NO. 12 JULY/AUGUST $2.50

ANALOG COMPUTING

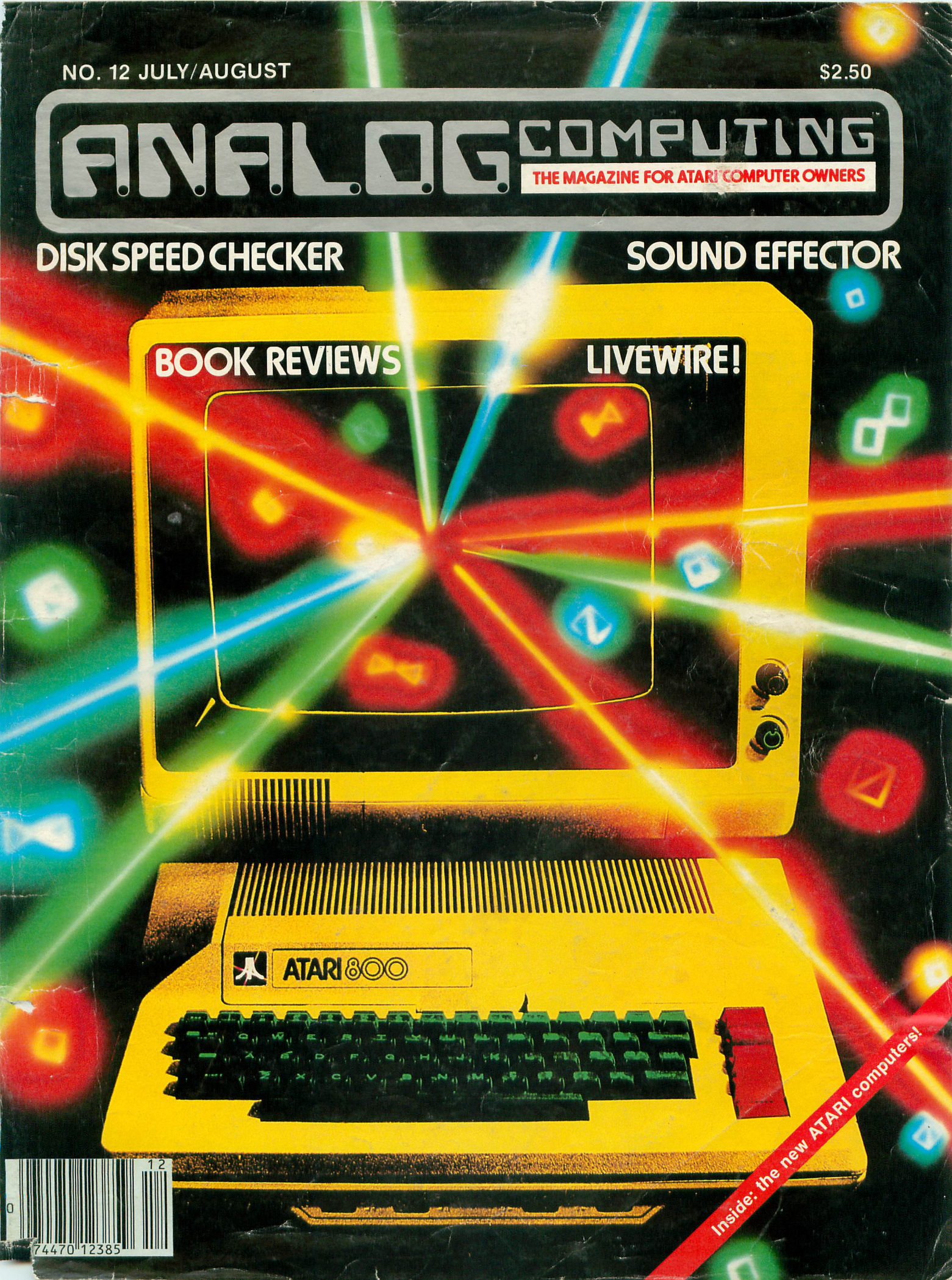
THE MAGAZINE FOR ATARI COMPUTER OWNERS

DISK SPEED CHECKER

SOUND EFFECTOR

BOOK REVIEWS

LIVEWIRE!



Inside: the new ATARI computers!

12
0 74470 12385

MOSAIC™

64K RAM SELECT™

The only Compatible 64K RAM for

ATARI® 400 and 800

Now Atari† owners can go where no Atari owner has ever gone before. With the Mosaic 64K RAM Select* you enter the world of more powerful computing with almost limitless applications!

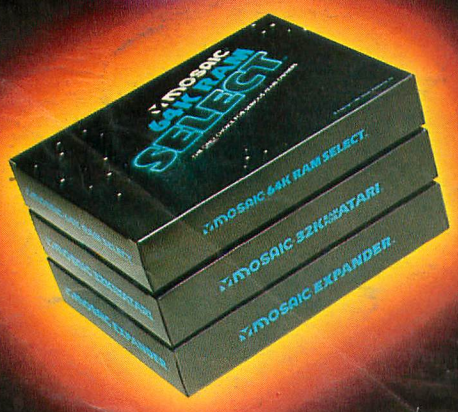
Atari 400 owners have 64K RAM at their disposal, with 48K RAM hard-wired and four banks of 4K RAM. Atari 800 owners can expand up to 192K RAM! All with complete compatibility with Atari peripherals and software.

The owner of a 64K Select will make better use of more powerful peripherals and software. Machine language programs such as Visicalc or word processing have more workspace, up to 30%.

Programming techniques difficult, time consuming or even impossible are now practical. Such as loading DOS utilities once, page flipping, chained programs, player missile data, and/or wedges, etc. etc. etc...

You'll have access to a membership in the Select Members Club to keep you updated of all the new applications! Of course, the Mosaic 64K Select is easy to install and use. No soldering and complete picture guided instructions included.**

The Mosaic 64K RAM Select, the most advanced memory system available for the Atari 400/800 computers. Serious Atari owners won't settle for less.



64K RAM SELECT FEATURES

1. Unlimited software applications.
10. No solder installation.
11. Powerful, most memory available.
100. No chip sockets for better reliability.
101. Versatile — multiple memory configurations.
110. Compatible with 8K and 16K ROM cartridges.
111. Low power design. Less power and heat than Atari 16K RAM.
1000. Can emulate Atari 1200 Memory. 1200 software.
1001. Test cycled 24 hours to insure reliability.
1010. Larger work space for disc software (i.e., Visicalc, Word Processor, etc.)
1011. Four year warranty.
1100. Allows 400 owners to run disc drives more effectively.
1101. Very low cost per byte.
1110. Allows more powerful graphic manipulations.
1111. Complete users guide.
10000. Membership in the "Select" club.
10001. Powerful program library.
10010. Disc emulation software available for super fast loads and saves.
10011. Tool kit software available — never type DOS again (format, directory and much more).
10100. All Mosaic 64K software maintains 48K RAM for program space.
10101. Allows for up to 192K RAM in Atari 800.
10110. Can be used with Atari 16K's and Mosaic 32K's.
10111. Gold edge connectors.
11000. String arrays.
11001. Allows 3-dimensional data arrays

CALL NOW FOR MORE INFORMATION AND YOUR NEAREST MOSAIC DEALER.
1-800-547-2807 (IN ORE 503-655-9574)

MOSAIC™ ELECTRONICS, INC
P.O. BOX 708
OREGON CITY, OR 97045

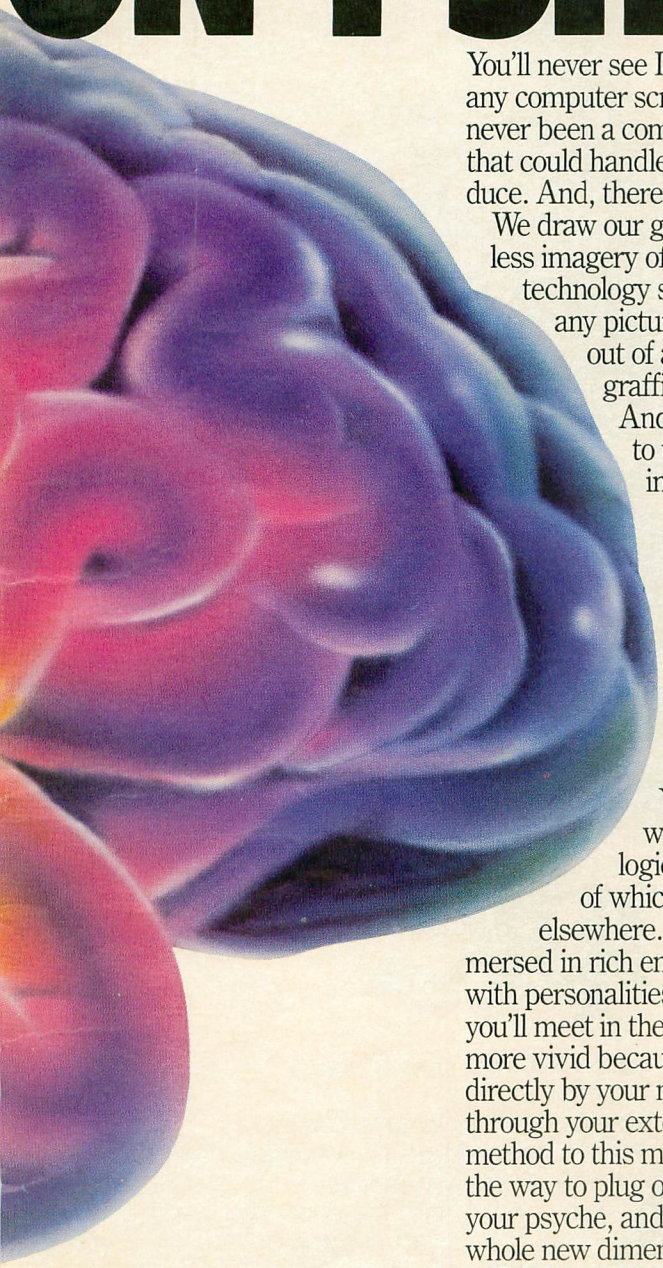
** Cable kits required but not included with purchase

* Trademark of MOSAIC ELECTRONICS, INC
† Atari is a registered trademark of Atari, Inc
Mosaic is not affiliated with Atari.

Leading Edge Products, Inc., 225 Turnpike Street, Canton, Massachusetts 02021.
Call: toll-free 1-800-343-6833; or in Massachusetts call collect (617) 828-8150. Telex 951-624.

WE STICK OUR G
THE SUN D

RAPHICS WHERE ON'T SHINE.



You'll never see Infocom's graphics on any computer screen. Because there's never been a computer built by man that could handle the images we produce. And, there never will be.

We draw our graphics from the limitless imagery of your imagination—a technology so powerful, it makes any picture that's ever come out of a screen look like graffiti by comparison.

And nobody knows how to unleash your imagination like Infocom.

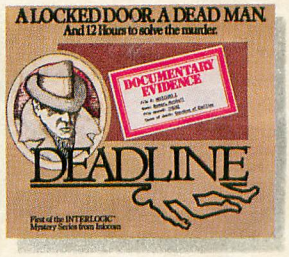
Through our prose, your imagination makes you part of our stories, in control of what you do and where you go—yet unable to predict or control the course of events.

You're confronted with situations and logical puzzles the like of which you won't find elsewhere. And you're immersed in rich environments alive with personalities as real as any you'll meet in the flesh—yet all the more vivid because they're perceived directly by your mind's eye, not through your external senses. The method to this magic? We've found the way to plug our prose right into your psyche, and catapult you into a whole new dimension.

Take some tough critics' words about our words. SOFTALK, for example, called ZORK® III's prose "far more graphic than any depiction yet achieved by an adventure with graphics." And the NEW YORK TIMES saw fit to print that our DEADLINE™ is "an amazing feat of programming." Even a journal as video-oriented as ELECTRONIC GAMES found Infocom prose to be such an eye-opener they named one of our games their Best Adventure of 1983.

Better still, bring an Infocom game home with you. Discover firsthand why thousands upon thousands of discriminating game players keep turning everything we write into instantaneous bestsellers.

Step up to Infocom. All words. No graffiti. The secret reaches of your mind are beckoning. A whole new dimension is in there waiting for you.



INFOCOM™

The next dimension.

Infocom, Inc., 55 Wheeler St., Cambridge, MA 02138

For your: Apple II, Atari, Commodore 64, CP/M 8", DEC Rainbow, DEC RT-11, IBM, NEC APC, NEC PC-8000, Osborne 1, TI Professional, TRS-80 Model I, TRS-80 Model III.

Word processing.

It's simple.

The typewriter was a wonder in its time. **Letter Perfect**™ is a wonder for today. Letter Perfect from LJK lets you use your computer to write letters and create reports and edit your work. Change a word. Move a line. Combine two paragraphs. You can do it all with Letter Perfect, and more. Much more.

When it comes to practical software for Ataris and Apples, Letter Perfect is simple to learn. And hard to beat. Ask your dealer for a demonstration, or write LJK for more information.

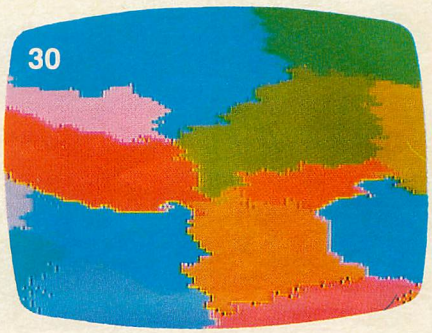
LJK™

LJK, INC. • 7852 Big Bend Blvd., St. Louis, MO 63119 • (314) 962-1855

ANALOG COMPUTING™
ISSUE NO. 12 JULY/AUGUST

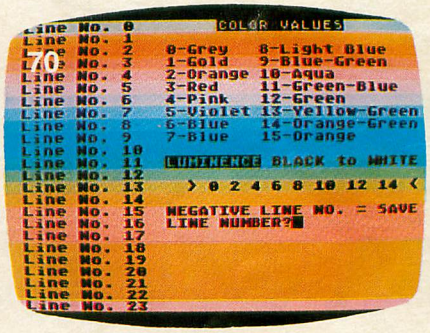
FEATURES/ARTICLES

The New ATARI Computers	Lee Pappas	35
De Re Letter Perfect	Arthur Leyenberger	43
ATARI Word Search	Marcy Caruthers	45
D:CHECK/C:CHECK and Control Characters		46
Notes to the ATARI Microsoft Basic Instruction Manual	Gerald Despain	48
Our Game	Joel Gluck	98



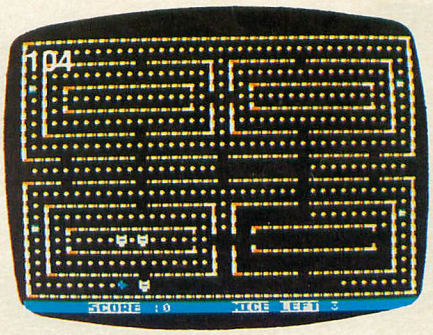
REVIEWS/PROFILES

Suspended	Brian Moriarty	64
ATARI Books Reviewed	Cris Popenoe & Lee Pappas	76
The Happy 810 Enhancement	Brian Moriarty	81
Database Programs	Richard Herring	87
Omnimon!	Brian Moriarty	101
The ALOG Pagewriter	Tony Messina	124
Bank Street Writer	Arthur Leyenberger	125



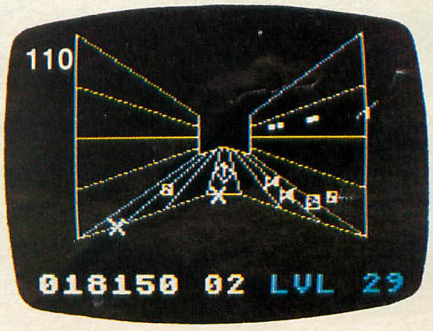
PROGRAM LISTINGS

Micropainter Pictures in BASIC	Tom Hudson	24
GTIA Expansion Demo	Andrew Katz	30
Sound Effector	Sheila Neece Spencer	40
From Rags to Riches	Bob Curtin	52
Multicolor Screen Generator	Richard J. Kalagher	70
Total String Search	Jerry Tucker	85
SNAIL	Brian Moriarty	94
ATARI's Multicolor Character Sets	Dave Plotkin	104
Livewire	Tom Hudson	110



COLUMNS

Editorial	Lee Pappas	8
Reader Comment		10
New Products	Marcia & Gary Rose	16
Index to Advertisers		132



THE PLACE: a remote outpost on an ice world light years from earth.

Suddenly the small planet THULE is surrounded by alien life orbs destined to change the atmosphere to suit themselves. However, this spells certain death for your base as the frozen mountains start to melt!

You take the command of your single seat fighter to destroy the aliens before it's too late. But you didn't know the aliens had help...

STAR SENTRY is an arcade-type space action game written entirely in machine language for one player. Cassette or disk, 24K. $29.95.

A.N.A.L.O.G SOFTWARE

P.O. BOX 23
WORCESTER, MA 01603
(617) 892-3488

Star Sentry is a trademark of A.N.A.L.O.G. Software.

A.N.A.L.O.G. STAFF

Editors/Publishers
MICHAEL DESCHENES
LEE H. PAPPAS

Managing Editor
JON A. BELL

Contributing Editors
JOEL GLUCK
TONY MESSINA
DR. GARY ROSE
MARCIA ROSE

Art Director
BOB DESI

Technical Division
CHARLES BACHAND
TOM HUDSON
BRIAN MORIARTY

Advertising Manager
MICHAEL DESCHENES

Distribution
PATRICK J. KELLEY

Typography
HENDRICKX &
LARRIVEE Co., Inc.

Production/Distribution
LORELL PRESS, INC.

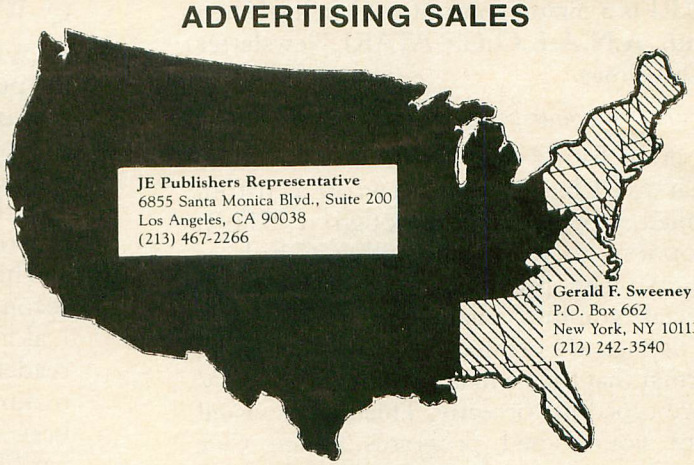
Contributors
MARCY CARUTHERS
BOB CURTIN
GERALD DESPAIN
RICHARD HERRING
RICHARD J. KALAGHER
ANDREW KATZ
ARTHUR LEYENBERGER
DAVE PLOTKIN
CRIS POPENOE
SHEILA NEECE SPENCER
JERRY TUCKER

A.N.A.L.O.G.
Magazine Corp. is in no way affiliated with ATARI.
ATARI is a trademark of ATARI, Inc.

ABOUT THE COVER . . .

The cover to this issue illustrates our arcade game Livewire. The cover was prepared by first taking several black and white photos of a monitor and an ATARI 800. The photos were stripped together to form a high-contrast composite, then the composite was shot as a large film positive. The positive was mounted on a sheet of glass, and the screen objects and "laser beams" were cut in. Color was added by taping various sheets of acetate to the back of the film positive. A sheet of diffusion material was then attached to the positive. The resulting artwork was illuminated by two movie lights. As with many of our covers, the light effects were a product of multiple exposures — including separate exposures for each element on the cover. In this case, there were 27 different elements, providing the colorful cover to issue no. 12 of **A.N.A.L.O.G.**

ADVERTISING SALES



JE Publishers Representative
6855 Santa Monica Blvd., Suite 200
Los Angeles, CA 90038
(213) 467-2266

Gerald F. Sweeney & Associates
P.O. Box 662
New York, NY 10113
(212) 242-3540

A.N.A.L.O.G. Computing
Home Office
Michael DesChenes
National Advertising
(617) 892-9230

Address all advertising materials to:
Michael DesChenes — Advertising Production
A.N.A.L.O.G. Computing
565 Main Street, Cherry Valley, MA 01611

A.N.A.L.O.G. COMPUTING (ISSN 0744-9917) is published bi-monthly for $14 per year by **A.N.A.L.O.G.** Magazine Corp., 565 Main Street, Cherry Valley, MA 01611, Tel. (617) 892-3488. Second-class postage paid at Worcester, MA and additional mailing offices. POSTMASTER: Send address changes to **A.N.A.L.O.G. COMPUTING**, P.O. Box 615, Holmes, PA 19043. No portion of this magazine may be reproduced in any form without written permission of the publisher. Program listings should be provided in printed form. Articles should be furnished as typed copy in upper and lower case with double spacing. By submitting articles to **A.N.A.L.O.G. COMPUTING**, authors acknowledge that such materials, upon acceptance for publication, become the exclusive property of **A.N.A.L.O.G.** If not accepted for publication, the articles and/or programs will remain the property of the author. If submissions are to be returned, please supply self-addressed, stamped envelope.
U.S.A. Newstand distribution by Eastern News Distributors, Inc., 111 Eighth Ave., New York, NY 10011.

Contents copyright © 1983 A.N.A.L.O.G. Magazine Corp.

EDITORIAL

by Lee Pappas

I would like to take this opportunity to answer some of the most frequently-asked questions that have recently been submitted to our offices.

Q: *What is the meaning of your name* **A.N.A.L.O.G.***?*

A: When Michael and I came up with the idea of starting the first ATARI-only publication, one of the most difficult aspects of the magazine was coming up with a suitable name. Since DIGITAL Equipment Corporation is predominant in our area (their headquarters is a half hour from our office), I jokingly suggested we call the magazine ANALOG (Amazingly, we have had people ask us if we know that an ATARI is a digital computer.) Michael then came up with **A.N.A.L.O.G.**; ATARI Newsletter And Lots Of Games.

Q: *How do you print your program listings?*

A: Our program listing method didn't just come about. A year ago, Charles Bachand wrote a custom program called, appropriately enough, LISTER, which has options to work with either C.Itoh or Epson printers. The program will print out all ATARI special graphics characters and inverse video. Our listings are printed 38 characters wide, the same format that they will appear in on your TV set if they are typed in correctly. This makes visual debugging of your typed programs easier. Our program listings are also printed out directly from working copies of the program. This helps to eliminate errors. While other listing methods are available, time has proven this as the most effective.

Q: *Who writes the articles and programs in* **A.N.A.L.O.G.***?*

A: Roughly half of the editorial content in the magazine is produced by readers like yourself. I feel our publication, for its size, has the most talented staff of any computer magazine in the country. We are very lucky to have the services of Charles Bachand, Tom Hudson, Tony Messina and Brian Moriarty, who are among the most knowledgable ATARI programmers in the field today, bar none. Our programs such as **Fill'er Up, Adventure In The Fifth Dimension, Maniac,** and **Livewire** are equal to, and in some cases better than, many commercially available pieces of software. Our utility programs ARE useful, our tutorials DO educate.

Q: *What back issues are available?*

A: Though several previous issues have been reprinted, at present only issues #2, & #7, and a limited supply of #9 & #10 are available. The **A.N.A.L.O.G. COMPENDIUM** will be ready shortly. This 160-page book will include the best programs and materials from the first ten issues, along with fresh material from the **A.N.A.L.O.G.** editorial staff. The **COMPENDIUM** will be spiral bound in 8½" x 11" format, will accept no outside advertising, and should be on sale at your favorite book or computer store August 1st.

Q: *When is* **A.N.A.L.O.G.** *going monthly?*

A: We have been contemplating going monthly since the publication of the first issue. Our first obligation is to our readers. When we feel that we can maintain the present quality of the magazine as a monthly publication, then we shall go monthly. With a bi-monthly circulation approaching 100,000, few of our readers have seen our total growth potential.

This issue of **A.N.A.L.O.G.** marks the end of our second year of publication. Michael DesChenes and I, along with the entire staff, would like to thank our readers, contributors, advertisers, and ATARI, for making **A.N.A.L.O.G.** what it is today: the first and best ATARI-only computer publication in the world. □

ATARI TECHNICAL SUPPORT & CUSTOMER SERVICE

ATARI has set up this department to assist you. Should any problems or questions arise call the number for your area if you need information concerning ATARI, or even non-ATARI products.

Technical Support: Sunnyvale, CA.
(800 numbers are toll free calls)

United States (except CA, HI, AK)
1-800-538-8543

Alaska & Hawaii
1-800-538-5282

California (outside Sunnyvale area)
1-800-672-1404

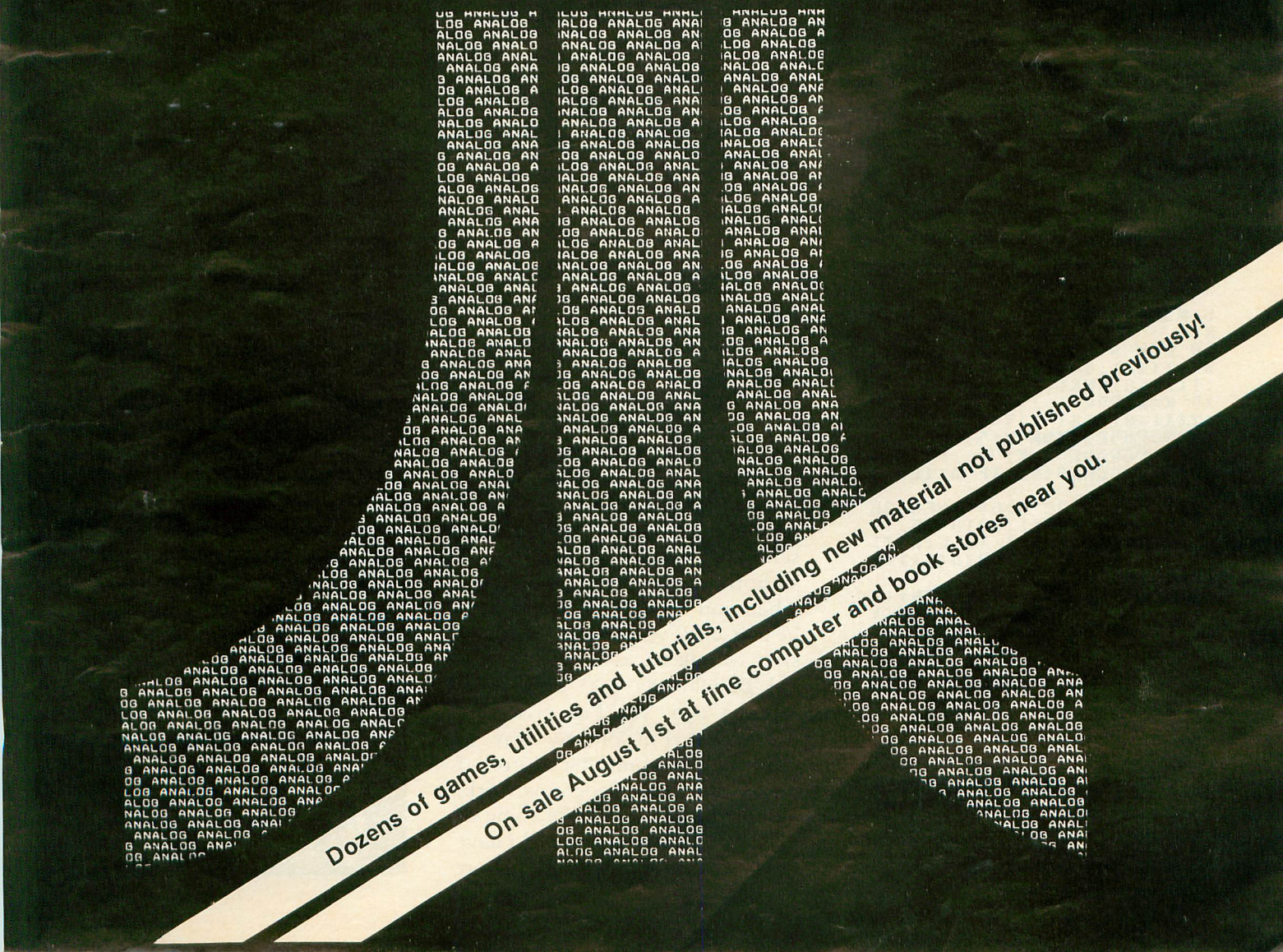
Sunnyvale/local and outside U.S.
1-408-745-2820

From the editors of
A.N.A.L.O.G. Computing

$14.95

THE A.N.A.L.O.G. COMPENDIUM

The best ATARI® Home Computer Programs from the first ten issues of A.N.A.L.O.G. Computing Magazine.



READER COMMENT

Sir:

At the end of each marking period, teachers in my school are required to complete a grade report showing grade distribution for each section. I guess many other teachers also have this sort of paperwork. The program listed below accepts letter grades A through E, counts the entries, and figures percents. The program also totals these numbers for several sections. The program is written to accomodate classes of up to 50 students. More students can be allowed by changing the dimension of A in line 10. There is no limit on the number of sections that can be accumulated. Although the program was written for the ATARI, it should be relatively easy to translate for other computers.

Sincerely,
Jeff Meyers
Baltimore, Maryland

```
5 POKE 752,1:OPEN #2,4,0,"
K:"
10 DIM A(50),X(5),A$(1),Y(
5),T(12):S=1:FOR I=1 TO 12
:T(I)=0:NEXT I
15 K=1:FOR I=1 TO 5:X(I)=0
:Y(I)=0:NEXT I:Y=0
20 ? "K$ECTION ";S:S=S+1:?
25 ? "GRADE ";K;" - ";:GET
 #2,A:? CHR$(A):IF A=155 T
HEN 40
30 IF A<65 OR A>69 THEN 25
35 A(K)=A:K=K+1:GOTO 25
40 K=K-1:FOR I=1 TO K:A(I)
=A(I)-64:X(A(I))=X(A(I))+1
:NEXT I
45 FOR I=1 TO 5:Y(I)=INT(1
00*X(I)/K*100+0.5)/100:Y=Y
+Y(I):NEXT I
50 ? "K":? :? "SECTION # "
;S-1:? :?
55 ? "GRADE","FREQ"," %":G
OSUB 135
60 FOR I=1 TO 5:? CHR$(I+6
4),X(I),Y(I):NEXT I:GOSUB
135
65 ? "TOTAL",K,Y
70 FOR I=1 TO 5:T(I)=T(I)+
X(I):T(I+6)=T(I+6)+Y(I):NE
XT I
75 T(6)=T(6)+K
80 ? :? :? "ANOTHER SECTIO
N (Y/N)?";:GET #2,A
85 IF A=89 THEN 15
90 ? "KCUMULATIVE":? :? :S
=S-1
95 FOR I=7 TO 11:T(I)=INT(
100*T(I)/S+0.5)/100
100 T(12)=T(12)+T(I):NEXT
I
105 ? "NUMBER OF SECTIONS
= ";S:? :?
110 ? "GRADE","FREQ"," %":
GOSUB 135
115 FOR I=1 TO 5:? CHR$(I+
64),T(I),T(I+6):NEXT I:GOS
UB 135
120 ? "TOTAL",T(6),T(12):?
 :? :? "START OVER (Y/N)?"
;:GET #2,A
125 IF A=89 THEN RUN
130 POKE 752,0:? "K":END
135 ? "------------------
------":RETURN
```

•

CHECKSUM DATA
(See p.46)

```
5 DATA 320,600,572,728,908
,185,937,930,988,236,266,8
86,436,743,741,9476
80 DATA 460,357,195,254,44
1,711,40,120,459,822,315,3
29,4503
```

•

Dear Sirs:

I would like to make a comment about Mr. Randall Beemer's letter in A.N.A.L.O.G. No. 11. It is pathetic to see some of the people in this world who just cannot appreciate anything or admit their own mistakes. For example, I am a head photographer in my high school. When everything is smooth, no one says a word, but when you make a mistake, you'll hear it until you're sick of it and start to talk back.

I bought my 800 only three months ago, yet I'm proud to claim that I'm on my way to becoming a computer "pro." I understand how programs work, and have begun to write some of my own. Where else could I have learned so much in such a short time? I know that it's a rhetorical question, but the answer is A.N.A.L.O.G. When I first started, A.N.A.L.O.G. programs didn't work for me either. However, you don't start driving racing cars until you've learned how to drive a car. It's the same with programming. You start with small programs like "Guess My Number" and gradually move up to a 1K program. If it works, then move on to a 2K program and so on.

Notice how A.N.A.L.O.G.'s program listings match up to the screen perfectly. Even special graphic characters are there. So far, A.N.A.L.O.G. is the only magazine for ATARI that has

Micro Match™
SAVES MONEY
Don't Let Programs Gather Dust!
TRADE Original SOFTWARE with Documentation for ALL MICROS . . . ALL PROGRAMS
WE MATCH TRADERS for only $5.00
GUARANTEED SATISFACTION
FOR UNLIMITED TRADING:
Ask about SOFTRADERS Worldwide Trading Network
- *Quarterly Directories*
- *Monthly Newsletter*
- *Cash Bonuses • Much more*

Send your system description, titles of all Software wanted, titles of all software to trade and S.A.S.E. Send no money.

SOFTRADERS™ International
1610 Shomaker Drive
Murphysboro, IL 62966

program listings which "synchronize" with the screen. This makes it many times easier to visualize just where you are in the program. If you take a straight edge and place it across the program so that only one line can be viewed at a time, your eyes will be less confused. Therefore, your eyes will read more accurately. Finally, I'm happy to say that An Adventure Game, The Halls of The Leprechaun King, and Fill 'Er Up worked flawlessly as listed.

In conclusion, if anyone refused to subscribe to **A.N.A.L.O.G.** and have an ATARI computer, they're on a diet for knowledge. I personally thank the **A.N.A.L.O.G.** staff for sharing so much of their knowledge with me at an unbeatable price. To refuse **A.N.A.L.O.G.** is maddening, not "sitting for four or five hours putting programs into the computer and not having them work." After all, not everyone can learn how to ride a bicycle without falling at least once.

Sincerely,
Hay Doan
Warren, Ohio

Thank you for your very kind words. I think that most editors would agree with me if I said that putting out a computer magazine must be one of the most difficult publishing jobs in the world. You have to assemble text, technical jargon, complex charts, and different types of program listings into some type of coherent form. (It is standard practice in the publishing world to notice typos and other mistakes only after you've printed 100,000 copies.) What's doubly annoying in producing a computer magazine is the fact that if there is but one error in a program listing, it can render the entire program useless. Occasionally the problem resides in the way the article is pasted up, or (rarely) a printing error can truncate a few characters from a listing, with the afore-mentioned results. All of the program listings in **A.N.A.L.O.G.** *are listed directly from working copies of the program, using Charles Bachand's screen dumper. (See this issue's editorial.) This helps us keep program listing errors to a minimum.*

—J.B.

Dear Sirs:

Here are some reprints of a couple of articles I wrote back in December of 1982 for our local ATARI Users' Group Newsletter, **(FR)ANTIC**. Incidentally, we sent several copies to individuals at ATARI, Inc., like Mark Cator, and Clarice Weisbach, just as we do every month.

I thought you might find it interesting that many of the same points your Mr. Brian Moriarty made in **A.N.A.L.O.G. Computing,** Issue #11, were also noted in my articles. Feel free to reprint these articles, in whole or in part, in your next issue.

I have also learned that ATARI now offers backup copies for sale to end users (presumably with proof of purchase) for $30.00 extra! I consider this to be a very weak attempt at supporting the user. Programs like BRODERBUND's BANK STREET WRITER come with two copies on two separate diskettes, and they were provided at a total cost to the user, less, indeed much less, than the other similar performance products!

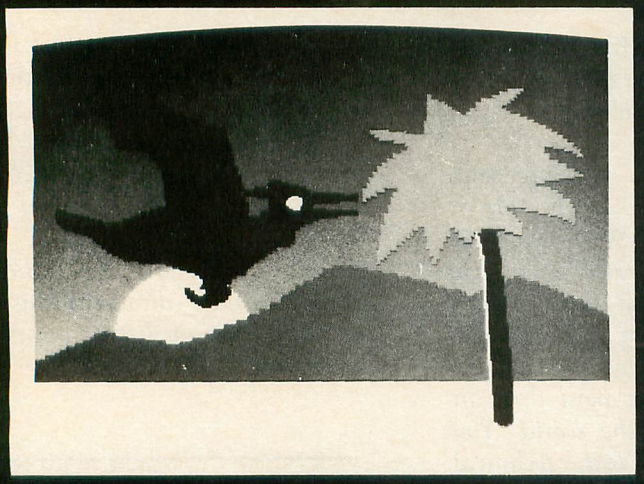
In closing, I would like to applaud your publication for having at least covered the topic of BACK-UP VS. PIRACY. I also noticed that your article never even mentioned HAPPY COMPUTING...I wonder why?

Sincerely,
P.R. Serafine, O.D.
President,
Alamo Area ATARI
User's Association

Attention Programmers!

A.N.A.L.O.G. Computing is interested in programs, articles, and software review submissions dealing with the ATARI 400 and 800 home computers. If you feel that you can write as well as you can program, then submit those articles and reviews that have been floating around in your head, awaiting publication. This is your opportunity to share your knowledge with the growing family of ATARI computer owners. **A.N.A.L.O.G.** pays between $30.00-$360.00 for all articles. All submissions for publication must be typed, upper and lower case with double spacing. Program listings should be provided in printed form, and on cassette or disk. By submitting articles to **A.N.A.L.O.G. Computing**, authors acknowledge that such materials, upon acceptance for publication, become the exclusive property of **A.N.A.L.O.G.** If not accepted for publication, the articles and/or programs will remain the property of the author. If submissions are to be returned, please supply a self-addressed, stamped envelope. All submissions of any kind must be accompanied by the author's full address and telephone number. Send programs to: Editor, **A.N.A.L.O.G. Computing**, P.O. Box 23, Worcester, MA 01603.

TAKE COMMAND OF PLAYER-MISSILE GRAPHICS



You can write brilliant animated graphics in Atari BASIC—without any bit-mapping, and without knowing machine language.

All you need is **PM ANIMATOR**, the new Player-Missile Graphics toolkit from **DON'T ASK.**

PM ANIMATOR makes it easy to: draw pictures and animate them, change your drawings and animation sequences, save your graphics creations on disk, and build them into your BASIC programs. You do it all with Player-Missile Graphics. You do it from BASIC, using two almost magical editors, plus **PM ANIMATOR's** special subroutines for Player-Missile Graphics control.

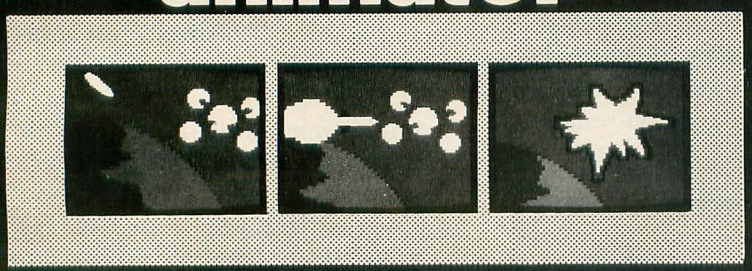
Create the most visually exciting software you've ever written. The power is yours.

Have your software dealer demonstrate **PM ANIMATOR.** Includes numerous demos and detailed owner's guide/tutorial. Requires 32K, disk. Suggested retail: **$34.95.**

Also available by mail from **DON'T ASK**. Send check or money order for $34.95 + $2.00 shipping/handling; California residents add 6% sales tax (6.5% if you reside in L.A. County).

Atari is a trademark of Atari, Inc.

PM animator



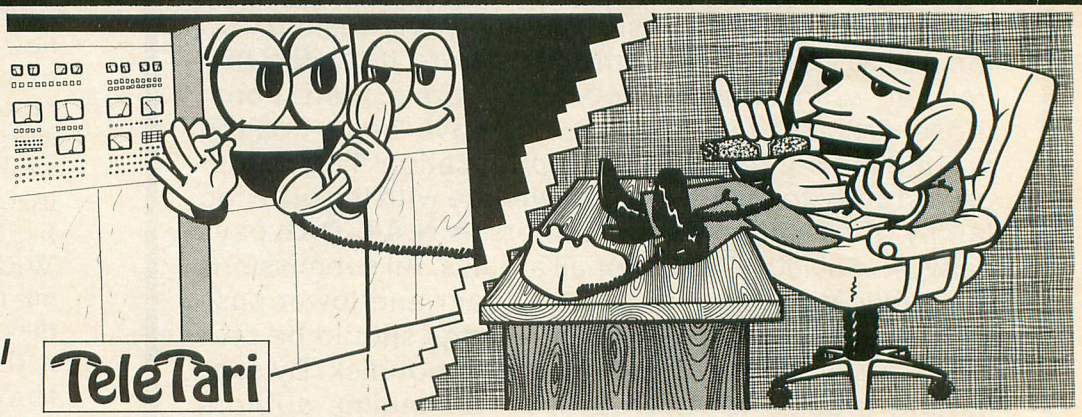
by Roger Bush

DON'T ASK
COMPUTER SOFTWARE

2265 Westwood Blvd., Ste. B-150
Los Angeles, California 90064
(213) 477-4514

PHONE RIGHT IN WITH TeleTari

The Friendly Terminal
by Harry Koons



Want to put your Atari in touch with other computers? **TELETARI** is just what your modem needs: a powerful telecommunications program that's a breeze to use. Choose the functions you want from a menu. Send or receive text or programs, save new data on disk, or print it on paper. A buffer of up to 20K bytes holds your data; page through it to find what you want. Adjust and save terminal parameters with another menu.

TELETARI is adaptable to most remote computers and most modems, including 1200 baud modems. It works through the RS232 port on the Atari 850 Interface, and it's suitable for any RS232 application and supports all 850 options. It's also compatible with the Bit 3 Full-view 80™ board.

Ask your software dealer for **TELETARI**, by **DON'T ASK. $39.95.** Requires 32K, disk, BASIC, 850 Interface.

DON'T ASK INC
COMPUTER SOFTWARE

2265 Westwood Bl., Ste. B-150
Los Angeles, CA 90064
(213) 477-4514

Or order by mail direct from **DON'T ASK**. Add $2.00 shipping/handling to your check or money order. Calif. residents add 6% sales tax (6.5% if you reside in L.A. County).

Dealer inquiries welcome

Atari is a trademark of Atari, Inc. Full-view 80 is a trademark of Bit 3 Computer Corporation.

The articles Mr. Serafine enclosed with his letter make fascinating reading. A substantial excerpt from one of them is reprinted below.

Look for my profile of the notorious "Happy Drive" elsewhere in this issue.

—B.M.

I have it from a spokesperson at ATARI CORPORATE that it is quite legal to "back up" or duplicate ANY existing program from ATARI or anyone else, PROVIDED that it is for your personal use. So if this is true, then why do software producers copyguard their products? The answer is obvious...to prevent UNAUTHORIZED duplication. The only trouble is, that it also prevents the purchaser's "authorized" duplication for personal use.

I feel that the software companies in general have missed the mark in trying to prevent Piracy. The policies of obtaining a back-up copy of software from a producer leave quite a lot to be desired. I am not opposed to copyguarding. My favorite game is PREPPIE!, which is one of the most heavily copyguarded programs available anywhere. What I am opposed to is the attitude of the companies that produce software that the purchaser only be given a new copy of the software, if the original is ruined, or defective, and usually only when the original is returned (presumably as proof of purchase) and only when the purchaser PAYS a fee ranging from $3.00 to nearly the full price of the software! This is ridiculous!

An example of a very reasonable policy is that of Adventure International. You can obtain a back-up copy of the game PREPPIE! by sending in a proof-of-purchase coupon and the cost of the diskette. You get two fresh copies of the programfor the purchase price plus this media price. You don't lose your original in the bargain.

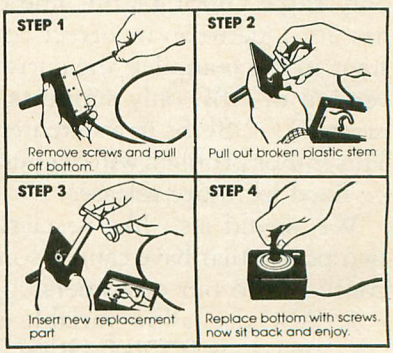
An example of a ridiculous policy is ATARI, Inc. You can purchase for $150.00, The Bookkeeper, which comes on four SLOW FORMAT and heavily protected diskettes. What's more, these diskettes do not even have reinforced hub rings! All this on a program which must, by it's very nature, constantly access the diskettes. Surely it doesn't take a genius to figure out that the diskettes WILL eventually wear out. Well let's see, we can back up our Bookkeeper, right? Well, unless the user has a special version of ATARI DOS, he/she cannot, since the disks have "bad sectors" which cause DOS to hang up. Well, maybe we can send in a coupon...oh, they don't give one with it. Well maybe they state their replacement policy on the package or in the documentation...oh, they don't.

This sort of attitude is what promotes Piracy. The companies which do not provide a fair means of obtaining a back-up copy of their software are in the majority. They spend thousands of dollars on programming and equipment to copyguard their products, and of course they pass this along to the purchaser. This higher priced software is justifiable if the company will provide a back-up copy for a reasonable price with proof of purchase. It is not justifiable if the company provides the software on inferior media and has NO stated back-up policy other than for the user to purchase a second copy at full price! Synapse Software is now providing a back-up copy of FILEMANAGER 800+ on the flip side of the original. This is a middle ground policy, but what happens if the disk is physically damaged? You zap BOTH copies at once! This is not as ideal a policy as that of Adventure International.

What is the solution for the end user? By boycotting the companies whose policies are unreasonable, your power can be felt! By writing to these com-

QUESTION !
HOW DO YOU MAKE YOUR ATARI® 400/800 WORK FOR YOU ?
ANSWER :
POIRE (pwahrr) I/O KITS !
INTRODUCTORY PACKAGE FOR INPUT AND OUTPUT INCLUDES: special! ONLY $9.95!
° HARDWARE: temperature sensor, led output, light response device, interfacing devices
° SOFTWARE / HARDCOPY; WORKING BASIC PROGRAMS FOR ABOVE, DIGITAL TIMER, COMPLETE INSTRUCTIONS, POIRE PRICE LIST
*ATARI is a reg. trademark of Atari inc.
POIRE PERIPHERALS
P.O. BOX 849
SMITHFIELD, R.I. 02828

JOYSTICK REPLACEMENT INSERT

EASY WAY TO REPAIR YOUR ATARI™ OR SEARS VIDEO™ JOYSTICK


Allow 4 to 6 weeks for delivery
$4.35 PAIR Plus 65¢ postage & handling
Name
Address
City State Zip
J. E. KOCH & CO.
P.O. Box 864, Durham N.H. 03824
sorry no C.O.D.'s please

panies and complaining your voice can be heard. It is also a good idea to write letters of praise to the companies whose policies you feel are fair, for positive reinforcement. I believe in getting quality software on quality media when I pay a premium price for it, and I think it is my right as a purchaser to have a back up copy for insurance against needless down time when my original is lost or damaged. If we were getting our programs on an indestructible medium, I could understand the company's not providing a back-up, but diskettes and cassettes are perishable! □

Dear Editor:

Thank you for including ABC in your review of BASIC compilers for ATARI computers. We at Monarch Data Systems feel the review was honest and fair in showing both positive and negative aspects of all the products.

There was, however, one mistake in the review regarding the line number that caused ABC to generate an error. The review reported that the error occurred on line 66 of the adventure program. It was really line 68 that caused the problem. Line 66 has only three GOSUBs but line 68 has 25! Due to an incorrect constant in the compiler, the current version of ABC only supports at most 20 GOSUBs in a statement. This minor problem will of course be fixed in future releases.

We would also like to clarify two points that have caused some confusion to our customers.

1. ABC *does* allow variable expressions in DIM, GOSUB, GOTO, and RESTORE statements.
2. ABC automatically shows both the error code *and* BASIC line number when errors occur at run-time.

Thanks for letting us clarify these points and keep up the great work on the magazine.

Sincerely,
E. Goldberg
Director of Marketing
Monarch Data Systems

Sorry about the typo. Incidentally, if you want to compile Adventure in the 5th Dimension with Monarch's ABC (version 1.02 or earlier), simply replace the following lines:

```
66 GOSUB 16:GOSUB 28:M$(0,
0+C15)=CL$:ST$(C5,C5)=CHR$
(Z):GOSUB 28:CL$=M$(0,0+C1
5):? OK$:POSITION C2,C0
67 ? #C2;"Your location:";
:POSITION C2,C1:Z=Z-64:IF
Z>19 THEN ON Z-19 GOSUB 45
,46,46,46,47,48:GOTO 69
68 ON Z GOSUB 30,31,31,32,
31,31,31,33,34,35,36,37,38
,39,40,41,42,43,44
```

—B.M.

Dear **A.N.A.L.O.G.**:

I have a question concerning your recent article on disk copy programs. My friend, who owns an Apple II, tells me about games he has copied from his friend using **Nibbles Away 2**. It would be a waste of time to go on about my honest intentions in using such a program, but I can just say that they would be honest. Anyway, it said in the article that "if you want to make dupes of Choplifter," etc., etc., "forget it!" Well, honestly or not, this is what my friend is doing, and I am wondering if there is anything like this for the ATARI. Your article said that there was not, but why? It also talked much about the mechanical workings of the 810. Do the Apple and the ATARI drives differ so much that the Apple is able to produce a copy of an Apple game, but the ATARI is not able to make a copy of an ATARI game?

I hope you can clarify this for me.

Sincerely,
Chris Bull
Carlisle, MA

Apple disk drives are "dumb." This is not intended as a slur; rather, it indicates the Apple drive's lack of built-in controller circuitry. The Apple's disk access functions are directed by an external controller board that plugs into the computer. This arrangement makes it possible to read or write an Apple disk almost any way you want — unlike the semi-intelligent ATARI drive, which allows only one type of read and two types of writes. The result is that it is much harder to copy-protect an Apple disk than it is to protect an ATARI disk. This fact has not been lost on programmers like Dan Gorlin (the author of **Choplifter**, *who deserves a fair profit from the sales of his game and would probably be very interested to know why your "friend" is making unauthorized backups.*

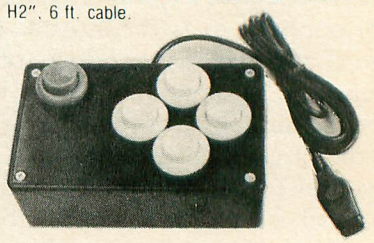
—B.M.

Send letters to:

READER COMMENT
P.O. BOX 23
WORCESTER, MA 01603

FingerTip Controller™
REPLACES JOYSTICK
For Atari® 400/800 Computers

8-way directional action. Two year warranty. 30-day moneyback guarantee. Five responsive arcade-quality durable buttons. Unbreakable plastic case. Left-hand models available. L6" W3¾" H2". 6 ft. cable.



Model 101—FingerTip Controller™ $19.95
KIT $14.95

Model 103—Mouth operated joystick for quadraplegics $65.00 Write for catalog.
Shipping & handling $3. Calif. residents add 6½% tax.

KY ENTERPRISES
Customized Video Games and Controllers
195 Claremont, Suite 288
Long Beach, CA 90803
(213) 433-5244

ComputAbility™ presents the Newest in Software Products for ATARI

ATARI 800 48K ..... CALL	ENTERTAINER KIT ..... CALL	48K RAM ..... CALL
ATARI 810 DISK DRIVE ..... CALL	COMMUNICATOR KIT ..... CALL	16/32 EXPANDER 74.95
ATARI 850 INTERFACE ..... CALL	HOME MANAGER'S KIT ..... CALL	**B-KEY 400 ..... 84.95**
ATARI 1010 PROGRAM RECORDER ... CALL	PROWRITER 8510 A ..... CALL	**SUNCOM JOYSENSOR**
EDUCATOR KIT ..... CALL	**MOSAIC**	Touch Sensitive Joystick 34.95
BOOKKEEPER KIT ..... CALL	64K RAM 149.00	Amdek Monitors ..... Call
PROGRAMMER KIT ..... CALL	32K RAM 87.95	

We Carry The Complete **PERCOM** Line. Call For Items and Prices.

SUPER SPECIALS
All Synapse Arcade Titles
$22.95 Disk/Tape
Prices Effective Now To July 31, 1983

Call For Our Special Prowriter Package.

FREE* SOFTWARE AND ACCESSORIES

ATARI

Conversational Languages-T	43.95
Programming 2 & 3 - T	21.95
Music Composer - C	32.95
My First Alphabet - D	26.95
Touch Typing - T	19.95
Home Filing Manager - D	37.95
Mailing List - T	19.95
Asteroids - C	26.95
Caverns Of Mars - D	28.95
Computer Chess - C	26.95
Missle Command - C	26.95
Super Breakout - C	26.95
Star Raiders - C	32.95
Assembly Editor - C	44.95
Basic - C	44.95
Macroassembler - D	65.95
Microsoft Basic - D	65.95
Pilot (Home Package) - C	58.95
Invitation To Programming I - T	18.95
Speed Reading - T	55.95
Basketball - C	26.95
Graph-It - T	15.95
Juggles House - D/T	22.95
Pilot (Educator) - C	97.95
Video Easel - C	26.95
Defender - C	32.95
Galaxian - C	32.95
Qix - C	32.95
Dig Dug - C	32.95
ET - C	38.95
Timewise - D	23.95
Atariwriter - C	61.95
Donkey Kong - C	32.95

ADVENTURE INTERNATIONAL

Preppie - D/T	23.95
S.A.G.A Adventures - D	31.95
Sea Dragon - D/T	27.95
Stratos - D/T	27.95
Bugoff - D/T	23.95
Preppie II - D/C	27.95
Stone of Sisyphus - D	27.95
Eliminator - D/T	20.95

ANALOG

Race In Space - D/T	20.95
Sunday Driver - D/T	23.95
Crash Dive! - D/T	23.95
Buried Bucks - D/T	23.95
Titan - D/T	23.95
Star Sentry - D/T	23.95

COMPUTABILITY DIVIDEND COUPON PREMIUMS

3 M Blank Disk - Box of 10	27.00 or 10 Coupons
Elephant Disks - Box of 10	22.00 or 8 Coupons
Flip 'n File Disk Holder	20.95 or 6 Coupons
Flip 'n File Cartridge Holder	20.95 or 6 Coupons
Monitor Stand	27.95 or 10 Coupons
VU - Case Disk Holder W/Lock	24.00 or 10 Coupons
Heavy Plastic Dust Cover 800 or 810	9.95 or 3 Coupons
First Book of Atari Software 1983	17.95 or 6 Coupons
Kids & The Atari	17.95 or 6 Coupons
The Atari Assembler	12.95 or 5 Coupons
Atari Games & Recreation	14.95 or 6 Coupons
Atari Pilot for Beginners	14.95 or 6 Coupons
The Visicalc Book Atari	14.95 or 6 Coupons
Atari Basic	12.95 or 5 Coupons
Atari Sound & Graphics	9.95 or 3 Coupons
Starfighter	12.99 or 5 Coupons
Slik Stik	9.95 or 3 Coupons
Extension Cable - 6 ft.	6.95 or 3 Coupons
Lefty Adaptor	9.95 or 3 Coupons
Stik Stand	6.99 or 3 Coupons
Suncom Tac II	19.95 or 8 Coupons
Suncom Game Switch	6.95 or 3 Coupons
TI Adaptor	12.95 or 5 Coupons
Kraft Switch Hitter Joystick	17.95 or 7 Coupons
Kraft Joystick	15.95 or 6 Coupons
Maxell 2 Pack Disks	8.95 or 3 Coupons
Inside Atari Basic	12.95 or 5 Coupons
Compute's First Book of Atari	12.95 or 5 Coupons
Compute's Second Book of Atari	12.95 or 5 Coupons
De Re Atari	17.95 or 6 Coupons
Wico Joystick	24.00 or 10 Coupons
$24.00 Worth of Software	10 Coupons

*COUPON PROGRAM

The purchase of each program (with the exception of Super Specials, Atari and APX) will earn you 1 COMPUTABILITY DIVIDEND COUPON. Save 10 coupons and redeem them for your choice of any program we sell for $24.00 or less. Less than 10 coupons may be redeemed for premium items as indicated. You pay only a $2.50 shipping & handling charge.

DATASOFT

Shooting Arcade - D/T	23.95
Pacific Coast Highway - D/T	23.95
Micropainter - D	27.95
Canyon Climber - D/T	23.95
Fathoms Forty - D	27.95
O'Riley's Mine - D/T	27.95
Rosen's Bridgade - D/T	27.95
Sands of Egypt - D	31.95
Zaxxon - D/T	31.95
Moon Shuttle - D/T	31.95

I.D.S.I.

Pool 1.5 - D	27.95
Pool 400 - Cart	31.95
Speedway Blast - Cart	31.95
Juggler - D	23.95

FIRST STAR

Astro Chase - D/T	23.95

BIG FIVE

Miner 2049'er - Cart	39.95
Scraper Caper - C	39.95

ON-LINE

Jawbreaker - D/T	23.95
Luna Leeper - D	23.95
Wizard and the Princess - D	25.95
Threshold - D	31.95
Ulysses - D	27.95
Mouskattack - D	27.95
Frogger - D/T	27.95

SIRIUS

Bandits - D	27.95
Way Out - D	31.95
Repton - D	31.95
Twerps - D	27.95
Wavy Navy - D	27.95
Blade of Blackpoole - D	31.95

SENTIENT

Cyborg - D	27.95
Goldrush - D/T	27.95

BRODERBUND

Apple Panic - D/T	23.95
Stellar Shuttle - D/T	23.95
David's Midnight Magic - D	27.95
Sky Blazer - D	25.50
Track Attack - D	23.95
Labyrinth - D/T	23.95
Serpentine - D	27.95
Dueling Digits - D	23.95
Choplifter - D	27.95
Genetic Drift - D/T	23.95
AE - D	27.95

EDU-FUN

Call For Items and Prices

MISCELLANEOUS

Night Mission - D/T	23.95
Jumpman - D	31.95
Airstrike - D	31.95
Castle Wolfenstein - D	23.95
Financial Wizard - D	49.95
Pinball Construction Kit - D	31.95
Pig Pen - D	23.95
Baja Buggies - D/T	25.50
Starbowl Football - D/T	25.50
Master Type - D	31.95
Ali Baba - D	26.50
Jeepers Creepers - D	23.95
Paint - D	33.95
Kid Grid - D/T	23.95

D - Disk T- Cassette
C - Cartridge

We Carry Hundreds of Items for ATARI 400/800, Ask for Our FREE CATALOG.

ATARI is a trademark of ATARI, Inc.

Mastercard/VISA Order Toll Free MasterCard **800-558-0003** No surcharge for credit cards VISA **In Wisc. Call 414/351-2007**

COMPUTABILITY
P.O. Box 17882
Milwaukee, WI 53217

ORDERING INFORMATION: To order by mail, send money order, certified check, or personal check (allow 14 days to clear) to COMPUTABILITY. Include $2.00 shipping on all software orders. Include 3% shipping on all hardware orders, minimum $2.50. Mastercard and Visa please include card number and expiration date. WI residents please add 5% sales tax. Canadian, APO & FPO software orders include 5% shipping minimum $5.00. All other foreign software, please add 15% shipping, minimum $7.00 (US Funds only). Prices subject to change without notice.

ORDER HOURS
Mon-Fri 12-9 PM (CST)
Sat 12-5 PM (CST)

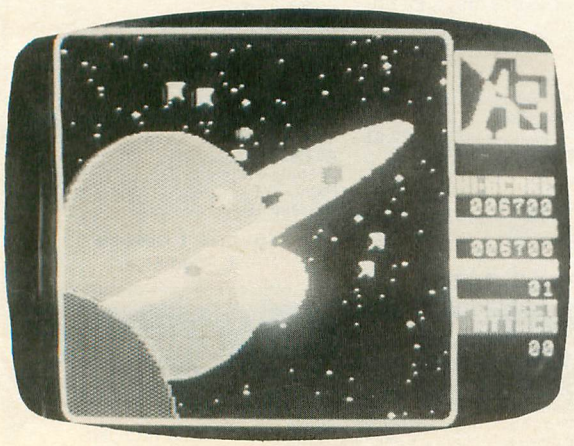
NEW PRODUCTS

by The Program Doctors

There are many new, exciting developments from the world of ATARI. ATARI is now seeking outside help from such companies as Datasoft and Roklan in software development. They have bought the rights to such quality programs as Reston's *PAINT* and Visicorp's *VISICALC* to be re-released under the ATARI brand name. In the very near future you will see *DONKEY KONG, MS. PAC-MAN, SUPERMAN III,* and a new cartridge version of *EASTERN FRONT.* The most important news from ATARI is the fact that several new computers with associated peripherals will be unveiled at the Summer Consumer Electronics Show. (See **A.N.A.L.O.G.**'s profile of these products elsewhere in this issue.)

On the third-party software front there have been several great new pieces of software released, especially in the arcade classification. Broderbund has done an excellent job putting both *CHOPLIFTER* and *SERPENTINE* on ROM. *A.E.*, a 48K disk with 3-dimensional graphics is the best of their new games. Beginning on Earth, you must chase the swooping *A.E.*, which fly in varied formations off the Earth's surface to the outer reaches of the Milky Way. Unlike other 3-D games, *A.E.* actually uses its graphics to enhance playability. Game play is fast and the five screens accurately recreate actual solar system conceptions.

The long-awaited *Sky Blazer* is finally out. If this game had been released on schedule (almost a year ago) it might have been something special. But with the constantly improving quality of game software, this game does not break any new ground.



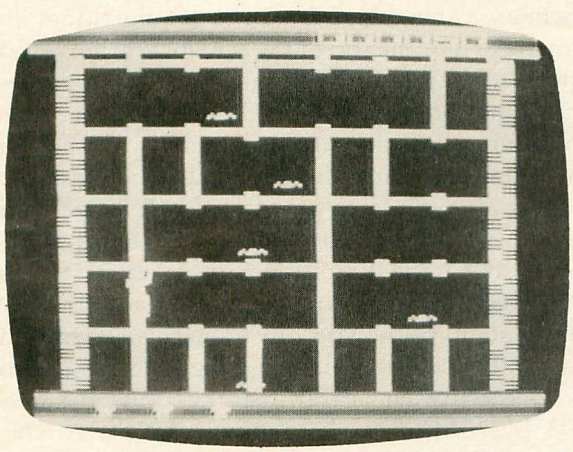
A.E.

To say that Broderbund's *BANK STREET WRITER* is an excellent word processor would be a very misleading statement, unless we qualify it by saying HOME word processor. While *LETTER PERFECT* is still the reigning Cadillac of word processors for the ATARI, it is expensive, requires a certain amount of "study time" to be able to use all the features effectively, and contains some things that are best suited for a small business. While *BANK STREET WRITER* has many limitations (no underlining, no right justify, no boldfacing, no mail list merge), its simplicity is its best feature. Most of the standard editing features are included, and on the back side of the disk is a tutorial that will take you step by step through the major menu options, with more in-depth instruction supplied in the well-written reference manual. Broderbund set out to write a word processor geared to students' term papers or that overdue letter to your Uncle Ron in Philadelphia, and in this they have succeeded admirably.

When the first Sirius games were released they were criticized for their under-utilization of ATARI's sounds and graphics. *SNEAKERS, SPACE EGGS* and *SNAKE BYTE* were Apple clones. With *BANDITS* and *WAYOUT* they turned the corner, since both were great games. Now with *REPTON* and the Hi-Res adventure *BLADE OF BLACKPOOLE* they can be considered among the elite of the third party creators. It takes a lot of guts to place the words "KILLER GAME" under the title *REPTON* but they are not kidding. This "save your planet from absolute destruction" game is unlike any of the previous "SYPFAD" games because in order for you to win you must have your planet destroyed. Sirius may have confused some people with their disk-based instructions but there are TWO separate screen displays, the second of which you can't get to unless you lose during the first part of the game, but survive! If this sounds confusing check this game out; it contains some of the most complete uses of ATARI sound and graphics to date and is a must for any *DEFENDER* freak.

Experienced adventurers will enjoy *BLADE OF BLACKPOOLE*, with its fast graphic drawings and point system style of play to allow replayability. Its medieval theme and fantasy logic take you on a picturesque journey in search of a mighty sword,

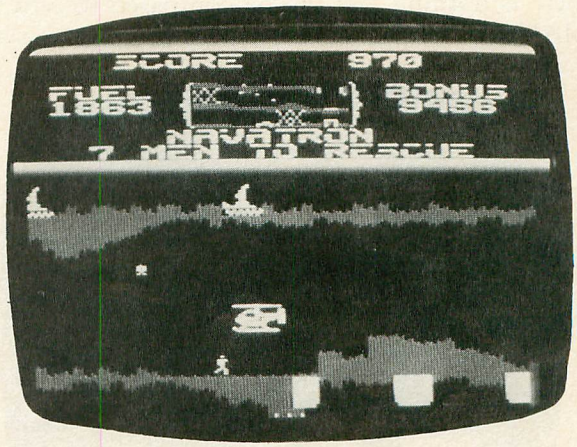
supposedly hidden in the Lake of Blackpoole. Sirius has yet another winner with this adventure and their soon-to-be-released *CRITICAL MASS* will surely place them right up there with Scott Adams, Infocom and Sierra On-Line as adventure leaders. But we feel that a word to the marketing people at Sirius is now called for. ATARI computer owners are a sophisticated lot. The amount of quality software you are producing is great and you should be congratulated. But *please* stop releasing your VCS conversions! *WORM WAR II, FAST EDDIE, TURMOIL,* and *SQUISH 'EM* are poor excuses for computer arcade games. Although all of these ROM-based games are conceptually good they lack the fine programming techniques with which Sirius is becoming synonymous. If the same attention that was paid to *SQUISH 'EM* for the Commodore 64 was given to the ATARI version, then this game could have been a hit, but we cannot recommend it.



Squish 'em

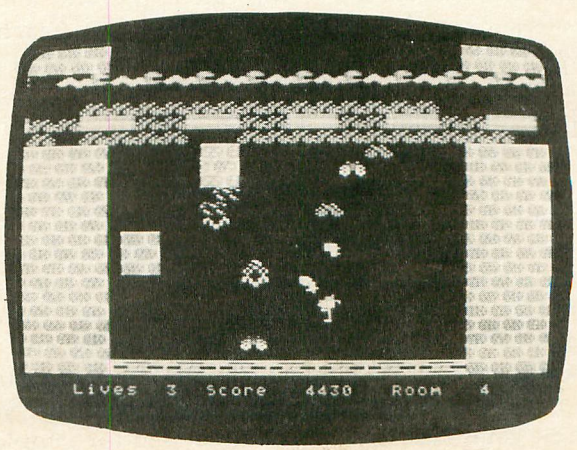
Sierra On-Line seems to be going in the opposite direction of Sirius. The company that gave us *FROGGER, THRESHOLD,* the original *JAWBREAKER* and the Hi-Res adventures, while still holding their high standing in the Apple market, is rapidly losing the respect they have earned from ATARI owners by releasing such programs as *MAURADER, WALL WAR, LUNAR LEEPER* and the re-written *JAWBREAKER.*

MAURADER is a cheap combination of *MISSILE COMMAND* and *SHAMUS,* with poor graphics, sounds and playability. *LUNAR LEEPER,* while a somewhat better game, is also sadly lacking in the graphics and sound areas. *WALL WAR* is a graphic symphony, and upon first boot-up, we began to think that maybe On-Line had come to their senses. Then we played it, and realized that the game is totally pointless. On-Line's decision to release their new version of *JAWBREAKER* is really hard to fathom. The third and latest version is an imitation of the Tigervision version written for the VCS. Unless this is a result of the widely publicized lawsuit between On-Line and ATARI over *PAC-MAN,* we can see absolutely no reason to take what was at one time the most popular game for the ATARI computer, and turning it into a class-B piece of software.



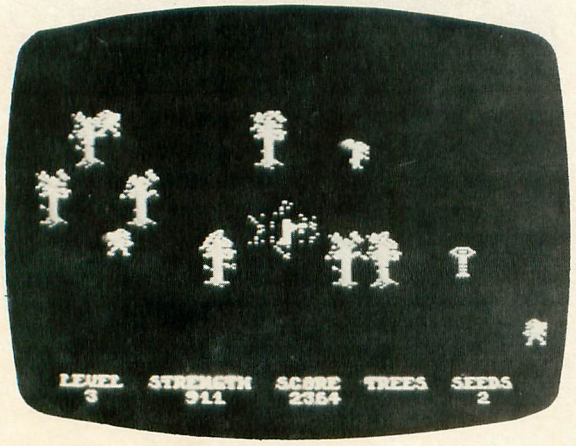
Fort Apocalypse

The recent release of five new games (*FORT APOCALYPSE, SHAMUS:CASE II, SURVIVOR, NECROMANCER* and *THE PHARAOH'S CURSE*) places Synapse at the top of the heap in third party software for the ATARI. *SHAMUS: CASE II* is a sequel to the original software smash. The Shadow is back with a new underwater fortress and new sidekicks to deter you as you attempt to find his throne room and rid the waters of his dastardly deeds. The lack of a pause key in the original was a major problem since, unless you had 3 arms and 4 eyes, there was no easy way to map the floors of the Shadow's Lair. In *CASE II* you not only have a pause key but whenever you do take a break you can view the entire progress of your mission. (The program draws the map for you and it saves that map from game to game.) Gamers please note: *CASE II* is totally different from *CASE I,* and this 32K T/D game is great.



Shamus II

The strangest of the new Synapse titles is *NECROMANCER*; this game is impossible to describe in the space allowed. It consists of three totally different sections, all interrelated; the second and third contain five levels each. Game play is fast and furious, and there is nothing that can be compared to *NECROMANCER* on the market at this time.

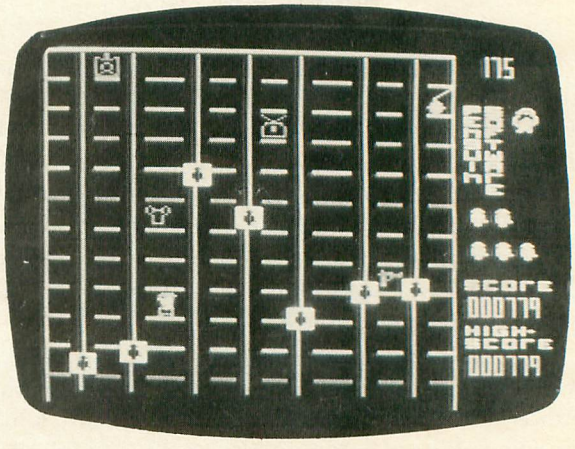


Necromancer

There have not been many games that four people could play at the same time, but *SURVIVOR* allows up to four interactive players working together to eliminate the armed forts of the Xenogryphs. Some very nice spaceship movement and shooting effects are included. *THE PHAROAH'S CURSE*, a multi-level arcade-adventure in the style of *SHAMUS*, and *FORT APOCALYPSE*, a combination of *CHOPLIFTER* and *CAVERNS OF MARS* round out the list of Synapse's latest products.

Odesta has released three new programs. *CHESS*, *CHECKERS*, and *ODIN* are just about as good as you can get. Beginning with the first-rate packaging job and going all the way to the well-written documentation, these programs are top-shelf. The programs were written by people who are authorities in their fields. Peter Frey is one of the U.S. Othello Association's top-rated players and a professor at Northwestern University, teaching psychology and computer science. Larry Atkin and David Slate are winners of the World Computer Chess Tournament, and 8 North American Computer Championships. These credentials alone should convince you that the game logic is superb, and all of the extra features just add to the overall polish. There are too many of them to list them all, but they range from different levels, opening move libraries, advice and prediction of best moves, graphic illustrations of attacks and defenses, and our favorite, the MOVIE, in which you can play a game, and then have the computer play it back for you. These games are highly recommended for people in all skill categories; they will help the beginners and challenge the masters. We don't know what will come next in the MIND OF MAN series, but if Odesta is open to suggestions, we sure could use some quality software for bridge, hearts, gin rummy, Scrabble...

SPY'S DEMISE is the winner of this issue's "Potato Chip" award. You can't stop playing it. Penguin Software's first ATARI release is an original arcade-type game that combines good graphics, catchy tunes and a puzzle in what is basically a very simple concept. The first line of the documentation describes it like this: "Generally there are two instructions. Left. Right." The idea is that you are a spy trying to locate and decipher the parts of a secret code that have been stored on separate floors of a diplomatic mission. The playfield is a grid work of the floors of the building, and you must make your way across each floor, and up to the next one, until you reach the top. There are seven embassy guards riding up and down in elevators and you must avoid them as you make your way across the floors. If you can make it to the top of the screen, you are rewarded with one line of a cryptic message. Each successive screen has one less floor, making it harder and harder to accurately time your walk across. Gather all the information, crack the code and Penguin Software will award you with an official *SPY'S DEMISE* T-Shirt (according to Penguin, T-Shirts will be awarded to the first solver from each state, each Canadian province, and each other country, but we feel that anybody who can solve this is deserving of recognition!) We welcome Penguin Software to the ever-growing list of third party producers and ask if *SPY'S DEMISE* is here now, can *PIE-MAN* and *TRANSYLVANIA* be far behind?

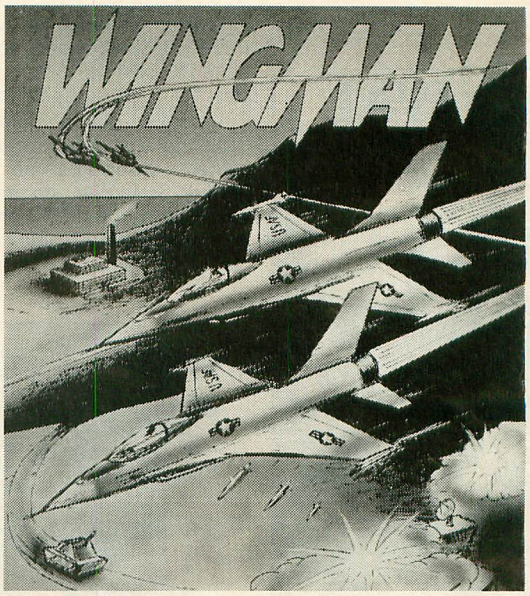


Spy's Demise

The long awaited *STARBOWL FOOTBALL* is finally available. Gamestar redid the game when it realized that 16K would not be enough memory to make a realistic football game. Styled after Mattel's Intellivision classic, at 24K *STARBOWL FOOTBALL* is by far the best sports game for the ATARI at this time. Its one or two player option is a definite

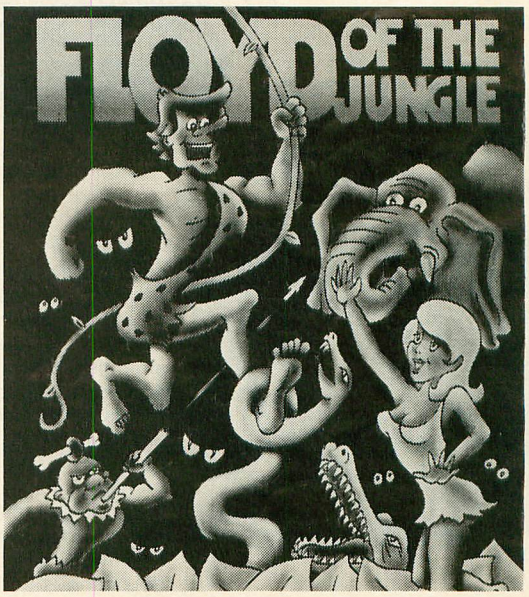
Experience the MicroProse Challenge ! ! !

Fly combat in a three-dimensional aerial dogfight over the Pacific during WWII . . . Requires real fighter pilot skills and maneuvers to survive to become an Ace or a W.G.F.P.! . . . Try "SPITFIRE ACE" for aerial combat over Europe . . . 1-4 player combat . . . ATARI, 40K Disk or 32K Cassette . . . $29.95.



Blue Flight of 2, armed with bombs, cannon, or air-to-air missiles, must use dogfighting loops, bombing, and strafing to defend its territory and destroy Red Flight territory. Split Screen, scrolling action with options for solo, head-to-head, or cooperative flying for 1-4 simultaneous players...ATARI, 40K Disk or Cassette...$34.95.

Scrolling, real time strategic wargame simulation requiring the NATO COMMANDER to defend Europe from East Bloc invasion. Battle plays in accelerated real time and demands realistic decisions and command actions to repel the enemy in five different battle situations . . . ATARI, 40K Disk or Cassette . . . $34.95.



Race through the dangerous jungle avoiding the elephants, alligators, pygmies with poison darts and other jungle perils to be the first to rescue the lovely Janice! . . . A zany footrace for 1-4 simultaneous players . . . ATARI, 32K Disk or Cassette . . . $29.95.

POSTERS AVAILABLE! — Large (17"x22") full color **HELLCAT ACE, FLOYD OF THE JUNGLE,** and **WINGMAN** posters are available for $3.00 each plus $1.00 postage and handling.

If you can not find our games at your computer store, you can order by MasterCard or Visa, money order, COD or check. Add $2.50 for postage and handling. MD residents add 5% sales tax. Call or write:

MicroProse Software 1 Caribou Court, Parkton, MD 21120, (301) 357-4739

DEALER INQUIRIES WELCOME!

ATARI is the registered trademark of ATARI, Inc.

NEW!

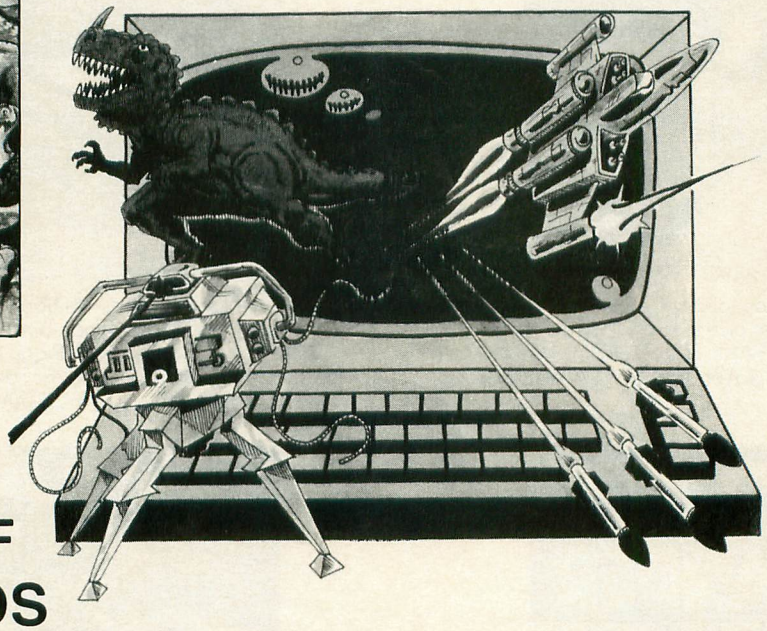
For ATARI® 400/800™

SURVIVAL
Computer Game

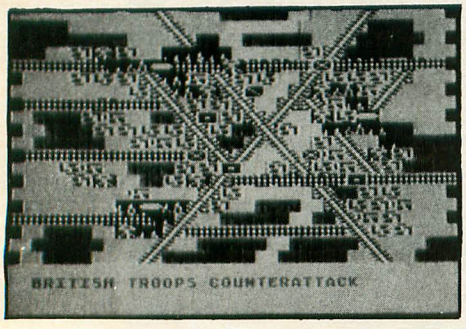
Your only chance for survival is to trudge 340 kilometers to an abandoned research station when your starship is downed on an alien world. But your food supply and weapons are limited to what you can carry, and the planet's carnivores are huge and hungry. SURVIVAL features full-color terrain and computer-generated encounters. Great for solitaire or multi-player gaming!

Experience the thrill and excitement of ship-to-ship combat in deep space. In this game for two players, each player creates a fleet, and then enters his moves and the weapons he wishes to fire. The computer resolves all movement and combat, records the damage, and then scores the victory points. Design your own scenarios, or use the preset ones—either way, STARFIRE is a classic!

STARFIRE
COMPUTER GAME



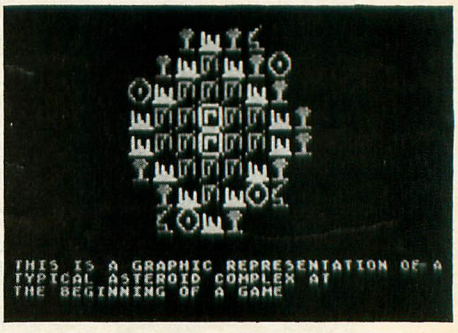
THE WAR OF THE WORLDS



Relive H. G. Wells' classic tale of the battle that ensued when the Martians invaded Earth and the humans desperately struggled to save Mankind. The computer-controlled Martians land their pods and launch their attack by burning anything and everything in their path. The player controls the humans, and must figure out how to stop the Martians before all of London is burning.

ASTEROID ZERO-FOUR

Your space fighter bomber swoops over the surface of the asteroid through the red glare of the laser towers' deadly fire. You are trying to incapacitate the asteroid's mining operations. But is your own asteroid safe? In this game for one or two players, you attack your opponent's asteroid with your heavily-armed bombers, and must score repeated hits to destroy it.



TASK FORCE COMPUTER GAMES™ are strategy games rather than reaction games. They allow a player time to think out his best move. The game program is recorded on a cassette tape, and complete instructions are included for loading and play.

All **TASK FORCE COMPUTER GAMES™** require an Atari® 400 or 800 16K computer and an Atari® 410 Cassette Player. Some require joysticks. A program version which allows the game to be replayed without reloading from the cassette tape is included for players with a 32K machine.

New Strategy Games for Atari 16K Cassette from

TASK FORCE COMPUTER GAMES™

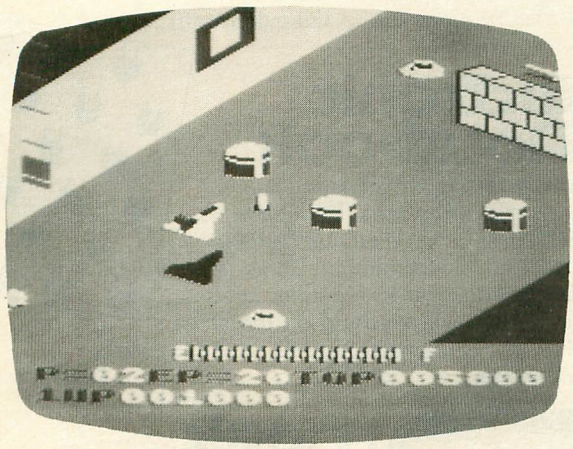
The NEW FORCE in gaming.

Atari is a Registered Trademark of Atari, Inc.

plus (it's hard enough getting our mates into space games without forcing a football game down their throat).

The most difficult aspect of *STARBOWL* is the offensive pass catching. Here's a hint: watch the defensive man who is guarding your designated receiver; as soon as the defensive man cuts to cover his programmed area throw the ball. This will increase your completion percentage. Speaking of sports games, another delayed release is Inhome Software's *BASEBALL*. This TWO player cartridge lacks playability, and at $50 retail your money could be better spent on a number of different items.

Datasoft's official Sega version of *ZAXXON* is here. Sadly, the 16K tape does not recreate the glamour of playing the arcade classic. On disk the program is definitely improved but unfortunately it still doesn't make you feel as if you've inserted a quarter in the slot. Don't worry, some enterprising programmer will take the *ZAXXON* concept and design a better game. Datasoft has not only antagonized the buyer by their widely advertised "available now" (in actuality the disk version was not out until May), but they did not even recreate the arcade feel of the game.



Zaxxon

The latest release from EPYX, a company well-known for its BASIC adventures, is called *JUMPMAN*. When we first heard of the pending release of this game we were, quite frankly, very skeptical. Upon seeing the game we were astounded. *JUMPMAN* is by far the best piece of software from EPYX. A 30-screen machine language arcade game with many difficult options, *JUMPMAN* includes music, great arcade sounds and graphics, and many different scenarios. Your mission is to rid Jupiter headquarters of bombs planted in every room. The building is heavily protected by robots, dragons, birds and unseen sharpshooters. Your *JUMPMAN* must climb ladders and ropes, deal with vanishing mazes and solve puzzles as he attempts to save the building.

Speaking of climbing games, another excellent one is *CRISIS MOUNTAIN* from Synergistic Software. This strategic action game combines two separate cavern scenes with increasingly difficult levels of play. You must disarm a cave that has been booby-trapped by terrorists and pick up their supplies and loot before the bombs explode and destroy the West Coast. *CRISIS MOUNTAIN* is quite addicting and random placement of the bombs and bonus objects make this dual screen game different every time you play.

Spinnaker has added to their rapidly growing line of educational products with *KINDERCOMP* (Ages 3-8), *STORY MACHINE* (Ages 5-9) and *FACEMAKER* (Ages 4-12). These 48K disks integrate learning with computer familiarity in a way that is fun and exciting. *KINDERCOMP* is five games in one: completing number sequences, matching series of shapes, drawing colorful pictures on the screen and having the computer act out a kaleidoscope of your child's name all help to develop creativity and improve counting skills and reading readiness. *STORY MACHINE* helps children learn to write sentences using words from a supplied listing, and then the computer acts it out. *FACEMAKER*, a computerized form of Mr. Potato Head with animation, is Brett's favorite (our two-year-old son — Theo's the computer, Brett's the kid!).

Financial Software Plus, Kalamazoo, MI., and Habcom Business Systems, Inc., Lindenhurst, IL., are helping to fill the void in the "Where is all the business software for the ATARI?" department. Financial Software Plus has a new *PAYROLL PACKAGE* that's user friendly and will work as a stand-alone program or as an integral part of their general ledger program. It was written by an accountant-programmer and is very flexible. The tax codes are user-changeable, with the ability to put in five different tax tables. It will run on a one- or two-drive system, and all reports including checks can be printed to either the screen or an optional printer. With a capacity of 100 employees per disk (and an unlimited number of disks), it can be used by almost any size company effectively.

Professional systems from professionals is also what Habcom Business Systems is all about. They are marketing a complete hardware and software package for funeral homes, and software written by a licensed funeral director. This program will handle all billing information efficiently and enables you to print itemized statements, payment reminders, collection letters and aging reports, with Pre-arrangement File and Inventory Control as optional features.

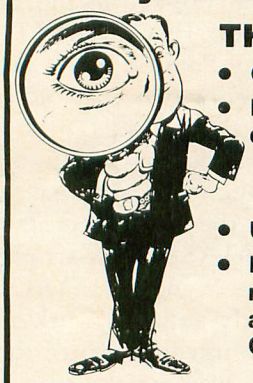
Computari has published the first issue of Financial Wizard Newsbits, sent to all Financial Wizard owners. It will be sent periodically to keep you informed of updates to FW, the first of which

should be available soon. *UTILITIES #2* will contain three additional ways to make your FW an even more powerful and useful tool. LEDGER will provide a general ledger printout by month; REGISTER will give you a complete check register with a balance shown next to every entry; FORECAST will give you statistical analyses and graphical representations of your future expenditures.

A-Bit-Better-Software (ABBS) has found a bug in the sort routine of their *MAGIC MAIL* program. If you own this program and are having trouble sorting, send your disk to ABBS at P.O. Box 28, Laurel, MD 20707, and they will send you a fixed version.

That about wraps it up for this issue. If by some bizarre chance you have not found at least one new program that appeals to you, come back next issue when we will report on the Summer Consumer Electronics Show and the First Annual Software Showcase. □

For your ATARI 400/800/1200

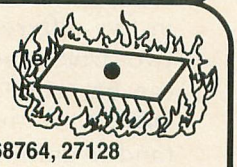


THE EXAMINER

- Give your cartridges a good look.
- Read any portion or all of your cartridge into memory.
  - Save to cassette or disk thru DOS.
- Uses joystick ports 1&2 or 3&4.
- Disassembler included – all machine language – list to screen and printer – HEX, ASC, Assembly Code displayed.

$89.95 Introductory Priced for ninety days

THE BYTEWRITER PROM BURNER



- Uses joystick ports 1&2 or 3&4
- Programs, Reads, Verifies 2516, 2716, 2532, 2732, 2732A, 2564, 2764, 68764, 27128
- No personality module

Introductory Price good for ninety days **$149.95**

90 Day Limited Warranty. Mail Cashiers check or Money Order (Personal checks will add 3 weeks to the 4 to 6 week delivery) plus $3.00 shipping to:

CONVOLOGIC, INC.
2800 West State Road 434, Suite 1276
Longwood, Florida 32750 Phone (305) 869-6630
Florida Residents Include 5% Sales Tax

by Mark Logies

DISKED

Take a closer look

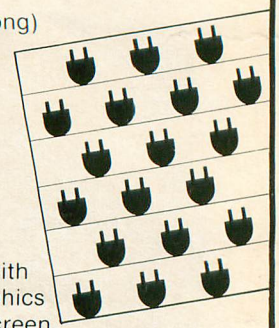
Runs in 32K . . .
ONLY $89.95

THE DISKED UTILITY PACKAGE contains numerous utility programs plus a comprehensive users' manual. With *DISKED* you can view and edit the contents of any sector in HEX, DECIMAL or CHARACTER (ATASCII or SCREEN CODE). You can disassemble *programs* into 6502 mnemonics using virtual addressing. You can recover deleted files, save crashed diskettes, map used and crashed sectors, copy any sector or block of sectors, move cassette boots up to disk and vice versa, create immediate mode files and multi-boot disks, PLUS MUCH MORE!

Each program is listable and user adaptable.

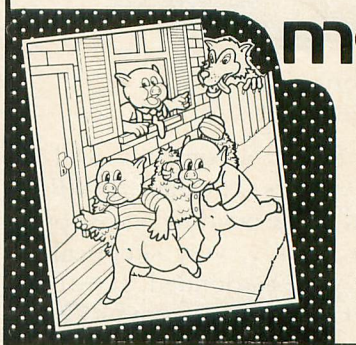
- Disassemble code into source compatible files
- Support non-standard cassette format
- Extensive memory reference
- Search routines (up to 128 bytes long)

Electronic Notebook



If you can jot it down on paper you can do it even more efficiently with ELECTRONIC NOTEBOOK. Simple to use. Flexible formatting. Comes with a manual and its own redefined graphics characters. Save anything on the screen to disk from drawings (high res) to mailing lists.

24K Diskette **$29.95**



magic Storybook

For young and old. See the three little pigs unfold before you in a beautiful scrolling storybook. Enjoy animation and a delightful musical narrative sound track.

16K Cassette **$29.95**

To order send check or money order to:

Amulet ENTERPRISES, INC.

Garfield Heights, OH 44125 / P.O. Box 25612 / 216-475-7766

Orders must include $1.50 shipping and handling.

ATARI

MasterCard VISA

KNIGHTS OF THE DESERT™

Introducing SSI's simulation of the North African Campaign of World War II — for your APPLE,® ATARI® and TRS-80.®

KNIGHTS OF THE DESERT. A pretty classy name for a classic wargame.

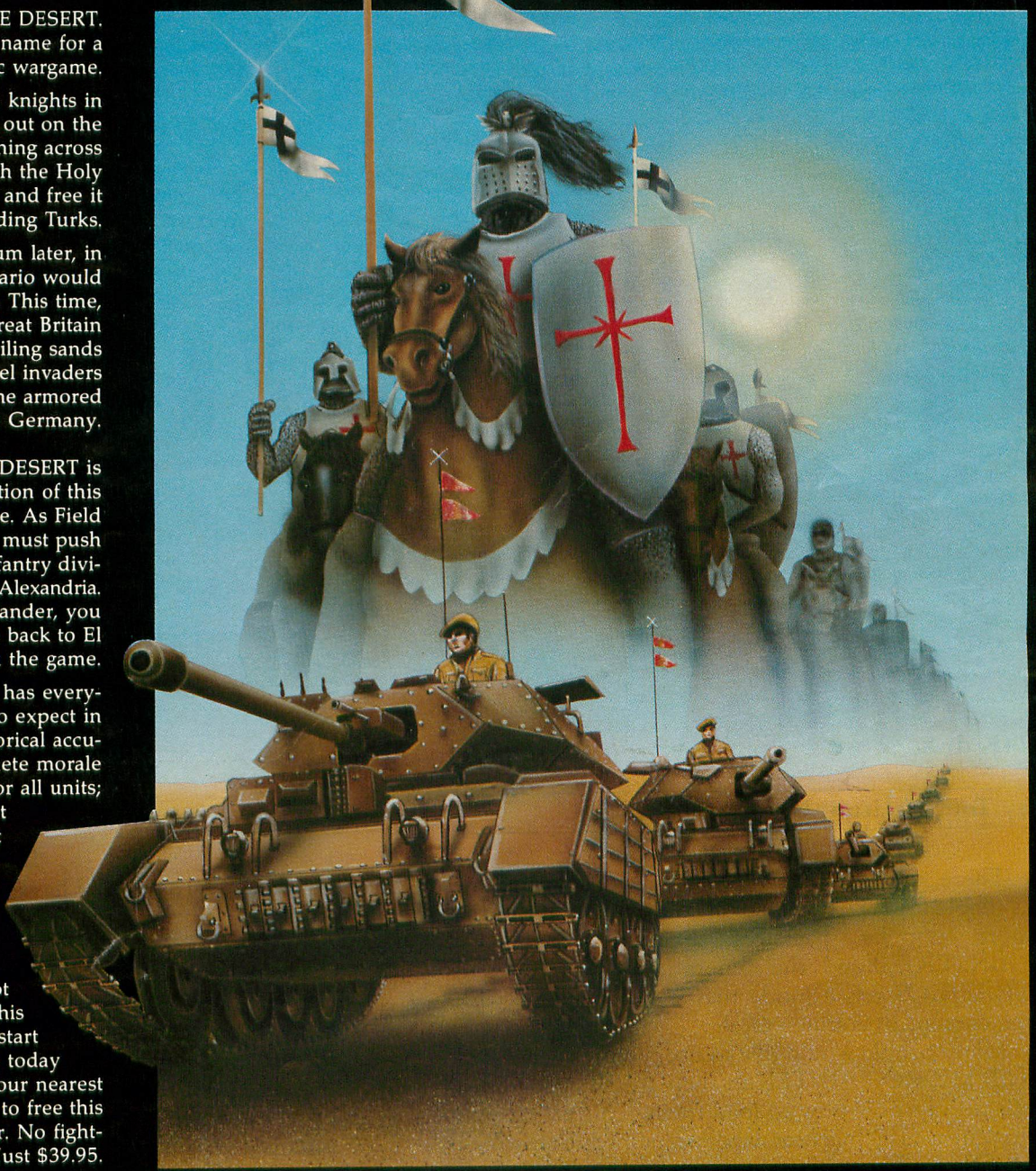
In the year 1096, knights in shining armor set out on the First Crusade, marching across Asia Minor to reach the Holy City of Jerusalem and free it from the invading Turks.

Nearly a millenium later, in 1941, a similar scenario would be played out. This time, Crusader tanks of Great Britain rolled across the broiling sands of North Africa to repel invaders of a different sort — the armored forces of Nazi Germany.

KNIGHTS OF THE DESERT is the faithful recreation of this 20th century crusade. As Field Marshal Rommel, you must push your Panzer and infantry divisions eastward to take Alexandria. As the British commander, you must sweep Rommel back to El Aghelia and win the game.

This simulation has everything you've come to expect in an SSI wargame: historical accuracy and detail; complete morale and strength ratings for all units; innovative movement rules and combat systems; two-player and solitaire modes; and best of all, maximum playability.

To see if you've got what it takes to meet this historical challenge, start off on a little crusade today — a quick trot to your nearest computer/game store to free this game from the dealer. No fighting is necessary. Just $39.95.



SSI

STRATEGIC SIMULATIONS INC

If there are no convenient stores near you, VISA and Mastercard holders can order direct by calling **800-227-1617, ext. 335 (toll free)**. In California, call 800-772-3545, ext. 335.

To order by mail, send your check to: Strategic Simulations Inc, 883 Stierlin Road, Bldg. A-200, Mountain View, CA 94043-1983. (California residents, add 6.5% sales tax.)

KNIGHTS OF THE DESERT is available on 48K disk for the Apple® II with Applesoft ROM card; 40K cassette or 40K disk for the Atari® 400/800; and 16K cassette for the TRS-80 Level II, Models I & III. When ordering, please specify computer and format.

WRITE FOR A FREE COLOR CATALOG OF ALL OUR GAMES.

Apple is a registered trademark of Apple Computer Inc. Atari is a registered trademark of Atari Inc. TRS-80 is a registered trademark of the Tandy Corporation.

24K disk

by Tom Hudson

There are several graphics artwork programs available for ATARI personal computers. One of the more popular packages, Datasoft's MICRO-PAINTER, allows the generation of pictures in GRAPHICS 7+, a mode that is not available with the current operating system.

Many people would like to use pictures generated with MICRO-PAINTER in their BASIC programs, but don't know how to load them. This article will present a fast, machine-language subroutine which sets up the proper graphics mode and loads standard MICRO-PAINTER files.

Micro-Painter Files

MICRO-PAINTER allows computer artists to easily draw and save high-resolution graphics displays. When a graphic display is saved, the entire graphics memory area is saved, along with four color indicator bytes. The picture area consists of 192 lines, each containing 40 bytes, for a total of 7680 bytes. This plus the 4 bytes of color information comes to a total of 7684 bytes in a MICRO-PAINTER picture file.

"Oh," you say, "all I have to do is put these bytes where they belong in memory, and that's it?" Not quite.

As mentioned earlier, MICRO-PAINTER uses GRAPHICS 7+, a mode similar to GRAPHICS 7, but with twice the vertical resolution. In order to get the proper display, we must tell the computer to display the picture in mode 7+. Listing 1 is a BASIC program which sets up the graphics mode, reads the picture file, and sets the proper colors. Listing 2 is the assembly language source code for the picture loader subroutine, for those readers interested in machine-language programming.

Picture Perfect

Type in the program in listing 1. After it is SAVEd, RUN it. The program will ask for a MICRO-PAINTER filename. Place a disk with a MICRO-PAINTER picture file on it in your disk drive and type in the filename, with the "D:" prefix. If you make a mistake, the program will ask again.

Once you enter a valid filename, the program will load the file very quickly, placing it on the screen.

While the picture is being loaded, you may notice that the colors in the picture are not correct. This is because the four color bytes are at the end of the file, and are read last. As soon as the picture is completely loaded, the colors will be changed to their proper values.

The Program

Let's look at Listing 1 and walk through the program.

Line 230 — This line sets up the string LD$ and READS the DATA in lines 390-430 into this string. This is a machine-language subroutine which sets up the GRAPHICS 7+ screen and reads the 7680 bytes of picture information into the screen RAM very quickly.

Line 290 — Sets up a string variable to hold the picture filename.

Line 300 — Inputs the picture filename and opens the file as input. The "TRAP 300" will cause any errors to be sent to line 300. That is, if there is any error condition, the program will ask for the filename again.

Line 310 — This line actually sets up the GRAPHICS 7+ mode and loads in the picture. The "GRAPHICS 24" command sets up a full-screen GRAPHICS 8 screen, which happens to use 7680 bytes, the same as GRAPHICS 7+. The USR call "A=USR(ADR(LD$))" converts the GRAPHICS 8 screen to GRAPHICS 7+, then reads the first 7680 bytes of the picture file into the display memory. During this operation, you will see the picture appear from the top of the screen to the bottom.

Line 320 — The USR call returns a value in the variable "A." If this value is a 1, the picture data was loaded successfully and the program continues with the next line. If the value is not 1, there was some type of error and the program goes to line 300 and asks for the filename again.

Line 330 — This line reads the last four bytes of the file, which contain the picture's color information. These values are POKEd into the color registers. At this point, the picture is completely loaded, with correct colors.

Line 340 — This line loops until the START key is pressed.

Line 350 — Once the START key is pressed, this line transfers control to line 300, which asks for another filename.

Lines 390-430 — These DATA statements are the machine-language values for the picture loader.

Using The Loader In Your Programs

The machine-language picture loader presented here is very easy to use in your own programs. Simply follow the step-by-step instructions.

1) Set up LD$ with the machine-language subroutine. (Line 230)
2) Open IOCB #1 as input with the desired filename. You MUST useIOCB #1 or the loader will not work.
3) Do a GRAPHICS 24 command.
4) Call the machine-language subroutine with the command: `A=USR(ADR(LD$))`

That's all there is to it!

Summary

With this subroutine, ATARI computer owners who use Datasoft's MICRO-PAINTER graphics package will be able to show their pictures in their BASIC programs. The subroutine is much faster than BASIC, and is easy to use. □

```
100 REM ********************************
110 REM *                              *
120 REM *      MICRO-PAINTER*          *
130 REM *      PICTURE LOADER          *
140 REM *                              *
150 REM *      BY: TOM HUDSON          *
160 REM *                              *
170 REM *  * TM OF DATASOFT, INC.      *
180 REM *                              *
190 REM ********************************
200 REM
210 REM *** READ LOADER DATA ***
220 REM
230 DIM LD$(117):FOR X=1 TO 117:READ N
:LD$(X)=CHR$(N):NEXT X
240 REM
250 REM *** INPUT FILENAME AND ***
260 REM *** LOAD PICTURE FROM  ***
270 REM *** DISK               ***
280 REM
290 DIM FILE$(15)
300 GRAPHICS 0:PRINT "ENTER MICROPAINT
ER FILENAME":INPUT FILE$:TRAP 300:CLOS
E #1:OPEN #1,4,0,FILE$
310 GRAPHICS 24:A=USR(ADR(LD$))
320 IF A()1 THEN 300
330 GET #1,C1:GET #1,C2:GET #1,C3:GET
#1,C4:CLOSE #1:POKE 712,C1:POKE 708,C2
:POKE 709,C3:POKE 710,C4
340 IF PEEK(53279)()6 THEN 340
350 GOTO 300
360 REM
370 REM *** PICTURE LOAD DATA ***
380 REM
390 DATA 216,104,173,48,2,24,105,3,133
,203,173,49,2,105,0,133,204,160,0,177,
203,201,79,208,21
400 DATA 169,78,145,203,165,203,24,105
,2,133,203,165,204,105,0,133,204,169,0
,240,14,201,15,208,6
410 DATA 169,14,145,203,208,4,201,65,2
40,17,165,203,24,105,1,133,203,165,204
,105,0,133,204,169,0
420 DATA 240,198,162,16,169,7,157,66,3
,169,0,157,72,3,169,30,157,73,3,165,88
,157,68,3,165
430 DATA 89,157,69,3,32,86,228,189,67,
3,133,212,169,0,133,213,96
```

•

CHECKSUM DATA
(See p.46)

```
100 DATA 778,241,397,385,250,348,256,5
80,262,805,76,837,82,434,88,5819
250 DATA 612,463,491,100,48,757,202,42
6,803,834,706,96,200,102,572,6412
400 DATA 843,818,225,976,2862
```

•

ATARI SINGS YOUR FAVORITE SONGS!!!

THE Original VOICE BOX Speech Synthesizer by the ALIEN GROUP has received rave reviews:

MICRO COMPUTING–"The VOICE BOX injects an endearing personality to your computer. The possibilities are enormous."

COMPUTE–"The VOICE BOX offers more human-like tones and does not blank out the screen."

CREATIVE COMPUTING–"English text and phonetic code may be freely intermixed rather than requiring separate modes as is the case without exception with every other speech system. A mode called talking face displays an animated face with impressive lip sync animation."

ANTIC–"There is a great potential for teaching children to spell and an added dimension to games overall. I believe the VOICE BOX is well worth the price tag."

ANALOG–"For ATARI owners who want to add speech to their programs, the Alien Group VOICE BOX is probably the best choice."

POPULAR SCIENCE–"The speech quality is excellent. Besides creating speech, the software has a bit of fun with graphics."

and on the new VOICE BOX II.....

TIME MAGAZINE–"Machine of the Year" "The VOICE BOX by the Alien Group enables an ATARI to say aloud anything typed on its keyboard in any language. It also sings "Amazing Grace" and "When I'm 64" or anything else that anyone wants to teach it.

INCORPORATE THE SINGING HUMAN FACE
INTO YOUR PROGRAMS AND GAMES

VOICE BOX II
Speech & Singing Synthesizer

The New VOICE BOX II for ATARI plugs into the serial port of the ATARI 400/800 with sound coming out of the TV/monitor. 48K DISK is required. It has all of the features of the original VOICE BOX plus many exciting new hardware and software features:

- The ability to sing with voice and 3 part music.
- A library of 30 famous songs.
- A comprehensive music system that allows the user to easily enter or modify new songs.
- Software that can convert the bottom two rows of the ATARI keyboard into a piano with a range of 3½ octaves using the shift and control keys.
- Programmable musical sound effects such as tremolo, vibrato, glissando and click track.
- A singing *human* face with lip-sync animation designed by Jerry White.
- A talking or singing *ALIEN* face with software that allows the user to change the face and 8 mouth patterns as he sees fit.
- The ability to speak with inflection and feeling.
- Can speak in a foreign language with correct foreign spelling as input.
- A talk and spell program by Ron Kramer. Users can program any vocabulary for this spelling game. In fact, this program can even speak in a foreign language like French, where the user must spell the correct word in English, or vice versa.
- GREEN GOBLINS–A talking arcade game by John Wilson.
- Random Sentence Generator–An amusing grammar game that helps teach school children to identify parts of speech and recognize a variety of sentence structures.
- NUMBER SPEAK–A subroutine by Scott Matthews that converts up to a 9 digit number into normal English pronunciation. Ideal for building your own math games.
- STUD POKER–A talking poker game by Jerry White.
- The screen never blanks out while talking or singing.
- Singing or speaking subroutines can be incorporated into your programs, requiring as little as 100 bytes of RAM plus 5 bytes for each word.
- Entries into the $5000 talking or singing game contest can be written using the VOICE BOX II–send for contest information.
- Price $169.00 includes VOICE BOX II and all of the above software.
- Inquire about our discounts for educational institutions.

To order by mail send a check or money order to the ALIEN GROUP for $169. Then, try the VOICE BOX II for 10 days, and if it isn't the finest value you've ever seen in a computer peripheral, the most challenging and provocative addition you've ever made to your system, return it in its original condition for a full refund.

THE ALIEN GROUP
27 West 23rd Street (212) 741-1770
New York, NY 10010

ALSO AVAILABLE AT LEADING COMPUTER STORES THROUGHOUT THE WORLD.

Atari is a registered trademark of Warner Communications.

```
;       ==========================
;       MICROPAINTER (TM) LOADER
;       ==========================

;       ==========================
;       WRITTEN BY: TOM HUDSON
;       A.N.A.L.O.G. COMPUTING
;       ==========================

;       ------------------------
;       OPERATING SYSTEM EQUATES
;       ------------------------

DLISTL  =   $0230       ;DISPLAY LIST LO
DLISTH  =   $0231       ;DISPLAY LIST HI
IOCB1   =   $10         ;CONTROL BLOCK OFFSET
GETCHR  =   $07         ;GET CHARACTERS CMD
SAVMSC  =   $0058       ;SCREEN POINTER
CIOV    =   $E456       ;CENTRAL I/O VECTOR
ICCOM   =   $0342       ;I/O COMMAND
ICSTA   =   $0343       ;I/O STATUS
ICBAL   =   $0344       ;I/O BUFFER LO
ICBAH   =   $0345       ;I/O BUFFER HI
ICBLL   =   $0348       ;BUFFER LENGTH (LO)
ICBLH   =   $0349       ;BUFFER LENGTH (HI)
BASVAL  =   $D4         ;BASIC RETURN VALUE

;       --------------------
;       MY WORKING VARIABLES
;       --------------------

LO      =   $CB
HI      =   $CC

;       --------------------
;       RELOCATABLE ROUTINES
;       --------------------

        ORG $6000       ;ANYWHERE

;       --------------------------
;       DISPLAY LIST INITIALIZATION
;       --------------------------

SETUP   CLD             ;CLEAR DECIMAL MODE
        PLA             ;(DISCARD)
        LDA DLISTL      ;FIND THE
        CLC             ;ADDRESS OF
        ADC #3          ;THE BASIC
        STA LO          ;DISPLAY LIST
        LDA DLISTH      ;AND PLACE
        ADC #0          ;IN A PAGE 0
        STA HI          ;WORKING AREA
        LDY #0          ;NO Y OFFSET
SCANDL  LDA (LO),Y      ;SCAN THE DISPLAY LIST:
        CMP #$4F        ;CHANGE
        BNE NOMLD       ;$4F (GR. 8)
        LDA #$4E        ;TO
        STA (LO),Y      ;$4E (GR. 7+)
        LDA LO          ;SINCE THIS WAS
        CLC             ;A 'LOAD MEMORY'
        ADC #2          ;INSTRUCTION (3 BYTES)
        STA LO          ;WE WILL SKIP
        LDA HI          ;THE NEXT 2 BYTES
        ADC #0          ;TO GET THE NEXT
        STA HI          ;DISPLAY LIST
        LDA #0          ;INSTRUCTION
        BEQ NXTDLB      ;ADDRESS.
NOMLD   CMP #$0F        ;CHANGE $0F (GR. 8)
        BNE NOREGL      ;TO
        LDA #$0E        ;$0E (GR. 7+)
        STA (LO),Y      ;AND GO TO
        BNE NXTDLB      ;NEXT D.L. INSTRUCTION.
NOREGL  CMP #$41        ;END OF DISP. LIST?
        BEQ LOAD        ;YES, LOAD DATA
NXTDLB  LDA LO          ;INCREMENT THE
        CLC             ;MEMORY POINTER
        ADC #1          ;TO GET THE
        STA LO          ;NEXT BYTE
        LDA HI          ;OF THE
        ADC #0          ;DISPLAY LIST
        STA HI          ;AND
        LDA #0          ;FORCE BRANCH
        BEQ SCANDL      ;BACK TO LOOP!

;       ----------------------------
;       SCREEN LOADER CODE
;
;       THIS CODE READS 7680 BYTES
;       FROM IOCB #1 VERY QUICKLY
;       AND PLACES THEM IN SCREEN RAM
;       ----------------------------

LOAD    LDX #IOCB1      ;CONTROL BLOCK
        LDA #GETCHR     ;COMMAND BYTE
        STA ICCOM,X     ;SET COMMAND
        LDA #7680&255   ;SCREEN SIZE LO
        STA ICBLL,X     ;SET LENGTH LO
        LDA #7680/256   ;SCREEN SIZE HI
        STA ICBLH,X     ;SET LENGTH HI
        LDA SAVMSC      ;POINT TO DISP LO
        STA ICBAL,X     ;SET I/O BUFFER LO
        LDA SAVMSC+1    ;POINT TO DISP HI
        STA ICBAH,X     ;SET I/O BUFFER HI
        JSR CIOV        ;LOAD THE SCREEN!
        LDA ICSTA,X     ;GET STATUS BYTE
        STA BASVAL      ;SAVE FOR RETURN
        LDA #0          ;PUT A ZERO...
        STA BASVAL+1    ;IN HI BYTE
        RTS             ;EXIT TO BASIC!

        .END
```

●

ENHANCE YOUR ATARI* 810

HAPPY 810 ENHANCEMENT

Speed up program development, loading, execution, and copying time by reading disks up to 3 times faster. Complete compatibility with existing software, with faster disk initialization, and reduced wear on the disk drive mechanism. No soldering or trace cutting required, complete installation instructions included, or contact your dealer. Diagnostic program included.

SOFTWARE ENHANCEMENTS (require HAPPY 810 ENHANCEMENT)

HAPPY BACKUP PROGRAM

Guaranteed to produce executable backup copies of any disk which can be read with a standard ATARI 810* disk drive. Backup those important disks in your library or use HAPPY BACKUP for small scale software production. Completely automatic duplication of format and data content of the source disk. Single and multiple drive versions available. Backup copies will work on a drive without the enhancement.

HAPPY COMPACTOR PROGRAM

Combines self booting programs which reside one per disk into one disk with many self booting programs using the HAPPY COMPACTOR file structure. Programs are then executed from the self booting HAPPY COMPACTOR menu, and may later be extracted back onto a single disk. Compacted programs disk will execute only on a drive which has the HAPPY 810 ENHANCEMENT. Pays for itself by reducing the number of backup disks you need, in addition to the added convenience.

HAPPY CUSTOMIZER PROGRAM

User friendly program to generate source disks with custom track format. Format is specified on a per track basis. Examples of usage and interpretation of results are included. This system requires a more advanced level user.

HAPPY 810 ENHANCEMENT WITH SINGLE DRIVE HAPPY BACKUP $249.95
MULTIPLE DRIVE HAPPY BACKUP PROGRAM ..... $ 49.95
HAPPY COMPACTOR PROGRAM ..... $ 49.95
HAPPY CUSTOMIZER PROGRAM ..... $ 99.95

CALL OR WRITE FOR ORDERING INFORMATION. Sorry, no COD or credit cards accepted. Dealers may inquire, send letterhead.

HAPPY COMPUTING
P.O. Box 32331
San Jose, CA 95152
(408) 251-6603

*ATARI 810 is a trademark of ATARI Inc.

80 COLUMN COLOR VIDEO BOARD FOR THE ATARI 800™

IF YOU USE YOUR ATARI 800™ FOR:

- PROGRAMMING
- WORD PROCESSING
- TERMINAL COMMUNICATIONS
- DATA BASES

THE AUSTIN 80™ COLOR VIDEO BOARD GIVES YOU THE OPTIMUM FEATURES...

—80 * 25 Character Screen
—256 Character set with line and box graphics
—Underline, blink, reverse, half intensity
—Smooth scrolling
—16 color RGBI or RGB outputs + composite video
—Uses medium resolution B&W or color monitor
—Fits in last slot of 800
—Light pen input

LIST PRICE $279.95

SOFTWARE TO MAKE OPTIMUM USE OF THE AUSTIN 80™

SMART TERMINAL — EMMULATES DEC VT100™ — $19.95

WORD PROCESSOR with CONFIGURABLE PRINTERS SUMMER '83

OPTIONAL RGBI OUTPUT CABLE — $34.95

AUSTIN 80™ CARRIES A 1-YEAR PARTS AND LABOR WARRANTY

Ask for AUSTIN BOARDS™ at your local dealer or call

617-772-0352

AUSTIN FRANKLIN ASSOCIATES

43 GROVE STREET, AYER, MA 01432

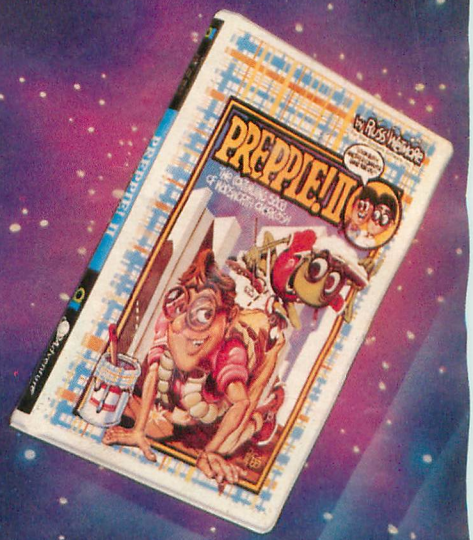
M/C, VISA & COD ACCEPTED

DEALER INQUIRIES INVITED

*ATARI IS A REGISTERED TRADEMARK OF ATARI, INC.

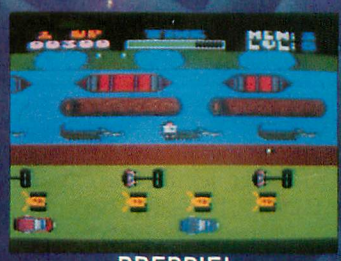
IT'S WRITTEN IN THE STARS!

And In The Best Magazines.

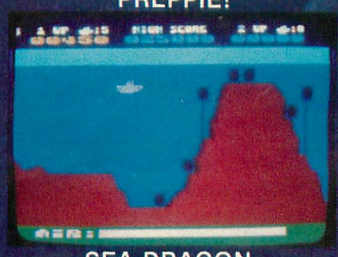


Dealers: Demo disks are available! Give us a call.

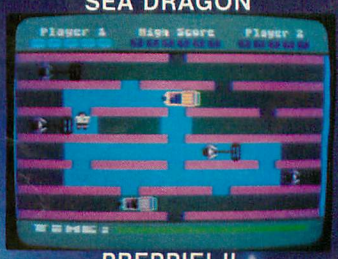
VIDEO REVIEW MAGAZINE
★ BEST ★ COMPUTER GAME OF THE YEAR
★ AWARD WINNER ★
★ BEST ★ COMPUTER AUDIO VISUAL EFFECTS
ELECTRONIC GAMES MAGAZINE



PREPPIE!



SEA DRAGON



PREPPIE! II

What's that?....
Why, the award-winning Russ Wetmore arcade games! Three shining examples of what Adventure International has to offer for your Atari*.

You don't have an Atari? Then check with your dealer for the version you can play on *your* system!

To order, see your local dealer. If he does not have the program, then call 1-800-3277172 (orders only please), or write for our free catalog.

SEA DRAGON Atari 400/800/1200		
32K Disk	052-0146	$34.95
16K Tape	050-0146	$34.95
PREPPIE! Atari 400/800/1200		
32K Disk	052-0147	$29.95
16K Tape	050-0147	$29.95
PREPPIE! II Atari 400/800/1200		
32K Disk	052-0175	$34.95
16K Tape	050-0175	$34.95

*Atari is a registered trademark of Atari Inc.

Published by

Adventure INTERNATIONAL
a subsidiary of Scott Adams, Inc.

BOX 3435 • LONGWOOD, FL 32750 • (305) 862-6917

16K cassette 24K disk

by Andrew Katz

After seeing the expansion of crystals in a TV film, I wanted to see if I could simulate that beautiful event using my ATARI. The graphics demonstration program presented in this article does just that. Type *Listing 1* into your computer and check your typing accuracy by using C:CHECK or D:CHECK. If you don't have either CHECK program, be sure you SAVE the expansion demo before running it.

After the program is entered, RUN it. You will see 15 different-colored "seeds" appear. These seeds will gradually begin to grow into larger groups of pixels, all pixels in a group being the same color. The shapes will grow until they collide with a different-colored group, at which time they will stop growing. Those shapes lucky enough to avoid early collisions will become the largest. Eventually the screen will become solid with color, resembling a colorful map. Pressing the START key will start the process again from the beginning.

The BASIC program provided (lines 70-110) can be changed to build other scenarios. Experiment with other graphic modes, make line drawings and watch them grow together, and so on.

There are several parameters which can be changed to give different effects. These parameters are in lines 1000-1040. The 3 in line 1040 controls the rate of expansion. Change it to a 2 and RUN the program. Now the rate of expansion is many times quicker. You will notice holes appearing as the shapes form. These holes fill soon and the shapes stay completely well formed. Change the 3 to 1 and the expansion will look like a boiling pot!

Why GTIA? Well, GTIA modes are the easiest to program, and of course they give the most color. This program will work for those without GTIA, but the colors will be different. I am told that all ATARI computers sold in 1982 and after have the GTIA. I recommend that anyone without a GTIA chip get

one from ATARI. They cost only $22 and are easy to install (see "Installing Your Own GTIA Chip" in **A.N.A.L.O.G.** #10).

I have provided the assembly source code listing (Listing 2) for those interested in seeing how the expansion works. In each cycle, a pixel is chosen at random. Note that I have cut the Y resolution in half to get a more even aspect ratio. Once the pixel is chosen, a neighborhood around the pixel is read (see FIGURE 1). The neighborhood is then reordered into a clockwise loop (one for pixels with an even X coordinate, and one for an odd coordinate). If the pixel chosen is uncolored AND there are 3 pixels in a row with the same color surrounding it, the pixel is plotted with that color. Otherwise it is left alone. That's all there is to it. If you have any questions or suggestions, contact me at 9 River St. Ext. 158, Little Ferry, NJ 07643.

Figure 1

One Neighborhood

XPOS	20	21	22	23
	0	1	2	3
	4	5	6	7
	8	9	10	11

Adjacent Neighborhoods (Dependent on X position)

IF XPOS ODD

0	1	2
4	5	6
8	9	10

IF XPOS EVEN

1	2	3
5	6	7
9	10	11

Editor's Note

Our programming staff has come up with an interesting modification to the expansion demo. First, change the 3 in line 1040 to a 1 to speed up the program execution. Then enter the following program lines and type RUN.

```
80 COLOR 8:FOR I=1 TO 37
82 REM
111 COLOR 2:FOR I=1 TO 13
112 Y=INT(RND(0)*92)+1:X=INT(RND(0)*78
)+1
113 PLOT X,Y*2:DRAWTO X,Y*2+5
114 NEXT I
```

This modification changes the 15 different color "seeds" to 2 colors, blue and orange. There are approximately 75% blue seeds and 25% orange, roughly the same proportions as areas of water and land on the earth. When the modified expansion demo is RUN, it will produce a display that looks remarkably like a planet's surface! Make your own modifications and see what you can come up with.□

Listing 1.

```
5 DIM E$(90)
10 FOR I=1536 TO 1783:READ A:POKE I,A:
NEXT I
20 FOR I=1 TO 90:READ A:E$(I,I)=CHR$(A
):NEXT I
70 GRAPHICS 11
80 FOR I=1 TO 15
82 COLOR I
90 Y=INT(RND(0)*92)+1:X=INT(RND(0)*78)
+1
100 PLOT X,Y*2:DRAWTO X,Y*2+5
110 NEXT I
120 A=USR(ADR(E$)):GOTO 70
1000 DATA 9,1,2,3,10,8,0,4
1010 DATA 11,7,6,5,1,2,3,9
1020 DATA 8,0,4,10,7,6,5,11
1030 DATA 0,1,80,81,160,161,78,94
1040 DATA 3,169,0,133,220,165,222,56
1050 DATA 233,1,74,133,221,144,2,230
1060 DATA 220,165,223,56,233,1,32,151
1070 DATA 6,24,165,214,101,88,133,212
1080 DATA 165,215,101,89,133,213,24,16
5
1090 DATA 212,101,221,133,212,165,213,
105
1100 DATA 0,133,213,162,0,224,12,240
1110 DATA 28,138,72,74,170,188,24,6
1120 DATA 104,170,177,212,72,74,74,74
1130 DATA 74,149,224,232,104,41,15,149
1140 DATA 224,232,24,144,224,96,162,11
1150 DATA 188,12,6,165,220,240,3,188
1160 DATA 0,6,181,224,153,236,0,202
1170 DATA 16,238,165,237,133,245,165,2
38
1180 DATA 133,246,165,239,133,247,96,1
33
1190 DATA 216,133,215,169,0,133,214,13
3
1200 DATA 217,24,102,215,102,214,102,2
15
1210 DATA 102,214,24,38,216,38,217,38
1220 DATA 216,38,217,38,216,38,217,38
1230 DATA 216,38,217,24,165,214,101,21
6
1240 DATA 133,214,165,215,101,217,133,
215
1250 DATA 96,169,240,133,219,165,220,2
40
1260 DATA 18,230,212,208,2,230,213,169
1270 DATA 15,133,219,6,218,6,218,6
1280 DATA 218,6,218,160,80,177,212,37
1290 DATA 219,5,218,145,212,160,120,17
7
1300 DATA 212,37,219,5,218,145,212,96
1310 DATA 104,173,31,208,201,6,208,1
1320 DATA 96,56,173,10,210,205,31,6
1330 DATA 176,248,133,223,230,223,56,1
73
1340 DATA 10,210,205,30,6,176,248,133
1350 DATA 222,230,222,32,33,6,32,118
1360 DATA 6,165,236,208,212,169,255,13
3
1370 DATA 218,162,1,181,236,197,218,24
0
1380 DATA 4,133,218,160,0,165,218,240
1390 DATA 6,200,204,32,6,240,9,232
1400 DATA 224,12,208,231,169,0,133,218
1410 DATA 165,218,240,173,32,201,6,24
1420 DATA 144,167
```

CHECKSUM DATA

(See p.46)

```
5 DATA 574,571,939,3,243,788,185,879,7
31,303,818,824,22,636,944,8460
1050 DATA 915,171,224,251,291,910,743,
174,37,28,937,711,529,537,223,6681
1200 DATA 446,212,229,244,309,518,22,9
30,211,240,211,910,727,504,193,5906
1350 DATA 931,285,268,198,865,24,180,9
87,3738
```

•

Listing 2.
Assembly Language Listing

```
0100  .TITLE GTIA EXPANSION: SHOWS FIELDS OF COLOR
0110 ;
0120 RANDOM  =  $D20A
0130 CONSOL  =  $D01F
0140 SAVMSC  =  $58      ;DP SCREEN POINTER
0150 PNTR    =  $D4      ;SCREEN POINTER WORK
0160 LOWER   =  $D6
0170 UPPER   =  $D7
0180 LOWER1  =  $D8
0190 UPPER1  =  $D9      ;STORAGE FOR DP NUMBERS
0200 COLOR   =  $DA      ;COLOR TO PLOT 1-15
0210 MASK    =  $DB      ;MASK FOR PLOT
0220 ODDFLAG =  $DC      ;1 MEANS ODD, 0 EVEN
0230 X1      =  $DD      ;TEMP VALUE
0240 XPOS    =  $DE      ;X POSITION OF 1-78
0250 YPOS    =  $DF      ;Y POSITION OF 1-94
0255 ;                    (CUT Y RES. BY HALF)
0260 GROSS   =  $E0      ;12 CELLS AROUND POINT
0270 NEIGHBORHOOD=$EC    ;12 CELLS
0275 ;                    ORDERED CLOCKWISE
0280 MAPO    =  $600     ;MAP ODD X
0290 MAPE    =  $60C     ;MAP EVEN X
0300 DIRWORD =  $618     ;INDEX TO PICK
0305 ;                    UP NEIGHBOR BYTES
0310 XMAX    =  $61E     ;XPOS RANGES TO
0320 YMAX    =  $61F     ;YPOS RANGES TO
0330 TRIPNO  =  $620     ;NUMBER OF ADJACENT
0335 ;                    PIXELS NEEDED
0340 CODE    =  $621
0345 ;
0350         *=  $600
0355 ;
0360         .BYTE 9,1,2,3,10,8,0,4,11,7,6,5
0370         .BYTE 1,2,3,9,8,0,4,10,7,6,5,11
0380         .BYTE 0,1,80,81,160,161
0390         .BYTE 78
0400         .BYTE 94
0410         .BYTE 3
0420 ;
0430 NEIGHBORS= *
0440         LDA #0
0450         STA ODDFLAG ;MAKE EVEN
0460         LDA XPOS
0470         SEC
0480         SBC #1
0490         LSR A       ;CARRY HAS ODD BIT
0500         STA X1      ;X1=(X-1)/2
0510         BCC EVEN
0520         INC ODDFLAG ;ODD X
0530 EVEN    =   *
0540         LDA YPOS
0550         SEC
0560         SBC #1
0570         JSR MULT80  ;DP HAS (Y-1)*80
0580         CLC
0590         LDA LOWER
0600         ADC SAVMSC
0610         STA PNTR
0620         LDA UPPER
0630         ADC SAVMSC+1
0640         STA PNTR+1
0650         CLC
0660         LDA PNTR
0670         ADC X1
0680         STA PNTR
0690         LDA PNTR+1
0700         ADC #0
0710         STA PNTR+1  ;PNTR=(Y-1)*80+X1+SAVMSC
0720         LDX #0
0730 NLOOP   =   *       ;FILL GROSS NEIGHBORHOOD
0740         CPX #12
0750         BEQ OUTNLOOP
0760         TXA
0770         PHA         ;SAVE X
0780         LSR A       ;(X/2)
0790         TAX         ;INDEX TO BYTE INDEXES
0800         LDY DIRWORD,X
0810         PLA
0820         TAX         ;RESTORE X
0830         LDA (PNTR),Y ;LOAD 2 PIXELS
0840         PHA         ;SAVE A COPY
0850         LSR A       ;MOVE...
0860         LSR A       ;UPPER NIBBLE...
0870         LSR A       ;TO
0880         LSR A       ;LOWER NIBBLE
0890         STA GROSS,X ;1ST BOX
0900         INX
0910         PLA         ;RETRIVE COPY
0920         AND #$0F
0930         STA GROSS,X ;2ND BOX
0940         INX
0950         CLC
0960         BCC NLOOP
0970 OUTNLOOP=  *
0980         RTS
0990 ;
1000 MAPPING=   *
1010         LDX #11
1020 MAPLOOP=   *
1030         LDY MAPE,X  ;GET THE MAP INDEX EVEN
1040         LDA ODDFLAG
1050         BEQ EVENMAP
1060         LDY MAPO,X  ;INDEX ODD
1070 EVENMAP=   *
1080         LDA GROSS,X
1090         STA NEIGHBORHOOD,Y ;DO MAPPING
1100         DEX
1110         BPL MAPLOOP
1120         LDA NEIGHBORHOOD+1
1130         STA NEIGHBORHOOD+9
1140         LDA NEIGHBORHOOD+2
1150         STA NEIGHBORHOOD+10
1160         LDA NEIGHBORHOOD+3
1170         STA NEIGHBORHOOD+11 ;ALLOW WRAP AROUND
1180         RTS
1190 ;
1200 MULT80 =   *
1210         STA LOWER1
1220         STA UPPER   ;*256
1230         LDA #0
1240         STA LOWER
1250         STA UPPER1
1260         CLC
1270         ROR UPPER
1280         ROR LOWER   ;*128
1290         ROR UPPER
1300         ROR LOWER   ;*64
1310         CLC
1320         ROL LOWER1
1330         ROL UPPER1  ;*2
1340         ROL LOWER1
1350         ROL UPPER1  ;*4
1360         ROL LOWER1
1370         ROL UPPER1  ;*8
1380         ROL LOWER1
1390         ROL UPPER1  ;*16
1400         CLC
1410         LDA LOWER
```

If you are serious about personal finance...

- **Budget Forecast**–26 expense categories
- **Check Entry**–easy data entry–scan & modify 26 major & 36 sub-categories–information block
- **Check Search**–single or multiple parameters–(up to seven) to search entries
- **Tabulations**–detailed expense vs. budget comparisons by month, year-to-date, category
- **Bar Graphs**–screen displays in graph form expenses vs. budget–by month or category–printing with graphic capable printers
- **Check Reconciliation**–fast clearing of resident checks & deposits, complete summary report
- **Checkwriter**–prints your custom checks
- **Printouts**–most popular printers
- **Multi-Colored Graphics** • **Audio Enhancements**
- **7 Utility Programs** • **User-Friendly Operation**
- **Easy To Use Instruction Manual** • **Audit Report**
- **Handsome Tinted Plastic Storage Case**

COMPUTE!
The Leading Magazine Of Home, Educational, And Recreational Computing

In a feature editorial.

"If you want to use a finance system, but don't want to spend several days trying to learn how to use one, then A Financial Wizard by Computari may be just what you need."

"The illustrated manual that comes with this program is clear, direct, and very thorough."

"It appears that this finance system was designed to achieve the best and most comfortable working relationship between the user and the program."

"The check entry routine is the most attractive feature of this finance system. Data prompts are very clear and the category item names are displayed at all times during data entry for your convenience."

"The file search capabilities of this program are superior. You are offered seven ways to look up the checks."

"The system is disk intensive. All data is saved automatically and immediately following all routines that either enter data or modify it."

"Scanning your entries is made possible by pressing START. You can see records very quickly this way."

"This is an excellent finance system–entertaining, accurate, and fun to use."

ANALOG COMPUTING
THE MAGAZINE FOR ATARI COMPUTER OWNERS

Analog Magazine in a comprehensive study of personal finance systems for Atari* computers.

"A Financial Wizard from Computari is by far the best of these programs and will be the standard of comparison for the others."

"The check entry mode is easy to use..."

"The way a Financial Wizard handles your tabulations is excellent. You can chart your actual expenses vs. your budget by month, by category or year to date."

"...where it really outshines the rest is in the check reconciliation."

"In effect it gives you your bank statement on the screen, a complete list by month of all your checks and deposits."

"A Financial Wizard has one disk that does everything..."

"Graphics, while really not a factor in the quality of programs of this type, do make your budgeting chores a little more pleasant. Again A Financial Wizard comes out on top."

"Everything about this program is excellent..."

Antic
The ATARI Resource

In a Report from Antic.

"Like most Atarians, I am captivated by the graphic, color and sound capabilities of my machine. Nothing quite discourages me more than to boot up an applications program (personal, business, etc.) and to be presented with the standard graphic 'o' white characters on a blue screen.

Of course the usefulness and effectiveness of a program is of primary importance. However, enhancing the dullest of applications programs with some of Atari's charms, is a great asset. A Financial Wizard, a personal finance program by Computari's Bill McLachlan, is an excellent example of an applications program that integrates many of the Atari's features into a well conceived and executed program."

"The use of color and sound in the data input prompts and error checking routines are so well done that it's quite simple to boot up the disk, follow along with the very clear documentation, and be 'up and running' in short order."

"I give A Financial Wizard high marks in ease of use, documentation and performance. If a disk-based home finance package is in your future, The Wizard should get serious consideration."

Computari's
A Financial Wizard 1.5
The logical choice.

The system is designed for Atari computers having a minimum of 32K and operating from a disk drive. The cost is only $59.95 plus $3 for handling/postage.

If your dealer does not have **A Financial Wizard** . . . Telephone orders are accepted on Mastercharge or Visa credit cards. Mail order must be accompanied by check or money-order or credit card #.

Dealer inquiries invited.

*trademark of Atari Inc.

OK residents ad 4% Tax.

Exclusively thru **ON LINE** COMPUTER CENTERS of OKC (405)751-7925

10944 North May, Oklahoma City, OK 73120

CHECK ENCLOSED ☐ VISA ☐ MASTERCHARGE

NAME (Print)_____

Address _____

City _____

State _____ Zip _____

Card # _____ Exp._____

Signature_____

```
1420        ADC LOWER1
1430        STA LOWER
1440        LDA UPPER   ;*64 + *16 = *80
1450        ADC UPPER1
1460        STA UPPER
1470        RTS
1480 ;
1490 PLOT   =   *
1500        LDA #$F0
1510        STA MASK    ;MASK UPPER NIBBLE
1520        LDA ODDFLAG
1530        BEQ NOADJUST ;IF X-1 IS EVEN NO ADJUSTMENT
1535                     ;TO PNTR IS NEEDED
1540        INC PNTR     ;OTHERWISE POINT TO
1545                     ;NEXT HORIZ BYTE
1550        BNE NOTZ
1560        INC PNTR+1
1570 NOTZ   =   *
1580        LDA #$0F
1590        STA MASK    ;SAVE MASK LOWER NIBBLE
1600        ASL COLOR
1610        ASL COLOR
1620        ASL COLOR
1630        ASL COLOR   ;MOVE LOWER TO UPPER NIBBLE
1640 NOADJUST=  *
1650        LDY #80     ;MUST POINT TO YPOS LINE
1660        LDA (PNTR),Y
1670        AND MASK
1680        ORA COLOR
1690        STA (PNTR),Y
1700        LDY #120    ;HALF LINE BELOW
1710        LDA (PNTR),Y
1720        AND MASK
1730        ORA COLOR
1740        STA (PNTR),Y
1750        RTS
1755 ;
1760 ; MAIN MODULE
1765 ;
1770        *=  $5000
1775 ;
1780        PLA         ;FOR BASIC
1790 LOOP   =   *
1800        LDA CONSOL
1810        CMP #6
1820        BNE CONTINUE
1830        RTS         ;RETURN TO BASIC ON START
1840 CONTINUE=  *
1850        SEC
1860 GETY   LDA RANDOM
1870        CMP YMAX
1880        BCS GETY
1890        STA YPOS
1900        INC YPOS    ;YPOS FROM 1-94
1910        SEC
1920 GETX   LDA RANDOM
1930        CMP XMAX
1940        BCS GETX
1950        STA XPOS
1960        INC XPOS    ;XPOS FROM 1-78
1970        JSR NEIGHBORS ;GET POINT NEIGHBORS GROSS
1980        JSR MAPPING ;MOVE TO CLOCKWISE NEIGHBORHOOD
1990        LDA NEIGHBORHOOD
2000        BNE         ;LOOP IF COLORED ALREADY
2010        LDA #$FF    ;ENSURE NEW COLOR
2020        STA COLOR
2030        LDX #1      ;START AT UPPER LEFT
2040 TRIPLOOP=  *
2050        LDA NEIGHBORHOOD,X
2060        CMP COLOR
2070        BEQ INCR    ;MATCH - INCRIMENT COUNT
2080        STA COLOR   ;NEW COLOR TO START
2090        LDY #0
2100 INCR   =   *
2110        LDA COLOR
2120        BEQ NOTYET  ;NO INCR ON 0 COLOR
2130        INY
2140        CPY TRIPNO  ;3 IS A TRIPLET
2150        BEQ HAVEIT
2160 NOTYET =   *
2170        INX         ;MOVE CLOCKWISE
2180        CPX #12
2190        BNE TRIPLOOP
2200        LDA #0
2210        STA COLOR
2220 HAVEIT =   *
2230        LDA COLOR
2240        BEQ LOOP    ;IF NO TRIPLET
2250        JSR PLOT
2260        CLC
2270        BCC LOOP
2275 ;
2280        .END
```

•

EXPAND YOUR ATARI 810®

NEW **- The CHIP with ARCHIVER Software**
Create custom formats, edit and disassemble sectors, back up **any** disk automatically. Supports multiple copies and multiple drives. The ultimate utility. $99.95 plus $4 shipping. Call for optional installation.

MIGHTY BYTE DISK COPIER
An economical but effective sector copier which creates bad sectors in two ways. $29.95 plus $2 shipping.

SPEED KIT
Slow down your Atari (Tandon) drive as necessary. $5.00 or $10.00 plus shipping installed.

We offer complete service on Atari Disk Drives.

Coming soon. . . . The ultimate cartridge back up.

VISA & MASTERCARD call now
(815) 229-2999 for fast delivery

MIGHTY BYTE COMPUTER
828 Green Meadow Ave., Dept. AG
Rockford, Illinois 61107

Atari 810 is a trademark of Atari, Inc.

THE NEW ATARI COMPUTERS!

by Lee Pappas

In recent months Commodore has slashed the prices on their VIC-20 and 64 computers. The Texas Instruments 99/4A price tag reads like a novice's score on Donkey Kong. As one of the editors of **A.N.A.L.O.G.**, it's amazing how much worry I sense from most ATARI (and even non-ATARI) owners. What is ATARI going to do?

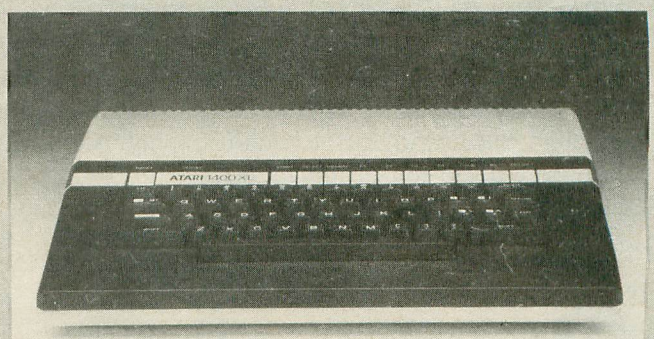
Well, for starters, 4 (four!) new computers have been announced: the **600XL, 800XL, 1400XL,** and the **1450XLD.** These represent ATARI's new main line of CPUs. All resemble the modern styling set forth by the 1200XL, all units have serial and processor-bus interfaces on the back, and all are still 8-bit machines.

600XL

The **600XL** is scheduled to retail below **$200** and is shipped with 16K of RAM, upgradable to 64K using an expansion module from ATARI(!).

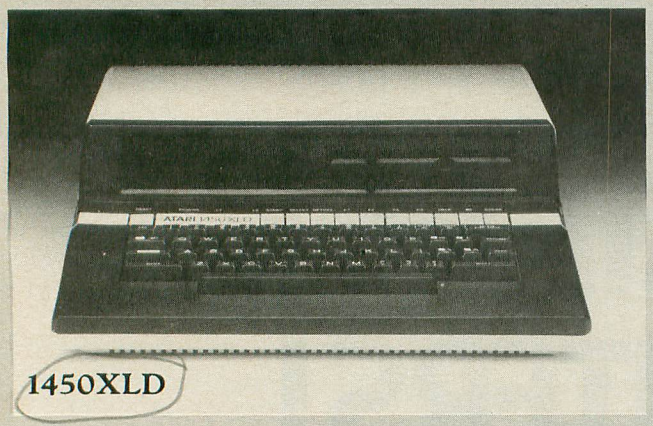
Then there is the **800XL**, which comes with 64K and should be priced around **$300**. There are even rumors of third-party companies releasing memory modules to increase RAM to 192K. The **1400XL** is also a 64K machine, with the addition of a built-in modem and voice synthesizer. (Great stuff!) This CPU should sell for about **$500.**

800XL



1400XL

The new flagship (flagcomputer?) of the ATARI line is the **1450XLD** (whew!). This too is a 64K machine with a BUILT IN double sided/double density disk drive, modem, and voice synthesizer. But that's not all... The disk drive data-transfer rate is 2 1/2 times faster than the 810 drive, and there is room in the **1450XLD** to add another *similar* drive. I feel the most incredible feature of this unit is the price — scheduled to be under $1000; probably at **$899!** At this time there is NO OTHER computer on the market that can match the feature-to-price capability of this computer.

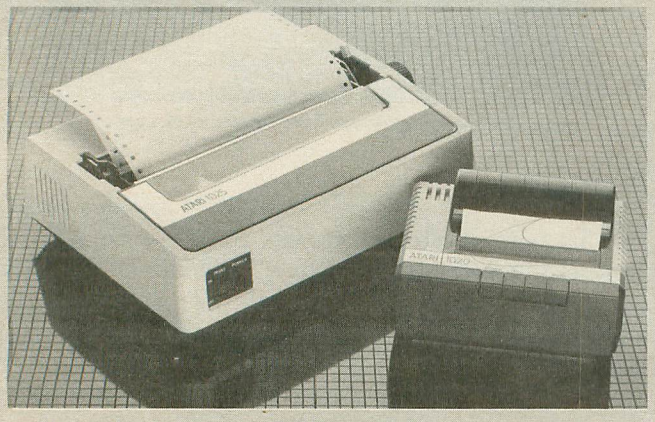


1450XLD

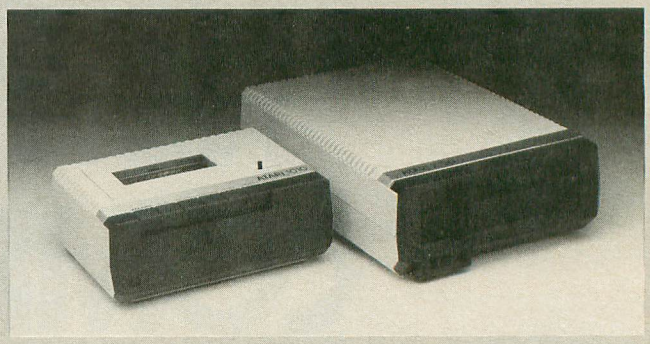
The **600XL** should be on your dealer's shelves by September, followed by the **800XL** later in the month, and the **1400XL** and **1450XLD** in the fourth quarter. All four machines are fully compatible with the 400/800 — even more so than the 1200XL is. Also, all of the operating system bugs in the 1200XL format have been removed. Rumors are that the 400, 800, and even the recently released 1200XL will be phased out as the new machines become available. However, ATARI promises that all of the new software will work on the current machines.

That's Not All, Folks

Along with the new computers comes an array of interesting new hardware with comparable styling. In issue #9 of **A.N.A.L.O.G.** we mentioned the ATARI **1020 COLOR PRINTER/PLOTTER** and the **1025 80 COLUMN PRINTER.** Newly announced is the **1027 LETTER QUALITY PRINTER.** This is NOT a dot matrix printer, but a high quality print style with a cylinder/impact print head. The price should be under $400 (read $349). Print speed runs at 20 characters/second, however at this price and print quality, that slowness shouldn't be an important factor.



To complement the new **1010 PROGRAM RECORDER** is the **1050 DISK DRIVE,** originally to be shipped with DOS II, then later in the year with DOS III which allows the drive to run at double density. Incidentally, DOS III utilizes the HELP key (a feature all of the new computers have) to assist in DOS III menu selection. The printers and storage devices will also work on the 400/800/1200XL computers.



The new **EXPANSION MODULE** boasts 8 ports, along with 2 RS-232 hookups and a bi-directional parallel interface.

Many of us have been craving for the ability to run CP/M programs on the ATARI computers. The new **CP/M EXPANSION MODULE** works with all the current and soon to be released computers with the exception of the 400. The unit will probably hook up through the serial line. This module allows you to run an incredible number of professional and high-quality business programs on the ATARI.

Another new piece of hardware the **1030 DIRECT CONNECT MODEM**, featuring auto-dial from the keyboard, autoanswer, and pulse and touchtone dialing modes. The new modem also includes a memory buffer and printer on/off switching. The 1030 works with both Telelink I and II.

The new **CX60 SUPERJOYSTICK** is self-centering and is made of high quality contact switches with 2 firing buttons (for right or left handed users). The **CX40** is a **REMOTE CONTROL** joystick, and the **CX80** is a **TRACKBALL** controller replicating those in the arcades. A new type of "controller," the **CX77 TOUCH TABLET** allows you to use either a pen or your finger to draw or input data to the computer. This supplements the **CX85** numeric keypad already on the market. A lightpen may also be available in the near future.

Again, with few exceptions, all of this hardware will work with the 400/800/1200XL. ATARI has also announced the availability in the near future of their own 48K RAM board for the 400. If ATARI starts filling in the gaps (especially in the memory department-see editorial in issue #11) this will leave the 3rd party companies, which up to now developed 400/800 expansion memory boards, out in the cold.

Next issue we will report on other new announcements from the Summer Consumer Electronics Show in Chicago. Fear not, loyal ATARI fans, the computer age is just beginning and ATARI is ready to lead the way. □

1 STOP SOFTWARE STORES for the ATARI 400/800

We've Got Software

Free Catalog Available

ATARI is a registered trademark of ATARI, INC.

P.O. BOX 21828
DENVER, COLORADO 80221
"Your Discount Software Store"
Orderline: (303) 431-6598

IF IT'S FOR AN ATARI® COMPUTER

WE HAVE IT!

AND AT A GREAT PRICE!

ATARI

ATARI® 1200XL

Atari® 400/800/1200 hardware and peripherals at a price too low to print! Our latest software catalog lists over 1000 programs for Atari® computers.

Send $2 to our Van Nuys Store for our latest catalog and 1983 Newsletter telling what's coming later this year!
(Specify on outside of envelope **ATARI® 400/800 catalog.***)*

Call our **HOTLINE** 24 Hrs/Day for recorded Software Availability & Sale Information **(213) 901-1005**

All mail order companies are not the same — We are not a Post Office Box — We operate a chain of stores and have a tremendous stock on hand.

G.A.M.E.S.™ WORLD'S LARGEST SELECTION OF VIDEO GAMES, PERSONAL COMPUTERS & SOFTWARE
©1983 G.A.M.E.S.

San Fernando Valley:
6626 Valjean Avenue
Van Nuys, CA 91406
(213) 781-1300
(½ mi W of 405, 2 blks N of Victory)

Orange County:
10529 Ellis Avenue
Fountain Valley, CA
(714) 964-2711
(½ mi W of 405, Euclid Offramp)

South Bay:
2814 W. Sepulveda
Torrance, CA
(213) 530-7905
(Next to Icabod Crane)

Ventura County:
3649 T. O. Blvd.
Thousand Oaks, CA
(805) 497-6115
(213) 991-1153
(In the Westlake Evergreen Center)

Santa Monica:
2834 S. M. Blvd.
Santa Monica, CA
(213) 453-8841
(at Yale)

Newhall:
23404 Lyons Ave.
Newhall, CA
(805) 259-8005
(In Lyons Station Plaza)

All stores open 7 days.

UNLIMITED SOFTWARE

Presents

DISK·OF·THE·MONTH CLUB

Tape · Cartridge · Disk

NO OBLIGATION · SEND FOR DETAILS NOW

SAVE UP TO 40%

HERE AT LAST!

UNLIMITED SOFTWARE
BOX 3223 LODI, NJ 07644

NAME _____

STREET ADDRESS _____

CITY _____ STATE _____ ZIP _____

I own the _____ computer
with cassette ☐ disk ☐

WE'LL TELL YOU WHERE TO GO!

to find the latest information for YOUR computer.

f/n COMPUTER NEWSLETTERS
are now available in a special edition for
ATARI COMPUTER OWNERS
(and in separate editions for all other micros)

We regularly survey:

Compute!/Interface Age/Personal Computing/Analog/Antic/Creative Computing/Softside/Compukids/Byte/Computing Teacher/Infoworld/Micro/Computer Gaming World/Digit/Computers and Electronics/Report Card/List/Softalk/Small Business Computers/Popular Computing/Desktop Computing/Micro Moonlighter Newsletter/W.P. News/Executive Computing News/Computer Systems News/Computers and People/AND MANY, MANY MORE!!!

AND PUBLISH AN UP-TO-DATE DIRECTORY OF ARTICLES ABOUT YOUR COMPUTER

Tutorials/Programming Aids/Graphics/Hints / Programs/Sound/Games/Subroutines/Utilities / Business/Personal/Hardware/Software/Reviews Recreation/General Interest/CAI Technical/Education/MORE!!!

Get the information you need fast and efficiently

Charter Subscription Rates:

5 issues $10.00 (2/3 single copy price)
1 Yr. (10 issues) $15.00 (1/2 single copy price)
(Canada $17.00, Foreign $25.00 US for 10 issues)

MC/VISA/AMEXP add $1.00

Include NAME AND MODEL of your computer.

f/n COMPUTER NEWSLETTERS
P.O. BOX 952 CLEVELAND, OH 44120

PRINTER SUPPLIES

ATARI 820

RIBBONS $5 ea.
3 for $16 6 for $30
PAPER $2.75 ea.
3 for $7.50/6 for $13.00

RIBBONS $6.00 ea.
3 for $11/6 for $21

ATARI 825

RIBBONS:

EPSON MX 70, 80 .....$7.50
NEC 8023A $8.50
Centronics ..... 3/$6.00
737, 739 (Spool)
ITOH Prowriter $8.50

CARTRIDGE REFILLS:

NEC 8023A..... 3/$8.95
EPSON MX 100 ..... 3/$12.95
Centronics 739..... 3/$12.50
Centronics 704 ..... 3/$15.50

All Black Nylon

Add $1 for shipping & handling

ESD P.O. BOX 952 CLEVELAND, OH 44120

NEW FOR ATARI

diskwiz

COMPLETE & AFFORDABLE DISK EDITING REPAIR & DUPLICATION SYSTEM FOR ATARI OR PERCOM DRIVES

• single load • fast mach. lang. • repair, explore, dup dos/non-dos sectors • simultaneous hex/ascii display and editing • print out all modes to any printer • dumps special & inverse chars to EPSON graftax & NEC 8023 • fast mapping and byte searches • file link trace • speedcheck and adjust • block move • auto link pointer, file code change • vtoc bit map changes or check • cross sector disassembler • fast/slow copy • 1 or 2 drives • hex-dec-asc conv. • complete manual • create "bad" sectors • fix deleted or open files • fix dup filenames • safely use non-formattable disks • easy, fast, complete • see review Analog 11 • now for 1200XL too!

All this for only $28.95 postpaid

Don't waste your money on simple copiers or more expensive programs that don't deliver as much.

48 hr. shipping for cashiers checks & money orders. Allow up to 3 weeks for personal checks, — C.O.D. add $2.00.

Club & dealer enquiry encouraged.

*Soon to be released: **PRINTWIZ***

Ask for it at your local dealer.

ALLEN MACROWARE
(213) 376-4105
P.O. Box 2205
Redondo Beach, CA 90278
1906 Carnegie Lane "E"

Atari, Epson, NEC & Percom, are trademarks of Atari, Inc., Epson America, Nippon Electric Company, Percom Data respectively.

COMPILE ATARI BASIC AND FLY!

With ABC™, Monarch's new BASIC compiler for ATARI 400 and 800, you develop and debug programs using your ATARI BASIC cartridge, then use ABC to transform them into compact code that runs up to 12 times faster, without the cartridge (and protects your source code, too). 40K and disk required. For your ABC diskette and manual, send check or money order for $69.95 (or $9.95 for manual alone).

Monarch Data Systems
P.O. Box 207, Cochituate
MA 01778, (617) 877-3457.

Mastercard/Visa by phone. Dealer inquiries invited. Mass. residents add 5% sales tax. ATARI, ATARI 400, and ATARI 800 are trademarks of ATARI, Inc.

IN A GALAXY OF SOFTWARE STARS, WE'RE THE ONE TO WATCH.

VARICOMMANDER

PMI is proud to announce the release of VARICOMMANDER! This is a state of the art variable manipulator for the Atari computer (400/800/1200), and an *extremely powerful* programming utility! VARICOMMANDER allows you to change any variable name to any other name you wish. With another option you can change *all* variable names to any names you wish. Other options include: automatic generation of one character names, automatic generation of two character names, all variables one name (Atascii character), or you can even rename all variables in your program automatically to two character names and retain string and dimension variable integrity. VARICOMMANDER is ergonomically designed with extensive error protection to save your valuable time. If you're a novice or an advanced programmer, VARICOMMANDER is for you!! VARICOMMANDER requires 32K RAM, BASIC cartridge and at least one Atari 810 (or equivalent) disk drive. (Will accommodate multiple disk drives.) $29.95.

PROGRAMMIN' STUFF

is a utility package for the basic programmer! The package contains: the PMI RENUMBER utility, the PMI BASIC CRUNCHER - program compacter, BASICDOS - gives you the most commonly used DOS functions from BASIC, PMI AUTORUN system - allows you to create your own AUTORUN. SYS file using up to a 50 character BASIC statement, the PMI RPM TEST - disk drive speed utility, the PMI PROGRAM SELECTOR - allows you to run any BASIC program by selecting a number off the menu, and the PMI PROGRAM ANALYZER - will list all variables in your program, how much RAM it occupies and line numbers that the variables first appear in. For full utilization of PROGRAMMIN' STUFF you should have at least 32K RAM, BASIC cartridge and one disk drive. Some *powerful* utilities for the basic programmer at a price you can live with — ONLY $26.95!

REPLICATOR SERIES

Still available from PMI - REPLICATOR ONE and REPLICATOR TWO - disk back-up utilities. REPLICATOR ONE - single disk drive. REPLICATOR TWO - dual disk drives. Requirements: 32K RAM, BASIC cartridge and disk drive(s). $34.95.

DEALER INQUIRIES INVITED

PMI

BRINGING COMPUTERS DOWN TO EARTH.

SPECIAL OFFER

- VARICOMMANDER *and* PROGRAMMIN' STUFF - only $45.95.

PROGRAMMERS!

If you have written a program that is technically sophisticated and also "user-friendly", PMI would be interested in publishing your work. For information on how to submit your material write to: PMI, P.O. Box 2895, Winter Park, FL 32790-2895, Or phone (305) 644-3822.

PMI, 2500 Lee Road, Suite 210 P.O. Box 2895, Winter Park, FL 32790-2895

☐ VARICOMMANDER ☐ PROGRAMMIN' STUFF ☐ REP. ONE ☐ REP. TWO
☐ VARICOMMANDER & PROGRAMMIN' STUFF SPECIAL PACKAGE
Total $ _____, plus $2.00 S. & H. (Florida residents add 5% sales tax)
☐ CHECK OR MONEY ORDER ENCLOSED ☐ C.O.D.

NAME (Print) _____

Address _____

City _____ State _____ Zip _____

Allow 3 weeks for personal checks to clear.

THE REPLICATOR SERIES IS NOT INTENDED TO DUPLICATE COPYRIGHTED MATERIAL. ATARI IS A REGISTERED TRADEMARK OF ATARI, INC.

SOUND EFFECTOR

16K cassette 24K disk

by Sheila Neece Spencer

After spending countless hours experimenting with sounds on my ATARI, I finally got tired of running the cursor back and forth to make changes in pitch, distortion, loops, etc. And almost invariably when I got a sound I really liked, I found I had no way to get it back — since I had been experimenting in immediate mode and had carelessly let the sound statements scroll off the top of the screen!

I got just as tired of writing short programs for sound generation — so instead I wrote the Sound Effector, which does all the work for me — and shows me exactly what program made that terrific sound.

The program is quite straightforward. You are asked to input values for pitch, distortion, and volume. (If you intend to run any of these values through a loop, you may enter any number you wish at this point.)

You will then be asked if you want any loops. If you respond with a "Y" to any of the loops, you will be asked for "FROM" and "TO" values, as well as a "STEP" value.

The program runs the values, with loops, and if you have used more than one loop, informs you which loop is the inner one and which the outer. You should make notes of this in case you like what you hear and want to use it in another program. After each sound you will be asked if you want to hear the sound again. An "N" will allow you to see the values you used — on your screen or printer. You can then go on to the next sound (or automatically to the next loop configuration) or end the program.

I've enjoyed experimenting with the program, and have come up with some pretty interesting sounds that I'm sure I wouldn't have gotten working in my usual haphazard way! □

```
5 OPEN #2,4,0,"K:":POKE 752,1:GOSUB 10
000
9 CLOSE #3:TRAP 11000
10 ? "{CLEAR}{DOWN}{DOWN}Do you want listings to the s
creen (1)or printer (2)?":GET #2,OUT
15 IF OUT=50 THEN OPEN #3,8,0,"P:":POK
E 752,1
16 IF OUT=49 THEN OPEN #3,8,0,"E:":POK
E 752,1
20 ? "{CLEAR}{DOWN}{DOWN}What pitch";:INPUT PIT:? "Wha
t distortion";:INPUT DIS:? "What volum
e";:INPUT VOL
50 ? "{CLEAR}{DOWN}{DOWN}Do you want any loops?";:GET
#2,A:IF A<>89 THEN 300
70 ? "{CLEAR}{DOWN}{DOWN}Want a pitch loop?";:GET #2,A
:IF A<>89 THEN 120
90 ? :? :? "Pitch loop - from";:INPUT
PL1:? "to";:INPUT PL2
110 ? "step";:INPUT PL3:IF PL3=0 THEN
? :? "0 CANNOT BE USED AS A STEP VALUE
!":? :GOTO 110
120 ? "{CLEAR}{DOWN}{DOWN}Want a distortion loop?";:GE
T #2,A:IF A<>89 THEN 170
140 ? :? :? "Distortion loop - from";:
INPUT DL1:? "to";:INPUT DL2
160 ? "step";:INPUT DL3:IF DL3=0 THEN
? :? "0 CANNOT BE USED AS A STEP VALUE
!";:? :GOTO 160
170 ? "{CLEAR}{DOWN}{DOWN}Want a volume loop?";:GET #2
,A:IF A<>89 THEN 230
190 ? :? :? "Volume loop - from";:INPU
T VL1:? "to";:INPUT VL2
210 ? "step";:INPUT VL3:IF VL3=0 THEN
? :? "0 CANNOT BE USED AS A STEP VALUE
!":? :GOTO 210
230 IF PL3 AND  NOT DL3 AND  NOT VL3 T
HEN 330
240 IF DL3 AND  NOT PL3 AND  NOT VL3 T
HEN 380
250 IF VL3 AND  NOT PL3 AND  NOT DL3 T
HEN 430
260 IF PL3 AND DL3 AND  NOT VL3 THEN 5
00
270 IF PL3 AND VL3 AND  NOT DL3 THEN 6
10
280 IF DL3 AND VL3 AND  NOT PL3 THEN 7
20
290 GOTO 830
300 SOUND 0,PIT,DIS,VOL:FOR TIME=1 TO
100:NEXT TIME:? :? :? "This was for so
und with no loops.":GOSUB 1200
305 IF A=89 THEN 300
310 IF A<>89 THEN ? :? "Do you want to
 see the values used?":GET #2,A
```

```
311 IF A<>89 THEN 470
312 ? #3;? #3;"Pitch=";PIT;? #3;"Disto
rtion=";DIS;? #3;"Volume=";VOL
320 GOSUB 1290:GOTO 470
330 ? "K":FOR PIT=PL1 TO PL2 STEP PL3:
SOUND 0,PIT,DIS,VOL:NEXT PIT:GOSUB 120
0:IF A=89 THEN 330
360 GOSUB 1210:GOTO 470
380 ? "K":FOR DIS=DL1 TO DL2 STEP DL3:
SOUND 0,PIT,DIS,VOL:NEXT DIS:GOSUB 120
0:IF A=89 THEN 380
410 GOSUB 1210:GOTO 470
430 ? "K":FOR VOL=VL1 TO VL2 STEP VL3:
SOUND 0,PIT,DIS,VOL:NEXT VOL:GOSUB 120
0:IF A=89 THEN 430
460 GOSUB 1210
470 SOUND 0,0,0,0:? "K↓↓Want another s
ound?":GET #2,A:IF A=89 THEN CLR :GOTO
 20
490 END
500 ? "K↓↓The pitch loop is the inner
loop.":FOR DIS=DL1 TO DL2 STEP DL3:FOR
 PIT=PL1 TO PL2 STEP PL3
510 SOUND 0,PIT,DIS,VOL:NEXT PIT:NEXT
DIS:GOSUB 1200:IF A=89 THEN 500
540 GOSUB 1210
550 ? "K↓↓The distortion loop is the i
nner loop.":FOR PIT=PL1 TO PL2 STEP PL
3:FOR DIS=DL1 TO DL2 STEP DL3
560 SOUND 0,PIT,DIS,VOL:NEXT DIS:NEXT
PIT:GOSUB 1200:IF A=89 THEN 540
590 GOSUB 1210:GOTO 470
610 ? "K↓↓The pitch loop is the inner
loop.":FOR VOL=VL1 TO VL2 STEP VL3:FOR
 PIT=PL1 TO PL2 STEP PL3
620 SOUND 0,PIT,DIS,VOL:NEXT PIT:NEXT
VOL:GOSUB 1200:IF A=89 THEN 610
650 GOSUB 1210
660 ? "K↓↓The volume loop is the inner
 loop.":FOR PIT=PL1 TO PL2 STEP PL3:FO
R VOL=VL1 TO VL2 STEP VL3
670 SOUND 0,PIT,DIS,VOL:NEXT VOL:NEXT
PIT:GOSUB 1200:IF A=89 THEN 660
700 GOSUB 1210:GOTO 470
720 ? "K↓↓The distortion loop is the i
nner loop.":FOR VOL=VL1 TO VL2 STEP VL
3:FOR DIS=DL1 TO DL2 STEP DL3
730 SOUND 0,PIT,DIS,VOL:NEXT DIS:NEXT
VOL:GOSUB 1200:IF A=89 THEN 720
760 GOSUB 1210
770 ? "K↓↓The volume loop is the inner
 loop.":FOR DIS=DL1 TO DL2 STEP DL3:FO
R VOL=VL1 TO VL2 STEP VL3
780 SOUND 0,PIT,DIS,VOL:NEXT VOL:NEXT
DIS:GOSUB 1200:IF A=89 THEN 770
810 GOSUB 1210:GOTO 470
830 ? "K↓↓The pitch loop is the innerm
ost loop, the volume loop the outermos
t."
840 FOR VOL=VL1 TO VL2 STEP VL3:FOR DI
S=DL1 TO DL2 STEP DL3:FOR PIT=PL1 TO P
L2 STEP PL3
850 SOUND 0,PIT,DIS,VOL:NEXT PIT:NEXT
DIS:NEXT VOL:GOSUB 1200:IF A=89 THEN 8
30
880 GOSUB 1210
890 ? "K↓↓The volume loop is the inner
most loop, the distortion loop the out
ermost."
900 FOR DIS=DL1 TO DL2 STEP DL3:FOR PI
T=PL1 TO PL2 STEP PL3:FOR VOL=VL1 TO V
L2 STEP VL3
910 SOUND 0,PIT,DIS,VOL:NEXT VOL:NEXT
PIT:NEXT DIS:GOSUB 1200:IF A=89 THEN 8
90
940 GOSUB 1210
950 ? "K↓↓The distortion loop is the i
nnermost  loop, the pitch loop the out
ermost."
960 FOR PIT=PL1 TO PL2 STEP PL3:FOR VO
L=VL1 TO VL2 STEP VL3:FOR DIS=DL1 TO D
L2 STEP DL3
970 SOUND 0,PIT,DIS,VOL:NEXT DIS:NEXT
VOL:NEXT PIT:GOSUB 1200:IF A=89 THEN 9
50
1000 GOSUB 1210
1010 ? "K↓↓The distortion loop is the
innermost  loop, the volume loop the o
utermost."
1020 FOR VOL=VL1 TO VL2 STEP VL3:FOR P
IT=PL1 TO PL2 STEP PL3:FOR DIS=DL1 TO
DL2 STEP DL3
1030 SOUND 0,PIT,DIS,VOL:NEXT DIS:NEXT
 PIT:NEXT VOL:GOSUB 1200:IF A=89 THEN
1010
1060 GOSUB 1210
1070 ? "K↓↓The volume loop is the inne
rmost loop,the pitch loop the outermos
t."
1080 FOR PIT=PL1 TO PL2 STEP PL3:FOR D
IS=DL1 TO DL2 STEP DL3:FOR VOL=VL1 TO
VL2 STEP VL3
1090 SOUND 0,PIT,DIS,VOL:NEXT VOL:NEXT
 DIS:NEXT PIT:GOSUB 1200:IF A=89 THEN
1070
1120 GOSUB 1210
1130 ? "K↓↓The pitch loop is the inner
most loop, the distortion loop the out
ermost."
1140 FOR DIS=DL1 TO DL2 STEP DL3:FOR V
OL=VL1 TO VL2 STEP VL3:FOR PIT=PL1 TO
PL2 STEP PL3
1150 SOUND 0,PIT,DIS,VOL:NEXT PIT:NEXT
 VOL:NEXT DIS:GOSUB 1200:IF A=89 THEN
1130
1180 GOSUB 1210:GOTO 470
1200 SOUND 0,0,0,0:? :? :? "Do you wan
t to hear that again?":GET #2,A:RETURN
1210 ? :? "Do you want to see the valu
es used?":GET #2,A:? :? :IF A<>89 THEN
 RETURN
1230 IF PL3 THEN ? #3;"Pitch=";PL1;" t
o ";PL2;" step ";PL3:GOTO 1250
1240 ? #3;"Pitch=";PIT
1250 IF DL3 THEN ? #3;"Distortion=";DL
1;" to ";DL2;" step ";DL3:GOTO 1270
1260 ? #3;"Distortion=";DIS
1270 IF VL3 THEN ? #3;"Volume=";VL1;"
to ";VL2;" step ";VL3:GOTO 1290
1280 ? #3;"Volume=";VOL
1290 POSITION 8,20:? "PRESS ANY KEY TO
 CONTINUE":GET #2,A:RETURN
10000 ? "K":POSITION 13,0:? "SOUND EFF
ECTOR"
10001 ? "↓↓This program allows you to
set up      complicated sounds using lo
ops in      the pitch, distortion, ";
10005 ? "and/or volume  of a sound.  E
ach loop will be set up in every possi
ble combination so that you";
10010 ? " can pick the sound you like
best  for your application. After all
var-  iations have been ";
10015 ? "played, you will be given a l
isting of how the sounds      were achi
eved, to your printer ";
10020 ? "if you so specify.  You can t
hen use the      sounds you have built
in your own      programs."
10025 POSITION 8,22:? "PRESS ANY KEY T
O CONTINUE";:GET #2,Z:RETURN
11000 ? "ERROR #";PEEK(195);"--PRESS A
NY KEY TO TRY AGAIN";:GET #2,Z:GOTO 9
```

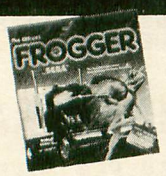
•

CHECKSUM DATA

(See p.46)

```
5 DATA 836,675,25,628,604,805,782,690,
380,490,117,709,484,453,914,8592
210 DATA 512,703,697,705,132,121,128,7
35,454,438,741,738,729,898,523,8254
360 DATA 894,407,881,592,815,845,59,74
8,109,811,148,136,907,889,128,8369
650 DATA 816,967,158,884,195,123,821,8
61,153,889,372,595,387,829,486,8536
900 DATA 555,395,819,475,600,403,927,2
69,780,645,933,287,789,663,932,9472
1130 DATA 163,797,655,100,931,4,737,22
1,981,100,34,202,64,33,88,5110
10005 DATA 917,500,730,424,336,445,335
2
```

Great Software • Great Service • ~~Great~~ incredible Prices

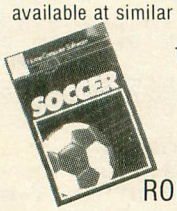


from Sierra On-Line

Frogger

16K Tape / 32K Disk **$22.88**

The official Atari computer version of the smash coin-op hit. Beautiful graphics. The disk version features seven different tunes.
All Sierra On-Line programs, including Ulysses & The Golden Fleece and The *Wizard & The Princess* in stock and available at similar savings.



from Thorn-EMI

Soccer

ROM Cart. **$34.88**

In our opinion, this is **the** best arcade sports game available today. Play vs. the computer or human opponents. Fantastic graphics.
All Thorn-EMI Cartridges including Submarine Commander and Jumbo Jet Pilot in stock and available at similar savings.

from SSI

The Cosmic Balance

48K Disk **$26.88**

Design and build starships, then battle it out in this combination strategic/arcade offering from SSI's Rapid Fire series.
All SSI programs including Knights in the Desert, The Cosmic Balance II and Tigers in the Snow in stock and available at similar savings.

from Epyx

Crush, Crumble & Chomp

32K Tape or Disk **$19.88**

Take on the persona of any of six demonic horror-film beasties (or create your own on disk). Then, pick out a mouthwatering metropolis and head for those buildings and bridges.
All Epyx programs including Jumpman, Temple of Apshai, and Monster Maze in stock and available at similar savings.

from Broderbund

Bank St. Writer

48K Disk **$49.88**

If you own a disk drive, but haven't yet acquired a word processor because the programs you've investigated are too complex and/or expensive for your needs, this program should excite you. Developed at the Bank Street School, it's surprisingly powerful and perfect for students and first-time users.
All Broderbund Software including AE, Choplifter and Stellar Shuttle in stock and available at similar savings.

from Infocom

Suspended

32K Disk **$33.88**

While in a state of cryogenic suspension, you control six robots with different personalities and abilities, as they respond to "incidents" occurring at various locations of the underground complex around you. A game board is included. Plan on spending over 50 hours with this masterpiece of strategic gaming.
All Infocom programs including Zork I, II, and III, Deadline and Starcross in stock and available at similar savings.

from Lightning

Mastertype

32K Disk **$25.88**

A breakthrough in interactive educational software. Learn to type as you battle wave after wave of invading words riding in hi-res spaceships! 17 pre-programmed lessons, plus others that you can create, guarantee continuous challenge and help you develop mastery of the Atari Keyboard.

from Thorn-EMI

Home Financial Management

16K Tape **$19.88**

Set up a budget and then see where you stand financially either in figures or through bar charts. This program should pay for itself!
All Thorn-EMI tapes including Figure Fun available at similar savings.

from Datasoft

Zaxxon

16K Tape or Disk **$25.88**

The long-awaited version of the 3-D arcade hit of 1983. A must-have game for the space gamer.
All Datasoft programs, including Sands of Egypt and Text Wizard available at similar savings.

from Spinnaker

In Search of the Most Amazing Thing

48K Disk **$26.88**

The newest program from Tom Snyder, author of Snooper Troops #1 and #2. Bargain with aliens at an auction, raise currency, then buy your provisions and board your specially-equipped B-Liner in search of the Most Amazing Thing. It's educational — and it's fun. Free bonus novelette included.
All Spinnaker software including Facemaker, Story Machine and Snooper Troops #1 and #2 in stock and available at similar savings.

from MUSE

Castle Wolfenstein

48K Disk **$18.88**

One of the most popular games ever released for the Apple is now available to you. Try to find the war plans and escape from the Nazi stronghold in this exciting blend of strategy and arcade action

from Sirius

Bandits

48K Disk **$22.88**

Bouncing nerve gas balloons, energy shields, space bandits attempting to steal your supplies — they're all on the screen in one of the best space arcade games yet.
All Sirius Software including Repton, Way Out and Sneakers in stock and available at similar savings.

Prices good thru July 30, 1983

Please call or write for FREE CATALOG

Mail order prices do not apply at our retail location.

HOW TO ORDER:

Use mail or phone. For immediate shipment pay by Money Order, Certified Check, Cashiers Check, VISA, or Master Card (add 4% for credit card). Personal checks are accepted but require 1-3 weeks to clear. 10% deposit required for C.O.D.

SHIPPING & HANDLING:

$2.50 for orders under $50; free shipping over $50; Mass. residents add 5% sales tax. Prices are mail order only and are subject to change without notice.

SOFTWARE PLUS

(617) 369-1992

for orders and information
phone hours: 10-6 EST Mon.—Sat.

45 Walden St., Box AA, Concord, Mass. 01742

DE RE LETTER PERFECT (almost)

by Arthur Leyenberger

Letter Perfect by LJK has become the premier word processor for the ATARI computer for many reasons. One particular reason is its versatile ability to be used in conjunction with just about any printer imaginable. With this flexability, however, comes complexity. My goal is that this article be helpful to the first-time user of LJK's Letter Perfect (LP) word processor. I am using LP right now with the Bit-3 80-column board and a green phosphor monitor, and although I have only had the program for a short time, I like it. However, the first few times I used the program I had fits. Hopefully, by sharing my experiences, you will be spared the hassles and your first attempt at using LP will a successful one. Also, I will present information on using the disk printer editor to configure a printer driver for the NEC 8023 and C. Itoh 8510 (Prowriter) printers.

First, LP does not use ATARI DOS, consequently disks that have been formatted with DOS will not work with LP. Therefore, you must format a disk using the Format Disk option of the main menu. Before you even get to that point, there are a few things that first need attending to. For you folks (like me) who have the disk version of Letter Perfect, turn the computer off and the disk drive on, remove any cartridge from your computer and boot up the LP disk (not the disk marked "disk printer editor" - I'll get to that in a while) by inserting the LP disk into the disk drive, closing the door and switching the computer on.

You will now see a cryptic prompt: "(EADQ)." The E, A and Q represent Epson, ATARI 825 (or Centronics 737 or Centronics 739), and Qume or Diablo printers, respectively. If you are using one of these printers, press the appropriate key, otherwise press D which stands for disk printer editor. For now, the best approach is to press D and then press return. The next two questions refer to which disk drive will contain your files and which will contain your database (if you are doing a mail merge). Since I only have one drive, I press return after each of these questions for the default option of 1 disk drive. Now you will see the main menu. The "<" key scrolls the menu pointer up to the top of the screen and the ">" scrolls the pointer down to the bottom of the screen. When using either key and the top or bottom has been reached, the pointer wraps around to the opposite end of the menu. Once you have positioned the menu pointer to the desired selection, you must then press the return key to actually request that option.

Let's assume you have formatted a disk, this disk is now in your drive, and you are still looking at the main menu wondering what all this stuff means. The most often-used menu options are Editor, Load, Save, Printer and Change Parameters.

To get started using the program, position the menu pointer to the Editor option and press return. You are now faced with a blank screen. The first line of your text should always be a format line. The format line is begun with a control-F, (it will appear as inverse video) and it allows you to set margins, fonts, line spacing, headers and footers and other things. If you don't specify a format line, the program will use default values for all of these (see page 33 of the LP manual for more information). I always use a format line because I want to know what the values of these options will be.

I will mention just a few options and their values to get you started. Assume your paper is 8- 1/2 inches wide and you want a one inch left and right margin. Also, you will be using pica print (which is 10 characters per inch or 10 pitch.) You should then specify the left margin (m) as 10 and the line width (w) as 65. Remember, 10 characters/inch, so a one inch left margin equals 10 characters. Likewise, a 65 character width will be equal to 6-1/2 inches. There is no need to specify the right margin since what ever remains from 8-1/2 inches automatically becomes the right margin.

Another useful option is line spacing (l). Line spacing may be from 1 to 5 lines. For term papers, business reports and articles submitted to magazines, use a line spacing of 2. For letters, use a line spacing of 1. Finally, if you want your text printed with right justification (as in this magazine, or simply to look nice) then use the justify option (j) with a value of 1. A value of 0 means no justification. These options

and all others are specified by pressing the lower case letter representing the option followed by the value. The following is the above mentioned format line as it would appear as the first line of your LP file. (The underlined F represents a control-F).

Fm10w6511j1

Be sure to press return after this first line. You are now ready to begin typing. Just remember that, unlike a typewriter where you press return after each line, in LP you just keep on typing and only press return at the end of a paragraph or where you want to end a specific line on the printer. Once you have finished typing your text (or about every five minutes worth of work), you should press the escape (ESC) key which will bring you back to the main menu. Then, position the menu pointer to the Save option, and press the return key. Now type a file name of up to 8 characters in length. You can not use a file name extension because Letter Perfect automatically puts an ".LP" at the end of your specified name. After the file has been saved, LP places you back at the main menu. Loading a file from disk is done in a similar way. Don't forget, when you are in the Editor mode, pressing the (ESC) key brings you back to the main menu and when you are in the main menu mode, you make your menu selection via the "<" or ">" keys and then pressing return.

So far I have talked about the main menu, the Editor mode, and loading and saving files. I will now discuss how to print your text on your printer. First, configure the disk printer editor with the specific codes that are required by your printer. It is a relatively straightforward procedure. What you are doing is setting up a little file on your disk (the disk that will hold all of your text files). The print driver tells LP what ASCII codes to send to your printer to do specific things. For example, on my C. Itoh printer the underline-on and underline-off codes are 27,88 and 27,89, respectively. Once this has been specified to LP, I simply use a control-U to toggle the underline on and off within my text.

Now that you know **what** you are doing, let me briefly tell you **how** to do it. Boot up the Disk Printer Editor Disk and answer the question as to what type of printer you have (read pages 76 through 88 in the LP manual at least once before you attempt to do this). Note that item 5, NEC, refers to the NEC Spinwriter printers, not the NEC 8023 dot matrix printer. Generally, the way this process works is for you to select a numbered option, press the return key and then change or enter the values associated with that printer function. You then press the return key to save those values and continue.

When the main menu comes up I select option 6 because I have a C. Itoh 8510 Prowriter printer. I am then given an opportunity to change some default values concerning things like margins, type fonts, etc. Pressing return instead of an option number brings up the next questions. I then accept the default values for double width printing and back-space character by pressing return twice. The program then asks for boldface on/off and underline on/off. I respond with the codes — 27,33/27,34 and 27,88/27,89, respectively. I now press return and come to the font questions. Up to four fonts may be described and they are numbered 0 through 3. The following are the fonts I can use on my printer and their codes: Pica (10 pitch) — 27,78; Elite (12 pitch) — 27,69; Condensed (17 pitch) — 27,81; and Proportional — 27,80. I press return once more and then I make sure my file disk is in the disk drive. Then I press shift-3, which records the above information on the disk and returns me to the Disk Printer Editor main menu once again. At this point I could configure another printer driver but I would have to answer all of the questions all over again. It would have been nice if my previously entered values remained, allowing me to modify just what I need to in order to configure another printer driver. By the way, only one print driver may be stored on each side of the disk.

When you are finished with the Disk Printer Editor, you'll want to return to the Letter Perfect program to actually print the masterpiece. To do this, insert your LP disk in the drive and select menu option 7 (exit) and follow the instructions. When the prompt (EADQ) appears, insert your file disk containing the printer driver, press D and then press shift-3. This will load the printer driver. For a one-drive system, press return twice and select the Load menu option. When LP requests it, type in your text file name and press return. You can now go back to the Editor mode to add, delete or modify your text or, if you want to print it, select the Printer menu option. Press return twice, adjust the paper and press return again. Your text is now printing on your printer. If not, ensure that your printer is on, it is in the select mode, it is connected correctly to the 850 interface, the interface is on and connected correctly to your ATARI computer. From now on, when you see the "EADQ" after booting up LP, insert your text file disk, press "D", and then press "#". This will load your printer driver which will be active for the entire session or until changed.

This article may have seemed a bit long-winded, but had I the advantage of reading the information contained herein when I first started using LP, I would have saved myself many hours of frustrating trial and error activity. There is much I have not covered in this article but this outline should at least get you started. The bells and whistles can come later. I am still learning too. As yet I can't do sub- and superscripting and right justified proportional printing. I also seem to have trouble with my paging, aft- -ltering the top and bottom margins when using a header. I'll just have to keep working on it. □

ATARI WORD SEARCH PUZZLE

by Marcy Caruthers

Here is a little word search puzzle incorporating some elementary and some advanced words for your ATARI vocabulary. **(Answers on page 93)**

ABS
ASC
AND
ANTIC
ATARI
BASIC
BIT
BREAK
BYE
BYTE
CLOG
CLR
CPU
CHIP
CLOAD
CLOSE
CONTROL
CSAVE
DIM
DMA
DOS
DATA
DELETE
DRAWTO
END
ENTER
FRE
FLOPPY
FOR
GTIA
GOTO
GRAPHICS
INPUT
LEN
LET
LIST
MANTISSA
MISSILE
NEW
NOT
OPEN
PTRIG
PEEK
PLAYER
PLOT
POKE
POKEY
POP
PRINT
RAM
REM
RND
ROM
RESTORE
RUN
SGN
SETCOLOR
SOUND
STATUS
STICK
STOP
TRAP
THEN
VAL

C O N T R O L L E P A D A M E R U N B R
I K Y P P O L F D O A S V I D R A Y R C
C L O A D Y G R A P H I C S C A T R U R
T H E R S D D E O T C S P S J E B V O R
I L O V E I T H E S E A V I E W J B O O
M D O S C M K W G O L C T L T C O L M M
P E M U T E E D T G R D R E S T O R E E
L L T A O R N B I O M J C P D C L E N T
X E C N V E U T A T A R I X T J I X Y L
E T Z D A T A M B O A T R E I D E T I E
Y E R Q D O R M A N T I S S A N T S N T
B I T W U N T Q J R P Z M A R E T C Y A
R L C E D A R E A R B I T O L P K D A V
E I O D E K O P S A O T M M P O K E Y E
A R N S A E F R S U L U T N L O V E M B
K E T R J E U I L Y C P U J A B S U P C
K N R E D P C N S L A N I L Y E T R T L
C T O N Z L H T H E N I R B E U A Y R O
I F U A A T I H E N E N T E R E T R I S
T O S V T H P D R A W T O O M A U S G E
S G N C C S A V E B U D E L E Y S T O P

WHAT IS D:CHECK/C:CHECK

Most program listings in **A.N.A.L.O.G.** are followed by a table of numbers appearing as DATA statements, called "CHECKSUM DATA." These numbers are to be used in conjunction with D:CHECK, which appeared in issue no. 10, and C:CHECK, which appeared in issue no. 11.

D:CHECK and C:CHECK are programs by Istvan Mohos and Tom Hudson. They are designed to find and correct typing errors when entering programs from the magazine. For those readers who do not have a copy of either article, send a pre-addressed, stamped, business-sized envelope to:

D:CHECK ARTICLE
P.O. BOX 23
WORCESTER, MA 01603

CONTROL CHARACTERS

Some program listings reproduced in A.N.A.L.O.G. may contain "strange" characters not shown on the ATARI keyboard. These are special characters which use the CTRL, ESC and "ATARI LOGO" (INVERSE) keys. Shown below is a list of these characters and the keystrokes used to get them. □

--- CTRL ,
--- CTRL A
--- CTRL B
--- CTRL C
--- CTRL D
--- CTRL E
--- CTRL F
--- CTRL G
--- CTRL H
--- CTRL I
--- CTRL J
--- CTRL K
--- CTRL L
--- CTRL M
--- CTRL N
--- CTRL O
--- CTRL P
--- CTRL Q
--- CTRL R
--- CTRL S
--- CTRL T
--- CTRL U
--- CTRL V
--- CTRL W
--- CTRL X
--- CTRL Y

--- CTRL Z
--- ESC ESC
--- ESC CTRL UP-ARROW
--- ESC CTRL DOWN-ARROW
--- ESC CTRL LEFT-ARROW
--- ESC CTRL RIGHT-ARROW
--- CTRL .
--- CTRL ;
--- ESC SHIFT CLEAR
--- ESC BACK S
--- ESC TAB
--- INVERSE CTRL ,
--- INVERSE CTRL A
--- INVERSE CTRL B
--- INVERSE CTRL C
--- INVERSE CTRL D
--- INVERSE CTRL E
--- INVERSE CTRL F
--- INVERSE CTRL G
--- INVERSE CTRL H
--- INVERSE CTRL I
--- INVERSE CTRL J
--- INVERSE CTRL K
--- INVERSE CTRL L

--- INVERSE CTRL M
--- INVERSE CTRL N
--- INVERSE CTRL O
--- INVERSE CTRL P
--- INVERSE CTRL Q
--- INVERSE CTRL R
--- INVERSE CTRL S
--- INVERSE CTRL T
--- INVERSE CTRL U
--- INVERSE CTRL V
--- INVERSE CTRL W
--- INVERSE CTRL X
--- INVERSE CTRL Y
--- INVERSE CTRL Z
--- ESC DELETE
--- ESC INSERT
--- ESC CTRL TAB (CLR)
--- ESC SHIFT TAB (SET)
--- INVERSE SPACE
--- INVERSE _
--- INVERSE CTRL .
--- INVERSE CTRL ;
--- INVERSE |
--- ESC CTRL 2
--- ESC CTRL BACK S
--- ESC CTRL INSERT

ATARI® 400 or 800 OWNERS
INTRODUCE YOURSELF TO THOUSANDS OF NEW PROGRAMS
PLUG IN A FLOPPY DISK DRIVE FOR LESS THAN $550.00

There are thousands of programs available only for computers with floppy disk drives. Micro Mainframe is proud to introduce our floppy disk drive system for the Atari® 400 and 800 computer systems. Our disk system provides the best features at the lowest price available.

STANDARD FEATURES:

- Comes complete and ready to run*
- Double density operation without patches to Atari® DOS
- Single or double density operation software or hardware selectable
- Printer port for standard Centronics parallel printers
- Eliminates the need for the 850 Expansion Interface
- 4K Printer spooler expandable to 38K
- Can be used with all your current Atari® peripherals
- Add additional drives for less than $300.00
- Supports double sided and 8″ floppy disk drives**
- MMF hard disk expansion drives available
- Reads all protected software disks
- Digital Phase Locked Loop Data Separation
- 90 Day factory warranty

With the addition of our expansion box, you can turn our disk drive into a full 64K Z-80® computer using your Atari® as a color terminal allowing you these additional features:

- Run CP/M® software
- Run TRS-80 Model II® software
- Run Oasis® software
- Full 64K Z-80® computing power
- Multiuser operation***

YOU'LL AGREE WITH EVERYBODY ELSE THAT MICRO MAINFRAME IS YOUR BEST BUY IN PERIPHERALS FOR YOUR ATARI® 400 OR 800

Dealer Inquiries are Solicited

MICRO MAINFRAME
11325 Sunrise Gold Circle, Bld. A
Rancho Cordova, CA 95670
(916) 635-3997

* Atari® DOS required
** Requires Maxi-DOS A® (available mid '83)
*** Requires Oasis® Software

Price and specifications subject to change without notice.

Atari is an Atari trademark
Oasis is a Phase One Systems trademark
CP/M is a Digital Research trademark
TRS-80 is a Tandy trademark
Maxi-DOS A is a Micro Mainframe trademark
Z-80 is a Zilog trademark

NOTES TO THE ATARI MICROSOFT BASIC INSTRUCTION MANUAL

by Gerald L. Despain

Rare indeed in the computer industry is the user's manual that answers every question. I have been using the ATARI Microsoft BASIC product for some time now. This is a good product that provides many advantages over the original 8K ATARI BASIC. The manual is good, but it does leave some unanswered questions. I have made a number of corrections, additions or notes in the margins of my manual. I believe these will be useful to others with this product.

The following comments apply to the manual CO16083-26 Rev. 1, documenting version 1.0. One errata sheet (printed on golden rod paper) has been issued by ATARI. Beware! Some of these notes may be documenting bugs that may be corrected or features that may be changed in future versions of the software. Where a note applies will be specified by the page number and the number of centimeters down the page from the horizontal rule at the top of each page. □

Inside front cover
Insert index to DEFSNG 10, DEFDBL 10, DEFINT 11, and DEFSTR 13.

Page 15, insert at centimeter 12:
If a relationship is false, a zero number will result. If a relationship is true, the number -1 will result. The actual non-zero value may be important in some expressions involving logical operators.

Page 17, change at centimeter 5:
If it is a binary 0 (all bits off) it becomes a binary -1 (all bits on) after this logical operation.

Page 17, insert at centimeter 14:
Note: The results of expressions involving logical operators do not always follow one's intuition. For the IF statement, zero means false and non zero means true. However, if A%=&0001 then A% is true but, since NOT A% is &FFFE (all bits on except one) then NOT A% is also true. Similarly if A%=1 and B%=2 then A is true, B is true, but A AND B is false. Thus, if a variable is to be used as a switch variable in operations like IF A% and IF NOT A%, then the value -1 should be used for true.

Page 30 insert at centimeter 15:
If any change is made to the program, it cannot be CONTinued. All variables will have been reset, including COMMON variables.

Page 34 change at centimeter 9:
Format: ON ERROR (GOTO) line number

Page 36 insert at centimeter 5:
The following example illustrates using RESUME from direct mode:

```
10 ON ERROR 40
20 OPEN #3,"P:" OUTPUT
30 GOTO 50
40 PRINT "Enable printer, then type RE
SUME":STOP
50 !
```

Page 38 insert at centimeter 21:
Space for only one character set can be allocated using OPTION CHR1 or CHR2. Invoking a second OPTION CHRn invalidates the previous OPTION CHRn.

Page 39 insert at centimeter 4:
Only one reserved area may be allocated with OPTION RESERVE. Invoking a second OPTION RESERVE invalidates the previous RESERVE.

Page 39 insert at centimeter 19:
Care must be taken in doing arithmetic on addresses returned with VARPTR. When using integer variables, addresses from hex &0000 to &7FFF are positive integers. Addresses from &8000 to &FFFF are negative integers. Adding an offset of say &20 to &7FF0 will cause an overflow error. The following illustrates one way to do address arithmetic and avoid overflows:

```
10 ! Illustrate address arithmetic
15 ! test mod routine
20 B%=&1000:C%=A%:GOSUB 250:GOSUB 90:P
RINT C%;C$
25 ! test add routine near 32K
30 FOR B%=-4 TO 4:C%=&7FFE:GOSUB 1700:
GOSUB 90:PRINT B%;C%;C$:NEXT B%
35 ! test add routine near 64K
40 FOR B%=-4 TO 4:C%=&FFFE:GOSUB 1700:
GOSUB 90:PRINT B%;C%;C$:NEXT B%
50 END
60 !
70 ! this routine converts the value i
n C% to hex in C%.
```

```
80 !
90 C$=" ":D$="0123456789ABCDEF"
100 C2%=(C% AND &F000)/4096:IF C2%<0 T
HEN C2%=16+C2%
110 C$=C$+MID$(D$,C2%+1,1)
120 C$=C$+MID$(D$,(C% AND &0F00)/256+1
,1)
130 C$=C$+MID$(D$,(C% AND &00F0)/16+1,
1)
120 C$=C$+MID$(D$,(C% AND &000F)+1,1)
150 RETURN
160 !
170 ! This routine adds B% to C% doing
 address style arithmetic.
180 ! (memory addresses above 32K are
negative)
190 ! Restrictions: -32767 < B% < 3276
8
200 !
210 IF C%<0 THEN C%=C%+B%:RETURN
220 IF (&7FFF-C%)<B% THEN C%=B%-(&7FFF
-C%)+&8000 ELSE C%=C%+B%
230 RETURN
240 !
250 ! This routine resets C% to the ne
xt address greater than C% on a mod B%
 boundary.
260 !
270 C%=(C% AND (1-B%)):GOTO 170
```

Page 42 change example at centimeter 16:

```
100 OPEN #3,"D:TEST.DAT" OUTPUT
110 NOTE #3,S%,B%
120 PRINT #3,AT(S%,B$) "TEST";
130 CLOSE #3
```

Page 42 insert at centimeter 20:
AT can be used only once per PRINT statement and must be the first item following the IOCB number.

Page 43 insert at centimeter 2:
If the position specified by TAB precedes the current print position, it will go to the next line at the specified TAB position.

Page 43 insert at centimeter 14:
TAB, SPC and AT cannot be used in a PRINT USING statement. The general format for PRINT USING is illustrated by the following example:

```
10 PRINT #3,USING "X= , Y= ";X;Y
```

Page 47 change at centimeter 15:
Format: LINE INPUT (=iocb) ("prompt_string";)
string_variable_name$

Page 48 insert at centimeter 6:
Quotes can be entered by the double quote convention.

Page 49 change at centimeter 20:
#6 is used for INPUT and OUTPUT to S:, the screen itself, in text modes of GRAPHICS 1 and GRAPHICS 2.

Page 59 insert at centimeter 16:
If the third parameter is missing, all the remaining characters in the string will be returned.

Page 62 insert at centimeter 13:
In graphics mode, SCRN$ returns a null string if the color register is zero.

Page 67 insert at centimeter 7:

Default Colors

Register	Hue	Luminance	Description
0-3,8	0	0	black
4	2	8	orange
5	12	10	light green
6	9	4	dark blue
7	4	6	red

Page 69 append to table 12-2

Graphic Mode	Mode Type	Columns	Rows Split Screen	Rows Full Screen	Number of Colors	RAM Required (Bytes)
9	GRAPHICS	80	—	192	1	8122
10	GRAPHICS	80	—	192	9	8122
11	GRAPHICS	80	—	192	16	8122

Page 73 Table 12-4

Replace Table 12-4 with the following:

Default Colors	Mode or Condition	Set-color Register	Poke Addr	Color	Description and Comments
Light blue	GRAPHICS 0	4	709	Register	Character luminance
Dark blue		6	710	number	Character and background hue,
				identifies	background luminance
Black	TEXT MODE	8	712	character	Border
Orange	GRAPHICS 1, 2	4	708	See	Character
Light green		5	709	table	Character
Dark blue		6	710	12-3	Character
Red		7	711		Character
Black	TEXT MODES	8	712		Background, border
Orange	GRAPHICS 3, 5, 7	4	708	1	Graphics point
Light green		5	709	2	Graphics point
Dark blue		6	710	3	Graphics point
Black	4-COLOR MODES	8	712	0	Background, border
Orange	GRAPHICS 4, 6	4	708	1	Graphics point
Black	2-COLOR MODES	8	712	0	Background, border
Light blue	GRAPHICS 8	5	709	1	Graphics point
Dark blue		6	710	2	Graphics point
Black	1 COLOR, 2 LUM.	8	712	0	Border
	GRAPHICS 9			Register Number identifies	
Gray	1 HUE, 16 LUM.	8	712	point luminance	Point and background hue, background lum (should be 0)
Black	GRAPHICS 10	0	704	0	Graphics point
Black	9-COLOR, 1 LUM.	1	705	1	Graphics point
Black		2	706	2	Graphics point
Black		3	707	3	Graphics point
Orange		4	708	4	Graphics point

Light Green		5	709	5	Graphics point
Dark Blue		6	710	6	Graphics point
Red		7	711	7	Graphics point
Black		8	712	8	Background, border
	GRAPHICS 11			Register	
See				number	
Table	16 HUE,	8	712	identifies	Point and background lum.,
12-1	1 LUM.			hue	background hue (should be 0)

Note graphics modes 9, 10, 11 require the GTIA chip instead of the CTIA chip for proper operation.

Page 86 insert at centimeter 18:

Mathematics of Music

A above middle C is standardized at a frequency of 440 Hz. Ideal tuning (or temperment) for other notes would yield a maximum number of consonant chords. Mathematically, no perfect tuning exists. Different compromises lead to different temperments. The most common temperment used now is equal temperment (all twelve notes equally spaced).

Using equal temperment, frequencies for notes can be approximated by the following. To be consistent with the Music Composer Cartridge, let the notes be numbered with C being 1, C# being 2, . . . , and B being 12. Let the octaves be numbered so that octave 4 begins with middle C., octave 5 being the next higher octave. The formula below approximates the pitch values:

INT(.5+2 (11-OCTAVE-NOTE/12))

The frequency for a given pitch value can be given by:

FREQUENCY=63921/(2x(PITCH+1))

or

FREQUENCY=440x2 ((NOTE-58)/ 12+OCTAVE

Using the SOUND command, frequencies from 125 Hz to 32KHz can be played. However, because of the resolution of the frequencies, only the musical notes from C of octave 3 thru C of octave 6 can be played accurately enough to "sound right." However, by using POKE commands, higher resolution frequencies are available. This makes available the complete range of the piano keyboard. This is accomplished by combining two voices into one (reducing the total number or voices available). The following example illustrates this technique. It combines voices 1 with 2 and 3 with 4 to provide two high resolution voices.

```
10 DEF FN(F)=INT((1789790/(2*F)-7)/256
)
20 DEF FL(F)=INT((1789790/(2*F)-7)) AN
D 255
30 PRINT "Frequencies";:INPUT F1,F3
40 DISTORTION=10:VOLUME=8
50 POKE &D208,&78 ! merge channels 1,2
 and 3,4; use 1.79 MHZ clock
60 POKE &D203,0:POKE &D207,0 ! turn of
f sound before changing freq. to preve
nt warbling
70 POKE &D200,FL(F1):POKE &D202,FN(F1)
 ! set channel 1,2 frequency
80 POKE &D204,FL(F3):POKE &D206,FN(F3)
 ! set channel 3,4 frequency
90 POKE &D203,DISTORTION*16+VOLUME ! t
urn on channel 1,2
100 POKE &D207,DISTORTION*16+VOLUME !
turn on channel 3,4
110 GOTO 30
```

Page 111 insert at centimeter 15:

For the COLORn registers, the high order 4 bits give the hue, the low order 4 bits (with bit 0 ignored) give the luminance.

Page 116 insert at centimeter 12:

The bits in CHACT control the display of "inverse" characters as below:

Bit	Value	Result
0	off	display "inverse" character as character
0	on	display "inverse" character as blank
1	off	display "inverse" as non-inverse
1	on	display "inverse" as inverse
2	off	display all characters right-side-up
2	on	display all characters with vertical reflection

Page 117 insert at centimeter 6:

POKE 0 is SDMCTL to disable ANTIC, POKE 34 to enable.

Page 121 insert at centimeter 5:

SKSTAT AND 8 = 0 if the SHIFT is depressed, SKSTAT AND 4 = 0 if the last key is still depressed.

Page 143 insert at centimeter 9:

AND can also be used as a bitwise AND operator.

Page 147 change at centimeter 5:

Example: NAME "D:SUB1" TO "SUB2"

Page 147 insert at centimeter 9:

NOT can also be used as a bitwise complement operator.

Page 147 change at centimeter 19:

Example: OPEN #1, "D:INVEN.DAT" OUTPUT

Page 148 insert at centimeter 4:

OR can also be used as a bitwise OR operator.

Page 150 change at centimeter 2:

Example: PRINT SPC(5);A$

Page 150 change at centimeter 13:

Example: PRINT TAB(20);A$

Page 157 change at centimeter 14:

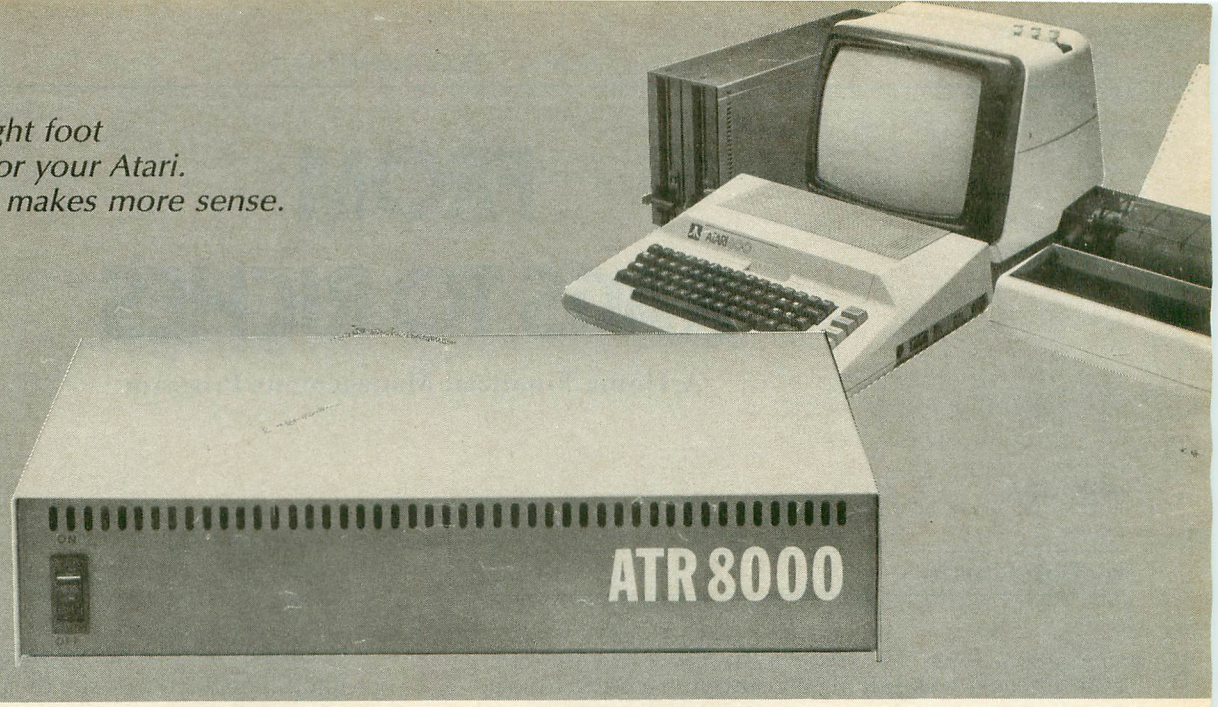
GET #1,D
POKE ADDR+I,D:NEXT I

Page 159 change the indicated lines:

170 FOR I=0 TO 159
370 CIO%(5)=0:CIO%(6)=0
470 GET #2,D:IF D 10 THEN PRINT CHR$(D);

Portions of the ATARI Microsoft BASIC User's Manual reprinted with permission of ATARI, Inc. All rights reserved.

Start off on the right foot
with an ATR8000 for your Atari.
In the long run, it makes more sense.



You're going to expand your Atari®... So why not do it right.

Your first step, purchase of an Atari 400 or 800, was smart. Your next logical step is to buy a SWP ATR8000™ interface unit.

An ATR8000 gives you more capability for less money. You can start small, but you can build big . . . from an outstanding home computer to a powerful CP/M™ machine. And prices for the ATR8000 start at only $349.95.

Yes . . . I'd like to know more about SWP's ATR8000 and CO-POWER-88 for my Atari 400/800 computer. Please rush me free literature.

Send to:
SWP Microcomputer Products, Inc.
2500 E. Randol Mill Rd. - 125
Arlington, Texas 76011
200

name

street address

city state zip

MAIL TODAY!

DEALER INQUIRIES INVITED.

SWP inc
MICROCOMPUTER PRODUCTS

2500 E. Randol Mill Rd
Arlington, Texas 76011
817/469-1181

We used to be Software Publishers, Inc.

ATR8000 and CO-POWER-88 are trademarks of SWP Microcomputer Products, Inc.; CP/M and CP/M-86 are trademarks of Digital Research Corporation; MSDOS is a trademark of Microsoft Corporation; Z-80 is a trademark of Zilog Corporation; Atari 400, Atari 800 and Atari 810 are trademarks of Atari, Inc.

PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

What you get first, in the amazingly adaptable ATR8000, is plug-together interfacing to all ordinary system devices:

- To floppy disk drives — The ATR8000 lets you hook up from one to four low-cost add-on drives, 5" or 8", one- or two-sided, in any mix . . . and go right to work with either a single- or double-density DOS. (DOS is optional.)
- To a printer — The ATR8000 parallel "Centronics-interface" is supported by a ROM driver program that you can access from Atari Basic.
- To a modem, to a serial data terminal or to any other RS-232 communicating device — The comprehensive users manual includes an Atari Basic serial printer driver.
- To Atari peripherals such as the 810 Disk Drive.

And of course the ATR8000 interfaces to the 400 or 800 computer itself. But system versatility is just the beginning; the ATR8000 also opens the door to another world of microcomputing.

Atari®-CP/M™ — A whole new world of personal computing

Quite simply, CP/M is the dominant operating system of the 8-bit microworld. Make the ATR8000 your first system expansion unit, and you can put the CP/M world in your own little jug.

Since the ATR8000 is actually a self-contained Z-80 computer, a low-cost upgrade converts your Atari-ATR8000 system into a full-capability CP/M machine. Of course you can also start right off with a CP/M-ATR8000. In either case, you get CP/M program-development capability, plus access to an enormous base of proven application programs that just load and go. The CP/M upgrade, which includes 64 Kbytes of RAM, costs just $249.95.

And it doesn't end there!

You can further upgrade your CP/M-ATR8000 to 16-bit microprocessing power . . . to CP/M-86 or MSDOS operation. Moreover, with SWP's CO-POWER-88™ upgrade, you not only retain your 8-bit processing capability, but you also can use CO-POWER-88 RAM — up to 256 Kbytes — as fast, simulated disk storage for CP/M operation.

Like the ATR8000, CO-POWER-88 comes with comprehensive documentation. Prices begin at $749.95 with 128 Kbytes of RAM and CP/M-86 operating system.

FROM RAGS TO RICHES

A Home Financial Management Program

48K disk

by Bob Curtin

I'll never forget the look on my wife's face the day I announced I was buying a computer for the house. Her eyes narrowed to suspicious slits, her jaw firmly set, and her lips drew into a thin tight line.

"No, really, honey," I soothed, "It'll be good for the kids! I can use it for word processing! You can do biorhythms and stuff! And it'll do the family finances!"

Well, a year later we are indeed using our ATARI for home finances, and I'm not exaggerating when I declare that the impact has been phenomenal. I'd long been a sloppy money manager, prone to paying the bills in response to a late notice, or worse. We never kept records of purchases and our filing system consisted of various drawers and boxes scattered around the house.

The checking accounts were always a disaster. We were getting shell shocked from the sound of ricocheting checks, and the accompanying service charges were costing us a small fortune.

The day came when we decided to get organized; to put things right; and to use our ATARI to help us do it. We ordered a computer printout of all of our accounts from our bank, bought a filing cabinet and set up a simple filing system, and then ran into a stone wall. Finding the financial management software for our ATARI proved to be a job unto itself. Nothing fit. Either the programs were too simple, too comprehensive (I mean, who needs custom checks printed?) or much too expensive.

After months of searching, I happened across a program entitled FAMILY CASH FLOW, written by Jerry Falkenhan. This excellent program is available through the ATARI Program Exchange for under twenty-five dollars and is a steal at that price.

We immediately incorporated FAMILY CASH FLOW (FCF) into our money management system, and though it proved invaluable in recording our expenditures and income in infinite detail, and in giving us a general overview of our finances for the year, it did have some shortcomings. For instance, it didn't provide the means for setting up and maintaining a weekly budget. It also didn't keep track of checking accounts, savings accounts, or cash on hand. I decided to write the missing parts myself, and what follows is not only the program listing and documentation, but a description of the home finance system which evolved from the use of this program and FAMILY CASH FLOW together.

Those of you out there who've not yet started using your computer for home finance management are in for a shock when you discover the difference it makes. My wife no longer glares at our ATARI with naked hatred. She doesn't love it yet, but she does treat it with a grudging respect.

The bills are now paid on time. The checking accounts are not just balanced at the end of the month; they are ALWAYS balanced. We can, in a matter of seconds, find out how much we paid for clothes last December, and even break it down to cost per individual! I can tell you how much I paid for any given item, in any given month, when the purchase was made, and the check number, all in under one minute.

As I said, there's been a phenomenal change in our home finances, and we owe it all to our ATARI.

Program Description

When I sat down to block out this budget program, there were two things I firmly fixed in my mind. First, I wanted to make the program as simple to use as possible, and also as safe and crashproof as possible. Second, although this program was written to be used in conjunction with FCF, it can also be used alone to maintain a weekly budget.

Unfortunately, I had to compromise some program speed in favor of a number of measures designed to keep the user from accidentally overwriting or wiping out data files. Data will automatically be entered and filed when accessing the budget modes and the checking account mode. Further, although you can change the week number from either budget mode, you can't change the month without returning to the main menu. This was done because the data files are named after months, and when the month changes, so does the data file name. If you were allowed to change the month, it'd be possible to

enter the data for one month, change the data file name, and then file the data from this previous month into the new file, thus destroying any data already in that file. I think the time spent waiting for automatic loading and filing of data is a small price to pay to guarantee the safety of the data itself.

All commands which alter or purge the data are two-step commands so that accidental file destructs are kept to a minimum.

Program features include up to thirty budget categories, twenty-five of which are user definable. All columns are right justified and have trailing zeros.

The checking account routine allows you to keep track of up to three checking accounts. It can also be used to keep track of savings accounts, slush funds, cash-on-hand, loan balances, or anything you'd like to keep a running tally on. When checks are written against an account, the amount is automatically deducted from the account balance, and the amount of the check and the check number is stored in memory. A running total of the outstanding checks is constantly displayed in the checking account mode, and a listing of all outstanding checks can be gotten on command. This listing includes the amount of each check and the check numbers.

A payment routine keeps track of the total payments made in each category, and a listing of these payments can also be gotten on command.

There are several other features or functions listed on the main menu which are supportive of the features I've just mentioned. I've made every attempt to anticipate data entry which would cause errors and have provided routines prevent the program from crashing.

Getting Started

After typing in the code, the first thing that must be done is to create a data file. To do this, simply run the program. When the main menu appears, press "C" (change date). This mode allows inputs of numeric values 1 to 5 and alpha inputs A to L. The numeric values represent week numbers and the alpha inputs correspond to the months shown on the display. Press the letter corresponding to the month for which you want to create a data file. The program will return to the menu. Type "F" (file data). The program will remind you that you forgot to enter a week number and will enter the date change mode again; enter any number between 1 and 5. When the main menu reappears, a data file has been created for the month you chose.

Next, using the table of commands, run all the functions and subroutines in the program to be sure

you've done your typing correctly. If you run into problems use the program outline to locate the respective block of code, and go over it to find your mistake. Once you've gotten the program up and running, the next stop is to define your categories.

Defining Categories

This step is one which requires some thought.

First of all, make a list of all of your expenses; all of them, no matter how petty. List them in any order. Now add to the list any expenses which seasonal, such as heating fuel or motorcycle insurance. Next, delete all occasional or one-time expenses, unless you plan on budgeting for such expenses over a period of time.

Once you've got a complete list of all of your regular expenses, combine like items, such as the premiums on two separate auto insurance policies, or the payments on more than one auto loan, and then give the category a label of fourteen letters or less. Label the rest of your expenses the same way.

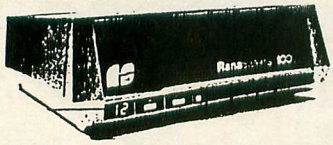
Next, these categories have to be divided into two separate groups, labelled "fixed expenses" and "variable expenses." Please bear in mind that the term "fixed" does not mean that the amounts in the individual categories in this group do not vary; most of them probably will. What it does mean is that expenses in this group must be paid or the service, or commodity, or whatever will stop or be withdrawn. For example, electricity is a fixed expense. Even though the amount of the bill may vary from month to month, if the bill is not paid, the electricity will be shut off. Other examples of fixed expenses are insurance policies, rent or mortgage payments, loan payments, television cable, telephone, medical insurance, etc.

On the other hand, "variable expenses" are those which you have direct control over. You may buy the item this week or not, or you may buy more or less of it, or you may put off buying it until next week, as you see fit. You're not locked in to a set payment or rate. These payments or expenses may be varied or eliminated each week to accomodate the fixed expenses. Note that the reverse is not true. You budget your fixed expenses and then you budget your variable expenses with what's left over.

Examples of variable expenses include gasoline/oil, recreation, food and clothing.

Once you've divided your categories into the two groups, press "E" (define categories) and type the labels you've given each category into their respective groups. I suggest filling up all unused spaces in a label, and also all unused categories with dashes. It'll

RANA 1000 DISK DRIVE
FOR YOUR ATARI COMPUTER



* Compatible with existing software
* Single density 90K
* LED readout defines five functions
* 90 day warranty
* Interchangeable with Atari 810
* Works with Atari DOS

Single/Double Density Drive **$329.00**

(Soon to be released with Double Density Software)

MPP - 1100 Parallel Printer Interface
(Eliminate need for Atari 850)

* Compatible with all software
* 2 year warranty **$79.00**

RAM FOR ATARI

64K Board (400) $120.00
48K Board (400) $100.00
32K Board (400/800) ..... $ 70.00
16K Board (800) ..... $ 40.00

Inhome Keyboard for (400) ..... $ 89.00
Joytyper Keyboard for (400) ..... $ 99.00

Note: Installation of Memory Boards or 400 Keyboards $20.00
You Pay Freight Costs

GENERIC MINI-FLOPPY DISKS

GUARANTEED

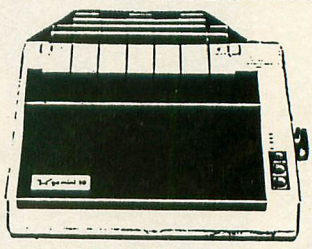
FULLY CERTIFIED 100% DEFECT FREE
Single/Double Density

DISKETTES (1 Box Min.)
10-29 (Diskettes) 17.49/box
30-99 (Diskettes) 15.99/box
100+ (Diskettes) 14.99/box

BULK DISKETTES WITH SLEEVES
10-29 (Diskettes) 1.59/Diskette
30-99 (Diskettes) 1.49/Diskette
100+ (Diskettes) 1.45/Diskette

DEALER INQUIRIES INVITED

GEMINI DOT MATRIX PRINTER



9 x 9 Dot Matrix
100 CPS. Bidirectional
6 Character Sets
7 Character Fonts
Cut Sheet: 8" to 10"
Fanfold: 3" to 10"
Copies: 3 carbonless sheets

GEMINI 10 (80 Column) $319.00
GEMINI 15 (136 Column) $479.00

CALL TOLL FREE: 1-800-824-7506

MC
VISA
C.O.D.

COMPUTER CREATIONS, Inc.
P.O. Box 292467
Dayton, Ohio 45429
(513) 335-4260 or
(513) 294-2002

CALL COLLECT

All Orders Add $2.50 Shipping and Handling. Ohio Residents Add 6% for Sales Tax.

make the display neater and easier to read.

When you've typed in all of your labels, repeat the file creation procedure outlined previously to store it on disk.

Now you're set to enter data.

The System

This is probably a good place to take a general overview of the budget program (BP) and how it relates to FCF. Also remember that nothing here is etched in stone, so if you feel uncomfortable with any part of the system, by all means change it to suit your needs.

In general, BP and FAMILY CASH FLOW are two sides of the same coin. FCF is used to document that which BP projects. BP allocates the funds to the different categories, and FCF documents the individual expenditures in each category. FCF also provides detailed documentation of income, and compares income to expenses on a monthly and yearly level.

The crux of the budget program is, logically, the two budget displays. The three columns (labelled "(#)", "TOT", and "VAR") represent, respectively, the weekly budget in each category, the total of all money budgeted for the month in each category, and the total variance in each category. The variance can be defined as the difference between the total money budgeted in a category, and the total payments made in a category. It's quite possible for the variance to become a minus number.

RUN the program and enter the month you created the data file for. Then press "A" (budget — fixed). The computer will remind you that you haven't entered a week number and will send you into the "change data" mode. Enter 1 for the week number. The computer will automatically load the category names which you defined earlier and print the fixed expense display on the screen.

The first column contains the amount budgeted for each category in the week enclosed in parentheses at the top of the column. To enter figures in this column, simply press the letter beside the category you want and enter the amount you want to budget. The computer will then be ready for another input.

Note that the screen display will not update itself automatically. Since the screen takes about eight seconds to print (due to the right justifying and trailing zeros subroutines) entering a lot of data would be a lengthy process if the screen reprinted itself after every input. Therefore, I made the screen update a command unto itself. Just press zero.

To illustrate how the budget display works, let's enter some data. Enter 10, 50 in category A, and update the display. Notice that 10, 50 is displayed in each column opposite category A.

Change the week number (press Q to get to the change date mode) and you'll see that column one is now empty, but column two and three have remained the same. This is as it should be since you haven't entered anything for the second week yet.

Now enter 10,00 in category A again and update the display. The first column will read 10,00 and the second and third will read 20,50. The second column reflects the total of all money budgeted in a category by adding all of the weeks together. The third column (variance) is the monthly total less the total payments made in each category. The variance is a useful tool in maintaining your budget from month to month.

If you change the week number back to one, you can see that the original amount budgeted for that week is still in place, but the total and variance reflect weeks one and two together.

Let's make a payment. This is done in exactly the same way as entering figures in column one, except that the data is put in the form of a minus figure. For instance, if you wanted to make a $50 payment in category F, you'd simply press "F" and enter -50. The computer will come right back and display what you entered and ask if it's correct. If it is, type "Y." If it isn't, type "N" (and re-enter the payment).

Make a $20 payment in category A and update the display. Column one still contains the weekly budget, column two still holds the monthly total, but column three now reads .50, or the monthly total less the total payments.

If you press "S" you'll be rewarded with a listing of the total payments made in each category. Notice that there's a 20.00 payment listed in category A. If you were to make another payment in category A, the new payment would be added to reflect a total for the month. (Individual payments are documented in FCF, while BP is only concerned with the totals in each category.)

As you can see from the format, the BP is used to allocate your money to the different categories each week, keep a running total for the month, and tell you through the variance whether you've over- or under-budgeted for the month and by how much.

The variance is carried over into the next month so that you can adjust for it. It's important to note, however, that the carried-over variance will not affect any data entered. In other words, starting the month with a minus variance in a given category will not lessen the variance caused by new data input. On the contrary, once new data is entered in a category, any carried-over variance will be wiped from memory in that particular category.

Turning now to the checking account routine, you can see that there are the balances and totals of checks outstanding for three accounts. The commands in this mode are pretty much self-explanatory, but there are a few things that you should know.

First, each account will handle a total of forty-five outstanding checks at any given time. This is sufficient for most people, but if you find yourself

writing more than forty-five checks a month in a particular checking account, you can borrow the check handling capacity of one of the unusued accounts and handle the balance manually through the deposit and withdrawal commands.

One of the most useful parts of this program is the outstanding checks listing. It's a simple matter to balance your checkbook each month by deleting the outstanding checks each month when the bank returns them.

Words of Caution

With the three columns and the category labels, the display is a bit crowded. I must warn you that the program will crash if any value greater than 9999.99 runs through the right justification subroutine, and printed to the screen. It was a matter of room more than anything else, and I reasoned that anyone with a budget of $10,000 a month would have absolutely no reason to use this program anyway.

When you're ready to create a file for a new month, simply load the data from the previous month by pressing "G" (get data). When the program returns to the menu, change the month to the new month, press "H" (clear data) and when the menu returns, press "F" (file data). The clear data command clears all of the variables except those containing the checking accounts, category definitions, and variances. This data will be retained and carried into the new month. REMEMBER TO CHANGE THE MONTH BEFORE FILING THE PURGED FILE OR YOU'LL DESTROY THE CONTENTS OF THE OLD FILE. This is worth repeating. To create a data file for a new month, you:

1. Press "C" (change date) and set the month to the most recent file.
2. When you return to the menu, press "G" (get data) and load the contents of the most recent file. (This gives you the checking account balances, outstanding check list, and category labels.)
3. When you return to the menu, press "C" again and change the month to what you want to create the new file for. THIS IS VERY IMPORTANT!
4. When you return to the menu, press "H" (clear data.)
5. When you return to the menu, press "F" (file data.) When you return to the menu, a new data file will have been created containing the checking account balances, outstanding check lists, category names, and variances.

Though it's really not necessary to save old files, I suggest keeping six months of old files at any given time. Then, when a new file is created, delete the file which is then seven months old. Even though all of your expenditures are recorded in infinite detail in FCF, reviewing the monthly variances from time to time will tell whether you're chronically over or under budgeting in a certain category.

Always be sure to keep back-up copies of your data files.

Hints, Suggestions, and Putting It All Together

This is sort of a potpourri of informational tidbits which might help you to keep your budget running smoothly after you've gotten it set up. Some of it may sound patently obvious, even to the most casual observer, but I include it for those of you out there who are anywhere near as inept with money as I, if that's possible.

First of all, before you can effectively plan ahead, you have to know where you **are.** Set up some sort of filing system to keep all of your bills, receipts, warranties, insurance policies, legal documents, medical records, recent bank statements, deposit slips, business letters, tax forms and records, school records, and so on, in a single, easily accessable place. Keep old bills only until you've actually been credited for the last payment on a new bill; then throw the old bill away. Do your filing every day; don't let it build up to a job that takes more than minutes at a time.

Records are extremely important in the scheme of financial affairs, so pay as many bills as possible with checks. If you make accurate and copious notations on each check as to exactly what the money is being spent for, you'll have little problems from your end of a lawsuit or an IRS audit. Find yourself a bank that gives out free checking (or even better, pays interest on your checking account) and then take full advantage of it.

Whenever you send out a check, be sure to make a notation in your checkbook of the **mailing date**, not just the date the check was written.

As I've mentioned previously, the FAMILY CASH FLOW program is used in this financial management system mainly to document expenditures. It's very good at this, allowing up to 125 individual entries per month (250 individual entries if you have two disk drives) in thirteen categories. Each entry documents the date, the amount of the payment, and allows a description of the payment up to 15 characters long. This discription is useful for a number of things, such a recording the check numbers along with the company the check was sent to. For instance, ELECTRIC (623). You can record where you've made cash purchases by including the name or initials of the store in the description. An example of this is: SHOES(KINNEY).

If you have credit cards, you can indicate the purchases made with them much the same way, i.e. DISKS(VISA). Incidentally, you should keep files for each credit card in your filing system to hold the receipts and monthly statements. When you make your monthly payments, you'll have a someplace to file the check number and date, other than your computer. It always pays to keep a hard copy.

Never mail a check that isn't covered by funds in your checking account. You can make the check out

ahead of time. You can enter it into your computer. You can even put the stamp on the envelope. But don't mail it until the money's actually in the account. Ol' Murphy just lays in wait for folks who make a habit of that, and it'll end up costing you in service charges.

Make savings one of your fixed expense categories. Pay yourself first, then pay your bills. I know you've heard it before, but pick a percentage, no matter how small, and skim that right off the top. Stick it into a savings account and forget it. Once you get into that habit, you can increase the percentage, and watch your dough grow!

Use the variances; they're great for tagging unwanted trends. If you notice categories which you have to constantly increase week after week, then go to the FAMILY CASH FLOW program and review the expenditures. For instance, if you see a trend toward an increase in gasoline usage, you may need a tune-up on the bomb.

FCF, if used properly, can show you some surprising things about your buying habits. Be absolutely ruthless in documenting expenditures, even if you're not too thrilled about being reminded of them. I'm definitely an impulse buyer, but after getting into the habit of telling my ATARI what I'd spent my money on that day, and then being ashamed of myself when the figures glared back at me when looking at it the next day, I tend to think more now before reaching for my wallet. Be honest. Don't bury embarrassing purchases. As a matter of fact, if you have any money-gulping bad habits like smoking or drinking, being reminded of the cold, hard cash going down the drain day after day can be an added incentive to moderate or abstain.

Now down to the nitty gritty. Just how do you use these numbers?

Well, first of all, you have to have some method of defining the weeks in a month. Most months on the calendar have at least one week which overlaps from one month to the next, that is, part of the week will begin in one month and then end in another month. This isn't a problem with a monthly budget, but with a weekly budget, unless you can automatically signify which month a particular week belongs in, the budget could get confusing, to say the least. The method for doing this has to be simple and consistant from month to month.

One method is to pick a day of the week to trigger the start of a new week. It really doesn't matter which day you choose, as long as it remains the same every week and month to month. The day you choose will determine the number of weeks in a month (either four or five) and will trigger the start of a new week. For instance, suppose you chose Wednesday as your "trigger" day. In August of 1983 there are five Wednesdays (the 3rd, 10th, 17th, 24th, and 31st). Therefore, there are five weeks in August. The first day of the month is Wednesday, August 3rd, and the last day of the month is Tuesday, September 6th. Note that August 1st and 2nd were included in the last week of July.

Of course, you may devise any method you want. Just be sure your method assigns each and every week of the year to a specific month and to no other.

That done, the next thing to do is to go back to your filing system.

Remember that the reason for setting up a budget in the first place is to separate your income into little piles according to the categories which you defined earlier. It wouldn't do to separate the money in name only, so the thing to do now is to provide a place to store the budgeted cash until it's needed. Get yourself some medium-sized coin envelopes and label one envelope for each category in the Budget Program which you pay in cash. Those categories which you pay by check obviously don't need envelopes because the cash is deposited in your checking account(s). Next, label file folders to match the envelopes. Some of the envelopes can be doubled up in file folders if they're similar. Just be sure to mark the folder with both labels. Now, when you budget a certain amount for a category, physically place the cash into the appropriate envelope.

Let's say you budgeted $65.00 in a given week for food, but spent only $56.50 at the market. The last column in your budget Program will show a variance of $8.50, and you should indeed put the remaining $8.50 back into the envelope to keep the computer honest. When it becomes time to budget for the next week, you may use the extra cash to augment your food budget. For instance, if you decided to stick to the $65.00 figure for food the next week, you need acutally only put $56.50 down as the budgeted figure for that week, but the variance will go to $65.00 and will reflect what's actually the cash total in the envelope.

A word of advice. It's not really a good idea to over-budget on a consistant basis and built up considerable amounts in your envelopes. It's a far better idea to take that extra cash and stuff it into a savings account or an IRA and earn interest on it. Try to budget exactly what you need and no more. Put $30 to $50 into your MISCELLANEOUS envelope to act as a buffer against minus variances.

Speaking of minus variances, be sure to mark on the outside of the MISCELLANEOUS envelope the category which "borrowed" the cash, and of course, the amount borrowed. Make the same notation on the category envelope. The next week, all minus variances should be paid back to MISCELLA—NEOUS file before any money is budgeted. For the sake of clarity, let's assume that in our FOOD category, we had a -8.50 variance left over from last week. If we wanted to maintain our $65.00 level, we'd have to budget $73.50, $8.50 would be put into the MISCELLANEOUS file, and $65.00 would be put into the FOOD file. Note that by entering

73.50 into the first column, the variance would automatically reflect the $65.00 which was truly budgeted. The monthly total will reflect any money which was budgeted to replace a minus variance.

You must remember that even though the variances are carried over into the next month, they have no effect on data entered for the new month. In fact, the old variances will be wiped from memory and replaced with updated variances in the new month.

Lastly, a word about the totals. The two totals under each column are the subtotal for the individual displays (on top) and the grand totals of the two displays together (on the bottom). The grand total under column one should never exceed your weekly income. (Easier said than done!) The grand total under column two should never exceed your monthly income. The grand total under column three, when at the end of a month, should never go below zero. (This assumes some sort of buffer in the MISCELLANEOUS file.)

Carry On

Well, there you have it: the bare bones for a system to keep close tabs on your money, document your expenditures, and budget weeks into the future. Mold it to fit your own particular needs, add whatever niceties you want, but I strongly suggest that you give your computer a chance to strut its stuff in something other than videogames. Either with this system or another, you'll be shocked out of your socks when you discover the speed, accuracy, and ease with which you can handle the household finances. To top it all off, paying the bills almost becomes fun! □

PROGRAM OUTLINE

1 — 25	Initialization
1000 — 1076	Date and Data File Name Routine
1500	Overall Tools
3000 — 3018	Fixed Expense Payments
3019 — 3040	Variable Expense Payments
4000 — 4115	Payment Verification
5000 — 5050	Checking Account Display
5500 — 5520	Checking Account Menu
5600 — 5620	Deposit Routine
5700 — 5720	Check Writing Routine
5800 — 5805	Withdrawal Routine
5900 — 5970	Outstanding Checks Routine
6002 — 6004	Date Reminder Routine
6005 — 6150	Fixed Expense Budget Display
6500 — 6525	Category Input
6530 — 6545	Amount Input
6600 — 6694	Variable Expense Budget Display
6700 — 6720	Category Input
6725 — 6740	Amount Input
7000 — 7416	Define Categories
8000 — 8010	Right Justification Routine
8100 — 8103	Initialization of Temporary String
8200 — 8205	Trailing Zeros Routine
9000 — 9099	Main Menu
9500 — 9550	Error Handling Routine
10000 — 10020	Save Data
10200 — 10299	Retrieve Data

COMMAND TABLE

MODE	COMMAND	RESULT
A	A - O	Category for Input
BUDGET - FIXED or	P	Return to Main Menu
BUDGET - VARIABLE		
	Q	Change Date
	R	Go to Fixed/Variable Expense Display
	S	List Payments
	0 (zero)	Update Display
	* * * * * * * * * *	
C	1 - 5	Week Number
CHANGE DATE	A - L	Month
	* * * * * * * * * *	
D	1	Deposit
CHECKING	2	Write Check
ACCOUNTS	3	Withdrawal
	4	List Outstanding Checks (accounts number)
		Delete Outstanding Checks ("Y" then the check number)
	5	Return To Main Menu
	* * * * * * * * * *	
E	4 - 30	Category to Define
DEFINE CATEGORIES	1 - 3/15-16	Return To Main Menu

```
1 YR=83
5 TRAP 9500
10 DIM TP$(15),N$(15),BL$(40),EX(45,10
),CH(3,3),MON$(15),PAY(45),IN(5,8),A$(
15),B$(15),C$(15),D$(15),E$(15),F$(15)
12 DIM G$(15),H$(15),I$(15),J$(15),K$(
15),L$(15),M$(15),N1$(15),O$(15),P$(15
),Q$(15),R$(15),S$(15),T$(15),U$(15)
14 DIM V$(15),W$(15),X$(15),Y$(15),Z$(
15),AZ$(12),YR$(2),EO$(2),CK(3,45),CK1
(3,45),AT$(12),MON1$(15)
20 BL$(1)=" ":BL$(40)=BL$:BL$(2)=BL$:D
D=2
25 YR$=STR$(YR):GOTO 8999
1000 POKE 710,12:POKE 712,12:POKE 709,
0:? "K":POKE 752,1:POSITION 6,3:? "###
##########################"
1005 POSITION 6,4:? "#":POSITION 33,4:
? "#":POSITION 6,5:? "# A JANUARY    G
 JULY     #"
1010 POSITION 6,6:? "#":POSITION 33,6:
? "#":POSITION 6,7:? "# B FEBRUARY   H
 AUGUST   #"
1015 POSITION 6,8:? "#":POSITION 33,8:
? "#":POSITION 6,9:? "# C MARCH      I
 SEPTEMBER #"
1020 POSITION 6,10:? "#":POSITION 33,1
0:? "#":POSITION 6,11:? "# D APRIL
  J OCTOBER   #"
```

```
1025 POSITION 6,12:? "●":POSITION 33,1
2:? "●":POSITION 6,13:? "● E MAY
  K NOVEMBER  ●"
1030 POSITION 6,14:? "●":POSITION 33,1
4:? "●":POSITION 6,15:? "● F JUNE
  L DECEMBER  ●"
1035 POSITION 6,16:? "●":POSITION 33,1
6:? "●":POSITION 6,17:? "●●●●●●●●●●●●●
●●●●●●●●●●●●●●"
1040 POSITION 7,20:? "ENTER MONTH OR W
EEK NUMBER":OPEN #1,4,0,"K:":GET #1,I:
CLOSE #1:POKE 53774,112
1042 IF I>48 THEN IF I<54 THEN W=I-48:
RETURN
1044 IF I<65 OR I>76 THEN FOR E=1 TO 1
0:SOUND 0,30,10,10:FOR J=1 TO 2
1045 IF I<65 OR I>76 THEN NEXT J:SOUND
 0,10,10,10:FOR J=1 TO 2:NEXT J:NEXT E
:SOUND 0,0,0,0:GOTO 1040
1050 GOTO I+1000
1065 MON$="    JANUARY":AZ$="D:JAN.":G
OTO 1100
1066 MON$="   FEBRUARY":AZ$="D:FEB.":G
OTO 1100
1067 MON$="      MARCH":AZ$="D:MAR.":G
OTO 1100
1068 MON$="      APRIL":AZ$="D:APR.":G
OTO 1100
1069 MON$="        MAY":AZ$="D:MAY.":G
OTO 1100
1070 MON$="       JUNE":AZ$="D:JUN.":G
OTO 1100
1071 MON$="       JULY":AZ$="D:JUL.":G
OTO 1100
1072 MON$="     AUGUST":AZ$="D:AUG.":G
OTO 1100
1073 MON$="  SEPTEMBER":AZ$="D:SEP.":G
OTO 1100
1074 MON$="    OCTOBER":AZ$="D:OCT.":G
OTO 1100
1075 MON$="   NOVEMBER":AZ$="D:NOV.":G
OTO 1100
1076 MON$="   DECEMBER":AZ$="D:DEC.":G
OTO 1100
1100 RETURN
1500 TOT5=0:TOT6=0:AV2=0:FOR E=1 TO 30
:TOT5=TOT5+EX(E,W):TOT6=TOT6+EX(E,6):A
V2=AV2+EX(E,8):NEXT E:RETURN
3000 ? "K":? "     FIXED EXPENSE PAYM
ENTS     ":? :? :? "RENT/MORTGAGE--"
3005 ? "ELECTRIC-------":? "TELEPHONE-
------)"
3010 ? A$:? B$:? C$:? D$:? E$:? F$:? G
$:? H$:? I$:? J$:? K$:? L$
3015 N$=8:FOR E=1 TO 15:POSITION 19,E+
3:TP$=STR$(EX(E,0)):GOSUB 8000:? N$(1,
N$):NEXT E
3018 OPEN #1,4,0,"K:":GET #1,I:CLOSE #
1:IF I>=0 THEN RETURN
3019 ? "K"
3020 ? "    VARIABLE EXPENSE PAYMENTS
   ":? :? :? "FOOD-----------":? "CLOT
HING-------"
3025 ? M$:? N1$:? O$:? P$:? Q$:? R$:?
S$:? T$:? U$:? V$:? W$:? X$:? Y$
3030 N$=8:FOR E=16 TO 30:POSITION 19,E
-12:TP$=STR$(EX(E,0)):GOSUB 8000:? N$(
1,N$):NEXT E
3040 OPEN #1,4,0,"K:":GET #1,I:CLOSE #
1:IF I>0 THEN RETURN
4000 POSITION 0,22:? "IS THIS PAYMENT
CORRECT? CAT=";CHR$(CA+64);" ";J:OPEN
#1,4,0,"K:":GET #1,I:CLOSE #1
4005 IF I=89 THEN RETURN
4010 IF I=78 THEN POP :GOTO 6545
4015 GOTO 4000
4100 POSITION 0,22:? "IS THIS PAYMENT
CORRECT? CAT=";CHR$(CA+49);" ";J:OPEN
#1,4,0,"K:":GET #1,I:CLOSE #1
4105 IF I=89 THEN RETURN
4110 IF I=78 THEN POP :GOTO 6740
4115 GOTO 4100
5000 POKE 82,0:POKE 710,12:POKE 712,12
:POKE 709,0:? "K":? "     CHECK
ING ACCOUNTS     "
5005 POSITION 0,3:? "ACCOUNT NO.
 1       2       3 "
5010 POSITION 0,4:? "──────────────────
──────────"
5015 POSITION 0,5:? "BALANCES":POSITIO
N 13,5:CA=0:E=0:GOSUB 8101:GOSUB 8000:
? N$(1,N5)
5020 POSITION 22,5:CA=0:E=1:GOSUB 8101
:GOSUB 8000:? N$(1,N5):POSITION 31,5:C
A=0:E=2:GOSUB 8101:GOSUB 8000
5025 ? N$(1,N5)
5030 POSITION 0,7:? "TOTAL OF":? "THE
CHECKS":? "OUTSTANDING"
5035 TO1=0:FOR E=1 TO 45:TO1=TO1+CK1(0
,E):NEXT E:POSITION 13,9:TP$=STR$(TO1)
:GOSUB 8000:? N$(1,N5)
5040 TO2=0:FOR E=1 TO 45:TO2=TO2+CK1(1
,E):NEXT E:POSITION 22,9:TP$=STR$(TO2)
:GOSUB 8000:? N$(1,N5)
5045 TO3=0:FOR E=1 TO 45:TO3=TO3+CK1(2
,E):NEXT E:POSITION 31,9:TP$=STR$(TO3)
:GOSUB 8000:? N$(1,N5)
5050 POSITION 0,12:? "
                    "
5500 POSITION 0,14:? "1 DEPOSIT":POSIT
ION 0,15:? "2 WRITE CHECK":POSITION 0,
16:? "3 WITHDRAWAL"
5502 POSITION 0,17:? "4 LIST OUTSTANDI
NG CHECKS":POSITION 0,18:? "5 RETURN T
O MENU"
5505 POKE 53774,112:POSITION 0,20:? "C
ATEGORY?";:OPEN #1,4,0,"K:":GET #1,CA:
CLOSE #1:POKE 53774,112
5507 IF CA<49 OR CA>53 THEN 5505
5510 ON CA-48 GOTO 5600,5700,5800,5900
,5520
5515 GOTO 5505
5520 ? "K":POSITION 0,12:? "     FILI
NG DATA --- PLEASE WAIT     ":GOSUB 1
0000:GOTO 9000
5600 POSITION 0,20:? "ACCOUNT NUMBER?"
:OPEN #1,4,0,"K:":GET #1,CA:CLOSE #1:I
F CA<49 OR CA>51 THEN 5600
5602 POKE 53774,112
5605 ? "↑                    ":? "↑DEP
OSIT";:INPUT J
5610 CH(0,CA-49)=CH(0,CA-49)+J
5620 GOTO 5000
5700 POSITION 0,20:? "ACCOUNT NUMBER?"
:OPEN #1,4,0,"K:":GET #1,CA:CLOSE #1:I
F CA<49 OR CA>51 THEN 5700
5702 POKE 53774,112
5705 ? "↑AMOUNT OF CHECK";:INPUT J:? "
                    ":?
"↑CHECK NUMBER";:INPUT NU
5707 POKE 53774,112:TP$=STR$(NU):IF LE
N(TP$)<3 THEN ? "↑CHECK NUMBER MUST BE
=>THREE SPACES":FOR E=1 TO 400:NEXT E
5708 IF LEN(TP$)<3 THEN ? "↑
                    ":GOTO 5705
5710 CA=CA-49:FOR E=1 TO 45:IF CK(CA,E
)=0 THEN CK(CA,E)=NU:CK1(CA,E)=J:GOTO
5720
5715 NEXT E
5720 CH(0,CA)=CH(0,CA)-J:GOTO 5000
5800 POSITION 0,20:? "ACCOUNT NUMBER?"
:OPEN #1,4,0,"K:":GET #1,CA:CLOSE #1:C
A=CA-49:IF CA<0 OR CA>2 THEN 5800
5802 POKE 53774,112
5805 ? "↑                    ":? "↑WITH
DRAWAL";:INPUT J:CH(0,CA)=CH(0,CA)-J:G
OTO 5000
5900 ? "K":POSITION 0,0:? "
OUTSTANDING CHECKS          "
5905 ? :? "ACCOUNT NUMBER?":OPEN #1,4,
0,"K:":GET #1,CA:CLOSE #1:CA=CA-49:IF
CA<0 OR CA>2 THEN 5905
5906 POKE 53774,112
5907 GOTO 5970
5910 POSITION 0,0:FOR E=1 TO 45
5920 IF CK(CA,E)<>0 THEN TP$=STR$(CK1(
CA,E)):GOSUB 8000:? CK(CA,E);"  $";N$(
1,N5);" ",
5925 IF PEEK(84)=19 THEN POKE 84,20
5930 NEXT E
5940 POSITION 0,19:? "DELETE OUTSTANDI
NG CHECKS?":OPEN #1,4,0,"K:":GET #1,J:
CLOSE #1:IF J=78 THEN 5000
5945 IF J=89 THEN 5950
```

We have over 1000 Educational Programs for use on your Atari 400/800 Computers!

You and your family will enjoy learning in your home when you

Stop Playing with Your Atari

All along you've heard there isn't much of a selection of low cost microcomputer courseware. Well, do you want to learn Physics, Psychology, or Philosophy? Accounting or Auto Mechanics? Sociology, Supervision or Statistics? Economics or Electronics? How about English as a Second Language? Would you like to teach your children Math or Reading? If you do, then we have the educational programs for you—and at affordable prices.

It's true there aren't many companies that offer full-length courses in subjects other than reading and arithmetic, and what is offered seems to be drills, tests, games, or simulations. What you really want is a course that covers the subject with, say, 16 full-length lessons called tutorial programs, where you interact with an expert programmer backed by a staff of experts. That's exactly what we have.

ASK THESE QUESTIONS

Why haven't you heard of us before? We're a public company that's been trading over the counter for 16 years. We've been developing interactive learning systems since 1957. We sell hardware and software for interactive film, slide, video and computer learning to the educational field, vo-techs, industries, military, and several state and federal agencies. Our programs are used in all 50 states and even in some foreign countries! In 1975, we started to convert to the Talk & Teach Computer-Assisted Instruction (CAI) System, licensed Atari to use it in 1977, and in 1981 licensed Radio Shack to use our Talk/Tutor System. So, why haven't you heard of us? Frankly, we've kept a low profile. Until now.

Is there something wrong with our software? Well, we don't ask you to enter your name so we can drop it into some later text. We don't ask you to type in your answer and refuse to accept it if it's not spelled just right. And, we don't branch around a lot when you make an error. Our programs simply let you know if you're wrong by proceeding only when you select the right multiple-choice answer.

This proven learning-by-positive-reinforcement method lets you proceed quickly and smoothly through the programs, without a lot of cute tricks. But, if you're a devoted computerist or game freak you may be disappointed at the lack of motion in most of the pictures, or our special visual effects. We have some dandies, like the mushroom cloud that rises over Hiroshima in our History series, but your learning is not distracted by needless special effects.

OVER 1000 PROGRAMS

We have 64 courses of 16 half-hour programs: 1024 programs! All are easy-reading, upper-and-lower-case. All are in Atari color. All are illustrated by frequent graphics, composed of special and regular characters. And, best of all, every frame of every program is accompanied by high-quality, full-time audio narration by professional voice talent. David Stanton, James Mathers, Pam Barrymore. Recorded and played back, not synthesized or digitized!

- If your child is having trouble with Reading or Math, or if he or she is exceptional, and could benefit from professionally programmed lessons or courses, then you need our educational programs for your Atari 400 or 800 to help your child.
- If you want to build your math skills, we have programs on Numbers and their meanings, Addition, Subtraction, Multiplication, Division, Fractions, Decimals, Percents, Angles, Graphs, Word Problems, Algebra, Statistics. There are ten series in all, 160 math programs. Again, all with color, pictures, and a friendly tutor's voice—all the time.
- If your verbal skills need polishing, try our Talk & Teach programs on the alphabet, spelling skills, and every level of vocabulary; Sight Words or Learn by Phonics; develop Reading Comprehension skills from stories and articles. There's even a series on the Great Classics.
- For self-development, try a 16-program course in Economics or Psychology. Or Supervision, Sociology, Counseling (Personal, School, or Employee), Writing, Business, Philosophy, Government, World History, U.S. History, or Accounting.
- For vocational skills, study our 16-program courses in Electronics, Fluid Power, Auto Mechanics, Shop, Carpentry, Construction, Meat Processing, Military Skills (64 programs), and there are many more.

YOU HAVE WHAT IT TAKES

You'll need your Atari 400 or 800, and the Atari Cassette recorder. And to present the Talk & Teach programs you need the Educational System Master cartridge: it's **$25** from us, if you don't have one.

We say these courses, which are recorded one program per side of C20 to C30 (half hour) cassettes, are the equivalent of a chapter, or perhaps an hours lecture. We've been told that by studying our Economics or Psychology course, a student could pass a secondary or college test for credit. Many who have such credits never learned all that's in these courses. And while some of our courses have 1980 copyrights, most are 1981 and 1982. In U.S. History, for example, you'll learn about America's foreign policy during the Falklands crisis as well as that in the Mideast in 1982. And we're putting this information at your fingertips.

Not sure whether you agree more with Rationalists or Existentialists? Do you commit logical fallacies? Try our Philosophy course. If you're not sure about neurosis or psychosis, classical or instrumental conditioning, then you need our Psychology course. Just how independent is the Federal Reserve? Get Economics, Program 12. Confused about the changes in traditional roles of political parties? It's Government 5. And let our tutor tell you patiently and clearly about measures of dispersion and central tendency. Our Statistics goes through F tests. We even have 16 full-length audio-computer programs with Spanish words and phrases.

Remember, these are all for your Atari! Yes, we've done programs for TRS80 Model I, III, Color, for the Apple and T. I. But that's another story.

Would you like to do something more than play games on your Atari? Tired of squeaks and robotics and want to hear a human voice? Do you want to further your education or help your children along in theirs? Now you can. For just **$9.90**, we'll send you one cassette with 2 programs from the course of your choice, 100% guaranteed to work in your Atari, and you can try us out. Better yet, get one full course of 16 programs on 8 cassettes for only **$59.90**. For full documentation, 32 pre-post tests, fancy binder, 8 cassettes with 16 programs of the course you want, send **$79.00**. That's less than books and tuition for most college classes. And we offer a 10 day, 100% exchange allowance. Does your alma mater? Send us your check, or call us at (405) 288-2301 with your Visa/Master Card number. We'll send your educational software pre-paid. Please allow 15 days delivery. Or see your Atari dealer. He may have some of our courses in stock. You've got nothing to lose but your games!

DORSETT
Educational Systems, Inc.

P.O. Box 1226, Norman, OK 73070
(405) 288-2301 VISA MasterCard

Atari is a trademark of Atari, Inc. Atari 400 and Atari 800 are trademarks of Atari, Inc. All references should be so noted

```
5947 GOTO 5940
5950 ? "↑                                ":
? "↑CHECK NUMBER";:INPUT J
5955 FOR E=1 TO 45
5960 IF CK(CA,E)=J THEN CK(CA,E)=0:CK1
(CA,E)=0
5965 NEXT E
5970 FOR E=0 TO 23:POSITION 0,E:? "
                                ":
NEXT E:GOTO 5910
5999 OPEN #1,4,0,"K:":GET #1,J:CLOSE #
1:IF J>=0 THEN 9000
6002 IF MON$="" THEN ? "ß":POSITION 6,
12:? "YOU FORGOT TO ENTER A MONTH":FOR
 E=1 TO 200:NEXT E:GOTO 1000
6003 IF W=0 THEN ? "ß":POSITION 3,12:?
 "YOU FORGOT TO ENTER A WEEK NUMBER":F
OR E=1 TO 200:NEXT E:GOTO 1000
6004 RETURN
6005 GOSUB 6002:GOSUB 6002:POKE 82,0
6006 POKE 710,12:POKE 712,12:POKE 709,
0:? "ß":POKE 559,34:POSITION 0,0:? MON
$;" BUDGET - FIXED EXPENSES "
6007 POSITION 20,1:? "(";W;")    TOT
   VAR":E=1:? "A RENT/MORTGAGE-":GOSUB
 8200
6010 ? "B ELECTRIC------":GOSUB 8200
6015 ? "C TELEPHONE-----":GOSUB 8200
6020 ? "D ";A$:GOSUB 8200
6025 ? "E ";B$:GOSUB 8200
6030 ? "F ";C$:GOSUB 8200
6040 ? "G ";D$:GOSUB 8200
6050 ? "H ";E$:GOSUB 8200
6060 ? "I ";F$:GOSUB 8200
6070 ? "J ";G$:GOSUB 8200
6080 ? "K ";H$:GOSUB 8200
6090 ? "L ";I$:GOSUB 8200
6100 ? "M ";J$:GOSUB 8200
6110 ? "N ";K$:GOSUB 8200
6111 ? "O ";L$:GOSUB 8200
6122 TOT1=0:FOR E=1 TO 15:TOT1=TOT1+EX
(E,W):NEXT E:TP$=STR$(TOT1):POSITION 1
6,18:GOSUB 8000:? N$(1,N5)
6123 TOT2=0:FOR E=1 TO 15:TOT2=TOT2+EX
(E,6):NEXT E:TP$=STR$(TOT2):POSITION 2
4,18:GOSUB 8000:? N$(1,N5)
6125 ? "↑      TOTALS":GOTO 6140
6140 AVG=0:FOR E=1 TO 15:AVG=AVG+EX(E,
8):NEXT E:TP$=STR$(AVG):POSITION 32,18
:GOSUB 8000:? N$(1,N5)
6145 POSITION 16,19:TP$=STR$(TOT5):GOS
UB 8000:? N$(1,N5)
6150 POSITION 24,19:TP$=STR$(TOT6):GOS
UB 8000:? N$(1,N5):POSITION 32,19:TP$=
STR$(AV2):GOSUB 8000:? N$(1,N5)
6500 POSITION 2,22:? "CATEGORY?":OPEN
#1,4,0,"K:":GET #1,J:CLOSE #1:IF J=48
THEN CA=1:GOSUB 1500:GOTO 6005
6501 CA=J-64:IF CA<1 OR CA>19 THEN POS
ITION 0,20:? "P RETURN TO MENU   0 UPD
ATE DISPLAY"
6502 IF CA<1 OR CA>19 THEN POSITION 0,
21:? "Q CHANGE DATE      R VARIABLE EX
PENSES"
6503 IF CA<1 OR CA>19 THEN POSITION 0,
22:? "S LIST PAYMENTS":FOR E=1 TO 400:
NEXT E:POSITION 0,20:GOTO 6507
6505 IF CA=16 THEN CA=1:? "ß":POSITION
 0,12:? "      FILING DATA --- PLEASE
WAIT      ":GOSUB 10000:GOTO 9000
6506 GOTO 6515
6507 ? "
        ":? "
                ":GOTO 6545
6515 IF CA=17 THEN MON1$=MON$:AT$=AZ$:
GOSUB 1000:MON$=MON1$:AZ$=AT$:CA=1:GOS
UB 1500:GOTO 6005
6520 IF CA=18 THEN GOSUB 1500:GOTO 660
0
6525 IF CA=19 THEN GOSUB 3000:CA=1:GOT
O 6005
6530 POSITION 20,22:? "AMOUNT";:INPUT
J:TP$=STR$(J):IF LEN(TP$)>4 AND TP$(LE
N(TP$)-2,LEN(TP$)-2)<>"." THEN 6701
6535 IF J<0 THEN GOSUB 4000:EX(CA,8)=E
X(CA,8)+J:EX(CA,0)=EX(CA,0)+ABS(J):GOT
O 6545
6540 EX(CA,W)=J:EX(CA,6)=0:FOR E=1 TO
5:EX(CA,6)=EX(CA,6)+EX(CA,E):NEXT E:EX
(CA,8)=EX(CA,6)-EX(CA,0)
6545 POSITION 0,22:? "
                ":GOTO 6500
6600 GOSUB 6002:GOSUB 6002
6602 POKE 82,0:POKE 710,28:POKE 712,28
:POKE 709,16:? "ß";MON$;" BUDGET - VAR
IABLE EXPENSES "
6605 POSITION 20,1:? "(";W;")    TOT
   VAR":E=1:? "A FOOD---------":GOSUB
8200
6610 ? "B CLOTHING-----":GOSUB 8200
6615 ? "C ";M$:GOSUB 8200
6620 ? "D ";N1$:GOSUB 8200
6625 ? "E ";O$:GOSUB 8200
6630 ? "F ";P$:GOSUB 8200
6635 ? "G ";Q$:GOSUB 8200
6640 ? "H ";R$:GOSUB 8200
6645 ? "I ";S$:GOSUB 8200
6650 ? "J ";T$:GOSUB 8200
6655 ? "K ";U$:GOSUB 8200
6660 ? "L ";V$:GOSUB 8200
6665 ? "M ";W$:GOSUB 8200
6670 ? "N ";X$:GOSUB 8200
6675 ? "O ";Y$:GOSUB 8200
6680 POSITION 8,18:? "TOTALS"
6685 TOT3=0:FOR E=16 TO 30:TOT3=TOT3+E
X(E,W):NEXT E:TP$=STR$(TOT3):POSITION
16,18:GOSUB 8000:? N$(1,N5)
6687 TOT4=0:FOR E=16 TO 30:TOT4=TOT4+E
X(E,6):NEXT E:TP$=STR$(TOT4):POSITION
24,18:GOSUB 8000:? N$(1,N5)
6690 AV1=0:FOR E=16 TO 30:AV1=AV1+EX(E
,8):NEXT E:TP$=STR$(AV1):POSITION 32,1
8:GOSUB 8000:? N$(1,N5)
6692 POSITION 16,19:TP$=STR$(TOT5):GOS
UB 8000:? N$(1,N5)
6694 POSITION 24,19:TP$=STR$(TOT6):GOS
UB 8000:? N$(1,N5):POSITION 32,19:TP$=
STR$(AV2):GOSUB 8000:? N$(1,N5)
6700 POSITION 2,22:? "CATEGORY?":OPEN
#1,4,0,"K:":GET #1,J:CLOSE #1:IF J=48
THEN CA=16:GOSUB 1500:GOTO 6600
6703 CA=J-49:IF CA<16 OR CA>34 THEN PO
SITION 0,20:? "P RETURN TO MENU   0 UP
DATE DISPLAY"
6705 IF CA<16 OR CA>34 THEN POSITION 0
,21:? "Q CHANGE DATE      R FIXED EXPE
NSES"
6707 IF CA<16 OR CA>34 THEN POSITION 0
,22:? "S LIST PAYMENTS":FOR E=1 TO 400
:NEXT E:POSITION 0,20
6708 IF CA<16 OR CA>34 THEN POSITION 0
,20:? "
      "
6709 IF CA<16 OR CA>34 THEN ? "
                                ":GOTO
6740
6712 IF CA=31 THEN ? "ß":POSITION 0,12
:? "      FILING DATA -- PLEASE WAIT
      ":GOSUB 10000:GOTO 9000
6715 IF CA=33 THEN CA=1:GOSUB 1500:GOT
O 6005
6718 IF CA=34 THEN GOSUB 3019:GOTO 660
0
6720 IF CA=32 THEN MON1$=MON$:AT$=AZ$:
GOSUB 1000:MON$=MON1$:AZ$=AT$:GOSUB 15
00:GOTO 6600
6725 POSITION 20,22:? "AMOUNT";:INPUT
J:TP$=STR$(J):IF LEN(TP$)>4 AND TP$(LE
N(TP$)-2,LEN(TP$)-2)<>"." THEN 6701
6730 IF J<0 THEN GOSUB 4100:EX(CA,8)=E
X(CA,8)+J:EX(CA,0)=EX(CA,0)+ABS(J):GOT
O 6740
6735 EX(CA,W)=J:EX(CA,6)=0:FOR E=1 TO
5:EX(CA,6)=EX(CA,6)+EX(CA,E):NEXT E:EX
(CA,8)=EX(CA,6)-EX(CA,0)
6740 POSITION 0,22:? "
                ":GOTO 6700
7000 ? "ß":POKE 710,128:POKE 712,128:P
OKE 709,138:POSITION 0,0:? "      FI
XED EXPENSE CATEGORIES      "
7005 ? :? "1 RENT/MORTGAGE":? "2 ELECT
RIC":? "3 TELEPHONE":? "4 ";A$:? "5 ";
B$:? "6 ";C$:? "7 ";D$:? "8 ";E$
7010 ? "9 ";F$:? "10 ";G$:? "11 ";H$:?
```

```
 "12 ";I$:? "13 ";J$:? "14 ";K$:? "15
";L$:? "16 DEFINE VARIABLE EXPENSES"
7020 GOSUB 7299
7100 POSITION 2,20:? "LABEL NUMBER";:I
NPUT E:IF E>16 THEN 7217
7110 POSITION 2,21:? "LABEL";:GOTO 720
0+E
7200 GOTO 9040
7201 GOTO 9000
7202 GOTO 9000
7203 GOTO 9000
7204 INPUT A$:GOTO 7000
7205 INPUT B$:GOTO 7000
7206 INPUT C$:GOTO 7000
7207 INPUT D$:GOTO 7000
7208 INPUT E$:GOTO 7000
7209 INPUT F$:GOTO 7000
7210 INPUT G$:GOTO 7000
7211 INPUT H$:GOTO 7000
7212 INPUT I$:GOTO 7000
7213 INPUT J$:GOTO 7000
7214 INPUT K$:GOTO 7000
7215 INPUT L$:GOTO 7000
7216 GOTO 7300
7299 FOR E=3 TO 5:POSITION 20,E:? "RET
URN TO MENU":NEXT E:RETURN
7300 ? "K":POKE 710,128:POKE 712,128:P
OKE 709,138:POSITION 0,0:? "      VARI
ABLE EXPENSE CATEGORIES      "
7305 ? :? "1 FOOD":? "2 CLOTHING":? "3
 ";M$:? "4 ";N1$:? "5 ";O$:? "6 ";P$:?
 "7 ";Q$:? "8 ";R$:? "9 ";S$
7310 ? "10 ";T$:? "11 ";U$:? "12 ";V$:
? "13 ";W$:? "14 ";X$:? "15 ";Y$
7320 FOR E=3 TO 4:POSITION 20,E:? "RET
URN TO MENU":NEXT E
7350 POSITION 2,20:? "LABEL NUMBER";:I
NPUT E:IF E>15 THEN 7417
7355 POSITION 2,21:? "LABEL";:GOTO 740
0+E
7400 GOTO 9040
7401 GOTO 9000
7402 GOTO 9000
7403 INPUT M$:GOTO 7300
7404 INPUT N1$:GOTO 7300
7405 INPUT O$:GOTO 7300
7406 INPUT P$:GOTO 7300
7407 INPUT Q$:GOTO 7300
7408 INPUT R$:GOTO 7300
7409 INPUT S$:GOTO 7300
7410 INPUT T$:GOTO 7300
7411 INPUT U$:GOTO 7300
7412 INPUT V$:GOTO 7300
7413 INPUT W$:GOTO 7300
7414 INPUT X$:GOTO 7300
7415 INPUT Y$:GOTO 7300
7416 INPUT Z$:GOTO 7300
8000 N$=BL$:DP=LEN(TP$)+1:FOR J=1 TO L
EN(TP$):IF TP$(J,J)="." THEN DP=J:J=N5
8005 NEXT J:NL=DP+DD:N$(N5-NL+1,N5)=TP
$:N$(N5-DD,N5-DD)=".":FOR J=N5-DD+1 TO
 N5:IF N$(J,J)=" " THEN N$(J,J)="0"
8010 NEXT J:RETURN
8100 TP$=STR$(EX(CA,W)):N5=7:RETURN
8101 TP$=STR$(CH(CA,E)):N5=8:RETURN
8102 TP$=STR$(PAY(CA)):RETURN
8103 TP$=STR$(IN(CA,W)):RETURN
8200 IF CA>15 THEN CA=E+15
8201 IF CA<16 THEN CA=E
8203 POSITION 16,E+1:GOSUB 8100:GOSUB
8000:? N$(1,N5):W1=W:W=6:GOSUB 8100:GO
SUB 8000:POSITION 24,E+1
8205 ? N$(1,N5):W=8:GOSUB 8100:GOSUB 8
000:POSITION 32,E+1:? N$(1,N5):W=W1:E=
E+1:RETURN
8999 GRAPHICS 0
9000 TRAP 9500:POKE 559,34:POKE 710,17
4:POKE 712,174:POKE 709,160:POKE 752,1
:? "K":POSITION 0,4:POKE 53774,112
9005 ? "                                
                "
9010 POSITION 10,6:? "A = BUDGET - FIX
ED":POSITION 10,7:? "B = BUDGET - VARI
ABLE":POSITION 10,8
9015 ? "C = CHANGE DATE":POSITION 10,9
:? "D = CHECKING ACCOUNTS":POSITION 10
,10:? "E = DEFINE CATEGORIES"
9017 POSITION 10,11:? "F = FILE DATA":
POSITION 10,12:? "G = GET DATA"
9018 POSITION 10,13:? "H = CLEAR DATA"
9020 POSITION 10,17:? "COMMAND?"
9022 POSITION 0,19:? "                  
                                  ":OPEN #1,4,0,
"K:":GET #1,J:CLOSE #1
9035 IF J=71 THEN ? "K":POSITION 16,10
:? "GET DATA":POSITION 14,11:? "ARE YO
U SURE?":GOTO 9037
9036 GOTO 9038
9037 OPEN #1,4,0,"K:":GET #1,E:CLOSE #
1
9038 IF J=71 THEN IF E=89 THEN GOSUB 6
002:GOSUB 10200:GOTO 9000
9040 IF J=70 THEN ? "K":POSITION 15,10
:? " FILE DATA":POSITION 14,11:? "ARE
YOU SURE?":GOTO 9042
9041 GOTO 9043
9042 OPEN #1,4,0,"K:":GET #1,E:CLOSE #
1
9043 IF J=70 THEN IF E=89 THEN GOSUB 6
002:GOSUB 10000:GOTO 9000
9045 IF J=68 THEN GOSUB 6002:POSITION
0,21:? MON$;" LOADING -- PLEASE WAIT
    ":GOSUB 10200:GOTO 5000
9050 IF J=65 THEN CA=1:GOSUB 6002:POSI
TION 0,21:? MON$;" LOADING -- PLEASE W
AIT      ":GOSUB 10200:J=65
9052 IF J=65 THEN GOSUB 1500:GOTO 6005
9055 IF J=66 THEN CA=17:GOSUB 6002:POS
ITION 0,21:? MON$;" LOADING -- PLEASE
WAIT      ":GOSUB 10200:J=66
9056 IF J=66 THEN GOSUB 1500:GOTO 6600
9057 IF J=69 THEN 7000
9060 IF J=67 THEN GOSUB 1000
9065 IF J=72 THEN ? "K":POSITION 14,10
:? "CLEAR DATA!":POSITION 13,11:? "ARE
 YOU SURE?":GOTO 9067
9066 GOTO 9000
9067 OPEN #1,4,0,"K:":GET #1,E:CLOSE #
1
9068 IF J=72 THEN IF E=89 THEN ? "K":P
OSITION 14,10:? "CLEARING!":POSITION 1
3,11:? "PLEASE WAIT"
9070 IF J=72 THEN IF E=89 THEN FOR E=0
 TO 7:FOR J=1 TO 30:EX(J,E)=0:NEXT J:N
EXT E
9099 GOTO 9000
9500 X=PEEK(195):IF X=3 OR X=5 THEN IF
 CA>15 THEN TRAP 9500:? "↑
                                ":GOTO 6730
9505 IF PEEK(195)=12 THEN IF CA<16 THE
N TRAP 9500:GOTO 6535
9506 IF PEEK(195)=12 THEN IF CA>15 THE
N TRAP 9500:GOTO 6730
9510 X=PEEK(195):IF X=3 OR X=5 THEN IF
 CA<16 THEN TRAP 9500:? "↑
                                ":GOTO 6535
9515 A=PEEK(195)
9516 IF A=130 OR A=170 THEN ? "K
 FILE NOT FOUND - TRY AGAIN      ":FOR
E=1 TO 100:NEXT E:CLOSE #1:GOTO 9000
9520 ERLN=PEEK(186)+256*PEEK(187):FOR
E=1 TO 10:SOUND 0,30,10,10:? "↑
INPUT ERROR - TRY AGAIN       "
9530 FOR J=1 TO 2:NEXT J
9540 SOUND 0,10,10,10:? "↑      INPUT
 ERROR - TRY AGAIN      ":FOR J=1 TO
2:NEXT J:NEXT E:SOUND 0,0,0,0
9550 ? "↑
                ":TRAP 9500:GOTO ERLN
10000 AZ$(7,8)=YR$:EO$=CHR$(155):OPEN
#1,8,0,AZ$:FOR E=0 TO 8:FOR J=1 TO 30:
PRINT #1,EX(J,E):NEXT J:NEXT E
10001 FOR E=0 TO 2:FOR J=1 TO 45:PRINT
 #1,CK(E,J):PRINT #1,CK1(E,J):NEXT J:N
EXT E
10002 FOR E=0 TO 2:PRINT #1,CH(0,E):NE
XT E
10005 PRINT #1;A$;EO$;B$;EO$;C$;EO$;D$
;EO$;E$;EO$;F$;EO$;G$;EO$;H$
10010 PRINT #1;I$;EO$;J$;EO$;K$;EO$;L$
;EO$;M$;EO$;N1$;EO$;O$;EO$;P$;EO$;Q$
10015 PRINT #1;R$;EO$;S$;EO$;T$;EO$;U$
;EO$;V$;EO$;W$;EO$;X$;EO$;Y$;EO$;Z$
10020 CLOSE #1:RETURN
```

```
10200 AZ$(7,8)=YR$:EO$=CHR$(155):OPEN
#1,4,0,AZ$:FOR E=0 TO 8:FOR J=1 TO 30:
INPUT #1,I:EX(J,E)=I:NEXT J:NEXT E
10202 FOR E=0 TO 2:FOR J=1 TO 45:INPUT
 #1,I:CK(E,J)=I:INPUT #1,I:CK1(E,J)=I:
NEXT J:NEXT E
10203 FOR E=0 TO 2:INPUT #1,I:CH(0,E)=
I:NEXT E
10205 INPUT #1;A$,B$,C$,D$,E$,F$,G$,H$
,I$,J$,K$,L$,M$,N1$,O$,P$
10210 INPUT #1;Q$,R$,S$,T$,U$,V$,W$,X$
,Y$,Z$
10299 CLOSE #1:RETURN
```

•

CHECKSUM DATA
(See p.46)

```
1 DATA 253,408,929,533,882,596,747,116
,81,302,270,291,301,318,625,6652
1040 DATA 219,782,220,478,224,503,508,
302,315,226,279,315,423,745,517,6056
1075 DATA 616,453,782,710,285,577,998,
640,290,392,864,994,234,973,894,9702
4005 DATA 497,978,722,896,500,968,726,
893,88,672,597,89,926,192,99,8843
5040 DATA 104,128,815,988,739,783,639,
918,762,287,609,494,434,441,736,8877
5700 DATA 614,497,737,642,354,618,512,
239,564,500,75,426,560,511,780,7629
5910 DATA 80,702,158,510,535,944,778,5
55,386,722,523,175,693,197,432,7390
6004 DATA 797,462,419,648,239,361,45,5
8,52,56,60,64,68,72,76,3477
6100 DATA 73,77,82,164,136,558,297,849
,172,105,342,107,775,944,770,5451
6507 DATA 737,468,754,292,604,176,4,57
5,215,833,955,181,95,945,102,6936
6630 DATA 96,109,103,116,110,123,117,1
30,124,137,741,287,233,375,863,3664
6694 DATA 199,975,37,901,394,885,227,1
32,313,799,59,619,170,19,575,6304
7000 DATA 409,67,29,980,769,41,746,740
,742,744,869,872,875,878,881,9642
7209 DATA 884,868,871,874,877,880,883,
748,605,610,743,201,547,780,65,10436
7400 DATA 752,746,748,888,50,894,897,9
00,903,906,890,893,896,899,902,12164
7415 DATA 905,908,475,516,883,695,647,
48,116,72,770,570,969,110,804,8488
9005 DATA 929,844,183,323,616,965,422,
217,781,558,761,250,759,549,749,8906
9045 DATA 414,836,700,244,700,896,731,
339,754,561,537,103,763,467,989,9034
9506 DATA 982,482,292,238,140,168,713,
170,252,989,101,36,944,297,165,5969
10200 DATA 626,162,946,965,97,208,3004
```

•

Family Cash Flow by Jerry Falkenhan is available from The ATARI Program Exchange (APX-20080) or your local ATARI dealer. 32K disk, $24.95.

FILE-FAX is the easiest-to-learn, simplest-to-use DBMS available today! Designed as a "filing system" for the businessman or hobbyist, FILE-FAX quickly accesses records, retrieving information at exceptionally high speeds.

FILE-FAX can be used to keep track of a wealth of information—about people, places, dates, events. It has an 8-level sort, wide ranging search capability, and a powerful report generator. Use it for inventory control, customer files, mailing lists, purchase records, and more—you are limited only by your own imagination.

FILE-FAX will run on your APPLE II or II+, Atari 800, IBM-PC, NEC PC-8001, Commodore 64, Osborne, and Victor 9000. Write for full details. Please specify the computer you are working with.

SUSPENDED by Michael Berlyn
INFOCOM, Incorporated
55 Wheeler Street
Cambridge, Massachusetts 02138
32K Disk $49.95

by Brian Moriarty

The home computer market is obsessed with graphics. Flip through any computer magazine and you'll find pages and pages of game advertisements, each promising high-res action graphics in at least four more colors than the hardware is capable of displaying. Game programmers spend countless hours squeezing the last pixel out of their playfields — and any dealer will tell you that a flashy title screen is worth more than a good game concept.

In this world where even the best computer games come and go in the space of a single month, the prose adventures of Infocom stand apart. Their unadorned text boasts only two colors (foreground and background); there are no illustrations, no sound effects to jazz up the action. Yet the Interlogic series is comfortably lodged in the top-25 list of every major software distributor.

What is Infocom's secret? Why does a 4-year-old text game like **Zork** continue to flourish when even the venerable Scott Adams Adventure Series (now "enhanced" with flickering graphics) fails to hold the interest of computer enthusiasts?

The answer, I think, has less to do with Infocom's famous packaging than with the fundamental quality of their products. When I play an Interlogic adventure, I don't get the feeling that the thing was coded according to a formula, shrink-wrapped and shoved out the door in a couple of weeks. There's a sense of completeness and pride in engineering, as if the programmer had a genuine emotional investment in the game. **Suspended**, the latest offering in the Interlogic Science Fiction Series, conveys this sense of personal authorship more than any other computer adventure I have played.

An intriguing scenario

Suspended was created by Michael Berlyn, a programmer best known as the author of the best-selling Apple adventures **Oo-Topos** and **Cyborg**. Just as this issue went to press, I received the new ATARI conversion of **Cyborg** from Berlyn's former company, Sentient Software. Look for a report on ATARI **Cyborg** in a later issue, and let's hope we'll see **Oo-Topos** in the near future.

Suspended is similar to **Cyborg** in that it puts the player in control of an imaginary cybernetic system. Your frozen brain is hooked into a network of "filtering computers" which are directly responsible for the care and feeding of an entire planet. This delicately-balanced network is maintained by a team of six robots which respond to your commands. The filtering computers allow you to address the robots individually, or in any combination.

Each robot is endowed with special hardware capabilities and a unique personality. Your job is to coordinate the action of the robots so that the planet you are babysitting remains comfortable and happy. The penalty for failure? Chaos, massive casualties and disconnection!

Like the other adventures in Infocom's Interlogic series, **Suspended** incorporates a sophisticated parser that understands complex English sentences, with a vocabulary of over 600 words. Phrases like "Put the rough object into the access panel then close the access panel" are perfectly legal; multiple commands may be entered on a single line by ending each phrase with a period. The program also accepts a number of useful abbreviations, and will support

the saving and loading of up to five separate game positions. You can choose between five levels of play difficulty (including an inconceivably tough "IMPOSSIBLE" game), or custom-design your own game configurations. These features should keep your copy of **Suspended** far away from the shelf where your "solved" adventures are gathering dust.

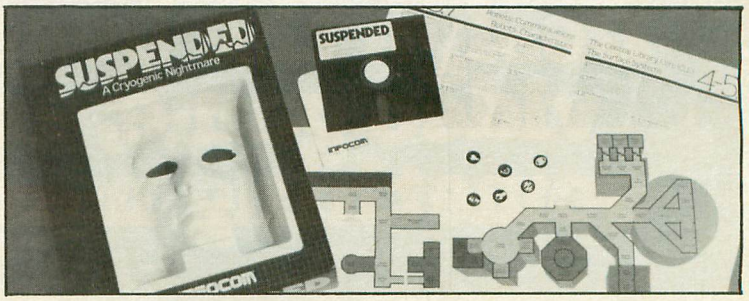
Suspended comes with an attractive full-color game board and a vinyl token for each robot. These allow you to keep track of where the robots are located in the planet's underground maintenance complex. The superb owner's manual provides an amusing historical background and detailed information about the robots' abilities and limitations. And let's not overlook that incredible packaging — an eerie molded mask with eyes that follow you around the room, saying "I really am worth fifty dollars!"

Clever characterizations

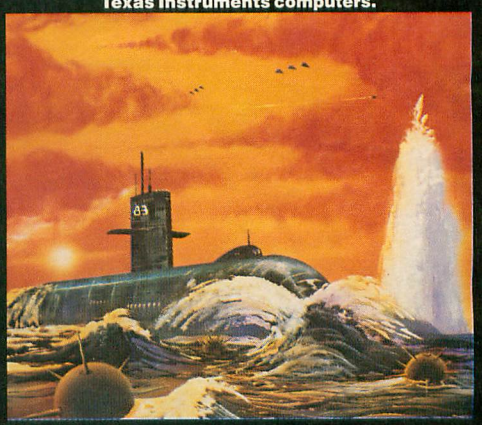
Berlyn's most impressive achievement in **Suspended** is his characterization of the six robots. Each responds to your commands with a rhetorical style that is fancifully suited to its function.

"Iris," the only robot equipped with visual receptors, is a wise-mouthed old woman who replies to your commands with "Okay, good looking," and interrupts the game with complaints when she needs a repair job. "Waldo" (an all-purpose worker with multiple grasping extensions) is an affable fellow with a distinctly blue-collar outlook. "Whiz" is the bookworm of the team; he communicates in a clipped, matter-of-fact manner and is only happy when plugged into an information pedestal. "Poet" reminds me of an ex-60s burnout. His replies are embellished with hip slang, horrible rhymes and obscure literary quotes.

A few hours with these electronic personalities will make them your friends. This is the kind of compliment you would normally extend to a good book or movie, not to a computer game. But the scenario and implementation of **Suspended** are so professionally crafted, that the product actually manages to transcend the typical text adventure (often nothing more than a puzzle that understands English), offering a level of involvement which can only be compared to the experience of a fine novel. That this feat is accomplished without elaborate graphics proves Infocom's contention that the mind is more imaginative than the eye.



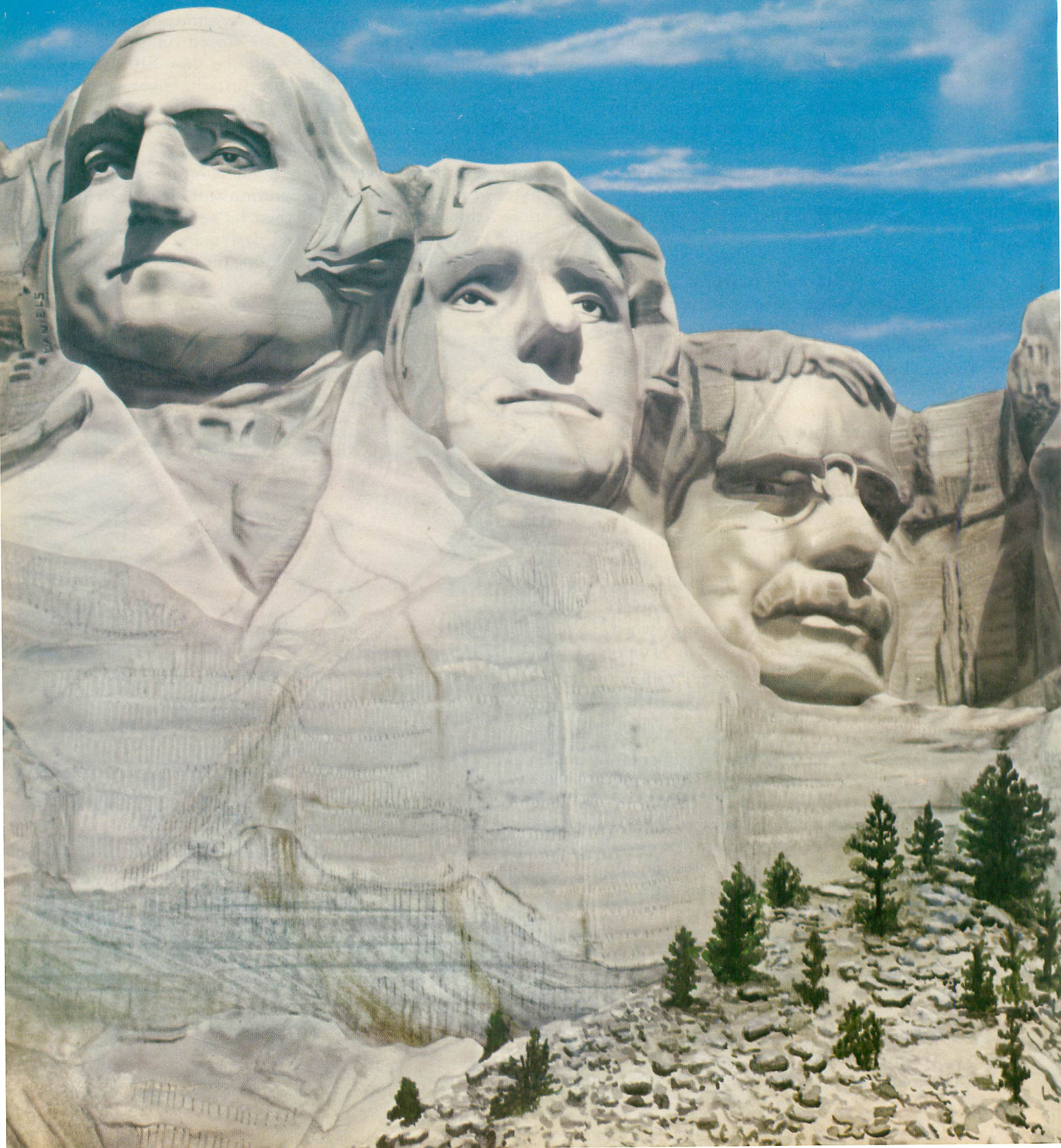
Suspended is not without its petty annoyances. Since the room and object descriptions are stored on a disk as text files, you have to be patient while the slow 810 disk drive beeps and clacks, searching for just the right sentences. Typing commands can get pretty tiresome after several hours of play, especially if you make your living by typing all day like I do. But these inconveniences are caused by the hardware, not the software; future home computers with megabytes of RAM and voice recognition will make such limitations a thing of the past. Until then, let's enjoy the pioneering efforts of authors like Michael Berlyn and companies like Infocom, whose products are among the finest examples of a new and entertaining means of self-expression which can now be regarded as "literature" without apology. □

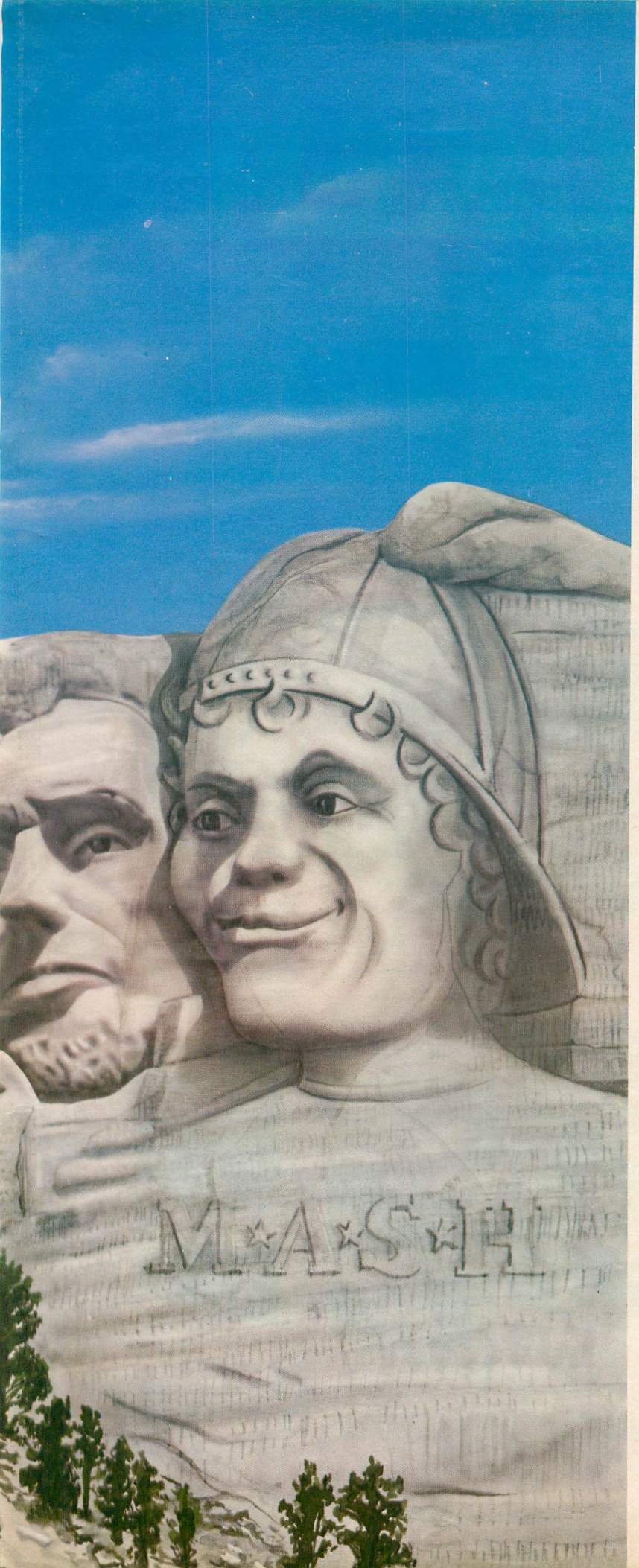
New Release
SEA CHASE™
ECPC Cartridge™ for use with Atari®, Commodore and Texas Instruments computers.

Submerge yourself in this fast action game of submarine survival and treasure hunting. You as commander of your very own yellow submarine must locate and capture the ten missing treasures while avoiding the deadly sea mines. A keen sense of logic and a love for keeping your head above water a must!
Available now for Atari 400, 800 and 1200 computers.

ROMOX
Romox Inc.
501 Vandell Way
Campbell, CA 95008
(408) 374-7200

Atari is a registered trademark of Atari Inc.

Design the best new M*A*S*H™ video game, and you'll get something money can't buy.





Fame.

That's right. F-A-M-E.

Because if the game you design is good enough, we'll make it and put your name on every one we sell.

And remember, you don't have to be a computer programmer to come up with a great game. You just have to have a great imagination, and give us a short description of your idea.

IF FAME ISN'T ENOUGH, HOW ABOUT A FORTUNE?

$25,000 to be exact. That's how much the game contract will bring you. Guaranteed. What's more, we're giving away a whole list of prizes for the other great game ideas we get.

- Four First Prize AMC Jeeps.®
- 400 Second Prize Texas Instruments 99/4A™ Home Computers.
- 4000 free Fox Video Games.

EVERYBODY WINS.

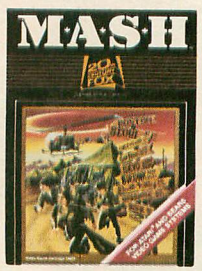
Because the new M*A*S*H game comes packaged with a smashing M*A*S*H T-shirt.

Absolutely free.

HOW DO YOU GET STARTED?

Just buy the original M*A*S*H game. The contest rules and entry blanks are in every package.

And if you win, you might say the rewards are monumental.



20th CENTURY FOX™

Games of the Century

THE M*A*S*H™ CONTEST. IT'S A SMASH.

HOFACKER

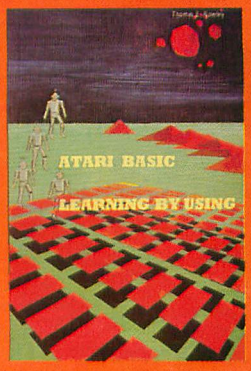
ATARI is a registered trademark of ATARI Inc. • VIC-20 is a registered trademark of Commodore • APPLE is a trademark of APPLE Computer Inc.

ELCOMP PUBLISHING, INC.
53 Redrock Lane, Pomona CA 91766 / USA
Phone (714) 623-8314

Payment: Check, money order, VISA, Master Charge, Eurocheck
Orders from outside USA: add 15 % shipping.
CA-residents add 6.5 % tax.

BOOKS + SOFTWARE

FOR ATARI 400/800® · VIC-20® · SINCLAIR/TIMEX® · OSI · APPLE® PET/CBM



ATARI BASIC — Learning by Using
An excellent book for the beginner. Many short programs and learning exercises.
Order-No. 164 $7.95

Games for the ATARI Computer
This book describes advanced programming techniques like player-missile-graphics and use of the hardware-registers. Contains many ready-to-run programs in BASIC and one called GUNFIGHT in machine language.
Order-No. 162 $7.95

How to program your ATARI in 6502 machine language
The subject of this book is to teach you how to program your ATARI computer in 6502 machine language. Contains a large collection of programs.
Order-No. 169 $9.95

Program Descriptions (ATARI)
Order-No. 173 $5.00

FORTH on the ATARI—Learning by Using, Order-No. 170 $7.95

Microcomputer Hardware Handbook (845 pages)
Descriptions, pinouts and specifications of the most popular microprocessors and support chips.
A MUST for the hardware buff.
Order-No. 29 $14.95

Care and Feeding of the Commodore PET
Eight chapters exploring PET hardware. Includes repair and interfacing information. Programming tricks and schematics.
Order-No. 150 $9.95

Complex Sound Generation
New revised applications manual for the Texas Instruments SN 76477 Complex Sound Generator.
Order-No. 154 $6.95

8K Microsoft BASIC Reference Manual
Order-No. 151 $9.95

Expansion Handbook for 6502 and 6802
Order-No. 152 $9.95

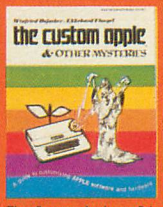
Books for OSI

The First Book of OHIO	#157	$7.95
The Second Book of OHIO	#158	$7.95
The Third Book of OHIO	#159	$7.95
The Fourth Book of OHIO	#160	$9.95
The Fifth Book of OHIO	#161	$7.95

Bare boards from the Custom APPLE Book

6522 I/O Board	#605	$39.00
EPROM Burner	#607	$49.00
8K EPROM/RAM Board	#609	$29.00
Prototyping board	#604	$29.00
Slot repeater board	#606	$49.00

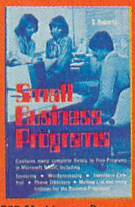
Order two boards and get the book FREE!



The Custom Apple + Other Mysteries — A complete quide to customizing the Apple Software and Hardware.
Order-No. 680 $24.95

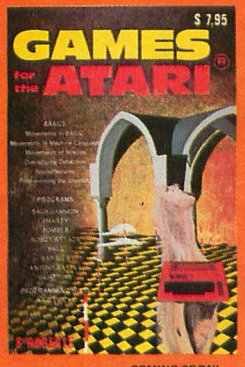
We also stock the boards which are used in the book "The Custom Apple..." (bare boards).

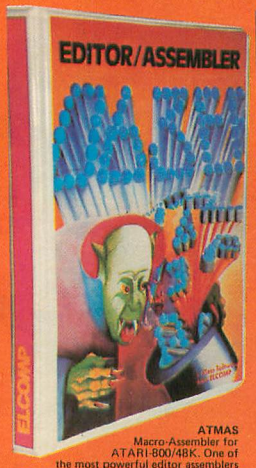
Programming in 6502 Machine Language on your PET + CBM
2 complete Editor/Assemblers (Source code 3 hexdump + description plus a powerful machine language monitor (hexdump).).
Order-No. 166 $19.95
Above assemblers on cassette (Book No. 166 included).
Order-No. 4812 $39.95



Programming in BASIC and machine language with the ZX-81 (82) or TIMEX 1000.
Order-No. 174 (book) $9.95

Small Business Programs
Complete listings for the business user.Inventory,invoice writing, mailing list and much more.
Order-No. 156 $14.90





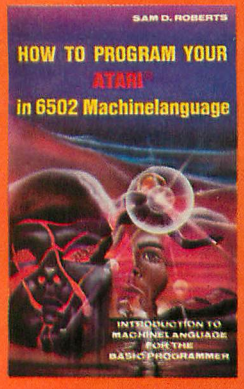
ATMAS
Macro-Assembler for ATARI-800/48K. One of the most powerful editor assemblers on the market. Versatile editor with scrolling. Up to 17k of source-code. Very fast, translates 5k source-code in about 5 sekonds. Source code can be saved on disk or cassette.(IncludesATMONA-1).
Order-No. 7099 disk version $89.00
Order-No. 7999 cartridge version $129.00

ATAS
Same as ATMAS but without macro-capability. Cassette-based.
Order-No. 7098 32K RAM $49.95
Order-No. 7998 48K RAM $49.95

ATMONA-2
This is a tracer debugger) that lets you explore the ATARI RAM/ROM area. You can stop at previously selected address, opcode, or operand. Also very valuable in understanding the microprocessor.Includes ATMONA-1.
Order-No. 7049 cassette version $49.95
Order-No. 7050 disk version $54.00

ATMONA-1
A powerful machine language monitor. Disassemble, dump (hex and ASCII), change memory location, block transfer, fill memory block, save and load-machine-language programs, start programs. Printer option via three different interfaces.
Order-No. 7022 cassette version $19.95
Order-No. 7023 disk version $24.95
Order-No. 7024 cartridge version $59.00

FORTH from Elcomp Publishing,Inc. is an extended Fig-Forth-version. Editor and I/O package included. Utility package includes decompiler, sector copy, Hex-dump (ASCII), ATARI Filehandling, total graphic and sound, joystick program and player missile. Extremely powerful!
Order-No. 7055 disk $39.95
Floating point package with trigonometric functions (0–90°).
Order-No. 7230 disk $29.95
Learn-FORTH from Elcomp Publishing, Inc.
A subset of Fig-Forth for the beginner. On disk (32K RAM) or on cassette (16K RAM).
Order-No. 7053 $19.95



COMING SOON! ORDER NOW!
A Look in the future with your ATARI (Astrology and how to do your own horoscope on the ATARI 800).
Order-No. 171 $9.95

Astrology and Biorhythm for ATARI (cass. or disk).
Order-No. 7223 $29.95
Birth control(Knaus Ogino). Cass. or disk.
Order-No. 7222 $29.95

Programs from Book No. 164
The programs from book No. 164 on disk (book included).
Order-No. 7100 $29.00
Programs from Book No. 162 on disk (book included)
Order-No. 7221 $29.95
GUNFIGHT
This game needs two joysticks. Animation+ sound.Comes on a bootable cassette.
Order-No. 7207 $19.95

Hardware-ADD-ONs for ATARI

EPROM BOARD (Cartridge) Holds two 4k EPROMs (2532). EPROMs not included.
7043 $29.95

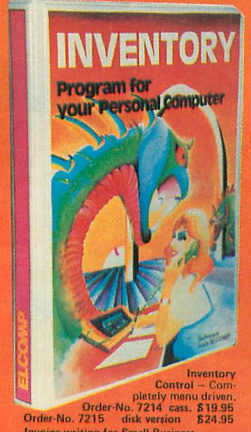
EPROM BOARD KIT
Same as above but bare board only with description.
Order-No. 7224 $14.95

Printer Interface
This construction article comes with printed circuit board + software. You can use The EPSON printer without the ATARI printer interface. (Gameport 3 and 4).
Order-No. 7211 $19.95

RS-232 Interface for your ATARI 400/800
Software + connector + constr. article.
Order-No. 8291 $19.95

EPROM BURNER for ATARI 400/800
Works with gameport. No additional power supply.Comes compl. assembled with software (2716,2732,2532).
Order-No. 7042 $179.00

EPROM BURNER for ATARI 400/800 Kit
Printed circuit board incl. software and extensive construction article.
Order-No. 7292 $49.00

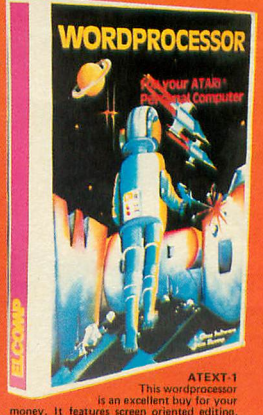


Inventory Control — Completely menu driven.
Order-No. 7214 cass. $19.95
Order-No. 7215 disk version $24.95

Invoice writing for Small Business
This program makes writing invoices easy.
Order-No. 7201 cassette version $29.95
Order-No. 7200 disk version $39.95

ATAMEMO — This is the date-block you always wanted. Makes effective time planing easy!
Order-No. 7310 disk only $29.95

Mailing-List — This menu driven program allows the small business man to keep track of vendors and customers. You can search for a name or address of a certain town or for an address with a certain note. 50 addresses are put into one file.
Order-No. 7212 cassette version $19.95
Order-No. 7213 disk version $24.95



ATEXT-1
This wordprocessor is an excellent buy for your money. It features screen oriented editing, scrolling, string search (even nested), left and right margin justification. Over 30 commands. Text can be saved on disk or cassette.
Order-No. 7210 cassette version $29.95
Order-No. 7216 disk version $34.95
Order-No. 7217 cartridge version $69.00
A version for the BIT3-80 col. card is avail.
ATCASH-1 — Cash register for ATARI
Order-No. 7307 disk only $49.95

Books + Software for VIC-20 (requires 3K RAM Exp.)

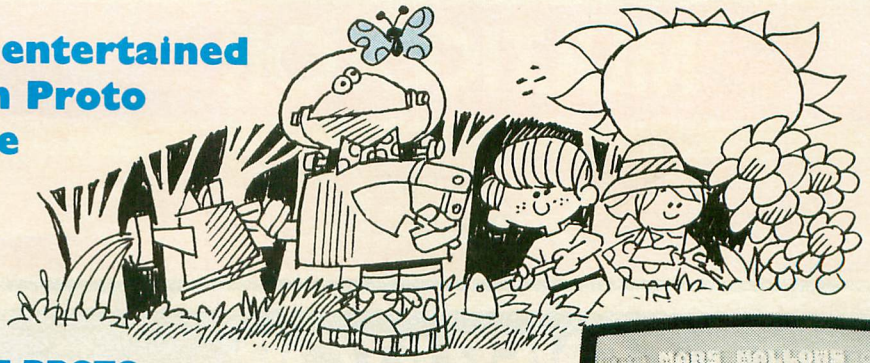
Wordprocessor,8KRAM	#4870	$19.95
Mailing List, 16K RAM	#4883	$14.95
Tricks for VICs (book)	#176	$ 9.95
TIC TAC VIC	#4880*	$ 9.95
GAMEPACK I(3games)	#4881	$14.95
Dual Joystick Instruct.	#4885	$ 9.95
INPUT/OUTPUT Progr	#4886	$ 9.95
Miniassembler	#4896	$19.95
Tennis, Squash,Break	#4881	$ 9.95
Runfil for VIC	#4894	$ 9.95

Universal Experimenter Board for the VIC-20 — (Save money with this great board). This board plugs right into the expansion slot of the VIC-20. The board contains a large prototyping area for your own circuit design and expansion. The construction article shows you how to build your own 3k RAM expander and ROM-board.
Order-No. 4844 $18.95

Software for SINCLAIR ZX-81 and TIMEX 1000
Machine Language Monitor
Order-No. 2399 $9.95
Mailing List #2398 $19.95

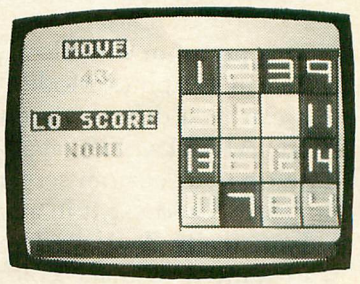
E.S.I. Takes the 'Boob' out of the Tube.

Your children will be entertained for hours playing with Proto in these three creative learning adventures.
(For Kids ages 4 to 10)

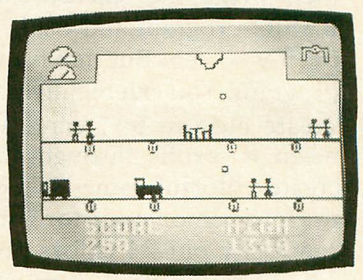


ADVENTURES OF PROTO The first in our series of adventure learning games. Children will enjoy teaching Proto to color pictures they create, inventing new songs and catching Proto's favorite snack, Mars-Mallows. The games even allow you to save the songs and pictures your little one and Proto create. The manual includes a story book and game pages. 16K Tape or 24K Disk. BASIC cartridge and joystick required. All three adventures for $24.95

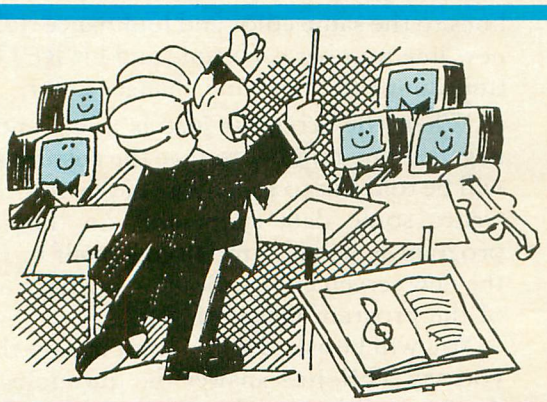
PROTO'S FAVORITE GAMES Ever since Proto came to earth he has been busy learning new games with his friends. You and your friends will have fun connecting the dots to see who can make the most squares. In Fifteen, see how many moves it will take you to unscramble the numbers from 1 to 15 (in the right order of course). Scorefour is Proto's new game of strategy similar to Tic-Tac-Toe but a lot trickier. One or two players can bowl in Proto's bowling alley where you try to score a perfect game of 300. 16K Tape / 32K Disk. BASIC cartridge and joystick required. Four fun filled learning games for $24.95.



PROTO'S FUN DAY It's Saturday and Proto wants to know what Earth kids do when they're not at school. Well, with the help of the sun, your child and Proto can grow a beautiful garden. In 'Kidstuff' they can try their luck at matching shapes. Or they can help Proto assemble brand new robots in Professor Von Chip's laboratory. 16K Tape / 32K Disk, joystick and BASIC cartridge are required. All three games for $24.95



For ALL Ages:



MUSIC MAJOR People of all ages can get a head start on music class with Educational Software's Music Major program. Presented in a lighthearted manner, this program uses comprehensive lessons to teach the fundamentals of music. Covering such topics as note recognition, key signatures and note counting, it is designed for use by both individual students and music classes. This program includes a thoroughly illustrated manual and offers a Quiz Master utility that allows teachers to create their own multiple choice tests. A sample quiz on Beethoven is included. 32K Tape or Disk. $39.95.

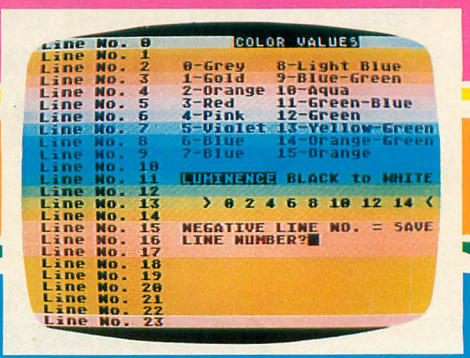
SEE YOUR LOCAL DEALER
If not available, order direct:

EDUCATIONAL SOFTWARE, Inc. 4565 Cherryvale Ave. Soquel, CA 95073

C.O.D. orders call (800)692-9520; in California call (408)476-4901. Include $3.00 postage. Calif. residents add 6.5% sales tax. Outside U.S. & Canada add 15% postage.

E.S.I. PROGRAM EXCHANGE * EDUCATIONAL SOFTWARE * PROTO

MULTICOLOR SCREEN GENERATOR



16K cassette 24K disk

by Richard J. Kalagher

This program will allow you to develop a custom screen in Graphics Mode 0. Each of the 24 lines of text can be a different color of your own choosing from ATARI's 128 available colors. After you develop your custom screen you can save it on disk or cassette and use it in any of your own programs.

I originally developed this program for a friend who wanted to make color slides for teaching. He used this program to set up a multicolor screen. He then wrote the text on the custom screen with a BASIC program and made slides by photographing the TV screen. But that is just one of the uses for this program. You can highlight titles in a different color, create custom text windows, make text disappear when it scrolls through an area of the screen, or create colorful games in Graphics 0. You can even use it to demonstrate for your friends how an ATARI can easily put 24 colors on the screen at once.

Using The Program

Before describing how and why the program works I will discuss how to use it. Type in the BASIC program from Listing 1, save an extra copy, and RUN it. After a brief initialization, the input screen will appear. The left side of the screen should have "Line No. X" written on each line where X is the line number (from 0 to 23). This is just an aid to help you identify the line you want to change. On the right side of the screen, the color values are given, along with a reminder that luminance values vary from 0 (black) to 14 (white) in steps of two. At this point, the cursor is resting halfway down the left side of the screen waiting for you to enter a line number. Enter a number between 0 and 23. If you enter an invalid number you will be prompted again to enter a line number.

Next, you will be prompted to enter a background color. Select a number from 0 to 15 from the list at the top of the screen. Then comes the background luminance. Zero will give you a very dark color while 14 will be a very bright color. If you enter an odd number it will automatically be rounded to the next lower even number. For example, a nine or an eight will both produce the same luminance. Finally, you will be asked for a character luminance. In Graphics mode 0 the character is the same color as the background but a different luminance. A low numerical value gives a dark character while a high value gives a light character.

When you press RETURN after entering the value for character luminance, the line you selected will change color. If you don't like the effect, enter the same line number and make the changes you want. If you want the same value for a parameter (except line number) that you previously entered, just hit RETURN at the prompt. This feature is very useful when you want to change a block of several lines to the same color and luminance. Just enter the new line number each time and hit RETURN three times until the new line changes color.

When the screen is just as you want it, enter a negative line number to save the custom screen. You will be told not to touch any keys while the program writes some data statements on the screen. The program is actually modifying itself to incorporate the new screen colors. Be sure you have made a copy of the program before this step.

You will be asked if you want to save the screen. If you say YES, just answer the questions and a subroutine will be saved on disk or cassette. You can merge this subroutine with any of your own programs by using the ENTER command. This subroutine will occupy lines 30000 to 30260 in your program. Just put a statement GOSUB 30000 in your program and you will get the custom screen.

This screen will stay until you press System Reset or execute a GRAPHICS statement in your program.

Theory Of Operation

The program works by using Display List Interrupts. The assembly language program in Listing 2 contains the interrupt code. Before each new Graphics Mode 0 line is drawn, an interrupt is generated and the machine code is executed. The code looks at the value in location COUNT to check which line is being drawn. The color for that line is taken from the table starting at COLTAB and the luminance is taken from the table starting at LUMTAB. These values are then put directly into the color registers. During the vertical blank interval, the value in COUNT is reset to 1 and the process repeats itself for the next screen.

The BASIC program in Listing 1 contains this machine language program in the DATA statements in lines 30170 to 30260. The statements in lines 30000 to 30160 POKE this code into the upper half of page 6, set the interrupt bits in the display list, and enable the interrupt code. Remember that this subroutine must be called after any GRAPHICS 0 statement in your program, although if you call the routine a second time you could call it at line 30050 since the machine language program will already be in memory. Also, line 30001 can be removed if you do not want to clear the screen.

The first part of the BASIC program is fairly straightforward: it basically sets up the input screen and after accepting the color values, POKES them into the color and luminance tables that the display list interupt code uses. TRAP statements are used to skip around the input statements if you type in an illegal value (e.g. RETURN). The variable that was input will then retain the same value it had previously.

The code in lines 31000 to 31330 is executed when a negative line number is input. This code first modifies the DATA statements to save the custom screen. It then prompts you to save the custom screen to disk or cassette. Notice that you can enter a file name that starts with "D:" or you can enter just the name and the "D:" will be added to the beginning of the file name. (As an exercise, try modifying this section of the code to recognize file names that start with "D2:".)

Other Considerations

There are several things to watch out for when using this program. First, you may notice that when you press a key, an extra scan line may momentarily appear between bands of different color. This is due to the fact that the ATARI keyclick routine uses the WSYNC register to time the keyclick. There is no easy way around this problem. You can trade off this problem for a slight constant jitter at the far right of the screen at the last line before a color change. To do this, try changing the last number in line 30170 and the first two numbers in line 30180 to 234 (i.e. the 141, 10, and 212 should all be changed to 234's).

Another problem occurs during the I/O to the disk, cassette or printer. During I/O the line counter is not updated. The screen will roll and show random blinking colors although it will return to normal after the I/O operation is complete. If this is bothersome to you, POKE location 54286 with 64 before the I/O and then POKE in a 192 after the I/O is complete. This will turn off the interrupts so that the whole screen will become the same as Line 0.

While not a problem, be aware that if a line has the same luminance for background and character you will not be able to see the text on that line. You can use this feature, however, to make text seem to disappear on a certain part of the screen.

Conclusion

I hope you find this program and the techniques used in it useful. Don't be afraid to experiment, either. For example, if you study the code carefully you should be able to do things like changing colors of lines at will during the running of your own programs. □

```
10 REM MULTICOLOR GRAPHICS 0
11 REM SCREEN GENERATOR
12 REM
13 REM Copyright 1983
14 REM by Richard J. Kalagher
15 REM
20 COLTAB=1712:LUMTAB=COLTAB+24
30 DIM A$(15)
50 GOSUB 30000
60 PRINT CHR$(125)
70 FOR Y=0 TO 23
80 POSITION 2,Y
90 PRINT "Line No. ";Y;
100 NEXT Y
110 POSITION 20,0
120 PRINT "COLOR VALUES"
130 RESTORE 570
140 CC=15
150 FOR I=1 TO 2
160 FOR N=0 TO 7
170 READ A$
180 POSITION CC,2+N
190 PRINT A$
200 NEXT N
210 CC=24
220 NEXT I
230 POSITION 15,11
240 PRINT "LUMINANCE BLACK to WHITE"
250 POSITION 15,13
260 PRINT "  > 0 2 4 6 8 10 12 14 <"
270 POSITION 15,15
280 PRINT "NEGATIVE LINE NO. = SAVE"
290 POSITION 15,16
300 TRAP 520
310 PRINT "LINE NUMBER";
320 INPUT LINE
330 IF LINE<0 THEN 31000
335 IF LINE>23 THEN 520
340 POSITION 15,18
350 PRINT "BACKGROUND COLOR";
360 TRAP 390
370 INPUT CLOR
380 IF CLOR>15 THEN 520
390 POSITION 15,20
400 TRAP 440
410 PRINT "BACKGROUND LUMINANCE";
420 INPUT LUM
430 IF LUM<0 OR LUM>15 THEN 520
440 POSITION 15,22
```

© Copyright, CompuClub 1983. All rights reserved.

Atari is a registered trademark of Warner Communications, Inc.

THE GREATEST ATARI® GAME OF ALL TIME.

Object: Capture more programs than from any other source. Score: The best prices for programs win.

Actually, every member of CompuClub is a winner, because no one pays lower prices for Atari® programs than our members.

And no other source offers as many programs, with a descriptive catalog covering every piece of software we offer!

CompuClub has hundreds of Atari® programs: games, education and business. It's an astonishing selection, but just as incredible are our prices and our catalog.

Prices always at least 25% below retail

Fact is, usually our prices on selected programs are even lower than that. And we're always running sales with savings of at least 50% from the list price on some of your favorite programs.

And there are several ways to pay: MasterCard, Visa, or the ever popular check or money order.

Annotated catalog, updated every 45 days

We don't like to knock the competition, even by implication, but there are definite advantages to a CompuClub membership. One of the best of them is our catalog, which not only offers an unbelievable number of programs, but includes a description of each and every one of them.

In fact, the catalog is so big and filled with so much information that we print a separate price list. And we keep adding so many programs that we have to update the catalog nine times a year during the course of your membership.

Think of it! No more wondering what's behind the fancy label, no more shooting in the dark or depending on the word of a clerk who may not be familiar with the program you're interested in.

Exclusivity for Atari® owners

We're not trying to be all things to all people. We are definitely the best thing since the floppy disk for Atari® owners, and only Atari® owners. CompuClub is very exclusive.

Our catalog is thick with hundreds of Atari® programs, and only Atari® programs. No more fumbling your way through thickets of strange symbols and codes for the different computers everybody else's catalogs try to cover.

The rules

The rules are simple. To play the CompuClub "game," you've got to be a member. Anyone can join, as long as they fork over a mere five bucks, and agree to buy three programs during the year of membership. Order and buy your programs at any time during the year, but we're sure with our selection and prices that you'll want to get going right away.

Five dollars buys you a one-year membership, exclusive Atari® program offerings, a fully annotated catalog with 9 updates during the year, a current price list (and any necessary updates), a subscription to our newsletter, and discounted prices at all times, including announcements of our periodic sales, which feature savings of 50% off and more.

You can join by filling out the coupon below, or get an instant membership by calling our toll-free number and giving us your MasterCard or Visa identifying number. We'll forward your registration and sales order materials, your catalog and price list, so you can begin ordering right away.

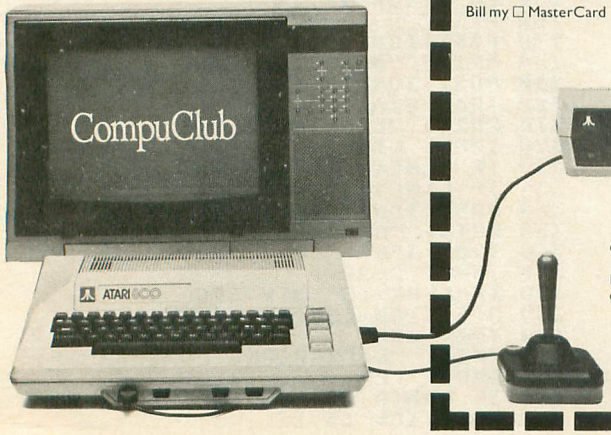
That's all there is to it.

If you think you play a good game, you've got to join CompuClub. It's easy to play, and it saves you money.

We think it's the best Atari® game going, because with us, everybody wins.

CompuClub

Where Atari owners belong.



A

YES, **CompuClub,** PO Box 652, Natick MA 01760

I want to play the greatest Atari® game of all. Please enroll me in CompuClub for one year, and rush my registration material, catalog and price list to me. I agree to buy any three programs during the course of my year of membership. I have enclosed my payment of $5, or authorization to bill my charge card account.

Please make your check payable to CompuClub
Payment enclosed ☐ check ☐ money order.
Bill my ☐ MasterCard ☐ Visa ID #_____

Expires_____

Signature_____

Name_____

Address_____

City_____ State_____ Zip_____

Computer Model_____ Disk ☐ Tape ☐

If you are not satisfied in any way with the conditions of your membership, you may cancel before ordering any programs from CompuClub. Your membership fee of $5 will be cheerfully refunded.

To join by phone, call toll-free.

800-631-3111

Please have your MasterCard or Visa card ready when you call. In Massachusetts, call 1-617-879-5232. We will forward your membership materials after confirming authorization for your charge.

```
450 PRINT "CHARACTER LUMINANCE";
460 TRAP 490
470 INPUT LUMC
480 IF LUMC<0 OR LUMC>15 THEN 520
490 POKE COLTAB+LINE,16*CLOR+LUM
500 POKE LUMTAB+LINE,LUMC
510 IF LINE=0 THEN GOSUB 30130
520 FOR N=16 TO 22 STEP 2
530 POSITION 15,N
540 PRINT "                    "
550 NEXT N
560 GOTO 290
570 DATA 0-Grey
580 DATA 1-Gold
590 DATA 2-Orange
600 DATA 3-Red
610 DATA 4-Pink
620 DATA 5-Violet
630 DATA 6-Blue
640 DATA 7-Blue
650 DATA 8-Light Blue
660 DATA 9-Blue-Green
670 DATA 10-Aqua
680 DATA 11-Green-Blue
690 DATA 12-Green
700 DATA 13-Yellow-Green
710 DATA 14-Orange-Green
720 DATA 15-Orange
30000 REM SUBROUTINE TO LOAD MACHINE C
ODE, SET INTERRUPT BITS, AND ENABLE TH
E DLI'S
30001 PRINT CHR$(125);"INITIALIZING...
 PLEASE WAIT":REM YOU CAN REMOVE THIS
LINE IF YOU WANT
30005 RESTORE 30170:FOR N=0 TO 99:READ
 X:POKE 1664+N,X:NEXT N
30010 COLTAB=1712:LUMTAB=COLTAB+24
30012 REM START COUNTER AND RESET EVER
Y VBI
30014 X=USR(1693)
30020 REM TELL ANTIC WHERE DLI CODE IS
30030 POKE 512,128
30040 POKE 513,6
30050 REM NOW SET INTERRUPT BITS
30060 DSTART=PEEK(560)+256*PEEK(561)
30070 FOR N=DSTART+6 TO DSTART+28
30080 POKE N,130
30090 NEXT N
30095 REM SET INTERRUPT BIT ON FIRST L
INE
30100 POKE DSTART+3,194
30110 REM ENABLE DLI
30120 POKE 54286,192
30125 PRINT CHR$(125)
30130 REM HANDLE LINE 0 AS BACKGROUND
30140 POKE 710,PEEK(COLTAB)
30150 POKE 709,PEEK(LUMTAB)
30160 RETURN
30170 DATA 72,138,72,174,156,6,189,176
,6,141
30180 DATA 10,212,141,24,208,189,200,6
,141,23
30190 DATA 208,238,156,6,104,170,104,6
4,1,104
30200 DATA 169,7,160,168,162,6,32,92,2
28,96
30210 DATA 169,1,141,156,6,76,98,228,1
48,148
30220 DATA 148,148,148,148,68,148,148,
148,148,148
30230 DATA 148,148,148,148,148,148,148
,148,148,148
30240 DATA 148,148,10,10,10,10,10,10,0
,10
30250 DATA 10,10,10,10,10,10,10,10,10,
10
30260 DATA 10,10,10,10,10,10,0,0,0,0
31000 REM ROUTINE TO SAVE OBJECT CODE
31005 TRAP 40000:REM CLEAR TRAPS
31010 PRINT CHR$(125)
31020 PRINT "PLEASE DON'T PRESS ANY KE
YS UNTIL"
31030 PRINT "SCREEN OPERATION IS COMPL
ETE"
31040 FOR DELAY=1 TO 600:NEXT DELAY
31050 PRINT CHR$(125)
31060 POSITION 2,2
31070 LINE=30170
31080 FOR N=0 TO 9
31090 PRINT LINE;" DATA ";
31100 FOR I=0 TO 9
31110 PRINT PEEK(1664+N*10+I);
31120 IF I<>9 THEN PRINT ",";
31130 NEXT I
31140 PRINT
31150 LINE=LINE+10
31160 NEXT N
31170 PRINT "CONT"
31180 POSITION 2,0
31190 POKE 842,13:STOP
31200 POKE 842,12
31210 PRINT CHR$(125)
31220 PRINT :PRINT "DO YOU WANT TO SAV
E THIS CUSTOM SCREEN";
31230 INPUT A$:IF LEN(A$)=0 THEN 31230
31240 IF A$(1,1)<>"Y" THEN END
31245 REM TURN OFF COLORS DURING I/O
31246 POKE 54286,64
31250 PRINT :PRINT "DISK OR CASSETTE";
31260 INPUT A$
31270 IF A$(1,1)="C" THEN 31315
31275 DIM F$(14):F$="D:"
31280 PRINT :PRINT "ENTER A FILE NAME"
;
31290 INPUT A$
31292 IF LEN(A$)>=2 THEN IF A$(2,2)=":
" THEN F$=A$:GOTO 31300
31295 F$(3)=A$
31300 LIST F$,30000,30260
31310 GOTO 31325
31315 TRAP 31317:LPRINT :REM CLEAR CAS
SETTE BUFFER
31317 TRAP 40000:PRINT "PRESS RECORD A
ND THEN RETURN"
31320 LIST "C",30000,30260
31324 REM TURN COLORS BACK ON
31325 POKE 54286,192
31330 END
```

•

CHECKSUM DATA

(See p.46)

```
10 DATA 340,311,257,451,968,266,446,83
2,833,486,284,294,435,760,255,7218
120 DATA 436,207,266,294,309,449,861,7
72,740,261,736,472,571,480,765,7619
270 DATA 488,785,495,708,277,43,13,893
,484,951,743,75,924,494,714,8087
410 DATA 594,158,115,483,401,747,64,27
0,433,860,865,349,361,206,761,6667
560 DATA 738,311,310,660,4,307,717,324
,329,361,371,581,744,620,925,7302
710 DATA 901,875,247,366,82,738,224,17
3,210,237,201,507,593,575,213,6142
30090 DATA 687,723,991,598,348,788,143
,544,595,57,670,830,820,821,717,9332
30220 DATA 484,309,263,322,793,376,294
,773,288,28,697,781,548,263,300,6519
31090 DATA 432,270,853,533,674,807,466
,685,603,551,865,34,775,223,728,8499
31240 DATA 978,22,529,192,890,724,890,
220,896,276,571,43,214,678,990,8113
31320 DATA 889,66,368,547,1870
```

•

Assembly Language Listing

```
10 ;DISPLAY LIST INTERRUPT SERVICE ROUTINE
20  .OPT NOEJECT
30 ;
40  *=1664 ;UPPER HALF PAGE 6
50 ;
60 BAK=53272 ;BACKGROUND COLOR REGISTER
70 LUM=53271 ;LUMINANCE COLOR REGISTER
```

```
80 WSYNC=54282 ;WAIT FOR SYNC
90 SETVB=$E45C
0100 JMPEND=$E462
0110  PHA ;SAVE A REGISTER
0120  TXA
0130  PHA ;SAVE X REGISTER
0140  LDX COUNT ;VALUE OF LINE ON SCREEN
0150  LDA COLTAB,X
0160  STA WSYNC ;WAIT FOR SYNC
0170  STA BAK
0180  LDA LUMTAB,X
0190  STA LUM
0200  INC COUNT
0210  PLA
0220  TAX ;RESTORE X
0230  PLA ;RESTORE A
0240  RTI ;RETURN FROM INTERRUPT
0250 COUNT .BYTE 1
0260 ;
0270 ;VERTICAL BLANK INTERRUPT ROUTINE
0280 ;
0290  PLA ;REMOVE ARGUMENT COUNT FROM STACK
0300  LDA #7 ;DEFERRED MODE
0310  LDY #VBI & $00FF ;ADDRESS OF THE
0320  LDX #VBI/256 ;VBI ROUTINE
0330  JSR SETVB
0340  RTS
0350 VBI LDA #1
0360  STA COUNT
0370  JMP JMPEND
0380 ;
0390 ;COLOR AND LUMINANCE TABLES
0400 COLTAB .BYTE $94,$94,$94,$94,$94,$94,$94,$94
0410  .BYTE $94,$94,$94,$94,$94,$94,$94,$94
0420  .BYTE $94,$94,$94,$94,$94,$94,$94,$94
0430 LUMTAB .BYTE $A,$A,$A,$A,$A,$A,$A,$A
0440  .BYTE $A,$A,$A,$A,$A,$A,$A,$A
0450  .BYTE $A,$A,$A,$A,$A,$A,$A,$A
0460  .END
```


RAM **48K** RAM

Expand your **ATARI 400*** *to a* **48K !!!**
by using our **48400 48K Ram** *expansion upgrade kit !!!!*

** *Prime* **64K** *memory chips.*
** *All integrated circuits chips are* **100%** *guaranteed. No seconds.*
** *Easy to follow instructions with detailed drawing diagrams.*
** ***Free*** *shipping in U.S.A.*

POLLY PRODUCTS U.S.A.

only $89.99

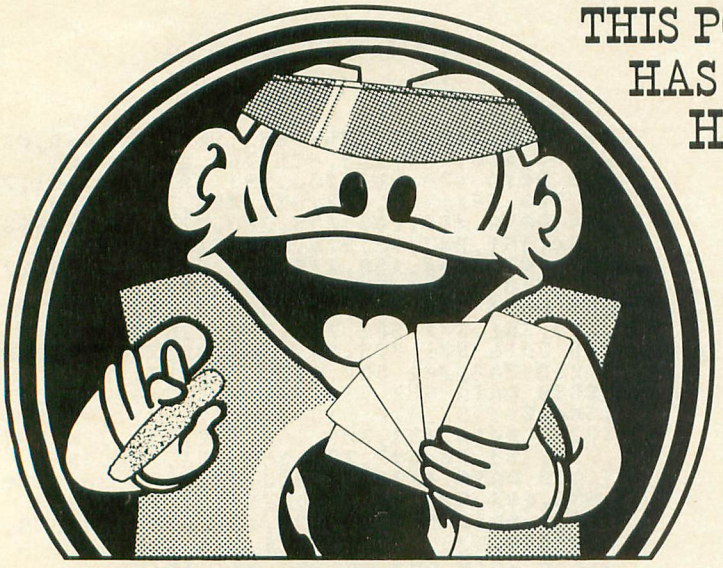
send chk. or mo.ordr

POLLY PRODUCTS of Riverside ← to.

P.O.Box 8485 , Riverside, California .
92515-8485

allow 4 wks for per. ck.-- Ca. Res. add 6%
ATARI 400* is a trademark of ATARI,Inc.

THIS POKER PLAYER HAS SOMETHING UP HIS SLEEVE . . . HE TALKS!



POKERSAM

by Jerry White

For the Atari 400, 800, and 1200 XL • Disk or cassette
Requires 32K RAM • Suggested retail: **$24.95**

The makers of S.A.M., the Software Automatic Mouth, now bring you a revolutionary talking game: **POKERSAM**. He narrates every hand aloud, naming the upturned cards, announcing the bets, and wisecracking whenever he gets the chance. Like a lot of poker players, he's sometimes full of bluster and he isn't always a good sport. But he's always a real character with a gift for gab.

Your Atari ***needs no separate speech synthesizer*** to produce **POKERSAM's** speech. It's all done with the S.A.M. speech system. As you may know, S.A.M. is available separately as an unlimited-vocabulary speech synthesizer that you can access in your own programs. **POKERSAM** is not a tool for creating your own computer speech, but it contains a small module of the S.A.M. system. This means it can make any Atari computer speak, without additional hardware or software!

To order direct from DON'T ASK, send a check or money order, or call to order C.O.D. Add $2.00 shipping and handling. California residents add 6% sales tax (6.5% if you reside in L.A. County). **Please specify disk or cassette version.**

Registered owners of S.A.M. for the Atari: you can get a special low-priced version of **POKERSAM**. Please write to DON'T ASK for information, and be sure to indicate your S.A.M. serial number.

Dealer inquiries welcome

DON'T ASK COMPUTER SOFTWARE INC

2265 Westwood Bl., Ste. B-150
Los Angeles, CA 90064
(213) 477-4514

ATARI is a trademark of ATARI INC.

Our New Keyboard Beats The Other Flat!

The Joytyper 400 For Your Atari 400®

Now get the *full* use of your Atari 400 with the Joytyper 400 from Microtronics. You'll be able to write programs, do word processing and everything else an Atari 800 can do — *comfortably.*

The Joytyper 400 is a standard computer keyboard like the one on the Atari 800. It has a stair-step layout; smooth easy keystroke action; large, uncluttered SHIFT keys; protected RESET and game keys.

The Joytyper 400 is a high-quality product backed by a 90-day warranty on materials and workmanship. Send for yours today. And put the finger on flat keyboards.

Joytyper 400 — $129.95

VISA and MASTERCARD accepted; include number and expiration date. Add $5 per order for postage and handling. Allow 3 weeks delivery on personal check orders. Dealer inquiries welcome.

MICROTRONICS, INC.
PO Box 8894, Ft. Collins, CO 80525
(303) 226-0108

Atari, Atari 400 and Atari 800 are registered trademarks of Atari, Inc.

Yes—rush me _____ JOYTYPER 400's at $129.95 each plus $5.00 postage and handling.

Name _____

Address _____

City _____ State _____ Zip _____

Master Charge No. _____

Visa No. _____

THE A.N.A.L.O.G. GUIDE TO ATARI COMPUTER PUBLICATIONS

by Cris Popenoe and Lee Pappas

When I started this article, I had no conception as to how many books and guides actually existed for the ATARI computer owner. This listing basically covers the books, with a brief description of each. In some cases opinions are given, however this listing is intended to inform our readers of detailed publications covering specific applications.

While we have tried to make this listing as complete as possible, no doubt there are a few ommisions. If any readers know of additional publications, feel free to drop me a line. —*LP*

LINDA A. SCHEIBER, **ADVANCED PROGRAMMING TECHNIQUES FOR YOUR ATARI,** including GRAPHICS and VOICE PROGRAMS, illustrated, 224pp. (0830615458), 13.95
Covers advanced programming techniques, especially graphics, color, and voice technology. Also covers sound, scrolling, display lists, and details on cassette handling.

- *ZIMMERMAN, LANCE.* **ATARI: A BEGINNER'S GUIDE.** BRADYRO83, 12.95p.
This is a comprehensive tutorial for the 400/800. Written in a user-friendly style, this informal text is designed to help beginners understand all aspects and capabilities of the ATARI.

- *INMAN, DON and KURT.* **THE ATARI ASSEMBLER.** Index, 281pp. PRENTIC 81, 12.95p.
The Inmans demonstrate how to master assembly language programming and show how to use the ATARI Assembler Cartridge with an ATARI 400 or 800. The book is designed for readers with some knowledge of the BASIC programming language, but assumes no assembly language background.

- *HASKELL, RICHARD, E.* **ATARI BASIC.** SPECTRU83, 13.95p.
This book provides a solid introduction to BASIC programming on the ATARI. Haskell provides a hands-on, top-down approach to programming and his instruction is augmented by a wealth of examples which cover topics such as low and high resolution graphics, loops and arrays, sound effects, bar graphs, and animated graphics.

- *ROWLEY, THOMAS E.* **ATARI BASIC: LEARNING BY USING.** 73pp. IJG81, 5.95p.
This book provides a supplementary resource for learning BASIC programming on an ATARI. The short programs and learning exercises are easy to follow and make learning programming enjoyable. Hands on interaction with the computer is essential. Most of the programs are written using simple ATARI BASIC statements; a few use sophisticated programming techniques. To benefit from this book, the user should have an elementary knowledge of BASIC programming techniques. 16K of memory is required for some of the routines.

- *ALBRECHT, BOB, LEROY FINKEL, and JERALD BROWN.* **ATARI BASIC—A SELF-TEACHING GUIDE.** 332pp. WILEYJO79, 10.95p.
This book shows you how to read, write, and understand the ATARI BASIC programming language. The authors provide a clear, easy-to-follow self-teaching manual which has been published in conjunction with ATARI. Numerous applications and games are also included.

- *HELD, GILBERT.* **ATARI BASIC, QUICK REFERENCE GUIDE.** WILEYJO82, 2.95p.
This Quick Reference Guide is printed on heavy coated stock, making it a handy item to have alongside you at the keyboard. Among the areas presented are the following: generic terms, BASIC operators, file naming convention, system commands, BASIC language statements, sound parameters, I/O control, and graphics and video control.

- TAYLOR, *JOHN* **ATARI 400/800 DISKGUIDE,** 32pp. OSBORNE83, 7.95p.
  This spiral-bound, computer-side guide contains all the important ATARI 400/800 commands and functions — DOS, ATARI BASIC, numeric functions, machine functions, and many others are all clearly summarized.

- *KOHL, HERB, TED KAHN, LEN LINDSAY, and PAT CLELAND.* **ATARI GAMES & RECREATIONS.** Many illustrations, index, 350pp. RESTON82, 14.95p.
  This book offers a different approach to introducing programming to the beginning computer user. The authors encourage you to develop your own ideas for computer games and provide models from which to draw ideas for such games. You'll start with easy games that will serve as building blocks for more complex and creative programs. At the end of each chapter are sophisticated programs that will interest experienced programmers or beginners who want a challenge. You'll learn how to develop your own programming styles and have fun as you do it. And in the process you'll discover and master all the capabilities of your machine. In addition to games, there is a special section on the graphics, sound, and color features of your ATARI.

- *CONLAN, JIM and TRACY DELIMAN, et al.* **ATARI PILOT FOR BEGINNERS.** Index, 229pp. RESTON83, 14.95p.
  This book teaches you how to give commands to your ATARI computer in the language known as PILOT. It is designed for users with an ATARI 400 or 800 home computer. PILOT is a fairly simple language which is designed to be easy to learn. The book allows the beginner to learn through play and experimentation, and all of the programs included in the book were tested by children and beginning adult computer users. Included are programs for music, color, graphics, and mathematics.

- *SCHREIBER, LINDA M.* **ATARI PROGRAMMING... WITH 55 PROGRAMS.** Index, 254pp. TABBOOK82, 13.95p.
  This hands-on guide to programming the ATARI 800 assumes no prior computer knowledge. The first chapters acquaint the reader with the ATARI and the different accessories that can be attached to it. New terminology is introduced gradually. The following chapters teach basic programming concepts. Each one introduces a few related commands. An explanation of each command is followed by an example of the way to use the command. The programs included further illustrate the use of the command and each program is accompanied by a detailed explanation. Sound, color, and graphics are covered in several programs. A final chapter explains how to make programs crash-proof, and there's also an explanation of error codes.

- *MOORE, HERB, JUDY LOWER, and BOB ALBRECHT.* **ATARI SOUND & GRAPHICS—A SELF-TEACHING GUIDE.** Index, 234pp. WILEYJO82, 9.95p.
  This excellent guide opens up the vast creative possibilities of artistic programming to owners of the ATARI 400 and ATARI 800—the most visually advanced home computers available today. With this self-paced, self-teaching guide, you'll advance progressively through simple techniques for creating an array of sounds and images. Even if you're a beginner with no computing experience, this easy-to-follow book lets you start seeing and hearing things on your ATARI right away. You'll learn how to compose and play melodies, draw cartoons, create sound effects and games, and progress to more sophisticated artistic programming. And because the book uses BASIC and requires no programming knowledge, you'll learn elementary BASIC programming in the context of each newly introduced technique.

ATARI TECHNICAL USER'S NOTES. Loose-leaf. ATARI81, (CO16555), 27.00

This information package provides details for the experienced programmer on the internal workings of the 400 and 800 computers. Also available from ATARI, source code listings for DOS and the operating systems.

ELLIS, MARK, ROBERT ELLIS, JOEL GOLDSTEIN. **ATARI USER'S GUIDE: BASIC AND GRAPHICS FOR THE ATARI 400/800/1200.** 300pp. BRADY83, 15.95p.
This comprehensive guide presents through an easy to read, yet detailed explanation. ATARI BASIC and graphics. This book covers specific information on the 400, 800, and the 1200XL computers, along with an outline on how a computer works. This guide also includes applications in graphics, word processing, and business.

- *STANTON, JEFFREY, ROBERT P. WELLS and SANDRA ROCHOWANSKY.* **THE BOOK OF ATARI SOFTWARE** 1983. Resource listing, index, 8½"x11", 347 pp. BOOKCOM83, 19.95p.
  This is an examplary resource manual. The software reviews have been prepared by computer professionals and each evaluation is written by an expert in the field. The programs are grouped by type. The major areas covered are business, education, communications, data base management, and entertainment. Each of the software critiques is lengthy and to the point.

COMPUTE!'s FIRST BOOK OF ATARI. Spiralbound, 192pp. COMPUTE!81, (094238600), 12.95
Helpful information from the pages of COMPUTE! including applications and useful programs. Also included are unpublished articles and memory map data.

COMPUTE!'s FIRST BOOK OF ATARI GRAPHICS. Spiral-bound, 248pp. COMPUTE!82, (0942386086), 12.95
This easy to use book provides programs, games, tutorials, and articles along with other helpful information for the experienced and inexperienced ATARI owner. Chapters cover animation, advanced graphics techniques, and redefining characters.

COMPUTE!'s SECOND BOOK OF ATARI. Spiral-bound, 250pp. COMPUTE!82, (094238606X), 12.95
Previously unpublished information from the editors of COMPUTE! Magazine. Included are programs and helpful articles on graphics and game utilities.

- *LARSEN, SALLY GREENWOOD,* **COMPUTERS FOR KIDS: ATARI EDITION.** 11" x 8½", 82pp. CREATIV81, 4.95p.
  This book is well-illustrated and easy-to-understand. The large type makes it accessible to children. Kids can find out how to put together a flowchart, and how to get a computer to do what they want it to do. They also learn the basics of computing and how to write their own games and draw pictures that move. There's also a section of hints for parents and teachers.

● *WILLIS, JERRY and MERL MILLER.* **COMPUTERS FOR PEOPLE.** Index, 200pp. DILITHI82, 7.95p.
This book would be suitable for anyone thinking of buying a small home computer, but it is most useful for those who are seriously looking at the ATARI. The book at times seems to be a promotional effort for ATARI, with many glossy color photographs of the ATARI and its peripherals throughout. The information is sound and reasoned and, while biased, is generally to-the-point and helpful. The authors begin by describing the many uses for computers in the home and office, emphasizing educational and game applications as well as business ones. One helpful feature of the book is a collection of suggestions for finding the computer that best suits your needs — an ATARI of course! The book concludes with an annotated resource guide and a glossary.

● *SMALL, DAVID and SANDY, and GEORGE BLANK, eds.* **THE CREATIVE ATARI.** Many illustrations, 8½″ x 11″, 250pp. CRCOMPU83, 15.95p.
This book contains a collection of articles, columns, and tutorials on the ATARI which originally appeared in **Creative Computing** Magazine. The material is organized into four sections: an introduction, with a discussion of ATARI memory concepts essential to programming; a tutorial on ATARI graphics; a collection of programming tips; and a wealth of ready-to-run programs along with reviews of commercial programs available for the ATARI.

TOM ROWLEY, **DESIGNS FROM YOUR MIND: ATARI GRAPHICS,** RESTON
Two sections, the first for novices, the second covering advanced graphic techniques. A guide to graphics and color on the ATARI with chapters on combining graphics with text, player/missile graphics, and creating graphic shape tables.

DE RE ATARI. Many charts, 8½″x11″, index, 150+pp. ATARI81 (APX90008), 19.95
This handbook for advanced programmers was written by Chris Crawford, Jim Dunion, and other specialists at ATARI. This series of tutorials covers, in detail, the techniques required to fine scroll, move player/missiles, operate vertical blanks, and fully utilize the potential of the ATARI 400 and 800 home computers. An indespensible manual for the advanced ATARI programmer.

FORTH ON THE ATARI: LEARNING BY USING, ELCOMP, 7.95
Covers the interesting language of FORTH for the ATARI. A language useful in manipulating graphics on the ATARI and programs that run much faster than BASIC. For beginners and those interested in becoming familiar with this advanced programming language.

● *ROBERTS, SAM D.* **GAMES FOR THE ATARI.** 115pp. IJG82, 7.95p.
This book is more than a mere listing of game programs. The first part provides clear instructions in techniques. Included are guidelines on drawing figures on the screen, movements, and sound. The selection of games is varied, and they take full advantage of the graphics and sound capabilities of the ATARI.

● *ROBERTS, SAM D.* **HOW TO PROGRAM YOUR ATARI IN 6502 MACHINE LANGUAGE.** 106pp. IJG82., 9.95p.
This book provides instruction in programming the ATARI in 6502 machine language. Also covered is the use of an assembler and the development of machine language subroutines from BASIC. The author provides thorough, hands-one guidelines.

● *CARRIS, BILL.* **INSIDE ATARI BASIC—A FAST, FUN, & FRIENDLY APPROACH.** 192pp. RESTON83, 12.95p.
This book intentionally avoids flowcharts, unnecessary technical details, and much of the computer jargon used in other books. The idea is plain language which the author hopes will lead to painless learning. The writing style is informal and humorous and all the basics are covered. Carris is Training Director with the Home Computer Division of ATARI.

INSIDE ATARI DOS. Spiral-bound. COMPUTE! (0942386027), 19.95
Written by the authors of the ATARI Operating system, this step-by-step book to the DOS system, is complete with comments and source listings. By Bill Wilkinson of Optimized Systems Software. An excellent guide to understanding the ATARI DOS.

● *CARLSON, EDWARD H.* **KIDS AND THE ATARI.** Spiral-bound, 218pp. RESTON83, 19.95p.
This lively introduction will have kids programming the ATARI in hours. Step-by-step lessons, exercises, and illustrations add to the book's utility as do the many games and homework drills. There are also notes for teachers and parents.

MAPPING THE ATARI. Spiral-bound, 194pp. COMPUTE!83, (0942386094), 14.95
The finest memory guide listing and sourcebook for the ATARI home computers. For programmers of all types, A.N.A.L.O.G. highly recommends this book. Crammed with information you can use on a daily-programming basis.

MASTER MEMORY MAP. 32pp. Educational Software, 6.95
Over 500 memory locations in an easy to read format. Helpful to beginning programmers in teaching which memory locations are important.

● *NORTH, ALAN.* **101 ATARI COMPUTER PROGRAMMING TIPS & TRICKS.** 126pp. ARCSOFT83, 8.95p.
This is a collection of programming techniques and shortcuts for the ATARI 400/800, each featuring a complete, ready-to-run program. Included are techniques for graphics, games, educational tools, and home financial aids. It's a simple, straightforward account.

● *CAPITAL CHILDREN'S MUSEUM.* **PAINT.** RESTON. 39.95.
This software package for use on the ATARI 800 enables individuals who thought they couldn't draw a straight line to create colorful works of art. Utilizing the color capacities of the ATARI, the Capital Children's Museum of Washington D.C. has developed a software package which allows users to create their own computer paintings. The PAINT diskette provides access to hundreds of color textures, allowing users to produce a virtually limitless number of artistic patterns, textures, and variations. There's even a special way to save art once it has been created. An accompanying manual provides instruction and documentation. The software requires 48K and a joystick.

● *THORNBURG, DAVID D.* **PICTURE THIS! — AN INTRODUCTION TO COMPUTER GRAPHICS FOR KIDS OF ALL AGES.** Spiral-bound, index, 8″x11″, 191pp. ADDISON82, 14.95p.
This book is designed as a handbook for those owning an ATARI 400/800 home computer. A remarkable combination of two modern educational tools, *PILOT* and *Turtle Geometry*, makes it possible to solve problems, create pictures, and invent games on your ATARI. PILOT is a powerful computer language that is simpler than BASIC and allows kids to talk with the computer. Turtle Geometry allows kids to create pictures in full color with a myriad of designs. It's a wonderful book which features a step-by-step approach which integrates projects throughout for constant learning reinforcement. And it's fun too!

MARK THOMPSON, **PROGRAMMING YOUR ATARI COMPUTER,** illustrated, 280pp. (080604532), 10.95
An introduction to computers and the ATARI in specific. Covers the fundamentals of BASIC, internal workings of the ATARI, and the ATARI peripherals. Program listings including two games are included.

● *POOLE, LON, MARY BORCHERS, and STEVEN COOK.* **SOME COMMON BASIC PROGRAMS: ATARI EDITION.** 8½″ x 11″, 200pp. OSBORNE81, 14.99p.
You can key these 76 short programs directly into your ATARI 400 or 800 computer and obtain a powerful collection of financial, statistical, and mathematics programs. Each program is presented with complete source listings, documentation, and sample execution.

STIMULATION SIMULATIONS: ATARI EDITION. HAYDON, 5.95p.
This book contains a dozen programs (games) in ATARI BASIC. The programs are well documented and are complete with listings, sample runs, instructions, and flowcharts. Several types of games are represented including space, fishing, and adventure.

● *NORTH, ALAN.* **31 NEW ATARI COMPUTER PROGRAMS FOR HOME, SCHOOL, OFFICE.** 95pp. ARCSOFT83, 8.95p.
This book contains a collection of ready-to-run programs which are designed to be easily input into an ATARI 400 or 800. Included are programs for the home, classroom, or small business. Each is at a level accessible to novice users.

● *BOOM, MICHAEL.* **UNDERSTANDING ATARI GRAPHICS.** 4¼″ x 11″, 48pp. ALFREDP82, 2.95p.
This hands-on manual teaches you how to create graphics on ATARI models 400 and 800. The book is directed at beginning and intermediate programmers. You will need to know ATARI BASIC, though you do not have to have prior programming experience. The book begins with basic terms and concepts important to graphics programming. Next it examines each of the ATARI BASIC commands used for generating video graphics. Final sections provide additional tips.

● *BEIL, DONALD H.* **THE VISICALC BOOK: ATARI EDITION.** Many illustrations, index, 313pp. PRENTIC82, 14.95p.
Personal computer users and hundreds of businesses across the U.S. are discovering a wide variety of uses for VisiCalc software. With VisiCalc, you design the model you wish to use, so you are able to examine every step of your business operations. If you are presently using VisiCalc on your ATARI home computer, and want to learn more about its expanded uses, or are thinking about purchasing VisiCalc, this book should be very helpful. It will show you how to build a model, enter your data, and begin to explore various business and financial questions. The book includes many practice problems and a wealth of illustrative exercises.

● *POOLE, LON, MARTIN McNIFF, and STEVEN COOK,* **YOUR ATARI COMPUTER: A GUIDE TO ATARI 400/800 PERSONAL COMPUTERS.** Many illustrations, 464pp. OSBORNE, 16.95
One of the most comprehensive books concerning the ATARI ever written. Between the covers one can find a wealth of information which is organized and written in a clear, concise manner. This 11 chapter book covers graphics (beginner and advanced), BASIC, sound, and the ATARI peripherals. The finest book for novice ATARI owners.

● *The above list was excerpted from* ***Computers: A Comprehensive Guide,*** *written and provided by Cris Popenoe, Yes! Bookshop, 1035 31st St., NW, Washington, DC 20007. These and over a thousand other computer related books are reviewed in the guide and are available by mail order or by calling (202) 338-2727.*

EXPLORE A NEW DIMENSION IN SOFTWARE

Action!

INTRODUCING ACTION! — Now the fastest 8-bit language

Another first from OSS! ACTION! is a brand new language designed to run on 6502-based computers, including Atari, Apple II, and Commodore 64. A powerful, structured language, ACTION! can draw out a new, higher dimension of performance from these machines, with speeds never seen before. ACTION! combines some of the best features of such languages as Pascal, C, and Algol, and offers speeds over 100 times faster than BASIC interpreters.

ACTION! is ideal for games, music processing, real-time control, and many other applications. But if what you're really looking for is raw speed in compiled code, ACTION! is just for you. There's more . . . ACTION! comes with a 128-column screen editor which rivals word processing programs, as well as a monitor mode which allows you to choose between on-line activities. ACTION!'s unique one-pass compiler will accept code from memory, disk, or cassette, and ACTION! has the ability to include source library files.

ACTION! is provided in cartridge form only. Introductory price for ATARI Version $99.00

Call or write for availability of Apple II and Commodore 64 Versions.

A Strong Software Family

Other major systems software products from OSS include:

BASIC A+	the only logical upgrade to Atari BASIC with extra features for games and business programs....$80.00
C/65	the first native mode "small c" compiler for Atari and Apple computers....$80.00
MAC/65	the finest and fastest complete 6502 macro assembler/editor package you can buy....$80.00
BUG/65	a powerful, self-relocatable debugger. FREE with MAC/65....$34.95

And More...

OS/A+, the first and finest operating system for BOTH Atari and Apple II computers, is NOW included FREE as a part of every OSS systems software package. OS/A+ features a keyboard-driven, easy-to-use command processor, several simple resident commands, and logical and readable requests for even the most sophisticated utility commands. Versions of OS/A+ for some higher capacity drives are available at extra cost.

NOTE: Unless otherwise noted, all OSS products require 48K and at least one disk drive.

ASK YOUR DEALER, or call or write for our brochure.

ATARI, APPLE II, and TINY C are trademarks of Atari, Inc., Apple Computer, Inc., and Tiny C Associates, respectively. MAC/65, C/65, BASIC A+, BUG/65, and OS/A+ are trademarks of Optimized Systems Software, Inc.

OSS Optimized Systems Software, Inc. 10379 Lansdale Avenue • Cupertino • California • 95014 • (408) 446-3099

HAPPY 810 ENHANCEMENT
HAPPY COMPUTING
P.O. Box 32331
San Jose, California 95152
Hardware kit $249.95
Optional software additional

by Brian Moriarty

Since the publication of my article on **Disk Backup Programs** in Issue #11, our office has been swamped with phone calls and letters from readers interested in the technology of software protection. Many of these people had questions about disk drive modifications — and nearly everyone wanted to know more about a mysterious product called "the Happy Drive."

At first we were hesitant to publish reviews or advertisements for the Happy 810 Drive Enhancement because of its unique potential for misuse. But after receiving a sample unit from Happy Computing and working with it for a couple of weeks, we decided that the legitimate performance benefits it offers are too significant to ignore. We hope this article will help clear up some of the misinformation surrounding the Happy drive, and that it will encourage the ATARI community to deal with the existence of such products in an intelligent, informed manner.

Learning how to read.

The Happy Enhancement is a plug-in circuit board that completely replaces the operating system of the ATARI 810 Disk Drive. It's designed to improve the efficiency of disks reads, provide a greater degree of control over disk formatting and reduce wear and tear on the drive mechanism.

To better understand how the Happy Enhancement works, let's take a look at the way an unmodified 810 reads a disk.

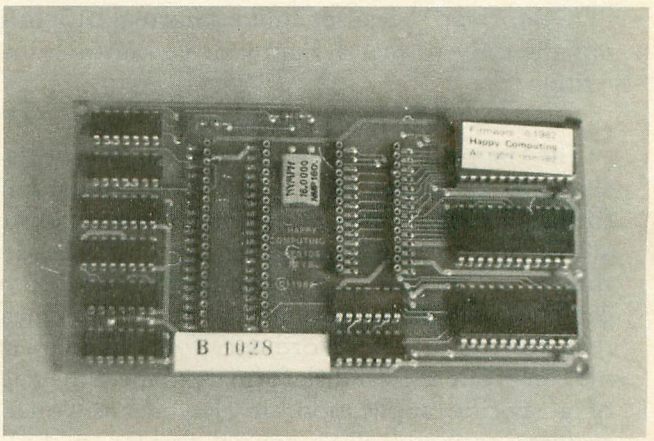
An 810 read operation begins when your ATARI commands the drive to fetch a particular sector. The controller system inside the 810 physically positions the read/write head over the track containing the requested sector, and waits for that sector to pass over the head. Then it reads the sector data into the 810's 128-byte disk buffer, checks the data for accuracy and dumps the contents of the buffer into the ATARI over the serial bus.

This method of disk reading works fine if all you need is a single sector. But most disk operations consist of multiple reads, in which several consecutive sectors must be pulled off the disk. It takes time to transmit those 128 bytes of sector data over the serial bus; during this period, the spinning disk may have carried the next physical sector away from the drive head. That means you have to wait a few fractions of a second between each sector access so that the disk can "catch up" with the read requests.

One way to improve the speed of disk reads would be to carefully interlace consecutively-numbered sectors on the tracks, so that sectors would pass over the head just as the drive was ready to read them. ATARI did just this when they released the revision "C" OS ROM for the 810 back in 1981. C-formatted disks boot up noticeably faster than disks prepared with the original "B" ROMs. But it still requires several complete disk revolutions to access every sector on a given track.

The Evelyn Wood solution.

The Happy 810 Drive Enhancement represents a complete re-thinking of the 810's disk-read process. Instead of the 128-byte disk buffer used by a normal 810, the Happy Enhancement incorporates a 4K buffer that can easily store an entire track's worth of data (18 sectors or 2304 bytes) all at once.



When a Happy drive is commanded to fetch a particular sector, it actually reads the entire track containing that sector into its giant buffer. This 18-sector "batch" read requires an average of only 1.05 disk revolutions! Subsequent sector requests from the same track are pulled out of the buffer, not off the disk. This means that the speed of sequential disks reads is limited mainly by the data transfer rate of the serial bus.

What does Happy's batch-read capability mean to you, the 810 user? Figure 1 shows the amount of time it takes to boot in the ATARI DOS.SYS and DUP.SYS files with and without the Happy Enhancement, using disks formatted under both versions of the 810 OS ROM. Figure 2 compares the speed of initializing a disk using DOS option "I."

Figure 1. DOS/DUP.SYS boot speeds

B-format, without enhancement	**18 seconds**
C-format, without enhancement	**14 seconds**
Either format, with enhancement	**11 seconds**

Figure 2. Disk formatting speeds.

Without Happy enhancement	**38 seconds**
With Happy enhancement	**25 seconds**

One of the nice things about a Happy drive is that it doesn't work as hard as a normal 810. That translates directly into longer equipment life. The difference is most dramatic when performing an intermittent disk read operation, such as ENTERing a file with BASIC or LOADing screens into a FORTH compiler. It's strange to watch the drive motor shut off while the computer continues to "beep," busily reading sectors out of Happy's 4K buffer. Happy Computing estimates a 30% reduction in drive wear over a standard 810.

The Happy Enhancement only affects the speed of disk read operations. Disk writes take place at the same miserably slow speed as an unmodified 810. Also note that a disk which has been DOS-formatted with a Happy drive will not boot faster on a normal drive, because Happy's DOS format is the same as the one used by the ATARI "C" ROM. I emphasize "DOS format" because, unlike a normal 810, this is not the only format a Happy drive knows how to write.

Custom disk formats.

The Happy drive's most controversial feature is its ability to recognize and reproduce non-standard disk formats. Happy's programmable operating system allows you to access individual sector ID headers, timing information and other parts of a disk you can't touch with a conventional drive. This means that, for the first time, ordinary folks like you and me can create special disk formats to meet the needs of a specific application. It also means you can recreate anybody else's special format, including those used for the purpose of copy protection.

The basic Happy 810 Enhancement kit comes with a disk program called Happy Backup. Happy's advertising says this program is "guaranteed to produce executable backup copies of any disk which can be read with a standard ATARI 810." The duplicate becomes a magnetic image of the source, and includes all protection features which may have been encoded into the original disk. I tried Happy Backup on a number of disks in my software library, including those incorporating the latest in professional custom formatting. The performance of the copies fully justifies Happy Computing's claim.

The flip side of the Happy Backup disk has a routine that lets you program the Happy drive to act just like a standard 810. This makes the system compatible with software that expects the disk-read process to take place at a "normal" speed — and prevents clever software publishers from detecting the presence of the Happy Enhancement. A diagnostic program is also included to verify that the drive is working properly.

An extra $99.95 will get you Happy Customizer, a program that works together with a Happy-enhanced drive to create non-standard disk formats on a track-by-track basis. The Customizer is great for small software publishers who want to protect their products without resorting to a high-priced duplication house. You can experiment with super-efficient sector interlacing schemes and other exotic formatting techniques to improve the performance of your disks.

Owners of more than one Happy drive can order a multi-drive version of Happy Backup for $49.95. This high-speed utility will let you make up to three duplicates of a standard DOS-format disk in about 2 1/2 minutes! And the Happy Compactor package ($49.95 additional) lets you combine several boot-load programs onto a single menu-driven disk.

The installation instructions for the Happy 810 Enhancement are among the best I have ever seen. The procedure requires no soldering or special tools; you simply remove the original 810 OS chips, plug the Happy board into the empty sockets, re-install two of the chips and put the drive back together. The Happy board uses good quality components and gold-plated connectors in the places where they count most.

Is it worth $250?

Prospective owners of a Happy 810 Enhancement should think carefully before spending. $250 is a significant fraction of the cost of a second disk drive — and two disk drives are probably more useful to the average ATARI user than a single Happy drive. However, if you already own two or more 810s, I think you'll find the high speed and special capabilities of a Happy drive to be a worthwhile investment.

The Happy 810 Enhancement is one of the most powerful hardware modifications available to ATARI computer owners. I hope the ATARI community will not abuse this power by using the Happy drive (and other similar products) to infringe on the rights of others. If Happy users operate their equipment with fairness and maturity, we will continue to enjoy the high caliber of hardware and software engineering that makes products like the Happy Drive a pleasure to use. □

We would like to hear comments from our readers on the subject of copying programs — protection or piracy? Send to:
READER COMMENT
P.O. BOX 23
WORCESTER, MA 01603

NEW POWERFUL PRODUCT!

SEE YOUR DEALER!

FOR ATARI 400/800 HOME COMPUTER

OMNIMON!™

A RESIDENT MONITOR

Software: DAVID YOUNG
Hardware: BILL WILLIAMS

- OMNIMON! is **resident**. It is a PC board which installs permanently into your computer but requires no user memory. Resides in unused $C000 page.
- OMNIMON! gives you **complete control**. Interrupt, examine and manipulate any program in memory or on disk! Enter monitor with SELECT/SYSTEM RESET.
- OMNIMON! can aid **recovery** from errors and glitches! Very **user friendly**!
- OMNIMON! has **flexible disk I/O** independent of DOS. Supports SD or DD and sequential or linked modes. Load DOS file, boot record or edit sector data! Create a sector map of any file or boot disk. Dump memory to disk.
- OMNIMON! has many **debugging tools**: display/alter memory or 6502's registers, disassembler, search memory, single step, printer dump, etc.
- OMNIMON! — TM of CDY Consulting 214-235-2146, 421 Hanbee, Richardson, TX 75080. **Dealer inquiries solicited**. Price: **$99.95**. ATARI is TM of ATARI, Inc.

MACHINE LANGUAGE UTILITIES

for ATARI 400/800/1200.

VERVAN Software

Vervan utility programs require no software modifications and are a must for all serious ATARI BASIC programmers.

CASDUP 1.0 & 2.0 To copy most BOOT tapes and cassette data files. 1.0 is a file copier. 2.0 is a sector copier. Cassette only $24.95

CASDIS To transfer most BOOT tapes and cassette data files to disk. Disk only $24.95

FULMAP BASIC Utility Package. VMAP-variable cross-reference, CMAP-constant cross-reference (includes indirect address references), LMAP-line number cross-reference, FMAP-all of the above. Will list "unlistable" programs. Also works with Editor/Assembler cartridge to allow editing of string packed machine language subroutines. All outputs may be dumped to printer. Cassette or Disk $39.95

DISASM To disassemble machine language programs. Works with or without Editor/Assembler cartridge. May be used to up or down load single boot files. All output can be dumped to printer. Cassette or Disk $24.95

DISDUP For disk sector information copying. May specify single sector, range of sectors, or all. Copies may be made without read varify. Disk $24.95

IJG products are available at computer stores, B. Dalton Booksellers and independent dealers around the world. If IJG products are not available from your local dealer, order direct. Include $4.00 for shipping and handling per item. Foreign residents add $11.00 plus purchase price per item. U.S. funds only please.

IJG, Inc. 1953 W. 11th Street
Upland, California 91786
Phone: 714/946-5805

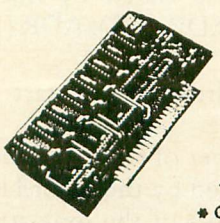
If it's from IJG IT'S JUST GREAT!

ATARI TM Warner Communications, Inc.

ATARI 400/800

48K

RAM BOARD



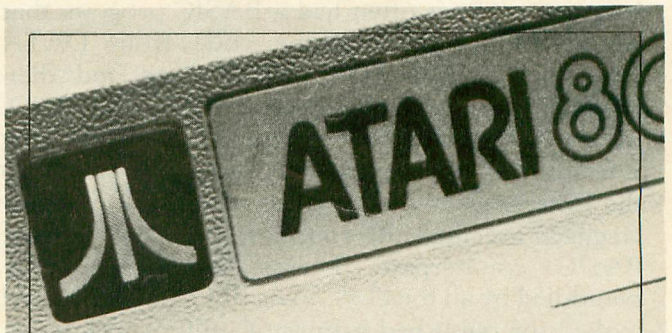
- 2 YEAR WARRANTY
- 200ns 64K DYNAMIC RAMS
- QUALITY COMPONENTS
- LOW POWER CONSUMPTION
- GOLD PLATED EDGE CONNECTOR
- CARTRIDGE DE-SELECT CIRCUITRY
- NO WIRING REQUIRED FOR THE 800
- 4 WIRE INSTALLATION FOR THE 400
- COMPLETE INSTALLATION INSTRUCTIONS

$129.95 Calif. residents add 6% sales tax

SEND CHECK OR MONEY ORDER TO:

NTI™ NEOTECHNIC INDUSTRIES INC.
P.O. BOX 277
REDONDO BEACH, CA. 90277

ATARI 400/800 are Trademarks of ATARI, Inc.



Learn to program the ATARI™ in 6502 Machine Language & BASIC.

Three new ATARI books for the serious programmer and beginner, are now distributed by IJG, for use with the ATARI 400 and 800 microcomputer systems.

ATARI BASIC, Learning By Using. This is an action book. You program with it more than you read it. You use it, you discover with it, you create it. Learn ATARI BASIC easily through the short programs provided. A great source of work problems for teacher or student. 73 pages. ISBN 3-92-1682-86-X $5.95.

Games For The ATARI. Provides ideas on how to create your own computer games. Contains primarily BASIC examples but, for very advanced programmers, a machine language example is included at the end of the book. 115 pages. ISBN 3-911682-84-3 $7.95.

How to Program Your ATARI In 6502 Machine Language. To teach the novice computer user machine language, the use of an assembler, and how to call subroutines from the BASIC interpreter. 106 pages. ISBN 3-92 1682-97-5 $9.95.

IJG products are available at computer stores, B. Dalton Booksellers and independent dealers around the world.

If IJG products are not available from your local dealer, order direct. Include $4.00 for shipping and handling per item. Foreign residents add $11.00 plus purchase price per item. U.S. funds only please.

IJG, Inc. 1953 W. 11th Street
Upland, California 91786
Phone: 714/946-5805

If it's from IJG IT'S JUST GREAT!

ATARI TM Warner Communications, Inc.

TOTAL STRING SEARCH

16K cassette 24K disk

by Jerry Tucker

The introduction of an ATARI 800 into my life certainly gave new meaning to my concepts of entertainment, education and free time. Just like everyone else that first makes the big plunge, I OD'd on games for the first month. I tinkered around with BASIC and removed my hat in awe whenever that mystical entity "MACHINE LANGUAGE" was mentioned. I did my best to learn BASIC and used it exclusively for all my programming attempts (after all, I was a practical man and realized my limitations). Following two or three extensive programming projects I began to notice some of the inherent limitations of programming strictly in BASIC. I also noticed quite a few assembly language listings in monthly magazines for utilities that might possibly "spruce-up" my BASIC programs. The machine language routines often had a BASIC program that would READ the machine code from DATA statements with a FOR..NEXT loop and then POKE it into PAGE 6 or inserted it into a STRING. My curiosity got the best of me and I started entering a few into my magic machine. I was duly amazed at the difference in the speed at which the machine language executed the routines compared to their BASIC counterpart. I was, however, totally befuddled by all the PLA, STA, BEQ, and LDXs so I looked for published listings of utilities which met the needs of the program I was working on at the time.

The hammer fell when I began to develop a utility that was designed to store a large amount of data. The program was required to search all of the data for a term and then display that term and the associated data field. The program was completed with a minimum of difficulty, however, the BASIC search through the complete data file took almost two minutes. There were ways to speed up the search but most involved searching only a portion of the data field which would not always uncover a term that could be buried anywhere in the data. The logical solution was to use machine language for the search and call it from BASIC with a USR statement. I remembered reading a few articles on searches so I gathered all of them together and looked for a listing that was tailor-made for my program. They were all excellent programs and displayed their capabilities very graphically, but none would search through my data, find a term buried in that data and returns its location in such a manner that the associated data field could be displayed. As you might expect I was now hooked and so began my submersion into machine language.

I bought and read everything I could lay my hands on that related to 6502 machine language programming. I also chose an assembler and began to experiment with searches. After many long hours and trips into never-never land the "light came on at the end of the tunnel" and Listing 1 is the final result. I have included extensive comments to help the reader follow the logic and program flow. Parts of the code might appear to be extra steps, but this was done to keep the program RELOCATABLE. This allows the use of a STRING for storage, and frees PAGE 6 for other uses.

Listing 2 is a combination BASIC loader for the SEARCH code and a demonstration of its speed. It creates a long string of characters (A$) and asks for the input of a term (DT$) which is randomly placed within A$. You are then given the option of printing A$ or going right to the search. Be warned that if you choose to print A$ it will take a little time for all of those 10,000 characters to be printed. You will then be asked to enter any part of the entered term and when RETURN is pressed the search will begin. The machine language routine is called by line 160: C=USR[ADR(B$), CNT, ADR (A$), ADR (DT$), RL, DTL]

1. ADR (B$) is the address of the start of the machine language code.
2. CNT is the total number of records defined as the length of A$ divided by the record length.
3. ADR(A$) is the address of the long string.
4. ADR(DT$) is the address of the desired term.
5. RL is the record length.
6. DTL is the length of the desired term.

The program will return in the blink of an eye with the location of the LAST occurrence of the desired term.

"Ah ha!" you respond. "What if the record I want is not the last occurrence of the term?" This could happen if the routine was used with a phone list and the only term known was the first name. Listing 1

will return only the location of the last occurrence of the name. A solution is to print every occurrence of the desired term which is accomplished with the addition of the 17 assembly instructions in Listing 3. These PRINT codes are inserted in the "FOUND" section in Listing 1 and 5 other changes are also made to keep the program relocatable. The PRINT section uses the ATARI's resident machine language subroutine that prints to the screen. In order to use this addition you must format your records with a CHR$(0) (entered as a CTRL, [,]) as the last character. This signals the PRINT routine that the end of the record has been reached and to return to the search and look for another match. Listing 2 is not written to accomodate this requirement and will return some bizarre results if tried.

Listing 4 is a BASIC subroutine that will load the code that is generated by the combined SEARCH and PRINT program. The machine language is inserted into a string in a similar manner to Listing 1. The call from BASIC is also the same.

The frustrations and long hours are now behind me and I must say I totally enjoyed the development of these programs. Maybe I have only scratched the surface of machine language, but I have found a new direction for my programming efforts. □

•

Listing 1.

```
0100 ;  ****************************************
0110 ;  *     STRING SEARCH ROUTINE            *
0120 ;  *                                      *
0130 ;  *  BASIC CALL C=USR(ADR(B$),CNT,       *
0140 ;  *  ADR(SS$),ADR(DT$),RL,DTL)           *
0150 ;  *  CNT          =NUMBER OF RECORDS     *
0160 ;  *  ADR(SS$)     =SEARCH STRING ADDRESS *
0170 ;  *  ADR(DT$)     =DESIRED TERM ADDRESS  *
0180 ;  *  RL           =RECORD LENGTH         *
0190 ;  *  DTL          =DESIRED TERM LENGTH   *
0200 ;  *                                      *
0210 ;  ****************************************
0220 ;
0230      *=  $0650     ; REFERENCE ADDRESS.  THE PROGRAM
0240 ;                    IS RELOCATABLE AND IS PLACED IN
0250 ;                    A STRING (B$) IN THE DEMO.
0260 CNTLO = $CB       ;
0270 CNTHI = $CC       ;
0280 RLLO  = $CD       ;
0290 DTLLO = $CE       ; PAGE 0 LOCATIONS
0300 TEMP  = $CF       ; FOR ADDRESS STORAGE.
0310 SSLO  = $D0       ;
0320 SSHI  = $D1       ;
0330 DTLO  = $D6       ;
0340 DTHI  = $D7       ;
0350 YSAVE = $D8       ;
0360 FNDLO = $D4       ; STORAGE ADDRESS FOR
0370 FNDHI = $D5       ; LOCATED RECORD.
0380 ;
0390      CLD          ; CLEAR DECIMAL MODE
0400      PLA          ; NUMBER OF VARIABLES NOT USED.
0410      PLA          ;
0420      STA CNTHI    ;
0430      PLA          ;
0440      STA CNTLO    ;
0450      PLA          ;
0460      STA SSHI     ;
0470      PLA          ;
0480      STA SSLO     ; START PULLING VARIABLE ADDRESSES
0490      PLA          ; FROM THE STACK BY HI AND LO BYTE
0500      STA DTHI     ; AND SAVE THEN IN PAGE 0 FOR LATER
0510      PLA          ; REFERENCE. NOTICE THAT THE
0520      STA DTLO     ; ADDRESSES ARE REMOVED IN THE ORDER
0530      PLA          ; THAT THEY ARE TYPED BUT IN THE
0540      PLA          ; ORDER HI BYTE THEN LO. UNUSED HI
0550      STA RLLO     ; BYTES ARE REMOVED BUT NOT SAVED.
0560      PLA          ;
0570      PLA          ;
0580      STA DTLLO    ;
0590      LDA #0       ;
0600      STA FNDLO    ; CLEAR THE RETURN ADDRESS.
0610      LDA #0       ;
0620      STA FNDHI    ;
0630 ;
0640 ; START THE SEARCH
0650 ;
0660      LDX #0       ; GET THE REGISTERS READY.
0670 BEGIN LDY #0      ;
0680      LDA (DTLO),Y ; FIRST BYTE OF THE DESIRED TERM.
0690 SUBR1 CPX #0      ; 1ST CHAR OF DESIRED TERM?
0700      BNE NOSAVE   ; NO, CONTINUE COMPARISON
0710      STY YSAVE    ; SAVE INDEX TO SEARCH STRING
0720 NOSAVE CMP (SSLO),Y ; COMPARE IT TO THE SEARCH STRING.
0730      BNE SUBR2    ; <> SO INCREASE THE SEARCH STRING.
0740      INX          ; INCREMENT X, COMPARE IT WITH END
0750      CPX DTLLO    ; OF THE DESIRED TERM.
0760      BEQ FOUND    ; YES, HAVE MATCH AND MUST SAVE IT.
0770      INY          ; A MATCH SO INCREMENT BOTH.
0780      CPY RLLO     ; END OF RECORD HAS BEEN REACHED?
0790      BEQ SUBR3    ; YES, THEN GO GET ANOTHER RECORD.
0800      PHA          ; IF NOT, USE STACK TO SAVE DATA
0810      TYA          ; TO REUSE AFTER THESE GYRATIONS
0820      PHA          ; THAT INCREMENT THE DESIRED TERM
0830      TXA          ; FOR ANOTHER COMPARISON.
0840      TAY          ;
0850      LDA (DTLO),Y ; FINALLY!
0860      STA TEMP     ; SAVE THE NEW ADDRESS WHILE WE
0870      PLA          ; REESTABLISH THE VARIABLES.
0880      TAY          ;
0890      PLA          ; DISCARD OLD VALUE, FREE UP STACK.
0900      LDA TEMP     ; SET UP FOR ANOTHER COMPARISON.
0910      CLC          ; USE TRICK TO FORCE A BRANCH AND
0920      BCC SUBR1    ; STILL KEEP PROGRAM RELOCATABLE.
0930 ;
0940 ; RECORD FOUND
0950 ;
0960 FOUND PHA         ; STORE THE ACCUMULATOR ON STACK.
0970      LDA CNTHI    ;
0980      STA FNDHI    ; LOAD THE FOUND RECORD ADDRESS.
0990      LDA CNTLO    ;
1000      STA FNDLO    ;
1010      PLA          ; CLEAN OFF THE STACK.
1020      LDX #0       ; SET UP X REGISTER FOR NEXT TIME.
1030      CPX #0       ;
1040      BEQ SUBR3    ; ONCE AGAIN WE FORCE A BRANCH.
1050 ;
1060 SUBR2 CPX #0      ; SEE IF AT START OF DESIRED TERM.
1070      BEQ AGAIN    ;
1080      LDY #0       ;
1090      LDA (DTLO),Y ;
1100      LDX #0       ; RESET D.T. INDEX
1110 AGAIN LDY YSAVE   ; GET POINTER BACK,
1120      INY          ; INCREMENT THE Y REGISTER AND
1130      CPY RLLO     ; LOOKS FOR THE END OF THE RECORD.
1140      BNE SUBR1    ; WE'RE NOT AT THE END SO....
1150 SUBR3 LDA SSLO    ; THIS SECTION GETS NEXT RECORD.
1160      CLC          ; WE DON'T WANT ANY EXTRA NUMBERS.
1170      ADC RLLO     ; ADD RECORD LENGTH
1180      STA SSLO     ; AND STORE IT FOR REFERENCE.
1190      BCC SUBR4    ; CARRY CLEAR, SO DON'T INCREASE HI
1200      INC SSHI     ; IF WE'RE HERE WE INCREMENT SSHI.
1210 ;
1220 SUBR4 LDA CNTLO   ; LET'S CHECK IF WE HAVE LOOKED
1230      BNE SUBR5    ; THROUGH ALL THE RECORDS (CNT=0).
1240      LDA CNTHI    ; CHECK THE HI BYTE TO BE SURE.
1250      BEQ HOME     ; IF IT'S 0 TOO THEN WE'RE ALL DONE.
1260      DEC CNTHI    ; IF THERE ARE ANY LEFT THEN
1270 ;
1280 SUBR5 DEC CNTLO   ; DECREASE THE COUNT LOCATIONS.
1290      CLC          ; ONCE AGAIN WE CAUSE A BRANCH AND
1300      BCC BEGIN    ; KEEP THE ROUTINE RELOCATABLE.
1310 HOME RTS          ; IF WE'RE HERE, SEARCH COMPLETED.
1320      .END         ; THAT'S ALL FOLKS
```

Listing 2.

```
5 REM ** LISTING 2 OF "TOTAL STRING SE
ARCH" by Jerry Tucker:15 February,1983
**
10 DIM A$(10000),B$(200),D$(100),R$(1
),C$(50):CNT=1:RL=50
20 GRAPHICS 17:POSITION 3,10:? #6;"INI
TIALIZING...":GOSUB 160
30 A$="▽":A$(10000)=A$:A$(2)=A$:CNT=IN
T(LEN(A$)/RL)
40 ? "↰WHAT TERM WOULD YOU LIKE TO ENT
ER":INPUT D$:D$=LEN(D$):C$=D$
45 IF LEN(D$)>RL THEN ? "TOO LONG!":F
OR DELAY=1 TO 1000:NEXT DELAY:GOTO 40
50 Z=INT(RND(0)*CNT):ST=INT(Z*RL+1):LN
=ST+D$-1:A$(ST,LN)=D$
60 TRAP 150
70 ? "↰RECORD COUNT=";CNT:? :? CHR$(34
);C$;CHR$(34):? "HAS BEEN ENTERED AS":
? "A$(";ST;",";LN;")":POKE 752,1:?
75 ? "IF YOU WOULD LIKE TO SEE A$ PRES
S ▽";:INPUT R$:IF R$<>"Y" THEN GOTO 90
80 ? "A$ WILL NOW BE PRINTED":FOR I=1
TO 1500:NEXT I:? A$:FOR I=1 TO 200:NEX
T I
90 ? "↰";CHR$(34);C$;CHR$(34):? "HAS B
EEN ENTERED AS":? "A$(";ST;",";LN;")":
?
100 ? "NOW ENTER ANY PART OF THE TERM
AND     THE SEARCH WILL BEGIN":POKE 752
,0:INPUT D$:D$=LEN(D$):C=0
110 C=USR(ADR(B$),CNT,ADR(A$),ADR(D$)
,RL,D$)
115 IF C=0 THEN POSITION 10,10:? "ENTR
Y WAS NOT FOUND":POSITION 5,12:? "PRES
S  RETURN  TO TRY AGAIN";
116 IF C=0 THEN INPUT R$:D$="":GOTO 9
0
117 ? "↰"
120 ? "LENGTH OF A$=";LEN(A$):? :? "NU
MBER OF RECORDS=";CNT
125 ? :? CHR$(34);D$;CHR$(34);" LOCAT
ED IN RECORD ";CNT-C:?
130 SP=(CNT-C)*RL+1:? A$(SP,SP+RL-1):?
```

```
140 ? "HIT RETURN TO INSERT ANOTHER"
;:INPUT R$:D$$="":GOTO 40
150 ? " RECORD NOT FOUND":? :? :TRAP
40000:GOTO 140
160 I=1:SRCH=0
170 READ SRCH:IF SRCH=-1 THEN RETURN
175 POKE 708,RND(0)*250:POKE 709,RND(0
)*250
180 B$(I,I)=CHR$(SRCH):I=I+1:GOTO 170
1000 DATA 216,104,104,133,204,104,133,
203,104,133,209,104,133,208,104,133,21
5,104,133,214
1010 DATA 104,104,133,205,104,104,133,
206,169,0,133,212,169,0,133,213,162,0,
160,0
1020 DATA 177,214,224,0,208,2,132,216,
209,208,208,43,232,228,206,240,22,200,
196,205
1030 DATA 240,50,72,152,72,138,168,177
,214,133,207,104,168,104,165,207,24,14
4,219,72
1040 DATA 165,204,133,213,165,203,133,
212,104,162,0,224,0,240,17,224,0,240,6
,160
1050 DATA 0,177,214,162,0,164,216,200,
196,205,208,186,165,208,24,101,205,133
,208,144
1060 DATA 2,230,209,165,203,208,6,165,
204,240,7,198,204,198,203,24,144,156,9
6,-1
```

•

CHECKSUM DATA
(See p.46)

```
5 DATA 516,609,570,135,585,585,55,473,
430,487,180,931,131,637,315,6639
116 DATA 976,372,286,588,977,153,576,8
65,258,331,801,947,279,418,666,8493
1040 DATA 50,665,210,925
```

•

Listing 3.

```
0100 ;***********************************************
0110 ;*                                             *
0120 ;*  THIS IS A SCREEN PRINT ROUTINE THAT IS     *
0130 ;*  TO BE INSERTED IN LISTING 1 BETWEEN LINE 1010 *
0140 ;*  AND LINE 1020.                             *
0150 ;*                                             *
0160 ;*  YOU MUST ALSO ADD THE FOLLOWING            *
0170 ;*  LINES:                                     *
0180 ;*     375 PRINT=$F6A4                         *
0190 ;*     1284  LDY #0                            *
0200 ;*     1286  LDA (DTLO),Y                      *
0210 ;*  YOU WILL NEED TO CHANGE LINE               *
0220 ;*  920 AND 1300 TO READ :                     *
0230 ;*     920  SHORT BCC NOSAVE                   *
0240 ;*     1300  BCC SHORT                         *
0250 ;*                                             *
0260 ;***********************************************
0270 ;
0280 ;
0290 PRNT LDA #$9B    ; A CARRIAGE RETURN TO PUT A BLANK
0300      JSR PRINT   ; LINE BETWEEN RECORDS.
0310 ;
0320      LDY #$00    ; THIS IS REQUIRED TO KEEP THE
0330 START TYA        ; Y REGISTER INFO  INTACT WHEN
0340      PHA         ; GOING TO PRINT BECAUSE
0350      LDA (SSLO),Y ; THE PRINT USES BOTH REGISTERS.
0360 ;
0370      JSR PRINT   ; GO LET THE ATARI DO ITS THING!!!
0380 ;
0390      PLA         ; PUT THE Y REG INFO BACK IN USE
0400      TAY         ; AND GET ANOTHER LETTER TO PRINT.
0410      INY         ;
0420      LDA (SSLO),Y ;
0430      CMP #$00    ; SEE IF IT IS A CHR$(0)
0440      BNE START   ; IF NOT GO PRINT ANOTHER CHARACTER
0450                  ; OR IF IT IS A CHR$(0) WE GO ON
0460                  ; WITH THE MAIN PROGRAM.
```

•

Listing 4.

```
10 REM ** BASIC LOADER FOR SEARCH AND
SCREEN PRINT by Jerry Tucker:15 Februa
ry 1983 **
20 REM ** THE BASIC CALL IS C=USR(ADR(
C$),CNT,ADR(A$),ADR(D$$),RL,DRL) **
30 REM ** THE RECORD MUST BE FORMATTED
 WITH CHR$(0) AS THE LAST CHAR. **
40 DIM C$(170):I=1:SRCH=0:RESTORE 70
50 READ SRCH:IF SRCH=-1 THEN RETURN
60 C$(I,I)=CHR$(SRCH):I=I+1:GOTO 50
70 DATA 216,104,104,133,204,104,133,20
3,104,133,209,104,133,208,104,133,215,
104,133,214
80 DATA 104,104,133,205,104,104,133,20
6,169,0,133,212,169,0,133,213,162,0,16
0,0
90 DATA 177,214,224,0,208,2,132,216,20
9,208,208,66,232,228,206,240,22,200,19
6,205
100 DATA 240,73,72,152,72,138,168,177,
214,133,207,104,168,104,165,207,24,144
,225,72
110 DATA 165,204,133,213,165,203,133,2
12,104,169,155,32,164,246,160,0,152,72
,177,208
120 DATA 32,164,246,104,168,200,177,20
8,201,0,208,240,162,0,224,0,240,17,224
,0
130 DATA 240,6,160,0,177,214,162,0,164
,216,200,196,205,208,163,165,208,24,10
1,205
140 DATA 133,208,144,2,230,209,165,203
,208,6,165,204,240,11,198,204,198,203,
160,0
150 DATA 177,214,24,144,168,96,-1
```

•

CHECKSUM DATA
(See p.46)

```
10 DATA 733,29,822,691,952,447,878,242
,394,545,681,81,423,410,724,8052
```

•

CompSoft ATARI

SPECIALIZING IN DISCOUNTED SOFTWARE

	List	Our Price
Adventure International		
Preppie (D/C)	$29.95	$22.50
S.A.G.A. Adventures (D)	39.95	29.95
Automated Simulations		
Invasion Orion (D/C)	$24.95	$18.95
Temple of Apshai (D/C)	39.95	29.95
Rescue of Rigel (D/C)	29.95	22.50
Atari		
Caverns of Mars (D)	$39.95	$27.95
Centipede (R)	44.95	29.95
Pac Man (R)	49.95	31.95
Star Raiders (R)	49.95	31.95
Atari Program Exchange		
Eastern Front (D/C)	$29.95	$22.50
My First Alphabet (D)	34.95	25.95
Broderbund		
Atari Panic (D)	$29.95	$22.50
Choplifter (D)	34.95	25.95

AND MUCH MORE!
Write for complete catalog

Compsoft
P.O. Box 2163, Glenview, Illinois 60025
(312) 777-5388
Hours: 9:00 a.m. - 6:00 p.m., Mon.-Sat.

No shipping or handling charges
No additional charge for VISA/Mastercard
Illinois residents add 6% sales tax

ATARI® IS A REGISTERED TRADEMARK

DATABASE SYSTEMS FOR THE ATARI

A Comparative Review

by Richard E. Herring

FileManager +
Synapse Software
820 Coventry Road
Kensington, CA 94707
40K BASIC $99.95

File-Fax
TMQ Software
82 Fox Hill Drive
Buffalo Grove, IL 60090
48K Machine Language $129.95

Data Perfect
LJK Enterprises, Inc.
P.O. Box 10827
Saint Louis, MO 63129
32K Machine Language $99.95

CCA Data Management System
CE Software
238 Exchange Street
Chicopee, MA 01013
40K BASIC $99.50

Along with wordprocessing and electronic spreadsheet applications, database systems are the most generally useful computer tools in an office, small business, or home management setting. Programs that allow the creation and manipulation of sets of data (databases) have a broad range of uses — from maintaining simple files like recipes and car expenses to complex business files such as accounts receivable and campaign contributions.

Database systems allow the user to establish a file, for example an address list. That file will be made up of records in a specific format which the user sets up. The record will consist of fields, each with a field name (like name, address, city, zip and phone) and a specified length. The database system will allow sorting the records to put them in the most useful order, searching for specific records or groups of records, and printing labels or columnar reports with each column representing a field.

There are four major database systems currently available for the ATARI computer. All are what would traditionally be called file management systems. Other types of database systems (multi-file, relational and network) allow the user to access more than one data file at a time. Although a variety of less sophisticated ATARI database systems are available, many of them are limited to specific tasks and do not have the flexibility and capabilities of the products described below.

General information about the four products is provided in Table 1. Note that throughout the tables included in this article, certain specifications are shown in brackets [ ] or parenthesis ( ). Brackets indicate functions to be contained in a new release, like *CCA DMS* version [4.2] to be released in 1983, while parenthesis mean that the text explains the feature more fully.

TABLE ONE — GENERAL INFORMATION

Feature	CCA DMS	Data Perfect	File-Manager +	File-Fax
Price	$99.50	99.95	99.95	129.00
Version	4.1 [4.2]	1.2	4D	2.0
Minimum memory required	40K	32K	40K	48K
Language (machine language subroutines)	BASIC•	Machine	BASIC•	Machine
Are error messages displayed?	Yes	Yes	Yes	Yes
Number of loads or programs	5(2 disks)	1	3	1
Does program use colorful displays?	No	No	Yes	No
Is program menu driven?	Yes	Yes	Yes	Yes
Is standard ATARI DOS used?	Yes	No	Yes	No
Is the program diskette copyable?	Yes	No	No	No
Maximum number of drives supported	2[4]	2	4	4

One of the most important features of powerful database systems is the quality of documentation provided. Ideal documentation would include a step by step tutorial which teaches the most commonly used commands, a glossary which lists and describes commands and functions alphabetically, a detailed index, a quick reference card which can be kept close at hand and a listing of the source code so the user can investigate the workings of the program and

modify it to fit specific needs. Table 2 compares the documentation available with the programs. None of the manuals fit the ideal — this is a case where quantity is an close as you get to quality.

TABLE 2 — DOCUMENTATION

Feature	CCA DMS	Data Perfect	File-Manager +	File Fax
Pages of documentation (size of page)	63 (8.5x11)	139 (8.5x11)	103 (6x9)	139 (6x9)
Is source code available and modifiable?	Yes	No	No	No
Is a quick reference card provided?	No	No	No	Yes

In all four cases, the written documentation contains sections which describe major program functions with examples. Most of the *CCA DMS* documentation is devoted to descriptions of cryptic messages, like "FMI 60," arranged in numerical order and not indexed by function. The bulk of the documentation for *Data Perfect*, *File-Fax* and *FileManager +* is divided into sections by program function. *Data Perfect's* manual is the only one which contains an index. *FileManager +* provides additional summaries of major operations and a command glossary. *File-Fax* is the only program which provides a quick reference card or which has help screens built into the program. However, they list only the commands used by all computer versions of *File-Fax* and not the ATARI-specific commands. The documentation for all four programs comes in high quality ring binders and all but *File-Fax* have tabbed sections.

The first limitations of a database system will be encountered when you have to decide just what information you are going to store and in what format the program will allow you to enter it. Basically, database systems allow you to create a form with labeled blanks. Each time you fill in the blanks, a record is created. You may create records until some limit (available RAM or disk space) is reached.

Table 3 shows the limits of each program's record and file management. *CCA DMS*, *Data Perfect* and *File-Fax* each limit the user to less than one full screen of data. *FileManager +* allows the data for each record to spread across parts of as many as nine pages (screens); however, many program functions allow the user to manipulate files based only on information contained on the first screen. To some people maximum record length, in order to fit in all the relevant data, is critical. But as records get longer, the maximum number of records in a file decreases, reducing the utility of maintaining a database.

Another characteristic which establishes the utility of a database system is the maximum number of fields allowed in each file. All four programs are well suited to handle name and address files which have short field lengths and few fields. If you will be creating files with a lot of text, *FileManager +* is a strong candidate, but if you need many fields, say to accumulate answers from a multiple choice/short answer questionnaire, then *Data Perfect* or *File-Fax* may be better. *File-Fax* is the only program which allows long field names, but the combined length of the field and its name can not be more than 40 characters. The other three programs limit you to short field names, which are later used for report headings.

TABLE 3 — GENERAL SPECIFICATIONS

Feature	CCA DMS	Data Perfect	File-Manager +	File-Fax
Maximum record length (characters)	249	511	2000	879
Maximum field length (characters)	110	127	100	40
Maximum number of fields per record	24	32	20	31
Maximum field name length	15 (+5 ID)	12	12	39
Maximum number of formulas per file	245 bytes	16	5	0
Maximum # of level breaks (subtotals)	1	4	0	1
Maximum # of database files on one disk	64	1	12	1
Maximum size of a database file	1 disk	1 disk	1 disk	4 disks

Usually if the field name is longer than the field, the heading will truncated when reports are printed. *CCA DMS* overcomes this by requiring the user to specify a five character ID. This ID is substituted for the field name of short fields when reports are printed. *Data Perfect* allows the user either to use field names or to specify any other headings when reports are printed. *File-Fax* requires that report headings be typed separately from field names.

Within each record, certain fields may be established to contain formulas. The user may create two fields, price and tax, so that when data is entered into the price field, the tax field (.05 times price, for example) is automatically calculated. Later when reports are printed, level breaks for subtotals may be inserted. *CCA DMS*, *Data Perfect* and *File-Fax* allows the user to choose whether or not to verify by the program. You simply tell the program that each time that the field "Purchaser Name" changes, it should subtotal all numeric fields (i.e. "Quantity," "Purchase Price" or whatever other fields you may have set up).

None of the programs except *File-Fax* will allow you to have a file larger than can fit on one diskette. *File-Fax* allows data files to span up to four diskettes, but you must have a corresponding number of disk drives. *Data Perfect* and *File-Fax* also limit you to only one data file, with corresponding report and label format files, on each disk. Both Programs use a non-standard DOS. *LJK* DOS allows a few extra bytes to be stored in each disk sector and

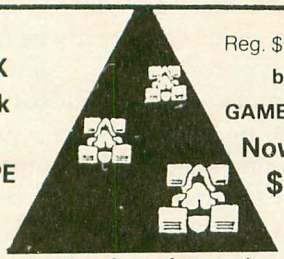
Royal Software

Make Royal Your ATARI® Source!

ATARI®

Over 1000 items for your Atari!

BAJA BUGGY



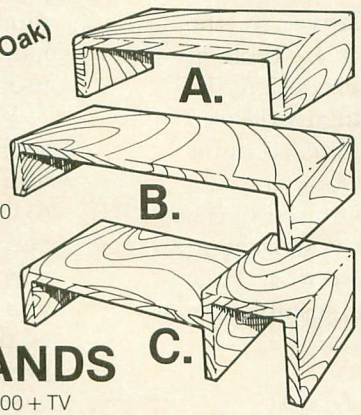
16K Disk OR TAPE

Reg. $32.95 by GAMESTAR

Now Only $29.60

If you're looking for a fast action driving game then we recommend this one. Good graphics and sound.

Sits over computer to hold your TV/Monitor.



Add $7.00 each for shipping.

T.V. STANDS

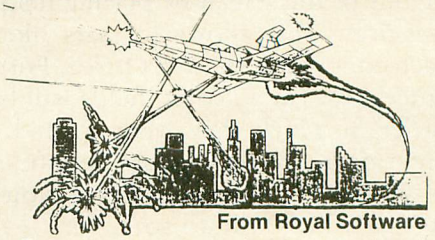
A. 800/400 + TV
B. 800/400 + 810 + TV
C. 800/400 + 2-Percoms + TV

A. = $29.95 B. = $39.95 C. = $44.95

METEOR STORM

16K Tape/Disk

NOW ONLY $29.95



From Royal Software

The city is about to be destroyed and ONLY you can save its people from destruction. FAST, arcade type action game.

FOOT BALL

★ Pass
★ Run
★ Kick

- One or Two Players
- 24K RAM Disk or Tape

Great Graphics Scrolling Field

Reg. $31.95

OUR PRICE $28.90

By Gamestar

INTRODUCING. . .

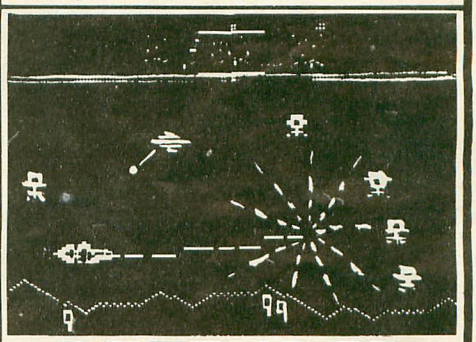
From Royal Software

48K DISK

$49.95

The most user-friendly mail maintenance program available! Here are a few of the outstanding features. . .

- New OS that offers fewer 'crashed-disks'-True random access-Store 500 to 2000 names/addresses per disk.
- Works on single or double density.
- Automatic delete of duplicates.
- Print a disk directory.
- Official state abbreviations are built-in.
- Make back-up copies. • Merge files
- Search files • Sort files
- Create sub-files • Print lables/file copy



DEFENDER

From Atari®

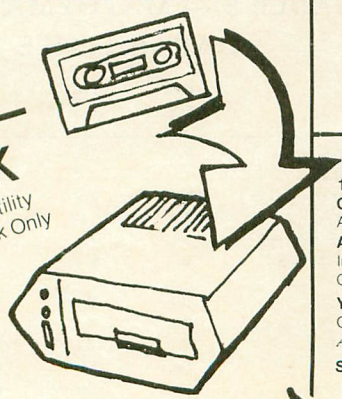
New!

- 16K Cartridge
- Super Excitement

Reg. $44.95 **NOW ONLY $39.50**

TAPE —TO— DISK

- A Disk Utility
- 32K Disk Only



BONUS!!!

- ★ Disk Speed Check
- ★ Screen Dump To Printer

From Royal Software

$29.95

BOOKS-BOOKS-BOOKS

1st BOOK OF ATARI, by Compute $12.00 each
Computes's 2nd BOOK OF ATARI
A collection of relevant articles from Compute Magazine.

ATARI TECHNICAL USERS NOTES, by Atari
Includes: Hardware manual, Operating system manual, Operating system source listing... Very Useful! $26.90

YOUR ATARI COMPUTER, by Lon Poole
One of the most comprehensive books on the Atari!
A must for the beginner. . . $16.95

SHIPPING NOTE: Add $1.00 per book for shipping.

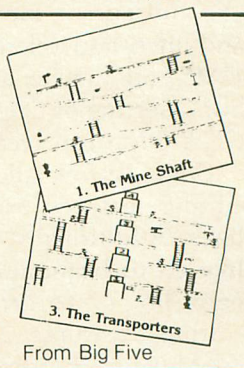
New!

MINER 2049er

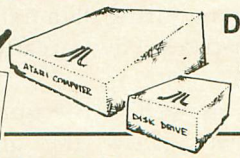
- 10 Different Screens
- 16K Cartridge
- Spectacular Sound & Graphics

Reg. $49.95

OUR PRICE ONLY $44.90



From Big Five



DUST COVERS

- 400/800 Computer
- 410 Recorder
- 810 Disk Drive

Only $8.95 Each

Free Catalog

Full of program descriptions
►WITH ANY ORDER◄ OR
SEND $1.00 Refundable with first order
Send us your name/address for Free Flyers!

We specialize in *ATARI Compatible Products*
So we know what works best!!!
Call for the latest info. . . (503)683-5361

Shipping: UPS, Parcel Post = $2.00—UPS Air = $3.90
Shipping on hardware & paper extra-Call for costs

Royal Software

2160 W. 11th Avenue
Eugene, Oregon 97402

48 Hour Shipping Available

For Credit Card Orders Call
1-800-452-8013

Open 8am - 6pm, Mon-Sat.

allows the program to run faster, but limits the number of files on each disk. *File-Fax's* DOS uses a data compression scheme which substantially increases disk storage capacity. Although *CCA DMS* will allow 64 files on a disk, several small files (for pointers, report formats, etc.) will be needed for each data file.

Capabilities of the programs relative to the creation and editing of files are shown in Table 4. *Data Perfect* and *File-Fax* let the user design the layout of the screen by placing fields in any desired position. This allows formats like three columns each containing ten short fields. Further, during data entry with *Data Perfect*, fields will be entered in the order in which they were created. If you want to enter data into the bottom field first and work your way up, *Data Perfect* allows you to establish a format which will do so.

TABLE 4 — CREATING AND EDITING RECORDS

Feature	CCA DMS	Data Perfect	File-Manager +	File-Fax
User designed screen mask?	No	Yes	No	Yes
All keyboard editing features allowed?	Yes	Most (+)	Most	Yes (+)
Edit or delete records individually?	Yes	Yes	Yes	Yes
Edit or delete records globally?	Delete	Yes	No	No
Are locked fields allowed?	Yes	No	No	No
Are repeating fields allowed?	No	Yes	Yes	(Yes)
Records saved to disk when entered?	Yes	Yes	Yes	Yes
Are you forced to have a back-up disk?	No	Yes	No	No

One of the real strengths of the ATARI is its advanced keyboard editing. This includes features like full cursor movement, insertion of characters and lines, and deletion of characters and lines, *CCA DMS* and *File-Fax* allow the use of all such features, but inserting or deleting lines during data entry with *CCA DMS* can create an incorrect record.

Data Perfect allows the use of all keyboard editing features except insertion and deletion of lines. Additionally, it provides several nice features like go to beginning of line, go to end of line and enter line up to cursor. *File-Fax* also provides extra editing features like home and back tab. *FileManager +* prevents inserting or deleting either lines or characters during data entry, but allows the use of those features when creating report or label formats.

Data Perfect, as well as the upcoming version of *CCM DMS*, will allow the global deletion of records. In other words, you could delete from a file all records in which the field "Zip Code" is 33333. Additionally, *Data Perfect* allows global editing. All products with a sale price of $29.95 could automatically be changed to $34.95.

Only *CCA DMS* allows the creation of locked fields — once data is entered into them, it cannot be changed without the field being unlocked. If you wanted to enter names and social security numbers into a customer file, someone else could later enter addresses and other data. You could prevent that person from accidentally changing a social security number by declaring it a locked field. On the other hand, *Data Perfect* and FileManager + allow the user to specify repeating fields.

When a blank screen mask appears for the entry of a new record, certain fields can already be filled in — you will not have to type those fields unless you want to change them. If you are entering addresses, ninety percent of which are in New York City, you could specify both the city and state fields as repeating and you would only have to enter those fields ten percent of the time. *File-Fax* can be set up to default to the previous data each time a new record is entered, but specific fields can not be selected. *File-Fax* also allows the user to choose whether or not to verify the accuracy of each record as it is entered.

FileManager+, *Data Perfect* and *CCA DMS* all have mathematical capabilities. Table 5 displays these in detail. All three programs allow the basic functions of addition, subtraction, multiplication, division, and exponentiation. Only *Data Perfect*, however, will allow you to place commas in long numbers. Both *FileManager +* and *Data Perfect* will recognize parenthesis in mathematical formulas as establishing priority of operation. Formulas in *CCA DMS* must be entered in the exact order in which operations are to occur. Although *File-Fax* can total numeric fields, it will not be able to accept formulas within fields until a planned utility disk becomes available.

TABLE 5 — MATHEMATICAL CAPABILITIES

Feature	CCA DMS	Data Perfect	File-Manager +	File-Fax
May one computed field reference another?	Yes	Yes	Yes	NA
Can program put commas in long numbers?	No	Yes	No	No
Do parenthesis set priority?	No	Yes	Yes	NA
# digits before defaulting to exponent	10	9	10	No limit
+ - *	Yes	Yes	Yes	No
Exponentiation	Yes	Yes	Yes	No
Square roots	No	Yes	Yes	No
Log, base 10	No	Yes	Yes	No
Log, base "e"	No	Yes	No	No
Sine, cosine and arctangent	No	Yes	No	No
Integer and absolute values	Yes	Yes	Yes	No
SGN (-1 for negative, 0 for positive)	No	No	Yes	No
RND	No	No	Yes	No
Boolean functions	No	Yes	No	No

A major advantage of an on-line database is that it allows you to search for and retrieve specific data. The less detail you have to remember about the data for the program to find it, the more powerful and

useful the program is.

Table 6 compares the search capabilities of the database systems. Searching by range of data means requesting such information from the file as all birthdays between October 15, 1949, and December 23, 1954. *FileManager +*, *File-Fax* and *Data Perfect* allow you to specify multiple levels like all files where the first name is Jim and the area code is 202. These three programs also allow wild card searches. You could add to the two criteria above the requirement that the last name start with an "H." *Data Perfect* and *CCA DMS* assign each record a number so you can also specify that as a search criterion.

TABLE 6 — SEARCH CAPABILITIES

Feature	CCA DMS	Data Perfect	File-Manager +	File-Fax
Search by range of data?	No	Yes	Yes	Yes
Maximum number of search criteria	1	9	5	31 (1/field)
Max number search criteria in 1 field	1	2	1	1
Are wild card searches allowed?	No	Yes	Yes	Yes
Can you search by record number?	Yes	Yes	No	No
Total fields in records found in search?	No	Yes	No	No
Print selected records during search?	No	Yes	Yes	Yes

Once data has been entered into a database system, the speed with which virtually any operation (searches, printed reports, etc.) is completed depends upon the physical ordering of the records in the file. Normally, records are saved in the order in which they are entered, not in alphabetical order. To make records more accessible, all database systems allow the records to be sorted. An accounts receivable file, for instance, may be sorted so that the records are in alphabetical order by the field "Company Name." If each company has several accounts, those may be placed in order by amount. In other words, there may be a primary sort of criterion, within which is a secondary criterion, within which...and so on. *CCA DMS* allows ten such sort criteria; and *File-Fax*, eight; twice as many as *FileManager +* or *Data Perfect*. All of the programs except *File-Fax* allow a subfile to be created easily from a larger database. From your original accounts receivable file, you could create a seperate file of accounts which are over ninety days old.

Sorts have two possible results. The individual records may be written to the disk in their new (sorted) order or a pointer file may be created. With a pointer file, the records are not written in the new order. Instead, a short file containing the positions of the records which the sort identified as first, second, etc. points to the records which are still arranged in the original order. It's like having a file cabinet where the folders are numbered instead of being in alphabetical order. When you want to find the file on aardvarks, you look up that word in a 3x5 index (pointer) file and find that the aardvark folder is number 702. The folders are not alphabetized — the index cards are and act as pointers. For the primary sort of criterion, both *Data Perfect* and *CCA DMS* rewrite the records in their new order. *FileManager +* and *File-Fax* create pointer files while leaving the records in the order in which they were originally entered.

The sort capabilities of the four database systems are shown in Table 7. The accuracy of a sort depends on the depth of the sort. Say you want to put an address file into alphabetical order by last name. The field "Last Name" is 25 characters long. You can alphabetize using all 25 characters, or just the first twelve, or five. As your data files grow longer, this is an important feature. The longer your file, the fewer characters the database system will sort on. With an address file of 100 records, you may be able to sort on a maximum of 255 characters. When that address file grows to 1100 records, the sort may be limited to twenty characters. All of the programs except *File-Manager +* interact with the disk as they sort, thus allowing sorts of more records than can exist in memory at one time. *File-Fax* always sorts on the entire field length, but, with some loss of speed, is able to do so even for an eight level sort.

TABLE 7 — SORT CAPABILITIES

Feature	CCA DMS	Data Perfect	File-Manager +	File-Fax
User controls depth of sort in a field	Yes	Yes	Yes	No
Sorts more files than memory can hold?	Yes	Yes	No	Yes
Maximum number of sort criteria	10	4	3	8
Allows creation of subfiles?	Yes	Yes	Yes	No
Ascending sorts (A-Z) allowed?	Yes	Yes	Yes	Yes
Descending sorts (Z-A) allowed?	Yes	Yes	No	No

Other than for casual uses of database systems, their most important feature is the ability to produce printed reports in useful formats. Table 8 gives a fairly self-explanatory comparison of report generation features. All four programs allow you to search for and print certain records from your file or the whole file. *Data Perfect* has the most flexible report features including the ability to edit a report format which was saved to disk, breaks between pages without sending printer control codes, the largest report title and the most subtotal levels. *Data Perfect's* report titles can have up to seven header lines (plus two detail lines), where each line is up to 127 characters. Not all printer control codes have to be included in that title format as they do with *File-Manager +*. *File-Fax* reports can be listed to the screen either with or without wrap around.

TABLE 8 — REPORTS

Feature	CCA DMS	Data Perfect	File-Manager +	File-Fax
Search allowed for report?	Yes	Yes	Yes	Yes
Can report format be saved to disk?	Yes	Yes	No	Yes
Can saved report format be edited?	No	Yes	NA	Yes
Allows sending printer control codes?	Yes	Yes	Yes	Yes
Change printer fonts within report?	No	Bold only	No	No
Can pages be automatically numbered?	Yes	Yes	No	Yes
Automatically breaks between pages?	(No)	Yes	(No)	Yes
Can user set # of lines between records?	No	Yes	Yes	Yes
Automatic dating of report by program?	No	Yes	No	No
Maximum width of printed report	150	127	132	132
Maximum # of characters in report title	120	7 lines	37	132
Maximum # of level breaks (subtotals)	1	4	0	1
Can report be listed to screen?	Yes	Format only	Yes	Yes
If report is listed to the screen, are fields broken in the middle?	No	NA	Yes	No

A specific type of report often used is the preparation of labels — commonly for mailing. Lables require that the fields to be printed be stacked one above the other rather than printed in the usual columns. Each of the four programs allows easy formatting and printing of labels. Features related to labels are shown in Table 9.

TABLE 9 — LABELS

Feature	CCA DMS	Data Perfect	File-Manager +	File-Fax
User designs layout of fields on label?	Yes	Yes	Yes	Yes
Maximum number of fields on label	24	32	(20)	31
Search allowed for label?	Yes	Yes	Yes	Yes
Print labels on specified conditions?	Range only	Yes	Yes	Yes
Is totaling allowed on break fields?	No	Yes	No	Yes

File-Fax allows you to toggle to the data entry screen, "pick-up" any field, and then drop it on your label format screen. One convenient feature of *File-Manager* + is that when you are setting up either label or report formats, you only have to type the first letter or two of the name of each field to be printed. The program matches the letters with its list of field names and completes the typing for you. All *FileManager* + fields which are to appear on labels must be on the first page (screen) of the record. (Remember that *FileManager* + records may be up to nine screens or 2000 characters long.)

Once you have built your database file and used it for a while, you will undoubtedly find that it needs to be modified. A certain field will have become unnecessary and will be occupying valuable space. Or you will think of another field that should be included and wish that you could go back and add it without reentering all of your data. You might even want to merge two existing files with the same or similar formats into one big file.

Table 10 shows which modifications each database system allows. An upcoming *File-Fax* utility disk will allow existing databases to be modified. All of the programs except *File-Fax* require that database files be packed in order to get rid of deleted records. During the editing process, deleted records are merely flagged. They are not erased from the disk file because that would leave a hole in the middle of your data. Packing the file removes each deleted record and moves the following files forward into the blank spack. *File-Fax* automatically packs data files without requiring a separate step.

TABLE 10 — MODIFY EXISTING DATABASE

Feature	CCA DMS	Data Perfect	File-Manager +	File-Fax
Can database files be merged?	Yes	Yes	Yes	No
Pack database (remove deleted records)?	Yes	Yes	Yes	Automatic
Can fields be renamed?	No [Yes]	Yes	Yes	No
Can field length be changed?	No [Yes]	Yes	Yes	No
Can fields be added or deleted?	No [Yes]	Yes	Yes	No

A final topic which concerns many users is compatibility. What other software will work with the program? What peripheral devices? And, is there any chance of transferring the data file to another computer?

Table 11 shows the compatibilities of each of the database systems. Compatibility with a word-processor means that the database file can be read and used by the wordprocessor. For instance, you might prepare form letters to "Dear (Field 1)". When the wordprocessor prints your letters it will read your database file, insert field 1 — hopefully someone's name — in the proper place and continue printing the letter. The body of the letter might contain other references to fields in the database file, such as amount of purchase, which would also be inserted. Once the first letter is printed, the word-processor will print another, this time using data from the second record in your database. Letters will continue to be printed until the last record is reached.

As supplied, none of the programs will work in double-density mode. Since your database is limited to the contents of one disk by all of the programs except *File-Fax*, a double density drive could effectively double the maximum file size possible. A *CCA DMS* user, however, has modified the note and point commands in that program to make it compatible with Percom double density drives. Those changes are apparently available through CE Software to owners who request them. The next upgrade of *File-Fax* will reportedly be compatible with Percom drives. The fact that a program is available for several computers does not mean that

data files will be compatible. It does, however, allow a user who switches to a different computer to work with a program which is familiar.

TABLE 11 — COMPATIBILITIES

Feature	CCA DMS	Data Perfect	File-Manager +	File-Fax
Can wordprocessor use database file?	No	Letter Perfect	[Text Wizard]	No
Compatible with Visicalc?	No [Yes one way]	No	[Yes]	[Yes]
Works with Bit 3 eighty column board?	No [Yes]	Yes	No	No
Will program work double density?	(Yes)	No	No	[Yes]
Works with Axlon Ramdisk?	No	No	Yes	No
Works with Macrotronics printer cable?	Yes	No	No	No
Version of program for Apple II?	Yes	Yes	No	Yes
Version of program for IBM PC?	No	No	Yes	Yes
Version of program for CP/M?	Yes	No	No	No
Version of program for Commodore 64?	No	No	[Yes]	Yes
Version of program for Osborne?	No	No	No	Yes
Version of program for NEC PC 8001?	No	No	No	Yes
Version of program for Victor 9000?	No	No	No	Yes
Result of exiting program?	Returns to BASIC	Boots new disk	Must turn off ATARI	Must turn off ATARI

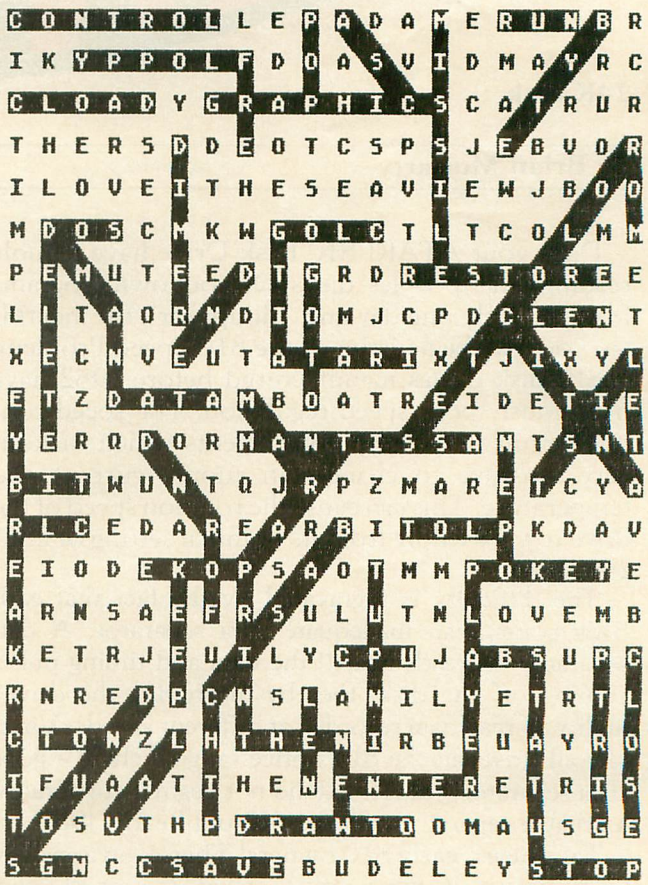
The next version of *CCA DMS* will allow the transfer of database files to *Visicalc*. (Transfer in the other direction will not yet be possible.) *FileManager+* will be compatible with the planned new version of *Text Wizard* (which probably will not be called Text Wizard II). Also, versions of *FileManager+* are planned for the Commodore 64 and the NEC 6000.

A new program from Synapse called *TrendManager* will be able to move data between the *FileManager+* and *Visicalc* formats. *TrendManager* is reportedly a statistical program (similar to *Visiplot/Visitrend*) which will allow six or more chart and graph formats. A planned *File-Fax* utility disk will allow files to be saved in formats compatible with *Visicalc* or Atari DOS. LJK's *Data Perfect* and *Letter Perfect* both use a non-standard DOS; however, a utility program ($29.95) is available to convert files between Atari DOS and LJK DOS.

If I were to design a database system with the worst features of all four programs, it would have the short documentation of *CCA DMS*, have the limited report formatting capabilities of *FileManager+*, and use the large number of disks (two per database file) that *Data Perfect* requires. Like *File-Fax*, it would have extremely limited mathematical capabilities and would be incapable of creating subfiles or of adding fields to or deleting fields from existing databases. Also, it would have *FileManager+'s* inability to save report formats and *CCA DMS's* occasional problems with error handling.

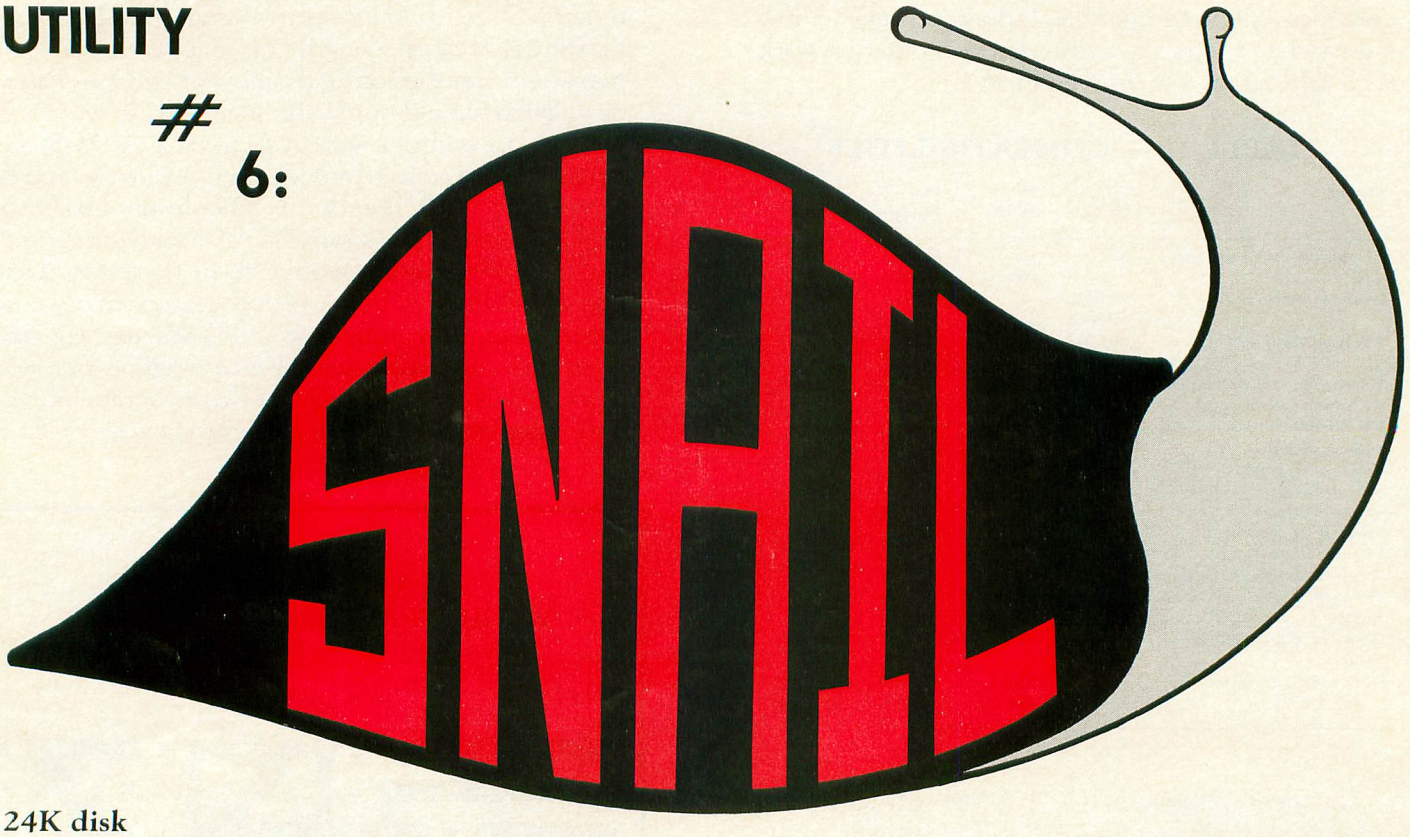
If I could design the same system picking the best features described above, it would have *CCA DMS's* copyable disk so that users could list, study and modify code to their hearts' content. The large maximum record length of *FileManager+* and maximum number of fields allowed by *Data Perfect* or *File-Fax* would surely be included. It would be able to sort on up to ten levels like *CCA DMS*, and would handle sorts to any depth like *File-Fax* and be compatible with the Bit 3 80-column board, as are *Data Perfect* and (soon) *CCA DMS*. *Data Perfect's* global editing feature would be in there too. Last, files could be used by a wordprocessor (that's *Data Perfect* and, hopefully soon, *FileManager+*), and would be compatible with *Visicalc* (either one-way like *CCA DMS* or through another program like the ones planned for *File-Fax* and *FileManager+*). □

Answers to the WORD SEARCH PUZZLE, (p.45)



Another ATARI Word Puzzle by Marcy Caruthers will appear in our next issue.

UTILITY # 6: SNAIL



24K disk

by Brian Moriarty

Does your ATARI 810 Disk Drive have trouble reading other peoples' disks? Do your own programs load perfectly one day and "disappear" the next? If so, you may be a victim of the 810 Speed Problem.

810 disk drives manufactured before 1982 have notoriously poor speed regulation. The speed control circuit uses cheap components which make it very sensitive to changes in supply current and temperature. This can cause the rotation speed of the drive to vary wildly from its nominal setting of 285-290 RPM.

The difficulty is aggravated by the fact that early 810s contain an inadequate data separator. A data separator "spreads apart" the data and timing pulses coming off the disk, thereby improving the drive's ability to read data recorded at different speeds. Virtually all drives in the 810's price range include a good data separator; yet ATARI did not begin incorporating a reliable separator into the 810 until early 1982.

Take heart, early 810 owners! There's an easy way to find out if your drive speed is out-of-spec. **A.N.A.L.O.G. Computing** proudly presents The Snail — a highly accurate disk-drive tachometer that will help you diagnose and eliminate problems caused by ATARI's thrifty manufacturing.

Words of warning.

You will void the warranty on your 810 Disk Drive if you open it up to adjust the speed. This includes both the regular 90-day warranty and any extended service contracts you may have paid for. If the warranty has already expired, you can fool around with your disk drive all you want, secure in the knowledge that a service technician will get richer if you foul something up. **A.N.A.L.O.G. Computing** assumes no responsibility for damages resulting from the use of the Snail program.

Now that you've been properly warned, let's take a look at The Snail.

Suppose you want to find out how fast a wheel is turning. One way to do it would be to mark a spot on the rim of the wheel and count the number of seconds it takes for the spot to make one complete revolution. Dividing 60 seconds by this figure would give you the rotation speed of the wheel in revolutions per minute (RPM).

The Snail uses a similar technique to determine the speed of your 810. It tells the drive to read the first sector on a disk and records the access time in 60ths of a second (jiffies). Then it divides the access time into 3600 (the number of jiffies in a minute) to determine how fast the drive is spinning.

To assure accurate timings, The Snail averages the results of 32 consecutive readings before dividing. This "smooths out" the data enough to eliminate short-term speed variations that could produce misleading results.

No ATARI program is complete without a nifty graphics display. This program uses player/missile graphics to draw a multicolored "snail" on your TV screen. The snail crawls along a line of RPM figures and changes color if your drive speed is outside the recommended range. The cute little snail is certain to delight small children — and how many disk utilities can make that claim?

Running the program.

After you've typed in and D:CHECKed the Snail program, save it on a disk. Then find an old formatted disk you don't care about, insert it into the drive you are testing and type RUN. After about three seconds your TV screen should look like this:

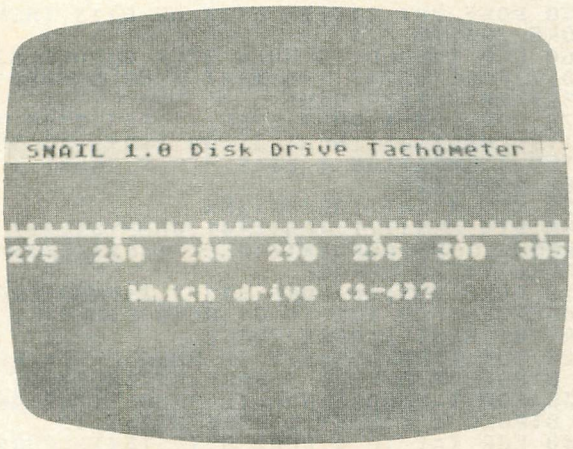


Figure 1.

Answer the "Drive Number?" prompt by typing 1, 2, 3 or 4 (no RETURN is necessary). The selected drive should start spinning and you will hear the steady beep-beep-beep of sectors being read. If the drive isn't connected properly, or the disk isn't formatted, or you type an illegal drive number, you'll get an error message along with a rude bleat from the console.

Soon the Snail will slide across your TV screen, dragging a white line along with him. When he stops, the pointer at the end of the line will indicate the average speed of your disk drive in revolutions per minute.

The optimum speed of an ATARI 810 Disk Drive is 288 RPM. As long as your drive speed remains near this value (285-290), the Snail will glow a healthy green. Faster or slower speeds will cause the Snail to turn red with anger.

To check another drive, or to abort the program, press the START key. Avoid touching the BREAK or SYSTEM RESET keys — these can cause the drive the spin helplessly until you turn off its power switch.

Adjusting your drive speed.

If the Snail is staying consistently "in the red," it's time to open up your drive and adjust the speed. The adjustment is an easy and relatively safe operation as long as you take your time. To do it, you'll need a penknife or safety razor, a medium-sized Phillips head screwdriver and a small flat screwdriver.

Clean your work area thoroughly to avoid contaminating the drive machanism. Then locate the four circular screw-hole covers on top of the 810 and carefully pry them out with the knife or razor. Use the Phillips head screwdriver to remove the four long retaining screws that hold the top cover in place. Gently lift the cover off the base of the drive and set it aside. Don't lose the screws!

You should now be looking into the raw, steaming guts of your 810. Avoid touching any of the wires or components inside the drive. And don't drop any foreign objects into the mechanism.

Your next task is to locate the potentiometer (knob) that controls the rotation speed of the drive. If you own a very early version of the 810, the speed potentiometer will be located near the back left side of the drive. It's a knurled plastic wheel, white or light blue in color, with a flat slot on the top (see Figure 2).

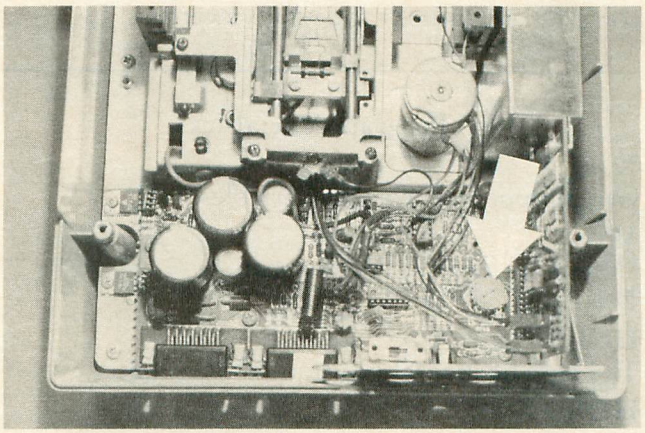


Figure 2.

In later versions of the 810, the speed control looks like a little green or blue box with a tiny screw on the top. You'll find it just left of center, a few inches away from the back of the drive (Figure 3).

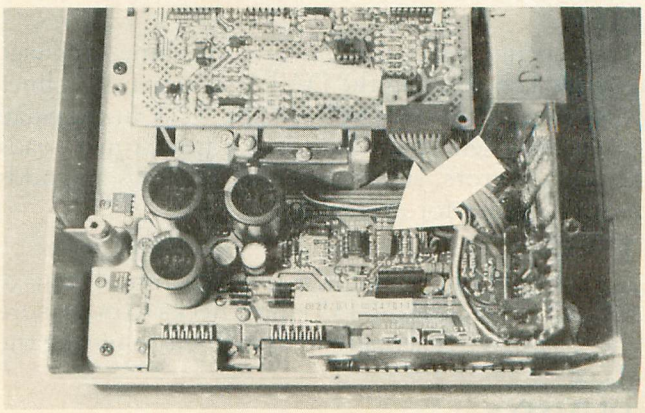


Figure 3.

Now you're ready to adjust the drive speed. Load the Snail program, insert a formatted disk into the opened drive and type RUN. Specify the proper drive number and wait for the snail to appear.

If your drive has a wheel-type speed control, carefully insert the end of your flat screwdriver into the slot on the wheel. Turn the wheel very slightly clockwise if the drive speed is too high (>290), or counterclockwise if the speed is too low (<285). Be patient; let the snail stabilize after each new adjustment. By carefully tweaking the wheel back and forth, you should be able to make the snail hover around the 288 mark. Replace the drive cover (did you lose the screws?) and the job is finished.

If your drive has a box-type control, insert the end of the screwdriver into the tiny screw on top of the box (you may need a very small screwdriver to do this). Turn the screw counterclockwise if the drive speed is too high, or clockwise if the speed is too low. This is a multi-turn potentiometer, so it may take several complete turns to make a significant difference. Let the drive stabilize after each adjustment, and keep tweaking the screw until the snail hovers comfortably close to 288 RPM. Replace the drive cover and congratulate yourself for your cleverness. □

Program Variables

X, Q, I
General-purpose working variables.

W
Horizontal direction of the snail.
1=RIGHT, -1=LEFT.

HNEW
The next horizontal position of the snail.

HOLD
The previous horizontal position.

PMPAGE
The first free memory page above the Snail program. Used to initialize player/missile graphics.

PMBASE
Absolute address of the first free byte in PMPAGE.

ML$
This string holds the 72-byte machine language routine contained in the DATA statements on lines 330-350. ML$ does 90% of the work in the Snail program; it sets up the built-in hardware timer, reads the disk sectors, stores the timer readings and adds them together for averaging.

TEST$
This 4-byte string holds a tiny machine language routine (PLA, JMP $E453) that checks to make sure the disk drive is actually working before testing the speed.

DUMMY$
A 128-byte dummy buffer for the resident disk handler. The address of this buffer is passed to the handler so that it won't overwrite anything important when it reads the disk.

WORK$
Used to store the 32 timer readings obtained by the machine language routine in ML$.

```
100 CLR :GRAPHICS 0:POKE 709,14:GOTO 2
00
110 X=USR(ADR(ML$),ADR(DUMMY$),ADR(WOR
K$)):IF X=0 THEN POKE 53248,0:POKE 532
49,0:POP :GOTO 100
120 Q=INT(3600/(X/32))-271:IF Q<3 THEN
 Q=3
130 IF Q>35 THEN Q=35
140 W=1:HNEW=Q*4+52:IF HNEW<HOLD THEN
W=-1
150 POKE 704,214:IF Q<14 OR Q>19 THEN
POKE 704,70
160 FOR I=HOLD TO HNEW STEP W:POKE 532
48,I:POKE 53249,I+8:NEXT I:HOLD=HNEW:P
OSITION 0,11:? "◆";
170 FOR I=Q-1 TO 0 STEP -1:POSITION I,
11:? CHR$(18);:NEXT I:FOR I=Q+1 TO 35
STEP 3:POSITION I,11:? "   ";:NEXT I
180 GOTO 110
190 REM * INITIALIZATION
200 DIM ML$(72),TEST$(4),DUMMY$(128),W
ORK$(32):PMPAGE=INT((PEEK(145)+3)/4)*4
:POKE 54279,PMPAGE
210 POKE 559,46:POKE 53277,3:PMBASE=PM
PAGE*256:FOR I=1 TO 72:READ B:ML$(I)=C
HR$(B):NEXT I:POKE 705,0
220 FOR I=PMBASE+570 TO PMBASE+574:REA
D B:POKE I,B:NEXT I:POKE 53248,24
230 FOR I=PMBASE+696 TO PMBASE+702:REA
D B:POKE I,B:NEXT I:POKE 53249,32
240 FOR I=1 TO 4:READ B:TEST$(I)=CHR$(
B):NEXT I:POKE 752,1:POSITION 3,8:? "
SNAIL 1.0 Disk Drive Tachometer"
250 POSITION 2,12:? "┼┼┼┼┼┼┼┼┼┼┼┼┼┼┼┼
┼┼┼┼┼┼┼┼┼┼┼┼┼┼┼┼
```

CHECKSUM DATA

(See p.46)

```
100 DATA 301,803,247,738,491,76,258,53
,710,481,540,638,933,953,266,7488
250 DATA 364,924,671,812,503,714,488,8
99,810,971,11,120,95,827,773,8982
400 DATA 356,800,1156
```

Assembly Language Listing

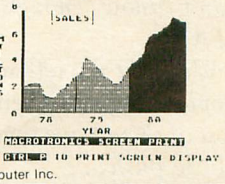
```
0100 ; SNAIL 1.0
0110 ; ATARI DISK DRIVE TACHOMETER
0120 ; (C)1983 ANALOG COMPUTING
0130 ;
0140 ; SYNTAX: X=USR(ML,B1,B2)
0150 ; ML=addr of this routine
0160 ; B1=addr of dummy disk buffer
0170 ; B2=addr of 32-byte work buffer
0180 ;
0190 ; Program equates
0200 ;
0210 BASIC = $D4     ; BASIC return addr
0220 POINTER = $CB   ; pointer to workbuffer
0230 TEMP =  $CD     ; temporary variable
0240 SYSTIM = $14    ; system jiffy timer
0250 CONSOLE = $D01F ; console key status
0260 DISKIO = $E453  ; disk handler entry
0270 DBUF =  $0304   ; disk buffer addr
0280 ;
0290     PLA         ; # arguments
0300     PLA         ; msb of disk buffer addr
0310     STA DBUF+1
0320     PLA         ; lsb
0330     STA DBUF
0340     PLA         ; msb of work buffer addr
0350     STA POINTER+1
0360     PLA         ; lsb
0370     STA POINTER
0380     CLD         ; clear decimal mode
0390     LDA #$00
0400     STA BASIC
0410     STA BASIC+1 ; clear BASIC return
0420     JSR DISKIO  ; bring drive up to speed!
0430 ;
0440 ; Read sector #1 32 times
0450 ;
0460     LDA #$1F
0470     STA TEMP    ; initialize index
0480 AGAIN
0490     LDA #$00
0500     STA SYSTIM  ; reset timer
0510     JSR DISKIO  ; read sector
0520     LDA SYSTIM  ; obtain access time
0530     LDY TEMP    ; and index
0540     STA (POINTER),Y ; save in buffer
0550     DEY
0560     BMI SUM     ; exit if buffer full
0570     STY TEMP    ; otherwise update index
0580     LDA CONSOLE
0590     CMP #$06    ; START key pressed?
0600     BNE AGAIN   ; no; get another sector
0610     RTS         ; otherwise exit
0620 ;
0630 ; Add up the timer readings
0640 ;
0650 ; BASIC return addr serves double duty
0660 ; as a temporary sum buffer
0670 ;
0680 SUM
0690     LDY #$1F    ; initialize index
0700 NEXTADD
0710     CLC
0720     LDA (POINTER),Y
0730     ADC BASIC
0740     STA BASIC
0750     BCC OKAY
0760     INC BASIC+1
0770 OKAY
0780     DEY
0790     BPL NEXTADD ; keep adding
0800     RTS         ; give sum to BASIC
```

ATARI®

GRAPHICS HARDCOPY
NOW FOR NEC & OKIDATA

Dumps anything on the screen of an ATARI 400/800 to a printer. All graphics & text modes. Players/missiles/scaling/grey scale/GTIA/more! Works with EPSON, NEC, Okidata, Centronics 739, IDS and Trendcom. Specify 800 or 400 and printer when ordering.

INCLUDES CABLE & SOFTWARE
850 MODULE **NOT** REQUIRED



(209) 667-2888
MACROTRONICS, inc.. C.O.D.
1125 N. Golden State Blvd.
Turlock, California 95380

PRESS CTRL P TO PRINT SCREEN DISPLAY

*ATARI is a registered trademark of ATARI Computer Inc.

ATARI®

PAYROLL SOFTWARE
FOR
THE ATARI® 800™

Miles Payroll System™ is an advanced and comprehensive payroll accounting system designed for businesses today. Cumulative totals are maintained for each employee, as well as complete reporting, check writing, and W-2 reporting. Some features include:

- Random access file organization for fast updating of individual records.
- Allows weekly, biweekly, semimonthly or monthly pay periods.
- Completely menu-driven and user-friendly.
- Regular, Overtime, Double time, Sick, Holiday, Vacation, Bonus and Commission earning categories.
- Payroll deductions include Federal W/H Tax, State W/H Tax, City W/H Tax, FICA, SDI, Group Insurance and 3 user-defined deductions.
- Tax sheltered annuity deduction capability for IRAs and other tax shelters.
- State and Federal Unemployment Insurance maintained.
- Complete file viewing and editing capability.
- Maintains up to 50 employees.
- Up to 10 user-defined Worker's Compensation classifications.
- Federal Tax tables may be changed in only 15 minutes each year by user when IRS changes tax.
- Table method used for State and City Tax, allowing compatibility with any state's or city's tax.
- Produces 15 different reports, including W-2 Forms Report.
- Checks calculated and printed automatically.
- PROGRAM ENABLING MODULE™ protects valuable payroll information from unauthorized users.
- 3 user-defined payroll deductions to accommodate customized needs such as savings, profit sharing, tax shelters, pensions, etc.
- Pay period, monthly, quarterly and yearly cumulative totals maintained for each employee.
- Automatic input error detection and recovery protects system from user-generated errors.
- Easy-to-follow, detailed, and comprehensive user's manual and tutorial leads the user step by step allowing anyone with little computer experience to easily operate the package. Includes index.
- Color, sound, and graphics utilized for user ease.
- Maintains employee pay history.
- Allows for manual payroll check writing.
- Packaged in a handsome 3-ring deluxe pocketed binder with 3 diskettes and manual.
- Reasonable price.

See your local store, or contact Miles Computing.

Miles™

MILES COMPUTING
7136 Haskell Ave. #204
Van Nuys, CA 91406
(213) 994-6279

Atari is a registered trademark of Atari, Inc.
Miles Computing, MILES PAYROLL SYSTEM, PROGRAM ENABLING MODULE are trademarks of Miles Computing, Van Nuys, California. Not affiliated with Atari, Inc.
$179.95. Requires 32K and two Atari® 810™ disk drivers. Payment in U.S. funds required with order. California residents add 6.5% sales tax. C.O.D. or prepayment only. Dealer inquires welcome.

OUR GAME

by Joel Gluck

Pssst. Hey you. Yeah, you. C'mere. A little closer...

I know you. You're the person who has always wanted to write a video game. You know some BASIC, and maybe you've even tried your hand at a game or two, but for some reason it never quite worked out.

Maybe you got bored with your idea. May you were disappointed with the results you were getting. Maybe you didn't know enough BASIC or enough about your ATARI.

Well, let me tell you something. I know hundreds of people like you. Their hearts are in the right place, and most of them have some really good ideas. All they need is a little push...

The Idea

A while ago I was offered the opportunity to write a column for A.N.A.L.O.G. Never one to turn down a great chance, I said "sure."

The problem was that I needed an idea for the column. Managing Editor Jon Bell suggested a few things, and one of them really caught my fancy; a column for people who are interested in writing video games.

Given that starting point. I began to think about "the ultimate column." How about a column that didn't only talk about writing video games, but developed one over a series of articles? Why stop there? Why not let the readers participate? They could send in ideas about anything; the general plot of the game, graphic and sound effects, game options, what the game should be called, any aspect at all. It would be a total collaboration between myself and the readers.

That's the idea. That's why this column is called *Our Game*.

Good Games

What makes a good video game good? Well, there are many different kinds of video games, so to be more specific, we'll be talking more about arcade-style games, and not so much about adventures, or computer chess, or card games.

A video game, like any game, should be fun. How much fun, you say? Well, it should be more fun than just watching television. When you sit down at a TV set to relax, you have a choice you can either sit back and watch, or you can tune on your computer and play a game. A video game should be enjoyable enough to convince you to turn on the computer.

Another test of a good game is the "replayability factor." A game may be fun, but does it keep you up playing 'til the wee hours? Does it make you say: "Aw, just one more game...?"

A good video game should take "a minute to learn and a lifetime to master." It should have complexities, but not more than your average 10 year-old can handle — unless, of course, the game is meant for small children. It shouldn't be too difficult or too easy; it should allow the novice to play a satisfying game, yet keep the experienced player from feeling he's done it all.

Many decent arcade games are unsuccessful because a first-time player loses too quickly. A well-designed game leaves the player satisfied with his performance, so that he wants to play again.

I/O

Input/output usually refers to the flow of data into and out of a device or a program. In video games, it can describe how the player interacts with the game. The input is the means of playing the game: the joystick, paddle, keyboard, keypad, track-ball, light-pen, or whatever. Output is the way the game talks back to the player, usually through graphics and sound effects (although I'm sure someone is working on video games that you can smell.)

Good input should be simple and feel natural. Would *Space Invaders* be as good if you had to type F-I-R-E on a keyboard, rather than pushing a button? A more realistic example is *Missile Command*: Doesn't the track-ball in the arcade version feel much more natural than the joystick in the home version?

Good output is not easy to achieve. Both graphics and sound must be appealing and dynamic. More significantly, they must be integrated. What good are a whole bunch of weird sound effects if an alien makes no noise when it blows up?

Another point about graphics: While great art isn't necessary, it is nice to have a variety of shapes and colors. The same applies to sound; I'm not demanding Mozart, but how about a little victory tune or some other music thrown in at appropriate times?

Output reaches its climax in "the special effect." Every good video game should have at least one

impressive special effect. In *Defender*, it's the huge explosion: in *Star Raiders*, it's "going into hyperspace." Although not strictly necessary, a good special effect can turn an "eh" game into a "wow" game.

All good home computer games should have a fairly elaborate introduction and conclusion, and good arcade games should have an eye-catching "attract mode" (what the machine does when nobody is playing it). Computer games should have plenty of options to keep players interested; the options should be simple to choose and convenient to enter.

A good video game should also be easy and fast to replay; you shouldn't have to sit through the instructions or list of options again. Neither should the game itself be too long. Take *Eastern Front*: It's a great game, but it takes hours to play, and you can't save the game and come back to it later. That's poor design.

The subject matter of a game is also important. A game may have all the attributes mentioned above, but if it's concerned with stamp collecting, I'd hardly be compelled to play. Furthermore, it's possible that a game can be too violent, or objectionable in other ways. A game based on destroying people in wheelchairs might not go over too well.

Separating the Pac-Men From the Boys

I can sum up the crucial element of a good video game in one word: originality. Any competent programmer can write yet another version of *Asteroids*, but the real genius is that of the original author.

Of course, I don't insist on *total* originality. *Galaxians* was based on *Space Invaders*, yet made a significant contribution of new ideas. *Galaga*, on the other hand...

This is not to say I refuse to play unoriginal games. I merely frown upon them. When I see another rehash of *Frogger*, for example, I say to myself "Boy, what a waste of creative energy!" Nothing sells as well, or is quite as impressive, as a new, original game.

Your Move

That about sums up what makes a good game. Do you disagree? I'm sure I missed *something*. Please write and tell me what you think.

Not only that, if you have any ideas for the game we're going to write together in the coming months, I'd like to hear them. Any important or trivial thing, whether it be an entire plot or simply a name (although it's a bit premature for that) will be warmly received.

Send your ideas, questions, and contradictions to:

Our Game
c/o A.N.A.L.O.G. Magazine
P.O. Box 23
Worcester, Mass. 01603

In most cases I won't be able to reply by mail, but I will try to include as much reader input as I can in future columns.

Next time we'll be discussing the steps for writing a video game, from the birth of the idea to the final touches. □

In addition to slaving away full time as a student at MIT in Cambridge, Joel has written several programs for the ATARI Program Exchange including ***Attank!, Babel,*** and ***fun-FORTH.***

ATARI PROGRAMS

FOR CASSETTE BASED SYSTEMS

DEPROGRAM II $69.95
Duplicate Any Problem Tape In Any Format (COPIES DOUBLE FILE FORMAT)
No Format Or Memory Limitations
Program Is In ROM
Requires TWO 410 Recorders
Interface Cable For Second Recorder Included
Includes All Deprogram I Functions

DEPROGRAM I $39.95
Duplicate Any Program Tape In Single File Format
Requires One 410 Recorder
Provides The Ability To Recover Data From Damaged Cassettes
Automatic Memory Size Adjustment
Boot Program

COMPUTER FURNITURE BY DEERFIELD
CT-1000 (COMPUTER DESK).... $179.95
Dimensions: 37½"x28"x26"
Shelving: 12½"x12"
CT-500 (COMPUTERTABLE)..... $99.95
Dimensions: 32"x20"x26"

is....

INTERFACE SYSTEMS...
1650 WASHINGTON AVENUE
CHARLOTTE NC 28216
704-334-8155

INCLUDE $1.50 FOR POSTAGE
NC RESIDENTS ADD 4% SALES TAX

ATARI, 400 ARE TRADEMARKS OF ATARI, INC.

ATARI®
MEANS BUSINESS

BUSINESS PACKAGES FOR $195.00 EACH

For the first time, Financial Software Plus introduces businesss packages for the Atari 400 or 800 computer that simulates business packages found on much larger and expensive computer systems. All our packages are written by an accountant-programmer and program designer so that you can be assured that our packages will meet your individual requirements.

INVENTORY

- Capacity of 500 part numbers, 250 customers, 250 vendors per disk.
- Maintains customer files, vendor files, and sales history by month and year-to-year date.
- Generates purchase orders, invoices, quotations, regular mailing labels, and shipping labels.
- Reports Include: Quantity in stock, quantity on order, backorder, reorder, and sales activity.
- Ability to limit reports by part numbers and vendor or both.

PAYROLL

- Capacity of 100 Employees per disk.
- User changeable tax codes-five different tax tables may be set up.
- Miscellaneous earnings and deductions categories are user specified and changeable at any time.
- Prints checks, W2's, month-end, quarterly, annual and tax reports.
- Fixed or variable deduction capability

COMMON FEATURES

- Will run on a one or two disk drive system at any time.
- All data disks are created automatically-unlimited storage capacity.
- All reports can be printed to the screen or printer-printer is optional.
- Can act as a stand alone package or a fully integrated system with our general ledger package.

Stop on down to your nearest dealer and ask for a demonstration.

Atari is a registered trademark of Atari Incorporated.

General Ledger, Accounts Payable, and Accounts Receivable Packages Available Soon.

FINANCIAL SOFTWARE PLUS

121 WEST CEDAR
KALAMAZOO, MICH. 49007
(616) 345-8546

DISTRIBUTOR AND DEALER INQUIRIES WELCOME

OMNIMON!
CDY Consulting
421 Hanbee
Richardson, Texas 75080
$99.95

by Brian Moriarty

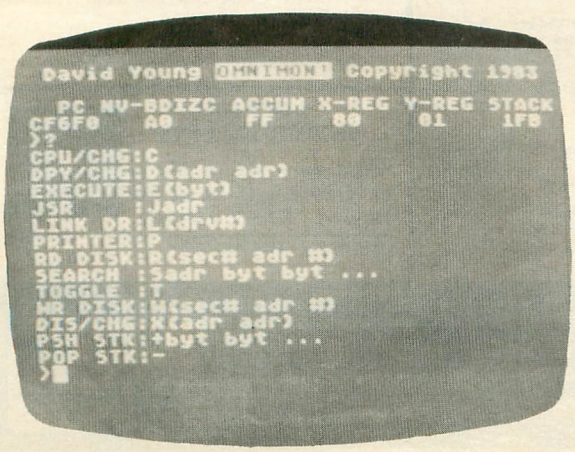
An advertising manager I know once joked that "today's product flaws are tomorrow's features." According to this definition, ATARI home computers are among the most feature-packed on the market. The 400/800 operating system in particular is full of quirky little "features" which 3rd-party suppliers have been successfully exploiting for years.

One of the most interesting flaws in the OS is the wasted 4K memory bank located at hex $C000. *OMNIMON!*, a new hardware product from CDY Consulting, replaces this otherwise useless memory area with a powerful ROM-resident system monitor, similar to the one included as standard equipment on other popular micros such as the Apple II.

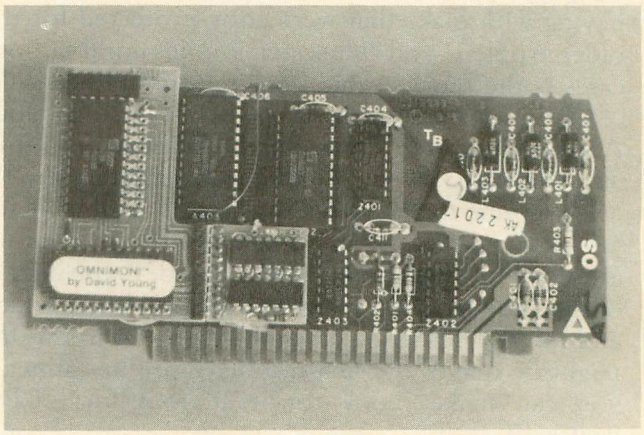
What it can do.

OMNIMON! is entered by pressing SYSTEM RESET while holding down either the OPTION or SELECT key. You can also activate it with a USR call out of BASIC, or by executing a JSR $C001 instruction in machine language. Once "inside," you can examine, search, disassemble and alter memory locations, monitor the 6502 registers and hardware stack, read and write individual disk sectors and keep printed records of your work. Best of all, you can access these functions whenever the computer is turned on, regardless of what other software may be running (including a cartridge).

The screen photo shows the *OMNIMON!* title display and a menu of all available commands. The menu can be reviewed at any time by typing the "?" character, a thoughtful touch which typifies the friendliness of the system. All of the most-needed monitoring and debugging functions are available. Many are reminiscent of those included in the ATARI Assembler/Editor cartridge.



The disk I/O commands are the most interesting part of the *OMNIMON!* system. They allow you to read any specified range of disk sectors into RAM, using either the 128 byte/sector boot format or the 125-byte/sector DOS format — in either single or double density mode! This means you can load and execute binary DOS files without using a DOS. *OMNIMON!* also lets you convert DOS files to boot files and vice-versa, a capability found only in the most expensive software-based disk management programs. Other possibilities include dumping any block of RAM, OS or cartridge ROM out to a disk and moving it back into RAM anywhere you like.



OMNIMON! checks the syntax of all user inputs and reverts to reasonable defaults if no parameters are specified. All of the ATARI's built-in screen editing functions are supported; you can use the "T" (Toggle) command to enter data in either hexadecimal or ATASCII characters.

Installation

It took less than five minutes to get *OMNIMON!* up and running on the 800 system in my office. First you pop open the lid, pull out the personality board in Slot #1 and discard its plastic cover. Then you pull out one of the OS ROM chips and plug the L-shaped *OMNIMON!* board directly into the empty socket. Solder a single jumper into place, replace the OS chip and personality board and you're ready to go. *OMNIMON'S* 16 page user's guide includes complete installation instructions for both the ATARI 800 and 400 computers. It cannot be used with the 1200XL system.

Compatibility.

The *OMNIMON!* board has behaved itself fairly well in the several weeks since I installed it. It appears to be fully compatible with all of the ATARI programming environments I tested, including the BASIC and Assembler/Editor cartridges, Microsoft BASIC, the ATARI Macro Assembler, OSS BASIC A+ and MAC/65, the ABC BASIC compiler and valFORTH.

I did run into trouble with a couple of copy-protected game disks. For instance, my review copy of *Pinhead* by Utopia Software refuses to boot properly on my modified 800; instead of initializing the game, the system makes a gurgling noise and jumps into *OMNIMON!*. A similar thing happens when I try to use *Disked* by Amulet Enterprises. Every time I answer a sector number prompt, the system drops out of BASIC and into *OMNIMON!*.

It's hard to say whether this behavior is being caused by the *OMNIMON!* board or by the offending software itself. The rarity of the phenomenon suggests that the programs are making illegal entries into the ATARI's resident disk handler, thereby interfering with *OMNIMON!*'s hooks into the operating system. This is similar to the problem owners of the new Apple IIe system are having with disks that were copy-protected for the older Apple II and II+ systems. The moral in both cases is the same: Avoid non-standard OS calls!

OMNIMON! can be a great addition to your ATARI computer if you know what to do with it. The ability to "freeze" a running program on-the-fly and examine the hardware registers is invaluable for testing and debugging; the sector-level disk functions are alone worth the price of the board. If you do lots of machine-language programming and know which end of the soldering iron to hold, *OMNIMON!* might be one of the smartest hardware investments you can make. Look for it at your local CDY dealer. □

A WARNING TO 1200XL OWNERS

If you own an ATARI 1200XL and typed in **Adventure in the 5th Dimension** from our last issue, you were in for a rude shock. The 1200XL operating system contains an insidious little bug which crashes the adventure every time you try to RUN it.

Unlike the ATARI 400 and 800 systems, the 1200XL is very picky about PRINTing to an OPENed screen device, especially when you're in a "forced" split-screen mode. The entire screen goes wacky if your PRINT statement makes the cursor enter the bottom text window. Try it yourself!

```
10 GRAPHICS 0
11 REM * Open the screen device (5:)
12 OPEN #2,8,0,"5:"
13 REM * Invoke forced split-screen
14 POKE 703,4
15 REM * Cursor to bottom of window
16 POSITION 39,19
17 REM * Print to the window
18 PRINT #2;"COMPATIBILITY"
```

Fortunately, the adventure program violates this undocumented restriction only once, in line 12. Since the purpose of line 12 is purely cosmetic (it puts a fancy white border across the top of the response window), the simplest way to deal with it is to eliminate it altogether.

We apologize for not discovering this problem before **The 5th Dimension** went to press. Please let us know about any other compatibility problems you may discover in the 1200XL systems.

NEW **THE MONKEY WRENCH II**
A PROGRAMMERS AID FOR ATARI 800
NEW AND IMPROVED — 18 COMMANDS

If you are a person who likes to monkey around with the ATARI 800, then THE MONKEY WRENCH II is for you!! Make your programming tasks easier, less time-consuming and more fun. Why spend extra hours working on a BASIC program when the MONKEY WRENCH can do it for you in seconds. It can also make backup copies of boot type cassette programs. Plugs into the right slot and works with ATARI BASIC cartridge.

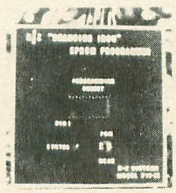
$59.95

The MONKEY WRENCH provides 18 direct mode commands. They are: AUTO LINE NUMBERING — Provides new line numbers when entering BASIC program lines. RENUMBER — Renumbers BASIC's line numbers including internal references. DELETE LINE NUMBERS — Removes a range BASIC line numbers.

VARIABLES — Display all BASIC variables and their current value. Scrolling — Use the START & SELECT keys to display BASIC lines automatically. Scroll up or down BASIC program. FIND STRING — Find every occurrence of a string, XCHANGE STRING — Find every occurrence of a string and replace it with another string. MOVE LINES — Move lines from one part of program to another part of program. COPY LINES — Copy lines from one part of program to another part of program. FORMATTED LIST — Print BASIC program in special line format and automatic page numbering. DISK DIRECTORY — Display Disk Directory. CHANGE MARGINS — Provides the capability to easily change the screen margins. MEMORY TEST — Provides the capability to test RAM memory. CURSOR EXCHANGE — Allows usage of the cursor keys without holding down the CTRL key. UPPER CASE LOCK — Keeps the computer in the upper case character set. HEX CONVERSION — Converts a hexadecimal number to a decimal number. DECIMAL CONVERSION — Converts a decimal number to a hexadecimal number. MONITOR — Enter the machine language monitor.

In addition to the BASIC commands, the Monkey Wrench also contains a machine language monitor with 16 commands used to interact with the powerful features of the 6502 microprocessor.

ATARI AND PET EPROM PROGRAMMER



Programs 2716 and 2532 EPROMs. Includes hardware and software. PET = $75.00 – ATARI (includes sophisticated machine language monitor) = $119.95

Eprom Cartridge- A.P.C. board and case which can be used in the ATARI 400 or 800 in the left or right slot. Uses 2532, 2732, or 2716 EPROMs. May contain up to 8K bytes. **$19.95**

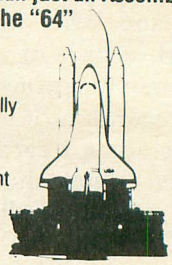
Memory Test- Make sure your RAM memory is normal. **$6.95** or **$9.95** on disk.

Typing Exercise- A typing drill program for beginners and experts. On disk. **$12.95**

More than just an Assembler/Editor!
Now for the "64"

MAE
for
PET
APPLE
ATARI
~~$169.95~~
New
Price
$99.95

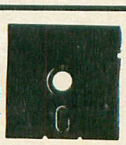
It's a Professionally Designed Software Development System



Blast off with the software used on the space shuttle project!

- Designed to improve Programmer Productivity.
- Similar syntax and commands — No need to relearn peculiar syntaxes and commands when you go from PET to APPLE to ATARI.
- Coresident Assembler/Editor — No need to load the Editor then the Assembler then the Editor, etc.
- Also includes Word Processor, Relocating Loader, and much more.
- Options: EPROM Programmer, unimplemented opcode circuitry.
- STILL NOT CONVINCED: Send for free spec sheet!

5¼ INCH SOFT SECTORED DISKETTES



Highest quality. We use them on our PETs, APPLEs, ATARIs, and other computers. $22.50/10 or $44.50/20

EPROMS 2716 = $4.50 2532 = $7.50

Eastern House

3239 Linda Dr.
Winston-Salem, N.C. 27106
(919) 924-2889 (919) 748-8446
Send for free catalog!

VISA* MasterCard

Necromancer

©1982 TIM BOXELL

First, restore the forests: Plant a glade of enchanted trees, and weave a network of ancient spells to protect them from hordes of attacking Troglodytes.

Another spell rallies the forces of nature around you. The very trees become your armies, marching into combat in the cavernous lairs of the Necromancer.

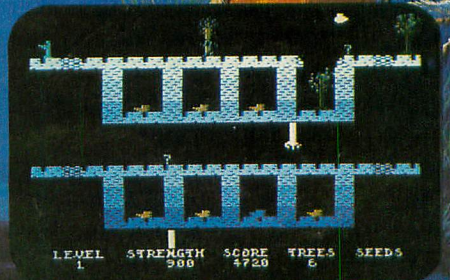
Then, meet the EVIL ONE himself in a cataclysmic final conflict in a silent grave yard, among the dead.

The fastest action, the newest graphics and a little bit of old-time magic. NECROMANCER by Bill Williams, the latest Instant Hit from Synapse. If unavailable from your dealer, send $34.95 plus $2 shipping to us direct.

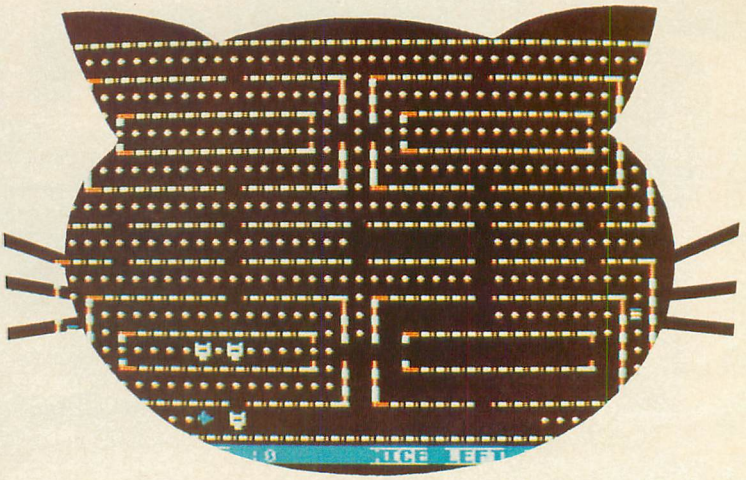
synapse

5221 Central Ave.
Richmond, CA 94804
(415) 527-7751

For the Atari 400/800® in 32K disk and cassette.
Available soon in 16K cartridge.



THE ATARI's FOUR COLOR CHARACTER SETS



16K cassette or 24K disk

by Dave Plotkin

The ATARI's ability to exploit redefined character sets is fairly well known to most users. Beginners may wonder why we bother with redefined character sets at all. After all, it's a lot of trouble (well, not really, but more trouble than PLOT and DRAWTO). You have to redefine each character either by hand (Heaven forbid!) or, more likely, using one of the many programs available for this purpose. Then you have to download the ROM character set into RAM, and modify the values of the bytes representing the letters which we want to change the shape of. While the step-by-step procedure for accomplishing this is amply documented elsewhere and is beyond the scope of this article, you can look at the program listing starting at line 32000 to see how it's done. The answer to why we bother is that the text modes are very powerful. Animation can be accomplished by simply printing characters to the screen. This is much faster than erasing and redrawing using PLOT and DRAWTO. It's also very easy to keep score right on the screen, since you are in a text mode. And, text modes take much less memory than the corresponding resolution graphic mode.

The limitation of using redefined character sets in GR.1 and 2 is that although five colors are available at once, each character can be only one color. You CAN get multi-color characters by artifacting a GR.0 character set. This is because each pixel in a GR.0 character is the same size as the pixels in GR. mode 8. A multitude of articles on artifacting GR.8 have appeared recently. Any of the methods of selectively placing pixels to obtain color that works in GR.8 will work when you redefine the GR.0 character set. You do lose half your horizontal resolution (plotting every other pixel), but more importantly, you lose your color indirection. Color indirection is the ability to change the value in a color register (using SETCOLOR) and have all the pixels on the screen plotted in that COLOR change to the new color. The colors generated using a redefined GR.0 character set (and GR.8) depend primarily on the background color, not on the values in the color registers.

Obviously, then, what we'd like to have is a character set of fairly high resolution (say, equivalent to GR.7) in which each character could be multicolored and redefinable. Your ATARI contains just such a set — in fact, two such sets — but they are a little hidden and you have to know where to look and how to call them. The first clue to the existence of the "hidden" character sets comes from study of the instruction set for the graphics chip in your ATARI known as "Antic." This instruction set is a set of numbers which tell Antic how to display the screen — which lines on the screen are to be in which graphics mode. A series of numbers chosen from the instruction set define the whole screen. This series is known as the Display List. Each time you issue the GRAPHICS N command, BASIC constructs a Display List for you to define the screen. Again, the full treatment of Display Lists is well beyond the scope of this article. For example, if the Display List contains a 2, Antic will put a line of GR.0 on the screen. Similarly, a 6 will tell Antic to put a line of GR.1 on the screen. But what happened to 3, 4 and 5?? Aha!! Antic modes 3, 4 and 5, also known as the Antic Instruction Registers (IR) are the three "hidden" sets. They are, of course, not hidden at all, but you can't call them from BASIC with a GRAPHICS N command. You have to construct the display list yourself, which CAN be done from BASIC.

We are going to concentrate on IR modes 4 and 5. IR mode 3 is a twist on GR.0 with some changes to accomodate lower case descenders. But IR modes 4 and 5 are 4 color character sets. These sets can add quite a lot of pizzaz to your programs. IR mode 4

characters are the same size as GR.0 characters, while IR mode 5 characters are twice as tall. The similarity in size between IR mode 4 and GR.0 characters presents the powerful possibility of designing and debugging a game entirely in GR.0 and only converting over to IR mode 4 after it is running (that's how CAT and MOUSE was written). One more note before proceeding into how to put IR modes 4 and 5 on YOUR screen. The normal ROM character set in you ATARI is almost unreadable in these modes. So if you want to do any scoring on the screen you'll either have to redefine the numbers so that they are readable, or better, leave a portion of the screen in GR.0, 1 or 2 so that scoring and information is readable on these lines. In CAT and MOUSE I left the very last line on the screen as GR.0.

The first step to setting up IR modes 4 and 5 is to call:

```
10 GRAPHICS 0
```

Then you have to find our where the Display List is in memory. The ATARI maintains a pointer in memory at locations 560(low byte) and 561(high byte). The pointer tells you where the Display List is. So the next statement is:

```
20 DL=PEEK(560)+PEEK(561)*256
```

Finally, you have to poke the correct values into the Display List to generate the screen you want. For IR mode 4:

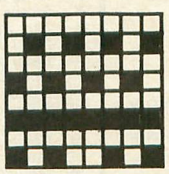
```
30 POKE DL+3,68:REM 68=64+IR MODE (4)
40 FOR A=6 TO 28:POKE DL+A,4:NEXT A
```

and for IR mode 5:

```
30 POKE DL+3,69
40 FOR A=6 TO 16:POKE DL+A,5:NEXT A
50 POKE DL+17,65:POKE DL+18,PEEK(560):
POKE DL+19,PEEK(561)
```

Line 50 is not necessary for the IR mode 4 Display List because the Display List for IR mode 4 is the same size (same number of lines on the screen) as the GR.0 Display List it replaces. The numbers POKEd in line 50 finish every Display List by telling Antic where to go back to find the beginning of the list. Since IR mode 4 and GR.0 have the same number of lines, the numbers in line 50 already finish the IR mode 4 Display List, they were put there when you called GR.0. But IR mode 5 characters are twice as tall, so there are fewer lines on the screen, and thus a shorter Display List. You therefore have to finish the Display List by putting in the necessary last line that tells Antic "all done, start over." Recall that if you decide to customize your display further by putting some lines of normal text on the screen, you have to follow the rules about total number of scan lines adding up to 192 (see *COMPUTE's First Book of ATARI*, "Designing your own ATARI Graphics Modes," by **A.N.A.L.O.G.** technical advisor Craig Patchett). Lines of GR.0 or 1 on an IR mode 4 screen are no problem, as they are the same height as IR mode 4. The same thing is true for lines of GR.2 on an IR mode 5 screen.

To specify the color of each pixel in the IR mode 4 and 5 characters is simple, although getting pleasing shapes and colors takes some experimentation. As you may already know, each letter is normally 8 columns (or pixels) wide. IR modes 4 and 5 break up the 8 columns of pixels into 4 columns of 2 pixels each. This reduces the horizontal resolution from the equivalent of GR.8 to the equivalent of GR.7. The color of each GR.7-sized block is determined by the way in which the 2 pixels in each group are lit. When neither pixel is lit, you get background color, register 4 (SETCOLOR 4). When only the right pixel is on, you get the color in register 0 (SETCOLOR 0). When only the left pixel is one, you get the color in register 1 (SETCOLOR 1). And when both the left and right pixels are on, you get the color in register 2 for regular letters and the color in register 3 for inverse letters. IR modes support inverse. The sketch below shows the enlarged layout of possible pixel patterns and the generated color. Note that the way the colors are defined is identical to how GR.7 defines its colors. Note also that IR mode 5 has the same horizontal and vertical resolution as GR.7, but IR mode 4 has the horizontal resolution of GR.7 and the vertical resolution of GR.8. You may wonder — is there a graphics mode with this same resolution? Yes there is, but you have to adjust a GR.8 Display List to get it...



No Pixels Lit: Background color
Right Pixel Lit: Color 1 (setcolor 0)
Left Pixel Lit: Color 2 (setcolor 1)
Both Pixels Lit: Color 3 or 4 (inverse)
Mixed: Left half color 2, right half color 1

As you can probably imagine, a fair amount of trial and error is necessary to get just the right shapes and color combinations, so plotting by hand and trying out the results in a program is pretty forbidding. Let me suggest therefore, that you pick up a copy of Sheldon Leemon's "INSTEDIT," one of the finest and most versatile character editors I've ever run across. It's available from the ATARI Program Exchange.

The game CAT and MOUSE is included to show you the versatility of IR modes 4 and 5. Note that there are no Player/Missile Graphics, no fancy screen PEEKs and POKEs, not even any machine

DISKEY

by Sparky Starks

Potential into practical reality. This is the core of DISKEY — a remarkable utility program that gives ATARI disk drive owners the flexibility to accomplish tasks that other utilities either ignored or only hinted at. With DISKEY, the user will be able to actually examine a disk and its directory, and repair some files that might otherwise have been lost. DISKEY also performs a multitude of other practical functions, including the following:

- ★ Automatically lists any unreadable or destroyed sectors
- ★ Sends contents of disk to printer selectively
- ★ Up to four separate drives may be addressed
- ★ Can be used to backup some of those "unbackupable" disks
- ★ Allows direct examination of any file
- ★ Over 50 separate key functions available

As an ATARI 400 or 800 owner, you have extraordinary power and versatility at your disposal. Tap into those resources effectively with DISKEY — new from Adventure International.

ATARI 400/800 32K DISK
052-0158 $49.95
(Note: Some features will require 40K)

SOME OF DISKEY KEY FUNCTIONS

A	Clear screen and filename
B	Byte compare, D1 to D2, OS to DS
C	Copy sectors, OD to DD, OS to DS
D	Toggle destination drive
E	Erase disk (format)
F	Select file sub-menu
L	Set automatic function lower limit (OS)
M	Modify Sector Map
N	New destination sector
O	Toggle originate drive
P	Print screen to printer
Q	Query (search for hex key, drive OD, sector OS to DS)
R	Read new OS, set DS to match
S	Search for ASCII key, drive OD, sector OS to DS
T	Tape to disk
U	Upper case conversion of printer lower case
V	Toggle write verify
W	Write memory buffer to sector DS, drive DD
X	Select EOR Sector Map screen print mask
Z	Zero memory buffer
+	Read upward, next sector on disk
–	Read downward
?	Directory information
!	Select directory sub-menu
cB	Byte compare, D1 to D2, whole disk
cC	Copy D1 to D2, whole disk
cD	Decimal to hex, ASCII conversion
cE	Erase disk (without new format)
cF	Modify sector forward sector chain reference
cH	Hex to decimal, ASCII conversion
cL	Locate bad sector on drive OD
cN	Modify sector file number reference
cO	Select one-drive functions sub-program
cP	Print current Disk Map
cR	RPM test drive OD
cS	Special file copy, no directory reference from source
cV	VTOC update and repair, drive OD
cY	Toggle Sure Response prompt enable
FA	File binary load address headers to printer
FD	Delete file
FF	Select filename for all file functions
FL	Lock file
FM	Show memory address load position in file
FQ	Relative Query
FR	Rename file
FS	Relative Search

BASIC ROUTINES FOR THE ATARI

by Jerry White

Finally, a self-help system that cuts through the stuffy technical jargon and allows the user to learn effective programming techniques fast! BASIC ROUTINES FOR THE ATARI has been written especially for ATARI 400 or 800 users who wish to write programs in BASIC. This package comes complete with an extensive manual and your choice of a tape or disk which contains all of the routines from the manual — which means you'll be able to actually see each of them in action on your ATARI. Some of the BASIC routines include joystick, sound, player missile strings and much more — and presented in a way that you'll quickly be able to learn and apply to your own programs.

If your programming ability lies somewhere between beginning and advanced, then look no further — BASIC ROUTINES FOR THE ATARI is the system for you.

BASIC ROUTINES book with 16K TAPE
051-0154 $24.95
BASIC ROUTINES book with 24K DISK
052-0154 $24.95

Published by Adventure INTERNATIONAL
a subsidiary of Scott Adams, Inc.
BOX 3435 • LONGWOOD, FL 32750 • (305) 830-8194

© COPYRIGHT 1982

To order, see your local dealer. If he does not have the program, then call 1 (800) 327-7172 (orders only please) or write for our free catalog.

language (except to download the character set, and I didn't write that, Alan Zett did). The game runs fairly quickly. I did make some concessions to BASIC's lack of speed, however. The sound is very simple, the strategy of the cats extremely single-minded, and the score is updated infrequently. Once you get the strategy, however, I think you'll find it fun to play. Couple of hints to get you started — the cats won't follow you past the edge of the screen, and if you keep a wall between your mouse and the cats, they just won't know what to do!

CAT AND MOUSE is a maze game. You control the mouse with your joystick. The object is to go around the maze, eating bits of cheese. You are diligently chased by three cats who will tenaciously follow you wherever you go. The mouse and cats travel at the same speed, so don't make any mistakes! At four points around the maze are large cheeses that allow your mouse to eat the cats for a while, getting extra points. When you eat the big cheese, the cats change color. A short warning tone tells you when the cats are about to change back to normal. Each new cat emerges from the center of the maze. They will not emerge when you are at the center, so don't worry. One of the nice features of the graphics is the moving walls of the maze. By merely exchanging the contents of two color registers, the walls appear to move. This same effect rotates the cat colors, changes the eyes of the scared cats from white to red and back again, animates the bits of cheese, and flashes the score on the bottom of the screen. Isn't color indirection wonderful?

DOCUMENTATION:

GAME VARIABLES —
TEMP — holds color register 0 (708)
Z1, Z — LOCATE variables
X,Y-coordinates of the mouse
ST — value of the joystick
XS,YS — offset of mouse
XN,YN — new coordinates of mouse
T — number of dots eaten
P,R,L — loop variables
SC — score
A(L) — status of cat; 0 then cat on board
AX(L), AY(L) — coordinates of cats
TEMPX, TEMPY — temporary coordinates of cat
DIRX, DIRY — direction cat is to move
FL(L), Z1(L) — keeps track of what is under the cats (like a cheese)
Q — counts down time till cats change back
CR — number of mice left

LINE DOCUMENTATION —
100 Rotates the screen colors
110 Check to see if mouse eats cats
120 Reads joystick
130 — 200 Move mouse, test for cheese eaten, keep score, test for eating the big cheese.
210 — 350 Logic for moving cats
500 — 560 Routine for mouse getting eaten
600 — 640 Routine for mouse eating the cats
700 — 720 Change the cats
900 — 930 End of game routine
1000 — 1040 Initializing routine to modify the display list.
1100 — 1350 Draw the board
32000 — 32111 Redefine the character set

```
1 PRINT CHR$(125);"INITIALIZING...":GO
SUB 32000:CLR :GOSUB 1000
90 POKE 53762,100
100 TEMP=PEEK(708):POKE 708,PEEK(709):
POKE 709,TEMP:LOCATE X,Y,Z:IF Z=27 THE
N GOTO 500
110 IF Z=16 THEN COLOR 64:PLOT X,Y:GOS
UB 600
120 POKE 53761,136:ST=STICK(0):XS=(ST=
7)-(ST=11):YS=(ST=13 OR ST=5 OR ST=9)-
(ST=14 OR ST=6 OR ST=10)
130 XN=X+XS:YN=Y+YS:IF XN>38 THEN XN=1
140 IF XN<1 THEN XN=38
150 POKE 53761,0:LOCATE XN,YN,Z:IF (Z=
17 OR Z=26 OR Z=5 OR Z=3 OR Z=18 OR Z=
124) THEN GOTO 210
160 IF Z=27 THEN COLOR 32:PLOT X,Y:GOT
O 500
170 IF Z=16 THEN COLOR 32:PLOT X,Y:X=X
N:Y=YN:COLOR 64:PLOT X,Y:GOSUB 600:GOT
O 210
180 IF Z=46 THEN T=T+1:SC=SC+10:GOTO 2
00
190 IF Z=9 THEN SC=SC+50:GOSUB 700
200 COLOR 32:PLOT X,Y:X=XN:Y=YN:COLOR
64:PLOT X,Y:IF T=418 THEN 800
210 FOR L=1 TO 3:LOCATE 19,11,Z1
220 IF A(L)=0 AND Z1=32 THEN IF INT(RN
D(0)*10)=0 THEN COLOR 27:AX(L)=19:AY(L
)=11:PLOT AX(L),AY(L):A(L)=1:GOTO 310
230 IF A(L)=0 THEN GOTO 310
240 LOCATE AX(L),AY(L),A
250 TEMPX=AX(L):TEMPY=AY(L):DIRX=SGN(X
-AX(L)):LOCATE AX(L)+DIRX,AY(L),Z1
260 IF (Z1=32 OR Z1=64 OR Z1=46 OR Z1=
9) THEN FL(L)=Z1(L):Z1(L)=Z1:AX(L)=AX(
L)+DIRX:GOTO 295
270 DIRY=SGN(Y-AY(L)):LOCATE AX(L),AY(
L)+DIRY,Z1
280 IF (Z1=32 OR Z1=64 OR Z1=46 OR Z1=
9) THEN FL(L)=Z1(L):Z1(L)=Z1:AY(L)=AY(
L)+DIRY:GOTO 295
290 GOTO 310
295 IF FL(L)=64 THEN FL(L)=32
300 COLOR FL(L):PLOT TEMPX,TEMPY:COLOR
 A:PLOT AX(L),AY(L)
310 NEXT L:IF Q=0 THEN GOTO 100
320 Q=Q-1:IF Q=5 THEN FOR B=1 TO 25:SO
UND 0,150,10,8:NEXT B:SOUND 0,0,0,0
325 IF Q>1 THEN GOTO 100
330 COLOR 27:FOR R=1 TO 3:IF A(R)=0 TH
EN GOTO 350
340 PLOT AX(R),AY(R)
350 NEXT R:GOTO 100
500 FOR P=1 TO 5:FOR W=1 TO 30:SOUND 0
,30,10,8:NEXT W
510 FOR W=1 TO 30:SOUND 0,50,10,8:NEXT
 W:NEXT P:SOUND 0,0,0,0
520 Q=0:CR=CR-1:IF CR=0 THEN GOTO 900
530 FOR L=1 TO 3:IF A(L)=0 THEN GOTO 5
50
540 COLOR Z1(L):PLOT AX(L),AY(L):AX(L)
=0:AY(L)=0:A(L)=0:FL(L)=32:Z1(L)=32
550 NEXT L:COLOR 32:PLOT X,Y
555 POSITION 13,23:? SC;:POSITION 30,2
3:? CR;
560 COLOR 64:X=19:Y=11:PLOT X,Y:GOTO 1
00
600 FOR P=1 TO 3:FOR W=1 TO 30:SOUND 0
,40,10,8:NEXT W:NEXT P
```

```
610 FOR W=1 TO 70:SOUND 0,30,10,8:NEXT
 W:FOR W=1 TO 30:SOUND 0,40,10,8:NEXT
W
620 FOR W=1 TO 60:SOUND 0,30,10,8:NEXT
 W:SOUND 0,0,0,0
630 FOR L=1 TO 3:IF AX(L)=X AND AY(L)=
Y THEN A(L)=0
640 NEXT L:SC=SC+200:POSITION 13,23:?
SC;:RETURN
700 Q=70:COLOR 16:FOR L=1 TO 3:IF A(L)
=0 THEN GOTO 720
710 PLOT AX(L),AY(L)
720 NEXT L:FOR W=1 TO 25:SOUND 0,W*A,1
0,8:NEXT W:SOUND 0,0,0,0:RETURN
800 FOR P=1 TO 4:FOR W=1 TO 30:SOUND 0
,35,10,8:NEXT W:NEXT P
810 FOR W=1 TO 70:SOUND 0,100,10,8:NEX
T W:SOUND 0,0,0,0:SC=SC+500
820 PRINT CHR$(125):T=0:GOSUB 1030:GOT
O 100
900 GRAPHICS 17:POSITION 0,5:PRINT #6;
"    YOU HAVE BEEN":PRINT #6;"      NI
CHE!":PRINT #6;"    FINAL SCORE"
910 PRINT #6;"    ";SC;" points.":PRIN
T #6;"       to play":PRINT #6;"  SPACE
 BAR PRESS fire"
920 IF STRIG(0)=1 THEN GOTO 920
930 GOSUB 1010:GOTO 100
1000 DIM A(5),AX(5),AY(5),Z1(5),FL(5)
1010 CR=3:SC=0:T=0
1020 GRAPHICS 0:POKE 752,1:POKE 756,PE
EK(106)+1:POKE 708,36:POKE 709,200
1030 FOR L=1 TO 3:A(L)=0:AX(L)=0:AY(L)
=0:Z1(L)=32:FL(L)=32:NEXT L:Q=0
1040 DL=PEEK(560)+256*PEEK(561):POKE D
L+3,68:FOR MM=6 TO 27:POKE DL+MM,4:NEX
T MM
1100 COLOR 46
1110 FOR X=1 TO 37:FOR Y=1 TO 21:PLOT
X,Y:NEXT Y:NEXT X
1120 COLOR 17:PLOT 0,0:PLOT 0,12:PLOT
2,2:PLOT 2,14:PLOT 4,4:PLOT 4,16
1130 PLOT 20,2:PLOT 20,14:PLOT 22,4:PL
OT 22,16
1140 COLOR 26:PLOT 4,6:PLOT 2,8:PLOT 0
,10:PLOT 4,18:PLOT 2,20:PLOT 0,22
1150 PLOT 22,6:PLOT 20,8:PLOT 22,18:PL
OT 20,20
1160 COLOR 5:PLOT 18,2:PLOT 16,4:PLOT
18,14:PLOT 16,16:PLOT 38,0:PLOT 36,2
1170 PLOT 34,4:PLOT 38,12:PLOT 36,14:P
LOT 34,16
1180 COLOR 3:PLOT 16,6:PLOT 18,8:PLOT
16,18:PLOT 18,20:PLOT 34,6:PLOT 36,8
1190 PLOT 38,10:PLOT 34,18:PLOT 36,20:
PLOT 38,22
1200 COLOR 18:PLOT 1,0:DRAWTO 37,0:PLO
T 3,2:DRAWTO 17,2:PLOT 21,2:DRAWTO 35,
2
1210 PLOT 3,8:DRAWTO 17,8:PLOT 21,8:DR
AWTO 35,8
1220 PLOT 5,4:DRAWTO 15,4:PLOT 23,4:DR
AWTO 33,4:PLOT 5,6:DRAWTO 15,6
1230 PLOT 23,6:DRAWTO 33,6:PLOT 1,10:D
RAWTO 37,10:PLOT 1,12:DRAWTO 37,12
1240 PLOT 3,14:DRAWTO 17,14:PLOT 21,14
:DRAWTO 35,14:PLOT 5,16:DRAWTO 15,16
1250 PLOT 23,16:DRAWTO 33,16:PLOT 5,18
:DRAWTO 15,18:PLOT 23,18:DRAWTO 33,18
1260 PLOT 3,20:DRAWTO 17,20:PLOT 21,20
:DRAWTO 35,20:PLOT 1,22:DRAWTO 37,22
1270 COLOR 124:PLOT 0,1:DRAWTO 0,9:PLO
T 0,13:DRAWTO 0,21:PLOT 2,3:DRAWTO 2,7
1280 PLOT 2,15:DRAWTO 2,19:PLOT 18,3:D
RAWTO 18,7:PLOT 18,15:DRAWTO 18,19
1290 PLOT 20,3:DRAWTO 20,7:PLOT 20,15:
DRAWTO 20,19:PLOT 36,3:DRAWTO 36,7
1300 PLOT 36,15:DRAWTO 36,19:PLOT 38,1
:DRAWTO 38,9:PLOT 38,13:DRAWTO 38,21
1310 COLOR 32:PLOT 11,2:PLOT 27,2:PLOT
 18,5:PLOT 20,5
1320 PLOT 11,8:PLOT 27,8:PLOT 4,10:PLO
T 11,10:PLOT 19,10:PLOT 27,10:PLOT 34,
10
1330 PLOT 4,12:PLOT 11,12:PLOT 19,12:P
LOT 27,12:PLOT 34,12
1340 PLOT 11,14:PLOT 27,14:PLOT 18,17:
PLOT 20,17:PLOT 11,20:PLOT 27,20
1350 COLOR 9:PLOT 1,4:PLOT 1,16:PLOT 3
7,4:PLOT 37,15
1355 POSITION 6,23:? "SCORE :";SC;:POS
ITION 20,23:? "NICE LEFT ";CR;
1360 COLOR 64:X=19:Y=11:PLOT X,Y:RETUR
N
32000 POKE 106,PEEK(106)-5:GRAPHICS 0:
START=(PEEK(106)+1)*256:POKE 756,START
/256:POKE 752,1
32010 DIM XFR$(38):XFR$="h▯♥▯LC▯MO▯L▯W2j
┴i▯h▯L♥▯LH▯KHP▯FL▯FW▯NIJPK♦"
32020 Z=USR(ADR(XFR$)):RESTORE 32100
32030 READ X:IF X=-1 THEN RESTORE :RET
URN
32040 FOR Y=0 TO 7:READ Z:POKE X+Y+STA
RT,Z:NEXT Y:GOTO 32030
32100 DATA 112,0,0,20,40,20,0,0,0
32101 DATA 256,48,48,252,255,60,48,0,0
32102 DATA 536,20,20,20,168,168,0,0,0
32103 DATA 552,0,0,0,168,168,20,20,20
32104 DATA 584,0,252,84,168,84,252,0,0
32105 DATA 640,195,255,255,235,255,255
,60,60
32106 DATA 648,0,0,0,21,21,40,40,40
32107 DATA 656,0,0,0,90,90,0,0,0
32108 DATA 992,20,20,20,20,40,40,40,40
32109 DATA 720,40,40,40,21,21,0,0,0
32110 DATA 728,130,170,170,130,170,170
,40,40
32111 DATA -1
```

•

CHECKSUM DATA
(See p.46)

```
1 DATA 959,46,879,679,486,167,120,721,
844,965,286,632,17,989,619,8409
230 DATA 394,1,785,113,385,124,719,655
,6,223,136,127,283,772,854,5577
500 DATA 655,911,930,133,276,151,950,5
16,663,648,717,214,692,734,747,8937
720 DATA 179,682,913,579,121,991,193,8
78,251,413,653,398,915,902,420,8488
1120 DATA 837,689,624,792,47,667,84,86
9,572,896,473,884,219,314,184,8151
1270 DATA 702,33,900,41,472,468,177,65
1,707,844,492,284,803,768,663,8005
32040 DATA 960,557,62,179,144,63,682,7
23,420,34,705,606,827,5962
```

•

WANT
TO
SUBSCRIBE?
CALL
TOLL FREE
1-800-345-8112
In Penna. 1-800-662-2444

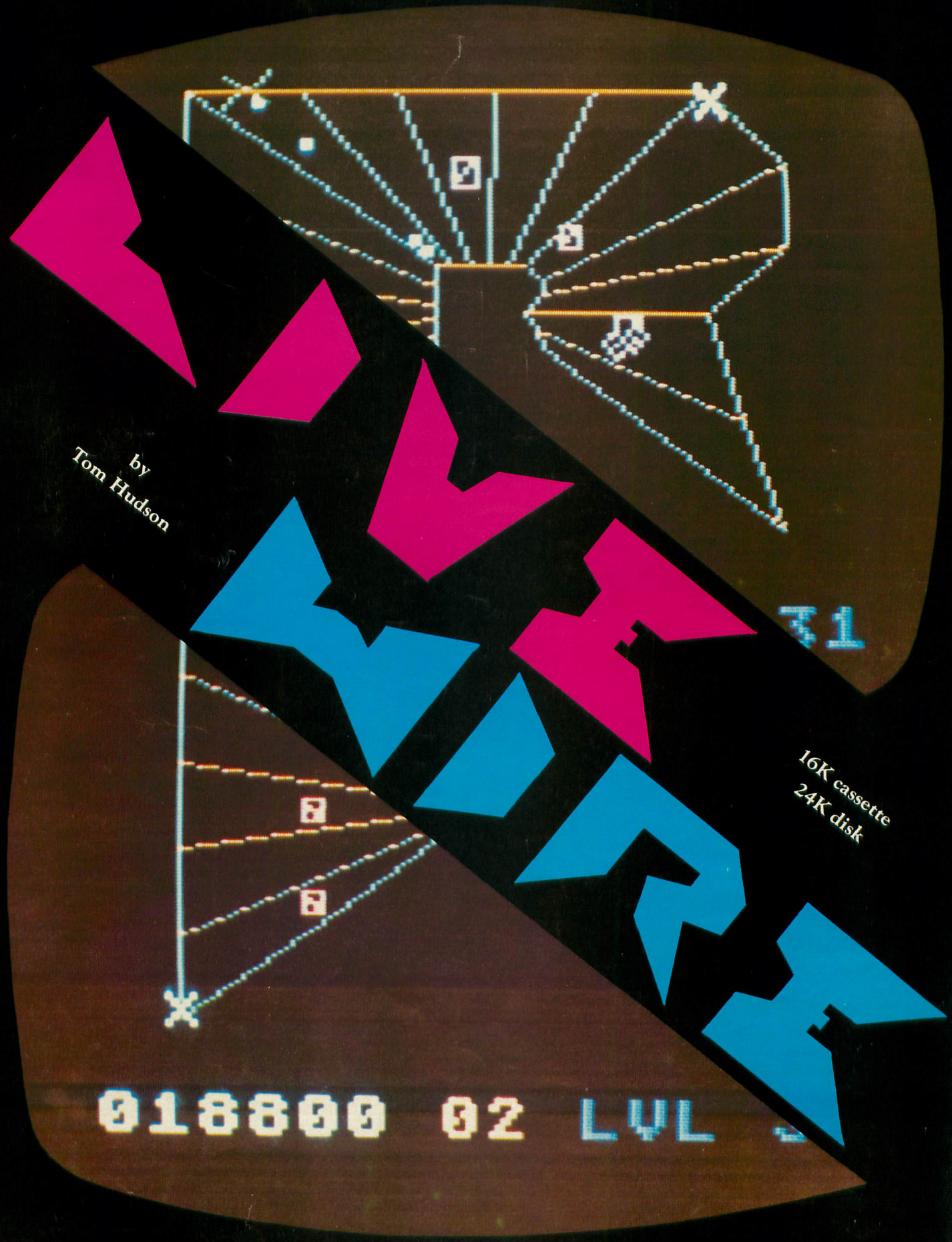
HAVE YOU FLOWN YOUR ATARI TODAY?

Imagine yourself at the controls of a small, single-engine plane, 10,000 feet in the air, on your approach to the runway and safety. You're running low on fuel, but your instruments show that you're on the glide path, and lined up with the runway. It's a beautiful, sunny day, and you can see the airport in the distance, across the grassy fields. But the crosswind is tricky, and it will take all your skill to land safely. You're coming down now, and the runway is getting closer. A bit left, OK, now lower the power, fine, now put down the flaps. Pull the nose up a bit more, you're a little low. Watch the power! Don't stall. OK. Here comes the runway. You hear the squeal of tires on pavement, your pulse quickens, you're down, but watch it, you're pulling right! Brakes, brakes! Left more! You've stopped safely! Good job. The first real-time flight simulator for ATARI is now available from MMG Micro Software. Written entirely in machine language, there are four levels of difficulty, landings in clear or foggy weather, landings with or without instruments, and with or without the real-time view from the cockpit. **Final Flight!** requires Atari 400/800, 24K, 1 joy stick, and is offered on tape or disk for the same suggested retail price of $29.95.

MMG

Final Flight! is available at your local dealer or direct from **MMG Micro Software.** Just send check or money order to P.O. Box 131, Marlboro, N.J. 07746 or for Mastercard, Visa, and C.O.D. deliveries call **(201)431-3472.** Please add $3.00 for postage and handling. New Jersey residents add 6% sales tax.

Atari is a registered trademark of Atari, Inc.


by
Tom Hudson
16K cassette
24K disk
018800 02 LVL

Before I start, I would like to thank all the readers who wrote letters to **A.N.A.L.O.G.** about my last assembly-language game, **Fill 'Er Up!** Your kind remarks certainly made all the hard work worthwhile. It is also gratifying to see all the reader-submitted modifications to the program. This is why **A.N.A.L.O.G.** contains assembly-language source code listings whenever possible — to challenge readers to go beyond what they read, and in the process, learn more about their computers.

This brings me to an important point: Even though **A.N.A.L.O.G.** prints commented assembly source code, space does not permit a complete discussion of a program's inner workings. In order to do this, a documentation package similar to APX's **Source Code for Eastern Front (1941)** would be needed. In such a package, the program author would provide in-depth documentation, memory maps, and so on.

If enough interest is shown, **A.N.A.L.O.G.** will publish a detailed documentation package for selected feature programs. If you would be interested in seeing such packages, just drop a postcard in the mail to me here at **A.N.A.L.O.G.** I welcome any comments or suggestions, such as the inclusion of the source files on a diskette, etc. There's no obligation, of course — we'd just like to hear your opinions.

So much for introductions. Let's get on to this issue's public-domain game program, **Livewire!**

Typing the program.

Before you go hacking away at your keyboard, let's take a quick look at the listings accompanying this article.

LISTING 1 is the main data and data checking routine. This listing is used to create both the disk and cassette versions of **Livewire!.** As with **Fill 'Er Up!,** the data statements are listed in hexadecimal (base 16) to allow it to run in a 16K cassette system. It's a necessary evil.

LISTING 2 should be added to LISTING 1 if you are using a 410 cassette recorder.

LISTING 3 should be added to LISTING 1 if you are using a disk drive.

LISTING 4 is the assembly-language source code for **Livewire!,** created with the ATARI Macro Assembler. **You DO NOT have to type in LISTING 4 to play the game!** It is provided for those readers interested in seeing how the program works.

Follow the instructions below to make either a cassette or disk version of **Livewire!.**

Cassette Instructions

1. Type LISTING 1 into your computer. If you have C:CHECK (Issue 11), use it to verify your typing. This will save headaches later.

2. After LISTING 1 has been correctly typed into your computer, type in LISTING 2. The program lines will automatically merge with LISTING 1. Make sure these lines were typed correctly. It's a good idea to CSAVE the entire program at this point.

3. Type RUN and press RETURN. The program will begin checking the DATA lines, printing the line number as it checks each one. It will alert you *if it* finds any problems. Fix incorrect lines and re-RUN the program if necessary until all errors are eliminated.

4. When all the data lines are correct, the program will ask you to "READY TAPE AND PRESS RETURN." Place a blank tape in your recorder, press RECORD and PLAY simultaneously and press RETURN. The message "WRITING FILE" will appear and the program will create a boot tape version of **Livewire!,** printing each data line number as it goes. When the READY prompt reappears, you're ready to load the game. Make sure your BASIC program has been CSAVEd before continuing.

6. To play **Livewire!,** rewind the tape created by the BASIC program to the beginning. Turn your computer OFF and remove any cartridges. Press PLAY on your recorder, then turn your computer ON while holding down the START key. The computer will BEEP once. Press RETURN and **Livewire!** will load and run automatically.

Disk Instructions

1. Type LISTING 1 into your computer. If you have D:CHECK II (Issue 10), use it to verify your typing.

2. After LISTING 1 is correctly typed into your computer, type in LISTING 3. The lines will automatically merge with LISTING 1. It's a good idea to SAVE the entire BASIC program after you're done typing.

3. Type RUN and press RETURN. The program will begin verifying the DATA lines, printing the line number as it checks each one. It will alert you if it finds any problems. Fix incorrect lines and re-RUN the program if necessary until all errors are eliminated.

4. When all the data lines are correct, the program will ask you to "INSERT DISK WITH DOS, PRESS RETURN." Place a disk with DOS in drive 1 and press RETURN. The message "WRITING FILE" will appear and the program will create an AUTORUN.SYS file, printing each data line number as it goes. When the READY prompt reappears, you're ready to play the game. Make sure your BASIC program has been SAVEd before continuing.

6. To play **Livewire!**, place the disk containing the AUTORUN.SYS file into drive 1. Turn the computer OFF, remove any cartridges and turn the computer back ON. **Livewire!** will load and run automatically.

Playing the game.

It's not every day that you get a chance to venture inside your computer. Prepare yourself, because **Livewire!** pits you against the horrible dangers that lurk inside that seemingly peaceful plastic enclosure.

In **Livewire!**, you are a logic probe on a mission to rid your computer of harmful electronic faults. You sit atop various circuit junctions (which just happen to spell "LIVEWIRE") as the enemies of your computer climb up the circuit lines toward you. There are 64 levels in the game, each one more difficult than the last.

You can use either a joystick or paddle to play **Livewire!**, but a paddle is recommended. Choose the desired controller with the SELECT key, then press START to begin playing.

Use your controller to move along the rim of the circuit. Your controller button fires up to six deadly electron bursts at a time, which destroy the enemy electronic faults on contact. Keep alert, because the enemies can also fire electron bursts at YOU!

In a tight situation, the space bar will destroy all enemy objects on the circuit. Use this weapon wisely, as you are allowed only one use of the space bar "zap" per circuit grid.

Points are awarded for the destruction of each enemy object. The current score is shown at the lower left of the screen. You begin each game with 3 lives (shown to the right of the score), with bonus lives awarded every 20,000 points. The current level number is shown at the lower right of the screen.

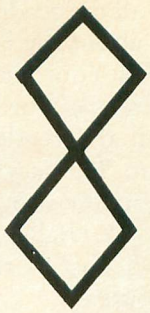
The ESC key will pause the game at any time. Press the ESC key a second time to continue game play.

Know your enemy.

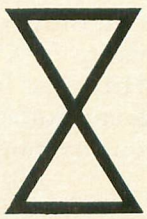
The enemies in **Livewire!** are not aliens, monsters or any other tangible threat. They are electronic impulses, out to systematically destroy your computer.

ARCS are clever objects which unpredictably jump from one circuit line to another. They are worth 50 points each.

SURGES rise up the circuit grid toward you, then change direction, heading back toward the buttom. If they are not destroyed before they hit the bottom, they create another ARC. SURGES are worth 100 points.

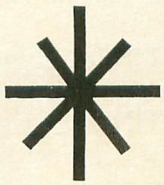


TRANSIENTS are nasty objects which appear and disappear at random as they rise up the circuit. When they are invisible, they cannot be destroyed by your electron bursts, but they can still destroy you! Be particularly careful if the transients become invisible near the top of the circuit. TRANSIENTS are worth 150 points.



VOLTAGE SPIKES aren't particularly dangerous until they reach the top of the circuit. When they do, they turn into SHORTS, described below. If you destroy a VOLTAGE SPIKE before it reaches the top of the circuit, it is worth 200 points.

RESISTANCES are perhaps the most dangerous enemy of all. They CANNOT BE DESTROYED by electron bursts. In fact, any shots which hit them are immediately bounced back at the logic probe! The only way to destroy a RESISTANCE is to use the space bar "zap" feature. When destroyed, a RESISTANCE is worth 250 points.



SHORTS are started by VOLTAGE SPIKES when they reach the rim of the circuit. Up to 4 of these enemies may be present at one time. Shorts are different from other objects in that they follow the rim of the circuit at random. They will destroy you on contact, so be very cautious when they are present. SHORTS can only be destroyed by the space bar "zap" feature, and are worth 400 points.

Final Comments

Livewire! is a difficult game, but it can be mastered. Cautious players will last longer than "daredevils," as is true with most games on the market today. I invite any comments, suggestions or modifications readers care to send in, and will be happy to print useful modifications in future issues. □

Listing 1.

```
1 REM *** LIVEWIRE ***
10 DATA 0,1,2,3,4,5,6,7,8,9,0,0,0,0,0,
0,0,10,11,12,13,14,15
20 DIM DAT$(91),HEX(22):FOR X=0 TO 22:
READ N:HEX(X)=N:NEXT X:LINE=990:RESTOR
E 1000:TRAP 60:? "CHECKING DATA"
25 LINE=LINE+10:? "LINE:";LINE:READ DA
T$:IF LEN(DAT$)<>90 THEN 110
28 DATLIN=PEEK(183)+PEEK(184)*256:IF D
ATLIN<>LINE THEN ? "LINE ";LINE;" MISS
ING!":END
30 FOR X=1 TO 89 STEP 2:D1=ASC(DAT$(X,
X))-48:D2=ASC(DAT$(X+1,X+1))-48:BYTE=H
EX(D1)*16+HEX(D2)
35 IF PASS=2 THEN PUT #1,BYTE:NEXT X:R
EAD CHKSUM:GOTO 25
40 TOTAL=TOTAL+BYTE:NEXT X:READ CHKSUM
:IF TOTAL=CHKSUM THEN 25
50 GOTO 110
60 IF PEEK(195)<>6 THEN 110
100 ? "WRITING FILE":PASS=2:LINE=990:R
ESTORE 1000:TRAP 60:GOTO 25
110 ? "BAD DATA: LINE ";LINE:END
1000 DATA 70F8704E00080E0E0E0E0E0E0E0E
0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E
0E0E0E0E0E0E0E0E0E0E0E0E0E,1896
1010 DATA 0E0E0E0E0E0E0E0E0E0E0E0E0E0E
0E0E0E0E0E0E0E0E0E0E4E00100E0E0E0E0E0E
0E0E0E0E0E0E0E0E0E0E0E0E0E,1778
1020 DATA 0E0E0E0E0E0E0E0E0E0E0E0E0E0E
0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E
0E0E0E0E0E0E0E0E0E0E0E0E0E,2408
1030 DATA 0E0E0E0E0E0E0E0E0E0E0E0E0E0E
0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E0E80
0047032141002070707070,3748
1040 DATA 70704763217074613217047232 1
3046332170703046432141AF2048A5C68D0AD4
8D1DD0A5C58D00D4A9E98D00,8122
1050 DATA 02A9208D0102684048A90A8D0AD4
8D16D0A9748D17D0A9288D18D0A93D8D00D468
40000000000000000000005C,11720
1060 DATA 766C000000212E212C2F2700232F
2D303534292E270000000006C697665776972656
0000000000A2B90000B4AFAD,14340
1070 DATA 00A8B5A4B3AFAE0000000000EAEF
F9F3F4E9E3EB0000000000000000F0E1E4E4
ECE5000000000000000000000,18671
1080 DATA 0000000000000000000000D82065
E4A900A27F9580CA10FBA90185A585A4A9438D
CA20A9218DCB20A9008D2F02,22765
1090 DATA 8D0ED48D08D28D1ED08DC802A203
9D582ECA10FAA2059D682ECA10FAA20295D895
DBCA10F9A2079D0C2ECA10FA,28295
1100 DATA A205BD03219D6821CA10F7A91DA2
059D862ECA10FA208D25208A26A90685BEA902
85D085C8202C26A90585B8A9,33151
1110 DATA 0A85B9A9AF8D3002A9208D3102A0
EBA228A907205CE4A9008D07D4208B2CA9748D
C402A9C48DC502A90A8DC602,38125
1120 DATA A9348DC702A93D8D2F02A9038D1D
D0A9C08D0ED4A9118D6F02A90F8DC1028DC202
8DC302A9168DC002AD1FD029,43000
1130 DATA 01D00AAD1FD02901F0F94C7B22AD
1FD02902D0E8A5CE18690129018 5CEAABD912F
8DCA20BD932F8DCB20A91E20,48088
1140 DATA 83264C4522A9008D3002A9208D31
02A90085A4A901858485B220A12CA5C72907AA
8DB42D85CC203826209B26A5,52487
1150 DATA B1D0FCA5BDF00320AF25854DA5B6
D0038D01D0A5A9D075A5CD85A9A205BD682E9D
6E2EA9009D682ECA10F2A5DE,58556
1160 DATA F00985DC205A25A90085DEA205A9
0015E5CA10FBA20415DFCA10FBC900F04DA205
B5E5D031AD0AD22907C905B0,63950
1170 DATA F7A8B9DF00F02238E90199DF0098
9D742EAD0AD2290FC90FF0F79D802EA91E9D86
2EA9019D7A2E95E5CA10C820,69526
1180 DATA 5B23202C25AD1FD0C907F0034C73
214CA222A5C7C93FF0161869185C72907D004
E6E4E6E4F8A5A51869185A5,74658
1190 DATA D84C8922A5AA186901C906D005A9
FF85AA6085AAA6AAB5E5F0EABD862EC9029039
AD0AD2290FD032AD0C2ED004,80275
1200 DATA A000F007AD0D2ED024A001BD862E
4A992C2E8D802E991C2E0A0A0A0A99242EA9FF
99142EA91585D1A901990C2E,84426
1210 DATA A900858420792 4A6AABD6E2EF01A
205526A6AABC742EB94E2E85DCB9532E85DD20
5A25A6AA4C2724BD862E38FD,89491
1220 DATA 7A2E9D862E3042C91ED004E6E1D0
3AC90AD00CBD742EC903D005A9FF9D7A2EBD74
2EC902D014AD0AD22901A6BD,94796
1230 DATA 802E18792731C90FB0039D802EBD
742EAABD8C2E858420792 44C5B23A90095E5A9
1585D2BD862E1042BD802EC5,99572
1240 DATA 95D006A90185DDD035BD742EC901
D02EA003B9582EF0058810F83022BD802E0A0A
0A0A186908995C2EA9019958,103946
1250 DATA 2EAD0AD2290199602EAD0AD2293F
99642E4C5B23A6AABD802E0A0A0A0A85B0BD86
2E4AB0151865B0A8B9A03185,108404
1260 DATA 8285B3B9A032858385B44CBB2418
65B0A8B9A0311879A1316A858285B3B9A03218
79A1326A858385B4A91E38FD,113958
1270 DATA 862E4A29FE0A0AA8A200B9012F9D
912EC8E8E008D0F4A6AABD742E0A0A0A85ABA9
0885AFA6ABBDB12EA8304059,119274
1280 DATA 992E85ADB9A12E85AEBDD92EA8B9
912E85ACA5821865AD8582A5831865AE8583A5
ABF00320BC2CA5831865AE85,125065
1290 DATA 83A5ABF00320BC2CC6AC10D9E6AB
C6AFD0B860A203BD582EF023BC602EBD5C2E18
792531C9F0B0089D5C2EDE64,130797
1300 DATA 2E100DAD0AD2293F9D642E29019D
602ECA10D560A000F8A5DA1865DD85DA84DDA5
D965DC85D984DCA5D865DB85,136620
1310 DATA D884DBD8208D25A5D8C5D00C20
A325F8A5D0186902D885D060A91085A6A200A0
00B9D800204026E8E8C8C003,142456
1320 DATA D0F360A5C8C905F005E6C8202C26
60208A26A207A9001D0C2ECAD0FAC900D0F2A2
039D582ECA10FAA9008584A9,147930
1330 DATA 0585AA207924A6AAA91E9D862EA9
019D7A2EAD0AD2290FC90FF0F79D802EC6AA10
E1A90F8DC0028D01D2AD0AD2,153150
1340 DATA 291F8D00D2A906208326CEC002AD
C0028D01D2D0E8A5C8F014C6C8202C26A93C20
8326A90685BDA9168DC00260,158188
1350 DATA 68684C7321A99085A6A5C8A20720
402660A05084A6A5A5A20E85A7290F05A69D04
21A5A74A4A4A4A4A05A69D0321,162753
1360 DATA 60A4B5A900A20E990005C8CAD0F9
A5B318693D8D01D0A5B418691AA884B5A20DBD
402E990005C8CA10F6A90185,168020
1370 DATA B66085A3A5A3D0FC60A90085D185
D285D3A2079D00D2CA10FA60A90185A4208A26
A92085C5A90085C6A2039D58,173892
1380 DATA 2ECA10FAA2079D0C2ECA10FA208B
2C8593A90685BEA5C74A4A4AAABDBC2D8DC402
BDC42D8DC502BDCC2D8DC602,179317
1390 DATA BDA92E85CDA5C72907AABDD42D85
DFBDDC2D85E0BDE42D85E1BDEC2D85E2BDF42D
85E3A204B5DF1865E495DFCA,186238
1400 DATA 10F6A5CC0A0A0A0A85C985CAAAA9
1085CBBD952F8582BDF52F8583BD5530858 5BD
B5308586ADC402F00620BC2C,191816
1410 DATA 201F2DC6CBF007E6CAA6CA4C1927
A6C986CAA90F85CBBD952F8582BDF52F8583BD
962F858518658626A8590BDF6,197853
1420 DATA 2F858618658 36A8591A90F38E5CB
859220BE28ADC402F00620BC2C201F2DC6CBF0
07E6CAA6CA4C4B27A6C986CA,203350
1430 DATA A90F85CB8593BD55308582BDB530
8583BD5630858518658 26A8590BDB630858618
65836A8591A90F38E5CB8592,208921
1440 DATA 20BE28ADC402F00620BC2C201F2D
C6CBF007E6CAA6CA4C9527A9008597AABDA031
8D8F31BDAF318D9F31207728,214191
1450 DATA A697A000B98F319DA031E8C8C010
D0F4A697BDA0328D8F31BDAF328D9F31207728
A697A000B98F319DA032E8C8,220159
1460 DATA C010D0F4A697BDA0338D8F31BDAF
338D9F31207728A697A000B98F319DA033E8C8
C010D0F4A697BDA0348D8F31,226189
1470 DATA BDAF348D9F31207728A697A000B9
8F319DA034E8C8C010D0F4A597186918597C9
F0F0034CD927A93D85C5A903,231953
1480 DATA 85C6A90085A460A910859A859 94A
859BA9008598A698BD8F31A699187D8F316AA6
9B9D8F31A59818659A859865,237537
```

```
1490 DATA 9AC911B00C8599A59B18659A859B
4C8428A59A4A859A85994AF005859B4C802860
A5920A0A0A0A186593AAA590,242533
1500 DATA 9DA031A5919DA032A593D014A582
9DA033A5839DA034A5859DAF33A5869DAF3460
A9CF8D0002A9208D0102D8A5,248149
1510 DATA A9F002C6A9A5A3F002C6A3A5B6F0
02C6B6A5BDF0034C002BA5A4F0034C62E4ADFC
02C91CD009A5B149FF85B14C,254446
1520 DATA 5229C921D028A5B2F024C6B2A205
A9019D682ECA10FAA203BD582EF00EA5DEF818
690485DED8A9009D582ECA10,259917
1530 DATA EAA9008DFC02A5B1F011A9008D01
D28D03D28D05D28D07D24C62E4A5D1F010C6D1
A6D1BD3E318D02D2BD29318D,265790
1540 DATA 03D2A5D2F010C6D2A6D2BD68318D
04D2BD53318D05D2A5D3F010C6D3A6D3BD8631
8D06D2BD7D318D07D2ADC202,272029
1550 DATA 1869108DC2028DC30229FC8DC702
C6BFD017AD902ED004A902D002A9008D902EAD
0AD2091F293F85BFE6BCA5BC,277192
1560 DATA C903D00AA900858CE687E6B8E6B9
A59DF005C69D4C312AA904859DA5CEF006AD7C
024C002AAD8402D02FA5BEF0,283089
1570 DATA 2BA207BD0C2EF003CAD0F8C6BEA9
019D0C2EA91585D1A9009D2C2EA5959D1C2E0A
0A0A0A9D242EA9019D142EA5,287552
1580 DATA CEF00FAD70024A4A4A4AC90F3022
A90ED01EA594F005C6944C002BA9028594AE78
02A595187DFC2D3004C90FD0,292322
1590 DATA 02A595C595F006A20986D385950A
0A0A0AAAAD0CD0290CF007A90185BD4C852CBD
A03118693D8D00D0A496BDA0,297276
1600 DATA 3218692085 96A900A20F99F803C8
CA10F9A90F85BAA90085BBA5B7290FAAA5BADD
712F900BDD812FB006AABD41,302643
1610 DATA 2F85BBA5B8290FAAA5BADD712F90
0DDD812FB008AABD512F05BB85BBA5B9290FAA
A5BADD712F900DDD812FB008,308100
1620 DATA AABD612F05BB85BBA5961865BA38
E908A8A5BB990004C68A10A1A5A2F005C6A24C
0F2BE6A1A90185A2E6A0A5A0,313913
1630 DATA 2901A8B9362E859EBE342E869CA9
03859FBD0C2ED0034CE32BA69FB4D4B9FF023D
3C2E99FF02B900033D3C2E99,318789
1640 DATA 0003B901033D3C2E990103A69CA5
A12901D00ABD2C2E187D142E9D2C2EBD142E30
43A005B9682ED039B9E500F0,322743
1650 DATA 34B9742EC904D005AD902EF028B9
802EDD1C2ED020B9862E4A38FD2C2EF004C9FE
9012B9742EF008A90199682E,327864
1660 DATA 4CF02BA9FF9D142E8810BFBD2C2E
F046C910F042187D242EAABDA031BCA0321869
40A69F9D04D0981869204894,333038
1670 DATA D4B9FF021D382E99FF02B900031D
382E99000 3B901031D382E990103C69FC69CA6
9CE49EF0264C242BA9009D0C,337375
1680 DATA 2EE0029002E6BEBD2C2ED010BD14
2E100BBD1C2EC595D004A90185BD4CE32BE6C2
A5C24A2901A8B9233185C4A5,342487
1690 DATA C22901A8A90785C1A90085C0A901
85C3B91531859CA900A6C3BC1731A20991C0C8
CA10FAA69CBD582EF92EBD5C,348107
1700 DATA 2EAABDA033BCA0318693EA6C39D
02D09818691C9D1731A8A6C4A90485CFBD1931
91C0C891C0C8CAC6CF10F2C6,354023
1710 DATA C33007C6C1E69C4C362C8D1ED04C
62E4A900AA9D00039D00049D00059D00069D00
07CAD0EE60A9088581A90085,358639
1720 DATA 80A214A0009891808 8D0FBCAD001
60E6814CAB2CA5830A85804A9002A8581068026
810680268106802681068026,363401
1730 DATA 81A900185808580A90865818581
A5822903AAA5824A4A85A8A8B1803D172DDD1B
2DF015A484BD172D390F2D85,368094
1740 DATA 8FBD132DA4A83180058F91806000
55AAFF3FCFF3FCC0300C034010401A586C583
900B38E583858AA901858CD0,373251
1750 DATA 0BA58338E586858AA9FF858CA585
C582900B38E5828589A901858BD00BA58238E5
858589A9FF858BA900858885,379321
1760 DATA 87A589C58A900A858D858E4A8588
4C762DA58A858D858E4A8587A58DF039A58818
658A8588C58E900EA58838E5,385091
1770 DATA 8E8588A58318658C8583A5871865
898587C58E900EA58738E58E8587A582186 58B
858220BC2CC68DD0C7600001,390578
```

```
1780 DATA 02030401050 3C43674F654060026
860C365626C6981898 46A8368418C638000000
00040608 0A000000 6080 90A,392949
1790 DATA 0B080A0C0E10121416060 80A0B0C
0E0F1000000 4080A0C0E100000000000010101
00FFFFFF0000000000000000,394004
1800 DATA 0000000000000000000000000000
0000000000000000000000000000000000000000
0000000307FF03030C30C0FC,394779
1810 DATA F3CF3F2828289254281010285492
2828280202000101500050005000000000000
0000000000000000000000,396350
1820 DATA 0000000000000000000000000000
0000000000000000000000000000000000000000
0002030203020000000000,396362
1830 DATA 0000000001FF01FF01FFFF010000
FF0101FF120F0E0C0B0A0907040301020005FF
0004050006 00FF0000000506,398545
1840 DATA 040701FF0006000 3010207FF0004
0605070506 04FF0307070707070000030707 07
0700000030303030 70000,399469
1850 DATA 0203030303030000010101030101
0300000000000001010100000001010202020 0
0001010102020200010102 02,399523
1860 DATA 0202030001010202020303010202
0202020303010202020303030401020203030 3
0404101010101010100808,399747
1870 DATA 0808080808080800000080402010
0804020100000000000010102020408102040
4080800000000010203040506,400521
1880 DATA 0708070605040302011110 0F0E0D
0C0B0A090A0B0C0D0E0F10435321210E0E0E0E
0E0E0E0E1A2733404B586471,401656
1890 DATA 0E0E0E0E0E0E0E0E0E0E0E0E0E0E
0E0E0E141A20262B313B454E54595F656B7171
5840270E0E0E1B1B0E0E0E27,403378
1900 DATA 4058710E0E0E0E0E1D2B3A465462
7171717171716A6471716452413020 0E0E0E0E
0E0E12223446586978 8D8D8D,406529
1910 DATA 8D8D8D8D8D8D1219222A323A434B
535B646C747D858D12273B5065798D8D8D8D79
65503B2712121212121223 35,410219
1920 DATA 47596A7C8D8D8D8D8D1231506F8D
847B72727B848D6F5031128D6E503D26121212
1212122B445C758D37373737,414069
1930 DATA 3737373737 3A3C3E4042446493737
3737373737373737373737373737393A3B3B
3C3D3F4143444545464749 49,416787
1940 DATA 44403C3737373939373737 3C4044
4937373737373 73A3D3F414346494949494948
4649494643403D3A37373737,419613
1950 DATA 3737434 74A4D5154575A5A5A5A5A
5A5A5A5A3C3E414447494C4E515356595C5E61
6343494D5054585A5A5A5A58,423265
1960 DATA 54504D4943434343434474A4D50
53565A5A5A5A5A434A50565A59575656575 95A
56504A435A55504B47434343,426822
1970 DATA 434343494E52565A000200008850
2050882020F8202040902FE01FF00A1A1A2A2
A3A3A4A4A5A5A6A6A7A7A8A8,431431
1980 DATA A9A9AAAA00C2A6B498A68A987C8A
6E7C606E5260445236442800414142424343 44
4445454646474748484949 4A,435765
1990 DATA 4A00502878 50A078C8A0F0C818F0
4018684090 68CC9000A1A1A2A2A3A3A4A40014
1E141E141E141E0000000000,439855
```

•

CHECKSUM DATA

(See p.46)

```
1 DATA 2,955,686,427,745,192,617,894,4
45,496,549,150,272,322,389,7141
1030 DATA 993,671,940,775,962,932,662,
276,400,422,663,103,693,416,588,9496
1180 DATA 176,598,503,578,666,412,121,
344,64,519,438,515,463,28,305,5735
1330 DATA 390,169,936,204,236,668,846,
422,616,396,89,494,357,417,326,6566
1480 DATA 274,201,274,482,387,131,433,
351,554,524,200,303,292,583,336,5325
1630 DATA 439,58,287,349,291,241,358,4
01,262,869,113,126,272,395,136,4597
```

```
1780 DATA 524,452,916,155,677,686,229,
769,894,892,759,155,902,950,995,9955
1930 DATA 750,717,85,838,937,928,776,5
031
```

•

Listing 2.

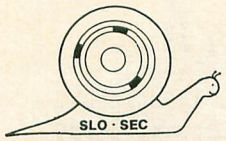
```
2 REM *** CASSETTE VERSION ***
65 IF PASS=2 THEN CLOSE #1:END
70 ? "READY CASSETTE AND PRESS RETURN"
;:OPEN #1,8,128,"C:":RESTORE 200:FOR X
=1 TO 35:READ N:PUT #1,N:NEXT X
200 DATA 0,36,221,31,255,31,169,60,141
,2,211,169,0,141,231,2,133,14,169,56,1
41,232,2,133,15,169,115
210 DATA 133,10,169,33,133,11,24,96
2000 DATA 000000000000000000000000000
000000000000000000000000000000000000000
000000000000000000000000,439855
2010 DATA 000000000000000000000000000
000000000000000000000000000000000000000
000000000000000000000000,439855
```

•

Listing 3.

```
2 REM *** DISK VERSION ***
65 IF PASS=2 THEN PUT #1,224:PUT #1,2:
PUT #1,225:PUT #1,2:PUT #1,115:PUT #1,
33:CLOSE #1:END
70 ? "INSERT DISK WITH DOS, PRESS RETU
RN";:DIM IN$(1):INPUT IN$:OPEN #1,8,0,
"D:AUTORUN.SYS"
90 PUT #1,255:PUT #1,255:PUT #1,0:PUT
#1,32:PUT #1,142:PUT #1,49
```

•



SLO·SEC

(SLOw speed SECtor write kit)

CREATE YOUR OWN PROTECTED DISKS WITH YOUR ATARI DISK DRIVE

* SLO-SEC enables your ATARI 810 disk drive to write unreadable (bad) sectors used in bad-sector disk protection routines.
* Easy disk drive modification requires only two solder connections.
* SLO-SEC will not interfere with normal disk drive operation.

Complete SLO-SEC kit:
Hardware and Step-by-Step Instructions: $9.95

Note: SLO-SEC is designed for second generation drives (manufactured after December, 1981)

For fast service use certified check, money order or charge card.
Please allow 2 to 3 weeks for personal checks to clear.

Please send _____ SLO-SEC kits at $ 9.95 each.

Name _____
Street _____
City _____ State____ Zip_____

MASTERCARD # _____ Exp. date _____
VISA # _____ Exp. date _____

Signature _____

CompuWare
1704 Princess St.
Wilmington, NC 28405

ATARI is a registered trademark of ATARI, Inc.

BASIC
BASM
ASSEMBLY

THE BASIC COMPILER THAT'S MORE THAN JUST A COMPILER!

- Are you fed up with slow interpretive BASIC?
- Are you fed up with having to kludge binary into your program?
- Are you fed up with being unfamiliar with assembly?
- **BASM combines the speed and flexibility of assembly with the familiarity of BASIC!**
- **No more awkward binary segments:** BASM handles both BASIC and assembly!
- **Learn assembly language by example:** BASM can list the assembly generated by your BASIC statements!

Atari and **Commodore 64**

COMPUTER ALLIANCE 21115 Devonshire • Chatsworth, Ca. 91311 • Suite 132B
(213) 368-4089

```
;       ============================
;                LIVEWIRE
;       ============================

;       ============================
;         WRITTEN BY: TOM HUDSON
;       A.N.A.L.O.G. COMPUTING #12
;       ============================

;       ---------------
;       PAGE ZERO USAGE
;       ---------------

        ORG $80

LO      DS  1
HI      DS  1
PLOTX   DS  1               ;PLOT X VALUE
PLOTY   DS  1               ;PLOT Y VALUE
COLOR   DS  1               ;PLOT COLOR
DRAWX   DS  1               ;DRAWTO X
DRAWY   DS  1               ;DRAWTO Y
ACCX    DS  1               ;X ACCUM.
ACCY    DS  1               ;Y ACCUM.
DELTAX  DS  1               ;DRAW WORK AREA
DELTAY  DS  1               ;DRAW WORK AREA
INCX    DS  1               ;DRAW X INCREMENT
INCY    DS  1               ;DRAW Y INCREMENT
COUNTR  DS  1               ;DRAWTO COUNTER
ENDPT   DS  1               ;DRAW ENDPOINT
HOLD    DS  1               ;WORK AREA
XWORK   DS  1
YWORK   DS  1
GRID    DS  1               ;GRID # WORK
OFFSET  DS  1               ;GRID OFFSET
PMTIME  DS  1               ;PLAYER MOVE TIMER
PLRGRD  DS  1               ;PLAYER GRID#
PLRY    DS  1               ;PLAYER Y POS.
GRIDNO  DS  1               ;GRID #
LAST    DS  1               ;GRID...
NEXT    DS  1               ;DIVIDE...
STEP    DS  1               ;WORK...
DEST    DS  1               ;AREAS
VBXHLD  DS  1               ;X HOLD
PFTIME  DS  1               ;PLAYER FIRE TIMER
ENDVAL  DS  1               ;WORK AREA
MISNUM  DS  1               ;MISSILE #
PRFLIP  DS  1               ;PROJ. FLIP FLAG
PRADVT  DS  1               ;PROJ. MOVE TIMER
PRADV1  DS  1               ;PROJ. TIMER
TIMER   DS  1               ;GENERAL TIMER
INTRFG  DS  1               ;INTRO FLAG
BCDLVL  DS  1               ;LEVEL #
SHCOLR  DS  1               ;CHAR. COLOR
SHOBYT  DS  1               ;CHAR. BYTE POS.
YOFSET  DS  1               ;PLOT Y OFFSET
OBTIM1  DS  1               ;OBJECT MOVE TIMER
OBJNUM  DS  1               ;OBJECT #
SHAPIX  DS  1               ;OBJ. SHAPE INDEX
LENGTH  DS  1               ;OBJ. LENGTH
XI      DS  1               ;OBJ. X INCREMENT
YI      DS  1               ;OBJ. Y INCREMENT
SHAPCT  DS  1               ;OBJ. SHAPE CNT.
HLDGRD  DS  1               ;OBJ. GRID WORK
PAUFLG  DS  1               ;PAUSE FLAG
ZAP     DS  1               ;ZAP FLAG
SAVEX   DS  1               ;WORK AREA
SAVEY   DS  1               ;WORK AREA
FLASHY  DS  1               ;OBJ. FLASH POS.
FLTIME  DS  1               ;FLASH TIME
SP1IX   DS  1               ;PLAYER...
SP2IX   DS  1               ;SHAPE...
SP3IX   DS  1               ;INDEX...
SPIX    DS  1               ;AREAS
PLTBYT  DS  1               ;PLYR. IMAGE BYTE
PSCNT   DS  1               ;PLYR. SHAPE COUNT
KILPLR  DS  1               ;KILL PLYR FLAG
PAVAIL  DS  1               ;# PROJ. AVAILABLE
TRANTM  DS  1               ;TRANSIENT TIMER
DESTLO  DS  1               ;DESTINATION...
DESTHI  DS  1               ;ADDRESS
SHFLIP  DS  1               ;SHORT FLIP FLAG
DESTNM  DS  1               ;SHORT PLYR #
CPYST   DS  1               ;SHORT IMAGE START
DMAC1   DS  1               ;DMA CTRL WORK
GRAC1   DS  1               ;GRAPHICS CTRL WK.
GRIDIX  DS  1               ;GRID INDEX
LIVES   DS  1               ;LIVES LEFT
GRDADJ  DS  1               ;GRID...
GRDWK   DS  1               ;DRAW...
GRDWK2  DS  1               ;WORK...
GRDNUM  DS  1               ;AREAS
OBJSPD  DS  1               ;OBJ. SPEED
JOYPAD  DS  1               ;STICK/PADDLE
CPYCNT  DS  1               ;SHORT COPY CNT.
BONUS   DS  1               ;BONUS VALUE
FIRSOU  DS  1               ;FIRE SOUND COUNT
OBDSOU  DS  1               ;OBJ. DEATH SOUND
MOVSOU  DS  1               ;PLYR MOVE SOUND
PRYHLD  DS  4               ;PROJ. Y HOLDS
SCORE   DS  3               ;SCORE
SCOADD  DS  3               ;SCORE ADD VALUE
MISCAD  DS  1               ;MISC. SCORE ADD
NUMOBJ  DS  5               ;OBJECTS LEFT
DIFF    DS  1               ;DIFFICULTY ADJUST
```

Assembly Language Listing

```
OBJPRS  DS  6               ;OBJ PRESENT FLAGS

;       --------------------
;       MISCELLANEOUS MEMORY
;       --------------------

PMAREA  =   $0000           ;P/M AREA
MISSLS  =   PMAREA+768
PL0     =   PMAREA+1024
PL1     =   PMAREA+1280
PL2     =   PMAREA+1536
PL3     =   PMAREA+1792
DISP    =   $0800           ;DISPLAY

;       ---------------
;       SYSTEM EQUATES
;       ---------------

VDSLST  =   $200            ;DLI VECTOR
WSYNC   =   $D40A           ;WAIT/SYNC
PTRIG0  =   $27C            ;PADDLE TRIG.
POT0    =   $270            ;PADDLE 0
KEY     =   $2FC            ;KEYBOARD
CONSOL  =   $D01F           ;CONSOLE BUTTONS
PMBASE  =   $D407           ;P/M BASE ADDR
RANDOM  =   $D20A           ;RANDOM #
SETVBV  =   $E45C           ;VBLANK SET
XITVBV  =   $E462           ;VBLANK EXIT
COLBK   =   $2C8            ;COLORS
COLPF0  =   $2C4
COLPF1  =   $2C5
COLPF2  =   $2C6
COLPF3  =   $2C7
AUDC1   =   $D201           ;AUDIO CONTROL
AUDC2   =   $D203
AUDC3   =   $D205
AUDC4   =   $D207
AUDF1   =   $D200           ;AUDIO FREQUENCY
AUDF2   =   $D202
AUDF3   =   $D204
AUDF4   =   $D206
AUDCTL  =   $D208           ;MAIN AUDIO CTRL.
PRIOR   =   $026F           ;PRIORITY
ATTRAC  =   $4D             ;ATTRACT MODE
DMACTL  =   $22F            ;DMA CONTROL
DLISTL  =   $230            ;DISP. LIST
GRACTL  =   $D01D           ;GRAPHICS CTRL.
NMIEN   =   $D40E           ;INTERRUPT ENABLE
COLPM0  =   $2C0            ;PLAYER COLORS
COLPM1  =   $2C1
COLPM2  =   $2C2
COLPM3  =   $2C3
HPOSP0  =   $D000           ;PLAYER POSITIONS
HPOSP1  =   $D001
HPOSP2  =   $D002
HPOSP3  =   $D003
HPOSM0  =   $D004           ;MISSILE POSITIONS
HITCLR  =   $D01E           ;COLLISION CLEAR
P0PL    =   $D00C           ;PL0 TO PLAYER COLL.
STICK   =   $278            ;JOYSTICK
STRIG   =   $284            ;STICK TRIGGER

        ORG $2000

;       ----------------------
;       MAIN GAME DISPLAY LIST
;       ----------------------

DLIST   DB  $70,$F0,$70,$4E
        DW  DISP
        DB  $E,$E,$E,$E,$E,$E,$E,$E,$E
        DB  $E,$E,$E,$E,$E,$E,$E,$E,$E
        DB  $E,$E,$E,$E,$E,$E,$E,$E,$E
        DB  $E,$E,$E,$E,$E,$E,$E,$E,$E
        DB  $E,$E,$E,$E,$E,$E,$E,$E,$E
        DB  $E,$E,$E,$E,$E,$E,$E,$E,$E
        DB  $E,$E,$E,$E,$E,$E,$E,$E,$E
        DB  $4E
        DW  DISP+$800
        DB  $E,$E,$E,$E,$E,$E,$E,$E,$E
        DB  $E,$E,$E,$E,$E,$E,$E,$E,$E
        DB  $E,$E,$E,$E,$E,$E,$E,$E,$E
        DB  $E,$E,$E,$E,$E,$E,$E,$E,$E
        DB  $E,$E,$E,$E,$E,$E,$E,$E,$E
        DB  $E,$E,$E,$E,$E,$E,$E,$E,$E
        DB  $E,$E,$E,$E,$E,$E,$E,$E,$E
        DB  $E,$E,$E,$E,$E,$E,$E,$E,$E
        DB  $E,$E,$E,$E,$E,$E,$E,$E,$E
        DB  $E,$E,$E,$E,$E,$E,$E,$E,$E
        DB  $E,$E,$E,$E,$E,$E,$E,$E,$E
        DB  $80,$00
        DB  $47
        DW  INFOLN
        DB  $41
        DW  DLIST

;       ----------------------------
;       TITLE SCREEN DISPLAY LIST
;       ----------------------------

TITLDL  DB  $70,$70,$70,$70,$70,$70
        DB  $70,$47
        DW  LASTSC
        DB  $70,$70,$46
        DW  MAGMSG
        DB  $70,$47
        DW  TITLE
        DB  $30,$46
        DW  AUTHOR
        DB  $70,$70,$30,$46
CONTRL  DW  JOYMSG
        DB  $41
        DW  TITLDL

;       ------------------------
;       DISPLAY LIST INTERRUPTS
;       ------------------------

DLI1    PHA                 ;SAVE ACCUM
        LDA GRAC1           ;GET GR. CTRL
        STA WSYNC           ;WAIT FOR SYNC
        STA GRACTL          ;STORE IT
        LDA DMAC1           ;GET AND SAVE
        STA $D400           ;DMA CTRL
        LDA #DLI2&255       ;POINT...
        STA VDSLST          ;TO...
        LDA #DLI2/256       ;NEXT...
        STA VDSLST+1        ;DLI!
        PLA                 ;GET ACCUM
        RTI                 ;AND EXIT!

DLI2    PHA                 ;SAVE ACCUM
        LDA #$0A            ;GET WHITE
        STA WSYNC           ;WAIT FOR SYNC
        STA $D016           ;PUT IN COLOR 0
        LDA #$74            ;PUT BLUE...
        STA $D017           ;IN COLOR 1
        LDA #$28            ;PUT ORANGE...
        STA $D018           ;IN COLOR 2
        LDA #$3D            ;SET UP...
        STA $D400           ;DMA CTRL
        PLA                 ;GET ACCUM.
        RTI                 ;AND EXIT

;       ----------------
;       SCREEN MESSAGES
;       ----------------

INFOLN  DB  0,0,0,0,0,0,0,0,0
        DB  0,0,$6C,$76,$6C,0,0,0
MAGMSG  DB  $21,$2E,$21,$2C,$2F,$27
        DB  0,$23,$2F,$2D,$30,$35
        DB  $34,$29,$2E,$27
TITLE   DB  0,0,0,0,$6C,$69,$76,$65
        DB  $77,$69,$72,$65,0,0,0,0
AUTHOR  DB  0,$A2,$B9,0,0,$B4,$AF
        DB  $AD,0,$AB,$B5,$A4,$B3
        DB  $AF,$AE,0
JOYMSG  DB  0,0,0,0,$EA,$EF,$F9,$F3
        DB  $F4,$E9,$E3,$EB,0,0,0,0
PADMSG  DB  0,0,0,0,0,$F0,$E1,$E4
        DB  $E4,$EC,$E5,0,0,0,0,0
LASTSC  DB  0,0,0,0,0,0,0,0,0
        DB  0,0,0,0,0,0,0,0,0

;       -----------
;       PROG START
;       -----------

LIVE    CLD
        JSR $E465           ;INIT SOUND
        LDA #0              ;CLEAR PAGE 0
        LDX #127
CPAGE0  STA $80,X
        DEX
        BPL CPAGE0
        LDA #1              ;INIT...
        STA BCDLVL          ;LEVEL #
        STA INTRFG          ;SET INTRO FLAG
        LDA #JOYMSG&255     ;DEFAULT...
        STA CONTRL          ;CONTROL...
        LDA #JOYMSG/256     ;IS...
        STA CONTRL+1        ;STICK!
        LDA #0              ;INIT...
        STA DMACTL          ;DMA
        STA NMIEN           ;INTERRUPTS
        STA AUDCTL          ;AUDIO
        STA HITCLR          ;COLLISION
        STA COLBK           ;BACKGND COLOR
        LDX #3              ;CLEAR SHORTS
CLRSHO  STA SHORTF,X
        DEX
        BPL CLRSHO
        LDX #5              ;ZERO OBJECT...
CLRDED  STA OBDEAD,X        ;CLR DEAD TABLE
        DEX
        BPL CLRDED
        LDX #2              ;ZERO SCORE
CLRSCO  STA SCORE,X
        STA SCOADD,X
        DEX
        BPL CLRSCO
        LDX #7
CLRPRJ  STA PROJAC,X        ;CLEAR PROJ.
        DEX
        BPL CLRPRJ
        LDX #5
MOVSCO  LDA INFOLN,X        ;COPY SCORE...
        STA LASTSC+5,X      ;TO LAST...
        DEX                 ;SCORE LINE
        BPL MOVSCO
```

Listing 4.

```
        LDA #29         ;SET ALL...
        LDX #5          ;OBJECTS TO...
INIOBS  STA OBJSEG,X    ;SEGMENT # 29
        DEX
        BPL INIOBS
        JSR SHOSCO      ;SHOW SCORE
        JSR SNDOFF      ;NO SOUNDS
        LDA #6          ;6 PROJECTILES
        STA PAVAIL      ;AVAILABLE
        LDA #2          ;SET...
        STA BONUS       ;BONUS=20000
        STA LIVES       ;2 EXTRA LIVES
        JSR SHOLIV      ;SHOW LIVES LEFT
        LDA #5          ;SET UP...
        STA SP2IX       ;PLAYER...
        LDA #10         ;SHAPE...
        STA SP3IX       ;INDEXES
        LDA #TITLDL&255 ;POINT TO...
        STA DLISTL      ;TITLE...
        LDA #TITLDL/256 ;DISPLAY...
        STA DLISTL+1    ;LIST
        LDY #VBI&255    ;POINT TO...
        LDX #VBI/256    ;VERTICAL...
        LDA #7          ;BLANK...
        JSR SETVBV      ;INTERRUPT
        LDA #PMAREA/256 ;SET UP P/M...
        STA PMBASE      ;BASE ADDRESS
        JSR PMCLR       ;CLEAR P/M
        LDA #$74        ;PUT BLUE...
        STA COLPF0      ;IN COLOR 0
        LDA #$C4        ;PUT GREEN...
        STA COLPF1      ;IN COLOR 1
        LDA #$0A        ;PUT WHITE...
        STA COLPF2      ;IN COLOR 2
        LDA #$34        ;PUT RED...
        STA COLPF3      ;IN COLOR 3
        LDA #$3D        ;SET UP...
        STA DMACTL      ;DMA,
        LDA #3          ;GRAPHICS,
        STA GRACTL      ;AND
        LDA #$C0        ;INTERRUPT...
        STA NMIEN       ;ENABLE
        LDA #$11        ;SET P/M...
        STA PRIOR       ;PRIORITY
        LDA #$0F        ;PUT WHITE...
        STA COLPM1      ;IN PLAYER 1,
        STA COLPM2      ;PLAYER 2
        STA COLPM3      ;AND 3
        LDA #$16        ;PUT YELLOW...
        STA COLPM0      ;IN PLAYER 0

;       -------------
;       INTRO SCREEN
;       -------------

INTRO   LDA CONSOL      ;START KEY...
        AND #1          ;PRESSED?
        BNE CKSEL       ;NO!
GOCHEK  LDA CONSOL      ;START KEY...
        AND #1          ;RELEASED?
        BEQ GOCHEK      ;NO, WAIT.
        JMP DIGIN       ;GO DIG IN!!
CKSEL   LDA CONSOL      ;SELECT KEY...
        AND #2          ;PRESSED?
        BNE INTRO       ;NAW, LOOP BACK.
        LDA JOYPAD      ;TOGGLE...
        CLC             ;STICK/PADDLE...
        ADC #1          ;INDICATOR...
        AND #1
        STA JOYPAD
        TAX
        LDA JPLO,X      ;AND SHOW...
        STA CNTRL       ;CONTROLLER...
        LDA JPHI,X      ;MESSAGE...
        STA CNTRL+1     ;ON SCREEN'
        LDA #30         ;30 JIFFY...
        JSR WAIT        ;WAIT'
        JMP INTRO       ;AND LOOP.

;       ----------------------------
;       HERE'S WHERE PROGRAM STARTS
;       ----------------------------

DIGIN   LDA #DLIST&255  ;POINT TO...
        STA DLISTL      ;GAME...
        LDA #DLIST/256  ;DISPLAY...
        STA DLISTL+1    ;LIST
        LDA #0          ;NO LONGER IN...
        STA INTRFG      ;INTRO
FOREVR  LDA #1          ;WE WANT...
        STA COLOR       ;COLOR 1
        STA ZAP         ;RESET ZAP.
        JSR CLRSC       ;CLEAR SCREEN
        LDA GRIDIX      ;GET GRID#
        AND #7          ;FIND WHICH...
        TAX             ;GRID SHAPE...
        LDA GRDTBL,X    ;TO DRAW...
        STA GRDNUM      ;AND STORE
        JSR SHOLVL      ;SHOW LEVEL#
        JSR DRGRID      ;DRAW GRID'
CONWT   LDA PAUFLG      ;WE PAUSED?
        BNE CONWT       ;YUP, LOOP.
        LDA KILPLR      ;PLAYER DEAD?
        BEQ PLIVE       ;NOPE'
        JSR DECLIV      ;ONE LESS LIFE'
PLIVE   STA ATTRAC      ;CANCEL ATTRACT'
        LDA FLTIME      ;FLASH GOING?
        BNE NOFEND      ;YES' STORE...
        STA HPOSP1      ;FLASH POSITION!
NOFEND  LDA OBTIM1      ;OBJECTS MOVING?
        BNE NOOHAN      ;NOT YET!
        LDA OBJSPD      ;RESET MOVE...
        STA OBTIM1      ;TIMER

;       ----------------------
;       COPY OBJECT KILL TABLE
;       ----------------------

        LDX #5          ;THIS SECTION
COPDED  LDA OBDEAD,X    ;COPIES THE
        STA OBDED2,X    ;OBJECT KILL
        LDA #0          ;TABLE WHICH IS
        STA OBDEAD,X    ;SET UP BY THE
        DEX             ;PROJECTILE
        BPL COPDED      ;HANDLER

        LDA MISCAD      ;MISC.SCORE?
        BEQ NOMSCO      ;NO'
        STA SCOADD+1    ;SET SCORE ADD...
        JSR ADDSCO      ;AND ADD IT'
        LDA #0          ;THEN RESET THE
        STA MISCAD      ;ADD VALUE.
NOMSCO  LDX #5          ;THIS SECTION
        LDA #0          ;TALLIES ALL
CKOBLV  ORA OBJPRS,X    ;OBJECTS THAT
        DEX             ;ARE ALIVE
        BPL CKOBLV
        LDX #4          ;NOW TALLY
CKOBWT  ORA NUMOBJ,X    ;ALL OBJECTS
        DEX             ;THAT ARE NOT
        BPL CKOBWT      ;ON GRID YET
        CMP #0          ;ANY OBJECTS?
        BEQ LVLEND      ;NO, END OF LEVEL!

        LDX #5          ;IS OBJECT
GENNOL  LDA OBJPRS,X    ;PRESENT?
        BNE NXTOGN      ;YES, TRY NEXT.
TRYTYP  LDA RANDOM      ;LET'S TRY TO
        AND #7          ;START UP A
        CMP #5          ;NEW OBJECT
        BCS TRYTYP      ;GET A TYPE
        TAY             ;ANY OF THAT
        LDA NUMOBJ,Y    ;TYPE WAITING?
        BEQ NXTOGN      ;NO, TRY NEXT
        SEC             ;DECREMENT #
        SBC #1          ;OF OBJECTS
        STA NUMOBJ,Y    ;WAITING.
        TYA             ;THEN SET
        STA OBJTYP,X    ;OBJECT TYPE.
NEWGRD  LDA RANDOM      ;GET A RANDOM
        AND #$0F        ;SUB-GRID
        CMP #15         ;NUMBER
        BEQ NEWGRD
        STA OBJGRD,X    ;AND SAVE IT
        LDA #30         ;PUT OBJECT AT
        STA OBJSEG,X    ;FAR END OF GRID
        LDA #1          ;SET UP...
        STA OBJINC,X    ;OBJ. INCREMENT
        STA OBJPRS,X    ;OBJECT PRESENT
NXTOGN  DEX             ;LOOP BACK TO DO
        BPL GENNOL      ;NEXT OBJECT

        JSR OBJHAN      ;HANDLE OBJECTS
        JSR SHOHAN      ;HANDLE SHORTS

NOOHAN  LDA CONSOL      ;ANY CONSOLE
        CMP #7          ;KEYS PRESSED?
        BEQ JCONWT      ;NOPE'
        JMP LIVE        ;YES, RESTART GAME
JCONWT  JMP CONWT       ;INDIRECT JUMP
LVLEND  LDA GRIDIX      ;ARE WE ON
        CMP #63         ;GRID #63?
        BEQ NOGRDI      ;YES, DON'T INC'
        CLC             ;INCREMENT
        ADC #1          ;GRID #
        STA GRIDIX      ;AND SAVE IT.
        AND #7          ;ADD 2 TO
        BNE NODIFI      ;DIFFICULTY IF
        INC DIFF        ;ON A MULTIPLE
        INC DIFF        ;OF 8 GRIDS.
NODIFI  SED             ;INCREMENT
        LDA BCDLVL      ;BCD LEVEL #
        CLC
        ADC #1
        STA BCDLVL
        CLD             ;NOW GO TO
NOGRDI  JMP FOREVR      ;DRAW NEW GRID.

;       ---------------
;       OBJECT HANDLER
;       ---------------

OBJHAN  LDA OBJNUM      ;INCREMENT
        CLC             ;OBJECT #
        ADC #1
        CMP #6          ;DONE?
        BNE STONUM      ;NO, CONTINUE.
        LDA #$FF        ;RESET
        STA OBJNUM      ;OBJECT #
        RTS             ;AND EXIT.
STONUM  STA OBJNUM      ;SAVE OBJ #
OBHLP1  LDX OBJNUM      ;GET OBJ #
        LDA OBJPRS,X    ;OBJ PRESENT?
        BEQ OBJHAN      ;NO!
OBLIVE  LDA OBJSEG,X    ;WITHIN 2 UNITS
        CMP #2          ;OF RIM?
        BCC NOOBFI      ;YES, DON'T FIRE
        LDA RANDOM      ;RANDOM CHANCE
        AND #$0F        ;OF SHOOTING
        BNE NOOBFI      ;DON'T SHOOT
        LDA PROJAC      ;PROJ. 0 ACTIVE?
        BNE TRYPR1      ;YES, IGNORE!
        LDY #0          ;FORCE BRANCH
        BEQ STOBFI      ;TO STORE IT
TRYPR1  LDA PROJAC+1    ;PROJ. 1 ACTIVE?
        BNE NOOBFI      ;YES, NO FIRE
        LDY #1          ;SET INDEX
STOBFI  LDA OBJSEG,X    ;INITIALIZE
        LSR A           ;PROJECTILE
        STA PROJSG,Y    ;SEGMENT #
        LDA OBJGRD,X    ;AND
        STA PROGRD,Y    ;SUB-GRID #
        ASL A           ;MULTIPLY
        ASL A           ;BY
        ASL A           ;16
        ASL A           ;AND
        STA PROJGN,Y    ;SAVE INDEX'
        LDA #$FF        ;SET INCREMENT
        STA PROINC,Y    ;(TOWARD RIM)
        LDA #21         ;START THE
        STA FIRSOU      ;FIRE SOUND
        LDA #1          ;AND
        STA PROJAC,Y    ;PROJECTILE
NOOBFI  LDA #0          ;SET COLOR 0
        STA COLOR       ;TO ERASE OBJECT
        JSR DRWOBJ      ;AND ERASE IT
        LDX OBJNUM
        LDA OBDED2,X    ;OBJ DEAD?
        BEQ NOOKIL      ;YES' START
        JSR FLASH       ;DEATH FLASH
        LDX OBJNUM
        LDY OBJTYP,X    ;GET OBJECT TYPE
        LDA POINT1,Y    ;GET POINTS
        STA SCOADD+1    ;AND READY
        LDA POINT2,Y    ;THE SCORE
        STA SCOADD+2    ;ADD VALUE
        JSR ADDSCO      ;ADD TO SCORE!
        LDX OBJNUM
        JMP KILOBJ      ;THEN KILL OBJ.
NOOKIL  LDA OBJSEG,X    ;INCREMENT
        SEC             ;OBJECT'S
        SBC OBJINC,X    ;SEGMENT
        STA OBJSEG,X    ;POSITION
        BMI KILOBJ      ;PAST RIM!
        CMP #30         ;TYPE 3 PAST END?
        BNE NOTOT3      ;NOPE'
        INC NUMOBJ+2    ;START TYPE 2
        BNE KILOBJ      ;FORCE BRANCH
NOTOT3  CMP #10         ;AT TYPE 3 TURN?
        BNE OBHLP2      ;NO'
        LDA OBJTYP,X    ;IS IT
        CMP #3          ;TYPE 3?
        BNE OBHLP2      ;NO'
        LDA #$FF        ;REVERSE OBJECT
        STA OBJINC,X    ;INCREMENT
OBHLP2  LDA OBJTYP,X    ;IS OBJECT
        CMP #2          ;TYPE 2?
        BNE SETHUE      ;NO, SET COLOR
        LDA RANDOM      ;GET RANDOM
        AND #1          ;DIRECTION
        TAY             ;FOR TYPE 2
        LDA OBJGRD,X    ;AND
        CLC             ;ADD OR
        ADC ADDSB1,Y    ;SUBTRACT 1
        CMP #15         ;PAST LIMIT?
        BCS SETHUE      ;YES'
        STA OBJGRD,X    ;SAVE NEW POS.
SETHUE  LDA OBJTYP,X    ;GET OBJ. TYPE
        TAX             ;AND GET
        LDA OBJHUE,X    ;COLOR #
        STA COLOR       ;SAVE IT
        JSR DRWOBJ      ;AND DRAW OBJECT'
        JMP OBJHAN      ;DO NEXT ONE

KILOBJ  LDA #0          ;OBJECT IS NO
        STA OBJPRS,X    ;LONGER ALIVE
        LDA #21         ;SET UP
        STA ORDSOU      ;DEATH SOUND
        LDA OBJSEG,X    ;CHECK
        BPL JOBHAN      ;FOR A
        LDA OBJGRD,X    ;COLLISION
        CMP PLRGRD      ;WITH PLAYER
        BNE CKSHOR      ;NO HIT
        LDA #1          ;HIT.
        STA KILPLR      ;KILL PLAYER!
        BNE JOBHAN      ;NEXT OBJECT
CKSHOR  LDA OBJTYP,X    ;OBJECT
        CMP #1          ;TYPE 1?
        BNE JOBHAN      ;NOPE'
        LDY #3          ;TRY SHORT:
TRYSHO  LDA SHORTF,Y    ;SHORT AVAILABLE?
        BEQ INISHO      ;YUP!
        DEY             ;KEEP...
        BPL TRYSHO      ;TRYING!
        BMI JOBHAN      ;NO SHORT AVAIL!
INISHO  LDA OBJGRD,X    ;MULTIPLY THE
        ASL A           ;OBJECT'S
        ASL A           ;SUB-GRID #
```

```
        ASL A           ;BY 16...
        ASL A
        CLC
        ADC #8          ;AND ADD 8 FOR
        STA SHORTX,Y    ;THE SHORT INDEX
        LDA #1          ;SHORT IS
        STA SHORTF,Y    ;ALIVE!
        LDA RANDOM      ;RANDOMIZE...
        AND #1          ;SHORT...
        STA SHORTD,Y    ;DIRECTION
        LDA RANDOM      ;AND THAT...
        AND #$3F        ;DIRECTION'S...
        STA SHORTT,Y    ;TIME!
JOBHAN  JMP OBJHAN      ;NEXT OBJECT

DRWOBJ  LDX OBJNUM      ;GET OBJECT #
        LDA OBJGRD,X    ;GET SUB-GRID #
        ASL A           ;MULTIPLY
        ASL A           ;BY 16...
        ASL A
        ASL A
        STA HLDGRD      ;AND SAVE.
        LDA OBJSEG,X    ;DIVIDE
        LSR A           ;SEGMENT BY 2
        BCS ODDSEG      ;PROCESS ODD #
        CLC             ;IT'S EVEN, ADD
        ADC HLDGRD      ;GRID INDEX
        TAY             ;PUT IN Y REG.
        LDA SEGX,Y      ;GET OBJECT'S
        STA PLOTX       ;X POSITION
        STA SAVEX       ;AND SAVE
        LDA SEGY,Y      ;GET OBJECT'S
        STA PLOTY       ;Y POSITION
        STA SAVEY       ;AND SAVE
        JMP ODDSKP      ;SKIP ODD ROUTINE
ODDSEG  CLC             ;IT'S ODD, ADD
        ADC HLDGRD      ;GRID INDEX
        TAY             ;PUT IN Y REG.
        LDA SEGX,Y      ;GET OBJECT'S
        CLC             ;X POS, ADD
        ADC SEGX+1,Y    ;NEXT X POS.
        ROR A           ;GET AVERAGE
        STA PLOTX       ;PUT IN PLOT X
        STA SAVEX       ;AND SAVE
        LDA SEGY,Y      ;GET OBJECT'S
        CLC             ;Y POS, ADD
        ADC SEGY+1,Y    ;NEXT Y POS.
        ROR A           ;GET AVERAGE
        STA PLOTY       ;PUT IN PLOT Y
        STA SAVEY       ;AND SAVE
ODDSKP  LDA #30         ;NOW CALCULATE
        SEC             ;THE OBJECT'S
        SBC OBJSEG,X    ;SIZE BASED ON
        LSR A           ;ITS POSITION
        AND #$FE        ;ON THE GRID
        ASL A
        ASL A
        TAY             ;PUT INDEX IN Y
        LDX #0          ;NOW COPY PART
COPYSZ  LDA SIZTBL,Y    ;OF THE SIZE
        STA SIZEWK,X    ;TABLE TO A
        INY             ;SIZE WORK AREA
        INX             ;THIS TABLE HOLDS
        CPX #8          ;8 SIZE VALUES
        BNE COPYSZ      ;BASED ON DIST.
        LDX OBJNUM      ;GET OBJECT #
        LDA OBJTYP,X    ;AND ITS TYPE
        ASL A           ;AND MULTIPLY
        ASL A           ;BY 8 FOR AN
        ASL A           ;INDEX INTO
        STA SHAPIX      ;THE SHAPE TABLE
        LDA #8          ;MAX 8 LINES IN
        STA SHAPCT      ;EACH OBJECT
DOBLP   LDX SHAPIX      ;GET LINE#
        LDA OBJDIR,X    ;& ITS DIRECTION
        TAY             ;A NEGATIVE #
        BMI ENDOBJ      ;INDICATES END
        LDA PXINC,Y     ;GET X INCREMENT
        STA XI          ;OF LINE,
        LDA PYINC,Y     ;Y INCREMENT
        STA YI          ;OF LINE,
        LDA OBJLEN,X    ;ABSOLUTE LENGTH
        TAY             ;OF LINE THEN
        LDA SIZEWK,Y    ;SCALED LENGTH
        STA LENGTH      ;AND STORE!
PLOTOB  LDA PLOTX       ;THIS SECTION
        CLC             ;ADJUSTS THE
        ADC XI          ;X AND Y PLOT
        STA PLOTX       ;VALUES...
        LDA PLOTY
        CLC
        ADC YI
        STA PLOTY
        LDA SHAPIX      ;DON'T PLOT
        BEQ NOPLT1      ;FIRST LINE!
        JSR PLOTCL      ;PLOT POINT
NOPLT1  LDA PLOTY       ;INCREMENT Y
        CLC             ;AGAIN TO ADJUST
        ADC YI          ;FOR GR. 7+
        STA PLOTY       ;ASPECT RATIO
        LDA SHAPIX      ;DON'T PLOT
        BEQ NOPLT2      ;FIRST LINE
        JSR PLOTCL      ;PLOT POINT
NOPLT2  DEC LENGTH      ;END OF LINE?
        BPL PLOTOB      ;NOPE!

        INC SHAPIX      ;NEXT LINE
        DEC SHAPCT      ;LAST LINE?
        BNE DOBLP       ;NOT YET!
ENDOBJ  RTS             ;ALL DONE!

;       --------------
;       SHORT HANDLER
;       --------------

SHOHAN  LDX #3          ;MAX. 4 SHORTS
SHHANL  LDA SHORTF,X    ;SHORT ALIVE?
        BEQ HANNXS      ;NO, DO NEXT
        LDY SHORTD,X    ;GET SHORT DIR.
        LDA SHORTX,X    ;GET X POS.
        CLC             ;AND ADJUST
        ADC ADDSUB,Y    ;POSITION
        CMP #240        ;ON GRID?
        BCS RESSHD      ;NO! DON'T MOVE
        STA SHORTX,X    ;OK, SAVE POS.
        DEC SHORTT,X    ;DIRECTION CHANGE?
        BPL HANNXS      ;NO!
RESSHD  LDA RANDOM      ;GET A RANDOM
        AND #$3F        ;DIRECTION TIME
        STA SHORTT,X    ;0-63 & SAVE
        AND #1          ;RANDOM DIRECTION
        STA SHORTD,X    ;0-1 & SAVE
HANNXS  DEX             ;MORE SHORTS?
        BPL SHHANL      ;YUP!
        RTS             ;ALL DONE!

;       ------------
;       ADD TO SCORE
;       ------------

ADDSCO  LDY #0          ;GET ZERO
        SED             ;SET DECIMAL MODE
        LDA SCORE+2     ;THIS SECTION
        CLC             ;INCREMENTS
        ADC SCOADD+2    ;THE 3-DIGIT
        STA SCORE+2     ;SCORE USING
        STY SCOADD+2    ;THE 3-DIGIT
        LDA SCORE+1     ;SCORE ADD
        ADC SCOADD+1    ;AREA, THEN
        STA SCORE+1     ;ZEROS OUT
        STY SCOADD+1    ;THE
        LDA SCORE       ;SCORE ADD
        ADC SCOADD      ;AREA USING
        STA SCORE       ;THE
        STY SCOADD      ;Y REGISTER.
        CLD             ;CLR DECIMAL MODE
        JSR SHOSCO      ;SHOW SCORE
        LDA SCORE       ;IS SCORE AT
        CMP BONUS       ;BONUS LEVEL?
        BNE NOBONS      ;SORRY!
        JSR INCLIV      ;BONUS, ADD LIFE!
        SED             ;SET DECIMAL
        LDA BONUS       ;GET OLD BONUS
        CLC             ;ADD 20000
        ADC #2          ;TO IT
        CLD             ;CLR DECIMAL
        STA BONUS       ;AND SAVE BONUS
NOBONS  RTS             ;FINIS!

;       ----------
;       SHOW SCORE
;       ----------

SHOSCO  LDA #$10        ;SET UP COLOR
        STA SHCOLR      ;BYTE FOR SHOW
        LDX #0          ;ZERO X
        LDY #0          ;& Y REGS
SSCOLP  LDA SCORE,Y     ;GET SCORE BYTE
        JSR SHOBCD      ;SHOW IT
        INX             ;INCREMENT SHOW
        INX             ;POS. BY 2
        INY             ;NEXT SCORE BYTE
        CPY #3          ;DONE?
        BNE SSCOLP      ;NOT YET!
        RTS             ;ALL DONE!

;       ----------------
;       INCREMENT LIVES
;       ----------------

INCLIV  LDA LIVES       ;DO WE HAVE
        CMP #5          ;5 LIVES NOW?
        BEQ NOMOLV      ;YUP, NO INC!
        INC LIVES       ;ONE MORE LIFE
        JSR SHOLIV      ;SHOW IT
NOMOLV  RTS             ;AND EXIT!

;       ----------------
;       DECREMENT LIVES
;       ----------------

DECLIV  JSR SNDOFF      ;NO SOUND

;       ----------------------------
;       WAIT FOR PROJECTILES TO END
;       ----------------------------

WAITPD  LDX #7          ;8 PROJECTILES
        LDA #0          ;ZERO TALLY
CKPRLV  ORA PROJAC,X    ;CHECK ALL
        DEX             ;PROJECTILES
        BNE CKPRLV      ;FOR ACTIVITY
        CMP #0          ;ANY ACTIVE?
        BNE WAITPD      ;YES! WAIT MORE!

;       ------------
;       STOP SHORTS
;       ------------

        LDX #3          ;4 SHORTS (0-3)
STPSHO  STA SHORTF,X    ;TURN OFF
        DEX             ;ALL OF 'EM
        BPL STPSHO      ;LOOP UNTIL DONE

;       --------------------------
;       PUT OBJECTS AT END OF GRID
;       --------------------------

        LDA #0          ;ERASE
        STA COLOR       ;COLOR
        LDA #5          ;ERASE ALL 6
        STA OBJNUM      ;OBJECTS
ERSOBJ  JSR DRWOBJ      ;ERASE IT!
        LDX OBJNUM      ;GET OBJECT #
        LDA #30         ;PLACE AT
        STA OBJSEG,X    ;SEG #30
        LDA #1          ;SET UP MOVE
        STA OBJINC,X    ;INCREMENT
RNDOBG  LDA RANDOM      ;GET RANDOM
        AND #$0F        ;SUB-GRID #
        CMP #$0F        ;0-14
        BEQ RNDOBG
        STA OBJGRD,X
        DEC OBJNUM      ;MORE OBJECTS?
        BPL ERSOBJ      ;YEAH, DO 'EM
        LDA #$0F        ;SHOW PLAYER
        STA COLPM0      ;DEATH HERE
        STA AUDC1       ;START SOUND
MOREWT  LDA RANDOM      ;SET RANDOM
        AND #$1F        ;DEATH SOUND
        STA AUDF1       ;FREQUENCY
        LDA #6          ;WAIT 0.1 SEC
        JSR WAIT
        DEC COLPM0      ;DEC BRIGHTNESS
        LDA COLPM0      ;NOW SET
        STA AUDC1       ;DEATH VOLUME
        BNE MOREWT      ;MORE WAIT
        LDA LIVES       ;MORE LIVES?
        BEQ DEAD        ;NO MORE LIFE!
        DEC LIVES       ;ONE LESS LIFE
        JSR SHOLIV      ;SHOW IT
        LDA #60         ;WAIT 1 SEC
        JSR WAIT
        LDA #0          ;RESET PLAYER
        STA KILPLR      ;KILL FLAG
        LDA #$16        ;AND
        STA COLPM0      ;PLAYER COLOR
        RTS             ;AND EXIT!
DEAD    PLA             ;ALL DEAD, PULL
        PLA             ;RETURN ADDR.
        JMP LIVE        ;AND RESTART GAME

;       ----------
;       SHOW LIVES
;       ----------

SHOLIV  LDA #$20        ;SELECT DISPLAY
        STA SHCOLR      ;COLOR
        LDA LIVES       ;GET LIVES
        LDX #7          ;7TH CHAR ON LINE
        JSR SHOBCD      ;SHOW IT!
        RTS             ;AND EXIT

;       ----------
;       SHOW LEVEL
;       ----------

SHOLVL  LDY #$30        ;SELECT DISPLAY
        STY SHCOLR      ;COLOR
        LDA BCDLVL      ;GET LEVEL#
        LDX #14         ;14TH CHAR

;       -----------------
;       BCD CHAR DISPLAY
;       -----------------

SHOBCD  STA SHOBYT      ;SAVE CHARACTER
        AND #$0F        ;GET NUM 1
        ORA SHCOLR      ;ADD COLOR
        STA INFOLN+1,X  ;SHOW IT
        LDA SHOBYT      ;GET CHAR.
        LSR A           ;SHIFT RIGHT
        LSR A           ;TO GET
        LSR A           ;NUM 2
        LSR A
        ORA SHCOLR      ;ADD COLOR
        STA INFOLN,X    ;SHOW IT
        RTS             ;AND EXIT!

;       ----------------------
;       FLASH OBJECT WHEN DEAD
;       ----------------------

FLASH   LDY FLASHY      ;GET Y POS.
        LDA #0          ;GET READY TO
        LDX #14         ;CLEAR OLD FLASH
CLFLSH  STA PL1,Y       ;ZERO OUT EACH
        INY             ;BYTE OF FLASH
```

```
        DEX             ;DONE YET?
        BNE CLFLSH      ;NO, LOOP.
        LDA SAVEX       ;GET OBJECT'S
        CLC             ;X POS. AND
        ADC #61         ;ADD 61 FOR
        STA HPOSP1      ;FLASH HORIZ.
        LDA SAVEY       ;GET Y POS AND
        CLC             ;ADD 26 FOR
        ADC #26         ;FLASH VERT.
        TAY             ;POSITION
        STY FLASHY      ;AND SAVE
        LDX #13         ;FLASH = 14 BYTES
SEFLSH  LDA FLBYTE,X    ;GET IMAGE
        STA PL1,Y       ;PUT IN PLAYER 1
        INY             ;NEXT P/M BYTE
        DEX             ;NEXT IMAGE BYTE
        BPL SEFLSH      ;LOOP.
        LDA #1          ;SET FLASH
        STA FLTIME      ;DURATION
        RTS             ;ALL DONE!

;       ----------
;       TIME DELAY
;       ----------

WAIT    STA TIMER       ;SET TIMER
WAITLP  LDA TIMER       ;TIMER = 0?
        BNE WAITLP      ;NOPE!
        RTS             ;TIMER FINISHED!

;       ---------------
;       TURN SOUNDS OFF
;       ---------------

SNDOFF  LDA #0          ;ZERO OUT:
        STA FIRSOU      ;FIRE SOUND
        STA OBDSOU      ;OBJ DEATH SOUND
        STA MOVSOU      ;PLYR MOVE SOUND
        LDX #7          ;ZERO ALL:
SNDOF2  STA AUDF1,X     ;AUDIO REGISTERS
        DEX
        BPL SNDOF2
        RTS             ;AND EXIT

;       ----------
;       DRAW GRID
;       ----------

DRGRID  LDA #1          ;TELL INTERRUPT
        STA INTRF6      ;IT'S INTRO
        JSR SNDOFF      ;TURN OFF SOUND
        LDA #$20        ;TURN OFF TOP
        STA DMAC1       ;OF SCREEN BY
        LDA #0          ;SHUTTING OFF
        STA GRAC1       ;DMA & GRAPHICS
        LDX #3          ;TURN OFF SHORTS
CLSHRT  STA SHORTF,X
        DEX
        BPL CLSHRT
        LDX #7          ;TURN OFF
CLPRJC  STA PROJAC,X    ;ALL PROJECTILES
        DEX
        BPL CLPRJC
        JSR PMCLR       ;CLEAR P/M AREA
        STA OFFSET      ;ZERO OFFSET
        LDA #6          ;SET 6 PROJECT.
        STA PAVAIL      ;AVAILABLE
        LDA GRIDIX      ;GET GRID #
        LSR A           ;DIVIDE
        LSR A           ;BY
        LSR A           ;8
        TAX             ;LOAD APPROPRIATE
        LDA C0TBL,X     ;GRID COLOR
        STA COLPF0
        LDA C1TBL,X     ;OBJECT COLOR 1
        STA COLPF1
        LDA C2TBL,X     ;OBJECT COLOR 2
        STA COLPF2
        LDA OBSTBL,X    ;OBJECT SPEED
        STA OBJSPD
        LDA GRIDIX      ;GET GRID
        AND #7          ;SHAPE INDEX
        TAX             ;LOAD:
        LDA OBCNT0,X    ;TYPE 0
        STA NUMOBJ      ;OBJECT COUNT
        LDA OBCNT1,X    ;TYPE 1
        STA NUMOBJ+1    ;OBJECT COUNT
        LDA OBCNT2,X    ;TYPE 2
        STA NUMOBJ+2    ;OBJECT COUNT
        LDA OBCNT3,X    ;TYPE 3
        STA NUMOBJ+3    ;OBJECT COUNT
        LDA OBCNT4,X    ;TYPE 4
        STA NUMOBJ+4    ;OBJECT COUNT
        LDX #4          ;ADJUST ALL
DIFFAD  LDA NUMOBJ,X    ;OBJECT COUNTS
        CLC             ;BY ADDING
        ADC DIFF        ;DIFFICULTY
        STA NUMOBJ,X    ;AND SAVE
        DEX
        BPL DIFFAD
        LDA GRDNUM      ;GET GRID #
        ASL A           ;MULTIPLY
        ASL A           ;BY 16
        ASL A
        ASL A
        STA GRDADJ      ;SAVE
        STA GRDWK       ;SAVE
        TAX             ;SET X INDEX
        LDA #16         ;LOAD 16 BYTES
        STA GRDWK2
GRDLIN  LDA CX,X        ;GET CLOSE X
        STA PLOTX
        LDA CY,X        ;GET CLOSE Y
        STA PLOTY
        LDA FX,X        ;GET FAR X
        STA DRAWX
        LDA FY,X        ;GET FAR Y
        STA DRAWY
        LDA COLPF0      ;INVISIBLE?
        BEQ NOGRD1      ;YES, DON'T DRAW
        JSR PLOTCL      ;PLOT CLOSE POINT
        JSR DRAW        ;DRAW TO FAR
NOGRD1  DEC GRDWK2      ;CONTINUE DRAWING
        BEQ GRDBO1      ;UNTIL ALL 16
        INC GRDWK       ;LINES ARE DONE
        LDX GRDWK
        JMP GRDLIN
GRDBO1  LDX GRDADJ      ;NOW DRAW 15
        STX GRDWK       ;CLOSE GRID
        LDA #15         ;BORDER LINES
        STA GRDWK2
GRDBL1  LDA CX,X        ;GET CLOSE X
        STA PLOTX
        LDA CY,X        ;GET CLOSE Y
        STA PLOTY
        LDA CX+1,X      ;NEXT CLOSE X
        STA DRAWX
        CLC             ;FIND POINT
        ADC PLOTX       ;BETWEEN THEM
        ROR A
        STA XWORK       ;AND SAVE IT'
        LDA CY+1,X      ;NEXT CLOSE Y
        STA DRAWY
        CLC             ;FIND POINT
        ADC PLOTY       ;BETWEEN THEM
        ROR A
        STA YWORK       ;AND SAVE IT'
        LDA #15         ;SET UP A WORK
        SEC             ;AREA TO HOLD
        SBC GRDWK2      ;THE POINTS
        STA GRID        ;BETWEEN LINES
        JSR GRIDSV      ;AND SAVE THEM
        LDA COLPF0      ;INVISIBLE GRID?
        BEQ NOGRD2      ;YES, DON'T DRAW
        JSR PLOTCL      ;PLOT CLOSE POINT1
        JSR DRAW        ;DRAW TO POINT 2
NOGRD2  DEC GRDWK2      ;MORE LINES?
        BEQ GRDBO2      ;NO!
        INC GRDWK       ;INCREMENT TO
        LDX GRDWK       ;NEXT LINE
        JMP GRDBL1      ;AND LOOP
GRDBO2  LDX GRDADJ      ;NOW DRAW 15
        STX GRDWK       ;FAR GRID
        LDA #15         ;BORDER LINES
        STA GRDWK2
        STA OFFSET      ;AND SET OFFSET
GRDBL2  LDA FX,X        ;GET FAR X
        STA PLOTX
        LDA FY,X        ;GET FAR Y
        STA PLOTY
        LDA FX+1,X      ;NEXT FAR X
        STA DRAWX
        CLC             ;AND FIND
        ADC PLOTX       ;MIDPOINT
        ROR A           ;BETWEEN THEM
        STA XWORK       ;AND SAVE IT'
        LDA FY+1,X      ;NEXT FAR Y
        STA DRAWY
        CLC             ;AND FIND
        ADC PLOTY       ;MIDPOINT
        ROR A           ;BETWEEN THEM
        STA YWORK       ;AND SAVE IT'
        LDA #15         ;USE THE SAME
        SEC             ;WORK AREA
        SBC GRDWK2      ;TO HOLD THE
        STA GRID        ;MIDPOINTS
        JSR GRIDSV      ;AND SAVE THEM
        LDA COLPF0      ;INVISIBLE GRID?
        BEQ NOGRD3      ;YES, DON'T DRAW
        JSR PLOTCL      ;PLOT FAR POINT 1
        JSR DRAW        ;DRAW TO POINT 2
NOGRD3  DEC GRDWK2      ;MORE LINES?
        BEQ GENCOO      ;NO!
        INC GRDWK       ;INCREMENT TO
        LDX GRDWK       ;NEXT LINE
        JMP GRDBL2      ;AND LOOP

;       ---------------------------
;       NOW GENERATE COORDINATE TABLE
;
;       THIS SECTION BUILDS THE SEGX,
;       SEGY, RIMX AND RIMY TABLES.
;       THE SEGX&Y TABLES ARE POINTS
;       UP AND DOWN THE GRID FOR PRO-
;       JECTILES AND OBJECTS.  THE
;       RIMX&Y TABLES ARE FOR THE
;       POSITIONING OF SHORTS.
;       ---------------------------

GENCOO  LDA #0
        STA GRIDNO
DIVCTL  TAX
        LDA SEGX,X      ;SET UP SEGWK
        STA SEGWK       ;WITH END
        LDA SEGX+15,X   ;COORDINATES
        STA SEGWK+16
        JSR DIVIDE      ;DIVIDE SEGWK
        LDX GRIDNO
        LDY #0
COPY1   LDA SEGWK,Y     ;COPY SEGWK
        STA SEGX,X      ;TABLE TO SEGX
        INX
        INY
        CPY #16
        BNE COPY1
;NOW THE Y COORDS
        LDX GRIDNO
        LDA SEGY,X      ;SET UP SEGWK
        STA SEGWK       ;WITH END
        LDA SEGY+15,X   ;COORDINATES
        STA SEGWK+16
        JSR DIVIDE      ;DIVIDE SEGWK
        LDX GRIDNO
        LDY #0
COPY2   LDA SEGWK,Y     ;COPY SEGWK
        STA SEGY,X      ;TABLE TO SEGY
        INX
        INY
        CPY #16
        BNE COPY2

;       ---------------------------
;       NOW GENERATE RIM COORDINATES
;       ---------------------------

        LDX GRIDNO
        LDA RIMX,X      ;SET UP SEGWK
        STA SEGWK       ;WITH END
        LDA RIMX+15,X   ;COORDINATES
        STA SEGWK+16
        JSR DIVIDE      ;DIVIDE SEGWK
        LDX GRIDNO
        LDY #0
COPY3   LDA SEGWK,Y     ;COPY SEGWK
        STA RIMX,X      ;TABLE TO RIMX
        INX
        INY
        CPY #16
        BNE COPY3
;NOW THE RIM Y COORDS
        LDX GRIDNO
        LDA RIMY,X      ;SET UP SEGWK
        STA SEGWK       ;WITH END
        LDA RIMY+15,X   ;COORDINATES
        STA SEGWK+16
        JSR DIVIDE      ;DIVIDE SEGWK
        LDX GRIDNO
        LDY #0
COPY4   LDA SEGWK,Y     ;COPY SEGWK
        STA RIMY,X      ;TABLE TO RIMY
        INX
        INY
        CPY #16
        BNE COPY4
        LDA GRIDNO      ;DO ALL 15
        CLC             ;GRID LINES
        ADC #16
        STA GRIDNO
        CMP #240        ;ALL DONE?
        BEQ ENDDVC      ;YOU BET'
        JMP DIVCTL      ;LOOP BACK'
ENDDVC  LDA #$3D        ;RESTART
        STA DMAC1       ;THE DISPLAY
        LDA #$03        ;AFTER GRID
        STA GRAC1       ;IS DRAWN
        LDA #0          ;NO MORE
        STA INTRF6      ;INTRO STATUS
        RTS             ;FINIS'

;       ---------------------------
;       DIVIDE SEGWK TABLE
;
;       THIS ROUTINE EXAMINES THE FIRST
;       AND LAST BYTES IN THE SEGWK
;       TABLE AND FILLS THE BYTES IN
;       BETWEEN WITH AN EVEN TRANSITION
;       FROM ONE ENDPOINT TO THE OTHER
;       ---------------------------

DIVIDE  LDA #16
        STA STEP
        STA NEXT
        LSR A
        STA DEST
DIVLP2  LDA #0
        STA LAST
DIVLP1  LDX LAST
        LDA SEGWK,X
        LDX NEXT
        CLC
        ADC SEGWK,X
        ROR A
        LDX DEST
        STA SEGWK,X
        LDA LAST
        CLC
        ADC STEP
        STA LAST
```

```
        ADC STEP
        CMP #17
        BCS NOSTEP
        STA NEXT
        LDA DEST
        CLC
        ADC STEP
        STA DEST
        JMP DIVLP1
NOSTEP  LDA STEP
        LSR A
        STA STEP
        STA NEXT
        LSR A
        BEQ ENDDIV
        STA DEST
        JMP DIVLP2
ENDDIV  RTS

;       ---------------------
;       GRID COORDINATE SAVE
;       ---------------------

GRIDSV  LDA GRID
        ASL A               ;*2
        ASL A               ;*4
        ASL A               ;*8
        ASL A               ;*16
        CLC                 ;ADD THE
        ADC OFFSET          ;OFFSET VALUE
        TAX                 ;SAVE IN INDEX
        LDA XWORK           ;GET X WORK
        STA SEGX,X          ;AND SAVE
        LDA YWORK           ;GET Y WORK
        STA SEGY,X          ;AND SAVE
        LDA OFFSET          ;DON'T CONTINUE
        BNE SAVEND          ;IF OFFSET >0
        LDA PLOTX           ;GET PLOTX
        STA RIMX,X          ;AND SAVE
        LDA PLOTY           ;GET PLOTY
        STA RIMY,X          ;AND SAVE
        LDA DRAWX           ;GET DRAWX
        STA RIMX+15,X       ;AND SAVE
        LDA DRAWY           ;GET DRAWY
        STA RIMY+15,X       ;AND SAVE
SAVEND  RTS                 ;ALL DONE!

;       ------------------------
;       VERTICAL BLANK ROUTINE
;       ------------------------

VBI     LDA #DLI1&255       ;POINT TO
        STA VDSLST          ;FIRST
        LDA #DLI1/256       ;DISPLAY LIST
        STA VDSLST+1        ;INTERRUPT
        CLD                 ;CLR DECIMAL MODE
        LDA OBTIM1          ;THIS SECTION
        BEQ NOOBTD          ;PROCESSES
        DEC OBTIM1          ;ALL TIMERS
NOOBTD  LDA TIMER
        BEQ NOTIMR
        DEC TIMER
NOTIMR  LDA FLTIME
        BEQ NOFTIM
        DEC FLTIME
NOFTIM  LDA KILPLR          ;PLAYER DEAD?
        BEQ CHKINT          ;NO, CONTINUE!
        JMP VBCONT          ;SKIP PLAYER STUFF
CHKINT  LDA INTRFG          ;IN INTRO?
        BEQ NOTINT          ;NO, CONTINUE!
        JMP XITVBV          ;EXIT IF INTRO
NOTINT  LDA KEY             ;GET KEYBOARD
        CMP #$1C            ;PAUSE (ESC)?
        BNE CKZAP           ;NO, CHECK ZAP
        LDA PAUFLG          ;GET PAUSE FLAG
        EOR #$FF            ;AND FLIP
        STA PAUFLG          ;AND STORE
        JMP ENDKEY          ;DONE W/KEY
CKZAP   CMP #$21            ;SPACE BAR?
        BNE ENDKEY          ;NAW, DONE W/KEY
        LDA ZAP             ;USED ZAP YET?
        BEQ ENDKEY          ;YES, NO ZAP
        DEC ZAP             ;ZAP NOW USED
        LDX #5              ;TIME TO KILL
        LDA #1              ;ALL OBJECTS
ZAPOBJ  STA OBDEAD,X
        DEX
        BPL ZAPOBJ
        LDX #3              ;AND KILL
ZAPSHO  LDA SHORTF,X        ;ALL SHORTS
        BEQ NOSKIL
        LDA MISCAD          ;ALSO SET
        SED                 ;MISCELLANEOUS
        CLC                 ;SCORE ADD
        ADC #4              ;FOR 400 POINTS
        STA MISCAD          ;FOR EACH SHORT
        CLD
        LDA #0              ;KILL
        STA SHORTF,X        ;SHORT
NOSKIL  DEX
        BPL ZAPSHO
ENDKEY  LDA #0              ;CLEAR
        STA KEY             ;KEYPRESS.
        LDA PAUFLG          ;PAUSED?
        BEQ NOPAU           ;NO, CONTINUE
        LDA #0              ;TURN OFF
        STA AUDC1           ;ALL SOUNDS
        STA AUDC2           ;DURING
        STA AUDC3           ;THE
        STA AUDC4           ;PAUSE
        JMP XITVBV          ;THEN EXIT
NOPAU   LDA FIRSOU          ;FIRE SOUND ON?
        BEQ NOFSND          ;NO!
        DEC FIRSOU          ;DEC COUNTER
        LDX FIRSOU          ;PUT IN INDEX
        LDA FIRFRQ,X        ;GET FREQUENCY
        STA AUDF2
        LDA FIRCTL,X        ;GET CONTROL
        STA AUDC2
NOFSND  LDA OBDSOU          ;OBJ DEATH SOUND?
        BEQ NOOSND          ;NO!
        DEC OBDSOU          ;DEC COUNTER
        LDX OBDSOU          ;PUT IN INDEX
        LDA OBDFRQ,X        ;GET FREQUENCY
        STA AUDF3
        LDA OBDCTL,X        ;GET CONTROL
        STA AUDC3
NOOSND  LDA MOVSOU          ;MOVE SOUND?
        BEQ CYCCOL          ;NO!
        DEC MOVSOU          ;DEC COUNTER
        LDX MOVSOU          ;PUT IN INDEX
        LDA MOVFRQ,X        ;GET FREQUENCY
        STA AUDF4
        LDA MOVCTL,X        ;GET CONTROL
        STA AUDC4
CYCCOL  LDA COLPM2          ;CYCLE
        CLC                 ;PLAYER 2
        ADC #16             ;COLOR
        STA COLPM2          ;SAVE IN P/M 2
        STA COLPM3          ;AND IN P/M 3
        AND #$FC            ;ALSO PUT IN
        STA COLPF3          ;PF3 FOR MISSILES
        DEC TRANTM          ;TRANSIENT TIME
        BNE NOTRAN          ;NO CHANGE
        LDA OBJHUE+4        ;FLIP
        BNE TRAN1           ;TRANSIENT
        LDA #2              ;HUE
        BNE STOTRN          ;TO EITHER
TRAN1   LDA #0              ;0 OR 2
STOTRN  STA OBJHUE+4
        LDA RANDOM
        ORA #$1F            ;RESET
        AND #$3F            ;THE
        STA TRANTM          ;TRANSIENT TIME
NOTRAN  INC PSCNT           ;INC PLYR TIMER
        LDA PSCNT           ;READY TO
        CMP #3              ;CHANGE SHAPE?
        BNE NOPSIN          ;NOT YET!
        LDA #0              ;BETTER RESET
        STA PSCNT           ;INDEX
        INC SP1IX           ;AND INCREMENT
        INC SP2IX           ;ALL SHAPE
        INC SP3IX           ;INDEXES!
NOPSIN  LDA PFTIME          ;SEE IF WE'RE
        BEQ FIRE            ;READY TO CHECK
        DEC PFTIME          ;IF PLAYER IS
        JMP CHKPMV          ;SHOOTING
FIRE    LDA #4              ;RESET FIRE
        STA PFTIME          ;TIMER
        LDA JOYPAD          ;USING STICK?
        BEQ RDSTRG          ;YES!
        LDA PTRIG0          ;GET PADL TRIGGER
        JMP CMPTRG          ;CHECK IT
RDSTRG  LDA STRIG           ;GET STICK TRIGGER
CMPTRG  BNE CHKPMV          ;NOT FIRING!
        LDA PAVAIL          ;ANY PROJ AVAIL?
        BEQ CHKPMV          ;NO!
        LDX #7              ;FIND AN
PRSCAN  LDA PROJAC,X        ;AVAILABLE
        BEQ GOTPRN          ;PROJECTILE
        DEX
        BNE PRSCAN
GOTPRN  DEC PAVAIL          ;1 LESS AVAILABLE
        LDA #1              ;IT'S NOW
        STA PROJAC,X        ;ACTIVE
        LDA #21             ;START UP
        STA FIRSOU          ;FIRE SOUND
        LDA #0              ;INITIALIZE
        STA PROJSG,X        ;SEGMENT # TO 0
        LDA PLRGRD          ;SET UP
        STA PROGRD,X        ;PROJ GRID#
        ASL A               ;AND
        ASL A               ;MULTIPLY
        ASL A               ;BY 16
        ASL A
        STA PROJGN,X        ;FOR INDEX
        LDA #1              ;INITIALIZE
        STA PROINC,X        ;PROJ INCREMENT
CHKPMV  LDA JOYPAD          ;USING STICK?
        BEQ GOSTIK          ;YES!
        LDA POT0            ;GET PADDLE
        LSR A               ;DIVIDE BY
        LSR A               ;16 TO GET
        LSR A               ;USABLE VALUE
        LSR A
        CMP #15             ;> 14?
        BMI STOPOS          ;NO, GO STORE
        LDA #14             ;MAX. IS 14
        BNE STOPOS          ;AND GO STORE
GOSTIK  LDA PMTIME          ;READY FOR STICK?
        BEQ RDSTIK          ;YES!
        DEC PMTIME          ;DEC TIMER
JVBC    JMP VBCONT          ;JMP TO CONTINUE
RDSTIK  LDA #2              ;RESET STICK TIMER
        STA PMTIME          ;TO 2 JIFFIES
        LDX STICK           ;GET STICK
        LDA PLRGRD          ;GET PLYR GRID #
        CLC                 ;ADD THE
        ADC STKADD,X        ;DIRECTION INC
        BMI SAMPOS          ;IF <0 REJECT
        CMP #15             ;IF <15,...
        BNE STOPOS          ;USE IT!
SAMPOS  LDA PLRGRD          ;GET GRID#
STOPOS  CMP PLRGRD          ;SAME AS LAST?
        BEQ NOPSTO          ;YES, DON'T STORE
        LDX #9              ;START UP
        STX MOVSOU          ;MOVE SOUND
        STA PLRGRD          ;SAVE GRID#
NOPSTO  ASL A               ;MULTIPLY
        ASL A               ;BY 16 FOR
        ASL A               ;POSITION
        ASL A               ;INDEX
        TAX
        LDA P0PL
        AND #$0C            ;HIT P2/P3?
        BEQ NOHSHO          ;NO!
        LDA #1              ;OOPS! HIT SHORT!
        STA KILPLR          ;KILL PLAYER
        JMP VBEND           ;AND EXIT VBLANK
NOHSHO  LDA SEGX,X          ;GET PLAYER'S
        CLC                 ;X POSITION AND
        ADC #61             ;ADJUST FOR P/M
        STA HPOSP0          ;AND SAVE
        LDY PLRY            ;HOLD OLD Y POS
        LDA SEGY,X          ;GET NEW Y POS
        CLC                 ;ADJUST FOR P/M
        ADC #32             ;BY ADDING 32
        STA PLRY            ;SET Y POS
        LDA #0              ;CLEAR OUT
        LDX #15             ;OLD PLAYER
CLRPS   STA PL0-8,Y         ;IMAGE
        INY
        DEX
        BPL CLRPS
        LDA #15             ;NOW COPY
        STA SPIX            ;16-BYTE
SPLOOP  LDA #0              ;PLAYER IMAGE
        STA PLTBYT          ;TO PLAYER 0
        LDA SP1IX
        AND #15
        TAX
        LDA SPIX
        CMP SPTBL,X
        BCC NOSP1
        CMP EPTBL,X
        BCS NOSP1
        TAX
        LDA PN1,X           ;GET IMAGE 1
        STA PLTBYT          ;AND SAVE
NOSP1   LDA SP2IX
        AND #15
        TAX
        LDA SPIX
        CMP SPTBL,X
        BCC NOSP2
        CMP EPTBL,X
        BCS NOSP2
        TAX
        LDA PN2,X
        ORA PLTBYT          ;ADD IMAGE 2
        STA PLTBYT          ;AND SAVE
NOSP2   LDA SP3IX
        AND #15
        TAX
        LDA SPIX
        CMP SPTBL,X
        BCC NOSP3
        CMP EPTBL,X
        BCS NOSP3
        TAX
        LDA PN3,X
        ORA PLTBYT          ;ADD IMAGE 3
        STA PLTBYT          ;AND SAVE
NOSP3   LDA PLRY
        CLC
        ADC SPIX
        SEC
        SBC #8
        TAY
        LDA PLTBYT          ;GET IMAGE BYTE
        STA PL0,Y           ;PUT IN P/M AREA
        DEC SPIX            ;MORE IMAGE?
        BPL SPLOOP          ;YES!
VBCONT  LDA PRADV1          ;ADVANCE PROJ?
        BEQ SETPRA          ;YES!
        DEC PRADV1          ;NO, DEC TIMER
        JMP FLIPIT          ;GO FLIP DISPLAY
SETPRA  INC PRADVT          ;SET ADVANCE
        LDA #1              ;TIMER
        STA PRADV1

;       ------------------------------
;       THIS SECTION FLIP-FLOPS THE 4
;       MISSILES IN ORDER TO ALLOW THE
;       DISPLAY OF 8 PROJECTILES.  AS
;       A RESULT, SOME FLICKER CAN BE
;       OBSERVED.
;       ------------------------------
```

```
FLIPIT  INC  PRFLIP         ;INC FLIP INDEX
        LDA  PRFLIP         ;GET INDEX
        AND  #1             ;MAKE 0/1
        TAY                 ;SAVE IN Y
        LDA  PREND,Y        ;GET # OF LAST
        STA  ENDVAL         ;PROJECTILE
        LDX  PRSTRT,Y       ;GET # OF FIRST
        STX  VBXHLD         ;PROJECTILE
        LDA  #3             ;START W/MISSILE
        STA  MISNUM         ;NUMBER 3
PROJLP  LDA  PROJAC,X       ;IS PROJ. ACTIVE?
        BNE  GOTPRJ         ;YOU BET.
        JMP  CKPEND         ;TRY ANOTHER
GOTPRJ  LDX  MISNUM         ;GET MISSILE #
        LDY  PRYHLD,X       ;GET LAST POSITION
        LDA  MISSLS+1,Y     ;ERASE OLD
        AND  MISLOF,X       ;PROJECTILE
        STA  MISSLS+1,Y     ;IMAGE
        LDA  MISSLS,Y
        AND  MISLOF,X
        STA  MISSLS,Y
        LDA  MISSLS+1,Y
        AND  MISLOF,X
        STA  MISSLS+1,Y
        LDX  VBXHLD
        LDA  PRADVT         ;READY TO
        AND  #1             ;ADVANCE PROJ?
        BNE  NOPADV         ;NOT YET
        LDA  PROJSG,X       ;GET PROJ SEG#
        CLC                 ;AND
        ADC  PROINC,X       ;ADD INCREMENT
        STA  PROJSG,X       ;THEN SAVE
NOPADV  LDA  PROINC,X       ;ENEMY SHOT?
        BMI  NOOHCK         ;NO OBJ HIT CHECK
        LDY  #5
OBKILP  LDA  OBDEAD,Y       ;ALREADY DEAD?
        BNE  NXTOCK         ;YES!
        LDA  OBJPRS,Y       ;OBJECT THERE?
        BEQ  NXTOCK         ;NO!
        LDA  OBJTYP,Y       ;TRANSIENT?
        CMP  #4
        BNE  NOTRNC         ;NO!
        LDA  OBJHUE+4       ;INVISIBLE?
        BEQ  NXTOCK         ;YES!
NOTRNC  LDA  OBJGRD,Y       ;SAME GRID #
        CMP  PROGRD,X       ;AS PROJ?
        BNE  NXTOCK         ;NO!
        LDA  OBJSEG,Y       ;SAME SEG #
        LSR  A
        SEC
        SBC  PROJSG,X       ;AS PROJ?
        BEQ  HITOBJ
        CMP  #254
        BCC  NXTOCK         ;NO!
HITOBJ  LDA  OBJTYP,Y       ;RESISTOR?
        BEQ  CGPRDR         ;YES!
        LDA  #1             ;KILL OBJECT
        STA  OBDEAD,Y
        JMP  KILLPR         ;AND PROJ.
CGPRDR  LDA  #$FF           ;PROJ NOW HEADING
        STA  PROINC,X       ;FOR PLAYER!
NXTOCK  DEY                 ;NEXT OBJECT
        BPL  OBKILP         ;MORE TO DO!
NOOHCK  LDA  PROJSG,X       ;IS PROJ SEG# =0?
        BEQ  KILLPR         ;YES, KILL IT!
        CMP  #16            ;=16?
        BEQ  KILLPR         ;YES, KILL IT!
        CLC                 ;NOW ADD PROJ
        ADC  PROJGN,X       ;GRID INDEX
        TAX                 ;AND GET
        LDA  SEGX,X         ;X COORD
        LDY  SEGY,X         ;AND Y COORD
        CLC                 ;ADD 64 TO
        ADC  #64            ;X COORD FOR
        LDX  MISNUM         ;P/M HORIZ
        STA  HPOSM0,X       ;AND SAVE
        TYA                 ;GET Y
        CLC                 ;ADD 32 TO
        ADC  #32            ;Y COORD FOR
        TAY                 ;P/M VERT
        STY  PRYHLD,X       ;AND SAVE.
        LDA  MISSLS-1,Y     ;NOW DRAW
        ORA  MISLON,X       ;PROJECTILE IN
        STA  MISSLS-1,Y     ;NEW POSITION
        LDA  MISSLS,Y
        ORA  MISLON,X
        STA  MISSLS,Y
        LDA  MISSLS+1,Y
        ORA  MISLON,X
        STA  MISSLS+1,Y
CKPEND  DEC  MISNUM         ;NEXT MISSILE #
        DEC  VBXHLD         ;NEXT PROJ.
        LDX  VBXHLD
        CPX  ENDVAL         ;DONE?
        BEQ  SHORTS         ;YES!
        JMP  PROJLP         ;DO NEXT PROJ.
KILLPR  LDA  #0             ;KILL PROJ.
        STA  PROJAC,X
        CPX  #2             ;ENEMY PROJ?
        BCC  NOAVIN         ;YES DON'T INC
        INC  PAVAIL         ;ANOTHER AVAIL
NOAVIN  LDA  PROJSG,X       ;SEGMENT 0?
        BNE  NOKILP         ;NO!
        LDA  PROINC,X       ;TOWARD RIM?
        BPL  NOKILP         ;NO!
        LDA  PROGRD,X       ;SAME GRID...
        CMP  PLRGRD         ;AS PLAYER?
        BNE  NOKILP         ;NO!
        LDA  #1             ;THE PLAYER
        STA  KILPLR         ;IS DEAD!
NOKILP  JMP  CKPEND         ;NEXT PROJ.

;       ------------------------------
;       THIS SECTION HANDLES SHORTS.
;       2 PLAYERS ARE USED TO SHOW A
;       MAXIMUM OF 4 SHORTS, SO SOME
;       FLICKER MAY BE OBSERVED.
;       ------------------------------

SHORTS  INC  SHFLIP         ;TOGGLE FLIP
        LDA  SHFLIP         ;MASK FLIP
        LSR  A              ;TO EITHER
        AND  #1             ;0 OR 1
        TAY                 ;PUT IN Y
        LDA  CPYSTN,Y       ;AND GET IMAGE
        STA  CPYST          ;TO USE (+/X)
        LDA  SHFLIP         ;GET FLIP,
        AND  #1             ;MASK AND
        TAY                 ;PUT IN Y
        LDA  #PL3/256       ;PUT PLAYER 3
        STA  DESTHI         ;IN DESTINATION
        LDA  #PL3&255       ;ADDRESS
        STA  DESTLO         ;HI & LO
        LDA  #1             ;SET DEST #
        STA  DESTNM
        LDA  SHSTRT,Y       ;GET START
        STA  VBXHLD         ;SHORT #
SHORLP  LDA  #0
        LDX  DESTNM
        LDY  SHYHLD,X       ;GET LAST INDEX
        LDX  #9             ;NOW ERASE
ERSSHO  STA  (DESTLO),Y     ;PREVIOUS
        INY                 ;SHORT
        DEX
        BPL  ERSSHO
        LDX  VBXHLD
        LDA  SHORTF,X       ;SHORT ALIVE?
        BEQ  NXTSHO         ;NO!
        LDA  SHORTX,X       ;GET INDEX OF
        TAX                 ;SHORT'S POS.
        LDA  RIMX,X         ;GET X COORD
        LDY  RIMY,X         ;AND Y COORD
        CLC
        ADC  #62            ;ADJUST X
        LDX  DESTNM         ;GET PLAYER#
        STA  HPOSP2,X       ;AND STORE
        TYA
        CLC
        ADC  #28            ;ADJUST Y
        STA  SHYHLD,X       ;SAVE IT
        TAY
        LDX  CPYST
        LDA  #4
        STA  CPYCNT
SHOCOP  LDA  SHOIMG,X       ;NOW COPY
        STA  (DESTLO),Y     ;SHORT IMAGE
        INY                 ;TO P/M
        STA  (DESTLO),Y     ;AREA
        INY
        DEX
        DEC  CPYCNT
        BPL  SHOCOP
NXTSHO  DEC  DESTNM         ;MORE?
        BMI  VBEND          ;NO, EXIT!
        DEC  DESTHI         ;NEXT PLAYER
        INC  VBXHLD
        JMP  SHORLP         ;LOOP BACK.
VBEND   STA  HITCLR         ;CLEAR COLLISION
        JMP  XITVBV         ;VBI DONE! (WHEW!)

;       ---------------------
;       CLEAR PLAYER-MISSILES
;       ---------------------

PMCLR   LDA  #0             ;PUT 255
        TAX                 ;ZEROS IN
PMCLP   STA  MISSLS,X       ;EACH P/M
        STA  PL0,X          ;AREA
        STA  PL1,X
        STA  PL2,X
        STA  PL3,X
        DEX
        BNE  PMCLP
        RTS                 ;FINIS!

;       -------------
;       CLEAR SCREEN
;       -------------

CLRSC   LDA  #DISP/256      ;INITIAL
        STA  HI             ;DISPLAY
        LDA  #DISP&255      ;ADDRESS
        STA  LO             ;WORK AREA
        LDX  #20            ;CLEAR 20 GROUPS
CLRSC2  LDY  #0             ;OF 256 BYTES
        TYA                 ;(5120 BYTES)
CLRSC3  STA  (LO),Y
        DEY
        BNE  CLRSC3
        DEX
        BNE  CLRSC4
        RTS
CLRSC4  INC  HI
        JMP  CLRSC2

;       ----------------------
;       GR. 7+ PLOTTER ROUTINE
;       (SEE A.N.A.L.O.G. #11)
;       ----------------------

PLOTCL  LDA  PLOTY          ;MULT. Y BY 32:
        ASL  A
        STA  LO
        LDA  #0
        ROL  A
        STA  HI             ;*2
        ASL  LO
        ROL  HI             ;*4
        ASL  LO
        ROL  HI             ;*8
        ASL  LO
        ROL  HI             ;*16
        ASL  LO
        ROL  HI             ;*32
        LDA  #DISP&255      ;ADD THE DISPLAY
        CLC                 ;ADDRESS TO GET
        ADC  LO             ;THE ACTUAL
        STA  LO             ;ADDRESS OF THE
        LDA  #DISP/256      ;BYTE THAT WILL
        ADC  HI             ;BE ALTERED FOR
        STA  HI             ;THE PLOT.
        LDA  PLOTX          ;MASK PLOTX FOR
        AND  #3             ;PLOT INDEX,
        TAX                 ;PLACE IN X.
        LDA  PLOTX          ;GET PLOTX AND
        LSR  A              ;DIVIDE
        LSR  A              ;BY 4,
        STA  YOFSET
        TAY
        LDA  (LO),Y
        AND  BMASK2,X
        CMP  COLOR1,X
        BEQ  PABORT
        LDY  COLOR          ;GET COLOR
        LDA  BMASK2,X       ;AND MASK OFF
        AND  COLORS,Y       ;PIXEL POSITION
        STA  HOLD           ;SAVE IT.
        LDA  BMASK1,X       ;MASK OFF PIXEL
        LDY  YOFSET         ;OF THE ADDRESS
        AND  (LO),Y         ;TO BE ALTERED
        ORA  HOLD           ;SET THE PLOT
        STA  (LO),Y         ;BITS AND STORE!
PABORT  RTS                 ;FINIS!

;       ----------------
;       PLOT MASK TABLES
;       ----------------

COLORS  DB   $00,$55,$AA,$FF
BMASK1  DB   $3F,$CF,$F3,$FC
BMASK2  DB   $C0,$30,$0C,$03
COLOR1  DB   $40,$10,$04,$01

;       -------------
;       DRAW HANDLER
;       -------------

DRAW    LDA  DRAWY
        CMP  PLOTY          ;IS DRAWY>PLOTY?
        BCC  YMINUS         ;NO!
        SEC                 ;SUBTRACT
        SBC  PLOTY          ;PLOTY FROM DRAWY
        STA  DELTAY         ;AND SAVE DIFFERENCE.
        LDA  #1             ;Y INCREMENT
        STA  INCY           ;= 1 (DOWN)
        BNE  XVEC           ;BRANCH!
YMINUS  LDA  PLOTY          ;SUBTRACT
        SEC                 ;DRAWY
        SBC  DRAWY          ;FROM PLOTY
        STA  DELTAY         ;AND SAVE DIFFERENCE.
        LDA  #255           ;Y INCREMENT
        STA  INCY           ;= -1 (UP)
XVEC    LDA  DRAWX          ;IS DRAWX
        CMP  PLOTX          ;> PLOTX?
        BCC  XMINUS         ;NO!
        SEC                 ;SUBTRACT
        SBC  PLOTX          ;PLOTX FROM DRAWX
        STA  DELTAX         ;AND SAVE DIFFERENCE.
        LDA  #1             ;X INCREMENT
        STA  INCX           ;IS 1 (RIGHT)
        BNE  VECSET         ;BRANCH!
XMINUS  LDA  PLOTX          ;SUBTRACT
        SEC                 ;DRAWX FROM
        SBC  DRAWX          ;PLOTX
        STA  DELTAX         ;AND SAVE DIFFERENCE.
        LDA  #255           ;X INCREMENT
        STA  INCX           ;IS -1 (LEFT)
VECSET  LDA  #0             ;ZERO OUT:
        STA  ACCY           ;Y ACCUMULATOR
        STA  ACCX           ;X ACCUMULATOR
        LDA  DELTAX         ;IS DELTAX>
        CMP  DELTAY         ;DELTAY?
        BCC  YMAX           ;NO!
        STA  COUNTR         ;SAVE DELTAX
        STA  ENDPT          ;IN COUNTR, ENDPT.
        LSR  A              ;DIVIDE BY 2 AND
        STA  ACCY           ;STORE IN Y ACCUM.
        JMP  DRAWGO         ;START DRAW
```

```
YMAX    LDA DELTAY      ;DELTAY LARGER,
        STA COUNTR      ;STORE IT IN
        STA ENDPT       ;COUNTR, ENDPT.
        LSR A           ;DIVIDE BY 2 AND
        STA ACCX        ;STORE IN X ACCUM.

;       ------------------------
;       NOW WE START THE ACTUAL
;       DRAWTO FUNCTION!
;       ------------------------

DRAWGO  LDA COUNTR      ;IF COUNTR=0...
        BEQ DRWEND      ;NO DRAW!
BEGIN   LDA ACCY        ;ADD DELTAY
        CLC             ;TO Y ACCUMULATOR
        ADC DELTAY
        STA ACCY
        CMP ENDPT       ;AT ENDPOINT YET?
        BCC BEGIN2      ;NO, GO DO X.
        LDA ACCY        ;SUBTRACT ENDPT
        SEC             ;FROM Y ACCUMULATOR
        SBC ENDPT
        STA ACCY
        LDA PLOTY       ;AND INCREMENT
        CLC             ;THE Y POSITION!
        ADC INCY
        STA PLOTY
BEGIN2  LDA ACCX        ;ADD DELTAX TO
        CLC             ;X ACCUMULATOR
        ADC DELTAX
        STA ACCX
        CMP ENDPT       ;AT ENDPOINT YET?
        BCC PLOTIT      ;NO, GO PLOT.
        LDA ACCX        ;SUBTRACT ENDPT
        SEC             ;FROM X ACCUMULATOR
        SBC ENDPT
        STA ACCX
        LDA PLOTX       ;AND INCREMENT
        CLC             ;PLOT X
        ADC INCX
        STA PLOTX
PLOTIT  JSR PLOTCL      ;PLOT THE POINT!
        DEC COUNTR      ;MORE TO DRAW?
        BNE BEGIN       ;YES!
DRWEND  RTS             ;NO, EXIT!

;       ------------------
;       MISCELLANEOUS DATA
;       ------------------

GRDTBL  DB  0,1,2,3,4,1,5,3
;           L,I,V,E,W,I,R,E

;       COLORS (0=GRID, 1=OBJ1 2=OBJ2)

C0TBL   DB  $C4,$36,$74,$F6
        DB  $54,$06,$00,$26
C1TBL   DB  $86,$0C,$36,$56
        DB  $26,$C6,$98,$18
C2TBL   DB  $98,$46,$A8,$36
        DB  $84,$18,$C6,$38

;       OBJECT COUNT TABLES (DIFFICULTY)

OBCNT0  DB  0,0,0,0,4,6,8,10
OBCNT1  DB  0,0,0,6,8,9,10,11
OBCNT2  DB  8,10,12,14,16,18,20,22
OBCNT3  DB  6,8,10,11,12,14,15,16
OBCNT4  DB  0,0,4,8,10,12,14,16

;       STICK ADD VALUES

STKADD  DB  0,0,0,0,0,1,1,1
        DB  0,$FF,$FF,$FF,0,0,0,0

;       PROJECTILE DATA

PROJAC  DB  0,0,0,0,0,0,0,0
PROINC  DS  8
PROGRD  DS  8
PROJGN  DS  8
PROJSG  DS  8
PRSTRT  DB  3,7
PREND   DB  $FF,3
MISLON  DB  $03,$0C,$30,$C0
MISLOF  DB  $FC,$F3,$CF,$3F

;       FLASH (OBJECT DEATH) DATA

FLBYTE  DB  $28,$28,$28,$92,$54,$28,$10
        DB  $10,$28,$54,$92,$28,$28,$28
;       OBJECT POINTS (250,200,50,100,150)

POINT1  DB  $02,$02,$00,$01,$01
POINT2  DB  $50,$00,$50,$00,$50

;       SHORT DATA

SHORTF  DS  4
SHORTX  DS  4
SHORTD  DS  4
SHORTT  DS  4

;       OBJECT DATA

OBDEAD  DS  6
OBDED2  DS  6
OBJTYP  DS  6
OBJINC  DS  6
OBJGRD  DS  6
OBJSEG  DS  6
OBJHUE  DB  2,3,2,3,2
SIZEWK  DB  0,0,0,0,0,0,0,0
PXINC   DB  0,0,1,$FF,1,$FF,1,$FF
PYINC   DB  $FF,1,0,0,$FF,1,1,$FF
OBSTBL  DB  18,15,14,12
        DB  11,10,9,7
OBJDIR  DB  4,3,1,2,0,5,$FF,0
        DB  4,5,0,6,0,$FF,0,0
        DB  0,5,6,4,7,1,$FF,0
        DB  6,0,3,1,2,7,$FF,0
        DB  4,6,5,7,5,6,4,$FF
OBJLEN  DB  3,7,7,7,7,7,0,0
        DB  3,7,7,7,7,7,0,0
        DB  3,3,3,3,3,7,0,0
        DB  2,3,3,3,3,3,0,0
        DB  1,1,1,3,1,1,3,0
SIZTBL  DB  0,0,0,0,0,1,1,1
        DB  0,0,0,1,1,2,2,2
        DB  0,0,1,1,1,2,2,2
        DB  0,1,1,2,2,2,2,3
        DB  0,1,1,2,2,2,3,3
        DB  1,2,2,2,2,2,3,3
        DB  1,2,2,2,3,3,3,4
        DB  1,2,2,3,3,3,4,4

;       PLAYER SHAPES

PN1     DB  $10,$10,$10,$10,$10,$10,$10,$10
        DB  $08,$08,$08,$08,$08,$08,$08,$08
PN2     DB  $00,$00,$00,$00,$80,$40,$20,$10
        DB  $08,$04,$02,$01,$00,$00,$00,$00
PN3     DB  $00,$00,$01,$01,$02,$02,$04,$08
        DB  $10,$20,$40,$40,$80,$80,$00,$00

;       SHAPE START/END POINTS

SPTBL   DB  0,1,2,3,4,5,6,7
        DB  8,7,6,5,4,3,2,1
EPTBL   DB  17,16,15,14,13,12,11,10
        DB  9,10,11,12,13,14,15,16

;       JOYSTICK/PADDLE MESSAGE POINTERS

JPLO    DB  JOYMSG&255,PADMSG&255
JPHI    DB  JOYMSG/256,PADMSG/256

;GRID DATA TABLES

CX      DB  14,14,14,14,14,14,14,14
        DB  26,39,51,64,75,88,100,113
        DB  14,14,14,14,14,14,14,14
        DB  14,14,14,14,14,14,14,14
        DB  14,20,26,32,38,43,49,59
        DB  69,78,84,89,95,101,107,113
        DB  113,88,64,39,14,14,14,27
        DB  27,14,14,14,39,64,88,113
        DB  14,14,14,14,14,29,43,58
        DB  70,84,98,113,113,113,113,113
        DB  113,106,100,113,113,100,82,65
        DB  48,32,14,14,14,14,14,14

CY      DB  18,34,52,70,88,105,123,141
        DB  141,141,141,141,141,141,141,141
        DB  18,25,34,42,50,58,67,75
        DB  83,91,100,108,116,125,133,141
        DB  18,39,59,80,101,121,141,141
        DB  141,141,121,101,80,59,39,18
        DB  18,18,18,18,18,35,53,71
        DB  89,106,124,141,141,141,141,141
        DB  18,49,80,111,141,132,123,114
        DB  114,123,132,141,111,80,49,18
        DB  141,110,80,61,38,18,18,18
        DB  18,18,18,43,68,92,117,141

FX      DB  55,55,55,55,55,55,55,55
        DB  58,60,62,64,66,68,70,73
        DB  55,55,55,55,55,55,55,55
        DB  55,55,55,55,55,55,55,55
        DB  55,57,58,59,59,60,61,63
        DB  65,67,68,69,69,70,71,73
        DB  73,68,64,60,55,55,55,57
        DB  57,55,55,55,60,64,68,73
        DB  55,55,55,55,55,58,61,63
        DB  65,67,70,73,73,73,73,73
        DB  73,72,70,73,73,70,67,64
        DB  61,58,55,55,55,55,55,55

FY      DB  67,71,74,77,81,84,87,90
        DB  90,90,90,90,90,90,90,90
        DB  60,62,65,68,71,73,76,78
        DB  81,83,86,89,92,94,97,99
        DB  67,73,77,80,84,88,90,90
        DB  90,90,88,84,80,77,73,67
        DB  67,67,67,67,67,71,74,77
        DB  80,83,86,90,90,90,90,90
        DB  67,74,80,86,90,89,87,86
        DB  86,87,89,90,86,80,74,67
        DB  90,85,80,75,71,67,67,67
        DB  67,67,67,73,78,82,86,90

SHSTRT  DB  0,2
SHYHLD  DS  2
SHOIMG  DB  $88,$50,$20,$50,$88
        DB  $20,$20,$F8,$20,$20
CPYSTN  DB  4,9

ADDSUB  DB  2,$FE           ;ADD/SUB. 2
ADDSB1  DB  1,$FF           ;ADD/SUB. 1

;       SOUND DATA

FIRCTL  DB  $00,$A1,$A1,$A2,$A2,$A3
        DB  $A3,$A4,$A4,$A5,$A5,$A6
        DB  $A6,$A7,$A7,$A8,$A8,$A9
        DB  $A9,$AA,$AA
FIRFRQ  DB  0,194,186,180,152,166
        DB  138,152,124,138,110,124
        DB  96,110,82,96,68,82
        DB  54,68,40

OBDCTL  DB  $00,$41,$41,$42,$42,$43
        DB  $43,$44,$44,$45,$45,$46
        DB  $46,$47,$47,$48,$48,$49
        DB  $49,$4A,$4A
OBDFRQ  DB  0,80,40,120,80,160
        DB  120,200,160,240,200,24
        DB  240,64,24,104,64,144
        DB  104,204,144

MOVCTL  DB  $00,$A1,$A1,$A2,$A2,$A3
        DB  $A3,$A4,$A4
MOVFRQ  DB  0,20,30,20,30,20,30,20,30

;       DATA TABLES

SEGWK   DS  17
SEGX    DS  256
SEGY    DS  256
RIMX    DS  256
RIMY    DS  256

        END LIVE
```

•

AS EASY AS FALLING OFF . . .

THE ALOG PAGEWRITER

For the Atari 400/800 (32K)

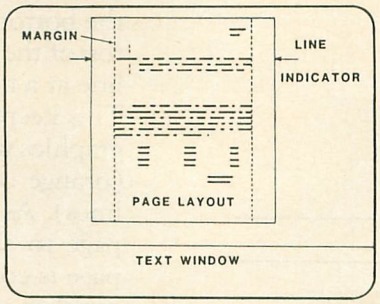
The **ALOG PAGEWRITER** turns your **ATARI** computer and 80 column printer into a very easy to use electronic typewriter. Because the entire page layout is displayed while the user is typing and editing, the **ALOG PAGEWRITER** is ideal for simple word processing tasks such as letters, notes, memos, or the kid's book reports and term papers. The average learning time is about five minutes.

KEY FEATURES:

- Uses standard Atari editing keys (e.g. INSERT, DELETE, TAB, etc.)
- A HELP screen with command summary
- Visible and fully adjustable margins
- FILL command for right justification
- Automatic return option (with word moving)
- Line 'Split' and 'Splice' commands
- Store 10 pages with no disk swapping
- Not copy protected

REQUIRED EQUIPMENT:

- ATARI 400 or 800 Computer
- ATARI 850 Interface Box
- At least 32K of RAM
- One disk drive
- 80 column printer



A FAST, SIMPLE, EASY TO USE

Word Processing Program

ONLY $39.95

To order direct, send check or money order to

ALOG COMPUTING
1040 Veronica Springs Rd.
Santa Barbara, CA 93105
(We pay shipping)

For information or credit card orders call our distributor,
COMSTAR (805) 964-4660
outside Calif. (800) 558-8803.

(ATARI is a trademark of Atari, Inc.)

THE ALOG PAGEWRITER STORY

ALOG Computing was formed in July of 1982 by a group of professional scientific computer programmers who felt it might be fun, interesting and possibly profitable to apply advanced programming techniques to the creation of simple, useful and inexpensive software for personal computers.

The ALOG PAGEWRITER is the first of a number of products under development to meet our criteria for release. It is creative, simple, useful and inexpensive. But above all, it's fun. It was fun to develop and it's fun to use. We did it for the ATARI because we wanted to show that the excellent ATARI graphics can be used for more than games.

Join the gang of happy PAGEWRITER users and you'll see what we mean. We've had nothing but good reports so far.

We are the only software and computer company you will ever need!

SOFTWARE GALLERY ® MAIL ORDER

P.O. BOX 3354, CHERRY HILL, N.J. 08034

TOLL FREE (800) 992-3300 FOR ORDER ONLY

FOR INFORMATION & N.J. CALL (609) 424-7106

SPECIAL OF THE MONTH

Buy One Cover at $8.99 and Receive the Second for $4.99

COMPUTER COVER

Features heavy duty canvas with vinyl interior - waterproof.

ATARI 800	$8.99	EPSON MX-80FT	$8.99
ATARI 810	$8.99	OKIDATA/μ82A	$8.99
EPSON MX-80	$8.99		

ATARI HOME COMPUTERS

Atari 1200	CALL
Atari 800	CALL
Atari 400	CALL
1050 Disk Drive	CALL

1010 RECORDER	$74.95
1020 PRINTER	$264.95
1027 DAISY WHEEL PRINTER	$299.95
830 MODEM	$154.95
820 PRINTER	$254.95
CX419 BOOKKEEPER KIT	$194.95
CX481 ENTERTAINER PKG.	$64.95
CX482 EDUCATOR PKG.	$131.95
CX483 PROGRAMMER PKG.	$52.95
CX484 COMMUNICATOR PKG.	$324.95

SOFTWARE

ASTEROIDS	$25.95
CENTIPEDE	$30.95
CAVERNS OF MARS	$30.95
DEFENDER	$30.95
GALAXIAN	$30.95
MISSILE COMMAND	$25.95
PAC-MAN	$30.95
STAR RAIDERS	$30.95
ATARI WRITER	$60.95

DISKETTES

Elephants

SS/SD (10) **$17.95**

SS/DD (10) **$20.95**

RAM BOARD

Intec

32K	$62.95
48K	$81.95
64K	$105.95

Atari

16K	$49.95

WICO

Joystick	$22.50
Famous Red Ball	$25.95
Track Ball	$49.95

BROOKES

Surge Protector (4 outlets)	$37.95
Surge Protector (6 outlets)	$82.95

EPSON PRINTERS

MX-80	$329.00
MX-80 FT	$459.95
FX-80	$549.95
MX-100	$619.00
PROWRITER	$369.95

MODEM

Hayes

Smart	$204.95
Smart 1200	$534.95
Chronograph	$199.95
Micromodem 100	$299.95
Micromodem II	$279.95

In Home Key Board for 400

$49.95

MONITORS

AMDEK (300)	$154.95
COLOR I	$299.95
COLOR II	$589.95

We carry a large selection of Atari software, call for FREE catalog with order ...or send $1 (refundable with order). UPS shipping 3% for hardware and $3 for software. N.J. resident add 6% sales tax.

VISA MasterCard

NOTE: Atari, Epson, IBM and Okidata are registered trademarks.

PRICES SUBJECT TO CHANGE WITHOUT NOTICE.

MASTER CARD OR VISA ADD 3%

ALOG
ALOG Computing
1040 Veronica Springs Rd.
Santa Barbera, CA 93105
$39.95
(805) 682-5248

by Tony Messina

Several weeks ago I (along with many other ATARI user group members) received a notice about a new word processor which was being offered by ALOG COMPUTING (no connection whatsoever with **A.N.A.L.O.G.**). The brochure stated the package was easy to use and could be learned within five minutes. I immediately called the publishers for an advanced copy for review and the package arrived within two days. Here are my findings.

The Design

Let me first tell you what the ALOG PAGEWRITER is not. It is **not** a full blown word processor with every conceivable function known to man. The design of the program was never intended to be such and the advertisement states this. With that out of the way, I can say that the ALOG PAGEWRITER is designed for simple word processing tasks such as composing letters, small reports and even small articles for publication (such as this review). As the name implies, the word processor creates documents a page at a time. Simply load the program and start typing. When one page is finished, save it to the disk and continue with the next page. When this is finished save it to the disk, and so on.

Commands/Features

The most unique feature of the ALOG PAGEWRITER is the display of the entire page layout. As you type in the text window, a bit mapped representation of the text appears in the upper graphics window. This lets you see exactly how the page will look when it is printed. In addition there are many commands available to adjust the margins of the page and format the output. All commands are of the form (CTRL) (Letter) If you can't remember which command to use, then CTRL H will produce a help screen which displays all commands and their function. This is a very nice feature to have. Typing in the text requires only familiarity with the standard ATARI editing functions. There are, however, commands which allow you to move the cursor to the top of a page, the beginning or end of a line, set double or single space mode between lines, justify lines, split lines for insertion of text, splice lines to get rid of unwanted spaces and a command to center text on a line.

Layout

When entering the PAGEWRITER from the initial screen, you are presented with a text mode at the bottom of the screen and a graphics mode at the top of the screen. The text window only displays one line at a time. You cannot view an entire document. This keeps things simple and isolates each line. The graphics window displays a simulated sheet of paper (orange outline) with left and right margins (green lines). As you type text, orange dots appear on the page to show the relative word position. As each page is completed it is saved to disk. The maximum number of pages per disk is limited to 10.

The Verdict

The ALOG PAGEWRITER does exactly what it claims to do. It is a well designed, user-oriented software product which is useful for simple word processing tasks. It does require you to read the documentation to become familiar with the commands but one reading will get you started. You may need to refer back to the documentation when implementing a little-used command. The PAGEWRITER supports a wide variety of 80-column printers and requires 32K and a disk drive. The price is $39.95 but group orders of 5 units or more will cost you $25.00. If all you plan to do are simple tasks then the ALOG PAGEWRITER is a bargain worth considering. □

MAKE MONEY WITH YOUR COMPUTER

☆ EASY
☆ GOOD PAY
⇨ START BUSINESS ⇦

FOR INFO

SEND ONE DOLLAR TO:

DAVE SHIFFER

1625 RUSTIC RD.
URBANA, OHIO
43078

BANK STREET WRITER
Broderbund Software
1938 Fourth St.
San Rafael, CA 94901
48K Disk $69.95

by Arthur Leyenberger

Broderbund Software has recently released a new word processor for the ATARI computer called **Bank Street Writer.** It is billed as "The Home Word Processor" and will probably address the needs of a specific group of ATARI computer owners: The Home User.

At first glance, **Bank Street Writer (BSW)** looks like a powerful and easy to use piece of software. Let's look at what features a "home user" would require in a word processor and use these as criteria to evaluate **BSW.** In this way, you will be able to judge **BSW** for yourself.

A major use of a "home" word processor is to write letters. **BSW** allows top, bottom, left and right margins to be specified either just prior to printing or permanently with its utility program. Automatic paragraph indenting is accomplished by simultaneously pressing the CONTROL key and the letter "I". Page ejects may be viewed before printing and adjusted as necessary. Most of the features that a home user would require to write letters are available.

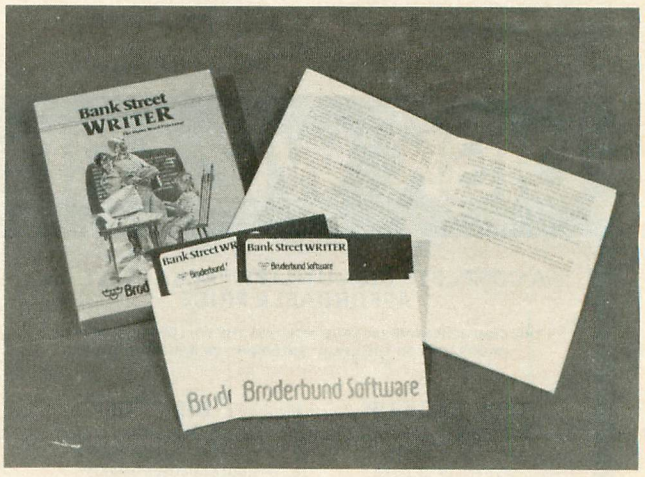
Some of the desireable letter-writing features not supported are: underlined text, right justification and block right capability. These absent capabilities do not prevent **BSW** from being useful for writing letters.

The second major use of a home word processor is to prepare reports and term papers by students. In addition to the features needed to write letters, the following capabilities are required: the ability to center text for making titles; page numbering and page headers (a one-liner that appears at the top of every page of the document except the first page); and finally, editing the text once it is written should be easy to perform and the program should prevent the user from making errors. **BSW** has all of these capabilities.

One of the strongest features of **BSW** is its ease of editing. For example, if the user wants to erase a block of text, the ERASE option of the main menu is selected. Then the cursor is sequentially positioned at the beginning and at the end of the block of text to be erased. Next, the computer highlights (with inverse video) the text in question and prompts, "Are you sure you want to erase the highlighted text?" If the user answers yes the text is removed. Any other response is taken as a "No". Should the user suddenly realize that he did **not** want to erase the block of text after the the text was removed, all is not lost. The UNERASE option of the main menu is selected and the missing text is restored.

The MOVE and MOVEBACK commands allow the user to shift blocks of text (up to 15 lines at a time) back and forth as a unit within the document. The same highlighting and query messages that appear with ERASE and UNERASE are used. Both the UNERASE and MOVEBACK commands only work on the last block of text accessed. Previously moved or erased text cannot be recovered.

Some additional features that are useful for writing reports are, regrettably, absent. Footnoting is not possible since superscripts are not supported. There is no method for passing printer control codes to the printer from either within the body of the text or elsewhere. This means that alternate type fonts such as bold face, italics or condensed printing can not be selected (assuming your printer has these capabilities). The only printer codes that are user selectable are the line feed/carriage return and form feed codes.



There is one feature of **Bank Street Writer** that makes it unique among the currently available word processors for the ATARI computer. This is the tutorial program that comes on the flip side of the disk. Unlike the word processor program itself which is written in **BASIC A+** (by Optimized Systems Software), the tutorial requires the ATARI BASIC cartridge to be installed. The tutorial covers the main functions of **BSW.** The first section explains text entry, capital letters, the return key and the wrap around feature. Wraparound allows the user to continue typing past the end of the 38 character line while the computer moves the excess words forward to the next line. Used instead of the carriage return on a typewriter, the wraparound function is a standard feature on almost all word processors.

The final portion of the tutorial program deals with the MOVE, MOVEBACK, ERASE and UNERASE functions. The tutorial is interactive in that it not only describes how a function works, but also requires the user to try it for themselves. In this way, the user gets hands-on experience using the program. Unfortunately the tutorial does not demonstrate the transfer functions (loading, saving, and printing documents). These are covered only in the manual.

Bank Street Writer uses a 38 character by 18 line screen. The maximum document size is approximately 2300 words (with the BASIC cartridge removed) which translates into roughly a nine page document. Since the program is written in BASIC it is not particularly fast. This is no problem when the document length is less than 3 pages. However, as the size of the document grows, the time it takes to switch from the "write" mode to the "edit" mode increases.

I began writing this review using **Bank Street Writer** itself. After about five 18-line screens (about half of this review) it was taking from 4 to 7 seconds to scroll up one line! At one point I measured 17 seconds to go from the "write" mode to the main menu. It was at this point that I pulled the plug and switched to **Letter Perfect** (LJK Enterprises) to complete the review. My main complaint with this lengthy response time lies with its effect on the first time computer user. If a child's first exposure to using a computer for serious activities (like word processing) results in the perception that a program that is easy to use must also require a lengthy response time, then that child is being done a disservice.

In spite of its shortcomings, **BSW** is the easiest word processor program to use for the ATARI computer. It is inexpensive, there is good error protection, the manual is clearly written and well organized, and two copies of the program are provided. The current version is incompatible with the ATARI 1200XL computer.

Bank Street Writer has almost everything going for it — it is up to the user to decide if it goes far enough. □

DISK WIZARD

© 1982

A COMPLETE DISK UTILITY PACKAGE AT AN AFFORDABLE PRICE

THIS COMPREHENSIVE PACKAGE INCLUDES THE FOLLOWING POWERFUL PROGRAMS FOR THE ATARI* 800 COMPUTER (MINIMUM: 32 K)

DISK BACK-UP
- SINGLE / DOUBLE DENSITY
- SUPPORTS 1 OR 2 DRIVES
- ALLOWS BACK-UP OF DISKS PROTECTED BY BAD SECTORING
- FAST COPY OPTION
- SECTOR STATUS SUMMARY
- OPTIONAL PRINTOUT OF SECTOR STATUS

DISK EDIT
- REVIEW / MODIFY ANY SECTOR
- WORKS WITH ALL FORMATS
- SINGLE / DOUBLE DENSITY
- SECTOR DISPLAY IN HEX AND ASCII
- SCAN SECTORS FOR A SERIES OF BYTES OR A STRING
- DECIMAL / HEX NUMBER CONVERSION

DISASSEMBLER
- DISASSEMBLE FROM DISK BY FILE NAME OR SECTOR NUMBERS
- OPTIONAL OFFSET
- OUTPUT TO SCREEN OR PRINTER
- SINGLE / DOUBLE DENSITY

DISK SPEED
- VERIFIES / ALLOWS ADJUSTMENT OF DISK SPEED

COMPREHENSIVE MANUAL INCLUDED

ORDERING INFORMATION

For fast delivery, send certified check or money order. Personal checks: allow 2 to 3 weeks. MASTERCARD & VISA accepted. (Maine Residents add 5% Sales Tax) Phone orders accepted on C.O.D. and charges.

$29.95 SHIPPING & HANDLING INCLUDED

C.A.P. SOFTWARE "Quality Software at an Affordable Price"

69 NEW BOSTON ROAD
YORK, MAINE 03909
(207) 363-3036

*ATARI is a registered Trademark of Atari, Inc.

FINE SCROLLING ON THE 1200XL

Here's an interesting trick for owners of the ATARI 1200XL — automatic fine screen scrolling in graphics mode 0!

This type of scrolling adds an interesting touch to text-oriented programs, eliminating the normal "jumping" nature of screen scrolling.

The program listed below is a short demonstration of the fine-scrolling ability of the 1200XL. Type it in and RUN it.

```
10 POKE 622,255
20 GRAPHICS 0
30 ? "FINE SCROLLING"
40 GOTO 30
```

You will notice that the program prints a message in an infinite loop. When the message fills the screen, the fine-scrolling mechanism starts.

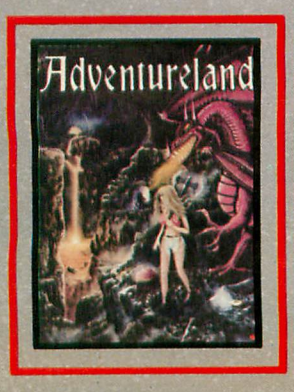
To use this technique in your own programs, all you need are two commands: POKE 622,255 and GRAPHICS 0.

The POKE command to location 622 tells the system to use fine scrolling. By POKEing a zero here the scrolling can be turned off again if you like. The GRAPHICS 0 command is necessary to start the scrolling handler.

That's all that is needed! You can even use these two commands from BASIC's immediate mode if you like.

Hello, We're Adventure International

And we're publishers of some of the finest microcomputer software programs available.
If you can write a **top-quality** program, or can convert some of our best-sellers to other computers, we want to hear from you — Now.
We have the advertising, international distribution, manufacturing and marketing know-how to send top-quality programs to the top of the charts.
If your program **is top quality** — give us a call, or write for our Adventure International Author Information Kit.



We are publishers of the top-selling Scott Adams Adventure Series and other fine Entertainment and Applications Programs.

Copyright © 1983

Adventure INTERNATIONAL

Box 3435
Longwood, Florida 32750
Telephone: (305) 862-6917
Ask for Author Assistance

YOU'VE GOT FROM NOW 'TIL THE END OF THIS PAGE TO BECOME MOUNTAIN KING.

GO!

See all those glittering diamonds? Grab 'em.

You need 1,000 diamonds fast. To score, you have to burrow deep. Deep into the caverns.

You craftily cop a dozen jewels. Then, jump to the ledge below. Then down to another. And another. But, STOP!

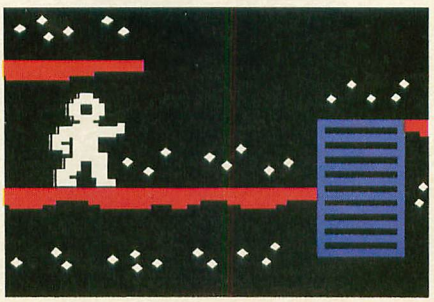
There's nothing but an abyss below. Nothing for you there except a bad fall—and even worse, delay!

No, don't go there. You've already stripped that vein of diamonds. Go where no one has ever dared venture before.

Follow the caverns. Deeper and deeper. Down the ladders. Over to the right—more jewels…and CURSES!…you've fallen. And you're losing time.

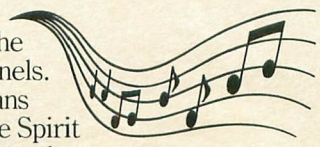
Grab those diamonds. Ah ha! You've reached 1000!

The Flame Spirit has been set free. Now you must capture it.



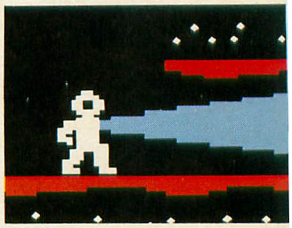
Quick—down another ladder. Listen!

Ghostly music floating through the black tunnels. That means the Flame Spirit is hiding nearby.



The music grows louder as you draw closer.

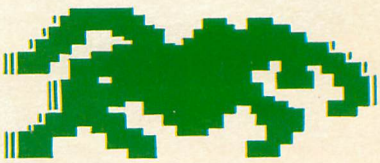
Now softer (quick, go back the other way). Louder again. Shine your flashlight. The Flame Spirit is very near. A flicker. Out of the corner of your eye. Shine that light!



There it is. Now, kneel before the Spirit and grab it. Gotcha! Run! Run to the Temple. Watch out! Behind you! A vampire bat trying to steal the Flame Spirit. Climb down, below the ledge. Another bat!

Down. To the very bottom of the mountain.

To the pit. And the darkness. Lit only by the shimmer of diamonds. Suddenly there's a rush of movement…a giant spider—after you.

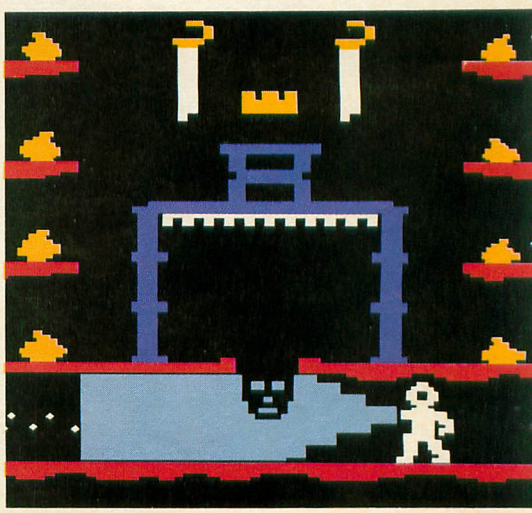


Run. Jump. Up to the ledge. Hurry! Jump again!

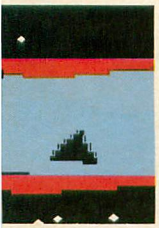
Aarrrrgggghhhh! You're caught. Woven in a tangled web. Hurry, break loose before he returns and you're devoured.

Ah! You've freed yourself. You've lost time, but you've gained character.

Now, on to the Temple. But beware of the guardian flames—one false move and you'll end up charred …and out of the game! Get to the Temple Portal, the Spirit in your grasp. Shine your light on the giant guardian skull. You kneel. (Not out of respect, but out of need—for without



neeling,
ntering the
èmple is forbidden.)
The entrance yawns
pen. And you leap in. There,
nshrined deep within the



sacred Temple,
emblazoned
with gold, is the
sovereign
crown. You must
get that crown.
Without it, you
cannot become
Iountain King. With it, you'll rule.
But now comes the tough part.
an you make the treacherous climb
ack to the surface? Can you
void the relentless bats and
preading cave fires on the
ay? Can you even find the way?
Get Mountain King.™ Plug it
nto your home computer. It will
lunge you into the depths, and lift
ou to the heights.

ANOTHER GAME TO DIG INTO.

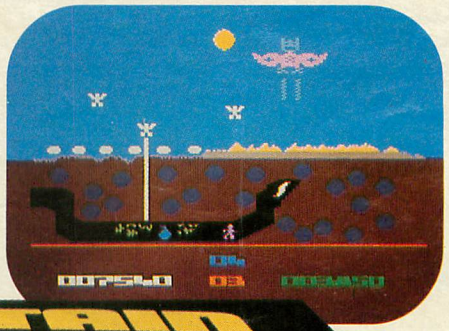
It's Boulders and Bombs.™
)ne to four can play. And with
9 levels of terrific tunneling
dventure, it's every bit as involving
s Mountain King.
Your challenge is to tunnel to
afety beneath the surface of an
nknown planet as hostile, alien
ultures seek to turn you into a
uried fossil, entombed in an alien
fe form.
While day turns to night above
round, you use your trusty roto-
uger to claw a path to safety
elow ground—through tons
f earth, boulders, and the
ver-spreading green
ave fungus.

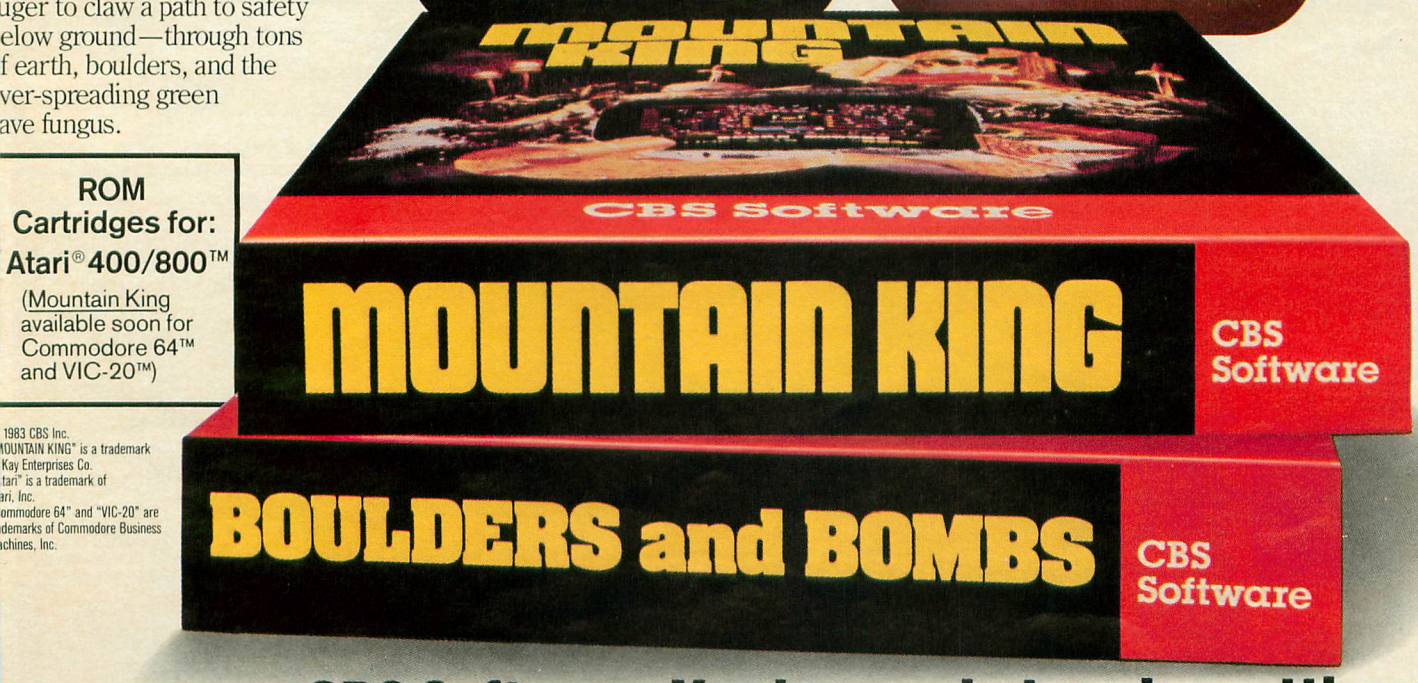
Fortunately,
you can unearth
time bombs along
the way to blast away
the hazards the vultures
toss at you.
But the crawling fungus
spreads as time runs out.
Now that you know the names of these challenging new games, and you know what it's like to play them, there's one other thing you should know:
They're from CBS Software. And even though that name says a lot about quality entertainment, we haven't mentioned it until now.

Because
at CBS Software,
we believe our
computer programs should
speak for themselves.

NEW! MOUNTAIN KING

NEW! BOULDERS AND BOMBS





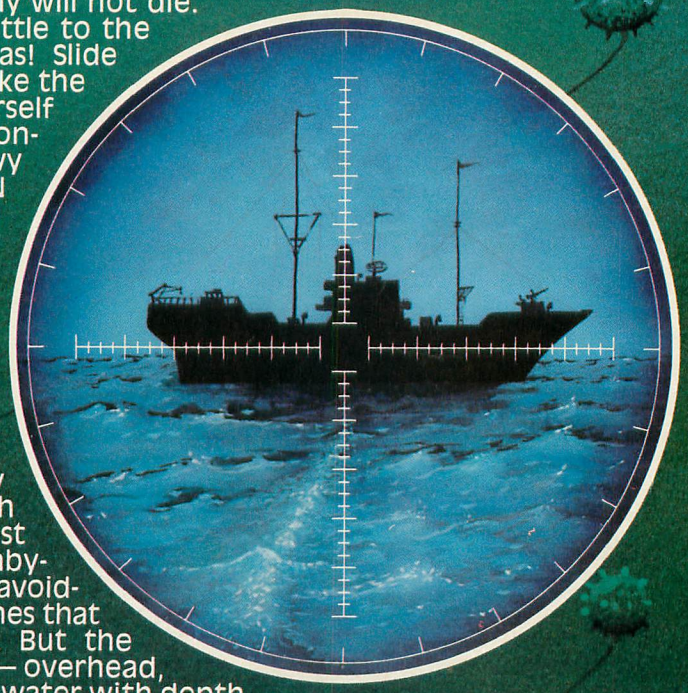
ROM Cartridges for: Atari® 400/800™
(Mountain King available soon for Commodore 64™ and VIC-20™)

1983 CBS Inc.
MOUNTAIN KING" is a trademark
Kay Enterprises Co.
tari" is a trademark of
ari, Inc.
ommodore 64" and "VIC-20" are
demarks of Commodore Business
achines, Inc.

CBS Software. You know what you're getting.

ABSOLUTELY RELENTLESS

The challenge of inner space — the fury of an enemy that seemingly will not die. This is SEA DRAGON — a battle to the death **under** the high seas! Slide into the Captain's chair, take the controls and prepare yourself for the most incredible non-stop action this side of Davy Jones' locker. SEA DRAGON puts you in control of a nuclear sub that's armed from stem to stern with enough firepower to take on King Neptune himself — and you'll need every missile, every torpedo, and every scrap of skill you can muster to survive.



The object of SEA DRAGON is to successfully navigate your sub through an underwater course past mountains and through labyrinthine passageways while avoiding clusters of explosive mines that rise from the seabottom. But the danger doesn't stop there — overhead, surface destroyers lace the water with depth charges; below, deadly attack bases and arcing lasers cut a killing swath that could reduce your sub to bubbling slag. But even these potentially lethal perils are dwarfed by the awesome menace that awaits you at the course's end.

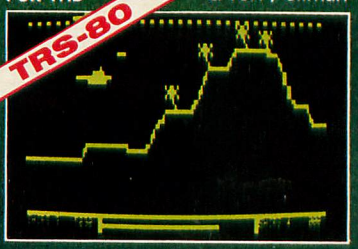
SEA DRAGON — every possible "extra" is here to ensure your playing pleasure: exciting sounds, high score save, machine language graphics and an eye-popping scrolling seascape that extends the equivalent of over two dozen screens placed end-to-end, providing a diverse and unique challenge that will not diminish after repeated playings.

Nothing you've ever seen on your micro could possibly prepare you for this! You are ready now, ready for the ultimate in undersea action with a pace that is absoutely unyielding. SEA DRAGON — the arcade has finally come home.

FOR THE APPLE by John Anderson "IT TALKS!"

FOR THE ATARI by Russ Wetmore

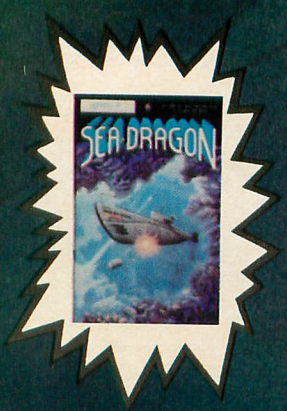
FOR THE TRS-80 by Wayne Westmoreland & Terry Gilman



ALL VERSIONS ARE JOYSTICK COMPATIBLE!

SEA DRAGON FEATURES

- Fantastic Scrolling Seascape
- Nearly Limitless Game Challenge
- High Score Save (disk version)
- Terrific Sound Effects
- Arcade Action Graphics™
- Apple version "talks" without special hardware!



ORDERING INFORMATION

APPLE 2 or APPLE 2 PLUS 48K Disk (DOS 3.3 required)
042-0146 ..... $34.95

ATARI 32K Disk
052-0146 ..... $34.95

ATARI 16K Tape
051-0146 ..... $34.95

TRS-80 32K Disk
012-0146 ..... $24.95

TRS-80 16K Tape
010-0146 ..... $24.95

Adventure INTERNATIONAL
A DIVISION OF SCOTT ADAMS, INC
PRICES SUBJECT TO CHANGE

To order, see your local dealer. If he does not have the program, then call 1-800-327-7172 (orders only please) or write for our free catalog.

Published by ADVENTURE INTERNATIONAL
a subsidiary of Scott Adams, Inc.
BOX 3435 • LONGWOOD, FL 32750 • (305) 830-8194

TO STAY ON TOP OF THE FIELD... READ THE MAGAZINE THAT LEADS THE FIELD!

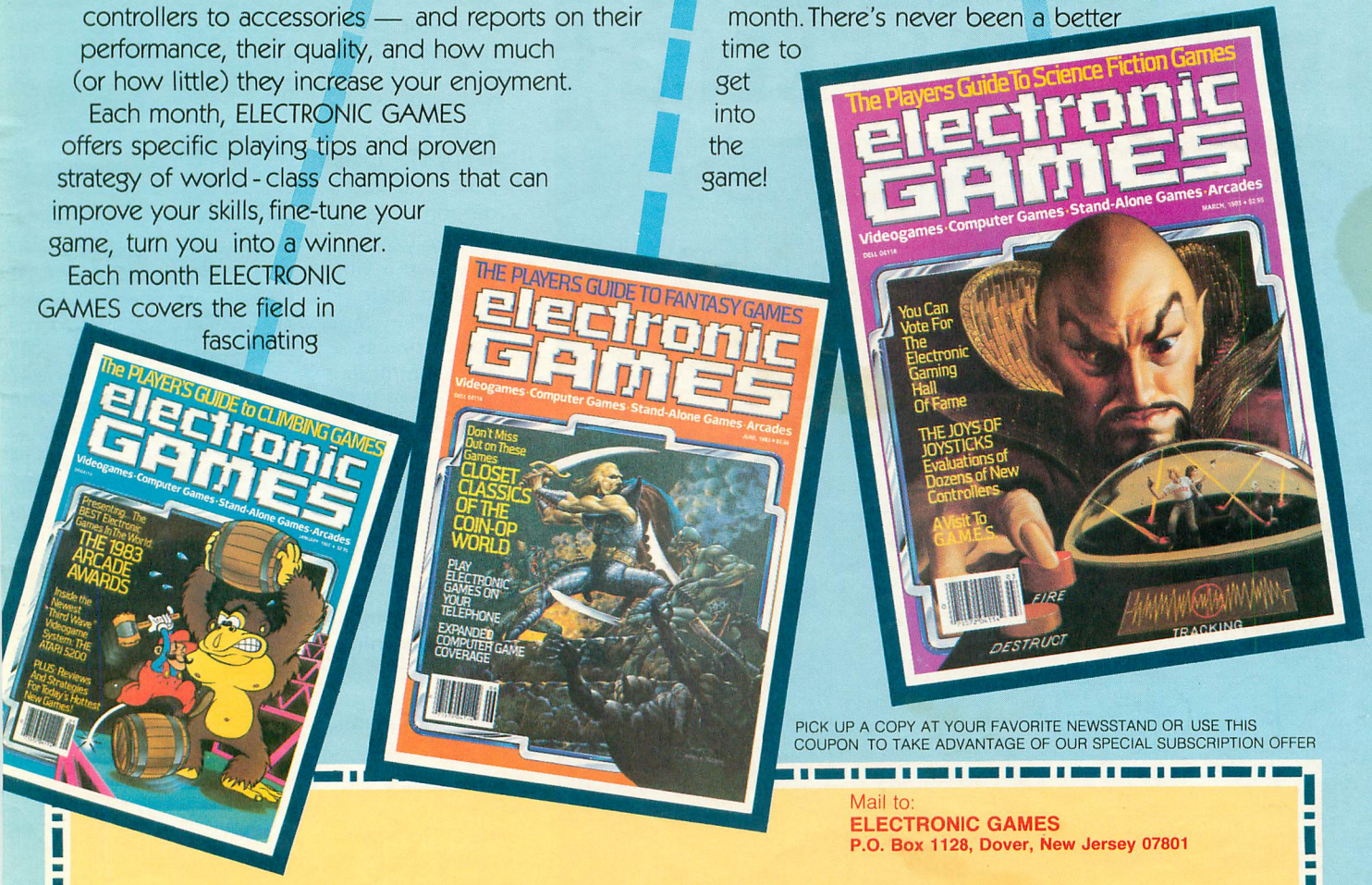
Each month, ELECTRONIC GAMES previews and reviews the newest software for your system — their graphics, their skill levels, their excitement quotient, how they play and how to play them better,

Each month, ELECTRONIC GAMES evaluates the newest equipment — from systems to controllers to accessories — and reports on their performance, their quality, and how much (or how little) they increase your enjoyment.

Each month, ELECTRONIC GAMES offers specific playing tips and proven strategy of world-class champions that can improve your skills, fine-tune your game, turn you into a winner.

Each month ELECTRONIC GAMES covers the field in fascinating features and entertaining columns written and edited by gaming's foremost authorities. Informative in all ways, but always lively reading, ELECTRONIC GAMES brings your hobby to life.

So if you're serious about having fun, you should be reading ELECTRONIC GAMES every month. There's never been a better time to get into the game!



PICK UP A COPY AT YOUR FAVORITE NEWSSTAND OR USE THIS COUPON TO TAKE ADVANTAGE OF OUR SPECIAL SUBSCRIPTION OFFER

Mail to:
ELECTRONIC GAMES
P.O. Box 1128, Dover, New Jersey 07801

YES! I'm serious about having fun! Send me one year (12 monthly issues) of **ELECTRONIC GAMES** at the get-acquainted rate of **$19.97.** Savings: almost $15.50 (44%) on the newsstand price of $35.40...more than $8.00 (29%) on the regular subscription rate of $28.00.

Name .....
(please print)

Address .....

City ..... State ..... Zip .....

☐ **Enclosed is my payment of $19.97** ☐ **Bill me later**

Look for your first copy within 60 days. Offer good for the U.S. only.

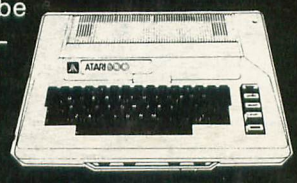
33T013

SUBSCRIBE & SAVE 44%

THE ORIGINAL ATARI® ONLY MAGAZINE

ANALOG COMPUTING

A.N.A.L.O.G. Computing is the original, most sought-after ATARI specialty magazine on the market. Each issue features program listings of utilities and games in both BASIC and Assembly language, tutorial articles, hardware and software reviews and updates on new products for both the ATARI home computers and the ATARI home game system. The articles in **A.N.A.L.O.G.** are written in a friendly, accessible style for both the novice and the advanced ATARI computer programmer. If you want the best, most extensive support for your ATARI computer system, then subscribe today. 1 year (6 issues) $14, 2 years (12 issues) $27, 3 years (18 issues) $38. Cassette and disk subscriptions are also available. Cassettes and disks contain **all** programs listed in the magazine. Cassette (6 issues) $36, disk (6 issues) $60.



SEND CHECK OR MONEY ORDER TO:
A.N.A.L.O.G. COMPUTING
DEPT. A P.O. BOX 615
HOLMES, PA 19043

OR CALL TOLL-FREE:
1-800-345-8112/OPERATOR A
IN PENN. 1-800-662-2444
MASTERCARD AND VISA ACCEPTED

ANALOG COMPUTING™
THE MAGAZINE FOR ATARI® COMPUTER OWNERS

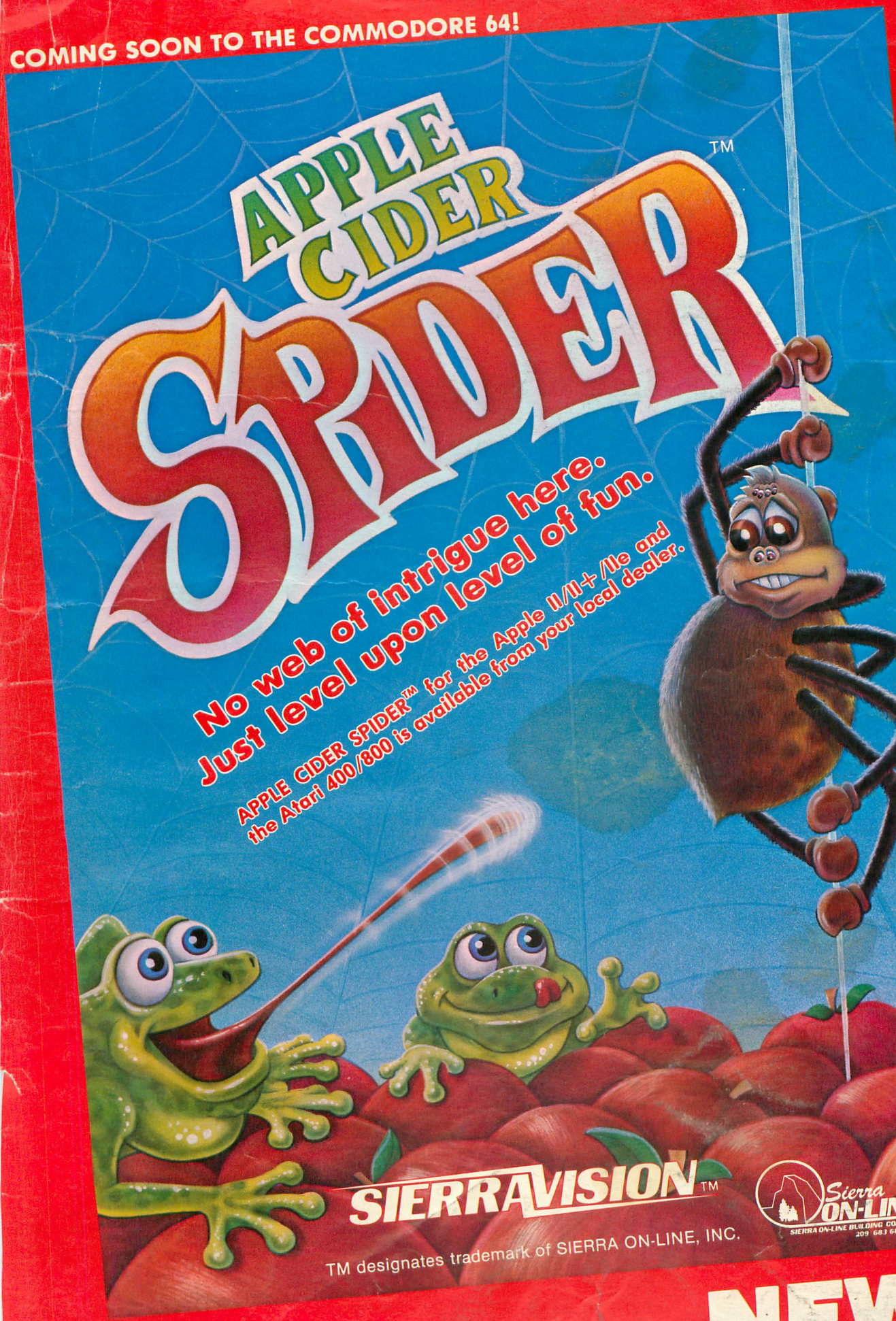
ATARI is a ® trademark of ATARI, Inc.

EASTERN NEWS DISTRIBUTORS, INC.

INDEX TO ADVERTISERS

Adventure International....29,106,127,130, OBC
Alien Group....26
Allen Macroware....38
ALOG....123
Amulet....22
Austin Franklin....28
CAP Software....126
CBS Software....128,129
CDY....83
CE Software....83
CompuClub....72
Compsoft....86
Computability....15
Computer Alliance....115
Computer Creations....54
CompuWare....115
Convologic....22
Don't Ask Software....12,74
Dorsett....60
Eastern House....102
Educational Software....69
Elcomp....68
Electronic Connexion....54
Electronic Games....131
ESD....38
Financial Software Plus....100
G.A.M.E.S.....37
Happy Computing....27
IJG....83
Infocom....2,3
I.S.....99
J.E. Koch & Co....13
Leading Edge....1
LJK....4
Macrotronics....97
Micro Mainframe....47
Microprose....19
Microtronics....75
Mighty Byte Computing....34
Miles Computing....97
MMG Micro Software....109
Monarch Data Systems....38
Mosaic....IFC
Neotechnic....83
On-Line Computer Centers....33
One Stop Software....37
OSS....7
PMI....39
Poire Peripherals....12
Polly Products....74
Rampage....53
Romox....64,65
Royal Software....89
Shiffer....124
Sierra On-Line....IBC
Softraiders....10
Software Plus....42
Software Publishing....51
Software Gallery....123
SSI....23
Synapse....103
Task Force Games....20
Tech II....126
TMQ....63
20th Century Fox Games....66,67

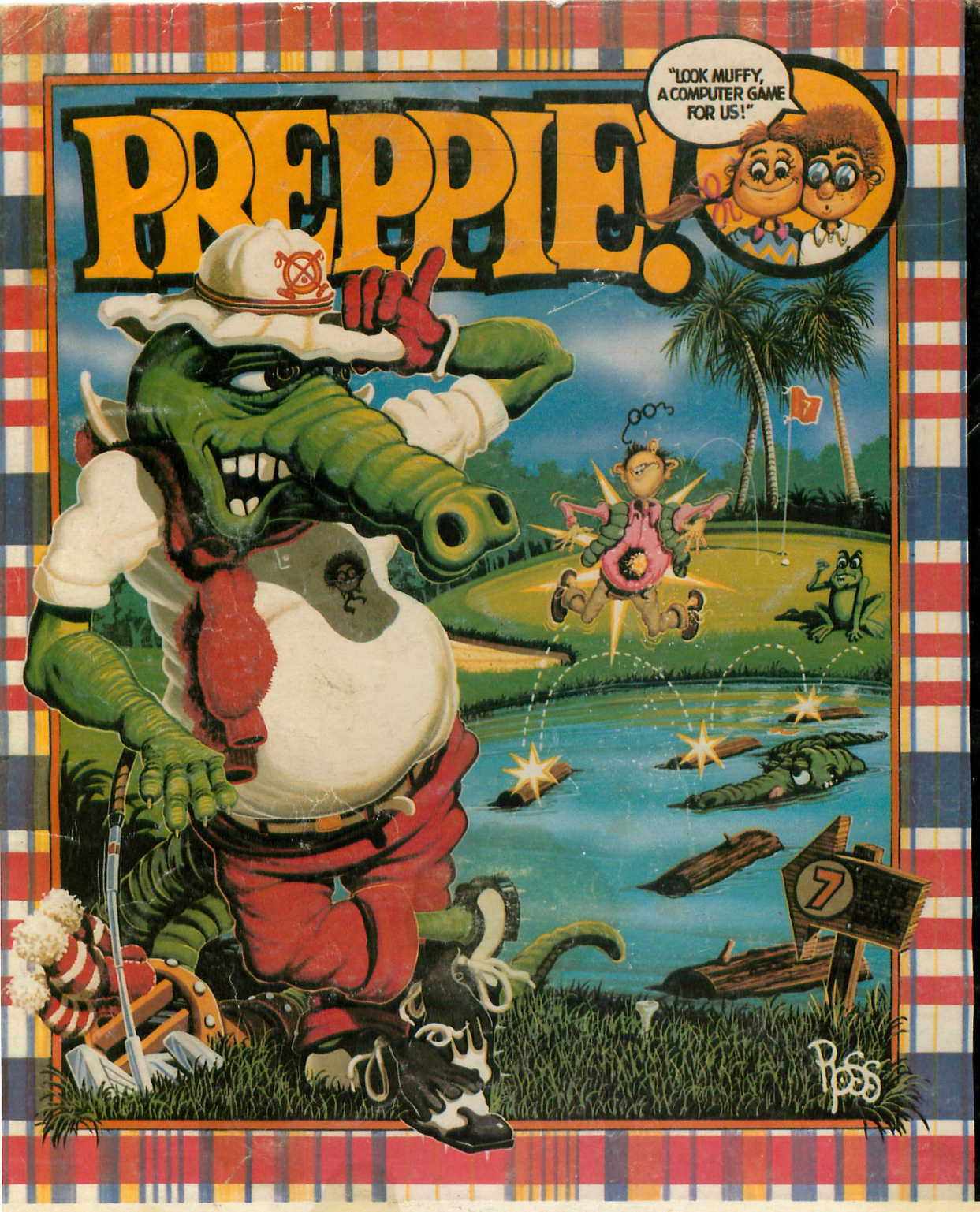
COMING SOON TO THE COMMODORE 64!



TM designates trademark of SIERRA ON-LINE, INC.

NEW

PREPPIE!

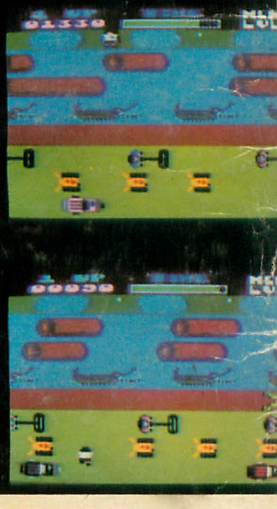


PREPPIE II IS HERE!

That's right you LaCo clad Atari owner. Wadsworth Overcash, our Weejuned young prepster continues his exploits — this time a college and just like daddy, he's decided t pledge a fraternity. Ha we got surprises for h (and you)!

AVAILABLE NO AT FINE COMPUTE STORES EVERYWHE

by Russ Wetmore



Good Golly! What A GAME!

The original arcade game **PREPPIE!** will give you hours of toe-tickling f e the controls, moving your young prepster about on the golf course. And what a golf course! It's unlike any you ayed on before. There are dangers **everywhere,** and only you can keep the little Ivy Leaguer from a fate worse then Penn State!

PREPPIE! is written in state-of-the-art machine language, is joystick compatible and fully utilizes the Atari's sound and graphics capabilities. Quite frankly, it will give you the most fun you can have on an Atari microcomputer.

PREPPIE! is available at fine computer, book, and hobby stores everywhere.

An exclusive game from

ai Adventure INTERNATIONAL

A DIVISION OF SCOTT ADAMS, INC.

To order, see your local dealer. If he does not have the program you want, then call 1-800-327-7172 (orders only) or write for our free catalog.

Published by ADVENTURE INTERNATIONAL
a division of Scott Adams, Inc.
BOX 3435 • LONGWOOD, FL 32750 • (305) 862-6917

"My Atari never did things like this before!"
—Holister Townsend Wolfe

"I had so much fun I almost blew my doughnuts."
—Theodore Boston III

"I haven't had this much fun since Buffy and I went to Princeton for the weekend."
—Martha Vineyard