don't* match, you'll hear a buzzing sound. The screen will turn red, and the cursor will be placed back at the first byte of data. Compare the magazine listing byte by byte with your entries. If a number's correct, press RETURN.

If you find an error, make the correction. When all data's valid, the screen will return to grey, and you'll be allowed to begin the next line.

Make sure you leave your disk in the drive while typing. The data is saved continuously.

You may stop at any time (except when you have a red screen) by entering the letter *Q* for byte #1. The file will be closed, and the program will return you to BASIC. When you've completed a file, exit **M/L Editor** in the same way.

When you've finished typing a program, the file you've created will be ready to run. In most cases, it should be loaded from DOS via the L option. Some programs may have special loading instructions; be sure to check the program's article.

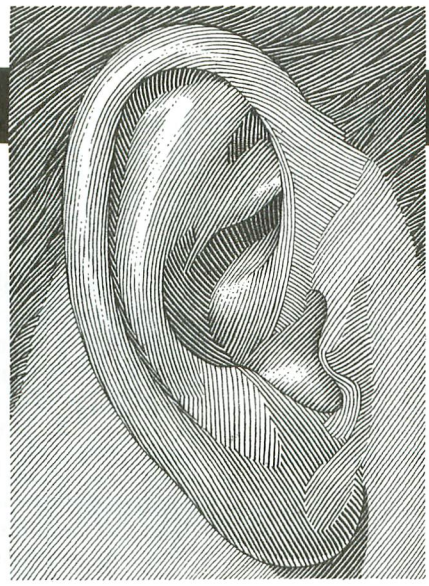
If you want the program to run automatically when you boot the disk, simply name the file AUTORUN.SYS (make sure you have DOS on the disk).

That's **M/L Editor**. Use it in good health.

The two-letter checksum code preceding the line numbers here is *not* a part of the BASIC program. For further information, see the *BASIC Editor II*, in issue 47.

Listing 1.
BASIC listing.

```
AZ 10 DIM BF(16),N$(4),A$(1),B$(1),F$(15)
   ,F1$(15)
LF 11 DIM MOD$(4)
BN 20 LINE=1000:RETRN=155:BACKSP=126:CHKS
   UM=0:EDIT=0
GO 30 GOSUB 450:POSITION 10,6:? "Start or
    Continue? ";:GOSUB 500:? CHR$(A)
ZG 40 POSITION 10,8:? "FILENAME";:INPUT F
   $:POKE 752,1:? " "
FE 50 IF LEN(F$)<3 THEN POSITION 20,10:?
   "  ":GOTO 40
NF 60 IF F$(1,2)<>"D:" THEN F1$="D:":F1$(
   3)=F$:GOTO 80
KL 70 F1$=F$
TN 80 IF CHR$(A)="S" THEN 120
FD 90 TRAP 430:OPEN #2,4,0,F1$:TRAP 110
HQ 100 FOR X=1 TO 16:GET #2,A:NEXT X:LINE
   =LINE+10:GOTO 100
WN 110 CLOSE #2:OPEN #2,9,0,F1$:GOTO 170
VT 120 TRAP 160:OPEN #2,4,0,F1$:GOSUB 440
   :POSITION 10,10:? "FILE ALREADY EXISTS
   !!":POKE 752,0
ZU 130 POSITION 10,12:? "ERASE IT? ";:GOS
   UB 500:POKE 752,1:? CHR$(A)
VH 140 IF CHR$(A)="N" OR CHR$(A)="n" THEN
    CLOSE #2:GOTO 30
QG 150 IF CHR$(A)<>"Y" AND CHR$(A)<>"y" T
   HEN 130
BH 160 CLOSE #2:OPEN #2,8,0,F1$
IE 170 GOSUB 450:POSITION 10,1:? "NOW ON
   LINE: ";LINE:CHKSUM=0
GH 180 L1=3:FOR X=1 TO 16:POSITION 13+(X<
   10)+12*(X>9),X+2:POKE 752,0:? "BYTE #"
   ;X;": ";:GOSUB 310
KH 190 IF EDIT AND L=0 THEN BYTE=BF(X):GO
   TO 210
FY 200 BYTE=VAL(N$)
OZ 201 MOD$=N$
BU 210 POSITION 22,X+2:? BYTE;"  "
YZ 220 BF(X)=BYTE:CHKSUM=CHKSUM+BYTE*X:IF
    CHKSUM>9999 THEN CHKSUM=CHKSUM-10000
MS 230 NEXT X:CHKSUM=CHKSUM+LINE:IF CHKSU
   M>9999 THEN CHKSUM=CHKSUM-10000
IG 240 POSITION 12,X+2:POKE 752,0:? "CHEC
   KSUM: ";:L1=4:GOSUB 310
EH 250 IF EDIT AND L=0 THEN 270
QM 260 C=VAL(N$)
SY 270 POSITION 22,X+2:? C;"   "
IL 280 IF C=CHKSUM THEN 300
DI 290 GOSUB 440:EDIT=1:CHKSUM=0:GOTO 180
LW 300 FOR X=1 TO 16:PUT #2,BF(X):NEXT X:
   LINE=LINE+10:EDIT=0:GOTO 170
FV 310 L=0
LG 320 GOSUB 500:IF A=ASC("Q") AND X=1 AN
   D  NOT EDIT THEN 420
PO 330 IF A<>RETRN AND A<>BACKSP AND (A<4
   8 OR A>57) THEN 320
DX 331 IF A=RETRN AND N$="" THEN N$=MOD$
TD 335 IF A=RETRN AND L=0 AND X>1 THEN 35
   0
JR 340 IF ((A=RETRN AND  NOT EDIT) OR A=B
   ACKSP) AND L=0 THEN 320
DW 350 IF A=RETRN THEN POKE 752,1:? " ":R
   ETURN
GG 360 IF A<>BACKSP THEN 400
SA 370 IF L>1 THEN N$=N$(1,L-1):GOTO 390
AS 380 N$=""
RE 390 ? CHR$(BACKSP);:L=L-1:GOTO 320
BB 400 L=L+1:IF L>L1 THEN A=RETRN:GOTO 35
   0
WX 410 N$(L)=CHR$(A):? CHR$(A);:GOTO 320
KN 420 GRAPHICS 0:END
YT 430 GOSUB 440:POSITION 10,10:? "NO SUC
   H FILE!":FOR X=1 TO 1000:NEXT X:CLOSE
   #2:GOTO 30
FD 440 POKE 710,48:SOUND 0,100,12,8:FOR X
   =1 TO 50:NEXT X:SOUND 0,0,0,0:RETURN
MY 450 GRAPHICS 23:POKE 16,112:POKE 53774
   ,112:POKE 559,0:POKE 710,4
XR 460 DL=PEEK(560)+256*PEEK(561)+4:POKE
   DL-1,70:POKE DL+2,6
HW 470 FOR X=3 TO 39 STEP 2:POKE DL+X,2:N
   EXT X:FOR X=4 TO 40 STEP 2:POKE DL+X,0
   :NEXT X
ZW 480 POKE DL+41,65:POKE DL+42,PEEK(560)
   :POKE DL+43,PEEK(561):POKE 87,0
AC 490 POSITION 2,0:? "analog ml editor":
   POKE 559,34:RETURN
WZ 500 OPEN #1,4,0,"K:":GET #1,A:CLOSE #1
   :RETURN
```



Sound Effects Editor

Takes the "error" out of trial-and-error sound effects.

by S.M. Baugh

I was reading about sound effects in a popular book on Atari game design recently, and ran across the statement that sound effects are usually created through trial and error. "Self," I said to myself, "why not get the computer to help with the trial to cut down on the error?" The **Sound Effects Editor** in Listing 1 is the result.

After you have saved a copy of the **Editor** and run it, you will see thirty vertical bars like an abacus, with some numbers along the sides and command references on the top.

You "draw" your sound effects with the **Editor** using a joystick in port 1. Move the cursor up the vertical bar for a higher tone and down for a lower tone. Press the fire button to set the first tone, and the cursor moves to the second bar, etc. If you set the tone at the very bottom on the zero line, there will be no tone at that position.

The commands at the top of the screen are explained below. But note that you can change the quality of each tone independently. For instance, after you set the tone on bar 1, you may change the distortion value of the next note by pressing D before pressing the fire button. Thus, in a thirty-tone sound effect, each tone might have different volume, distortion and sustain values. This would be quite tiresome to achieve through trial and error.

To change the command values at the top of the screen, press the key of the first letter of the command as follows:

(1) *Voice* — Press V to toggle between the four Atari voices numbered 0-3, as in the BASIC command: *SOUND V,n2,n3,n4*. You may set one tone in one voice, the next tone in a second voice, and so on, in order to have overlapping voices. Explosions are much more interesting with several voices set to different pitches and different distortion ranges.

(2) *Distortion* — Press D to set the even-numbered distortion values of the tone. This is the same as BASIC: *SOUND n1,n2,D,n4*. The default value is *10*, which is an undistorted tone.

(3) *Loudness* — Press L to raise or lower the volume of the sound as in BASIC: *SOUND n1,n2,n3,L*.

(4) *Sustain* — Press S to set the amount of time each note will be held. The value is in "jiffies" or 1/60th of a second each. Thus, descending tones set to *0* or *1* race like falling bombs, while a nice, distorted explosion tone set to a sustain of *60* jiffies lasts for 1 second.

(5) *Control* — Press C to set the "Control" feature normally not used with the BASIC SOUND command. This value is placed in POKEY's AUDCTL register at 53768 ($D208) for various effects. For instance, a value of *1* changes the clock base from 64 KHz to 15 KHz, making the sound an octave or so lower. A value of *64* changes the clock base of voice 0 to 1.79 MHz, which is barely audible. Experiment! For more on this feature, see *De Re Atari*, Chapter Seven, or Ian Chadwick's *Mapping the Atari*, page 124.

(6) *Notes* — This is an extra feature for the musically inclined. The **Sound Effects Editor** is not intended as a music composer, so the default pitch scale on the left of the screen (marked *SND* for "sound") is an unmusical range of tones. Each pitch value—as in the command *SOUND n1,P,n3,n4*—moves from a value of *255* to *17* (STEP-17). This gives you the broadest range of tones good for certain sound effects.

However, when you press N, the notes (NTS) scale

on the right of the screen is selected. These pitch values are musical notes from middle C, at the bottom, to high C. (Set Control to *1*, to obtain a range from low C to middle C.) Now you can use the **Sound Effects Editor** for some simple tunes if you wish, or for sound effects set to different tones.

When you experiment a little, you'll see that all these commands are provided to make available the greatest variety of sounds for your sound effects. Now press any non-command key, such as ESCAPE. This shows you the five consol commands you will use:

(1) START — Press the START key on the consol to play through the sound you're working on. You can play through it whenever—and as often as—you wish.

(2) OPTION — Press OPTION to erase a sound you're working on, and to change the screen colors. But be careful! Once erased, a sound effect cannot be retrieved.

(3) START+SELECT — Press the START and SELECT keys together to save a copy of the sound effect on the screen to disk. The result is a LISTed BASIC routine starting at Line 2000, labeled SOUND.SUB. This routine includes a machine language sound player in a string called ML$. To use this routine in your BASIC program, simply move the lines that DIMension and define ML$ to the start of your program, and put the USR(ADR(ML$)) line where you want the sound played. The data lines contain the information used by the USR routine.

Caution: if you have saved a copy of a sound effect onto a disk, don't save another to that disk, or the first will be written over and lost.

If you want to use only the data for the sound effects with the BASIC SOUND command, you must first convert the data, whose design was for use with the machine language player. Listing 2 performs this conversion for your convenience. Type it in and list it to disk. Type *NEW*, and use the ENTER command to enter the SOUND.SUB and Listing 2.

The data lines contain thirty groups of five numbers. Each group of five contains the same information as in this example: *2030 DATA 2,31,166,1,10.*

The *2* represents the Voice * 2, so divide this number by *2* to get the voice for the SOUND command.

The *31* is the pitch value used—like *SOUND n1,31,n3,n4.*

The *166* is a combination of the distortion and volume values * 16. You must know the volume value ahead of time and use the formula: *Distortion=(166–VOL)/16.*

The *1* is the value POKEd into AUDCTL at 53768.

The *10* is the sustain value in jiffies.

However, the machine language sound player included in the subroutine is more efficient and faster than BASIC's SOUND command.

(4) SELECT+OPTION — Press SELECT and OPTION to send the sound effect data to your printer. Neither saving nor printing a sound effect erases it from the **Editor**.

(5) START + OPTION — Press START and OPTION to exit to BASIC. Type *RUN* if you exit accidentally.

That's it! You may want to make some changes to the program, such as rescaling the SND pitch values—see Lines 330-340 and the variable P for "pitch." But whatever improvements the **Sound Effects Editor** can stand, I think it will make your sound effects trials less "errorsome."

S.M. Baugh, with a B.A. in Classics and an M.Div., is currently in a Ph.D. program in Ancient History. He is seriously threatening to buy an ST, and learn C and 6800 machine language, after enjoying his XE for a year.

The two-letter checksum code preceding the line numbers here is *not* a part of the BASIC program. For further information, see the *BASIC Editor II*, in issue 47.

Listing 1.
BASIC listing.

```
MX 5 REM *** SOUND EFFECTS EDITOR by S.
   M. Baugh ***
MB 10 D0=0:D1=1:D2=2:D3=3:D4=4:D5=5:D6=6:
   D7=7:D8=8:D9=9:D10=10:D11=11:D12=12:D1
   6=16:D20=20:DIM M(29,4),D$(6),COL(15)
NL 20 POKE 752,D1:? CHR$(125):POSITION D8
   ,D10
GO 30 GOSUB 1500:GOSUB 1200:GOSUB 1300:GO
   SUB 2000:COL(D0)=242
FK 40 GOSUB 1000:POKE 764,255
KJ 50 IF PEEK(53279)=D6 THEN 200
PC 60 IF PEEK(53279)=D4 THEN 800
IR 70 IF PEEK(53279)=D3 THEN 40
UX 80 IF PEEK(53279)=D2 THEN GRAPHICS 0:E
   ND
NY 90 IF PEEK(53279)=D1 THEN 900
KZ 100 ST=STICK(D0):IF ST<15 THEN 300
JJ 110 IF STRIG(0)=D0 THEN 500
AC 120 IF PEEK(764)=255 THEN 50
BY 130 K=PEEK(764):POKE 764,255:D=(D1*(K=
   16))+(D2*(K=58))+(D3*(K=D0))+(D4*(K=62
   ))+(D5*(K=18))+(D6*(K=35))
WY 140 IF D=D0 THEN 700:REM OTHER MENU
EU 150 ON D GOTO 600,610,620,630,640,650
IV 199 REM PLAY SOUND
LZ 200 TRAP 40000:FOR L=D0 TO 29:K=USR(AD
   R(ML$),M(L,D0),M(L,D1),M(L,D2),M(L,D3)
   ,M(L,D4)):NEXT L
TF 210 SOUND D0,D0,D0,D0:SOUND D1,D0,D0,D
   0:SOUND D2,D0,D0,D0:SOUND D3,D0,D0,D0:
   GOTO 50
OD 299 REM MOVE CURSUR
BD 300 POSITION X+D5,Y:? CHR$(OC)
TB 310 X=X+((ST=D7)*(X<29))-((ST=D11)*(X>
   D0)):IF ST=14 THEN Y=Y-D1*(Y>D7):IF ST
   =D1 THEN 360
MM 320 IF ST=13 THEN Y=Y+D1*(Y<22):IF ST=
   D1 THEN 370
QM 330 IF ST=14 THEN P=P-17*(P>17):GOTO 3
   90
AU 340 IF ST=13 THEN P=P+17*(P<255):P=P*(
   Y<21):GOTO 390
MW 350 GOTO 400
SY 360 I=I+D1*(I<15):P=PEEK(1536+I):GOTO
   380
UY 370 I=I-D1*(I>D0):P=PEEK(1536+I)
NS 380 IF Y=21 THEN P=121:GOTO 400
CL 390 IF Y=21 THEN P=255
NG 400 POSITION X+D5,Y:SCRN=PEEK(88)+PEEK
```

```
   (89)*256:RCRS=PEEK(84):CCRS=PEEK(85)
BT 410 SPOT=SCRN+(RCRS*40)+(CCRS):OC=PEEK
   (SPOT):OC=OC-(64*(OC=84)):? "||":GOTO 5
   0
YR 499 REM BUTTON PRESSED
VD 500 M(X,D0)=V*D2:M(X,D1)=P:M(X,D2)=D16
   *D5+LD*(P)D0):M(X,D3)=C:M(X,D4)=S*(P)D
   0)
XI 510 FOR L=D7 TO 22:POSITION X+D5,L:? "
   |":NEXT L:POSITION X+D5,Y:? "●":X=X+D1
   :IF X=30 THEN X=D0:Y=22
NL 520 POSITION X+D5,Y:SCRN=PEEK(88)+PEEK
   (89)*256:RCRS=PEEK(84):CCRS=PEEK(85)
BY 530 SPOT=SCRN+(RCRS*40)+(CCRS):OC=PEEK
   (SPOT):OC=OC-(64*(OC=84)):? "||":GOTO 5
   0
IU 599 REM CHANGE QUALITIES
SN 600 V=V+D1:V=V*(V<D4):POSITION 18,D3:?
    V:GOTO 50
MP 610 D5=D5+D2:D5=D5*(D5<15):POSITION 18
   ,D4:? "  ":POSITION 18,D4:? D5:GOTO 50
II 620 LD=LD+D1:LD=LD*(LD<D16):POSITION 1
   8,D5:? "  ":POSITION 18,D5:? LD:GOTO 5
   0
QY 630 S=S+D1:S=S*(S<61):POSITION 32,D3:?
    "  ":POSITION 32,D3:? S:GOTO 50
EN 640 C=(C*D2):C=C+(C=D0):C=C*(C<129):PO
   SITION 32,D4:? "   ":POSITION 32,D4:?
   C:GOTO 50
TX 650 SC=SC+D1:SC=SC*(SC=D1):P=D0:I=D0:Y
   =22:OC=124
TK 660 IF SC=D1 THEN POSITION D1,D6:? "SN
   D":POSITION 36,D6:? "NTS":GOTO 680
XP 670 POSITION D1,D6:? "SND":POSITION 36
   ,D6:? "NTS"
WS 680 FOR L=D7 TO 22:POSITION X+D5,L:? "
   |":NEXT L:POSITION X+D5,Y:? "||":GOTO 5
   0
JK 699 REM ALTERNATE MENU
GZ 700 POSITION D6,D3:? "START - Play
   SEL+OPT - Print "
YC 710 ? "   OPTION - New    START+OPT -
    End"
ZG 720 ? "    START+SEL- Save    (Any Key
   )   ":POKE 764,255
HG 730 IF PEEK(764)=255 THEN 730
YH 740 POKE 764,255:POSITION D6,D3:? "Voi
   ce:      ";V;"     ":POSITION 22,D3:?
   "Sustain:  ";S;"    "
WM 750 ? "    Distortion: ";D5;"     ":PO
   SITION 22,D4:? "Control:  ";C;"   "
ER 760 ? "    Loudness:   ";LD;"     ":PO
   SITION 22,D5:? "Notes/Sound    "
RK 770 GOTO 50
US 799 REM SAVE TO DISK
HZ 800 TRAP 50:CLOSE #D1:OPEN #D1,D8,D0,"
   D:SOUND.SUB":LN=2000:D$=" DATA "
WX 810 ? #D1;LN;" DIM ML$(54):RESTORE 203
   0";CHR$(155):LN=LN+D10
OX 820 ? #D1;LN;" ML$=";CHR$(34);ML$;CHR$
   (34);CHR$(155):LN=LN+D10:? #D1;LN;" FO
   R L=0 TO 29:";
FE 830 ? #D1;"READ V:READ P:READ Q:READ C
   :READ S:U=USR(ADR(ML$),V,P,Q,C,S):NEXT
    L:RETURN";CHR$(155)
QZ 840 A=D0:B=D4:FOR I=D1 TO D6:GOSUB 860
   :A=A+D5:B=B+D5:NEXT I
OE 850 CLOSE #D1:GOTO 50
OV 860 LN=LN+D10:? #1;LN;D$;
VP 870 FOR L=A TO B:? #D1;M(L,D0);",";M(L
   ,D1);",";M(L,D2);",";M(L,D3);",";M(L,D
   4);:IF L<B THEN ? #D1;",";
PB 880 NEXT L:? #D1;CHR$(155):RETURN
JZ 899 REM PRINT SOUND DATA
TR 900 TRAP 50:LPRINT "*** SOUND EFFECTS
   EDITOR DATA ***":LPRINT
IR 910 LPRINT "1. Voice x 2":LPRINT "2. P
   itch":LPRINT "3. Distortion x 16 + Vol
   ume"
QD 920 LPRINT "4. POKE 53768 (AUDCTL - $D
   208)":LPRINT "5. Sustain (Jiffies)":LP
   RINT
YC 930 FOR L=0 TO 29
OI 940 LPRINT "DATA ";M(L,D0);",";M(L,D1)
   ;",";M(L,D2);",";M(L,D3);",";M(L,D4)
WS 950 NEXT L:GOTO 50
ZA 999 REM SET SCREEN
SE 1000 P=D0:V=D0:D5=D10:LD=D6:S=D2:C=D0:
   SC=D0:I=D0:OC=124:POKE 206,D0:GOSUB 21
   00
CM 1010 POSITION D6,D3:? "Voice:      ";V
   ;"   Sustain:  2 ";? "   Distortion:
   ";D5;"  Control:  0  "
VQ 1020 ? "    Loudness:   6   Notes/Soun
   d"
HR 1040 FOR Y=D7 TO 22:X=D5:POSITION X,Y:
   ? "||||||||||||||||||||||||||||||":NEX
   T Y
AL 1050 POSITION D1,D6:? "SND":POSITION 3
   6,D6:? "NTS"
UE 1060 X=D0:Y=22:POSITION X+D5,Y:? "||":F
   OR L=D0 TO 29:FOR I=D0 TO D4:M(L,I)=D0
   :NEXT I:NEXT L:RETURN
UW 1199 REM TITLE SCREEN
KP 1200 GRAPHICS 17:SETCOLOR D0,D2,D12:SE
   TCOLOR D1,D3,D8:SETCOLOR D2,D3,D10:SET
   COLOR D3,D10,D8:POSITION D0,D6
JL 1210 DIM T$(30):T$="SOUND effects EDIT
   OR          ":RESTORE 1250
HY 1220 FOR L=D0 TO 29:READ V:READ P:READ
    Q:READ C:READ S:U=USR(ADR(ML$),V,P,Q,
   C,S):? #D6;T$(L+D1,L+D1);:NEXT L
VF 1230 ? #D6:? #D6:? #D6:? #D6;"    by s
   .m.baugh"
HQ 1240 SOUND D0,D0,D0,D0:SOUND D1,D0,D0,
   D0:FOR L=D1 TO 500:NEXT L:RETURN
IA 1250 DATA 0,34,143,1,5,0,17,143,2,20,0
   ,17,138,2,5,0,17,135,2,5,0,17,132,2,5
IA 1260 DATA 0,17,130,2,30,0,85,97,64,20,
   0,119,98,64,20,0,85,99,64,20,0,119,100
   ,64,20
UX 1270 DATA 0,85,101,64,20,0,119,102,64,
   20,0,85,103,64,20,0,119,104,64,20,0,85
   ,105,64,20
VF 1280 DATA 0,119,106,64,20,0,85,105,64,
   20,0,119,104,64,20,0,85,103,64,20,0,11
   9,102,64,20
TH 1290 DATA 0,85,101,64,20,0,119,100,64,
   20,0,85,99,64,20,0,119,98,64,20,0,85,9
   7,64,20
KG 1300 DATA 0,119,97,64,20,0,85,97,64,20
   ,0,119,97,64,20,0,85,97,64,20,0,119,97
   ,64,20
QP 1399 REM SET SCALE
JN 1400 RESTORE 1410:FOR L=D0 TO 15:READ
   D:POKE 1536+L,D:NEXT L:RETURN
TD 1410 DATA 0,121,108,96,91,81,72,64,60,
   53,47,45,40,35,31,29
RA 1499 REM SET ML$
KF 1500 RESTORE 1510:DIM ML$(54):FOR L=D1
    TO 54:READ D:ML$(L)=CHR$(D):NEXT L:RE
   TURN
LT 1510 DATA 104,104,104,170,104,104,133,
   203,104,104,133,204,104,104,133,205,10
   4,104,168,169
HF 1520 DATA 0,157,0,210,157,1,210,141,8,
   210,133,20,165,203,157,0,210,165,204,1
   57
HT 1530 DATA 1,210,165,205,141,8,210,196,
   20,144,2,176,250,96
FC 1999 REM SET UP DISPLAY
SF 2000 GRAPHICS 0:POKE 752,D1:RESTORE 20
   70
TO 2010 FOR L=1024 TO 1068:READ D:POKE L,
   D:NEXT L:POKE 208,0:POKE 710,16
FL 2020 DL=PEEK(560)+PEEK(561)*256:FOR L=
   DL+11 TO DL+26:POKE L,130:NEXT L
```

```
JM 2030 POKE 512,0:POKE 513,4:POKE 54286,
   192
XV 2040 POSITION D2,D1:? "  Sound Effects
   Editor  by S.M.Baugh  "
PU 2050 D=255:FOR L=D7 TO 22:POSITION D1,
   L:? D:D=D-17:NEXT L
VY 2060 RESTORE 1410:READ K:FOR L=D7 TO 2
   1:READ D:POSITION 36,L:? D:NEXT L:POSI
   TION 36,22:? K:RETURN
XY 2070 DATA 72,138,72,166,208,189,27,4,1
   41,10,212,141,24,208,232,224,16,208,2,
   162,0,134,208,104,170,104,64
BR 2080 DATA 18,20,18,22,18,20,18,22,18,2
   0,18,22,18,20,18,20,18,0
C5 2100 IF COL(D0)=242 THEN RESTORE 2110:
   FOR L=D0 TO 15:READ D:COL(L)=D:NEXT L:
   GOTO 2200
VB 2110 DATA 18,20,18,22,18,20,18,22,18,2
   0,18,22,18,20,18,22
VV 2120 FOR L=D0 TO 15:COL(L)=COL(L)+D16:
   NEXT L
BQ 2200 POKE 710,COL(D0)-D2:POKE 208,0:FO
   R L=D0 TO 15:POKE 1051+L,COL(L):NEXT L
   :RETURN
```

Listing 2.
BASIC listing.

```
HG 5 REM *** SOUND EFFECTS EDITOR CONVER
   TER  ***
IZ 2000 RESTORE 2030:VOL=6:REM Change to
   volume value if different
QJ 2005 FOR L=1 TO 30:READ VOICE:VOICE=IN
   T(VOICE/2):READ PITCH:READ DIST:DIST=I
   NT((DIST-VOL)/16)
BS 2010 READ CNTL:READ SUSTAIN:SOUND VOIC
   E,PITCH,DIST,VOL:POKE 53768,CNTL
HT 2015 POKE 20,0
ZD 2020 IF PEEK(20)<SUSTAIN THEN 2020
GX 2025 NEXT L
```

Roland TR-707
Rhythm composer

ROLANDCORP U.S.
1200 Dominion Circle
Los Angeles, CA 90040-3647
(213) 685-5141
$595.00

by Craig Patchett

To be perfectly honest, I used to be somewhat skeptical about rhythm synthesizers (the "composer" in the **TR-707**'s name comes from its editing capabilities); most of the inexpensive models I'd heard before were instantly identifiable as synthetic. This isn't surprising, as it's hard to realistically imitate percussive sounds.

Roland doesn't even try. Instead, they have digitally recorded the sounds of real instruments (two bass drums, two snares, three toms, rimshot, cowbell, handclap, tambourine, closed and open hi-hat, and crash and ride cymbals). When you press a key, the appropriate recording is converted back into an analog signal and amplified.

The result is nothing short of astounding. When I first played the **TR-707**'s built-in demo for friends (without telling them that it was coming from a synthesizer), they all wanted to know who the drummer was. Even *after* I showed them the sleek **TR-707**, they wouldn't believe me—until they had played it themselves.

No matter how good the sound from a rhythm synthesizer is, it doesn't do you much good if you can't do anything with it. Even an expert drummer would have trouble playing something professional by tapping on the **TR-707**'s keys, and most people buy a rhythm synthesizer because they *aren't* professional drummers.

Obviously then, the ease of creating a complex (or simple) drum piece is just as important as the quality of the resulting sound, if not more so. This is where the "composer" in the **TR-707**'s name comes into play.

At the top of the **TR-707** is a 2¾"x2" LCD display window that indicates the current tempo, mode, and, perhaps most important, gives a graphic depiction of the current bar (a bar is a musical division of time), which is divided into sixteen equally spaced "steps."

For each instrument sound, there's a row of sixteen dots in this depiction. They're turned on or off, depending on whether or not the corresponding instrument is to be played at that particular step. While a bit difficult to describe, this method of displaying a bar greatly simplifies the task of creating one.

A bar can be created in one of two ways. The first is called "step editing" and is, perhaps, the easiest, since you don't have to worry about timing. In this mode, you specify the instrument sound that you want to add or change, then use the **TR-707**'s sixteen instrument keys to select the steps for which you want that instrument to be played (LEDs above the keys, as well as the dots in the LCD window, indicate which steps are on and which are off).

By doing this for each instrument, you can gradually build up a complete bar. If you make a mistake or change your mind, corrections are as simple as pressing the key for a step that's turned on, to turn it off again.

The other way of creating a bar is called "tap editing," and lets you build your bar in real time. In other words, each instrument key now controls that instrument sound (rather than controlling a step for one particular instrument), and you simply hit a key when you want that instrument to play.

The bar plays over and over again as you edit (as it does in step edit mode), so you can layer instruments on top of each other as you go. Or you can erase mistakes (by holding down a key for one complete play of the bar). You can even switch over to step editing mode to do the fine tuning.

A one-bar phrase as created above is also called a rhythm "pattern." up to sixty-four such patterns can be created and stored in the **TR-707**'s memory, then sequenced together to form one of four "tracks."

Together, these tracks allow the sequencing of up to 998 bars, in any order, to form a complete drum piece. Track editing is even simpler than pattern editing and includes capabilities for inserting, deleting, copying and replacing bars. Once completed, tracks can even be saved to a regular tape recorder, an optional memory cartridge or an external computer (with the appropriate software).

Some of the **TR-707**'s other capabilities include adding shuffle, flam and accents, changing tempo, changing scale (2/4, 3/4, 4/4, 6/8, multiples of these, other special times like 5/4 and 7/4, and mixed times—all can be easily set) and adjusting the volume of each instrument sound individually (the back of the **TR-707** also has individual outputs for each instrument, as well as a combined output, so that you can add echo, equalization or whatever suits your needs).

You can even play the **TR-707** from an external keyboard, such as that on the Ca-

sio **CZ-101**. This is done through the built-in MIDI interface, which, among other things, allows you to synchronize the **TR-707** to a MIDI clock signal. This is necessary, if you want to play something that requires the **TR-707** to be in time with one or more other synthesizers. And, since MIDI allows you to have your Atari play the **TR-707**, the track and pattern editing capabilities can be extended even further with MIDI.

The **TR-707** is a dream come true for anybody who's sick of using their desktop as an imaginary drum set, as it allows anyone with an ear for percussion to produce professional-sounding drum pieces. And, at $595 suggested retail (I've seen it advertised for under $475), it's a dream that's affordable.

The **TR-707** comes with an extensive manual that makes learning the seemingly complex system easy. The only complaint I have about the manual is this: they include a MIDI guide apparently translated from Japanese by someone with a limited knowledge of English. It is, as a result, close to incomprehensible. An example: "It is of cource [*sic*] true, however, let us provide further description not to cause misunderstanding." Sure. Fortunately, the guide is more of an extra than a necessity, and can be ignored without penalty.

Craig Patchett is the author of several microcomputer books and a valued contributor to ***ANALOG Computing****. A loyal Atari supporter since 1979, he's currently a software engineer for Perkin-Elmer Corp. in Norwalk, Connecticut.*

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Hard Disk Primer

Curious about hard disk drives? Here's an explanation of them by an authority—the president of ICD, Inc.

by Tom Harker

Once you've tried one, you'll never want to give it up. That's the problem with hard disk drives: they're psychologically addictive. A hard disk drive will move your computer into a whole new class of productivity machines. Whether your use is telecommunications or a database for your business, a hard disk drive will double your efficiency. There are a few issues we'll discuss that should help you select the hard disk drive that's best for you. First, a little inside information.

What's inside.

The *winchester* type or "fixed" hard disk drive operates like a floppy disk drive from which you can't remove the disk. The disk and heads are inside a sealed chamber that should never be opened. A hard disk is much faster, more reliable, and stores many times the capacity of a floppy. The speed and precision of a hard drive results in greater density and shorter access times. An Atari 1050 turns the disk at 288 rpm (revolutions per minute). A fixed hard disk drive spins at 3600 rpm. There are also removable hard disk drives available, which usually have the disk in a plastic cartridge. These generally run at 1800 rpm, and head movement is considerably slower.

The hard disk drive head is aerodynamically designed to float on a cushion of air several microns (millionths of an inch) above the *platter* or disk. The platter is accurately machined and very rigid, unlike a floppy. There are usually two or more heads in each fixed drive (20-meg drives usually have four), with one or two heads on each side of the platter. Many drives have more than one platter. The platters are divided by concentric circles called *cylinders*. These are like the "tracks" on a floppy disk. A 5¼-inch platter will have from 150 to 640 cylinders, compared to 40 tracks on a formatted Atari 1050 disk. As you may have already surmised, precision *stepping* (head movement) is required.

Density.

There are currently two commonly found *density* schemes (also called *data packing* or *encoding*) used. The most common and least expensive is called *MFM* (Modified Frequency Modulation). MFM is the standard encoding method used with double-density drives. MFM is what 1050 disk drives use for dual density (FM is used for single density), and what US Doublers use for "full double" density. A standard 5¼- or 3½-inch hard disk drive using 256 byte sectors with MFM encoding will format 32 sectors per cylinder.

Recently, a newer encoding scheme called *RLL* (Run Length Limited) was developed. This scheme packs one and a half times the data of MFM in the same amount of space. A standard 5¼- or 3½-inch hard disk drive using 256 byte sectors with RLL encoding will format 48 sectors per cylinder. Since RLL packs more density, it requires special media. RLL controller boards only put out RLL encoding, and MFM controllers only put out MFM. You cannot mix the two types on the same controller.

Drive manufacturers have modified their standard MFM-rated drives to handle RLL encoding. An example is the Seagate ST238 30-meg. It is identical to the ST225 20-meg, except that it has been certified for RLL use. The company probably uses a higher quality magnetic coating on the platters and may also be adjusting the data timing electronics.

If you format an ST238 drive with an MFM controller, you'll end up with 20 meg. If you format the same drive with an RLL controller, you'll end up with 30 meg. It is not recommended that you format an ST225 with an RLL controller. It will probably give you 30 meg, but the data integrity is not guaranteed—and that's very important with hard drives!

Speed.

The interface is another area of major difference between hard and floppy drives. High-speed SCSI or SASI interfaces are used with hard drives and are capable of transferring 5-meg bps (bits per second). The computer architecture, operating system and DOS usually slow the actual transfer rate considerably. Atari 1050 disk drives transfer data at 19.2K baud, while Atari SF354 drives work at near 250K baud. These are all *burst* rates (the fastest transfer rate hypothetically possible); actual data transfer is much slower, due to head seeking and settling times as well as DOS overhead. See the following chart for actual calculated speeds done under test.

The test procedure was to copy a large file from a device (RAMdisk, floppy disk, hard disk) back to the same device. In this comparison, baud was converted to bytes per second by dividing by 10, which should give a more meaningful value to these numbers. TOS was used with the 520ST, and SpartaDOS with a 130XE was used for the 8-bit tests.

Type	Burst Rate	Actual Rate
1050 Double Density	1.9K bytes/sec	.9K bytes/sec
1050 DD UltraSpeed	5.4K bytes/sec	2.5K bytes/sec
MIO RAMdisk	56.0K bytes/sec	54.0K bytes/sec
MIO Hard Disk	42.0K bytes/sec	14.0K bytes/sec
SF354	25.0K bytes/sec	4.0K bytes/sec
ST RAMdisk	500.0K bytes/sec	(est.) 200.0K bytes/sec
ST Hard Disk	500.0K bytes/sec	30.0K bytes/sec

Size.

The fixed hard disk drive is a high-speed storage device which holds 5 or more megabytes, depending on the size you purchase. The 20-meg is the most commonly sold size today and is the equivalent of 222 single-density disks on an 8-bit, or 55 single-sided ST disks.

Parts breakdown for an external drive.

Case and Power Supply — The case should have metal shielding to keep the RFI (Radio Frequency Interference) noise down. Power connectors and mounting brackets are required. The case needs a quiet fan to keep things cool inside. A well-filtered switching power supply, around 45 watts with 4 amps of +5 vdc and 2 amps of +12 vdc, is important.

Host Adapter — This is the MIO hard disk port for the 8-bit Ataris. The ST computers need a host adapter board to convert the DMA port to a standard SCSI or SASI interface. A host adapter may also have other functions which add versatility to the computer (like a real-time clock or other ports).

Controller — This is the complex device which actually controls the hard disk drive. It's an intelligent, high-speed device with a CPU, ROM, RAM, and interface circuitry including a well-tuned analog section. The controller has an instruction set which interprets commands from the computer and performs the functions on the drive units. Most controllers are capable of handling two separate hard drive units (some restrictions on multiple drives will vary, depending on controller design). Controllers also have a device ID, which means that a well-designed host adapter can handle up to eight controllers at once. The controller also requires power, usually derived from the drive's power supply inside the case.

Hard Drive Unit — This is the heart of the system . . . and the part people always discover deals on, in magazines like *Computer Shopper*. Yes, 20 meg for $300 or 10 meg for $200 sounds like a bargain, but you also need the other parts mentioned here to make your system fully functional. The hard drive unit is the delicate sealed mechanism where all the data is stored. It has a circuit board, usually with an ST506/ST412 interface. This is identified by a 34-pin and a 20-pin male edge connector. It also has a polarized plug for DC power (like the controller). The hard drive units are commonly available in full-height and half-height configurations in the 5¼-inch disk size, and the half-height configuration in the 3½-inch size. The advantage of the half height models is that you can usually fit two of these units together, sharing one case and power supply. Some of the newer 3½-inch drives also have automatic head unloading when power goes off. This is a nice feature and can extend head life. A hard disk unit should be expected to give at least two full years of continuous service. Since they are sealed units, it is not recommended that you attempt any service on a bad unit. Any dust allowed inside can destroy reliability.

Cables — There are several cables required for an external drive assembly. The first set uses 20-pin and 34-ribbon cables to connect the ST506/ST412 interfaces to the controller. The next is the 50-conductor cable to connect the controller's SCSI port to the host adapter. (An ST also requires a cable from the host adapter to the DMA port.) Of course, the others are the AC and DC power connectors. When building your own system, most problems stem from improperly connected equipment.

Program — A good format program allows versatility with the use of different drives (if any). It also sets the *sector skew* (interlace) which can affect access speed. The control program can also affect speed. The ST currently requires a handler to be loaded into RAM from floppy disk.

Low-cost drives for the IBM PC and compatibles.

This breakdown has shown the requirements for an external ST or 8-bit Atari drive, and why they are more expensive than the "cheap" IBM-type hard drives sold for the PC and compatibles. An open architecture, and enough space and power for an internal hard disk drive saves $$$. Fewer cables and less expensive controllers (due to the sheer volume of PCs with hard drives) are also used with the PCs, resulting in a lower cost.

Reliability.

Hard drives can be very reliable if properly designed and used. The design should include a heavy-duty switching power supply. These are smaller and run much cooler than do their linear counterparts. (Linear supplies work okay, as long as they're properly cooled, and you don't mind the added weight and size.) Proper cooling is a major factor in hard drive reliability. A fan is still considered a necessity by most. Some 3½-inch drives can be run with-

out fans, but they do seem to run a bit warm. No one really knows how much of a wear factor this will add over the next few years.

Hard disk drives should be left on 24 hours a day, or turned on and off just once a day at most. They are *not* meant to be cycled on and off many times a day, like a light switch. It takes a tremendous amount of torque to get the platter spinning and speed up to 3600 rpm. This torque creates wear on the bearings—and the heads—on most drives. Another good practice is to park the heads before transporting the drive. This positions the heads to the inside of the data area, where damage is least critical.

Probably the worst thing you can do to a hard drive is move it or bump it while it's turned on. This is where some real damage can occur. At 3600 rpm, if the head touches the platter (from shock), both can be instantly destroyed. Just remember to exercise care; treat it gently, as you would a baby.

Hard drives are very reliable if properly used, and can provide years of continuous use. They're much more reliable than floppy disks; you just lose far more data if damage occurs. With good design, proper operating procedure, and with regular backup, you'll enjoy a hard drive immensely! I know I wouldn't work without one.

Conclusion.

I hope this article has taken some of the mystery and confusion out of the hard disk drive issue. It is my belief that anyone who's considering using a computer for a business application or a serious BBS should also consider purchasing a hard disk drive. You'll be amazed with the performance.

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8-bit news!

THE CONNECTION

Quik Pix: The Print Shop, from White Lion Software, gives **AtariWriter** owners the capability to add a graphic to headers and footers, or even make their own letterheads. Icons can be used in newsletter headlines or articles, and finished work can be saved to disk and then retrieved at a later date.

Among the many **Quik Pix** features are drop-down menus, various borders to select from and a mail-merge option.

A second version, **Quik Pix PC: The Print Shop**, is available for users of **PaperClip**. The same features that apply to the **AtariWriter** version work here, as well. This program also offers drop-down menus and several border selections. Both packages work with any Epson or compatible printer, such as Panasonic, Star SG-10, Gemini 10X and Legend.

Priced at $29.95 each; 48K Disk. White Lion Software, P.O. Box 357, Ridge, NY 11961.

CIRCLE #136 ON READER SERVICE CARD

8-BIT SUPPORT

A new Innovative Concepts kit modifies the Atari CX-85 Numeric Keypad for all software and any Atari 8-bit. All you need is the $39.95 kit and an easy modification.

RAMdrive + 64K brings the 600XL up to 64K, giving it the ability to run 800XL software. No soldering is required on 600XLs with socketed chips. This kit also includes the RAM chips. $24.95.

800XL owners can upgrade to 256K, allowing for RAMdisk setup or bank-switching memory. Minimal soldering is necessary; it's complete with instructions for installation, user/technical notes, RAM chips, and two disks containing RAMdisk handlers, source codes and other utilities that use the added memory. **RAMdrive + XL** sells for $59.95.

For 130XE owners, **RAMdrive + XE** gives you the option of expanding up to 320K. Similar to the XL version, but with another 64K. Designed for those experienced in electronics, as quite a bit of soldering/unsoldering skills are required. Includes memory chips and everything else mentioned with the XL kit. $44.95.

RAMdrive + 576K is available by special order only. This kit is recommended only for those with more advanced kit-building skills. Boosts the 130XE up to 576K of RAM in several different variations. For information and pricing, contact the manufacturer.

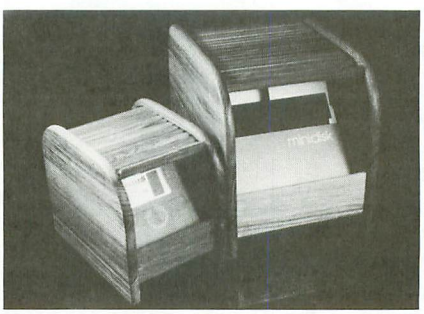
Finally, **Imitator Controller** gives Happy board owners the ability to control writing in fast or slow mode via a switch. It also lets you control write protect in three modes and monitor the write-protect status using a two-color LED. The manufacturer claims easy installation. $29.95.

For more information on any of these products, you can contact Innovative Concepts at 31172 Shawn Dr., Warren, MI 48093 — (313) 292-0730. CIRCLE #137 ON READER SERVICE CARD

TEAK TO TEAK

Solid teak roll-top organizers for your disks are now available, for either 5¼- or 3½-inch disks. The genuine hand-rubbed teak files feature a roll-top door and flexible index dividers.

Model 1200T, sold for $49.95, stores 120 5¼-inch disks. **Model 700T**, at $22.95, holds 70 5¼-inch disks. **Model 300T** for 3½-inch drive owners holds 30 disks, for a retail price of $19.95. So give your desk a classic look—and keep your work neatly organized at the same time.



From AAA International Co., 22706 Cheryl Way, El Toro, CA 92630 — (714) 951-0747.

CIRCLE #140 ON READER SERVICE CARD

OTHER NEWS

Are you curious about how others are turning a profit from their knowledge of computing? The **Association of Electronic Cottagers** has a **new handbook** out, covering the ten most popular methods for making money using personal computers. Some of the home-based businesses include: writing, data entry and processing, desktop publishing and mailing list services.

For information on joining the AEC, you can contact them at P.O. Box 1738, Davis, CA 95617-1738. CIRCLE #138 ON READER SERVICE CARD

■ ■ ■

Now Atari 8-bit owners can enjoy playing one of the popular adventures that ST users are experiencing. **Phantasie**, a multiple-character role-playing, graphic adventure, involves sorcery, with trolls and other mystical individuals. You and your compatriots, be they elves, orcs, lizard men or gnomes, search the land for the Nine Rings necessary to destroy the evil Gelnor. Playing time is said to be thirty to sixty hours.

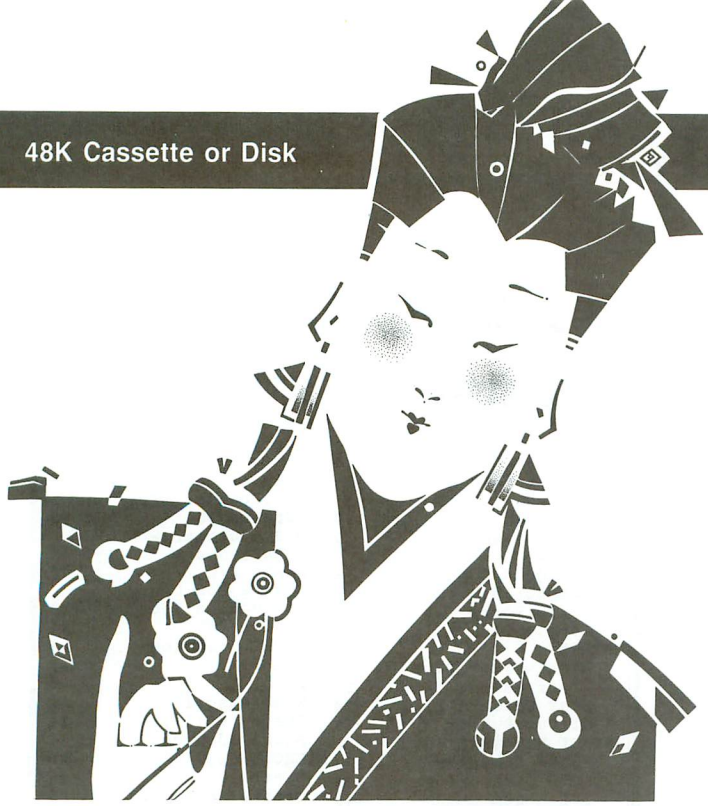
Retail is $39.95; 48K Disk. Strategic Simulations, Inc., 1046 N. Rengstorff Ave., Mountain View, CA 94043 — (415) 964-1353.

CIRCLE #139 ON READER SERVICE CARD

NEW DRIVE?

Latest news reports say the 3½-inch floppy disk drive for the 8-bit line has been scrapped in favor of a **new 5¼**. This drive is said to be double-density/double-sided, and the A-DOS, previously developed for 3½-inch drives is now being rewritten for the new drive. The new floppy drive, we're told, is intended to be fully compatible with the 810 and 1050, as well as other drives, such as the Rana, Track, etc.

And what was the reason for the change? Many manufacturers of software for the Atari lines were not wild about producing products for the 3½-inch format; they felt such production was too expensive to be cost effective. Atari abided by the software developers' requests and remained with the 5¼-inch setup. Prices, availability and further information will be printed in these pages as the information is released.



Shakuhachi Keyboard

Re-create the haunting tones of the Japanese bamboo pipe on your Atari.

by Albert Baggetta

One of the great powers of the home computer is its ability to simulate. In its "eye," it can graphically simulate objects; in its "brain," it can logically simulate situations; in its "ear," it can simulate the real world of sound; and through its "mouth," it can reproduce this myriad of sounds.

As a musician, I'm fascinated with the Atari's ability to imitate musical sounds. Whenever I hear a unique one, I turn to my Atari and ask it to reproduce the sound. With some help from me, it usually comes through. First I have to find out where the sound is coming from and how it's being reproduced. Is it a "plucked" sound? Does it fade away quickly or slowly? Is the effect made up of more than one sound? After I decide on these and other ideas, I try to make my good old 8-bit Atari put them all together to create a sound simulation.

Recently I became intrigued with the musical soundtrack from *The Karate Kid*, especially that haunting flute sound produced by the Japanese *Sho* or the *Shakuhachi* (bamboo pipe). The sound is so familiar to us westerners, from the movies and television, that it seemed a natural for computer simulation. After much experimentation, I created the accompanying program, **Shakuhachi Keyboard**.

I decided that the sound I was looking for has two characteristics. The musical tone is accompanied by an aspiration (a blowing of air). Because of this, the volume of the tone goes from soft to loud to instant quiet (when the aspiration stops). As you can see, if you know anything about the Atari's technique for reproducing sound, I was going to need some high-pitched "white noise," along with a musical tone that fades in, up to a high point of volume. This effect is created by the short loops and sound statements in Lines 300 to 310 of the program.

I needed some notes, too. A little research revealed that the Japanese do not use our western scales for music, but they do use some of the notes. A typical pattern follows:

Note	Pitch
G	162
A	144
C	121
D	108
E	96
G	81

My program selects from this combination of notes randomly, to create an ongoing Japanese melody (not too difficult for the western ear to accept). Random delays also help to simulate timing and originality in the creative process. (Who said a computer can't be an artist?)

I used a split screen in the graphics 0 mode. The top of the screen displays the program title with a couple of wispy birds drifting against a sunny sky. To make the program somewhat informational, the name of each note is displayed at the bottom of the screen.

Type in the program and experiment with it. Maybe you can even create a more elaborate music editor, one that will allow users to generate their own tunes for the computer to play. Then we can put on our kimonos, sit back with a cup of tea and enjoy the oriental sounds of the synthesized **Shakuhachi**.

(Listing begins on next page.)

Albert Baggetta has been a high school English teacher for twenty years. He's been interested in BASIC programming for about five years, and likes to experiment with programs relating to graphics, music and the English language.

The two-letter checksum code preceding the line numbers here is *not* a part of the BASIC program. For further information, see the *BASIC Editor II*, in issue 47.

Listing 1.
BASIC listing.

```
AE 10 REM ******************************
KH 20 REM *    SHAKUHACHI KEYBOARD     *
FU 30 REM *                            *
LX 40 REM *       BY A.BAGGETTA        *
KN 50 REM *    ATARI HOME COMPUTERS    *
WS 60 REM *          (C)1987           *
AK 70 REM ******************************
PE 80 REM SAVE "D:JAPANFLT.BAS
VN 90 GRAPHICS 0:POKE 703,4:POKE 752,1:?
   #6;CHR$(125):SETCOLOR 1,0,0:SETCOLOR 2
   ,0,0:SETCOLOR 4,0,0
KF 100 ? #6:? #6:? #6:? #6
AU 110 ? #6;"          ";CHR$(8);CHR$(10)
FX 120 ? #6;"        ";CHR$(8);CHR$(7);CHR
   $(136);CHR$(138)
AU 130 ? #6;"      ";CHR$(136)
WB 140 ? #6;"     Shakuhachi  Keyboard"
MT 150 ? #6:? #6;"
    ";CHR$(8);CHR$(10)
IK 160 ? #6;"                          ";CHR$
   (8);CHR$(7);CHR$(136);CHR$(138)
UD 170 ? #6;"                          ";CHR$
   (136)
NG 180 POSITION 0,18:? #6;"              JA
   PANESE SCALE"
NZ 190 POSITION 0,19:? #6;"           ^^^^
   ^^^^^^^^^^^^^^^"
TI 200 FOR I=0 TO 15
XO 210 SETCOLOR 2,1,I:SETCOLOR 4,1,I:SETC
   OLOR 1,1,15-I:NEXT I
NZ 220 X=INT(RND(0)*6)+1
LT 230 ON X GOTO 240,250,260,270,280,290
SY 240 P=162:? "G ";:GOTO 300
PH 250 P=144:? "A ";:GOTO 300
PJ 260 P=121:? "C ";:GOTO 300
RU 270 P=108:? "D ";:GOTO 300
TF 280 P=96:? "E ";:GOTO 300
SM 290 P=81:? "G ";:GOTO 300
MH 300 FOR D=0 TO 4 STEP 0.3:SOUND 0,P,10
   ,D:SOUND 1,1,8,1:NEXT D
FN 310 SOUND 0,P,10,D:SOUND 1,1,8,1
QB 320 FOR E=1 TO INT(RND(0)*350):NEXT E
CV 330 SOUND 1,0,0,0:SOUND 0,0,0,0:REM RE
   MOVE REM FOR DELAY BETWEEN NOTES AB=1^
   1
MW 340 GOTO 220
```

Étude in C♯ Minor

A sound and graphics practical application in ST BASIC.

by David Lindsley

This article and the program accompanying it will help you show off the sound and graphics capabilities of your ST BASIC. The tune is one I wrote a few years ago, demonstrating the combination of all three voices on the ST. In addition, I've included a picture at the beginning, to show that more can be done with BASIC than drawing circles and squares.

The Atari ST is not limited to the three voices that come with the system. A synthesizer and software can produce up to fifteen sounds by plugging into the built-in MIDI ports, thus making the ST very expandable. But even without added peripherals, you can still obtain impressive sound with your ST.

ST BASIC has two commands that will allow you to access the three-voice sound chip in your ST. They are SOUND and WAVE. With these, you can create just about any sound or noise you want.

First, let's take a look at the SOUND statement:

```
SOUND voice,volume,note,octave,duration
```

There are three voices, fifteen volume settings, twelve notes, and eight octaves, along with an infinite number of duration settings—more than enough to create any type of sound or noise. The notes C through B are represented by the numbers *1* through *12*. Middle C on the piano would be OCTAVE 4, NOTE 1. Let's go ahead and play that note, by typing in the following:

```
10 sound 1,15,1,4,50
20 sound 1,0,0,0,0
```

When this is run, you will hear the note sounded for one second. (Don't forget to turn up the volume on your monitor!) The first number in Line 10, *1*, is the voice that we're using; *15* is the volume level(maximum); *1* is the note C; *4* is the octave; and *50* is the duration (a value of *100* would be 2 seconds).

Notice that on Line 20 it is necessary to shut off the sound by substituting *0*s for the values. Now let's put a few notes together and make a little song. Here's a tune that has only eight notes:

C,E,G,F,E,F,D,E

Translated into numbers it looks like:

1,5,8,6,5,6,3,5

Now we're able to plug these numbers into the SOUND statement:

```
10 sound 1,15,1,5,15
20 sound 1,15,5,5,15
30 sound 1,15,8,5,15
40 sound 1,15,6,5,15
```

. . .and so on, but that's a lot of work. Why not let the computer do all the work for you (that's why you bought it, right)? Using a FOR/NEXT loop and a READ statement will make our tune look like this:

```
10 for i=1 to 8:read x
20 sound 1,15,x,5,15
30 next
40 data 1,5,8,6,5,6,3,5
50 restore:goto 10
```

(Press CTRL-C to end the song)

Okay: so far so good, but I said there were *three* voices available. Go back and edit the tune, changing the SOUND voice number to *2* or *3*. What's this? Nothing happened! So where are the other two voices?

Enter the WAVE statement.

In order to get more than one voice, we need to use the WAVE statement. This is how it looks:

```
WAVE enable,envelope,shape,period,delay
```

There are thirty-one different *enable* settings, sixteen

envelope settings, ten *shapes* and thirty-one *period* settings. The *delay* setting should always be *0*, otherwise there will be an audible separation before the next sound. The WAVE statement is explained in greater detail in other books and publications—for example, the May 1986 issue of **ST-Log**, in **ST Sound Waves**. WAVE is used to combine voices and to modify the type of sound or noise created.

Let's make some changes to our tune:

```
5  wave 3,3,13,15,0
10 for i=1 to 8:read x,y
20 sound 1,15,x,5,0
25 sound 2,14,y,4,15
30 next
40 data 1,0,5,5,8,0,6,5
45 data 5,0,6,6,3,0,5,8
50 restore:goto 10
```

(Press CTRL-C to end the song)

Now we have *two* voices playing at the same time. Notice that the duration value for sound 1 is now *0*, and the value of *15* has moved down to sound 2. This is how you get the voices to overlap. The last voice controls the duration. All other voices are always set to *0*.

In the next example, both sound 1 and sound 2 have a duration value of *0*, while sound 3 is assigned the duty of timing the duration.

Let's get all three voices working together, and complete our little tune by adding a bass riff. This time we'll give sound 3 the freedom to move up or down in octaves, by assigning value to the variable *oct* (of course, this could be done with any or all voices).

```
10 c=3:while c>0
20 wave 7,7,13,15,0
30 for i=1 to 8:read x,y,z,oct
40 sound 1,14,x,5,0
50 sound 2,14,y,4,0
60 sound 3,14,z,oct,15
70 next:c=c-1
80 data 1,0,1,3,5,5,8,3,8,0,1,
3,6,5,8,3
90 data 5,0,6,2,6,1,10,3,3,0,
8,2,5,3,12,3
100 restore:wend
110 sound 1,14,1,5,0
120 sound 2,14,5,4,0
130 sound 3,14,1,3,40
140 sound 1,0,0,0,0
150 sound 2,0,0,0,0
160 sound 3,0,0,0,0
```

Notice the use of the WHILE/WEND loop to make the music repeat three times before the ending is played at Line 110. Lines 140 through 160 turn the sound off.

Transposing sheet music.

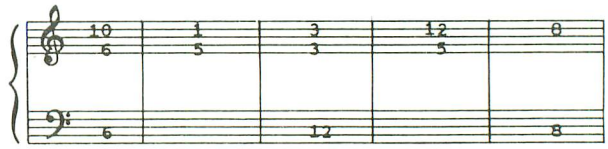
The sidebar accompanying this article shows a measure of music as written for the piano. The first thing we need to do is assign the numeric values for each note from the table. We also need to specify which octave each note is in. Notice that the duration values are not expressed for sound 1 and sound 2, because sound 3 determines the duration value. For this example, let's make a quarter note equal *30* and an eighth note equal *15*. Now these values are ready to be used in the data statements at the end of your program. Use ETUDE.BAS as an example format for your music.

Piano to computer.

As written on piano:

NOTE	VALUE
C	1
C♯	2
D	3
D♯	4
E	5
F	6
F♯	7
G	8
G♯	9
A	10
A♯	11
B	12

Substitute numbers for notes:



Or more simply stated:

SOUND 1	10	1	3	12	8
SOUND 2	6	5	3	5	
SOUND 3	6		12		8

Add octave values:

SOUND 1	10,4	1,5	3,5	12,4	8,4
SOUND 2	6,4	5,4	3,4	5,4	
SOUND 3	6,2		12,2		8,2

Fill blanks with preceding note and indicate duration value on sound 3 only:

SOUND 1	10,4	1,5	3,5	12,4	8,4
SOUND 2	6,4	5,4	3,4	5,4	5,4
SOUND 3	6,2,30	6,2,30	12,2,30	12,2,15	8,2,15

Enter numbers by columns into DATA statement:

```
data 10,4,6,4,6,2,30,1,5,5,4,6,2,30
data 3,5,3,4,12,2,30,12,4,5,4,12,2,15
data 8,4,5,4,8,2,15
```

Precede data with the WAVE and SOUND statements as shown below:

```
10 wave 7,7,13,1280,0
20 for i=1 to 5  '5 is nr of notes
30 read n1,x,n2,y,n3,z,d
40 sound 1,14,n1,x,0
50 sound 2,14,n2,y,0,
60 sound 3,15,n3,z,d
70 next
80 restore:goto 20
90 data 10,4,6,4,6,2,30,1,5,5,4,6,2,30
100 data 3,5,3,4,12,2,30,12,4,5,4,
12,2,15
120 data 8,4,5,4,8,2,15
```

The graphics.

The entire graphics section of this demonstration was created using the VDISYS commands. They are extremely fast. (For more information on using these and other

VDISYS commands, see **VDI Sampler** in the June 1986 issue of **ST-Log**).

The mouse is turned off in Line 210, to prevent interference as the program draws and plays the music, and is restored just prior to returning to the command window at the end of the program. Notice the absence of a CLEARW 2:FULLW 2 command at the beginning of the program. This is because the VDI calls are able to cover the entire screen.

Running the program.

Type in ETUDE.BAS and save a copy to disk before you run it. Make sure your ST is in low resolution if you want to see the graphics portion, but the music will play in any resolution.

---

*For years, David Lindsley wanted a computer. A year ago, he got an Atari 520ST—and loves it. Despite recent critisism, he finds ST BASIC powerful and easy to use, especially for novices. He enjoys creating pictures with **DEGAS** and **Neo-Chrome** (from which **Étude** was derived). By day, he is an electrical designer in Phoenix, Arizona.*

Listing 1.
ST BASIC listing.

```
10 'ETUDE IN C# MINOR by David Lindsle
y
20 dim pxy(22),th(26):ps=peek(systab)
30 if ps=1 or ps=2 then 40 else 60
40 clearw 2:fullw 2:gotoxy 1,10:?"You
must be in LOW res. to see picture"
50 wave 7,7,13,15,0:restore MUSICDATA:
gosub MUSIC:end
60 for i=0 to 15:read ci,red,green,blu
e:gosub SETCOLOR:next
70 data 0,857,714,714,1,0,0,0,2,1000,0
,0,3,428,571,285
80 data 4,714,714,571,5,571,571,571,6,
285,285,285
90 data 7,857,857,714,8,428,428,428,9,
571,857,1000
100 data 10,571,285,571,11,714,571,857
,12,714,857,571
110 data 13,142,142,857,14,1000,1000,1
000,15,571,428,714
120 poke &hfffc02,&h0012'turn off mous
e
130 for i=1 to 9:gosub DOSHAPE:next
140 data 9,4,0,0,319,0,319,72,0,72,12,
4,0,73,319,73,319,199,0,199
150 data 11,4,0,72,80,50,200,60,319,72
160 data 15,7,0,72,0,60,25,50,40,55,55
,60,60,65,110,72
170 data 15,7,200,72,230,60,250,54,265
,50,295,40,319,45,319,72
180 data 10,6,0,72,25,67,140,72,280,55
,319,65,319,72
190 sa=3400:ea=1600:cx=260:cy=169:radx
=35:rady=15:handle=6
200 gosub ELLARC
210 data 3,4,109,147,230,147,255,190,9
3,190
220 data 3,4,60,160,94,160,75,185,32,1
85
230 data 3,6,280,174,299,174,305,178,3
15,187,293,187,278,176
240 color 1,1,1:for i=1 to 10:read x,y
:gosub PERBOTTOM:next
250 side=0:for i=1 to 5:read x,y:gosub
 PERSIDE:next
260 restore LINEDATA
270 side =319:for i=1 to 5:read x,y:go
sub PERSIDE:next
280 data 6,15,24,33,42,96,105,114,123,
132
290 data 186,195,204,213,222,276,285,2
94,303,312
300 LINEDATA:
310 data 106,109,113,118,124,144,149,1
55,162,170
320 for i=1 to 13:gosub DOSHAPE:next
330 data 4,4,99,137,225,137,245,176,83
,176
340 data 4,8,113,62,206,62,209,65,209,
130
350 data 205,134,113,134,110,131,110,6
5
360 data 4,4,50,141,84,141,65,160,22,1
60
370 data 4,6,268,156,270,154,289,154,2
95,158,304,172,278,172
380 data 7,6,270,154,274,158,280,169,2
77,173,268,164,268,156
390 data 5,4,23,161,64,161,64,174,23,1
74
400 data 5,8,280,170,302,170,303,171,3
03,172
410 data 302,173,280,173,279,172,279,1
71
420 data 8,4,113,65,207,65,207,129,113
,129
430 data 8,4,65,160,84,141,84,150,65,1
75
440 data 6,8,121,71,196,71,198,72,198,
120,196,121,121,121,120,120
450 data 120,72,6,8,83,176,245,176,246
,177,245,178
460 data 245,179,83,179,82,178,82,177
470 data 14,4,124,75,193,75,193,116,12
4,116
480 data 9,4,128,78,189,78,189,113,128
,113
490 color 1,7,7:gosub DOLINE
500 data 2,280,169,301,169
510 color 1,5,5:gosub DOLINE:gosub DOL
INE
520 data 2,274,158,294,158,2,280,154,2
85,158
530 color 1,8,8:gosub DOLINE:gosub DOL
INE
540 data 2,93,153,233,153,2,23,160,64,
160
550 color 1,14,14:gosub DOLINE
560 data 3,269,156,273,158,279,169
570 color 1,1,1:for i=1 to 60:gosub DO
LINE:next
580 data 9,113,63,206,63,208,65,208,12
8,206,130
590 data 113,130,111,128,111,65,113,63
600 data 2,113,134,205,134,2,186,131,1
86,133,2,195,131,195,133
610 data 5,99,137,225,137,245,176,83,1
76,99,137
620 data 2,96,147,229,147,2,93,154,233
,154,2,92,155,234,155
630 data 9,84,141,50,141,22,160,22,175
640 data 65,175,84,150,84,141,65,160,6
5,175
650 data 2,96,158,178,158,2,183,158,19
9,158,2,204,158,230,158
660 data 2,95,161,178,161,2,183,161,20
0,161,2,204,161,231,161
670 data 2,94,164,168,164,2,174,164,17
8,164,2,183,164,201,164
680 data 2,206,164,233,164,2,93,167,17
8,167,2,184,167,201,167
690 data 2,207,167,235,167,2,93,170,16
9,170,2,208,170,230,170
700 data 2,97,173,165,173,2,97,174,165
,174,2,209,173,236,173
```

```
710 data 2,278,174,298,174,7,28,170,56
,170,56,169,28,169,28,166
720 data 56,166,56,169,5,42,164,53,164
,45,172,34,172,42,164
730 data 2,183,168,201,168,2,208,174,2
36,174,2,35,103,15,103
740 data 2,45,130,25,130,2,46,182,21,1
82,2,20,142,0,142
750 data 2,58,119,78,119,2,83,106,68,1
06,2,18,113,0,113
760 data 2,90,91,75,91,2,50,96,68,96
770 data 2,80,138,93,138,2,95,129,84,1
29
780 data 2,116,187,141,187,2,210,183,1
85,183,2,274,197,297,197
790 data 2,270,173,250,173,2,245,167,2
65,167,2,240,147,231,147
800 data 2,215,135,230,135,2,304,159,3
19,159,2,299,135,279,135
810 data 2,250,129,270,129,2,250,118,2
35,118
820 data 2,305,119,319,119,2,300,103,2
85,103,2,284,116,299,116
830 data 2,255,103,270,103,2,240,97,25
5,97,2,222,105,210,105
840 color 1,5,5:for i=1 to 3:gosub DOL
INE:next
850 data 2,114,64,205,64,2,112,66,112,
128
860 data 4,196,74,196,118,197,119,197,
73
870 color 1,7,7:for i=1 to 19:gosub DO
LINE:next
880 sa=3400:ea=1600:cx=260:cy=149:radx
=35:rady=15:handle=6
890 gosub ELLARC
900 data 4,124,119,194,119,195,120,123
,120
910 data 4,110,131,110,65,113,62,206,6
2
920 data 2,97,146,229,146,2,96,152,232
,152,2,96,160,177,160
930 data 2,183,160,198,160,2,204,160,2
30,160,2,95,163,167,163
940 data 2,183,163,199,163,2,206,163,2
32,163,2,94,166,177,166
950 data 2,184,166,200,166,2,207,166,2
34,166,2,93,169,168,169
960 data 2,208,169,228,169,2,98,172,16
4,172,2,209,172,236,172
970 data 2,84,175,243,175,2,25,159,65,
159
980 color 1,8,8:gosub DOLINE
990 data 4,121,73,122,73,123,74,122,74
1000 color 1,6,6:y1=158:y2=161:for i=1
 to 26:read x:gosub KEYS:next
1010 y1=161:y2=164:for i=1 to 24:read
x:gosub KEYS:next
1020 y1=164:y2=167:for i=1 to 24:read
x:gosub KEYS:next
1030 y1=167:y2=170:for i=1 to 18:read
x:gosub KEYS:next
1040 y1=170:y2=173:for i=1 to 8:read x
:gosub KEYS:next
1050 gosub DOLINE:gosub DOLINE:x=102:y
1=145:y2=137
1060 for x=102 to 204 step 6:gosub DIA
GONAL:next
1070 x=40:y1=149:y2=143:for x=40 to 65
 step 5:gosub DIAGONAL:next
1080 sa=3400:ea=1600:cx=260:cy=150:rad
x=34:rady=15:handle=6
1090 gosub ELLARC
1100 data 95,100,105,110,115,120,125,1
30
1110 data 135,140,145,150,155,160,165,
170
1120 data 178,182,187,193,199,203,210,
217,224,230
1130 data 94,102,108,114,120,126,132,1
38,144,150,156,162,168
1140 data 173,178,182,188,194,200,205,
212,219,226,231
1150 data 93,103,109,115,122,127,133
1160 data 138,143,148,153,158,163,173,
178
1170 data 183,188,195,201,206,214,220,
227,233
1180 data 92,107,114,120,127,131,137,1
42,147
1190 data 152,157,162,169,207,215,221,
228,235
1200 data 97,105,158,165,208,222,230,2
36
1210 data 6,95,153,95,152,97,150,185,1
50,183,152,183,153
1220 data 11,268,157,272,160,278,170,2
78,174,268,164
1230 data 268,156,270,154,289,154,295,
158,304,172,278,172
1240 wave 7,7,13,15,0:sound 1,15,2,3,0
1250 color 1,2,2:for i=1 to 14:gosub D
OLINE:next
1260 data 2,54,173,55,172,2,183,132,18
3,132,2,92,174,94,174
1270 data 2,150,99,150,100,2,165,99,16
5,100,2,152,95,152,96
1280 data 2,163,95,163,96,2,145,96,149
,92,2,167,103,167,103
1290 data 2,146,105,148,103,2,169,105,
169,105,2,151,86,151,89
1300 data 2,164,86,164,89,2,166,92,170
,96
1310 color 1,1,1:for i=1 to 2:read cx,
cy,radx,rady
1320 handle=5:gosub ELLARC:next:sound
1,15,9,3,0
1330 color 1,1,1:for i=1 to 17:read cx
,cy,radx,rady
1340 gosub ELLARC:next:sound 1,15,2,3,
0
1350 color 1,1,1:for i=1 to 9:read cx,
cy,radx,rady
1360 gosub ELLARC:next
1370 data 46,185,5,3,115,185,5,3,20,14
5,5,3,45,132,4,2
1380 data 80,137,4,2,95,130,3,2,18,115
,4,3,35,105,3,2,50,97,3,2
1390 data 90,92,2,1,58,117,3,2,83,107,
3,2,210,185,5,3
1400 data 275,195,5,3,270,175,4,2,245,
165,3,2,240,149,3,2
1410 data 215,134,3,2,304,157,5,3,299,
137,4,2,250,128,3,2
1420 data 250,116,3,2,222,106,3,2,240,
96,3,2
1430 data 255,102,3,2,284,115,3,2,300,
104,4,2,305,117,4,2
1440 wm=2:gosub WMODE:text$="E T U D E
"
1450 tc=13:th=24:te=5:cx=85:cy=24:gosu
b DOTEXT
1460 text$="I N  C #  M I N O R"
1470 sound 1,15,9,3,0:te=4:cx=27:cy=50
:gosub DOTEXT
1480 text$="by David Lindsley"
1490 th=8:te=32:cx=60:cy=197:gosub DOT
EXT
1500 text$=chr$(14)+chr$(15)
1510 tc=2:th=26:cx=142:cy=106:gosub DO
TEXT
1520 rc=1:tc=1:th=6:te=0:gosub DOTEXT:
gosub MUSIC
1530 'clear picture and put header bac
k
1540 gosub DOSHAPE:cx=20:cy=8
```

```
1550 text$="Desk  File  Run  Edit  Deb
ug":gosub DOTEXT
1560 ci=0:red=1000:green=1000:blue=100
0:gosub SETCOLOR
1570 POKE &hffffc02,&h008:fullw 2:end't
urn mouse on
1580 DOSHAPE:
1590 read c:color 1,c,c,8,2
1600 read n:for x=0 to(n*2)-1:read pxy
(x):next x
1610 poke contrl,9:poke contrl+2,n 'nr
 of sides
1620 poke contrl+6,0
1630 for x=0 to (n*2)-1     'coordinate
s
1640 poke ptsin+(x*2),pxy(x)
1650 next x:vdisys(1):return
1660 DOLINE:
1670 read n:for x=0 to(n*2)-1:read pxy
(x):next x
1680 poke contrl,6:poke contrl+2,n 'nr
 of x y pairs
1690 poke contrl+6,0
1700 for x=0 to (n*2)-1     'coordinate
s
1710 poke ptsin+(x*2),pxy(x)
1720 next x:vdisys(1):return
1730 DOTEXT:
1740 poke contrl,22:poke contrl+2,0 't
ext color
1750 poke contrl+6,1:poke intin,tc  'c
olor index
1760 vdisys(1)
1770 poke contrl,106:poke contrl+2,0't
ext effect
1780 poke contrl+6,1:poke intin,te  'e
ffect index
1790 vdisys(1)
1800 poke contrl,12:poke contrl+2,1 't
ext height
1810 poke contrl+6,1:poke ptsin,0
1820 poke ptsin+2,th        'text height
 in pixels
1830 vdisys(1)
1840 if rc=1 then rc=0:return
1850 poke contrl,8:poke contrl+2,1  'g
raphic text
1860 poke contrl+6,len(text$)       's
tring length
1870 poke ptsin,cx:poke ptsin+2,cy  'x
y coords
1880 for i=0 to len(text$)-1
1890 poke intin+(i*2),asc(mid$(text$,i
+1,1))
1900 next i:vdisys(1):return
1910 WMODE:
1920 poke contrl,32:poke contrl+2,0 'w
riting mode
1930 poke contrl+6,1:poke intin,wm  'm
ode index
1940 vdisys(1):return
1950 PERBOTTOM:                     'b
ottom lines
1960 poke contrl,6:poke contrl+2,3  'p
olyline
1970 poke contrl+6,0:poke ptsin,x   'x
 coordinate
1980 poke ptsin+2,199:poke ptsin+4,150
1990 poke ptsin+6,72:poke ptsin+8,y 'y
 coordinate
2000 poke ptsin+10,199:vdisys(1):retur
n
2010 PERSIDE:                       's
ide lines
2020 poke contrl,6:poke contrl+2,3  'p
olyline
2030 poke contrl+6,0:poke ptsin,side'
2040 poke ptsin+2,x:poke ptsin+4,150'x
 coordinate
2050 poke ptsin+6,72:poke ptsin+8,side
2060 poke ptsin+10,y:vdisys(1):return
2070 KEYS:
2080 poke contrl,6:poke contrl+2,2  'p
olyline
2090 poke contrl+6,0
2100 poke ptsin,x:poke ptsin+2,y1   'f
irst xy
2110 poke ptsin+4,x:poke ptsin+6,y2 's
econd xy
2120 vdisys(1):return
2130 DIAGONAL:
2140 poke contrl,6:poke contrl+2,2  'p
olyline
2150 poke contrl+6,0
2160 poke ptsin,x:poke ptsin+2,y1   'x
y coords
2170 poke ptsin+4,x+17:poke ptsin+6,y2
2180 vdisys(1):return
2190 ELLARC:
2200 poke contrl,11:poke contrl+2,2 'e
lliptical arc
2210 poke contrl+6,2:poke contrl+10,ha
ndle
2220 poke intin,sa:poke intin+2,ea  's
tart,end angles
2230 poke ptsin,cx:poke ptsin+2,cy  'x
y of center
2240 poke ptsin+4,radx              'r
adius x axis
2250 poke ptsin+6,rady              'r
adius y axis
2260 vdisys(1):return
2270 SETCOLOR:
2280 poke contrl,14:poke contrl+2,0 's
et color
2290 poke contrl+6,4:poke intin,ci  'c
olor index
2300 poke intin+2,red
2310 poke intin+4,green
2320 poke intin+6,blue
2330 vdisys(1):return
2340 MUSIC:
2350 repeat=2
2360 for r=1 to 54:read n1,a,n2,b,n3,c
,d:sound 1,14,n1,a,0
2370 sound 2,15,n2,b,0:sound 3,13,n3,c
,d:next
2380 MUSICDATA:
2390 data 9,4,2,3,0,1,20,2,4,2,3,0,1,2
0,5,4,9,3,9,5,10
2400 data 7,4,9,3,4,5,10,9,4,9,3,5,5,1
0,9,4,5,2,2,5,10
2410 data 7,4,7,2,7,5,20,2,4,7,2,7,5,2
0,9,4,9,3,2,5,20
2420 data 7,4,9,3,2,5,10,5,4,9,3,2,5,1
0,9,4,2,3,0,1,20
2430 data 2,4,2,3,0,2,20,5,4,9,3,9,5,1
0,7,4,9,3,7,5,10
2440 data 9,4,9,3,5,5,10,9,4,5,2,2,5,1
0,7,4,7,2,7,5,20
2450 data 2,4,7,2,7,5,20,9,4,9,3,2,5,2
0,7,4,9,3,2,5,10
2460 data 5,4,9,3,2,5,10,10,4,10,3,0,5
,20,2,4,10,3,0,5,20
2470 data 5,4,5,3,10,5,9,2,4,5,3,9,5,9
,5,4,5,3,7,5,9
2480 data 7,4,5,3,10,5,9,9,4,9,3,9,5,2
0,12,3,9,4,9,5,20
2490 data 9,4,5,3,12,4,10,9,4,4,3,12,4
,10,9,4,2,3,12,4,10
2500 data 9,4,5,3,12,4,10,7,4,2,3,7,4,
20,12,3,7,3,10,5,20
2510 data 10,4,12,3,12,5,10,9,4,12,3,1
2,5,10,7,4,12,3,12,5,10
2520 data 4,4,4,3,12,5,10,9,4,5,3,5,5,
10,10,4,5,3,5,5,10
```

```
2530 data 9,4,5,3,5,5,10,10,4,10,3,5,5
,10,12,4,12,2,5,5,10
2540 data 10,4,12,2,5,5,10,9,4,12,2,5,
5,10,5,4,5,3,5,5,10
2550 data 7,4,7,3,7,5,20,2,4,7,3,7,5,2
0,7,4,5,3,7,5,10
2560 data 5,4,5,3,7,5,10,7,4,5,3,7,5,1
0,10,4,5,3,7,5,10
2570 for s=1 to 80:read n1,x,n2,y,n3,z
,d
2580 sound 1,15,n1,x,0:sound 2,15,n2,y
,0:sound 3,15,n3,z,d:next
2590 data 0,5,2,4,2,3,10,9,5,2,4,2,3,1
0,7,5,0,4,2,3,10
2600 data 5,5,0,4,2,3,10,5,5,9,4,2,3,1
0,2,5,9,4,2,3,10
2610 data 5,5,0,4,2,3,10,7,5,0,4,2,3,1
0,0,5,12,3,12,2,10
2620 data 12,4,12,3,12,2,10,7,5,0,4,12
,2,10
2630 data 4,5,0,4,12,2,10,4,5,7,4,12,2
,10,12,4,7,4,12,2,10
2640 data 4,5,0,4,12,2,10,7,5,0,4,12,2
,10,0,5,10,3,10,2,10
2650 data 10,4,10,3,10,2,10,2,5,0,4,10
,2,10,5,5,0,4,10,2,10
2660 data 5,5,5,4,10,2,10,10,4,5,4,10,
2,10,2,5,0,4,10,2,10
2670 data 5,5,0,4,10,2,10,0,5,0,4,9,3,
10,0,5,0,4,10,3,10
2680 data 0,5,2,4,10,3,10,5,4,2,4,10,3
,10,4,4,2,4,10,3,9
2690 data 10,3,2,4,0,3,9,5,4,10,3,0,2,
9,9,4,0,4,0,3,9
2700 data 7,5,7,4,2,3,9,4,5,7,4,2,3,9,
2,5,7,4,2,3,9
2710 data 4,5,7,4,2,3,9,7,5,12,4,2,3,9
,4,5,12,4,2,3,9
2720 data 2,5,12,4,2,3,9,4,5,12,4,2,3,
9,2,5,11,4,2,3,9
2730 data 4,5,11,4,2,3,9,2,5,11,4,2,3,
9,4,5,11,4,2,3,9
2740 data 2,5,11,4,2,3,9,4,5,11,4,2,3,
9,2,5,11,4,2,3,9
2750 data 4,5,11,4,2,3,9,7,5,7,4,2,3,9
,4,5,7,4,2,3,9
2760 data 2,5,7,4,2,3,10,4,5,7,4,2,3,1
0,7,5,12,4,2,3,9
2770 data 4,5,12,4,2,3,9,2,5,12,4,2,3,
9,4,5,12,4,2,3,9
2780 data 2,5,11,4,2,3,9,4,5,11,4,2,3,
9,2,5,11,4,2,3,9
2790 data 4,5,11,4,2,3,9,2,5,11,4,2,3,
9,4,5,11,4,2,3,9
2800 data 2,5,11,4,2,3,9,4,5,11,4,2,3,
9,7,5,7,4,2,3,9
2810 data 4,5,7,4,2,3,9,2,5,7,4,2,3,9,
4,5,7,4,2,3,9
2820 data 7,5,12,4,2,3,9,4,5,12,4,2,3,
9,2,5,12,4,2,3,9
2830 data 4,5,12,4,2,3,9,2,5,11,4,2,3,
9,4,5,11,4,2,3,9
2840 data 2,5,9,4,2,3,9,4,5,9,4,2,3,9,
2,5,7,4,2,3,9
2850 data 4,5,7,4,2,3,9,2,5,4,4,2,3,9,
12,4,4,4,2,3,9
2860 repeat=repeat-1
2870 if repeat=0 then goto 2880 else r
estore MUSICDATA:goto 2360
2880 for i=1 to 24:read n1,x,n2,y,n3,z
,d
2890 sound 1,15,n1,x,0:sound 2,15,n2,y
,0:sound 3,15,n3,z,d:next
2900 sound 1,0,0,0,0:sound 2,0,0,0,0:s
ound 3,0,0,0,0:return
2910 data 9,4,2,3,2,3,20,2,4,2,3,2,3,2
0,5,4,9,3,5,3,10
2920 data 7,4,9,3,5,3,10,9,4,9,3,5,3,1
0,9,4,5,2,5,3,10
2930 data 7,4,7,2,7,3,20,2,4,7,2,7,3,2
0,9,4,9,3,5,3,20
2940 data 7,4,9,3,5,3,10,5,4,9,3,5,3,1
0,9,4,2,3,2,3,20
2950 data 2,4,2,3,2,3,20,5,4,9,3,5,3,1
0,7,4,9,3,5,3,10
2960 data 9,4,9,3,5,3,10,9,4,5,2,5,2,1
0,7,4,2,3,2,3,20
2970 data 2,4,2,3,2,3,20,7,4,9,3,5,3,2
0,5,4,9,3,5,3,20
2980 data 7,4,9,3,5,3,20,10,4,9,3,5,3,
40,9,4,2,3,5,3,110
2990 'CLOSING SCREEN DATA
3000 data 0,4,0,0,319,0,319,199,0,199
```

```
 10 data  989, 742, 53, 970, 863, 822,
 356, 15, 178, 473, 5461
 110 data  698, 915, 635, 609, 928, 50
8, 348, 276, 213, 45, 5175
 210 data  404, 85, 163, 691, 736, 808
, 55, 188, 922, 653, 4705
 310 data  868, 646, 341, 215, 953, 68
, 158, 149, 91, 489, 3978
 410 data  113, 281, 101, 584, 203, 88
2, 438, 370, 519, 772, 4263
 510 data  346, 581, 361, 186, 753, 58
1, 61, 849, 916, 292, 4926
 610 data  893, 42, 921, 445, 230, 102
, 167, 202, 169, 98, 3269
 710 data  484, 46, 80, 513, 569, 709,
 159, 400, 346, 353, 3659
 810 data  520, 297, 45, 787, 247, 181
, 102, 218, 84, 288, 2769
 910 data  956, 43, 157, 212, 236, 215
, 269, 529, 965, 257, 3839
 1010 data  819, 832, 848, 763, 440, 1
20, 272, 180, 161, 982, 5417
 1110 data  161, 946, 11, 378, 643, 22
3, 549, 473, 555, 66, 4005
 1210 data  706, 287, 807, 156, 999, 9
57, 973, 980, 130, 204, 6199
 1310 data  161, 946, 355, 723, 186, 8
44, 360, 268, 339, 682, 4864
 1410 data  675, 402, 621, 881, 773, 3
53, 359, 868, 251, 160, 5343
 1510 data  313, 430, 3, 699, 647, 782
, 312, 607, 119, 780, 4692
 1610 data  248, 467, 350, 436, 876, 5
18, 787, 585, 474, 350, 5091
 1710 data  436, 876, 603, 152, 136, 7
53, 189, 43, 756, 168, 4112
 1810 data  177, 675, 753, 742, 195, 7
16, 3, 433, 209, 835, 4738
 1910 data  400, 337, 801, 796, 15, 81
4, 96, 783, 452, 947, 5441
 2010 data  176, 785, 622, 409, 852, 8
92, 266, 789, 458, 647, 5896
 2110 data  885, 772, 785, 788, 457, 7
73, 804, 778, 497, 527, 7066
 2210 data  308, 854, 422, 805, 817, 7
79, 872, 792, 163, 634, 6446
 2310 data  999, 824, 779, 406, 570, 8
05, 339, 894, 297, 331, 6244
 2410 data  327, 306, 311, 339, 323, 5
67, 173, 468, 599, 588, 4001
 2510 data  977, 540, 698, 597, 337, 4
28, 847, 666, 299, 295, 5684
 2610 data  517, 248, 689, 651, 781, 6
49, 522, 522, 254, 71, 4904
 2710 data  310, 280, 283, 278, 166, 3
07, 293, 282, 289, 273, 2761
 2810 data  64, 300, 288, 71, 155, 591
, 230, 823, 676, 874, 4072
 2910 data  309, 350, 344, 337, 317, 3
43, 325, 577, 182, 693, 3777
```

Zero Free

Pack every sector on your disks for efficient storage.

by Mike Stortz

Over the years, I've collected quite a few binary load programs, distributed over thirty-two disk sides. I've always tried to fit these programs together on a disk as economically as possible, spending hours over a hot calculator, but there were usually ten or twenty free sectors left over.

I recently obtained a "boot menu," a program that eliminated the need to have DOS and an AUTORUN.SYS file on each disk. I had to redistribute my programs to take advantage of this extra space anyway, so I decided that a utility program to replace my calculator—and callused digits—was in order. **Zero Free** was the result.

Since some amount of speed was obviously going to be needed, I naturally chose to write in Action! I take second place to few people in my admiration of this excellent language. Machine language is fine where speed or small size are necessities rather than conveniences, but it's a terror to debug (at least, it's a terror for *me* to debug). I knew that I wanted to combine file lengths to add up to 707 sectors, but I had no idea how to go about it. I wrote several "intelligent" (and unsuccessful) algorithms before deciding to do the job with brute computing power.

Zero Free will read in the directories of your disks (ignoring any .SYS extenders) and fiercely recombine them randomly, until it meets with a favorable arrangement. You may be suprised at how few programs are required for **Zero Free** to come up with a completely full disk. It then prints out the appropriate filenames to a disk file, the screen or your printer.

Using *Zero Free*.

Insert your Action! cartridge, and type and save Listing 1. Please use **D:Check in Action!** from issue 44 to check your typing.

When run, **Zero Free** will provide you with initial instructions. Give the number of free sectors you have per disk, the maximum number of files you wish to have on a disk side (I did this because my labeling program will only fit seven filespecs on a label), and D, S or P, depending on whether you wish the program output to go to a file named D:PRINTOUT, the screen or your printer, respectively.

Insert each disk that has files you want to pack and press the SPACE BAR. The directory of each disk will be displayed. If a program on the current disk has the same name as a file previously entered, a number sign (#) appears next to it. If these two files are also of equal length, an equal sign (=) appears. You'll probably want to eliminate duplicate files. You can do this by pressing the letter next to the unwanted program. You can also add an extra file, by pressing the plus sign (+) and giving the filename and its length.

When you've finished entering files, press ESC to quit data entry and begin calculation. **Zero Free** will produce a list of files that will fill as much space as possible on a disk side. If you've selected output for D:PRINTOUT, you will be prompted for a disk to write it on.

When zero waste is no longer possible, **Zero Free** will go for the minimum waste it can find. This process continues until all files have been assigned, or till the user has pressed a key and aborted the program.

Using **Zero Free** and a boot menu program like NoDOS, QuikLoad, or BOOT, I reduced my library from thirty-two to twenty disk sides, a savings of six disks. Now, I can put write-protect tabs and neat labels on all those disks, secure in the knowledge that I have—**Zero Free** sectors.

*Mike Stortz is the P.D. Librarian for G.R.A.S.P., the Richmond, Virginia Atari users' group. Seemingly unable to find employment in the programming field, he's working on about thirty projects at once, including a graphic arcade/adventure game that will make **Ultima III** look like "Hunt the Wumpus."*

Listing 1.
Action! listing.

```
;       CHECKSUM DATA
;[9F CA 03 3A 1A 80 5A 02
; 43 F0 3F 9D 21 E0 1F F6
; 95 99 75 78 70 06 4C 37
; 46 73 A7 3D 60 39 F1 BC
; 99 AF 06 8C 79 5B B9 7D
; D1 68 EC 7E EC E7 4C 9F ]

BYTE btemp,spaces,len,checkflag,
     maxfiles,devc,num,quit,
     lmargin=82,shflok=702,ch=764,
     atract=77,crsinh=752,errno=73,
     brkkey=17

CARD idx,which,ctemp,sum,max,spare,
     free,a,b,loss,leastloss,waste,
     addlen,TmpErr,dl=560,sc=88

INT  ii

BYTE ARRAY names(6000),name(20),
     extender(5),hold(324),
     string1(14),string2(14)

CARD ARRAY length(500),hlen(27),
     programs(500),pr(500)


CARD FUNC Min(CARD aa,bb)

  IF aa<bb THEN RETURN(aa)
  ELSE RETURN(bb)
  FI

PROC ClearOut()

  Position(2,17)
  FOR a=1 to 10 DO
    Put(156)
  OD
  Position(2,18)

RETURN


PROC MyError()

  ClearOut()
  IF brkkey=0 THEN
    Error=TmpErr
    Break()
  ELSEIF errno<>159 THEN
    Print("Disk Error #")
    PrintBE(errno)
    PutE()
    Print("Check the drive and ")
    PrintE("press a key.")
    ii=GetD(2)
  ELSE
    PrintE("Unexpected error.")
    Print("Check things and press ")
    PrintE("a key.")
    ii=GetD(2)
  FI
RETURN


PROC Title()

  lmargin=0
  Graphics(0)

FOR btemp=1 to 10 DO
  Put(127)  Put(158)
OD
Print("              ")
Put(159)  Put(125)
Poke(dl+9,7)
Poke(dl+10,6)
Poke(710,194)
Poke(708,198)
Poke(712,192)
crsinh=1

Print("┌──────────────────────────────────────")
Print("─────────────┐")
Print("|   Written in ACTION! by ")
Print("Mike Stortz  |")
Print("|      G.R.A.S.P. of ")
Print("Richmond, Va.      |")
Print("└──────────────────────────────────────")
Print("─────────────┘")
lmargin=2
Print("    <zero><free>      ")
PrintE("NO EMPTY SECTORS  ")
Print("  This program reads in ")
PrintE("the contents")
Print("of your binary file disks, ")
PrintE("remembers")
Print("their lengths, and sorts ")
PrintE("them to")
Print("occupy the least number ")
PrintE("of diskettes.")
Print("ZEROFREE will hold about ")
PrintE("500 ")
PrintE("programs & their lengths.")
PutE()
Print("  A disk has 707 free ")
PrintE("sectors if you")
Print("use a boot menu like ")
PrintE("QuikLoad, or 668")
Print("sectors minus the length ")
PrintE("of your menu")
PrintE("if using DOS.")
PutE()
Print("  A '#' will appear ")
PrintE("before a filename")
Print("if it is a duplicate, ")
PrintE("or a '=' will")
Print("appear if it is of ")
PrintE("equal length.")
PutE()
Print("      ** Please press ")
PrintE("a key ** ")
ii=GetD(2)

crsinh=0

free=0
DO
  ClearOut()
  Print("How many free sectors ")
  Print("available? ")
  free=InputC()
UNTIL free>0 OD

maxfiles=0
DO
  ClearOut()
  Print("Maximum files per disk? ")
  maxfiles=InputB()
UNTIL maxfiles>0 OD

devc=0
DO
  ClearOut()
  PrintE("Output to D:PRINTOUT,")
  PrintE("   screen,")
  PrintE("or printer")
  Print("  (D/S/P)? ")
```

```
    devc=GetD(2)
  UNTIL devc='D OR
        devc='P OR
        devc='5 OD

  Graphics(0)
  Poke(710,194)
  crsinh=1

RETURN

PROC GetDir()

  Put(125)
  ClearOut()
  Print("}   Now up to ")
  PrintC(max)
  PrintE(" programs.")

  num=0
  Close(1)
  Open(1,"D:*.*",6,0)
  DO
    InputMD(1,name,18)
    MoveBlock(extender+1,name+11,3)
    extender(0)=3
    ii=SCompare(extender,"SYS")
    IF name(0)>16 AND ii#0 THEN
      num==+1
      MoveBlock(hold+num*12+1,name+3,
                11)
      hold(num*12)=11
      hlen(num)=ValC(name+14)
      IF num=26 THEN EXIT FI
    FI
  UNTIL EOF(1) OD
  Close(1)

RETURN

PROC PrintDir()
  BYTE dup

  Put(125)

  IF num>0 THEN
    Print(" ")
    FOR btemp=1 TO num DO
      IF max>0 THEN
        FOR ctemp=1 TO max DO
          MoveBlock(string1+1,
                    hold+12*btemp+1,11)
          string1(0)=11
          MoveBlock(string2+1,
                    names+12*ctemp+1,11)
          string2(0)=11
          ii=SCompare(string1,string2)
          IF ii=0 AND
            hlen(btemp)=length(ctemp)
              THEN
              ii=10
          FI
          IF
            ii=0 OR ii=10 THEN EXIT
          FI
        OD
      FI

      IF ii=0 THEN
        dup='#
      ELSEIF ii=10 THEN
        dup='=
      ELSE
        dup=32
      FI
      PrintF("%C -%C%S%C ",192+btemp,
                dup,hold+12*btemp,127)
      OD
    FI
    PutE()

RETURN

PROC CopyDir()

  MoveBlock(names+12+max*12,hold+12,
            num*12)
  MoveBlock(length+2+max*2,hlen+2,
            num*2)
  max==+num

RETURN

PROC Add()

  ClearOut()
  SetBlock(string1,14,32)
  PrintE("Enter filename to add")
  PrintE("(No '.', please)")
  InputMD(0,string1,11)
  IF string1(0)=0 THEN RETURN FI
  string1(string1(0)+1)=32
  string1(0)=11
  ClearOut()
  Print("Enter length of ")
  PrintE(string1)
  addlen=InputC()
  IF addlen=0 OR addlen>400 THEN
    RETURN
  FI

  num==+1
  MoveBlock(hold+num*12,string1,12)
  hlen(num)=addlen

RETURN

PROC Delete()

  btemp==-64
  IF btemp#num THEN
    MoveBlock(hold+btemp*12,
              hold+(btemp+1)*12,
              (num-btemp)*12)
    MoveBlock(hlen+btemp*2,
              hlen+(btemp+1)*2,
              (num-btemp)*2)
  FI
  IF num>0 THEN
    num==-1
  FI

RETURN

PROC GetLibrary()

  DO
    IF idx>480 THEN EXIT FI

    PrintDir()
    ClearOut()
    Print("Insert next disk to ")
    PrintE("be cataloged")
    PrintE("and press SPACE,")
    PrintE("  LETTER to delete,")
    PrintE("  +  to add, or")
    PrintE("  ESC  to quit & print")

    btemp=GetD(2)

    IF btemp=32 THEN
```

```
      CopyDir()
      GetDir()
    ELSEIF btemp>64 and btemp<65+num
      THEN
      Delete()
    ELSEIF btemp='+ THEN
      Add()
    ELSEIF btemp='& THEN
      CopyDir()
      RETURN
    FI
  OD
RETURN

PROC PrintName()

  PrintD(1,names+which*12)
  PrintD(1," ")
  spaces==+1
  IF spaces=4 OR
    (spaces=3 AND devc='5) THEN
    spaces=0
    PutDE(1)
  FI

RETURN

PROC KeyCheck()

  IF ch<255 THEN
    ch=255
    PutE()
    FOR idx=1 TO max DO
      PrintD(1,names+programs(idx)*12)
      PrintD(1," ")
      PrintCDE(1,
               length(programs(idx)))
    OD
    PrintE("Press RETURN.")
    ii=GetD(1)
    quit=1
  FI

RETURN

PROC PrintMess()

  Put(125)
  PutE()
  PrintF("%S%U%E",
         "Programs left    - ",max)
  PrintF("%S%U%E",
         "Sectors wasted   - ",spare)
  PrintF("%S%U%E",
         "Allowable waste - ",waste)
  PutE()
  PrintE("Press any key to abort")
  PutE()
  Print("Thinking about ")
  PrintE("combinations...")
  PrintE("This many free sectors :")
RETURN

PROC Switch()

  idx=Rand(max)+1
  which=Rand(max)+1
  ctemp=programs(idx)
  programs(idx)=programs(which)
  programs(which)=ctemp

RETURN
```

```
PROC PrintOut()

  spaces=0
  FOR idx=1 TO len DO
    which=programs(idx)
    PrintName()
  OD

  IF spaces#0 THEN
    PutDE(1)
  FI

  PrintCD(1,free-sum)
  PrintDE(1," FREE")
  spare==+free-sum

  IF devc='5 THEN
    PutE()
    Print("Press any key ")
    PrintE("to continue")
    btemp=GetD(2)
  FI

RETURN

PROC Remove()

  FOR idx=len+1 TO max DO
    programs(idx-len)=programs(idx)
  OD
  max==-len
  IF max=0 THEN
    Close(1)
    Close(2)
    ClearOut()
    PrintE("All done...")
    Break()
  FI

RETURN

PROC Check()

  sum=0
  b=Min(max,maxfiles)

  FOR idx=1 TO b DO
    len=idx
    ctemp=sum
    which=programs(idx)
    sum==+length(which)

    IF sum>free THEN
      sum=ctemp
      len==-1
      EXIT
    FI
    loss=free-sum
  OD
RETURN

PROC PrintLibrary()

  FOR idx=1 to max DO
    programs(idx)=idx
  OD

  PrintMess()

  DO
    atract=0
    leastloss=1000
    FOR a=1 to 10000 DO
```

```
      IF quit=1 THEN EXIT FI
      Keycheck()
      Switch()
      Check()
      IF loss<leastloss THEN
        leastloss=loss
        PrintCE(loss)
        a=1
        IF loss=0 THEN EXIT FI
      FI
    OD

    waste=leastloss

    FOR a=1 TO 10000 DO
      IF quit=1 THEN EXIT FI
      Keycheck()
      Switch()
      Check()
      IF loss<=leastloss THEN
        a=1
        PrintOut()
        Remove()
        PrintMess()
      FI
    OD
    IF quit=1 THEN EXIT FI
  OD

PROC Main()

  Close(2)
  Open(2,"K:",4,0)
  TmpErr=Error
  Error=MyError
  idx=0   spare=0   waste=0    quit=0
  max=0   num=0     shflok=64
  ZERO(hold,240)

  Title()
  GetLibrary()

  Close(1)
  IF devc='D THEN
    ClearOut()
    Print("Insert disk to ")
    PrintE("hold D:PRINTOUT")
    PrintE("  and press any key")
    btemp=GetD(2)
    Open(1,"D:PRINTOUT",8,0)
  ELSEIF devc='S THEN
    Open(1,"E:",12,0)
    Poke(710,194)
    Poke(708,198)
  ELSE
    Open(1,"P:",8,0)
  FI

  crsinh=1
  PrintLibrary()

  Close(1)
  Close(2)
  Error=TmpErr

RETURN
```

●

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BASICally Melodic

How to tease BASIC into giving you the music you want.

by Clayton Walnum

Most programmers would agree that, to get the most out of Atari's sound chip—especially when it comes to music—you have to resort to machine language. This is true. BASIC is much too slow and inflexible to allow you to perform many of the feats of sound prestidigitation you may have kicking around in your wonderfully creative mind. But that doesn't mean BASIC is incapable of producing some pleasing results. It just takes a little care and planning. In fact, you might be amazed at what you can accomplish if you're not afraid of a few mental calluses.

For instance, you can get around BASIC's lack of speed by stripping your music down to its simplest components. The less you force BASIC to do, the faster the program will run. This means giving up a lot of the extras you might like to use in your music, such as tailoring each sound's envelope to match a particular instrument's, but you'll find that such small sacrifices will make possible surprisingly complex musical compositions.

One problem with BASIC that we can't get around is the fact that, being single-minded, BASIC can handle only one job at a time. When music is playing in your program, everything else must come to a halt; those slavering aliens you worked so hard to animate must give up their attack until the music's final refrain issues from your monitor's speaker. The only reasonable way around this is to set up a vertical blank interrupt (VBI) to play the music, and that requires—you guessed it—machine language.

The first step.

Before we go any further, type in Listing 1 using **BASIC Editor II** to check your work, then run it.

Not bad for BASIC, eh? Take a look at Line 60 and tell me what you see there. Looks like a delay loop, right? Even though BASIC is slow, the program in Listing 1 requires so little processing time that we have to slow it down in order to make the music listenable. Experiment with different values in the loop. If you want to hear BASIC *burn*, take the loop out completely.

As I said, the program is fast because we've given it so little to do. In fact, the entire "player" section of the program consists of only the statements from Lines 10 through 90. If we wanted to be less fussy, and weren't afraid to type some extra data statements, we could reduce the player section even more. Lines 10, 40, 80 and 90 allow us to reuse much of the data found in succeeding lines, which greatly reduces the amount of memory the program consumes. We could, however, easily do without them, as long as we were willing to make our music data "linear"—that is, play the music from start to finish without reusing any of the data.

How can we manage to play complex music with such a small "player"?

Trade secrets.

Like any piece of music, the composition reproduced in Listing 1 contains several unique parts. It's this uniqueness that places the task of programming music on the same frustration level as trying to get a date with Phoebe Cates. Headache and heartbreak!

You can see from Listing 1 that, to play our music, we read a line of data, use the data to alter the output of each of the four sound channels, then loop back to read another line of data.

We could, of course, reproduce our music with a huge list of SOUND statements, each statement with its own parameters, and thus eliminate the problem of different note durations (a problem we'll deal with a couple of paragraphs from now). We'd then simply turn on a voice and

go about our business, until it's time to change the voice to another note. In this way, we would manipulate each voice separately, without being forced by a loop structure to change the other sound channels as well.

But that would be clunky, and consume much more memory than the looping method does. As programmers, we should always be on the lookout for more elegant solutions to our problems.

Whenever you see a piece of code that repeats the same statements over and over, using a loop is the obvious solution. In our case, using a loop creates a problem even as it solves one. What happens when we want one voice to sound a quarter note, another an eighth note, another a half note—yet we're changing all the sound registers at the same moment, each time we move through the loop?

Troublesome, yes. . .

The trick.

. . . but easily resolved.

Fact 1: If we use the looping method, each note in the music must have the same duration, since every time we perform another iteration of the loop, we change all four voices.

Fact 2: The notes that make up our music do not have the same duration. In fact, all four voices must be rhythmically independent.

Obviously, Fact 1 and Fact 2 don't get along too well. Since we've already resolved that using a loop is the proper way to write our program, let's see what we can do to make Fact 2 fit into the plan. Let's restate it this way:

Fact 2: The notes that make up our music do not *appear* to have the same duration. In fact, all four voices must be rhythmically independent *to the ear.*

What does that mean? Simple. When you come right down to it, a quarter note is really just two eighth notes played one after the other with no pause between them. Likewise, a half note is just two quarter notes pushed together.

So, if we find the note of shortest duration in our music then rewrite everything relative to that, the loop structure of our program becomes feasible. In other words, if the music we wish to reproduce on our Atari is made up of eighth notes, quarter notes and half notes, we must break down each quarter note to two eighth notes and each half note to four eighth notes. Now, all we have to do in our program is play a series of eighth notes, making Fact 1 and Fact 2 completely compatible.

The data.

All of the data for our music is found starting at Line 100 of Listing 1. To make it easy to edit, it's organized by measure, with each measure made up of eight lines of numbers. Each voice requires two pieces of data. Therefore, every line of data contains eight numbers, two for each of the four voices.

It's no coincidence that there are eight lines of data. After breaking the music down, I found that the note of shortest duration was an eighth note. In common time, there are four beats per measure, each beat being the duration of a quarter note. So how many eighth notes do we have per measure? (Say, "Eight.")

Each line of data, then, represents one eighth note for all four voices. The first pair of values is used for SOUND 0, the second pair for SOUND 1, the third pair for SOUND 2, and the fourth pair for SOUND 3. The first value of each pair is the frequency (or pitch) of the sound (see Table 1 for the pitch values needed to duplicate the various notes). The second number is a value we'll use when we want to pause briefly between notes. We have to do this, because two notes of the same frequency will blend together—unless we separate them. Unfortunately, we can't just go through and pause after every note. We sometimes need to use the blending effect to merge two eighth notes into one quarter note, remember?

Stepping through the program.

Now, let's take a quick look at how the program does its thing.

Line 10 — Causes the program execution to continue at Line 80 when we run out of data.

Line 20 — Reads the first line of data.

Line 30 — Uses the value read into P0, P1, P2 and P3 to briefly turn off the appropriate sound channel (if this value is *0*), allowing us to have two consecutive notes of the same pitch without blending them into one. This value is the volume parameter for the SOUND statement. For a pause, use *0*. For no pause, make this value equal to the volume parameter for the appropriate SOUND statement in Line 50.

Line 40 — Since the only change in the music during the second pass through the data is the addition of the fourth voice, we place the SOUND 3,N,N,N statement into an IF statement, separating it from the other three SOUND statements in Line 50. This saves us from typing a lot of extra data.

Line 50 — Here, we use the pitch values read from the data to turn on the sound channels.

Line 60 — This delay loop sets the duration of the notes.

Line 70 — Go back and read the next line of data.

Line 80 — When we run out of data, the TRAP statement in Line 10 will cause program execution to continue here, where we set the flag PASS to activate voice 3, set the data pointer to the beginning of the first measure of music (skipping over the drum and bass intro), set a new TRAP for Line 90, then go back to read through the data.

Line 90 — When we run out of data the second time, the TRAP set in Line 80 will cause the program to continue here. All this line does is initialize the program to repeat the entire piece. The only way out is to press BREAK or RESET (or, if you're desperate, you can cut the power).

Let there be music.

And there you have it: a simple way to program impressive pieces of music through BASIC. Get out all that sheet music that's been kicking around and give it a try. It's a meticulous process, but if you're diligent, you'll be pleased with the results.

Table 1.

Musical pitch values

High	C	29
	B	31
	A♯	33
	A	35
	G♯	37
	G	40
	F♯	42
	F	45
	E	47
	D♯	50
	D	53
	C♯	57
	C	60
	B	64
	A♯	68
	A	72
	G♯	76
	G	81
	F♯	85
	F	91
	E	96
	D♯	102
	D	108
	C♯	114
Middle	C	121
	B	128
	A♯	136
	A	144
	G♯	153
	G	162
	F♯	173
	F	182
	E	193
	D♯	204
	D	217
	C♯	230
	C	243

The two-letter checksum code preceding the line numbers here is *not* a part of the BASIC program. For further information, see the *BASIC Editor II*, in issue 47.

Listing 1.
BASIC listing.

```
5F 10 TRAP 80
QD 20 READ F0,P0,F1,P1,F2,P2,F3,P3
MI 30 SOUND 0,F0,0,P0:SOUND 1,F1,10,P1:SO
   UND 2,F2,10,P2
OX 40 IF PASS=2 THEN SOUND 3,F3,10,6
UN 50 SOUND 0,F0,0,4:SOUND 1,F1,10,8:SOUN
   D 2,F2,10,6
FZ 60 FOR X=1 TO 50:NEXT X
RX 70 GOTO 20
IZ 80 PASS=2:RESTORE 470:TRAP 90:GOTO 20
LC 90 RESTORE :PASS=1:SOUND 3,0,0,0:GOTO
   10
LN 100 REM MEASURE 1
BJ 110 DATA 50,4,0,0,0,0,0,0
EL 120 DATA 0,0,0,0,0,0,0,0
GT 130 DATA 1,4,0,0,0,0,0,0
EZ 140 DATA 1,0,0,0,0,0,0,0
BR 150 DATA 50,4,0,0,0,0,0,0
ZT 160 DATA 50,0,0,0,0,0,0,0
HB 170 DATA 1,4,0,0,0,0,0,0
FH 180 DATA 1,0,0,0,0,0,0,0
MW 190 REM MEASURE 2
BI 200 DATA 50,4,0,0,0,0,0,0
EK 210 DATA 0,0,0,0,0,0,0,0
GS 220 DATA 1,4,0,0,0,0,0,0
EY 230 DATA 1,0,0,0,0,0,0,0
BQ 240 DATA 50,4,0,0,0,0,0,0
ZS 250 DATA 50,0,0,0,0,0,0,0
HA 260 DATA 1,4,0,0,0,0,0,0
FG 270 DATA 1,0,0,0,0,0,0,0
NM 280 REM MEASURE 3
HH 290 DATA 50,4,0,0,144,6,0,0
FJ 300 DATA 0,0,0,0,144,6,0,0
GR 310 DATA 1,4,0,0,0,0,0,0
FX 320 DATA 1,0,0,0,144,6,0,0
BO 330 DATA 50,4,0,0,144,0,0,0
EY 340 DATA 50,0,0,0,144,6,0,0
GZ 350 DATA 1,4,0,0,0,0,0,0
KD 360 DATA 1,0,0,8,0,0,0,0
OC 370 REM MEASURE 4
HG 380 DATA 50,4,0,0,144,6,0,0
GB 390 DATA 0,0,0,0,144,6,0,0
GQ 400 DATA 1,4,0,0,0,0,0,0
FW 410 DATA 1,0,0,0,144,6,0,0
BN 420 DATA 50,4,0,0,144,0,0,0
EX 430 DATA 50,0,0,0,144,6,0,0
GY 440 DATA 1,4,0,0,0,0,0,0
KC 450 DATA 1,0,0,8,0,0,0,0
OS 460 REM MEASURE 5
HF 470 DATA 50,4,0,0,144,6,0,0
GA 480 DATA 0,0,0,0,144,6,0,0
NU 490 DATA 1,4,60,0,0,0,47,4
UP 500 DATA 1,0,53,0,144,6,45,4
RF 510 DATA 50,4,47,0,144,0,40,4
YD 520 DATA 50,0,53,0,144,6,45,4
NJ 530 DATA 1,4,60,0,0,0,47,4
NI 540 DATA 1,0,47,8,0,0,40,4
PI 550 REM MEASURE 6
CR 560 DATA 50,4,47,8,144,6,40,4
WT 570 DATA 0,0,47,8,144,6,40,4
NT 580 DATA 1,4,60,0,0,0,47,4
VH 590 DATA 1,0,53,0,144,6,45,4
RE 600 DATA 50,4,47,0,144,0,40,4
YC 610 DATA 50,0,53,0,144,6,45,4
NI 620 DATA 1,4,60,0,0,0,47,4
NH 630 DATA 1,0,47,8,0,0,40,4
PY 640 REM MEASURE 7
LD 650 DATA 50,4,47,8,192,6,64,4
AW 660 DATA 0,0,47,8,192,6,60,4
NF 670 DATA 1,4,64,0,0,0,53,4
YH 680 DATA 1,0,60,0,192,6,47,4
DB 690 DATA 50,4,53,8,192,0,45,4
TY 700 DATA 50,0,60,0,192,6,40,4
MW 710 DATA 1,4,64,0,0,0,35,4
GH 720 DATA 1,0,53,0,0,0,31,4
QO 730 REM MEASURE 8
HG 740 DATA 50,4,53,8,192,6,35,4
XD 750 DATA 0,0,53,8,192,6,40,4
OD 760 DATA 1,4,64,0,0,0,45,4
YG 770 DATA 1,0,60,0,192,6,47,4
WK 780 DATA 50,4,53,0,192,0,53,4
WQ 790 DATA 50,0,60,0,192,6,60,4
OO 800 DATA 1,4,64,0,0,0,64,4
LR 810 DATA 1,0,53,0,0,0,64,4
RE 820 REM MEASURE 9
HH 830 DATA 50,4,53,8,182,6,72,4
CG 840 DATA 0,0,53,8,182,6,64,4
```

```
KQ 850 DATA 1,4,72,0,0,0,60,4
VQ 860 DATA 1,0,64,0,182,6,53,3
XL 870 DATA 50,4,60,0,182,0,47,4
AJ 880 DATA 50,0,64,0,182,6,53,4
KY 890 DATA 1,4,72,0,0,0,60,4
LL 900 DATA 1,0,60,0,0,0,47,4
TD 910 REM MEASURE 10
IE 920 DATA 50,4,60,8,182,6,47,4
CC 930 DATA 0,0,60,8,182,6,47,4
KP 940 DATA 1,4,72,0,0,0,60,4
WR 950 DATA 1,0,64,0,182,6,53,4
XK 960 DATA 50,4,60,0,182,0,47,4
AI 970 DATA 50,0,64,0,182,6,53,4
QD 980 DATA 1,4,72,8,0,0,60,4
OJ 990 DATA 1,0,72,8,0,0,60,4
LL 1000 REM MEASURE 11
OT 1010 DATA 50,4,81,8,162,6,29,4
HK 1020 DATA 0,0,81,8,162,6,57,4
NY 1030 DATA 1,4,81,8,0,0,31,4
FY 1040 DATA 1,0,81,8,162,6,64,4
GE 1050 DATA 50,4,81,8,162,0,35,4
KV 1060 DATA 50,0,81,8,162,6,72,4
OJ 1070 DATA 1,4,81,8,0,0,40,4
RD 1080 DATA 1,0,81,8,0,0,81,4
NF 1090 REM MEASURE 12
NC 1100 DATA 50,4,91,8,162,6,45,4
FS 1110 DATA 0,0,91,8,162,6,91,4
VE 1120 DATA 1,4,91,8,0,0,47,4
LO 1130 DATA 1,0,91,8,162,6,96,4
```



```
GB 1140 DATA 50,4,81,8,162,0,53,4
RE 1150 DATA 50,0,91,8,162,6,108,4
QT 1160 DATA 1,4,91,8,0,0,60,4
MW 1170 DATA 1,0,91,8,0,0,121,4
NX 1180 REM MEASURE 13
CO 1190 DATA 50,4,96,8,192,6,0,0
VH 1200 DATA 0,0,96,8,192,6,0,0
LY 1210 DATA 1,4,96,8,0,0,0,0
VY 1220 DATA 1,0,96,8,192,6,0,0
WE 1230 DATA 50,4,96,8,192,0,0,0
ZX 1240 DATA 50,0,96,8,192,6,0,0
MK 1250 DATA 1,4,96,8,0,0,0,0
KN 1260 DATA 1,0,96,8,0,0,0,0
OP 1270 REM MEASURE 14
YC 1280 DATA 50,4,96,8,192,6,76,4
PK 1290 DATA 0,0,96,8,192,6,76,4
ZZ 1300 DATA 1,4,96,8,0,0,76,4
OZ 1310 DATA 1,0,96,8,192,6,76,4
RS 1320 DATA 50,4,96,8,192,0,76,4
VL 1330 DATA 50,0,96,8,192,6,76,4
AL 1340 DATA 1,4,96,8,0,0,76,4
YO 1350 DATA 1,0,96,8,0,0,76,4
PH 1360 REM MEASURE 15
TQ 1370 DATA 50,4,76,8,192,6,64,4
LD 1380 DATA 0,0,76,8,192,6,64,4
XA 1390 DATA 1,4,76,8,0,0,64,4
KS 1400 DATA 1,0,76,8,192,6,64,4
NG 1410 DATA 50,4,76,8,192,0,64,4
QZ 1420 DATA 50,0,76,8,192,6,64,4
WK 1430 DATA 1,4,76,8,0,0,64,4
UN 1440 DATA 1,0,76,8,0,0,64,4
PZ 1450 REM MEASURE 16
PO 1460 DATA 50,4,64,8,192,6,53,4
HG 1470 DATA 0,0,64,8,192,6,53,4
TH 1480 DATA 1,4,64,8,0,0,53,4
HX 1490 DATA 1,0,64,8,192,6,53,4
JE 1500 DATA 50,4,64,8,192,0,53,4
MX 1510 DATA 50,0,64,8,192,6,53,4
SR 1520 DATA 1,4,64,8,0,0,53,4
QU 1530 DATA 1,0,64,8,0,0,53,4
QR 1540 REM MEASURE 17
PJ 1550 DATA 50,4,53,8,192,6,45,4
HC 1560 DATA 0,0,53,8,192,6,45,4
TB 1570 DATA 1,4,53,8,0,0,45,4
HT 1580 DATA 1,0,53,8,192,6,45,4
KB 1590 DATA 50,4,53,8,192,0,45,4
MS 1600 DATA 50,0,53,8,192,6,45,4
SL 1610 DATA 1,4,53,8,0,0,45,4
QO 1620 DATA 1,0,53,8,0,0,45,4
RJ 1630 REM MEASURE 18
PI 1640 DATA 50,4,53,8,192,6,45,4
HB 1650 DATA 0,0,53,8,192,6,45,4
TA 1660 DATA 1,4,53,8,0,0,45,4
HS 1670 DATA 1,0,53,8,192,6,45,4
KA 1680 DATA 50,4,53,8,192,0,45,4
NT 1690 DATA 50,0,53,8,192,6,45,4
SK 1700 DATA 1,4,53,8,0,0,45,4
QN 1710 DATA 1,0,53,8,0,0,45,4
```

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by Jason Leigh

Ava-who? I have to admit, Avatex is a name not many Atari modem users recognize. It's one I wouldn't have known, if it weren't for the persistent mentioning of it by my computer colleagues. What surprised me most was the price I got from E+E Data Comm—only $99.00!

When the modem first arrived, I was skeptical. Would it be reliable, or even attractive (kind of like a blind date)? But as soon as I got the modem up and running, all doubts faded. The Avatex 1200-baud Hayes-compatible modem offers most of the features found on a standard Hayes modem, but for one-third the price. The Avatex comes with an external power supply, a manual and a CompuServe subscription package, including four hours of free connect time.

The modem circuitry is housed in an attractive white case, with a full complement of status lights. These LEDs indicate the current status of the communications link. The modem supports automatic tone or pulse dialing, automatic answering, disconnect and self test. The back panel reveals a set of dip switches which allow you to select the option you need to get the modem working with your particular terminal program.

In addition, there's an RS232c port, and an input and output phone connector. The RS232c port makes the Avatex compatible with any computer currently on the market; all that's needed is an appropriate interface. The Atari 520 and 1040STs already have a built-in RS232 port, so this modem can be connected directly to the computer, via a $15.00 DB25P to DB25P cable.

The instruction manual is brief, but contains sufficient information to get you started. It includes short program listings in BASIC and notes on how to operate the modem for Atari, IBM PC, Apple II and Commodore 64 computers. The self-test operations are well documented, so you can easily troubleshoot any problems you may encounter. If problems persist, or if you have any questions you'd like answered before purchasing the modem, you can call E+E Data Comm for technical assistance at 1-800-4-AVATEX.

At the price, this modem is a breakthrough in the current, increasing need for low-cost, high-speed telecommunications. I recommend it.

Jason Leigh is a junior in Computer Science at the University of Utah. In his spare time, he enjoys writing for ***ANALOG Computing****, and is now a part-time software developer for Zobian Controls.*

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by Jay Pierstorff

CardWare is a greeting card maker that's actually two programs in one. It will create an animated, musical birthday story using anyone's name and age. It will also make up greeting cards of different styles and designs on graphics-capable dot-matrix printers.

Musical Message is the first program on the disk. It runs a four-and-a-half minute birthday show, alternating graphics and text screens with musical accompaniment.

Your Musical Message can be viewed from the main disk, or saved to a blank disk and sent as a floppy birthday greeting. Now you know what to expect for your birthday!

CardWare also contains an all-occasion card maker for use with a graphics printer. You can type in three lines of twenty characters each, to define your occasion or message. Then you select from four ¼-page graphics for the card's cover. Choose a teddy bear, rocking horse, birthday cake, or toy train. The printed result is folded into four sections to make a greeting card, with the graphic on the cover and the message inside.

A full-page graphic with a three-line message at the bottom may be printed, too. There are three scenes to choose from: a village scene, toy shop, or jolly baker with (you guessed it) a birthday cake.

Since this is Hi Tech's first Atari entry, there are bound to be a few problems. A nasty bug locked up my 130XE when creating a floppy birthday card. Loading the translator disk solved the problem. Not as serious—but equally annoying—are the eight (count 'em) disk swaps required to create a birthday disk!

Unfortunately, two-drive systems are not supported. Files created using **CardWare** aren't in standard DOS format, so no other files may reside on the created birthday disk, and you won't be able to include any of your own. The music could use a little work. The songs play nicely, but only two of the Atari's four voices are used.

There isn't a scrap of documentation included—and you won't need any, either. Just follow the menus and boot the translator to create musical messages.

CardWare is a good first effort for Hi Tech. I won't throw away my copies of **The Print Shop** or **Typesetter**, but **CardWare** is also now a permanent resident in my disk library.

Jay Pierstorff is a professional musician who plays guitar and sings with the fifties group, Rocky and the Revellettes. He has been an Atari enthusiast since 1983. His primary interests are music and graphics programs, but he does enjoy a "shoot-em-up" now and then.

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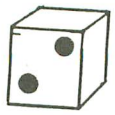
LUCKY   SEVEN

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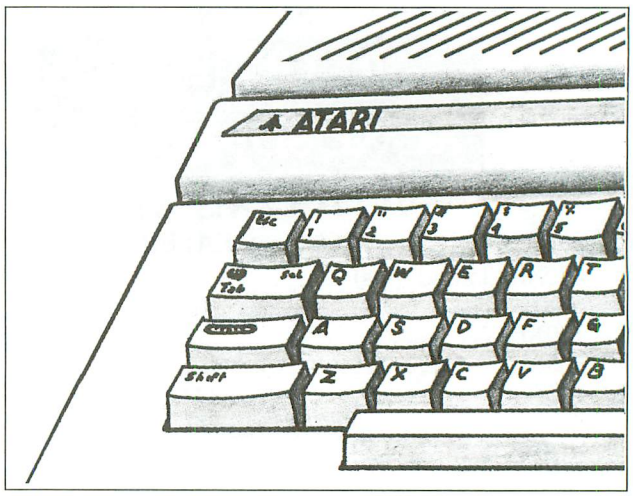

A sweet little text editor.

by Bryan Schappel

Well, someone had to do it. Someone had to write a text editor for the 8-bit Atari, one you could type in and get a lot of use out of. . .and that someone was me.

In the last few years, quite a few compiled languages have become available for the 8-bit Atari. Some of these are Deep Blue C, Kyan Pascal, Draper Pascal, and DVC/65. All these programs require you to create your source code with a text editor, load the compiler, compile the source code, and go back to the editor to fix your mistakes. If you're like me, the only text editor you have is **AtariWriter**. That means you have to plug in the cartridge, boot up, edit your text, save it, remove the cartridge, load the compiler, and so on. Not only is this process tedious and time consuming, it also puts plenty of wear and tear on your computer.

I bet you thought, "Gee, it sure would be nice to have a little text editor that you could binary load from DOS, do a little editing and, with the touch of two keys, pop back into DOS again. That would certainly make life a lot easier."

Well, I thought so, too. And, as I thought these sick thoughts, my mind kept screaming, "Why don't *you* write a text editor?" So I did. I now offer you **T:EDIT** (short for Text EDITor).

Some of the things my mind told me **T:EDIT** must do were. . . (1) this editor must be a full-scrolling screen editor like those other fancy editors; (2) it had better have a lot of commands, or else; and, finally, (3) it *has to be easy to use*. So, to appease my mind, I made **T:EDIT** do all these things and a little more.

Typing it in.

Listing 1 is the BASIC data used to create the TEDIT.COM file. For those of our readers interested in the assembly language source code of this program, the listing is available on the disk version of this magazine, or on the **ANALOG Computing** Atari Users' Group SIG on the Delphi network.

Please refer to **M/L Editor** on page 10 for typing instructions. When you've typed the listing, the resultant file should be named TEDIT.COM.

To use **T:EDIT**, after creating the TEDIT.COM file, simply turn your computer off, remove all cartridges (on XL and XE computers, hold down OPTION while booting up) and follow these loading instructions.

If you're using ATARI DOS 2.0s, type *L* and RETURN, then type *TEDIT.COM* and RETURN. **T:EDIT** will load and run automatically.

From OSS OS/A+ DOS or from SpartaDOS, simply type *TEDIT* and hit RETURN. The program will load and run automatically.

The program resides in cartridge slot A memory locations ($A000 - $BFFF) and uses addresses $BC00 - $BFFF as screen memory. This was done to allow the maximum amount of text space on a 48K Atari. The amount of free space varies on each computer and with each DOS. With SpartaDOS version 2.3e, you get 37120 bytes of text space.

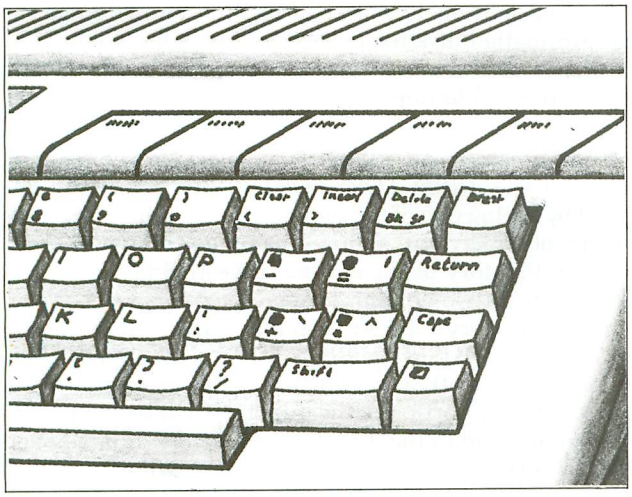

Table 1. — The commands.

TEXT COMMANDS

Key	Function
^L	Load a text file
^S	Save a text file
^P	Print a text file
^M	Print to any device
^X	Disk directory
^F	Global search and replace
^C	Erase text in memory
^I	Toggle insert mode
^O	Show "false" spaces
^E	Erase spaces
^K	Change char case (^CAPS)
^R	Reverse two characters
^Q	Quit **T:EDIT** and enter DOS
^N	Count words in text
TAB	Insert five spaces
DS	Delete back one character
^DS	Delete one character
^>	Insert one space
SH>	Insert 255 spaces
SHDS	Delete 1 screen line

CURSOR CONTROLS

Key	Function
^+	Move 1 character to left
^*	Move 1 character to right
^–	Move up one screen line
^=	Move down one screen line
^T	Jump to top of text
^B	Jump to bottom of text
^A	Jump to beginning of line
^Z	Jump to end of line
^W	Jump one word to the right
^U	Jump up 1 screen of text
^D	Jump down 1 screen of text
^H	Home cursor to upper left

The screen editor.

T:EDIT is a screen-oriented text editor, very much like **AtariWriter**. Because it's screen oriented, **T:EDIT** gives you a very natural programming environment. The screen editor in **T:EDIT** uses a word-wrap routine, so that none of the words will be broken on the right margin. This method is similar to that of most word processing packages, and makes the screen much easier for the user to read and comprehend.

The editing screen is twenty lines high and thirty-eight characters across. There are three lines at the bottom of the screen used to display information and ask for input. The first of the three lines is the *cursor* line. It contains the *row* and *column* position of the cursor on the editing screen, and the number of free bytes left for new text. The two following lines are the input/output lines used to display messages.

You may enter almost any character you wish into your document, except a few. No control characters are permitted, as they're reserved for commands; CTRL-COMMA, CTRL-PERIOD, CTRL-SEMICOLON and CTRL-CLEAR are not allowed. Uppercase, lowercase and all inverse video keys are allowed.

If you must insert any control characters into your text, you can do so by pressing SELECT and the key you want as a control. This method will only work for letters, such as CTRL-A. While in the editor, all control characters appear in a "tech-computer" font; these are larger and easy to distinguish from normal text.

Command description.

To use one of the commands in Table 1, simply type the correct key combination, given under the heading *Key*. In the table, the ∧ character indicates that the CONTROL key is pressed with the letter after the ∧. *SH* indicates that you press and hold SHIFT; *DS* stands for DELETE-BACK-SPACE key; and < and > are the CLEAR and INSERT keys, respectively.

Before I describe all the commands, I'd like to tell you how to abort most. With any command that asks you for keyboard input, simply press the ESC key. The command will abort, and you can continue to edit your text. Some commands will ask you, *Are you sure - Y/N?* The only key that will give a yes response is *Y* key; any other key is taken as a no.

Load a text file (∧L). This command allows you to load *any* standard ATASCII text file into memory. You'll be prompted for a filename, and, after you enter this, the current text file will be erased and the new file loaded. Once the loading begins, all text in memory is lost forever. If the load was successful you can edit the file. Otherwise, the message *LOAD FILE ERROR* will appear, and you must press a key to continue.

Save a text file (∧S). This command permits you to save the text in memory to disk. You're asked for a filename, then the save begins. If the save is successful, you can continue to edit text; otherwise, the message *SAVE FILE ERROR* will appear, and you must press a key to continue to edit your text. This command will overwrite a disk file if it already exists, so be sure you've typed the correct filename.

Print a text file (∧P). This command will print the file in memory to your printer, in 80-column format. If your printer's not on-line, the message *PRINTER ERROR* will appear at the bottom of the screen, and you must press a key to continue editing. Pressing BREAK during printing will halt the printing and force a PRINTER ERROR.

The print function will produce formatted output with no broken words on the right margin. It will skip the perforations between pages and number each page in the upper left-hand corner.

The print function will work on *any* 80-column printer, since it doesn't send any control codes to the printer. Because of this, you must have the paper at the *top* of form before you start printing, or else the page breaks won't be in the right places. If the end of text is reached before the end of a page, the print function will form feed to the top of the next page for you.

Since you can load any text file into **T:EDIT**, the print routine must be able to print anything. If you load a file from **AtariWriter** into **T:EDIT** it's embedded with various control characters having some meaning to **AtariWriter**—but none to **T:EDIT**. So the print routine will simply print all control characters as inverse uppercase characters. On most printers, these characters will come out as italics.

Print to Device (∧M). This function is exactly the same as the print command, except that the text may be sent to any Atari device (barring only the E: and S: devices). This is an extremely powerful feature, allowing one to make formatted disk files of text for uploading to the Delphi Atari User's Group. These files can then be downloaded and printed to *any* 80-column printer, with the DOS copy function.

Disk Directory (∧X). When you select this command, you are asked: *DIRECTORY FOR DRIVE - [1-2-3-4-8]?* Respond by typing one of the numbers in the brackets (pressing any other key will abort). Then the screen will clear, and the directory of the chosen drive will be printed to the screen in two-column format.

If the directory's longer than one screen, the message *DIRECTORY PAUSED - PRESS A KEY* will appear. Simply press any key (ESC to abort), and the screen will clear. The remaining portion of the directory will be displayed.

When the end of the directory is reached, the message *DIRECTORY FINISHED - PRESS A KEY* will appear. Just press a key to continue to edit your text.

If you attempt to get a directory from a drive that doesn't exist—or you press BREAK while the directory's being read, or you have no disk in the drive—you'll get a *DIRECTORY ERROR*. When you get this error, simply press any key to continue editing your text.

Global Search and Replace (∧F). When this is executed, you're asked *FIND WHAT?* Respond with a string up to twenty-four characters in length and press RETURN. If the program finds the string, the screen will move to the beginning of the string, and the string's first character will be highlighted in inverse video. Then you're asked *REPLACE STRING - Y/N?* If you wish to do so, respond by pressing *Y*; otherwise, hit any other key to abort. If you pressed *Y*, you're asked *REP. WITH?* Type in your replacement string, up to twenty-four characters, and press RETURN. The program will then begin to replace *all* occurrences of the search string. Once a replace starts, it can't be stopped until it ends, so be careful. The search/replace will begin at the current cursor position and continue until the end of text is reached.

Erase text in memory (∧C). This command will wipe out text currently in memory. You're asked if you're sure about the erase. If you say yes, the document in memory is erased and you may enter a new one. Once text is erased, you can't recover it.

Toggle Insert Mode (∧I). **T:EDIT** has two modes of operation, "replace" and "insert." Replace is the default mode. The insert mode is useful, but can get very slow if you're inserting at the top of a long document. To tell which mode you're in, the cursor line will be blue for replace mode and red for insert mode.

Show "false" spaces (∧O). Pressing this key will cause any space used to word wrap the screen to appear as a small dot. Pressing it again will make all "false" spaces blanks again. This is a very useful command. It shows you which spaces are yours and which are generated for the word wrap's sake.

Erase spaces (∧E). This function will erase all spaces, from the cursor to the next non-space character. You'll see the use of this command later.

Change character case (∧K or ∧CAPS key). Pressing this key will cause the character under the cursor to be changed to uppercase if it was in lowercase, and vice versa. After this command executes, the cursor moves one character to the right.

Reverse two characters (∧R). This command is for all the people out there who just love to make transposition errors. When you use it, the character under the cursor will be swapped with the character to the right of the cursor.

Quit T:EDIT (∧Q). This command will exit you back to DOS. It will also erase your text, so you're asked if you're sure. If you answer yes, you'll go to DOS.

To re-enter **T:EDIT** from Atari DOS 2.0s, you can either reload it or perform a RUN AT ADDRESS, with the address being *9FFD*. From OSS OS/A+ or from SpartaDOS, typing *RUN* or *RUN 9FFD* at the *D1:* prompt will restart **T:EDIT**.

Count Words in text (∧N). When you press ∧*N*, **T:EDIT** will count all the words in your text and display the number on the first I/O line at the bottom of the screen. This is a true word count, not faked by counting spaces and dividing by two, hence it's accurate to within one word of the actual number of words in memory. When the program is through counting, you're asked to press a key. Do so and you may edit more text.

Insert five spaces (TAB). Pressing the TAB key will insert five spaces into the text at the cursor position (not tab across the screen). This can be useful if you're in replace mode and want some space to insert a new word. The program can insert five spaces in the same amount of time it can insert one space, so this can be quite a time saver.

Delete back one character (DS). Pressing DELETE-BACKSPACE will delete the character to the left of the cursor and move the rest of the document up. Again, this can be slow with large documents.

Delete one character (∧DS). This deletes the character under the cursor and moves the rest of the document up.

Insert one space (∧>). This will move the document down and insert a space under the cursor.

Insert 255 spaces (SH−). If you must have a lot of room for new revisions, this is how you get it. The command will insert 255 spaces from the cursor's position—in the time it takes to insert one space. If you find that you don't need all this space, simply press ∧E to remove the remaining spaces.

Delete one screen line (SHDS). This will delete text from the cursor position to the end of the line the cursor's sitting on. Usually, this is anywhere between one and twenty characters.

A note about deleting text: text deleted is lost forever. Since the deletions are usually rather small, this doesn't cause too many problems. However, care should be taken before deleting anything.

Cursor movement.

T:EDIT uses the arrow keys (∧+, ∧*, ∧−, ∧=) to move the cursor around the screen, much like the normal screen editor—with a few variations.

If you're at the bottom of the screen and try to go further down, a new line of text will appear. The same goes for trying to cursor off the top of the screen. If you try to go past the left margin, you wind up on the last character of the previous line. If you cursor past the last character on a line, the cursor is placed on the first character of the next line. There are other ways to move the cursor around within the document.

Jump to TOP of text (∧T). This will place the cursor at the top of your text. The cursor is also in the "home" position. (The home position is the upper left corner of the screen).

Jump to BOTTOM of text (∧B). This will move the cursor to the end of the document. It's placed after the last character in the document.

Moving on the line (∧A, ∧Z). ∧A will place the cursor on the first character on the screen line. ∧Z will place the cursor on the last.

Jump one word to the right (∧W). This will move the cursor to the next word in the document. The command was included as a replacement for the TAB function.

Moving by screenfuls (∧U, ∧D). Pressing ∧U will send the cursor home and move it back nineteen lines of text. Pressing ∧D will move the cursor home, then bring it forward nineteen lines.

Homing the cursor (∧H). ∧H will move the cursor to the home position.

That finishes up the commands for **T:EDIT**. Now we'll look at some of the program's technical aspects.

Entering filenames.

T:EDIT allows you to load or save text from any disk drive or device. When you select either SAVE or LOAD, you're asked for a filename. You can respond in many ways. Here are some examples:

(1) filename.ext RETURN
(2) d2:filename.ext RETURN
(3) C: RETURN
(4) E:filename.ext

In example (1), you simply enter a filename. **T:EDIT** will default to using drive 1 as the device. In (2), you specified drive number and filename; therefore, **T:EDIT** will use this device and name. In (3), we specified the device as the cassette drive. In (4), we tried to load/save text to the screen editor. If you try this to either the E: or S: devices, **T:EDIT** defaults to the D: device. This makes **T:EDIT** extremely powerful. So, if you want a simple rough text printout, just save it to the printer (*P:*). You won't get any page breaks or page numbers, but it can be useful.

T:EDIT has a smart filename handler. If your filename has any lowercase, control or inverse characters, they'll all be converted to normal video uppercase characters. Since you may enter up to twenty-four characters for a filename, the program can access text files stored in subdirectories with SpartaDOS or MYDOS version 4.0, thus making **T:EDIT** easier to use.

Technical notes.

The program uses a custom display list and display list interrupts (DLIs) to produce an attractive screen. The blinking underline used for the cursor was quite a little task to code.

The cursor works this way:

(1) We figure out which character's under the cursor and copy its definition to another character (in this case, character 127).

(2) Then we replace the character under the cursor with character 127.

(3) Now, simply blink the eighth bit in character 127 with an *EOR #$FF*. By doing this, you get a nice little cursor that looks really neat on a character with a descender, like a *y* or *g*.

All the text is stored in memory in internal code, for speed. If we store all text in internal code, there's no time needed to convert a screenful of text each time we redraw the screen. When text is saved, it's saved in ATASCII.

You'll notice that the DLIs don't flicker during I/O operations. This is because the immediate mode vertical blank is used to copy the screen color shadow registers into their corresponding hardware registers.

I've found **T:EDIT** a very useful utility to have around. I hope you get as much use from it as I have.

Bryan Schappel is a Computer Science major at the University of Wisconsin. He's been programming the Atari for four years. Besides writing programs, his main computer interests are word processing and data management.

Listing 1.
***M/L Editor* data.**

```
1000 DATA 255,255,253,159,133,183,76,1
03,180,0,0,0,0,0,0,0,7899
1010 DATA 0,0,24,24,24,24,0,24,0,0,102
,102,102,0,0,0,5306
1020 DATA 0,0,102,255,102,102,255,102,
0,24,62,96,60,6,124,24,1251
1030 DATA 0,0,102,108,24,48,102,70,0,2
8,54,28,56,111,102,59,9416
1040 DATA 0,0,24,24,24,0,0,0,0,0,14,28
,24,24,28,14,3110
1050 DATA 0,0,112,56,24,24,56,112,0,0,
102,60,255,60,102,0,689
1060 DATA 0,0,24,24,126,24,24,0,0,0,0,
0,0,0,24,24,2914
1070 DATA 48,0,0,0,126,0,0,0,0,0,0,0,0
,0,24,24,2492
1080 DATA 0,0,6,12,24,48,96,64,0,0,60,
102,110,118,102,60,194
1090 DATA 0,0,24,56,24,24,24,126,0,0,6
0,102,12,24,48,126,7938
1100 DATA 0,0,126,12,24,12,102,60,0,0,
12,28,60,108,126,12,7754
1110 DATA 0,0,126,96,124,6,102,60,0,0,
60,96,124,102,102,60,1064
1120 DATA 0,0,126,6,12,24,48,48,0,0,60
,102,60,102,102,60,9028
1130 DATA 0,0,60,102,62,6,12,56,0,0,0,
24,24,0,24,24,3940
1140 DATA 0,0,0,24,24,0,24,24,48,6,12,
24,48,24,12,6,3864
1150 DATA 0,0,0,126,0,0,126,0,0,96,48,
24,12,24,48,96,7060
1160 DATA 0,0,60,102,12,24,0,24,0,0,60
,102,110,110,96,62,9430
1170 DATA 0,0,24,60,102,102,126,102,0,
0,124,102,124,102,102,124,3444
1180 DATA 0,0,60,102,96,96,102,60,0,0,
120,108,102,102,108,120,2928
1190 DATA 0,0,126,96,124,96,96,126,0,0
,126,96,124,96,96,96,3298
1200 DATA 0,0,62,96,96,110,102,62,0,0,
102,102,126,102,102,102,2694
1210 DATA 0,0,126,24,24,24,24,126,0,0,
6,6,6,6,102,60,5914
1220 DATA 0,0,102,108,120,120,108,102,
0,0,96,96,96,96,96,126,3106
1230 DATA 0,0,99,119,127,107,99,99,0,0
,102,118,126,126,110,102,3987
1240 DATA 0,0,60,102,102,102,102,60,0,
0,124,102,102,124,96,96,2770
1250 DATA 0,0,60,102,102,102,108,54,0,
0,124,102,102,124,108,102,3050
1260 DATA 0,0,60,96,60,6,6,60,0,0,126,
24,24,24,24,24,5748
1270 DATA 0,0,102,102,102,102,102,126,
0,0,102,102,102,60,24,1212
1280 DATA 0,0,99,99,107,127,119,99,0,0
,102,102,60,60,102,102,2023
1290 DATA 0,0,102,102,60,24,24,24,0,0,
126,12,24,48,96,126,8778
1300 DATA 0,0,30,24,24,24,24,30,0,0,64
,96,48,24,12,6,5250
1310 DATA 0,0,120,24,24,24,24,120,0,0,
8,28,54,99,0,0,5670
1320 DATA 0,0,0,0,0,0,0,255,0,0,0,0,0,
0,0,0,3360
1330 DATA 0,63,51,51,127,115,115,115,0
,126,102,102,127,103,103,127,5139
1340 DATA 0,127,103,103,96,99,99,127,0
,126,102,102,119,119,119,127,5734
1350 DATA 0,127,96,96,127,112,112,127,
0,127,96,96,127,112,112,112,5552
1360 DATA 0,127,99,96,111,103,103,127,
0,115,115,115,127,115,115,115,5826
1370 DATA 0,12,12,12,12,60,60,60,0,12,
12,12,14,14,110,126,7238
1380 DATA 0,102,102,108,127,103,103,10
3,0,48,48,48,112,112,112,126,3424
1390 DATA 0,103,127,127,119,103,103,10
3,0,103,119,127,111,103,103,103,5184
1400 DATA 0,127,99,99,103,103,103,127,
0,127,99,99,127,112,112,112,5455
1410 DATA 0,127,99,99,103,103,103,127,
7,126,102,102,127,119,119,119,5902
1420 DATA 0,127,96,127,3,115,115,127,0
,127,28,28,28,28,28,28,8534
1430 DATA 0,103,103,103,103,103,103,12
7,0,103,103,103,103,111,62,28,2897
1440 DATA 0,103,103,103,111,127,127,10
3,0,115,115,115,62,103,103,103,4633
1450 DATA 0,103,103,103,127,28,28,28,0
,127,102,108,24,55,103,127,1947
1460 DATA 0,0,0,0,0,0,0,0,0,0,24,60,12
6,24,24,24,5162
1470 DATA 0,0,24,24,24,126,60,24,0,0,2
4,48,126,48,24,0,6636
1480 DATA 0,0,24,12,126,12,24,0,0,255,
231,207,129,207,231,255,2165
1490 DATA 0,0,0,60,6,62,102,62,0,0,96,
96,124,102,102,124,2104
1500 DATA 0,0,0,60,96,96,96,60,0,0,6,6
,62,102,102,62,8842
1510 DATA 0,0,0,60,102,126,96,60,0,0,1
4,24,62,24,24,24,6496
1520 DATA 0,0,0,62,102,102,62,6,124,0,
96,96,124,102,102,102,2898
1530 DATA 0,0,24,0,56,24,24,60,0,0,6,0
,6,6,6,6,3088
1540 DATA 60,0,96,96,108,120,108,102,0
,0,56,24,24,24,24,60,7976
1550 DATA 0,0,0,102,127,127,107,99,0,0
,0,124,102,102,102,102,2300
```

```
1560 DATA 0,0,0,60,102,102,102,60,0,0,
0,124,102,102,124,96,1754
1570 DATA 96,0,0,62,102,102,62,6,6,0,0
,124,102,96,96,96,706
1580 DATA 0,0,0,62,96,60,6,124,0,0,24,
126,24,24,24,14,6710
1590 DATA 0,0,0,102,102,102,102,62,0,0
,0,102,102,102,60,24,9592
1600 DATA 0,0,0,99,107,127,62,54,0,0,0
,102,60,24,60,102,9031
1610 DATA 0,0,0,102,102,102,62,12,120,
0,0,126,12,24,48,126,9490
1620 DATA 0,0,0,0,0,0,0,0,0,0,24,24,24,2
4,24,24,24,3804
1630 DATA 24,0,96,112,124,124,112,96,0
,0,0,0,0,0,0,0,5306
1640 DATA 0,0,0,0,0,0,0,0,0,0,112,112,11
2,66,0,188,2,9046
1650 DATA 2,2,2,2,2,2,2,2,2,2,2,2,2,2,2,
2,2,1922
1660 DATA 2,2,176,194,35,164,16,2,2,65
,0,164,0,0,0,0,6893
1670 DATA 35,47,44,26,0,16,18,0,0,0,50
,47,55,26,0,16,4706
1680 DATA 16,0,0,0,38,50,37,37,26,0,16
,16,16,16,16,0,4015
1690 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,1690
1700 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,1700
1710 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,1710
1720 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,1720
1730 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,1730
1740 DATA 0,0,0,0,255,254,253,159,158,
157,156,155,127,126,125,31,9936
1750 DATA 30,29,28,27,64,0,32,96,32,64
,0,96,144,2,76,79,9726
1760 DATA 65,68,32,70,73,76,69,58,155,
83,65,86,69,32,70,73,1640
1770 DATA 76,69,58,155,80,82,73,78,84,
32,68,69,86,58,155,70,2832
1780 DATA 73,78,68,32,87,72,65,84,63,1
55,82,69,80,46,32,87,1738
1790 DATA 73,84,72,58,155,68,73,82,69,
67,84,79,82,89,32,70,1904
1800 DATA 79,82,32,68,82,73,86,69,32,9
1,49,45,50,45,51,45,9455
1810 DATA 52,45,56,93,63,155,68,73,82,
69,67,84,79,82,89,32,1992
1820 DATA 80,65,85,83,69,68,32,45,32,8
0,82,69,83,83,32,65,533
1830 DATA 32,75,69,89,155,68,73,82,69,
67,84,79,82,89,32,70,2000
1840 DATA 73,78,73,83,72,69,68,32,45,3
2,80,82,69,83,83,32,531
1850 DATA 65,32,75,69,89,155,68,73,82,
69,67,84,79,82,89,32,2110
1860 DATA 69,82,82,79,82,155,82,69,80,
76,65,67,69,32,83,84,2054
1870 DATA 82,73,78,71,32,45,32,89,47,7
8,63,155,81,85,73,84,2420
1880 DATA 32,69,68,73,84,79,82,155,69,
82,65,83,69,32,77,69,2010
1890 DATA 77,79,82,89,155,80,82,73,78,
84,32,84,69,88,84,155,3911
1900 DATA 83,65,86,69,32,73,47,79,32,6
9,82,82,79,82,155,76,2786
1910 DATA 79,65,68,32,73,47,79,32,69,8
2,82,79,82,155,80,82,2946
1920 DATA 73,78,84,69,82,32,69,82,82,7
9,82,155,80,97,103,101,4267
1930 DATA 32,35,32,32,32,32,155,33,50,
37,0,57,47,53,0,51,7630
1940 DATA 53,50,37,0,13,0,57,15,46,31,
87,79,82,68,32,67,8987
1950 DATA 79,85,78,84,58,32,48,48,48,4
8,48,155,69,58,155,80,2585
1960 DATA 58,155,49,50,51,52,56,68,49,
58,68,49,58,42,46,42,9239
1970 DATA 155,5,84,26,69,68,73,84,0,13
,0,97,0,48,114,111,9879
1980 DATA 103,114,97,109,0,52,101,120,
116,0,37,100,105,116,111,114,4146
1990 DATA 255,255,14,55,114,105,116,11
6,101,110,0,34,121,26,255,255,8216
2000 DATA 11,34,114,121,97,110,0,48,14
,0,51,99,104,97,112,112,2491
2010 DATA 101,108,255,255,7,8,99,9,0,1
7,25,24,22,0,65,78,8202
2020 DATA 65,76,79,71,0,35,111,109,112
,117,116,105,110,103,255,255,108
2030 DATA 12,13,0,48,114,101,115,115,0
,97,0,43,101,121,0,13,9862
2040 DATA 253,0,96,123,125,12,19,20,2,
21,4,3,16,17,126,28,7155
2050 DATA 29,30,31,254,255,1,23,26,18,
157,127,15,8,9,156,5,857
2060 DATA 6,11,24,14,13,237,169,233,16
8,218,168,176,170,194,173,252,5955
2070 DATA 172,54,168,90,169,137,168,62
,172,116,173,49,173,38,172,29,7577
2080 DATA 172,49,172,42,171,100,170,11
9,170,199,170,228,170,61,171,67,1458
2090 DATA 171,243,172,212,170,221,170,
220,173,52,174,156,174,210,175,119,483
1
2100 DATA 178,96,176,64,169,160,0,152,
153,0,188,153,0,189,153,0,6497
2110 DATA 190,200,208,244,160,31,153,0
,191,136,16,250,96,160,79,169,9989
2120 DATA 0,153,75,164,136,16,250,96,1
60,39,208,243,160,39,169,0,8796
2130 DATA 153,115,164,136,16,250,96,14
1,26,167,140,27,167,32,255,166,9797
2140 DATA 160,0,185,255,255,201,155,24
0,9,32,71,180,153,77,164,200,1430
2150 DATA 208,240,96,173,252,2,201,255
,240,249,162,255,142,252,2,133,5561
2160 DATA 146,162,126,72,142,31,208,17
3,11,212,205,11,212,240,251,202,4751
2170 DATA 202,16,241,104,168,192,192,1
44,2,160,154,177,121,133,147,201,2323
2180 DATA 128,240,208,201,129,208,9,16
5,148,73,128,133,148,76,42,167,8848
2190 DATA 201,130,208,9,165,149,73,64,
133,149,76,42,167,201,131,208,358
2200 DATA 6,169,64,133,149,208,172,201
,132,208,5,169,11,133,147,96,9170
2210 DATA 201,133,240,159,165,146,201,
64,176,19,165,147,201,97,144,13,9345
2220 DATA 201,123,176,9,165,149,240,5,
5,146,76,75,167,162,15,189,7599
2230 DATA 155,164,197,147,240,3,202,16
,246,240,4,165,147,69,148,133,515
2240 DATA 147,96,164,128,200,132,158,3
2,229,182,173,250,183,141,44,164,3158
2250 DATA 173,251,183,141,45,164,165,1
29,133,158,32,229,182,173,250,183,4777
2260 DATA 141,54,164,173,251,183,141,5
5,164,76,98,228,72,138,72,166,127
2270 DATA 151,208,8,165,175,240,4,169,
66,208,3,189,179,164,141,10,9089
2280 DATA 212,141,24,208,230,151,104,1
70,104,64,169,0,133,151,160,3,7548
2290 DATA 185,196,2,153,22,208,136,16,
247,165,170,208,31,230,138,165,2495
2300 DATA 138,201,16,208,12,173,255,16
3,73,255,141,255,163,169,0,133,2338
2310 DATA 138,165,172,240,7,164,171,16
9,63,153,88,164,76,95,228,165,1233
2320 DATA 141,240,12,169,127,160,165,3
2,14,167,32,97,168,144,1,96,5722
2330 DATA 160,0,132,141,132,144,200,13
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2,129,132,128,32,220,166,172,232,3179
2340 DATA 2,200,132,145,32,244,170,76,
244,166,32,3,167,160,18,185,9025
2350 DATA 206,165,153,117,164,136,16,2
47,32,42,167,41,127,201,91,144,8708
2360 DATA 3,56,233,32,201,89,240,5,32,
244,166,56,96,32,244,166,9799
2370 DATA 24,96,169,115,160,165,32,14,
167,32,97,168,144,3,76,244,7543
2380 DATA 166,104,104,169,7,160,98,162
,228,32,92,228,169,6,160,95,9040
2390 DATA 162,228,32,92,228,169,64,141
,14,212,162,0,169,12,141,66,6766
2400 DATA 3,32,86,228,162,0,169,3,141,
66,3,169,12,141,74,3,2932
2410 DATA 142,75,3,169,243,141,68,3,16
9,165,141,69,3,32,86,228,6923
2420 DATA 108,10,0,165,144,133,139,133
,152,165,145,133,140,133,153,76,165
2430 DATA 77,179,165,141,208,1,96,169,
192,160,164,32,14,167,32,181,8406
2440 DATA 177,32,155,172,169,8,133,173
,32,240,176,48,42,162,16,165,7936
2450 DATA 144,157,68,3,165,145,157,69,
3,56,165,134,229,144,157,72,8980
2460 DATA 3,165,135,229,145,157,73,3,1
69,11,32,4,178,48,8,32,1965
2470 DATA 19,177,198,170,76,161,172,16
9,151,160,165,32,14,167,32,19,6481
2480 DATA 177,32,42,167,198,170,76,161
,172,165,141,208,1,96,169,203,1730
2490 DATA 160,164,32,14,167,32,181,177
,169,8,133,173,32,240,176,48,9164
2500 DATA 23,16,37,165,141,240,32,169,
140,160,165,32,14,167,32,97,6658
2510 DATA 168,176,20,32,29,177,16,16,3
2,19,177,169,181,160,165,32,6698
2520 DATA 14,167,198,170,76,42,167,96,
169,1,133,196,165,144,133,136,389
2530 DATA 165,145,133,137,32,75,178,48
,223,165,196,133,158,32,229,182,2430
2540 DATA 173,252,183,24,105,32,141,20
2,165,173,250,183,24,105,32,141,9861
2550 DATA 203,165,173,251,183,24,105,3
2,141,204,165,160,0,132,157,185,863
2560 DATA 195,165,153,159,183,201,155,
240,3,200,208,243,32,83,178,48,1553
2570 DATA 167,32,75,178,48,162,32,233,
175,48,157,165,197,201,255,240,5840
2580 DATA 6,165,157,208,241,240,173,16
5,157,240,6,32,75,178,76,222,1817
2590 DATA 169,198,170,76,19,177,169,18
1,160,164,32,14,167,32,181,177,9523
2600 DATA 169,4,133,173,32,240,176,48,
81,32,244,170,162,16,165,142,9934
2610 DATA 157,72,3,165,143,157,73,3,16
9,7,32,4,178,48,59,162,4226
2620 DATA 16,189,72,3,56,233,1,157,72,
3,189,73,3,233,0,157,5629
2630 DATA 73,3,165,144,125,72,3,133,13
4,133,136,165,145,125,73,3,6712
2640 DATA 133,135,133,137,32,19,177,23
0,141,198,170,160,1,169,0,145,9081
2650 DATA 136,200,208,251,32,161,172,7
6,77,179,192,136,240,193,32,19,585
2660 DATA 177,169,166,160,165,32,14,16
7,198,170,76,42,167,166,128,202,1233
2670 DATA 134,130,165,139,56,229,130,1
33,139,165,140,233,0,133,140,96,478
2680 DATA 160,0,177,139,240,8,201,96,2
40,4,200,208,245,96,200,208,5103
2690 DATA 10,230,140,165,140,197,135,1
44,2,208,19,177,139,240,239,24,1786
2700 DATA 152,101,139,133,139,165,140,
105,0,133,140,76,225,181,165,134,1368
2710 DATA 133,139,165,135,133,140,76,2
25,181,169,0,133,152,165,135,56,115
2720 DATA 233,4,197,145,176,2,165,145,
133,153,32,77,179,76,165,170,9928
2730 DATA 32,100,170,166,129,189,133,1
83,168,136,76,150,170,165,152,133,2746
2740 DATA 139,165,153,133,140,96,165,1
75,73,1,133,175,96,160,0,177,8581
2750 DATA 139,72,200,177,139,136,145,1
39,200,104,145,139,96,165,144,133,1928
2760 DATA 136,133,152,133,139,133,134,
165,145,133,137,133,153,133,140,133,17
18
2770 DATA 135,56,169,159,229,145,133,1
43,170,169,0,133,142,160,255,198,4145
2780 DATA 137,145,136,200,230,137,145,
136,200,208,251,230,137,202,208,246,95
56
2790 DATA 145,136,96,169,1,133,176,169
,0,133,177,32,101,171,169,0,7461
2800 DATA 168,145,139,76,225,181,169,2
55,133,176,208,15,169,5,133,176,1916
2810 DATA 32,82,171,177,139,208,1,200,
76,150,170,169,0,133,177,32,8888
2820 DATA 101,171,169,0,168,166,176,14
5,139,200,202,208,250,96,24,165,3561
2830 DATA 134,101,176,165,135,101,177,
201,159,144,3,104,104,96,24,165,8330
2840 DATA 139,133,178,101,176,133,180,
165,140,133,179,101,177,133,181,56,198
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2850 DATA 165,134,229,178,133,182,165,
135,229,179,133,183,32,164,171,24,1845
2860 DATA 165,134,101,176,133,134,165,
135,101,177,133,135,96,165,183,170,278
9
2870 DATA 5,182,208,1,96,24,138,101,17
9,141,207,171,165,178,141,206,3663
2880 DATA 171,24,138,101,181,141,210,1
71,165,180,141,209,171,232,164,182,669
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2890 DATA 208,4,240,13,160,255,185,255
,255,153,255,255,136,192,255,208,842
2900 DATA 245,206,207,171,206,210,171,
202,208,234,96,165,178,141,1,172,4268
2910 DATA 165,179,141,2,172,165,180,14
1,4,172,165,181,141,5,172,166,984
2920 DATA 183,240,30,169,0,133,184,160
,0,185,255,255,153,255,255,200,8014
2930 DATA 196,184,208,245,238,2,172,23
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2940 DATA 226,165,182,208,224,96,230,1
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,225,181,32,29,172,32,71,172,8808
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,172,32,38,172,76,98,172,6851
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3000 DATA 56,165,134,229,180,133,182,1
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3010 DATA 2,230,183,32,226,171,165,134
,56,229,188,133,134,165,135,229,4731
3020 DATA 189,133,135,96,169,0,133,190
,240,4,169,128,133,190,165,144,2323
3030 DATA 133,136,165,145,133,137,56,1
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3040 DATA 136,72,165,190,240,23,104,20
1,155,208,4,169,96,208,34,201,1682
3050 DATA 127,208,4,169,125,208,26,32,
71,180,76,232,172,104,201,96,894
3060 DATA 208,4,169,155,208,11,201,125
,208,4,169,127,208,3,32,80,7717
3070 DATA 180,145,136,200,208,201,230,
137,202,208,196,96,173,4,162,73,2809
3080 DATA 16,141,4,162,96,32,212,170,1
60,0,165,152,24,121,134,183,9577
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3090 DATA 133,152,133,139,165,153,105,
0,133,153,133,140,200,192,19,208,1731
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3110 DATA 3,76,176,170,32,77,179,76,22
5,181,32,100,170,166,129,165,1452
3120 DATA 139,24,125,133,183,133,139,1
65,140,105,0,133,140,224,20,208,710
3130 DATA 30,138,72,165,128,72,165,152
,24,109,134,183,133,152,165,153,1511
3140 DATA 105,0,133,153,32,77,179,104,
133,128,104,133,129,162,19,189,9434
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8,168,136,76,150,170,32,100,170,50
3160 DATA 166,129,224,1,240,19,202,202
,165,139,56,253,134,183,133,139,3654
3170 DATA 165,140,233,0,133,140,76,102
,173,32,166,173,166,139,134,152,1492
3180 DATA 166,140,134,153,197,128,144,
2,165,128,168,136,76,150,170,32,9812
3190 DATA 212,170,32,242,179,132,130,1
92,255,208,1,96,165,139,56,229,3072
3200 DATA 130,133,139,165,140,233,0,13
3,140,152,96,169,0,133,157,32,8428
3210 DATA 166,173,165,139,133,152,165,
140,133,153,230,157,165,157,201,19,342
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3220 DATA 208,237,76,225,181,32,2,174,
32,199,170,165,191,56,229,134,2507
3230 DATA 133,130,165,192,229,135,5,13
0,176,56,165,139,56,229,134,133,1615
3240 DATA 130,165,140,229,135,5,130,24
0,21,208,13,165,139,133,180,133,1460
3250 DATA 191,165,140,133,181,133,192,
96,230,139,208,2,230,140,56,165,2740
3260 DATA 139,133,178,229,191,133,188,
165,140,133,179,229,192,133,189,32,451
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3270 DATA 119,172,165,191,133,139,165,
192,133,140,76,225,181,165,139,133,419
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3280 DATA 136,133,180,165,140,133,137,
133,181,160,0,177,136,208,25,200,2011
3290 DATA 208,249,165,137,197,135,144,
12,165,134,133,136,165,135,133,137,208
0
3300 DATA 160,0,240,4,230,137,208,227,
24,152,101,136,133,178,169,0,675
3310 DATA 101,137,133,179,56,165,134,2
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3320 DATA 183,56,165,178,229,180,133,1
88,165,179,229,181,133,189,230,182,818
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3330 DATA 208,2,230,183,32,226,171,56,
165,134,229,188,133,134,165,135,3965
3340 DATA 229,189,133,135,96,169,214,1
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3350 DATA 1,96,165,171,133,193,160,44,
185,159,183,153,253,183,136,16,3268
3360 DATA 247,32,234,174,201,255,240,2
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3370 DATA 111,168,176,12,169,225,160,1
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3380 DATA 96,32,234,174,165,195,201,25
5,240,246,32,91,175,32,225,181,5438
3390 DATA 76,216,174,165,139,133,136,1
65,140,133,137,160,0,162,0,189,154
3400 DATA 253,183,32,71,180,209,136,24
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3410 DATA 10,230,137,165,137,197,135,2
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3420 DATA 24,152,101,136,133,130,165,1
37,105,0,133,131,165,134,197,130,1327
3430 DATA 165,135,229,131,144,41,56,16
5,130,229,193,133,139,133,194,165,4152
3440 DATA 131,233,0,133,140,133,195,32
,225,181,160,0,177,139,73,128,673
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3450 DATA 145,139,32,77,179,160,0,177,
139,73,128,145,139,152,96,169,756
3460 DATA 255,133,195,96,56,165,139,13
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3470 DATA 181,229,195,5,130,208,97,169
,255,133,195,24,165,193,101,139,3287
3480 DATA 133,178,169,0,101,140,133,17
9,56,165,134,229,180,133,182,165,4132
3490 DATA 135,229,181,133,183,230,182,
208,2,230,183,165,193,197,171,240,8374
3500 DATA 27,32,226,171,56,165,134,229
,193,133,134,165,135,233,0,133,2659
3510 DATA 135,165,171,133,176,169,0,13
3,177,32,101,171,160,0,185,159,453
3520 DATA 183,32,71,180,145,139,200,19
6,171,208,243,24,165,139,101,171,4149
3530 DATA 133,139,165,140,105,0,133,14
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3540 DATA 63,201,33,144,10,201,59,176,
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3550 DATA 29,172,32,119,182,160,0,177,
136,201,96,240,25,153,163,183,2791
3560 DATA 200,192,70,144,242,132,197,1
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3570 DATA 200,177,136,240,1,136,132,19
7,152,56,101,136,133,136,165,137,1784
3580 DATA 105,0,133,137,160,0,185,163,
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,138,201,192,208,2,169,155,72,1537
3600 DATA 104,153,163,183,200,196,197,
208,221,169,155,153,163,183,32,83,4159
3610 DATA 178,48,21,56,165,136,229,134
,133,130,165,137,229,135,5,130,1465
3620 DATA 144,4,169,255,133,197,169,0,
96,165,144,133,136,165,145,133,2404
3630 DATA 137,169,0,133,166,133,167,16
9,225,160,165,32,14,167,32,165,250
3640 DATA 176,144,21,160,0,185,30,165,
201,155,240,9,32,71,180,153,112
3650 DATA 95,164,200,208,240,76,42,167
,230,166,208,2,230,167,32,171,3377
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,164,136,16,247,48,208,160,0,932
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208,11,200,208,243,230,137,32,3773
3680 DATA 220,176,144,236,96,32,210,17
6,160,0,177,136,41,127,240,11,284
3690 DATA 201,96,240,7,200,208,243,230
,137,208,239,152,24,101,136,133,4280
3700 DATA 136,144,2,230,137,165,136,56
,229,134,133,130,165,137,229,135,4207
3710 DATA 5,130,144,2,240,1,96,24,96,3
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3720 DATA 169,3,157,66,3,169,42,157,68
,3,169,184,157,69,3,165,7610
3730 DATA 173,157,74,3,169,0,157,75,3,
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3740 DATA 157,66,3,76,86,228,160,2,185
,246,165,153,42,184,136,16,470
3750 DATA 247,169,8,133,173,208,194,16
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3760 DATA 32,42,167,201,27,208,4,198,1
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3770 DATA 120,166,240,236,136,16,248,1
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3780 DATA 4,169,0,133,171,32,170,177,1
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3790 DATA 208,1,136,169,0,153,88,164,1
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3800 DATA 191,164,171,153,159,183,201,
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3810 DATA 1,136,153,88,164,200,192,25,
144,1,136,132,171,32,170,177,897
3820 DATA 76,55,177,173,159,183,201,15
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3830 DATA 172,24,96,165,171,208,6,141,
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3840 DATA 177,144,5,104,104,76,244,166
,162,0,173,160,183,201,58,240,3932
3850 DATA 22,173,161,183,201,58,240,15
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3870 DATA 42,184,201,155,240,6,200,232
,224,25,208,237,173,42,184,201,6206
3880 DATA 69,240,4,201,83,208,5,169,68
,141,42,184,96,162,16,157,9255
3890 DATA 66,3,165,144,157,68,3,165,14
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3900 DATA 155,240,18,201,123,176,14,20
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,42,167,160,4,217,249,165,240,3884
3970 DATA 4,136,16,248,96,141,2,166,16
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77,198,170,76,42,167,32,220,9697
4000 DATA 166,169,2,24,105,0,133,154,1
69,188,105,0,133,155,169,0,8284
4010 DATA 133,198,133,157,32,47,179,48
,77,160,0,185,159,183,201,155,2282
4020 DATA 240,8,32,71,180,145,154,200,
208,241,230,198,165,198,201,2,6256
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,165,157,201,20,240,16,165,154,3213
4040 DATA 24,105,20,133,154,165,155,10
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4050 DATA 160,165,32,14,167,32,42,167,
201,27,240,20,169,236,160,164,2833
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4080 DATA 159,157,68,3,169,183,157,69,
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105,0,133,154,169,188,105,9433
4100 DATA 0,133,155,165,152,56,229,144
,133,130,165,153,229,145,5,130,2652
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153,128,5,200,201,127,208,6,863
4130 DATA 134,129,132,128,165,174,41,1
27,201,96,240,25,192,38,208,230,4139
4140 DATA 136,177,136,41,127,201,127,2
08,2,165,174,201,0,240,5,136,1201
4150 DATA 208,239,160,37,200,132,130,1
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,64,145,154,200,76,202,179,24,1953
4180 DATA 165,154,105,40,133,154,144,2
,230,155,232,224,21,240,3,76,1495
4190 DATA 123,179,165,136,133,132,165,
137,133,133,96,165,139,197,144,208,503
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4200 DATA 9,165,140,197,145,208,3,160,
255,96,169,0,133,136,165,140,2483
4210 DATA 56,233,4,133,137,197,145,176
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4220 DATA 137,160,0,177,136,200,201,96
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,240,15,192,38,208,245,136,177,5324
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4250 DATA 32,89,180,29,171,164,166,150
,96,32,89,180,29,175,164,166,1583
4260 DATA 150,96,72,42,42,42,42,41,3,1
34,150,170,104,41,159,96,6974
4270 DATA 216,169,0,133,138,133,175,13
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4280 DATA 34,141,47,2,169,7,160,185,16
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4300 DATA 169,192,141,14,212,169,4,141
,198,2,169,0,141,48,2,169,7462
4310 DATA 164,141,49,2,32,71,168,165,1
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4320 DATA 121,133,122,169,160,141,244,
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4330 DATA 139,133,174,16,2,198,185,41,
127,133,186,132,187,6,186,38,158
4340 DATA 187,6,186,38,187,6,186,38,18
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4350 DATA 160,7,177,186,69,185,153,248
,163,136,16,246,32,106,183,160,3469
4360 DATA 0,169,127,145,139,32,77,179,
173,252,2,201,255,240,237,32,5770
4370 DATA 49,167,170,160,0,132,185,165
,174,145,139,138,160,8,140,31,299
4380 DATA 208,172,31,208,192,5,208,36,
138,16,4,160,128,132,185,41,8900
4390 DATA 127,201,97,144,7,201,123,176
,3,56,233,32,201,65,144,12,8705
4400 DATA 201,91,176,8,56,233,64,69,18
5,76,159,181,160,31,138,41,9607
4410 DATA 127,201,28,144,1,138,217,124
,166,240,5,136,16,248,48,31,9420
4420 DATA 152,10,168,185,156,166,141,1
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4430 DATA 255,255,169,0,133,172,32,244
,166,32,77,179,76,194,180,165,3428
4440 DATA 141,208,2,230,141,165,147,20
1,155,240,21,41,127,160,3,217,2181
4450 DATA 120,166,240,5,136,16,248,48,
3,76,194,180,201,32,144,249,2824
4460 DATA 165,147,201,155,208,2,169,96
,72,160,0,177,139,201,96,240,3418
4470 DATA 4,165,175,240,3,32,42,171,10
4,32,71,180,160,0,145,139,8834
4480 DATA 32,77,179,56,165,139,229,134
,133,130,165,140,229,135,5,130,2775
4490 DATA 144,12,165,139,105,0,133,134
,165,140,105,0,133,135,230,139,1570
4500 DATA 208,2,230,140,32,225,181,76,
194,180,32,47,182,56,165,139,1658
4510 DATA 229,152,165,140,229,153,176,
24,56,165,152,229,144,133,130,229,5507
4520 DATA 145,5,130,240,11,165,139,133
,152,165,140,133,153,32,77,179,1717
4530 DATA 56,165,132,229,139,133,136,1
65,133,229,140,133,137,5,136,240,4347
4540 DATA 2,176,20,24,165,152,109,134,
183,133,152,165,153,105,0,133,838
4550 DATA 153,32,77,179,76,7,182,96,56
,165,134,233,0,133,130,165,1054
4560 DATA 135,233,159,5,130,144,8,169,
0,133,134,169,159,133,135,56,262
4570 DATA 165,139,229,144,133,130,165,
140,229,145,5,130,176,9,165,144,2315
4580 DATA 133,139,165,145,133,140,96,5
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4590 DATA 229,135,5,130,176,1,96,165,1
34,133,139,165,135,133,140,96,1800
4600 DATA 160,84,169,32,153,159,183,13
6,16,250,96,165,166,133,160,165,4391
4610 DATA 167,133,161,169,0,133,162,13
3,163,133,164,133,165,248,160,16,3668
4620 DATA 6,160,38,161,162,3,181,162,1
17,162,149,162,202,208,247,136,6770
4630 DATA 208,238,216,96,32,130,182,16
0,0,162,0,185,163,0,32,216,9735
4640 DATA 182,165,168,157,244,183,165,
169,157,245,183,232,232,200,192,3,8513
4650 DATA 208,233,160,5,185,244,183,24
,105,16,153,244,183,136,16,244,3829
4660 DATA 96,72,41,15,133,169,104,74,7
4,74,74,133,168,96,165,158,429
4670 DATA 160,0,132,159,140,252,183,20
1,200,144,11,160,2,141,252,183,4952
4680 DATA 56,233,200,76,9,183,201,100,
144,8,160,1,140,252,183,56,1593
4690 DATA 233,100,201,10,144,7,56,233,
10,230,159,208,245,24,105,16,771
4700 DATA 141,251,183,165,159,24,105,1
6,141,250,183,173,252,183,24,105,4090
4710 DATA 16,141,252,183,96,162,2,169,
234,157,191,180,202,16,250,169,6555
4720 DATA 40,133,154,169,188,133,155,2
32,189,8,166,168,201,255,240,17,6521
4730 DATA 232,189,8,166,201,255,240,9,
201,253,240,20,145,154,200,208,7903
4740 DATA 239,165,154,24,105,40,133,15
4,165,155,105,0,133,155,208,215,3444
4750 DATA 76,42,167,169,0,56,229,134,1
33,166,169,159,229,135,133,167,5256
4760 DATA 32,171,182,160,4,185,245,183
,153,65,164,136,16,247,96,226,4814
4770 DATA 2,227,2,253,159,0,0,0,0,0,0,
0,0,0,0,0,7039
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ST notes

by D.F. Scott

Newsworthy happenings in the ST world.

What price GDO$?

This month, we focus again on GDOS (Graphic Device Operating System), that elusive, expensive, explosive 9K of code designed to handle multiple typeset fonts and shapes in the ST. Last February in **ST notes**, we told you Regent Software President Frank Cohen was developing a public domain *replacement* for GDOS, and had begun a letter-writing campaign to Atari Corp. executives, including CEO Jack Tramiel, asking that the $500-per-year licensing fee not be imposed.

Since then, numerous questions have been raised concerning GDOS's place and future as a part of the ST programming environment. First of all, since GDOS font-drivers can consume 70K of code, is GDOS what we really want? If the final version of GDOS turns out to be superiorly executed code, will the licensing fee for all programmers who wish to incorporate it lock small developers out of the burgeoning desktop-publishing market? If GDOS is unacceptable, will Regent's RDOS—or any other replacement—be considered a suitable operating standard, so that other programs could use the same data produced by RDOS? If GDOS continues to be modified, will this prevent companies which have developed GDOS-incorporated software for the PCs (for instance, Ventura Graphics) from porting their products over to the ST?

Such questions were discussed during a worldwide electronic conference conducted by ANALOG Publishing's Atari SIG over the Delphi network, and moderated and transcribed by Matthew J.W. Ratcliff (username: MATRAT). Featured conference guests were Frank Cohen (REGENTWARE); along with Tom Hudson (THUD), author of **DEGAS Elite** and **CAD-3D**; and Daniel L. Moore (DLM), author of **PaperClip Elite** and **SynCalc**.

Dan Moore's description was that "GDOS is 'Graphics DOS' and is a part of the VDI [Virtual Device Interface] system. It is supposed to supply device-independent graphics for all devices hooked up to the ST. A device can be the screen, a printer, a film plotter, a laser printer. With GDOS, it is possible to write a program that outputs graphics to a pen plotter without the program knowing what the device is, how the device works, or information on that device. That is the theory. In practice, things aren't quite that simple."

Frank Cohen feels that the results of Atari's implementation of the Digital Research, Inc. code "have been less than satisfactory, considering DRI gave the original GDOS source [code] to Atari well over a year ago, and Atari has not firmly released it to date." He adds, "GDOS was important as an excuse for developers to get more time to develop products that approach [the quality of] those available on the Macintosh."

I asked the guests how programmers, as private citizens, could provoke the changes needed to give GEM the solid feel of the Mac input/output system. Cohen replied first, "The VDI routines of GEM are comparable to the Mac toolbox, with the notable exception that the Mac OS has a very consistent design philosophy, making it really easy to use. The AES [Applications Environment Services] and GDOS parts of GEM are really where DRI's solution falls apart compared to the Mac solution. . . My personal feeling is that a complete rewrite of the AES and GDOS routines would bring us up to the Mac level."

The VDI, among other things, takes care of general output to the screen or to individual windows; the AES keeps track of the identity of each window and of user input through particular locations of the screen. The AES handles "user events," like the clicking of the mouse button within a particular rectangle, through what's often called a "pipeline." Here, each event waits its turn on a first-come-first-served basis, and is analyzed upon request of the program. GDOS, as a part of VDI, is designed to treat graphic screen objects or fonts as files, called "metafiles," just as they would be if stored on disk—which can be done.

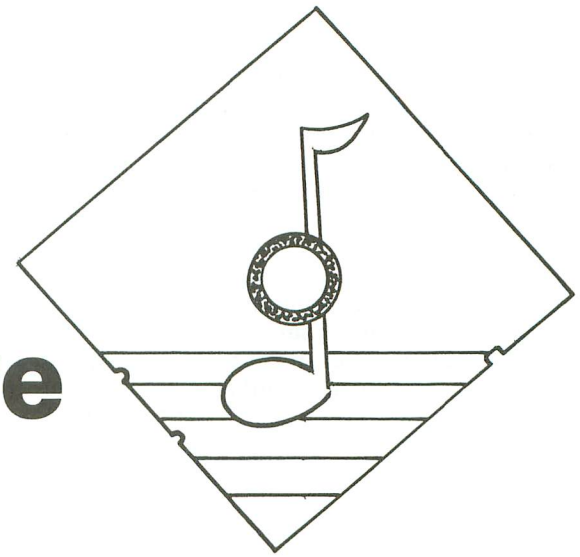
Tom Hudson, who used GDOS for **DEGAS Elite**'s fonts, said, "My primary experience with GDOS is in the area of fonts; and, frankly, font support is a joke. In a system that brags about ease of use, windows, etc., it's ridiculous to use the ASSIGN.SYS to load your fonts. That is my primary complaint. There should be a dynamic font loader/unloader and file selector."

Dan Moore adds to the growing list of complaints that GDOS "is a major memory hog. You really need a meg or two to handle having lots of printer and screen fonts loaded. On 520s, I end up having to dump almost everything to disk, free all my RAM, and then pull in data in small chunks from disk and use GDOS to output it. This isn't particularly fast. I wouldn't mind a replacement, but whose?"

About metafiles, Moore adds that they are "inherently device-independent. They contain no info on the actual resolution of the device, other than saying that the program wants something with a given size so OUTPUT.APP can rescale it. The

(continued on page 66)

An overview of 8-Bit MIDI Software



Our favorite guitarist-turned-programmer gives you a comparative look at what's on the market.

by Charles F. Johnson

With all the clamor about MIDI software for the ST, it's easy to forget there are some excellent MIDI packages for the Atari 8-bit line, as well. Of course, you don't have quite the same freedom of choice as you do on the ST; all of the 8-bit MIDI software seems to come from one company, Hybrid Arts. But the variety of programs they offer makes it easy to find the MIDI application you need, and their software is of a uniformly high quality.

The *MidiMate* interface.

Since the Atari 800, 800XL and 130XE computers do not have MIDI ports as standard hardware, Hybrid makes the **MidiMate** MIDI interface box. This interface connects to the Atari serial port (the same port the disk drive uses). One minor annoyance is that it has no serial port extension, so it must be the last thing in your I/O chain. The **MidiMate** provides MIDI IN and OUT DIN plugs, as well as SYNC IN and OUT ¼-inch phone plugs. The SYNC connections are used for synchronizing a MIDI sequencer to an external source (like the sync pulse generated by a drum machine), or for recording a sync tone on tape. None of the Hybrid Arts MIDI software will work without a **MidiMate** interface connected.

MidiTrack II and *MidiTrack III*.

The Hybrid Arts 8-bit **MidiTrack** sequencers are powerful programs with many professional features. **MidiTrack II** is the version which works on the 800 or 800XL with 64K. For the 130XE, Hybrid makes **MidiTrack III**, which uses all of the 130XE's 128K memory to add many more features and a larger note storage capacity. Both sequencers offer 16 tracks and tape-recorder-like operation, with step-time or real-time note entry, automatic time correction (called "quantizing") and transposition. All MIDI data is recorded, including pitch wheel, mod wheel, breath controller, velocity, aftertouch and patch changes. Individual tracks can be turned on or off, and punch-in and punch-out points can be set. *Punch-in* and *punch-out* are the terms used to describe re-recording just a particular section of music, without doing the whole piece over. With **MidiTrack**, this whole process can be automated; you just play from the beginning (you can even play along), and the program automatically starts and stops recording at the times you set.

MidiTrack III has more sophisticated editing functions than does **MidiTrack II**, as well as the capacity to record more music. With **MT III**, you can define a section of a track and move it to another point in time on another track—very handy for repeating sections. There is a powerful (and complex!) looping option, allowing for the construction of lengthy pieces from small sections.

I must say that these are not the easiest programs in the world to learn. All commands are issued via the keyboard, with occasionally cryptic, non-mnemonic keys. For example, to save a track you've just recorded, you have to hit the SHIFT and INVERSE keys. I think the user interface of **MidiTrack II/III** could stand a bit of improvement in this respect; but overall, these sequencers perform well and have most (if not all) the necessary functions to create music easily and quickly.

The *MMS*.

Many of you are probably familiar with the **Advanced Music System** (**AMS**) by Lee Actor, originally marketed by the Atari Program Exchange. This music composition program uses the Atari's internal sound chip to create four-voice compositions, and is generally considered to be the best of its type. Hybrid Arts is now marketing a MIDI version of the program, called the **MIDI Music System** (or **MMS**).

The **MMS** is a single-step monophonic sequencer. This means that all music is entered one note at a time, and each track can only play one note at a time (no chords). You can easily build chords by layering different tracks on top of each other, however. With the **MMS**, notes can be entered either from the computer keyboard or from a MIDI synthesizer.

The **MMS** uses a spreadsheet-style editing scheme, which can be both a help and a hindrance. It's fairly easy for the computer hobbyist to become accustomed to this method, but musicians without much computer experience will probably find it a bit awkward at first. Once you do learn the technique, however, it turns out to be quite pleasant to use. Tempo changes and looping are supported, and you have 99 tracks to play with. (You'll need them, since you can't put chords on a single track.)

If you already have a large library of music files created with the earlier non-MIDI **AMS**, you can convert them to **MMS** format with an included converter program. You won't believe how good some of those old **AMS** files can sound played on a MIDI synthesizer!

This software would probably be best categorized as entertainment, rather than a professional tool; but if you want to get into MIDI and don't need (or want) everything that **MidiTrack III** offers, the **MIDI Music System** may be a good bet.

Patch librarians.

The great thing about modern synthesizers is the ease with which you can modify the sounds they make. It's possible to build up large "libraries" of synth sounds (or "patches," from the days when people patched cords into sockets to change sounds) with the help of a program called a "patch librarian." The Hybrid Arts programs **MidiPatch DX** and **MidiPatch CZ** perform this function for Yamaha DX and Casio CZ synths.

These programs do not allow you to edit and change sound parameters from the computer, but they do let you save and load patches to and from disk, give them names, change the order of patches in a bank, and perform other useful functions. **MidiPatch DX** and **MidiPatch CZ** are almost identical in operation; both programs work quite well.

Hybrid also offers a program called **DX Editor**, which has all the functions of **MidiPatch DX** plus a numeric editor for modifying patch data in Yamaha DX and TX synthesizers. In addition to these programs, there are patch librarians available for the Sequential Circuits Prophet 5, the Sequential Circuits DrumTraks drum machine, the Oberheim OB-8, and Yamaha RX-11 and RX-15 drum machines.

But what if you don't have one of these synthesizers? What if you prefer some other synth, like a Korg or a Siel? In this case, you'll want to check out the Hybrid Arts **GENPatch** program (the GENeric Patch librarian). This program lets you construct configuration files (based on the information included in your synth's manual) that will let **GENPatch** act as a patch librarian for just about any type of MIDI synthesizer, including many drum machines. The program comes with prewritten configuration files for many popular synths—and also includes a configuration editor, in case yours isn't among them.

Owners of the Ensoniq Mirage sampling synthesizer will be interested in the **OASIS Graphic Editor**. This program will only run on the 130XE. It will display sampled waveforms in variable resolutions, and allow freehand drawing and editing of the waveforms in high-resolution graphics. This is an extremely powerful program; it actually extends the capabilities of the Mirage by allowing overlapping waveforms and multi-sampling, and the visual waveform display makes it a simple matter to remove unwanted noise from sampled sounds.

Other stuff?

A recent issue of the British magazine *International Musician and Recording World* had a notice about a company in England that is producing MIDI software and hardware for the 8-bit Atari. The company is Two-Bit Software; they're marketing a MIDI interface box similar to Hybrid's **MidiMate**, called **MIDI Master**. According to the article, the box has MIDI in and out plugs, and a serial I/O extension port, but no provision for tape sync.

Check out the accompanying product list and put some musical magic into your Atari's life.

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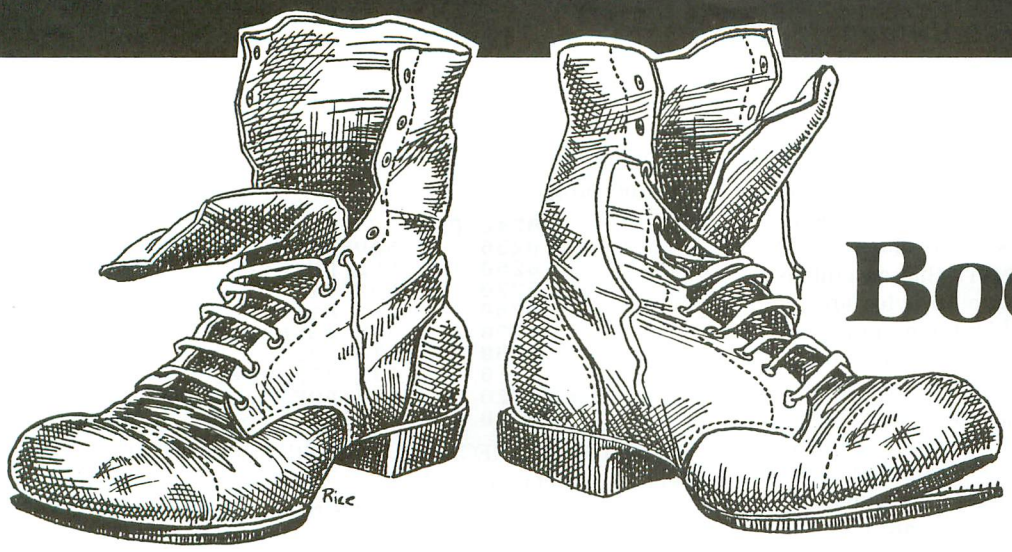
Product List

MidiMate MIDI Interface	
Retail Price	$199.99
MidiTrack II	
Retail Price	$187.00
with **MidiMate**	$349.00
MidiTrack III	
Retail Price	$197.00
with **MidiMate**	$374.00
Midi Music System (MMS)	
Retail Price	$64.00
MidiPatch DX	
Retail Price	$79.00
MidiPatch CZ	
Retail Price	$79.00
GenPatch	
Retail Price	$149.00
Pro-5 Patch	
Retail Price	$79.00
OB-8 Patch	
Retail Price	$79.00
DrumPatch	
Retail Price	$49.00
RX Patch	
Retail Price	$49.00
OASIS (for Ensoniq Mirage)	
Retail Price	$187.00

All products manufactured by:
Hybrid Arts, Inc., 11920 W. Olympic Boulevard
Los Angeles, CA 90064 — (213) 826-3777



Boot Camp

Macromania.

by Karl E. Wiegers

How many of you out there are using a macro assembler? Let's see a show of hands. Okay, that's about what I expected. Now, how many of you are using MAC/65 from Optimized Systems Software? Mm, hmm. How about the venerable Atari Macro Assembler (AMAC)? I see. I'll bet some of you aren't using a macro assembler at all. The original Atari Editor/Assembler cartridge (or OSS's equivalent, called EASMD, where *D* is for "debugger") is still hanging around a lot of cartridge slots, I suspect.

Today's discussion will be of most interest to those of you who own a macro assembler, but haven't really fiddled around with macros yet. However, this doesn't mean readers using an assembler without a macro capability should toss this issue out. Once you see what you can do with macros, you just might want to upgrade your system.

This is part one of a two-part discussion on using macros in assembly language programming. We'll see just what macros are, and talk about how they're created using both MAC/65 and AMAC. Along the way, we'll compare some features of the two assemblers, encounter some of the less commonly used directives (such as those for conditional assembly) and discuss some programming techniques. Next time, we'll continue building a library of macros to let us write assembly language programs that read suspiciously like BASIC. Don't stop here just because you can't do macros yet, or because the terminology scares you off. If you already knew all this stuff, I'd be out of a job!

I give up; what's a macro?

The word or prefix *macro* refers to large things, as opposed to *micro*, which refers to small things. In computerese, a macro is one "command" that performs the functions of several individual commands. By writing a macro, you are essentially creating your own extensions to the intrinsic commands available in the language you're using. Once created, this kind of pseudocommand is a shorthand way of representing several functions in a single statement.

In assembly language, a macro is a block of individual assembly statements. When defining the macro, we indicate where the block of instructions that make up the macro begin, and where they end. We give the macro a name, so we can refer to it when writing a program for some particular application. To use the macro, we simply type the name we gave it as if we were entering a standard assembly mnemonic, like LDA or TAX. During the assembly process, the assembler will replace this macro name with the block of individual statements the name represents. We can use the macro as many times as we want in the program, saving us the labor (and associated chance of errors) of re-entering the same block of statements each time we need them.

Macros vs. subroutines.

So far, this description sounds suspiciously similar to that of a subroutine. However, there are some fundamental differences between an assembly language macro and a subroutine.

A *subroutine* is a block of assembly statements beginning with a label (so we can call it) and ending with an RTS (ReTurn from Subroutine) instruction. The subroutine instructions appear only once in the source and object code of an assembly program. The object code for the subroutine is separated in memory from the instructions making up the body of the program that calls the subroutine. We can call the subroutine as many times as we want, and, each time we do, the program jumps to the same memory location and begins executing the subroutine.

In contrast, a macro definition exists only in the assembly source code. When the assembler encounters a call to

a macro, it inserts into the object code the entire block of code generated by the macro definition. (An exception occurs when the macro contains instructions for conditional assembly, which we'll get to a little later.) So, if you've defined a macro named PRINTIT that assembles to 50 bytes of machine language, those 50 bytes are inserted into the object code produced by the assembler—everywhere the PRINTIT "instruction" appears in the source code. This process is called *macro expansion*.

If references to PRINTIT occur four times in the source code for a program, this will lead to 200 bytes of object code derived from the macro. However, if you had a subroutine named PRINTIT that was 50 bytes long, you could call PRINTIT a thousand times in the program and still only have those 50 bytes of object code derived from the subroutine. See the difference?

Macros provide another degree of flexibility that assembly subroutines don't have. It is possible to define a macro with several parameters that can be different each time you invoke (or use) the macro. This way, the object code you get each time the macro is expanded can be different. With a subroutine, you write it once and it stays that way forever.

The bottom line is that macros are great when you're writing source code. They can save a lot of typing, debugging and file space. You can write macros to do just about any task that pops up repeatedly in a program. However, you create additional object code every time you invoke the macro. So trust me: you'd rather use a subroutine than a macro if you have to perform exactly the same operation many times. Of course, we *can* combine a macro with a subroutine. . .

Enough theory. Let's meet your first macro.

Meet the macro.

Suppose you're writing some Display List Interrupts (also known as DLIs), and you need to save the contents of the accumulator and X- and Y-registers on the stack in each DLI. (This idea should be familiar from issue 46). Such a repetitive operation lends itself nicely to a macro.

Let's define a macro named SAVEREGS. In MAC/65 syntax, we write a segment of code that looks like this:

```
0100 .MACRO SAVEREGS
0110       PHA
0120       TXA
0130       PHA
0140       TYA
0150       PHA
0160 .ENDM
```

In each DLI we write, we can perform the whole process of saving the registers by typing SAVEREGS as an instruction. We might as well write a counterpart macro to restore the registers at the end of the DLI:

```
0170 .MACRO RESTORE
0180       PLA
0190       TAY
0200       PLA
0210       TAX
0220       PLA
0230 .ENDM
```

We could use this in a typical DLI, in the following fashion (assume that addresses CHSET, WSYNC, CHBASE and COLOR0 have been declared in an equates list elsewhere in the program):

```
0240 DLI
0250       SAVEREGS
0260       LDA CHSET/256
0270       LDX #1
0280       LDY #198
0290       STX WSYNC
0300       STA CHBASE
0310       STY COLOR0+2
0320       RESTORE
0330       RTI
```

Using the SAVEREGS and RESTORE macros like this saves eight lines of code in the DLI routine—and makes it easier to read. We can do this wherever—in the whole program—we need to save all three registers. Another advantage is that, if we need to change the macro for some reason (not that you *ever* forget anything the first time through), the change is applied everywhere the macro is used the next time you assemble the program.

The Atari Macro Assembler uses a slightly different syntax than does MAC/65. The SAVEREGS macro would be entered like this in AMAC:

```
SAVEREGS: MACRO
          PHA
          TXA
          PHA
          TYA
          PHA
          ENDM
```

Notice that AMAC doesn't require statement numbers, and the name of the macro appears in the label field of the source line. Also, the *MACRO* and *ENDM* delimeters don't begin with a period in AMAC.

Macro ecology.

Perhaps you've wondered about the neutral habitat of the macro. Macros are found in many parts of the assembly language world. Quite a number have been spotted lurking at the very beginning of the source listing. Some have carved out an ecological niche between the equates normally found near the top of a listing and the beginning of the executable statements in the program (that is, before the ** = $5000* or similar directive). Still other macros are known to inhabit the nether reaches of programs, among the .BYTE statements that so often abound there. Some varieties share the same environment as subroutines, although the two really are quite different species.

The macro is a hardy creature, able to live practically anywhere in a source program except directly amidst the primary code. Reported sightings of macros have been increasing recently, and their population appears to be growing rapidly. My own collection of captive macros prefers to be nestled just below the equates list. Perhaps it's warmer there.

Macros with parameters.

Let's write a macro to simulate the BASIC POKE command. If you recall your Atari BASIC, a statement like *POKE 710,84* means you want to store the decimal value *84* into location *710*. Thus, the POKE command requires two pieces of data: what to poke and where to poke it. The value to poke will always be from *0* through *255* decimal,

and the address to be poked must be from *0* through *65535* decimal. How can we write a macro to accommodate any possible combination of these two pieces of data?

The solution is to pass parameters to our macro. The macro definition is written using symbols to represent some of the data items in the assembly instructions. Each time you invoke the macro, you specify the actual values of the parameters to use at that time. During the macro expansion process, the actual values are substituted in place of the parameters. This way, each use of the macro in a program can result in the generation of a different object code if the parameters are different. Let's see an example.

Our POKE macro requires two parameters. Both MAC/65 and AMAC use the symbols %1 and %2 to represent the first and second parameters passed to the macro, respectively. Each time you invoke the POKE macro, the value of the first parameter you supply will replace every occurrence of %1 in the macro. Please enter the following program for MAC/65:

```
0100 .OPT OBJ
0110 .MACRO POKE
0120     LDA #%2
0130     STA %1
0140 .ENDM
0150 ;program starts here
0160     *= $5000
0170     POKE 710,84
0180     BRK
```

The POKE macro says to take the second parameter specified when the macro is invoked (*84* in Line 170) and load that value into the accumulator (Line 120). Then, store the accumulator contents into the address specified by the first parameter (Line 130). If you run this program, you should see the background color of the graphics 0 screen change. The POKE 710,84 syntax is exactly the same as the BASIC POKE command.

AMAC does things a little differently. Below is the equivalent progam for AMAC.

```
POKE:   MACRO WHERE,WHAT
        LDA #%2
        STA %1
        ENDM
;program starts here
        ORG $5000
        POKE 710,84
        BRK
```

Notice that we specified names for the two parameters (WHERE and WHAT) in the AMAC macro declaration statement. These names are dummies, used for documentation simply to remind you that parameter %1 is the *address* you're going to poke (WHERE) and %2 is the *value* you're going to poke (WHAT). Try changing the second parameter to different values and see what happens. AMAC also differs in that it requires the ORG directive (AMAC calls it a "pseudo-operation" or "pseudo-op") to specify the starting location for the program.

AMAC lets you use up to nine parameters in a single macro, called %1 through %9. A maximum of sixty-three parameters can be used in a MAC/65 macro. MAC/65 also has a special "parameter" called %0. This always contains the number of parameters actually passed to a particular macro expansion. Why would anyone want to know this, you ask? After all, if I defined a macro containing two parameters, like POKE, I'll always be sure to pass two parameters when I invoke the macro, like POKE 710,84. Right?

Maybe. Maybe not. I don't know about you, but I sometimes make mistakes when I'm programming. Or suppose you give your nifty new macro to a friend, and she omits one of the parameters inadvertently? The technical term for the result is a *crash*. This is an opportune time to take a brief diversion and talk about what I call "defensive programming."

Defensive programming.

Every day, I go to work at Eastman Kodak Company in Rochester, New York. There I sit down at a terminal connected to an IBM mainframe and write applications programs for other research scientists to use. (This is an odd career for an ex-organic chemist, but that's the way it worked out.) The people who use these programs don't care how they're written; they just want them to work correctly and be easy to use. Other people frequently want to modify programs I've written. Thus, I have to build in lots of error trapping to protect users from themselves, and my programs must be clearly organized and well documented so other programmers can understand them. I call this approach "defensive programming."

An important programming law when you're writing for users other than yourself states that, just when you think you've covered all the ways a user can do do something silly with your program, someone will come up with something new and creative. Take my POKE macro (please). Can you be positive another person will *always* remember to use two parameters when invoking the macro? Can you be positive another user will *never* supply a second parameter (the value to be poked) outside the range of *0* through *255*?

The answer to both questions is no. So how can we build some protection into the POKE macro, in order to keep people from fowling up and wasting a lot of time trying to find their problem? It's pretty easy to cover the two scenarios I mentioned in the POKE macro.

First solution: with MAC/65, examine the number of parameters specified in %0. The .IF directive can test for a specific condition, just as in BASIC (only better), and we can cause an assembler error to be issued with the .ERROR directive. Detecting an error at assembly time is lots nicer than waiting until execution time. Second solution: take the low byte of the second parameter to make sure we always have a value from *0* through *255*. The modified POKE macro below illustrates these methods.

```
0100 .MACRO POKE
0110 .IF %0 <> 2
0120 .ERROR "Wrong number of
parameters in POKE"
0130 .ELSE
0140     LDA # <%2
0150     STA %1
0160 .ENDIF
0170 .ENDM
```

Lines 110-160 define an .IF block for conditional assembly. If the condition in Line 110 is true (that is, if the number of parameters is not equal to 2), then the statements in the next lines are assembled, down to the .ELSE in Line 130. But if the condition in Line 110 is false (meaning that the correct number of parameters was supplied), then assembly continues with Line 140, the first statement after the .ELSE.

The .IF blocks are very powerful. You can actually nest the .IF/.ENDIF blocks within each other, down to fourteen levels. You can have as many lines of code as you like between the .IF/.ELSE, .IF/.ENDIF and .ELSE/.ENDIF delimiters. And .IF blocks can be used in macros, or anywhere else in an assembly program. AMAC has the same sort of IF blocks, except the directives do not begin with a period (*IF* instead of *.IF*).

Remember, these directives or pseudo-ops don't correspond to actual 6502 machine language instructions. They're just commands that make our assembly programs smarter and more flexible.

A word about operators in the two assemblers. In Line 140 of the preceding macro, we used the less-than symbol (<) to indicate that we want to load the accumulator with the low byte of the value in parameter %2. This is a MAC/65 convention. In AMAC, you accomplish the same thing with the LOW operator: *LDA #LOW %2*. A technique that works with any assembler is to perform a logical AND operation of the subject value with decimal 255: *LDA #%2&255*. All of these methods retain only the 8 least significant bits of the operand, which is a fancy way of saying the low byte of %2.

A macro of a different color.

Let's try to write a macro to emulate another commonly used BASIC command, SETCOLOR. In BASIC, this command has the form: *SETCOLOR X,Y,Z*. *X* refers to the color register we wish to change (*0-4*), *Y* to the hue number (*0-15*), and *Z* to the luminance number (*0-15*). The SETCOLOR command simply stores the desired color number into a particular color register address. The actual color number equals *16 * hue + luminance*. I imagine you know that you can mimic the SETCOLOR command with a POKE, in the form: *POKE 708+X,16*Y+Z*. We should be able to write a macro to do the same thing.

I'll begin with a bare-bones macro to do the dirty deed, then we can worry about error trapping and other refinements. If our SETCOLOR macro is to have the same form as the BASIC command, it obviously requires three parameters (%1, %2 and %3). Furthermore, we'll have to mul-

tiply %2 by *16* and add the result to %3, to calculate the color number. Fortunately, assemblers let you use operators like * for multiplication in expressions.

Here's a first try at the SETCOLOR macro, in MAC/65 format:

```
0100 COLOR0 = $2C4
0110 .MACRO SETCOLOR
0120      LDX #%1
0130      LDA #%2*16
0140      CLC
0150      ADC #%3
0160      STA COLOR0,X
0170 .ENDM
```

Line 100 establishes an equate for the address of color register 0. Line 120 loads the value of the first parameter into the X-register, so we can use it as an offset to point to the desired color register in Line 160. Line 130 loads the accumulator with the second parameter multiplied by *16*. Lines 140-150 add the value of parameter 3 to whatever is already in the accumulator.

The ADC instruction means "ADd with Carry." The data following the ADC is added to the value in the accumulator. In this case, we're using the immediate addressing mode, so the data to be added is just the value of parameter 3. If the result is greater than *255*, the accumulator contains the sum minus *255*, and the carry flag in the processor status register is set to *1*. It's important to CLear the Carry flag to 0 (CLC instruction) before performing an ADC, so you can reliably test the carry flag if you need to later on.

After all this arithmetic, the accumulator contains the actual color number. Line 160 stuffs that number into the appropriate color register.

The SETCOLOR macro will work fine as written. Now let's consider some possible problems. There's the one we discussed before, of supplying the wrong number of parameters when invoking the macro. That one's easy to fix with MAC/65, by using the %0 test. But what if a parameter isn't an immediate value like *84*, referring instead to the contents of address location *84*? The macro has to be able to handle either situation. Since the only valid color register numbers are *0* through *4*, let's regard any %1 values greater than *4* as referring to a memory location. Similarly, hue and luminance values can only go from *0* through *15*, so we'll assume that %2 and %3 values greater than this refer to memory locations. Hmmmm. Sounds like a job for conditional assembly with .IF!

Listing 1 contains a complete form of the SETCOLOR macro, with comments so anyone else could use it and

a tiny program to let you try it out. Experiment with different values for the parameters and see what happens. In practice you might not always make your macros this elaborate, but I hope we've brought up some points you may not have thought about otherwise.

Lines 410-460 of the listing illustrate another point. Remember how we multiplied parameter %2 by *16* in a single expression a little earlier? Well, that works fine with an immediate operand for the LDA instruction, but not when we're loading the register with the contents of a memory location, as in Line 420. An easy way to multiply the contents of the accumulator by *16* is to shift each bit in the accumulator 4 bits to the left (the more significant direction). Each execution of the ASL A (Arithmetic Left Shift of the Accumulator) instruction multiplies the contents of the accumulator by *2*. Of course, any bits set in the high nybble (left 4 bits) fall off the edge of the earth after the fourth ASL A, but that's okay. If you're trying to use a hue number greater than *15*, you deserve that fate.

The Y-register is just used as a temporary holding place for parameter %3 in Lines 570-610. This is sort of a juggling act, but it gets the job done.

Son of Macromania.

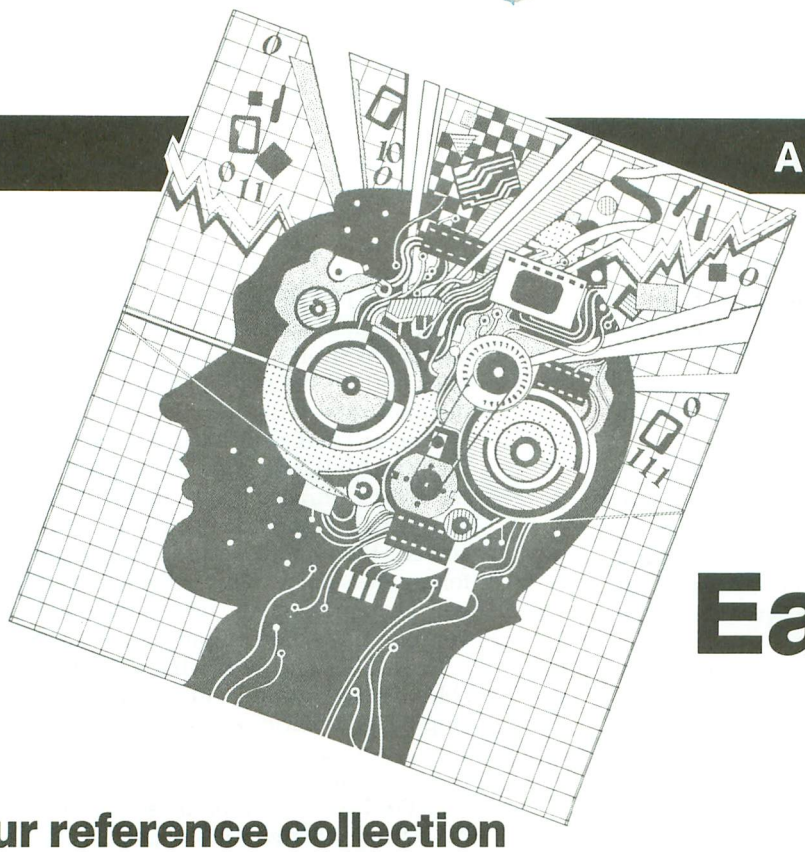
Think back to the form of the macros we talked about today, POKE and SETCOLOR. Do they remind you of any other language? (Hint: say Atari BASIC.) If we can write enough macros to perform the familiar BASIC operations, we can begin to write assembly programs almost as easily as BASIC programs. Plus they'll be nearly as easy to read.

In the next installment, I'll present a number of macros to get you started writing pseudo-BASIC programs using MAC/65. (Users of AMAC or other assemblers will have to adapt the routines, but that's not too hard.) I'll also describe a way to manage this library of macros and incorporate them easily into your future programs, with the .INCLUDE directive. Until then, think about the kinds of tasks you perform in your own programs which might lend themselves to "macrofication."

Despite having a Ph.D. in organic chemistry, Karl Wiegers earns a living writing applications software for photographic research at Eastman Kodak Company, mostly on an IBM mainframe. He is also interested in educational applications of Atari 8-bit, Atari ST and Apple II computers.

Listing 1.
Assembly listing.

```
0100 ;SETCOLOR macro example
0110 ;by Karl E. Wiegers
0120 ;
0130 ;Usage:  SETCOLOR X,Y,Z
0140 ;
0150      .OPT OBJ
0160 ;
0170 ;in a real program, put this
0180 ;equate in your usual equates
0190 ;
0200 COLOR0 = $02C4
0210 ;
0220      .MACRO SETCOLOR
0230 ;
0240 ;check for right # of parameters
0250 ;
0260        .IF %0<>3
0270        .ERROR "SETCOLOR error"
0280        .ELSE
0290 ;
0300 ;set offset for color register
0310 ;
0320          .IF %1>4
0330          LDX %1
0340          .ELSE
0350          LDX #%1
0360          .ENDIF
0370 ;
0380 ;if %2>15 assume it's an address;
0390 ;multiply by 16 with four ASL A
0400 ;
0410          .IF %2>15
0420          LDA %2
0430          ASL A
0440          ASL A
0450          ASL A
0460          ASL A
0470 ;
0480 ;otherwise just multiply by 16
0490 ;
0500          .ELSE
0510          LDA #%2*16
0520          .ENDIF
0530 ;
0540 ;if %3>15 assume it's an address;
0550 ;put it in Y-reg. temporarily
0560 ;
0570          .IF %3>15
0580          LDY %3
0590          .ELSE
0600          LDY #%3
0610          .ENDIF
0620 ;
0630 ;store what's already in the
0640 ;accumulator briefly, even though
0650 ;we haven't added yet
0660 ;
0670        STA COLOR0,X
0680 ;
0690 ;keep just the low nybble of
0700 ;what's in the Y-register
0710 ;
0720        TYA
0730        AND #15
0740 ;
0750 ;add %3 (now in A) to %2*16 (now
0760 ;in COLOR0,X) and store again
0770 ;
0780        CLC
0790        ADC COLOR0,X
0800        STA COLOR0,X
0810        .ENDIF
0820      .ENDM
0830 ;
0840 ;sample program to try SETCOLOR
0850 ;
0860      *=  $5000
0870       SETCOLOR  2,6,4
0880      BRK
```



Easy Find

Get your reference collection and program library under control—at last!

by Jim Siemion

There you are, sitting on the floor again with magazines scattered everywhere, trying to find that article on player/missile graphics you saw just a few months ago. . .or was it earlier? Well, an hour later you've finally found it! Must have been a little farther back than you remembered, but no matter, you've got it now.

Without hesitation, you type it in and wait for the moment of truth: you run the program and your keyboard locks up! You recheck your typing with **BASIC Editor II** (last-printed in issue 47), and it checks out okay. Must be a bug in the original program. So you pull out your magazines and start looking through later issues for a fix in the **Reader comment** section. . .If this is a familiar scenario for you, I think you're going to like **EasyFind**.

Typing it in.

To create your copy of **Easy Find**, you must perform the following steps:

(1) Type in Listing 1, using the **BASIC Editor II** from issue 47 to check your work, then save it to disk.

(2) Run the program typed in step 1. It will create the file MLSTRING.LST on your disk.

(3) Type in Listing 2, using the **BASIC Editor II** to check your work, then save it to disk.

(4) With the program typed in step 3 still in memory, merge the file created in step 2 with the command *ENTER "D:MLSTRING.LST"*.

(5) Finally, save the completed **EasyFind** program to disk.

Using it.

EasyFind is a menu-driven indexing system much like the card catalog found in a library. It was originally designed to search and retrieve articles from Atari magazines such as **ANALOG Computing**. However, it can and has been used for almost any kind of reference information you can think of: technical journals, club newsletters, record and tape collections, and many others. It will search through files of information and only select those records that match search phrases you dictate.

If you had used **EasyFind** in our example, you could have asked it to find all the information on P/M graphics, and it would have displayed on-screen—or output to a printer or disk file—all reference articles for that subject. Furthermore, it could have told you of all the fixes submitted for the program, so, instead of locking up your keyboard, the program would have run right the first time!

If you're like most Atari enthusiasts, your collection of magazines extends back many years—and grows monthly. The problem of finding all that good stuff from months or years ago keeps getting worse as your collection get bigger. But wait! What did you buy a computer for (aside from game-playing)? Wasn't it to do those things we humans aren't well suited for?

And one of the best tools for organizing piles of data for easy access is a database program. **EasyFind** is really a specialized database program, specifically designed for searching and retrieving text-based information in a very quick and easy way. As you'll see, in this database there are no numeric fields or complicated record formats. Each reference record is simply seven lines of text, much like an index or library catalog card. Because the record is so simple, you don't need any specialized data entry procedures. Records can be created using any standard word-processing program or text processor.

Features.

EasyFind has many features that make it enjoyable to use: simple menus, on-line help, windows, scrolling dis-

play windows, two display formats, output to printer or disk, multiple search phrases, Boolean logic, and more.

After you've started up **EasyFind**, you will be presented with a full screen display. At this point, you can activate any of **EasyFind**'s features via the menus and certain keys. But first, let's look at the screen display.

The Screen Display.

The screen is divided vertically into three main areas:

The Option Menu is at the bottom of the screen. This is where you control how and what **EasyFind** will do. There are nine different option choices in this menu: Search, File, Disk, Record, Keywords, Autoprint, Output, Display and Exit.

The Option Display is at the top of the screen. This always shows you what options you've selected: Disk, File, Record, Output and Autoprint.

The Display Window is in the middle of the screen. Here, selected records are displayed, as well as on-line help. This is a 12-line window which scrolls.

The Keys.

All of **EasyFind**'s functions are controlled by just the few keys described here. Of course, there are times when you have to use the alphanumeric keys to enter search phrases or filenames when prompted, but the keys here control the menu and display.

Left and Right Arrow Keys. Using these keys (without holding down the CTRL key) lets you select an option from the option menu at the bottom of the screen. When an option is selected, it will appear in reverse video. Although the menu is seen on two lines, you only have to use these two keys to select any option. Also, the menu wraps around from Search to Exit, so that if you move left past Search, you wind up down at the bottom at Exit.

There are other menus shown in smaller windows for choices to options. For example, the AutoPrint option has a small menu of two choices: ON or OFF. The arrow keys are used to select either of these choices.

Up and Down Arrow Keys. These keys (I *hate* holding down CTRL, so you don't need to do it with these keys, either) find the Next or Last record in the current index file. Once you've told **EasyFind** what filè to search, the up arrow key will find the last record in the file, and the down arrow will find the next record. If you use these keys before you enter a search phrase, **EasyFind** will display each record in the file.

Another use for these arrow keys is with the File option. If you activate this option, you will be shown a vertical menu of filenames from which you select one by moving up and down the list.

HELP, RETURN, START, ESC. One of the most useful features is **EasyFind**'s context-sensitive on-line help function. It's activated at any time by pressing the HELP key on XL and XE machines, or CTRL-H on the Atari 400s and 800s. You might be asking yourself, "What *is* 'context-sensitive on-line help'?" This simply means that, when you ask for help, the computer knows what option you're using and displays help relevant to only that option.

The RETURN key is an all-purpose key. When a menu choice has been selected (shown in reverse video) you "activate" that choice with RETURN. This applies both to the main option menu and the smaller menus in the windows.

When START is pressed, **EasyFind** "starts" searching through the database for whatever records match the search phrases you've entered. As it finds a record, it will automatically display that record on the screen, then continue to look through the database for another match. This is the lazy man's key. I mean, why keep pressing the down arrow all the time, when you can have the computer do it for you?

Now that you know what START does, you probably want to know how to stop it. The ESCape key will stop the automatic search function and put you back in control again. This can give you time to look at things before going on. If you press START again, **EasyFind** will continue its search through the database from wherever it stopped.

Menu options.

The menu at the bottom of the screen controls the whole program and is the most important to understand. Let's look at each menu item.

The Search Option.

When you want to find information in an index, you have to tell the computer what to look for. Here, you can enter one or two search phrases of up to twenty characters each, and also tell the computer if it has to match both phrases in the record or only one of the phrases. For example, let's say you wanted to find out all reviews of game programs. You would enter *REVIEW* for the first search phrase, *GAME* for the second, and require that records must match BOTH phrases. This corresponds to the Boolean AND function. If you had said that records only need to match EITHER phrase, this would be like the Boolean OR function, and records with either GAME or REVIEW in them would be selected. Also, if you wanted to select or look at all records, you need only enter an asterisk (*) for the first search phrase.

The File Option.

There can be many different files or databases on a disk for which you would want to search. When you activate this option, a directory of all files on the current disk with an extension of .DAT will appear in a text window. Using the up and down arrows, you select one of the files you want to search for information. Once you've selected the file, simply press RETURN and that file will be opened for use by **EasyFind**.

The Disk Option.

You can search files on any disk drive, including a RAMdisk. For those users with more than one disk drive, several different databases can be kept on multiple disk drives. When you activate this option, you will see the prompt *DISK:* in a small text window. You can enter any number between *1* and *8*. If you enter an invalid number, the program defaults to drive 1 for the current drive. Once you select a valid disk drive, you will be shown the file option menu and must select a file to search.

The Record Option.

Information is accessed by records when you're searching for a given reference. The records are stored in the database file as simple sequential records. However, when you read these records, **EasyFind** remembers where they are in the file and can later access them by number. When you activate this option, you will see the prompt *RECORD:* in a small text window. If you enter a record number that's already been accessed, that record will be displayed. This option is only valid in the full screen display mode. You'll also note that the current record being displayed is shown in the upper right-hand corner of the option display area.

The Keywords Option.

Searching for references involves telling **EasyFind** to find a certain phrase or combination of phrases within the records. In order to facilitate searching, a set of forty-six keywords commonly found within Atari magazines are offered here. When you activate this option, the list of keywords is shown in the display window. In the Atari magazine indexes sold by Sierra Services, if these words don't occur within the title or description, they're added to the description, to better organize and categorize the information.

The Autoprint Option.

Sometimes you want to maintain a copy of the records you've found. You can do this with the autoprint option. When you activate it, you're presented with a small text window in which you have two choices: ON or OFF. By using the left or right arrows, you can select your choice, then activate the choice by pressing RETURN. If you turn the autoprint feature ON, every record selected will be sent to the output device you've indicated. The form of the record depends on the display format: if the full display format is active, then a full seven-line record will be sent to the output device. However, if you're in the brief mode, only a single line will be output per record.

The Output Option.

This option works in conjunction with the autoprint option and can be one of the more powerful options. It lets you output selected records to any device you choose. Normally, this would be the printer or P: device, but it can be a disk or cassette file. When you activate this option, you'll see the prompt *Output Device:* in a text window. You can enter any valid device specification up to fifteen characters in length and end your entry by pressing RETURN.

After you've entered your new device specification, the old output device is closed and the new one opened for output. For example, if you want to create subsets of your database file, you can enter a disk filename as the output device. Then, whenever records are selected and the autoprint option is on, they will be saved in the disk file. Please note that you have to enter a new device name before the old file will be closed.

The Display Option.

There are two display formats for viewing records in a database file: full and brief. As mentioned earlier, each reference record is seven lines of text. The full format displays all seven lines of the record in the display window. The brief format displays only one line per record, but can show up to eleven records on-screen at once. The line includes record number, month and up to thirty-one title characters. You can toggle back and forth between full and brief displays. This is where they're most useful. For example, if you were searching a database file and you expected to find a lot of matching records, you might want to specify brief format. When you saw a title that looked like the right one, you could then select the full format and see the complete record. Once done, you can go back to the brief display, and the screen will be the same as it was before you went into full display.

The Exit Option.

This is the easiest option of all. It simply closes all the files, stops the **EasyFind** program, and returns you to BASIC.

Index files.

As we said earlier, **EasyFind** is a specialized database program, originally designed to search and retrieve references to articles and programs in Atari magazines. The databases containing this information are called index files, since they're essentially card or magazine indexes. The index files have a very simple design; because of their simplicity, they are also very flexible.

File Format.

All database programs work with records. **EasyFind** is no different, although its definition of a record varies slightly from what you might expect. Normally, a record is a collection of related data items, usually called fields. For **EasyFind**, a record is a collection of seven lines or strings of information. There are no fields or specialized formats. Anything you want can be entered in these lines or strings. What could be simpler?

Actually, each of these lines or strings is a "record" as far as the Atari I/O is concerned, since it considers a record to be some number of contiguous bytes terminated by an End Of Line (EOL) or RETURN character.

Here's the file format **EasyFind** expects to read. Each line must be thirty-nine characters or less, and it must be terminated by an EOL character. Anytime you PRINT a string in BASIC, it's terminated by an EOL character; most word processors terminate when you press RETURN.

Line 1: Magazine, Month, Year, Page, Author
(Each of these "fields" should be separated by a space.)
Line 2: Title or article
Line 3: Description of article
Line 4: Description of article
Line 5: Description of article
Line 6: Description of article
Line 7: Description of article

Note: Although **EasyFind** doesn't care what information is in these seven lines, as far as searching and retrieving is concerned, the brief format will look for a space between the magazine and month in the first ten characters of Line 1. If it finds a space, it takes the next three characters and displays them as the month. It also uses the first thirty-one characters of Line 2 in the display as the title.

How to create your own indexes.

The easiest way to create your own index files is by us-

ing a standard word processor compatible with **AtariWriter** format. For each database record, enter up to seven lines and terminate each line by pressing RETURN. You must end each line with a RETURN. Do not use the word wrap feature.

You don't have to fill in each line. For example, if you only have five lines of useful information for one record, just press RETURN once for each of the two missing lines. This, in effect, gives you five actual lines and two empty lines. The only rule here is that each record must have seven lines, whether empty or not.

Another way to create an index file would be with a simple BASIC program such as this one:

```
10 OPEN #1,8,0,"D:MYFILE.DAT"
20 DIM LINE$(39)
30 INPUT LINE$
40 PRINT #1;LINE$
50 GOTO 30
```

Once you're through entering data, just press BREAK and close the file by entering *CLOSE #1* in immediate mode.

Note: **EasyFind** expects each index file to have an extension of .DAT. When the file option is activated, it only allows you to select or open a file with this extension. The following are examples of filenames **EasyFind** would recognize: ANALOG85.DAT, MYDATA.DAT

An example.

Let's step through an example of how you might use **EasyFind** if you wanted some information on player/missile graphics. After you start up **EasyFind**, you will be presented with a full screen display.

Press the right arrow key until "File" is selected, then hit RETURN. You'll see a small window mid-screen, with the prompt *Disk:*. Let's assume your index file is in disk drive 1 and is called ANALOG86.DAT.

Enter 1 and press RETURN. **EasyFind** will read the disk directory on disk 1 and display that directory in a window in the middle of the screen.

Press the down arrow until the file ANALOG86.DAT is selected, then press RETURN. The file will now be opened.

Press the left arrow key until "Search" is selected, then press RETURN. You now see a window in the middle of the screen with a prompt, *Phrase:*. Enter *P/M* and press RETURN.

You will still be in the same window with the same

(continued on page 89)

// ST notes *continued from page 54*

real problem with metafiles is that the program doesn't know what it is outputting to. It can't check font sizes, or names, or actual device resolution. Metafiles are great for object drawing, but for text they stink."

The conference resolved that GDOS in its current form was inadequate; although it should be Atari, not DRI, which makes any corrections to it. //

Batteries *dis*-included.

Electronic Arts has, as of April 3rd, announced its intent to purchase rights to the brand *Batteries Included*, as well as production and distribution rights to BI's current product line. BI employees, under mysterious circumstances, were terminated prior to the signing of the deal between EA, BI and BI's owner, ITM. EA will still be allowed to contact BI's independent authors to negotiate for contract renewals. BI's **PaperClip** author, Dan Moore, has confirmed to us that he's already been contacted by EA. Upcoming issues will bring you full details.

According to BI's former Vice President for Creative Services, Marty Herzog (now with Atari Canada), BI was plagued in its final days by piracy. Herzog says it was the case for most BI titles that "For every one sold, I believe there were two that were pirated. *Two-thirds* of [our] user base pirated software. I know there were a lot of people out there who asked to buy manuals from us. It's a fact of life that [piracy] does happen, and we kind of resigned ourselves to it."

Might BI's low prices on the consumer market shelves have been too drastic a measure to combat piracy? Answers Herzog, "The original **DEGAS** came out at $39.95, and even there we found we were still getting pirated. Originally, we were going to put **Thunder!** out at $39, also. Then we were talking about Borland doing a copy-protected version and an un-copy-protected version, so we compromised and put it out a little more expensively, but still no copy protection. It was Borland which started the idea of doing **SideKick** in a protected and unprotected version; in the unprotected version you pay a bit more. Then we compromised on **Thunder!** at $49.

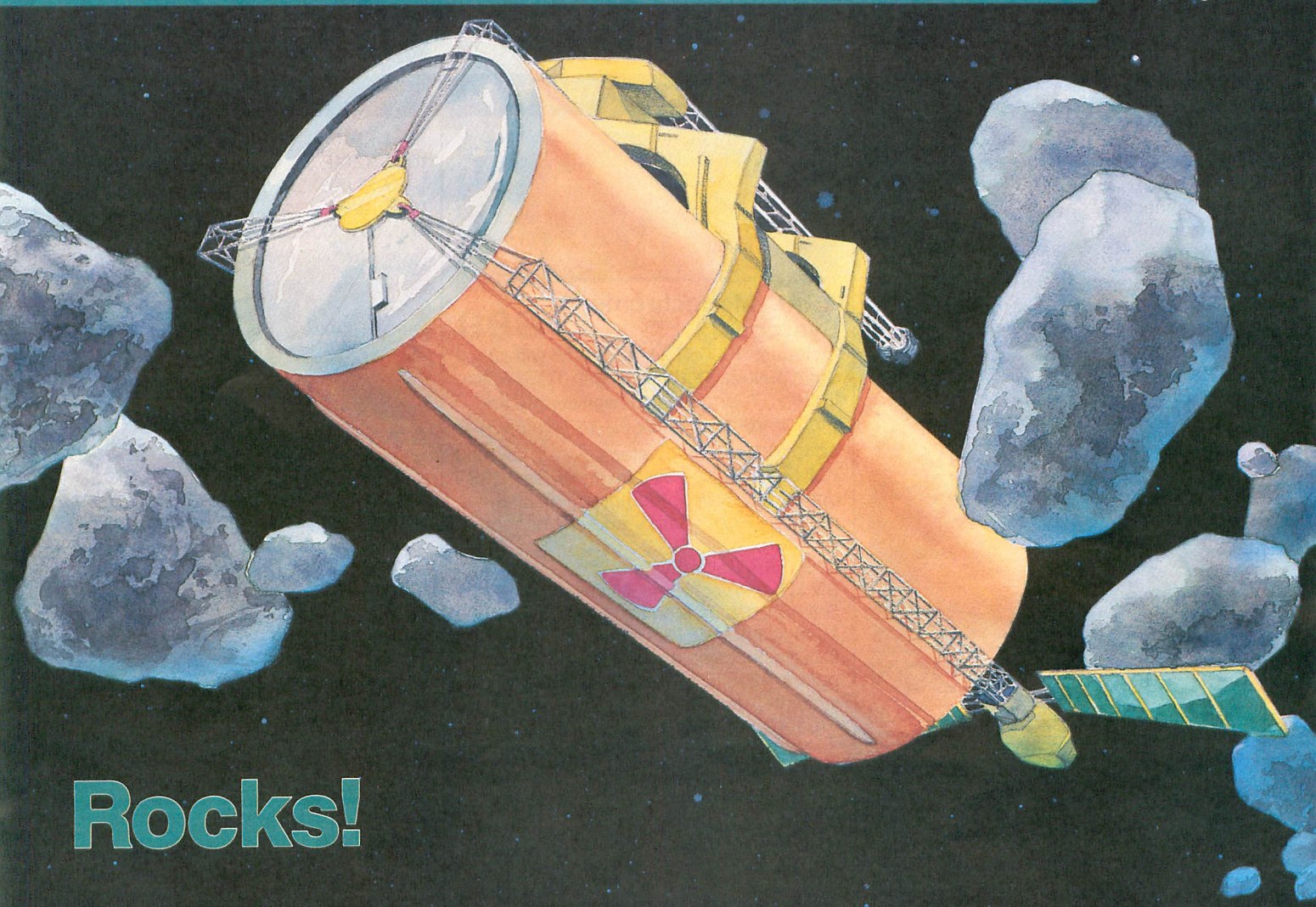
"We also played with the idea," adds Herzog, "of a plug-in key; we originally did it with our 8-bit software line. There was even a point where we went so far as to consider a plug-in cartridge that would also be a clock card, and our software would not work without that clock card." //

Argonaut boards a bigger ship.

Electronic Arts President Trip Hawkins has confirmed that **Starglider** author Jeremy "Jez" San has been contracted by EA to produce some new entertainment titles, perhaps under an Affiliated Titles Program agreement with San's company, Argonaut Software. **Starglider** has received the most critical acclaim of any game available for the ST; *Byte* columnist Jerry Pournelle has tied it with EA's **Starflight** as his Best Computer Game of 1986.

Hawkins adds to that acclaim by saying, "**Starglider**, I think, is probably the only really outstanding game for the ST." **Starglider** is distributed in the U.S. by Firebird Licenses, USA.

That's the **notes** for this month. I'll see you on Delphi. //



Rocks!

by Douglas Engel

The crew was ecstatic—after four years of searching, an inhabitable star system had been found for the Earth's refugees. As the fleet passed each of the ten planets of the system, scanners showed more signs of the ancient civilization that once prospered here. There were even some energy readings. A landing party was dispatched to investigate. Its members returned with reports of gigantic pyramids, huge underground cities, massive nuclear furnaces, giant radioactive waste dumps—and no signs of life.

The star system was soon brought back to life. People moved into the underground cities and activated the reactors. The advanced technology of the civilization was harnessed, to create impenetrable defense screens of artificial asteroids called **Rocks**, to protect each planet from the aliens who had destroyed the colonists' home. Everything seemed to be progressing very well, until the day the colony discovered what had happened to the former inhabitants of the system.

The reactors were in full operation, producing 24 tons of waste each day—waste which was dumped in each planet's massive waste dump, waste which was still active in some strange way. The radiation at each dump continued to increase until it reached the now-critical levels. Something had to be done to prevent disaster.

You've been assigned to the radiation dispersal team working to save as many of the planets as possible from total destruction by the mysterious radiation. To accomplish this task, you've been given three remote-controlled shuttle pods. You must carefully navigate a pod through the **Rocks** and land on the disposal pad, where a canister of waste will be automatically loaded onto your pod. Next, you must pilot your ship back through the **Rocks** and teleport the canister into one of the passing fleet ships, which will transport it to deep space, to be harmlessly dispersed.

Although this may sound simple, it's not. Any collision between your pod and another object will result in the loss of the pod. Any attempt to land on the rough ground —or with a canister on board—will crash the pod. When

When you want to talk Atari

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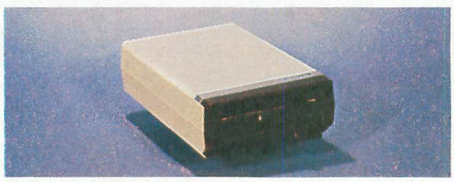

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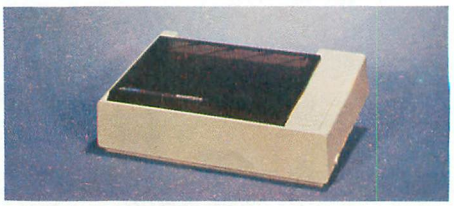

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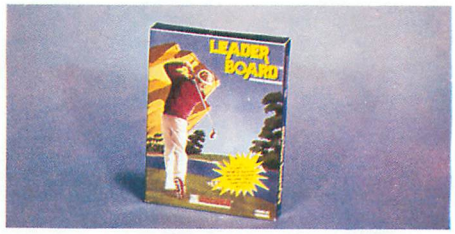

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the radiation level gets high enough, strange discharges may destroy your pod.

To further complicate matters, enemy spy satellites have been reported scouting the area. These satellites will explode on contact, also destroying your pod. Finally, if you manage to remove five canisters from a dump, you'll move to the next planet and be given another spare pod. If the radiation level gets too high, the planet will be devastated —and your services will no longer be required.

Typing it in.

Listing 1 is the BASIC data used to create your copy of **Rocks!** Please see **M/L Editor** on page 10 for typing instructions.

Playing *Rocks!*

Rocks! is a game for one player, and requires one joystick and 24K of memory on any 8-bit Atari computer. The starting level is selected at the beginning of the game on the title screen, by pressing the SELECT key.

The game will begin when the START key is pressed. If you want to abort a game and start a new game, you may press START during play. If you'd like to change the starting level during a game, you may press SELECT to abort the current game and return to the title screen, where a new level may be chosen.

You start the game above the first planet, with the fleet passing above you and the **Rocks** immediately below you. Beneath the **Rocks** lies the planet's atmosphere; below that is the waste dump. The bottom of the screen displays the instruments aboard your pod. These instruments include: C, the number of canisters yet to be moved; RADS, your radiation meter; FUEL, your fuel gauge; and, finally, P, the number of pods you have.

You move in space by pushing your joystick in any of the eight standard directions. The pod will move in that direction. When you head into the atmosphere, the planet's gravity starts to pull on your pod, so you can move left or right normally, but must use upward thrust to decelerate a fall and to accelerate upward.

To land, you must center your pod above the disposal pad and thrust upward to slow your fall. You must be falling slowly at the point of contact with the pad, or you'll crash. Do not attempt to land with a canister on board your pod, because the shock will detonate the unstable waste.

Pushing the joystick button when a canister is on your pod will activate the teleport beam. If this beam makes contact with one of the fleet ships, the canister will teleport aboard that ship, and the radiation level will decrease. If the beam expends itself, or contacts an object, the canister will disperse, but the radiation will remain.

As above, when five canisters have been removed from a dump, you'll move on to the next planet, advance one level and be given another spare pod. When all five canisters have been removed from each of the ten planets, you'll return to the first planet to continue the task. At this point, you will have reached the highest difficulty and will remain at this level.

The game is lost if the radiation level reaches maximum and destroys the current planet, or if you lose all of your pods. Good luck, and watch out for the **Rocks!**

---

*Douglas Engel has an A.A.S. in Electrical Technology and has been a computer enthusiast since 1981. He owns an Atari 2600, 600XL, 800XL and 520ST, and numerous peripherals. **Rocks!** is his first assembly language game. His other interests include art, animation and automobiles (especially classic T-Birds).*

Listing 1.
M/L Editor Data.

```
1000 DATA 255,255,0,32,246,47,169,3,14
1,15,210,169,22,141,8,2,2781
1010 DATA 169,38,141,9,2,169,29,141,19
5,2,169,0,141,8,210,133,4926
1020 DATA 204,133,206,173,244,2,133,20
5,169,64,133,207,160,64,162,1,8133
1030 DATA 177,204,145,206,200,208,249,
230,205,230,207,202,16,242,169,64,4706
1040 DATA 141,244,2,160,0,162,0,189,21
6,70,141,26,80,142,27,80,4019
1050 DATA 162,7,173,26,80,10,141,26,80
,144,4,169,73,208,2,169,4331
1060 DATA 0,153,224,59,200,202,16,234,
174,27,80,232,224,25,208,215,1792
1070 DATA 169,64,141,14,212,169,0,141,
47,2,160,98,162,228,169,7,6372
1080 DATA 32,92,228,169,136,141,48,2,1
69,61,141,49,2,169,11,141,3617
1090 DATA 0,2,169,38,141,1,2,169,192,1
41,14,212,32,41,36,32,1708
1100 DATA 68,37,133,77,141,200,2,169,2
,141,196,2,169,4,141,197,6348
1110 DATA 2,169,6,141,198,2,169,134,14
1,199,2,173,95,71,141,201,8206
1120 DATA 60,169,34,141,47,2,173,31,20
8,201,7,240,249,133,77,201,199
1130 DATA 5,208,17,238,201,60,173,201,
60,201,26,208,20,169,16,141,7192
1140 DATA 201,60,208,13,201,6,208,222,
173,31,208,201,7,208,249,240,3555
1150 DATA 36,141,95,71,162,64,160,0,20
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173,31,208,201,7,240,183,202,3118
1170 DATA 208,240,76,192,32,169,0,141,
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1180 DATA 7,169,16,157,87,71,202,16,25
0,169,19,141,218,59,173,95,8220
1190 DATA 71,141,201,60,141,97,71,169,
80,160,0,162,1,32,17,37,1094
1200 DATA 32,68,37,32,41,36,169,5,141,
129,66,141,134,66,169,168,6117
1210 DATA 141,165,66,169,21,141,183,59
,141,37,80,169,3,141,29,208,5582
1220 DATA 169,80,141,7,212,169,0,162,1
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1230 DATA 83,160,0,162,5,32,17,37,169,
83,133,205,169,0,133,204,6643
1240 DATA 169,41,168,169,128,145,204,2
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1250 DATA 8,144,239,162,215,189,0,83,9
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,48,160,0,162,9,32,17,37,1756
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1290 DATA 38,24,105,64,160,0,145,204,3
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1310 DATA 204,176,61,133,204,144,211,1
41,26,80,165,204,201,254,176,202,4408
```

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9,37,141,58,80,169,14,56,1860
1340 DATA 237,58,80,24,109,57,80,24,10
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1350 DATA 230,205,230,205,202,16,143,1
69,49,133,205,169,0,133,204,160,495
1360 DATA 0,169,208,145,204,200,169,81
,145,204,200,32,131,37,24,105,7143
1370 DATA 3,141,26,80,169,82,145,204,2
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1380 DATA 145,204,200,169,212,145,204,
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1390 DATA 37,109,201,60,109,201,60,105
,32,24,101,204,176,6,133,204,7217
1400 DATA 201,240,144,187,162,3,169,0,
133,204,169,49,133,205,160,0,7955
1410 DATA 177,204,230,205,145,204,198,
205,200,192,48,208,243,230,205,230,835
8
1420 DATA 205,202,16,234,169,2,141,169
,61,169,3,141,217,61,162,4,6342
1430 DATA 173,10,210,41,3,240,249,201,
3,240,245,157,168,61,201,1,298
1440 DATA 208,7,169,4,157,240,61,208,5
,169,0,157,240,61,169,0,6629
1450 DATA 157,8,62,232,224,11,208,216,
162,4,32,137,37,105,1,157,5079
1460 DATA 216,61,173,10,210,201,48,144
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1470 DATA 11,208,231,169,48,141,48,2,1
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1480 DATA 169,158,141,0,2,169,37,141,1
,2,160,30,162,38,169,7,2233
1490 DATA 32,92,228,169,63,141,47,2,20
8,47,173,43,80,240,2,208,7091
1500 DATA 40,173,31,208,201,7,208,22,1
73,30,80,162,0,142,30,80,3889
1510 DATA 201,5,208,3,76,106,32,201,6,
208,6,76,15,33,141,30,1569
1520 DATA 80,173,35,80,240,212,76,49,3
3,32,85,37,32,68,37,169,2390
1530 DATA 48,141,62,80,169,126,141,28,
80,32,31,36,173,17,80,240,4518
1540 DATA 20,206,218,59,173,218,59,201
,16,208,10,162,18,32,247,36,6297
1550 DATA 169,255,141,25,80,169,87,141
,41,80,169,152,141,22,80,169,6800
1560 DATA 125,141,53,80,169,108,141,19
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1570 DATA 37,141,38,80,141,17,80,141,2
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1580 DATA 141,16,80,141,43,80,141,10,8
0,169,255,141,21,80,169,1,5170
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60,24,105,192,141,223,60,173,8916
1600 DATA 201,60,201,25,208,12,169,209
,141,249,60,169,208,141,250,60,2426
1610 DATA 208,11,24,105,193,141,250,60
,169,208,141,249,60,173,25,80,9370
1620 DATA 208,20,162,6,32,247,36,169,0
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36,76,20,35,172,34,80,216,4695
1640 DATA 174,12,80,189,87,71,24,105,1
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1650 DATA 136,208,237,169,255,141,36,8
0,96,24,233,9,157,87,71,202,7933
1660 DATA 16,225,76,20,35,169,84,160,0
,162,2,32,17,37,96,162,2288
1670 DATA 17,169,0,157,0,208,202,16,25
0,96,69,79,37,78,96,162,5965
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,64,63,224,70,240,12,224,46,8234
1690 DATA 240,8,224,22,240,4,202,16,23
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,62,80,202,169,0,157,0,5278
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,173,10,210,41,7,96,173,4716
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,80,141,0,80,141,3,80,2094
1900 DATA 141,2,80,96,72,138,72,166,20
2,141,10,212,189,160,63,141,9469
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1920 DATA 208,189,112,63,141,24,208,18
9,136,63,141,25,208,189,64,63,7934
1930 DATA 141,22,208,189,32,62,240,16,
141,10,212,141,7,208,189,32,7578
1940 DATA 62,24,125,56,62,141,10,212,1
41,7,208,230,202,189,9,71,8501
1950 DATA 141,10,212,141,27,208,224,2,
208,6,173,2,208,141,33,80,6590
1960 DATA 224,11,208,9,173,48,80,32,52
,36,141,21,208,104,170,104,5840
1970 DATA 64,72,169,54,32,52,36,141,22
,208,104,64,173,9,210,141,6724
1980 DATA 252,2,104,64,173,43,80,240,3
,76,138,47,169,0,133,202,6700
1990 DATA 141,18,80,173,37,80,240,3,76
,138,47,173,25,80,240,13,5378
2000 DATA 173,132,2,208,5,104,104,76,1
5,33,76,211,47,173,13,80,3601
2010 DATA 208,3,76,211,38,238,15,80,17
3,15,80,201,56,144,18,201,6888
2020 DATA 224,144,61,162,18,142,25,80,
32,247,36,32,68,37,76,138,3408
2030 DATA 47,162,3,32,43,36,162,12,189
,40,63,24,105,1,41,15,9515
2040 DATA 9,112,157,40,63,157,160,63,1
41,0,210,105,32,141,2,210,6404
2050 DATA 169,207,141,1,210,141,3,210,
232,224,19,208,219,76,138,47,423
2060 DATA 162,119,173,42,80,41,15,93,2
00,62,157,200,62,157,64,63,6161
2070 DATA 169,15,141,1,210,141,3,210,1
69,143,141,5,210,141,7,210,9024
2080 DATA 173,15,80,141,0,210,10,141,2
,210,10,141,4,210,73,255,7632
2090 DATA 141,6,210,202,16,204,76,138,
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47,162,23,189,168,61,240,103,9471
2100 DATA 189,192,61,221,216,61,144,92
,169,0,157,192,61,189,168,61,9417
2110 DATA 201,2,240,43,169,3,56,253,8,
62,157,240,61,254,8,62,7246
2120 DATA 189,8,62,201,4,208,64,157,24
0,61,169,0,157,8,62,142,6271
2130 DATA 27,80,189,241,70,170,254,48,
61,174,27,80,76,65,39,254,7473
2140 DATA 8,62,189,8,62,157,240,61,201
,4,208,27,169,0,157,240,9144
2150 DATA 61,157,8,62,142,27,80,189,24
1,70,170,222,48,61,174,27,7664
2160 DATA 80,76,65,39,254,192,61,202,1
6,145,238,54,80,173,54,80,7620
2170 DATA 201,128,208,12,162,10,222,32
,62,202,16,250,232,142,54,80,8827
2180 DATA 238,55,80,173,55,80,201,28,2
40,14,201,30,240,17,201,58,8018
2190 DATA 240,20,201,60,240,28,208,41,
169,13,141,129,66,208,122,169,9519
2200 DATA 5,141,129,66,208,115,169,13,
141,134,66,169,184,141,165,66,9415
2210 DATA 208,103,169,5,141,134,66,169
,168,141,165,66,169,0,141,55,7195
2220 DATA 80,238,8,80,173,8,80,201,40,
240,6,201,60,240,12,208,9087
2230 DATA 23,169,2,141,113,63,141,114,
63,208,62,169,40,141,113,63,6557
2240 DATA 141,114,63,169,0,141,8,80,23
8,9,80,173,9,80,201,56,5352
2250 DATA 240,6,201,72,240,17,208,33,1
69,127,141,244,67,169,247,141,2883
2260 DATA 202,67,141,206,67,208,18,169
,63,141,244,67,169,243,141,202,3315
2270 DATA 67,141,206,67,169,0,141,9,80
,173,17,80,240,3,76,148,5676
2280 DATA 41,173,31,80,208,122,173,62,
80,201,192,208,3,76,219,40,8925
2290 DATA 205,53,80,176,3,76,26,41,238
,24,80,173,24,80,201,10,4471
2300 DATA 208,59,169,0,141,24,80,173,1
4,80,240,4,169,255,208,3,8475
2310 DATA 173,120,2,77,20,80,41,1,208,
12,206,59,80,208,30,169,5984
2320 DATA 1,141,59,80,208,23,238,59,80
,173,59,80,201,16,208,13,6640
2330 DATA 169,15,141,59,80,173,20,80,7
3,1,141,20,80,173,59,80,3491
2340 DATA 238,0,80,205,0,80,240,2,176,
13,169,0,141,0,80,173,5188
2350 DATA 20,80,240,6,238,62,80,76,55,
41,206,62,80,76,55,41,3504
2360 DATA 173,32,80,208,20,238,2,80,20
8,29,169,255,141,2,80,173,8761
2370 DATA 120,2,41,1,240,3,76,109,41,1
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2380 DATA 80,32,143,37,141,20,80,174,3
,80,189,33,71,205,2,80,4283
2390 DATA 240,3,76,109,41,189,69,71,14
1,1,210,189,51,71,141,0,5319
2400 DATA 210,24,165,224,105,24,133,22
4,169,0,101,225,133,225,24,165,652
2410 DATA 226,105,24,133,226,169,0,101
,227,133,227,238,3,80,76,109,9171
2420 DATA 41,173,20,80,208,3,76,18,40,
173,59,80,201,11,144,42,4219
2430 DATA 173,32,80,208,37,173,28,80,2
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2440 DATA 80,176,23,169,6,141,12,80,14
1,31,80,32,79,37,141,34,2264
2450 DATA 80,238,34,80,32,246,35,76,10
9,41,238,17,80,76,109,41,4525
2460 DATA 169,1,141,20,80,169,8,141,59
,80,173,14,80,208,33,173,6349
2470 DATA 120,2,41,1,240,29,173,120,2,
41,2,240,28,173,14,80,3872
2480 DATA 208,14,173,120,2,41,4,240,22
,173,120,2,41,8,240,25,3836
2490 DATA 76,109,41,206,62,80,76,55,41
,238,62,80,76,55,41,206,5553
2500 DATA 28,80,169,1,141,18,80,208,10
,238,28,80,169,2,141,18,4602
2510 DATA 80,208,0,173,62,80,201,37,17
6,5,169,37,141,62,80,173,6797
2520 DATA 28,80,201,38,176,5,169,38,14
1,28,80,169,209,205,28,80,7604
2530 DATA 176,5,169,209,141,28,80,32,1
79,36,173,45,80,208,113,238,9617
2540 DATA 46,80,240,3,76,134,42,32,125
,37,240,3,76,134,42,32,3389
2550 DATA 125,37,240,7,169,1,141,49,80
,208,5,169,254,141,49,80,7901
2560 DATA 32,131,37,240,251,141,52,80,
173,10,210,9,8,141,48,80,5183
2570 DATA 32,137,37,205,96,71,176,2,14
4,3,173,96,71,10,10,10,1715
2580 DATA 170,160,0,189,200,69,153,126
,87,232,200,192,8,208,244,169,4306
2590 DATA 0,141,47,80,141,7,80,141,60,
80,169,255,141,45,80,32,6202
2600 DATA 131,37,208,7,169,255,141,56,
80,208,5,169,0,141,56,80,6244
2610 DATA 238,47,80,173,47,80,205,52,8
0,208,113,173,50,80,208,80,8729
2620 DATA 173,29,80,56,233,128,16,5,73
,255,24,105,1,141,60,80,4298
2630 DATA 169,255,56,237,60,80,74,74,7
4,74,74,141,60,80,238,7,5809
2640 DATA 80,173,7,80,201,11,144,26,20
1,12,144,7,169,0,141,7,3715
2650 DATA 80,240,29,169,160,13,60,80,1
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2660 DATA 208,14,173,60,80,74,9,128,14
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,109,49,80,141,29,80,141,4231
2680 DATA 3,208,208,8,169,0,141,45,80,
141,3,210,173,56,80,240,8703
2690 DATA 3,238,48,80,238,39,80,173,39
,80,201,56,208,18,169,0,6526
2700 DATA 141,39,80,238,40,80,173,40,8
0,201,255,208,3,141,13,80,7841
2710 DATA 173,40,80,201,128,144,36,173
,66,80,208,31,32,125,37,13,4130
2720 DATA 42,80,208,23,173,10,210,201,
38,176,2,144,247,201,209,144,2957
2730 DATA 2,176,241,141,2,208,169,255,
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2740 DATA 238,23,80,173,23,80,201,113,
144,18,169,0,141,23,80,206,6848
2750 DATA 21,80,208,8,141,1,210,169,25
5,141,14,80,173,13,80,240,9410
2760 DATA 12,173,41,80,24,105,32,141,4
,208,76,68,45,173,40,80,4318
2770 DATA 74,74,74,24,109,41,80,141,4,
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2780 DATA 22,80,202,142,5,208,169,0,14
1,53,80,240,13,173,21,80,6337
2790 DATA 74,74,74,24,109,22,80,141,5,
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2800 DATA 32,80,240,15,173,17,80,208,1
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2810 DATA 141,5,80,173,5,80,208,3,76,1
14,44,238,4,80,173,4,4873
2820 DATA 80,201,1,240,3,76,56,44,169,
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2830 DATA 41,8,240,34,238,50,80,169,5,
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2840 DATA 3,206,12,80,32,79,37,141,34,
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2850 DATA 76,26,44,76,32,44,173,62,80,
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2860 DATA 240,241,173,33,80,240,121,16
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2880 DATA 246,35,173,40,80,24,105,224,
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2890 DATA 40,80,206,183,59,173,183,59,
201,16,208,68,173,218,59,201,2001
2900 DATA 25,240,3,238,218,59,173,201,
60,201,25,240,3,238,201,60,1680
2910 DATA 173,96,71,201,15,240,3,238,9
6,71,174,97,71,232,224,26,331
2920 DATA 208,2,162,16,142,97,71,32,68
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2930 DATA 10,80,141,63,80,141,37,80,16
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2960 DATA 80,232,232,169,207,61,0,83,1
57,0,83,202,172,6,80,200,8411
2970 DATA 169,207,224,35,208,6,32,85,3
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2980 DATA 26,80,169,48,45,10,210,240,2
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2990 DATA 136,208,221,169,207,61,0,83,
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3000 DATA 208,15,173,62,80,201,128,176
,11,173,5,208,13,4,208,240,9480
3010 DATA 3,238,17,80,32,137,37,9,171,
141,194,2,173,17,80,240,7807
3020 DATA 3,76,68,45,173,31,80,208,102
,173,14,80,240,3,76,68,5986
3030 DATA 45,173,120,2,41,15,201,15,24
0,85,41,3,201,2,240,6,5445
3040 DATA 201,1,240,19,208,28,173,62,8
0,24,105,9,170,32,133,36,4406
3050 DATA 232,32,133,36,76,220,44,174,
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3080 DATA 240,3,238,44,80,141,1,210,16
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3090 DATA 44,80,240,9,206,44,80,173,44
,80,141,1,210,238,19,80,7674
3100 DATA 173,19,80,201,64,208,7,169,0
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3120 DATA 33,71,144,1,200,169,66,153,0
,85,173,50,80,208,3,76,5997
3130 DATA 217,45,169,0,141,56,80,169,3
1,141,48,80,32,6,37,238,4937
3140 DATA 51,80,173,51,80,201,56,144,2
5,32,6,37,169,0,141,3,2639
3150 DATA 208,141,29,80,141,50,80,141,
51,80,141,45,80,141,3,210,6509
3160 DATA 240,93,173,10,210,41,24,168,
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3170 DATA 11,201,40,176,7,169,1,141,11
,208,208,33,169,64,237,51,8918
3180 DATA 80,141,2,210,169,8,141,3,210
,169,0,141,11,208,185,72,8546
3190 DATA 70,32,35,37,157,126,87,200,2
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3200 DATA 237,51,80,141,2,210,169,15,1
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3210 DATA 70,32,35,37,157,118,87,157,1
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3220 DATA 66,80,208,3,76,109,46,238,65
,80,173,65,80,201,108,208,212
3230 DATA 25,169,0,141,5,210,141,65,80
,141,66,80,141,2,208,170,8466
3240 DATA 157,122,86,232,224,96,208,24
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3250 DATA 141,5,210,169,80,56,237,65,8
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3260 DATA 26,80,141,4,210,173,10,210,4
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3270 DATA 32,35,37,157,202,86,200,202,
208,243,240,55,173,65,80,56,1510
3280 DATA 233,32,141,4,210,169,0,141,2
05,86,141,206,86,169,79,141,861
3290 DATA 5,210,170,173,10,210,41,31,1
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3300 DATA 124,86,157,125,86,157,126,86
,200,152,41,31,168,202,202,202,2926
3310 DATA 202,16,230,173,50,80,208,8,1
73,15,208,240,3,238,50,80,9452
3320 DATA 173,16,80,240,34,201,1,208,2
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3330 DATA 14,74,74,9,64,141,7,210,169,
32,141,6,210,208,8,169,8575
3340 DATA 0,141,16,80,141,7,210,173,17
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3350 DATA 38,80,169,48,24,109,38,80,14
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3360 DATA 144,28,201,48,176,3,76,28,47
,201,80,144,59,201,120,144,8735
3370 DATA 5,169,255,141,43,80,169,0,14
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3380 DATA 36,169,10,141,1,210,173,10,2
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3390 DATA 169,7,141,11,80,185,72,70,32
,35,37,32,138,36,232,200,7021
3400 DATA 206,11,80,16,240,76,134,47,3
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3410 DATA 240,13,136,16,248,173,44,80,
74,74,74,74,141,1,210,76,6695
3420 DATA 134,47,169,15,141,1,210,169,
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3430 DATA 2,141,193,2,173,28,80,56,233
,4,141,0,208,24,105,8,4773
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3470 DATA 185,152,70,141,26,80,32,46,3
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3480 DATA 0,85,202,200,206,11,80,173,1
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3490 DATA 141,30,208,173,64,80,208,40,
206,63,80,208,60,169,180,141,1545
3500 DATA 63,80,141,64,80,162,0,32,247
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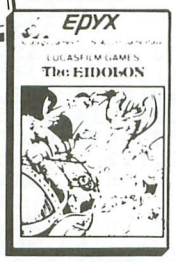

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,36,173,10,80,240,12,169,7920
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3540 DATA 210,141,42,80,173,37,80,13,2
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3600 DATA 94,96,98,98,92,88,87,89,127,
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3610 DATA 127,127,127,127,127,86,90,94
,96,98,100,92,88,86,91,92,6646
3620 DATA 89,92,89,85,90,92,88,86,91,9
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3630 DATA 94,96,100,97,105,106,95,99,9
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3910 DATA 236,233,229,242,218,192,208,
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3920 DATA 192,192,192,192,231,225,237,
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3940 DATA 239,237,240,236,229,244,229,
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3950 DATA 214,0,48,16,212,0,49,212,128
,48,212,128,48,212,64,55,8403
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4000 DATA 0,61,212,128,48,112,112,112,
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4010 DATA 4,112,134,112,112,112,112,11
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4070 DATA 80,64,142,142,64,64,64,64,64
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4080 DATA 64,64,64,64,64,64,64,143,143
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4090 DATA 0,0,0,0,0,128,130,132,134,13
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4120 DATA 0,0,192,204,255,0,0,0,0,192,
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4130 DATA 192,192,192,204,255,0,12,222
,204,192,192,192,192,0,0,30,381
4140 DATA 0,0,0,0,0,0,66,97,71,0,3,15,
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4150 DATA 5,0,64,144,164,228,228,144,6
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4160 DATA 15,0,84,229,121,249,249,229,
84,0,12,63,190,238,254,62,3265
4170 DATA 10,0,0,64,80,80,144,80,64,0,
20,233,249,249,233,20,1094
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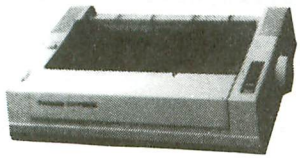

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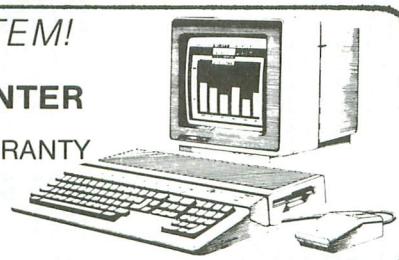

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4180 DATA 0,0,16,228,228,228,16,0,0,0,
0,32,228,228,228,32,8232
4190 DATA 0,0,40,249,121,249,249,185,3
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4210 DATA 5,0,0,56,57,41,36,16,0,0,56,
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4220 DATA 0,0,0,8,57,57,41,37,5,0,5,5,
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4230 DATA 0,192,84,90,170,170,84,84,19
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4240 DATA 12,3,10,169,169,170,170,10,3
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4260 DATA 59,0,0,0,0,0,3,15,61,0,0,0,0
,64,80,148,9473
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4280 DATA 238,0,3,15,61,255,247,191,25
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4290 DATA 86,190,235,190,234,190,187,2
38,187,254,255,254,238,187,234,238,485
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4300 DATA 170,254,251,222,238,187,250,
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4310 DATA 174,153,165,165,166,166,106,
153,154,166,153,169,150,105,165,153,48
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4320 DATA 85,89,150,101,89,150,105,86,
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4330 DATA 102,64,83,155,85,85,89,85,86
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4340 DATA 101,126,95,151,89,85,89,149,
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4350 DATA 101,153,169,149,101,149,151,
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4360 DATA 255,255,190,239,255,187,255,
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4370 DATA 191,170,186,255,238,255,251,
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4380 DATA 254,170,170,251,255,191,254,
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4420 DATA 255,255,175,255,255,255,251,
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4430 DATA 255,255,255,243,255,255,255,
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4440 DATA 255,255,213,89,89,170,89,89,
85,255,255,95,85,165,85,87,2342
4450 DATA 127,255,255,255,255,255,255,
255,255,255,251,255,255,63,255,255,627
0
4460 DATA 255,0,0,0,0,0,0,0,0,0,36,126
,126,36,36,0,9305
4470 DATA 0,24,0,0,0,0,0,0,0,0,0,60,12
6,66,66,231,2486
4480 DATA 0,0,0,36,126,126,36,36,0,0,2
4,0,0,0,0,0,6814
4490 DATA 0,0,0,0,60,126,66,231,0,0,36
,126,126,36,36,0,2446
4500 DATA 0,24,0,0,0,0,0,0,0,0,0,60,12
6,66,66,231,2516
4510 DATA 0,0,36,126,126,36,36,0,0,0,0
,0,0,0,0,0,6220
4520 DATA 0,0,0,36,102,66,66,231,0,0,3
6,126,126,36,36,0,2470
4530 DATA 0,0,0,0,0,0,0,0,0,0,0,0,36,66,
66,66,231,1430
4540 DATA 0,0,36,126,126,36,36,0,0,0,0
,24,0,0,0,0,6538
4550 DATA 0,0,0,36,66,66,66,255,0,0,36
,126,126,36,36,0,2512
4560 DATA 0,0,24,24,0,0,0,0,0,0,0,36,6
6,66,90,255,2372
4570 DATA 0,0,36,126,126,36,36,0,0,24,
24,8,0,0,0,0,6880
4580 DATA 0,0,0,36,66,90,90,231,0,0,36
,126,126,36,36,0,2662
4590 DATA 24,24,8,16,0,0,0,0,0,0,0,36,
90,90,66,231,2298
4600 DATA 0,0,36,126,126,36,36,24,24,8
,16,8,0,0,0,0,7070
4610 DATA 0,0,0,60,90,66,66,231,0,0,36
,126,126,36,60,24,3340
4620 DATA 8,16,8,16,0,0,0,0,0,0,24,60,
66,66,66,231,2200
4630 DATA 0,0,36,126,126,60,60,8,16,8,
16,8,0,0,0,0,7212
4640 DATA 0,24,24,36,66,66,66,231,0,0,
36,126,126,60,60,0,3226
4650 DATA 8,16,8,16,0,0,0,0,0,24,24,36
,66,66,66,231,2182
4660 DATA 0,0,36,126,126,60,60,0,0,8,1
6,8,0,0,0,0,7034
4670 DATA 0,24,24,36,66,66,66,231,0,0,
36,126,126,60,60,0,3256
4680 DATA 0,0,8,16,0,0,0,0,0,0,24,24,36,
66,66,66,231,2172
4690 DATA 0,0,36,126,126,60,60,0,0,0,0
,8,0,0,0,0,6808
4700 DATA 0,24,24,36,66,66,66,231,0,0,
36,126,126,60,60,0,3286
4710 DATA 0,0,0,0,0,0,0,0,0,0,24,24,36,6
6,66,66,231,2114
4720 DATA 0,0,36,126,126,60,60,0,0,0,0
,0,0,0,0,0,6742
4730 DATA 0,24,24,36,102,66,66,231,0,0
,36,126,126,60,60,0,3496
4740 DATA 0,24,0,0,0,0,0,0,0,24,24,60,
126,66,66,231,3260
4750 DATA 0,0,68,40,16,56,56,56,16,14,
206,100,63,63,100,206,6617
4760 DATA 14,54,73,28,62,62,28,42,73,3
4,28,28,127,127,8,8,1745
4770 DATA 20,8,28,28,28,28,8,62,8,20,0,25
5,24,255,24,24,36,3548
4780 DATA 0,7,7,164,127,164,7,7,0,40,1
6,16,56,56,16,16,9971
4790 DATA 40,0,0,60,153,126,153,60,0,1
6,84,56,124,56,84,16,3810
4800 DATA 40,0,0,26,188,127,188,26,0,1
6,56,18,60,60,18,56,1948
4810 DATA 16,16,16,124,56,16,84,56,84,
129,90,60,102,102,60,90,5664
4820 DATA 129,0,28,62,85,62,28,0,0,0,0
,0,219,126,24,0,1245
4830 DATA 0,0,36,8,24,72,2,16,0,0,66,4
0,52,16,68,0,8790
4840 DATA 16,4,64,40,20,57,60,80,2,128
,37,30,44,154,33,72,3158
4850 DATA 2,64,49,132,0,131,90,0,4,68,
132,65,18,130,44,17,3005
4860 DATA 64,4,8,16,16,16,32,64,128,64
,64,32,16,8,8,4,9316
4870 DATA 2,2,4,8,16,16,8,4,4,2,1,1,2,
4,8,8,5593
4880 DATA 4,1,0,40,2,4,31,38,15,21,15,
75,5,19,0,66,8398
4890 DATA 0,32,0,68,1,18,5,139,27,78,1
1,6,35,0,0,1,8173
```

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4900 DATA 0,128,0,17,0,10,5,27,7,43,13
,39,11,6,64,0,7826
4910 DATA 2,0,10,16,0,85,0,5,2,139,5,3
,35,1,128,8,9572
4920 DATA 0,7,142,57,39,160,4,81,69,72
,32,7,145,65,135,32,4528
4930 DATA 4,81,69,64,128,4,78,57,47,32
,4,8,11,14,17,20,9022
4940 DATA 23,26,29,32,35,38,41,44,47,5
0,53,56,59,62,65,68,2148
4950 DATA 71,75,34,34,34,34,34,34,34,3
4,34,34,34,34,34,33,9677
4960 DATA 33,33,33,33,33,33,33,33,49,4
9,10,20,56,64,80,88,1661
4970 DATA 96,104,112,120,128,136,144,1
52,160,168,200,208,32,32,0,56,9346
4980 DATA 48,95,93,91,89,88,88,89,91,9
3,95,48,56,0,136,128,6348
4990 DATA 0,72,72,40,40,40,40,40,40,40
,40,40,40,72,72,0,838
5000 DATA 16,16,16,16,16,16,16,16,16,0
,0,226,2,227,2,0,1666
5010 DATA 32,0,0,0,0,0,0,0,0,0,0,0,0,0
,0,0,5042
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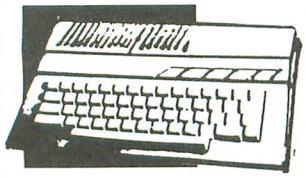

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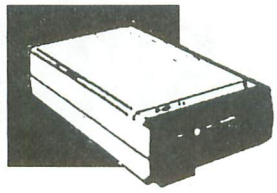

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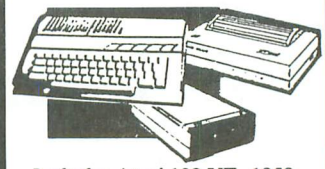

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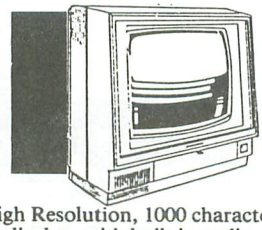

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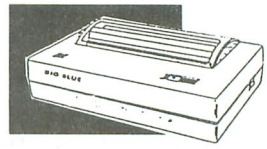

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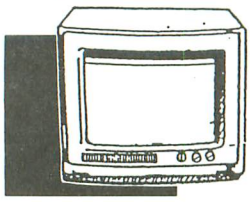

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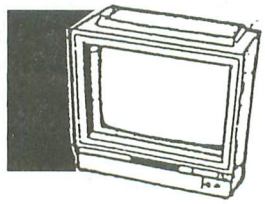

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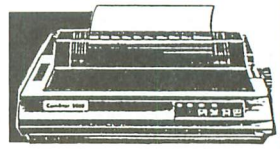

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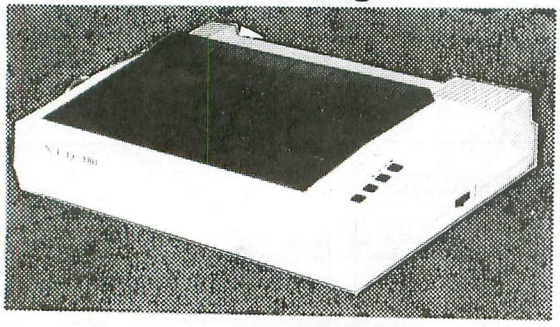

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8K bytes utility buffer

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Text Mode — Bi-directional
Graphic Mode — Uni-directional

Interface
Centronics Parallel Port

Paper
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Fanfold, Multipart paper: max. 3 sheets (original plus 2 copies)

Character Fonts
Pica, Elite, Italics, Condensed

Printing Method
Impact dot matrix

Printing Speed
160-180 CPS at standard character printing

Printing Characters
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NLQ 12 x 18 dot matrix (33cps)
Character size: 2.12 x 2.8 mm (standard)
Character sets: Full ASCII character set (96)
32 International characters

Ink Ribbon Cartridge
Ribbon Life: 3 million characters/cartridge

Physical Dimensions
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Weight: 12.7 lbs.

Maximum Number of Characters

Standard:	10 cpi	80 cpl
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Elite:	12 cpi	96 cpl
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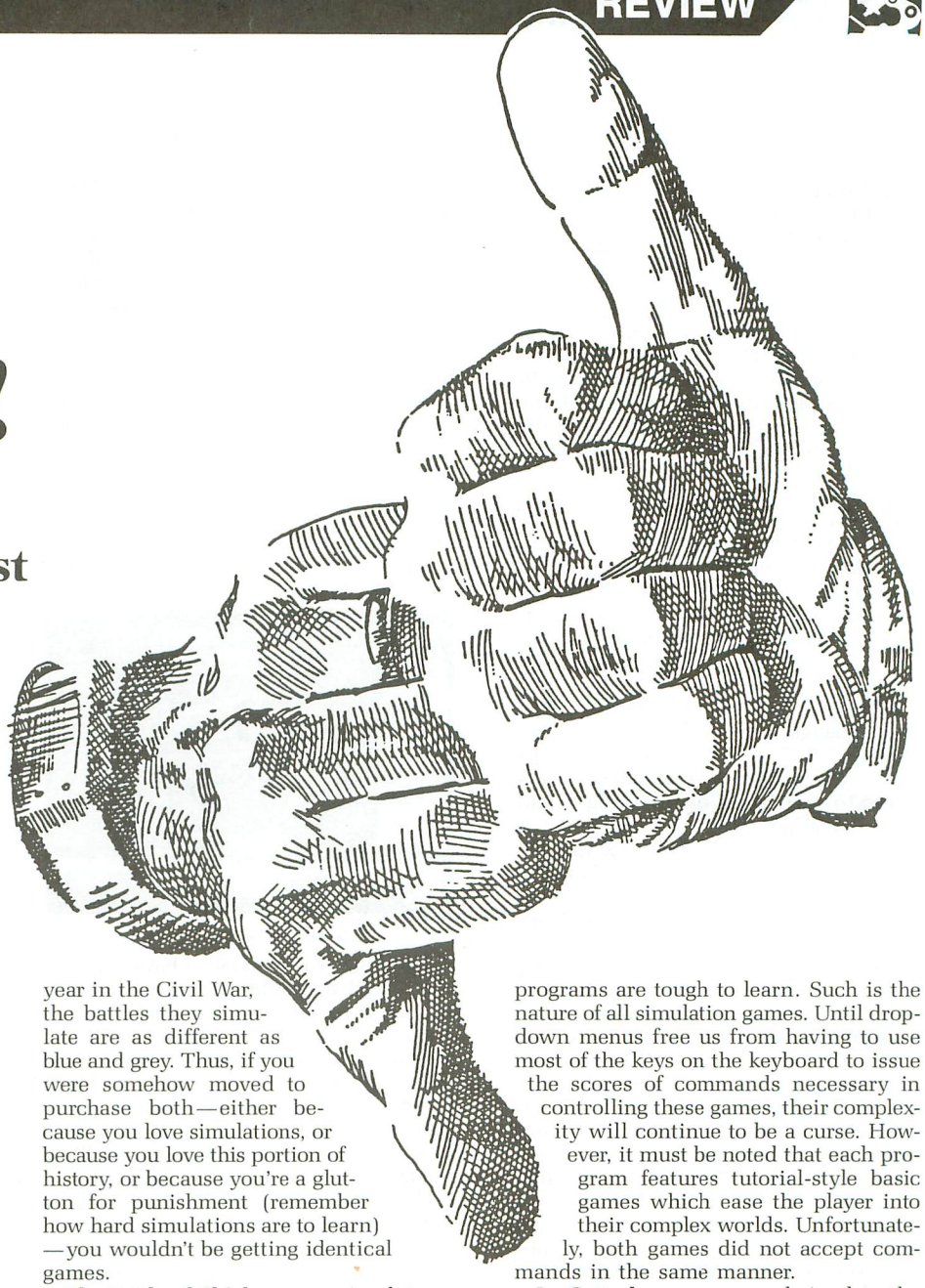


by Steve Panak

For a long time, Atari owners have had but one real choice in quality simulations. The market had been purged until recently of all but the strongest producer of these specialized games: SSI. But the software forest is full of predators; the king of the jungle has been threatened by Worlds to Conquer.

The company has chosen Electronic Arts to distribute its line of simulation games. Last issue, I looked at their **Rommel Battles for Tobruk**. I found it had easy control and multiple difficulty levels that would let it grow with its owner.

Still unresolved was the burning issue: just *who* is now the king of war simulators? This month, I chose from each company a game simulating conflict during the U.S. Civil War. Without further ado, here's the battle of the century, to determine exactly *who* is the king of the war simulation.

The Battle of Chickamauga

by Worlds to Conquer, Inc.
GAME DESIGNER'S WORKSHOP
P.O. Box 1646
Bloomington, IL 61702
48K Disk $39.95

Gettysburg: The Turning Point

by Chuck Kroegel and David Landrey
SSI
1046 North Rengstorff Avenue
Mountain View, CA 94043
48K Disk $59.95

While both these games cover the same year in the Civil War, the battles they simulate are as different as blue and grey. Thus, if you were somehow moved to purchase both—either because you love simulations, or because you love this portion of history, or because you're a glutton for punishment (remember how hard simulations are to learn)—you wouldn't be getting identical games.

The Battle of Chickamauga simulates a battle taking place in Georgia, in September of 1863, while **Gettysburg: The Turning Point** allows you to engage in the famous battle of Gettysburg, in July of 1863. So, if you have a soft spot for one of these battles, you now know which to choose. For me, it would be **Gettysburg**; the locale was a favorite tourist trap of my youth.

While both games allow one or two to play (two-player mode is a recent addition to SSI games), **Gettysburg** also allows the computer to play both sides. If you choose a computer opponent, **Chickamauga** provides three levels of computer intelligence. The same effect can be achieved by directing **Gettysburg** to favor one side or the other.

As far as difficulty of play goes, both programs are tough to learn. Such is the nature of all simulation games. Until drop-down menus free us from having to use most of the keys on the keyboard to issue the scores of commands necessary in controlling these games, their complexity will continue to be a curse. However, it must be noted that each program features tutorial-style basic games which ease the player into their complex worlds. Unfortunately, both games did not accept commands in the same manner.

In **Gettysburg**, you are chained to the keyboard. Like an enemy POW, I found myself out of my gaming environment, searching the reference sheet for the correct key to issue the desired command. Chickamauga, while no less complex, did not tie me down to the keyboard, but let me issue commands freely from the end of the joystick cable. I would always rather play comfortably from my easy chair, not hunched over the keyboard. In this, **Chickamauga** has to take the battle.

As far as flow of play goes, both games function at nearly the same level; such has been the evolution of simulations. As expected, each game is divided into phases. **Gettysburg** breaks into two main ones: Operations Phase, in which you move troops and target the enemy; and Combat Phase, in which confrontations are re-

solved and troops recover. An End-of-Day Phase, which simulates retreat and rest, is added at the end of each day.

In **Chickamauga**, each commander in turn gives orders to his troops. After each side is through commanding, a resolution phase moves the units and settles the various controversies. A review phase is your window into these resolutions. Together, these phases let players study the results of their command, step by step, in both directions. In a two-player game with the hidden enemy option activated, only the troops visible to both sides are displayed on the board.

Speaking of options, both games are full of them. While **Chickamauga** allows three levels of play, the control of difficulty in **Gettysburg** is much more precise. You can favor either side, or play a historically neutral version. You can also control the arrival of troops and the amount of ammunition either side receives. You can play any of four scenarios: July 1st, 2nd or 3rd, 1863; or, for the true diehard, all three. **Chickamauga** allows either a one- or two-day game. Both let you hide enemy troops in two-player mode; **Chickamauga** allows you to turn on or off morale, fatigue and communication factors, as well as the sound. These factors are always considered in **Gettysburg**, and are controllable in the intermediate and advanced games.

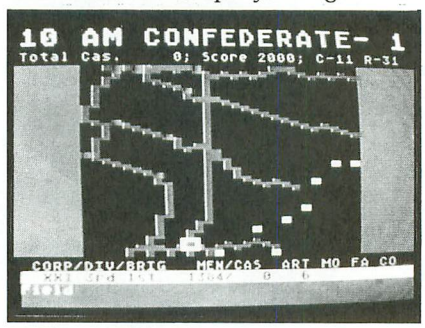
An additional feature of **Gettysburg**'s advanced game is the consideration of the deaths of various leaders and the ensuing breaks in the chain of command. Leaders don't come into play in **Chickamauga**, but the communication feature mimics leadership somewhat—if you can't communicate with a unit, its moves are slow and uncertain. Both games consider arrival of reinforcements. **Gettysburg** will allow the setting of a time limit for completing Command phase, while **Chickamauga** contains features to facilitate playing by mail.

Each game declares a victor. Both give points for casualties caused, as well as objectives captured. Both will let you save and restore games in progress; **Chickamauga** also saves and restores a series of moves. **Gettysburg** provides a help menu of available commands, while in **Chickamauga** you can cycle through those units awaiting orders. **Gettysburg** cycles you through units with problems—low morale, men, or ammo—but it's up to you to remember which units are uncommanded. I always have trouble remembering which men I've failed to give orders to.

Chickamauga is much more tightly tied to real time than is **Gettysburg**. In **Chickamauga**, each turn lasts two hours. You issue commands to each unit in each turn. Firing takes twenty minutes, or a unit can rest for forty minutes. Moving takes varying amounts of time, depending on the type (march, cautious advance or attack) and environment (road, hill or woods).

Gettysburg, while keeping time throughout play, is much less tied to it, as far as you, the commander, are concerned. At the beginning of each turn (and mid-turn, in its intermediate and advanced versions), each unit receives a certain number of operation points. Each option—movement, firing or fortification —costs operation points. Both amounts received and costs vary according to the aptitudes and attributes of the units in question.

The two games have increasingly complex play levels, to let novices gain experience as they become proficient at the simulation. With the start-up portion of each game's manual, either may be immediately and easily learned. Remember, I don't mean as "easily" as in an arcade game—but they're vast improvements over simulations of a couple years ago.



Gettysburg: The Turning Point.

Getting to the manuals, I have to award this skirmish to **Gettysburg**. Its glossy 8x11 booklet is superbly written and fully illustrated. The twenty-six pages cover basic, intermediate and advanced games, and charts and maps help you understand how the game works, as well as what is happening historically. Interested players will love the details on how various modifiers affect battle, and the historical text and bibliography will appeal to historians. A reference sheet on the back cover keeps all those confusing commands in sight, while a plastic covered map of the battlefield, with a reference sheet on the back, is built to last. On a sour note, I must add that, while the parts inventory lists two such cards, my package had only one.

Chickamauga offers about the same amount of documentation, but materials are scattered among five manuals, ranging in size from one to twenty-three pages. One sheet is for reference; another covers loading, saving, and restoring games and moves, plus playing by mail. A third is a hands-on introduction to get the novice quickly involved. Of the two main manuals, the first covers rules; the other addresses historical concerns. All materials are well written, but lack the polish of the SSI manual. The main drawback was disorder—I like having everything together, rather than having to search through several pieces to find the information.

Unfortunately, as in many battles, there's no clear winner here. Each program can stand on merits which the other lacks. In the end; personal preference will decide between the two. I can tell you that **Gettysburg: The Turning Point** was a more polished product—as you might expect, since SSI has been in this battle for years now. This game has the complexity that only years of development could produce, and it's this complexity which results in a more accurate simulation. On the other hand, **The Battle of Chickamauga** is a much easier game to learn and to play, and offers most of the features of its opponent. I would have to recommend it for the beginner. Its lower price also makes the decision to try a simulation a little less painful. Only time will tell which of these two fine companies will be at the top of the simulation world. But if these games are any indications of future skirmishes between the two, then all simulation fans will profit from the war.

Ogre

by Steve Meuse
ORIGIN SYSTEMS, INC.
340 Harvey Road
Londonderry, NH 03053
48K Disk $39.95

I've been waiting a while for this one. About a year ago, I received a catalog from Origin Systems, creators of the popular **Ultima** series. In it were listed other, non-**Ultima** games including this one, and my wait is finally over.

Ogre is based on Steve Jackson's strategy board game of the same name. **Ogre** is also an incredible solo fighting "Cybertank." And, as you might expect, your goal is to destroy this tank (or pilot it, depending on your allegiance). While this aspect offers no surprises, I found the program anything but ordinary.

This is the first piece of 8-bit software I've seen that controls like an ST program, utilizing pull-down menus and a pointer in game play. And, though the joystick control of the pointer isn't as good as that of the mouse, the method let me learn to play very quickly and smoothly, with minimal studying of manuals.

Before you begin, you must choose to play against either the **Ogre** Mark III or Mark V, the Mark V being stronger. You then set up defensive board positions. In this simulation-type game, you command a number of defensive unit types: heavy tanks, missile tanks, howitzers, infantry and ground effect vehicles. In the deployment phase, these units are placed on the field, according to your design (you can save up to twenty-five layouts) or via one of the five preset fields.

The object of defense is to protect the command post. To buy units, you're given a number of defensive points, determined by which **Ogre** model you battle.

As you might expect, the big guns cost a lot more than the infantry. But you'll need a proper mix if you want any chance of beating the **Ogre**.

Using the pointer, you choose and position units. If you want to play fair, you stop placing units when you run out of points. If you fail to do so, the program reminds you that you're cheating—but, having pity, it lets you proceed. Don't worry: if you play fair, you can add more units later on. And you'll have to when the **Ogre** wipes out your first wave. After setting the field, you start commanding your units.

To do so, you move the pointer to a unit, then click on it with the joystick button. Next, either drag the unit to the hex it is to move to, or to the enemy it's to attack. Clicking on RANGE highlights hexes on the map, to show movement and firing range of the currently active unit. You can position movable units first, then all units can fire—separately or in unison, concentrating their guns on the **Ogre**.

I'll tell you right now: **Ogre** can't be destroyed. But its weapons can be neutralized; its tanklike treads, shredded. Succeed at these and **Ogre** will lose—but don't hold your breath. After firing, hovercrafts are allowed another turn, to try to escape the **Ogre**'s wrath.

Once you've completed your pathetic commands, it's time to watch the **Ogre** destroy your puny forces. Using its artificial intelligence, it destroys your units as it cleaves a bloody path to your command post. Destroying some units with cannons, crushing others beneath its treads, it's a force to be reckoned with. After the killing spree is over, it's the defense's turn. And so it continues, until a victory by one side (usually the **Ogre**'s) is achieved.

While the graphics were competent, they weren't of ST quality. However, I was amazed at how closely the 8-bit display mocked that of the ST. I experienced no problems discerning the various icons and menu text; screen displays were also clear. Although the joystick is inferior to the mouse for moving the pointer around on-screen (it moves too slowly, losing the "pointing" quality of the mouse), the control of this game is superior to any non-ST simulation game I've seen.

Ogre's documentation is the kind I like to see: two booklets, finely crafted and bound, along with a reference card. The first booklet offers a historical perspective of the **Ogre**, as well as a frighteningly real depiction of 21st-century warfare. It's a time when plastic yields extremely strong, lightweight armor. . .when infantry is encased in armor plated, powered suits. . . when cybertanks are the most feared weapon. This finely written book explains the various combatants, as well as how the game works.

The second booklet contains strategy and notes concerning a number of defenses for **Ogre** controllers and opponents. Also included is a section on its artificial intelligence: how the program evaluates the values of various hexes. Finally, a reference card of machine-specific information lists the various control key combinations which substitute for pointer control. Rounding out the materials, is a radiation badge with six detection stickers. The little extras deserve kudos.

Ogre has a number of options. One- or two-player games are available, though I was disappointed to see that the computer could only play the **Ogre**'s side. Its skill can be set to any of three levels; its message speed (telling what it's doing) can be increased; and its "no move" turns (in which the **Ogre** does not or cannot move) skipped. Finally, both sound and helpful reminders can be turned off.

You should realize by now that I loved **Ogre**. Its concept was unique and original, its graphics acceptable, and its control superior. I saw no weak points in the game. The ST version is out of this world. **Ogre** is a brute of a game.

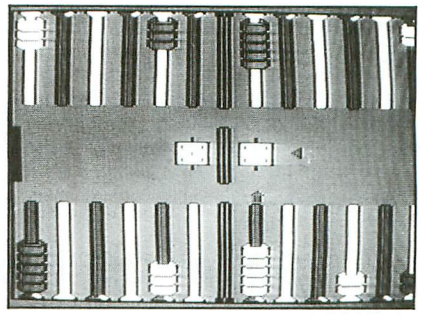
Peggammon

by Michael C. Gilbert
ARTWORX SOFTWARE COMPANY, INC.
150 North Main Street
Fairport, NY 14450
48K Disk $14.95

I doubt that many people, on seeing Artworx's **Peggammon** on a shelf, immediately grabbed it, clutching it to protect it from slower consumer-predators as they made it their own. The thing is simply not attractive. But, its very reasonable price buys more than your money's worth.

Peggammon is a backgammon game. Identical to its predecessor in every way, it offers a backgammon fix to all Atari 8-bit owners. Those of you not familiar with the game can refer to any library for the full story. Basically, though, backgammon is a race around a board, with moves determined by the roll of two dice. Both strategy and luck come into play, as each player attempts to bring his pieces home—while thwarting the opponent's progress by blocking the adversary's pieces and sending them back to the start.

Each turn begins with a roll of the dice, after which you can move pieces around the board, if possible. I say "if possible," because you can only move onto a space that's unoccupied, or occupied by your own men or only one of your opponent's pieces. If you hit on one of your opponent's men, he's sent back to the bar (the starting point) and must try to re-enter the game. Each of the two dice can be applied separately; that is, a seven—made up of a three and a four—lets you move one piece seven spaces, or two pieces three and four spaces, respectively. Rolling doubles allows four moves of whatever shows on



Backgammon for bits — Peggammon.

the dice. These are, basically, all the rules of the game, but its complexity and luck have kept it a favorite for eons.

After booting, this bargain game offers you a couple of options. One or two can play, and either can make the opening move in one of the two game versions. The first plays like backgammon; the second alters the set-up to allow an additional roll of the dice anytime "doubles" are rolled. Options are activated by one or more of the START, OPTION or SELECT keys.

An editor lets you set up a board position and play the games, as well as take back a faulty move. ESCape toggles you in and out of edit mode. You can also, in this mode, enter a problem to see how the program solves it. Play is controlled by one or two joysticks. Using the sticks, you roll the dice and select a "from" position. Moving to your destination and pressing the button again completes the move; choosing an illegal move allows you select a new "from" position.

As one might expect from the low price, documentation and packaging are pretty shabby. A single piece of cardboard about the size of two end-to-end disks is folded around the game disk and sealed with shrink wrap. Once opened, the inside of this cardboard sleeve contains the instructions and an extremely condensed set of rules for backgammon. As far as offering a challenge, **Peggammon** plays a rather good game. I was able to beat it when luck was with me; it was victorious when fate favored its silicon soul. All I can say is that, for the price, **Peggammon** is a steal.

That's it for this month. As I quickly found out, only time will tell whether SSI or Worlds to Conquer makes the best simulation. Though SSI's game had a slightly higher quality, it also had a higher price—and both simulations gave me a respectable game. Still, I think I liked **Ogre** best this month. Its captivating concept and ease of play make it a sure winner.

The author wishes to thank the Magic One Computer Shop of Barberton, Ohio for their invaluable assistance in the creation of this chronicle.

Super 3D Plotter II

by Randolph Constan
ELFIN MAGIC
23 Brook Place
E. Islip, NY 11730
48K Disk $39.95

by Matthew J.W. Ratcliff

Super 3D Plotter II is a logical extension of that popular program **Solid States**, written by Tom Hudson for issue 16. **Solid States** was so popular, in fact, it spawned one of the largest follow-up series of articles ever seen in these pages, and was the inspiration for **CAD-3D**.

Randolph Constan was apparently quite inspired by **Solid States**, as well, because **Super 3D Plotter II** (**S3DP** hereafter) is a phenomenal accomplishment for an 8-bit machine like the Atari. Due to lack of memory and processing power, it can't compare with **CAD-3D**, but this powerful three-dimensional editor, viewer, animator and plotter in a machine language package stands *very well* on its own.

S3DP allows you to load or create a new 3D image. The manual starts you off with a tutorial on loading and viewing some of the images on the program disk, including the Tie fighter, X-Wing fighter, and several other classic **Solid States** images. The manual presents a good tutorial introduction on 3D graphics, with plenty of diagrams—a *must* for understanding this sophisticated program. A handy quick reference card is provided, and it's excellent for helping you with the basic controls of **S3DP**, after you've become familiar with the overall operation.

Once an image is loaded, you can display it, then do some breathtaking and bizarre things with it. The origin of the X,Y,Z-coordinate system is at the center of the screen. The –Z dimension comes out toward you, and the +Z extends behind the screen. **S3DP** projects the 3D image onto a 2D display with amazing speed, due to some "very powerful 'natural' algorithms developed by Elfin Magic." I don't know how he does it, but it's *fast*. This overcomes the one of the biggest drawbacks of **Solid States**—and that isn't all folks!

Now that you're viewing the 3D image, you can press the *A* or *Z* keys to rotate the image in the X,Y plane. This spins the object clockwise or counterclockwise on the screen, about its center. You don't just press a key to move it once, but to set it in *continuous motion*. For small objects, it really moves. For large objects (up to a limit of 255 points—the program's most severe limitation), the rotation is slower but can still move and redisplay the image every few seconds, much faster than **Solid States** ever could handle.

Press the *S* and *X* keys to rotate the object in the Y,Z plane, spinning it toward or away from you. The *D* and *C* keys will rotate the object in the X,Z plane, like a carousel.

The keys are not mnemonically selected, but geographically situated on your keyboard. *A* is directly above *Z*, *S* above *X*, and so on. They spin the object in opposing directions. You can press any combination of the keys to create very interesting viewing effects. The more you press a key, the faster it spins, by making larger angular steps of rotation. Directly above the three key pairs for rotation are *Q*, *W* and *E* keys, which are used to freeze rotation in that plane.

An object is generally drawn as a series of points, connected by lines. If you create an image by surfaces (like building an image with sheet metal rather than wire frame), you can also view an image with hidden line removal (CTRL-S).

When you create an object using surfaces, you can specify one of three colors for each. Then, when viewing, pressing SHIFT-S will toggle the color fill or shading mode. The additional data allowing surface-oriented images results in slower rotations, but the results are worth it. Since **Solid States** did not support this feature, most of these old pictures cannot be viewed with hidden line removal and shading.

Data entry is a breeze. If you press OPTION when selecting "create" or "edit" an image, control is sent to a custom text entry display. Here, you can enter your points and lines, and can create images by surface as well (for shading and hidden line removal). Working from an isometric drawing, it is easy to enter your data. Editing, too, is simple.

If you can manage to think in three dimensions on a two-dimensional display, you can also enter your data via joystick. In this mode, you are sent to a graphics mode 8 display, with a text window at the bottom. You can enter a point by X- and Y-positioning with the joystick. As you position a line's endpoint, **S3DP** continuously draws a rubber-band line from your current position to the origin of the line. Current X- and Y-positions are updated continuously on the text portion of the display.

I found it difficult to get precise positioning on the screen. It seems to jump by as many as six digits for even the smallest tap on the joystick. There is a "slow draw" mode, selectable from the keyboard, but it doesn't help much. You will have to "rough in" your drawing this way, then go back to the text input mode to fine tune these values. It would have been ideal if the pro-

(continued on page 95)

 continued from page 66

prompt, but on the second line. Just press RETURN. Now, to start searching, press START. You should see the record number in the upper right-hand corner of the screen, counting upward. As soon as a record is found with the string *P/M*, it will be displayed.

To stop searching, press the ESC key. After the first record is found, press ESC to test this feature.

To continue searching, press START again. The searching will go on from where you left off in the index file.

Conclusion.

Of course, this article has only shown some of the features and ways in which **EasyFind** can be used. If you spend some time using the program, you'll come up with your own special techniques and applications.

Jim Siemion started Sierra Services in 1984. He has a degree in mathematics and has been working with computers for over fifteen years. Jim's first efforts were with a TRS-80 system which was traded in for an Atari in 1981.

The two-letter checksum code preceding the line numbers here is *not* a part of the BASIC program. For further information, see the *BASIC Editor II*, in issue 47.

Listing 1.
BASIC listing.

```
AY 10 REM
PW 20 REM THIS PROGRAM CONVERTS THE DATA
SF 30 REM STATEMENTS IN LINE 200-630
JE 40 REM INTO MACHINE LANGUAGE STRINGS
XX 50 REM FOR LINES 4400,4410,4420,4430
KY 60 REM AND 4435 IN EasyFind.
BE 70 REM
OM 80 OPEN #1,8,0,"D:ML5TRING.LST"
KI 100 REM SETUP FOR "SEARCH"
KY 110 PRINT #1;"4400 SEARCH=ADR(";CHR$(3
   4);:RESTORE 200:READ LENGTH:GOSUB 800
JH 120 REM SETUP FOR "UPCASE"
WR 130 PRINT #1;"4410 UPCASE=ADR(";CHR$(3
   4);:RESTORE 300:READ LENGTH:GOSUB 800
GJ 140 REM SETUP FOR "FLIP"
ID 150 PRINT #1;"4420 FLIP=ADR(";CHR$(34)
   ;:RESTORE 400:READ LENGTH:GOSUB 800
UN 160 REM SETUP FOR "COPY"
YV 170 PRINT #1;"4430 COPY=ADR(";CHR$(34)
   ;:RESTORE 500:READ LENGTH:GOSUB 800
JI 180 REM SETUP FOR "CUP"
RK 190 PRINT #1;"4435 CUP=ADR(";CHR$(34);
   :RESTORE 600:READ LENGTH:GOSUB 800
LV 192 CLOSE #1
OU 194 END
ME 195 CLOSE #1
RW 196 REM
UD 197 REM DATA STATEMENTS
SC 198 REM
BH 200 DATA 72,104,104,133,204,104,133,20
   3,104,133,206
RJ 210 DATA 104,133,205,104,104,133,207,1
   04,133,209
GA 220 DATA 104,133,208,160,0,177,203,209
   ,205,208
JY 230 DATA 7,196,207,240,21,200,208,243,
   198,208
LY 240 DATA 208,6,165,209,240,19,198,209,
   230,205
DD 250 DATA 208,227,230,206,208,223,165,2
   08,133,212
XI 260 DATA 165,209,133,213,96,169,0,133,
   212,133
LT 270 DATA 213,96
AZ 300 DATA 59,216,104,104,133,204,104,13
   3,203,104,133
GG 310 DATA 206,104,133,205,165,205,5,206
   ,208,1
TB 320 DATA 96,165,205,56,233,1,133,205,1
   65,206
WE 330 DATA 233,0,133,206,160,0,177,203,4
   1,223
KP 340 DATA 145,203,165,203,24,105,1,133,
   203,165
OF 350 DATA 204,105,0,133,204,169,0,240,2
   11
BA 400 DATA 59,216,104,104,133,204,104,13
   3,203,104,133
GH 410 DATA 206,104,133,205,165,205,5,206
   ,208,1
TC 420 DATA 96,165,205,56,233,1,133,205,1
   65,206
KH 430 DATA 233,0,133,206,160,0,177,203,7
   3,128
KQ 440 DATA 145,203,165,203,24,105,1,133,
   203,165
OG 450 DATA 204,105,0,133,204,169,0,240,2
   11
LS 500 DATA 39,104,104,133,215,104,133,21
   4,104,133,217
LE 510 DATA 104,133,216,104,133,218,104,1
   70,160,0
RN 520 DATA 177,214,145,216,200,208,4,230
   ,215,230
NL 530 DATA 217,202,208,242,198,218,16,23
   8,96
FU 600 DATA 32,104,104,104,72,162,57,160,
   0,173,0
VS 610 DATA 210,101,20,141,22,208,141,10,
   212,136
VJ 620 DATA 208,242,202,208,237,104,56,23
   3,1,208
OI 630 DATA 228,96
QT 800 REM
CY 810 REM OUTPUT DATA VALUES AS STRING
JI 820 REM CHARACTERS.
QZ 830 REM
YP 835 PRINT "LENGTH = ";LENGTH
ZY 840 FOR I=1 TO LENGTH:READ A:PRINT #1;
   CHR$(A);:NEXT I
TF 850 PRINT #1;CHR$(34);")"
ZQ 860 RETURN
```

Listing 2.
BASIC listing.

```
HF 100 REM +--------------------------+
EG 110 REM |                          |
LM 120 REM |  EasyFind V2.0           |
   Magazine Index Retrieval
WG 130 REM |                          |
LF 140 REM |      SIERRA SERVICES     |
XH 150 REM |        P.O. BOX 40454    |
LD 160 REM |      BELLEVUE, WA 98004  |
TV 170 REM |        (206) 881-0512    |
HV 180 REM +--------------------------+
GA 190 DIM QL$(1),QL(11)
LH 200 GOSUB 4150:REM INITIALIZE
UY 210 GOTO 1610:REM JUMP TO START
PB 220 REM *
BF 230 REM * GETKEY SUBROUTINE
PF 240 REM *
AA 250 SPECIAL=C0
UW 260 IF PEEK(53279)=6 THEN SPECIAL=C1:R
   ETURN
JU 270 IF PEEK(HELPKEY)=17 THEN POKE HELP
   KEY,C0:GOSUB 3980:GOTO 250
```

```
GF 280 IF PEEK(CH)=255 OR PEEK(CH)=154 TH
   EN 260
SL 290 GET #C3,BYTE
YP 300 IF BYTE=CTRLH THEN GOSUB 3980:GOTO
    250
ZB 310 RETURN
PC 320 REM *
CH 330 REM * CHARACTER CHECK ROUTINE
PG 340 REM *
JG 350 IF BYTE=RETURN THEN EXIT=C1:RETURN
WW 360 IF BYTE=126 AND IPOS>C1 THEN PRINT
   "←■←";:IPOS=IPOS-1:TEMP$(IPOS)="":RET
   URN
BM 370 IF (BYTE<32 OR BYTE=96 OR BYTE>123
   ) THEN PRINT CHR$(253);:RETURN
XQ 380 PRINT CHR$(BYTE);:TEMP$(IPOS)=CHR$
   (BYTE):IPOS=IPOS+C1:RETURN
PQ 390 REM *
KK 400 REM * GET OPTION CHOICE
PB 410 REM *
XA 420 IPOS=OPOS(OPTION):ILEN=OPOS(OPTION
   +C1)-IPOS-C2
WM 430 A=USR(FLIP,ADR(MENU$(IPOS)),ILEN)
ON 440 IF BYTE=RIGHTARROW THEN 490
PC 450 REM * GET NEXT CHOICE ON LEFT
NG 460 OPTION=OPTION-C1:IF OPTION<C1 THEN
    OPTION=MAXOPTION
NL 470 GOTO 500
SW 480 REM * GET NEXT CHOICE ON RIGHT
BQ 490 OPTION=OPTION+C1:IF OPTION>MAXOPTI
   ON THEN OPTION=C1
WX 500 IPOS=OPOS(OPTION):ILEN=OPOS(OPTION
   +C1)-IPOS-C2
WJ 510 A=USR(FLIP,ADR(MENU$(IPOS)),ILEN)
LK 520 POSITION C2,21:PRINT MENU$(C1,36);
   :POSITION C2,22:PRINT MENU$(39,72);
ZH 530 RETURN
PI 540 REM *
JA 550 REM * OPEN WINDOW
PM 560 REM *
RZ 570 NWINDOW=NWINDOW+C1:WPTR=WINDOW(NWI
   NDOW)
CO 580 WINDOW$(WPTR)=CHR$(Y):WINDOW$(WPTR
   +C1)=CHR$(HEIGHT):WINDOW$(WPTR+C2)=" "
WR 590 WPTR=WPTR+C2:WINDOW=SCREEN+Y*C40
YL 600 A=USR(COPY,WINDOW,ADR(WINDOW$(WPTR
   )),HEIGHT*C40)
OL 610 WINDOW(NWINDOW+C1)=WPTR+HEIGHT*C40
   +C2
PZ 620 WINDOW=WINDOW+X
LU 630 EDGELINE$(C1)=CHR$(209):EDGELINE$(
   C2)=LINE$(C1,WIDTH-C2):EDGELINE$(LEN(E
   DGELINE$)+C1)=CHR$(197)
XB 640 A=USR(COPY,ADR(EDGELINE$),WINDOW,W
   IDTH)
GL 650 EDGELINE$(C1)="||":EDGELINE$(C2)=BL
   ANK$(C1,WIDTH-C2):EDGELINE$(LEN(EDGEL
   INE$)+C1)="||":WINDOW=WINDOW+C40
AL 660 FOR I=C2 TO HEIGHT-C1:A=USR(COPY,A
   DR(EDGELINE$),WINDOW,WIDTH):WINDOW=WIN
   DOW+C40:NEXT I
EN 670 EDGELINE$(C1)=CHR$(218):EDGELINE$(
   C2)=LINE$(C1,WIDTH-C2):EDGELINE$(LEN(E
   DGELINE$)+C1)=CHR$(195)
XJ 680 A=USR(COPY,ADR(EDGELINE$),WINDOW,W
   IDTH)
ZU 690 RETURN
PC 700 REM *
QT 710 REM * CLOSE WINDOW
PG 720 REM *
BN 730 WPTR=WINDOW(NWINDOW)
GM 740 Y=ASC(WINDOW$(WPTR,WPTR)):HEIGHT=A
   SC(WINDOW$(WPTR+C1,WPTR+C1))
WL 750 WPTR=WPTR+C2:WINDOW=SCREEN+Y*C40
KG 760 A=USR(COPY,ADR(WINDOW$(WPTR)),WIND
   OW,HEIGHT*C40)
HI 770 NWINDOW=NWINDOW-C1
ZT 780 RETURN
PU 790 REM *
ZS 800 REM * PERFORM SEARCH
PF 810 REM *
RD 820 DONE=C0:TRAP 1290:IF  NOT FORMAT T
   HEN GOSUB 1300
LT 830 ON SEARCH GOTO 880,840
VI 840 REM *** GET NEXT RECORD
RU 850 RECORDNUM=RECORDNUM+C1:NOTE #C1,X,
   Y:SECTOR(RECORDNUM)=X:BYTE(RECORDNUM)=
   Y
DK 860 IF  NOT FULLDISPLAY AND RECORDNUM<
   QL(MAXLINE) THEN RECORDNUM=QL(CURLINE-
   8+C1):GOTO 920
QK 870 GOTO 930
XU 880 REM *** GET PRIOR RECORD
YB 890 IF RECORDNUM<=C1 THEN DONE=C1:RETU
   RN
LA 900 RECORDNUM=RECORDNUM-C1
CM 910 IF  NOT FULLDISPLAY AND CURLINE>TO
   PLINE THEN RECORDNUM=QL(CURLINE-TOPLIN
   E)
BD 920 POINT #C1,SECTOR(RECORDNUM),BYTE(R
   ECORDNUM)
CF 930 INPUT #C1;REF$,TITLE$,DESC1$,DESC2
   $,DESC3$,DESC4$,DESC5$
GD 940 POSITION 35,C1:PRINT "■■■";:POSITI
   ON 35,C1:PRINT STR$(RECORDNUM);
RK 950 RECORD$=REF$
OJ 960 RECORD$(LEN(RECORD$)+C1)=TITLE$
EK 970 RECORD$(LEN(RECORD$)+C1)=DESC1$
FU 980 RECORD$(LEN(RECORD$)+C1)=DESC2$
HE 990 RECORD$(LEN(RECORD$)+C1)=DESC3$
MY 1000 RECORD$(LEN(RECORD$)+C1)=DESC4$
OK 1010 RECORD$(LEN(RECORD$)+C1)=DESC5$
YD 1020 X=USR(UPCASE,ADR(RECORD$),LEN(REC
   ORD$))
AO 1030 P1UP$=P1$:X=USR(UPCASE,ADR(P1UP$)
   ,P1LEN)
EI 1040 P2UP$=P2$:X=USR(UPCASE,ADR(P2UP$)
   ,P2LEN)
HB 1050 MATCH1=C0:MATCH2=C0:IF P1$="*" TH
   EN 1130
QG 1060 IF P1LEN<>C0 THEN MATCH1=USR(SEAR
   CH5,ADR(P1UP$),ADR(RECORD$),P1LEN-C1,L
   EN(RECORD$)-P1LEN+C1)
ZU 1070 IF P2LEN<>C0 THEN MATCH2=USR(SEAR
   CH5,ADR(P2UP$),ADR(RECORD$),P2LEN-C1,L
   EN(RECORD$)-P2LEN+C1)
AH 1080 IF MATCH$="EITHER" AND  NOT (MATC
   H1 OR MATCH2) THEN RETURN
TD 1090 IF MATCH$="BOTH" AND  NOT (MATCH1
    AND MATCH2) THEN RETURN
JE 1100 REM *
OH 1110 REM * DISPLAY RECORD
JK 1120 REM *
AF 1130 IF  NOT FULLDISPLAY THEN 1360
HX 1140 POSITION C0,10:PRINT CLEAR$;
IT 1150 POSITION C0,11:PRINT CLEAR$;
DS 1160 FOR I=13 TO 17:POSITION C0,I:PRIN
   T CLEAR$(C1,39);:NEXT I
TI 1170 POSITION C0,10:PRINT REF$;
LL 1180 POSITION C0,11:PRINT TITLE$;
IT 1190 POSITION C0,13:PRINT DESC1$;
JS 1200 POSITION C0,14:PRINT DESC2$;
LT 1210 POSITION C0,15:PRINT DESC3$;
NU 1220 POSITION C0,16:PRINT DESC4$;
PV 1230 POSITION C0,17:PRINT DESC5$;
DV 1240 IF AUTOPRINT$="OFF" THEN RETURN
QA 1250 TRAP 1270
XF 1260 ? #C2;REF$:? #C2;TITLE$:? #C2;DES
   C1$:? #C2;DESC2$:? #C2;DESC3$:? #C2;DE
   SC4$:? #C2;DESC5$
OU 1270 TRAP 40000
BB 1280 RETURN
ZD 1290 DONE=C1:RETURN
JI 1300 REM *
ZV 1310 REM * FORMAT DISPLAY
JO 1320 REM *
```

```
NA 1330 FOR I=TOPLINE-C1 TO BOTLINE:POSIT
   ION C0,I:PRINT CLEAR$;:NEXT I:LET FORM
   AT=C1
EF 1340 IF FULLDISPLAY THEN POSITION C0,8
   :PRINT "REFERENCE:":RETURN
KC 1350 POSITION C0,8:PRINT "REC MTH TITL
   E";:RETURN
KA 1360 REM *
VC 1370 REM * BRIEF DISPLAY
KG 1380 REM *
SF 1390 IF RECORDNUM=LASTREC THEN RETURN
SF 1400 IF LASTLINE$<>"" THEN X=USR(FLIP,
   ADR(LASTLINE$),LEN(LASTLINE$)):POSITIO
   N C0,CURLINE:PRINT LASTLINE$;
QQ 1410 ON SEARCH GOTO 1420,1480
NQ 1420 IF CURLINE>TOPLINE THEN CURLINE=C
   URLINE-C1:GOTO 1520
EW 1430 X=USR(COPY,ADR(QL$)+C1,ADR(WSAVE$
   ),66):X=USR(COPY,ADR(WSAVE$),ADR(QL$)+
   7,66)
QG 1440 X=USR(COPY,WSTART,ADR(WSAVE$),WSI
   ZE+C40)
VH 1450 POSITION C0,CURLINE:PRINT CLEAR$(
   C1,39);
WO 1460 X=USR(COPY,ADR(WSAVE$),WSTART+C40
   ,WSIZE)
QZ 1470 GOTO 1520
AU 1480 IF CURLINE<BOTLINE THEN CURLINE=C
   URLINE+C1:GOTO 1520
RH 1490 X=USR(COPY,ADR(QL$)+7,ADR(QL$)+C1
   ,66)
NM 1500 X=USR(COPY,WSTART+C40,WSTART,WSIZ
   E)
UX 1510 POSITION C0,CURLINE:PRINT CLEAR$(
   C1,39);
EZ 1520 FOR I=C1 TO 10:IF REF$(I,I)=" " T
   HEN MONTH$=REF$(I+C1,I+C3):GOTO 1540
XE 1530 NEXT I:MONTH$="   "
YB 1540 ILEN=LEN(TITLE$):IF ILEN>31 THEN
   ILEN=31
FL 1550 LASTREC=RECORDNUM:QL(CURLINE-8)=L
   ASTREC:IF CURLINE-8>MAXLINE THEN MAXLI
   NE=CURLINE-8
UX 1560 LASTLINE$=CLEAR$(C1,ILEN+8):LASTL
   INE$=STR$(RECORDNUM):LASTLINE$(5)=MONT
   H$:LASTLINE$(9)=TITLE$(C1,ILEN)
ML 1570 TRAP 1580:IF AUTOPRINT$="ON" THEN
    PRINT #C2;LASTLINE$
PD 1580 TRAP 40000
JM 1590 X=USR(FLIP,ADR(LASTLINE$),ILEN+8)
   :POSITION C0,CURLINE:? CLEAR$(C1,39);:
   POSITION C0,CURLINE:PRINT LASTLINE$
AL 1600 RETURN
KT 1610 REM +-------------------------+
YJ 1620 REM | START MAIN PROGRAM      |
KZ 1630 REM +-------------------------+
HS 1640 GOSUB 3380:IF NFILES>C0 THEN CFIL
   E=C1:GOSUB 3490:CLOSE #C1:OPEN #C1,C4,
   C0,FILE$
GC 1650 GOSUB 4680
EX 1660 X=PEEK(16)-128:IF X>=C0 THEN POKE
    16,X:POKE 53774,X
SJ 1670 TRAP 1760
ZO 1680 POSITION 8,C1:PRINT DISK$;
UW 1690 TRAP 1700:POSITION 17,C1:PRINT "[redacted]";:POSITION 17,C1:PRINT FNAME$
   ((CFILE-C1)*13+C3,CFILE*13-C3);
IQ 1700 TRAP 1710:POSITION 35,C1:PRINT "[redacted]";:POSITION 35,C1:PRINT STR$(RECORDN
   UM);
HG 1710 TRAP 40000:POSITION 9,C2:PRINT "[redacted]";:POSITION 9,C2:PRINT O
   UTDEV$;
VI 1720 POSITION 35,C2:PRINT "[redacted]":POSITI
   ON 35,C2:PRINT AUTOPRINT$;
JZ 1730 REM *
KE 1740 REM * CONTROL THE DISPLAY
KF 1750 REM *
XW 1760 GOSUB GETKEY
UZ 1770 IF  NOT SPECIAL THEN 1810
VI 1780 SEARCH=C2:GOSUB 790
YI 1790 IF PEEK(CH)=ESC OR DONE THEN 1760
UK 1800 GOTO 1780
CA 1810 IF BYTE<>UPARROW THEN 1830
ZX 1820 SEARCH=C1:GOSUB 790:GOTO 1760
XM 1830 IF BYTE<>DOWNARROW THEN 1850
AR 1840 SEARCH=C2:GOSUB 790:GOTO 1760
RR 1850 IF BYTE<>LEFTARROW THEN 1870
DW 1860 GOSUB 420:GOTO 1760
NK 1870 IF BYTE<>RIGHTARROW THEN 1890
EC 1880 GOSUB 420:GOTO 1760
WF 1890 IF BYTE<>RETURN THEN 1760
XU 1900 ON OPTION GOTO 1910,2270,2470,259
   0,2750,2920,3050,3170,3330
JX 1910 REM *
DX 1920 REM * SEARCH OPTION
KD 1930 REM *
AU 1940 X=C4:Y=TOPLINE:HEIGHT=6:WIDTH=33
AC 1950 GOSUB WINDOWOPEN
MU 1960 POSITION 18,C4:PRINT "[redacted]";:POSITION 18,5:PRINT "[redacted]";
AT 1970 POSITION 24,6:PRINT "[redacted]";:MAT
   CH$="EITHER":P1$="":P2$=""
GE 1980 TEMP$="":X=C4:Y=TOPLINE+C2:GOSUB
   2210
DQ 1990 P1$=TEMP$:P1LEN=LEN(P1$):IF IPOS=
   C1 THEN 2180
BB 2000 POSITION 18,C4:PRINT P1$;
FX 2010 TEMP$="":X=C4:Y=TOPLINE+C3:GOSUB
   2210
ED 2020 P2$=TEMP$:P2LEN=LEN(P2$):IF IPOS=
   C1 THEN 2180
FK 2030 POSITION 18,5:PRINT P2$;
GF 2040 GOSUB WINDOWCLOSE
JS 2050 REM *
ML 2060 REM * PROMPT FOR RECORD MATCH
JY 2070 REM *
BY 2080 X=5:Y=10:HEIGHT=5:WIDTH=32
ZX 2090 GOSUB WINDOWOPEN
TM 2100 POSITION 7,12:PRINT "Find Records
    Matching :";
VK 2110 POSITION 22,13:PRINT "Phrases";
DX 2120 TEMP$="BOTH EITHER"
HH 2130 XP=10:YP=13
AY 2140 NCHOICE=C2:MPOS(C1)=C1:MPOS(C2)=6
   :MPOS(C3)=13
FU 2150 GOSUB 3780
TN 2160 MATCH$=CHOICE$
VY 2170 POSITION 24,6:PRINT MATCH$
JQ 2180 POSITION C0,C0:PRINT CHR$(145);:G
   OSUB WINDOWCLOSE
CF 2190 TRAP 2200:IF RECORDNUM>C0 THEN PO
   INT #C1,SECTOR(C1),BYTE(C1)
OZ 2200 GOSUB 1300:CURLINE=8:MAXLINE=C0:Q
   L(C0)=C0:LASTLINE$="":RECORDNUM=C0:SSA
   VE=C0:GOTO 1680
JK 2210 REM *
XM 2220 REM * GET SEARCH PHRASE
JQ 2230 REM *
UL 2240 EXIT=C0:IPOS=C1:POSITION X+C2,Y:P
   RINT "Phrase : ";
TH 2250 GOSUB GETKEY:GOSUB 320:IF IPOS<=P
   SIZE AND EXIT=C0 THEN 2250
AW 2260 RETURN
KC 2270 REM *
BJ 2280 REM * FILE OPTION
KI 2290 REM *
BO 2300 X=C4:Y=C2:WIDTH=20:HEIGHT=17
YM 2310 GOSUB 3380:GOSUB WINDOWOPEN
OS 2320 POSITION 6,C3:PRINT "SELECT FILE:
   ";
LK 2330 IF NFILES=C0 THEN POSITION 6,5:PR
   INT CHR$(253);"NO FILES ON DISK":FOR I
   =C1 TO 200:NEXT I:GOTO 2440
MQ 2340 XP=7:YP=5:TEMP$=FNAME$
```

```
IW 2350 A=USR(FLIP,ADR(TEMP$),LEN(TEMP$))
DO 2360 NCHOICE=NFILES:IF NCHOICE>12 THEN
    NCHOICE=12
AD 2370 FOR I=C1 TO NCHOICE+C1
YZ 2380 MPOS(I)=(I-C1)*13+C1
FX 2390 NEXT I
QR 2400 GOSUB 3590:CFILE=CHOICE
AI 2430 GOSUB 3490:CLOSE #C1:OPEN #C1,C4,
   C0,FILE$
EP 2440 POSITION C0,C0:PRINT CHR$(145);
GQ 2450 GOSUB WINDOWCLOSE
KX 2460 RECORDNUM=C0:SSAVE=C0:GOTO 1680
KG 2470 REM *
HV 2480 REM * DISK OPTION
KM 2490 REM *
MI 2500 X=5:Y=C4:WIDTH=20:HEIGHT=5
ZJ 2510 GOSUB WINDOWOPEN
FN 2520 POSITION 10,6:PRINT "DISK: ";
DW 2530 GOSUB GETKEY:IF BYTE<ASC("1") OR
   BYTE>ASC("8") THEN BYTE=ASC("1")
TI 2540 DISK$=CHR$(BYTE):PRINT DISK$
EU 2550 POSITION C0,C0:PRINT CHR$(145);
AD 2560 RECORDNUM=C0:SSAVE=C0:GOSUB WINDO
   WCLOSE
WE 2570 IF DISK$<>FILE$(C2,C2) THEN 2300
UR 2580 GOTO 1680
KO 2590 REM *
IZ 2600 REM * RECORD OPTION
JS 2610 REM *
MQ 2620 X=5:Y=C4:WIDTH=20:HEIGHT=5
ZR 2630 GOSUB WINDOWOPEN
VN 2640 IF FULLDISPLAY THEN 2670
DG 2650 POSITION 6,6:PRINT CHR$(253);"INV
   ALID OPTION FOR";:POSITION 6,7:PRINT "
   BRIEF DISPLAY MODE";
EF 2660 FOR I=C1 TO 200:NEXT I:GOTO 2720
XQ 2670 POSITION 10,6:PRINT "RECORD:      <
   <<<";
QV 2680 IPOS=C1:EXIT=C0
CK 2690 GOSUB GETKEY:GOSUB 320:IF IPOS<=3
    AND EXIT=C0 THEN 2690
YD 2700 TRAP 2710:X=VAL(TEMP$):RECORDNUM=
   X:GOTO 2720
IX 2710 RECORDNUM=C0
XL 2720 TRAP 40000:POSITION C0,C0:PRINT C
   HR$(145);:GOSUB WINDOWCLOSE
QL 2730 IF FULLDISPLAY AND RECORDNUM<>C0
   THEN TRAP 1290:GOSUB 920
UJ 2740 GOTO 1680
KG 2750 REM *
UW 2760 REM * KEYWORDS OPTION
KM 2770 REM *
JM 2780 X=C0:Y=TOPLINE-C1:HEIGHT=13:WIDTH
   =40
AL 2790 GOSUB WINDOWOPEN
JY 2800 POSITION C2,TOPLINE:PRINT "ACTION
    ADVENTURE BASIC BBS CASSETTE";
NS 2810 POSITION C2,TOPLINE+C1:PRINT "CHI
   LDREN CIO COMMUNICATIONS DISK";
MP 2820 POSITION C2,TOPLINE+C2:PRINT "DIS
   PLAY LIST DLI DOS EDUCATION";
JO 2830 POSITION C2,TOPLINE+C3:PRINT "FIN
   ANCE FIX GAME GEM GRAPHICS";
XE 2840 POSITION C2,TOPLINE+C4:PRINT "HAN
   DLER HARDWARE HOME USE INTERFACE";
UN 2850 POSITION C2,TOPLINE+5:PRINT "IOCB
    LEARNING MEMORY MIDI ML MODEM";
LB 2860 POSITION C2,TOPLINE+6:PRINT "MONI
   TOR MUSIC O/S P/M PATCH PRINTER";
NB 2870 POSITION C2,TOPLINE+7:PRINT "RAMD
   ISK REVIEW SOUND SPEECH ST TAPE";
OA 2880 POSITION C2,TOPLINE+8:PRINT "TOS
   UPDATE UTILITY WORD PROCESSING";
WK 2890 POSITION C2,TOPLINE+9:PRINT "XE X
   L";
TZ 2900 POSITION 7,TOPLINE+11:PRINT "Pres
   s <RETURN> to Continue";
DB 2910 GOSUB GETKEY:GOSUB WINDOWCLOSE:GO
   TO 1760
KB 2920 REM *
XF 2930 REM * AUTOPRINT OPTION
KH 2940 REM *
SU 2950 X=C4:Y=C4:HEIGHT=5:WIDTH=25
AG 2960 GOSUB WINDOWOPEN
GY 2970 POSITION 6,6:PRINT "Autoprint:";
MN 2980 TEMP$="ON OFF"
IU 2990 XP=17:YP=6
NF 3000 NCHOICE=C2:MPOS(C1)=C1:MPOS(C2)=C
   4:MPOS(C3)=8
FE 3010 GOSUB 3780:REM GET CHOICES
HQ 3020 AUTOPRINT$=CHOICE$
GD 3030 GOSUB WINDOWCLOSE
TW 3040 GOTO 1680
JT 3050 REM *
LX 3060 REM * OUTPUT OPTION
JZ 3070 REM *
PZ 3080 X=C4:Y=C4:HEIGHT=5:WIDTH=32
ZY 3090 GOSUB WINDOWOPEN
FI 3100 POSITION 6,6:PRINT "Output Device
   :                <<<<<<<<<<<<<<<<";
PR 3110 IPOS=C1:EXIT=C0
ZP 3120 GOSUB GETKEY:GOSUB 320:IF IPOS<FI
   LELEN AND EXIT=C0 THEN 3120
OH 3130 IF IPOS<=C1 THEN 3150
DA 3135 IF TEMP$(C1,C1)="S" OR TEMP$(C1,C
   1)="E" THEN 3150
FN 3140 OUTDEV$=TEMP$:TRAP 3150:CLOSE #C2
   :OPEN #C2,8,C0,OUTDEV$
JI 3150 POSITION C0,C0:PRINT CHR$(145);:G
   OSUB WINDOWCLOSE
UE 3160 GOTO 1680
KB 3170 REM *
LR 3180 REM * DISPLAY OPTION
KH 3190 REM *
MZ 3200 X=4:Y=4:HEIGHT=5:WIDTH=26
ZE 3210 GOSUB WINDOWOPEN
YQ 3220 POSITION 6,6:PRINT "Display:";
MC 3230 XP=15:YP=6:TEMP$="FULL BRIEF"
ZD 3240 NCHOICE=C2:MPOS(C1)=C1:MPOS(C2)=6
   :MPOS(C3)=12
FX 3250 GOSUB 3780
JN 3260 POSITION C0,C0:PRINT CHR$(145);:G
   OSUB WINDOWCLOSE
KA 3270 IF  NOT (CHOICE$="FULL" AND FULLD
   ISPLAY=C0) THEN 3300
BQ 3280 X=USR(COPY,WSTART,ADR(WSAVE$),WSI
   ZE+C40):SSAVE=1
HN 3290 FULLDISPLAY=C1:GOSUB 1300:RECORDN
   UM=LASTREC:IF LASTREC<>C0 THEN GOSUB 9
   20
VJ 3295 GOTO 1680
FV 3300 IF  NOT (CHOICE$="BRIEF" AND FULL
   DISPLAY=C1) THEN 1760
RP 3310 FULLDISPLAY=C0:IF  NOT SSAVE THEN
    CURLINE=8:LASTLINE$="":GOSUB 1300:GOT
   O 1760
TY 3320 SSAVE=C0:RECORDNUM=LASTREC:A=USR(
   COPY,ADR(WSAVE$),WSTART,WSIZE+C40):IF
   LASTREC<>C0 THEN GOSUB 920
UQ 3325 GOTO 1680
JT 3330 REM *
ZS 3340 REM * EXIT OPTION
JZ 3350 REM *
DG 3360 GRAPHICS C0:END
KI 3380 REM *
JW 3390 REM * DISK DIRECTORY
JM 3400 REM *
RO 3410 TRAP 3470
WJ 3420 FILE$(C2,C2)=DISK$:TEMP$=FILE$:TE
   MP$(4)="*.DAT"
VB 3430 FNAME$="":NFILES=C0
EK 3440 CLOSE #C4:OPEN #C4,6,C0,TEMP$
IY 3450 INPUT #C4,TEMP$:IF TEMP$(11,13)<>
   "DAT" THEN 3450
KP 3460 NFILES=NFILES+C1:FNAME$((NFILES-C
   1)*13+C1)=TEMP$:GOTO 3450
```

```
IM 3470 TRAP 3475:CLOSE #C4
BR 3475 IF NFILES=C0 THEN FNAME$="
        ":RETURN
BH 3480 RETURN
KN 3490 REM *
OB 3500 REM * SELECT FILENAME
JR 3510 REM *
QS 3520 CHOICE$=FNAME$((CFILE-C1)*13+C1,C
   FILE*13)
XF 3530 FILE$(4)=""
XW 3540 FOR I=C3 TO 10
ZL 3550 IF CHOICE$(I,I)<>" " THEN FILE$(I
   +1,I+C1)=CHOICE$(I,I)
FT 3560 NEXT I
EC 3570 FILE$(LEN(FILE$)+C1)=".DAT"
BJ 3580 RETURN
KP 3590 REM *
VX 3600 REM * VERTICAL MENU
JT 3610 REM *
NF 3620 FOR I=C1 TO NCHOICE:POSITION XP,Y
   P+I-C1:PRINT TEMP$(MPOS(I),MPOS(I+C1)-
   C1);:NEXT I
SZ 3630 CHOICE=C1
EM 3640 IPOS=MPOS(CHOICE):ILEN=MPOS(CHOIC
   E+C1)-IPOS
LT 3650 A=USR(FLIP,ADR(TEMP$(IPOS)),ILEN)
PG 3660 POSITION XP,YP+CHOICE-C1:PRINT TE
   MP$(MPOS(CHOICE),MPOS(CHOICE+C1)-C1);
XZ 3670 GOSUB GETKEY
CQ 3680 IF BYTE<>UPARROW THEN 3720
ZQ 3690 A=USR(FLIP,ADR(TEMP$(IPOS)),ILEN)
   :POSITION XP,YP+CHOICE-C1:PRINT TEMP$(
   MPOS(CHOICE),MPOS(CHOICE+C1)-C1);
RZ 3700 CHOICE=CHOICE-C1:IF CHOICE<C1 THE
   N CHOICE=NCHOICE
SX 3710 GOTO 3640
ZS 3720 IF BYTE<>DOWNARROW THEN 3760
ZA 3730 A=USR(FLIP,ADR(TEMP$(IPOS)),ILEN)
   :POSITION XP,YP+CHOICE-C1:PRINT TEMP$(
   MPOS(CHOICE),MPOS(CHOICE+C1)-C1);
HT 3740 CHOICE=CHOICE+C1:IF CHOICE>NCHOIC
   E THEN CHOICE=C1
TJ 3750 GOTO 3640
XZ 3760 IF BYTE<>RETURN THEN 3670
BK 3770 RETURN
KQ 3780 REM *
DZ 3790 REM * HORIZONTAL MENU
JU 3800 REM *
SI 3810 I=C1
YZ 3820 IPOS=MPOS(I)
ZF 3830 ILEN=MPOS(I+C1)-IPOS-C1
LU 3840 A=USR(FLIP,ADR(TEMP$(IPOS)),ILEN)
AL 3850 POSITION XP,YP:PRINT TEMP$;
YA 3860 GOSUB GETKEY
GY 3870 IF BYTE<>RIGHTARROW THEN 3910
MG 3880 A=USR(FLIP,ADR(TEMP$(IPOS)),ILEN)
YH 3890 I=I+C1:IF I>NCHOICE THEN I=C1
SW 3900 GOTO 3820
SK 3910 IF BYTE<>LEFTARROW THEN 3950
LQ 3920 A=USR(FLIP,ADR(TEMP$(IPOS)),ILEN)
CA 3930 I=I-C1:IF I<C1 THEN I=NCHOICE
TI 3940 GOTO 3820
ZB 3950 IF BYTE<>RETURN THEN 3860
OT 3960 CHOICE$=TEMP$(IPOS,IPOS+ILEN-C1)
BO 3970 RETURN
KU 3980 REM *
JJ 3990 REM * DISPLAY HELP SCREENS
JF 4000 REM *
CY 4010 X=C0:Y=8:HEIGHT=13:WIDTH=C40
BX 4020 XS=PEEK(84):YS=PEEK(85)
ZH 4030 GOSUB WINDOWOPEN
ZB 4040 RESTORE 5010+(OPTION-C1)*10
LL 4050 READ J:FOR I=C1 TO J
TF 4060 READ RECORD$:POSITION C2,(TOPLINE
   +I-C1):PRINT RECORD$;:NEXT I
CQ 4070 POSITION 7,BOTLINE+C1:PRINT "Pres
   s <RETURN> to Continue";
EQ 4080 GET #C3,BYTE
GW 4090 GOSUB WINDOWCLOSE
KS 4100 POKE 84,XS:POKE 85,YS
AH 4110 RETURN
JN 4120 REM *
KU 4130 REM * PROGRAM INITIALIZATION
JT 4140 REM *
HN 4150 LINELEN=39:FILELEN=15:C0=0:C1=1:C
   2=2:C3=3:C4=4:C40=40:NRECS=350:PSIZE=2
   0
YR 4160 DIM FNAME$(12*(FILELEN-C2)),TEMP$
   (12*(FILELEN-C2)),CLEAR$(LINELEN+C1),O
   UTDEV$(FILELEN),FILE$(FILELEN)
UW 4170 DIM REF$(LINELEN),TITLE$(LINELEN)
   ,DESC1$(LINELEN),DESC2$(LINELEN),DESC3
   $(LINELEN)
XW 4180 DIM DESC4$(LINELEN),DESC5$(LINELE
   N),RECORD$(7*LINELEN),LASTLINE$(LINELE
   N)
PD 4190 DIM MPOS(10),OPOS(10)
LE 4200 DIM CHOICE$(20),MENU$(72),MONTH$(
   C3),MATCH$(6)
YH 4210 DIM P1$(PSIZE),P2$(PSIZE),P1UP$(P
   SIZE),P2UP$(PSIZE)
QE 4220 DIM DISK$(C1),AUTOPRINT$(C3)
KV 4230 DIM SECTOR(NRECS),BYTE(NRECS)
VJ 4240 DIM WINDOW$(1210),WINDOW(5),WSAVE
   $(440)
AD 4250 DIM BLANKS$(C40),LINE$(C40),EDGEL
   INE$(C40)
PJ 4260 MAXOPTION=9:TOPLINE=9:BOTLINE=19:
   CURLINE=8:MAXLINE=C0:QL(C0)=C0:OPTION=
   C1:LET FORMAT=C0
NY 4270 FILE$="DX:"
KB 4280 CLEAR$(C1)=" ":CLEAR$(LINELEN+C1)
   =" ":CLEAR$(C2)=CLEAR$(C1)
PL 4290 BLANK5$(C1)=CHR$(128):BLANK5$(C40
   )=CHR$(128):BLANK5$(C2)=BLANK5$(C1)
XE 4300 LINE$(C1)=CHR$(210):LINE$(C40)=CH
   R$(210):LINE$(C2)=LINE$(C1)
MN 4310 DISK$="1":RECORDNUM=C0:OUTDEV$="P
   :":LASTLINE$="":FULLDISPLAY=C1:LASTREC
   =C0:SSAVE=C0:AUTOPRINT$="OFF"
GL 4320 LET RETURN=155
PU 4330 RIGHTARROW=42:LEFTARROW=43:DOWNAR
   ROW=61:UPARROW=45
CF 4340 ESC=28:CH=764:HELPKEY=732:CTRLH=8
IG 4350 POKE HELPKEY,C0
KH 4360 LET GETKEY=220:WINDOWOPEN=540:WIN
   DOWCLOSE=700
BJ 4370 MENU$="Search  File  Disk  Record
    Keywords  AutoPrint  Output  Display
    Exit  "
MK 4380 OPOS(C1)=C1:OPOS(C2)=9:OPOS(C3)=1
   5:OPOS(4)=21:OPOS(5)=29
AX 4390 OPOS(6)=39:OPOS(7)=50:OPOS(8)=58:
   OPOS(9)=67:OPOS(10)=73
JU 4440 NWINDOW=C0:WINDOW(C1)=C1
LB 4450 SCREEN=PEEK(88)+256*PEEK(89)
HY 4460 WSTART=SCREEN+TOPLINE*C40:WSIZE=(
   BOTLINE-TOPLINE)*C40
HH 4470 OPEN #C3,4,C0,"K:"
KL 4480 REM *
HX 4490 REM * DISPLAY TITLE SCREEN
JP 4500 REM *
FI 4510 GRAPHICS C0:POKE 708,C0:POKE 709,
   C0:POKE 710,C0:POKE 711,C0
JQ 4520 DL=PEEK(560)+256*PEEK(561)+4
IE 4530 POKE DL-C1,71
LC 4540 FOR X=C2 TO 6:POKE DL+X,7:NEXT X
EF 4550 FOR X=7 TO 18:POKE DL+X,6:NEXT X
EO 4560 POKE DL+19,65
YL 4570 POKE DL+20,PEEK(560):POKE DL+21,P
   EEK(561)
BC 4580 POKE 87,C2
IP 4590 POSITION C3,C1:PRINT #6;"EASYFIND
    V2.0"
DR 4600 POSITION C3,C3:PRINT #6;"MAGAZINE
    INDEX"
```

```
ZU 4610 POKE 87,C1
5R 4620 POSITION C2,7:PRINT #6;"SIERRA  S
   ERVICES"
PK 4630 POSITION C2,9:PRINT #6;"P.O.  BOX
    40454"
YD 4640 POSITION C1,11:PRINT #6;"BELLEVUE
   ,WA  98004"
WD 4652 POSITION C3,14:PRINT #6;"ATARI MA
   GAZINE"
HE 4654 POSITION C1,15:PRINT #6;"INDEXES
   AVAILABLE"
BE 4656 POSITION C3,16:PRINT #6;"1983 - P
   RESENT"
HG 4660 POKE 708,C40:POKE 710,74:POKE 712
   ,128
WH 4665 X=USR(CUP,C4)
BJ 4670 RETURN
KP 4680 REM *
KN 4690 REM * DISPLAY MAIN SCREEN
JT 4700 REM *
QA 4710 GRAPHICS C0
SK 4720 SETCOLOR C2,C0,8:SETCOLOR C1,C0,C
   0
LP 4730 POKE 752,C1:REM TURN CURSOR OFF
GM 4740 POSITION C0,C0:PRINT "┌──OPTIONS─
   ──────────────────────────────┐
                                 ";
OS 4750 POSITION C0,C1:PRINT "│ Disk:
   File:              Record:    │";
YZ 4760 POSITION C0,C2:PRINT "│ Output:
                   Autoprint:    │";
IK 4770 POSITION C0,C3:PRINT "│
                                 │";
QM 4780 POSITION C0,C4:PRINT "│ Search Ph
   rase: ──────────              │";
LZ 4790 POSITION C0,5:PRINT "│
          ──────────             │";
VT 4800 POSITION C0,6:PRINT "│ Find Recor
   ds Matching ──────  Phrases   │";
RO 4810 POSITION C0,7:PRINT "└──────────
   ──────────────────────────────┘";
IX 4820 POSITION C0,8:PRINT "  Help is av
   ailable for each option by   ";
YO 4830 POSITION C0,9:PRINT "  highlighti
   ng the option and then       ";
DI 4840 POSITION C0,10:PRINT "  pressing
   <HELP> or <CTRL>H            ";
AE 4850 POSITION C0,11:PRINT "
                                ";
YI 4860 POSITION C0,12:PRINT "  <RETURN>
   = Selects highlighted option ";
QO 4870 POSITION C0,13:PRINT "  <START>
   = Search and display records ";
WU 4880 POSITION C0,14:PRINT "  <ESC>
   = Stop record search         ";
DO 4890 POSITION C0,15:PRINT "
                                ";
EG 4900 POSITION C0,16:PRINT "  LEFT,RIGH
   T ARROWS highlight the menu  ";
TB 4910 POSITION C0,17:PRINT "      opti
   ons at the screen bottom     ";
XV 4920 POSITION C0,18:PRINT "  UP,DOWN A
   RROWS will display the next  ";
OE 4930 POSITION C0,19:PRINT "      or p
   revious record               ";
BI 4940 POSITION C0,20:PRINT "┌──OPTIONS
   MENU──────────────────────────┐";
RY 4950 POSITION C0,21:PRINT "│ Search  F
   ile  Disk  Record  Keywords  │";
JM 4960 POSITION C0,22:PRINT "│ AutoPrint
    Output  Display  Exit       │";
IJ 4970 POSITION C0,23:PRINT "└──────────
   ──────────────────────────────┘";
FN 4980 POSITION C0,C0:PRINT CHR$(145);
IA 4990 POKE SCREEN+959,195
AD 5000 RETURN
JL 5010 DATA 10,Search phrases restrict t
   he selection
DJ 5011 DATA of references to those that
   contain
QA 5012 DATA the specified search phrase(
   s). If
VG 5013 DATA you enter two phrases, you w
   ill be
BI 5014 DATA asked if the reference must
   contain
SF 5015 DATA EITHER or BOTH of the phrase
   s.
TI 5016 DATA If you enter * as the first
   search
PC 5017 DATA phrase all records will be s
   elected.
RY 5018 DATA EasyFind is case-insensitive
    and
JX 5019 DATA treats upper and lower case
   the same.
ZU 5020 DATA 7,EasyFind will display a li
   st of all
VC 5021 DATA files on your disk with an e
   xtension
GU 5022 DATA of ".DAT".  The UP and DOWN
   arrow
DV 5023 DATA keys will select a file and
   pressing
BZ 5024 DATA <RETURN> will activate that
   file.
ZF 5025 DATA The file activated will be u
   sed in
KS 5026 DATA all searches.
RT 5030 DATA 7,Data disks can be placed o
   n any drive
BF 5031 DATA from 1 to 8, including RAMDI
   SKS.
AA 5032 DATA Disk drives can be changed a
   t any
SD 5033 DATA time you choose.  When promp
   ted for
GI 5034 DATA DISK: , enter a number betwe
   en 1
PK 5035 DATA and 8.  Any other entry is a
   ssumed
MV 5036 DATA to be a 1.
JQ 5040 DATA 8,EasyFind can access record
   s that have
AY 5041 DATA already been selected by the
   ir record
IU 5042 DATA number.  This option is only
    valid in
GX 5043 DATA the full display mode.  When
    prompted
LZ 5044 DATA for "RECORD:" just enter a v
   alid
EB 5045 DATA number and EasyFind will dis
   play that
TQ 5046 DATA record if it contains the se
   arch
JN 5047 DATA phrase(s).
MB 5050 DATA 5,Keywords have been added t
   o records
FO 5051 DATA to facilitate searching.  Th
   ese key-
PA 5052 DATA words help classify the reco
   rds
IW 5053 DATA in Sierra Services Atari Mag
   azine
XK 5054 DATA Indexes.
HX 5060 DATA 6,AutoPrint will send each s
   elected
YH 5061 DATA record to the Output Device
   shown
IY 5062 DATA in the Options section.  The
   records
TH 5063 DATA will be in the same format a
   s they
WN 5064 DATA appear on screen.  This opti
   on can
```

```
RW 5065 DATA be turned ON or OFF.
MM 5070 DATA 7,You can output any selecte
   d records
YO 5071 DATA to any output device.  When
   prompted
PU 5072 DATA for an "Output Device:" simp
   ly
IV 5073 DATA enter any valid device speci
   fication.
SB 5074 DATA This is usually the printer
   (P:) or
GN 5075 DATA a disk file (e.g. D:MYFILE.O
   UT).
BC 5076 DATA Output is controlled by Auto
   Print.
EK 5080 DATA 8,Records can be shown in ei
   ther a full
HO 5081 DATA or brief display.  A full di
   splay
TO 5082 DATA shows 1 record on screen at
   a time.
KO 5083 DATA The brief display shows 1 li
   ne per
TG 5084 DATA record, but only shows the r
   ecord
KX 5085 DATA number, month, and title.  Y
   ou can
GH 5086 DATA toggle back and forth betwee
   n the
VO 5087 DATA two display formats.
DT 5090 DATA 2,Exit simply stops the prog
   ram and
XP 5091 DATA returns to BASIC.
```


Review *continued from page 88*

gram allowed you to use the cursor keys on the keyboard, to change X- and Y-positions a single digit at a time. You can specify a line or surface, once the first segment is defined. Color and Z-positions are also prompted for. This mode of entry is a little confusing at first, and takes some getting used to. With some practice, you'll probably find it superior to the text mode of entry, however.

Once your image is defined, you can display it—with all the features noted above—or save it to disk. If you have an interesting view on the screen, just press CTRL-P to make a quick (*very* quick) dump to your Epson or compatible printer. CTRL-SHIFT-P will generate a full-page graphic dump of your 3D graphic at its current view size and angle. While viewing your image, if you want a **MicroIllustrator** copy of the display, simply press CTRL-SHIFT-T. It is saved as D:PICTURE, the default filename used by **MicroIllustrator** (with Koala or Atari touch tablets) when transferring picture files in an uncompressed (62-sector) file. This only works in the high-resolution mode, as does printing. The SELECT key, while displaying an image, changes graphics modes. The lower resolution gives you three-color objects when shading is enabled.

One of the neatest effects you can achieve with **S3DP** is seen when you press the *Y* key while rotating an object. This temporarily disables screen clearing between image redraws. You have an *instant* high-resolution spirograph. Quick dumps of these images can be used to make some smart-looking greeting cards.

After you've created your beautiful cityscape, there's something else you *must* try. Go back to the menu and select the load command, while pressing the OPTION key. Load up your X-Wing fighter image and go back to your picture. Voilá, the two images have been merged! Now your X-Wing fighter looks as if it's flying over the city. This feature allows you to create a sophisticated composite image from simple building blocks. Individual objects' relative positioning can be set up before the merge by adjusting the current object's X-, Y- and Z-position, with another key combination similar to that described for rotating objects.

If you have scads of **Solid States** files, you'll be happy to know that a converter utility comes with **S3DP**. This program will transform **Solid States** files into the proper format for **S3DP** viewing and editing. Another BASIC utility program is provided, to help you create your own printer driver if your printer's not Epson compatible.

This program has features too numerous to cover in detail. I've found **Super 3D Plotter II** to be fast, bug free and great fun to use. The manual's tutorial approach is helpful. Its greatest limitation is that it can handle only 255 points maximum. That isn't a lot, and there's no way around it. I would settle for *much slower* rotations, in exchange for the ability to define thousands of points (up to the memory limit of the computer), rather than just a couple hundred. If you're having trouble with geometry in school, you will find this program educational. It's not often you can have this much fun and learn a lot at the same time.

If you liked **Solid States**, then **Super 3D Plotter II** is a must!

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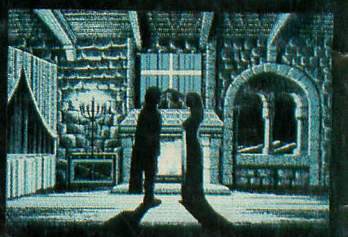

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