NO. 46
SEPTEMBER 1986

U.S.A. $3.50
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THE #1 MAGAZINE FOR ATARI® COMPUTER OWNERS

ANALOG COMPUTING™

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Magic Spell
La Machine
Moonlord

PLUS ST-LOG

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NEW for the ST -- only from MichTron

BBS 2.0 by Timothy Purves — $79.95

A Bulletin Board System that's full featured, easy to use, and affordable? Only from MichTron! *BBS* turns your computer and auto-answer modem into a full-blown electronic mail and message system!

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If you sift endlessly through messy, out-dated customer lists, then spend hours typing mailing labels, *Mighty Mail* is a dream come true. It sorts and prints all your customer lists and labels. You'll save enough with your first zipcode-sorted bulk-mailing to pay for the program!

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- **And more** - Deletes redundant entries, retrieves report layouts, prints to disk files, and even makes test labels.

MichTron Utilities by Timothy Purves — $59.95

What would a tool be worth that could turn back time and end frustration? Before you find out that such a tool would be priceless, prepare yourself with *MichTron Utilities*. This program lets you recover lost data, repair damaged disks, and change bytes on your disks or hard drive.

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- **Change file names, volume names, and attributes**
- **Copy or verify individual sectors**
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- **Recover data from damaged disks** - Flip through the disk data and click on the mouse to accept or reject it.
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CIRCLE #101 ON READER SERVICE CARD

NO. 46 SEPTEMBER 1986

THE #1 MAGAZINE FOR ATARI® COMPUTER OWNERS

ANALOG COMPUTING

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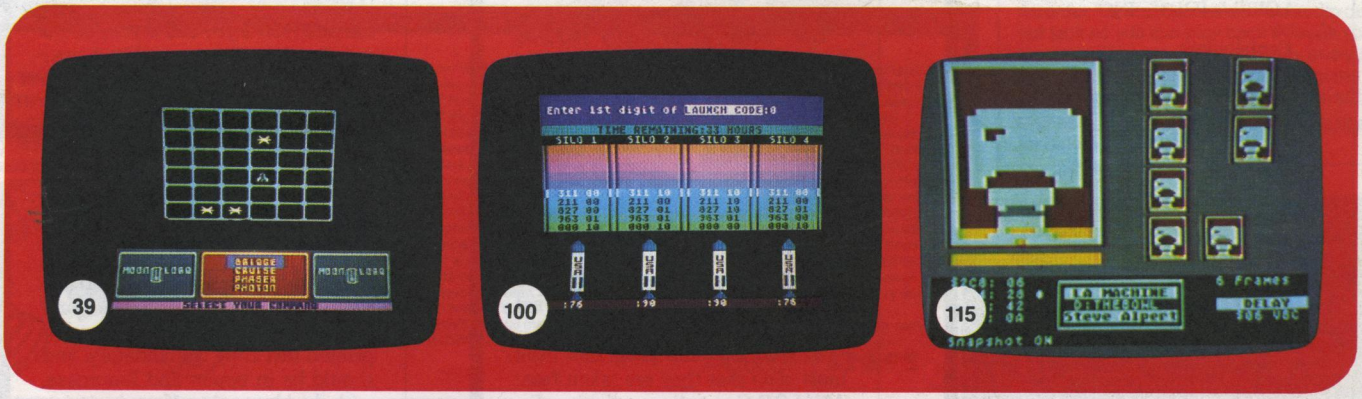

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An incorrectly addressed letter can be delayed as long as two weeks before reaching the proper destination.

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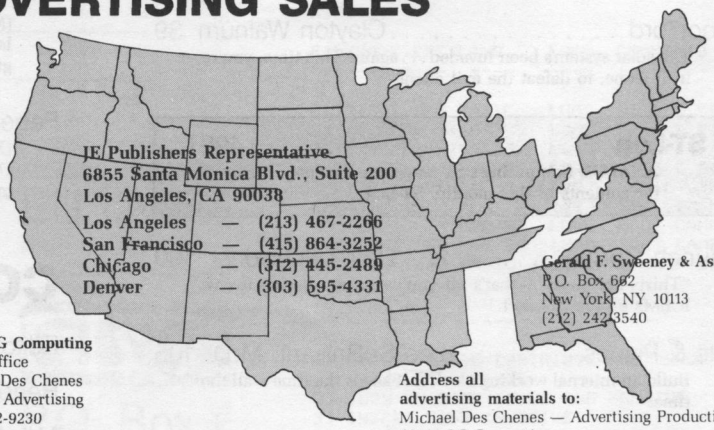

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Due, however, to many requests from Atari club libraries and bulletin board systems, our new policy allows club libraries or individually-run BBSs to make certain programs from **ANALOG Computing** available during the month printed on that issue's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

In addition, any programs used must state that they are taken from **ANALOG Computing** magazine. For further information, contact **ANALOG Computing** at (617) 892-3488.

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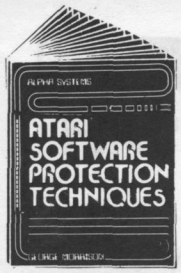
When submitting articles and programs, both program listings and text should be provided in printed *and* magnetic form, if possible. Typed or printed text copy is mandatory, and should be in upper- and lowercase, with double spacing. If a submission is to be returned, please send a self-addressed, stamped envelope.



BOOK I + DISK: (The Original) Thoroughly explains the techniques used by advanced software pirates, and the copy protection methods used to stop them. It offers clear and understandable explanations *sophisticated enough for software writers of any scale yet easy* enough for a beginner just wanting to learn more about Atari® computers. A MUST READ FOR ALL ATARI® OWNERS.

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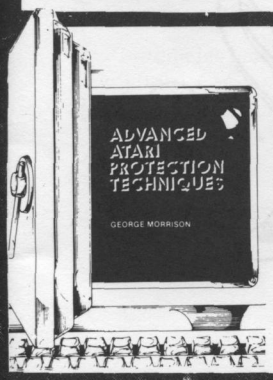

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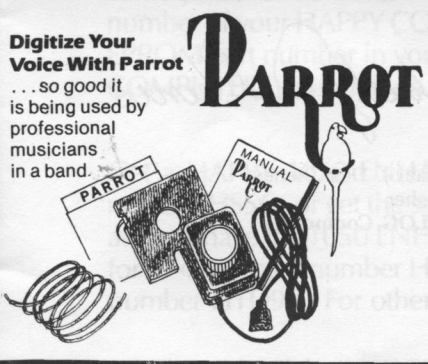

PARROT

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CIRCLE #102 ON READER SERVICE CARD

Editorial

As an **ANALOG Computing** reader, you may have noticed— and, we hope, have used—our "reader service card." There's one in the back of every issue.

If you've never used the card to request information from one of our advertisers, give it a try. Now, perhaps you don't need any materials from the advertisers. If that's the case, then I'd like to ask you to take the time to fill out the small survey section on the card.

This information helps us determine what you readers like or dislike about any given issue. The survey results also help advertisers determine the responses their ads are getting.

ATARI PERSONAL USAGE:
(Some multiple ownerships)

400/800	43%
800XL	39%
XE	21%
ST	20%
1200XL	2%
600XL	1%

INTEND TO PURCHASE A NEW ATARI:

YES	53%
NO	44%
NO ANSWER	3%

MODEL TO BE PURCHASED:

ST	41%
1040	23%
520	18%
XE	8%
UNDECIDED	2%

Naturally, we think it would be great if all our readers filled out this card, every month. But what I'm really asking is that those of you who don't normally use the reader service card take a few minutes and fill it out this month. The previous information was tabulated from the most recent batch of reader service cards received. It would be most interesting to see if these percentages change, should we get a larger number of cards returned.

Our last two issues ran the **ANALOG Computing** on Delphi ad, and the response has been very good. As readers, I hope that most of you who are active in telecommunications will also join us on Delphi's Atari SIG.

When you come into the Atari Users' Group, you'll be able to choose from over 2,000 downloads. Best of all, you'll get to talk to most of the editorial staff. It's a good channel for you to let us know what's happening out there in the Atari user's world. We want to stay in touch, and this seems to be the best way.

And, speaking of telecommunications, take a look at the new column, **Database Delphi**, by Matthew Ratcliff. He'll keep you up to date on what's new with our Delphi SIG and touch on other topics relating to telecommunications.

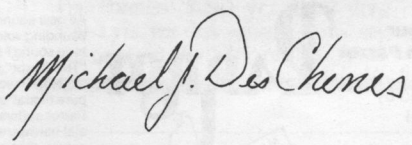
ST-Log has been getting easier to fill lately, what with more articles and advertisers. Many of our regular **ST-Log** readers have by now noticed that we're putting an additional "bonus" program on the disk version.

Last month, it was an ST version of the ever-popular 8-bit **Solid States**. This issue, we have a very useful disk menu labeler, which is an extension of the **Dx Lister** program on page 57ST.

Next month's bonus is going to be something special (I love making people go nuts waiting for something). Don't miss it—it's unbelievable!

One last thing: any ST owners who'd like to pocket an extra $5,000.00, become a household name *and* have their faces plastered all over these pages for the Atari world to gawk at . . .take a look at the details of our ST programming contest in the ad on page 84ST.

We hope you'll enter any programs you may be working on. Even if you don't win, you may still qualify for publication and reap the profits that way.



Michael J. Des Chenes
Publisher
ANALOG Computing

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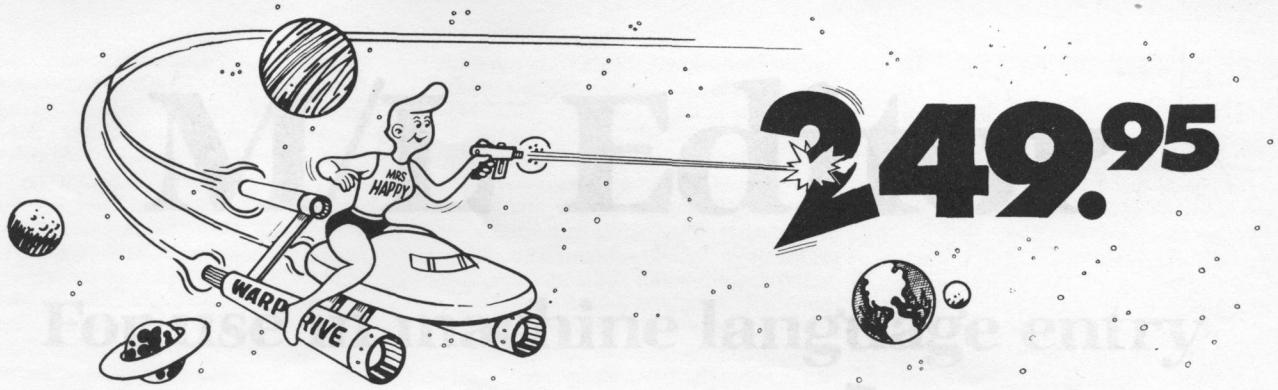

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CIRCLE #103 ON READER SERVICE CARD

Reader Comment

Words for the Home Shopper.

I would like to submit the following update to the **Home Shopper** (issue 43). In the article, I stated that your store database could contain twenty-three aisles of information. True, but the browse screen will scroll if all twenty-three aisles are defined. Lines 500 and 540 should be updated as follows:

```
500 FOR I=0 TO 22
540 ? "     ";AISLE$;:IF I
<22 THEN ?
```

Also, in the "Using the USR routines" section of the article, it was indicated that *POKE 711,NEWCOLR2* would change the bottom half of the screen, to allow a new color when using my two-color DLI utility. This should have been:

```
POKE 1711,NEWCOLR2
```

The editors thought I'd made a typo, since *711* is a common SETCOLOR location. It should be *1711*, however, where my DLI routine stores the bottom half of the screen color.

I gave you another goodie at the last minute, but forgot to update the article. I stated that you should "always execute a graphics 0 command just before this USR call" for the double screen colors.

In the first version of **Shopper** I did, this was true. But I updated, so it wasn't necessary. You can use this to your advantage in creating certain special effects. Quit the **Shopper**, then try this tricky one-liner:

```
F.X=1 TO 99:F.I=1 TO 22:A=
USR(1620,I,255*RND(0)):N.I
:F.I=22 TO 1 STEP -1:A=USR
(1620,I,255*RND(0)):N.I:N.
X
```

N. is the Atari BASIC abbreviation of *NEXT*, *F.* is *FOR* (necessary to fit the one-liner into one Atari BASIC program line.

You can create some less obnoxious special effects with this routine in your own programs. If you're working on a **Shopper** update, you may wish to try the following immediate mode command, to look at all the aisle topics (not aisle data) at once:

```
FOR I=8000 TO 8440 STEP 20
:LIST I:? CHR$(28);:NEXT I
```

I hope this helps you get even more use out of the **Shopper** and its USR routines. Sorry for the mix-up.

Sincerely,
Matthew J.W. Ratcliff
St. Louis, MO

I am using the **Home Shopper** from your June magazine.

I think that the program is very good, but I ran into a little problem using it. I ran it and set up a shopping list, only to discover that I hadn't turned on the printer. I found it's not easy to leave the program to enter the printer codes.

To avoid having a loyal **ANALOG Computing** subscriber kick his dog, I have added two lines to end this problem.

```
20 ? "K":DIM RET$(1):POSIT
ION 2,2:? "DO YOU WANT THE
 PRINTER ON [Y/N]";:INPUT
RET$:IF RET$<>"Y" THEN 50
30 LPRINT CHR$(27);CHR$(24
);
40 REM UP TO 23 AISLES, 19
 ITEMS PER AISLE
```

The printer codes in Line 30 are for an Olympia electronic compact NP, but I think that other printer codes can be substituted, making that line compatible with most other printers.

Ronald M. Green
Roy, UT

Switching the Flip Switch.

I am writing in regard to your article **The 810 Flip Switch**, by Steve Schelb, in issue 44. Mr. Schelb wrote a very detailed article, but he left out one very important fact. That is, which jack one is supposed to solder the wires to!

The correct jack number is "J101," located on the side board near the rear of the drive. Connections can easily be made to the red and black wires on the lower part of the connector.

Also, instead of a slide switch, I would recommend a subminiature toggle switch (Radio Shack No. 275-612). This switch will fit nicely on the front panel, about ¼ inch to the left of the "BUSY" light.

Sincerely,
Robert C. Stoll
Sawyer AFB, MI

In **ANALOG Computing** issue 44, Steven Schelb authored **The 810 Flip Switch**—how to wire a switch into the Atari 810 disk drive so the back of disks can be written to without punching out the sides of the diskette.

I have three 810 drives which I modified over a year ago, and was really surprised at Mr. Schelb's choice of a switch. The slide switch which he uses would be very difficult to mount, since it requires a rectan-

(continued on page 8)

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 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* (issue 45) and its update on page 9.

Listing 1.
BASIC listing.

```
AZ 10 DIM BF(16),N$(4),A$(1),B$(1),F$(15)
   ,F1$(15)
BN 20 LINE=1000:RETRN=155:BACKSP=126:CHKS
   UM=0:EDIT=0
GO 30 GOSUB 450:POSITION 10,6:? "Start or
    Continue? ";:GOSUB 500:? CHR$(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
WM 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$)
BU 210 POSITION 22,X+2:? BYTE;"  "
YZ 220 BF(X)=BYTE:CHKSUM=CHKSUM+BYTE*X:IF
    CHKSUM>9999 THEN CHKSUM=CHKSUM-10000
MS 230 NEXT X:CHKSUM=CHKSUM+LINE:IF CHKSU
   M>9999 THEN CHKSUM=CHKSUM-10000
IG 240 POSITION 12,X+2:POKE 752,0:? "CHEC
   KSUM: ";:L1=4:GOSUB 310
EW 250 IF EDIT AND L=0 THEN 270
QM 260 C=VAL(N$)
5Y 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
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
```

gular hole for the tab and two small screw holes.

I used a miniature on/off toggle switch, which can be mounted on the front panel by drilling a hole through the Atari logo directly above the LEDs. A ⅛-inch diameter hole is large enough for most miniature toggle switches.

The heat generated by the drill bit may cause the Atari logo to come loose, since it's on a small piece of aluminum that is glued in place; however, it can be put back on and held in place by the switch's holding nut. This location is much more convenient than on the side, top, or back.

Persons who open up their drive to make this modification may run into another problem—not all Atari 810 drives are the same. One of the drives I modified uses a microswitch to detect the presence of the write-protect notch, instead of the light source and detector.

Drives of this type have only two wires connected to the side board, not five, as in the other model drives. After you mount the toggle switch, the wires can be routed between the side board and drive mechanism.

Charles A. Cole
Sierra Vista, AZ

Helper help.

In his article **Function Key Helper** in the July issue of **ANALOG Computing**'s **ST-Log**, Matthew Ratcliff described the "annoying" way the screen flips between output and command screens when using the a$=input$(1) command.

If you run the BASIC program while the edit window is open, the windows don't open and close, and a key is grabbed instantly. I run all my programs from the edit window now.

You can use the mouse to run from the drop-down menu, or just type *RUN* on any empty line (as in no line number) in the edit window and hit RETURN. When you stop the program, it returns to the edit window.

Sincerely,
Gordon Billingsley
Murphysboro, IL

More on the 256K XL RAM upgrade.

I would like to clear up a couple of points made in the review of the Newell Industries 256K memory upgrade for the Atari computers (issue 44). Although it was not known to you at the time of the review, instructions for installing the memory upgrade in the 1200XL are now included (by popular demand).

You mistakenly had the price as $28.00. The prices are $39.95 without RAM, and $69.96 with RAM. Both of these include MYDOS, which supports the extra memory and can be configured to a RAMdisk of up to 192K.

You mentioned that total cost to install the upgrade approaches $150.00. In fact, this figure is much less. At retail, the cost would be $69.95 plus $30.00 for installation, for a total of $99.95. Add $10.00 if you have the old ANTIC and want it replaced. If you look through the ads in **ANALOG Computing**, you can find it for less.

For those who do not have an 800XL, we sell the whole computer, with the upgrade installed, for $149.95.

I would also like to mention that the other upgrade reviewed *(ICD RAMBO XL)* does not support memory protection or ANTIC control, which you pointed out can cause compatibility problems. It also does not include the DOS to support it.

When you add the cost of $39.95 for the DOS and $49.95 for the kit without the RAM, it totals up to $89.90, as compared to $39.95 for the Newell upgrade—which has the additional support for the memory protection and ANTIC control, and comes with the DOS.

Thank you for the space to express my views.

Wes Newell
Newell Industries
Wylie, TX

Foreign subscriptions and BoulderDash for the 810.

I have been an avid reader of **ANALOG Computing** for the past three years. . .I would like to subscribe, if only you did not demand an eleven-dollar surcharge for foreign readers. . .You have to package the magazine whether its destination is inside the U.S. or abroad. Whatever your answer, it will not deter me from buying and enjoying **ANALOG Computing** for many years to come.

I have recently purchased **BoulderDash 2** on disk and found that it would not load properly most of the time in my 810 drive. I wrote to Databyte in London, and they told me that the duplicating house that they use could not cure the problem of loading on an 810, even though it worked all right on a 1050.

Databyte also told me that they were doing their own duplicating for the 810. They said it was proving successful, and that they would replace my disk. I mention this in case anybody else has had a problem, either in the U.K. or the States.

Yours faithfully,
Vaughan Pitman
South Humberside, U.K.

Thanks for all your comments. We did, in fact, realize that we were penalizing foreign readers and have changed our policy. Starting with issue 45's subscription cards, you'll see that our foreign rates are now flat fees, which include all charges. We hope that the drop in price will encourage U.K. and Continental readers to subscribe. —*Ed.*

Art for art's sake.

Without a doubt, **ANALOG Computing** publishes some of the highest quality software ever found in a magazine, but an often overlooked fact is that **ANALOG Computing** is also a showcase for an excellent artist—namely, Gary Lippincott.

His high quality, and sometimes bizarre, fantasy art is a heck of a lot better than the simple line-drawings found in other magazines. All of Mr. Lippincott's work is excellent, but the watercolor masterpieces included with the **Fire Bug** and **Adventurous Programming** articles are my personal favorites.

I was pleasantly surprised to find one of his drawings accompanying my **Electroids** program, as well. Let's give credit where credit is due. To both **ANALOG Computing** and Gary Lippincott—keep up the incredible work!

Sincerely,
James Hague
Richardson, TX

Gary Lippincott lives and works in Spencer, Massachusetts, a quiet country town where his fantasies take shape. He studied at Maryland Institute College of Art as a painting major.

He's been using his talents with watercolors and other media professionally for eleven years now. For the past year and a half, he's been busy working on textbook illustrations for grade school materials. His ***ANALOG Computing*** *work lets him live out the fairy tales he imagines—for all of us. He also does commissioned works for many varied individuals—Ed McMahon, for one.*

You can see his works at the Boskone science fiction convention every year.

More Action!, please.

ANALOG Computing is one of the highlights of my computing reading, and I look forward to receiving the magazine each month.

This month (issue 44), your article **D:CHECK in Action!** is a special treat. First, it will surely make typing in the Action! coding a great deal more fun, with less chance of error. Second, I hope that inclusion of this program means we'll see more space devoted to Action! articles and programs in the future.

My conversion to Action! has been slow and, at times, a bit painful, mentally. I realize that the number of people programming in Action! is quite small when compared to those programming in BASIC, but I would appreciate your consideration of either some strong, comprehensive tutorials, or some suggestions as to where one might find additional hard copy on Action! programming.

I should also like to encourage you to provide more tutorials on programming. Some of your readers, if they're like me,

depend on your magazine as an educational tool. Most of what I've learned about programming (BASIC, Logo, Action!) has been gleaned from the popular publications that have supported Atari computers.

Computers are not required in my profession, they provide no financial rewards for me, but they are my escape from the world during the evening hours, providing me with peace of mind.

Thank you for publishing your fine magazine. Please consider my request for more tutorials, especially in Action!

Sincerely,
Donald Sexauer
Greenville, NC

We try. You might check out our Special Issue, due out this fall. A separate publication for 8-bit users, it will give you quite a few Action! programs. —Ed.

Help keep the 8-bits strong.

I have been the faithful owner of an 800 for four years, and was sincerely looking forward to many more years, until recently. The death of new software for the 8-bits has me worried.

I use my 800 for games, word processing and some database work for my job. Many of the best new programs came out only for the Commodore 64 and Apple.

I especially refer to The Newsroom by Springboard. They apparently have no intention of publishing this for our computers. I could really use it as an effective sales tool in my business. I urge all your readers to write Springboard (7808 Creekridge Circle, Minnapolis, MN 55435)—and other software houses not bringing out their best programs for Atari. Ask them to reconsider, or we'll all be buying new, non-Atari computers. The peripherals we buy won't be Atari's, and the magazine won't be **ANALOG Computing**. That would be a sad epitaph for the best home computers ever made.

Sincerely,
Joseph H. Bode
Jupiter, FL

At the risk of repeating ourselves again, we urge our readers to do something about piracy—it is what's killing the 8-bit software industry. Please take a look at Matt Ratcliff's report on the June CES (on page 127). We hope you'll see the seriousness of this issue.

Please do write to software developers. But remember, they won't publish programs they can't sell. —Ed.

Atari excitement.

Okay, people, I think it's about time someone wrote who defends **ANALOG Computing**'s opinion about Atari computing! Except for **Mr. Scratch** (issue 41's **ST-Log**), which disturbed me because of my religion, I have found **ANALOG Computing** to be one of the "big three" magazines I currently buy, along with *Antic* and *COMPUTE!*.

I'm sorry Mr. Mosher, but I live, eat and breathe Atari. In fact, only God ranks higher in my life. And to those griping about "gee, you're abandoning us 8-bitters," I have something to say. Hey, people, I own a 600XL and a 130XE. I love them both. And soon I will have a 520ST.

The people at *Antic* and **ANALOG Computing** have been using Atari 8-bits for years, so no wonder they're ready for reliving Atari excitement. You all know the excitement of having a brand-new computer for the first time.

I totally agree with the attitude the magazines have: "still support the 8-bits, but enlarge ST support." I'm sorry, Mr. Mosher, but I agree on letting people know about Atari computers in a positive way when I have the chance.

Also, Atari isn't stupid. Jack Tramiel's move to put the 520ST in Toys 'R' Us, Sears and K-Mart is a smart idea.

As for piracy. . .I have to admit I own some (pirated programs). When I first got my 130XE, I didn't realize how badly we users could hurt the industry. We have to totally reject piracy, or it will spell the end of the Atari.

One last thing: EOA is planning to market **Marble Madness** for the STs, right? Please confirm this.

Sincerely,
Terry Miller
Allen, TX

*In the words of a wine-cooler company, "Thank you for your support." As for **Marble Madness**, EOA does have plans to get it out. . .when and for how much is uncertain at press time. —Ed.*

Home Inventory fix.

The following lines should be added to the **Home Inventory** program listing from our issue 43.

```
4880 GRAPHICS K0:POKE K710
,K4:POKE K709,K255:POKE K1
6,K64:POKE K53774,K64:POKE
 K752,K1:X=K0:I1=K0
4890 POSITION K13,K19:? "R
eading File"
4900 FILE1$="D:INV.DAT":FI
LE2$="D:INV.TMP":CLOSE #K1
:CLOSE #K2:OPEN #K1,K4,K0,
FILE1$:OPEN #K2,K8,K0,FILE
2$
4910 INPUT #K1,DE5C$,DATE$
,ID$,COST
4920 IF DATE$="XXXXXX" THE
N 5000
4930 COST$=STR$(COST)
4940 IF LEN(COST$)<K10 THE
N COST$(LEN(COST$)+K1)=" "
:GOTO 4940
4950 REC$(K1,K20)=DE5C$:RE
C$(K21,26)=DATE$:REC$(27,4
1)=ID$:REC$(42,51)=COST$
```

(continued on next page)

BASIC Editor II UPDATE

Yes, friends, you're absolutely correct. It is, of course, impossible to type in **BASIC Editor II** (issue 45) using the old **BASIC Editor** (issues 43 and 44). Don't bother to ask how these things happen—you wouldn't believe it, anyway.

You should use **Unicheck** (issue 39) to check your typing after entering **BASIC Editor II**. Checksums for the **BASIC Editor II** listings are given below.

CHECKSUMS FOR LISTING 1.

```
32600 DATA 6,665,923,757,8
09,171,225,898,532,499,910
,267,912,144,735,8453
32638 DATA 97,358,230,693,
706,878,317,127,36,597,238
,258,182,430,168,5315
32668 DATA 864,953,472,385
,887,724,72,687,908,736,62
5,612,672,184,891,9672
32698 DATA 8,856,85,949
```

Add *:GOTO 60* to the end of Line 40 of Listing 2.

CHECKSUMS FOR LISTING 2.

```
10 DATA 203,265,465,844,29
4,973,652,270,978,797,278,
275,835,209,301,7639
160 DATA 355,94,254,420,93
5,840,580,419,974,564,5435
```

We hope to publish the full, corrected version in our next issue, for your convenience. Sorry about that.

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CIRCLE #105 ON READER SERVICE CARD

```
4960 I1=I1+K1
4970 X1=X1+K1
4980 ALL$(I1*51-50,I1*51)=
REC$
4990 GOTO 4910
5000 PRINT "K":GOSUB 5710:
GOSUB 5690
5010 KX=64:GOSUB 2770:GOSU
B 3380
5020 POKE 708,196:POSITION
 K5,K2:? "
      SORT"
5030 I1=I1+K1:ALL$(I1*51-5
0,I1*51)=PAD$
```

Double density demanded.

I've been subscribing to **ANALOG Computing** since issue 13 and have always been impressed with the quality of your programs. However, I have some complaints about type-in utilities, specifically **Load*It** and **Formatter** from issue 39.

I spent approximately three hours typing in these two programs, only to find they don't suit my needs. For instance, the object file loader portion of **Load*It** will *only* work with DOS 2.0. The **Load*It** article did not stress strongly enough that the program makes a call to a portion of RAM where DOS 2.0 is *assumed* to be. The **Formatter** FMT.COM file was supposedly written for DOS XL, a double-density DOS. The file will not perform any of its functions in double-density format.

It has been an unfortunate practice of many software authors to assume that all persons taking the time to type in the program would be using the antiquated DOS 2.0 or the slightly upgraded DOS 2.5, neither of which directly support double density. There are many subscribers who own third-party drives or modified 1050 drives that support double density, and we are tired of spending time typing in programs that aren't compatible with our favorite hardware and software.

I am of the opinion that additional testing should be done on type-in utility programs. I would like to see tests under at least three entirely different versions of DOS and all possible density configurations. This may not always be possible, but I think the very least you could do would be to print the type of DOS utility was written for and the density configurations it was tested under.

In summary, please do not assume that all Atari owners own an 810 or unmodified 1050 drive, and use only DOS 2.0 or 2.5. And *please* put the term "double density" in your vocabulary. There are thousands of readers and subscribers who would appreciate it.

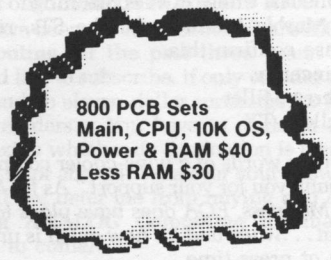
Sincerely,
Kelly K. McMillin
Oceanside, CA

P.S.: I was able to get **Load*It** to work in double density in DOS 2.0, by writing DOS 2.0 to a disk formatted for double density. I believe that two drives are required to accomplish this feat. The DUP.SYS for DOS 2.0 will also work this way. Pretty neat, huh?

An omission.

ANALOG Computing inadvertently omitted mentioning that some of the program routines in the **Calendar Printer** by David Plotkin (issue 43) were first published by Allen Macroware. We apologize to Allen Macroware for any confusion.

Reader Comment
P.O. Box 23, Worcester, MA 01603



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CIRCLE #104 ON READER SERVICE CARD

Counting without fingers

A fractured history of digital computers

by Paul R. Robinson

It all began with fingers and toes. With their digits, cavepeople counted the bison trampling their crops, the rapacious pillagers waiting in line outside their caves, and the fang marks slashed across their backs by friendly neighborhood saber-toothed tigers.

The first computing device was the abacus, used by Oriental wise men to keep track of dynasties, and to count the heads lopped off by insatiable warlords hungry for conquest. To this day, an experienced abacus user can multiply faster than many electronic calculators—faster, even, than Silicon Valley girls at a Jordache sale.

Dull-witted Occidentals, in contrast, couldn't count past ten without taking their shoes off until 1642, when Blaise Pascal, lazy son of a French merchant, built an adding machine to figure his father's accounts.

Mathematician Gottfried Wilhelm Leibnitz was even lazier than Pascal. He dawdled for twenty-three years—from 1671 to 1694—while building his calculator. And, while it could multiply, divide and take square roots, it was based upon binary, rather than decimal, arithmetic. Binary computers are especially useful to butchers, war protesters and other people with only two fingers.

Too lazy to build a calculator, George Boole instead wrote an 1859 treatise on symbolic logic. His ideas about gate switching provided the foundation for modern digital computing. They also became quite popular in affluent suburbs throughout America.

Herman Hollerith, American statistician, was perhaps the laziest man of all time. In 1886, he was *still* working on the 1880 census! To give himself even more time to waste, he invented an electrical device that read the holes punched in data cards. When the 1890 census rolled around, this machine helped Hollerith and his cohorts compile the results in less than one year.

By 1911, Hollerith had so much free time that he helped establish a company with the unlikely name: Computing Tabulating Recording Company. Typically, Hollerith tired of writing out this pompous appellation time after time, so he eventually changed it to International Business Machine—IBM for short.

Conceptually, Boole and Hollerith owed much to Charles Babbage, inventor of the cow catcher. Babbage described mechanical "analytical engines" as early as 1834, but he never managed to finish building one. Despite his indolence, people still credit Babbage with several important ideas, including feedback loops, the storage of numbers on punched cards, and conditional transfers. A conditional transfer is, of course, one which depends upon whether the boss's son wants the job.

It's remarkable that Babbage didn't even *think* of electronic microcomputers—or electronic mainframes, for that matter. His defenders excuse this blunder by pointing out that we didn't even have electric can openers back then. The fact remains that, in Babbage's time, electrical phenomena had been known for centuries.

Modern electronics began when 12th-century English merchants devised magnetic compasses to keep their ship captains from getting lost every time the fog rolled in.

Soon afterward the French crusader Petrus Peregrinus de Mariourt—who carried a compass with him—got lost anyway near Warsaw, while on his way from Madrid to Paris. During his aimless wanderings, he noticed that samples of naturally magnetic lodestone had two poles, a North Pole and a South Pole. The abundance of pole-possessing lodestones around Warsaw eventually gave the region its modern name—Poland.

Meanwhile, back in England in 1600, William Gilbert published *De Magnete Magneticisque Corporibus et de Magno Magnete Tellure*, a romance novel in which he coined the term "electric field." Inspired by Gilbert's racy prose, Steven Gray discovered electrical conductors in 1729.

Back across the Channel, Charles Francois de Cisternay Dufay, gardener for the King of France, announced the existence of "attractive" and "repulsive" electrical forces, after long years of observing the King's various concubines.

Benjamin Franklin was one of the luckiest of early key experimenters with electricity. He was also one of the stupidest. After seeing (no doubt several times) how lightning bolts scorched trees, tall buildings and unprotected livestock, he sallied forth to fly a kite in the midst of a ferocious thunderstorm. Franklin's 1752 adventure confirmed that lightning is electrical in nature. It also set an example that leads to the electrocution of luckless imitators every year.

In 1767, English chemist Joseph Priestly found that an electrostatic charge obeys an inverse square law: by doubling the distance between himself and Benjamin Franklin, he quadrupled his chances of staying alive.

Italian scientists finally learned about electricity in 1791. In that year, Luigi Galvani, anatomy professor from Bologna, wrote his most famous harlequin thriller, *De Viribus Electricitatus in Motu Musculari Commentarius*, in which he confessed to getting his kicks by making frog legs twitch with electrical sparks. (Twenty-seven years later this same theme made big bucks for Mary Wollstonecraft Shelley, author of *Frankenstein*.)

In 1800, Count Alessandro Giuseppe Antonio Anastasio Volta constructed his voltaic pile, the first useful battery. He used it to give even bigger shocks to frogs and other unfortunate small creatures.

Theoretical advances came from Andre-Marie Ampere, who showed in 1825 that electricity and magnetism could relate; and by Georg Ohm's irresistible wife, who on their wedding night coined the phrase, "Ohm, my!"

Michael Faraday, yet another Englishman, demonstrated the first electric motor in 1831. It operated on the Principle of Magnetic Induction, a concept somewhat related to Interest on a Tax Deduction.

When the Germans got into the act, things really started to roll. Wilhelm Eduard Weber, Rudolf Kohlrausch and Gustav Kirchhoff (who was really an American) showed in the 1850s that electricity and magnetism can relate not only to each other, but to light as well.

The English got the final say on this matter when James Clerk Maxwell (who was really a Scot) published equations which described this *ménage à trois* mathematically, and proved that coffee brewed in his house was good to the last drop. Maxwell's work completed classical electromagnetic theory.

Subsequent experiments with subatomic particles shed new light on electromagnetism. Sir Joseph John Thomson and Sir John Sealy Edward Townsend discovered electrons in 1896-1898. And, in 1911, Robert Andrews Millikan measured the charge on electrons with his famous "oil drop" experiment. Recently, you'll recall, ARCO emulated Millikan by dropping its gasoline charge cards, and the Arabs of OPEC dropped what they charge for whole barrels of oil.

In 1900, Max Planck excited the Catholic Church by proving that light had mass. In 1909, Hendrik Antoon Lorentz rewrote Maxwell's equations in nonclassical terms, leaving out the part about the coffee. Now the theoretical stages—both classical and pop—were set for the impending Age of Computers.

So what? What good is theory if you can't sell it? Leave it to the Americans to ask that. They scoffed at Faraday, who started building electric motors in 1822, but never sold a single one of them. They scoffed at Volta, too. He told the world about his piles in 1800, but it wasn't until 1836, when Daniell built the Daniell cell, that batteries went commercial. So, short on theory, perhaps, but long on greed, Americans proceeded to invent (and sell) the following electrical gadgets:

Telephone	A.G. Bell,	1876
Phonograph	T.A. Edison,	1877
Microphone	T.A. Edison,	1877
Switchboard	E.T. Holmes, at home,	1877
Light bulb	T.A. Edison,	1878-9
Electric flat iron	H.W. Seely,	1882
Dictating machine	C.S. Taintor,	1885
Transformer	W. Stanley,	1885
Gramophone	E. Berliner,	1887
AC motor	N. Tesla,	1888
Electric stove	W.S. Hadaway, Jr.,	1896
Mercury vapor lamp	P.C. "G-Spot" Hewitt,	1901
Radiotelephone	R.A. Fessenden,	1902
Triode	L. De Forest,	1906
Vacuum cleaner	J.M. Spangler,	1907
Automatic toaster	C. Strite,	1928
Electric shaver	J. Shick,	1928
FM radio	E.H. Armstrong,	1933
LP records	P.C. Goldmark,	1948
And, of course,		
The zipper	W.L. Judson,	1893

By the mid-1930s, there existed both a theoretical basis and a compelling need for computers—the need for rich American inventors to keep track of all their money.

During World War II, Harvard's Howard Aiken and Hollerith's IBM succeeded where Charles Babbage failed. They constructed the Harvard Mark I computer. Fifty feet square and eight feet high, it was somewhat larger than today's wristwatch calculators.

J. Presper Eckert and John W. Mauchley completed what some sources say was the first all-electric computer in 1946 at University of Pennsylvania. They named their beast the Electronic Numerical Integrator and Calculator. But their greatest contribution came when they shortened the name to ENIAC, thereby inventing the acronym. Without acronyms, the computer industry as we know it today could not exist.

Eckert and Mauchly then helped build UNIVAC I, the computer that rendered voting obsolete by correctly predicting Eisenhower's victory over Stevenson in 1952.

But in 1945, long before UNIVAC, a significant event occurred in (of all places) New Jersey: Bell Telephone Laboratories hired a physicist named John Bardeen to study semiconductors. At Bell Labs, scientists would sit and think—left leg crossed over right, right elbow on left knee, right hand stroking beard. They'd thought about semiconductors for years, to no avail. But Bardeen thought differently—right leg crossed over left, left elbow on right knee, left hand dangling off to one side. This new way of thinking led him to invent the transistor in 1947, for which he shared the 1956 Nobel Prize in physics with Walter H. Brattain and William B. Shockley. (Bardeen has won only one Nobel since. He shared the 1972 Prize for a theory of superconductors, through which—in contrast to semiconductors—electrons flow like quarters through a video arcade.)

The first transistor gave birth to solid-state electronics. Transistors began replacing vacuum tubes in 1950 when Shockley unveiled the "p-n-p" junction transistor.

Bell Labs built early transistors from germanium, a relatively rare element. In 1954, Gordon Teal and his group at Texas Instruments made the first silicon-based junction transistor. Since silicon is cheaper and more durable than germanium, this innovation greatly enhanced the practicality of solid state electronics.

Five years later, Jack Kilby of TI filed for a patent on integrated circuits, in which transistors and other electrical components of all races, colors and creeds live together in harmony on a single silicon chip. That same year, Robert Norton Noyce of Fairchild Semiconductor filed for a similar patent. To this day, historians are still trying to decide who was really the first to file. Meanwhile, both companies continue to make millions from integrated circuits.

Noyce, with Gordon Moore and Andrew Grove, established Intel Corporation in 1968. And, by inventing the RAM chip and the microprocessor in 1970, Intel gave birth to pocket calculators, digital watches and **Donkey Kong**. The rest will be history.

From fingers and toes to microchips, people from many cultures contributed to the Computer Revolution now sweeping the world. This revolution daily changes the way we play, the way we work and the way we make war. These people were motivated by laziness, sadism, stupidity and greed. It's a tribute to the American way of life—as practiced by the Japanese—that, in the end, greed triumphed over all.

Paul R. Robinson, with a Ph.D. in Chemistry, has served as an Assistant Professor of Chemistry at the University of Illinois, Champaign-Urbana; as a staff scientist at Oak Ridge National Laboratory; and as a research chemist for Unocal Corporation (formerly Union Oil Company of California). In the past two years, he has earned almost $40 as a free-lance writer.

An earlier version of this "history" was published in the February Chemtech.

Database Delphi

News and updates about the *ANALOG Computing* Atari Users' Group on Delphi

by Matthew J.W. Ratcliff

Welcome to **Database Delphi**. This is where you'll be hearing the latest from the world of telecommunications. **ANALOG Computing** (as most of you already know) has moved its TCS to Delphi, where it's known as the Atari Users' Group.

Delphi's an on-line information service similar to CompuServe, but has much lower rates—and no surcharge for 1200 or 2400 baud.

Most people will be able to connect via Uninet or Tymnet—a local call in most large cities. The hourly rates for Delphi are higher than they were for **ANALOG Computing**'s TCS, but I'm sure that your phone company was hitting you up for more money in long distance fees.

What's in store.

Once into Delphi, just enter *GROUP ATARI* to get into our SIG (Special Interest Group). Your next menu will be the main control center.

You may look at Announcements on various topics, posted by SYSOPs (System Operators) and other users. You may get into the Member Directory to post information about yourself, or find data on others with similar interests. Or, in Conference, you can page other members who are on-line at the same time and have a meeting of two or more. It's like having a "typo-phone" connection with people who share your interests—a great way to make new friends.

You may enter the Poll section to read or participate in on-line surveys. We'll update this with new questions and topics of interest regularly. Poll results will be summarized here and used to improve the features of the SIG and of **ANALOG Computing**. You may even create your own polls.

Databases offer many different programs and information files for your downloading pleasure. Programs and documentation on the current issue will be available, along with information about upcoming issues, classic XE and ST programs, graphics, **DEGAS** pictures, and much more. You'll even have your own workspace—on-line disk storage space for your personal use.

A Shopping Service is reserved and will probably be made available for renewing subscriptions, purchasing back issues of **ANALOG Computing** magazines and disks, and more.

Delphi Mail is your electronic postal service, for sending and receiving private messages, to and from others on the system. Whenever you log in, you're alerted to any pending mail.

Topics Available gives you a list of the subjects you can expect to see in different areas of the SIG. You can use the Entry Log to find when your friends were on last, or you can check to see Who's On right now, for possible conferencing.

The Forum is where most of the action is. You can participate in ongoing discussions about Atari computers and software. For programming problems, you'll find help from experts. An almost direct line to **ANALOG Computing** editors and some Atari notables (like Neil Harris of Atari Corp.) is available through the Forum and Mail, so you can take your questions and ideas "right to the top."

The Set Defaults function is used to tell the Delphi computer system how to talk to your particular computer, modem and terminal software combination.

Nosy polls.

LP1 (a user on Delphi) wants to know the name of your favorite terminal software.

Of almost 100 responses, there were three clear winners. AMODEM 7.1 (and variations on that theme) was the most popular, at 28%. There was no room in the selection list for AMODEM 7.2. It was preferred for its autodial capabilities, superior to most any other terminal software. At 27%, the runner up was "Your Own." Many users prefer to code their own terminal software to meet specific needs.

HomeTerm came in third, with 24% of the vote. Some complain that **HomeTerm** has too small a capture buffer, but others simply capture to RAM disk on their 130-XE. I like **HomeTerm** for its split-screen feature—great for conferencing on Delphi. There wasn't much mention of ST terminal software in the poll; we should probably run a separate one for that, in the future.

Another user, RAMBO, asks if we should not "consider both the ST and Amiga as progressive computers and quit bickering about which is best, so we can concentrate on the real 'enemies,' namely the lame IBM and Macintosh computers."

Well, most strongly agree, but I think the poll may have been a bit biased. The consensus is that we needn't consider any machine—or company—as an enemy. Let the price-to-performance ratio speak for itself (as did that of the 1040ST, in the March 1985 issue of *Byte*).

DGG wants to know what programming

language (if you have but one to choose from) you would most prefer in developing software for the ST. Almost 30% say Modula-2, with an even 14% split for OSS's Personal Pascal, Lattice C, and Megamax C. Only 9% would want to write in ST BASIC, and *no one* polled wants to develop software in ST Logo or Hippo C.

GEMIGENE asks us which printers are most popular among the SIG members. It's no surprise to see Epson at the top of the list, with a 42 percent share of the vote. Gemini follows, with 28 percent, and third is Okidata, at 10 percent.

One poll just started is a question about whether an ST SIG should break off from the Atari SIG. We'll leave this open for a while and give newcomers a chance to make their thoughts known.

I would think most 8-bit users would like to keep up with the ST world. And ST owners may still learn or derive ideas from those with 8-bit machines. I hope this doesn't become a rivalry (beyond a friendly one), to split the Atari SIG.

The most valid comment I've heard thus (which works both ways) far is, "I'm paying for connect time and am not interested in 8-bit stuff, or paying to scan through it looking for ST-specific material." The problem with having two separate SIGs is that it may spread the resources of **ANALOG Computing** editors (who do double duty as SYSOPs) a bit thin, adversely affecting overall support of all members.

SYSOP connections.

If you'd like to leave comments or suggestions to editors of **ANALOG Computing** or SYSOPs, you can send us EMAIL on Delphi. I'd welcome any ideas for polls, improvements to the SIG's features, or topics of discussion for the On-line Conferences we'll be holding in the future.

Our first will probably be On-line with **ANALOG Computing**, where you can chat with any of the editorial staff.

You can send mail to me by addressing it to MATRAT—what else? The main SYSOP, Charles Bachand, can be contacted via ANALOG2, and our prolific Clayton Walnum is ANALOG4. Art Leyenberger is username NJANALOG.

If you see us in the Who's On list, feel free to give us a Page. We'll be glad to chat with you if we aren't too busy.

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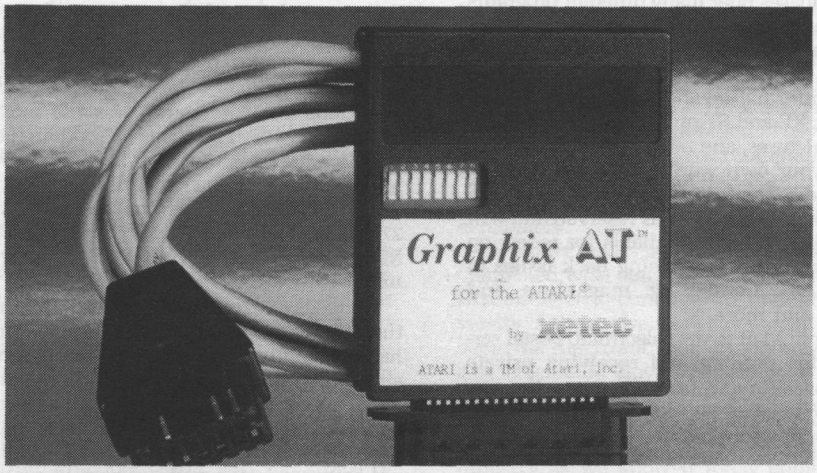

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CIRCLE #106 ON READER SERVICE CARD

Magic Spell

Now you can create your own, specialized spelling checker in 32 or 48K of memory

by Angelo Giambra

Magic Spell is a machine language program to locate spelling errors in documents produced by word processors (such as **AtariWriter**), which allows you to make immediate corrections. It can process files created by any word processor, provided they're in standard Atari 2.0S DOS format.

The design philosophy behind **Magic Spell** is unlike that of other speller programs. The average person's working vocabulary is only several thousand words. **Magic Spell** capitalizes on this fact. Instead of a huge dictionary containing words you'll probably never use, **Magic Spell** lets you customize a dictionary to fit your personal needs. When the program begins, the entire dictionary is loaded into memory. Since **Magic Spell** doesn't have to access the disk to look up words, the checking is incredibly fast.

With 48K, **Magic Spell** can fit up to 6,500 words in memory; with 32K, about 3,900 words. As you continue to use the program, you'll discover that it will mold itself to your needs.

Keying in Magic Spell.

Listing 1 is the BASIC data used to create your copy of **Magic Spell**. Please refer to **M/L Editor** on page 7 for typing instructions. You should call the file SPELLER. Listing 2 should also be typed with **M/L Editor**, under the name SPMAINT.

To run the program, remove all cartridges and boot your system from the disk containing the SPELLER file. When the DOS menu appears, use the L option to load the file. Press *L*, then RETURN.

The system will ask *LOAD FROM WHAT FILE?* Key in *SPELLER* and hit RETURN. **Magic Spell** will load and begin executing.

To load the SPMAINT program, use DOS's L option as above. When the system asks *LOAD FROM WHAT FILE?*, key in *SPMAINT* and RETURN.

Instructions.

After **Magic Spell** loads into your computer, a title screen will appear, displaying the program name. Press the START key to begin your spell-checking session. The first time you use the **Magic Spell**, there'll be no dictionary on your disk. When the program discovers this, it will create a new dictionary of twenty-six words in memory.

When a dictionary exists on the disk, the message *LOADING DICTIONARY* displays. Later, you'll see that it's possible to have many dictionaries, on different disks. Any disk containing a dictionary will be referred to as a "dictionary disk."

When **Magic Spell** finishes loading the dictionary, it displays a message to show how many words there are in that dictionary. You then see the prompt *ENTER FILENAME*. If you have only one disk drive, remove the dictionary disk and insert the disk containing the document whose spelling you wish to check. If you have two drives, insert the disk with the document in the drive designated as drive 2. ***Do not remove the dictionary disk from drive 1.***

The document file must be in standard Atari 2.0S DOS format. Most word processors produce such files. At this writing, the only ones I know of which **Magic Spell** can't process are those from the **Letter Perfect** word processor, by LJK Enterprises.

Key in the document name (including the file extension, if applicable) and press RETURN. Filenames can be entered in several ways. Here are some examples.

```
SAMPLE 1          (Defaults to Drive 1)
D:SAMPLE          (Defaults to Drive 1)
D1:SAMPLE.DOC
D2:SAMPLE
```

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Magic Spell *continued*

If **Magic Spell** can't find the named file on the disk, it displays the message *FILE NOT ON DISK*. If this happens, key in the correct filename, or check to ensure that you've inserted the correct disk.

Magic Spell then begins to read the document and check the words for correct spelling. As it does, it displays the current word count on the screen. This count is approximate and increments by 5s. Only when **Magic Spell** completely finishes checking the document does it give you the exact number of words found within.

When the program encounters a word not in its dictionary, a message like the following is displayed on-screen: *NO MATCH: meticulus*. The word displayed, of course, is the one **Magic Spell** couldn't find.

In addition, a 36-character context line appears at the bottom of the screen, to show you the context in which the word was used. **Magic Spell** now positions the cursor directly below the word and waits for a response from you.

There are two possibilities at this point: (1) the word's correct, but isn't included in this **Magic Spell** dictionary; or (2) the word's incorrectly spelled.

If the first is the case (the word's correct, but not in the dictionary), just hit RETURN at this point. **Magic Spell** will display the message *ADD WORD TO DICTIONARY?*

To insert the word in the dictionary, key in a *Y* and press RETURN. If you don't wish to add this word, merely press RETURN. **Magic Spell** always interprets RETURN as a *no*. That way, it's almost impossible to accidentally add a word to your dictionary.

In the second instance (where the word *was* incorrectly spelled), type in the correct spelling. **Magic Spell** will replace the incorrect word with the one you've keyed in, so enter it exactly as you wish it to appear.

Magic Spell places the keyboard in lowercase mode at this point. If you want capitals, use the SHIFT CAPS-LOWR key. Remember, make sure the word you key in is spelled correctly. If it's shorter or longer than the word it's replacing, **Magic Spell** will adjust your document accordingly.

Keep in mind that the first few times you use **Magic Spell**, it will stop frequently on words—the dictionary's small. But you'll be surprised how quickly it builds up. Soon, **Magic Spell**'s dictionary will reflect your personal writing style, and the program will become extremely effective in spotting misspelled words.

Be very careful when adding words to a dictionary. **Magic Spell** is only as precise as its dictionary. If you insert words incorrectly, **Magic Spell** can no longer be relied on to keep your documents literate.

After you key in a correct word and RETURN, **Magic Spell** checks to see if the word's already in its dictionary. If it is, spell checking resumes. If not, **Magic Spell** displays the message *ADD WORD TO DICTIONARY?* Key in the letter *Y* and press RETURN to add the new word. Otherwise, just press RETURN.

When **Magic Spell** finishes checking the document, the final exact word count displays on-screen. Then you'll see *ANOTHER FILE? Y/N*. If you wish to look over another document, hit *Y* and RETURN. In this way, multiple files can be checked during one session.

If you're finished (*N*), replace the dictionary disk in drive 1 and press RETURN. If you didn't update the dictionary, **Magic Spell** returns you to the DOS menu.

When you're using only one drive and have updated the dictionary, **Magic Spell** will ask you to *INSERT DICTIONARY DISK PLEASE THEN PRESS RETURN*. Once you've done so, the program writes out a new copy of the dictionary to the disk.

If you're using two disk drives, **Magic Spell** doesn't display the above prompt. Instead, it immediately writes the update to the dictionary disk in drive 1.

When **Magic Spell** finishes, there'll be two copies of the original document on your disk. Let's assume your word processing document was called LETTER.DOC. After processing, you'll find the files LETTER.DOC and LETTER.BAK on your diskette. LETTER.DOC is the updated version with corrected words. LETTER.BAK is your original.

If, for some reason, you decide to return to the original and discard the corrected document, simply delete LETTER.DOC, then change the name of LETTER.BAK to LETTER.DOC. Both functions can be performed using the DOS menu.

Note: **Magic Spell** opens a temporary file, DOCUMENT.TMP, on your disk during the spell-checking session. Your entire document's rewritten to this file. When **Magic Spell** ends, it changes your filename to <filename>.BAK, then changes DOCUMENT.TMP to the original filename.

Because of this, there must be at least as many free sectors on your disk as there are in your document. If not, **Magic Spell** will abort, with the message *DISK FULL ABORTING*. In addition, the source document must not be locked, since **Magic Spell** changes its name. If it's locked, **Magic Spell** aborts with *FILE LOCKED ABORTING*.

Creating a new dictionary.

You may decide to build several custom dictionaries with specialized words, such as medical or computer terms. This is easy with **Magic Spell**.

When you press START to begin a spell-checking session, **Magic Spell** looks for the file WORDS on the disk in drive 1. If it finds this file, it loads the dictionary into memory.

If can't find the file, it creates a brand new dictionary in memory. This new dictionary contains only twenty-six words, each beginning with a different letter of the alphabet.

To create a new dictionary, follow this procedure.

(1) Prepare a blank disk, by formatting it with option I of the DOS menu. Use option H to write the DOS files to this disk. Next, remove the disk from the drive and label it *Custom Dictionary*.

(2) Load the **Magic Spell** program in the usual manner.

(3) Remove the **Magic Spell** disk and insert the blank, formatted disk from step 1.

(4) Press START. **Magic Spell** will create a new dictionary in memory. The disk in drive 1 now becomes your dictionary disk.

(5) Remove the "custom dictionary" disk and insert the disk containing your document. Proceed as you normally would from this point.

After you finish checking your document for spelling errors, be sure the drive 1 disk is your new custom dictionary disk.

SPMAINT instructions.

SPMAINT is a maintenance program, designed to let you view and delete words from the dictionary. You may see all the words, or selected portions of the dictionary.

SPMAINT is loaded in much the same way as **Magic Spell**. Use the L (binary load) option from the DOS menu. When prompted to *LOAD FROM WHAT FILE?*, key in *SPMAINT* and press RETURN. SPMAINT will load into memory and begin execution.

After it's loaded, the program displays *PRESS START* on-screen. Insert your dictionary disk in drive 1 and hit START. You'll see the message *LOADING DICTIONARY.*

Once the dictionary's been loaded into memory, a menu screen appears. It contains: (1) List Dictionary; (2) Delete Word; (3) Free Memory; and (4) End.

Listing the dictionary.

To list words in the dictionary, choose option 1, by keying in the number *1* and pressing RETURN. SPMAINT displays *LOW LIMIT.*

Key in the word (or portion of a word) where you wish to begin listing words. For instance, to view all words beginning with AL, key in *AL* and RETURN.

Now SPMAINT will display *HIGH LIMIT.* Key in the upper limit. If you want SPMAINT to stop at words beginning with BA, key in *BA* and press RETURN.

SPMAINT will then give the message *PRESS ANY KEY TO START AND STOP LISTING, PRESS X TO CANCEL LISTING, PRESS RETURN WHEN READY.* When you RETURN, SPMAINT can begin to list the words in the ranges specified, in alphabetical order.

You may stop the screen from scrolling by pressing any key. Pressing any key again restarts scrolling. If, however, you wish to abort the listing, press *X*.

When SPMAINT finishes listing the words you wanted, it displays *PRESS RETURN WHEN READY.* Hit RETURN to go back to the main menu.

To view all the words in the dictionary, don't give a lower or upper limit. Press RETURN at these prompts. Here are some other examples:

List all words beginning with *B*.

```
LOW LIMIT = B
HIGH LIMIT = C
```

List all words in the dictionary, starting with words beginning with *MAR*.

```
LOW LIMIT = MAR
HIGH LIMIT = <press RETURN>
```

List all words from beginning of dictionary up to words that start with *GH*.

```
LOW LIMIT = <press RETURN>
HIGH LIMIT = GH.
```

Because of the method **Magic Spell** uses to efficiently utilize memory, all words will be in alphabetical order, except for the pronoun *I*, which will be treated as if it were spelled *II*. This isn't an error; it's just due to the way the dictionary's maintained by the programs.

Deleting words.

To delete words from the dictionary, key in option *2* and press RETURN. SPMAINT will display *ENTER WORD TO DELETE.* Do so, remembering that you must spell the word exactly as it appears in the dictionary. If it's misspelled in the dictionary, you must misspell it the same way.

SPMAINT will then scan the dictionary for the word. If it can't be found, SPMAINT displays this message: *WORD NOT IN DICTIONARY. PRESS RETURN WHEN READY.*

If this happens, hit RETURN. SPMAINT will take you to the menu again. Choose option 1 to list the dictionary. Perhaps you spelled the word wrong.

If SPMAINT locates the word you're deleting, it displays *WORD DELETED.* Press RETURN to go back to the menu screen.

Free memory.

This option allows you to see how much RAM is still available. You can then calculate how many more words will fit into memory, before exceeding your computer's capacity. Divide the RAM amount by *6* to get an approximate count of the number of words which may be added. For instance, if there are 12,000 characters of free memory available, you can get approximately 2,000 more words in your dictionary.

Ending SPMAINT.

To end your maintenance session, choose option 4 by typing *4* and pressing RETURN. If you haven't updated the dictionary, you'll immediately return to the DOS menu. If you deleted any words, SPMAINT writes the dictionary to disk, then returns you to the DOS menu.

Helpful hints.

If you write a lot of letters to friends, it's a good idea to add their names to the dictionary, to prevent **Magic Spell** from thinking they're spelling errors. You can add names of places or streets, too.

Magic Spell recognizes hyphenated words and possessives, such as *butler's*. You can add these to your dictionary, if you wish.

Sometimes you may run two words together in your document—*soonafter.* **Magic Spell** thinks this is one word and stops on it. Key in the correction: *soon after.* Your document will be corrected. When **Magic Spell** asks *ADD WORD TO DICTIONARY?*, make sure your response is *not* a *Y*. You'd be adding two words at once, which is a no-no.

When deleting words from the dictionary with SPMAINT, you may accidentally take out the wrong one. If this happens, you may abort the maintenance session by pressing SYSTEM RESET. You'll return immediately to the DOS menu, without having updated the dictionary.

Remember, **Magic Spell** and SPMAINT work with a copy of the dictionary in memory. The actual file isn't updated until the dictionary gets rewritten to disk.

Magic Spell *continued*

Table 1.

MAGIC SPELL ERROR MESSAGES

FILE NOT ON DISK — The requested file does not exist.

DISK FULL. ABORTING — There isn't enough room on the disk to write out the temporary file.

FILE LOCKED. ABORTING — Source document is locked; **Magic Spell** is aborting.

MEMORY FULL. CANNOT ADD WORD — There's no more room left to add words to the dictionary.

SPMAINT ERROR MESSAGES

WORD NOT IN DICTIONARY — SPMAINT could not find the word in the dictionary.

FILE NOT ON DISK. ABORTING — SPMAINT could not find the dictionary on the disk.

Final note.

Your dictionary is valuable. Always keep a backup copy. You don't want to lose it after building it up to 6,500 words.

Magic Spell can be a great aid if you create a lot of documents. You'll never again have to pore over each and every word, looking for misspellings. I hope you find it efficacious.

Angelo Giambra's been in data processing for eight years. He's been an avid Atari hobbyist since buying his computer three years ago. An incessant tinkerer, he enjoys writing machine language utilities and extensions to the OS and DOS.

Listing 1.

```
1000 DATA 255,255,139,0,205,0,68,79,67
,85,77,69,78,84,46,84,1667
1010 DATA 77,80,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,1247
1020 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,1020
1030 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,1030
1040 DATA 0,0,0,0,0,0,0,0,0,207,0,209,
0,1,0,0,5632
1050 DATA 253,3,32,4,32,32,32,32,32,32
,32,32,32,32,32,32,5453
1060 DATA 32,32,32,32,32,32,32,32,32,3
2,32,32,32,32,32,32,5412
1070 DATA 32,32,32,32,32,32,32,32,32,27,5
,28,5,0,0,30,5,3413
1080 DATA 125,5,87,79,82,68,83,32,73,7
8,32,68,73,67,84,73,367
1090 DATA 79,78,65,82,89,58,32,32,32,3
2,32,155,73,78,83,69,331
1100 DATA 82,84,32,68,73,67,84,73,79,7
8,65,82,89,32,68,73,640
1110 DATA 83,75,32,80,76,69,65,83,69,3
2,32,32,155,87,79,82,1079
1120 DATA 68,83,32,82,69,65,68,58,32,4
8,32,32,32,32,32,32,6813
1130 DATA 65,78,79,84,72,69,82,32,70,7
3,76,69,63,32,89,47,9906
1140 DATA 78,32,0,6,99,6,32,32,32,32,3
2,32,32,32,32,32,5517
1150 DATA 32,32,32,32,32,32,32,32,32,3
2,32,32,32,32,32,32,5502
1160 DATA 32,32,32,32,32,32,32,32,32,3
2,155,84,72,69,78,32,9217
1170 DATA 80,82,69,83,83,32,82,69,84,8
5,82,78,32,32,32,32,8986
1180 DATA 32,85,80,68,65,84,73,78,71,3
2,68,73,67,84,73,79,847
1190 DATA 78,65,82,89,32,32,32,32,32,1
55,68,49,58,68,79,67,9969
1200 DATA 85,77,69,78,84,46,84,77,80,1
55,162,6,241,6,32,32,2191
1210 DATA 32,69,110,116,101,114,32,70,
105,108,101,32,78,97,109,101,3290
1220 DATA 32,32,32,155,155,127,32,32,3
2,32,32,32,78,79,32,77,9225
1230 DATA 65,84,67,72,58,32,29,65,100,
100,32,116,111,32,68,105,1392
1240 DATA 99,116,105,111,110,97,114,12
1,63,32,32,32,32,70,105,108,1550
1250 DATA 101,32,110,111,116,32,111,11
0,32,100,105,115,107,155,247,6,5803
1260 DATA 254,6,0,0,0,66,65,75,0,0,0,6
4,251,64,169,0,439
1270 DATA 133,130,133,129,133,135,169,
125,133,128,169,252,133,136,169,28,212
1280 DATA 133,137,169,146,133,131,169,
65,133,132,160,0,177,131,145,136,8695
1290 DATA 200,208,249,230,137,230,132,
165,137,201,43,144,239,240,237,162,594
0
1300 DATA 16,169,3,157,66,3,169,133,15
7,68,3,169,43,157,69,3,2880
1310 DATA 169,0,157,72,3,169,0,157,73,
3,169,12,157,74,3,169,3039
1320 DATA 0,157,75,3,32,86,228,165,16,
41,127,133,16,141,14,210,4762
1330 DATA 169,146,141,198,2,141,200,2,
169,1,141,240,2,169,0,133,5760
1340 DATA 85,133,86,169,21,133,84,169,
11,157,66,3,169,193,157,68,6241
1350 DATA 3,169,43,157,69,3,169,31,157
,72,3,169,0,157,73,3,1777
1360 DATA 32,86,228,169,0,133,84,133,8
5,133,86,32,165,41,169,11,4229
1370 DATA 157,66,3,169,135,157,68,3,16
9,43,157,69,3,169,32,157,4364
1380 DATA 72,3,169,0,157,73,3,32,86,22
8,173,31,208,201,6,208,7730
1390 DATA 249,162,32,169,3,157,66,3,16
9,195,157,68,3,169,42,157,5739
1400 DATA 69,3,169,0,157,72,3,169,0,15
7,73,3,169,4,157,74,2773
1410 DATA 3,169,0,157,75,3,32,86,228,4
8,3,76,75,65,169,12,1773
1420 DATA 157,66,3,169,0,157,68,3,169,
0,252,64,247,65,157,69,6477
1430 DATA 3,169,0,157,72,3,169,0,157,7
3,3,32,86,228,160,0,3230
1440 DATA 169,77,133,136,169,43,133,13
7,165,136,153,151,0,165,137,153,8989
1450 DATA 152,0,200,200,192,54,240,24,
152,72,160,0,177,136,201,128,9274
1460 DATA 176,6,32,118,40,76,42,65,32,
118,40,104,168,76,22,65,1460
1470 DATA 169,26,141,27,5,169,1,141,24
7,6,76,11,30,162,16,169,3249
1480 DATA 11,157,66,3,169,167,157,68,3
,169,43,157,69,3,169,26,3469
1490 DATA 157,72,3,169,0,157,73,3,32,8
6,228,169,77,133,136,169,7244
1500 DATA 43,133,137,162,32,169,7,157,
66,3,169,151,157,68,3,169,5384
1510 DATA 0,157,69,3,169,54,157,72,3,1
69,0,157,73,3,32,86,1335
1520 DATA 228,76,145,29,169,9,133,85,1
33,84,169,0,133,86,162,16,4476
1530 DATA 169,11,157,66,3,169,222,157,
68,3,169,6,157,69,3,169,4624
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1540 DATA 20,157,72,3,169,0,157,73,3,3
2,86,228,96,169,10,133,4551
1550 DATA 85,169,0,133,86,169,20,133,8
4,162,16,169,11,157,66,3,3112
1560 DATA 169,48,157,68,3,169,43,157,6
9,3,169,28,157,72,3,169,3798
1570 DATA 0,157,73,3,32,86,228,169,2,1
33,135,76,20,32,169,10,2887
1580 DATA 133,85,169,0,133,86,169,20,1
33,84,248,65,243,66,162,16,7228
1590 DATA 169,11,157,66,3,169,20,157,6
8,3,169,43,157,69,3,169,3714
1600 DATA 28,157,72,3,169,0,157,73,3,3
2,86,228,169,0,133,20,3239
1610 DATA 165,20,201,150,144,250,169,2
,133,135,76,20,32,169,7,157,5459
1620 DATA 66,3,169,76,157,68,3,169,43,
157,69,3,169,64,157,72,4421
1630 DATA 3,169,156,157,73,3,32,86,228
,160,0,177,136,201,129,144,8959
1640 DATA 3,32,248,41,32,118,40,165,13
7,197,204,144,238,240,3,76,9973
1650 DATA 206,29,165,136,197,203,144,2
27,240,225,162,32,169,12,157,66,332
1660 DATA 3,169,0,157,68,3,169,0,157,6
9,3,169,0,157,72,3,1660
1670 DATA 169,0,157,73,3,32,86,228,160
,0,56,173,248,6,233,1,6186
1680 DATA 141,248,6,176,3,206,249,6,32
,7,42,173,248,6,141,27,4832
1690 DATA 5,173,249,6,141,28,5,169,0,1
41,248,6,141,249,6,169,7395
1700 DATA 0,133,209,141,240,2,169,10,1
33,85,169,0,133,86,169,6,5102
1710 DATA 133,84,162,16,169,11,157,66,
3,169,162,157,68,3,169,6,4039
1720 DATA 157,69,3,169,30,157,72,3,169
,0,157,73,3,32,86,228,3869
1730 DATA 169,5,157,66,3,169,206,157,6
8,3,169,42,157,69,3,169,5132
1740 DATA 20,157,72,3,169,0,157,73,3,3
2,244,66,239,67,86,228,7636
1750 DATA 160,1,185,206,42,201,58,240,
33,200,185,206,42,201,58,240,1907
1760 DATA 3,76,155,30,136,185,206,42,1
53,203,42,153,84,6,153,232,8956
1770 DATA 42,201,49,240,4,169,1,133,20
9,200,162,0,200,185,206,42,41
1780 DATA 157,206,42,201,155,240,4,232
,200,208,242,162,32,169,13,157,1353
1790 DATA 66,3,169,203,157,68,3,169,42
,157,69,3,169,0,157,72,4194
1800 DATA 3,169,0,157,73,3,32,86,228,1
6,43,192,167,208,3,76,5397
1810 DATA 86,29,32,252,28,162,32,169,1
2,157,66,3,169,0,157,68,3826
1820 DATA 3,169,0,157,69,3,169,0,157,7
2,3,169,0,157,73,3,1870
1830 DATA 32,86,228,76,19,30,169,3,157
,66,3,169,203,157,68,3,4543
1840 DATA 169,42,157,69,3,169,0,157,72
,3,169,0,157,73,3,169,3474
1850 DATA 4,157,74,3,169,0,157,75,3,32
,86,228,169,9,133,84,4637
1860 DATA 169,0,133,86,32,165,41,169,1
,141,240,2,169,8,133,85,5308
1870 DATA 169,0,133,86,169,6,133,84,16
2,16,169,11,157,66,3,169,4589
1880 DATA 173,157,68,3,169,42,157,69,3
,169,22,157,72,3,169,0,2687
1890 DATA 157,73,3,32,86,228,32,165,41
,32,165,41,169,14,133,85,4416
1900 DATA 169,0,133,86,169,12,133,84,1
69,11,240,67,235,68,157,66,7825
1910 DATA 3,169,89,157,68,3,169,5,157,
69,3,169,12,157,72,3,2373
1920 DATA 169,0,157,73,3,32,86,228,162
,48,169,3,157,66,3,169,5032
1930 DATA 84,157,68,3,169,6,157,69,3,1
69,0,157,72,3,169,0,2190
1940 DATA 157,73,3,169,8,157,74,3,169,
0,157,75,3,32,86,228,4025
1950 DATA 169,125,133,128,169,0,133,13
0,133,135,32,95,41,165,130,208,8256
1960 DATA 2,240,3,76,20,32,160,0,173,1
60,6,201,32,144,67,201,6455
1970 DATA 155,240,12,32,245,40,173,160
,6,141,10,4,76,214,31,32,3308
1980 DATA 245,40,169,32,141,10,4,173,1
60,6,201,65,144,28,201,91,6343
1990 DATA 144,11,201,97,144,28,201,123
,144,3,76,254,31,165,135,208,9702
2000 DATA 24,32,124,35,32,73,42,76,254
,31,201,48,144,4,201,58,5354
2010 DATA 144,5,169,0,76,5,32,169,1,13
3,135,32,43,41,192,128,3926
2020 DATA 144,3,76,37,29,76,166,31,32,
217,41,32,84,42,162,32,2472
2030 DATA 169,12,157,66,3,169,0,157,68
,3,169,0,157,69,3,169,3500
2040 DATA 0,157,72,3,169,0,157,73,3,32
,86,228,162,48,169,12,4644
2050 DATA 157,66,3,169,0,157,68,3,169,
0,157,69,3,169,0,157,3459
2060 DATA 72,3,169,0,157,73,3,32,86,22
8,236,68,231,69,165,135,9215
2070 DATA 201,2,208,3,76,45,35,169,0,1
33,135,160,0,185,206,42,6245
2080 DATA 201,155,240,16,201,46,208,6,
72,169,1,133,135,104,153,87,7003
2090 DATA 6,200,208,233,153,87,6,169,4
4,153,206,42,132,206,165,135,664
2100 DATA 240,7,56,165,206,233,4,133,2
06,162,0,200,189,206,42,153,995
2110 DATA 206,42,157,235,42,200,232,22
8,206,208,241,169,46,153,206,42,3784
2120 DATA 157,235,42,232,152,72,160,0,
185,250,6,157,235,42,200,232,2583
2130 DATA 192,3,208,244,104,168,200,16
2,0,189,250,6,153,206,42,232,2079
2140 DATA 200,224,3,208,244,169,155,15
3,206,42,162,32,169,33,157,66,8682
2150 DATA 3,169,232,157,68,3,169,42,15
7,69,3,169,0,157,72,3,3182
2160 DATA 169,0,157,73,3,32,86,228,192
,170,240,4,192,128,176,98,337
2170 DATA 169,32,157,66,3,169,203,157,
68,3,169,42,157,69,3,169,5605
2180 DATA 0,157,72,3,169,0,157,73,3,32
,86,228,48,68,160,0,3255
2190 DATA 185,139,0,153,206,42,200,192
,12,208,245,169,44,153,206,42,870
2200 DATA 162,0,200,189,87,6,201,155,2
40,7,153,206,42,200,232,208,3375
2210 DATA 242,153,206,42,162,32,169,32
,157,66,3,169,203,157,68,3,6024
2220 DATA 169,42,157,69,3,169,0,157,72
,3,232,69,227,70,169,0,6029
2230 DATA 157,73,3,32,86,228,169,0,133
,85,169,0,133,86,169,6,5121
2240 DATA 133,84,32,165,41,32,111,35,1
69,10,133,85,169,0,141,240,7007
2250 DATA 2,162,16,169,11,157,66,3,169
,108,157,68,3,169,5,157,4919
2260 DATA 69,3,169,18,157,72,3,169,0,1
57,73,3,32,86,228,169,5657
2270 DATA 5,157,66,3,169,160,157,68,3,
169,6,157,69,3,169,1,3404
2280 DATA 157,72,3,169,0,157,73,3,32,8
6,228,173,160,6,201,89,7078
2290 DATA 208,77,32,111,35,32,165,41,1
69,0,133,130,133,129,133,135,7276
2300 DATA 169,125,133,128,160,0,185,13
9,0,153,87,6,200,192,12,144,7168
2310 DATA 245,160,0,169,32,141,160,6,1
53,253,3,200,192,36,208,248,2153
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2320 DATA 160,0,169,26,133,85,169,0,13
3,86,169,12,133,84,32,8,3022
2330 DATA 41,173,160,6,153,101,5,200,1
92,7,208,242,76,11,30,173,7577
2340 DATA 247,6,208,3,76,78,35,169,1,1
41,240,2,165,209,208,92,9426
2350 DATA 32,111,35,162,16,169,11,157,
66,3,169,56,157,68,3,169,4681
2360 DATA 5,157,69,3,169,33,157,72,3,1
69,0,157,73,3,32,86,2064
2370 DATA 228,169,12,133,85,169,0,133,
86,169,37,157,68,3,169,6,4319
2380 DATA 157,69,3,169,17,157,72,3,169
,0,228,70,223,71,157,73,7200
2390 DATA 3,32,86,228,169,7,157,66,3,1
69,160,157,68,3,169,6,5059
2400 DATA 157,69,3,169,1,157,72,3,169,
0,157,73,3,32,86,228,4404
2410 DATA 32,111,35,162,16,169,11,157,
66,3,169,54,157,68,3,169,4717
2420 DATA 6,157,69,3,169,30,157,72,3,1
69,0,157,73,3,32,86,2107
2430 DATA 228,32,165,41,169,12,157,66,
3,169,0,157,68,3,169,0,2987
2440 DATA 157,69,3,169,0,157,72,3,169,
0,157,73,3,32,86,228,4439
2450 DATA 162,48,169,3,157,66,3,169,19
5,157,68,3,169,42,157,69,6134
2460 DATA 3,169,0,157,72,3,169,0,157,7
3,3,169,8,157,74,3,2654
2470 DATA 169,0,157,75,3,32,86,228,169
,11,157,66,3,169,151,157,7375
2480 DATA 68,3,169,0,157,69,3,169,54,1
57,72,3,169,0,157,73,4237
2490 DATA 3,32,86,228,56,165,203,229,1
51,133,136,165,204,229,152,133,4681
2500 DATA 137,24,165,136,105,2,133,136
,144,2,230,137,162,48,169,11,7259
2510 DATA 157,66,3,169,76,157,68,3,169
,43,157,69,3,165,136,157,6713
2520 DATA 72,3,165,137,157,73,3,32,86,
228,76,78,35,162,32,169,5874
2530 DATA 33,157,66,3,169,84,157,68,3,
169,6,157,69,3,169,0,3220
2540 DATA 157,72,3,169,0,157,73,3,32,8
6,224,71,219,72,228,76,7958
2550 DATA 90,33,162,48,169,12,157,66,3
,169,0,157,68,3,169,0,2990
2560 DATA 157,69,3,169,0,157,72,3,169,
0,157,73,3,32,86,228,4559
2570 DATA 108,10,0,169,6,133,85,169,0,
133,86,169,20,133,84,96,5371
2580 DATA 173,160,6,141,29,5,32,202,35
,173,10,4,73,128,141,10,2889
2590 DATA 4,160,255,76,157,35,173,160,
6,153,100,6,73,128,153,11,5437
2600 DATA 4,152,72,32,95,41,104,168,20
0,165,130,208,14,173,160,6,8521
2610 DATA 32,206,40,173,254,6,240,222,
173,160,6,141,161,6,153,11,8191
2620 DATA 4,32,31,36,32,130,40,173,161
,6,141,160,6,96,201,97,6498
2630 DATA 144,3,56,233,32,56,233,65,10
,168,185,151,0,141,242,6,7844
2640 DATA 185,152,0,141,243,6,185,153,
0,133,136,185,154,0,133,137,8698
2650 DATA 56,165,136,233,2,133,136,176
,2,198,137,160,0,177,136,201,703
2660 DATA 128,176,6,32,19,36,76,249,35
,32,118,40,165,136,141,244,8602
2670 DATA 6,165,137,141,245,6,96,56,16
5,136,233,1,133,136,176,2,8087
2680 DATA 198,137,96,132,206,192,0,208
,13,173,29,5,141,100,6,230,7043
2690 DATA 206,169,1,141,253,6,32,196,4
1,32,119,36,160,0,152,72,4836
2700 DATA 185,10,4,201,128,144,2,73,12
8,141,220,72,215,73,10,4,5700
2710 DATA 32,206,40,173,254,6,208,8,32
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2720 DATA 104,173,10,4,201,27,208,5,16
9,32,141,10,4,160,1,169,4402
2730 DATA 32,153,10,4,200,192,23,208,2
48,169,0,141,253,6,96,173,286
2740 DATA 242,6,133,131,173,243,6,133,
132,173,244,6,133,133,173,245,3126
2750 DATA 6,133,134,160,0,169,0,133,13
5,24,165,131,101,133,133,136,8330
2760 DATA 165,132,101,134,133,137,169,
0,105,0,133,138,70,138,102,137,7326
2770 DATA 102,136,32,19,36,177,136,201
,128,176,6,32,118,40,76,173,6482
2780 DATA 36,32,118,40,177,136,201,128
,144,8,169,1,133,135,177,136,9223
2790 DATA 73,128,217,130,6,144,67,240,
2,176,24,200,165,135,208,7,9282
2800 DATA 196,206,240,15,76,188,36,196
,206,240,3,76,18,37,169,0,6002
2810 DATA 133,207,96,56,165,136,233,2,
133,136,176,2,198,137,160,0,8566
2820 DATA 177,136,201,128,176,6,32,19,
36,76,248,36,32,118,40,165,5228
2830 DATA 136,133,133,165,137,133,134,
76,43,37,160,0,177,136,201,128,9105
2840 DATA 176,6,32,118,40,76,20,37,32,
118,40,165,136,133,131,165,6811
2850 DATA 137,133,132,165,132,197,134,
240,5,144,9,76,67,37,165,133,7497
2860 DATA 197,131,144,7,169,1,133,207,
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76,139,216,73,211,74,36,169,9566
2870 DATA 1,133,207,165,208,240,3,76,2
1,39,169,1,133,208,166,128,9156
2880 DATA 202,164,206,173,253,6,208,1,
200,189,33,4,201,32,144,18,7095
2890 DATA 201,123,144,6,201,155,208,10
,169,32,153,10,4,200,192,23,7008
2900 DATA 176,12,232,224,125,176,7,236
,104,3,176,2,144,219,169,2,8741
2910 DATA 133,85,169,0,133,86,169,22,1
33,84,162,16,169,11,157,66,6033
2920 DATA 3,169,253,157,68,3,169,3,157
,69,3,169,36,157,72,3,4171
2930 DATA 169,0,157,73,3,32,86,228,169
,10,133,85,169,0,133,86,6167
2940 DATA 169,15,133,84,169,0,141,240,
2,169,11,157,66,3,169,192,7846
2950 DATA 157,68,3,169,6,157,69,3,169,
10,157,72,3,169,0,157,4536
2960 DATA 73,3,32,86,228,160,0,173,29,
5,141,160,6,32,8,41,2047
2970 DATA 165,206,201,1,208,8,173,29,5
,205,100,6,240,14,185,100,7643
2980 DATA 6,141,160,6,32,8,41,200,196,
206,208,242,169,17,56,229,1822
2990 DATA 206,168,169,32,141,160,6,32,
8,41,136,208,250,169,155,141,801
3000 DATA 160,6,32,8,41,169,32,141,160
,6,169,9,133,85,169,0,4792
3010 DATA 133,86,169,17,133,84,32,8,41
,169,0,141,190,2,173,100,5791
3020 DATA 6,141,246,6,169,5,157,66,3,1
69,212,74,207,75,100,157,9262
3030 DATA 68,3,169,6,157,69,3,169,30,1
57,72,3,169,0,157,73,4595
3040 DATA 3,32,86,228,169,64,141,190,2
,173,100,6,201,155,240,50,116
3050 DATA 141,29,5,160,0,185,101,6,201
,155,240,6,153,100,6,200,8519
3060 DATA 208,243,192,0,208,7,200,173,
29,5,141,100,6,132,206,32,6786
3070 DATA 196,41,173,29,5,32,202,35,32
,119,36,165,207,208,9,76,6702
3080 DATA 232,38,173,246,6,141,100,6,1
69,10,133,85,169,0,133,86,6187
3090 DATA 169,18,133,84,169,11,157,66,
3,169,202,157,68,3,169,6,5948
3100 DATA 157,69,3,169,20,157,72,3,169
,0,157,73,3,32,86,228,5199
3110 DATA 169,5,157,66,3,169,160,157,6
8,3,169,6,157,69,3,169,5758
3120 DATA 1,157,72,3,169,0,157,73,3,32
,86,228,173,160,6,201,8015
3130 DATA 89,240,2,208,3,32,22,39,169,
1,141,240,2,169,15,133,5917
3140 DATA 84,32,165,41,169,17,133,84,3
2,165,41,169,19,133,84,32,4795
3150 DATA 165,41,169,22,133,84,169,2,1
33,85,169,0,133,86,32,165,6319
3160 DATA 41,169,0,133,208,96,169,1,14
1,247,6,169,0,133,135,173,9366
3170 DATA 29,5,201,97,144,3,56,233,32,
56,233,65,10,168,165,137,8534
3180 DATA 217,152,0,144,70,240,2,176,7
,165,208,75,203,76,136,217,1605
3190 DATA 151,0,144,59,165,137,217,154
,0,144,15,240,3,76,140,39,6719
3200 DATA 165,136,217,153,0,144,3,76,1
40,39,160,0,177,136,201,128,9071
3210 DATA 144,8,169,1,133,135,177,136,
73,128,217,130,6,144,16,240,9741
3220 DATA 2,176,29,165,135,208,8,200,1
96,206,240,20,76,88,39,160,9969
3230 DATA 0,177,136,201,128,176,6,32,1
18,40,76,125,39,32,118,40,3953
3240 DATA 165,203,133,131,165,204,133,
132,160,0,24,165,131,101,206,133,789
3250 DATA 133,165,132,105,0,133,134,20
5,49,2,240,5,144,55,76,180,7728
3260 DATA 39,165,133,205,48,2,144,45,1
69,10,133,85,169,0,133,86,6140
3270 DATA 169,20,133,84,162,16,169,11,
157,66,3,169,248,157,68,3,7015
3280 DATA 169,42,157,69,3,169,28,157,7
2,3,169,0,157,73,3,32,2918
3290 DATA 86,228,76,129,40,177,131,145
,133,56,165,131,233,1,133,131,193
3300 DATA 176,2,198,132,56,165,133,233
,1,133,133,176,2,198,134,165,1029
3310 DATA 137,197,132,144,224,240,3,76
,14,40,165,136,197,131,144,213,1938
3320 DATA 240,211,185,130,6,145,136,20
0,196,206,208,246,152,72,173,29,3616
3330 DATA 5,201,97,144,3,56,233,32,56,
233,65,10,168,200,200,24,8879
3340 DATA 185,151,0,101,206,153,151,0,
185,152,204,76,199,77,0,105,8922
3350 DATA 0,153,152,0,200,200,192,54,2
08,233,104,168,136,177,136,73,2904
3360 DATA 128,145,136,173,248,6,72,173
,249,6,72,24,173,27,5,105,5805
3370 DATA 1,141,27,5,141,248,6,173,28,
5,105,0,141,28,5,141,3386
3380 DATA 249,6,32,7,42,104,141,249,6,
104,141,248,6,96,24,165,7621
3390 DATA 136,105,1,133,136,144,2,230,
137,96,160,255,152,72,173,29,725
3400 DATA 5,141,160,6,32,43,41,192,128
,144,7,192,255,240,3,76,9341
```


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```
3410 DATA 37,29,165,206,201,1,208,12,1
73,29,5,205,100,6,208,4,6317
3420 DATA 104,160,0,96,76,186,40,185,1
00,6,141,160,6,152,72,32,5713
3430 DATA 43,41,192,128,144,8,192,255,
240,4,104,76,37,29,104,168,8186
3440 DATA 200,196,206,208,226,96,72,16
9,0,141,254,6,104,201,39,240,1911
3450 DATA 27,201,45,240,23,201,65,144,
12,201,91,144,15,201,97,144,9517
3460 DATA 4,201,123,144,7,72,169,1,141
,254,6,104,96,162,1,160,7683
3470 DATA 0,189,253,3,153,253,3,232,22
4,14,240,3,200,208,242,96,4289
3480 DATA 152,72,162,16,169,11,157,66,
3,169,160,157,68,3,169,6,5782
3490 DATA 157,69,3,169,1,157,72,3,169,
0,157,73,3,32,86,228,5494
3500 DATA 104,168,96,165,129,201,125,2
08,36,169,200,77,195,78,0,133,171
3510 DATA 129,162,48,169,11,157,66,3,1
69,158,157,68,3,169,4,157,6887
3520 DATA 69,3,169,125,157,72,3,169,0,
157,73,3,32,86,228,165,7281
3530 DATA 129,170,173,160,6,157,158,4,
230,129,96,165,128,201,125,208,3345
3540 DATA 44,169,0,133,128,162,32,169,
7,157,66,3,169,33,157,68,6139
3550 DATA 3,169,4,157,69,3,169,125,157
,72,3,169,0,157,73,3,4612
3560 DATA 32,86,228,189,72,3,208,3,76,
151,41,165,128,170,205,104,470
3570 DATA 3,208,5,169,1,133,130,96,189
,33,4,141,160,6,230,128,8590
3580 DATA 96,162,16,169,11,157,66,3,16
9,0,157,68,3,169,6,157,5278
3590 DATA 69,3,169,37,157,72,3,169,0,1
57,73,3,32,86,228,96,5895
3600 DATA 160,0,185,100,6,201,97,144,3
,56,233,32,153,130,6,200,8415
3610 DATA 196,206,208,238,96,162,48,16
9,11,157,66,3,169,158,157,68,9217
3620 DATA 3,169,4,157,69,3,165,129,157
,72,3,169,0,157,73,3,4686
3630 DATA 32,86,228,96,24,173,248,6,10
5,1,141,248,6,144,3,238,9273
3640 DATA 249,6,96,32,154,42,177,243,2
01,128,144,5,73,128,76,27,7568
3650 DATA 42,153,51,5,200,16,239,153,5
1,5,169,10,133,85,169,0,6106
3660 DATA 133,86,169,10,133,84,162,16,
169,11,196,78,99,79,157,66,7470
3670 DATA 3,169,30,157,68,3,169,5,157,
69,3,169,26,157,72,3,4138
3680 DATA 169,0,157,73,3,32,86,228,96,
32,248,41,230,205,165,205,3264
3690 DATA 201,5,208,69,32,154,42,177,2
43,201,128,144,5,73,128,76,9151
3700 DATA 104,42,153,101,5,200,16,239,
153,101,5,169,26,133,85,169,8649
3710 DATA 0,133,86,169,12,133,84,162,1
6,169,11,157,66,3,169,101,6542
3720 DATA 157,68,3,169,5,157,69,3,169,
7,157,72,3,169,0,157,5271
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```
3730 DATA 73,3,32,86,228,169,0,133,205
,96,173,248,6,133,212,173,3039
3740 DATA 249,6,133,213,32,170,217,32,
230,216,160,0,96,32,32,32,6885
3750 DATA 32,195,200,197,195,203,201,2
06,199,32,196,207,195,213,205,197,9303
3760 DATA 206,212,155,68,58,87,79,82,6
8,83,155,68,49,58,126,79,5714
3770 DATA 128,79,68,49,58,142,79,117,8
0,67,65,78,78,79,84,32,4020
3780 DATA 65,68,68,32,87,79,82,68,32,3
2,77,69,77,79,82,89,3384
3790 DATA 32,70,85,76,76,70,73,76,69,3
2,76,79,67,75,69,68,3209
3800 DATA 32,32,65,66,79,82,84,73,78,7
1,32,32,32,32,32,32,418
3810 DATA 32,68,73,83,75,32,70,85,76,7
6,32,32,65,66,79,82,2712
3820 DATA 84,73,78,71,32,32,32,32,32,3
2,32,32,32,128,193,65,2887
3830 DATA 212,65,212,65,205,86,197,79,
210,65,77,197,79,77,197,201,2647
3840 DATA 85,78,203,73,84,197,69,212,2
17,207,206,79,79,210,85,73,2410
3850 DATA 67,203,79,79,205,207,207,83,
197,73,69,215,197,45,82,65,559
3860 DATA 217,79,213,79,207,255,69,58,
29,29,127,127,77,97,103,105,7758
3870 DATA 99,32,83,112,101,108,108,155
,155,155,127,127,80,114,101,115,9736
3880 DATA 115,32,211,212,193,210,212,1
55,28,127,32,32,32,32,32,76,5307
3890 DATA 111,97,100,105,110,103,32,68
,105,99,116,105,111,110,97,114,7584
3900 DATA 121,155,155,127,67,111,112,1
21,114,105,103,104,116,32,49,57,6117
3910 DATA 56,52,32,98,121,32,65,46,32,
71,105,97,109,98,114,97,5546
3920 DATA 155,224,2,225,2,0,64,0,0,0,0
,0,0,0,0,0,5887
```

●

Listing 2.

```
1000 DATA 255,255,0,64,251,64,169,0,13
3,178,133,177,133,207,169,125,569
1010 DATA 133,176,169,252,133,208,169,
28,133,209,169,161,133,203,169,65,1554
1020 DATA 133,204,160,0,177,203,145,20
8,200,208,249,230,209,230,204,165,7839
1030 DATA 209,201,38,144,239,240,237,1
62,16,169,3,157,66,3,169,198,8275
1040 DATA 157,68,3,169,38,157,69,3,169
,0,157,72,3,169,0,157,2686
1050 DATA 73,3,169,12,157,74,3,169,0,1
57,75,3,32,86,228,165,4397
1060 DATA 16,41,127,133,16,141,14,210,
169,146,141,198,2,141,200,2,6715
1070 DATA 169,1,141,240,2,169,11,157,6
6,3,169,42,157,68,3,169,3710
1080 DATA 37,157,69,3,169,46,157,72,3,
169,0,157,73,3,32,86,894
1090 DATA 228,169,21,133,84,169,11,157
,66,3,169,57,157,68,3,169,3927
1100 DATA 38,157,69,3,169,30,157,72,3,
169,0,157,73,3,32,86,819
1110 DATA 228,169,0,133,85,133,86,169,
12,133,84,162,16,169,11,157,4942
1120 DATA 66,3,169,226,157,68,3,169,38
,157,69,3,169,22,157,72,3888
1130 DATA 3,169,0,157,73,3,32,86,228,1
73,31,208,201,6,208,249,9814
1140 DATA 162,32,169,3,157,66,3,169,4,
157,68,3,169,37,157,69,3003
1150 DATA 3,169,0,157,72,3,169,0,157,7
```


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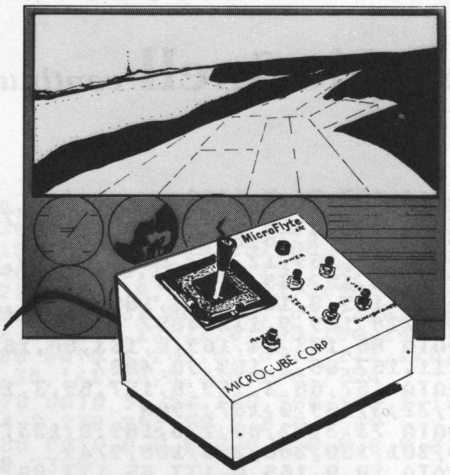

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Magic Spell *continued*

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3,3,169,4,157,74,3,1292
1160 DATA 169,0,252,64,247,65,157,75,3
,32,86,228,48,3,76,88,2908
1170 DATA 65,169,12,157,66,3,169,0,157
,68,3,169,0,157,69,3,1203
1180 DATA 169,0,157,72,3,169,0,157,73,
3,32,86,228,169,9,133,4057
1190 DATA 85,133,84,169,0,133,86,162,1
6,169,11,157,66,3,169,98,4007
1200 DATA 157,68,3,169,6,157,69,3,169,
28,157,72,3,169,0,157,2966
1210 DATA 73,3,32,86,228,169,0,133,20,
165,20,201,150,208,250,108,9749
1220 DATA 10,0,169,0,133,85,133,86,169
,12,133,84,162,16,169,11,3684
1230 DATA 157,66,3,169,200,157,68,3,16
9,38,157,69,3,169,26,157,4409
1240 DATA 72,3,169,0,157,73,3,32,86,22
8,162,32,169,7,157,66,4251
1250 DATA 3,169,210,157,68,3,169,35,15
7,69,3,169,54,157,72,3,2862
1260 DATA 169,0,157,73,3,32,86,228,76,
252,28,169,7,157,66,3,3692
1270 DATA 169,76,157,68,3,169,43,157,6
9,3,169,64,157,72,3,169,3996
1280 DATA 156,157,73,3,32,86,228,162,3
2,169,12,157,66,3,169,0,2978
1290 DATA 157,68,3,169,0,157,69,3,169,
0,157,72,3,169,0,157,2746
1300 DATA 73,3,32,86,228,160,0,169,0,1
41,240,2,162,16,169,11,4386
1310 DATA 157,66,3,169,42,157,68,3,169
,37,157,69,3,169,127,157,5204
1320 DATA 72,3,248,65,243,66,169,0,157
,73,3,32,86,228,169,5,4681
1330 DATA 157,66,3,169,96,157,68,3,169
,6,157,69,3,169,1,157,3294
1340 DATA 72,3,169,0,157,73,3,32,86,22
8,173,96,6,201,49,240,7001
1350 DATA 18,201,50,240,20,201,51,240,
22,201,52,240,3,76,61,29,4605
1360 DATA 76,165,34,32,26,30,76,61,29,
32,2,33,76,61,29,56,7498
1370 DATA 173,229,2,237,6,36,133,212,1
73,230,2,237,7,36,133,213,8549
1380 DATA 32,170,217,32,230,216,160,0,
177,243,201,128,176,6,153,52,9366
1390 DATA 38,200,208,244,73,128,153,52
,38,162,16,169,11,157,66,3,3593
1400 DATA 169,32,157,68,3,169,38,157,6
9,3,169,25,157,72,3,169,3535
1410 DATA 0,157,73,3,32,86,228,169,167
,157,68,3,169,38,157,69,5624
1420 DATA 3,169,31,157,72,3,169,0,157,
73,3,32,86,228,169,5,3528
1430 DATA 157,66,3,169,134,157,68,3,16
9,6,157,69,3,169,1,157,3584
1440 DATA 72,3,169,0,157,73,3,32,86,22
8,76,61,29,169,11,157,3567
1450 DATA 66,3,169,169,157,68,3,169,37
,157,69,3,169,19,157,72,3939
1460 DATA 3,169,0,157,73,3,32,86,228,1
69,5,157,66,3,169,36,3416
1470 DATA 157,68,3,169,6,157,69,3,169,
30,157,72,3,169,0,157,3256
1480 DATA 73,3,244,66,239,67,32,86,228
,169,11,157,66,3,169,188,7254
1490 DATA 157,68,3,169,37,157,69,3,169
,19,157,72,3,169,0,157,3321
1500 DATA 73,3,32,86,228,169,5,157,66,
3,169,66,157,68,3,169,4481
1510 DATA 6,157,69,3,169,30,157,72,3,1
69,0,157,73,3,32,86,1197
1520 DATA 228,169,11,157,66,3,169,207,
157,68,3,169,37,157,69,3,3850
1530 DATA 169,27,157,72,3,169,0,157,73
,3,32,86,228,169,234,157,8220
1540 DATA 68,3,169,37,157,69,3,169,24,
157,72,3,169,0,157,73,3175
1550 DATA 3,32,86,228,169,2,157,68,3,1
69,38,157,69,3,169,30,3260
1560 DATA 157,72,3,169,0,157,73,3,32,8
6,228,169,167,157,68,3,5144
1570 DATA 169,38,157,69,3,169,31,157,7
2,3,169,0,157,73,3,32,1221
1580 DATA 86,228,169,5,157,66,3,169,13
4,157,68,3,169,6,157,69,4503
1590 DATA 3,169,1,157,72,3,169,0,157,7
3,3,32,86,228,173,36,4164
1600 DATA 6,201,155,240,29,141,96,6,14
1,3,37,169,1,141,130,6,2911
1610 DATA 173,66,6,201,155,240,24,141,
97,6,169,1,141,131,6,76,4025
1620 DATA 66,31,169,0,141,130,6,169,65
,141,3,37,76,25,31,169,2113
1630 DATA 0,141,131,6,169,91,141,97,6,
173,130,6,208,13,173,210,7610
1640 DATA 35,133,240,67,235,68,208,173
,211,35,133,209,76,102,31,173,9221
1650 DATA 3,37,56,233,65,10,168,185,21
0,35,133,208,185,211,35,133,79
1660 DATA 209,173,252,2,48,33,72,169,2
55,141,252,2,104,201,22,208,9598
1670 DATA 3,76,73,34,173,252,2,48,251,
72,169,255,141,252,2,104,9908
1680 DATA 201,22,208,3,76,73,34,32,171
,32,160,0,173,130,6,208,4979
1690 DATA 3,76,191,31,185,12,37,201,15
5,240,13,217,36,6,144,5,4740
1700 DATA 240,16,76,191,31,76,109,32,1
69,155,217,36,6,240,56,76,5978
1710 DATA 109,32,200,169,155,217,36,6,
208,218,160,0,173,131,6,240,9361
1720 DATA 38,185,12,37,201,155,240,31,
217,66,6,144,26,240,3,76,5541
1730 DATA 73,34,200,169,155,217,66,6,2
40,3,76,198,31,169,155,217,9702
1740 DATA 12,37,240,3,76,73,34,160,0,2
4,165,85,109,132,6,201,4540
1750 DATA 38,144,37,169,155,141,134,6,
162,16,169,11,157,66,3,169,4793
1760 DATA 134,157,68,3,169,6,157,69,3,
169,1,157,72,3,169,0,2081
1770 DATA 157,73,3,32,86,228,160,0,185
,12,37,201,155,240,40,141,7963
1780 DATA 134,6,152,72,162,16,169,11,1
57,66,3,169,134,157,68,3,3989
1790 DATA 169,6,157,69,3,169,1,157,72,
3,169,0,157,73,3,32,1167
1800 DATA 86,228,236,68,231,69,104,168
,200,208,209,169,32,141,134,6,9666
1810 DATA 169,11,157,66,3,169,134,157,
68,3,169,6,157,69,3,169,4288
1820 DATA 1,157,72,3,169,0,157,73,3,32
,86,228,160,0,177,208,6983
1830 DATA 201,128,176,6,32,198,35,76,1
09,32,32,198,35,173,3,37,2583
1840 DATA 56,233,65,10,168,165,209,217
,213,35,144,4,240,5,176,10,7515
1850 DATA 76,102,31,165,208,217,212,35
,144,246,238,3,37,173,3,37,6939
1860 DATA 201,91,240,3,76,102,31,76,73
,34,160,0,169,1,133,207,5067
1870 DATA 162,1,177,208,201,128,176,11
,157,12,37,169,0,133,207,200,8625
1880 DATA 232,208,239,73,128,72,165,20
7,240,35,173,3,37,201,65,240,9979
1890 DATA 7,201,73,240,3,76,238,32,104
,205,3,37,208,16,141,12,4569
1900 DATA 37,169,155,141,13,37,169,1,1
41,132,6,208,19,104,157,12,4183
1910 DATA 37,173,3,37,141,12,37,232,16
9,155,157,12,37,142,132,6,4829
1920 DATA 96,162,16,169,11,157,66,3,16
9,87,157,68,3,169,38,157,4968
1930 DATA 69,3,169,31,157,72,3,169,0,1
```

```
57,73,3,32,86,228,169,5379
1940 DATA 5,157,66,3,169,36,157,68,3,1
69,6,157,69,3,169,30,2794
1950 DATA 157,72,3,169,0,157,73,3,32,8
6,228,173,36,6,141,3,2860
1960 DATA 37,56,232,69,227,70,233,65,1
0,168,185,210,35,133,208,185,1509
1970 DATA 211,35,133,209,32,171,32,160
,0,185,12,37,201,155,240,27,7417
1980 DATA 217,36,6,144,22,240,2,176,56
,200,169,155,217,36,6,208,8801
1990 DATA 232,169,155,217,12,37,240,74
,76,120,33,160,0,177,208,201,9428
2000 DATA 128,176,6,32,198,35,76,120,3
3,32,198,35,165,209,205,7,6791
2010 DATA 36,144,193,240,3,76,158,33,1
65,208,205,6,36,144,181,240,645
2020 DATA 179,162,16,169,11,157,66,3,1
69,139,157,68,3,169,38,157,5671
2030 DATA 69,3,169,28,157,72,3,169,0,1
57,73,3,32,86,228,76,3979
2040 DATA 73,34,173,132,6,201,1,240,3,
206,132,6,24,165,208,109,7488
2050 DATA 132,6,133,203,165,209,105,0,
133,204,160,0,177,203,145,208,1862
2060 DATA 24,165,203,105,1,133,203,144
,2,230,204,165,204,205,7,36,9564
2070 DATA 144,12,240,3,76,1,34,165,203
,205,6,36,176,6,32,198,5309
2080 DATA 35,76,217,33,173,36,6,56,233
,64,10,141,134,6,160,52,4218
2090 DATA 56,185,210,35,237,132,6,153,
210,35,185,211,35,233,0,153,9501
2100 DATA 211,35,136,136,204,134,6,176
,231,162,16,169,11,157,66,3,5889
2110 DATA 169,118,157,68,3,169,38,157,
69,3,169,21,157,72,3,169,4369
2120 DATA 0,157,228,70,223,71,73,3,32,
86,228,169,1,141,135,6,5266
2130 DATA 162,16,169,11,157,66,3,169,1
67,157,68,3,169,38,157,69,5474
2140 DATA 3,169,31,157,72,3,169,0,157,
73,3,32,86,228,169,5,4248
2150 DATA 157,66,3,169,96,157,68,3,169
,6,157,69,3,169,1,157,4114
2160 DATA 72,3,169,0,157,73,3,32,86,22
8,76,61,29,162,48,169,4936
2170 DATA 11,157,66,3,169,133,157,68,3
,169,36,157,69,3,165,177,6234
2180 DATA 157,72,3,169,0,157,73,3,32,8
6,228,96,173,135,6,208,7008
2190 DATA 3,76,73,35,162,48,169,3,157,
66,3,169,4,157,68,3,2461
2200 DATA 169,37,157,69,3,169,0,157,72
,3,169,0,157,73,3,169,3824
2210 DATA 8,157,74,3,169,0,157,75,3,32
,86,228,169,11,157,66,5101
2220 DATA 3,169,210,157,68,3,169,35,15
7,69,3,169,54,157,72,3,3832
2230 DATA 169,0,157,73,3,32,86,228,56,
173,6,36,237,210,35,133,7201
2240 DATA 208,173,7,36,237,211,35,133,
209,24,165,208,105,2,133,208,9867
2250 DATA 144,2,230,209,162,48,169,11,
157,66,3,169,76,157,68,3,4681
2260 DATA 169,43,157,69,3,165,208,157,
72,3,165,209,157,73,3,32,5600
2270 DATA 86,228,162,48,169,12,157,66,
3,169,0,157,68,3,169,0,3096
2280 DATA 157,69,224,71,172,72,3,169,0
,157,72,3,169,0,157,73,4314
2290 DATA 3,32,86,228,108,10,0,165,177
,201,125,208,36,169,0,133,7883
2300 DATA 177,162,48,169,11,157,66,3,1
69,133,157,68,3,169,36,157,5955
2310 DATA 69,3,169,125,157,72,3,169,0,
157,73,3,32,86,228,165,6071
2320 DATA 177,170,173,96,6,157,133,36,
230,177,96,165,176,201,125,208,3112
2330 DATA 44,169,0,133,176,162,32,169,
7,157,66,3,169,8,157,68,4819
2340 DATA 3,169,36,157,69,3,169,125,15
7,72,3,169,0,157,73,3,3498
2350 DATA 32,86,228,189,72,3,208,3,76,
184,35,165,176,170,205,104,148
2360 DATA 3,208,5,169,1,133,178,96,189
,8,36,141,96,6,230,176,7754
2370 DATA 96,24,165,208,105,1,133,208,
144,2,230,209,96,0,0,0,4569
2380 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,2380
2390 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,2390
2400 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,2400
2410 DATA 0,0,0,167,73,167,73,0,169,73
,176,73,68,58,87,79,4284
2420 DATA 82,68,83,155,207,73,202,74,1
25,29,29,29,127,127,77,97,5204
2430 DATA 103,105,99,32,83,112,101,108
,108,155,155,127,32,32,32,68,4009
2440 DATA 105,99,116,105,111,110,97,11
4,121,32,77,97,105,110,116,101,5998
2450 DATA 110,97,110,99,101,155,155,12
7,32,32,32,49,46,32,32,76,1306
2460 DATA 105,115,116,32,68,105,99,116
,105,111,110,97,114,121,155,127,7824
2470 DATA 32,32,32,50,46,32,32,68,101,
108,101,116,101,32,87,111,3386
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2480 DATA 114,100,155,127,32,32,32,51,
46,32,32,70,114,101,101,32,1600
2490 DATA 77,101,109,111,114,121,155,1
27,32,32,32,52,46,32,32,69,1151
2500 DATA 110,100,155,127,32,32,32,155
,127,32,32,32,76,79,87,32,1709
2510 DATA 76,73,77,73,84,155,127,32,32
,32,127,32,32,32,72,73,1251
2520 DATA 71,72,32,76,73,77,73,84,155,
127,32,32,32,127,32,32,1732
2530 DATA 32,80,82,69,83,83,32,65,78,8
9,32,75,69,89,32,84,1712
2540 DATA 79,32,83,84,65,82,84,155,127
,32,32,32,32,32,32,65,496
2550 DATA 78,68,32,83,84,79,80,32,76,7
3,83,84,73,78,71,155,3823
2560 DATA 127,32,32,32,80,82,69,83,83,
32,88,32,84,79,32,67,1183
2570 DATA 65,78,67,69,76,32,76,73,83,8
4,73,78,71,155,155,155,6180
2580 DATA 155,127,32,32,203,74,156,75,
32,70,82,69,69,32,77,69,2686
2590 DATA 77,79,82,89,58,32,32,32,32,3
2,32,155,127,67,111,112,3255
2600 DATA 121,114,105,103,104,116,32,4
9,57,56,52,32,98,121,32,65,2025
2610 DATA 46,32,71,105,97,109,98,114,9
7,155,155,127,32,32,32,69,4190
2620 DATA 78,84,69,82,32,87,79,82,68,3
2,84,79,32,68,69,76,1715
2630 DATA 69,84,69,155,127,32,32,32,15
5,155,127,32,32,32,32,32,1583
2640 DATA 32,87,79,82,68,32,68,69,76,6
9,84,69,68,155,155,127,5508
2650 DATA 32,32,32,87,79,82,68,32,78,7
9,84,32,73,78,32,68,1218
2660 DATA 73,67,84,73,79,78,65,82,89,1
55,155,127,32,32,32,80,3589
2670 DATA 82,69,83,83,32,82,69,84,85,8
2,78,32,87,72,69,78,2527
2680 DATA 32,82,69,65,68,89,155,127,69
,58,127,127,32,32,32,32,2296
2690 DATA 32,76,111,97,100,105,110,103
,32,68,105,99,116,105,111,110,6033
2700 DATA 97,114,121,155,127,127,32,32
,32,32,32,32,32,80,114,1117
2710 DATA 101,115,115,32,211,212,193,2
10,212,155,0,6,35,6,32,32,3933
2720 DATA 32,32,32,32,32,32,32,32,32,3
2,32,32,32,32,32,32,7072
2730 DATA 32,32,32,32,32,32,32,32,32,3
2,32,32,32,32,32,32,7082
2740 DATA 32,155,98,6,125,6,32,32,32,7
8,111,32,68,105,99,116,2909
2750 DATA 105,111,110,97,114,121,32,45
,32,65,98,111,114,116,105,110,5464
2760 DATA 103,155,133,6,133,6,1,135,6,
138,6,0,0,0,97,224,1923
2770 DATA 2,225,2,0,64,0,0,0,0,0,0,0,0
,0,0,0,3548
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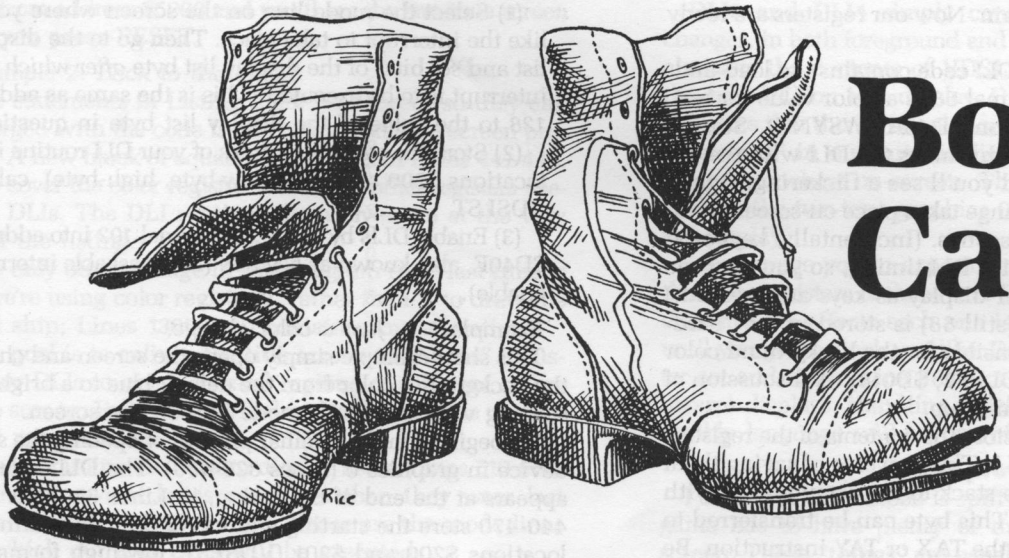


Boot Camp

by Karl E. Wiegers

Last time out, we ended up with the title screen to what promises to be a very silly program, "Attack of the Suicidal Road-Racing Aliens."

This is a mixed graphics mode screen, containing segments of graphics modes 1, 2, 7 and 0. We created the screen by setting up our own "display list." This tells the computer which graphics mode to use for each horizontal line on the TV, and where in RAM to find the information to be displayed.

Our title screen is nice, but it just doesn't have the colorful pizzazz of real games. We need some way to get around the usual five-colors-at-a-time limit. Fortunately, just such an mechanism exists: the display list interrupt or DLI. Today we'll explore the DLI—and spice up our title screen in the process.

Display list interrupts.

An introduction to DLIs always begins with a review of the TV display process. The TV's electron beam begins writing on the screen at the upper left corner. It draws one horizontal line, then is turned off just long enough for the electron beam to move back across the screen and down one line.

During this brief period, while the gun's doing a horizontal retrace, we have just enough time to run a tiny machine language program. Such a program, my friends, is a DLI, sometimes called a "horizontal blank interrupt." The execution time may be short, but the possibilities are many.

Depending on the graphics mode, the horizontal blanking period is between 15 and 60 machine cycles long. This gives us time to run a program containing five to ten load-and-store operations. It's plenty of time to change the contents of color registers, point to a redefined character set, change the positions of players or missiles, alter the contents of sound registers, and so on.

These changes will be in effect as soon as the electron gun begins to draw the next scan line on the TV screen. Many amazing special effects can be produced using DLIs. We'll concentrate mostly on color changes this month.

Writing a DLI.

There are just a few things to keep in mind as you write a DLI. The most important is that it must be *short*. If the DLI is still executing when the electron gun comes back on, there may be distortions in the screen display. Let's examine the DLI routine that appears in Lines 620-670 of Listing 1, reproduced here:

```
0620    DLI  PHA
0630         LDA #68
0640         STA WSYNC
0650         STA COLPF2
0660         PLA
0670         RTI
```

The first instructions in your DLI must save the contents of any registers (accumulator, X, Y) used in the DLI. In 6502 lingo, the PHA instruction is used to push the contents of the accumulator onto the program stack. This is a good place to briefly stash the accumulator.

Our load-and-store operations use only the accumulator, so that's the only register saved on the stack (Line 500).

To save the X- and Y-registers requires a two-step procedure. First, transfer the contents to the accumulator with a TXA or TYA instruction. Then store the accumulator on the stack with the PHA again. Now our registers are ready for DLI use.

The next portion of the DLI code contains the load-and-store operations. The decimal 68 is a color value for red. It's stored first into location $D40A (WSYNC). Storing something in WSYNC synchronizes the DLI with the TV display. Omit this line and you'll see a flickering, jagged edge, because the color change takes place on-screen, rather than tidily behind the scenes. (Incidentally, keyboard input can also interfere with DLI timing, so you may see flickers and jumps in your display as keys are pressed.)

Next, the accumulator (still 68) is stored in the "hardware color register" responsible for the background color of a graphics 0 screen (COLPF2, $D018). A discussion of hardware registers is coming up.

Naturally, we need to restore the contents of the registers before exiting from the DLI. The converse of saving them is to move a byte from the stack to the accumulator with a PLA (pull) instruction. This byte can be transferred to the X- or Y-registers using the TAX or TAY instruction. Be sure to restore registers in the reverse order in which you saved them.

The final instruction of the DLI routine must be to "return from interrupt" (RTI). This is similar to the return from subroutine (RTS) instruction, but don't get them confused!

Chasing your shadow.

I'm sure you remember the five color registers at addresses $2C4-$2C8 (COLOR0-COLOR4) that we've manipulated in previous columns. These are "shadow registers" for a corresponding group of "hardware registers" at addresses $D016-$D01A (COLPF0-COLPF4).

The real computer action takes place in the hardware registers. However, the hardware registers are "write-only"; we can't read them and find out what they contain at any time. Hence, the corresponding read/write shadow registers were created.

Most programs make color register changes in the shadow registers, as we have. Every sixtieth of a second, during the vertical blanking period, contents of the shadow registers are written into the corresponding hardware registers, thus implementing any color changes in the next TV frame drawn.

DLI routines are executed in between vertical blank intervals. Thus, copying to a shadow register does us no good. The solution is to write directly into the hardware registers in our DLI routines. The playfield color registers are not unique in this regard. Table 1 lists some other hardware/shadow combinations useful for DLI routines.

Table 1. — Hardware and Shadow Registers.

Hardware	Shadow	Purpose
$D016-$D01A	$2C4-$2C8	Playfield colors
$D012-$D015	$2C0-$2C3	Player/missile colors
$D409	$2F4	Character set base address
$D01B	$26F	Player priorities

DLI setup.

Besides writing the DLI routine itself, we have to tell the Atari what to do with it. There are three steps:

(1) Select the mode line on the screen where you'd like the interrupt to take place. Then go to the display list and set bit 7 of the display list byte *after which* the interrupt is to be executed. This is the same as adding *128* to the value of the display list byte in question.

(2) Store the starting address of your DLI routine into locations $200 and $201 (low-byte, high-byte), called VDSLST.

(3) Enable DLIs by storing a decimal *192* into address $D40E, also known as NMIEN (nonmaskable interrupt enable).

Example 1 — Just a color change.

This short example simply opens the screen and changes the background color from the default blue to a bright red, starting with the ninth mode line on the screen.

We begin with the familiar process of opening the screen device in graphics 0 (Lines 320-430). The DLI code itself appears at the end of the listing, in Lines 620-670. Lines 440-470 store the starting address of the DLI routine into locations $200 and $201 (VDSLST, low/high format).

Since the color change is to start with the ninth line of graphics 0, we must set bit 7 of the display list byte for the eighth mode line. But where's the display list?

The open screen procedure lets the Atari create a display list wherever it likes. Fortunately, it stores the address of the first byte of the display list in locations $230 and $231, referred to as SDLSTL. I'm going to copy these values into a couple of spare bytes in page 0, called TEMP in this example (Lines 480-510).

Now, why did I do that? I want to access a byte in the display list, and an easy way is to use the 6502's "indirect indexed" addressing mode. An indirect indexed instruction for loading the accumulator looks like this:

```
LDA ($CD),Y
```

This procedure begins with an address in a 2-byte page 0 location ($CD and $CE, low/high). It then points to that address, offsets by the value in the Y-register, and loads the contents of the resulting location into the accumulator.

Going back to Listing 1, we have the address of the display list in locations TEMP and TEMP+1. Now think about what the display list looks like, based on last month's discussion.

It begins something like this (in decimal form): *112, 112, 112, 66, xx, xx, 2, 2, 2, 2, 2, 2, 2, 2 . . .* (The xs refer to some unknown location for the start of screen memory; it's not important now.) This portion of the display list goes down through the first nine mode lines of graphics 0 (ANTIC 2) on the screen. The DLI is to be executed after the eighth mode line. Count down the display list, starting at 0, and the magic number is 12 bytes from the start. So load the Y-register with a decimal *12* and load the accumulator using indirect addressing mode, as in Lines 520-530 of Listing 1.

To set bit 7 of whatever's in the accumulator, we can use the ORA instruction. Bit 7 corresponds to decimal *128* ($*80* hex), so Line 540 does the trick. Store the result right back

where we found it initially (Line 550), and our display list has been properly activated for one DLI. Lines 560-570 actually cause the DLI to begin being executed. Run this program from address $5000 and you'll see the two-tone screen until you press RESET.

Example 2. Back to the aliens.

The statements in Listing 2 are numbered, so they can be merged with the code from last month's title screen program. A new block of equates is inserted in Lines 441-448. These cover the color registers and some other registers useful in DLIs. The DLI routines themselves are at the very end of the listing.

The only other change in this program from last time is that we're using color register 2, rather than 1, to draw the rocket ship; Lines 1300-1380 contain some alterations.

Our goal is to enliven the title screen to "Aliens" by using four DLIs to create several regions of different colors on the screen. For kicks, we'll also throw in a little character set manipulation.

Please examine the custom display list in Lines 510-560. Notice that several bytes are larger than they were last month—by the quantity of 128. These are the mode lines after which our four DLIs will be executed.

Lines 621-624 place the address of the first DLI (DLI1, naturally) into VDSLST. But wait! There's only the one DLI address pointer, yet we have four DLIs. Whatever shall we do?

I suggest that DLI1 load the address of DLI2 into VDSLST, DLI2 load the address of DLI3, and so on, with DLI4 pointing back to DLI1 for the next time the screen's drawn. This is one cumbersome feature of using multiple DLIs in a single display. Alternatives that sometimes work are "table-driven" or algorithmic DLIs, which we may encounter in future columns.

The code at Lines 921-931 enables DLIs and sets some initial values in the color registers. Notice that we're using the playfield color registers here, not the hardware registers.

Look now at the DLI routines, starting at Line 3480. DLI1 simply changes the background of the top part of the screen to gray (color 4). Then it loads the address of DLI2 into VDSLST (Lines 3530-3560).

DLI2 uses both the accumulator and the X-register, so you can see how to save both on the stack and restore them later. The X-register is used for color change, but I got more creative with the accumulator. It actually selects a different character set to be used.

You'll recall that the normal character set used for graphics 1 and 2 shows only uppercase letters in four different colors. In effect, only half of the standard Atari characters can be displayed in these modes. The hardware register called CHBASE ($D409) can be loaded with the decimal value *226*, to show lowercase and control characters from the other half of the standard character set (the default value in CHBASE is *224*). Unfortunately, this half of the character set contains no blank character; a heart is printed instead. This explains the funny-looking display you see from DLI2.

My point is to illustrate how a DLI can be used to change character sets in the middle of the screen. Many character set editor programs use this feature to show both the normal characters and your redefined characters at the same time.

DLI3 and DLI4 simply cause some additional color changes, in both foreground and background registers. DLI4 also sets the contents of VDSLST back to the address of the first DLI on this display, DLI1.

Notice that there's no relationship between DLIs and the "segments" in our custom display list. The DLIs can be placed anywhere on-screen. This feature permits niceties such as the two-tone graphics 0 segment at the bottom of the display.

I encourage you to experiment with different values in the color registers of these four DLIs, to make sure you understand the effects each one is causing. Play with them until you get the look you like. Don't fiddle with the character set address in Line 3630, or you could get some very bizarre displays. Handling redefined character sets in assembly language will be one of our future topics.

Sneak preview.

I think our title screen is spiffy enough now. Every Atari game has to have plenty of things moving around the screen. These "things" are usually the famous players and their sidekicks, the missiles. Next month, we'll talk about how to define the shapes of some players and have them move around the screen under their own power. Moving them around under your control with a joystick will come after that. Do check back... A

Karl E. Wiegers provides computer support for photographic researchers at the Eastman Kodak Company. This means he's wasting his Ph.D. in organic chemistry, but he has a lot of fun. He also writes commercial educational chemistry software for the Apple II.

Listing 1.
Assembly listing.

```
0100 ;DLI Listing 1
0110 ;
0120 ;by Karl E. Wiegers
0130 ;
0140     .OPT NO LIST,OBJ
0150 ;
0160 TEMP =  $CB
0170 VDSLST = $0200
0180 SDLSTL = $0230
0190 ICCOM = $0342
0200 ICBAL = $0344
0210 ICBAH = $0345
0220 ICBLL = $0348
0230 ICBLH = $0349
0240 ICAX1 = $034A
0250 ICAX2 = $034B
0260 CIOV =  $E456
0270 COLPF2 = $D018
0280 WSYNC = $D40A
0290 NMIEN = $D40E
0300 ;
0310     *=  $5000
0320     LDX #$60     ;open screen
0330     LDA #3
0340     STA ICCOM,X
0350     LDA #SCREEN&255
0360     STA ICBAL,X
0370     LDA #SCREEN/256
0380     STA ICBAH,X
```

```
0390      LDA #12
0400      STA ICAX1,X
0410      LDA #0
0420      STA ICAX2,X
0430      JSR CIOV
0440      LDA #DLI&255 ;point to DLI
0450      STA VDSLST
0460      LDA #DLI/256
0470      STA VDSLST+1
0480      LDA SDLSTL   ;copy DL address
0490      STA TEMP     ;to page zero
0500      LDA SDLSTL+1
0510      STA TEMP+1
0520      LDY #12      ;set DLI bit on
0530      LDA (TEMP),Y ;line 8
0540      ORA #128
0550      STA (TEMP),Y
0560      LDA #192     ;enable DLI
0570      STA NMIEN
0580 END  JMP END      ;wait for reset
0590 ;
0600 SCREEN .BYTE "S"
0610 ;
0620 DLI  PHA          ;save A on stack
0630      LDA #68      ;color is red
0640      STA WSYNC    ;synchronize
0650      STA COLPF2   ;background reg.
0660      PLA          ;restore A
0670      RTI          ;all done
```

Listing 2.
Assembly listing.

```
0100 ;DLI Listing 2
0110 ;
0120 ;by Karl E. Wiegers
0130 ;
0225 VDSLST = $0200
0441 ;
0442 ;color & charset registers,etc.
0443 ;
0444 COLOR0 = $02C4   ;shadow register
0445 COLPF0 = $D016   ;hardware reg.
0446 CHBASE = $D409   ;hardware,charset
0447 WSYNC = $D40A    ;synchronize
0448 NMIEN = $D40E    ;enable DLI
0470 ;
0490      *=  $3F00
0500 DLIST
0510      .BYTE 112,112,112,70,0,$40
0520      .BYTE 134,7,7,135,7,7,7,13,13
0530      .BYTE 13,13,13,13,13,13,13
0540      .BYTE 13,13,13,13,13,13,13
0550      .BYTE 13,13,13,13,13,13,13
0560      .BYTE 141,2,130,2,2,65,0,$3F
0561 ;
0621      LDA #DLI1&255 ;set address
0622      STA VDSLST    ;of first DLI
0623      LDA #DLI1/256
0624      STA VDSLST+1
0921      LDA #192      ;enable DLI
0922      STA NMIEN
0923      LDA #152      ;set initial
0924      STA COLOR0    ;colors
0925      LDA #86
0926      STA COLOR0+1
0927      LDA #14
0928      STA COLOR0+2
0929      LDA #26
0930      STA COLOR0+4
0931      LDA #34       ;turn screen on
1300      LDA #REG2&255 ;color reg.2
1310      STA ICBAL,X
1320      LDA #REG2/256
1330      STA ICBAL+1,X
1340      JSR PLOTPOINT
1380      LDA #3
3105 REG2 .BYTE "C"
3470 ;
3480 DLI1
3490      PHA           ;save accum.
3500      LDA #4        ;color gray
3510      STA WSYNC     ;synchronize
3520      STA COLPF0+4
3530      LDA #DLI2&255 ;point to
3540      STA VDSLST    ;next DLI
3550      LDA #DLI2/256
3560      STA VDSLST+1
3570      PLA           ;restore accum.
3580      RTI           ;all done
3590 DLI2
3600      PHA           ;save registers
3610      TXA
3620      PHA
3630      LDA #226      ;change charset
3640      LDX #70       ;color is red
3650      STX COLPF0    ;for foreground
3660      STA WSYNC
3670      STA CHBASE    ;change charset
3680      LDA #DLI3&255 ;point to
3690      STA VDSLST    ;next DLI
3700      LDA #DLI3/256
3710      STA VDSLST+1
3720      PLA           ;restore registers
3730      TAX
3740      PLA
3750      RTI           ;all done
3760 ;
3770 DLI3
3780      PHA
3790      TXA
3800      PHA
3810      LDA #14       ;more colors...
3820      LDX #18       ;you've seen
3830      STA WSYNC     ;it all before
3840      STA COLPF0+1
3850      STX COLPF0+2
3860      LDA #DLI4&255
3870      STA VDSLST
3880      LDA #DLI4/256
3890      STA VDSLST+1
3900      PLA
3910      TAX
3920      PLA
3930      RTI
3940 DLI4
3950      PHA
3960      TXA
3970      PHA
3980      LDA #0
3990      LDX #198
4000      STA WSYNC
4010      STA COLPF0+1
4020      STX COLPF0+2
4030      LDA #DLI1&255
4040      STA VDSLST
4050      LDA #DLI1/256
4060      STA VDSLST+1
4070      PLA
4080      TAX
4090      PLA
4100      RTI
```

Soft Touch

A Touch Tablet tutorial to help you use AtariArtist

by Jack Morrison

The **AtariArtist** cartridge that comes with the new Atari **Touch Tablet** is a marvelous piece of software, but the **Tablet** itself has many uses besides picture drawing.

Since the manual doesn't explain how to jump in with user-written software, I did some experimenting, in BASIC. This article will show you how to read **Touch Tablet** input, control a cursor and load **AtariArtist** pictures into your own programs.

If you have an Epson or compatible printer, you'll also find out how to make a hard copy of your masterpieces!

Use as directed.

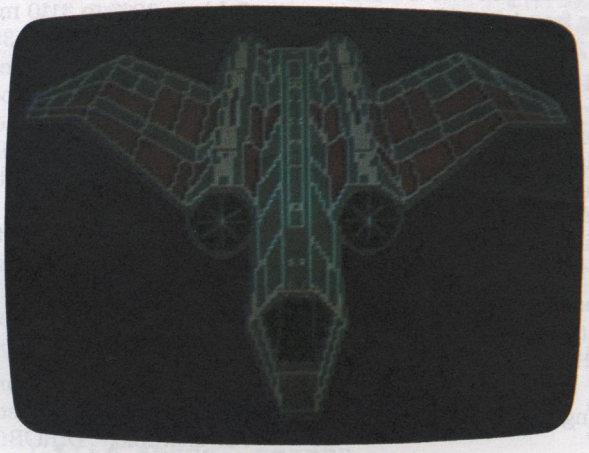
Touch Tablet plugs into the controller jacks on the front of your Atari and acts as if it were two paddle controllers. It provides an electrical resistance, which the computer digitizes into a numeric value sixty times per second. You can read these values from BASIC by using the PADDLE function. If the **Tablet** is plugged into the first controller jack, PADDLE(0) reads the horizontal or X-coordinate value, and PADDLE(1) reads the vertical or Y-coordinate value.

If nothing's touching the **Tablet**, both values are at their maximum, *228* (all values are in decimal, unless noted).

When the stylus (or any other pointing object) is within the red border line of the **Tablet**'s surface, the X-coordinate ranges from about *10* (left border) to *210* (right border). The Y-coordinate is from about *12* (bottom) to *215* (top).

The left control button can be read with the PTRIG(0) function, which returns a *1* normally, or *0* if the button's pressed. The right control button can be read in a similar way, using PTRIG(1).

The button on the stylus works like the joystick's "forward" switch. From BASIC, STICK(0) returns a *15* normally, *14* if this button's pressed. Figure 1 (created with **AtariArtist**!) summarizes for you.



A sound beginning.

Listing 1 is a short example, to start you thinking about other uses for the versatile **Tablet**. Type in and run the listing. Whenever you touch the **Tablet**, you'll create a sound; moving right on the **Tablet** raises the pitch, while moving up raises the volume. Pressing the stylus button changes the distortion value.

I like the effect produced by "walking around" the **Tablet** with your fingers—try it! (Notes on all the listings are provided at the end of this article.)

Cursors—foiled again!

The most common **Tablet** use is as a pointing device. Apple Macintosh folks like to say that everyone knows how to point, so pointing programs tend to be easy to use.

The **AtariArtist** feature menu is an excellent example. A menu in a computer program is like a one in a restaurant—it lists what's available, and you can get what you

want by pointing at a selection. In order to see what you're pointing at, programs usually display a cursor, a small symbol that moves around the screen, mimicking motions of the stylus on the **Tablet**. The Atari's player/missiles are perfect for displaying cursors, since they're so easy to manipulate on-screen. Below are two example programs controlling a cursor with the **Tablet**.

The first cursor example (Listing 2) uses an "absolute" cursor, which just means that coordinates read from the **Tablet** are used for the cursor's absolute position.

This works like the drawing cursor in **AtariArtist**—it appears when you press down on the **Tablet**, in a screen position corresponding to that on the **Tablet**.

Note that the cursor blinks rapidly. This is because the player data must be erased when the cursor moves, since it could pop up anywhere. Some extra programming could prevent this, but I wanted to keep the example simple.

The second example (Listing 3) uses a "relative" cursor position. This means that, when you move on the **Tablet**, what matters is the direction you take (not where you are). It demands a bit more programming, but has some advantages. You can get much finer control over the cursor—and still be able to cover a large area, by "walking" the cursor in repetitive movements.

The **AtariArtist** cursor in magnify mode is a variation of relative cursor control. Notice that the cursor stays on-screen. Since it can't take any sudden jumps, it doesn't have to be completely redrawn, so the flickering is gone.

Now that we have control of a cursor, we can use it to select items from a menu. Listing 4 is a tongue-in-cheek example.

Up against the wall.

Listing 5 is a BASIC program, which reads a compressed picture and displays it, illustrating how you might use your **AtariArtist** creations in your own programs.

This program will also create a black-and-white hard copy plot of the picture, suitable for framing. If you have a printer other than an Epson MX-70, you'll need to figure out how to modify the plotting portion (or find an appropriate screen dump utility).

By the way, Listing 5 is quite slow—a good candidate for use in polishing your assembly language skills (which I leave as an exercise for the reader).

Another note: since each pixel is 2 bits wide, the plot ends up with the same half-height pixels that ANTIC mode E has. The proportions come out correctly—automatically!

Program notes.

Listing 1 — A simple tablet control example.

Line 60 turns off the sound, if nothing's pressing on the **Tablet**.

Line 75 calls a subroutine to change the distortion value, if the stylus button's pressed.

Lines 80 and 85 read the **Tablet** coordinates. Pitch is reversed from the X-coordinate, so that the right edge of the **Tablet** gives the highest pitch (smallest pitch value). The Y-coordinate is scaled to provide a volume setting, ranging from *0* to *15*.

Lines 110 and 120 modify the distortion and display the new value.

Line 140 waits until the stylus button's released, so the distortion changes only once per button click.

Listing 2 — Cursor control with absolute coordinates.

Lines 110 to 2090 set up the player/missile graphics area and cursor image data. I've used a couple of BASIC string-handling tricks to simplify and speed up this program. Lines 2040 to 2090 fool BASIC into thinking string A$ is stored where the cursor graphics area actually is, so that storing into A$ causes the cursor to change.

Line 3010 reads the tablet coordinates and reverses the Y-value.

Line 3020 makes the cursor disappear (by setting the horizontal position to *0*), if nothing's touching the **Tablet**.

Lines 3030 to 3060 limit the range of X- and Y-values. You might prefer to "wrap around" from left to right and top to bottom.

Line 3080 erases the old cursor data with another string-handling trick.

Line 3100 plots the new cursor.

Listing 3 — Cursor control with relative coordinates.

Lines 110 to 2090 set up the player/missile graphics, as in Listing 2. The cursor area is erased only once, in Line 2800.

Line 3010 reads **Tablet** coordinates; Line 3020 waits until something's touching the surface.

Line 3022 uses the SGN function to increment or decrement the cursor X- and Y-position, depending on the difference between current and previous tablet coordinates.

Line 3026 saves the current tablet position for the next time around.

Listing 4 — Menu input example.

Lines 110 to 2090 are the same graphics setup used in the previous two programs.

Lines 2110 to 2130 display the menu options. Make up your own menu, if you wish.

Lines 3010 to 3110 move the cursor, using absolute tablet coordinates. Line 3025 was added to check for any of the three buttons being pressed.

Lines 4000 to 4500 perform menu decoding when a button's been pressed. Since each menu item has its own line, only the Y-coordinate is needed. If this coordinate's close to a displayed menu item, that item is displayed; otherwise, the button press is ignored. By the way, the easiest way to figure out what coordinate limits to use for your menu is to write a dummy subroutine like this:

```
4000 POSITION 3,17 : ? XT, YT; " " : RETURN
```

Then, just note the coordinates printed when the cursor's at the boundaries of your menu items.

Listing 5 — Read and plot packed pictures.

Lines 30 and 32 get the picture device and filename. For example, *"D:ROBOT.PIC"*.

Lines 35 to 50 read the file header and extract the important data. The call to Line 400 sets up the graphics screen, while Line 50 POKEs in the color register settings.

Lines 60 and 65 start the picture unpacking, determining whether vertical or horizontal decoding is required.

Line 70 starts the hard copy plot if requested.

The subroutine starting at Line 100 is called from the

vertical and horizontal decoding routines when they're ready for the next picture data byte. Line 100 checks to see if any repetitions are left for the current decoded data run. If not, the next run is read and decoded. For a long run (first byte of 0), Line 120 computes the 2-byte run length. For a direct run, Line 130 adjusts the run length and sets the DIRECT flag. Lines 150 and 160 get the next byte and decrement the run length before returning.

Lines 400 to 480 set up the ANTIC mode E graphics display list. If you have an XL, you can replace these lines with:

```
400 GRAPHICS 15+16
410 DISP=PEEK(88)+256*PEEK(89)
420 RETURN
```

The rest of us need to build the display list ourselves. Since the display takes more than 4096 bytes of data, two "load memory scan" instructions are needed to cross the 4K boundary. Line 470 tells the OS to use the new display list.

Lines 600 to 650 decode a vertically-compressed picture. For each vertical column, two passes are made, filling in every other byte of the column, calling the unpack routine at Line 100 for each data byte.

Line 710 decodes a horizontally-compressed picture, by sequencing straight through the display area addresses.

Lines 800 to 870 plot the decoded image from screen memory to an Epson MX-70 printer. A few strange tricks are needed here, since the Atari printer interface doesn't know about raw binary data (only about character data). It simply outputs data in 40-character blocks, unless a carriage return comes first. Meanwhile, the Epson stores 80 bytes of image data at a time, then stops receiving characters while it plots this data. Lines 830 and 835, therefore, start each graphics line with exactly 40 characters, ending with spaces for a margin and commands to set the line height and bit graphics mode.

Line 845 provides a delay between each 80 bytes of graphics data, while the Epson's doing its thing. Lines 850 and 852 get the next byte and convert carriage return characters (13 ASCII, 155 ATASCII) into similar bytes that don't cause premature buffer output. Line 855 outputs the data to the printer.

Drawing conclusions.

I hope **Soft Touch** has given you some useful techniques and ideas for getting more from your Atari **Touch Tablet**. Together with **AtariArtist**, the **Tablet**'s a powerful graphics tool.

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CIRCLE #114 ON READER SERVICE CARD

With these techniques, it has many other intriguing uses. Here are two examples to get you thinking.

Try a programmable touch keyboard. Take the menu concept one step further, perhaps with printed overlays on the surface of the **Tablet** itself. Your **Tablet** can become a piano keyboard, a calculator keyboard, a telephone keypad, even a spacecraft control panel.

Perhaps you'd like to see character recognition. Imagine word processing without a typewriter keyboard. Be warned though, this is *not* a simple project.

Jack Morrison is president of SoftCenter Industries, a company specializing in microcomputer games, while he also works as an aerospace consultant. A graduate of UCLA's Computer Science department, his other interests include music and a Great Dane called Rufus.

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* (issue 45) and its update on page 9.

Listing 1.
BASIC listing.

```
AX 10 REM Touch-Tablet Controlled Sound
VE 20 REM 3/84 J. Morrison
BA 30 REM
ZW 40 DIST=10
MJ 50 REM ** main loop **
OO 60 REM turn off sound if stylus up
ZP 70 IF PADDLE(0)=228 THEN SOUND 0,0,0,0
   :GOTO 50
TN 75 IF STICK(0)=14 THEN GOSUB 100:REM s
   tylus button pressed
HM 80 PITCH=228-PADDLE(0)
LY 85 VOL=INT(PADDLE(1)/229*16)
FA 90 SOUND 0,PITCH,DIST,VOL:GOTO 50
BQ 95 REM
II 100 REM ** change distortion **
IX 110 DIST=DIST+2:IF DIST>14 THEN DIST=0
HF 120 ? " DISTORTION = ";DIST
SA 130 REM wait until button is released
VY 140 IF STICK(0)=14 THEN 140
ZH 150 RETURN
```

Listing 2.
BASIC listing.

```
KG 10 REM ** Cursor Control with Tablet
HX 20 REM **   (absolute cursor)
WW 30 REM ** 3/84 J. Morrison
EZ 100 REM ** setup P/M cursor **
XX 110 DIM A$(512),B$(12):GRAPHICS 0
HV 120 FOR I=1 TO 12:READ A:B$(I)=CHR$(A)
   :NEXT I
PH 130 DATA 0,0,128,192,224,240,224,176,2
   4,8,0,0,0
DE 140 A$(512)=" ":POKE 752,1:?
VI 2000 POKE 559,62:POKE 704,255
QD 2020 I=PEEK(106)-16:POKE 54279,I
EU 2030 POKE 53277,3
NM 2040 VTAB=PEEK(134)+256*PEEK(135)
CX 2050 ATAB=PEEK(140)+256*PEEK(141)
AO 2060 OFFS=I*256+1024-ATAB
QZ 2070 HI=INT(OFFS/256):LO=OFFS-256*HI
LU 2090 POKE VTAB+2,LO:POKE VTAB+3,HI
IP 2900 REM
EJ 3000 REM ** main loop **
ID 3010 XT=PADDLE(0):YT=228-PADDLE(1)
UB 3020 IF XT=228 THEN POKE 53248,0:GOTO
   3000
HR 3030 IF XT>198 THEN XT=198
BR 3040 IF XT<49 THEN XT=49
RB 3050 IF YT>213 THEN YT=213
TD 3060 IF YT<33 THEN YT=33
NO 3080 A$(2)=A$
VJ 3100 A$(YT,YT+11)=B$:POKE 53248,XT
NR 3110 GOTO 3000
```

Listing 3.
BASIC listing.

```
KG 10 REM ** Cursor Control with Tablet
DQ 20 REM **   (relative cursor)
WW 30 REM ** 3/84 J. Morrison
BB 40 REM
EZ 100 REM ** setup P/M cursor **
XX 110 DIM A$(512),B$(12):GRAPHICS 0
HV 120 FOR I=1 TO 12:READ A:B$(I)=CHR$(A)
   :NEXT I
PH 130 DATA 0,0,128,192,224,240,224,176,2
   4,8,0,0,0
DE 140 A$(512)=" ":POKE 752,1:?
VI 2000 POKE 559,62:POKE 704,255
QD 2020 I=PEEK(106)-16:POKE 54279,I
EU 2030 POKE 53277,3
NM 2040 VTAB=PEEK(134)+256*PEEK(135)
CX 2050 ATAB=PEEK(140)+256*PEEK(141)
AO 2060 OFFS=I*256+1024-ATAB
QZ 2070 HI=INT(OFFS/256):LO=OFFS-256*HI
LU 2090 POKE VTAB+2,LO:POKE VTAB+3,HI
NF 2800 A$(2)=A$
IP 2900 REM
EJ 3000 REM ** main loop **
ID 3010 XT=PADDLE(0):YT=228-PADDLE(1)
CN 3020 IF XT=228 THEN 3000
OS 3022 X=X+SGN(XT-XTOLD):Y=Y+SGN(YT-YTOL
   D)
ED 3026 XTOLD=XT:YTOLD=YT
RA 3030 IF X>198 THEN X=198
UL 3040 IF X<49 THEN X=49
BT 3050 IF Y>213 THEN Y=213
MR 3060 IF Y<33 THEN Y=33
FA 3100 A$(Y,Y+11)=B$:POKE 53248,X
NR 3110 GOTO 3000
```

Listing 4.
BASIC listing.

```
PT 10 REM ** Menu Demonstration
WW 30 REM ** 3/84 J. Morrison
BB 40 REM
EZ 100 REM ** setup P/M cursor **
FW 110 DIM A$(512),B$(12),ITEM$(20):GRAPH
   ICS 0
HV 120 FOR I=1 TO 12:READ A:B$(I)=CHR$(A)
   :NEXT I
PW 130 DATA 0,12,62,115,126,252,248,124,1
   27,62,12,0
DE 140 A$(512)=" ":POKE 752,1:?
VI 2000 POKE 559,62:POKE 704,255
QD 2020 I=PEEK(106)-16:POKE 54279,I
EU 2030 POKE 53277,3
NM 2040 VTAB=PEEK(134)+256*PEEK(135)
CX 2050 ATAB=PEEK(140)+256*PEEK(141)
AO 2060 OFFS=I*256+1024-ATAB
QZ 2070 HI=INT(OFFS/256):LO=OFFS-256*HI
LU 2090 POKE VTAB+2,LO:POKE VTAB+3,HI
IP 2100 REM ** setup menu **
QM 2110 ? "          RESTAURANT ATARI":? :?
EE 2120 ? :? "          Roast Beef"
```

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```
BO 2122 ? :? "          Fried Chicken"
CS 2124 ? :? "          Tuna Fish Salad"
ZD 2126 ? :? "          Cheeseburger"
KL 2130 POSITION 1,20:? ">>POINT TO SELEC
   TION AND PUSH BUTTON<<"
IP 2900 REM
EJ 3000 REM ** main loop **
ID 3010 XT=PADDLE(0):YT=228-PADDLE(1)
UB 3020 IF XT=228 THEN POKE 53248,0:GOTO
   3000
CH 3025 IF PTRIG(0)=0 OR PTRIG(1)=0 OR ST
   ICK(0)=14 THEN GOSUB 4000
HR 3030 IF XT>198 THEN XT=198
BR 3040 IF XT<49 THEN XT=49
RB 3050 IF YT>213 THEN YT=213
TD 3060 IF YT<33 THEN YT=33
NO 3080 A$(2)=A$
VJ 3100 A$(YT,YT+11)=B$:POKE 53248,XT
NR 3110 GOTO 3000
JB 3190 REM
SX 4000 REM ** button pushed - find item
FO 4010 IF YT>64 AND YT<76 THEN ITEM$="RO
   AST":GOTO 4500
BH 4020 IF YT>81 AND YT<93 THEN ITEM$="CH
   ICKEN":GOTO 4500
ZK 4030 IF YT>97 AND YT<109 THEN ITEM$="T
   UNA FISH":GOTO 4500
DI 4040 IF YT>113 AND YT<125 THEN ITEM$="
   BURGER":GOTO 4500
JT 4100 RETURN :REM out of range
NT 4500 POSITION 3,17:? "ONE ";ITEM$;" CO
   MIN' UP!       ":RETURN
```

Listing 5.
BASIC listing.

```
FG 10 REM ** Read and Plot Packed Picture
    Data
WY 12 REM ** 3/84 J. Morrison
BG 14 REM
KX 20 DIM F$(20),A$(10),HDR$(32)
UT 25 REM ** get file to display **
JG 30 GRAPHICS 0:? :? "Enter Device:Filen
   ame for picture":INPUT F$
OH 32 ? "Plot image on hardcopy (Y/N)";:I
   NPUT A$
XW 35 REM ** process file header **
SH 40 OPEN #1,4,0,F$:INPUT #1,HDR$
UL 45 FOR I=LEN(HDR$) TO 25:GET #1,A:NEXT
    I
VX 47 GOSUB 400:REM setup graphics
NG 50 A=708:FOR I=14 TO 18:POKE A,ASC(HDR
   $(I,I)):A=A+1:NEXT I
HQ 55 REM ** read and unpack picture **
QI 60 IF ASC(HDR$(8))=1 THEN GOSUB 600:GO
   TO 70:REM vertical
OR 65 GOSUB 700:REM else horizontal
NM 70 IF A$(1,1)="Y" THEN GOSUB 800
YW 80 END
BG 90 REM
NI 100 REM ** get next packed byte **
BD 105 IF COUNT>0 THEN 150:REM no read ne
   cessary
SD 110 DIRECT=0:GET #1,COUNT:GET #1,B
QT 120 IF COUNT=0 THEN GET #1,COUNT:COUNT
   =COUNT+256*B-1:GET #1,B:RETURN
GV 130 IF COUNT>127 THEN COUNT=COUNT-128:
   DIRECT=1:GOTO 160
LH 150 IF DIRECT THEN GET #1,B
KA 160 COUNT=COUNT-1:RETURN
RC 180 REM
SX 400 REM ** setup Antic mode E display
YK 405 D=PEEK(106):DL=(D-1)*256:DISP=(D-3
   1)*256
UJ 410 FOR A=DL TO DL+4:READ B:POKE A,B:N
   EXT A
ZN 420 DATA 112,112,112,78,0
BB 430 POKE DL+5,D-31
HV 440 FOR A=DL+6 TO DL+198:POKE A,14:NEX
   T A
BP 450 POKE DL+101,78:POKE DL+102,0:POKE
   DL+103,D-16
HQ 460 POKE DL+199,65:POKE DL+200,0:POKE
   DL+201,D-1
FC 470 POKE 560,0:POKE 561,D-1
ZQ 480 RETURN
RH 490 REM
MW 600 REM ** vertical decoding **
RD 610 FOR COL=0 TO 39:D=DISP+COL
MY 620 FOR A=D TO D+7600 STEP 80:GOSUB 10
   0:POKE A,B:NEXT A
IK 630 FOR A=D+40 TO D+7640 STEP 80:GOSUB
    100:POKE A,B:NEXT A
UJ 640 NEXT COL
ZM 650 RETURN
RD 660 REM
PG 700 REM ** horizontal decoding **
ML 710 FOR A=DISP TO DISP+7679:GOSUB 100:
   POKE A,B:NEXT A
ZH 720 RETURN
QY 730 REM
LO 800 REM ** Hardcopy plot to MX-70 **
FT 810 CLOSE #1:OPEN #1,8,0,"P:"
RH 820 FOR COL=0 TO 39:D=DISP+COL
YP 830 FOR B=1 TO 20:PUT #1,0:NEXT B
RK 835 ? #1;"              ";CHR$(27);"A";
   CHR$(8);CHR$(27);"K";CHR$(192);CHR$(0)
   ;
AJ 840 FOR A=7640 TO 0 STEP -40
CC 845 IF INT(A/3200)*3200=A THEN FOR B=1
    TO 200:NEXT B
ZH 850 B=PEEK(A+D):IF B=155 THEN B=154
QF 852 IF B=13 THEN B=12
FM 855 PUT #1,B:NEXT A:? #1:NEXT COL
LQ 860 CLOSE #1
ZS 870 RETURN
```

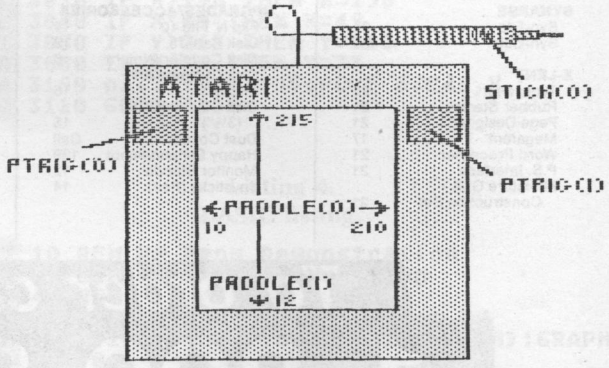
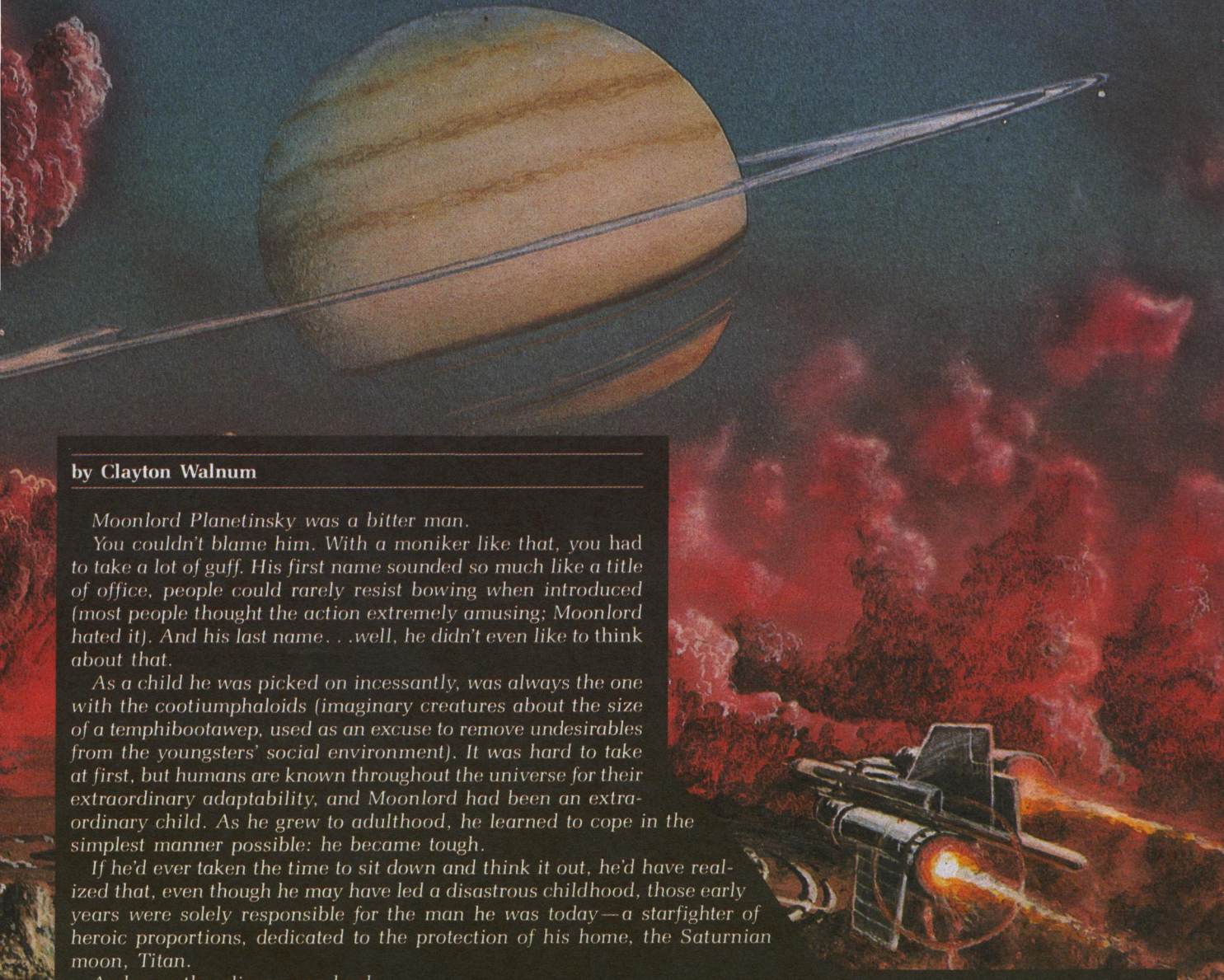


Figure 1.

Moonlord



by Clayton Walnum

Moonlord Planetinsky was a bitter man.

You couldn't blame him. With a moniker like that, you had to take a lot of guff. His first name sounded so much like a title of office, people could rarely resist bowing when introduced (most people thought the action extremely amusing; Moonlord hated it). And his last name. . .well, he didn't even like to think about that.

As a child he was picked on incessantly, was always the one with the cootiumphaloids (imaginary creatures about the size of a temphibootawep, used as an excuse to remove undesirables from the youngsters' social environment). It was hard to take at first, but humans are known throughout the universe for their extraordinary adaptability, and Moonlord had been an extraordinary child. As he grew to adulthood, he learned to cope in the simplest manner possible: he became tough.

If he'd ever taken the time to sit down and think it out, he'd have realized that, even though he may have led a disastrous childhood, those early years were solely responsible for the man he was today—a starfighter of heroic proportions, dedicated to the protection of his home, the Saturnian moon, Titan.

And now the aliens were back.

They were first sighted circling Epimetheus, but when they learned of their discovery by the Titanian fleet, they spread themselves thinly across the galactic milieu to gain time for the finalization of their attack plans.

To ordinary recruits of the Titanian Territorial Guard, the intruders had slipped into nonexistence, vanished beyond any hope of reprisal. The Guard's helplessness in the face of this strange defense tactic was understandable. After all, each of them had boring, normal names, like Regant Loppydock, Corlental Riddgobber, and, the most common of all, Tilogartingham Philopeeperton. They had had happy childhoods, had been readily accepted by their peers, had never had to struggle with a mocking society.

They weren't tough.

"Ah, Moonlord," said Leeryup Coddldoop, Commander-in-Chief of the TTG, "Glad to see you again." The commander began to bow, then snapped upright, cursing himself for getting caught in old habits. The last thing he wanted was to alienate Moonlord Planetinsky now. But, hey, he must be used to it. Even Moonlord's best friend Yupyup Manghat utilized the bow once in a while for a little fun.

"How's your buddy Yupyup doing?" Coddldoop asked. "Haven't seen him around in a while."

Moonlord's eyes narrowed. "He's in the hospital, recovering from a severe beating." His meaning was as clear as a starship porthole.

The commander cleared his throat. "Uh. . .ahem. . . yes. . .well." His face flushed. He felt a little dizzy.

"Communications problem?" Moonlord queried, lighting up a Hyperion brand smokyngstickolungolator (the original settlers from Earth had used the silly name "cigar"). "Don't worry about it. I know why you sent for me."

"You do?"

"Sure. The aliens were sighted a couple of days ago, and now they've made themselves scarce. You need someone with the skills to track them down and blast them into asteroid dust before they attack the moons. I was briefed before I got here."

"You were?"

"Relax, Commander. I've made all the necessary arrangements."

"You have?"

"I'm your man."

"You are?. . .Uh, yes! You are! There's just a couple of minor problems."

Moonlord frowned. "And what might those be?"

The commander blinked, sniffed. "Well, first of all, our compudigibinotometer-XE says there's a maximum of 100 galactic standard days until the alien invasion. You have to complete your mission by then."

Moonlord shrugged. "No problem."

"And. . .there's just one other tiny detail."

"Yes?"

"It seems nobody will go with you, except your own crew. It's just too dangerous."

"What! You expect me to knock off an entire alien invasion single-handedly? How many ships in the alien fleet?"

"A few," the commander squeaked.

"Three?" Moonlord asked.

"Well, a bit more than a few."

"Ten?"

"Closer." Coddldoop was beginning to fidget.

"How much closer?"

"A little."

Moonlord sighed, cracked his knuckles, glared. "I'm going to ask this one more time. Get the picture?"

"How dare you talk to the commanding officer of the. . ."

"Stow it!"

Coddldoop's mouth snapped shut. The fact was that nobody, nobody, wanted to be on the wrong side of Moonlord Planetinsky. Besides, Moonlord was it, their only hope.

"How many?" Moonlord asked.

"About fifty," Coddldoop mumbled.

"FIFTY! You want me to get rid of fifty alien craft?"

"If it wouldn't be too much trouble."

Moonlord thought for a minute. "What the heck. I'll do it. I need a good challenge."

The commander's eyes glowed. "Thank you, thank you! I knew we could depend on you." In the course of these expressions of gratitude, it was a natural thing to bow.

Coddldoop learned to enjoy hospital food.

Typing Moonlord.

The instructions below should be followed exactly to create your copy of **Moonlord**.

1) Type in Listing 1, using **BASIC Editor II** (issue 45) and its update (page 9 of this issue) to verify your work. Be sure to save a backup copy.

2) Place a disk containing DOS in drive 1 and run the program created from Listing 1. A character set file and a machine language file will be written to your disk. These files (*MOONLORD.FNT* and *MOONLORD.ML*) must be present when you play the game.

3) Type in Listing 2, using the updated **BASIC Editor II** to verify your work.

4) Save this program to the same disk containing the files *MOONLORD.FNT* and *MOONLORD.ML*.

5) To play **Moonlord**, run the program created from Listing 2.

Playing Moonlord.

When you run the program, the first thing you'll see (after the title screens) is the galactic map, represented on your screen by a 18 x 8 grid. Each square in the grid is 1 sector of the galactic milieu. Hidden within these 144 sectors are the 50 alien craft you must locate and destroy. Relax. It's not quite as bad as it seems. The aliens always travel in pairs, therefore only 25 sectors actually contain the enemy.

To make your job a little easier, there are two starbases you may dock with, allowing you to stock up on supplies and make repairs. There's one base at each end of the galaxy, and, just like the aliens, they're randomly placed at the beginning of each game, forcing you to explore.

To win the game, you must locate and destroy all 50 alien craft. You have only 100 galactic standard days in which to complete your mission. It'll take careful conservation of supplies and planned movement, so those who like to leap into the fray without a strategy will find failure a constant companion.

Though there's only one way to win the game, there are many ways to lose (natch). The first is running out of time. You've got 100 days. No extensions. All begging will be ignored.

The second way to lose your hero status is to allow your energy to run out. Keep your eye on it; when it's gone, so are you. Don't forget to check up on the status of your weapons, either. If you should be in the heat of battle and find that both your weapons systems are down. . .well, the aliens are pretty ruthless. They won't destroy you; they'll just disable your engines and leave you floating helplessly in space. The result? *End of Game.*

Finally, use of your ship's jump capabilities is a risky venture indeed. Each time you decide to utilize them, you're taking a 1-in-10 chance of destroying your engines.

The bridge.

Below the galactic map, you'll find the bridge. This is where you'll gain access to the ship's main functions.

There are four systems available to you here: scanners, cruise engines, a status display and jump engines. Use your joystick to select the system you wish to activate, then press the trigger.

To move your ship from one galactic sector to another, select the "cruise" command. You're allowed to move in only four directions, but may move as many sectors as you wish. Use the joystick to enter the cruise vector (the direction you want to move), then press the trigger. You may then enter the length of the cruise by pushing your joystick forward or backward. When the number of sectors you wish to move has been selected, press the trigger. Your ship will appear in the target sector.

If you should enter invalid cruise data (such as trying to move off the edge of the map), the computer will insist that you try again. Each sector of movement uses ten units of energy and one day of time.

Throughout the game, it's important to keep close tabs on your ship's condition and supplies. You can't afford to be stuck far from a starbase when your energy's almost depleted, and it helps to know what weapons are functional before you spring into battle. All this information is available in the status display. To view the status display, select the "status" option from the bridge menu, and press your fire button.

Your ship's six systems are displayed on the left, each followed by a number indicating how many days are needed to repair that system. A *0* means the system is fully functional.

On the right, information can be found on supplies, as well as the time remaining and the alien count.

Damaged systems must be repaired before they can be used. Damage is measured by the number of days the crew requires to complete repairs. If you won't use a damaged system right away, you need do nothing. The crew will automatically get to work, applying their best efforts to the restoration of your ship. Remember: one sector of movement on the galactic map consumes one day. A system that requires three days to repair will be operative after a move of three sectors.

If you find you must make repairs immediately, before continuing with the game, you may do so by selecting the "repair" option from the status subsystem menu. Use the joystick to tell the ship's computer how long you wish to wait for repairs, then press the trigger. The repairs will be made, and the status screen updated.

If more than one system needs repair, the times are not added together. Each system has its own crew. For example, if your photon launchers require four days to repair, and your short-range scanner needs two days, it'll take only four days to fix both systems. Given the above circumstance, if you should select only two days of repair time, the short-range scanner would be operational, while the launchers would require two additional days of repair before you can use them. Logical?

Don't forget that the time you spend waiting for repairs will be subtracted from the time available to your mission. Sometimes it's better to continue crippled than to waste a lot of time sitting around.

Should you find that you must move a long distance in a minimum amount of time, the jump engines may fill your need. Unfortunately, the jump engines are still experimental; their safety and reliability cannot be guaranteed. You have no control over where you'll end up, and each jump carries a 1-in-10 chance of leaving you engineless, helplessly afloat in the timeless void of space. In other words, the game could come to an abrupt ending.

Each jump consumes one day and thirty units of energy. Due to its undependability, you may have to jump several times before you get where you want (or at least in that general area). Is it worth the risk? That depends on how desperate you are.

Scanners and such.

When you activate the scanners, you'll be moved to the scanner subsystem menu, allowing you to choose between long- or short-range scanners.

The long-range scanners examine sectors adjacent to your position and mark the galactic map appropriately. They *do not* indicate the status of your current sector. You must use your short-range scanners to get this information (or move to a different sector, in which case your old sector will be marked with the proper icon). Empty sectors are indicated by a white dot; aliens are represented by a red cross; and starbases appear as a blue square.

The short-range scan allows you to see your current sector in greater detail. Each sector of the galactic map is divided into thirty-six smaller sectors. Suns, aliens, starbases and your own ship are represented by icons on the SRS display (see Figure 1). Four systems commands are available from the "Short-range scan subsystem" (SRSSS) menu: bridge, cruise, phaser and photon. To return to the bridge, select the bridge option.

Once you enter the SRS, you must destroy all aliens in the sector. You won't be allowed to return to the bridge until you do so. And, of course, the aliens aren't going sit around polishing their antennae while you remove them from the galaxy. Each time you complete an action, the aliens will fire on you. If you get hit, you'll hear a low buzzing sound. Each hit causes up to six days' damage to one of your systems.

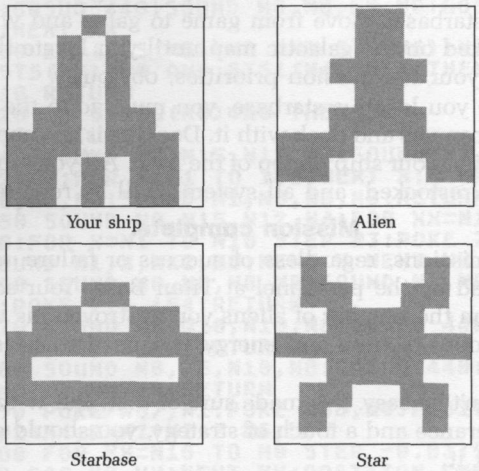


Figure 1.

Moonlord *continued*

You may move about in the short-range display in much the same manner as in the galactic map. Select the cruise option from the SRSSS menu, press the trigger, then enter your cruise vector and distance.

Unlike the galactic map, your movement here is somewhat restricted. You can't move through a sun, an alien, or a starbase. If anything is in your way, you must maneuver around it.

Movement on the short-range display consumes no time, but costs you 3 energy points per sector.

The phasers are the first of your weapons systems, and your most powerful. When activated, they release a burst of electromagnetic energy in every direction, damaging any alien craft on your scanners. The amount of damage done depends on the number of alien craft present and their distance from your ship. Damage is cumulative. You may have to fire more than once to get the job done.

To activate the phasers, select the phaser option from the SRSSS menu, then use your joystick to tell the ship computer the amount of power to allocate. Each power point will be subtracted from your remaining energy, so be stingy, allocating just enough to get the job done. That, of course, is the trick. It'll take you a few games to figure out the magic numbers.

Photon torpedoes (globes of compacted light energy) can be used to fire on alien craft which are in alignment (horizontally, vertically, or diagonally) with your ship. Their range is sufficient to strike any ship on your scanners, and a strike is always fatal. To fire a photon, select the photon option from the SRSSS menu, then enter the torpedo's vector. Firing a photon consumes no energy.

But nothing comes for free. In order to fire photons, your launchers must be working, and you must have photons on hand. (Can't fire something you don't have, can you?) At the start of the game, you're given ten photons. You'll be restocked only when you dock with a starbase. Obviously, you're going to have to use them judiciously.

When you set out from Titan Base, your ship is carrying all the supplies it can hold. It'll be necessary, at certain points in the game, to stock up. For this reason, there are two starbases, one at each end of the galactic milieu.

The starbases move from game to game and will not be marked on the galactic map until you locate them—one of your top mission priorities, obviously.

Once you locate a starbase, you must go to the short-range scanners and dock with it. Docking is accomplished by moving your ship on top of the base. All your supplies will be restocked, and all systems will be repaired.

Mission complete.

All missions, regardless of success or failure, will be evaluated by the personnel at Titan Base. Your score is based on the number of aliens you destroyed, as well as the amount of time and energy you used (the less, the better).

It won't be easy. I've made sure of that. But with some perseverance and a touch of strategy, you should get the hang of it.

Oh, by the way, don't tolerate any bowing.

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*, issue 45, and the update on page 9.

Listing 1.
BASIC listing.

```
FA 10 DIM XFR$(28),A$(1):FOR X=1 TO 28:RE
   AD A:XFR$(X)=CHR$(A):NEXT X
HO 20 POKE 106,PEEK(106)-4:GRAPHICS 0
FY 30 ? "PRESS RETURN TO BEGIN":INPUT A$:
   GRAPHICS 0:POKE 710,0:POKE 752,1
EJ 40 POSITION 4,10:? "Creating character
    set data file"
GP 50 POKE 203,N0:POKE 204,PEEK(106):D=US
   R(ADR(XFR$))
XP 60 CHB=PEEK(106)*256
SF 70 READ A:IF A=-1 THEN 90
GY 80 FOR Z=0 TO 7:READ J:POKE CHB+A*8+Z,
   J:NEXT Z:GOTO 70
XO 90 OPEN #1,8,0,"D:MOONLORD.FNT"
II 100 FOR X=0 TO 1023:A=PEEK(CHB+X):PUT
   #1,A:NEXT X:CLOSE #1
UB 110 POSITION 4,10:? " Creating machine
    language file  "
BL 120 OPEN #1,8,0,"D:MOONLORD.ML"
NE 130 FOR X=1 TO 100:READ A:PUT #1,A:NEX
   T X:CLOSE #1
VI 140 POSITION 4,10:? "                ALL
   DONE!           "
SE 150 REM ******XFR$ DATA******
NG 160 DATA 104,169,0,133,205,168,169,224
   ,133,206,177,205,145,203,200,208
SO 170 DATA 249,230,204,230,206,165,206,2
   01,228,208,239,96
SX 180 REM ******CHARACTER DATA******
GC 190 DATA 2,0,20,20,85,85,20,20,0
AQ 200 DATA 3,124,170,170,170,170,170,170
   ,124
NI 210 DATA 5,0,31,120,89,89,89,89,89
QB 220 DATA 6,0,248,30,154,154,154,154,15
   4
WC 230 DATA 7,89,89,91,91,91,120,31,0
NF 240 DATA 8,154,154,218,218,218,30,248,
   0
CP 250 DATA 10,16,40,56,40,124,198,198,0
AD 260 DATA 15,0,0,0,24,24,0,0,0
SO 270 DATA 16,0,126,102,110,118,118,126,
   0
FZ 280 DATA 17,0,120,120,24,24,24,126,0
AZ 290 DATA 18,0,126,102,12,56,112,126,0
NI 300 DATA 19,0,126,14,24,12,118,126,0
LV 310 DATA 20,0,28,60,124,108,126,14,0
XR 320 DATA 21,0,126,96,126,6,118,126,0
DA 330 DATA 22,0,124,96,126,102,118,126,0
QL 340 DATA 23,0,126,6,14,14,14,14,0
TM 350 DATA 24,0,126,102,60,102,118,126,0
RQ 360 DATA 25,0,126,102,126,6,14,14,0
ZR 370 DATA 33,0,124,108,108,254,198,198,
   0
MF 380 DATA 34,0,124,108,126,102,102,126,
   0
DV 390 DATA 35,0,126,102,96,112,118,126,0
SO 400 DATA 36,0,124,102,102,118,118,126,
   0
AJ 410 DATA 37,0,126,96,126,112,112,126,0
TZ 420 DATA 38,0,126,96,126,112,112,112,0
```

```
CY 430 DATA 39,0,126,102,96,110,118,126,0
BV 440 DATA 40,0,102,102,126,230,230,230,
   0
VC 450 DATA 41,0,48,48,48,56,56,56,0
KA 460 DATA 42,0,12,12,14,14,110,126,0
JT 470 DATA 43,0,108,108,124,126,102,102,
   0
FZ 480 DATA 44,0,96,96,112,112,112,126,0
PN 490 DATA 45,0,119,119,127,107,99,99,0
VF 500 DATA 46,0,126,102,102,102,102,102,
   0
CI 510 DATA 47,0,126,110,110,102,102,126,
   0
BW 520 DATA 48,0,126,102,118,126,96,96,0
TZ 530 DATA 49,0,126,102,102,102,126,28,0
CB 540 DATA 50,0,124,108,108,126,118,118,
   0
RC 550 DATA 51,0,126,96,126,6,102,126,0
TU 560 DATA 52,0,126,24,24,28,28,28,0
II 570 DATA 53,0,102,102,102,102,118,126,
   0
AJ 580 DATA 54,0,102,102,118,126,60,24,0
FU 590 DATA 55,0,99,99,107,127,119,119,0
NI 600 DATA 56,0,118,118,60,60,118,118,0
GM 610 DATA 57,0,102,102,126,24,24,24,0
ZF 620 DATA 58,0,126,14,24,112,112,126,0
RQ 630 DATA 64,0,0,0,0,0,0,0,0
HJ 640 DATA 65,24,24,28,31,31,28,24,24
GU 650 DATA 67,24,24,56,248,240,0,0,0
JZ 660 DATA 68,24,24,56,248,248,56,24,24
UG 670 DATA 69,0,0,0,240,248,56,24,24
NW 680 DATA 71,0,3,3,7,31,31,3,3
FP 690 DATA 72,0,192,192,192,192,192,192,
   192
LN 700 DATA 73,3,3,3,3,3,15,31,0
SK 710 DATA 74,192,192,192,192,192,240,24
   8,0
MI 720 DATA 81,0,0,0,15,31,28,24,24
UM 730 DATA 83,24,24,60,255,255,60,24,24
RK 740 DATA 87,0,0,0,255,255,60,24,24
IR 750 DATA 88,24,24,60,255,255,0,0,0
CL 760 DATA 90,24,24,28,31,15,0,0,0
HW 770 DATA 97,16,40,40,40,108,238,214,21
   4
YB 780 DATA 98,24,24,60,24,60,231,195,0
TQ 790 DATA 99,0,24,102,255,129,255,0,0
HQ 800 DATA 100,74,1,84,19,164,1,168,34
BB 810 DATA 101,66,102,60,255,60,102,66,0
BM 820 DATA 102,0,0,0,24,24,0,0,0
DL 830 DATA 103,0,0,60,36,36,60,0,0
ZI 840 DATA 104,0,60,66,66,66,66,60,0
RE 850 DATA 105,126,129,129,129,129,129,1
   29,126
GP 860 DATA -1
XI 870 REM ******MV$ DATA******
UK 880 DATA 216,104,104,104,133,213,104,2
   4,105,2,133,206,104,133,205,104,133,20
   4,104,133,203,104,104,133,208
IM 890 DATA 104,104,133,209,104,104,24,10
   1,209,133,207,166,213,240,16,165,205,2
   4,105,128,133,205,165,206,105
IA 900 DATA 0,133,206,202,208,240,160,0,1
   62,0,196,209,144,19,196,207,176,15,132
   ,212,138,168,177,203,164
KU 910 DATA 212,145,205,232,169,0,240,4,1
   69,0,145,205,200,192,128,208,224,166,2
   13,165,208,157,0,208,96
```

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Listing 2.
BASIC listing.

```
EV 10 GRAPHICS 0:POKE 559,0
AL 20 N0=0:N1=1:N2=2:N3=3:N4=4:N5=5:N6=6:
   N7=7:N8=8:N9=9:N10=10:N11=11:N12=12:N1
   3=13:N14=14:N15=15:N16=16:N17=17
HW 30 N18=18:N19=19:N20=20:N21=21:N22=22:
   N87=87:N88=88:N89=89:N559=559:N752=752
   :N756=756:ST=N0:GOTO 2350
KI 40 FOR X=N1 TO 432:L=INT(RND(N0)*36):S
   EC$(X,X)=CHR$(L):NEXT X
PM 50 FOR X=725 TO 747:POKE PMB+X,255:POK
   E PMB+X+128,255:NEXT X:RETURN
HC 60 FOR X=N1 TO 25
SP 70 C=(INT(RND(N0)*N18)+N1)*N2:R=(INT(R
   ND(N0)*N8))*N2+N1:P=((R+N1)/N2-N1)*N18
   +C/N2:IF BRD$(P,P)<>"/" THEN 70
WF 80 BRD$(P,P)=CHR$(34):NEXT X:RETURN
VO 90 FOR X=N1 TO N15 STEP 0.1:POKE 709,X
   :NEXT X:FOR X=N1 TO 450:NEXT X:FOR X=N
   15 TO N1 STEP -0.1:POKE 709,X:NEXT X
YX 100 RETURN
LR 110 RESTORE 2940:FOR X=N0 TO 44:READ A
   :POKE 1536+X,A:NEXT X
EE 120 FOR X=N1 TO 40:READ A:CL$(X)=CHR$(
   A):NEXT X:RETURN
WZ 130 GRAPHICS N0:POKE 710,N0:POKE 709,N
   0:POKE N752,N1:RETURN
RQ 140 FOR X=N1 TO N6:STS(X)=STS(X)-U:IF
   STS(X)<N0 THEN STS(X)=N0
SL 150 NEXT X:RETURN
SR 160 SY=INT(SSEC/N6):SX=SSEC-SY*N6:AY=I
   NT(OA(A)/N6):AX=OA(A)-AY*N6:DIS=INT(SQ
   R((SY-AY)^2+(SX-AX)^2)+0.5):RETURN
ZP 170 ST=STICK(N0):IF STRIG(N0)=N0 THEN
   RETURN
CA 180 IF ST=N13 THEN RW=RW+N4:IF RW>MAX
   THEN RW=MAX
UR 190 IF ST=N14 THEN RW=RW-N4:IF RW<MIN
   THEN RW=MIN
BD 200 FOR X=N1 TO 50:NEXT X:A=USR(PMV,N0
   ,PMB,ADR(P0$),112,RW,N6):GOTO 170
JN 210 IF BRD$(SEC+N1,SEC+N1)<>CHR$(34) T
   HEN RETURN
RQ 220 POKE N87,N0:POKE N88,N20:FOR X=N9
   TO N12:POSITION N13,X:? "
    ":NEXT X
PZ 230 FOR X=N0 TO N1:IF OP(X)>N0 THEN GO
   SUB 250
SK 240 NEXT X:RETURN
JI 250 POSITION N16,N10:? "ALIEN ";X+N1:P
   OSITION N15,N11:? "ATTACKING"
HW 260 FOR Z=255 TO N0 STEP -N10:SOUND N0
   ,Z,N10,N4:SOUND N1,Z+N2,N10,N4:NEXT Z
WV 270 SOUND N0,N0,N0,N0:SOUND N1,N0,N0,N
   0:DAM=INT(RND(N0)*N6)+N1:IF DAM>N1 THE
   N RETURN
NG 280 DAM=INT(RND(N0)*N6)+N1:DP=INT(RND(
   N0)*N6)+N1:STS(DP)=STS(DP)+DAM
AX 290 FOR XX=N1 TO N6:SOUND N0,100,N12,N
   8:GOSUB 440:SOUND N0,N0,N0,N0:GOSUB 44
   0:NEXT XX
KN 300 IF (STS(N5)>N0 AND STS(N6)>N0) OR
   (STS(N5)>N0 AND ST51(N4)<N1) THEN 2170
ZB 310 RETURN
KP 320 IF STRIG(N0)=N0 THEN 320
ZF 330 RETURN
SO 340 SOUND N0,N15,N12,N2:SOUND N1,150,N
   12,N8:FOR X=N1 TO 150:NEXT X:SOUND N0,
   N0,N0,N0:SOUND N1,N0,N0,N0:RETURN
NZ 350 SOUND N0,N15,N12,N4:FOR XX=N1 TO N
   20:FOR X=N1 TO N16 STEP N3:POKE 711,X:
   SOUND N1,X,N12,N8:NEXT X:NEXT XX
LS 360 SOUND N0,N0,N0,N0:SOUND N1,N0,N0,N
   0:POKE 711,154:RETURN
CF 370 SOUND N0,N10,N10,N8:GOSUB 440:SOUN
   D N0,N0,N0,N0:RETURN
PP 380 SOUND N0,75,N10,N8:GOSUB 440:SOUND
    N0,N0,N0,N0:RETURN
RA 390 POKE N87,N1:POKE N88,N0:POSITION C
   *N2+N4,R*N2+N2:? #6;"D"
LB 400 FOR XX=N16 TO N0 STEP -0.03:SOUND
   N0,200,N0,XX:NEXT XX:POSITION C*N2+N4,
   R*N2+N2:? #6;" "
```

```
YS 410 POKE N87,N0:POKE N88,N20:ST$1(N2)=
   ST$1(N2)-N1:IF ST$1(N2)=N0 THEN 2170
WL 420 IF OP(N0)<N1 AND OP(N1)<N1 THEN BR
   D$(SEC+N1,SEC+N1)="/"
ZG 430 RETURN
UR 440 FOR Z=N1 TO N10:NEXT Z:RETURN
UW 450 SOUND N0,50,N12,N8:FOR X=N1 TO N20
   :NEXT X:SOUND N0,N0,N0,N0:RETURN
FH 460 R=INT(SSEC/N6):C=SSEC-R*N6:POSITIO
   N C*N2+N4,R*N2+N2:? #N6;"a":RETURN
OJ 470 IOCB=848:ICCOM=IOCB+N2:ICBAL=IOCB+
   N4:ICBAH=IOCB+N5:ICBLL=IOCB+N8:ICBLH=I
   OCB+N9
UC 480 POKE ICCOM,N7:AH=INT(A/256):AL=A-A
   H*256:NH=INT(X/256):NL=X-NH*256
SY 490 POKE ICBAL,AL:POKE ICBAH,AH:POKE I
   CBLL,NL:POKE ICBLH,NH
UL 500 A=USR(ADR("hhh[ESC]LV[ESC]"),N16):CLOSE #N
   1:RETURN
MT 510 REM *******MAIN SCREEN********
ZA 520 GRAPHICS N0:POKE N559,N0:POKE 5428
   6,255:POKE 710,N0:POKE 82,N0:POKE N752
   ,N1:POKE N756,CHBASE/256
NH 530 DL=PEEK(560)+256*PEEK(561)+N4:POKE
    DL,N0:POKE DL+N1,GMAP:POKE DL+N17,130
   :POKE DL+23,130
EY 540 POKE N88,N0:POKE N89,GMAP
ND 550 POKE 512,N0:POKE 513,N6:POKE 1580,
   N0:POKE 54286,192:POKE N559,46:POKE HP
   OSP1,96:POKE HPOSP2,128:RW=N87
RR 560 FOR X=N18 TO N21:POSITION N13,X:?
   M1$((X-N17)*N14-N13,(X-N17)*N14):NEXT
   X
YC 570 R=INT(SEC/N18):C=SEC-R*N18:R=R*N2+
   N1:C=C*N2+N2:POSITION C,R:? "*":OCH=AS
   C(BRD$(SEC+N1,SEC+N1))
UR 580 POKE 77,N0:MIN=N87:MAX=99:GOSUB 17
   0:ON (RW-83)/N4 GOTO 600,1860,1650,210
   0
HP 590 REM *********SCAN*********
ZI 600 GOSUB 320:POKE HPOSP0,N0:FOR X=N18
    TO N21:POSITION N17,X:? "      ":NEXT
    X:POSITION N13,N18:? "  SCAN RANGE  "
XR 610 POSITION N17,N20:? "SHORT":POSITIO
   N N17,N21:? "LONG":RW=95
YV 620 MIN=95:MAX=99:GOSUB 170:ON (RW-90)
   /N4 GOTO 640,1540
JE 630 REM ******SHORT RANGE******
EO 640 IF ST$(N3)>N0 THEN GOSUB 340:GOTO
   560
TO 650 GRAPHICS N0:POKE N559,N0:POKE 5428
   6,255:POKE N756,(CHBASE/256)+N2:DL=PEE
   K(560)+256*PEEK(561)+N4
ZD 660 POKE DL-N1,70:FOR X=N2 TO N16:POKE
    DL+X,N6:NEXT X:POKE DL+N17,134:POKE D
   L+23,130
HY 670 POKE DL+25,65:POKE DL+26,PEEK(560)
   :POKE DL+27,PEEK(561):POKE 1580,N0:POK
   E 54286,192
SI 680 POKE N88,N0:POKE N89,SMAP:POKE DL,
   N0:POKE DL+N1,SMAP:POKE 708,52:POKE 70
   9,N8:POKE 710,44:POKE 711,154
RZ 690 POKE N87,N1:POKE N752,N1:POKE 77,N
   0
CZ 700 FOR X=N4 TO N14 STEP N2:FOR Y=N2 T
   O N12 STEP N2:POSITION X,Y:? #6;" ":NE
   XT Y:NEXT X
XF 710 FOR X=N0 TO N2:L=ASC(SEC$((SEC+N1)
   *N3-X)):R=INT(L/N6):C=L-R*N6
HE 720 POSITION C*N2+N4,R*N2+N2:? #N6;"E"
   :NEXT X:GOSUB 460
KH 730 IF BRD$(SEC+N1,SEC+N1)<>CHR$(34) T
   HEN 780
KS 740 FOR X=N0 TO N1
MB 750 L=INT(RND(N0)*36):OA(X)=L:OP(X)=N5
ND 760 R=INT(L/N6):C=L-R*N6:LOCATE C*N2+N
   4,R*N2+N2,A:IF A<>ASC(" ") THEN 750
PH 770 POSITION C*N2+N4,R*N2+N2:? #N6;"B"
   :NEXT X
VF 780 IF BRD$(SEC+N1,SEC+N1)<>"#" THEN 8
   10
QH 790 L=INT(RND(N0)*36):R=INT(L/N6):C=L-
   R*N6:LOCATE C*N2+N4,R*N2+N2,A:IF A<>AS
   C(" ") THEN 790
MK 800 POSITION C*N2+N4,R*N2+N2:? #N6;"c"
FT 810 RW=N87:POKE N87,N0:POKE N559,46
FJ 820 MIN=N87:MAX=99:GOSUB 170:ON (RW-83
   )/N4 GOTO 830,860,1050,1250
CX 830 IF OP(N0)>N0 OR OP(N1)>N0 THEN GOS
   UB 340:GOTO 820
OF 840 GOTO 520
AZ 850 REM *******SHORT CRUISE*******
PR 860 GOSUB 320:IF ST$(N2)>N0 THEN GOSUB
    340:GOTO 820
LY 870 MAX=N5:OSSEC=SSEC:POKE N87,N0:POKE
    N88,172:POKE N89,PEEK(N89)-N2
BK 880 GOSUB 1940:SSC=SSEC-U*N6*(DR=N1)+U
   *(DR=N2)+U*N6*(DR=N3)-U*(DR=N4)
SB 890 IF SSC<N0 OR SSC>35 THEN GOSUB 450
   :GOTO 880
AH 900 IF (DR=N2 AND INT(SSC/N6)>INT(SSEC
   /N6)) OR (DR=N4 AND INT(SSC/N6)<INT(SS
   EC/N6)) THEN GOSUB 450:GOTO 880
YA 910 POKE N87,N1:POKE N88,N0:POKE N89,S
   MAP:R=INT(OSSEC/N6):C=OSSEC-R*N6:R1=R:
   C1=C
JK 920 IF U=N0 THEN 1020
WA 930 C1=C1+XOF:R1=R1+YOF:LOCATE C1*N2+N
   4,R1*N2+N2,A
EV 940 IF A<>ASC("c") THEN 990
YG 950 POSITION C*N2+N4,R*N2+N2:? #N6;" "
   :POSITION C1*N2+N4,R1*N2+N2:? #N6;"a"
BE 960 FOR X=N1 TO 30:SOUND N0,50,N10,N8:
   GOSUB 440:SOUND N0,N0,N0,N0:GOSUB 440:
   NEXT X
QX 970 FOR X=N1 TO N6:ST$(X)=N0:NEXT X:PS
   =PS+600-ST$1(N3):ST$1(N3)=600:ST$1(N4)
   =N10
KK 980 POSITION C1*N2+N4,R1*N2+N2:? #N6;"
   c":GOSUB 460:GOTO 1220
AL 990 IF A<>ASC(" ") THEN POSITION C1*N2
   +N4,R1*N2+N2:? #N6;CHR$(A):GOSUB 450:G
   OTO 870
ET 1000 IF R1*N6+C1=SSC THEN 1020
RP 1010 GOTO 930
XW 1020 POSITION C*N2+N4,R*N2+N2:? #N6;"
   ";ST$1(N3)=ST$1(N3)-U*N3:IF ST$1(N3)<N
   1 THEN 2170
ZR 1030 SSEC=SSC:GOSUB 460:GOTO 1220
IB 1040 REM ********PHASERS*********
XR 1050 IF ST$(N5)>N0 THEN GOSUB 340:GOTO
    820
ZO 1060 POKE N88,N20:FOR X=N9 TO N12:POSI
   TION N17,X:? "      ":NEXT X:POSITION
   N16,N10:? "POWER=0":PHP=N0
GC 1070 POKE HPOSP0,N0:GOSUB 320
CI 1080 IF STRIG(N0)=N0 THEN 1130
ZC 1090 ST=STICK(N0):IF ST<>N13 AND ST<>N
   14 THEN 1080
VE 1100 PHP=PHP+N1*(ST=N14)-N1*(ST=N13):I
   F PHP<N0 THEN PHP=99
LR 1110 IF PHP>99 THEN PHP=N0
FX 1120 POSITION 22,N10:? PHP;" ":GOTO 10
   80
BY 1130 ST$1(N3)=ST$1(N3)-PHP:IF ST$1(N3)
   <N1 THEN 2170
DF 1140 GOSUB 350:IF OP(N0)<N1 AND OP(N1)
   <N1 THEN 1220
NW 1150 IF OP(N0)<N1 OR OP(N1)<N1 THEN 11
   90
RK 1160 FOR A=N0 TO N1:GOSUB 160:DAM=INT(
   PHP/N6/DIS+0.5):OP(A)=OP(A)-DAM:IF OP(
   A)>N0 THEN 1180
YD 1170 POKE N87,N1:POKE N88,N0:L=OA(A):R
   =INT(L/N6):C=L-R*N6:GOSUB 390
IS 1180 NEXT A:GOTO 1220
```

```
MO 1190 A=N0:IF OP(N1)>N0 THEN A=N1
RR 1200 GOSUB 160:DAM=INT(PHP/N3/DIS+0.5)
   :OP(A)=OP(A)-DAM:IF OP(A)>N0 THEN 1220
VW 1210 L=OA(A):R=INT(L/N6):C=L-R*N6:GOSU
   B 390
VX 1220 GOSUB 210:POKE N87,N0:POKE N88,N2
   0:POSITION N15,N9:? "  BRIDGE  ";:POSI
   TION N15,N10:? "  CRUISE  ";
RE 1230 POSITION N15,N11:? "  PHASER  ";:
   POSITION N13,N12:? "    PHOTON    ";:G
   OTO 820
XK 1240 REM ********PHOTONS********
LN 1250 GOSUB 320:IF ST$(N6)>N0 OR ST$1(N
   4)<N1 THEN GOSUB 340:GOTO 820
PC 1260 POKE 766,N1:POKE HPOSP0,N0:POKE N
   87,N0:POKE N88,N20:ST$1(N4)=ST$1(N4)-N
   1:GOSUB 300
PC 1270 POSITION N16,N9:? "VECTORS":POSIT
   ION N17,N10:? "  ↑  ":POSITION N17,N1
   1:? " ← →  "
GD 1280 POSITION N17,N12:? "  ↓  ":OST=N
   14:XOF=N0:YOF=-N1
VU 1290 D1$=DD$:ST=STICK(N0):IF STRIG(N0)
   =N0 THEN 1400
UJ 1300 IF ST=N15 OR ST=OST THEN 1290
CQ 1310 IF ST=N14 THEN D1$(N2,N2)="▛":XOF
   =N0:YOF=-N1:OST=N14
CP 1320 IF ST=N6 THEN D1$(N3,N3)="▜":XOF=
   N2:YOF=-N1
HA 1330 IF ST=N7 THEN D1$(N6,N6)="▟":XOF=
   N2:YOF=N0
FP 1340 IF ST=N5 THEN D1$(N9,N9)="▙":XOF=
   N2:YOF=N1
LI 1350 IF ST=N13 THEN D1$(N8,N8)="▀":XOF
   =N0:YOF=N1
TC 1360 IF ST=N9 THEN D1$(N7,N7)="▌":XOF=
   -N2:YOF=N1
TI 1370 IF ST=N11 THEN D1$(N4,N4)="▐":XOF
   =-N2:YOF=N0
HX 1380 IF ST=N10 THEN D1$(N1,N1)="▄":XOF
   =-N2:YOF=-N1
KA 1390 FOR X=N1 TO N3:POSITION N18,X+N9:
   ? D1$(X*N3-N2,X*N3):NEXT X:GOSUB 370:O
   ST=ST:GOTO 1290
TK 1400 R=INT(55EC/N6):C=55EC-R*N6:R=R*N8
   +23:C=C*N16+80:X=N0
OH 1410 A=USR(PMV,N3,PMB,ADR(P3$),C,R,N6)
   :C=C+XOF:R=R+YOF:X=X+N2:SOUND N1,X,N8,
   N4
MV 1420 H=PEEK(53255):POKE 53278,N1:IF H(
   >N1 AND H(>N4 THEN 1510
YK 1430 POKE HPOSP3,N0:SOUND N1,N0,N0,N0:
   C=INT((C-80)/N16+0.5):R=(R-23)/N8:L=R*
   N6+C:IF H=N4 THEN 1470
NU 1440 IF OA(N0)=L THEN OP(N0)=N0:GOTO 1
   460
ZV 1450 OP(N1)=N0
BJ 1460 GOSUB 390:GOTO 1520
IP 1470 C=C*N2+N4:R=R*N2+N2:POKE N87,N1:P
   OKE N88,N0
XY 1480 SOUND N0,180,N10,N8:POSITION C,R:
   ? #6;"F":GOSUB 440:SOUND N0,100,N10,N8
   :POSITION C,R:? #6;"G":GOSUB 440
MZ 1490 SOUND N0,60,N10,N8:POSITION C,R:?
    #6;"H":GOSUB 440:SOUND N0,N20,N10,N8:
   POSITION C,R:? #6;"I":GOSUB 440
RE 1500 POSITION C,R:? #6;"E":GOTO 1520
ON 1510 IF C(170 AND C)70 AND R(68 AND R)
   18 THEN 1410
WR 1520 POKE HPOSP3,N0:SOUND N0,N0,N0,N0:
   SOUND N1,N0,N0,N0:GOTO 1220
RX 1530 REM *******LONG RANGE*******
LG 1540 GOSUB 320:IF ST$(N4)>N0 THEN GOSU
   B 340:GOTO 560
VM 1550 FOR X=N1 TO N8:IF X(N4 THEN 55=SE
   C-N20+X
WC 1560 IF X=N4 OR X=N5 THEN 55=SEC-(X=N4
   )+(X=N5)
FG 1570 IF X>N5 THEN 55=SEC+N18-(X=N6)+(X
   =N8)
SE 1580 R=INT(55/N18):C=55-R*N18:R=R*N2+N
   1:C=C*N2+N2:P=((R+N1)/N2-N1)*N18+C/N2
XH 1590 TRAP 1630:A=ASC(BRD$(P,P)):IF (IN
   T((SEC+N1)/N18)=(SEC+N1)/N18) AND (X=N
   3 OR X=N5 OR X=N8) THEN 1630
DI 1600 IF INT(SEC/N18)=SEC/N18 AND (X=N1
    OR X=N4 OR X=N6) THEN 1630
CW 1610 POSITION C,R:? "i":FOR V=N8 TO N0
    STEP -N1:SOUND N0,30,N10,V:SOUND N1,4
   0,N10,V:NEXT V
CA 1620 SOUND N0,N0,N0,N0:SOUND N1,N0,N0,
   N0:POSITION C,R:? BRD$(P,P)
EF 1630 NEXT X:TRAP 40000:RW=N87:GOTO 560
MN 1640 REM *******STATUS**********
YY 1650 GOSUB 320:GRAPHICS N0:POKE N559,N
   0:POKE 54286,255:POKE 756,CHBASE/256:D
   L=PEEK(560)+256*PEEK(561)+N4
JE 1660 POKE N89,ST$:POKE N752,N1:POKE DL
   -N1,70:POKE DL,0:POKE DL+N1,ST$:POKE D
   L+N17,130:POKE DL+23,130
EY 1670 POKE 512,N0:POKE 513,N6:POKE 1580
   ,N0:POKE 710,98
WR 1680 FOR X=N1 TO N4:POSITION 30,X*N2:?
    ST$1(X);:IF ST$1(X)<10 THEN ? "  ":GO
   TO 1700
HT 1690 IF ST$1(X)<100 THEN ? " "
BE 1700 NEXT X:POKE 77,N0
HJ 1710 FOR X=N1 TO N6:POSITION N15,X*N2-
   N1:? ST$(X):NEXT X:POSITION N13,N17:?
   "BRIDGE":POSITION N13,N18:? "REPAIR"
SC 1720 POKE 54286,192:POKE N559,46
ML 1730 RW=91:MIN=RW:MAX=95:GOSUB 170:GOS
   UB 320:ON (RW-86)/N4 GOTO 520,1750
CR 1740 REM *********REPAIR********
GN 1750 GOSUB 320:POKE HPOSP0,N0:POSITION
    N13,N17:? "DAYS=0":POSITION N13,N18:?
    "      ":DAYS=N0
HY 1760 IF STRIG(N0)=N0 THEN 1810
IO 1770 ST=STICK(N0):IF ST<>N13 AND ST<>N
   14 THEN 1760
LN 1780 DAYS=DAYS+N1*(ST=N14)-N1*(ST=N13)
   :GOSUB 440:GOSUB 440:IF DAYS<N0 THEN D
   AYS=N9
TP 1790 IF DAYS>N9 THEN DAYS=N0
HA 1800 POSITION N18,N17:? DAYS:GOTO 1760
BU 1810 ST$1(N1)=ST$1(N1)-DAYS:IF ST$1(N1
   )<N1 THEN 2170
UV 1820 FOR X=N1 TO N6:ST$(X)=ST$(X)-DAYS
   :IF ST$(X)<N0 THEN ST$(X)=N0
XQ 1830 NEXT X:GOTO 1650
MA 1840 ST$(N1)=ST$(N1)-DAYS:IF ST$(N1)<N
   1 THEN 2170
JO 1850 REM *********CRUISE********
NU 1860 GOSUB 320:IF ST$(N2)>N0 THEN GOSU
   B 340:GOTO 580
OF 1870 MAX=N17:GOSUB 1940:SC=SEC-U*N18*(
   DR=N1)+U*(DR=N2)+U*N18*(DR=N3)-U*(DR=N
   4)
TN 1880 IF SC<N0 OR SC>144 THEN GOSUB 450
   :GOTO 1870
UL 1890 IF (DR=N2 AND INT(SC/N18)>INT(SEC
   /N18)) OR (DR=N4 AND INT(SC/N18)<INT(S
   EC/N18)) THEN GOSUB 450:GOTO 1870
DT 1900 POSITION C,R:? CHR$(OCH):SEC=SC:S
   T$1(N1)=ST$1(N1)-U:ST$1(N3)=ST$1(N3)-U
   *N10
JO 1910 IF ST$1(N1)<N1 OR ST$1(N3)<N1 THE
   N 2170
HW 1920 GOSUB 140:GOTO 560
LD 1930 REM *******CRUISE SUB*******
GI 1940 POKE 766,N1:POKE HPOSP0,N0:DR=N1:
   XOF=N0:YOF=-N1:OST=N14
PY 1950 FOR X=N1 TO N4:POSITION N13,X+N17
   :? M3$(X*N14-N13,X*N14):NEXT X
FJ 1960 D1$=D$:ST=STICK(N0):IF STRIG(N0)=
```

Moonlord *continued*

```
   N0 THEN U=N0:GOSUB 380:GOSUB 320:GOTO
   2030
ZU 1970 IF (ST<>N14 AND ST<>N7 AND ST<>N1
   3 AND ST<>N11) OR ST=OST THEN 1960
ES 1980 IF ST=N14 THEN D1$(N2,N2)="↑":DR=
   N1:XOF=N0:YOF=-N1
GH 1990 IF ST=N7 THEN D1$(N6,N6)="→":DR=N
   2:XOF=N1:YOF=N0
BA 2000 IF ST=N13 THEN D1$(N8,N8)="↓":DR=
   N3:XOF=N0:YOF=N1
TF 2010 IF ST=N11 THEN D1$(N4,N4)="←":DR=
   N4:XOF=-N1:YOF=N0
KH 2020 FOR X=N1 TO N3:POSITION N15,X+N17
   :? D1$(X*N3-N2,X*N3):NEXT X:GOSUB 370:
   OST=ST:GOTO 1960
WZ 2030 GOSUB 320
IY 2040 ST=STICK(N0):IF STRIG(N0)=N0 THEN
    GOSUB 380:RETURN
GY 2050 IF ST=N14 THEN U=U+N1:IF U>MAX TH
   EN U=N0
VI 2060 IF ST=N13 THEN U=U-N1:IF U<N0 THE
   N U=MAX
MA 2070 GOSUB 440:IF U<N10 THEN POSITION
   23,N19:? "0";U:GOTO 2040
VK 2080 POSITION 23,N19:? U:GOTO 2040
OD 2090 REM **********JUMP**********
ZX 2100 IF ST5(N1)>N0 THEN GOSUB 340:GOTO
    580
OP 2110 ST51(N1)=ST51(N1)-N1:ST51(N3)=ST5
   1(N3)-30:IF ST51(N1)<N1 OR ST51(N3)<N1
    THEN 2170
KW 2120 SEC=INT(RND(N0)*143)+N1:POSITION
   C,R:? CHR$(OCH):XX=48
QA 2130 FOR X=N0 TO N16:SOUND N0,XX,N10,N
   8:XX=XX-N3:POKE 710,X:NEXT X:SOUND N0,
   N0,N0,N0:U=N1:GOSUB 140
PF 2140 IF INT(RND(N0)*N10)+N1=N1 THEN 21
   70
QA 2150 GOTO 520
ST 2160 REM *******GAME OVER*******
QQ 2170 X=(50-ST51(N2))*50-PS+ST51(N1)*N2
   0*(ST51(N2)=N0)+1000*(ST51(N2)=N0)
EN 2180 POKE HPOSP0,N0:POKE HPOSP1,N0:POK
   E HPOSP2,N0
YY 2190 GRAPHICS N0:POKE N559,N0:POKE N75
   6,CHBASE/256:POKE 752,N1:POKE 708,54:P
   OKE 710,N20
NE 2200 DL=PEEK(560)+256*PEEK(561)+N4:FOR
    Z=N4 TO N16:POKE DL+Z,N6:NEXT Z:POKE
   DL+N20,N6:POKE DL+21,N6
CB 2210 POKE 82,N0:POKE N559,34:T$="INCOM
   ING MESSAGE FROM TITAN BASE":C1=N2:R1=
   N1:GOSUB 2330:FOR Z=N1 TO 75:NEXT Z
DI 2220 IF ST51(N2)<N1 THEN 2260
RU 2230 T$="DO NOT ATTEMPT TO":C1=N0:R1=N
   4:GOSUB 2330:T$="RETURN. THE MOONS":R1
   =N5:GOSUB 2330
FJ 2240 T$="HAVE BEEN TAKEN BY":R1=N6:GOS
   UB 2330:T$="THE ALIENS. YOUR":R1=N7:GO
   SUB 2330
FJ 2250 T$="MISSION HAS FAILED.":R1=N8:GO
   SUB 2330:GOTO 2290
ZW 2260 T$="CONGRATULATIONS!":C1=N1:R1=N4
   :GOSUB 2330:T$="YOUR MISSION HAS":R1=N
   5:GOSUB 2330
LH 2270 T$="BEEN COMPLETED.":R1=N6:GOSUB
   2330:T$="YOU WILL RETURN":R1=N7:GOSUB
   2330
XL 2280 T$="HOME A HERO.":R1=N8:GOSUB 233
   0
XB 2290 POSITION 28,N10:? "MISSION EVALUA
   TION: ";X:POSITION 30,N14:? "PLAY AGAI
   N [Y\N]";
DS 2300 POSITION N6,N15:INPUT A$:IF A$<>"
   Y" AND A$<>"y" AND A$<>"N" AND A$<>"n"
    THEN 2300
LX 2310 IF A$="Y" OR A$="y" THEN 2440
JC 2320 GRAPHICS N0:END
AV 2330 FOR C=N1 TO LEN(T$):GOSUB 380:POS
   ITION C1+C,R1:? T$(C,C);:NEXT C:RETURN
XO 2340 REM ******INITIALIZE*******
AN 2350 DIM BD$(38),BD1$(38),BD2$(N13),BR
   D$(144),P0$(N6),SEC$(432),CL$(40),M1$(
   56),M2$(240),M3$(56),D$(N9),D1$(N9)
SI 2360 DIM ST5(N6),OA(N2),OP(N2),ST51(4)
   ,P3$(N6),DD$(N9),A$(N1),N$(N10),T$(40)
HF 2370 M1$="     SCAN          CRUISE
      STATUS          JUMP      "
KP 2380 M2$(N1,80)="┌──────┐ ┌──────┐
   ──────┐ ┌──────┐ │      │          ||
          ||       |"
AW 2390 M2$(81,160)="|MOON%&LORD||
          ||MOON%&LORD||     '(     ||
          ||     '(     |"
AU 2400 M2$(161,240)="|          ||
          ||      | └──────┘ └──────
   ──────┘ └──────┘"
ON 2410 M3$="    ↑    ||          ← →   || 00
    ↓    ||      BEARING||UNITS"
OH 2420 BD$="├┼┼┼┼┼┼┼┼┼┼┼┼┼┼┼┼┼┼┼┼┼┼┼┼
   ┼┼┼┼┼┼┤":BD1$="|  |  |  |  |  |  |  |  |
    |  |  |  |  |  |  |  |"
IW 2430 BD2$="└┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴┴
   ┴┴┴┴┴┴┘":D$=" ↑ ← → ↓
   ":DD$="┌↑┐← →└↓┘"
WH 2440 BRD$(N1)="/":BRD$(144)="/":BRD$(N
   2)=BRD$
MN 2450 SEC=81:SSEC=21:ST51(N1)=100:ST51(
   N2)=50:ST51(N3)=600:ST51(N4)=N10:OP(N0
   )=N0:OP(N1)=N0:OA(N0)=N0:OA(N1)=N0
JE 2460 FOR X=N1 TO N6:ST5(X)=N0:NEXT X
WH 2470 PS=N0:HPOSP0=53248:HPOSP1=53249:H
   POSP2=53250:HPOSP3=53251
WG 2480 GOSUB 130:POSITION N11,N8:? "ANAL
   OG Computing":POSITION N15,N10:? "Pres
   ents":GOSUB 90
PW 2490 IF  NOT ST THEN RTOP=PEEK(106)-37
   :POKE 106,RTOP
GH 2500 GRAPHICS N0:POKE N559,N0:POKE 82,
   N0:ST5=RTOP+N1
ST 2510 GMAP=RTOP+N7:SMAP=RTOP+N11:CHBASE
   =(RTOP+N17)*256:PMV=(RTOP+21)*256:PMG=
   RTOP+25:PMB=PMG*256:GOSUB 110
IV 2520 POKE N88,N0:POKE N89,ST5:A=USR(AD
   R(CL$),36)
NX 2530 GOSUB 130:POSITION N11,N9:? "A Cl
   ayton Walnum":POSITION N11,N11:? "Prod
   uction of...":GOSUB 90
HJ 2540 OPEN #N1,N4,N0,"D:MOONLORD.ML":A=
   PMV:X=100:GOSUB 470
UG 2550 OPEN #N1,N4,N0,"D:MOONLORD.FNT":A
   =CHBASE:X=1024:GOSUB 470
NL 2560 FOR X=N1 TO N6:READ A:P0$(X)=CHR$
   (A):NEXT X:FOR X=N1 TO N6:READ A:P3$(X
   )=CHR$(A):NEXT X
TI 2570 POKE 53256,N3:POKE 53257,N3:POKE
   53258,N3:POKE 53289,N3:POKE 704,118:PO
   KE 705,52:POKE 706,53:POKE 707,N14
UP 2580 POKE 54279,PMG:POKE 53277,N3:POKE
    623,N1
HQ 2590 GRAPHICS N2:POKE 710,N0:POKE N756
   ,CHBASE/256:POSITION N5,N4:? #N6;"moon
   %&lord"
TM 2600 POSITION N9,N5:? #N6;"'(":GOSUB 4
   0
YZ 2610 GRAPHICS N0:POKE N559,N0:POKE N75
   2,N1:POKE N87,N0:POKE 88,N0:POKE N89,G
   MAP
HM 2620 POSITION N1,N0:? "┌┬┬┬┬┬┬┬┬┬┬┬┬
   ┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬┬
```

```
   RND(N0)*N8))*N2+N1:P=((R+N1)/N2-N1)*N1
   8+C/N2:IF BRD$(P,P)<>"/" THEN 2660
SV 2670 BRD$(P,P)="#"
HQ 2680 C=(INT(RND(N0)*N3)+N15)*N2:R=(INT
   (RND(N0)*N8))*N2+N1:P=((R+N1)/N2-N1)*N
   18+C/N2:IF BRD$(P,P)<>"/" THEN 2680
PO 2690 BRD$(P,P)="#":FOR X=N1 TO N6:POSI
   TION N0,X+N16:? M2$(X*40-39,X*40);:NEX
   T X
CT 2700 POSITION N10,23:? "SELECT YOUR CO
   MMAND";:POKE N87,N1:POKE N89,SMAP:POKE
    82,N0
NT 2710 POSITION N3,N1:? #N6;"┌─┬─┬─┬─┬─┬─┬─
   ─┐"
WJ 2720 FOR X=N2 TO N12:POSITION N3,X:IF
   INT(X/N2)=X/N2 THEN ? #N6;BD1$(N1,N13)
   :GOTO 2740
KK 2730 ? #N6;BD2$
GW 2740 NEXT X:POSITION N3,N13:? #N6;"└─┴
   ─┴─┴─┴─┴─┘":POKE N87,N0
PO 2750 FOR X=N1 TO N6:POSITION N20,X+N7:
   ? M2$(X*40-39,X*40);:NEXT X
ZY 2760 POSITION 37,N9:? "BRIDGE";:POSITI
   ON 37,N10:? "CRUISE";:POSITION 37,N11:
   ? "PHASER";
KG 2770 POSITION 37,N12:? "PHOTON";:POSIT
   ION 30,N14:? "SELECT YOUR COMMAND";
QM 2780 POKE N87,N0:POKE N89,STS:POSITION
    N7,N0:? "STATUS"
AR 2790 POSITION N22,N1:? "┌──────────────
   ──────┐"
ZU 2800 POSITION N22,N2:? "|  JUMP ENGINE
   S:   ||  ┌──────────────┐"
HT 2810 POSITION N22,N3:? "|
   ──────|  |   TIME:    ||"
KM 2820 POSITION N22,N4:? "|CRUISE ENGINE
   S:   ||  |              |"
BW 2830 POSITION N22,N5:? "|
   ──────|  |  ALIENS:   ||"
DX 2840 POSITION N22,N6:? "|    SR SCANNER
   S:   ||  |              |"
FJ 2850 POSITION N22,N7:? "|
   ──────|  |  ENERGY:   ||"
XW 2860 POSITION N22,N8:? "|    LR SCANNER
   S:   ||  |              |"
YO 2870 POSITION N22,N9:? "|
   ──────|  |PHOTONS:    ||"
UO 2880 POSITION N22,N10:? "|         PHASE
   RS:   ||  └──────────────┘"
QN 2890 POSITION N22,N11:? "|
   ──────|":POSITION N22,N12:? "|      LAU
   NCHERS:   ||"
KU 2900 POSITION N22,N13:? "└──────────────
   ──────┘"
QC 2910 FOR X=N1 TO N6:POSITION N20,X+N15
   :? M2$(X*40-39,X*40);:NEXT X
GF 2920 POKE N88,N20:POSITION N17,N18:? "
   BRIDGE":POSITION N17,N19:? "REPAIR"
VV 2930 POSITION N10,N22:? "SELECT YOUR C
   OMMAND";:OCH=ASC(BRD$(SEC+N1,SEC+N1)):
   GOTO 520
VA 2940 REM ***** DLI ROUTINE *****
IC 2950 DATA 72,138,72,152,72,174,44,6,18
   9,40,6,232,188,40,6,141,10,212,141,23,
   208,140,24,208,232
ZA 2960 DATA 224,4,208,2,162,0,142,44,6,1
   04,168,104,170,104,64,10,4,0,88,0
VP 2970 REM *******CL$ DATA**********
AF 2980 DATA 104,104,104,133,205,165,88,1
   33,203,165,89,133,204,162,0,169,0,168,
   145,203,200,208,251,232,228,205
RG 2990 DATA 240,11,24,165,204,105,1,133,
   204,240,234,208,232,96
FI 3000 REM ******P0$ DATA******
GI 3010 DATA 255,129,129,129,129,255
HN 3020 REM ******P3$ DATA******
BU 3030 DATA 0,0,24,24,0,0
```


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ST·LOG™

THE ATARI ST OPERATOR'S MAGAZINE

SEPTEMBER 1986 ISSUE 6

THIS ISSUE:

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ST-LOG

THE ATARI ST OPERATOR'S MAGAZINE

ISSUE 6
SEPTEMBER 1986

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A popular program on the Atari 8-bits is ported over to the ST, giving you text and graphic editing capabilities.

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Getting around GEM's desktop

Some tips for the beginning ST user

by Philip S. Gallo, Jr., Ph.D.

Some six weeks ago, my ST arrived. The next day, I found a brand new IBM clone in my office, compliments of the university at which I work.

As a dedicated 8-bit Atari user, I had no prior experience with either machine. Today, the ST seems like an old friend, whereas the clone remains a mysterious and cantankerous adversary. It rarely, if ever, does what I want, in the way I want it done.

The challenge of trying to learn two new machines at once has certainly convinced me that the ST is a marvelously friendly, easy computer to use.

Nevertheless, a lot of ST users seem to be doing things the hard way, possibly because of the lack of information in the somewhat skimpy owner's manual. It's also probably this deficiency which has led reviewers to mistakenly complain about the difficulty of certain "housekeeping" operations (e.g., the transfer of files into and out of folders).

Before we get into that subject, let's begin with the basics. I'll assume you've read the owner's manual and are familiar with elementary operations, such as resizing windows, selecting options by "clicking" on them with the mouse, opening disk drives and "dragging" things with the mouse.

On the color system, a newly formatted disk will boot into the machine in the low-resolution mode, with all windows closed. Since most of your work will be in medium resolution, this isn't usually desirable.

I like to keep all my disks in a similar format, so I've prepared a master disk to use as a template for all my newly formatted disks.

In creating the master disk, I used the "set preferences" option of the desktop to call up medium resolution. With the mouse, I dragged the trash can to the lower right corner of the screen and the two floppy disk icons to the lower left corner. I opened a window to drive A and sized the window so it has about a quarter-inch margin at the top and sides, while extending downward to about one-half inch from the top of the disk icons.

By doing this, I can view two complete rows of eight file icons each. The next step was to call the "save desktop" option and save this configuration to disk.

Now, when I format new disks, I boot up with this master. After each disk has been formatted, I save this desktop on it. All my disks look alike and all boot up with the window to drive A open showing the first eight file icons.

I can scroll up and down to see more icons, and they'll always be displayed in two neat rows. I'm sure all of you know by now that, if you place a new disk in drive A and press the ESC key, the new disk's icons will be displayed in whatever desktop configuration's showing. If you didn't know it. . .well, you do now.

Since each disk holds a considerable amount of information, it's possible to have literally dozens of programs on a single disk. Scrolling through them to find the one you want becomes a chore. GEM has conveniently provided us with subdirectories, called "folders."

To create a folder, you merely go to the file menu and click on the "create new folder" option. If you had six different games on the disk, as well as a number of other programs, you might want to create a folder and name it GAMES.

You can, of course, drag each file to the folder, copying the files in one at a time. But it's much simpler to drag all of them at once and copy them. The easiest way to do this is to hold the SHIFT key down and use the mouse to click each file you want transferred.

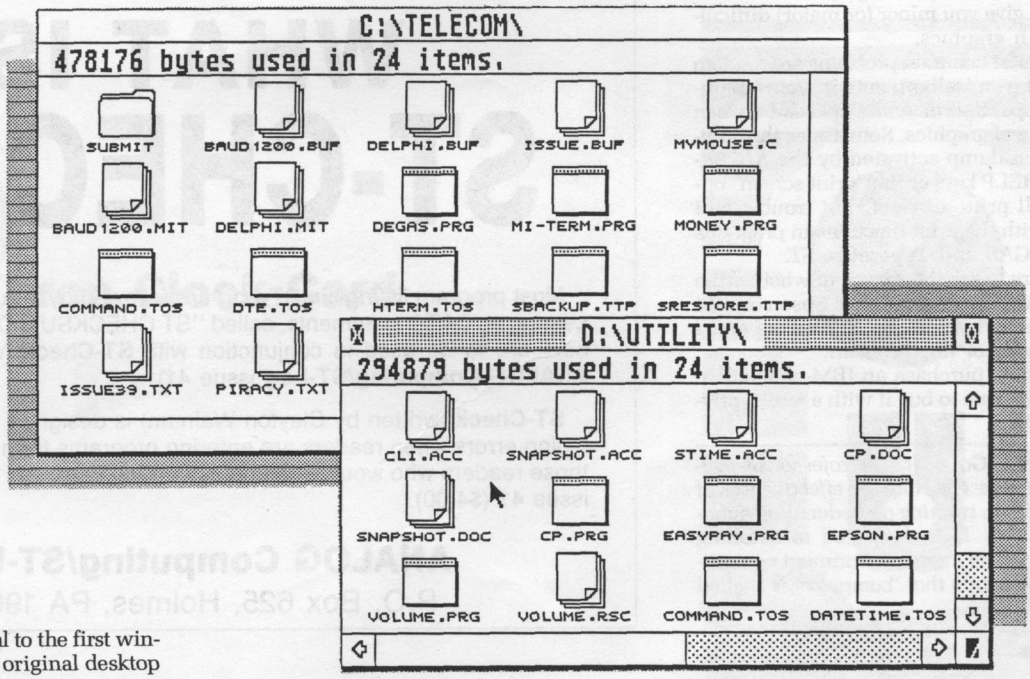
Each file will turn black when clicked. Release the SHIFT key and click on any of the files you've selected. When you start to drag that file to the folder, all the selected files will come along. Thus, the whole set can be copied into the folder at one pass.

Once they're safely copied into the folder, use the same SHIFT-click procedure to drag them to the trash can and delete them from the desktop in one fell swoop.

Moving right along. . .

The real problem, presumably, crops up when you want to copy a file from a folder to the desktop, or into another folder. In the January issue of *Byte* magazine, Jon Edwards and Phillip Robinson wrote ". . .to move a file out of a folder, matters are further complicated by the fact that the folder opens to take over the window from which it derived. You would first have to move the file to a different disk, delete the original file from the folder, then copy the file back to the original disk, but not within the folder, and then delete the first copy you made. It sounds difficult because it is." Wrong, gentlemen!

GEM has a feature that allows four windows to be open simultaneously. When you opened up your folder, you used only two windows. Your next move: click on drive A to open it again. A third window will



appear on-screen, identical to the first window opened, namely, the original desktop of drive A.

You may have to move this third window down toward the bottom of the screen a bit, so it won't obscure the contents of your folder. Now, simply click the item you want to move from the folder to the desktop, then drag it down to the window just opened. When you copy it, the item will be on the desktop.

If you want it out of the folder permanently, you'll have to click it again in the folder and drag it to the trash can. Maybe this isn't as elegant as the Macintosh's procedure, but it's a lot better than copying it to a completely different disk and back again!

Remember, you still have only three windows open. If you want to move a file from your GAME folder into the PUZZLE folder, locate the PUZZLE folder in window three and click it open. Now your fourth window's open, and your screen shows the contents of the GAME and PUZZLE folders.

From here, it's no great trick to copy a file out of one folder into another. When you're through, click the fourth, third and second windows closed—and you're back to the original desktop.

Of course, these tricks will only work if you have enough empty disk space to temporarily hold both copies of the file (or files) you wish to transfer. If you don't, the use of a RAMDISK will solve the problem. Read on.

How do you spell "relief"?

The only really tedious GEM operations occur when you've only one disk drive and wish to copy whole disks or individual files to a second disk. GEM does require an inordinate number of disk swaps for these operations.

The first fix is to get the TOS ROM chips installed. Not only do ROM chips yield an additional 200K of program space, they provide enough free RAM to read an entire disk's contents at once. For $25.00 to $35.00 installed, they have to be the biggest bargain in town.

The second fix is to obtain two special, invaluable programs for your library. The first is a copy program; the second is a RAMdisk. Such programs are inexpensive, and are now being published by several companies. If you have a modem, public domain versions can often be found on ST BBSs.

All the copy programs have two things in common...They copy faster than GEM's built-in routines and require only one disk swap. These programs read the disk in one pass, prompt you to insert the destination disk and write to it in one pass.

By contrast, even with ROM chips, GEM makes you swap disks three times. Copying individual files to another disk is *really* a headache. GEM makes you swap disks several times for each file to be copied.

If you need to copy seven files from one disk to another, you'll get dizzy swapping disks—and quite confused. Here's where a RAMdisk can save the day.

A RAMdisk sets aside a portion of memory, then "tricks" the computer into thinking this memory is another drive. When you "install" the RAMdisk, its drive icon will actually appear on the desktop. This icon can be opened to a window, just as a real disk drive icon would be.

By defining the RAMdisk with enough space for all the files to be transferred, you can SHIFT-click the files and copy them all at once to the RAMdisk.

Put the destination disk into your drive, press ESC to get a directory of your new disk, then SHIFT-click the files again, copying them from the RAMdisk to the destination disk. Since the RAMdisk operates virtually instantaneously, the whole process hardly takes more time than it would with two drives.

If you're trying the trick mentioned earlier for copying a file out of a folder and don't have disk space for two copies of it, open the RAMdisk instead of opening drive A again. Copy the file to the RAMdisk and delete it from the folder. Then close the folder and copy the file from the RAMdisk to the desktop, or into another folder.

Use your GEM in good health.

I hope these tips will prove helpful to you. They'll certainly reduce the time you'll need to devote to disk housekeeping chores—and give you more time to explore what has to be one of the most enjoyable computers ever designed.

One final word. If you're about to buy a new printer for your ST, try to avoid any printer advertising itself as "IBM compatible." The ST wants its printer to be Epson compatible...which isn't the same thing at all. An IBM-compatible printer will probably produce text with no prob-

lem. However, depending upon the brand, it could give you minor (or major) difficulties with graphics.

The most common problems are random garbage or misalignments in your graphics dumps, and/or white spaces between each line of graphics. Sometimes the built-in screen dump activated by the ALTERNATE-HELP keys or the "print screen" option will print all right. But trouble will occur with the print functions in programs like **DEGAS** and **Typesetter ST**.

Be sure to ask the salesman whether the printer you're considering is Epson or IBM compatible. Even many ST dealers aren't fully aware of this problem.

If you do purchase an IBM-compatible printer, be sure to buy it with a return privilege.

Philip S. Gallo, Jr., a professor of psychology, is researching the effectiveness of computers in training and educating autistic children. He's dedicated to extolling Atari's virtues in an environment committed to the notion that "computer" is spelled IBM.

WHAT IS ST-CHECK?

Most program listings in **ST-Log** are followed by a table of numbers appearing as DATA statements, called "ST CHECKSUM DATA." These numbers are to be used in conjunction with **ST-Check** (which appeared in **ANALOG Computing/ST-Log** issue 41).

ST-Check (written by Clayton Walnum) is designed to find and correct typing errors when readers are entering programs from the magazine. For those readers who would like copies of the article, you may send for back issue 41 ($4.00).

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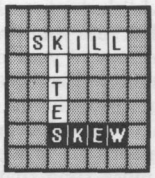

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"...the whole game design is extremely user-friendly...a winner." ANALOG COMPUTING, June 1986

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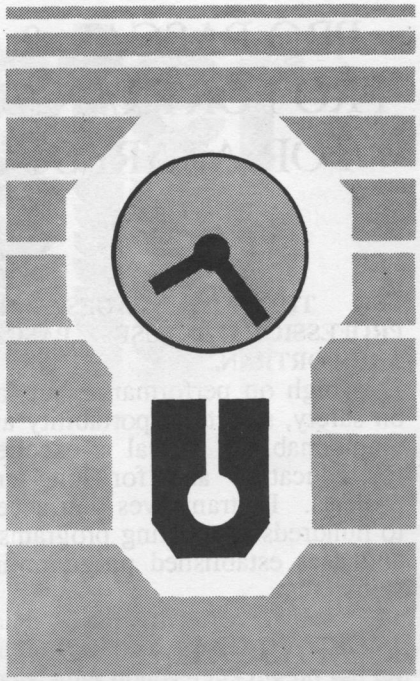

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by Matthew J.W. Ratcliff

I really like time- and date-stamping on my disk files—when I remember to set the time, that is. If the time isn't correct, those stamps are of no use to anyone.

With it set properly, the stamps provide a valuable reference. They're helpful in keeping track of the last time files were updated. This is especially true for hard disks, where you can afford the space for many archive copies of a program under development.

The problem with maintaining a record on the ST is that you must boot up a disk with DESK1.ACC on it, pull down the desktop, and click on the control panel. Then you have to click on the time line and type the correct time. Ditto for the date line. This is a major drag—and usually doesn't get done. Thank goodness for the **LogiKhron Clock Card**!

The **LogiKhron** plugs into the ST's cartridge port, extending the width of the computer's "footprint" another 2¼ inches.

The package comes with a disk containing two files, DESK5.ACC and CLOCK.RSC. If your TOS allows it, I suggest renaming the DESK5.ACC to CLOCK.ACC. (Some older versions of TOS looked for DESKx.ACC, where x was a digit from 1 to 6.) This will help you associate the files, when copying your timing accessories to other disks. There's no copy protection on the disk.

With these files on your boot disk (with TOS in ROM or RAM), your system clock is set automatically. You can pull down the desktop and select the CLOCK. The current time and date will be displayed. If you wish to set either, the process is the same as when using the control panel.

Sometimes the control panel clock won't be automatically updated when the **LogiKhron** is loaded. There's a time lag, which may range from 1 to 59 seconds. This is documented in the manual and is *not* a problem. The correct time is *always* written to disk, even if the control panel doesn't show it yet. The **LogiKhron** accessory displays the proper time.

The brief manual adequately describes setup and use of the **LogiKhron** card. Files for it will only cost you about 5K of disk space. (And you ROM/TOS owners will want these files on just about every disk.)

When loaded, the accessory actually takes about 11K of RAM. The additional RAM is due to operating system overhead, for installing an accessory. It's true for *all* accessories. You can probably do without DESK1.ACC on most of your disks, however, saving 19K of RAM.

The DESK1.ACC contains the control panel and install printer functions. Once these are set to your specific needs, you can just save your desktop (only about 500 bytes) to your disks and forget about that accessory. And, with **LogiKhron**, you can forget about the time—it's already taken care of.

I have only two minor complaints about the **LogiKhron**. The cartridge has battery backup which will last from three to six years. The problem is that it can't be replaced. The "cartridge" is actually a circuit board, sealed in plastic resin. When the battery wears out, the **LogiKhron** must be replaced.

Product manager Shawn Fogle of Soft Logik informs me that the cartridge will be replaced free of charge, if the battery fails within six months after purchase. Any time after that, it may be replaced for a reasonable $15.00.

My second complaint about the clock card is that it doesn't have a "piggyback" slot for other cartridges. When other cartridges become available for the ST, the **LogiKhron** must be removed to use them—you lose your automatic time setting.

Both of these limitations are minor. . . and understandable. This product is being delivered at a very affordable $49.95. The only reason this cartridge doesn't have a removable case for battery replacement is because none are available.

Once ST ROM cartridge cases are available, the **LogiKhron** may well be modified to make battery replacement quite simple. With a battery life of three to six years, you won't have to worry about it for a while, anyway.

The **LogiKhron** has performed flawlessly for me. Being the lazy sort of programmer, who hates typing any more than necessary, I found the **LogiKhron** an absolute must. I highly recommend it.

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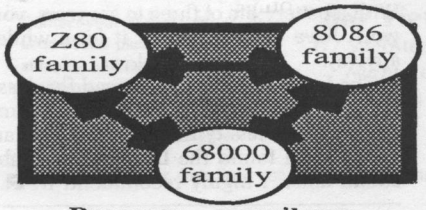

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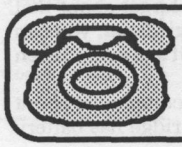
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CIRCLE #120 ON READER SERVICE CARD

Dx Lister

This utility will quickly list a disk's entire contents to your screen or printer

by Douglas Weir

According to a possibly apocryphal story, Digital Research originally intended to include routines in GEM and TOS that would get directory listings from the disk drives and send them to a printer. Specifications were scribbled out during a project meeting and a programmer hastily assigned. Unfortunately, he misread the name of a data structure called "drive block" as "livestock" and wrote a cattle-sorting program instead (watch for "HerdStar," soon to appear on local software shelves).

This is a two-in-one feature: "Dx.ttp" is a ready-to-run program included on this issue's ST disk version, briefly described below. The bulk of this article, however, gives a listing and explanation of a set of routines from **Dx** which you can use in your own assembly language programs. You don't need the subscription disk to use this article.

Dx lists the entire contents of a disk either to the screen or to a printer. Unless told to do otherwise, it will recursively search the entire disk and give the contents of all subdirectories. If you have a Star SG-10 or Okidata 192 printer, you can tell **Dx** to print its output in a special reduced format, suitable for disk labels. (The normal-size print option will work on any printer.)

The full pathname of a subdirectory is printed before its contents, in order to make clear just "where" the subdirectory is. If the disk has a volume name, this will be printed at the top of the listing. You can also define a title string to be printed before everything else, if you wish. Details of these and a few other options will be found below.

The program will handle about 400 separate pathnames (subdirectory names) and a total of about 3000 filenames. It does *not* check for conformance to these limits.

Now for a discussion of the set of subroutines listed below. I use these routines to interpret single characters typed after the program name, before RETURN. With a ".TTP" application, you would type these characters in the dialog box GEM presents, after double-clicking on the program icon. The routines look for occurrences of any of a set of programmer-defined characters, and if a valid character is found, a corresponding flag is set to "true." Otherwise, it remains "false."

The nice thing about these routines is that, in order to add, delete or change flags and codes, all you have to do is change the data declarations. Everything else is automatic; you never have to alter the routines themselves.

The characters (separated by spaces) can be typed in any order and may be upper- or lowercase. The number of characters is limited by the value of ARG__SIZE (argument size), which is the number of bytes reserved by check__c__args for parse__word to copy the next word into. For our purposes, these words will always be one character long, but you can use parse__word to return any size string of blank-terminated characters. Of course, you can change the value of ARG__SIZE, if you wish. (Warning: changing anything may result in an increase in argh__size, a mysterious debugging constant.)

An explanation of how these routines work ought to serve as a nice introduction to 68000 assembly language programming. But where should I start? Beginners will find the 68000 easier than most other chips, simply because the 68000 does so much more. Still, brief comments are almost doomed to appeal only to those with some previous assembly language experience. For this I apologize.

With this disclaimer in mind, let's take a look at the routines. The first section should be the very first in your program. When an ST program begins execution, the stack pointer is pointing to the return address used at the end of the program to return to the caller (i.e., the operating system). This address is a longword.

Next on the stack is another longword, the "base page"

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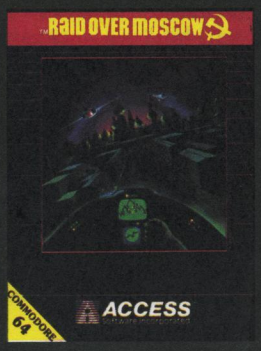

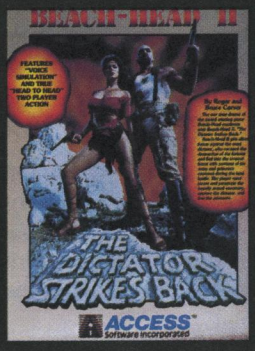

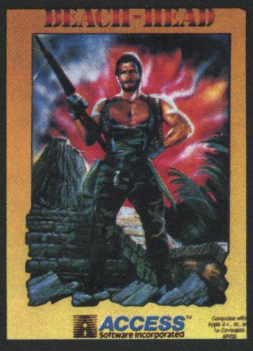

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address of the executing program. This marks the beginning of a memory area with useful facts about the program. We're interested only in what was on the program's command line when it was typed in. A location 128 bytes from the start of the base page contains the address of the command line.

So the program does the following in its first four lines:

(1) Gets the base page address from the stack and puts it into register a5.

(2) Computes the address of the command line pointer by adding 128 (hexadecimal 80) to the base page address, and puts the result into a2 (*lea*—"load effective address"—calculates an address and puts it into the designated register; *pea*—"push effective address"—also calculates an address, but pushes the result onto the stack).

(3) The contents of a2 now point to a byte holding the number of characters on the command line; this is followed by the actual characters. So the character count is put into d0, and after the post-increment, a2 points to the start of the command line.

I should mention that the string of characters made available to the program as the command line includes all characters typed after the program name, terminated by a *null* (binary zero).

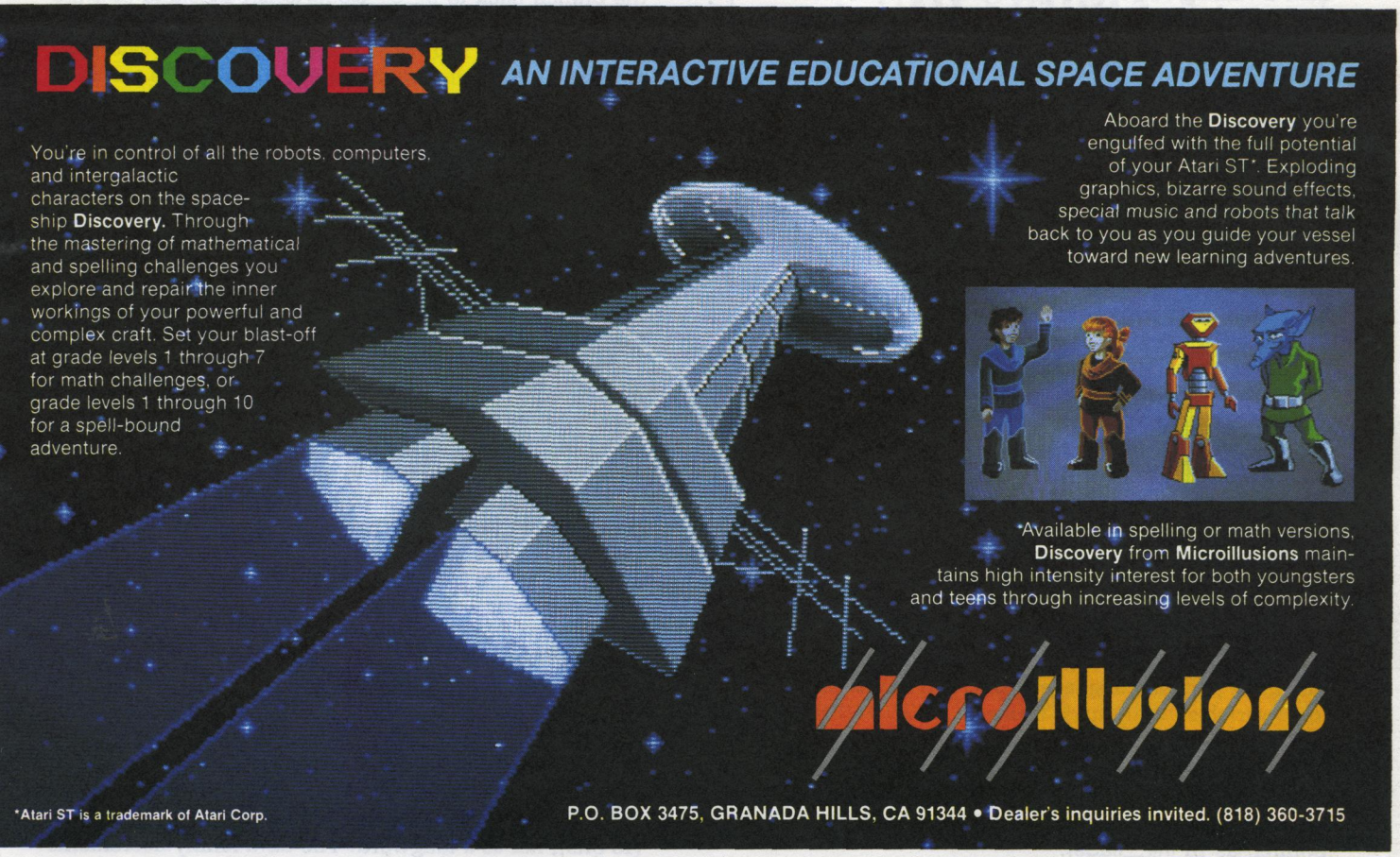
If running as a .PRG application from TOS, the program will find a blank at the start of the string (this is the space separating the program name from the rest of the line). But the command line received by a .TTP application won't have that first blank. Usually this makes no difference at all, but it's worth pointing out.

The next four lines put a couple of parameters on the stack, call init_flags and clean up the stack afterwards; then check_c_args is called in the same way, only with five parameters on the stack. After this call, the flags in your data area are set to true or false, depending on which characters were typed on the command line, and you can continue with the rest of your program.

As for the subroutines, I'll discuss only a couple of interesting points. The header information found at the beginning of each gives a synopsis of the function.

I chose to pass parameters to these subroutines via the stack. This is slower than simply using registers, but it's much easier to maintain register integrity within subroutines this way. Let's take a closer look at how it's done.

To pass two values to init_flags, I push the values onto the stack and branch to the subroutine. At the beginning of the subroutine, a link instruction is executed, specifying an address register and an immediate value. This is what happens:



(1) The contents of the designated register (here, *a6*) are saved on the stack. Naturally, this is always a 32-bit value.

(2) The new value of the stack pointer is loaded into the designated register.

(3) The specified immediate value is added to the stack pointer.

The net result of all this activity is that the address register you specify in the instruction now points to a constant location in the stack.

When a subroutine begins, the stack pointer is pointing to a 32-bit (i.e., 4-byte) return address. *Above* this address is whatever data was pushed on the stack before the routine was called. After the link, the specified register points to its old value; 4 bytes up from that is the return address; and 4 bytes from the return address is the data.

So by adding *8* to the value of a6 in init__flags, you get the address of the last data put on the stack before calling the routine. By adding *12*, you get the address of the next-to-last data, etc. Suppose code__nr was word-size (2 bytes) instead of a longword; then you would only add *10* to a6 to get the stack address of "flags."

What about the immediate value that's added to the stack pointer by link? Remember that the 68000 stack grows downward in memory. If you add a value to the stack pointer, you effectively remove space from the stack. If you subtract a value, you reserve space. For example, whenever parameters have been passed on the stack to a subroutine, a value equal to the combined size of all the parameters should be added to the stack pointer after the subroutine completes. In this way, the stack pointer is restored to its original value before the parameters were pushed.

Look at the beginning of check__c__args. Here the negative immediate value ARG__SIZE is added to the stack pointer. A section of the stack ARG__SIZE-bytes large is now reserved. But how do you access it, and what do you use it for?

This is where the register specified in link becomes doubly useful. Just as you add values to a6 to access data *higher up* in the stack, you can subtract values from a6 to access memory *lower down*. By subtracting the same immediate value specified in link, you get the base address of the stack memory area which you reserved. This memory can now be used for whatever purpose you want.

The beauty of this system is that the area thus reserved is completely private to the subroutine which uses it. While the routine is active, the variables in this area are active; when the routine completes and unlk is executed, all this space is de-allocated from the stack, and the variables *go away*.

An area allocated on the stack in this way is called a *stack frame*, and the register used to access it is called the *frame pointer*. Languages like C and Pascal implement local variables with stack frames.

Thus, link has a double function. Sometimes it's used only to set up a frame pointer, to retrieve parameters pushed on the stack before the subroutine was called (in this case, an immediate value of *0* is added to the stack pointer, as in init__flags).

Sometimes it's used to allocate space for variables local to a subroutine. Or it can be used to do both at once. Whenever link is used, unlk must be used at the end of the subroutine, to restore the stack situation before you attempt to return:

```
Link a6, #-local__size      set up frame pointer
movem.l d0-d3,-(sp)         save registers
. . .(code). . .
movem.l (sp)+,d0-d3         restore registers
unlk a6                     restore stack
rts                         and return. . .
```

The space between the parentheses was originally occupied by my new **Koala Pad**-driven version of the ST operating system, K-OS.

You can use any register (except a7, of course) as the frame pointer; by convention, it's usually a6.

Finally, I'd like to discuss the bit of code in check__c__args between the labels c__c__scan and c__c__s001. Here the 68000 "decrement and branch" instruction is used to loop through all the valid character codes and compare each one with the character returned by parse__word, until a match is found or the valid codes are exhausted.

Most of this work is done by the two instructions:

```
cmp.b (a1),d4                    code found?
c__c__stest: dbeq d2,c__c__sloop  if not and more codes. . .
```

Here, the byte pointed to by a1 is compared to the byte in d4. The dbeq instruction takes care of everything else: either the zero flag is set (i.e., the bytes are equal), so that the branch back to c__c__sloop is not executed and the loop ends. Else if the bytes are not equal, then register d2 is decremented: if d2 contains a non-negative value (including *0*), then the branch to "c__c__sloop" is executed and the loop continues; otherwise, the loop ends.

In other words, dbeq means: unless the *equal* condition is met (i.e., the zero flag = 1, meaning that a comparison has been successful), decrement the indicated register and branch if the result is not −1.

There are two ways to get around this: either load the loop counter with a value one less than the intended count value, or label the dbra instruction and jump to it on the first iteration, thereby decrementing the counter once, before doing anything.

I use the latter method, but it has a pitfall. You must make sure, when you first jump to dbeq, dbmi, or whatever, that the 68000's status bits are not by coincidence set in such a way that the terminating condition is already true—and the loop never executes at all.

This can be a very hard bug to track down. If you make sure the last thing you do before the jump is load the count register, you won't have to worry. Move sets the status bits according to the value moved, and if the count is *0* to start with, the loop won't execute—which is what you want. But one can't always arrange things this way.

Remember, too, that move's to address registers have no effect on the status bits. Of course, with the dbra form, you don't have to worry about the status bits.

Note that, at the end of the check__c__args section, I test the count register to see if it was counted down to −1. If so, no valid match was found. The important thing to remember is that you must check the register as a word (16 bits), not as a longword. The dbra family decrements

the count register as a word value and leaves the upper 16 bits untouched. So, if I were to test d2 as a longword, I would never detect an error condition. This also means, of course, you can't have a count value greater than *32767* when using the "decrement and branch" instructions.

A government official was recently quoted as saying that "friends come and go, but enemies linger on." The same could be said of assembly language. Despite the experts' predictions, it's still there, lurking underneath C, BASIC and Pascal, like the old plumbing in a remodelled house. I hope these routines prove useful tools for those who want to learn to work at this level.

How to use the program.

Options.

Options can be in upper- or lowercase. They must be separated by spaces. They can be in any order, as long as those requiring strings are immediately followed (with a space separator) by the string.

- o — okidata printer (with r).
- t — star/gemini printer (with r).
- v — verbose mode (print file size, type, creation date, etc.).
- p — print listing, normal size.
- r — print listing, label size (with o or t).
- a — specifies drive a:.
- b — specifies drive b:.
- c — specifies drive c:.
- d-k — specifies drives d:-k:.
- n — include a title string in listing (+ string).
- s — set stack size (+ string) (maximum stack size is approximately 200K; minimum is 1K.)
- l ("ell") — set search level pathname (+ string).
- > — redirect output to a disk file (followed with *no* intervening spaces by filename. The filename is *not* terminated by a quote.)

Note: all strings are terminated by a single quote (').

Here are some examples, to help clarify the usage:

dx a p. . . print a short-form listing of the directories and their contents on disk a.

dx v c s 4000' p. . . print a long-form listing of the directories and their contents on disk c (hard disk), and set the stack size to 4K.

dx n disk contents' b v t s 3000' r. . . print a long-form listing in reduced size of the directories and their contents on disk b, with a title "disk contents" at the top of the listing, and set the stack size to 3K; SG-10 printer is specified.

dx l \stuff\nonsense' v c. . . display the contents of the directory \stuff\nonsense on disk c, long form, on the screen only.

dx a v >b:blip.dir b. . . output the directories and their contents from disk a (long form) to a file on disk b named blip.dir.

The slight inconsistency in the syntax for output redirection occurred because this was not a feature of the program as written, but rather of the operating system. I discovered it by accident(!) as I was testing the program, and am simply passing it on.

```
DISK CONTENTS 3 JULY 1986:
\
ADADEBUG.LDX      00   04:52    10/18/85    32034
ADXBASIC.TRN      00   18:04    05/29/85    32034
ADAPASS6.PRG      00   04:44    10/18/85     3898
ADA68000.RUN      00   01:13    10/18/85    32034
ADAPASS4.PRG      00   00:38    10/18/85    32034
TINYTOS.IMG       00   00:46    10/18/85       64
ADAPASS2.PRG      00   01:09    10/18/85    32034
ADAPASS1.PRG      00   01:24    10/18/85    32034
ADAPASS5.PRG      00   18:24    05/29/85    32034
ADAPASS3.PRG      00   17:55    05/29/85    32034
ADADOCS           16   21:10    05/29/85        0
ADAIO             16   21:16    05/29/85        0
\ADADOCS\
README            00   21:11    05/29/85     6144
TUTORIAL.DOC      00   21:11    05/29/85    11711
IMP.PRG           00   21:11    05/29/85    13687
LIB.PRG           00   21:12    05/29/85    17389
\ADAIO\
KEYBOARD.INC      00   21:18    05/29/85      333
SCREEN.INC        00   21:18    05/29/85     6144
GEM1.INC          00   21:18    05/29/85     1952
GEM2.INC          00   21:18    05/29/85     3627
```

I included a large number of drive designators because of the possibility that users might have hard drives partitioned into several logical drives. The original selection (which can be seen in the sample data section above) would not have allowed access to drives beyond c.

(Listing starts on next page)

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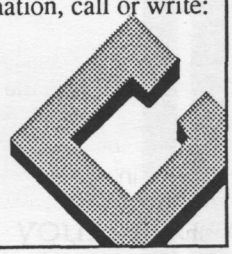

CIRCLE #123 ON READER SERVICE CARD

Listing 1. — Assembly listing.

```
     Note: in the comments to the following code, the symbol " -> "
means "pointer to" or "contains a pointer to".

*******************************************************************************
*** This version is compatible with the A568 assembler included in the
***     Atari Developer's Kit.
*** INITIALIZATION: these should be the first instructions in your
***     program...
sys_start:
          move.l    4(a7),a5            a5 == base page address
          lea.l     $80(a5),a2          point to command line
          clr.l     d0                  clear for byte size value
          move.b    (a2)+,d0            get byte count

***  a2 -> command line
***  d0 == byte count of command line
          move.l    #flags,-(sp)        base of flags area
          move.l    #code_nr,-(sp)      nr of flags in table
          bsr       init_flags          initialize flags
          addq.l    #8,sp               pop args

*** process command line codes
          move.l    #code_scale,-(sp)
          move.l    #code_nr,-(sp)      number of codes possible
          move.l    #codes,-(sp)        table of codes
          move.l    d0,-(sp)            byte count
          move.l    a2,-(sp)            address of command line
          bsr       check_c_args        set flags
          add.l     #20,sp              pop args

*** ...the rest of your program follows here...


*******************************************************************************
*** SUBROUTINES: these are called from the main program (above).
*****
*
* init_flags-- initializes a standard table of (byte-size) flags to
*              FALSE.
*    at entry:
*              a6 + 8  -> size of table.
*              a6 + 12 -> base of table.
*    at exit:
*              table  is initialized.
*              all registers preserved.
*
*****
init_flags:
          link      a6,#0               set frame pointer
          movem.l   a0/d0,-(sp)         save registers
          movea.l   12(a6),a0           base of table
          move.l    8(a6),d0            size of table
          bra.s     initf_test          now start
initf_loop:
          move.b    #FALSE,(a0)+        initialize a flag
initf_test:
          dbra      d0,initf_loop       go till end
          movem.l   (sp)+,a0/d0         restore registers
          unlk      a6                  deallocate frame
          rts                           and return

*****
*
* parse_word-- returns a word (delimited by a space or end of string)
*               from a string.
*              the word must be <= 76 chars (ARG_SIZE, == size of local
*               area reserved by caller).
* at entry:
*              a6 + 8  -> address of string.
*              a6 + 12 -> byte count of string.
*              a6 + 16 -> area into which to copy word (null-terminated).
* at exit:
*              a0 -> next word of original string.
```

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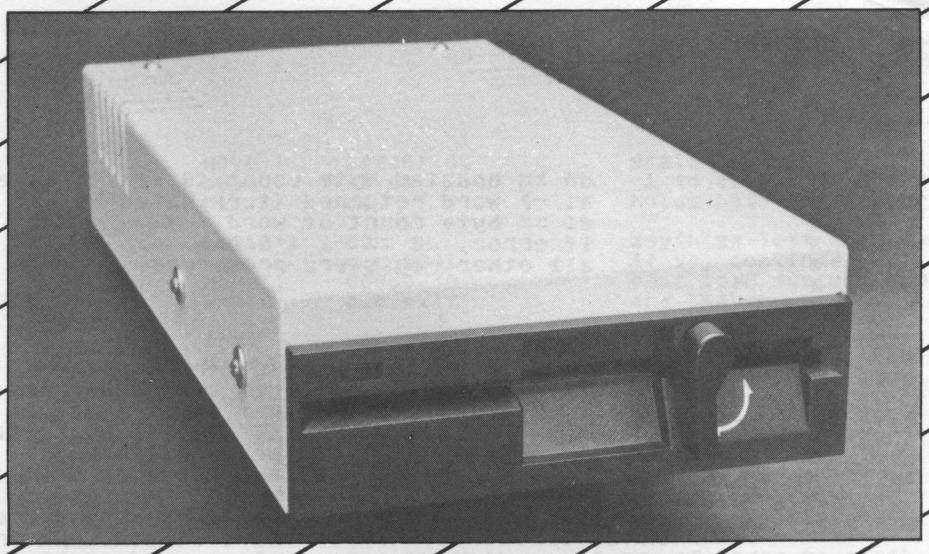

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```
*               d0 == updated byte count (0 if string exhausted).
*               a1 -> word returned (terminated by 0).
*               d1 == byte count of word.
*               if error, d0 == -1 ('BAD').
*               all other registers preserved.
*
*****
parse_word:
          link      a6,#0             set frame pointer
          movea.l   8(a6),a0          get string address
          move.l    12(a6),d0         get byte count
          bgt.s     p_w_001           if count > 0, continue
          move.l    #BAD,d0           else return error
          bra       w_f_002           and leave
p_w_001:
          movea.l   16(a6),a1         point to copy space
          movem.l   a1/d2,-(sp)       save it and count register
          clr.l     d1                clear word count
          move.l    #ARG_SIZE-1,d2    start control count (-1 for null)
parse_loop:
          cmp.b     #BLANK,(a0)       blank?
          bne.s     p_l_001           if not
          subq.l    #1,d0             else decrement string count
          addq.l    #1,a0             point to next char
          bra       p_w_exit          and return word
p_l_001:
          subq.l    #1,d0             else decrement string count
          bne.s     p_l_002           continue if string not exhausted
          addq.l    #1,d1             else count this last char...
          move.b    (a0)+,(a1)+       copy last valid char...
          bra       p_w_exit          and return final word
p_l_002:
          move.b    (a0)+,(a1)+       copy char
          addq.l    #1,d1             count this one
          subq.l    #1,d2             decrement control count
          bne.s     p_l_003           if > 0, continue
          subq.l    #1,d0             else decrement string count
          bra       p_w_exit          and leave
p_l_003:
          bra       parse_loop        keep going
p_w_exit:
          move.b    #0,(a1)+          terminate word with null
w_f_001:
          movem.l   (sp)+,a1/d2       point back to start of return word
*                                      and restore d2
w_f_002:
          unlk      a6                deallocate frame
          rts                         and return

*****
*
* check_c_args-- checks one-letter command-line arguments and sets
*                internal flags as appropriate.
* at entry:
*               a6 + 8  -> address of command line string.
*               a6 + 12 -> byte count of command line string.
*               a6 + 16 -> base address of array of char codes to
*                                look for.
*               a6 + 20 -> nr of char codes in array.
*               a6 + 24 -> code table scale factor.
* at exit:
*               d0 == completion code (returns GOOD if there's
*                  anything else on command line-- even only spaces).
*               flags will be set TRUE or FALSE as appropriate.
*               all other registers preserved.
*
*****
check_c_args:
          link      a6,#-ARG_SIZE       set frame pointer
          movem.l   a0-a2/d1-d4,-(sp)   save registers
          move.l    12(a6),d0           command line byte count
          bgt.s     c_c_a001            if count > 0, continue
          move.l    #BAD,d0             else load error code
          bra.s     c_c_exit            and leave
c_c_a001:
          movea.l   8(a6),a0            command line address
```

```
            move.l    24(a6),d3          scale factor
            subq.l    #1,d3              -1 to allow for address reg inc
            clr.l     d4                 holds byte for comparisons
c_c_word:
            tst.l     d0                 anything left in command line?
            bne.s     c_c_w001           if so, continue
            move.l    #GOOD,d0           else load success code
            bra.s     c_c_exit           and leave
c_c_w001:
            pea       -ARG_SIZE(a6)      local space address
            move.l    d0,-(sp)           current command line count
            move.l    a0,-(sp)           rest of command line
            bsr       parse_word         get next word
            add.l     #12,sp             pop args
*** (a1) -> code to check; d1 == count; (a0) -> rest of cmdline;
***           d0 == bytes left
            cmp.l     #1,d1              one-char arg?
            beq.s     c_c_scan           if so, continue
            bra.s     c_c_word           else skip this one
c_c_scan:
            move.l    20(a6),d2          nr of codes to check
            movea.l   16(a6),a2          base of codes table
            bra.s     c_c_stest          start checking
c_c_sloop:
            move.b    (a2)+,d4           next byte
            cmp.b     (a1),d4            code found?
c_c_stest:
            dbeq      d2,c_c_sloop       if not and more codes to check
            tst.w     d2                 really a match?
            bmi.s     c_c_s001           if not
            move.b    #TRUE,0(a2,d3.l)   else set flag = TRUE
c_c_s001:
            bra.s     c_c_word           and get next word
c_c_exit:
            movem.l   (sp)+,a0-a2/d1-d4  restore registers
            unlk      a6                 deallocate local space
            rts                          and return

*******************************************************************************
*** DATA DECLARATIONS:
*****
*
* standard flags table.
*
*****
GOOD        equ       0          return code == success
BAD         equ       -1         return code == fail
ARG_SIZE    equ       76         max total length of command line arguments
TRUE        equ       1          == C "true" cond
```


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```
FALSE     equ       0          == C "false" cond
BLANK     equ       32         ascii space == " "

                    even
code_base           equ       *                    base of codes table

*** now comes a list of the characters you want to use
codes               dc.b      'O','G'              command line codes
                    dc.b      'V','P','R','A','B','C'
                    dc.b      'N','S','D'

*** the next four lines do not change!
code_nr             equ       *-code_base          size of table
code_count          dc.l      code_nr              save it
code_scale          equ       *-code_base          index between codes and flags
flags               equ       *                    base of flags table

*** these are the flags which correspond to the characters listed above.
***   If the codes are changed, then the flags must also be changed to
***   maintain a one-to-one corrspondence. If a valid character code
***   (one of those listed above) is found on the command line, then its
***   corresponding flag will be set to "true" after the routine
***   'check_c_args' is called; otherwise it remains "false".
okidata             ds.b      1                    oki printer
star                ds.b      1                    star/gemini printer
verbose             ds.b      1
print_it            ds.b      1
small_prt           ds.b      1
drive_a             ds.b      1
drive_b             ds.b      1
drive_c             ds.b      1
set_title           ds.b      1
set_stack           ds.b      1
search              ds.b      1                    alternate search level
```

●

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CIRCLE #128 ON READER SERVICE CARD

Format+

Double your disk access rates

by Brian Duggan

The ST is the first computer with qualities needed by both home and business computers—a user-friendly, graphics-oriented interface at a moderate price, with lots of memory, high-speed CPU and a DMA interface for easy hard disk expansion.

However, the true value of a PC for business purposes is highly dependent upon its floppy disk I/O speed. The new database, spreadsheet and integrated business programs are hundreds of thousands of bytes long. They'll tax floppy disk I/O to its limit. Indeed, everything's larger in the 16-bit world. Even BASIC has expanded to 140K on the ST, and that, at the ST's present speed, takes 18-20 seconds just to load.

After reformatting your disks with **Format+**, you'll experience a large increase in I/O speed, plus a corresponding increase in your ST's value for business use. How large an increase? Well, hold on to your hat, this is *not* a misprint. . .Read/Write will now take place at the raw rate of 23,000 bytes/second. This is at 5 tracks/second—double the present rate, it's the theoretical maximum for a floppy disk.

In fact, all disk access rates are doubled. Even writing to the disk with Verify on (the default on the ST) is doubled to 11,500 bytes/second or 2.5 tracks/second. This is also the theoretical maximum speed, as it takes one turn of the disk to Write and one turn to read back and verify.

If you're not experiencing any soft errors and are using work disks, you can write with reasonable safety, having verify off, and enjoy the full 23,000 byte rate. By the way, the disk copy utility will always automatically perform a verification, whether the verify flag is set or not.

No changes, just more.

Format+ doesn't change the present 9-sector format of the disk in any way (except for a slight squeezing of the spacing between sectors, from 40 to 36 bytes). What's changed is the "dead" space on each track.

This is the space after the last sector and before the index mark, which signals the start of the track's first sector. Extra formatting information is put there in three small "pseudo" sectors, numbers 10, 11 and 12.

These supply the 8-MHz 68000 CPU and the DMA Controller with sector and track information they need to perform the low-level housekeeping required for a move to the next track to take place. They're so quick that they can reset the disc controller, get the new track and read/write commands from DOS, step the disk head to the next track and verify the head movement. . . All in the time it takes for the "dead" space to pass by the disk head—and before the next index (or start) mark appears.

This permits a continuous read/write—something that's impossible for 8-bit computers, and for the IBM PC. This is the vaunted "68000 power."

The extra format information on the disk is completely transparent to GEMDOS, which knows nothing about sectors 10,11 and 12. Only the lowest level XBIOS knows about them, and it (being a drone) just takes and executes orders. It doesn't question the orders.

If you have any concern about overworking the stepper motor, this is on for 3 in every 200 milliseconds (one disk rotation), a duty factor of only 1.5 percent. In fact, since the raw disk read rate is now consistently doubled at all times (no matter *what* the program or DOS does, unlike the write rate), drive head wear is also pretty much halved —which greatly extends both drive and disk life.

To the keyboard.

Format+ has been kept as simple as possible. Instead of writing a lengthy stand-alone assembly language utili-

ty, difficult to type in and debug, I've taken advantage of having TOS available in RAM and used BASIC to modify it, shuffling the barest modicum of bytes. Type it in, save it to disk, and then let's **Format+** some disks.

Ready? Boot TOS into RAM (the original 5-29-85 or 6-20-85 version is needed and will be checked for), reload BASIC and run the program. It will modify the XBIOS format routine of TOS. Quit BASIC and format several disks. TOS has now been "corrupted," so remember to reboot after you finish formatting.

Test the results using the disk copy utility, by copying BASIC to one of the newly formatted disks (single disk copy should take about 17 seconds less). Erase everything from the disk except BASIC and its RSC file. Load BASIC (it should now take 11 or 12 seconds, instead of 18) and *POKE &H444,0*. This turns off the write verify flag (POKEing *255* will turn it back on).

Now, time how long it takes for BASIC to do a BSAVE *"Test",100000,100000*. If everything has gone well, BASIC will write 100K to the disk in 10 seconds flat, a net write rate of 10K/second.

Quit BASIC and "trash" the test file. You can now check and test the system file copy and file read utilities by copying BASIC to itself. Click on and move the BASIC icon down on the desktop. Then click on the copy box when it appears. You will get a *Name Conflict Warning*. . .Type in any name you like (I used *BASICA*), then time how long it takes for the system utilities to read and copy BASIC back to the same disk.

It should've taken 20 seconds to read and write the 140K file—only 2 or 3 seconds longer than it takes just to load (read) BASIC in the normal format! With verify off, reading and writing are now taking about equal times (10 seconds in, and 10 seconds out). So, net read and net write rates are about equal, at 14,000 bytes/second each.

Who ate the rate?

By this time, you might be wondering whatever happened to the 23,000 bytes/second. What's slowing down the net disk read/write rate? If you guessed GEMDOS, you're right. GEMDOS is very slow. Including head movements, it took GEMDOS 8 seconds to do its high-level file search work, while the low-level XBIOS made the actual transfer in 12 seconds (60 tracks at 5 track/second).

The business or power user who uses disk-sized databases and compilers will find that the ST can now load (without searches) an entire 350K disk into its memory in 18 to 20 seconds. And it performs a memory-to-disk dump at a comparable rate. This is about 19,000 bytes/second despite DOS overhead, which comes close to the theoretical maximum, and is even comparable to some hard disks.

What to expect.

Reads will be performed at a constant 23,000 or 5 tracks/second rate, with a net read rate of 14 to 16,000+ bytes/second for large files (i.e., **STWriter** loads its ST-WMAN file—90K—at 15.5K in 5.8 seconds and, by the way, will also copy it to a new name at 12K in 7.5 seconds.

For small files of less than 40K, GEMDOS will now take as much or more time than the actual read itself. A 20K file loads in less than 1 second (at 5 tracks/second), while GEMDOS putters around taking 2+ seconds to do whatever it does.

Writes are completely at the mercy of the program. A well-behaved program, writing with verify off, can run at or near the speed of the read cycle, as **STWriter** does. This is up to a net 14,000+ rate for larger files, with GEMDOS and the program determining the small file time. It's still less than 6 seconds for a 40K file.

Writes with verify on will take longer, at the raw 11.5K rate. However, 20 to 40K files still will only take 6 to 8 seconds to complete, even then. All this permits rapid fire PC/user interaction—a real boon in business use.

Misbehaved programs with small (<16K) and/or non-disk track-sized I/O buffers will tack on an extra 30 to 100 percent overhead. With verify on, they can drag the write rate to its knees, down to 1.3K/second. You now know where the blame lies for poor output performance times!

Enjoy using your "super" 16-bit computer, with its 23,000 byte I/O rate. Listen to that little disk drive give its all for you! Now, if someone would optimize those slow GEMDOS routines. . .

Brian P. Duggan is a graduate chemist who's a new Atarian. He got into computing back in 1981, with a TRS-80. The power of the ST has now made his writing, programming and cerebral recreation all pleasure with no pain!

Listing 1.
BASIC listing.

```
10    ' Format Plus: Copyright 1986 by
 Brian Duggan
20    Fullw 2: Clearw 2
30    Gotoxy 24,2: ? "* * * FORMAT P L
 U S * * * "
40    Gotoxy 27,5: ? "TOS Version: "
50    Gotoxy 26,3: ? Chr$(189);" 1986
by Brian Duggan"
60    Txt =9 : Gosub Effect: Gotoxy 14
,10 : ? "REMINDER:";
70    Txt =0: Gosub Effect: ? "  For 2
3,000 bytes/sec WRITE rate"
80    Gotoxy 24,11: ? "Poke &H444,0  (
255 to restore Verify)"
90    'TOS Version check ********
100   Def Seg =&H5000: A =Peek(&H18):
B =Peek(&H19)
110   If (A =5 AND B =41) OR (A =6 AND
 B =32) Then  f =0: Goto Modify
120   F$ ="************** A B O R T E D
 ****************"
130   Gotoxy 41,5: ?"Not 5-19 or 6-20-
85 TOS"
140   Color 2: Goto Finish
150   Modify:  If A =6 Then Adjust =-2
 Else Adjust =0
160   Gotoxy 40,5: ? "O.K.":F$ ="*****
** C O M P L E T E D--Ready To Format
*******
170   Color 3: Goto ChangeTOS
180   Effect:  Def Seg =0
190   Poke Contrl,106: Poke contrl+2,0
: Poke contrl+6,1:Poke intin,Txt
200   vdisys(1): Return
210   FINISH: Gotoxy 14,8: ? F$: Color
 1
220   Sound 1,8,10,4,55: Sound 1,0,0,0
,0: End
```

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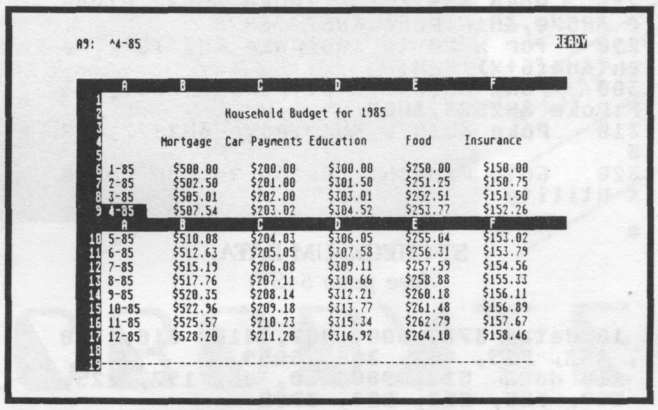

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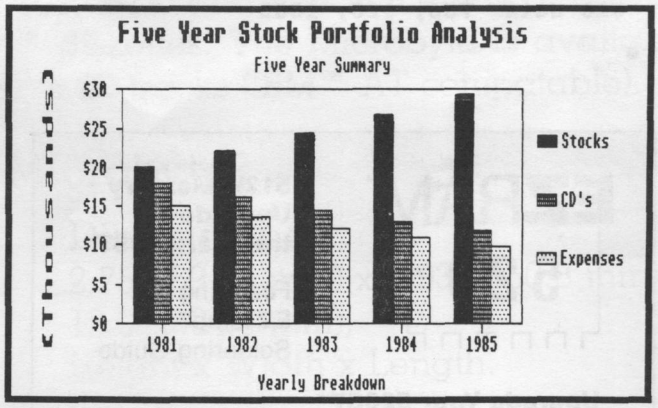

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SYSTEM REQUIREMENTS: Amiga with 512K; One disk drive; Monochrome or color monitor; Works with printers supported by the Workbench.

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```
230   ChangeTOS:' **** Original TOS ne
eded in Ram ****
240   Def Seg = &H100+ Adjust
250   Poke &H56c,0: Poke &H56d,&H0c
260   Def Seg = &H6000+ Adjust
270   Poke &H563,&H22:Poke &H582,2:Pok
e &H583,&H18
280   Poke &H57c,&H61:Poke &H57d,0:Pok
e &H57e,&H1F:Poke &H57f,&H78
290   for x =0 to 300:poke &H24f6+x,Pe
ek(&H4f6+x):NEXT
300   Poke &H2521,&H01:Poke &H254f,&H6
F:Poke &H2573,&H6C
310   Poke &H2576,&H4e:Poke &H2577,&H7
5
320   Goto Finish:' Ready to run Forma
t Utility
```

•

ST-CHECKSUM DATA.

(see page 54ST)

```
 10 data  377, 606, 987, 418, 616, 780
, 482, 965, 462, 366, 6059
 110 data  510, 980, 50, 86, 197, 225,
 567, 325, 222, 620, 3782
 210 data  445, 603, 779, 814, 391, 85
8, 194, 629, 730, 970, 6413
 310 data  738, 928, 1666
```

•

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Typesetter ST

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Monochrome & color $39.95

by Matthew J.W. Ratcliff

Typesetter ST is the first in XLent Software's "printware" series for the new Atari 520ST systems. This is a graphics and text-editor package, suited to designing small newsletters or business advertisements.

Unlike **NEO-Chrome** or **DEGAS**, **Typesetter ST** allows you to edit within an area equal to one page on your Epson or NEC (or compatible) printer. A page on the printer works out to 960 by 672 pixels, as opposed to the ST's 640 by 400 (monochrome).

Typesetter breaks the picture into quadrants, which overlap for editing. It isn't a full-blown drawing program, like **NEO-Chrome** or **DEGAS**, but **Typesetter ST** has a few advantages over both of these.

Typesetter seems to be suited more for use as a utility, to supplement the drawing programs mentioned above. It comes with routines that will convert picture files into different display formats. Several character set files are contained on the unprotected disk, as well as both versions of the program—monochrome and color. The color version was tested for this review.

When **Typesetter** is run, you're presented with the "graphics card" menu of functions. Behind it is your graphics work area. The usual drawing functions are available, to plot points, draw lines, and so forth. Objects like rectangles, pies and ellipses may be drawn with different pattern and hatch fills. Pen width and color may be changed as you draw.

Typesetter can automatically create shapes which the current version of **NEO-Chrome** (0.5) can't handle. But you can't dynamically resize them, as in **DEGAS**. The objects may be more accurately thought of as icons, whose size you can adjust.

It uses the trial-and-error method—you change size from the graphics card, entering a value from *1* to *10* and drawing the new sized shape. Your best bet is to start small and work your way up. There are no cut-and-paste features in **Typesetter**.

Although you use a mouse to draw and place shapes on the screen, all program commands are accessed through function keypresses. Most are from the graphics card menu, but many are submenus. You're constantly reaching from the keyboard to the mouse, and back again.

If you get confused and type while in the mouse edit mode, all the keys are buffered. Then, when you do get back to the menu, the keyboard buffer isn't cleared—all your accidental keystrokes are treated as commands.

Also, whenever you select a menu function, you're returned to the graphics screen as your command is processed, then again to the menu. You must press the SPACE BAR to get back to your picture. The most logical interface would be to go directly to the graphics screen.

Each time you go to a different menu or mode of editing, all the functions take on different meanings. Aside from being very confusing, this doesn't take advantage of the elegant mouse interface used in most other programs (**DEGAS**, for instance). The function key interface makes using **Typesetter** during a long editing session a tedious chore.

You *will* have great fun playing with all the pattern and hatch fills, thirty-six in all. Examples are given in the brief manual.

If you wish to experiment with different patterns, you'll find the "user interface" a real pain. While drawing, you click the right mouse key to get back to the graphics card. Press *F* for the fill style, then type in the fill value (*1* through *24*) and press RETURN.

After the graphics card comes back again, you must hit the SPACE BAR to go back to the graphics screen.

The primary advantage of **Typesetter** is that it can load, edit and print a screen larger than the ST can display. Typically, you'll load a **DEGAS** or **NEO-Chrome** picture and add to it. Once the picture's loaded, you can easily add text, shapes and patterns to the extra "white space" at the bottom of the original.

NEO-Chrome supports text, and **DEGAS** also supports custom character sets. But custom characters have long been a hallmark of XLent's products.

You can load and edit with different character sets, placing letters anywhere on the original, or in the "extra white space" at the bottom. Text may be rotated in increments of 90 degrees (sideways and upside down). **DEGAS** comes with a character set editor; **Typesetter** does not.

Several "border texts" are provided with one of the custom character sets. With it, you can create fancy borders around an entire screen, or any portion of it.

I've run into a minor problem here. As mentioned in the documentation, while entering text at any angle of rotation other than 0 degrees, you don't have a cursor. It's

very difficult to accurately set up a text border this way.

Once in text entry mode, you may choose from 24 font sizes, the smallest giving you 106 characters across the display. Pressing the F1 key yields a menu of common text entry parameters you can change, such as underline or outline mode. While editing in text mode, you have several other function keys at your disposal, none of which appear in menus. You'll find these only in the documentation.

Pressing F2 gets you to yet another function menu, where inverse or normal video characters may be chosen. Character height and width can be adjusted, as well as overlay mode. Text adjusts to many heights and widths. This gives you much more control over text sizing than does either **NEO-Chrome** or **DEGAS**.

The F7 and F8 keys allow you to define margin widths, to make columnar text entry easier. And finally, from the text entry mode, pressing F10 will send control to the disk input/output options.

Here's my biggest gripe about **Typesetter**. If you forget how to spell a filename, you're out of luck. There's no way to get a disk directory—an absolute must in any applications program. I hope future versions will incorporate this feature. At any rate, from the disk I/O submenu, you can load or save **Typesetter** screens in many different formats.

While editing in graphics mode (with the mouse), you may press SHIFT keys for one of two differently scaled overlay grids. These tell what quadrant you're in and show an overlay of the exact pixel areas on the display, in terms of the printer's output. This is very helpful in keeping track of where you're editing "on the paper." While in text entry mode, these grids are accessed through the F4 and F5 keys.

You can also shrink a picture vertically by 25% or 33%, which can bring your images into better proportion. **Typesetter** can't "stretch" a picture, however, to make it fill a printed page. Height to width ratios of icons are adjustable, and the screen may be cleared—by page, quadrant (one-fourth of the current display), or current cell (portion of the entire picture filling the display).

Once you have your finely tuned document saved and ready to print, select the print option from the graphics card menu. This is where **Typesetter** truly shines.

I've been disappointed with my Gemini 10X printer, since getting the ST. The ALTERNATE-HELP-key picture dumps look sloppy, with about one-half dot of white space between each line of graphics. Contrast was poor, as well. I was about ready to trade up, until I started dumping pictures with the **Typesetter**. These have an excellent gray scale, with tighter line spacing, and fill the page nicely (if you edit in all the quadrants).

If you want pictures to take up the entire page and need a better graphics dump facility for your ST, **Typesetter** may suit your needs. It has many features lacking in **NEO-Chrome**. XLent's documentation highly recommends **DEGAS** to create pictures, with a **Typesetter**-performed final edit. No, **Typesetter ST** can't replace **DEGAS** or **NEO-Chrome**, but it will serve as a useful companion utility.

Matthew Ratcliff is an electrical engineer in St. Louis, Missouri. When not using his spare time to write articles, he's president of ACE St. Louis and a remote SYSOP on Gateway City BBS, (314) 647-3290.

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by
Matthew R. Singer

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RAMdisk Benchmarks	Compile	Link	Execute
Seive of Eratosthenes	10	21	5.3
Null Program	7.1	5.5	—

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- CASE has an ELSE and may contain subranges
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  - Bit-wise operators
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  - Absolute addressing
  - Interrupt structure
- Programs may be broken up into Modules for separate compilation
- Multi-tasking is supported
- Module version control
- Open array parameters (VAR r: ARRAY OF REALS:)
- Type transfer functions
- Definable scope of objects

Pascal and Modula-2 source code are nearly identical. Modula-2 should be thought of as an enhancement to Pascal (they were both designed by Professor Niklaus Wirth).

Regular Version: $79.95 **Developer's Version: $149.95**

The developer's version supplies an extra diskette containing a symbol file decoder, link and load file disassemblers, a source file cross referencer, symbolic debugger, high level Windows Module, and the Resource Compiler.

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CIRCLE #132 ON READER SERVICE CARD

THE CES Scene

A look at the June show tells us... "The STs are all right!"

by Arthur Leyenberger

"Toto, I have a feeling we're not in Kansas anymore. . ." (Glenda, the Good Witch of the North arrives in a marvelous sphere). Dorothy, upon seeing Glenda: "Now I *know* we're not in Kansas."

These immortal words from *The Wizard of Oz* kept going through my mind, as I entered the Atari booth (the largest seen since the Tramiels took over) at the June Consumer Electronics Show (CES) in Chicago. After the last few shows, nothing here looked like what I was used to—either in the video game glory days or in the vacuum that had followed..

The video game and home computer industry had taken a nose dive two years earlier, and each succeeding exposition gave evidence that the golden days had passed. I entered the largest annual trade show, amidst Dixieland bands and 100,000-plus attendees, I was prepared to report on yet another gloomy show.

Then I saw the Atari booth—thirty-odd software vendors, showing off their wares in what was easily the most exciting, overcrowded booth in West Hall. Kansas, indeed!

We bring you the new, the exciting, the technically astounding ST software that was being exhibited at the twentieth annual Summer CES. From what I saw at this four-day electronics, hardware and software bazaar, the remainder of 1986 will be very good for Atari ST users. The ST is an unqualified success, and the floodgates have opened wide to let forth a rush of software.

Software forever.

With the STs beginning to enjoy national popularity, you might ask how many programs are currently available? As of the start of CES, I could count over 200 titles on my local dealer's shelves.

The following companies announced or demonstrated ST software in Chicago. Some of the information here was obtained while viewing demos in the hectic Atari area; other tidbits were gleaned from the vendors' booths. For this reason, the detail presented here varies from one publisher to another. Companies are presented in alphabetical order.

Abacus Software was showing their CAD-like program, **PCBoard Designer**. It provides interactive layout of PC boards, component listing, automatic routing of traces and camera-ready printout. **PCBoard Designer** was demonstrated on a monochrome monitor and appeared to be a sophisticated program. It's currently shipping and retails for $395.00.

Abacus also announced a number of new titles. **ST TextPro** is a professional word processor that features multi-column output, automatic indexing and table of contents, fast text input and scrolling, definable function keys, and the ability to print sideways—for $49.95.

ST Text Designer is a page-making package, to create layouts from word processing files. The program can read files from **TextPro** or other ASCII files, then add lines and merge graphics with text. Available this summer, **Text Designer** will retail for $49.95.

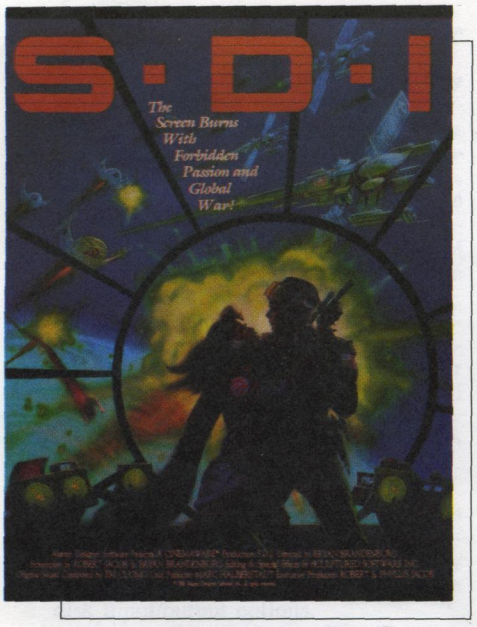
ST DataPro is billed as a simple yet versatile database program for the ST. Screen templates are used, to make database design and data input easier. Unlimited record length is possible, with a maximum of 64000 records. Available by the time you read this, it will list for $49.95.

ST PaintPro is a drawing and design package. Multiple windows allow you to copy and paste between them; rotation and a wide range of text formats and options are offered. Available now for $49.95.

Abacus also displayed three new ST books. ***Atari BASIC Training Guide*** is a functional, educational introduction to ST BASIC. From problem analysis to commands to algorithms, the book provides fundamentals of programming in an easy-to-understand format.

Another new Abacus book is ***Atari ST Graphics and Sound***. It teaches you how to create graphics and use the ST's built-in sound facilities. Examples are in BASIC, C, Logo and Modula-2, so there's something for every programming taste. Some of the topics are: mirror and rotation, graphics under GEM, coordinate transformations, raster and vector graphics, plotting and 2- or 3-D functions, waveform generation, the sound chip, and the ST as a synthesizer. Of course, there's far more information than space allows me to mention here.

The third new Abacus book is entitled ***Atari ST Tricks and Tips***. Chapters cover: using GEM from BASIC, combining BASIC and machine language, creating a RAMdisk and print spooler, automatically starting TOS applications, and much more. If you'd like to learn more about programming your ST, this and the two books mentioned above can help. All have sample



One of the Cinemaware offerings, *SDI*.

programs and tips for the new or expert programmer.

The Abacus books are currently available for $20.00 each, except ***BASIC Training Guide***, which is $17.00.

Activision shared a booth with several other publishers. The most exciting news from these folks is that their **Music Studio** has recently been released for the ST computers.

This music composition program, designed by Audio Light, allows the user to create music interactively and control up to fifteen instruments in one song, or up to eight voices at once. **Music Studio** has four tracks and can be interfaced with a MIDI instrument, though it also works with the built-in, three-voice sound chip of the ST.

When using a synthesizer keyboard, via the MIDI interface, **Music Studio** does not function as a sequencer or multi-track tape recorder. It is, rather, a composing program and uses standard music notation to edit and compose. Although real-time keyboard input is not accepted, the program can send output to a MIDI keyboard. Drop-down menus and mouse control make the **Music Studio** easy and enjoyable to use.

With this program currently selling for $50.00, work is already beginning on the next version. The latter *will* have real-time keyboard capture, as well as a MIDI patch librarian capability.

Activision also showed the **Paint Works** (formerly **N-Vision**), by Audio Light. This easy-to-use painting program is also available now, for $49.95. Look for **ST-Log** reviews of both these Activision programs soon.

Artworx demonstrated **Strip Poker for the ST** within Atari's exhibit area. This is basically the same program released for the 8-bits a few years ago.

Now, however, the program's completely mouse driven, and the graphics are substantially improved. Interestingly, the 8-bit graphics were uploaded to the Amiga, and **Deluxe Paint** by Electronic Arts was used to improve the pictures.

Resolution was increased to about four times the previous capacity, and colors were added. As a last step, the graphics were ported to the ST. Talk about a round-about trip to the ST!

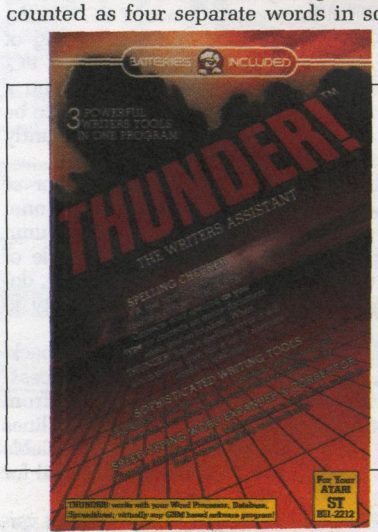
Strip Poker for the ST will be selling for $39.95, with optional data disks at $19.95 each. The original game-playing algorithms were used for the ST version, so it's neither easier nor more difficult than its predecessor. Future data disks will use digitized graphics for, um . . . added realism. **Strip Poker** will be available by the time you read this article.

Artworx is already shipping **Compu-Bridge for the ST**, at $29.95. A **backgammon variant** will also be out by the time we're in print. And a new game called **Hole-In-One Golf** will be available soon, too. Artworx is solidly behind the ST and will continue to offer programs for it.

Batteries Included, a longtime supporter of 8-bit and now 16-bit Atari users, showed several new products at their booth. One of these was **Thunder!: The Writer's Assistant**.

As a spelling checker for the ST, **Thunder!** is unique in a number of ways. One is its ability to correctly check a word which has a number within it. No other currently marketed spelling checker for *any* computer can handle this type of spelling error.

Another unique aspect of **Thunder!**—its dictionary has 50,000 *real* words. Other products claim as many or more words, but count derivatives separately. For example, *walk, walks, walked* and *walking* could be counted as four separate words in some spelling checkers. In **Thunder!**, they're considered one word. Of course, you can create your own supplemental dictionaries, as well.



Batteries Included's *Thunder!*

Two versions of **Thunder!** are provided on the distribution disk. One is a desktop accessory, to be used whenever accessories are normally available. It works only with GEM-based word processors (actually, with any GEM-based program). What's especially useful is that, when **Thunder!**'s been loaded as a desk accessory, consuming about 100K of memory, it can be disabled at any time, freeing up that memory —*without* rebooting. Nice touch!

The other version is a stand-alone program to be used with any file. It's handy in checking files created by non-GEM programs, or an entire GEM-created file. This program runs from the desktop and, when finished, returns you to the desktop. In addition to doing a spelling check, it provides you with a range of statistics, like character, syllable, word and sentence counts, and two types of readability indices.

In addition to a spelling checker accessory, **Thunder!** provides a word expansion feature. If I want, for example, I can define *CES* as "Consumer Electronics Show." Then, whenever I type *CES*, "Consumer Electronics Show" would be entered . . . a very useful feature.

Thunder! retails for $39.95. It's quality ST software, clearly one of the most impressive ST programs at CES.

According to President Michael Reichmann, Batteries Included has sold over 25,000 copies of **DEGAS**. In discussing the fact that **DEGAS** has done so well while not copy protected, Reichmann said copy protection is no longer an issue. All BI's products are sold without copy protection, a policy they intend to continue. The industry is slowly realizing: this is the way application software should be marketed.

I had a sneak preview of the next-generation **DEGAS**, **DEGAS Elite**. Scheduled to be released by August, it will sell for $79.95. Current **DEGAS** owners will be able to upgrade for half the price and their original **DEGAS** disk.

DEGAS Elite has significant improvements, too many to state here. Eight screens are now provided, and colors, objects, clip art, and so forth can be copied easily from one screen to another. Another powerful feature is the ability to specify a starting and ending color—and have the program fill in all the colors between for your palette.

Drives from A to P are now supported, and folders can also be used. Regardless of what resolution you're now in, any picture type—low, medium or high—can be loaded into the current screen. **DEGAS Elite** automatically does the conversion as it brings in the program.

NEO-Chrome and **Koala** pictures can be

loaded directly, too. And the current on-screen picture can be saved in any of these file formats.

You can use four different animation speeds, in four different directions, in four different ranges of colors at once, on one screen. In addition, any portion of a picture can be grabbed and copied to another screen, or even used as a brush. Very impressive!

The new **DEGAS** will automatically do anti-aliasing of a picture. The concept of anti-aliasing is that, if you put a complementary color along the edge of another color, it will seem to smooth the original's jagged lines. It's truly amazing to watch all the corners being magically rounded off. The effect is a marked improvement in your image.

One of the cleverest aspects of the program is that you'll be able to save a **DEGAS** picture as an ST icon. Also, you can grab a corner of a picture and stretch it in any direction. Eight levels of magnification are available in **DEGAS Elite**, for fine detail work, and both manual rotation and rotation by degrees are provided.

All in all, **DEGAS Elite** is state-of-the-art software for the ST, a significant improvement over its excellent original.

Batteries Included also showed their **IS*Talk** ST telecommunications program. It's a full-scale terminal program, based on the GEM graphics interface. **IS*Talk** is easy to use, with a host of sophisticated features—spelling checker, macros, replay, auto log-on, and much, much more. It's retailing now for $79.95.

Also coming from Batteries Included: an upgraded version of the popular 8-bit **HomePak**; **PaperClip Elite**, which will allow the inclusion of **DEGAS Elite** files within text; **BTS The Spreadsheet**; a personal diary program called **Time Link**; and another 8-bit upgrade, **B/Graph**, the graphics charting and statistics package. No question about it—BI is solidly behind the ST, with a wide range of products.

Batteries Included also announced a merger with ITM Corp., a Canadian holding company. BI will retain its autonomy, but will now have a parent company, to provide greater financial strength for growth. Basically, this deal means they'll be able to publish more software in the months ahead.

Broderbund, parent company of Synapse, brought two previously released 8-bit titles for the ST, **Essex** and **Brimstone**.

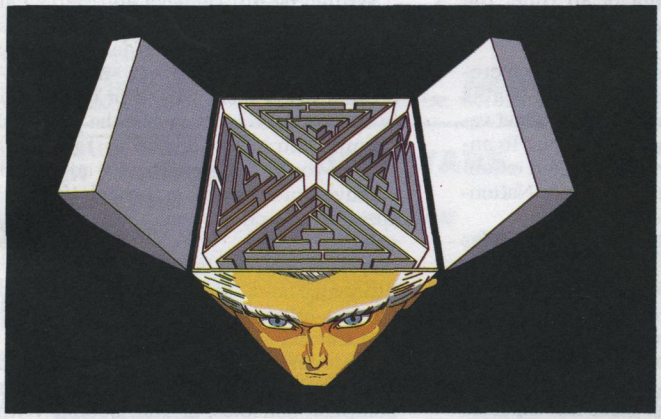
Essex puts you in the realm of science fiction, playing the part of a tourist aboard the starship *Essex*. What began as a peaceful vacation turns into an intergalactic rescue mission, led by the one person who can thwart the insidious Vollchons threatening all planets in the Sirius sector.

Brimstone is a fantasy, wherein you help Sir Gawain of the Round Table find the five mystical words which will release him from Ulro, the netherworld. Beyond the moat and massive door to the castle, you must outwit deranged white apes and defeat the Underdemons—or be trapped for eternity. Sounds pretty tough to me.

Both text adventure games feature 1500-word vocabularies and are played in real time. If you linger making a move, the action continues. **Essex** and **Brimstone** are available now at $44.95 each.

Electronic Arts shared a distributor's booth with other software publishers. The views of its president Trip Hawkins, concerning the Atari ST and Amiga computers, are well known. Briefly, he feels the Amiga is the better machine, while the ST has no future. Therefore, he won't develop ST software, but has heavily supported the Amiga.

The company does, however, have one ST program: **Financial Cookbook**. This is



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an updated, improved version of the 8-bit title. We hope, as the ST's success is seen, EA will develop software for it.

Epyx Software, the folks who brought you **Rescue on Fractalus** and **Ballblazer**, two great Lucasfilm games for 8-bit computers, among others, were proudly showing two titles for the ST.

A new, enhanced version of **Temple of Apshai**, called **The Trilogy**, is available now. This role-playing adventure features 1400 separate chambers, multiple dungeon levels, improved graphics and faster action play. **The Trilogy** lists for $30.00 and includes **Temple of Apshai**, **Curse of Ra** and **Upper Reaches of Apshai**.

Epyx's **Rogue** has been a popular game at colleges for years. The goal is to find your way through a maze of ever-changing dungeons and magical places, recover the Amulet of Yendor and return to level 1. Of course, spending time in the underground world sounds a lot easier than it really is. Available now for $34.95.

Winter Games, enjoyed on a host of systems, now comes to the ST. Seven true-to-life sporting events, from bobsledding and ski jumping to figure skating, challenge the user. The Biathlon and four other events are included, and skill and stamina are required to succeed. An opening ceremony complete with national anthems greets up to eight players. **Winter Games**, available now, sells for $34.95.

Epyx's *Winter Games*.

World Games is a continuation of Epyx's "Game" series. In this one, eight events allow you to compete with up to eight other players. Cliff diving, sumo wrestling, barrel jumping, bull riding, weight lifting, giant slalom, pole vaulting, and hop, skip and jumping should keep you busy for quite some time. **World Games** will be available in the third quarter for $34.95.

Infocom announced three new interactive fiction titles for the ST this time around. **Leather Goddesses of Phobos**, by veteran author Steve Meretzky, is Infocom's first entry in the comedy category.

This product, geared for the standard-level player, combines comedy and sex, and takes the genre to new heights (or depths, depending on how you look at it). Three different playing modes are provided—Tame, Suggestive or Lewd—corresponding to P, PG and R movie ratings.

The saga begins in 1936 in Upper Sandusky, Ohio, where you've been boozing it up at a sleazy bar (Lewd)—or where you're enjoying an evening with your friends in a local lounge (Tame). You get the idea, right? Anyway, you're kidnapped by space creatures and carried to the Martian moon Phobos. There you learn that the Leather Goddesses are planning to turn Earth into their private sexual playground (L)—ahem, use Earth for their own indiscreet purposes (T).

Your goal is to get what you need in order to build a special Anti-Leather Goddesses Machine. Included with the program are a 3-D comic book, an intimate map of the catacombs and a sensuous scratch 'n' sniff card. All this fun, and the three different naughtiness levels, can be had for $39.95 this fall.

Another new Infocom ST title is **Trinity**, written by Brian Moriarty. A cross between the "Twilight Zone" and *Alice in Wonderland*, **Trinity** leads you to an alternate universe, where magic and physics coexist—and every atomic explosion that's ever occurred is inexplicably connected.

The story's chilling climax takes place in the New Mexico desert on July 16, 1945, where you'll arrive minutes before the most fateful experiment of all time: the world's first atomic explosion, code-named **Trinity**.

This is the first Infocom story to recreate actual locations and events. It begins in London; you're a tourist on a budget vacation. Where it ends is up to you. To ensure accuracy, Moriarty conducted extensive research, visiting Los Alamos National Laboratory and the Trinity site.

To get you started, the package includes a copy of *The Illustrated Story of the Atomic Bomb*, in the famous Classic Comics style. **Trinity** will be retailing for $39.95 by the time this issue's out.

The third title announced was **Moonmist**, by Stu Galley and Jim Lawrence. This introductory-level game has a Gothic setting. Each of the four variations has its own puzzles, treasures, hiding places and solution. As a result, **Moonmist** has more replay value than any other Infocom title to date.

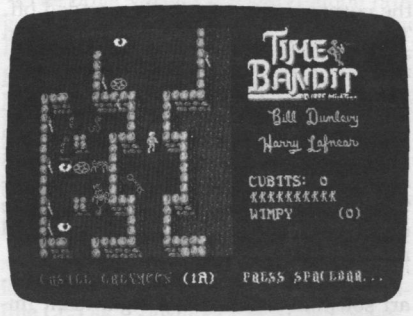
You play a famous young sleuth ready for adventure. A friend declares, "I know it sounds dramatic, but I think someone is trying to kill me," and you dash into action. Arriving at Tresyllian Castle, you're about to be in a treasure hunt, meet eccentric characters (including a ghost or two), and otherwise be put upon to solve the mystery. **Moonmist** will sell for $39.95 this fall.

Metacomco, the systems software house specializing in the 68000-based computers, announced a couple of new products for the ST.

No details were forthcoming, but it was learned that Metacomco's redoing Atari ST BASIC. The improved implementation will be out in the third quarter of 1986.

The company also announced **MCC Pascal** for the ST. This is an ISO Pascal compiler with a screen editor, linker, libraries and user manual. This version conforms to the ISO 7185 international standard Pascal. A company spokesperson told me that, compared to OSS's Personal Pascal, **MCC Pascal** has a faster compiler, slower linker and produces code that's almost identical.

MichTron was showing many existing products in their stall at the Atari booth. One of the most popular programs there was **Time Bandit**.



Time Bandit from MichTron.

Written by Bill Dunlevy and Harry Lafner, **Time Bandit** is billed as the most detailed video game ever designed for a home computer. And it's not hype—anyone who's seen, played or been within 10 feet of the screen when the program's running can attest to that.

In it, you're the **Time Bandit**, an animated adventurer travelling through time and space in search of treasure. From a land called Timegates, you can choose to enter one of sixteen portals, each leading to a different "land" and a distinct time period. The future, ancient Egypt, deep space and the old West await your visit.

Once in, you must fight off the Evil Guardians—and search for scrolls, books, computer consoles, or even people. Within the arcade action of the game there are three graphics-activated text adventures. To get out of the current land, you must find the key to the lock blocking your exit. This is one exciting game.

There's much more to it, but suffice it to say that **Time Bandit** demonstrates the power, speed and graphic beauty of the Atari ST. The program's written entirely in machine language and consumes 350K of memory. You can buy it now, for $39.95.

Another major title shown by Gordon Monnier, president of MichTron, was **Cornerman**, a **Sidekick**-like multiple desk accessory. It can be purchased now for $49.95 and gives you no less than ten functions, all under one accessory name.

Here's what you get: a complete ASCII

(continued on page 78)

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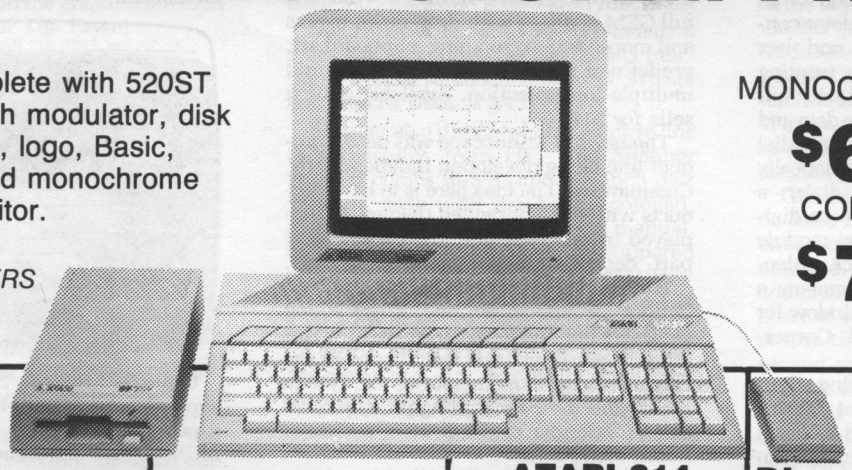

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reference table, with decimal, hexadecimal, character and mnemonic information for all 256 ASCII codes; a 16-digit calculator containing binary, octal, decimal and hex modes, three summing memories, printing tape display and more; a notepad with full editing, word wrap and automatic date and time stamp; a phone dialer with autodial capability; a phone log which automatically transfers information from the dialer; a fifteen-puzzle game; two clocks (one digital, one analog); a complete setup module to customize dialer, RS-232, clock, calculator and window position parameters; a print utility; and (gasp) a DOS window for use with MichTron's **DOS Shell**. **Cornerman** is one *big* bargain.

Microprose was demonstrating their nearly complete version of **Silent Service** for the ST. Here, you command a World War II submarine in the depths of the Pacific—and must sink enemy ships without being destroyed. Written by **F-15 Strike Eagle** author Sid Meier, the game will ship almost immediately.

The most notable difference between the ST and previous 8-bit versions lies in the graphics. Far more detail is evident in the ST program. For example, only four ship sizes could be seen through the periscope of an 8-bit, whereas there are now 128 different ship sizes. This adds greatly to the realism of the game.

Another major difference: the game has been entirely reconfigured, to be played via mouse icons. Periscope, throttle, game speed, zoom, etc., are now controlled by pointing and clicking.

In addition, varied screens appear in response to moving Captain Bob. The damage screen shows problems separately, as the instrument screen shows a set of analog gauges.

The third big change in the ST **Silent Service** is that the game's been made more historically accurate, wherever possible. More authentic convoy routes, behavior of the Japanese and additional Japanese warships have been added. Now you can run into Japanese convoys that are fast, dangerous and make for juicy targets.

Three different games are provided: training, convoy with heavy cruisers and carriers, and war patrol. The most challenging is war patrol, where you try to sink as much tonnage as you can before you: run out of ammunition, are too damaged to continue, or are sunk.

Silent Service for the ST is scheduled for the end of June at $39.95. Like all Microprose products, it's well conceived, well implemented and fun to play.

One of the more impressive software products of the show was Migraph's **Easy Draw**. Billed as a professional ST drawing program, it's object-oriented, allowing you to create custom business graphics, presentation materials, multi-dimensional illustrations and line drawings.

The program offers many features to make drawing easy—multiple windows, full GEM interface with drop-down menus and mouse action, zooming, clipboard art, predefined patterns, object rotation, and multiple font selection. Available now, it sells for $149.95.

The news at Mindscape was an ST product line being developed independently, **Cinemaware**. The idea here is to have products with movie-oriented themes. All are played in real time and are, for the most part, decision-making games of strategy.

For example, **King of Chicago** finds Al Capone in jail; you're one of the young gangsters fighting to take over the city. Another title, **Sinbad and the Throne of the Falcons**, brings up memories of Tyrone Power and the Arabian Nights. The third title is **Defender of the Crown**, a kind of Robin Hood tale.

The initial ST title, scheduled for release this fall, is **SDI** (**Strategic Defense Initiative**). This science fiction adventure puts a young, beautiful Russian cosmonaut and a handsome American scientist in the midst of global war. It's billed as a story and flight simulator in one package. At least twenty-seven screens will accompany the story line, requiring two disks for the entire game.

Each product in the series will have at least 700K (really over a megabyte, due to the company's proprietary data compression technique). All the graphic adventures are mouse driven, with several action sequences—a sky battle, jousting, a sword fight with skeletons—controlled interactively by you.

These arcade sequences require a certain amount of expertise for completion. Moreover, the games are nonlinear in nature; you can find yourself in any part of the story.

The designers of **Cinemaware** are striving for interactive movies. The games combine arcade action, the depth and interest of text adventure and the appeal of graphics and sound (all will feature original music scores). From the sample screens I saw, they all look like hits.

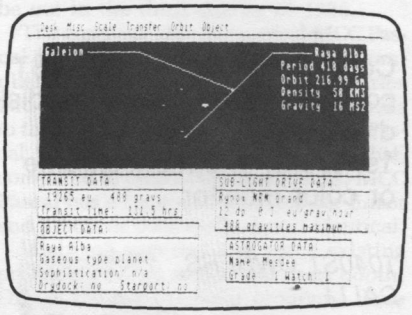
All four will be available by the end of the year.

Omnitrend Software demonstrated **Universe II** in Atari's section. This is a science fiction role-playing game for one, in which you're an undercover agent for the Federated Worlds Special Forces.

While operating a merchant vessel, you're called to perform covert missions within the United Democratic Planets—still earning a living, organizing a crew, upgrading your equipment from the 98 available parts, and exploring planets firsthand, to solve object-oriented puzzles.

As the game progresses, the long-range goal is gradually revealed; it's something about an ancient alien artifact, known only as the hyperspace booster.

Omnitrend's **Universe II** is selling now for $69.95.



Universe II from Omnitrend.

Optimized Systems Software (OSS), long supporters of Atari 8-bit computers (with products like Action!, BASIC/XL and BASIC/XE), also had a booth within the Atari area. The ever-congenial Bill Wilkinson demonstrated their first ST product: **Personal Pascal**.

The programming language runs under GEM and contains drop-down menus for editing, linking and compiling. Of course, the mouse makes creation all the more simple.

OSS decided to create their own GEM AES and VDI calls in this version of Pascal. The program editor uses a text-based design, with cut and paste capability, and help screens similar to those of the Action! editor. Automatic file backup, automatic indenting, English language error messages and debug tracing are included.

Personal Pascal retails for $75.00 and has been shipping for a few months. The language is disk-based and comes with an almost 300-page manual. OSS plans to support the Atari ST, as it has the 8-bits.

One of the most exciting software programs at this year's CES was **The Pawn** from Rainbird, a British publisher. It had been available for almost two months and was demonstrated by Anita Sinclair, one of the authors.

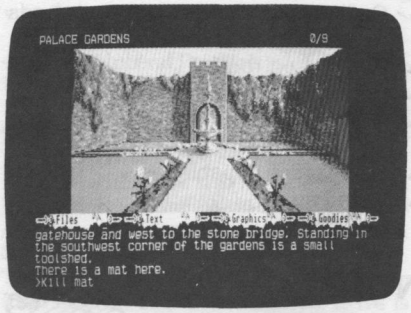
The Pawn is an ST graphic text adventure startling in both its sophistication and implementation. If you've gotten used to parsers in text adventures from Infocom and others, you'll be amazed at the level of this one.

One attractive feature of the game is that its pull-down menus, in the shape of scrolls, are used to issue commands. Another remarkable feature of **The Pawn**: when you pull down on one of these scrolls at the top of the screen, you bring a low-resolution color picture over your medium-resolution text. The pictures, by a noted British artist, are excellent.

The entire adventure is written in machine code, rather than C or Pascal, so it runs a lot faster than others you're used to. **The Pawn**, at $45.00, can be purchased now.

I was privy to a glance at **The Pawn**'s se-

quel, **Guild of Thieves**. Though sworn to secrecy, I *can* tell you the graphics are even better than those of **The Pawn**!



Sophisticated — *The Pawn* from Britain's Rainbird.

Another product shown by Rainbird was **Starglider**. It's an all-action, air-to-air and air-to-ground combat flight simulator that uses fast-moving, 3-D vector graphics. Extensive development went into the smooth vector graphics, to create the experience of low-level flight.

Pilot of the sole surviving ground attack vehicle left to oppose invaders from the planet Novenia, you have defense, attack and maneuver capabilities. But you must plot strategy while flying, refueling in flight and entering rotating missile depots. Your mission: destroy the alien's powerful flagship, *Starglider*. The game will be available in the third quarter, at $44.95.

Shanner displayed a variety of products in their booth. Recently recovered from the mess with VIP, Shanner's ready to move ahead—with software, hardware and accessories—according to James Copland.

At CES was their **full-color, GEM-based word processor**, which allows four documents to be edited simultaneously. Priced at $79.95, it will be available by the time this issue hits the stands.

Shanner also showed the **LogiKhron Clock Card**, acquired from Soft Logik. The manual's been rewritten and the cartridge modified, to allow access to the internal battery. See the review on page 55ST. It's currently retailing for $49.00.

ST-Key is a $20.00 macro key program for the ST. It lets you assign up to twenty macro functions to the ST's ten function keys. This program is said to work in conjunction with any other ST program.

Sound Wave One is a single-track, seven-octave ST MIDI sequencer. On the shelves now, it lists for $50.00.

Sound Wave Eight, an eight-track "professional" MIDI sequencer, will accept and control up to sixteen synthesizers. It's supposed to duplicate the functions of a professional recording studio, at $180.00.

Shanner has recently acquired two products from Blue Moon Software, **Macro Manager** and **Macro Desk**. The first is a **Sidekick**-style program, with a scientific calculator, alarm clock/calendar, event log and card file. In addition, it has project time recording and scheduling functions.

Macro Desk is not as feature-laden; it gives you everything but the project functions. **Macro Manager** retails for $70.00, and **Macro Desk** is $40.00.

Shanner also displayed the complete line of accessories from ITC. The **Shanner Planner** comes in 3½- and 5¼-inch disk versions, each with space for a notepad, disks, pen, calculator, software manual, business cards and ruler. The zippered portfolio comes gift boxed, for $39.95.

On the hardware side, Shanner displayed the **SD-2000**, a $429.00 dual disk drive for the ST. It has two double-sided, double-density drives in one fairly small enclosure, and a beefed-up power supply accompanies the unit.

Sierra On-Line brought their new ST chess game, **Kemplin Chess** (Kempelen is thought to be the father of game-playing machines).

This soon-to-be-released, $34.95 program is said to be one of the most powerful chess games on any microcomputer. Besides being a phenomenal chess game, it takes advantage of the ST's unique features. The board can be rotated or tilted, in order to be seen from another perspective (including 3-D), and colors can be set to your preference.

Sierra On-Line also showed the first in their business product series. Called **ST OneWrite**, its main target is the small businesses—storefronts and single doctor's or lawyer's offices.

Most accounting programs for computers expect the user to do General Motors' accounting on a micro. **ST OneWrite** goes the other way.

It follows the pegboard binder metaphor of the cash disbursement accounting module, but goes a step further—it replaces the traditional manual system with the ST's power and graphics. Once a check's written, the information is kept for future use. Whenever another check's made out to the same payee, all you have to enter is its amount.

Checks can be printed on a dot-matrix or daisy-wheel printer, with notes on the stub. Your cash account is automatically credited, so you need only specify the account to debit. If you're unsure of your chart of accounts, pull it up in a window at any time. Expenses can be split over several accounts, if need be.

Once the account is specified and RETURN is pressed, the program will cross check numbers entered. Then the bank balance is automatically adjusted and the transaction posted to all necessary accounts. It's also posted separately into a vendor record—to keep track of how much business is done with individual vendors. Finally, all numbers are entered on the balance sheet and income statements.

Basically, the drudgery (in which errors often occur) is eliminated by this system. Especially useful: the income statement is accurate right up to the last check written.

ST OneWrite is a three-module system: cash disbursements, receivables and general ledger. Suggested retail for each module is $130.00. Sierra's currently working on a payroll system, although no firm shipping date has been announced.

This is the first major small-business software I've seen. As this program and others like it become available, the Atari ST can fulfill its potential—as the powerful computer for "most of us."

File Edit Options Reports Month Year Practice

General Journal

Journal #: 1 Month: March Out of Balance by: 348.72

	DATE	DESCRIPTION	ACCNT	TITLE	DEBIT	CREDIT
1	3/1/86	Depreciation Entry	570	Depreciation	3540.44	
2			170	Accum. Depr. - Furn.		3540.44
3						
4	3/2/86	Acquired Truck	160	Furniture & Equipmen	11500.00	
5			100	Cash in Bank - Check		1500.00
6			260	Note Payable - Bank		10000.00
7						
8	3/10/86	Purchase 500 shares	300	Capital Stock	7500.00	
9			100	Cash in Bank - Check		7500.00
10						
11	3/15/86	Deposit on Building	180	Deposits	1000.00	
12			100	Cash in Bank - Check		1000.00
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14	3/18/86	Misc Office Supplies	670	Office Supplies	348.72	
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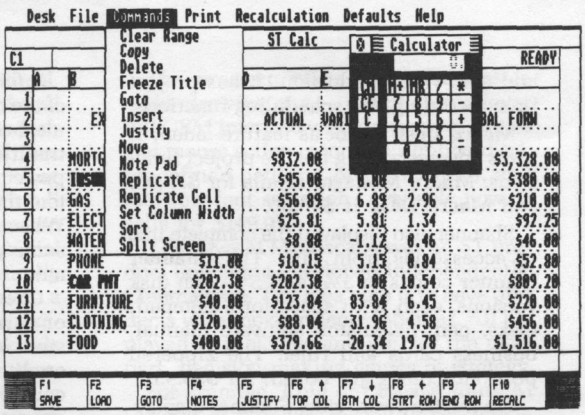

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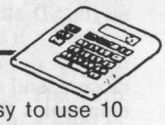

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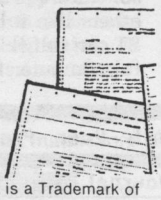

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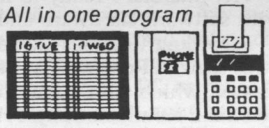

The best part is that HelpMate stays "hidden" in memory until needed, and then can be called up for use, even while another program is running. The pull down menus can be used with most ST programs or by themselves.

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CIRCLE #135 ON READER SERVICE CARD

CES Scene *continued*

Sublogic had hoped the **ST Flight Simulator** would be out in April. At the June CES, though, I was curtly told it would be available *real soon*. Those of you holding your breath for it may now exhale.

Supra Corporation (formerly MPP, Microbits Peripheral Products) showed a **3½-inch, 20-megabyte hard disk** for the ST. Actually, they weren't showing it, but had provided other companies with demo units for CES. What better way to advertise?

Anyway, the disk will retail for $799.00, by the end of June. A 10-megabyte hard disk is sold directly from the factory at $549.00 (reduced from its earlier price). The 20-megabyte drive will be available from dealers, and a 60-megabyte drive is in the prototype stage. All Supra ST hard disks connect to the DMA port and come with a boot program.

Unison World, makers of **PrintMaster**, exhibited **The Newsletter Program** on an IBM PC. It should be available for the ST by the end of the year.

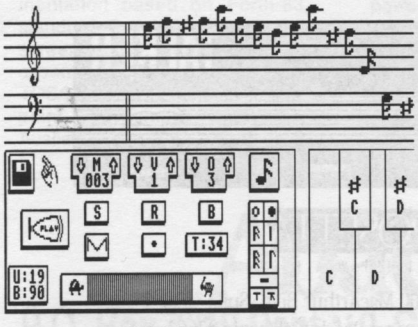
It will let you mix text and graphics on the same page, in a newsletter format. Fonts can be changed dynamically anywhere on the page, and multiple column printout is supported.

The Newsletter Program works with the QSL laser printer, as well as dot-matrix printers. Price will be under $100.00 (or, more likely, closer to $50.00).

XLent Software had several ST products out. **Rubber Stamp ST** is a combination of several graphic utilities, to let you create custom printouts for labels, index cards, logos and letterheads.

You can use graphics from **NEO-Chrome** and **DEGAS**, or create your own within the program. Complete control adds text, shrinks, rotates, copies sections, inverts and otherwise manipulates images. **Rubber Stamp ST** can also use custom character sets designed with the **DEGAS** font editor. The program, available now, sells for $39.95.

Another new XLent program is **Megafont ST**. This, too, is a port of an existing 8-bit program. With it, graphic files from **DEGAS**, **NEO-Chrome**, **Rubber Stamp** and others can be printed, in a variety of sizes. In addition, **1stWord**, ASCII and program files can be printed in varied character styles, including those used by the **DEGAS** font editor. The program supports a number of printers and will be going for $39.95 by the time you read this.



ST Music Box.

ST Music Box is a MIDI package to let you compose for a MIDI keyboard or the ST console speaker. Compositions can be entered via mouse or keyboard, and a range of editing features (insert, delete, key signature and many more) are provided. The **ST Music Box** should be selling for $49.95 at this issue's release.

The End.

The amount of software now available for the Atari ST is simply amazing, all the more incredible when you realize the ST appeared thirteen short months ago now. There was still more from others like Hippopotamus, but we just couldn't include it all.

To all skeptics out there (publishers, dealers and users): the ST is real; ST software is real; and I personally welcome back a healthy computer industry.

As Dorothy said, clicking her heels, three times, "There's no place like home, there's no place like home, there's no place like home" For an ST user, the 1986 Summer CES was a hell of a show.

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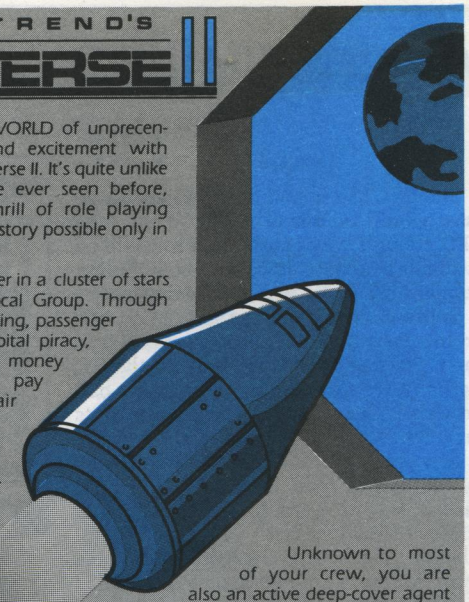

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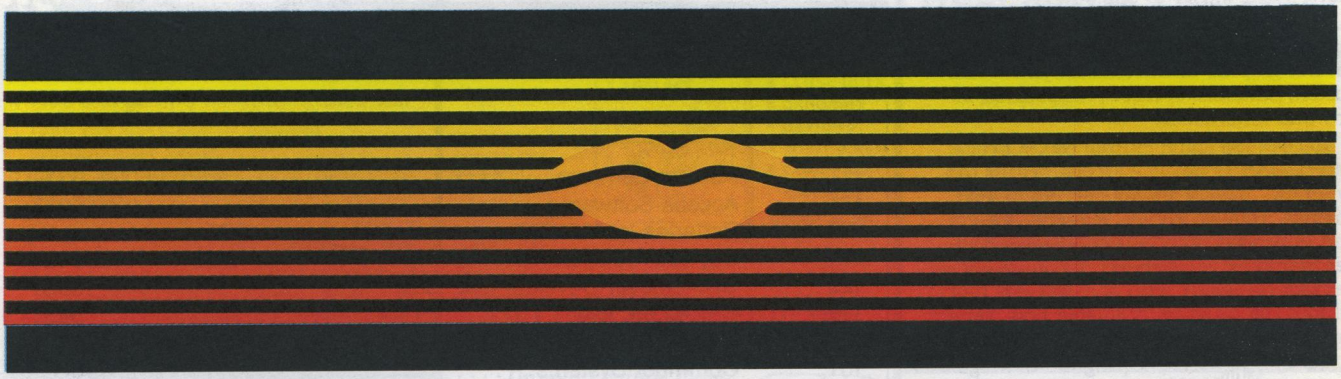

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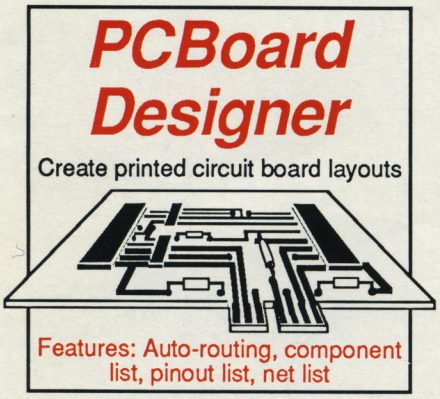

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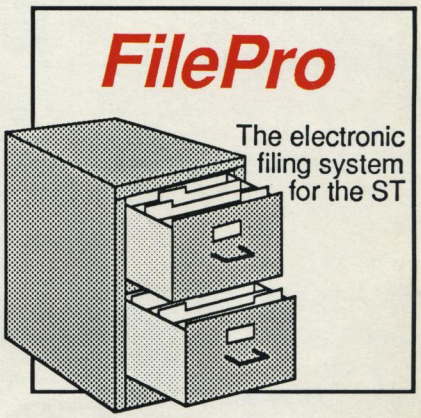

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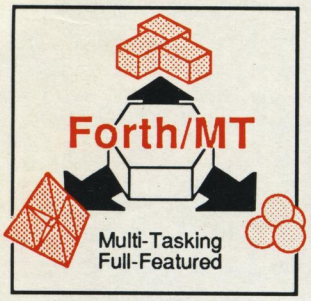

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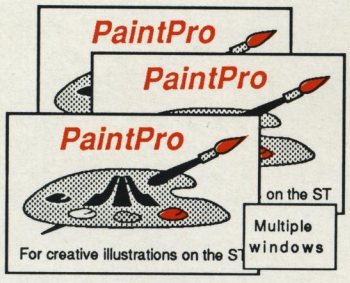

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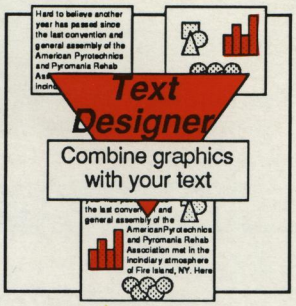

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1. All entries must be original creations and cannot be submitted, or be under consideration, anywhere else. This includes any other contests or competitions currently underway.

2. Feel free to submit as many entries as you like, as often as you like. The deadline for submissions to the contest is December 31, 1986. All entries must be in by that date to qualify for the contest judging (however, programs received after this date will be considered for regular **ST-Log** publication).

There is no limit to what types of programs we are looking for. Business or educational, graphics oriented or musically inclined, we want to see them all.

3. The entries can be in any programming language of your choice, on 3½-inch single- or double-sided disk, with both run-time and source code. It's quality that counts, not format. If your program is in a compiled language, the compiled object or run-time code must be a free-standing program—one which can be run by someone without a copy of that language. This rule does not apply to programs written in ST BASIC and Logo, which come with the ST. Also, we need to be able to distribute the program legally, without licensing fees or obligation to the language's maker. Contact the manufacturer to find out if the language you're using has distribution requirements.

4. Please make sure that all entries have accompanying documentation, and that all written materials pertaining to the entries (including articles) are submitted as standard double-spaced typewritten manuscript. Please try to make the text as informative as possible, as it pertains to the usage of the program. This accompanying piece could be in the vein of a "making of" the entry, and could include some of your personal programming hints, etc.

5. Any submissions that do not qualify for prizes will be returned only if you supply us with a stamped, self-addressed envelope or mailer. Please do not send originals of your program—make sure you keep a copy for your own use.

6. Contest judging will be done by the staff of **ST-Log**. The decision of the judges in all contest categories will be final. Contest winners will be announced in **ST-Log** during the first quarter of 1987.

7. This contest is void where prohibited by law. Full-time employees of ANALOG 400/800 Magazine Corp. are ineligible for this contest.

8. Send your entries to: **ST-Log**, c/o ANALOG 400/800 Magazine Corp., P.O. Box 23, Worcester, MA 01603.

Good luck!

THE ATARI ST OPERATOR'S MAGAZINE
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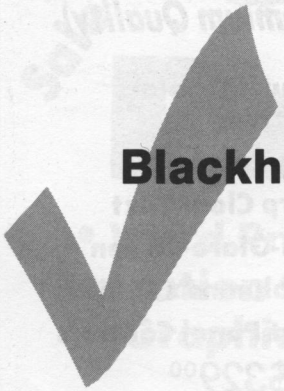

Blackhawk

by Andy Eddy

I've always rooted for small, independent software producers to overcome their size handicaps and become successful in a volatile marketplace. With so much to lose, should a product not meet the public's approval, the ones out there who try should be commended for their unseen battle.

Orion Software is one such company. They've introduced their first product, **Blackhawk**. I had hoped for a bigger thrill, but it seems they have a bit of work ahead of them before challenging the major software manufacturers.

Your main plan, as the mission leader in **Blackhawk**, is to guide your helicopter deep behind enemy lines, to rescue the forty hostages held captive there (reminiscent of the bestselling **Choplifter**) and bring them back to the safety of your aircraft carrier. This takes you and your chopper through the rocket-infested jungle lands of your hostile opponent—the computer.

Along the way to the American Embassy (now in enemy control and where the captives are being held) you can opt to destroy the many oil tanks, buildings and battle tanks that your limited arsenal can obliterate. This weapon cache consists of air-to-ground rockets (for blasting the above-mentioned land-based targets) and automatic cannons, which come in handy when battling the occasional enemy helicopter straying into your path.

The updated "status window" at the top of the screen will constantly keep you abreast of supplies remaining, as well as vital information about fuel quantity, altitude and range to the embassy.

Excessive rocket strikes on your ship will lower the crew total, and, should the crew's number reach zero, your helicopter will crash. You must also exceed a minimum altitude over the terrain—or risk a crash that will bring a quick end to the scenario.

Unfortunately, there are a few things that prevent you from enjoying this game to the fullest. While it's Orion's intention to provide inexpensive programs to Atari users (and indeed they've succeeded at *that* task) it appears that **Blackhawk** lacks the necessary polish to make it an exciting battle.

It's a mixed blessing that the game can be controlled through the use of two joysticks. Without the ability to hold both of them comfortably, there are problems. While functions handled by the second stick are still keyboard controllable, it reminds me of my experiences with the arcade game **Defender**; there were simply too many buttons to keep track of.

My main complaint with games of this type accompanies their increases in difficulty. Consideration has to be made for differences in player ability, and, unfortunately, most programmers make the game more intense just by increasing speed of play or the mileage you must cover. Without the incorporation of fresh challenges into the contest, play quickly becomes run-of-the-mill.

Blackhawk is a promising start for this freshman company, and I'd hate to see their talents go for naught in the eyes of wary consumers. No one wants to spend money on a lackluster product, so when someone comes along offering performance and a good price to boot, they can expect to go through greater-than-normal scrutiny.

Blackhawk, with its somewhat blocky artwork and hardly innovative theme, is a mediocre introduction—but, at $15.00, it shines a little more than it normally would. Computers and software have come a long way in the last few years, and we've come to expect a great deal from the industry. Let's hope Orion tightens things up for the next go-round. We'll see if they can live up to the promise they show. A

*Andy Eddy works as a cable TV technician in Connecticut, but has been interested in computers since high school. While his family's Atari 800 is three years old, he's been avidly playing arcade games since **Space Invaders** and is a former record holder on **Battlezone**.*

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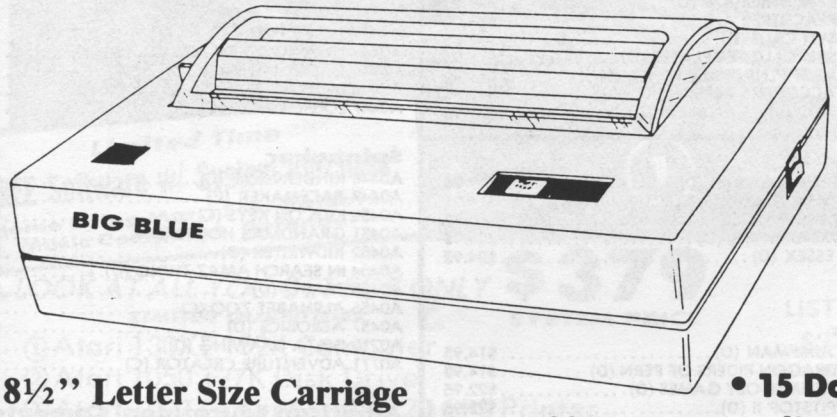

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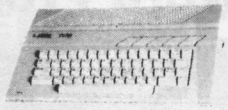

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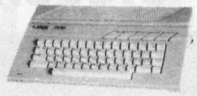

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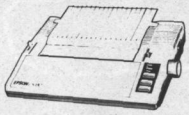

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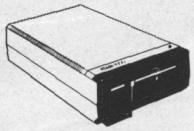

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CIRCLE #134 ON READER SERVICE CARD

Panak strikes!

Reviews of the latest software

by Steve Panak

We've hit it again, loyal readers: the midsummer drought. Software seems to evaporate, and the few new games which appear do so like small islands on the horizon, viewed by the sailor lost at sea—optimistic mirages. My frenzied mind, groping for *anything* to play, seems to seize upon and enjoy what hindsight tells me are the worst games I've ever seen.

Fortunately, such is not the case this month, for I'm just entering the drought. Its most acrid fruits will reach these pages in early autumn. To help you get through those dreaded days, I've selected these games for your perusal. Enjoy.

Fooblitzky

by Michael Berlyn
INFOCOM, INC.
125 CambridgePark Drive
Cambridge, MA 02140
48K Disk $39.95

This new program proves that success belongs to those who take chances. Let me explain.

Most companies, when they have a good thing going (are selling at least enough to nudge themselves into the black), tend to become complacent. They stick to their tried and true formula. They may change some minor variable ever so slightly, but are otherwise stagnant.

For the past few years, Infocom has been following this pattern, issuing a chain of top-notch text adventures consistently among the best I review in these pages. That's stagnation I can live with.

But the geniuses who have given us such classics as **Zork** and **Deadline** have apparently, and surprisingly, diverged from their usual course. They've released a product which might very well be the most talked-about game this year. . . **Fooblitzky**.

Having skillfully accomplished the remarkable task of merging computer and novel, they've taken on a possibly greater challenge—fusing board game and computer. Gaming may never be the same.

A strange mixture of games like Clue, Mastermind, and Trouble (as well as a number whose names I no longer remember), **Fooblitzky** will supply board game fans with hours of pleasure. The concept is simple: up to four players each secretly select one of eighteen items; the object of the game is to deduce the four selected items (if less than four play, the computer selects the remainder).

The items are available in and around various shops in the town of **Fooblitzky**. You move about the board (displayed on a highly detailed screen), using up your available moves and foobles (money).

You might have to buy something, or work to earn more cash. You might call a store to see what it has, or bump into another player and pick up his dropped items. Since you can only carry four items at once, you might want to hide something in your locker, or sell it, or give it away. And, if you're not careful in the crosswalk, you'll land in the hospital. I could go on and on.

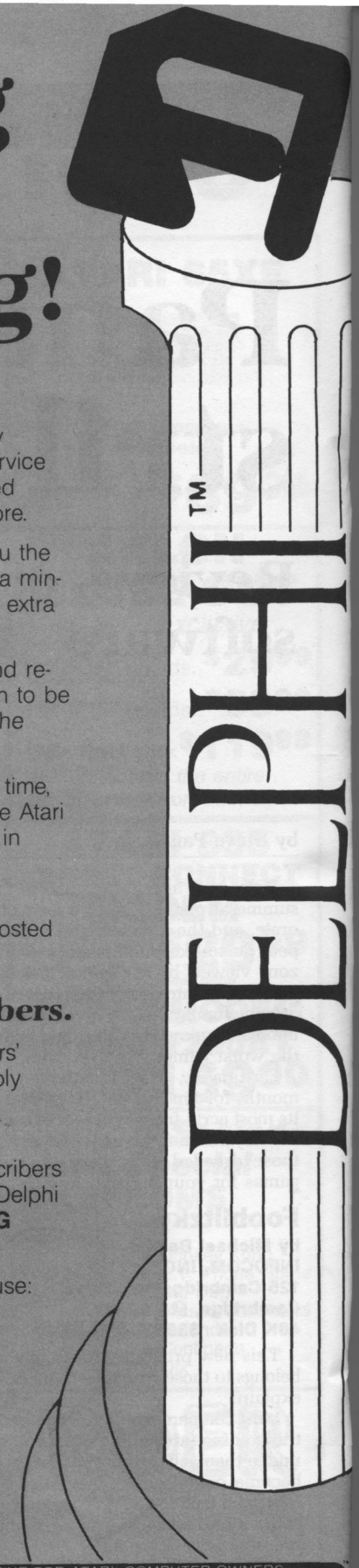
All moves and choices are made with one joystick, which must be passed around. After setting up the game and choosing the items, play progresses just as in any other board game. Each player, in turn, spins the wheel of fortune, moves a few squares, then performs some action.

The game is easy to learn and even easier to play. But, like all Infocom games, it requires you to think. When you believe you've deduced the four items, take them to a checkpoint. If you're right, you're the winner. And if not, you'll be told how many *are* right (although not *which* are right). Using these clues, as well as careful observations of the other players' actions, you'll soon have the four items.

The package continues Infocom's tradition of superb documentation and game paraphernalia. The game is completely explained in a rules and regulations manual, supplemented by a "bare essentials" pamphlet, which lets you get right into the game. Both are well written and easy to understand.

To support the game, there are large

ANALOG Computing on Delphi... more of a good thing!



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But now, Delphi offers the Atari Users' Group, operated by the same people who bring you the #1 Atari magazine, **ANALOG Computing**. You can access Delphi for as little as 10 cents a minute from most cities in the U.S. There are no additional telephone charges, and there's no extra charge for access at 1200 or 2400 bps.

On Delphi, we'll give you a variety of services, including a Forum, where you can send and receive messages from Atari users worldwide. The Atari database consists of hundreds (soon to be thousands) of programs you can easily download and use right away. . .even those from the pages of **ANALOG Computing**. You can also upload your own programs for others.

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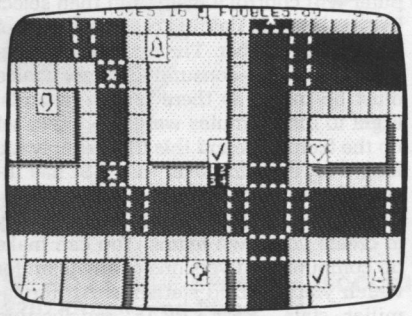
plastic-coated worksheets and magic markers, to keep track of everything which occurs along your journeys. The worksheets are continuously used and erased, and exist perpetually.

This being Infocom's first foray into graphics, you might very well ask how they were. I might very well answer, "Great." The various caricatures were whimsically drawn and entertaining. The board is nicely detailed and scrolls smoothly among the four gaming quadrants. The only problem lies in the disk loads necessary to display them, which slowed play somewhat.



Fooblitzky.

Another problem was in design. Often, when you're stuck in the hospital, or working in the restaurant—with no desire to spin—you must spin anyway. This, too, slows play down. But we're nitpicking. Your biggest problem will be getting three other players to join you in the quest.

Fooblitzky does for board games what the other Infocom works did for books—revolutionize them . . .computerize them . . .and bring them into the 21st century—and beyond. Like all great games, it's a merger of chance, luck and skill, which will perplex and entertain you for hours. If you like board games, and the comradery that accompanies them, then **Fooblitzky** is for you.

Racing Destruction Set

ELECTRONIC ARTS
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Once upon a time, there was a company whose games you could count on as being consistently worthwhile. Then they forsook Atari, to develop software for the wondrous Amiga.

However, now that the Amiga's floundering, the company has come back to publishing software for the Atari machines. Unfortunately, if this new game is the best they can do, Commodore can have them.

Racing Destruction Set (**RDS**) is the newest Electronic Arts game. In the past, they've blessed us with such classics as **One on One** and **Pinball Construction Set**. However, those consumers who will buy EA's games sight unseen are surely going to curse this one.

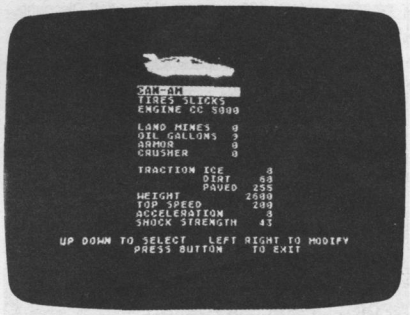
While **RDS** may not be the most abysmal thing I've ever seen, it wins hands down for being the most disappointing. This is both because of the company it came from and because of its failure to live up to the promise implicitly made.

The concept is exciting and immediately grabbed my interest. I really looked forward to trying this game. But, unlike **Pinball Construction Set**, the quality is just not there.

As you might expect from the title, the program allows you to design racing tracks, then race on them. Again expectedly, you can race against the computer, or against a human opponent.

Unexpectedly, you can choose from a number of cars, as well as motorcycles, dune buggies, jeeps and even lunar rovers. Further, **RDS** lets you vary the tires and engines, and add a number of specialized features for the destruction mode, including armor and land mines. The variety I like to see in software is certainly available here.

Alas, there seems to be a little too much for the program and computer to handle—the graphics suffer. To say the graphics were atrocious would be a compliment. The lack of control is frustrating. Although a standard joystick control pattern is used (right/left to turn, forward to accelerate, back to brake) and is thus learned quickly, even with a lot of practice it's not likely that you'll ever be satisfied with your performance.



Racing Destruction Set.

Setting up tracks is fun and simple. Using the joystick, you select and move preshaped segments, placing one against the other, building your dream track.

Unfortunately, for the reasons I've mentioned in the foregoing paragraphs, racing on it is a nightmare. I hesitate to tell you much more, for fear you'll be tricked into actually buying the **RDS**. The track editor is powerful, and, if you could satisfactorily race on **RDS**, the game would be a must. But you can't, and it isn't.

As a result of these problems, the **Racing Destruction Set**'s not going to be played much. But relax, there are other uses; personally, I'm always in need of blank disks.

Monday Morning Manager

TK COMPUTER PRODUCTS
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Computer Baseball

by Charles Merrow and Jack T. Avery
SSI
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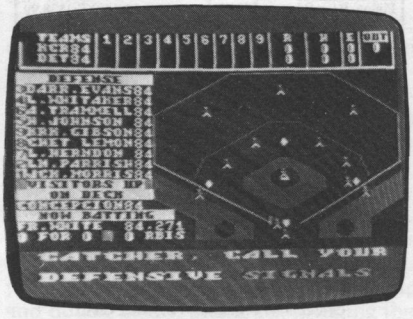
With baseball season just about over, I thought it might be a good time to appease the baseball fanatics out there, who are currently buckling down to prepare for withdrawal. My heart goes out to you poor, demented souls. So, in an uncharacteristic act of mercy, I've taken a look at a couple of simulations, which should tide you over until next April.

Of the two games reviewed here, **Monday Morning Manager** (**MMM**) was the cheapest looking. But, though its looks imply a low standard, hidden inside the simple plastic portfolio is an adequate simulation.

After booting the disk, you choose your teams and decide whether or not the computer will manage. All choices are made with the joystick. The version I tested, last year's, had thirty-six teams on the game disk. It offered the chance to order, by mail, any additional teams from 1901 to the present. The 1986 version contains sixty-four teams from 1905 to 1985.

Next, you set batting order and fielding positions, and select the starting pitcher. Since the players may only take certain positions, you can encounter problems if you run out of eligible players. You'll have to start over when you fall into this trap. This slight problem aside, setup is speedy. You can have teams on the field within three to four minutes after booting up.

A message area at the bottom of the screen displays a commentary on action on the field. Other readouts provide stats on the batter, batter on deck and team lineup. To the right is a graphic representation of the field, which shows plays dynamically, as they occur. Both games tested had



Monday Morning Manager.

this feature, to differing extents. A prompt requests you to input your strategy.

The offensive player has four choices: hit, bunt, pinch hit and run, or steal. The defensive player's choices are: pitch, walk, attempt a base runner pickoff, or to go to the bullpen.

In addition, after a hit, the offense may choose to tag up and run, while the defense chooses where to throw the ball. The joystick input method allows players to lean back and enjoy the game, although it also tends to limit the available options.

With the computer controlling both teams, it takes about eight minutes to complete a game. Once done, you may save the game stats for later use, storing them on disk. These stats may also be viewed. What's more, they can be sorted (as to top ten in various categories) and printed. You can also print team rosters. Other specialties of **MMM** allow you to trade players and draft free agents.

The manual for **MMM** was truly a bargain job—four pages printed on a dot-matrix printer. Fortunately, although it's not overly attractive, it does explain the game thoroughly. The reference cards—useful to remind you of the commands until you master the program—are equally spartan, but, again, they do the job.

So as I see it, **Monday Morning Manager** is the minor leaguer of these games. Even though it offers the fan the most use of his printer to document his own league,

Computer Baseball.

and even though the joystick control allowed the easier play, I can't recommend it highly.

Since SSI is tops in the field of simulation software, I expected their **Computer Baseball** would be the closest to the real thing possible inside a scant 48K. And it was. Like many SSI games, you'll need a BASIC cartridge for this one. What you'll also need is a lot of spare time. . . because, like the real thing, this game drags on endlessly.

Once again, you start out by picking the teams to play, and whether or not the computer will control a team. You then select batting line-up, fielding positions and, of course, the pitcher. The method of selection is very time-consuming. Every choice must be input, as there are no defaults. Eight to nine minutes were needed to set up the teams. I found this to be simply too long. However, to offset this, SSI has included a number of unique features.

Probably the best feature is the ability to create your own teams. You can make up computerized versions of any team for which you can find statistics. All the familiar stats—RBIs, ERAs and batting averages—are used, so there should be little problem computerizing your favorite major league team, or any minor and little leagues you come across. Again, the time problem appears. It takes quite a while to create a single player, much less a team, so you've got to be really committed to use this feature.

Two stiff cards remind you of the sixteen defensive and ten offensive options. These are as varied as how tightly you hold the runners on base, how the infield and outfield play and, of course, pitching options. Each choice is made with a two-letter code selected via the keyboard. It takes about thirty minutes to play a game. Slowing down play are the frequent disk loads necessary when you change players.

Finally, graphically, the screen is the worse of the two games. Further, the action on it moves very slowly. The 10-page manual is complete, especially at explaining how to estimate abilities to help you accurately create your own teams. It also gives some background on legendary world series match-ups.

Despite its potential, **Computer Baseball** is a strikeout.

The author wishes to express his appreciation to The Magic One Computer Shop of Barberton, Ohio for their constant support in the creation of this series.

*For a review of **MicroLeague Baseball**, see page 95.*

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MicroLeague Baseball

MICRO LEAGUE SPORTS ASSOCIATION
2201 Drummond Plaza
Newark, DE 19711-5711
48K Disk $39.95

by Bob Curtin

Tony Armas takes a few steps off second as the batter sets himself, waiting for Guidry's pitch. Marty Barrett managed to fend off the previous pitch, a blistering fastball, which just caught the inside corner. The count still remains at three and two. It's the top of the ninth with one out, and the Yankees are leading the Boston Red Sox three to one.

Guidry stretches and delivers a vicious slider to the outside. Barrett reaches for it and hits a towering fly ball to shallow right field. Dave Winfield trots in, gets under it and hauls it in for the second out.

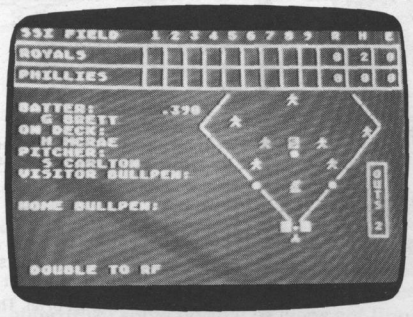
Well, folks, it looks like it's up to Dewey Evans. No, wait! The manager's pulling him out! There's going to be a pinch hitter! It's Bob Curtin! Guidry pales as he stares, slack-jawed, at the figure stepping into the batter's box. Steeling himself against the inevitable and trying to ignore the sudden, deathly silence from the stands, Guidry winds up and throws...

Wait a minute! Hold it! Time out. Bob Curtin doesn't play for the Boston Red Sox! Well, true. But with the Micro League Sports Association's **MicroLeague Baseball** (**MLB**), you may put him or any other player on the team of your choice.

MLB is a computer simulation of major league baseball, using the statistics from real players—both past and present. The game comes boxed with a disk containing the game program and twenty-five historical teams, two reference manuals (Manager's Rulebook and Team Rosters), and two double-sided quick reference cards.

Be aware that **MLB** is *not* an arcade game, nor is it a dry statistical simulation devoid of graphics. Quite the contrary. The graphics are beautiful and detailed, right down to occasional head-first slides and the manager's stomping out to the mound.

Unlike an arcade game, which oftimes requires frantic manipulation of a joystick to play the game, **MLB** requires simple (and leisurely) one-touch keypresses. You take the part of the team manager, not that of a player.



MicroLeague Baseball.

Once you've booted up, you'll be asked to choose the two teams and who'll play them (computer or human). You may play against the computer or another human, or even have the computer play itself. This last option would come in handy for anyone ambitious enough to try to recreate an entire season.

At this point, you choose the starting pitchers and set the lineups. A full roster of fifteen players and ten pitchers is provided for each team, and the lineup defaults to that most commonly used by each team historically.

You may, of course, shuffle the team around at will and set the batting order to whatever you want. You may even change position assignments, though putting a player in a position he's not "rated" for will likely produce a flurry of errors from the poor soul, since his defense rating drops as low as is possible.

Just as in the real thing, you may warm up relief pitchers in the bullpen, replace pitchers, bring in pinch hitters or runners, and even go out to the mound to settle down your pitcher. Failing to warm up a pitcher before he's brought in for relief raises the chance that he'll be a bit shaky at the start of his stint.

Also, as in the real game, your pitcher can lose his stuff. I've had a pitcher coasting along, the game well in hand, only to have him start getting hammered. A trip to the mound sometimes works (for a while), but generally it's time to give him the hook.

This is where your expertise comes in, especially in a series of games, where pitching rotation comes into play. It's difficult to pull your ace starter in early innings in an important game; there's always the chance he'll settle down, but then again...

MLB gives you all the same ammunition enjoyed by real major league managers. You're equipped with a full range of pitching, running and batting options. Squeeze plays, sacrifice and surprise bunts, steals and double steals, pitchouts, bringing the infield in (or just in at the corners), inten-

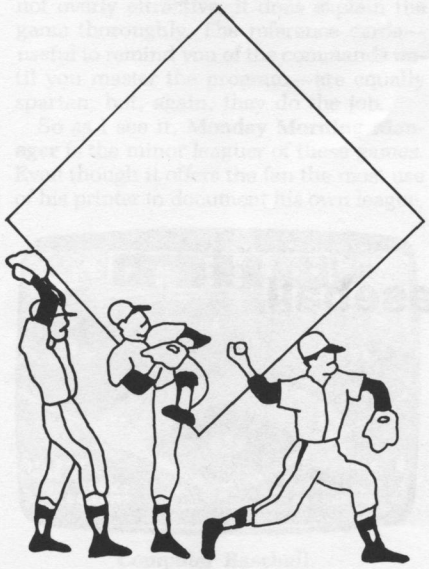
tional walks, and hit and run plays—all are at your disposal.

The MLSA offers a **General Manager/ Owner** disk for an additional $39.95. If you're a baseball fan, it's worth every penny.

With the **GM/O** disk, you can load team rosters from any team disk or the game disk, then trade and draft players, alter statistics, create new players (now you know how Bob Curtin infiltrated the Red Sox), or create entire new teams.

I formed a league with some friends of mine and, after a preliminary session of setting up the pitching rotation rules and updating the 1985 rosters to 1986 status, we proceeded to play a fifty-game "season."

The competition was fierce, and we even had some mid-season trades go on. (In case you're wondering, the KC Royals took the pennant.) This game is ideal for league play. It usually only takes 30 to 40 minutes for a 9-inning game, so a number of games can be played in a single evening.



One thing that struck me was that players whose teams weren't scheduled to play on a particular night would show up anyway, just to watch the games. I toyed with the idea of selling beer and hot dogs, but my wife glared me down.

The game is a masterpiece and, with the optional disks, its shelf-life borders on the infinite. It's a game with enough subtleties to satisfy the most demanding baseball fan, yet simple enough to be played enjoyably by anyone. I recommend it highly.

Oh, one last note. The ST version of **MicroLeague Baseball** is due for release in September, with additional features and even more superb graphics. I, for one, will not hesitate to buy it.

Huh? Curtin? Oh, he struck out.

Bob Curtin is a machinist who got into computing in 1982, when he bought an Atari 800. He uses it for writing, programming and telecommunications. He prefers the more cerebral computer games.

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THE END USER

THIS MONTH:

A wealth of information, replies to readers, ST notes and copy software for honest folks.

by Arthur Leyenberger

"Why did the computer user throw the clock out the window?"

"I dunno."

"To make time fly." Hey, I don't invent these jokes, I just report them. Seriously, is time flying for you as it is for me? Does it *really* seem like two years since Jack Tramiel and family rescued Atari? A lot has happened in those two years—to the computer industry, to Atari and to me. Read on, my friend.

Assuming you got this issue recently, it's been a year and a month since the 520ST became available. It took Atari six months to develop (from June 1984, when Jack and friends bought the company), and another six months after that to get it on the street. Not only is this remarkable, but many so-called experts in the computer industry predicted it couldn't be done.

Free enterprise.

The United States was founded on free enterprise: some normal citizens got tired of paying tribute to England, so they got together and started a revolution. Granted, there was a little more to it than that, but, basically, some folks had a good idea . . . and did something about it.

That story's been retold dozens of times in the world of computers. From Wozniak and Jobs, who started Apple in their garage when Hewlett-Packard declined to take them seriously, to Dan Bricklin, one of the authors of **VisiCalc**—a little hard work never stopped anyone with a good idea. Such is the case with William Brandt, Jr.

Who's William Brandt, Jr., you ask? His name or picture will surely not be on the cover of *Time* this year, but he's one of many Atari users who put their money where their computers are.

Like a lot of new users, he found needed, useful information in various Atari-oriented magazines. But it seems, when he finally realized he needed information, he could never remember where he'd seen it. He therefore did the only logical thing—he started an index of magazine articles.

Little did Bill know that what he began for his own use would eventually become a major tome, handy for other Atarians. I happened recently across a copy of Bill's 69-page index, and I wanted to pass the information along. It's available for $15.00, postage paid, from: Article Index, c/o William Brandt, Jr., 27 Mohawk Trail, Westfield, NJ 07090.

The index is broken down by topics—fifty-five in all. Within each topic, entries are categorized by article, game, review, or utility. Each entry consists of title, author, magazine, volume, number, issue, date, page and programming language (if appropriate).

The current version covers **ANALOG Computing**, *Antic*, *Atari Connection*, *Atari Explorer*, *COMPUTE!* and *Home Computing*. Bill hopes to include other publications (such as *Creative Computing*, *Byte* and *Family Computing*) in a future edition.

Bill Brandt's done an excellent job. He invested the time for a thorough job and took the risk of publishing it on his own. I've no financial interest in his endeavor, but I'm proud that I encouraged him.

Arthur Leyenberger is a human factors psychologist and free-lance writer living in New Jersey. He has been an Atari enthusiast for four years. When not computing, he enjoys playing with robotic toys.

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Delphi — NJANALOG

No other publication I know of puts all this information in one place and is so easy to use. My advice is to buy a copy—support Bill Brandt, Atari computerists and free enterprise. Nice work, Bill.

The mailbag.

I don't know about your cat, but mine likes to sleep on papers, magazines and software. Actually, I have three cats—and sometimes feel like Fred MacMurray. Anyway, Raggs is sleeping on some old papers. . .Oops! That's reader mail. Thanks, Raggs, for reminding me: I need to catch up.

Some interesting mail has arrived in the last month or so. Much of it chastises me (and **ANALOG Computing**) for spending too much time on the ST and "neglecting" the 8-bits. Interestingly, an almost equal number complain about not *enough* ST coverage. The rest is a mixed (mail)bag.

Gordon Billingsley of Murphysboro, Illinois writes to tell me about the new **1st Word** for the ST. Its version 1.04 (and later) overcome two flaws of the original: the lack of double spacing and the idiotic form feed that occurs before every printout.

The latest **1st Word** contains a new option, "spacing," in the drop-down style menu. When it's checked, you're in double spacing, both on-screen and in your printout.

Gordon also says the form feed can be eliminated, by editing the printer description file. Load the printer driver appropriate for your setup into **1st Word** and change the line that reads *20, C * Vertical Initialization*. Change the *C* (or whatever's there) to a *0* (zero), save the file, then run INSTALL.PRG again. Select the recently edited file when prompted. The .DOT file created will no longer cause a form feed each time you print.

Thanks for the update, Gordon. It's good to know these changes have been made to an otherwise good program. My only problems: a more descriptive term than *spacing* could have been used, and two options might have been presented—"single space" and "double space." Also, the method used to get rid of the initial page eject is more hokey than the concept of "write only memory."

Whether or not the printer page ejects ought to be an option in a drop-down menu, or in the setup procedure. Why do we have to become programmers to get things to work properly?

The next letter comes from Milwaukee, Wisconsin. It must have been a long, cold winter for Kenneth Jennings to write such a tome. To reply cogently required me to first take my blood pressure pills. Next, I had to study his tirade and pick out the salient points. Having done this, I thought I'd share a few of his comments—and my response—with you.

Kenneth says, "*Do not* give up your 8-bit computers in favor of the ST." He cites two main reasons: public domain software for the 8-bits won't run on the ST, and your peripherals won't work. *Of course* they won't work. The ST is a different computer; it uses different hardware and software. Why *should* they work?

Next he talks about Atari really being Commodore and vice versa, referring to the fact that Jack Tramiel *was* Commodore for many years. Now, with Jack as head of Atari, the ST seems to really be a Commodore computer, in terms of price and the way it's advertised, whereas the Amiga has a chip set by Jay Miner, designer of the Atari 800. So the ST is a Commodore, and the Amiga is truly an Atari. Sigh. I think we've been over all this before. Where have you been, Kenneth Jennings?

There are other ironic comparisons between Commodore and Atari. For example, 8-bit Atari owners have used the Commodore 1701/02 color monitor for years. It was, simply, the best monitor for the job. Now we find many Amiga owners using the Atari ST RGB monitor, because it's superior to the washed-out look of the Amiga's color monitor.

Kenneth then asks: "Why did you buy an 8-bit Atari computer in the first place? If you bought it because it was cheap, then go buy an ST—it's cheap, too, not powerful. If you bought your Atari 8-bit because it was the most technologically advanced computer, then buy an Amiga because *it* is the most advanced." I won't bore you with the details of the two machines, most of which have already been printed, in **ANALOG Computing** and elsewhere.

What Kenneth fails to realize is that people purchased 8-bit Atari computers because they were (and are) good computers and a good *value*, not because they were the most expensive, or the least expensive, or whatever. Atari's hallmark has always been value. Sure, I bought a 48K Atari 800, two 810 disk drives and a printer for $2000 in 1981. I did so because it was the best value around.

The same is true for the Atari ST. It happens to be less costly than the Amiga. Both are good machines, but the Atari is simply the better *value*. Looking at all aspects of the two—graphics, sound, memory, disk drives, amount of available software, and, yes, price—the ST wins, hands down. It ain't just *my* opinion, either.

Kenneth goes on to chastise **ANALOG Computing** for not covering the Amiga. We "don't run full-page, 4-color ads for the Amiga," he says. He claims that **ANALOG Computing** is an "Atari house organ." Give me a break, Ken!

We don't cover the Amiga, because we're a magazine for *Atari* users. We don't run Amiga ads, because Commodore doesn't place their promotional material in an Atari-only magazine. As for being a "house organ" for Atari Corp. . . .Have you been reading the magazine with your eyes open lately?

Consider this: several times I've written about what I consider a "mushy" keyboard on the ST. In addition, the keys are too wide and too sculpted, causing me to continually make typing errors. Reread the issue 39 **End User** and see what I had to say about the way Atari does business. In bed with Atari? Hardly!

As far as the hype you spoke of in your letter, **ANALOG Computing** is not (and has never been *close* to being) the leader in this area. If you want to see hype, check out *Amiga World* or *Mac World*.

Finally, Kenneth Jennings tells us, "If **ANALOG Computing** courageously decides to print all or even part of this obviously anti-Tramiel letter, I urge everyone reading it to compliment them on not being a house organ for Atari. Maybe I was wrong." Q.E.D.

The 8-bit scene.

Until a few days ago, I thought a chipmunk was a cute, furry, outdoor version of a hampster. Now I know: a **Chipmunk** is an ingenious 8-bit backup program from Microdaft.

Chipmunk offers Atari 800, 1200, XL and XE owners the ability to copy complete disks, without expensive disk drive hardware modifications.

The catch is, since **Chipmunk** isn't as sophisticated as the hardware boards, it can copy only the software for which it has parameters. Not to worry, though, the initial release can copy over 250 programs.

Here's how it works: the original program is first sector copied, with the one provided or with any sector copier. Then, the parameter menu's brought up on-screen, and you select the name of the program you wish to back up. **Chipmunk** loads the parameters and writes them to the destination disk. No fuss, no muss.

What you end up with is an unprotected copy of the original boot disk—not a binary file. That is, if you were to make a copy of the copy, you could do it with Atari DOS.

The program works with any disk drive available for the 8-bit Ataris. In addition, one or two drives can be used. There's also a utility to list BASIC programs that can't otherwise be listed, plus an undelete utility.

Under Federal copyright laws, you can make backups of software for your own use. Some software companies copy-protect their programs, to prevent illegal duplication. Unfortunately, this prevents software owners from making legitimate backup copies. **Chipmunk** is provided only for the copying of disks you own, not for illegal purposes.

Ironically, **Chipmunk** will not copy itself, in order to "prevent widespread piracy of our product." At least, though, a backup copy's included with the package.

If you want the ability to backup your software for archival reasons, but don't want to spend big money for the drive modification, check out **Chipmunk** from Microdaft.

It sells for $35.00 and is available from: Microdaft, 19 Harbor Drive, Lake Hopatcong, NJ 07849. If you send a self-addressed, stamped envelope, Microdaft will return a free list of programs that can be copied by **Chipmunk**.

ST notes.

Three new ST books have found their way to my desk. Actually, they've been there for a while, buried with my 1977 tax return. But that's another story. All three books are from COMPUTE! Books and are described briefly below. Each of the trio sells for $15.00.

The Elementary Atari ST by William Sanders is, as the title suggests, a beginner's guide to the ST. It's meant to prepare the novice to use the ST's sound, graphics and other features. Detailed setup and step-by-step instructions for ST BASIC are provided. It, like other COMPUTE! Atari books, gives plenty of examples to help you understand all the nuances of each topic.

The Elementary Atari ST has tutorials on disk and file usage, printer access, drawing and animation graphics, Logo and FORTH. Most of the book is spent discussing how to program in ST BASIC. In this its goal as an ST BASIC primer is accomplished.

The second title, *Elementary ST BASIC*, is written by C. Regina. It picks up with ST BASIC where the first leaves off. As usual, program examples are frequent, to aid the reader.

With the book is information for ordering a disk of the programming examples. *Elementary ST BASIC* is a very complete treatise on the language.

The third COMPUTE! Books ST title is *Introduction to Sound and Graphics on the Atari ST*, by Tim Knight. It takes you through the process of creating impressive graphics and sound, and shows you how to get the most from your ST. Examples are provided in three languages: ST BASIC, Logo and FORTH.

ST Sound and Graphics is heavily illustrated with sample screen photos. Because of the book's organization, it seems a tutorial, rather than a reference guide approach. In other words, the fundamentals of programming sounds and graphics are learned in a step-by-step fashion.

All three books are available from COMPUTE! Books, P.O. Box 5406, Greensboro, NC 27403 — (919) 275-9809.

Cloning?

I get excited when I receive a Federal Express package. It occurs infrequently, and there's a certain element of "big business pizzazz" associated. Often, no one's home during the day to accept the parcel, so it's usually left with a neighbor. This heightens the excitement—I must wait a little longer before discovering its contents.

I recently got such a package from Central Point Software. Inside was **Copy II ST**, a disk-copying program for the ST. It can make backup copies of most copy-protected (and unprotected) programs. **Copy II ST** can handle even the most sophisticated protection schemes. Of course, it's designed for *archival* copies only, for your *own* use.

Many software manufacturers copy-protect their products, to physically prevent people from making and giving away or reselling copies. Under the law, as above, you have a right to make copies only for your use, to back up the original. This is the *only* right afforded you under the law. Making disk copies with this or any other program, for any other purpose, is strictly illegal and a Federal offense.

Copy II ST comes with a short, well-written instruction manual and over sixty programs tested with it. You'll find programs like **VIP Professional**, **Final Word**, Haba and Hippo products, and more, can be successfully backed up.

Copy II ST provides a fast sector copier and a bit copier utility, to make "carbon copies" of disks. The procedure usually requires sector copying a disk, then bit copying a specific track. One or two single- or double-sided disk drives can be used.

The program's easy to use and completely mouse driven. Information about progress of the copy is displayed on-screen in a two-dimensional grid called the "Copy Status Box."

As **Copy II ST** reads a track, the letter *R* appears in each cell of this box. As the program writes a track, the letter *W* appears. Then, for every track copied successfully, a dot is left behind in that position. If there was an error copying the track, a *R* or *W* is left behind, referring to either a read or write error.

Some people question the legitimacy of disk copy programs like this one. I typically answer with an example. . .If you have any Hippopotamus Software products, such as **Hippo Disk Utilities**, with their copy protection technique which occasionally trashes this or another disk, you'll want to back up the program before you use it. There's a need for the copying programs, and I'm glad to see that Central Point has decided to fill the void with their product.

Illustrating that their intent is: (1) for the program to be used only in making personal backup copies of disks, and (2) to inform people about their rights under the law, Central Point has included ADAPSO's "Thou Shalt Not Dupe" flyer.

ADAPSO is an industry group spreading the word: pirating software is not only a crime, but is *wrong*. For more information, contact ADAPSO, at (703) 522-5055.

Copy II ST is retailing now for $39.95 (plus $3 shipping, if purchased direct from the company) and is not, itself, copy protected. Check your local dealer, or order from: Central Point Software, Inc., 9700 SW Capitol Highway, Suite 100, Portland, OR 97219.

There isn't much to say about a copying program, other than whether it works or not. This one works as advertised and represents the first professional disk backup program for the ST. My advice: buy the program and use it—don't abuse it.

Calling it a day.

That's it for this installment of **The End User**. It's time to pack up and move on down the road. See ya next time.

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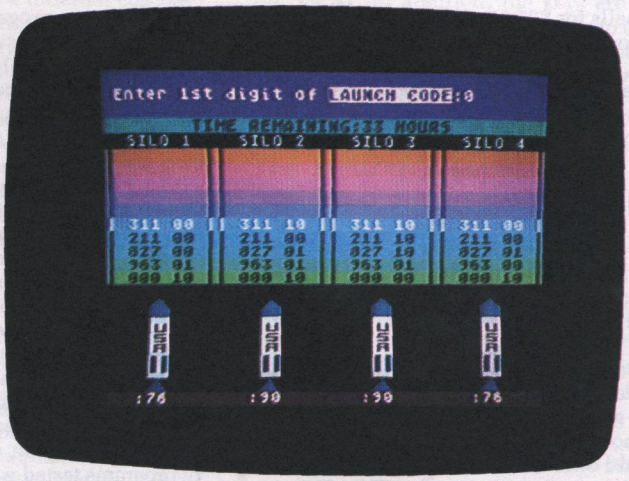
CIRCLE #144 ON READER SERVICE CARD

Launch Code

Only you can save the day by cracking the enemy's code



by David Schwener

You've got thirty-six hours to disable the twelve ICBM's enemy spies have tampered with. After locking your Atari into the scrambling circuits of the defense computer, you must discover the launch code for each of these twelve missiles, in time to abort launch.

Using your joystick controller, you enter a three-digit launch code. The number's then evaluated for accuracy. If the entered code is incorrect, the computer will give clues which can be used for another try.

Unfortunately, the enemy spies were clever enough to add a tamper-sensing device. Becoming careless with your attempts causes the missiles to enter the immediate-launch mode—giving you less than two minutes to stop their takeoff.

Each group of four missiles, with their single launch code, is more difficult to disable than the last. If a mission is completed by disabling all twelve, you'll receive a message of congratulations.

Entering launch codes.

To enter the first digit of a launch code, push or pull the joystick, to increase or decrease the number in the launch code indicator window. When you've reached the number you wish to enter, press the trigger button. A tone will sound, and you'll be ready to enter the second digit. Continue using your joystick and trigger for the second and third digits.

After pressing the trigger button for your third, the entire code will be entered for computer evaluation. You may abort this process by pressing the SELECT key, instead of the trigger button.

Clues.

Clues are the key to success in winning **Launch Code**. The concept may seem difficult at first, so pay attention!

Each time a launch code is entered, the computer compares it to the four missile launch codes hidden inside your Atari. Above each missile is displayed the code that was entered, plus a two-digit number to the right. The two-digit number is your *clue*.

Its first digit indicates how many numbers are correct—and in the correct position. Its second digit indicates how many numbers are correct, but in the wrong position.

Confusing? Let's try some examples.

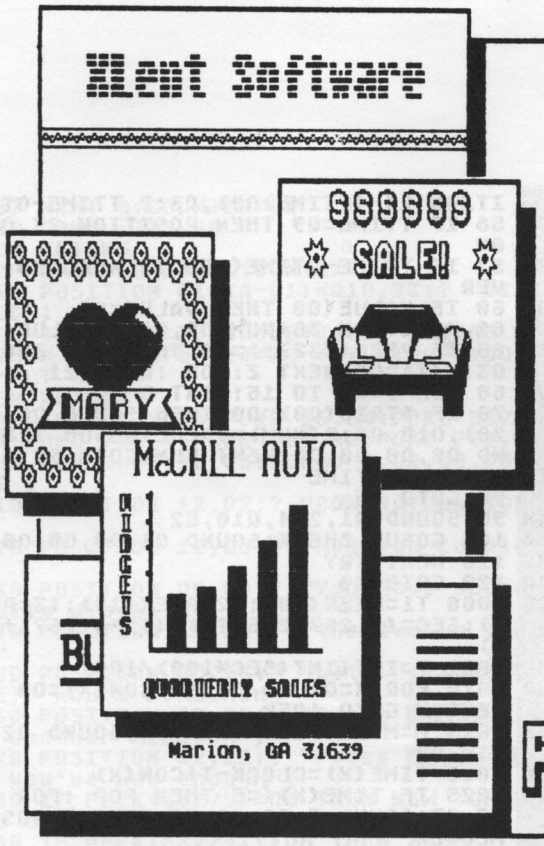
The first column below is the secret launch code, the second column is a number we've entered, and the third is the clue the computer would give. All possible combinations of clues are shown.

SECRET LAUNCH CODE	ENTERED LAUNCH CODE	CLUE	
123	145	10	
123	415	01	
123	135	11	
123	023	20	
123	230	02	
123	132	12	
123	456	00	
123	123	30	Missile Disabled!!!

Notice a *30* clue means a perfect match; this will, therefore, disable the missile.

A *00* clue means none of your three numbers match the secret launch code. Beware: the *00* clue is the triggering mechanism for the immediate launch mode.

When you get this one, depending upon which group of missiles you're working on, two or three of the *00* clues



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CIRCLE #145 ON READER SERVICE CARD

Launch Code *continued*

will start the missiles into countdown. The countdown time also varies, as shown below.

SILO #	NUMBER OF 00 CLUES	COUNTDOWN TIME
1-4	3	90 seconds
5-8	2	90 seconds
9-12	2	60 seconds

When the immediate launch mode is triggered, the green bar at the bottom of the screen will begin flashing red, with a warning tone. The timer below the silo that triggered the immediate launch mode will begin counting down.

Don't despair! You can still abort the launch and continue with the game—if you can discover the secret launch code in time. If you do, and no other missiles are counting down, the red bar will turn green again, indicating that no missiles are in the immediate launch mode. Any timer, however, that reaches :00 seconds will cause the game to end.

Game over.

The game is over when: (1) you disable all twelve missiles; (2) a silo timer reaches zero; or (3) the main countdown clock reaches zero.

If (2) or (3) occurs, the missiles are put into the launch-ready position, and the correct launch codes for each silo are displayed. You can then play again by pressing the START key.

Happy launching!

David Schwener has been programming on an Atari for two and a half years, mainly in BASIC with some assembly. All his royalties now go into a "Jackintosh" fund. He hopes to get an ST with as little outside income as possible. His wife has the same hopes.

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* (issue 45) and its update on page 9.

Listing 1.
BASIC listing.

```
EW 1 REM LAUNCH CODE Ver 5.1
SS 2 REM David Schwener Mar 85
BC 3 REM ANALOG Computing
VU 5 Q1=1:Q2=Q1+Q1:Q3=Q2+Q1:Q4=Q2+Q2:Q5=Q
   3+Q2:Q6=Q3+Q3:Q7=Q4+Q3:Q8=Q4+Q4:Q9=Q4+
   Q5:Q10=Q5+Q5
JJ 10 GOSUB 15000:GOSUB 27400:GOSUB 30000
   :GOSUB 20000
UX 12 POKE 712,Q0:POKE 708,12:POKE 752,Q1
LM 19 GOSUB 28000:POKE 559,34
JA 20 FOR TRY=Q1 TO Q10
VM 21 POSITION 32,Q1:? "     ";
UE 30 FOR NUM=Q1 TO Q3
NM 32 VALUE=Q0
IW 33 POSITION Q7,Q1:? DIGIT$(Q3*NUM-Q2,Q
   3*NUM);
QD 35 ST=STICK(Q0):IF ST<>15 THEN POKE 77
   ,Q0:SOUND Q3,VALUE*Q10,Q10,Q8:SOUND Q3
   ,Q0,Q0,Q0
IW 40 VALUE=VALUE+(ST=14)-(ST=13)
MP 50 IF VALUE>Q9 THEN VALUE=Q0
LN 55 TTIME=INT((256-PEEK(19))/7.111):POS
   ITION 24-(TTIME>Q9),Q3:? TTIME-OTIME
DG 56 IF TTIME=Q9 THEN POSITION 23,Q3:? "
   0"
HY 57 IF TTIME-OTIME<=Q0 THEN GOSUB GAMEO
   VER
QO 60 IF VALUE<Q0 THEN VALUE=Q9
QV 62 POSITION 30+NUM*Q2,Q1:? VALUE
IJ 65 IF PEEK(53279)=Q5 THEN FOR Z=Q1 TO
   Q3:C(Z)=Q0:NEXT Z:POP :GOTO 21
VO 68 FOR D=Q1 TO 15:NEXT D
CL 70 IF STRIG(Q0)=Q0 THEN SOUND Q0,PEEK(
   20),Q10,Q8:C(NUM)=VALUE:GOSUB TIME:SOU
   ND Q0,Q0,Q0,Q0:NEXT NUM:GOTO 95
II 80 GOSUB TIME
UG 90 GOTO 35
KX 95 SOUND Q1,254,Q10,Q2
AA 100 GOSUB CHECK:SOUND Q1,Q0,Q0,Q0
HT 110 NEXT TRY
PQ 120 GOTO 20
QG 1000 T1=PEEK(20):T2=PEEK(19):T3=PEEK(1
   8):SEC=(4.267*256*T3)+(T2*4.267)+(T1/6
   0)
BL 1001 T=INT(INT(SEC*100)/100)
KR 1010 FOR X=Q1 TO Q4:IF CON(X)=Q0 THEN
   NEXT X:GOTO 1050
VB 1015 M=M+Q1:POKE 1735,68:SOUND Q2,200,
   Q10,Q6
BR 1020 TIME(X)=CLOCK-T+CON(X)
AO 1025 IF TIME(X)<=0 THEN POP :FOR I=Q0
   TO Q3:SOUND I,Q0,Q0,Q0:NEXT I:GOSUB GA
   MEOVER
DQ 1030 IF TIME(X)=Q9 THEN POSITION Q4+(X
   -Q1)*Q10,23:? "0";
QF 1040 POSITION Q4+Q1*(TIME(X)<Q10)+(X-Q
   1)*Q10,23:? TIME(X);:NEXT X
OE 1050 IF M=Q0 THEN POKE 1735,196:SOUND
   Q2,Q0,Q0,Q0:M=Q0:RETURN
XF 1060 M=Q0:POKE 1735,Q0:SOUND Q2,Q0,Q0,
   Q0:RETURN
IG 1500 REM
SU 1505 POKE 1707+24+20-TRY,14
LN 1506 POKE 1707+24+20-TRY+1,2
PR 1507 IF TRY=1 THEN POKE 1707+24+10,2
JB 1508 POSITION Q0,15-TRY:? "|          ||
        ||          ||          ";
AE 1509 FOR A=Q1 TO Q4
HW 1510 RP=Q0:RN=Q0:CX1=Q0:CX2=Q0:CX3=Q0
DZ 1520 IF DISABLE(A)=Q1 THEN NEXT A:GOTO
   1625
LM 1530 IF CODE(A,Q1)=C(Q1) THEN RP=RP+Q1
   :CX1=Q1
OT 1540 IF CODE(A,Q2)=C(Q2) THEN RP=RP+Q1
   :CX2=Q1
SA 1550 IF CODE(A,Q3)=C(Q3) THEN RP=RP+Q1
   :CX3=Q1
ST 1560 IF CX1=Q0 THEN IF CODE(A,Q1)=C(Q2
   ) OR CODE(A,Q1)=C(Q3) THEN RN=RN+Q1
VS 1565 IF CX2=Q0 THEN IF CODE(A,Q2)=C(Q1
   ) OR CODE(A,Q2)=C(Q3) THEN RN=RN+Q1
WM 1570 IF CX3=Q0 THEN IF CODE(A,Q3)=C(Q1
   ) OR CODE(A,Q3)=C(Q2) THEN RN=RN+Q1
QA 1580 IF RP=Q0 AND RN=Q0 THEN FLAG(A)=F
   LAG(A)+Q1
XS 1600 IF FLAG(A)=LVL THEN COUNTER=COUNT
   ER+1
GG 1610 POSITION Q2+(A-Q1)*Q10,15-TRY:? C
   (Q1);C(Q2);C(Q3);" ";RP;RN;
VE 1615 IF RP=Q3 THEN GOSUB SHUTDOWN
HR 1620 GOSUB TIME:NEXT A
PA 1625 IF COUNTER>Q0 THEN GOSUB LAUNCH
AU 1630 RETURN
OE 2000 T1=PEEK(20):T2=PEEK(19):T3=PEEK(1
   8):SEC=1092.352*T3+T2*4.267+T1/60
SA 2001 SEC=INT(SEC*100)/100:MIN=INT(SEC/
   60):M=M*60:T=INT(SEC):IF T=Q0 THEN 200
   0
WL 2005 FOR A=Q1 TO Q4:IF FLAG(A)=LVL THE
   N CON(A)=T:FLAG(A)=FLAG(A)+Q1
```

```
XT 2007 NEXT A:COUNTER=Q0
HF 2010 POKE 1735,68
AG 2020 RETURN
UH 2500 DISABLE(A)=Q1:CON(A)=Q0
ZG 2510 POSITION Q1+(A-Q1)*Q10,23:? "DISA
   BLED";
OB 2550 TDISABLE=TDISABLE+Q1:IF TDISABLE=
   4 THEN POKE 1707+24+20-TRY,2:POP :GOTO
    CMPLT
BC 2560 RETURN
DY 4000 GRAPHICS Q0:POKE 16,64:POKE 53774
   ,64:POKE 710,4:POKE 709,12:POKE 752,Q1
HO 4005 FOR I=Q0 TO Q3:SOUND I,Q0,Q0,Q0:N
   EXT I
AR 4010 POSITION 12,Q2:? "CONGRATULATIONS
   !"
LU 4020 POSITION 12,Q5:? "Mission complet
   e"
FA 4030 POSITION Q5,Q9:? "You have succes
   sfully disabled";
JI 4040 POSITION 11,11:? "the twelve ICBM
   's"
PX 4050 POSITION Q9,13:? "with ";TTIME-OT
   IME;" hours remaining"
LR 4060 POSITION Q3,20:? "Press START f
   or another mission";
CA 4070 POSITION Q2,22:? "Press OPTION
   if you've had enough";
BL 4080 IF PEEK(53279)=Q3 THEN NEW :GRAPH
   ICS Q0:END
OU 4090 IF PEEK(53279)<>Q6 THEN 4080
NN 4100 GOSUB 8010:GOSUB 30000:GOSUB 2002
   5:GOTO 12
BK 8000 FOR D=Q1 TO 300:NEXT D:POKE 53248
   ,Q0:GOSUB 8010:GOTO 8015
EA 8010 GRAPHICS Q0:POKE 16,64:POKE 53774
   ,64
YD 8012 POKE 710,Q0:POKE 752,Q1:POSITION
   15,12:? "Standby...":FOR I=Q1 TO 200:N
   EXT I:RETURN
OE 8015 POKE 559,Q0
LP 8020 GOSUB 30000:GOSUB 20025:GOTO 12
KB 9000 FOR I=Q1 TO Q8:POSITION Q0,16:? "
   ":NEXT I
TU 9010 FOR N=21 TO 28:POKE N+DSTART,130:
   POKE 1707+N,68:POKE 1707+N+24,14:NEXT
   N
VA 9020 POKE 1707+25+24,Q0
JA 9030 POSITION 14,16:? "BIRD'S AWAY!"
MW 9040 POSITION Q8,18:? "The correct cod
   es were:"
TC 9050 FOR A=Q1 TO Q4:POSITION Q3+(A-Q1)
   *Q10,20:? CODE(A,Q1);CODE(A,Q2);CODE(A
   ,Q3):NEXT A
V5 9070 POSITION Q6,22:? "Press START t
   o try again.";
GP 9210 IF PEEK(53279)<>Q6 THEN GOTO 9210
XK 9215 GOSUB 8010:POKE 559,Q0
LX 9230 GOSUB 30000:GOSUB 20025:GOTO 12
EI 15000 GRAPHICS Q2:POKE 16,64:POKE 5377
   4,64:POKE 752,Q1:POKE 712,166:POKE 709
   ,14:POKE 710,166:POKE 708,186
KW 15002 SOUND Q0,Q0,Q0,Q0:POKE 53768,Q4:
   POKE 53761,170:POKE 53764,150:POKE 537
   63,170
YH 15005 M=Q1:L=Q0
WG 15010 POSITION Q4,Q2:? #Q6;"launch cod
   e"
JC 15020 POSITION Q8,Q6:? #Q6;"^^^"
FG 15030 POSITION Q8,Q5:? #Q6;"000"
PP 15050 ON M GOSUB 15100,15120,15140,151
   50,15160,15180
RI 15055 GOSUB 15500
AT 15060 IF L>75 THEN L=Q0:M=M+Q1:GOTO 15
   050
LK 15065 IF M>Q5 THEN M=Q0
FE 15070 GOTO 15055
XR 15100 ? :? "Can you discover the launc
   h code...":? :RETURN
LG 15120 ? :? "          ...in time?"
   :? :RETURN
KW 15140 ? :? "          By David Schwener
   ":? :RETURN
IO 15150 ? :? "        For ANALOG Computi
   ng":? :RETURN
ZK 15160 ? :? " Press START to begin yo
   ur mission":? :RETURN
PW 15180 ? :? "    Hurry! Time is running
    out":? :RETURN
PV 15200 GOSUB 15500
AF 15250 GOTO 15200
RE 15500 A=INT(RND(0)*999):POSITION Q8,Q5
   :? #Q6;A:L=L+Q1
TV 15503 IF LL THEN POKE 711,74:LL=Q0:GOT
   O 15510
GD 15505 POKE 711,154:LL=Q1
UB 15510 IF PEEK(53279)=Q6 THEN POP :SOUN
   D Q0,Q0,Q0,Q0:SOUND Q1,Q0,Q0,Q0:GOTO 1
   6000
ZD 15520 IF L>37 THEN POKE 53760,(75-L)+9
   0:POKE 53762,(75-L)+91:RETURN
BR 15530 POKE 53760,L+90:POKE 53762,L+91:
   RETURN
DJ 16000 RETURN
BJ 20000 DIM CODE(Q4,Q3),FLAG(Q4),TIME(Q4
   ),CON(Q4),C(Q3),DISABLE(Q4),DIGIT$(Q9)
WE 20020 DIGIT$="1st2nd3rd"
BC 20025 LEVEL=Q0
JO 20030 CLOCK=90:LVL=Q3
GW 20100 VALUE=Q0:TIME=1000:CHECK=1500:RE
   START=20100:SHUTDOWN=2500:LAUNCH=2000:
   CMPLT=25000:GAMEOVER=9000:MESSAGE=4000
UE 20105 OTIME=Q0:TTIME=Q0
OF 20110 C(Q1)=Q0:C(Q2)=Q0:C(Q3)=Q0:TDISA
   BLE=Q0
II 20120 FOR A=Q1 TO Q4:FOR B=Q1 TO Q3:CO
   DE(A,B)=A*B:NEXT B:NEXT A
RP 20150 FOR A=Q1 TO Q4
RK 20160 FOR B=Q1 TO Q3
PX 20170 CODE(A,B)=INT(RND(Q0)*Q10)
GA 20180 IF CODE(A,Q1)=CODE(A,Q2) OR CODE
   (A,Q2)=CODE(A,Q3) OR CODE(A,Q1)=CODE(A
   ,Q3) THEN 20170
DR 20190 NEXT B
EO 20200 FLAG(A)=Q0:CON(A)=Q0:DISABLE(A)=
   Q0
CC 20210 NEXT A
IX 20220 POKE 20,Q0:POKE 19,Q0:POKE 18,Q0
ME 20240 POSITION Q1,Q1:? "Enter     digi
   t of LAUNCH CODE:";
PF 20280 POSITION Q8,Q3:? "TIME REMAINING
   :   HOURS";
AW 20290 FOR I=Q5 TO 14:POSITION Q0,I:? "
   |         ||          ||          ||
    |";:NEXT I
FB 20295 FOR I=Q1 TO Q4:POSITION Q3+(I-Q1
   )*Q10,23:? ":";CLOCK;
QR 20296 POSITION Q2+(I-Q1)*Q10,Q4:? "SIL
   O ";I+LEVEL*Q4;
IJ 20297 NEXT I
DH 20300 RETURN
MY 25000 LEVEL=LEVEL+Q1:IF LEVEL=Q3 THEN
   GOSUB MESSAGE
JI 25005 A=PEEK(19)
HX 25010 POSITION 12,Q0:? "CONGRATULATION
   S";
KL 25020 POSITION Q0,Q1:? "      Prepare
   for the next 4 silos    ";
FT 25030 POSITION Q9,Q2:? "press START wh
   en ready";
VU 25035 FL=Q0
PS 25040 FOR P=201 TO 250
KP 25042 IF PEEK(53279)=6 THEN FL=1:POSIT
   ION 6,1:? "
    ";
ZP 25043 POSITION 7,2:? "*****Please Stan
```

```
   dby******";
CT 25045 K=PEEK(1717)
RF 25050 SOUND Q0,P,Q10,Q8:SOUND Q1,P+Q1,
   Q10,Q8:SOUND Q2,P+Q2,Q10,Q8:SOUND Q3,P
   +Q3,Q10,Q8
OY 25051 POKE 1717,PEEK(1718):POKE 1718,P
   EEK(1719):POKE 1719,PEEK(1720):POKE 17
   20,PEEK(1721):POKE 1721,PEEK(1722)
JT 25052 POKE 1722,PEEK(1723):POKE 1723,P
   EEK(1724):POKE 1724,PEEK(1725):POKE 17
   25,PEEK(1726):POKE 1726,K:NEXT P
JH 25053 IF FL<Q1 THEN 25040
FO 25055 FOR P=Q0 TO Q3:SOUND P,Q0,Q0,Q0:
   NEXT P
IN 25060 LVL=Q2
YZ 25070 IF LEVEL=Q2 THEN CLOCK=60
YY 25080 POKE 559,Q0
BY 25085 POKE 19,A
TQ 25090 OTIME=36-TTIME+OTIME
TP 25120 ? "K":GOSUB 20110:GOTO 19
BC 27400 POKE 106,PEEK(106)-Q5:START=(PEE
   K(106)+Q1)*256:POKE 752,Q1
HJ 27402 GRAPHICS 17:POKE 16,64:POKE 5377
   4,64
QR 27405 POSITION Q4,Q4:? #Q6;"LOCKING IN
   TO":POSITION Q5,Q7:? #Q6;"SCRAMBLING":
   POSITION Q6,Q9:? #Q6;"CIRCUITS"
FO 27406 POSITION Q3,15:? #Q6;"please sta
   ndby"
KF 27407 POKE 712,70:POKE 710,156:POKE 70
   8,206
VK 27409 DIM M$(38):RESTORE 27415
QJ 27410 FOR I=1 TO 38:READ A:M$(I,I)=CHR
   $(A):NEXT I
XK 27415 DATA 104,169,0,133,203,133,205,1
   69,224,133,206,165,106,24,105,1,133,20
   4,160,0,177
GJ 27416 DATA 205,145,203,200,208,249,230
   ,204,230,206,165,206,201,228,208,237,9
   6
KK 27420 E=USR(ADR(M$)):RESTORE 27510
EV 27430 READ X:IF X=-Q1 THEN RESTORE :RE
   TURN
TJ 27440 FOR Y=Q0 TO Q7:READ Z:POKE X+Y+S
   TART,Z:POKE 709,64+Y*Q2:NEXT Y
EX 27450 GOTO 27430
DX 27510 DATA 520,0,0,0,0,0,0,3,3
FM 27520 DATA 528,3,15,15,63,255,255,255,
   255
IS 27530 DATA 536,192,240,240,252,255,255
   ,255,255
JF 27540 DATA 544,0,0,0,0,0,0,192,192
ZF 27550 DATA 552,15,63,63,255,85,85,85,8
   5
HP 27560 DATA 560,255,255,255,255,85,85,8
   5,85
MB 27570 DATA 568,255,255,255,255,85,85,8
   5,85
BZ 27580 DATA 576,240,252,252,255,85,85,8
   5,85
SJ 27590 DATA 584,85,85,85,85,85,85,85,85
ZR 27600 DATA 592,89,89,89,89,90,85,90,89
YR 27610 DATA 600,101,101,101,101,165,85,
   165,85
KY 27640 DATA 608,90,85,90,85,90,89,90,89
CQ 27650 DATA 616,165,101,165,85,165,101,
   165,101
RT 27700 DATA 624,89,85,85,105,105,105,10
   5,105
ZP 27710 DATA 632,101,85,85,125,125,125,1
   25,125
FP 27720 DATA 640,105,105,105,105,105,85,
   85,85
TR 27730 DATA 648,125,125,125,125,125,85,
   85,85
GS 27750 DATA 656,0,0,0,0,0,0,0,3
DY 27760 DATA 664,3,3,15,15,63,63,255,255
DC 27770 DATA 672,192,192,240,240,252,252
   ,255,255
CQ 27780 DATA 680,0,0,0,0,0,0,0,192
HC 27790 DATA -1
HI 27999 REM ROCKET DRAWING
U5 28000 FOR I=Q1 TO Q4
SC 28010 POSITION Q4+(I-Q1)*Q10,16:? CHR$
   (2);CHR$(3)
GZ 28020 POSITION Q4+(I-Q1)*Q10,17:? CHR$
   (6);CHR$(7)
XU 28030 POSITION Q4+(I-Q1)*Q10,18:? CHR$
   (10);CHR$(11)
GD 28040 POSITION Q4+(I-Q1)*Q10,19:? CHR$
   (12);CHR$(13)
D5 28050 POSITION Q4+(I-Q1)*Q10,20:? CHR$
   (14);CHR$(15)
MB 28060 POSITION Q4+(I-Q1)*Q10,21:? CHR$
   (16);CHR$(17)
GO 28070 POSITION Q4+(I-Q1)*Q10,22:? CHR$
   (19);CHR$(20)
HG 28080 NEXT I
EY 28090 RETURN
5Z 30000 RESTORE 30170:FOR N=Q0 TO 99:REA
   D X:POKE 1664+N,X:NEXT N
JB 30005 GRAPHICS Q0:POKE 16,64:POKE 5377
   4,64:POKE 756,START/256:POKE 559,Q0
XV 30010 COLTAB=1712:LUMTAB=COLTAB+24
ZT 30014 X=USR(1693)
ML 30030 POKE 512,128
WR 30040 POKE 513,Q6
MP 30060 DSTART=PEEK(560)+256*PEEK(561)
TG 30070 FOR N=DSTART+6 TO DSTART+20
FR 30080 POKE N,130
JD 30090 NEXT N
YK 30092 FOR N=DSTART+21 TO DSTART+27:POK
   E N,132:NEXT N
KG 30095 POKE DSTART+28,130
JV 30100 POKE DSTART+Q3,194
RG 30120 POKE 54286,192
HQ 30125 ? "K"
DL 30140 POKE 710,PEEK(COLTAB)
VE 30150 POKE 709,PEEK(LUMTAB)
EA 30160 RETURN
WN 30170 DATA 72,138,72,174,156,6,189,176
   ,6,141
QV 30180 DATA 10,212,141,24,208,189,200,6
   ,141,23
RB 30190 DATA 208,238,156,6,104,170,104,6
   4,1,104
SW 30200 DATA 169,7,160,168,162,6,32,92,2
   28,96
VX 30210 DATA 169,1,141,156,6,76,98,228,1
   00,100
AQ 30220 DATA 100,166,0,56,72,88,104,120,
   136,152
SN 30230 DATA 168,184,200,0,148,148,148,1
   48,148,148
RY 30240 DATA 148,196,14,14,14,2,12,2,2,2
RX 30250 DATA 2,2,2,2,2,2,2,68,68,68
WG 30260 DATA 68,68,68,68,68,14,0,0,0,0
```

•

Bits & Pieces

A hardware utility series

by Lee S. Brilliant, M.D.

If imitation is the highest form of flattery, then Jonathan Buckheit should be very flattered. "Who?" you ask. Well, go back to **ANALOG Computing**'s issue 31, June 1985. You'll see he authored the article **Atari Clock**.

I found this one of the most imaginative programs I'd seen in a long time; it was original, novel, useful, simple, elegant and just about the same as a program I'd written, **Atari Time**. In fact, about the only difference is that **Atari Clock** forgets the time when the power's off; **Atari Time** won't forget!. . .and it also knows the date and day of the week.

C'mon now, how can the computer remember anything once the power's off? If you haven't guessed yet, it involves the joystick ports. If you did guess, then go to the head of the class!

Atari Time started while I browsed through a local electronics shop, where I saw a clock chip for only $15—and it was a 4-bit clock chip. "So what!" you say? Well, that's 4 bits for addresses and 4 bits for data; 4+4=8. Perfect: it fits into two joystick ports. Now, if you were wondering what you could do with all the trivia of the last three **Bits & Pieces** articles, this is for you!

The heart of the matter.

Atari Time uses an MSM5832 clock chip manufactured by Oki Semiconductor and sold by several sources (see parts list). If you remember from the first in this series, we said that computers have address and data buses. This chip is like a 16-byte memory on a 4-bit address and a 4-bit data bus.

We'll use joystick plug 1 for the data bus and 2 for the addresses. The set-up will be almost exactly the same as the simultaneous I/O experiment we rigged up in the last **Bits & Pieces** (issue 44). Instead of LEDs and wire jumpers, we'll output an address through plug 2, then read the data from that address through plug 1.

Because there are 4 address bits on joystick 2, there can only be 16 possible addresses. This is enough for the day of the week, the month, day, year, hours, minutes and seconds. Joystick 1 also has only 4 bits, so each address or register must store a number between 0 and 15. Each part of the time must be stored in low/high bytes in *decimal* form.

So, if the clock time is 24 seconds, then address 0 contains the number 4, and address 1 contains the number 2. Counting all the registers in Table 1, you'll see that you only need thirteen, so we only need addresses 0 to 12. The rest are nonfunctional. The addresses hold data according to Table 1.

The clock keeps time with a crystal that oscillates at 32,768 cycles a second. Dividing this base frequency by 2 fifteen times yields pulses once a second. This pulse drives the seconds register, while the other registers trip when the lower ones overflow.

Reading the clock isn't too difficult. You start with the first register's address, send it out over the four joystick pins connected to the address bus, then read the contents of that register on the data bus connected to the other joystick pins. Simple, right?

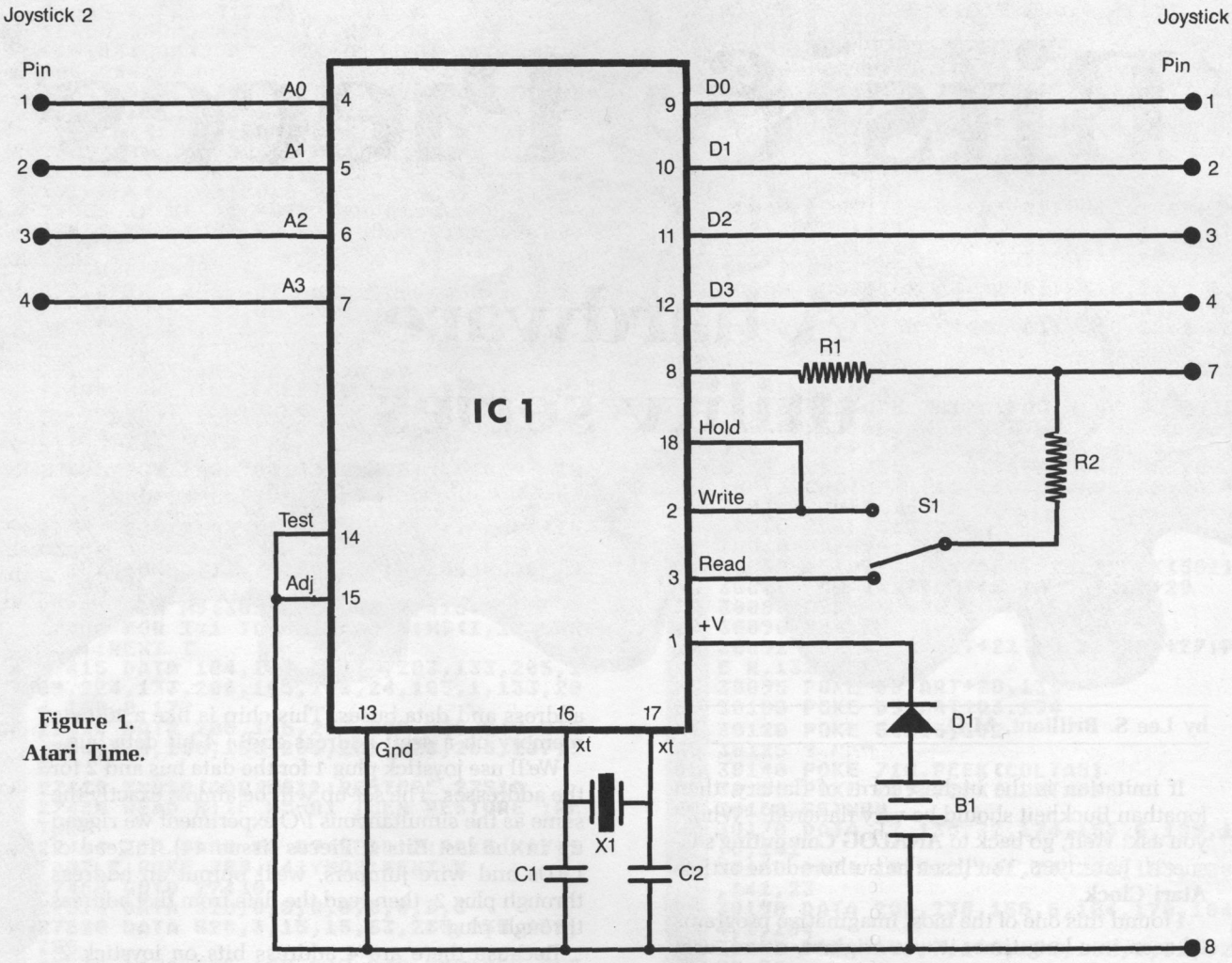

Figure 1. Atari Time.

ADDRESS	FUNCTION
0	SECONDS LO
1	SECONDS HI
2	MINUTES LO
3	MINUTES HI
4	HOURS LO
5	HOURS HI (bits 0&2) BIT 2:0=AM 1=PM BIT 3:0=12 HOUR 1=24 HOUR
6	DAY OF WEEK
7	DAY LO
8	DAY HI BIT 2: 0=LEAP YEAR 1=NORMAL
9	MONTH LO
10	MONTH HI
11	YEARS LO
12	YEARS HI
13	NONE
14	NONE
15	NONE

Table 1. — Registers.

The other pins on the chip have functions, too.

Write: A *1* on this pin allows you to send time data to the registers, to set the proper time.

Read: A *1* here allows you to read the registers.

Chip Select (CS): A *1* here enables all the functions of the clock. A *0* disables everything, but the clock internally keeps time.

Hold: A *1* here stops the clock from counting. This must be *1* to write the time to the registers.

The rest don't concern us here.

You can build **Atari Time** on the breadboard from the last **Bits & Pieces**, or use the printed circuit shown in Figure 2.

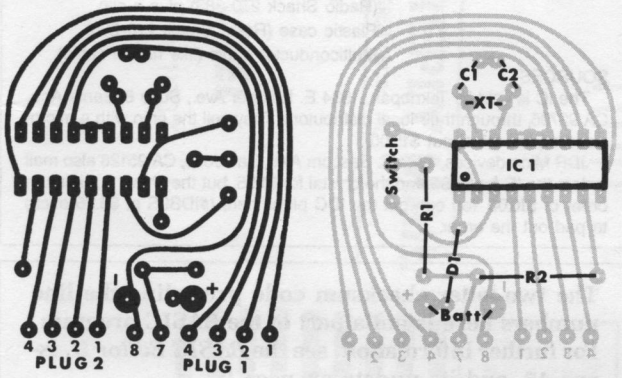

Figure 2.

Solder two joystick cables to the pads on the edge as labeled, and connect to two 9-pin "D" plugs. Although the parts list calls for solder-type plugs, I use solderless IDC plugs. They're more expensive and harder to find (you might have to order them by mail, or go to a computer parts store), but they're easier to use and don't require a hood or any modifications to fit into the joystick ports.

If you use the solder-type plugs, you'll need to break off the tabs on the hoods and use small flathead screws to join the hoods to the plugs. If you use manufactured joystick cables, be *sure* of your color codes for each cable, because the colors used for each pin may differ.

Figure 3.
Photo of completed *Atari Time* unit.

House the circuit board and batteries in a plastic case large enough to hold them. Note that, even though there's no direct connection between the IC's + voltage and the computer power, no current is drawn from the batteries when the computer's on. In fact, the diode, D1, is needed to keep power from flowing from the computer into the batteries. Using a good quality alkaline battery should allow a year's continuous operation.

Got the time?

Using **Atari Time** isn't very complicated; there are three programs. Listing 1 is in BASIC and lets you set your **Atari Time**. Type it in and save it to disk, then plug in **Atari Time**. Now run it.

You'll be prompted to input the time, date, and so forth, but not seconds—writing anything to the seconds registers only sets them to *0*.

When prompted, open the clock case and move the SET/RUN switch to SET, then press RETURN. As soon as the screen says the time is set, move the switch to RUN; otherwise, the clock won't start keeping time.

The addressing in BASIC may seem a little complex, because the time data must stay stable while the address changes. Changing the address and the time data at the same time causes new data to be written to the old address, since the clock is slower than the computer.

Listing 2 is simply a BASIC demo program to show how the clock works. Note that the addresses are multiplied by *16*, to give the correct bit values for joystick 2.

For example, if the address is *9*, you multiply by *16* to give *144*. Again, this is like the experiment in issue 44. Remember, the pins are viewed in the reverse of the order that binary numbers are written.

```
PLUG 2          PLUG 1
0 0 0 0         1 0 0 1 =   9
1 0 0 1         0 0 0 0 = 144   × 16
```

This is similar to calculating low-byte/high-byte addresses, except you multiply by *16* instead of *256*.

Listing 3 is a BASIC loader for a machine language program that works like the **Atari Clock** mentioned earlier. The initialization routine sets up joystick ports and alters the display list, to create an extra screen line in graphics 0.

The program reads and displays the time during the vertical blank interval (VBI), and is both auto-loading and reset-proof. It also uses a display list interrupt (DLI) to keep the display set to the border color, regardless of how you change color registers. Without this, you could cause the display to disappear, if you set COLOR1 and COLOR2 to the same value.

If you use a 400 or 800, there'll be a flicker whenever keys are pressed. My 800XL doesn't have this problem. If you want to get rid of it, delete the DLI routine in the assembly listing and reassemble as AUTORUN.SYS.

Atari Time loads and runs in memory above the DOS buffers. If you increase the number of default buffers (or use a different DOS), you'll need to reassemble to a different starting address. The source code is included.

You'll notice there's a loop called DELAY, which seems to have no function. This loop compensates for the 8 microseconds it takes the clock to stabilize data outputs.

This is necessary because the CMOS circuits in the 5832 chip are very slow—but use very little power.

Your computer uses TTL circuits. While they're fast, they consume a lot of power. I measured the actual power consumed in standby mode at 12 microamperes, as opposed to the approximately 1,500,000 microamperes eaten up by a typical 800XL.

The rest of Listing 3 acquires time data and converts it to the Internal Code needed by the ANTIC display hardware, then formats it in the display buffer. Note that two registers also contain data for 12/24-hour display, AM/PM and leap year. These must be handled before the time is displayed.

If you want to write your own program to read time from the clock—perhaps to put time stamps onto disk files—you need to be aware of a minor potential problem. Let's say it's 10:59:59 when you start reading the time.

You have read the the hour, but, before you can read the next register, the seconds increment—the rest of the registers now contain *0*. Thus, while the actual time is 11:00:00, you've read 10:00:00!

To avoid this, you can either add some circuitry, or simply loop until you detect the seconds register increment, then read the time.

Now you know: lighting little LEDs isn't all the joystick ports are good for. There are many useful devices which can be interfaced through joystick ports.

I like making little gadgets and writing short, cute programs; I *don't* like writing DOS patches. But the most immediately useful application I can think of for **Atari Clock** is a DOS which records the time and date whenever a program or file is written to disk. Someone out there, please write a program to do this.

Another practical use would be for the security system considered in our last segment, to turn lights or radios on and off at specific times. A BBS would find this clock useful to keep accurate time, or to power-up knowing the time.

You can read the hardware clock and use it to set the Atari's internal real-time clock. That way it would come up smart—knowing the correct time and date. This could be a real blessing if you live in an area subject to power outages.

In our next installment, we'll consider a few more aspects of the joystick ports, including optical sensors, light pens and timer programs. Until then, keep tinkering. And please write. If you have any great applications or any topics you'd like to see discussed, please let me know.

An obstetrician-gynecologist by day, Lee Brilliant, M.D. turns into a bug-eyed computer monster by night. He started on computers in August 1983 with TI 99/4A and rapidly graduated to Atari. He's programmed Apple, TI, Commodore and IBM, but prefers his old 800. His favorite pastime is tearing computers apart to see how they tick. Of course, he uses a scalpel!

PARTS LIST

B1	Size AA alkaline batteries
C1,C2	20 picofarad capacitors
D1	Any small signal diode (Radio Shack 276-1122)
IC1	MSM5832 clock chip (see sources below)
P1,P2	9-pin female "D" plugs with hoods (Radio Shack 276-1538 & 276-1539; see text)
R1,R2	100K ohm ¼-watt resistors
S1	Single-pole double throw switch (½ of Radio Shack 275-407)
X1	32.768 kiloHertz crystal (see sources below)
Miscellaneous	Battery holder (Radio Shack 270-383) plus a clip Plastic case (Radio Shack 270-230) Multiconductor cable (like ribbon cable)

SOURCES

The IC is sold by Teknopak, 1534 E. Edinger Ave., Suite 8, Santa Ana, CA 92705, through their local distributors. They sell the chip with a micro-sized crystal for about $15.00.

JDR Microdevices, 1224 S. Bascom Ave., San Jose, CA 95128 also mail orders the IC for $3.95 and the crystal for $1.95, but they have a minimum order of $10.00 You can get the IDC plugs here (#IDB9S at $3.25 each) to pad out the order.

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*, issue 45, and its update on page 9.

Listing 1.
BASIC listing.

```
QC 10 OPEN #1,4,0,"K:":? "K"
GH 20 TRAP 1000
IT 30 T=54016
UD 40 DIM DAY$(2),AP$(2)
DH 50 DATA SU,MO,TU,WE,TH,FR,SA
SU 100 ? "       *** CLOCK SETTING ***"
QL 110 POSITION 2,3:? "ENTER YEAR (last 2
   digits only)    ◀◀◀◀";:INPUT YR
WF 115 IF YR>99 THEN 110
BD 120 POSITION 2,5:? "ENTER MONTH:    ◀◀
   ◀◀";:INPUT MO
LS 125 IF MO>12 THEN 120
HT 130 POSITION 2,7:? "ENTER DAY:    ◀◀◀◀
   ";:INPUT DAY
NP 135 IF DAY>31 THEN 130
CT 140 POSITION 2,9:? "WHICH FORMAT:
   1) 12 HOUR":? "▶▶     2) 24 HOUR";
IJ 150 GET #1,AMPM:IF AMPM<49 OR AMPM>50
   THEN 170
XL 160 AMPM=AMPM-49
DV 170 POSITION 2,12:? "ENTER HOUR:    ◀◀
   ◀◀";:INPUT HR
YM 171 IF HR>AMPM*12+12 THEN 170
CI 172 IF AMPM=1 THEN 180
VR 174 ? "CHOOSE 1) AM   OR 2) PM:";
FM 175 GET #1,AP:IF AP<49 OR AP>50 THEN 1
   75
RZ 176 AP=AP-49:IF AP=0 THEN AP$="AM"
IC 177 IF AP=1 THEN AP$="PM"
MS 180 POSITION 2,15:? "ENTER MINUTES:
   ◀◀◀◀";:INPUT MIN
YG 185 IF MIN>59 THEN 180
OA 190 POSITION 2,17:? "CHOOSE THE DAY OF
   THE WEEK:"
PU 195 ? "  1. SU    2. MO    3. TU    4.
```

```
   WE":? "  5. TH    6. FR    7."
PJ 200 GET #1,W:IF W<49 OR W>55 THEN 200
UE 210 W=W-49
YQ 220 POSITION 2,21:? "IS THIS A LEAP YE
   AR <Y/N>";
ZN 230 GET #1,LY
OA 240 IF LY=78 THEN LY=0:GOTO 270
PV 250 IF LY=89 THEN LY=1:GOTO 270
NK 260 GOTO 230
RO 265 REM
GM 266 REM CONVERT INPUTS TO BINARY CODED
    DECIMAL
RU 267 REM
AT 270 TRAP 40000:HRH=INT(HR/10):HRL=HR-1
   0*HRH:MINH=INT(MIN/10):MINL=MIN-10*MIN
   H:SECH=INT(SEC/10):SECL=SEC-10*SECH
CR 280 YRH=INT(YR/10):YRL=YR-10*YRH:MOH=I
   NT(MO/10):MOL=MO-10*MOH:DAYH=INT(DAY/1
   0):DAYL=DAY-10*DAYH
MM 300 ? "K":RESTORE 50:POKE 182,W:READ D
   AY$
TB 310 ? DAY$;" ";MOH;MOL;"/";DAYH;DAYL;"
   /";YRH;YRL;? :? "TIME(HR:MIN:SEC)":? :
   ? HRH;HRL;":";MINH;MINL;":";SECH;SECL;
ME 320 IF AMPM=0 THEN ? "  ";AP$
BY 330 ? :? :? "IS THIS CORRECT? <Y/N)";
GR 340 GET #1,K
HN 350 IF K=78 THEN RUN
UR 360 IF K=89 THEN 380
OI 370 GOTO 340
GH 380 P=PEEK(54018):POKE 54018,P-4:POKE
   54016,255:POKE 54018,P
EF 400 HRH=HRH+4*AP+8*AMPM:DAYH=DAYH+4*LY
YR 410 ? "K":? "SWITCH CLOCK TO THE SET
   T MODE THEN":? "PRESS ANY KEY TO WRITE
    THE TIME TO":? "THE CLOCK."
WO 420 POKE 764,255
EA 430 IF PEEK(764)=255 THEN 430
HY 435 REM ********************************
   ***
UR 436 REM THIS PART ACTUALLY SETS THE TI
   ME
IE 437 REM ********************************
   ***
BN 440 POKE T,192+YRH:POKE T,176+YRH
CV 450 POKE T,176+YRL:POKE T,160+YRL
SH 460 POKE T,160+MOH:POKE T,144+MOH
DR 470 POKE T,144+MOL:POKE T,128+MOL
JL 480 POKE T,128+DAYH:POKE T,112+DAYH
JM 490 POKE T,112+DAYL:POKE T,96+DAYL
NN 500 POKE T,96+W:POKE T,80+W
KZ 510 POKE T,80+HRH:POKE T,64+HRH
VR 520 POKE T,64+HRL:POKE T,48+HRL
FK 530 POKE T,48+MINH:POKE T,32+MINH
MC 540 POKE T,32+MINL:POKE T,16+MINL
SF 550 POKE T,16:POKE T,0
XC 600 ? :? :? "KRESET CLOCK TO READ AND
    YOU ARE":? "DONE."
PR 999 END
FG 1000 L=PEEK(186)+256*PEEK(187):TRAP 10
   00:GOTO L
```

Listing 2.
BASIC listing.

```
VD 10 T=54016:TC=54018
KX 20 P=PEEK(TC):POKE TC,P-4:POKE T,240:P
   OKE TC,P
IS 30 DIM DAY$(10),AP$(2)
OG 40 POKE 752,1:RESTORE 50
SW 50 DATA SUNDAY,MONDAY,TUESDAY,WEDNESDA
   Y,THURSDAY,FRIDAY,SATURDAY
WV 90 ? "K":? "  ***** THE CORRECT TIME I
   S *****"
PB 100 POKE T,96:W=PEEK(T)-96:POKE T,112:
   DLO=PEEK(T)-112:POKE T,128:DHI=PEEK(T)
```


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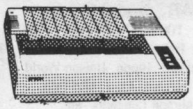

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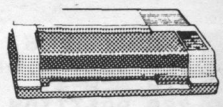

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```
   -128:POKE T,144:MOL=PEEK(T)-144
HW 110 POKE T,160:MOH=PEEK(T)-160:POKE T,
   176:YLO=PEEK(T)-176:POKE T,192:YHI=PEE
   K(T)-192
JB 120 POKE T,80:HHI=PEEK(T)-80:POKE T,64
   :HLO=PEEK(T)-64:POKE T,48:MHI=PEEK(T)-
   48:POKE T,32:MLO=PEEK(T)-32
YH 130 POKE T,80:HHI=PEEK(T)-80:AMPM=(HHI
   >7):HHI=HHI-8*AMPM:AP=(HHI>3):HHI=HHI-
   4*AP:AP$="":POKE 182,W:READ DAY$
HX 140 POKE T,16:SHI=PEEK(T)-16:POKE T,0:
   SLO=PEEK(T)
TJ 150 IF AMPM=0 AND AP=1 THEN AP$="PM"
SS 170 POSITION 4,3:? DAY$;"  ";MOH;MOL;"
   /";DHI;DLO;"/";YHI;YLO;"   ";
CU 180 ? HHI;HLO;":";MHI;MLO;":";SHI;SLO;
   "  ";AP$;"   "
LH 200 GOTO 100
```

●

Listing 3.
BASIC listing

```
WE 10 REM **********************
XM 20 REM *   ATARITIME        *
XS 30 REM *by Lee Brilliant MD*
WH 40 REM **********************
QW 100 DIM BUFF$(500):? "ß"
HA 110 FOR LINUM=0 TO 24:CKSUM=0:? "CHECK
   ING DATA LINE ";LINUM*10+1000;
HC 120 FOR D=1 TO 20:READ N:CKSUM=CKSUM+N
   :BUFF$(LINUM*20+D)=CHR$(N):NEXT D
RF 130 READ N:IF N<>CKSUM THEN POP :? "ßß
   ß DATA ERROR":STOP
RQ 140 ? :TOTAL=TOTAL+CKSUM:NEXT LINUM:IF
    TOTAL<>51165 THEN ? "ßßßERROR IN CHEC
   KSUM DATA":STOP
IE 150 ? "ßINSERT FORMATTED DOS DISK. ANY
    FILE":? "NAMED AUTORUN.SYS WILL BE OV
   ERWRITTEN"
BE 160 ? :? "PRESS RETURN TO WRITE FILE:B
   REAK TO":? "ABORT":POKE 764,255
HV 170 IF PEEK(764)<>12 THEN 170
OB 180 POKE 764,255:OPEN #1,8,0,"D:AUTORU
   N.SYS":? #1;BUFF$(1,483):CLOSE #1:END
UE 1000 DATA 255,255,252,28,200,29,173,48
   ,2,201,172,208,7,173,49,2,201,29,240,3
   ,2527
AB 1010 DATA 32,241,29,216,160,4,162,6,32
   ,123,29,133,203,10,24,101,203,170,189,
   180,2247
AQ 1020 DATA 29,153,201,29,232,200,192,7,
   208,244,200,200,162,10,32,159,29,169,1
   5,133,2604
FY 1030 DATA 204,153,201,29,200,162,8,32,
   123,29,41,3,32,162,29,162,12,32,153,29
   ,1796
EC 1040 DATA 200,200,169,26,133,204,162,5
   ,32,123,29,133,203,41,3,32,162,29,32,1
   53,2071
LM 1050 DATA 29,32,153,29,200,200,165,203
   ,41,8,208,18,169,17,166,203,224,4,208,
   2,2279
EH 1060 DATA 169,32,32,140,29,169,29,32,1
   40,29,76,98,228,138,10,10,10,10,141,0,
   1522
CS 1070 DATA 211,32,149,29,173,0,211,41,1
   5,96,202,24,105,16,153,201,29,200,96,2
   34,2217
FK 1080 DATA 234,234,96,165,204,153,201,2
   9,200,32,123,29,32,140,29,32,123,29,32
   ,140,2257
OY 1090 DATA 29,96,112,240,66,201,29,129,
   0,0,51,53,46,45,47,46,52,53,37,55,1387
EI 1100 DATA 37,36,52,40,53,38,50,41,51,3
   3,52,241,29,246,30,173,48,2,24,105,138
   1
OC 1110 DATA 3,141,178,29,133,203,173,49,
   2,105,0,141,179,29,133,204,169,172,141
   ,48,2232
BA 1120 DATA 2,169,29,141,49,2,160,0,177,
   203,200,192,0,240,13,201,65,208,245,16
   9,2465
TT 1130 DATA 172,145,203,200,169,29,145,2
   03,169,54,141,0,2,169,30,141,1,2,169,1
   92,2336
TN 1140 DATA 141,14,212,96,72,169,78,141,
   0,2,169,30,141,1,2,173,200,2,141,24,18
   08
GI 1150 DATA 208,169,10,141,23,208,104,64
   ,72,169,54,141,0,2,169,30,141,1,2,173,
   1881
MN 1160 DATA 198,2,141,24,208,173,197,2,1
   41,23,208,104,64,162,0,138,157,201,29,
   232,2404
HR 1170 DATA 224,40,208,248,173,2,211,72,
   41,251,141,2,211,169,240,141,0,211,104
   ,141,2830
EF 1180 DATA 2,211,160,252,162,28,169,7,3
   2,92,228,96,0,0,32,103,30,32,147,30,18
   13
BB 1190 DATA 169,205,141,231,2,169,30,141
   ,232,2,96,173,142,30,133,10,173,143,30
   ,133,2385
XM 1200 DATA 11,173,148,30,133,12,173,149
   ,30,133,13,172,99,228,174,100,228,169,
   7,32,2214
JH 1210 DATA 92,228,169,252,141,231,2,169
   ,28,141,232,2,108,10,0,165,12,141,148,
   30,2301
OO 1220 DATA 165,13,141,149,30,169,144,13
   3,12,169,30,133,13,32,103,30,165,10,14
   1,142,1924
QW 1230 DATA 30,165,11,141,143,30,169,161
   ,133,10,169,30,133,11,76,150,30,226,2,
   227,2047
GI 1240 DATA 2,205,30,0,0,0,0,0,0,0,0,0,0
   ,0,0,0,0,0,0,237
```

●

Listing 4.
Assembly listing.

```
;************************************
;*ATARI TIME by Lee Brilliant M.D.*
;************************************
;
;
;---------------
;SYSTEM EQUATES
;---------------
INITAD  =   $02E2
PORTA   =   $D300
PACTL   =   $D302
SETVBV  =   $E45C
XITVBV  =   $E462
TEMP    =   $CB
SEP     =   $CC
DLIST   =   $0230
DOSINI  =   $0C
MEMLO   =   $02E7
DOSVEC  =   $0A
COLOR1  =   $02C5
COLOR2  =   $02C6
COLOR4  =   $02C8
COLPF1  =   $D017
COLPF2  =   $D018
TXTLUM  =   $0A
VDSLST  =   $0200
NMIEN   =   $D40E
ASSEMBLE =  $1CFC   ;CHANGE IF
            NON-STANDARD DOS
;
;-----------------
;BEGIN VBI ROUTINE
;-----------------
;
        *=  ASSEMBLE
VBI     LDA DLIST   ;HAS DLI CHANGED
        CMP #DLDATA&255 ;BECAUSE OF
;           GRAPHICS CALL
        BNE WRNGDL  ;IF YES THEN
;           CHANGE DL
        LDA DLIST+1
        CMP #DLDATA/256
        BEQ START   ;NO THEN CONTINUE
WRNGDL  JSR DLCHNG
START   CLD         ;START VBI
        LDY #4      ;L MARGIN
        LDX #6      ;DAY OF WEEK
        JSR GETIT
        STA TEMP    ;X3 FOR OFFSET
```

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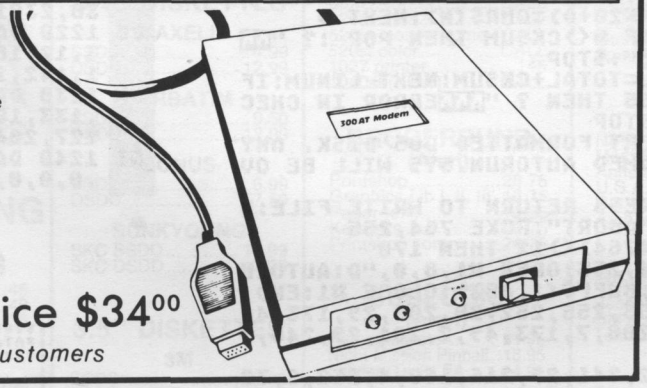

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```
        ASL A
        CLC
        ADC TEMP
        TAX
DAYLOOP LDA DTABLE,X ;PRINT DAY
        STA BUFF,Y
        INX
        INY
        CPY #7       ;ALL 3 LETTERS?
        BNE DAYLOOP  ;IF NO, REPEAT
        INY
        INY
        LDX #10      ;MONTH
        JSR GETX2
        LDA #15      ;"/"
        STA SEP
        STA BUFF,Y
        INY
        LDX #8       ;DAY
        JSR GETIT
        AND #3       ;MASK LEAP YR BIT
        JSR PUTX2
        LDX #12      ;YEAR
        JSR SEPX2
        INY
        INY
        LDA #26      ;":"
        STA SEP
        LDX #5       ;HOURS
        JSR GETIT
        STA TEMP
        AND #3       ;MASK HOUR
;               CONTROL BITS
        JSR PUTX2
        JSR SEPX2    ;MINUTES
        JSR SEPX2    ;SECONDS
        INY
        INY
        LDA TEMP     ;24HOUR CLOCK?
        AND #8
        BNE END      ;YES? DONE
        LDA #17      ;LOAD "A"
        LDX TEMP
        CPX #4       ;AM?
        BNE NEXT     ;YES
        LDA #32      ;IF NO, LOAD "P"
NEXT    JSR PUTIT    ;PRINT IT
        LDA #29      ;"M"
        JSR PUTIT    ;PRINT IT
END     JMP XITVBV   ;ALL DONE
;
;CLOCK SUBROUTINES
;
GETIT   TXA          ;GET REGISTER ADR
        ASL A        ;MUTIPLY BY 16
        ASL A
        ASL A
        ASL A
        STA PORTA    ;CALL REGISTER
        JSR DELAY    ;WAIT FOR
;                CMOS BUSEC
        LDA PORTA    ;GET RESULTS
        AND #15      ;MASK ADDRESS
        RTS
PUTIT   DEX          ;NEXT REGISTER
;        + SEPARATOR
        CLC
        ADC #16      ;CONVERT TO ICODE
        STA BUFF,Y   ;PUT IN SCRN BUF
        INY          ;NEXT COLUMN
        RTS
DELAY   NOP          ;8 USEC.
        NOP
        NOP
        RTS
SEPX2   LDA SEP      ;2 DIGITS
        STA BUFF,Y   ;PUT TO SCREEN
        INY          ;NEXT COLUMN
GETX2   JSR GETIT    ;GET 2 AND PUT 2
PUTX2   JSR PUTIT    ;GET 1 AND PUT 2
GETX1   JSR GETIT    ;GET 1 AND PUT 1
        JSR PUTIT
        RTS
DLDATA  .BYTE 112,240,66 ;DL DATA
        .WORD BUFF
        .BYTE 129    ;JUMP WITH DLI
OLDDL   .WORD 0
DTABLE  .BYTE "35.-/.45%7%$4"
        .BYTE "(5&2)3!4"
BUFF    *=  BUFF+40  ;SCREEN BUFFER
;
;-----------------------
;INITIALIZATION ROUTINES
;-----------------------
;
DLCHNG  LDA DLIST    ;CHANGE DISPLAY
        CLC          ;LIST START ADR
        ADC #3
        STA OLDDL
        STA TEMP
        LDA DLIST+1
        ADC #0
        STA OLDDL+1
        STA TEMP+1
        LDA #DLDATA&255 ;POINT TO NEW
        STA DLIST    ;DISPLAY LIST
        LDA #DLDATA/256
        STA DLIST+1
        LDY #0       ;FIX END OF
NEXTDL  LDA (TEMP),Y ;DL TO POINT
        INY          ;TO NEW DLI
        CPY #0
        BEQ DLISET
        CMP #65
        BNE NEXTDL
FIXJMP  LDA #DLDATA&255
        STA (TEMP),Y
        INY
        LDA #DLDATA/256
        STA (TEMP),Y
;
;-------------------------------
;DISPLAY LIST INTERRUPT ROUTINES
;-------------------------------
;
DLISET  LDA #DLI1&255 ;SET DLI VEC
        STA VDSLST
        LDA #DLI1/256
        STA VDSLST+1
        LDA #192
        STA NMIEN    ;ENABLE DLI'S
        RTS
DLI1    PHA          ;DLI STARTS HERE
        LDA #DLI2&255 ;CHANGE DLI VEC
        STA VDSLST
        LDA #DLI2/256
        STA VDSLST+1
        LDA COLOR4   ;SET TO BCKGRND
        STA COLPF2
        LDA #TXTLUM  ;SET LUMINANCE
        STA COLPF1
        PLA
        RTI
DLI2    PHA
        LDA #DLI1&255 ;RESET DLI VEC
        STA VDSLST
        LDA #DLI1/256
        STA VDSLST+1
        LDA COLOR2   ;RESET SCRN CLRS
        STA COLPF2
        LDA COLOR1
        STA COLPF1
        PLA
        RTI
;
;----------------
;INITIALIZE PORTS
;----------------
;
INIT    LDX #0
        TXA
CLRLOOP STA BUFF,X   ;CLR SCRN BUFF
        INX
        CPX #40
        BNE CLRLOOP
        LDA PACTL    ;INIT JOYSTICKS
        PHA          ;SAVE FOR LATER
        AND #255-4   ;SET DATA CTL
        STA PACTL    ;TO WRITE
        LDA #240     ;UPPER 4 BITS
        STA PORTA    ;TO OUTPUT
        PLA
        STA PACTL    ;RESTORE CTL REG
        LDY #VBI&255 ;SET UP FOR
        LDX #VBI/256 ;VBI INIT
        LDA #7
        JSR SETVBV   ;SET VBI
        RTS
;
;------------------------
;MEMORY AND DOS MANAGER
;------------------------
;
TEMPDOS .WORD 0
RESET   JSR INIT     ;INCLUDE IN
BOOTDOS JSR BOOTDOS ;RESET CHAIN
ADJMEM  LDA #NEWMEM&255 ; LOMEM
        STA MEMLO
        LDA #NEWMEM/256
        STA MEMLO+1
        RTS
XITDOS  LDA TEMPDOS ;RESTORE DOS
        STA DOSVEC   ;VECTORS
        LDA TEMPDOS+1
        STA DOSVEC+1
        LDA BOOTDOS+1
        STA DOSINI
        LDA BOOTDOS+2
        STA DOSINI+1
        LDY XITVBV+1 ;RESET STOCK VBI
        LDX XITVBV+2
        LDA #7
        JSR SETVBV
        LDA #ASSEMBLE&255
        STA MEMLO    ;RESET LOMEM
        LDA #ASSEMBLE/256
        STA MEMLO+1
        JMP (DOSVEC)
NEWMEM
;-------------------
;WARMSTART ROUTINE
;-------------------
PWRUP   LDA DOSINI   ;CHANGE DOS VEC
        STA BOOTDOS+1 ;TO SET UP
;                RESET CHAIN
        LDA DOSINI+1 ;THIS SECTION
;                SELF DELETES
        STA BOOTDOS+2
        LDA #RESET&255
        STA DOSINI
        LDA #RESET/256
        STA DOSINI+1
        JSR INIT
        LDA DOSVEC
        STA TEMPDOS
        LDA DOSVEC+1
        STA TEMPDOS+1
        LDA #XITDOS&255
        STA DOSVEC
        LDA #XITDOS/256
        STA DOSVEC+1
        JMP ADJMEM
        *=  INITAD
        .WORD PWRUP
        .END
```

●

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by David N. Plotkin

Page Designer (**PD**) is a versatile new package for your Atari from XLent Software. With it, you can design pages for use as signs, ads, or anything else requiring a custom layout. High-resolution graphics and multiple typefaces are simple to incorporate, giving a great deal of creative freedom.

When you first boot up **PD**, you're presented with a main menu. The first choice is to run the **PD** package itself. When you do so, you see a screen which is blank, except for some status notes on the first line. Through various combinations of the CNTRL and letter keys, you may: load a graphics 7.5 or 8 picture from disk; place text on the screen in either 40 or 80 columns; load one of the fifteen alternate character sets; clear the screen; switch into graphics mode; or switch between the top and bottom half of the page.

The last option, toggling between the top and bottom half of the page, is necessary because you can only see half the page you're designing on the screen at any time. This increases the resolution of the page, enabling you to do some very fine detail work. You may load a picture to either half of the page. Once it's loaded, you can overlay it with text. Putting text on-screen before loading a picture doesn't work, as the picture will erase the text when it is loaded.

Pictures to be loaded must be in uncompacted form, thus screens generated with the **Koala Pad** won't work directly. However, a choice on the main menu is the one to uncompact your **Koala Pad** file, so that it can be used with **PD**.

PD supports both a 40-column and an 80-column text mode. In the 40-column mode, you can use one of the supplied alternate character sets, or create your own from the multitude of commercial packages. The supplied character sets include such goodies as Serif, Archaic, Adventure, Script and Stylish.

Also included is an alternate "borders" character set. This consists of fifty-two designs which can be useful in making up borders (among other things).

The graphics mode is a sketchpad, which can be used to generate simple designs or to modify pictures loaded from disk. It doesn't incorporate many fancy options, but does support the basics, such as point plotting, line drawing, and some automatic shape generation.

It's handy to have and very easy to use. The cursor is controlled by your joystick, and moving the cursor up to the top line of the screen enables you to select a different option. The sphere-drawing routine is especially eyecatching.

Once you've completed your design, you may save it to disk and, of course, print it out. **PD** supports a multitude of printers, including the Epson and Epson compatibles. It works well on the Star printers, as well as on HP Thinkjet.

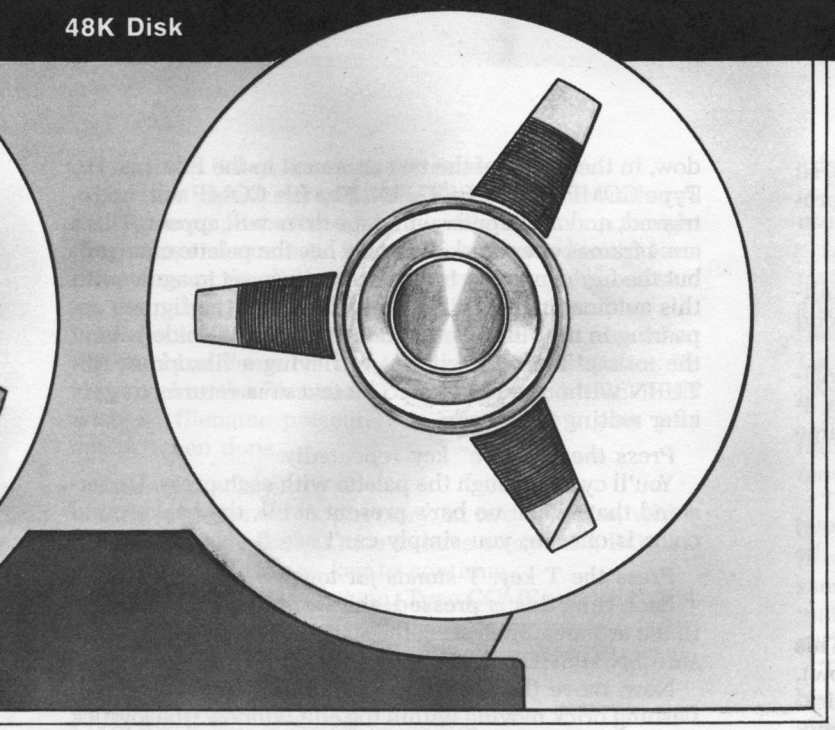
PD comes with a manual, which is, unfortunately, the weakest part of the package. The names of the fonts included on the disk aren't given anywhere, nor are print samples of the different fonts shown. The characters which make up the borders set are also not shown, making selection of the appropriate design a rather hit-or-miss affair. The manual could use some improvement in these respects.

All in all, **PD** is a well written and useful package. Comparisons to Broderbund's **Print Shop** are inevitable.

While not as much of a "cookbook" as **Print Shop**, **PD** offers more freedom in page layout. Further, for those who, like this reviewer, aren't artists, XLent offers four disks of graphics by Jennifer Brabson, whose considerable talent can be seen in XLent's advertisements. At $10.00 each, these disks considerably enhance **PD**'s usefulness.

I recommend XLent Software's **Page Designer** for those whose creativity is crying to get out.

David Plotkin, with his Master's degree in Chemical Engineering, is a Project Engineer for Chevron U.S.A. He purchased his Atari in 1980 and is interested in programming and game design, as well as word processing.



La Machine

Let your computer do the work in creating bit-mapped animation

by Stephen Alpert

Originally, I called this program **Datamaker**. It was supposed to be a bare-bones effort, not very pretty or fancy, but the thing got bigger and fatter. I kept adding "attachments," as if it were a vacuum cleaner or a food processor. So, finally, I rechristened it **La Machine** and sent it to **ANALOG Computing**.

The program was written to help me with the enormous amount of work required in creating bit-mapped animated figures. Consider the figures in **La Machine**; they're 4 bytes wide by 30 scan lines high, totaling 120 bytes per frame. Assuming we animate this figure over 4 cyclical frames, the amount of data to be handled is 4x120=480 bytes. But the problem blooms when you attempt *horizontal motion* of the figure.

The reason for this is somewhat complicated. Even in graphics mode 7½, the distance on the screen between 2 adjacent bytes is noticeable. Let's say a figure's on-screen, for instance, at hex location $8000, and we wish to move it to the right. We could erase the figure at $8000 and redraw it at $8001, then continue across the screen in this manner. The figure will appear to have moved.

The problem is that the motion will appear too crude and jerky—1-byte movement is too coarse! How can you move less than 1 byte? The answer is, you can't. You must make the figure *appear* to have moved less than 1 byte.

The basic moves.

This is accomplished by shifting the figure's data 2 bits to the right and drawing it at the *same* screen location. The figure will appear to have moved right 1 pixel. Do this two more times, for a total of 6 bits shifted, before restoring the original data and putting the figure at $8001. You'll get the smoothest possible motion.

The bad news is that these shifts alter the data, and it has to be painstakingly calculated by hand (use a pencil). The point: the numbers involved are growing.

We now have 120 bytes x 4 (counting three shifts of data) x 4 frames = 1920 bytes of data to animate and move a figure on-screen. That's just for one figure! Think of the torture involved if you're using graph paper to draw the figures before converting the data into binary then hexadecimal, and later doing shift calculations. Also, this way, the figures never come out too well the first time.

Enter La Machine.

The video game I'm writing is packed with little figures like these. So I plug in **La Machine**, and it really manhandles the little guys—swallows 'em up and spits out the numbers!

The program allows easy creation of shapes in four colors. It animates them, sends the data to printer or screen, calculates three shifts if desired, and stores and retrieves to and from the disk (sorry, no cassettes).

If you didn't understand all the stuff you just read, stick around anyway; you'll get a vast savings in toil and moil. Let your *computer* do some work once in a while. It's good for its circuits.

Listing 1 is the BASIC data used to create your copy of **La Machine**. Refer to **M/L Editor** on page 7 for typing instructions. You should create the file under the name AUTORUN.SYS.

Listing 2 should also be typed using **M/L Editor**. Create this file under the name COMP. The data file this listing produces must be on the same disk as the file created from Listing 1.

La Machine is written entirely in machine language, so there are a heckofalotta[1] data statements. If you like to program, or would like to try, it'll be worth the effort.

Machining.

Now, let's take a guided tour of **La Machine**'s capabilities. This will avoid frustration, disgruntlement and a good deal of perspiration in most Terrans.

Boot the disk. Once DOS has loaded, the 62-sector AUTORUN file will quickly load and run. After a 3- or 4-second delay for self-aggrandizement, you'll see one large and six small toilet bowls.

Press the B *key.* B *stands for big.*

The large window (hereafter called the edit window) will animate through 6 frames. To stop, press either the SPACE BAR or the trigger of joystick 1.

Press the A *key.* A *stands for actual size.*

The toilet will now wave bye-bye, in actual size. This takes place in the small window (the animation window). Now press the > key a couple times. Each press quickens the animation by 1 Vertical Blank Cycle, or 1/60 second.

The delay interval between frames is displayed in the text area and changes with each keypress. The < key slows the animation. You'll find that moving the joystick left and right accomplishes the same thing (but not as smoothly). Press either the SPACE BAR or joystick trigger to exit.

Pound on the SPACE BAR a few times. SPACE BAR *stands for Space Barn*[2].

The editor indicator ball moves to indicate the frame now appearing in the edit window.

Press the 4 *key.*

This changes the system to handle only 4-frame animation instead of 6-frame. See that the FRAMES number changes in the text area, to indicate 4 frames. The 4, 5 and 6 keys all function in this manner. The only other effect they have is that the edit indicator ball always moves to frame 0 when these keys are pressed. Set FRAMES back to 6 by pressing the 6 key.

Press the P *key.* P *stands for palette.*

The text area changes to green, indicating palette change mode. Press the joystick button repeatedly. A COLOR BAR beneath the edit window cycles through the palette, and the register indicator ball moves to indicate the shadow register involved. The shadow register's hex location and the hex value of its contents are displayed. Move the joystick left and right to change the intensity of the color; move it forward and backward to alter the hue. Notice that the hex values change, also. Hit any key except *P* to exit this mode. The text mode changes back to gray.

Press the G *key. It stands for get.*

The text area will turn blue to indicate file retrieval mode. You'll see a square cursor appear in the file window, in the center of the text area next to the Filespec D:. Type *COMP* and hit RETURN. The file COMP will be retrieved, and a computer with tape drive will appear. There are 4 frames of artwork. Not only has the palette changed, but the frame number indicator has been set to agree with this automatically. This is actually one of the figures appearing in my video game (though I haven't decided about the toilet). To abort without retrieving a file, press RETURN without a filename. The text area returns to gray after exiting this mode.

Press the "inverse" key repeatedly.

You'll cycle through the palette with each press. Understand that, when no bar's present at all, the background color is chosen; you simply can't see it.

Press the T *key.* T *stands for toggle.*

Each time this is pressed, the words *on* and *off* toggle in the text area, indicating the status of SNAPSHOT. Make sure SNAPSHOT is off.

Now, move the joystick around and notice the small, flashing brick moving within the edit window (the joystick won't respond to diagonal movements). Pressing the button will deposit color on that spot. The color will be the same as the COLOR BAR, and you should notice that the change occurs in the associated frame simultaneously.

To change color, use the inverse key. Now, doodle a little; make a mess on the screen. Then press *R* for recall. The frame will return to the condition it was in prior to your doodling. If you want, try the same thing with SNAPSHOT on—the mess is permanent.

Hard copy.

Don't you hate programs that let you make nice pictures, but won't let you have the data? What's the big secret? Turn on your interface and printer.

Press the D *key.* D *stands for data.*

The printer will immediately begin printing the data *for the frame with the ball next to it only*, in 5 x 30 format (frames are numbered 0 through 5, not 1 through 6). It'll proceed to shift the data to the right by 2 bits and print this data. It will shift and print twice more, then stop. You may abort at any time by pressing the SPACE BAR.

If there's no printer on-line, the data will go to the screen, instead. I did this as an afterthought, but at least it stops after each shift, so you can copy the data or look it over. Press any key at each pause to continue. You'll need to use CTRL-1 to see the first couple of lines before they scroll off the screen, though.

Want to know why it prints in 5 x 30, when the frames are only 4 x 30? Well, when you shift bits to the right, you bump bits out at the right end and *0*s in at the left. You need a fifth byte to take in the rightmost bits. So, before shifting, the right column is always empty—all *0*s.

Press the U *key.*

Hitting a *U* instead of a *D* will yield the data without performing the shifts.

Press the CLEAR key.

The frame being edited and the edit window will fill with the palette color. This can be used to wipe the frames, by setting the COLOR BAR to the background color.

---

[1]**Heckofalotta** (heck-uv-a-lot-tuh) *adj.* Multitudinous, very numerous. *See "oodles."*

[2]**Space Barn** (spayce barn) *n.* A place to put your cows in space; a famous dairy-products chain in the Motorola Nebula.

Back Issues

Press the S *key.* S *stands for save.*

The text area turns red. When you've done work you want to save, press S and type in a filename of up to eight characters and numbers. All work is contained within seven sectors on the disk-one sector per frame, plus one sector for palette and "frames used" information.

Obey the rules of DOS 2.0; don't start with a number. **La Machine** doesn't allow wild cards or extenders. To abort, delete the filename—or, in any case, hit RETURN with no filename present. The text window goes gray again, when done.

Press the * *key.*

This provides a disk directory, in two columns, which comes in handy. Isn't it nice to have everything DOS 2.0 compatible? Press any key to continue.

Now, press the *G* key again. Type *COMP* and RETURN. After COMP loads, press the 6 key to switch to 6-frame animation. Now, move the ball (using the SPACE BAR) until it's at the second or third frame.

Press the C *key.* C *stands for copy.*

The test area turns violet, to indicate copy mode. Now, press the SPACE BAR repeatedly. Notice that a ball marks the COPY FROM frame, while another moves freely. Take the moving ball to one of the blank frames and press the *1* key.

The frame will instantly be filled with a duplicate of the COPY FROM frame. If you don't want to copy, you may abort by pressing any key except *1* or the SPACE BAR. The text area goes gray once more.

Go to the head of the class.

That ends the tour. . .still awake? How's this: If you'd like your own work to appear at boot-up, do some drawings, then save as described in the tour. When done, reboot your system with BASIC and a DOS 2.0 disk present. The procedure is to go to the DOS menu from BASIC, then load the AUTORUN.SYS file, using option L (binary load). Then retrieve your artwork and press RESET.

The system will return you to BASIC, whereupon you'll put **La Machine** back in the drive and return to the DOS menu, by typing *DOS*. Select option K (binary save) and respond to the prompt with:

D:AUTORUN.SYS,4300,60C1,,4700

This will save the whole program, latest work included, right over the old AUTORUN.SYS file. *All commas are necessary.* **La Machine** will then boot up with your work present. Neat!

Are you wondering why the animation window is out of line with the other frames? Well, originally, the program handled only 4 frames. I put the window where I felt like putting it. Later, I decided 6 frames would allow greater flexibility. I added two more windows, spacing them far enough apart that the ball would fit easily between the two rows of frames. Consequently, the animation window needs to be moved. Sadly, like many programmers, I'm far too lazy to actually *carry out* such a correction.

Now, what do you really do with **La Machine**? Use it to create characters for your programs. No need to try for perfect animation, as in a movie; 4 frames is usually plenty. Take a look at some video game characters. A lot of them use only 2 frames.

La Machine is best used for "cyclical" animation (animation that's continuous, as a circle). This is usually best, anyway. Program logic to animate and move the figure is then easier, more straightforward. To really benefit from **La Machine** you'll need to do some assembly language programming. BASIC will be too slow.

Start out simply. Motion isn't always necessary; create figures that animate in place. Toilet bowls don't need to move, for example; people wouldn't appreciate it.

This can really be a useful program, good for experimenting with bit-mapping figures, to learn more about this technique of programming (which many beginners seem mystified by). Player/missile animation is great and makes life easier, but there are only four player/missiles, and color is a problem.

The multicolor character mode, ANTIC mode 4, is nice, but can be very restrictive. Bit-mapping in mode 7½ really gives you a lot of power and freedom. The price is memory, of course, but there's little you can't do in this mode.

Stephen Alpert is a free-lance programmer, working on a marketable video game for Atari computers. He worked as an electronic technician for about seven years, leaving the field after discovering that computers would better satisfy his technical and creative interests.

Listing 1.

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255,255,234,170,170,171,234,170,7692
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63
1030 DATA 255,251,239,191,255,251,239,
255,255,251,239,255,255,251,239,255,47
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1040 DATA 255,251,239,255,255,251,239,
255,255,251,239,234,175,251,239,170,23
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1050 DATA 171,251,239,170,171,251,234,
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1060 DATA 254,171,234,176,58,171,234,1
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1120 DATA 175,251,239,170,171,251,239,
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1820 DATA 2,160,0,169,170,145,240,145,
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2550 DATA 22,0,0,0,81,82,82,82,82,82,8
2,82,82,82,82,82,2899
2560 DATA 82,69,0,0,0,22,0,38,114,97,1
09,101,115,0,0,0,9118
2570 DATA 0,4,18,35,20,26,0,18,24,0,84
,0,124,128,172,161,2872
2580 DATA 128,173,161,163,168,169,174,
165,128,124,0,0,0,0,0,0,973
2590 DATA 0,0,0,0,0,0,0,0,0,0,4,18,35,21
,26,0,20,4205
2600 DATA 18,0,0,0,124,0,36,26,52,40,3
7,34,47,55,44,0,7422
```

```
2610 DATA 0,124,0,0,0,128,128,128,164,
165,172,161,185,128,128,0,8613
2620 DATA 0,4,18,35,22,26,0,16,33,0,0,
0,124,179,244,229,4955
2630 DATA 246,229,128,161,236,240,229,
242,244,124,0,0,0,0,0,4,4021
2640 DATA 16,22,0,54,34,35,0,0,0,0,0,0
,0,0,0,0,3296
2650 DATA 0,0,0,0,90,82,82,82,82,82,82
,82,82,82,82,82,3022
2660 DATA 82,67,0,0,0,0,0,0,0,0,0,0,0,
0,0,0,2876
2670 DATA 0,51,110,97,112,115,104,111,
116,0,47,46,0,0,0,0,8469
2680 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,2680
2690 DATA 0,0,0,0,0,0,0,0,169,78,141,152
,96,169,75,141,153,6788
2700 DATA 96,169,0,133,20,96,165,20,20
1,180,208,250,169,161,141,152,3552
2710 DATA 96,169,76,141,153,96,96,174,
41,92,189,15,92,133,244,189,631
2720 DATA 21,92,133,245,169,1,141,239,
71,169,6,141,240,71,162,0,8685
2730 DATA 160,0,189,79,92,145,244,232,
200,204,239,71,208,244,165,244,8487
2740 DATA 24,105,40,144,2,230,245,133,
244,206,240,71,208,226,96,174,5679
2750 DATA 41,92,189,15,92,133,244,189,
21,92,133,245,169,1,141,239,1742
2760 DATA 71,169,6,141,240,71,162,0,16
0,0,189,85,92,145,244,232,1648
2770 DATA 200,204,239,71,208,244,165,2
44,24,105,40,144,2,230,245,133,2473
2780 DATA 244,206,240,71,208,226,96,16
9,0,141,36,92,141,37,92,169,8205
2790 DATA 56,141,40,92,169,144,141,7,2
12,169,14,141,192,2,169,56,7767
2800 DATA 141,0,208,162,0,169,240,157,
34,148,232,224,4,208,248,169,4577
2810 DATA 2,141,29,208,141,27,208,96,3
2,233,77,174,41,92,232,236,1734
2820 DATA 212,69,208,2,162,0,142,41,92
,32,126,74,32,177,77,173,6173
2830 DATA 1,92,240,28,201,40,208,9,32,
126,74,32,234,72,76,90,5996
2840 DATA 79,201,54,208,14,32,177,82,1
73,51,92,240,3,32,96,73,5526
2850 DATA 76,90,79,201,45,208,25,174,5
1,92,208,9,238,51,92,32,6662
2860 DATA 217,80,76,90,79,162,0,142,51
,92,32,217,80,76,90,79,5381
2870 DATA 201,39,208,6,32,133,80,76,90
,79,201,33,240,154,201,21,8757
2880 DATA 208,6,32,227,82,76,90,79,201
,63,208,6,32,44,83,76,4524
2890 DATA 90,79,201,58,208,6,32,63,84,
76,90,79,201,11,208,6,5214
2900 DATA 32,63,84,76,90,79,201,18,208
,16,162,100,142,48,92,32,5513
2910 DATA 221,86,162,4,142,48,92,76,90
,79,201,62,208,19,169,66,7171
2920 DATA 141,48,92,32,103,87,169,4,14
1,48,92,32,35,88,76,90,3225
2930 DATA 79,201,61,208,19,169,164,141
,48,92,32,103,87,169,4,141,6564
2940 DATA 48,92,32,165,88,76,90,79,201
,10,208,6,32,122,73,76,4790
2950 DATA 90,79,201,24,208,8,169,4,32,
9,81,76,90,79,201,29,4136
2960 DATA 208,8,169,5,32,9,81,76,90,79
,201,27,208,8,169,6,4682
2970 DATA 32,9,81,76,90,79,201,7,208,6
,32,193,81,76,90,79,5285
2980 DATA 173,132,2,208,61,173,36,92,2
4,42,42,170,189,237,90,133,8977
2990 DATA 245,189,117,90,133,244,24,10
9,37,92,144,2,230,245,133,244,2673
3000 DATA 162,4,160,0,173,2,92,145,244
,165,244,24,105,40,144,2,7266
3010 DATA 230,245,133,244,202,208,237,
32,234,72,173,51,92,240,3,32,9732
3020 DATA 96,73,174,120,2,224,15,240,5
8,224,6,240,54,224,10,240,1179
3030 DATA 50,224,5,240,46,224,9,240,42
,224,14,208,3,76,251,79,9460
3040 DATA 224,13,208,3,76,52,80,224,11
,240,27,173,40,92,24,105,5690
3050 DATA 4,170,236,38,92,240,12,238,3
7,92,142,0,208,142,40,92,7721
3060 DATA 32,111,80,76,105,78,173,40,9
2,24,105,252,205,39,92,48,6988
3070 DATA 242,170,206,37,92,142,0,208,
142,40,92,32,111,80,76,105,5851
3080 DATA 78,174,36,92,240,248,189,101
,91,133,246,173,132,91,133,247,4669
3090 DATA 160,0,169,0,145,246,200,192,
4,208,249,202,189,101,91,133,3537
3100 DATA 246,173,132,91,133,247,142,3
6,92,160,0,169,240,145,246,200,4377
3110 DATA 192,4,208,249,32,111,80,76,1
05,78,174,36,92,224,29,240,9602
3120 DATA 246,189,101,91,133,246,173,1
32,91,133,247,160,0,169,0,145,291
3130 DATA 246,200,192,4,208,249,232,18
9,101,91,133,246,173,132,91,133,3862
3140 DATA 247,142,36,92,160,0,169,240,
145,246,200,192,4,208,249,32,3530
3150 DATA 111,80,76,105,78,169,0,133,2
0,173,120,2,201,15,240,10,6374
3160 DATA 165,20,201,8,240,4,208,241,2
08,235,96,32,151,89,169,8,142
3170 DATA 141,242,71,174,57,92,232,224
,4,208,2,162,0,142,57,92,7354
3180 DATA 32,141,89,169,242,133,244,16
9,117,133,245,160,0,189,53,92,1416
3190 DATA 145,244,200,192,16,240,3,76,
170,80,165,244,24,105,40,144,9099
3200 DATA 2,230,245,133,244,206,242,71
,208,225,32,206,80,189,53,92,2546
3210 DATA 141,2,92,96,169,0,133,20,165
,20,201,10,208,250,96,169,315
3220 DATA 255,141,242,2,169,116,133,24
4,169,77,133,245,160,2,173,51,1128
3230 DATA 92,240,14,185,61,92,145,244,
136,208,248,173,241,2,208,251,6813
3240 DATA 96,185,58,92,145,244,136,208
,248,173,241,2,208,251,96,72,4500
3250 DATA 32,233,77,162,0,142,41,92,32
,177,77,104,141,212,69,170,9211
3260 DATA 189,113,93,24,105,224,141,19
1,76,96,32,68,81,169,255,141,746
3270 DATA 252,2,206,66,81,174,66,81,20
8,11,162,20,142,66,81,173,7724
3280 DATA 10,210,141,192,2,76,98,228,1
5,120,173,252,2,201,255,208,4132
3290 DATA 6,169,0,141,1,92,96,201,54,2
40,66,201,40,240,62,201,1085
3300 DATA 21,240,58,201,45,240,54,201,
39,240,50,201,33,240,46,201,1838
3310 DATA 63,240,42,201,58,240,38,201,
11,240,34,201,62,240,30,201,1504
3320 DATA 18,240,26,201,61,240,22,201,
10,240,18,201,24,240,14,201,405
3330 DATA 29,240,10,201,27,240,6,201,7
,240,2,169,0,141,1,92,5872
3340 DATA 96,169,171,141,0,2,169,81,14
1,1,2,169,255,141,14,212,8914
3350 DATA 96,72,138,72,173,47,92,174,4
8,92,141,10,212,141,23,208,8901
3360 DATA 142,24,208,104,170,104,64,32
,152,82,173,40,92,72,169,0,6078
3370 DATA 141,0,208,169,2,10,10,10,10,
170,169,12,157,66,3,32,2346
3380 DATA 86,228,169,2,10,10,10,10,170
,169,6,157,74,3,169,0,3406
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3390 DATA 157,75,3,169,91,157,68,3,169
,92,157,69,3,169,3,157,6237
3400 DATA 66,3,32,86,228,152,48,80,169
,162,141,48,2,169,96,141,8296
3410 DATA 49,2,169,162,141,198,2,141,2
00,2,169,12,141,197,2,169,8801
3420 DATA 0,133,240,169,129,133,241,16
5,17,157,72,3,169,0,157,73,7803
3430 DATA 3,169,93,157,68,3,169,93,157
,69,3,169,5,157,66,3,4428
3440 DATA 32,86,228,152,48,6,32,118,82
,76,58,82,169,255,141,242,1254
3450 DATA 2,173,242,2,201,255,240,249,
169,2,10,10,10,10,170,169,8034
3460 DATA 12,157,66,3,32,86,228,169,0,
141,48,2,169,96,141,49,6022
3470 DATA 2,104,141,40,92,141,0,208,32
,102,89,96,160,0,169,93,6775
3480 DATA 133,246,169,93,133,247,177,2
46,24,105,224,145,240,200,192,17,4880
3490 DATA 208,244,165,240,24,105,20,14
4,2,230,241,133,240,96,160,0,1112
3500 DATA 132,240,169,129,133,241,169,
0,145,240,200,208,251,230,241,165,9568
3510 DATA 241,201,133,208,241,96,6,169
,120,141,41,83,169,16,141,42,7704
3520 DATA 83,169,66,133,240,169,98,133
,241,160,0,173,2,92,145,240,1809
3530 DATA 200,192,16,208,249,165,240,2
4,105,40,144,2,230,241,133,240,4253
3540 DATA 206,41,83,208,228,32,234,72,
96,169,0,141,0,208,141,241,1584
```

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3550 DATA 2,32,233,77,173,241,2,240,3,
76,18,83,173,132,2,208,8304
3560 DATA 3,76,18,83,174,41,92,232,236
,212,69,208,2,162,0,142,9782
3570 DATA 41,92,32,126,74,76,238,82,17
3,40,92,141,0,208,169,0,7651
3580 DATA 141,41,92,32,177,77,32,126,7
4,173,132,2,240,251,96,0,8732
3590 DATA 0,0,32,233,77,169,255,141,24
2,2,141,0,208,169,30,141,455
3600 DATA 240,71,169,37,133,244,169,11
4,133,245,174,41,92,189,3,92,273
3610 DATA 133,240,189,9,92,133,241,160
,0,177,240,145,244,200,192,4,4117
3620 DATA 208,247,165,244,24,105,40,14
4,2,230,245,133,244,165,240,24,4050
3630 DATA 105,40,144,2,230,241,133,240
,206,240,71,208,218,32,214,83,5053
3640 DATA 174,41,92,232,236,212,69,208
,2,162,0,142,41,92,173,132,9569
3650 DATA 2,240,50,173,120,2,201,7,208
,6,32,226,83,76,55,83,6341
3660 DATA 201,11,208,6,32,248,83,76,55
,83,173,242,2,201,33,240,675
3670 DATA 20,201,55,208,6,32,226,83,76
,55,83,201,54,208,3,32,6287
3680 DATA 248,83,76,55,83,169,0,141,41
,92,32,177,77,32,126,74,5387
3690 DATA 173,132,2,240,251,173,40,92,
141,0,208,96,169,0,133,20,7623
3700 DATA 165,20,205,176,82,208,249,96
,173,176,82,24,105,255,208,2,1987
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3710 DATA 169,15,141,176,82,169,255,14
1,242,2,32,7,84,96,173,176,9854
3720 DATA 82,24,105,1,201,16,208,234,1
69,1,76,236,83,173,176,82,1250
3730 DATA 41,15,170,189,113,93,24,105,
224,141,59,77,173,176,82,41,8796
3740 DATA 240,24,106,106,106,106,170,1
89,113,93,24,105,224,141,58,77,9097
3750 DATA 173,120,2,201,15,208,249,96,
169,83,141,98,86,169,0,141,9625
3760 DATA 0,208,76,80,84,162,80,142,98
,86,162,0,142,126,86,201,9452
3770 DATA 11,240,3,238,126,86,169,255,
141,242,2,169,0,141,35,92,9301
3780 DATA 169,96,141,14,212,169,1,10,1
0,10,10,170,169,12,157,66,4897
3790 DATA 3,32,86,228,169,1,10,10,10,1
0,170,169,8,157,74,3,3576
3800 DATA 169,0,157,75,3,169,98,157,68
,3,169,86,157,69,3,169,7000
3810 DATA 3,157,66,3,32,86,228,48,159,
32,62,86,32,126,74,32,4260
3820 DATA 234,72,32,96,73,169,133,133,
246,169,91,133,247,162,0,160,2592
3830 DATA 0,140,96,92,140,127,86,172,1
27,86,177,246,72,41,240,74,1402
3840 DATA 74,74,74,168,185,113,93,157,
97,92,104,41,15,168,185,113,9025
3850 DATA 93,157,217,92,232,238,127,86
,238,96,92,173,96,92,201,4,1246
3860 DATA 208,213,169,0,141,96,92,142,
67,81,138,74,74,170,202,189,1277
3870 DATA 131,86,72,41,240,74,74,74,74
,168,185,113,93,157,161,86,242
3880 DATA 104,41,15,168,185,113,93,157
,191,86,174,67,81,224,120,208,2907
3890 DATA 166,169,30,141,242,71,169,4,
141,96,92,162,16,169,100,157,9670
3900 DATA 68,3,169,86,157,69,3,169,13,
157,72,3,169,0,157,73,5632
3910 DATA 3,172,41,92,185,113,93,141,1
11,86,172,35,92,185,113,93,9270
3920 DATA 141,121,86,169,11,157,66,3,3
2,86,228,169,113,157,68,3,7139
3930 DATA 169,86,157,69,3,169,11,157,6
6,3,32,86,228,169,3,157,7275
3940 DATA 72,3,169,128,157,68,3,169,86
,157,69,3,160,0,185,97,7149
3950 DATA 92,141,128,86,185,217,92,141
,129,86,200,169,32,141,130,86,1016
3960 DATA 152,72,169,11,157,66,3,32,86
,228,104,168,206,96,92,208,1209
3970 DATA 221,169,4,141,96,92,173,242,
2,201,255,240,3,76,217,85,2715
3980 DATA 152,72,74,74,168,136,185,161
,86,141,128,86,185,191,86,141,2282
3990 DATA 129,86,169,155,141,130,86,16
9,11,157,66,3,32,86,228,104,7992
4000 DATA 168,206,242,71,208,168,173,9
8,86,201,83,208,3,32,80,86,8889
4010 DATA 173,126,86,240,10,238,35,92,
173,35,92,201,4,208,33,169,9606
4020 DATA 255,141,14,212,169,1,10,10,1
0,10,170,169,12,157,66,3,3928
4030 DATA 32,86,228,173,98,86,201,83,2
08,5,104,104,76,0,71,96,6590
4040 DATA 169,30,141,242,71,169,2,141,
78,92,160,0,140,127,86,162,9033
4050 DATA 0,174,127,86,24,126,133,91,2
32,126,133,91,232,126,133,91,1792
4060 DATA 232,126,133,91,152,170,126,1
31,86,206,78,92,208,227,169,2,2262
4070 DATA 141,78,92,200,192,30,240,9,1
52,10,10,141,127,86,76,11,5776
4080 DATA 86,76,167,84,162,0,138,157,1
31,86,157,191,86,157,161,86,1352
4090 DATA 232,224,30,208,242,96,169,25
5,141,242,2,173,242,2,201,255,6757
4100 DATA 240,249,169,255,141,242,2,96
,83,58,155,155,155,14,70,82,8769
4110 DATA 65,77,69,35,32,48,155,14,83,
72,73,70,84,35,32,48,2261
4120 DATA 32,32,32,155,0,7,48,48,155,0
,0,0,0,0,0,0,7089
4130 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,4130
4140 DATA 0,0,0,0,0,0,0,0,48,48,48,48,48
,48,48,48,48,9324
4150 DATA 48,48,48,48,48,48,48,48,48,48,4
8,48,48,48,48,48,48,678
4160 DATA 48,48,48,48,48,48,48,48,48,48,4
8,48,48,48,48,48,48,688
4170 DATA 48,48,48,48,48,48,48,48,48,48,4
8,48,48,48,48,48,48,698
4180 DATA 48,48,48,173,41,92,141,49,92
,141,50,92,169,255,141,242,2942
4190 DATA 2,173,242,2,201,31,240,84,20
1,33,240,7,201,255,240,241,7317
4200 DATA 76,38,87,173,41,92,205,49,92
,240,3,32,233,77,238,41,9867
4210 DATA 92,173,41,92,205,212,69,208,
5,169,0,141,41,92,141,50,7746
4220 DATA 92,32,177,77,169,255,141,242
,2,76,235,86,173,49,92,141,1479
4230 DATA 41,92,205,50,92,240,3,32,233
,77,173,50,92,141,41,92,8074
4240 DATA 32,177,77,32,126,74,169,255,
141,242,2,96,173,49,92,170,1180
4250 DATA 173,41,92,141,50,92,142,41,9
2,32,126,74,173,50,92,170,7940
4260 DATA 142,41,92,32,234,72,32,96,73
,76,38,87,96,160,8,169,6673
4270 DATA 0,153,2,77,136,208,250,169,1
28,141,2,77,169,2,10,10,5963
4280 DATA 10,10,170,169,4,157,74,3,169
,0,157,75,3,169,111,157,7730
4290 DATA 68,3,169,93,157,69,3,169,3,1
57,66,3,32,86,228,160,7774
4300 DATA 2,140,127,86,162,32,169,1,15
7,72,3,169,0,157,73,3,5035
4310 DATA 169,92,157,68,3,169,93,157,6
9,3,169,7,157,66,3,32,4458
4320 DATA 86,228,173,92,93,201,155,240
,84,201,126,240,54,201,48,48,2461
4330 DATA 233,201,91,16,229,201,58,48,
4,201,65,48,221,172,127,86,342
4340 DATA 153,81,93,56,233,32,153,0,77
,238,127,86,173,127,86,201,1621
4350 DATA 11,208,5,169,10,141,127,86,1
69,128,172,127,86,153,0,77,8650
4360 DATA 76,180,87,172,127,86,192,2,2
40,176,169,0,153,0,77,206,475
4370 DATA 127,86,172,127,86,169,128,15
3,0,77,76,180,87,172,127,86,9843
4380 DATA 153,81,93,169,0,153,0,77,96,
173,84,93,201,155,240,117,2073
4390 DATA 169,96,141,14,212,169,2,10,1
0,10,10,170,169,12,157,66,5514
4400 DATA 3,32,86,228,169,2,10,10,10,1
0,170,169,8,157,74,3,4192
4410 DATA 169,0,157,75,3,169,81,157,68
,3,169,93,157,69,3,169,7575
4420 DATA 3,157,66,3,32,86,228,48,45,1
60,0,140,127,86,185,64,7942
4430 DATA 92,157,68,3,185,71,92,157,69
,3,169,121,157,72,3,169,8063
4440 DATA 0,157,73,3,169,9,157,66,3,32
,86,228,238,127,86,172,454
4450 DATA 127,86,192,7,208,216,169,2,1
0,10,10,10,170,169,12,157,6576
4460 DATA 66,3,32,86,228,169,255,141,1
4,212,96,173,84,93,201,155,3306
4470 DATA 240,126,169,96,141,14,212,16
9,2,10,10,10,10,170,169,12,5063
4480 DATA 157,66,3,32,86,228,169,2,10,
10,10,10,170,169,4,157,5471
```

```
4490 DATA 74,3,169,0,157,75,3,169,31,1
57,68,3,169,93,157,69,7726
4500 DATA 3,169,3,157,66,3,32,86,228,4
8,54,160,0,140,127,86,7025
4510 DATA 185,64,92,157,68,3,185,71,92
,157,69,3,169,121,157,72,8539
4520 DATA 3,169,0,157,73,3,169,5,157,6
6,3,32,86,228,238,127,9497
4530 DATA 86,172,127,86,192,7,208,216,
32,102,89,32,61,74,32,48,5619
4540 DATA 89,169,2,10,10,10,10,170,169
,12,157,66,3,32,86,228,6138
4550 DATA 169,255,141,14,212,96,32,233
,77,162,0,142,41,92,32,126,7766
4560 DATA 74,32,177,77,32,234,72,32,96
,89,32,233,77,238,41,92,9183
4570 DATA 174,41,92,224,6,208,231,32,2
33,77,162,0,142,41,92,32,8110
4580 DATA 126,74,32,177,77,96,160,255,
136,208,253,96,173,208,69,141,5470
4590 DATA 200,2,162,0,189,209,69,157,1
96,2,232,224,3,208,245,173,5636
4600 DATA 212,69,201,4,48,7,201,6,16,3
,76,137,89,169,6,32,4085
4610 DATA 9,81,96,32,163,89,160,0,169,
84,145,244,96,174,57,92,561
4620 DATA 32,163,89,169,0,160,0,145,24
4,189,31,92,133,245,189,27,1998
4630 DATA 92,24,105,3,144,2,230,245,13
3,244,96,2,170,170,170,170,3976
4640 DATA 128,2,0,0,0,0,128,2,0,0,0,0,
128,2,0,0,7376
4650 DATA 0,0,128,2,0,0,0,0,128,2,0,0,
0,0,128,2,8166
4660 DATA 0,0,0,0,128,2,0,0,0,0,128,2,
0,0,0,0,6744
4670 DATA 128,2,0,0,0,0,128,2,0,0,0,0,
128,2,0,0,7406
4680 DATA 0,0,128,2,0,0,0,0,128,2,0,0,
0,0,128,2,8196
4690 DATA 0,0,0,0,128,2,0,0,0,0,128,2,
0,0,0,0,6774
4700 DATA 128,2,0,0,0,0,128,2,0,0,0,0,
128,2,0,0,7436
4710 DATA 0,0,128,2,0,0,0,0,128,2,0,0,
0,0,128,2,8226
4720 DATA 0,0,0,0,128,2,0,0,0,0,128,2,
0,0,0,0,6804
4730 DATA 128,2,0,0,0,0,128,2,0,0,0,0,
128,2,0,0,7466
4740 DATA 0,0,128,2,0,0,0,0,128,2,0,0,
0,0,128,2,8256
4750 DATA 0,0,0,0,128,2,170,170,170,17
0,128,66,70,74,78,226,114
4760 DATA 230,234,238,130,134,138,142,
34,38,42,46,194,198,202,206,98,3112
4770 DATA 102,106,110,2,6,10,14,162,16
6,170,174,66,70,74,78,226,9538
4780 DATA 230,234,238,130,134,138,142,
34,38,42,46,194,198,202,206,98,3132
4790 DATA 102,106,110,2,6,10,14,162,16
6,170,174,66,70,74,78,226,9558
4800 DATA 230,234,238,130,134,138,142,
34,38,42,46,194,198,202,206,98,3152
4810 DATA 102,106,110,2,6,10,14,162,16
6,170,174,66,70,74,78,226,9578
4820 DATA 230,234,238,130,134,138,142,
34,38,42,46,194,198,202,206,98,3172
4830 DATA 102,106,110,98,98,98,98,98,9
8,98,98,99,99,99,99,100,8300
4840 DATA 100,100,100,100,100,100,100,
101,101,101,101,102,102,102,102,102,86
18
4850 DATA 102,102,102,103,103,103,103,
103,103,103,103,104,104,104,104,105,89
38
4860 DATA 105,105,105,105,105,105,105,
106,106,106,106,107,107,107,107,107,93
18
4870 DATA 107,107,107,108,108,108,108,
108,108,108,108,109,109,109,109,110,96
38
4880 DATA 110,110,110,110,110,110,110,
111,111,111,111,112,112,112,112,112,18
4890 DATA 112,112,112,113,113,113,113,
113,113,113,113,114,114,114,114,115,33
8
4900 DATA 115,115,115,115,115,115,115,
116,116,116,116,34,38,42,46,50,5508
4910 DATA 54,58,62,66,70,74,78,82,86,9
0,94,98,102,106,110,114,7694
4920 DATA 118,122,126,130,134,138,142,
146,150,154,148,255,255,255,255,234,18
72
4930 DATA 170,170,171,234,170,170,171,
234,170,170,171,234,170,170,171,234,64
6
4940 DATA 170,170,171,234,170,170,171,
235,255,255,235,239,255,255,251,239,66
18
4950 DATA 255,255,251,239,175,255,251,
239,191,255,251,239,255,255,251,239,78
70
4960 DATA 255,255,251,239,255,255,251,
239,255,255,251,239,234,175,251,239,74
63
4970 DATA 170,171,251,239,170,171,251,
239,0,3,251,234,255,254,171,234,1515
4980 DATA 255,254,171,234,255,254,171,
234,176,58,171,234,128,10,171,234,8026
4990 DATA 191,250,171,234,191,250,171,
213,117,117,87,213,255,253,87,255,464
5000 DATA 255,255,255,255,255,255,255,
0,85,47,127,207,31,56,136,98,2051
5010 DATA 103,108,114,98,103,188,12,92
,172,197,21,99,105,110,115,99,9677
5020 DATA 105,169,209,249,33,76,76,76,
77,0,0,0,120,56,56,0,2724
5030 DATA 0,192,48,12,3,10,4,0,0,1,0,0
,85,170,255,1,3045
5040 DATA 47,38,38,47,46,0,0,120,240,1
04,224,88,208,67,67,67,9094
5050 DATA 68,68,69,69,0,60,255,255,255
,255,60,0,0,0,0,0,5427
5060 DATA 0,68,58,42,46,42,4,16,70,70,
70,70,70,70,70,70,3176
5070 DATA 53,53,53,70,70,70,70,70,48,7
0,51,70,50,67,48,70,3449
5080 DATA 48,67,48,70,49,67,56,70,48,6
7,48,70,50,67,48,70,3183
5090 DATA 48,70,50,70,65,69,66,70,70,6
6,70,70,53,53,53,70,3715
5100 DATA 53,53,53,70,53,53,53,70,54,6
5,53,70,54,69,53,70,3354
5110 DATA 54,65,53,70,54,50,53,70,54,6
5,53,70,54,69,53,70,3376
5120 DATA 54,65,53,70,54,69,53,70,54,6
5,53,70,53,53,53,70,3263
5130 DATA 65,65,66,70,65,65,66,70,65,6
5,66,70,70,70,70,22,3633
5140 DATA 70,70,70,70,70,70,70,53,53,5
3,55,55,70,70,55,55,3391
5150 DATA 51,48,55,52,48,48,55,52,48,4
8,55,52,48,57,55,52,2219
5160 DATA 48,48,55,52,48,48,55,54,51,4
8,55,55,65,65,55,55,2686
5170 DATA 70,70,55,53,53,53,55,53,53,5
3,55,53,53,53,55,53,2501
5180 DATA 65,65,55,53,54,50,55,53,65,6
5,55,53,69,54,55,53,2933
5190 DATA 65,65,55,53,54,69,55,53,65,6
5,55,53,50,54,55,53,2810
5200 DATA 65,65,55,53,53,53,55,70,65,6
5,70,70,65,65,70,70,4070
5210 DATA 65,65,70,70,70,70,70,68,58,8
4,72,69,66,79,87,76,5166
```

```
5220 DATA 155,0,155,49,53,55,32,70,82,
69,69,32,83,69,67,84,4380
5230 DATA 79,82,83,155,155,75,58,48,49
,50,51,52,53,54,55,56,3649
5240 DATA 57,65,66,67,68,69,70,0,0,0,0
,0,0,0,0,0,7137
5250 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5250
5260 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5260
5270 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5270
5280 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5280
5290 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5290
5300 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5300
5310 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5310
5320 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5320
5330 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5330
5340 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5340
5350 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5350
5360 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5360
5370 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5370
5380 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5380
5390 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5390
5400 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5400
5410 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5410
5420 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5420
5430 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5430
5440 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5440
5450 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5450
5460 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5460
5470 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5470
5480 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5480
5490 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5490
5500 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5500
5510 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5510
5520 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5520
5530 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5530
0,0,5560
5570 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5570
5580 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
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```
0,0,5580
5590 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5590
5600 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5600
5540 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5540
5550 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5550
5560 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
5610 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5610
5620 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5620
5630 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
0,0,5630
5640 DATA 0,0,0,0,0,0,112,112,112,78,2
40,97,14,14,14,14,3724
5650 DATA 14,14,14,14,14,14,14,14,14,1
4,14,14,14,14,14,14,7554
5660 DATA 14,14,14,14,14,14,14,14,14,1
4,14,14,14,14,14,14,7564
5670 DATA 14,14,14,14,14,14,14,14,14,1
4,14,14,14,14,14,14,7574
5680 DATA 14,14,14,14,14,14,14,14,14,1
4,14,14,14,14,14,14,7584
5690 DATA 14,14,14,14,14,14,14,14,14,1
4,14,14,14,14,14,14,7594
5700 DATA 14,14,14,14,14,78,0,112,14,1
4,14,14,14,14,14,14,8674
5710 DATA 14,14,14,14,14,14,14,14,14,1
4,14,14,14,14,14,14,7614
5720 DATA 14,14,14,14,14,14,14,14,14,1
4,14,14,14,14,14,14,7624
5730 DATA 14,14,14,14,14,14,14,14,14,1
4,14,14,142,66,161,76,3223
5740 DATA 2,2,2,2,2,65,0,96,112,112,11
2,66,0,129,2,2,2948
5750 DATA 2,2,2,2,2,2,2,2,2,2,2,2,2,2,
2,2,6022
5760 DATA 2,2,2,2,65,0,128,0,224,2,225
,2,0,71,0,0,2530
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Listing 2.
BASIC listing.

```
1000 DATA 255,255,255,255,255,255,255,
255,245,85,85,87,247,255,255,247,9772
1010 DATA 247,3,240,55,244,32,192,7,24
4,0,192,7,244,16,201,135,7978
1020 DATA 244,0,192,7,244,32,192,7,246
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1170 DATA 244,152,193,7,244,0,192,7,24
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1190 DATA 245,85,85,87,245,106,170,87,
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1200 DATA 245,102,38,87,245,106,170,87
,245,102,230,87,245,106,170,87,1268
1210 DATA 245,98,230,87,245,106,170,87
,245,85,85,87,255,170,170,191,2771
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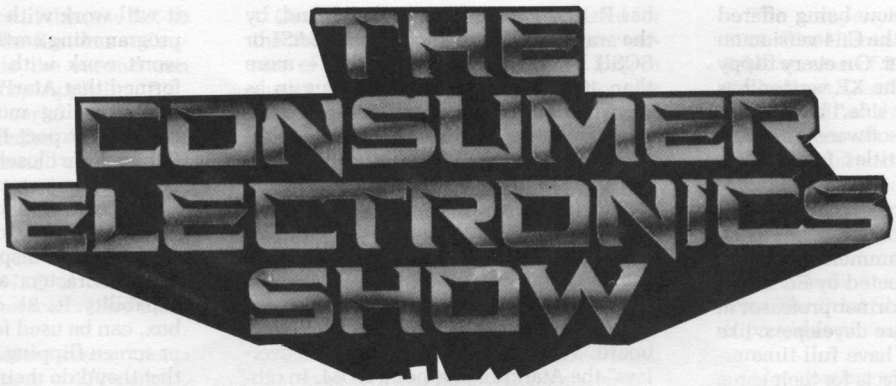

June CES & The 8-bit Atari

by Matthew J.W. Ratcliff

At the June Consumer Electronics Show (CES), assignments were divided. My task was to cover 8-bit Atari news for **ANALOG Computing**, while Art Leyenberger handled the 16-bit systems for **ST-Log**. At the end of the first day, I noticed that Art had three large bags of "ST goodies" (press kits and review software). All I had was one little bag of 8-bit information. It seemed to me then that the 8-bit Ataris weren't faring so well. I was disheartened, but not discouraged.

With some digging, I did find a lot of great stuff for the 8-bit Atari computers. Before continuing with the juicy details, I'd like to mention a few interesting trends in the 8-bit realm.

First, a lot of our long-time software supporters are dropping (or severely curtailing) 8-bit projects, in favor of ST developments. It's interesting to note, however, that many continue to support the Commodore 64 and 128 machines very strongly.

This is what I found most distressing. Discussions with people from Epyx, Atari, and Microprose revealed the basic reason. The word *piracy* came up quite often.

Bill Stealey, CEO of Microprose, stated that "Atarians are some of the most sophisticated computer users anywhere," and "they are the biggest pirates in the world." Sales figures don't lie, folks.

Bill went on to say, "I know I get about one-fourth the units I used to get from a new release" for the 8-bit machines. This problem has driven many other software companies completely out of business—or, at least, out of the Atari market.

Bob Botch, Vice President of Epyx marketing, said, "Everyone has problems with piracy, on all systems that they support." The decisions Epyx (or any manufacturer) makes to support a particular computer are based on the market.

Right now, Commodore and Apple versions are their hottest sellers, followed by IBM. Epyx has decided to port some software to the ST, to break new ground and test the waters for one of the hottest-selling systems on the market. Typically, once the software's running on the three top sellers, all other conversions are a matter of priorities for their programming staff, based on demand.

While Bob Botch didn't single out any particular system as having the worst piracy problem, he did indicate that "the current lack of new titles for the 8-bits is due primarily to a significant drop in sales of the 8-bit Atari line." You'd expect sales to be increasing, when some sources say about 30,000 XEs per month are being sold. Where are consumers getting their software, if 8-bit software sales continue to plummet?

Epyx is still supporting the 8-bits, as evidenced by their new release of **World Karate Championship**. Their future developments are also entirely dependent on sales, and less than half of their software titles for the C64 are currently planned for the XE.

John Skruch of Atari Corp. explained to me that the company is going to disk-based software. The idea is to keep costs as low as possible and offer the product at a very reasonable price. Atari will continue to use copy protection, designed to stop the "casual copier." The company feels that providing quality software, such as **Star Raiders II** and **Planetarium**, at an affordable $19.95 will improve sales and discourage piracy. John also stressed the importance of documentation needed to use these programs (most notably **Planetarium**). Its necessity will encourage people to purchase the software, in order to get the most out of it.

John expressed concern that prices for software are coming down, due to competition and a lack of demand. This provides more value to the end user, but results in very slim profit margins. . .which makes software vendors even more vulnerable to piracy.

Of course, there's a piracy problem in every facet of the computer industry. However, sources indicate more than twice as many C64s in the home as Atari 8-bits (before taking over Atari, Mr. Tramiel did a good job of selling those little suckers). Since there are so many fewer Atari home computers out there, piracy hurts us much more.

It's a simple fact of life. If software developers can't make a reasonable profit on their product in the Atari 8-bit market, they will drop that product. If you don't want Atari 8-bit computers to die, buy your software—don't rip it off. Does lack of support upset you? If you have *any* pirated software in your library, you have no right to complain. Enough said?

New software trends.

At the other end of the spectrum, I saw the Atari name in traditionally-Commodore software booths. Apparently, the Commodore's software market is becoming saturated. Due to the similarities between the XE and C64 (6502 microprocessor, sprites/player-missiles, similar graphics resolutions, and so on), it's relatively simple to port software from the C64 to the XE.

Many programs are now being offered on "flippy" disks, with the C64 version on one side, XE on the other. On every flippy disk I've come across, the XE version has always occupied the "B side," but at least we're getting some new software. There are some interesting new titles for the XE, ported directly from the Commodore world, which I'll cover later.

Also interesting to note: software is no longer written by programmers only. **Conflict in Vietnam** was created by Ed Bever, Ph.D., a historian and former professor at Princeton. Many software developers, like Epyx and Microprose, have full-time artists to develop visual effects for their game programs. As this trend continues, software quality will keep improving. Programs are more than just the result of a hacker's many months of tedious work; they're true works of art.

There has been a push in the ST market away from software protection, primarily due to the fact that hard disks are finally becoming widely available and affordable. If a program's protected, you can't usually back it up, or install it on a hard disk for convenience. As a result, we're beginning to see a new form of "protection" for the ST and 8-bit computers.

Many new programs are very "documentation dependent." As Bill Stealey explained, MicroProse is dedicated to providing "more value and more documentation." He went on to say, "If a pirate rips off our product, he'll miss out on 80 percent of the functionality of that game without the docs." That's why **Conflict in Vietnam** gives you 110 pages of documentation—much more than a game-playing guide, it's an informative history lession.

We've seen the same thing in Infocom games for some time now. What started to be a unique packaging approach has become a hallmark of excellence, associated with the Infocom name. Infocom's newer products have even more unusual packaging (3-D comic books and glasses). without their printed stories and unique paraphernalia, you may play an Infocom game, but you can't win.

Awesome hardware.

ICD, makers of Sparta DOS and the US Doubler, have done it again! They were given a spot in the huge, bustling Atari display area. Several new goodies were announced, which will turn your XE or XL into a "turbo micro." Enough suspense—let's get on with it.

Hardware hackers have been trying to add more and more RAM to the XE/XL lines. Some are up to over half a megabyte in the 130XE, for some wild RAMdisks. ICD has gone one better, with their new **Multi Function Input Output Board (MIO)**. This device has from 256K to 1 megabyte of RAM.

But they didn't stop there. The **MIO** also has R: and P: interfaces built in. And, by the way, you can plug standard (SASI or SCSI) hard disks into it, as well—more than 100 megabytes! You can plug in as many as eight 16-megabyte hard drives (or partition larger drives into smaller logical drives).

The **MIO** plugs into the 130XE, or the 600XL (64K-upgraded) or 800XL computers. (Sorry, 65XE owners, Atari forgot to put in your parallel bus connection.) It's a "parallel bus device." This means that the ROM software required to drive all these hardware goodies is built into the **MIO** board. When enabled, its software "overlays" the Atari floating-point ROM. In other words, these neat-o devices cost you no RAM.

You want a printer buffer? Of course! The **MIO**'s setup software lets you configure that 1 meg as RAMdisks, or RAMdisks and printer buffer. Up to 512K may be partitioned for the printer spooler.

If you still aren't satisfied, you'll be pleased to know that the **MIO** board will also give your *hardware* 80-column capability. It will be a piggyback add-on board, to fit inside the **MIO** box. The box is about the same size as a 1050 disk drive, but half the height. The 80-column output will be in the form of composite video or TTL, the latter for IBM-style monitors.

What are these goodies going to cost? The **MIO** will cost $199.00 for 256K, or $349.00 for 1-meg versions. The 80-column card will add less than $100.00 to that cost. It may be purchased separately and installed by the user.

ICD is now marketing affordable printer and modem cables. These plug directly into your 850 or P:R: connection and your modem or Centronics interface printer. The cables sell for a reasonable $14.95.

A rather unique cable is also planned by ICD. At one end will be the 8-bit's SIO connector, and at the other a Centronics printer connector. This **Printer Connection** will retail at under $40.00.

How does it work? Simple: all the electronics for this little gem are so small they fit inside the cable's connector! No software need be loaded to support it—it has all its smarts right in that connector.

Atari demonstrated an interesting piece of hardware, the **XEP80**, an 80-column card for Atari 8-bits. This box has about the same "footprint" as the 1050 disk drive, but is about a third as tall. It plugs into joystick port 1 or 2. You may plug an inexpensive monochrome monitor into the rear of the box, right next to its printer connector. The **XEP80** has a standard (IBM-style) printer connector, to which you can plug your favorite Centronics interface printer.

The box is driven by a handler that boots from disk, costing you some RAM. It hooks into the E: driver, so you can use it right away. Without any extra software, it will work with BASIC and most other programming cartridges. Unfortunately, it won't work with **AtariWriter**. I was informed that **AtariWriter+** and **Silent Butler** are being modified to support the **XEP80**. I expect **PaperClip** and **SynCalc** (which have closely followed Atari's other hardware improvements in the past—like extra RAM support in the 130XE) will be modified to support it, as well.

The **XEP80** display is *fast*. It has sharp, crisp characters and full screen-editing capability. Its 8K of RAM, internal to the box, can be used for custom character sets or screen flipping. I was informed by ICD that they'd do their best to make their **MIO** 80-column card compatible with Atari's.

After being assured at the West Coast Computer Faire that Atari *was not* planning a 1200-baud modem anytime soon, I heard open talk at CES about such a device. No model number or release date has been specified, but it will sell for under $100.00. Its SIO connector will hook up directly to 8-bit systems, and it will have a standard RS232 port for 850- or P:R:-equipped 8-bits or STs. It will support the Hayes standard command set for modem communications.

While Atari talked about new hardware, Avatex and SmarTeam delivered. The **SmarTeam 300/1200-baud modem** is still selling for around $200.00. As stated in my review, it has minor communication problems at 300 baud. A SmarTeam representative told me a simple resistor change would fix that problem, but didn't say how current owners could get the update.

The **Avatex 300/1200-baud modem** is currently selling (*very* well) for under $100.00. All reports I've heard indicate emphasize its Hayes compatibility and reliability.

Atari was still talking about its new 3½-inch drive for 8-bit machines, but no release date has been set. I think we'll hear something more definite at November's COMDEX. OSS is developing the DOS for it, and Bill Wilkinson cleared up the storage question for me. He said the disks will hold 320K, formatted.

The new ADOS will be very high speed (about twice as fast as the 1050's) and efficient. It will support subdirectories and many other sophisticated features. Bill also assured me that 1050s and these 3½-inch drives can be on the same system, with no problems.

Epyx showed off a slick new joystick, whose curved base fits neatly into your hand. With your left hand curled around the base, your index finger rests comfortably on the fire button. The short bat handle has a positive click to it and a very solid feel. No name, price, or exact release date has been set, but I'm told it's currently the hottest-selling stick in England.

Star Micronics showed several new printers at CES. Apparently, the SG-10 will

be discontinued in favor of the new **NX-10** and **NL-10** versions. The first has a Centronics interface, while the second can have parallel (Centronics), Apple IIc, IBM-PC (still Centronics!), serial (RS232), or Commodore 64/128 interface "cartridges." They're as simple to install as putting a ROM cartridge in the Atari computer.

These printers are rated at 120 characters per second draft mode, 30 in near-letter-quality. (The SG-10 also has NLQ capability.) I like the NLQ of the Epson FX85/185 printer; its characters have more of a "typeset" look.

These new Star printers seem quieter and are supposed to have a 100-percent Epson-compatible mode. They sport new cartridge ribbons, too. Although much like the ribbons for Epsons, they aren't interchangeable. That means replacement ribbons for the **NX/NL** printers will probably be harder to find, and more expensive.

I was told by Brian Kennedy, manager of marketing services for Star Micronics, that all previous reviews of Star printers have knocked the printer for "messy ribbon spools." I feel it's one of their nicest features, however. If that's your preference, then scarf up an SG-10, if you can still find one.

COVOX demonstrated the **Voice Master**, with improved speech recognition capabilities. I was impressed to see it recognize the demonstrator's commands, despite the din in the Atari booth. Now included with **Voice Master** is **Word Editor**, which lets you edit the amplitude values of your digitized speech.

COVOX is also marketing the **Speech Construction Set**, a full-blown speech editing system, with features such as "cut and paste" among different voices. This companion software sells for $39.95.

Pacemark showed a very interesting piece of hardware technology, the **Falcon ACS box**. It's a Centronics printer interface unit for multiple host computers (Atari or others), with which up to eleven personal computers can share one or two parallel printers.

This intelligent box can automatically switch between host computers as they require printer services. Each is allotted a different buffer area within the **Falcon**, and is spooled to the printer as it's available. A 4-button control panel and 16-character LCD display on the **Falcon** allow complete user control of priorities and printer-switching times. The unit is selling for $449.95 with 64K, $589.95 with 128K of buffer memory.

Atari showed off its revamped **2600** and **7800** game machines. The **7800** also supports **2600** game cartridges. It still has a 6502 engine under the hood, similar to a 130XE, but has greatly enhanced player/missile graphics capabilities. (Up to 100 little monsters can zap around the screen at a time.)

One of the software titles I saw listed for the **7800** was **Galaga**. It's a far superior version of **Galaxian**, which didn't last long in the arcades, and was never very popular for the 8-bit systems. I certainly hope Atari releases a version of **Galaga** for the 8-bits. Call or write the company to ask for an one, if you want it—*I do!*

Zobian Software displayed **The Rat** (no relation to yours truly), a mouse for your 8-bit computer. It comes with a graphics program and cursor control routine. The product faces two major problems. First, it should be with a lot of software out for 8-bits. Second, at $114.95, it costs more than most will pay for an XE computer system this year.

New software.

A company called Hi Tech Expressions demonstrated their new greeting-card software at the Atari booth. Their products, which follow the flippy trend, include **CardWare**, **WareWithAll**, **HeartWare** and **PartyWare**.

CardWare creates birthday cards on your printer, or animated "greetings" disks. At a dirt cheap $9.95, I thought it would be a real bargain. But I found the animations were simply **Movie Maker** files. If you already have **Movie Maker**, you won't see much new here. There are only three printer graphics to choose from. The software isn't user friendly, in that you can't cancel selections. Finally, I found the worst problem while printing a greeting card.

I noticed the printer didn't feed much between graphic print lines. Close inspection revealed that the graphic dump software uses only the bottom four of eight printhead pins. "Big deal!" you say? It *is* a big deal.

I wrote some graphic dump software ages ago. Too lazy to map the graphics into eight pins at a time, I let it drive only the bottom two. Within a couple weeks, all my commas looked like periods; descenders on lowercase characters were fading out on my Gemini 10X. Within a month, my graphics dumper had literally destroyed the printhead (completely threw a pin out). The replacement cost $40.00! Using **CardWare** frequently could, potentially, do the same to your printhead.

WareWithAll, at $14.95, is a package of colorful paper, envelopes, markers and more, to help you create unique greeting cards. The $9.95 **HeartWare** is, basically, **CardWare** with a Valentine's theme. According to the ad, **PartyWare** can be used to create party decorations, start to finish. For $14.95, it will make banners, hats, placemats, games and more.

Another company to show off its desktop publishing prowess was Springboard Software Inc. They demonstrated some extremely impressive alternatives to **The Print Shop**. Unfortunately, an Atari version is "not planned at this time."

The company's number is (612) 944-3915. Give them a call if you'd like an Atari 8-bit version of **The Newsroom**, **Clip Art Collections**, **Certificate Maker**, or **Rainbow Painter**. All of these are available for the Commodore 64.

XLent Software had released **PS Interface**. A companion to **The Print Shop**, it lets you create fonts, put pictures into font characters and interface **Typesetter** graphics, as well.

PS Interface will also convert graphics from **The Print Shop** into **Typesetter** icons. It provides picture disk management features.

Also coming from XLent is David Plotkin's **Miniature Golf Construction Set**. A public domain version was published some time ago. It was very popular back then, and this updated and enhanced version should do quite well.

Broderbund had finally released **The Print Shop Companion** for the 8-bit Atari, formerly available only for Commodore and Apple computers. This program follows **The Print Shop** tradition in user friendliness and ease of use. The **Companion** has many features its predecessor was criticised for lacking.

Epyx announced several new products, among which were the **Movie Monster Game**, the **World's Greatest Baseball Game** and **Championship Wrestling**. These are all in the works for the Commodore 64, but the no support is planned for Atari equipment at this time. If you want them, call or write Epyx (and, if they deliver, buy the programs).

Their Lucasfilm game **Ballblazer** was never the chartbuster Epyx expected, but "sold strongly and steadily for a long time," according to Noreen Lavoi, Public Relations Manager. If the graphically spectacular **Koronis Rift** and **The Eidolon** sell well, we might see more such excellent products.

Epyx has combined **Temple of Apshai**, **The Upper Reaches of Apshai** and **The Curse of Ra** into one package, the **Temple of Apshai Trilogy**. Any of the games may be selected at the outset; all are on a single flippy disk.

Epyx continued support of the 8-bits with their new **World Karate Championship**, scheduled for release in July. I had an opportunity to play the C64 version at CES. Its graphics, haunting oriental melody, sound effects and playability follow the Epyx tradition of excellence. Rather than explaining its play, I suggest you head for the local arcade. Plunk a few quarters into the **Karate Champ** machine, and you'll get a feel for just what you can expect (it only lacks the voice synthesis).

Mastertronic, billed as the "world's fastest growing software company," had over thirty titles for Commodore and has begun to port over to Atari. Currently, four 8-bit Atari titles are available: **Vegas Poker and Jackpot**, **Last V-8**, **Action Biker** and **Kick-**

start. The price, on flippies, is a mere $9.99 each!

The object of **Vegas Poker and Jackpot** is self-explanatory; their play is not. The brief documentation on the package's back refers to function keys. Most 8-bits don't have function keys, however, so you have to figure out how to play on your own.

The other three programs above all have superb, smooth-scrolling graphics. In **Kickstart**, two motorcycle riders go head-to-head on a split-screen display. The object is to beat each other (or the clock, in single-player mode) across a racetrack full of ramps, water hazards, and more. If you get through the first circuit, you know what comes next? Right...a tougher track. (This game is reminiscent of **Aztec Challenge**, but far more sophisticated.)

In **Action Biker**, you're a cycle rider in search of forty items, on your way through a 3-D screen of ramps, roadways, walls and water hazards. The 3-D effect and motorcycle controls are very well done.

I'm already addicted to this game. I find it amazing that, while scrolling along, you can actually ride up and around a ramp, and even jump fences. This is an impressive $9.95 game. And, if you get all forty treasures, you enter the final drag race.

The **Last V-8** is a race against time, to return underground before your radiation shield decays. (I wonder if the name's a statement about the current U.S. auto industry trend...) In this one, you have an overhead view of your high-speed car. The controls take a while to get used to, but play is very fast.

I have two overall complaints about these games. You can't interrupt and begin again with a START keypress. This has long been standard on 8-bit game software, but Mastertronic is a relative newcomer.

Also, none of their games handles RESET properly. Rather than stealing the Atari RESET vector (so you're returned to the title screen), they make you reboot. If you get stuck in a frustrating game, you have to ride it out.

Other titles coming from Mastertronic include **Ninja**, **Speed King** and **Elektra Glide**. In **Speed King**, race your motorcycle on world-class circuits against nineteen computer-controlled riders.

Elektraglide is billed as a "fantasy racing epic," where you "move at awesome speeds through 100 percent high-resolution landscapes" on your Harley. **Ninja** is a martial arts simulation with "authentic multi combat fight routines." The Commodore 64 version at CES was lightning fast, with excellent graphics. Reminiscent of Bruce Lee movies, this promises to be a hot seller.

Several software houses are beginning to take the 130XE's extra RAM very seriously. **PaperClip 2.0** now supports the extra memory with added buffer space for text, plus a built-in spelling checker called **SpellPack** (with a 36,000-word dictionary). You may create a supplementary file of words, too.

Not only does **PaperClip 2.0** support the 130XE's four extra 16K banks of RAM, it will automatically recognize up to eleven more. It'll be great for you hardware hackoholics out there, expanding the 130XE like crazy. If you have a registered copy of **PaperClip**, the upgrade will only cost $15.00. Contact Batteries Included for information on their upgrade policy.

Precision Software, a well-known company in the Commodore realm, has released its **Superscript** word processor for

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Meetings; newsletter: *Nybbles & Bytes*.
President: Jeff Wood.

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Meetings; BBS; newsletter. President: Ray Lang.

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6055 Cahuenga Blvd., #2, North Hollywood, CA 91606
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Edmonton Atari Computer Hobbyists (EACH)
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800XLs and 130XEs. The 130XE version gives you two edit windows; the 800XL, only one.

It supports a 20,000- to 30,000-word, user-expandable dictionary. The disk is heavily protected (my first copy never *would* boot on my 1050), and backup copies cost $20.00 each. I suspect this product is too little, too late. It seems to me **AtariWriter** and **PaperClip** have already satisfied the needs of most 8-bit owners.

Bill Wilkinson manned an OSS both in the Atari display area, giving demos of **BASIC XL/XE**, **Action!**, and more. Both BASICs continue to sell very well. OSS's sophisticated **Writer's Tool** has never done so, despite all its good reviews, due to its late arrival on the Atari market. Maybe we'll see it updated to support Atari's 80-column card.

If you want to learn assembly programming on your 8-bit Atari, I still contend that OSS **MAC/65** is the world's fastest assembler on a micro. I highly recommend it.

Microprose continues to support 8-bits, with chartbusters like **Silent Service**, **F-15 Strike Eagle** and **Conflict in Vietnam**. **Silent Service**, with over 100,000 copies sold (all versions), is still strong. **F-15 Strike Eagle** has been updated with a "Libyan mission." **Conflict in Vietnam**'s historically accurate simulation teaches you about the realities and frustrations of that war. It's *not* just another Rambo-style shoot-'em-up.

Gunship, a flight and battle simulation of the AH-64A Apache helicopter, was due out last November, but Bill Stealey said at CES it wasn't good enough then. So, at the risk of losing over a million dollars in revinue, it's still in the works. When it does hit the shelves, you can bet it'll be a superb product.

In **Destroyer Escort**, you take on the role of convoy escort at the helm of a heavily armed destroyer, or a more lightly-equipped corvette vessel. This product is expected in the fall.

Another fall release from Microprose is code-named **Condor**. It promises to be an exciting flight and combat simulator. Although no particular aircraft model has been named, the fact sheet on this game shows a silhouette of an F-16 Falcon, the newest Air Force jet.

Incocom introduced several new products at their BYOB (Bring Your Own Brain) party. Two of these will be available for the 8-bit models.

Moonmist, by Stu Galley, is a gothic mystery set in a haunted Cornwall castle. The introductory-level game is targeted at women and men. Unlike other Infocom mysteries, this one gives clues if you get stumped. The idea is to introduce you to the joy and fantasy of interactive fiction gaming, while minimizing frustration. To ensure plenty of playtime, **Moonmist** has four different solutions for you.

Certainly the most unique program ever created for the home computer is Steve Meretzky's **Leather Goddesses of Phobos**. This 1930 science fiction spoof sends you "on an erotic romp through the solar system." It can be played in tame, suggestive, or lewd modes, equivalent to G, PG, and R movie ratings, respectively. Of course, you must be 18 to enter the R-rated level.

A couple years ago, Steve put the title on a product chart just for a laugh. Since then, he reported, "hardly a week would go by without someone cracking a joke about (it)." True to Infocom's unique packaging style, **Goddesses** comes with a 3-D comic book and glasses, a secret map, and a "scratch and sniff" card—all integral to the game. These should help deter piracy, while adding warmth and humor.

Also shown was Infocom's earlier release, **Ballyhoo**. Here, the circus you've entered isn't just glitter and glamour; you're plunged into a mysterious world of crime and corruption. While meeting some of the circus's rather unusual personalities, you must try to solve puzzles to save the owner's kidnapped daughter.

Artworx exhibited their many affordable educational and action games. The **Linkword Language Series** lets you learn a foreign language "in just ten hours." Versions include Spanish, French, German and Italian, with a second level of Russian and French planned for future release.

Linkword teaches foreign words with imagery, associating them with similar sounding English words. An audio tape accompanies each version, to help you with proper pronunciation. Each language package sells for $24.95.

Some other 8-bit Artworx titles, for less than $25.00 each, include **Bridge 4.0**, **Hole-In-One Golf**, **Monkeymath**, **Monkeynews** (a program to improve reading skills), **Peggammon** (backgammon) and **Cycleknight** (an action-adventure motorcycle race).

Atari is a bit behind schedule, but **Silent Butler**, **Star Raiders II** and **Planetarium** are finally out for 8-bits.

Silent Butler, a personal and home finance program, was shown at the 1985 CES in 1985, but, as of this writing, is still not available. Now that the 80-column card is almost a reality, I expect the **Butler** is being held up for 80-column support.

Main Street Publishing is marketing classic Atari software, at an average price of only $6.00. If you're a relative newcomer to the 8-bit realm, this would be a great place to stock up on software at superb prices.

Microcomputer Games, a division of Avalon Hill, announced eight forthcoming titles. Only two are planned for 8-bit models at this time.

Spitfire 40 is a World War II aircraft game and flight simulator, with a $35.00 price tag. **Guderian** is a WWII simulation of the German blitzkrieg, due this October.

Datasoft continues to support Atari 8-bit computers with several new titles. **Yie Ar Kung Fu** is expected by the end of the year, another in the growing base of karate and kung fu simulation games.

Three graphics-assisted adventure games coming from Datasoft include **221 Baker Street** (a Sherlock Holmes who-done-it), **Mercenary** (with 3-D mazes and flight simulations) and **Gunslinger**.

A unique software product this year (maybe the most unusual hardware, for that matter) was shown in its very early test version—the **SpartaDOS X** cartridge. It's to be a 32K ROM piggyback cartridge for the 8-bits. It will plug into the computer directly, and any program cartridge will be able to go on top of it (and be stacked on the RTIME cartridge, a computing tower of power).

The complete 13K of **SpartaDOS 3.2d** will be incorporate many of the most useful command files. Among some of the cartridge's unique features: a combination menu and command processor. If you need the menu, you'll simply press RETURN at the prompt of the command processor. The menu will pop up, and all **SpartaDOS** commands may be executed from here. To help you learn the DOS, any menu selection will print to the screen—as you'd have entered it into the command processor.

The DOS works with ICD's **MIO** board, of course, and had no problems relinquishing control to any cartridge piggybacked on it (even the OSS super cartridges). It will support the 3½-inch drives coming from Atari, as well as the high-speed I/O feature on Indus GT drives.

This promises to the the fastest DOS ever built for the XL/XEs. At a price of $79.95, it's expected in September.

At CES, I had an opportunity to interview the men from ICD. In that article (next issue), you'll find many more technical details about the **SpartaDOS X** cartridge and the other new products coming from ICD.

The end.

This year's CES saw many new products for the 8-bit Atari computers, with new companies providing some software. ICD and Atari Corp. are overwhelming us with powerful new hardware.

Things are faring well for 8-bit owners, overall. Just remember, if you want continued support, buy the software. It's a matter of survival for the best 8-bit computers ever built!

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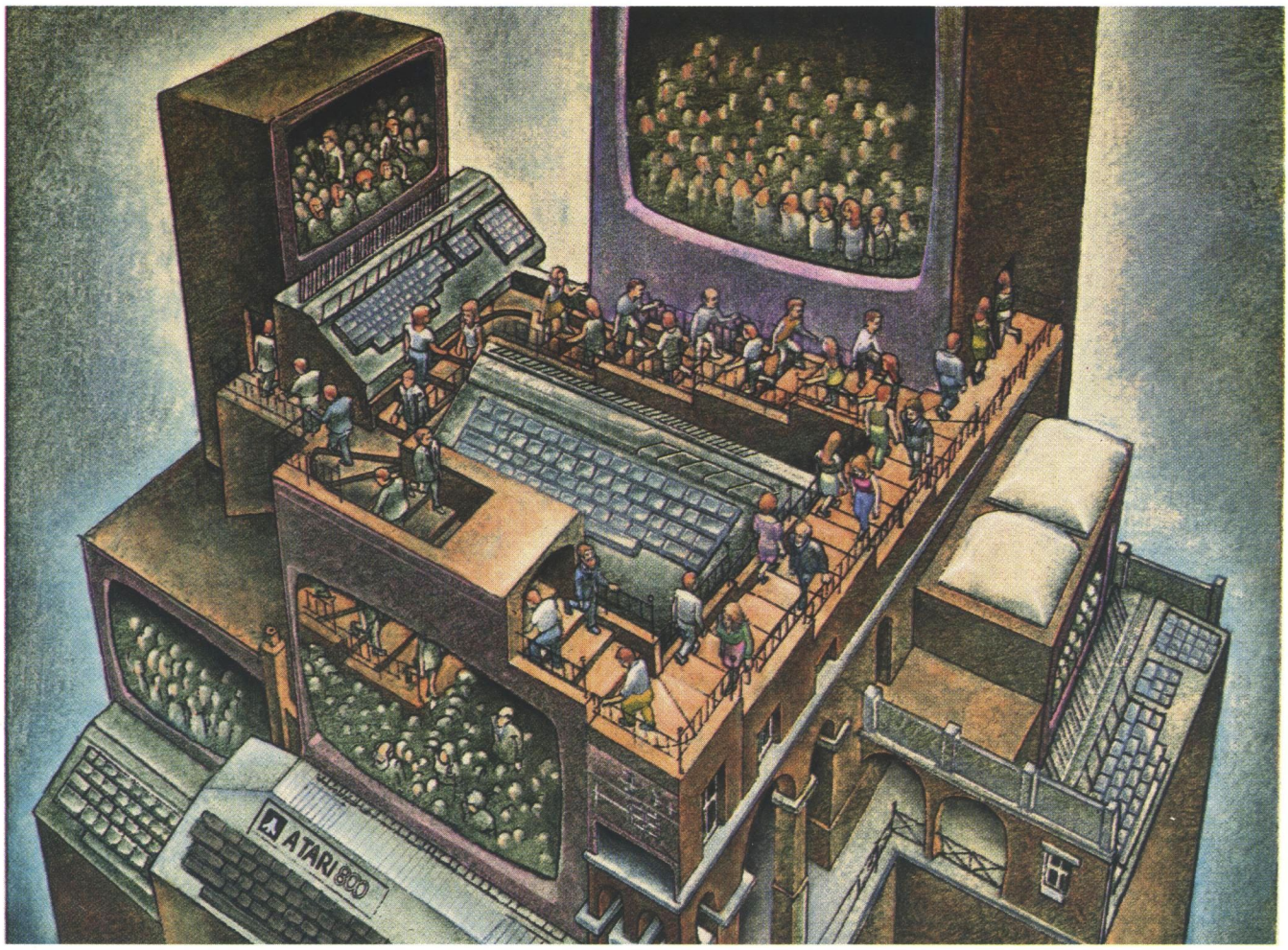

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