

# Antic

The ATARI Resource

BONUS GAME

SOUND  
&  
MUSIC

*M. Rappaport '82*

October/November 1982  
Vol. 1, No. 4  
\$2.50



# MORE THAN EVER, ATARI HOME COMPUTERS ARE SPEAKING YOUR LANGUAGE.

With more program languages than ever to choose from, you now have more opportunities than ever to utilize the amazing capabilities of the ATARI 800™ Home Computer.

Whether you're a beginning programmer, or at the forefront of the art, you'll find an ATARI programming language that can make your task quicker and simpler than ever before. Just look at what ATARI has to offer:

**ATARI Microsoft BASIC**—Now we offer the industry standard, the most powerful Microsoft BASIC yet. With simple commands, it allows you to take advantage of unique ATARI hardware features such as our well-known player/missile graphics. For ease of programming, it includes n-dimensional arrays for numerics and string handling. And importantly, conversion procedures are simple.

**ATARI Macro Assembler**—Faster and more powerful than any ATARI language before, the ATARI Macro Assembler also allows you to access more memory space. And it's excellent for I/O interface and manipulation of such features as: player/missile graphics, sound registers and peripherals. In addition, the macro processor and "include" file library features speed-up program development considerably.

**Fig-FORTH\***—For specialized programming needs, such as educational or game applications, ATARI Fig-FORTH is uniquely effective. Fig-FORTH combines power and simplicity in an efficient 10K size, with characteristics of an interpreter and the speed of machine language code.

**ATARI BASIC**—An affordable and easy to use BASIC that requires only 8K of memory. It allows you to take advantage of the spectacular ATARI graphics and sound capabilities.

And its immediate mode error messages greatly simplify debugging.

**ATARI Assembler Editor**—An excellent tool to assist the assembler-programmer in creating, editing and debugging assembly programs.

**PILOT**—ATARI PILOT is an exceptional learning language, with built-in "turtle" graphics to let you create spectacular designs and pictures with very short programs. Simple one or two-letter commands allow you to create a dialogue with the computer. And a single "match" command can perform complex text evaluation and pattern-matching instantly.

**ATARI Pascal\***—An excellent high-level language for teaching structured programming, and for developing and maintaining programs. In addition to offering all the features of the ISO Pascal standard, ATARI Pascal offers unique extensions that allow you to take advantage of ATARI graphics and sound capabilities.

ATARI is constantly developing new ways to help you get more out of your ATARI 800 Home Computer. So watch for more innovative and exciting programming languages from ATARI in the future.

For more information, write to ATARI, Inc.,  
Dept. C27Z, P.O. Box 16525,  
Denver, CO 80216.

© 1982 ATARI, Inc. All Rights Reserved.  
\*Available from the ATARI Program Exchange



**ATARI HOME COMPUTERS**  
We've Brought The Computer Age Home.™

# THE MOSAIC RAM SYSTEMS FOR ATARI\*

## CLEARLY THE BEST



MOSAIC 32K RAM

### THE SCREEN CLARITY TEST



THE COMPETITION

## YOU CAN SEE THE MOSAIC DIFFERENCE

### WHAT THE EXPERTS HAD TO SAY

A.N.A.L.O.G. 400/800 MAGAZINE said in a 32K RAM board comparison test: "The Mosaic 32K RAM showed no sign of interference and gave the best screen clarity" and "Mosaic uses what we feel are the highest quality components which may improve reliability".

INTERFACE AGE said after replacing the Atari memory board with a Mosaic 32K RAM: "Once in place there is no noticeable change in screen clarity" and "in view of its excellent performance it should be a serious choice for those Atari owners intending to expand their memory."

Each Mosaic RAM board gives you more than just the best screen clarity but also the best in reliability, flexibility, and compatibility. The Mosaic RAM systems offer you the best in every way — these features prove it.

- Works in both the Atari 400\* & 800\* computers.
- 4 year guarantee.
- Complete instructions.
- Test cycled 24 hours for reliability.
- Gold edge connectors for better reliability.
- Quick no-solder installation.
- Full flexible memory configuration.
- Can be used with 8K, 16K and future products.
- Designed to take advantage of Atari 800's superior bus structure.
- Designed for inter-board communication in Atari 800.
- Allows Atari 800 to have 2 slots open for future expansion.
- Always the best components used for superior screen clarity and reliability.
- Low power design for safety and reliability.
- Available companion board (\$5) to allow running The Mosaic RAM systems independent of other boards.

### THE MOSAIC RAM SYSTEMS FOR THE SERIOUS ATARI OWNER.

#### THE MOSAIC 32K RAM

For the serious Atari owner. This is the 32K RAM board you've been hearing about. It has every feature you could want from a RAM board and more features than any other board offers. Each Mosaic 32K RAM comes with complete instructions so in a few minutes you will have expanded your Atari 800 to 48K RAM. The Mosaic 32K RAM works as well in the Atari 400, but we suggest the NEW Mosaic Expander.

#### THE MOSAIC EXPANDER

This is the most effective way you can expand to 32K RAM for your Atari 400 computer. And at almost the 16K price! The revolutionary Mosaic Expander is a memory board with 16K RAM in place and open slots to add 16K more from the Atari 16K board that comes with your Atari 400. Each board comes with complete instructions so in a few minutes you will have expanded to 32K RAM.

For your nearest Mosaic dealer call: toll free 1-800-547-2807.

\*Trademark of Atari, Inc.

**MOSAIC**  
ELECTRONICS

P.O. Box 708 Oregon City, Oregon 97045  
503/655-9574, 1-800 547-2807

# Antic™

The ATARI® Resource

OCT/NOV 1982 Volume 1, Number 4

## FEATURES



### SOUND ADVICE by Dave Plotkin

12

Use POKE instead of SO.

### ATARI INSTITUTE TEACHES MUSIC by Herb Moore

14

ATARI teaches music to teachers.

### AUDIO WHILE YOU CLOAD by John Victor

28

Add voice to your cassette programs

### MUSIC WITH BASIC by Jerry White

32

A short how-to

### ZOUNDS by Ed Rotberg

34

An introduction to music synthesis

## DEPARTMENTS

### STARTING LINE

### A SOUND INTRODUCTION by James Capparell

10

### INSIDE ATARI

### UPGRADES AVAILABLE

14

### ASSEMBLY LANGUAGE

### BUBBLE SORT by Adrian Dery

18

### SYSTEMS GUIDE

### ON HAVING A GOOD TIME by Pete Goodeve

23

### PILOT YOUR ATARI

### A MUSICAL PILOT by Ken Harms

25

### IN THE PUBLIC DOMAIN

### SPEED DEMON by John Magdziarz

41

### ★★FROG★★ BONUS GAME by Stan Ockers

44

### EDUCATION

### TUNING YOUR ATARI by Linda Schreiber

48

### FORTH FACTORY

### TURTLE GRAPHICS PART II by Gordon Smith

56

### TAPE TOPICS

### A MESSAGE ON THE MEDIUM by Carl Evans

62

### I/O BOARD

6

### EDITORIAL

9

### PRODUCT REVIEWS

50

### PUBLIC DOMAIN SOFTWARE RELEASE

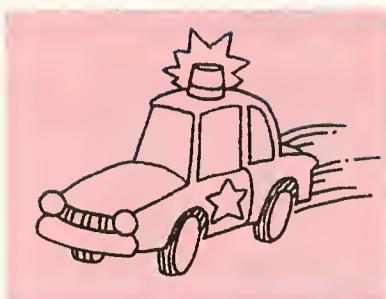
54

### GOTO DIRECTORY (DEALERS)

77

### SUBSCRIPTION FORM

78





## Introducing the PERCOM Alternative to ATARI Disk Storage

Your Atari 800 is the finest home computer on the market. Now you can own a floppy disk system that measures up — an RFD mini-disk storage system from Percom.

At Percom we've been making disk storage systems since 1977.

Our designs are proven, our quality is well known. And we back our dealers with service know-how. Expect more from Percom. You won't be disappointed.

- Operate in either single- or double-density storage mode using Atari DOS 2.0S. In double-density you can store almost 184 Kbytes (formatted) on one side of a 40-track diskette.

For the best thing next to your computer, see your Atari dealer about a Percom RFD floppy disk storage system. For the name of your nearest dealer, call Percom toll-free 1-800-527-1222.

- Connect your Percom RFD first-drive system directly to your computer or connect into your system through your Atari 810 Disk Drive.
- Add an RFD first-drive system with its versatile four-drive controller, then connect as many as three more low-cost RFD add-on drives.
- Write application programs that can query and set up your system to operate a different type drive at each cable position — that can even change configuration as the program executes.

- Get quality and state-of-the-art capability at competitive prices. Percom first-drive RFD systems are priced from only \$799, first add-on drive is only \$459. Cables included.

Watch for announcement of a new, powerful, easy-to-use disk-operating system for your Percom-equipped Atari 800 computer.

Minimum system requirements — are an Atari 800 computer with 24-Kbytes of RAM and compatible video display system; Atari's disk-operating system (ver 2.0S) and owner's manual.

Yes ... I'd like to know more about Percom RFD disk drives for my Atari 800 Computer. Rush me free literature.  
Send to: **PERCOM DATA COMPANY, Inc., Dept. 18-A01**  
11220 Pagemill Road, Dallas, Texas 75243

name \_\_\_\_\_

street \_\_\_\_\_

city \_\_\_\_\_ state \_\_\_\_\_

zip \_\_\_\_\_ phone number \_\_\_\_\_  
I plan to add a hard disk system to my Atari:  yes  no.

**MAIL TODAY!**

# PERCOM

PERCOM DATA COMPANY, INC.  
11220 PAGEMILL RD • DALLAS, TX 75243 • (214) 340-7081

ATARI 800 & ATARI 810 are trademarks of the Atari Corporation.  
PERCOM is a trademark of Percom Data Company, Inc.

# I/O BOARD

## TOP-OF-FORM

In the chart accompanying the survey of printers (ANTIC Issue #3) you show the Atari 825 as having "top of form" capability. I don't think it does. It doesn't respond to the standard "control + L" form feed, nor does it have a manual form feed control.

This deficiency would cause us to choose a different printer, perhaps the Epson or the NEC, which do look competent.

Harold Barton,  
Engineer  
Ford Aerospace &  
Communications  
Newport Beach, CA

*You are correct. There is no top-of-form command. We also should point out that the NEC 8203A-C will not work with the Atari Word Processor program without altering that program, a task not easily accomplished by an amateur. The version of DataSoft's Text Wizard that will work with the NEC should be available by October, 1982.—ANTIC ED*

## TRACE RACE

I want a "trace" routine for my ATARI. I understand that Basic A+ has one, but right now that product is more than I need.

Would you put this in I/O Board to see if any of your readers can come up with one? I'd like to have features like "list branch commands only," and "show loops once, with times looped."

Walter Varner  
Palo Alto, CA

*Our first contest! Send all entries to TRACE RACE, care of ANTIC. Winner gets a free copy of Basic A+, courtesy of Optimised Systems Software. All entries must be in no later than January 31, 1983.—ANTIC ED*

## LET'S GET IT RIGHT

De Re ATARI is an excellent book, but the authors should have consulted a Latin teacher. "De re" means "of the thing," as in De Re Metallica by

Agricola, which translates "of the metallic thing." "Re" is in the ablative case (singular, feminine). "Metallica" is an adjective, so ATARI should be adjectivized, as "De Re ATARICA" (feminine), or better, "De Rerum ATARII" (masculine, plural), which translates as "of the things about ATARIES."

D. Grau  
Forest Hills, N.Y.

## MUSIC WHILE YOU WAIT

How can I record music, or other audio, on a cassette so that it plays when the cassette is loading? PDI does it, for example, on Pumpkin Stand.

I already know how to POKE 53018 on and off. This works great after the program is loaded, because the audio is recorded on a section of tape where no data is found. I am under the impression that the audio with data must be recorded after the data because a CSAVE erases all channels on the tape. I also believe that normally recorded audio signals interfere with the computer's ability to receive a CLOAD.

I notice that PDI's music-while-loading plays on the left speaker of a stereo system. How do they record on only one channel?

Robert Cash  
Pekin, IL

*John Victor, President of PDI, explains in this issue. Also note our Tape Topics section in this and future issues, for related information.—ANTIC ED*

## LOOSENING LINES

While typing in your games, I've noticed several lines got so long they wouldn't fit. Line 672 of Deathstar has 119 characters, and line 745 has 117, exceeding the limit of ATARI's logical line. Pac Invaders also has that problem at lines 370, 390 and 430. It's not always clear where to break a line without affecting the program. Please advise.

Donald Harrier  
Tallmadge, OH

*Sorry about that. We will try to avoid tight lines in the future, but you can also correct by moving the margin two spaces left with a POKE 82,0 in immediate mode. Also, using any legal abbreviations (F. for FOR, N. for NEXT) and eliminating spaces will save space. BASIC will expand abbreviations for you when it interprets the line. In fact, that's usually why the listed line is longer than allowed.*  
—ANTIC ED

## LICKIN' CHICKEN

Space Invaders invades my space.  
I lose at Asteroids too.  
I never get far in Caverns of Mars  
And Star Raiders makes me blue.  
I made the third screen of Apple Panic  
When the "cores" finally did me in.  
I guess I should give up computer games  
And go back to games like Gin.  
But I then found a game that I can win;  
Yes, a game that I can beat!  
I can get that Chicken across the road  
And I don't even have to cheat.  
So, I guess there's a game for each of us;  
A game for our way and style.  
You go ahead and smash the Galaxians.  
I'll just dodge cars for a while.

Guy Hurt  
Lansing, MI

## MORE CHICKEN

I think I made an improvement to Stan Ocker's Chicken game (ANTIC #1). I found during play that if the chicken gets hit by the bottom part of a car, the chicken is moved up, but not clear of the car. So the chicken gets hit again by the same car.

I thought this was unfair and frustrating, so I altered the program as follows:

535 POKE 1560, PEEK(1560)-33:  
A =USR(LD,0,PM):  
IF DIF > 1 THEN DIF = DIF-1

This change moves you up a full lane, clearing you of the car you hit.

Mike Colvin  
Sacramento, CA

by Russ  
Wetmore



## Good Golly! What A GAME!

The original arcade game PREPPIE! will give you hours of toe-tickling fun. You take the controls, moving your young prepper about on the golf course. And what a golf course! It's unlike any you have ever played on before. There are dangers everywhere, and only you can keep the little Ivy Leaguer from a fate worse than 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



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

**RESTON SOFTWARE PRESENTS**



 **Capital Children's Museum**

Expand the boundaries of your imagination and creativity with PAINT—your brush is the Atari's joystick and your canvas is the monitor. Book/software: \$39.95

*For the Atari 800/48K. Atari 400/16K version coming soon!*



Reston Publishing Company, Inc. A Prentice-Hall Company 11480 Sunset Hills Road  
Reston, VA 22090 (800)-336-0338

*Editor & Publisher*  
James Capparell

*Assistant Editor*  
Robert DeWitt

*Contributing Editors*  
Jon Loveless  
Ken Harms  
Carl Evans

*Technical Consultant*  
Jerry White

*Art Director*  
Marni Tapscott

*Production Assistants*  
Mona Borger  
Linda Tapscott

*Typesetting*  
Terrific Graphics

*Circulation Manager*  
Les Torok

*Software Librarian*  
Dave Duberman

*Contributing Writers*  
Dave Plotkin  
Gordon Smith  
Linda Schreiber  
Adrian Dery  
Ed Rotberg  
Herb Moore  
Clyde Spencer  
Pete Goodeve  
John Victor

*Contributing Illustrator*  
John Musgrove

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

October / November, 1982, Volume 1, Number 4  
**ANTIC—The ATARI Resource** is published six  
times per year by **ANTIC Publishing**. Editorial  
offices are located at 297 Missouri Street, San  
Francisco, CA 94107. Phone is (415) 864-0886.  
See page 78 for subscription information.

*Central European Distributor:*  
Ing. W. Hofacker GMBH  
Tegernseerstrasse 18  
D-8150 Holzkirchen  
08024 7331

*Australian Distributor:*  
Futuretronics  
79-81 Levanswell Rd.  
Moorabbin, Vic. 3189  
Australia  
03 555 9544

**ANTIC** The ATARI Resource (ISSN applied for)  
is published six times per year for \$15.00 by  
**ANTIC Publishing Co.**, 297 Missouri St.,  
San Francisco, Ca. 94107. Second Class Postage  
pending at San Francisco, Ca. and additional mailing  
offices. POSTMASTER: Send address change  
to **ANTIC** 297 Missouri St. San Francisco, Ca.  
Copyright © 1982 by **ANTIC Publishing**.  
All Rights Reserved. Printed in USA.

With our fourth issue now history and the long wait for subscription fulfillment accomplished, I thought it would be appropriate to tell you something of our goals and editorial direction.

Since our first issue was released back in April, we've tripled the number of copies printed and doubled the number of pages. Obviously, ANTIC is rapidly establishing its place at the side of your computers. Our paid circulation suggests we are the most widely read independent magazine for the ATARI owner, and we thank you for your confidence and support. We have had the opportunity to discuss ATARI with users world wide. Your dedication and enthusiasm reinforces the notion that we are active participants in a discovery that rivals the appearance of fire or the wheel.

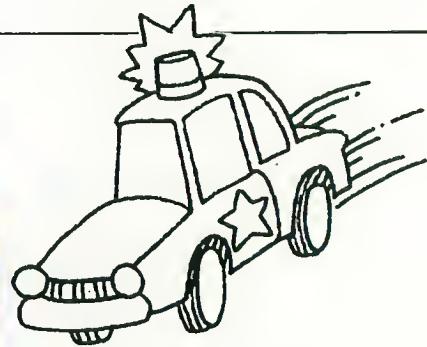
Active participants need information, accurate and up-to-date. Being long-time residents of the "silicon valley" area has provided us important professional and personal contacts which help bring you this information. Atari corporate headquarters is right down the road, and of course we try to bring you a look inside whenever possible.

Most of our writers are well-qualified old hands at the ATARI. Some are authors of significant pieces of commercial software, like Jerry White. Jerry will now be serving as our Technical Consultant, expect listings to improve and bugs to diminish. Carl Evans, president of Vervan Software, will be bringing you a new department, Tape Topics. You can expect more articles for the beginner. Watch for a new series by Bob Albrecht, starting next issue. Linda Schreiber will continue to provide excellent examples of teaching games. We also expect to print excerpts from her new graphics book published by Tab Books. I should also mention the excellent quality of work we are getting from our new users. For those of you who would like to write for ANTIC, but don't know where to begin, send for our new Author's Guide.

We continue looking for new ideas and encourage your participation in our magazine. I/O Board is very important in this regard. We appreciate your criticisms, and while your favorite ideas may not see print, I assure you we give serious consideration to all. Expect continued improvement in our design and art and perhaps some surprises here too. We encourage any artists or cartoonists to consider ANTIC.

The ATARI community is growing fast. ATARI is the number-one-selling home computer, and sales show no sign of slacking. I predict there will be half a million ATARI computers in homes by the end of 1983. I would like to think that each ATARI owner can benefit from ANTIC, we are The ATARI Resource. In fact my attitude is if you own an ATARI then you should be reading ANTIC. Spread the word — see you next issue.

Jim Capparell  
Editor / Publisher  
ANTIC — The ATARI Resource



by JIM CAPPARELL

# a SOUND introduction

Many new users have not realized the tremendous potential for music and sound hidden in their ATARI computers. After all, a computer that can produce phaser noise or let you hear Indianapolis cars race down the straightaway, by altering a few simple commands, should be capable of more.

The following applies to both the 400 and 800 and is completely memory independent.

Sound on the ATARI is really made possible by the same technology that brought you hand-held calculators. I'm talking about the integrated circuit. In this case a special integrated circuit was designed and named POKEY (Pots and Keys). Every ATARI built has this special chip and therefore can play music and generate interesting sounds.

You might think of POKEY as a barber shop quartet, since there are four voices available. Each voice can be turned up loud or so low it can barely be heard. Each barber (voice) can "sing" or sound 255 different notes or pitches. Some of these are so similar your ear can't distinguish the differences. Among them are several that correspond to the musical scale (see Table 1). Each voice can be made to sound a pure tone — as if you were to whistle the note — or distort the tone. Distortion is one way of taking a familiar note and making it sound like a growl, hiss or rumble.

Let's put this in the context of the standard ATARI BASIC statements.

SOUND A,B,C,D is the general format to generate sound, where:

A = Voice, one of the four barbers. A can equal any value from 0 to 3.

B = Pitch or note. This can equal any number from 1 to 255. The higher the value the lower the note.

C = Distortion. Any even number from 0 to 14. Ten gives the purest tone with least distortion.

D = Volume. Any number from 1 to 15 is legal. A zero turns sound off.

That seems pretty easy, and so it is. Try this! SOUND 0,121,10,8 [press return]. This will cause the first barber (his number is zero) to sing middle C with as little distortion as possible. Now vary the volume; try a 4 and then a 14. Eight is a good volume value when more than one barber is singing. Experiment with Distortion; change the 10 to a 4, then a 14. Restore the sound statement as it is above. Now, add a second barber.

SOUND 1,72,10,8      This voice sings the note A above C.

SOUND 2,45,10,8      This voice sings the note F.

SOUND 3,193,10,8      This sings E below middle C.

TABLE 1

E 193	C 121 Middle C
F 182	D 108
G 162	E 96
A 144	F 91
B 128	

Turn off each barber's voice by making the corresponding volume 0.

To turn off all voices, type END.

The legal abbreviation for the SOUND command is SO.; try it and save typing.

The following sounds should be experimented with. They are presented to get the wheels turning. I'm sure you can all do much better.

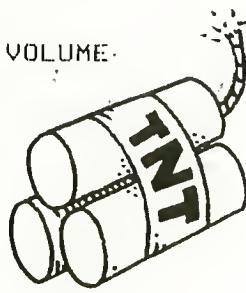
## STARTING LINE

Our first sound is an explosion. Change the value of DUR in line 30. Experiment with volume changes in line 90.

```

10 REM EXPLOSION
20 REM DUR=LENGTH OF EFFECT, 1-10
30 DUR=6
40 PITCH=20:GOSUB 80
50 SOUND 1,0,0,0:SOUND 2,0,0,0
60 GOTO 30
70 REM *** SUBROUTINE ***
80 SOUND 2,75,8,15
90 ICR=0.79+DUR/100
100 V1=15:V2=15:V3=15:REM VOLUME
110 SOUND 0,PITCH,8,V1
120 SOUND 2,PITCH+20,8,V2
130 SOUND 2,PITCH+50,8,V3
140 V1=V1*ICR
150 V2=V2*(ICR+0.05)
160 V3=V3*(ICR+0.08)
170 IF V3>1 THEN 110
180 SOUND 0,0,0,0:RETURN

```



Sound number two is a familiar siren. Change the DUR value in line 30. Try varying the step size in line 60.

```

10 REM SIREN
20 REM DUR=TIME IN SECONDS
30 DUR=10
40 LO=50:HI=35:STP=-1
50 FOR TIME=1 TO DUR
60 FOR PITCH=LO TO HI STEP STP
70 SOUND 0,PITCH,10,14
80 FOR WAIT=1 TO 15:NEXT WAIT
90 NEXT PITCH
100 XX=LO:LO=HI:HI=XX:STP=-STP
110 NEXT TIME
120 SOUND 0,0,0,0:GOTO 30

```

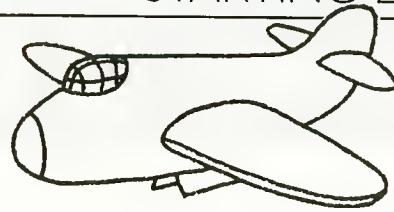
Sound number three is a European variation of the siren. Run it, you'll hear the difference. Experiment with the LO and HI values in line 40.

```

10 REM EUROPEAN SIREN
20 REM DUR=SECONDS RUN
30 DUR=5
40 LO=57:HI=45:PITCH=HI
50 FOR TIME=0 TO DUR*2
60 SOUND 0,PITCH,10,14
70 FOR WAIT=1 TO 180:NEXT WAIT
80 PITCH=LO:LO=HI:HI=PITCH
90 NEXT TIME
100 SOUND 0,0,0,0:GOTO 30

```

There are many opportunities for the experimenter using the sound command. Perhaps a program using the joystick to vary pitch or distortion would make your experimentation easier. Random notes and harmonies can be very interesting. Look up and use the Random command in your BASIC Reference Manual. If you should write something interesting let us know, ANTIC is always looking for new, interesting and helpful material.

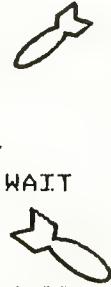


Sound four is the whistle and explosion of a falling bomb. Try to determine what makes the whistle sound and what part of the program makes the explosion sound.

```

10 REM WHISTLE & BOMB
20 REM DUR=LENGTH OF EFFECT
30 DUR=5
40 V1=4:FOR PITCH=30 TO 75
50 SOUND 0,PITCH,10,V1
60 SOUND 1,PITCH+3,10,V1*0.7
70 FOR WAIT=1 TO DUR*3:NEXT WAIT
80 V1=V1*1.03:NEXT PITCH
90 SOUND 2,35,8,12
100 V1=15:V2=15:V3=15
110 PITCH=DUR+5:ICR=0.79+DUR/100
120 SOUND 0,PITCH,8,V1
130 SOUND 1,PITCH+20,8,V2
140 SOUND 2,PITCH+50,8,V3
150 V1=V1*ICR
160 V2=V2*(ICR+0.05)
170 V3=V3*(ICR+0.08)
180 IF V3>1 THEN 120
190 SOUND 0,0,0,0:SOUND 1,0,0,0
200 SOUND 2,0,0,0:GOTO 30

```

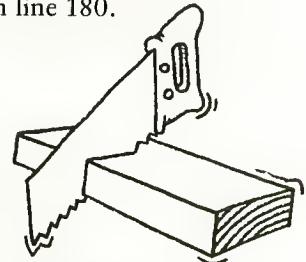


Sawing wood is sound five. Try changing the pitch and volume. Also eliminate the wait in line 180.

```

20 REM SAWING WOOD
30 REM DUR=SECONDS RUN
40 DUR=8
50 FOR TIME=1 TO DUR
60 ST=6:VL=12:GOSUB 90
70 ST=8:VL=8:GOSUB 90
80 NEXT TIME:RETURN
90 FOR PITCH=ST+5 TO ST STEP -1
100 GOSUB 160:NEXT PITCH
110 FOR PITCH=ST TO ST+5
120 GOSUB 170:NEXT PITCH
130 SOUND 0,0,0,0:SOUND 1,0,0,0
140 FOR WAIT=1 TO 25:NEXT WAIT
150 GOTO 40
160 SOUND 0,PITCH,2,VL
170 SOUND 1,PITCH,8,VL*0.7
180 WAIT=(WAIT/5)*5:RETURN

```



# SOME SOUND ADVICE

by DAVE PLOTKIN

The SOUND statement in Atari BASIC is very powerful. Its ability to modify tone, distortion, and volume for each of four voices has been put to good use elsewhere in this issue. One of the problems with the SOUND statement is that using it extensively slows down program execution. While this is true of BASIC statements in general, with the SOUND statement there is an easy alternative — SOUND registers. SOUND registers are memory locations which control properties (tone, distortion and volume) of the ATARI's sound.

Memory Location	Function
53760	Tone of Voice 1 (SOUND 0)
53761	Distortion and Volume of Voice 1
53762	Tone of Voice 2 (SOUND 1)
53763	Distortion and Volume of Voice 2
53764	Tone of Voice 3 (SOUND 2)
53765	Distortion and Volume of Voice 3
53766	Tone of Voice 4 (SOUND 3)
53767	Distortion and Volume of Voice 4
53768	Tone "clock" control

The even-numbered memory locations (53760, 62, 64, 66) control the TONE; or which note the ATARI will play. This is identical to the second number in a SOUND statement. For example, to get the same tone as SOUND 0, 100, 10, 8 you would POKE 53760, 100. This specifies Voice 0, note 100. But what about distortion and volume? The odd-numbered memory locations (53761, 63, 65, 67) take care of these two characteristics for each voice via the following relation:

$$16^* \text{DISTORTION} + \text{VOLUME}$$

where DISTORTION is the third number in the SOUND statement (10 in our example) and VOLUME is the fourth number (8 in our example).

The equivalent POKE in our example is  $16^*(10) + 8 = 168$ , and you would specify POKE 53761, 168. Try it. Type in: POKE 53760, 100:POKE 53761, 168 [RET]. The other pairs of registers work the same way. You can turn off the note by specifying zero in either TONE or DISTORTION-and-VOLUME registers.

Memory location 53768 is an interesting one. The ATARI maintains two internal "clocks" which it uses to measure the frequency of the sound wave it generates. The two clocks run at different speeds. Switching clocks changes the frequency (and thus the tone) of the sound. Bit 1 of memory location 53768 controls which "clock" the ATARI uses to produce its sound. Normally Bit 1 is off, and the ATARI's sounds correspond to the tables in the reference manual. Turning Bit 1 on (POKE 53768, 1) selects the

slower clock, and alters the tone produced upward. Toggling Bit 1 off and on will switch all four voices up and down for a pretty good "alarm" effect. Note that the loop:

FOR N = 0 TO 255:POKE 53768, N: NEXT N  
turns the Bit 1 off and on very nicely without having to worry about setting and resetting the bit. The reason this works is that the values jump back and forth from odd to even, turning the Bit 1 on and off.)

How much faster is POKE than SOUND? Well, let's try an example. The following program downloads the ROM character set into RAM so it can be modified. With no sound (leave out the SOUND statements in line 30), this process takes 15.7 seconds. There are much faster ways to do this, but you can use this method until you feel confident. Fifteen seconds is a long time to sit looking at a computer doing nothing visible. Most people start getting nervous and wondering if "Atari Lockup" has struck again. Let's add some sound to assure the user that something is happening.

```
10 POKE 106,PEEK(106)-4:POKE 53761,168:POKE  
53763,168:GRAPHICS 0  
20 CHBASE = PEEK(106):OLDCH = 57344:NWCH =  
CHBASE * 256  
30 FOR X = 0 TO 1024:C = PEEK(OLDCH + X):POKE  
NWCH + X,C:SOUND 0,C,10,4:SOUND 1,X,10,4  
40 NEXT X
```

Downloading the character set now takes some 25 seconds. If we try the following instead, substituting POKEs, the character set loads in about 20 seconds.

```
10 POKE 106,PEEK(106)-4:POKE 53761,168:POKE  
53763,168:GRAPHICS 0  
20 CHBASE = PEEK(106):OLDCH = 57344:NWCH =  
CHBASE * 256  
30 FOR X = 0 to 1024:C = PEEK(OLDCH + X):POKE  
NWCH + X,C:POKE 53760,C:POKE 53762,140  
40 NEXT X
```

Note that X, which varies from 0 to 1024, can be used as an input to the SOUND statement — each time it rolls over a multiple of 255, it starts over at 0 (thus 256 is 0, as is 513 and 769). This is *not* true of the POKE statement, so a constant was used. Doing a calculation to keep everything in range (such as POKE 53762, X/4) slows things down still further (about 28 seconds) and isn't a good idea.

Finally, various sources give the equations that relate tone to the internal clocks and note frequency. While these equations are beyond the scope of this article, they can be useful to music computer enthusiasts.

# INTRODUCING THE SPEAKER OF THE HOUSE

Thinking of upgrading your Atari® System with a speech synthesizer?

Heard one "horror story" too many?

Well, now you can get your Atari® talking with the speech synthesizer designed specifically for Atari® 400 and 800 computers.

## Unlike Others.

The I TALK II™ was engineered with hardware that won't limit the versatility of your Atari®. Comes Complete.

With the I TALK II™ you won't be required to make additional purchases.

Such as an interface module.

Or extra cable.

Or an external speaker.

And you won't need an external power supply.

## Easy Installation.

Because the I TALK II™ was designed specifically for the Atari® 400 and 800 computers, installation is fast and simple. Less than one minute.

## Program Simplicity.

The I TALK II™ boasts four voices and an unlimited vocabulary. With the I TALK II™ it's no chore to incorporate with your own programs. Your synthesizer comes with complete easy instructions.



## THE I TALK II™ SPEECH SYNTHESIZER

By RealTime Electronics

Each I TALK II™ comes complete with a diskette or cassette featuring —

- Machine Language Driver allows I TALK II™ to speak without interrupting your basic program or graphics routines - occupies approximately one page of memory.
- Word Editor - Create your own words.
- Sentence Builder.
- Dictionary - Store words for later use (dictionary and sentence builder not available on cassette).

### Bonus Features.

- Educational Game: Word Blaster.
- Arcade-Style Game: Coming soon. *Follow-up software will be constantly available. Only 16K required for any game utility above.*

And your I TALK II™ comes with a **12 Month Limited Warranty.**

Need one more reason to order now?

Well, the I TALK II™ is now available for a limited time only at the special introductory price of **\$199**. That's **\$59.00** off our regular retail price.

So, write or phone today: Greenbrier Marketing International, Inc., 8225 East Rovey, Scottsdale, AZ. 85253

**602/948-0005.**

When ordering please indicate *disk* or *cassette*.

# GREENBRIER

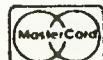
MARKETING INTERNATIONAL, INC.

8225 EAST ROVEY - SCOTTSDALE, AZ 85253

602/948-0005



VISA® and MASTERCARD® orders accepted.



# ATARI INSTITUTE TEACHES MUSIC

by HERB MOORE

"We'll begin this morning's session with a fishing report. The lake has all kinds of fish in it. I did pretty well using artificial lures, but there were a couple of fellows using worms and they were doing even better."

In this relaxed fashion, Dr. Fred T. Hoffstetter, Director of the University of Delaware's Office of Computer-Based Instruction, addressed the students at the "Computer Applications to Music" seminar sponsored by the Atari Institute for Educational Action Research. He was telling them about another of the many activities available to them during their two-week stay this summer at Clear Water Estate in the Catskill Mountains of New York.

Fred finds himself in the unusual position, for a teacher, of trying to entice his students away from their class work for volley ball games, canoe rides, etc. But then, these were hardly typical students. Most of the participants in this workshop are teachers themselves. To be precise, they are mostly music educators at the high school and college level. Many of them were taking this class for credit through the University of Delaware, and most of them wanted to take as much advantage as possible of the equipment available to them in the lab.

---

*Herb Moore is a musician, teacher, and co-author of "ATARI Sound and Graphics" (with Judy Lower and Bob Albrecht), published by John Wiley & Sons.*

The lab provided an ATARI system for each student, consisting of an 800 computer, a Disk Drive, and a CRT. There were also several printers available so students could print listings of their programs. Or, if they wanted to use the University of Delaware's PLATO computer system, there was a terminal with which to do so. With this system, students are able to experiment with an ear training program called GUIDO which was developed by Dr. Hoffstetter. Also available in the lab, was a Synclavier digital synthesizer with which students could create and store their own instrument sounds, and play them back using an organ style keyboard.

So there is ample inspiration for class projects. And these projects are what seem to be keeping the students from volley ball and fishing. A look at, and listen to, some of these projects makes it difficult to believe that, less than two weeks previous, most of these students had never used a computer, let alone programmed one to create sound and graphics.

One student program has the computer randomly generate a chord of up to four notes. The user then tries to identify the chord by entering its name. If the answer is correct, another chord is generated. If the answer is incorrect, the player gets another try. If missed three times in a row the chord is played again and its name is displayed on the screen.

Another student program gives a

screen display of two sine waves slightly out of phase with each other, and generates two slightly different tones to demonstrate the beat frequencies that occur in the sound. The user then tries to match the tones by moving a joystick. Yet another program gives a screen display of guitar chords with their correct fingerings.

One of the few nonprofessionals in the class happened to be a high school student from Old Greenwich, Connecticut. He designed a program that allows you to generate a note sequence which is continually played while you vary pitch, speed, and loudness with a joystick.

There are two or three programs being worked on by members of the class which are intended to help students become familiar with the positioning of notes on the staff. There were also projects showing where the notes are on the piano keyboard, and a colorful display of Solfeggio, the "Do, Re, Mi" method of teaching notes. Another unusual project showed different positions for dance choreography on the screen.

Although most of these projects are not the kind of refined products you would expect to buy in a computer store, they clearly demonstrate just how quickly a motivated person can learn to program the ATARI computer. The chief language used in the course was BASIC, but other languages, such as Atari PILOT and a version of LOGO were also demonstrated.

One interlude, which saved a few braincells by temporarily diverting students, was a day spent with Tim Gallwey, the author of *The Inner Game of Tennis*. Since the students were mostly music teachers, the group worked on applying the "inner game" techniques to the teaching of music. Many insights into one's own music were discovered.

This was the first event sponsored by the Atari Institute for Educational Action Research that focused completely on music. Judging from the reactions of the participants, the seminar was a success.

According to Ted M. Kahn, Executive Director of the Atari Institute, its goals are to support through grants of equipment and minor funding projects engaged in *action research*. Action research is defined as having an orientation towards:

- social action as integral part of the research project
- improvement in learning and teaching techniques
- significant impact on social equity
- the promotion of lifelong learning

Dr. Kahn feels that the outcome of projects supported by the Institute should help advance the state-of-the-art of educational technology.

The "Computer Applications to Music" course clearly revealed a number of unique ways in which the ATARI computer can be integrated into the music teaching process. Many of the participants in the class will undoubtedly continue to refine their projects, and all of them will surely play a more active part in the development of computer-based music teaching.

# UPGRADES AVAILABLE

The ATARI Home Computer Division currently offers four upgrades on the Home Computer product line. Each of these upgrades is explained below.

### GTIA Upgrade

The GTIA (General Television Interface Adaptor) chip offers enhanced graphics capabilities over the CTIA chip, which was the original graphics chip used in the 400 and 800 computers. The GTIA offers 12 different graphics modes, 16 colors, and 16 intensities. The GTIA is fully compatible with software written for the CTIA since it has a superset of the CTIA's capabilities. The CTIA was the standard chip with all 400 and 800 computers manufactured prior to November, 1981.

Atari's Regional Service Centers will perform this upgrade on out-of-warranty-units for \$62.52 (\$22.52 in parts, \$40.00 labor).

### 810 ROM C

An 810 drive with ROM C and DOS 2.0 will offer improved performance in read and write operations between the

810 and the 400 or 800. ROM C causes diskettes to be formatted with an improved sector layout which is more efficient than that used by earlier 810 control ROM's.

ROM C is automatically included in drives manufactured after October, 1981. Atari's Regional Service Centers will perform the upgrade on out-of-warranty units for \$53.56 (\$8.56 in parts, \$45.00 in labor). 810 units still in the 90-day warranty period will be upgraded free of charge, on request.

### Operating System Version B

The OS ROM's in the 400 and 800 are available in a revision B form, which provide a higher level of system performance by improving the operating system peripheral I/O control routines. OS version B eliminates annoying pauses in disk and printer operations that sometimes occurred with OS version A. OS version B is compatible with DOS 2.

OS version B ROM's have been automatically included in 400 and 800 computers manufactured since November,

1981. Atari's Regional Service Centers will perform the upgrade on out-of-warranty units for \$49.78 (\$30.00 in labor, \$19.78 in parts). 400's and 800's still in the warranty period will be upgraded free of charge.

### 810 Data Separator Board

The Data Separator Board for the 810 improves the drive's ability to distinguish between data pulses and clock pulses on the disk. This is necessary in part because of the variations in the characteristics of different diskettes. The data separator lowers the chance of a misread from the disk.

Data separator boards have been a standard part of all drives produced since October, 1981. Older drives that are out-of-warranty may be upgraded at an Atari Regional Service Center for a charge of \$135.61 (\$40.00 labor, \$95.61 parts).

The HCD Factory Authorized Service Centers will also perform these upgrades on request, although their prices may differ from the RSC's. Any 810 still in the warranty period will be upgraded free of charge.

# BENCHMARKING THE FASTCHIP

by CLYDE SPENCER

The FASTCHIP, from Newell Industries, replaces the existing math package chip in the Operating System (OS) card. This chip substantially decreases the execution time of arithmetic operations. To determine how much faster our ATARI is with the new chip installed we need to talk a little about benchmarks.

Benchmarks are simple programs that compare specific operations in a computer. They may be designed to test a particular ability, such as the time required to perform an addition or multiplication, or they may be designed to test all operations. Probably the most usable benchmarks are those which attempt to simulate average operating conditions.

There is no general agreement as to what constitutes average conditions, let alone what is a standard benchmark. Here are two benchmarks, with similar running times, that I have some familiarity with.

The first benchmark was originally suggested by Greg Dolkus, formerly of the Homebrew Computer Club. This short program exercises your Central Processing Unit (CPU) by calculating the first prime number larger than one million:

```
10 FOR I=1000001 TO 1000003 STEP 2
20 FOR D=3 to SQR (I) STEP 2
30 IF I/D=INT(I/D) THEN 60
40 NEXT D
50 PRINT I
60 NEXT I
```

The correct answer is 1000003; not all computers offer enough precision to give the correct answer. The ATARI does. Greg had reported the following times for various machines:

Apple II	5 seconds
Commodore Pet	6 seconds
OSI	6 seconds
TRS-80	12 seconds

A significant increase in speed can be accomplished with the ATARI by turning the ANTIC chip off. This can be done by POKEing a 0 in decimal location 559. The ANTIC chip can be reactivated with a 34 POKEd into 559. Because of the different speed options available in the ATARI, I will list several benchmark times.

Atari 400/800 (ANTIC ON, with original OS)	15 seconds
Atari 400/800 (ANTIC OFF, with original OS)	11 seconds
Atari 400/800 (ANTIC ON, with FASTCHIP)	9.5 seconds
Atari 400/800 (ANTIC OFF, with FASTCHIP)	6.5 seconds

BASIC A+ by Optimized Systems Software appeared to run about 1/4 second faster in all cases. Microsoft BASIC was unavailable for comparison.

I recently received a different benchmark by R. Broucke, from the University of Texas at Austin. This program compares both the speed AND precision of most of the major microcomputers by computing the sum of a thousand squares:

```
50 S=0
100 X=0
200 FOR N=1 TO 1000
300 S=S+X*X
400 X=X+0.00123
500 NEXT N
600 PRINT S,X
```

Because of the repeated additions of floating point numbers of the same sign, this program does a good job of testing error propagation. The correct answers are:

S = 503.543802149    X = 1.23

Broucke states that those computers, such as the ATARI, that use a four byte mantissa for representing floating point numbers, can be expected to run about 25% slower than those that use a three byte mantissa, such as the IBM personal computer. The following abridged table lists some of the more popular computers along with times and answers:

COMPUTER	TIME	S	X
TRS color Computer	37	503.543832	1.2300004
Commodore Pet	30	503.543832	1.23000004
Commodore Vic-20	27	503.543832	1.23000004
Apple II	26	503.543832	1.23000004
TRS-80 model II	23	503.545	1.23
Apple III	20	503.545	1.23
Sinclair ZX-81	13.5	503.54383	1.23
Osborne I (MBASIC)	8	503.545	1.23
IBM Personal Computer	7.5	503.545	1.230001
Atari 400/800 (ANTIC ON)	15.5	503.543594	1.23
Atari 400/800 (ANTIC OFF)	10.5	503.543594	1.23
Atari 400/800 (ANTIC ON, with FASTCHIP)	11.5	503.543594	1.23
Atari 400/800 (ANTIC OFF, with FASTCHIP)	8	503.543595	1.23

As you see, I left the best till last. The ATARI tests were done with the 8K cartridge BASIC. BASIC A+ was about 1/4 second faster; Microsoft BASIC was unavailable for comparison. With the FASTCHIP installed and ANTIC turned off, the Atari is as fast as (and more precise than) the other two fastest machines.

Based on these particular benchmarks, one can expect a 23-41% increase in speed with FASTCHIP, the average being a little over 30%.

# DATA PERFECT

## FOR THE ATARI 400 AND 800 COMPUTERS

### YOU MAKE THE COMPARISON

	D.P.	FILE MANAGER "800"		D.P.	FILE MANAGER "800"
<b>GENERAL INFORMATION</b>			<b>REPORT GENERATOR</b>		
Cost of Program	\$99.95		Design Report To User Specifications	YES	
Cost of Utilities Program <i>(Included In Program)</i>	\$00.00		Level Breaks Allowed At Users Option <i>(Up To 4 Level Breaks Per Report)</i>	YES	
Cost of Reports Program <i>(Included In Program)</i>	\$00.00		Designate Font To Be Used In Report	YES	
Compatible With Letter Perfect (tm)	YES		Boldfacing Allowed In A Report <i>(With Dot Matrix Printer)</i>	YES	
Word Processing	YES		Mathematical Formulas Allowed In Report <i>(Example, Field X' + Field Y' = Field Z')</i>	YES	
Menu Driven <i>(Very User Friendly)</i>	YES		Auto Page Number Allowed In Report	YES	
Complete Documentation <i>(Manual Tabbed And Indexed)</i>	YES		Auto Date Entering Allowed In Report	YES	
Single Load Program <i>(No Swapping Of Program Diskette)</i>	YES		Repeating Characters Allowed	YES	
Machine Language <i>(Extremely Fast Operation)</i>	YES		Optional Level Breaks and Page Breaks When Sort Values Change	YES	
Can Use Single Disk Drive	YES		Up To 7 Lines Allowed For Header on Each Report	YES	
Can Use Multiple Disk Drives	YES		Up To 2 Lines Allowed For Detail Information On A Report	YES	
Ability To Design Screen Mask <i>(User Designs Arrangement Of Data)</i>	YES		Variable Spacing Allowed Between Data On Items In A Report	YES	
Full Keyboard Editing Available <i>(Delete/Insert A Character; Go To End/Beg. of Line; Fine 'n', TAB, ETC.)</i>	YES		Multiple Fields Allowed In A Report <i>(Number, Date, Alpha, Formula)</i>	YES	
Compatible With Bit 3 80-Column Board <i>(40-Column and 80-Column Version Available)</i>	YES		Search Criterion Allowed On Report <i>(Same Criteria As In Editor)</i>	YES	
Works With Any Parallel Printer <i>(Supports Atari 850 Interface)</i>	YES		Ability To Have "Literal" Data Printed In A Report	YES	
Totals Of Numeric Field <i>(Return Total And Average Value/Field)</i>	YES		Ability To Have "Conditional" Data Printed In A Report	YES	
Fail Safes Provided For Data Protection	YES		Use A Default Date Field	YES	
Error Messages Displayed	YES		Designate Default Value For Specific Fields	YES	
Status Lines For Ease of Use <i>(Options Always Available For Reference)</i>	YES				
<b>SEARCHES AND EDITING</b>			<b>LABELS REPORT GENERATOR</b>		
Multiple Searches Allowed On Same Record <i>(Search On 9 Criteria Per Record)</i>	YES		Mailing Labels Allowed <i>(Specifically Designed For Labels)</i>	YES	
Search On Two Criteria In Same Field <i>(Up To 4 Fields In Single Record)</i>	YES		User Designs Data Placement On Label <i>(One Across Label Design)</i>	YES	
Wild Card Searches <i>(And/Or, Include, Character, Or Block)</i>	YES		Multiple Fields Allowed On Label <i>(Date, Alpha, Numeric, Formula)</i>	YES	
Search On Basis Of Record Number <i>(Search For An Individual Record)</i>	YES		Repeating Characters Allowed	YES	
Search On Range Of Data Desired <i>(Dates, Numbers, Values, Greater Or Less Than, Equal To, etc.)</i>	YES		Front Designation Allowed	YES	
Editing Of Records Individually	YES		Print Labels On A Conditional Basis	YES	
Editing Records Globally <i>(Verification Allowed)</i>	YES		Search Criteria Valid On Label <i>(Same Search Criteria As Editing)</i>	YES	
Delete Records Individually <i>(Verification Allowed)</i>	YES				
Deleting Records Globally <i>(Verification Allowed)</i>	YES				
<b>UTILITIES SECTION</b>			<b>MATHEMATICAL ABILITIES</b>		
Add Fields To Existing Data Base	YES		Basic Math Calculation Addition, Subtraction, Multiplication, Division	YES	
Delete Fields From Existing Data Base	YES		Built In Calculator (Automatic) <i>(Use In Editing, Or Adding Data)</i>	YES	
Reformat A Data Base <i>(Copy Format Of Existing Data Base)</i>	YES		Find the Integer Value Of A Numeric Expression	YES	
Make Additional Copies Of Data Base <i>(Create Data Base For Extended Records)</i>	YES		Find The Log Base 'e' Of 'x'	YES	
Sort On Multiple Criteria <i>(Sort On Basis Of 4 Fields In A Sort)</i>	YES		Find The Log Base 10 Of 'x'	YES	
Sorts On Multiple Criteria <i>(Ascending Or Descending)</i>	YES		Find The Absolute Value Of 'n'	YES	
Depth Of Sort Can Be Changed <i>(Designate Number Of Charters Deep To Sort)</i>	YES		Exponential Notation Used	YES	
Merge Information From Other Data Bases <i>(Merge Standard Text Files)</i>	YES		Find The Square Root Of 'n'	YES	
Add Or Delete Fields From Data Base	YES		Formulas Allowed Between Fields <i>[Field x (+ - *)/ Field y = Field z] [Field x (+ - *)/ N = Field Y]</i>	YES	
Merge Previous Entered Data From Existing File	YES				
Back Up A Data Base <i>(Make A Back Up Of Current Source Data)</i>	YES				
Pack A Data Base <i>(Remove Deleted Records From Disk Storage)</i>	YES				
			<b>SPECIFICS</b>		
			Maximum Number Of Fields Per Record	32	
			Maximum Number Of Formulas In A File	16	
			Maximum Length Of A Field	127	
			Maximum Record Length	511	
			Maximum Number Of Level Breaks	4	
			Records Per Diskette <i>(Depends On Length And Number Of Fields)</i>	VAR.	
			Data Bases Allowed On Each Diskette <i>(Can Be Expanded To Additional Diskettes)</i>	ONE	
			Form Letter Capability <i>(Compatible With Letter Perfect)</i>	YES	

P.O. BOX 10827  
**LJK ENTERPRISES, INC.** ST. LOUIS, MO. 63129  
[314] 846-6124

Atari - A Trademark of Atari Inc., Full View 80 a Trade Mark of Bit 3 Computers,  
File Manager 800 A Trademark of Synapse Software, Letter Perfect, Data  
Perfect A Trademark of LJK Enterprises, Inc.

# BUBBLE SORT

by ADRIAN DERY



This is a handy Sort Utility intended to be called from Basic and allows you to sort almost anything that can fit in your computer's memory. The flexibility of the Sort should cover many applications. Records may be any size up to 256 bytes. The sort fields may be any size up to the length of the record. You can sort on as many different fields as you need, and each field can be independently sorted in ascending or descending sequence.

The sorting technique is the traditional Bubble Sort which works by looking through a file of records in memory, and comparing the sort field of each record to the one following it. If any two adjacent records are not in sequence, the sort will exchange the positions of those two records. The sort continues to scan the file until there are no more records to exchange. In this way, records with the higher sort fields get pushed towards the end of the file, and records with the lower sort fields get pushed towards the beginning of the file. All of this takes place in memory so that it appears that the records BUBBLE into place.

The Sort only requires 182 bytes and the machine language is relocatable, therefore you can load and execute this sort anywhere in memory. Although you can put the Sort in any program you like, your file size is going to be limited by available memory. For large files, it is best to write a small Basic program that contains only this Sort, a String large enough to hold your file,

and whatever Basic statements it takes to load a file, call the Sort and write out the new sequenced file.

Although the Sort works very fast, its speed can be improved by about 30% by turning Antic off. Just before calling the sort, save the value at PEEK(559) then POKE in a zero. All this does is shut down the screen display, but in so doing, it makes about 30% more CPU cycles available to the Sort. After the sort, POKE the saved value back into 559 and the screen display will turn back on.

All sort parameters are passed to the Sort in the Basic USR call in the following sequence: 1. Address of the String containing the file. 2. Length of the records. 3. Number of records to be sorted. The next parameters specify the fields to be sorted by; 4.1. Position of the first byte of the field. 4.2. Length of the field. 4.3. '0' for ascending sequence, or '1' for descending sequence. Sort Fields are specified in Major to Minor order. That is, if you want to sort on State, and Zip Code within State, then State is the Major order and should be the first set of Sort Field parameters. The only limitation on the number of sort fields is the number of parameters that fit in the Basic statement calling the Sort.

The program in Listing 2 loads the machine language code for the Sort in Lines 1 to 9. The rest of the program demonstrates one of many techniques that can be used to read an unsequenced file, sort and rewrite a sequenced file.

Type and run the program and, at the prompt, enter the first and last names of about 9 friends. The first names will be sorted ascending, the last names will be sorted descending and then displayed on the screen.

```

10 REM SORT UTILITY DEMONS
   TRATION
20 DATA 216,104,56,233,3,1
   33,217,104,133,204,104,
   133,203,104,133,215,104
   ,133,214,104,133,210,10
   4,133,209,162,0
30 DATA 104,104,157,0,1,23
   2,228,217,208,246,56,16
   5,209,233,2,133,209,165
   ,210,233,0,133,210,48,1
   08,165,209,133,211
40 DATA 165,210,133,212,16
   5,204,133,206,133,208,1
   65,203,133,205,24,101,2
   14,133,207,165,208,101,
   215,133,208,160
50 DATA 0,185,0,1,190,2,1,
   134,218,190,1,1,200,200
   ,200,132,216,168,136,17
   7,205,209,207,240,12,16
   5,218,208,4,144
60 DATA 16,176,46,144,44,1
   76,10,200,202,208,234,1
   64,216,196,217,208,210,
   198,211,169,255,197,211
   ,208,6,166,212,240
70 DATA 11,198,212,165,208
   ,133,206,165,207,24,144
   ,172,165,213,240,4,134,
   213,208,148,96,134,213,
   160,0,177,205,170
80 DATA 177,207,145,205,13
   8,145,207,200,196,214,2
   08,241,240,203
90 DIM SORT$(182):FOR I=1
   TO 182

```

## ASSEMBLY LANGUAGE

```

100 READ A:$ORT$(I,I)=CHR$(  
    A):NEXT I  
110 REM -----  
-----  
120 REM INPUT A FILE TO BE  
    SORTED  
130 DIM FILE$(270),NAME$(15  
    )  
140 FILE$="" :FILE$(270)=FI  
    LE$  
150 FILE$(2)=FILE$  
160 GRAPHICS 0  
170 ? "ENTER THE NAMES OF 9  
    FRIENDS"  
180 FOR I=0 TO 8:LE=I*30+1  
190 ? I+1;" FIRST NAME ";:I  
    NPUT NAME$  
200 FILE$(LE,LE+14)=NAME$  
210 ? I+1;" LAST NAME ";:IN  
    PUT NAME$  
220 FILE$(LE+15,LE+29)=NAME  
    $  
230 NEXT I  
240 REM -----  
-----  
250 REM PRINT UNSORTED FILE  
260 GRAPHICS 0:? "UNSORTED  
    NAME LIST"  
270 FOR I=0 TO 8:LE=I*30+1  
280 ? FILE$(LE,LE+29)  
290 NEXT I  
300 REM -----  
-----  
310 REM SORT AND PRINT THE  
    FILE  
320 ANTIC=PEEK(559):POKE 55  
    9,0  
330 X=USR(ADR(SORT$),ADR(FI  
    LE$),30,9,16,15,1,1,15,  
    0)  
340 POKE 559,ANTIC  
350 ? ?:? "SORTED NAME LIST"  
360 FOR I=0 TO 8:LE=I*30+1  
370 ? FILE$(LE,LE+29)  
380 NEXT I  
390 END
[REDACTED]
Variable checksum = 170377

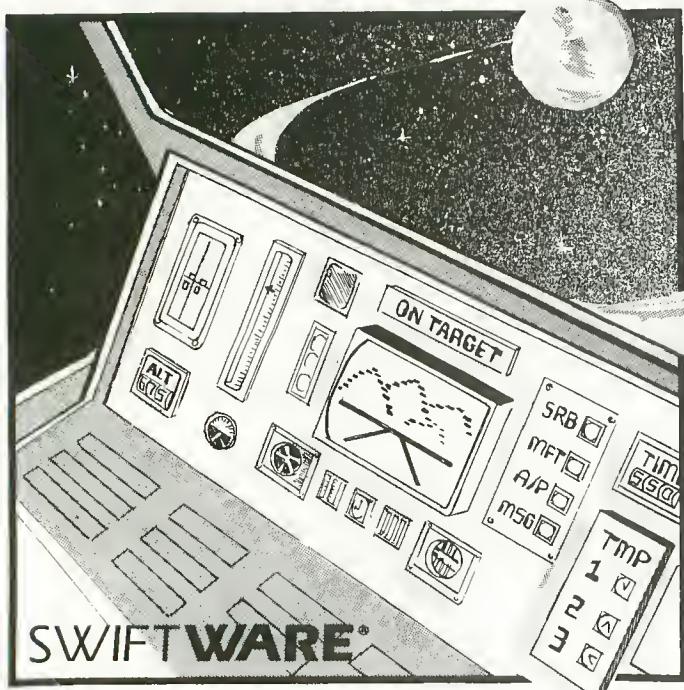
Line num range   Code Length
 10   - 60      SC   578
 70   - 180     AM   463
 190  - 300     FB   331
 310  - 390     QT   269

0100 ;UTILITY SORT - CALLED FROM BASIC
0105 ;
0110 ;ENTRY PARAMETERS:
0115 ;
0120 ; 1. FILE ADDRESS
0125 ; 2. RECORD LENGTH <=256 BYTES
0130 ; 3. NUMBER OF RECORDS TO SORT
0135 ; 4. ANY NUMBER OF FIELDS TO SORT IN
0140 ;    MAJOR TO MINOR ORDER
0145 ;        4.1 FIELD POSITION
0150 ;        4.2 FIELD LENGTH
0155 ;        4.3 0=ASCENDING 1=DESCENDING
0160 ;
0165     ORG $0600
0170 FILE    = 203      ;FILE START ADDRESS
0175 PNTR1   = 205      ;POINTERS TO TWO
0180 PNTR2   = 207      ;ADJACENT RECORDS.
0185 RECNBR  = 209      ;NUMBER OF RECORDS
0190 SCOUNT  = 211      ;RECORD COUNTER
0195 BUBLE   = 213      ;OUT OF SEQUENCE
0200 RECSIZ  = 214      ;SIZE OF RECORD
0205 FLDNDX = 216      ;SORT FIELD COUNTER
0210 FLDCNT  = 217      ;NUMBER OF SORT FIELDS
0215 SORTAD  = 218      ;ASCENDING/DESCENDING
0220 STACK   = 256      ;SAVE SORT FIELDS HERE
0225 ;
0230 ;DETERMINE HOW MANY FIELDS TO SORT
0235     CLD
0240     PLA      ;ALL BUT THE FIRST
0245     SEC      ;THREE PARAMETERS
0250     SBC #3    ;ARE FIELDS TO
0255     STA FLDCNT ;SORT
0260 ;
0265 ;PICK UP SORT PARAMETERS
0270     PLA      ;FILE START
0275     STA FILE+1 ;ADDRESS
0280     PLA      ;
0285     STA FILE  ;
0290     PLA      ;RECORD LENGTH
0295     STA RECSIZ+1 ;
0300     PLA      ;
0305     STA RECSIZ ;
0310     PLA      ;NUMBER OF RECORDS
0315     STA RECNBR+1 ;
0320     PLA      ;
0325     STA RECNBR ;
0330 ;
0335 ;PICK UP FIELDS TO SORT
0340     LDX #0
0345 PICKFIELDS
0350     PLA      ;GET ALL THE SORT
0355     PLA      ;FIELD PARAMETERS FOR
0360     STA STACK,X ;POSITION, LENGTH
0365     INX      ;AND DIRECTION.
0370     CPX FLDCNT ;ANY MORE
0375     BNE PICKFIELDS ;GO GET THEM
0380 ;
0385 ;SET UP NUMBER OF RECORDS TO SORT

```

listing continued on page 21

# *Fly the SPACE SHUTTLE* *from your* **ATARI®**



**SWIFTWARE®**

## **SPACE SHUTTLE**

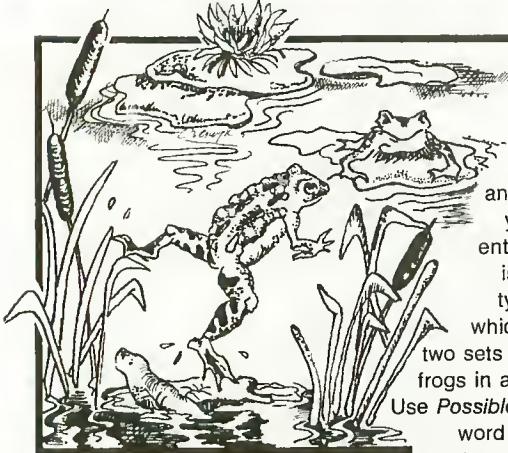
By Paul Kindl

Join the crew of the Space Shuttle as they prepare to take the next step into the world of space travel. Take control of the world's first reusable spaceship, the Space Shuttle, and in an accurate full graphic simulation, place yourself in the cockpit. Pilot the Space Shuttle through take-off with booster stage separations, orbit, descent down the glide path and landing to touchdown — complete with a chase plane and scrolling runway visible through the cockpit windscreens. You assume command throughout all phases of the mission aided by complete instrumentation.

Price: \$29.95 32K Diskette

ATARI® is a registered trademark of Atari Inc., a Warner Communications, Co.

## **FUN 'N' GAMES™**

  
Leapfrog, Possible, and Wordgames giving you hours of fun and entertainment. Leapfrog is a Chinese-Checker type jumping game in which you try to position two sets of animated jumping frogs in a minimum of moves. Use Possible to help descramble word jumble puzzles or to create your own. Wordgames,

two games in one, contains Guessit — a deductive alphabetic reasoning game for one or two players and Wordjumble - a multiple word descrambling puzzle with play-on-word hints and mystery answers. Disk version of Guessit works with a Votrax Type'N'Talk. A real crowd pleaser. Joystick and printer optional.

By Jerry White

Price: \$17.95 16K Cassette/ \$19.95 24K Diskette

## **HAUNTED HILL™**

Fight bats and ghosts in the dark of the cemetery.

This exciting, all machine language game has arcade quality graphics and speed. Requires Joystick.

By George Richardson

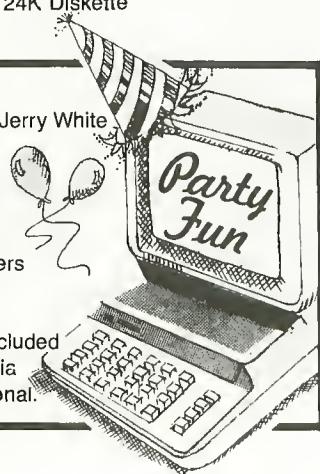
Price: \$24.95 16K Cassette/ \$29.95 16K Diskette

## **TRIVIA TREK™**

By Jerry White

Play it for fun, test your knowledge or entertain friends. Fun for the whole family and great at parties. A multiple choice trivia game for one or two players complete with 500 trivia questions in fifty categories and two thousand multiple choice answers. Included is a program for creating your own trivia questions and answers. Joystick optional.

Price: \$29.95 32K Diskette



## **Plus many more**

AVAILABLE AT SELECT COMPUTER STORES

MAIL ORDERS: Send check or money order plus \$2.50 shipping and handling. N.Y. Residents add 7 1/4% sales tax.

TELEPHONE ORDERS: (516) 549-9141

Dealer Inquires Invited

Send for FREE catalog



**SWIFTY SOFTWARE, INC.**  
64 Broad Hollow Road  
Melville, New York 11747



©1981, 1982 SWIFTY SOFTWARE, INC.

## ASSEMBLY LANGUAGE

```

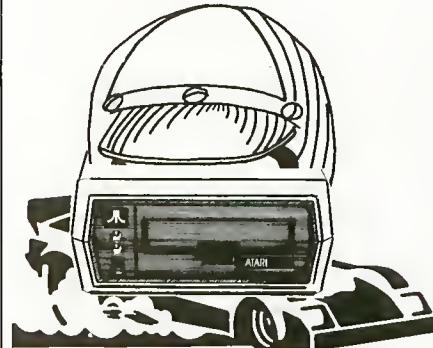
0390      SEC
0395      LDA RECNBR    ;MUST BE AT LEAST
0400      SBC #2        ;TWO RECORDS TO
0405      STA RECNBR    ;SORT
0410      LDA RECNBR+1   ;
0415      SBC #0        ;
0420      STA RECNBR+1   ;
0425      BMI ENDSORT   ;ELSE GET OUT
0430      ;
0435 ;MAIN LINE SORT LOOP
0440      ;
0445 SORT     LDA RECNBR    ;RESET NUMBER OF
0450          STA SCOUNT    ;RECORDS TO SORT
0455          LDA RECNBR+1   ;
0460          STA SCOUNT+1   ;
0465          LDA FILE+1    ;SET UP POINTERS
0470          STA PNTR1+1    ;FOR THE FIRST
0475          STA PNTR2+1    ;AND
0480          LDA FILE      ;SECOND RECORDS.
0485 BUMPRECORD
0490          STA PNTR1    ;PUT PNTR2
0495          CLC          ;AHEAD
0500          ADC RECSIZ    ;OF
0505          STA PNTR2    ;PNTR1
0510          LDA PNTR2+1   ;BY
0515          ADC RECSIZ+1  ;ONE
0520          STA PNTR2+1   ;RECORD.
0525      ;
0530 ;SEQUENCE CHECK RECORDS
0535      ;
0540          LDY #0        ;RESET STACK INDEX
0545 NEXTFIELD
0550          LDA STACK,Y   ;FIELD POSITION.
0555          LDX STACK+2,Y  ;SORT DIRECTION
0560          STX SORTAD    ;SAVE IT.
0565          LDX STACK+1,Y  ;FIELD LENGTH.
0570          INY          ;BUMP
0575          INY          ;STACK
0580          INY          ;INDEX
0585          STY FLDNDX   ;AND SAVE IT.
0590          TAY          ;FIELD POSITION TO Y
0595          DEY          ;MAKE RELATIVE TO ZERO
0600 SEQCHECK
0605          LDA (PNTR1),Y  ;COMPARE ADJACENT
0610          CMP (PNTR2),Y  ;RECORDS
0615          BEQ SEQNDX    ;= KEEP ON LOOKING
0620          LDA SORTAD    ;GET SORT DIRECTION
0625          BNE DSNDG    ;GO TO DESCENDING
0630      ;
0635 ; SORT IN ASCENDING SEQUENCE
0640      ;
0645          BCC BUMPINDEX  ;< BUMP NEXT RECORD
0650          BCS SWAP      ;> SWAP POSITIONS
0655      ;
0660 ; SORT IN DESCENDING SEQUENCE

```

listing continued on next page

# TURN YOUR ATARI 810 DISK DRIVE INTO A REAL SPEED DEMON.

WITH



## FAST-CHIP

- Increases overall speed of 810 disks by 10 to 40%.
- Faster Reads/Faster Writes
- Plugs into existing IC socket
- Easy to install
- No soldering required
- One Year Warranty
- Excellent Documentation

### ORDERING INFORMATION

Available at your local Atari dealer or Atari Service Center for only \$39.95 (installation may be extra).

If not available in your area call BINARY directly to place your order. Our order lines are open 24 hours per day, 7 days per week.

### Shipping and handling charges:

North America: Add \$2.50  
Outside N.A.: Add 10%  
Michigan Residents: Add 4% tax.  
C.O.D.: Add \$2.00

### Payment Methods:

VISA, Master Charge, AMEX, cash, certified check, personal check (allow for clearance), money order.

Look for Binary Software Products at your local computer store.

Dealer Inquiries invited

**BINARY™**  
COMPUTER SOFTWARE  
3237 Woodward Ave.  
Berkley, MI 48072  
(313) 548-0533

BINARY CORPORATION

# T.H.E. SMART TERMINAL®



TURN YOUR ATARI 400 OR 800 INTO A REAL SMART TERMINAL

Get up to date information from services like Dow Jones, Compuserve, The Source, and local timesharing computers.

Save the information on disk or cassette for editing or reviewing when you disconnect from the telephone line!

Send the edited information back to the timesharing system when you are ready.

#### REDUCE YOUR CONNECT CHARGES BY READING AND WORKING OFF LINE!!

- Use Friendly
- Disk or Cassette Based
- Works with Hayes Smart Modern
- X-ON//X-OFF Protocol
- Runs in 16K
- Serial or Parallel Printers
- Menu or Command Driven
- Save Data on Cassette or Disk
- Upload/Download Atari 400 or 800
- Multiple files in memory

This package allows you to define, transmit and receive characters so you can send characters and control codes not found on the Atari keyboard and receive characters that the Atari can translate into something it understands.

#### A POWERFUL COMMUNICATIONS PACKAGE AT A SUPER PRICE!

**T.H.E. MOST Sophisticated Communications Package Available for the Atari, 400 or 800 and its available on Cassette, too!**

#### ORDERING INFORMATION

Call BINARY directly to place your order. Our order lines are open 24 hours per day, 7 days per week.

#### Shipping and handling charges:

North America: Add \$2.50

Outside N.A.: Add 10%

Michigan Residents: Add 4% tax.

#### Payment Methods:

VISA, Master Charge, AMEX, cash, certified check, personal check (allow for clearance), money order.

Look for Binary Software Products at your local computer store.

Dealer Inquiries invited

**BINARY™**  
COMPUTER SOFTWARE  
3237 Woodward Ave.  
Berkley, MI 48072  
(313) 548-0533

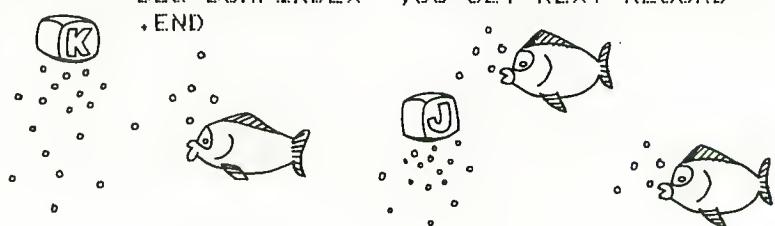
BINARY CORPORATION

## ASSEMBLY LANGUAGE

```

0665 ;
0670 DSNDG  BCC SWAP      ;< SWAP POSITIONS
0675           BCS BUMPINDEX ;> BUMP NEXT RECORD
0680 ;
0685 SEQNDX INY          ;CHECK THE LENGTH OF
0690           DEX          ;THE SORT FIELD AND
0695           BNE SEQCHECK   ;KEEP SEQUENCE CHECKING.
0700           LDY FLDNDX    ;ANY MORE FIELDS
0705           CPY FLDCNT    ;TO SORT
0710           BNE NEXTFIELD ;YES, GO TO IT
0715 ;
0720 ;INDEX THROUGH THE SORT FILE
0725 ;
0730 BUMPINDEX
0735           DEC SCOUNT    ;COUNT DOWN RECORDS
0740           LDA #255      ;AND CHECK FOR
0745           CMP SCOUNT    ;END OF FILE.
0750           BNE NOTEOF    ;
0755           LDX SCOUNT+1  ;
0760           BEQ CKSWAP    ;
0765           DEC SCOUNT+1  ;
0770 NOTEOF LDA PNTR2+1    ;BUMP PNTR2 AND
0775           STA PNTR1+1    ;PNTR1 TO THE
0780           LDA PNTR2      ;NEXT RECORDS.
0785           CLC          ;
0790           BCC BUMPRECORD
0795 ;
0800 ;AT END OF FILE SEE IF A SWAP WAS MADE
0805 ;
0810 CKSWAP LDA BUBLE     ;IF NO RECORDS SWAPPED
0815           BEQ ENDSORT   ;THEN IS END OF SORT,
0820           STX BUBLE     ;ELSE SEQUENCE CHECK
0825           BNE SORT      ;THE FILE AGAIN.
0830 ENDSORT
0835           RTS          ;BACK TO BASIC
0840 ;
0845 ;SWAP RECORDS IF OUT OF SEQUENCE
0850 ;
0855 SWAP  STX BUBLE     ;STILL OUT OF SEQUENCE
0860           LDY #0
0865 SWAPLOP
0870           LDA (PNTR1),Y ;THIS ROUTINE
0875           TAX          ;EXCHANGES THE
0880           LDA (PNTR2),Y ;POSITIONS OF TWO
0885           STA (PNTR1),Y ;OUT OF SEQUENCE
0890           TXA          ;ADJACENT RECORDS
0895           STA (PNTR2),Y ;
0900          INY          ;
0905           CPY RECSIZ    ;KEEP LOOPING FOR
0910           BNE SWAPLOP   ;THE LENGTH OF RECORD.
0915           BEQ BUMPINDEX ;GO GET NEXT RECORD
0920           .END

```



# ON HAVING A GOOD TIME

by PETE GOODEVE

**M**ost enlightened users know the ATARI computers have a crystal-controlled clock that reports to the CPU with an interrupt each time a vertical TV scan begins. The scan rate is a constant sixty times per second, so this looks like an ideal basis for an accurate time-of-day clock.

But anyone who has tried this will have stumbled across a few obstacles. For a start, crystal-controlled accuracy isn't that good. Run your program for an hour or so and you will find that it's about five seconds slow. Also, an accurate clock should keep running independently of other computer activities. It is not very helpful if, when the program stops, so does the clock. It would be even more disastrous if the clock module code was erased.

What is wrong with our "precise" 60 Hz scan rate? It is not, as you might think, simply sloppy engineering! In fact the frequency is a tightly maintained 59.92 Hz. The reason for this odd value goes back in electronic history.

#### A twisty tale of time

In the days before color TV, the vertical scan rate was indeed exactly 60 Hz. Color meant that a lot more information now had to be packed into the space originally allocated for black and white transmission, without upsetting older receivers tuned to the same signal. A color frequency with its own set of harmonics and sidebands would, given a chance, insinuate themselves onto the other signals, causing "her-

ringbone" patterns in the picture. These effects were minimized by careful juggling of the various frequencies involved.

Unfortunately, the ATARI gets a little more complicated. Unlike a standard color TV transmission, where the color signal is carefully kept unrelated to the line frequency, the Atari *wants* an exact number of color clocks per line, so that it can generate colors digitally. The color clock itself must adhere to the standard pretty closely, because this is critical for proper color, but now all the other frequencies are divided down from this, ending up with that vertical scan frequency of 59.92 a second (compared with a broadcast TV rate of 59.94).

We have a simple cure for this tardiness. Every time we compute that our time-keeping has slipped one "tick" (i.e. one vertical scan period) out of step, just add an extra one into the count. The proper interval between corrections is almost thirteen seconds. With this correction we get well within the accuracy of the crystal, and should keep time within a couple of seconds per day.

#### Hanging on to the reins

What about keeping the clock running and on time, independent of other activities? The main hangup is that most processing related to the vertical-scan interrupt is inhibited when urgent tasks — like servicing the disk — have to be done. Normally our clock must be treated in the same way. There is a

critical path for the clock interrupt which is not blocked at these critical times, but if we did all our timekeeping there we would quickly run into serious trouble, by interfering with all our peripheral communications.

The solution is to split our processing, doing only the essential counting of seconds in the unblockable path, and all the rest in the non-critical way. If the main process finds that it has missed some seconds while it was blocked, it just does some extra cycles to catch up. (By the way, if you knowledgeable readers know that the ATARI operating system already has several clocks and timers based on the same interrupt, and are wondering why we don't just use one of them, the reason is that they are all either used for something else, or are cleared by "RESET"; so constructing one of our own is a necessity.)

The ability to postpone updating our clock, that we have gained with this split-processing approach, turns out to be useful in another way. The time that is so diligently kept by our clock has to be read at some point — usually by a BASIC program. The trouble is that more than one number is involved (hours, minutes and seconds). At the speed with which we can do things in BASIC there is a good possibility that by the time the last number is read, the first is no longer valid! To correct this problem we simply add a flag that, when set, freezes the clock. We set this before picking up the time values and

continued on page 65

# FIRST and FINEST

## In Systems Software for Atari and Apple

### MAC/65

First we delivered Atari's Assembler/Editor (the cartridge).

Then we produced our enhanced "EASMD."

Now OSS is introducing the finest integrated assembly language development system yet!

In addition to being ideal for writing small, "quick and dirty" subroutines and programs, MAC/65 shows its full power and speed when used with even the most complex of large assembly language source files.

Naturally, MAC/65 is upward compatible with both EASMD and the Atari cartridge. And, of course, the object code output is also compatible with OS/A+, Atari DOS, and/or Apple DOS, as appropriate.

MAC/65 ..... \$80.00\*

### OS/A+

Optimized Systems Software — the group that produced both the first Apple DOS and the first Atari DOS — now brings you OS/A+, which combines the finest features of these and other successful personal computer operating systems.

OS/A+ is the first and finest operating system available for both Apple II and Atari computers and features a keyboard-driven, easy-to-use command processor. In addition to several simple resident commands, OS/A+ allows logical and readable requests for even the most sophisticated utility commands. In fact, the user can even add system commands as desired.

But the real power and flexibility of OS/A+ is its ability to easily interface to devices and disk drives of virtually any kind and size. File compatibility (with Apple DOS or Atari DOS, as appropriate), device independence, batch processing, easy of use — OS/A+ truly brings the finest in operating systems to your computer.

AND NOW OS/A+ (for standard Atari or Apple drives) is included as a part of every standard OSS language package. Versions of OS/A+ for some higher capacity drives available at extra cost.

Unless otherwise noted, all OSS products require 48K and at least one disk drive. We recommend 64K for the Apple version of OS/A+.

### SpeedRead+

The first and still finest speed reading tutor designed for you to use on your computer is available only from OSS.

SpeedRead+ uses time-proven techniques to train you to instantly recognize words and phrases, and yet it goes far beyond what mere mechanical devices are capable of.

SpeedRead+ exercises your peripheral vision, improves your eye movement and timing, and generally works with you at your pace... now and in the future.

NOTE: The Atari version of SpeedRead+ needs only 16K of RAM.

SpeedRead+ ..... \$59.95



As a product of Tiny C Associates, tiny-c was the first structured language interpreter for microcomputers. Now OSS brings this innovative interpretive language to your home computer. While not having the speed and power a true C compiler, tiny-c is an excellent choice for the programming student who is ready to begin learning the valuable techniques of structured languages.

tiny-c provides an easy-to-use, easy-to-modify environment that encourages experimentation while promoting proper programming style. The tiny-c package includes not only a comprehensive and instructional user manual but also complete source.

tiny-c ..... \$99.95\*

\*REMEMBER: Standard OS/A+ is included at no extra charge with BASIC A+, MAC/65, C/65, and tiny-c.

ATARI, APPLE II, and TINY C are trademarks of Atari, Inc., Apple Computer, Inc., and Tiny C Associates, respectively. SpeedRead+, MAC/65, C/65, BASIC A+ and OS/A+ are trademarks of Optimized Systems Software, Inc.

### C/65

NOW AVAILABLE!

The first native mode C compiler ever produced for Atari and Apple computers.

C/65 supports a very usable subset of the extremely powerful and popular C language. Just as C is used by the most sophisticated programmers from the professional and academic communities, so shall C/65 prove to be a powerful and much-needed tool for 6502 software developers.

C/65 supports integer and character types (and arrays), pointers, fully recursive functions, and much more.

NOTE: C/65 requires MAC/65 or an equivalent assembler. Two disk drives recommended but not required.

C/65 ..... \$80.00\*

### TRADE UP

Trade up from Atari's Microsoft Basic to BASIC A+ and receive a \$15 discount. Call or write for details.

### BASIC A+

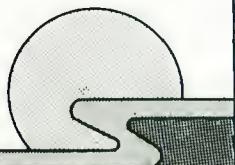
"From the authors of Atari BASIC..."

It's a fact! OSS gave you that first and most popular language for Atari Home Computers. But why be content with the first when you can have the finest?

BASIC A+ is the only logical upgrade available to the Atari BASIC programmer. While retaining all the features which make Atari BASIC so easy to use, we've also given BASIC A+ features that place it at the forefront of modern interpretive languages. BASIC A+ will let you explore the worlds of structured programming, superior input/output, helpful programming aids, and even a very comprehensive PRINT USING command. And, exclusively for the Atari computer, an almost unbelievable array of PLAYER/MISSILE GRAPHICS commands and functions.

BASIC A+ ..... \$80.00\*

Optimized Systems Software, Inc., 10379 Lansdale Ave., Cupertino, CA 95014, (408) 446-3099



# THE Musical PILOT

by KEN HARMS

This article will open the door to string parsing, a powerful way to analyze PILOT strings. Along the way, we'll read and write on the disk / cassette, do some Boolean algebra, change data types and reveal a beautiful PILOT bug. And, oh yes, we'll play four-voice music.

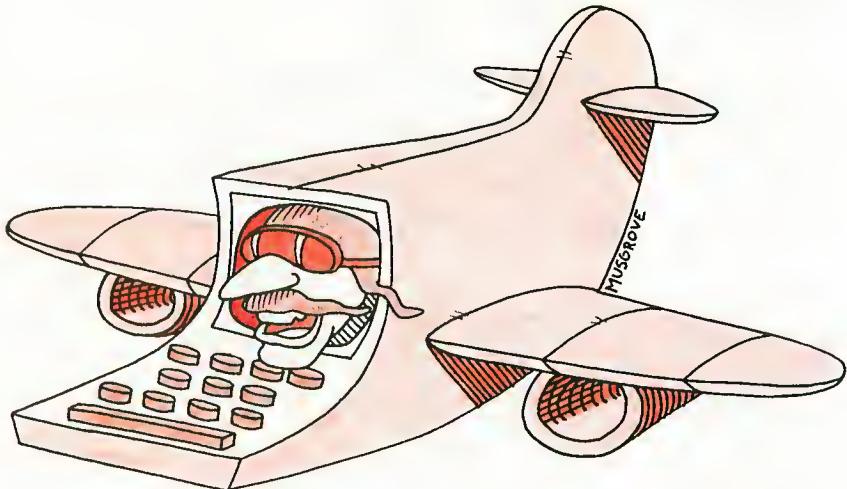
As always, we'll be way "beyond the book." Since it will be getting pretty deep, I'll give page references to Atari's PILOT Primer.

A string is a combination of letters, numbers, symbols, words, etc., "strung together." In PILOT, a "string variable" is made by giving it a name (always beginning with "\$") in an A:ccept or C:ompute instruction (pp. 69-76). The book tells how to concatenate ("grow") strings. We'll discuss how to parse ("cut") strings so you can analyze each part of a string. This could be useful for analyzing sentences, riddles, or in this case, for storing data for a program's use (PILOT lacks a "Data" statement).

String parsing relies on the Match String command which produces three pre-named variables, \$Left, \$Match, and \$Right (pp. 41-44, 81-82). Parsing programs work as follows (refer to the Pilot Player listing):

1. Place the string into the "accept buffer" (line 1270).
2. Match on the "separator." In this case, I used the blank as a separator. In line 1280, we skip over the initial blank, which the A:ccept instruction inserts in each string, and M:atch on the second blank. (Note the right arrow in the instruction which doesn't print in front of the "\_\_").
3. Check for the end of string (the JN: in line 1290).
4. Store the remainder of the string (found in \$Right) in a safe place (line 1300).
5. Use \$LEFT as the parsed word, letter, etc. (lines 1310-1370).
6. Jump back to step 1.

Although this may seem complicated, it's conceptually as easy as BASIC.



To play a C,D,E,F chord for a sixteenth, the Pilot Composer produces a string looking like this: " 1 3 5 6 16 ! ". The first four values are the usual notes (pp. 106-107) for each of the ATARI's four voices. The "16" is the inverse duration of the note (1/16 of a note). The "!" is a "terminator" to tell us that we're out of notes. Our problem: parse it and play it. The \*Loop2 routine (lines 1250-1390) cuts the string and sets up variables for each voice and for the PAUSE command. After each Match String, the variables look this way (the underlines represent blanks):

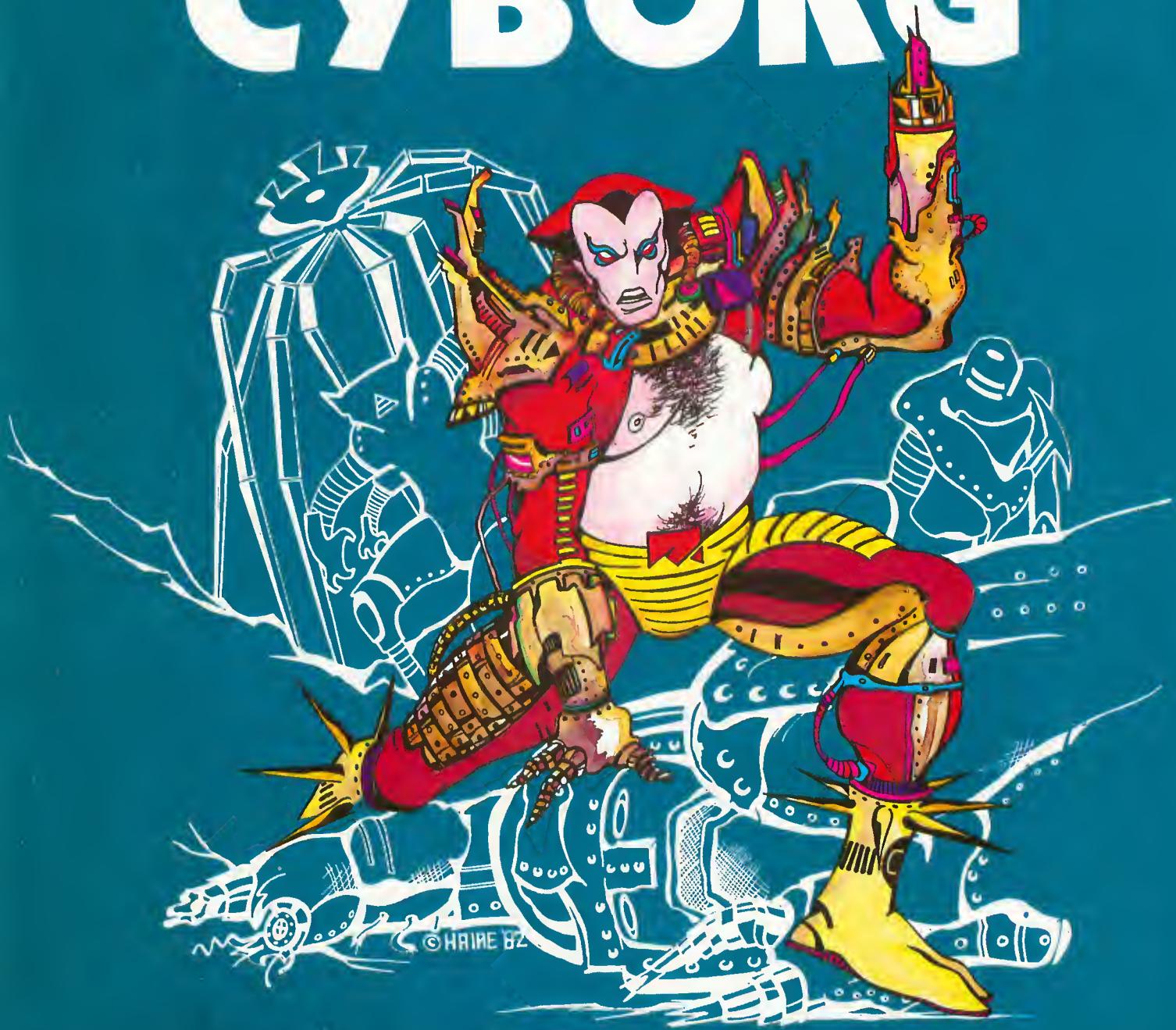
PASS	SPLAYVALUES				\$LEFT USED FOR
	BEFORE MATCH	\$LEFT	\$MATCH	\$RIGHT	
0	__1_3_5_6_16__	NULL	NULL	NULL	
1	__1_3_5_6_16__	1__	_____	_3_5_6_16__	#A
2	__3_5_6_16__	3__	_____	_5_6_16__	#B
3	__5_6_16__	5__	_____	_6_16__	#C
4	__6_16__	6__	_____	_16__	#D
5	__16__	16__	_____	_____	#L
6	_____	16__	_____	_____	NO MATCH

Simply put, each value marches to the left into the \$LEFT bucket and then gets used. Notice that the "no match" in pass six did not change any of the special string variables.

The Pilot Composer parses strings in a similar fashion but on each letter. In this case, the match parsing instruction (line 1200) skips two spaces (the leading blank and the first letter) and M:atches on the next character to put all remaining characters in \$MATCH (the comma does that). Once the string is split, a simple \$LEFT inspection finds the character and then restores the balance of the string. The \*TRANSLATE module (lines 1400-1690) performs a similar M:atch to find good notes and durations in \$GOODNOTES and \$GOODDURATION, and then to translate them into note and duration values. The translation lookup in \$NOTEABLE is "fail safe" — it first M:atches on the note followed by "/" and then M:atches on the subsequent ". ". This forces the value (a 5, say) into \$LEFT. This was required, since at M:atch for 1 or 8 without the ". " would have found the value of notes C and

continued on page 27

# CYBORG



Three hundred years in the future, the gaming grids are dominated by the human/machine hybrids known as Cyborgs. As the newest achievement of the cybernetic sciences, your final testing demands that you battle, and defeat, the most dangerous robotics in the universe. Humanoid robots, killer hyper-spheres and giant spider creatures test your relays. Up to forty enemies converge on you as you frantically fire your arm pistol. As you clear each arena, your opponents move faster, take more hits, and mutate into additional nightmarish creations.

Cyborg can be played with one or two joysticks. One joystick moves your Cyborg, the other fires your energy weapon. With one joystick, the joystick button fires your pistol. Cyborg has full color mode 7.5 graphics, incredible sound effects, one or two player options, and one or two joystick control. It saves high scores and pauses with the touch of a button. We guarantee that Cyborg is one of the fastest, most exciting games you'll ever play on your Atari, or return it within 14 days for a full refund.

**CYBORG** Atari 400/800 16K cassette . . . \$29.95    **CYBORG** Atari 400/800 16K diskette . . . \$29.95  
Please add \$2.00 for first class postage, \$4.00 for overseas air mail.

Med Systems Software • PO Box 3558 • Chapel Hill, NC 27514  
To order, call: 1-800-334-5470, or see your dealer

G. Of course, I could have designed the string in reverse order — that's an improvement for you.

Let's digress to the music before going on with the programming. The Pilot Music "System" now has two simple programs. Pilot Composer accepts four-note chords composed of the eight basic notes (no sharps or flats), followed by a duration (a whole note, half note, etc.). It checks these data, catches most errors, and rings a "bell" when it's ready for another chord. It won't find short chords, so make sure you enter four notes and a duration, or change the \*TRANSLATE module between lines 1670 and 1680. Chords are written to the disk or cassette every 10 chords. This is required since the maximum length of an accept buffer is 254 characters.

The Pilot Player asks for a tempo (how fast to play) and a file of music. It then opens that file and plays the notes stored there.

Back to the Pilot Composer program. Under PILOT (pp. 73), strings are concatenated by naming two strings in a C:ompute (or A:ccept) instruction (e.g.: C:\$ONE = \$ONE \$TWO). If, however, one of the strings is "undefined" because it has never been used before, it has the value of a text literal rather than the value of a string. In the example, if \$TWO had the value JOHN but \$ONE was undefined, the new value of \$ONE would be \$ONEJOHN — hardly what we wanted! I avoid this by initializing strings used in this way (see lines 130 & 140).

PILOT input and output (I/O) is handled with READ:, WRITE: and CLOSE: instructions. Each instruction requires a "device name" (a "C:" for cassette or a "D:" for disk) and, for disk, a file name. These are separated from following data by a comma. The data can be text literals, numeric or string variables. In a single file, READ: must be separated from WRITE: by a CLOSE:. You can try this in immediate mode or in a program:

## DISK

```
WRITE:D:TEST,ABCD
CLOSE:D:TEST
READ:D:TEST,$STRING
T:$STRING
```

## CASSETTE

```
WRITE:C:,ABCD
CLOSE:C:
READ:C:,$STRING
T:$STRING
```

We'll have more on I/O in a future article to discuss a hidden glitch. For now, just do as line 430 does and put all device specifications in a single string.

Keeping a clean screen in a program often requires erasing a line on the screen. It's not so simple in PILOT since the "blank line" string automatically defaults to one character. Lines 750 and 1230 show an easy way; just print a series of blanks followed by a non-printing character such as an arrow. Line 750, for instance, prints the #A followed by a blank and a left arrow. When the line is printed, the right-most character is blanked out, and the left arrow holds the space, but doesn't show. You can type an arrow by hitting the ESC key then holding down the CTRL key while hitting the desired arrow key. Repeat all three strokes for each arrow.

Although the Primer tells us that variables come in two flavors — strings (pp. 69-81) and numerics (pp. 85-92), we never find out how to change one into the other. It's simple but tricky. String variables can be made from numeric variables by C:omputing or A:ccepting them:

```
C:$ONE = #A
A:$ONE = #A
```

A string variable can be turned into a numeric variable ONLY by A:ccepting it:

```
A:#A = $ONE
```

After this instruction, #A will have the numeric value from \$ONE; non-numeric data will be disregarded (see the Player program, lines 1310-1350).

Line 1140 in the Player program presents a powerful way to combine "relational operators" to make "conditional statements" (pp. 89-90). Linking conditions with "+" signs creates "logical ors". For instance, line 1140 would be read, "if #T = 256 OR if #T = 128 OR if #T = 64 then J:ump . . .". In other words, if #T equaled any one of the three numbers, the program would find a "true" and J:ump. Neat! But, you can't do it the other way, with a JN: instruction to execute on a "false," because the "N" looks at the M:atch register, not at the conditionals.

You can get "logical ands" by multiplying the conditionals:

```
T(#T = 100)*(#U = 200)*(#V = 50):ALL THREE
```

This statement would be read: "if #T = 100 AND if #U = 200 AND if #V = 50 then T:type ALL THREE".

At last, the BUG. (A friend says that micros are too small to have bugs. She claims that they have fleas!) Right there on page 31 the Primer tells us that the computer "ignores" remarks. Although that may be accurate in the linguistic sense, it's not so in the operative sense. In line 1150 in the Composer program the remark set off by a "[" MUST be typed without spaces. It seems that the [ turns any intervening spaces into significant space and, therefore, part of the accept buffer. Ditto for other commands. I don't know if it's a bug or a flea — I know it's a bear to figure out! (Atari's internal manuals even have it wrong!) Be safe, don't use brackets when in doubt.

listing on page 68

# AUDIO WHILE YOU CLOAD

by JOHN VICTOR

*"Your mission, Jim, if you choose to accept it . . ."*

There is no question that the microcomputer community dislikes computer cassettes — and with good reason. In the early days of computing when hobbyists had no other storage medium, hours of frustration were spent trying to save or load programs from cassettes. When disk storage became available, most hobbyists gladly juked their cassettes. Many manufacturers have quietly stopped supporting their cassette systems.

Unfortunately, this has prejudiced software developers against the use of the Atari cassette system. However, I consider this component one of Atari's strongest points. The Atari system, unlike most others, uses a cassette player made specifically to run on the ATARI. This makes cassette recording and playback much more reliable.

But the strongest point is this: the Atari cassette is recorded in stereo. The digital information for programs is stored on the right track. Sound recorded on the left track is played back through the user's TV set. The existence of the leftside sound track means that recorded voice or music can be played at any time while the computer is on — either during the running of a program or during the loading of a program.

One technique that we use at PDI is to put voice instructions on the left sound track to play while a cassette is loading. This means that we do not have to put instructions for using the program in the program itself, reducing the memory requirements. At least half of the Atari market consists of 16K ATARI 400 computers. By keeping memory requirements within 16K (and providing programs in cassette format) a software publisher will reach a greater percentage of the Atari market.

The existence of a voice track gives the program user something to do in the time it takes to load the program. This can set the mood for the game itself. In MOONBASE 10 we use the voice to give the player a "recorded message" from Earthbase control as to the nature of the mission (just like MISSION IMPOSSIBLE). Most of the four and a half minutes it takes to load the program is spent doing something related to playing the game.

To create and use the voice track during the cassette load, several things have to be done. First, the sound that the

---

*John Victor is President of Program Design, Inc., a software manufacturer whose products for the ATARI computers include MOONBASE 10 and Pumpkin Stand, both of which use the techniques described in this article.*

computer makes during a cassette load has to be turned off. This is done with a POKE 65,0. This can be put in a loader program placed first on the cassette. This loader program will contain a visual display, the POKE 65,0, and a CRUN routine that will automatically load and run the main program.

The following is the CRUN routine. POKE 764,32 will automatically produce a carriage RETURN so that the next program will begin loading. The ASCII values in the REM statement are those for the machine language CRUN routine found in the USR routine. (USR routines are used to run machine language from BASIC.)

```
1000 REM ROUTINE TO CRUN NEXT PROGRAM
1005 POKE 65,0
1010 POKE 764,32
1020 X=USR(ADR("'"3)7H)TH
      6;)A"))
1030 REM ASC VALUES FOR ABOVE STRING
1040 REM 162,253,154,169,183
      ,72,169,84,72,169,4,32,
      182,187,169,255,76,4,18
      7
```

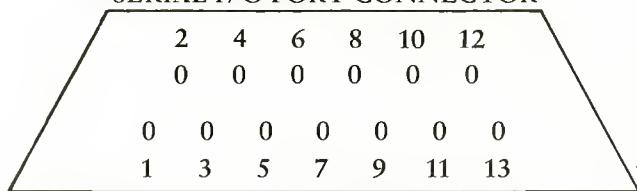
After the first program is loaded and run, instructions will be put on the screen and the next program load started. Any recorded sound in the left channel will now be heard clearly in the TV set. Positioning of the recording is important.

Atari programs have a two-second string of zeros recorded at the end of each cassette program. The programs stop loading two seconds before the recorded program ends. This means that the recorded voice or music can begin just before the first program ends, but must end two seconds before the main program's record track. Otherwise the computer is going to turn off the voice track before it finishes.

The Atari 410 Program Recorder can play back voice and music but cannot be used to record it. This must be done on a stereo tape deck or a reel-to-reel recorder. For the sake of quality, master tapes from which cassettes are going to be manufactured should be made on reel-to-reel recorders ONLY! Cassette recorders do not produce good enough SOUND to be copied. There is just too much speed variation and lack of separation between the two stereo tracks on cassette masters. If the user only wants a few copies, then a stereo tape deck is okay, but this is not acceptable for commercial software producers.

The first step in making the master tape is to record the programs. The ATARI computer makes no provision to connect the ATARI to a stereo recorder, so the programmer will have to rig up something. This is not very difficult. The "data out" and the "ground" pins in the peripheral connector are the ones that send the program signal to the recorder.

#### SERIAL I/O PORT CONNECTOR



- |                         |                  |
|-------------------------|------------------|
| 1. Clock In             | 8. Motor Control |
| 2. Clock Out            | 9. Proceed       |
| 3. Data In to Computer  | 10. +5 / Ready   |
| 4. GND                  | 11. Audio In     |
| 5. Data Out of Computer | 12. +12          |
| 6. GND                  |                  |
| 7. Command              | 13. Interrupt    |

These can be connected to the recorder with a cable that has alligator clips on one side and an RCA connector on the other. A local Radio Shack or audio dealer may have this, or an audio technician can make one. The alligator clips are then connected to the ATARI pins 5 and 6, and the RCA is plugged into the right recording jack of the stereo unit. It's not a bad idea to put tape over the alligator clips to keep them from touching the wrong points.

Before recording, start the computer outputting and set the VU meter on the recorder at between 7 and 5. Also note the reading on the tape counter.

Record the loader program. The computer will lay down 18 seconds of pilot tone before the program is recorded. However, after the program is loaded, the computer will continue to output pilot tone. Listen to the computer for an indication of when the program stops, and immediately shut off the recorder. Next, record the main program. Using the tape counter, keep track of where on the tape the second program is.

The voice (or music) can now be recorded. To record voice, connect a microphone to the left-side "mic" jack. The recorder must be one that will not erase the right track while the left one is being recorded. This can be determined quite simply — there must be a separate record button for each track.

Using the tape counter as a guide, rewind the tape. Then begin recording voice instructions and / or music on the left track. This must be finished 2 seconds before reaching the end of the recorded program (because that is where the computer is going to stop when the program is loading).

It will also help to have an appropriate graphic on the screen while the main program is being loaded. If directions are being given, the directions might also appear on the screen at the same time.

This technique can enhance a program and make it more interesting. It also adds a "professional" touch to cassettes.

## THE VOICE OF THE FUTURE . . .

### HEAR TODAY

Now your computer can talk with an ECHO™ speech synthesizer from Street Electronics!

Our SPEAKEASY™ phoneme system provides unlimited vocabulary while using a minimum of memory. The TEXTALKER™ text-to-speech firmware allows you to simply type in a word or phrase and let the computer do the rest. With nearly 400 grammatical rules contained in the system, your computer can properly pronounce most correctly spelled words. Simple commands allow you to select from:

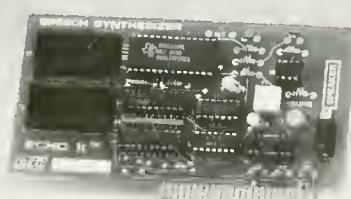
- Entire words pronounced or spelled letter by letter
- Different volumes
- Spoken punctuation if desired

The applications of the ECHO speech synthesizer are virtually unlimited, ranging from business and education to games to aiding the handicapped. The ECHO II which plugs into the Apple II is priced at \$199.95. The ECHO-GP is a complete stand alone unit which is compatible with most any computer; it sells for \$369.95.

### Echo Speech Synthesizers



**Street Electronics Corporation**  
1140 Mark  
Carpinteria, California 93013  
(805) 684-4593



# NEW FROM WESTON SOFTWARE

## AUTHORIZED EDUFUN! DEALER!

EduFun! Educational games for use with the Atari 400 and 800 Computers

Each EduFun!...program offers a unique combination of computer-generated learning and fun from a company with years of experience in educational publishing.

All of these games are a must for the family with young children.

Finally quality programs for your children. The games can be used by children aged 5 to 14... We offer the New EDUFUN! programs. Each program offers a unique combination of educational design and creativity. Designed for both the home and school use, the programs make excellent use of computer graphics, sound and animation without sacrificing sound instructional principles and content. Developed by experienced educators and field tested by students and teachers in schools. The programs allow children to learn and explore basic concepts through games that teach and entertain the child.

EDUFUN! programs make learning fun. The new programs have been designed to teach basic math skills in an exciting way. The games provide the child with both practice in key mathematical skills and enrichment experiences.

## A LOOK AT THE GAMES!!!! (Each package includes two games)

(Available in cassette 16K & diskette 32K)



### ALIENCOUNTER/FACE FLASH Ages 5 to 9

AlienCounter (counting) flying saucers...close encounters...alien visitors...how many should you land?

Face Flash (counting and base ten numeration) ready...set...now you see them...now you don't...how many were there?

### THE JAR GAME/CHAOS Ages 6 to 10

The Jar Game (problem solving and spatial visualization) follow the gold...pick the right jar...land the buzzing fly...you're sure to beat the computer.

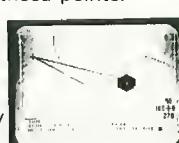
Chaos (classification and direction) up, down, left, right...move your ship...capture the magic figures but don't crash.



### GULP!!/ARROW GRAPHICS Ages 7 to 12

Gulp! (addition and multiplication drill) the race is on...faster, faster...don't get caught...watch out for those jaws! A great game to help master those basic facts.

Arrow Graphics (problem solving and spatial visualization) follow the bouncing arrow...where did it go?...retrace its steps...ring up those points!



### GOLF CLASSIC/COMPUBAR Ages 9 and up

Golf Classic (angle and length estimation) fore!...play the angles...don't be long or short...a game of geometric skills for children aged 9 to 99

Compubar (reading graphs, constructing arithmetic expressions) add this bar...subtract that one...did you read them correctly?...you're on your way to becoming a Compubar master...

### FRENZY/FLIP FLOP Ages 7 to 12

Frenzy (Subtraction & Division)...Frenzy is the name of the game...division and subtraction is the skill...super sound and graphics will cause the player to go wild with excitement...for children aged 7 to 12...

Flip Flop (Transformational Geometry)...rotate figures that are presented on the computer...figure out which diagrams are congruent...excellent graphic patterns for children ages 7 to 12...

### BATTLING BUGS/CONCENTRATION Ages 9 to 14

Battling Bugs (Integer Readiness)...Positive and Negative Numbers...Don't let this game bug you! Keep an eye on the bugs...they are very tricky...for children aged 9 to 14.

Concentration (Fractions Galore!)...try your skill with fractions...action with fractions can fractionize your brain...what a challenge! for children aged 9 to 14.

## SUPPORT MATERIALS

EduFun! packages contain the following materials designed to help children use the programs more effectively:

- an instruction guide for children, parents and teachers
- reward stickers for good work
- ideas for additional, extending activities.

## RECORD KEEPING

Diskette programs contain a record keeping program which stores information about the child's performance and provides parents and teachers with valuable data.

All programs require the ATARI BASIC cartridge. Atari is a trademark of Atari, Inc. EduFun is a trademark of Milliken Pub. Company

Mail to: Weston Software

P.O. Box 141

San Luis Obispo, Ca 93406

805-544-6863

All orders must be prepaid (money order, check or charge). All payments must be in US funds. (Outside the US add \$4.00 shipping and handling for air mail, \$2.00 for surface mail.) CA residents 6% sales tax.

Add \$2.00 for shipping

Payment Enclosed

Please charge my  VISA  MasterCard

Account No. \_\_\_\_\_

Expires \_\_\_\_\_

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_

State \_\_\_\_\_

Zip \_\_\_\_\_

## BOOK SHELF

### ATARI® Games and Recreation



A dynamite seller! Designed for the beginner as well as the experienced programmer. Provides a marvelous exploration of the types of games the Atari can run. Gives the programmer mastery of the Atari's capabilities. Has number and logic games, complete with graphs and visual tricks • letters, words and language games • appendices with flashcards, graph paper designs, and error dictionary • game designer's toolbox included...Basic language...

28Bpp paper/\$14.95

### ATARI® Sound and Graphics



This crystal-clear guide is the first book to open up the vast creative possibilities of artistic programming to owners of the ATARI 400 and ATARI 800—the most visually advanced personal micros on the market. With this self-paced, self-teaching guide, you'll advance step-by-step through simple techniques for creating a fascinating array of sounds and images...compose and play melodies...draw cartoons...create sound effects and games...The book uses BASIC....

234pp paper/\$9.95

### Your ATARI® Computer: A Guide to ATARI® 400/800™ Personal Computers



Authored by the same team that brought you the Apple II User's Guide, Your ATARI® Computer provides similar invaluable reference material for ATARI® home computer users. This is a "how-to" guide written for the novice. It covers all the common external devices, including disk drives and printers. The reader can also learn to program in ATARI® BASIC and use sound and color graphics to enhance the programs. Tables, charts and programming tips included.

458pp paper \$15.00

### The ATARI® Assembler



Here it is! A guide for using the Atari Assembler Cartridge with the Atari 400 and 800. Your customer's bonus: they'll also learn assembly language programming. Has a learn-by-doing approach • a refreshing writing style that makes learning fun • models to inspire creativity. Uses customer's BASIC background as a basis for learning.

320 pp paper/\$12.95

### ORDER FORM

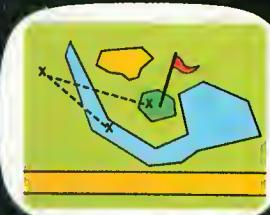
HCO1 ALIENCOUNTER/FACE FLASH (16K cassette) . . . . .	\$29.95
HCO1 ALIENCOUNTER/FACE FLASH (32K diskette) . . . . .	\$32.95
HCO2 THE JAR GAME/CHAOS (16K cassette) . . . . .	\$29.95
HCO2 The JAR GAME/CHAOS (32K diskette) . . . . .	\$32.95
HCO3 GULP!!/ARROW GRAPHICS (16K cassette) . . . . .	\$23.95
HCO3 GULP!!/ARROW GRAPHICS (32K diskette) . . . . .	\$32.95
HCO4 GOLF CLASSIC/COMPUBAR (16K cassette) . . . . .	\$29.95
HCO4 GOLF CLASSIC/COMPUBAR (32K diskette) . . . . .	\$32.95
HCO5 FRENZY/FLIP FLOP (16K cassette) . . . . .	\$29.95
HCO5 FRENZY/FLIP FLOP (32K diskette) . . . . .	\$32.95
HCO6 BATTLING BUGS/ CONCENTRATION (16K cassette) . . . . .	\$29.95
HCO6 BATTLING BUGS/ CONCENTRATION (32K diskette) . . . . .	\$32.95
B21 Atari Games and Recreations . . . . .	\$14.95
B22 Atari Sound and Graphics . . . . .	\$9.95
B23 Your Atari Computer: A Guide To Atari 400/B00 . . . . .	\$15.00
B24 The Atari Assembler . . . . .	\$12.95

MILLIKEN PUBLISHING COMPANY'S  
**EduFun!™**



**Exciting, new  
educational games  
for the  
ATARI\***

- MILLIKEN PUBLISHING . . . the leading publisher of educational software for schools
- EDUcational games . . . designed to help and challenge children at home and school
- FUN! . . . for the family and classroom



Put it all together and you've got MILLIKEN'S EDUFUN! programs . . . For your edutainment

CONTACT YOUR COMPUTER DEALER OR

MILLIKEN PUBLISHING COMPANY

**EduFun!™ Division**

1100 Research Blvd., St. Louis, MO 63132

\*Available on the Atari 400 and 800 computers. Available soon on the Apple, TI 99/4, and Commodore VIC 20.



# MUSIC WITH BASIC

by JERRY WHITE



*Two songs and a tutorial for  
would be composers.*

This tutorial and example program demonstrate one of the many ways of playing music using ATARI BASIC. Those of you with no knowledge of music may simply type in the program and follow the instructions on the screen. If you have some knowledge of music, and you'd like further information on how this program works, read on.

The program begins with a GOTO 370. This bypasses the main program loop, subroutines, and song DATA, and brings us to our setup and screen display. Here we specify GRAPHICS 0, set the background color at random, turn off the cursor, set the left margin at 5, set the print tab width at 7, and NP=0. The numeric variable NP will be used to count the Notes Played. Lines 380-420 display our program description, author name, and user options. POKE 764,255 tells the computer to ignore the last key pressed.

The routine beginning at line 430 and ending at line 460 waits for the user to press a normal video 1, 2, or 3. Nothing will happen until one of these keys is pressed. The checking is done by peeking at location 764 until it contains

a 31, 30, or 26. These are the internal keycodes for 1, 2, and 3. By checking the last key pressed, we eliminate the need to press the RETURN key.

Once we have a valid key, we position the cursor at the appropriate option number on the screen, and print that number using inverse video. The numeric variable PLAY is used to store the number of notes we are about to play.

If option one was selected, we do not have to use a RESTORE command since the DATA for this song precedes any other DATA. If either of the other options has been chosen, we use the RESTORE command to point to the line number where the appropriate DATA begins.

If the number 3 key was pressed, we also must set a flag to indicate a special condition. Since this program reruns itself when a song is over, we set the variable EXIT = 1 in line 450 before GOTO 120 instruction.

Look at line 120. In English, it says that if the number of Notes Played is equal to the number of notes we wanted to PLAY, then go to line 470. Line 470 begins with "IF EXIT". This is the same

as saying "IF EXIT <> 0". So IF EXIT = 0, the program falls through to line 480 where we have a RUN command. If EXIT <> 0 then we reset the left margin, turn the cursor back on, tell the user that BASIC has control, and END the program.

Now that we know how the program starts and how it ends, let's see what happens in between. Let's assume you have chosen option number 3. As you pressed the number 3 key, an ASCII 26 was automatically stored in location 764. At line 450 we hit a true condition and highlight the number 3 on the screen, set PLAY = 10, RESTORE 360, set EXIT = 1, and GOTO 120.

The routine from line 120 through 150 is called the main program loop. We haven't played any notes yet so NP = 0 and we fall through to line 130. Here we read two bytes of DATA. This will result in the variable PITCH being set to 91 and DUR being set to 12. Remember, we are reading the DATA that begins in line 360. Also in line 130 we add 1 to NP.

In line 140, we see if PITCH = 0, and if it is, we GOTO our REST routine which begins at line 170. PITCH = 91



so we GOTO our SOUND routine at line 200.

We will POKE the value of DUR into a countdown timer at RAM location 540. Countdown timers count backwards at the rate of 60 per second until zero is reached. In other words, when we POKE 540,DUR, since DUR = 12, exactly 12/60 of a second later, the countdown timer will reach zero. In that same line we calculate the pitches we will use in SOUND registers 1 and 2, and store the value of PITCH+1 in P1 and PITCH-1 in P2.

At line 210 we turn the tables and set DUR = PEEK(540), and check to see if it is equal to zero. At this point it isn't zero yet, so we continue on to line 220 and see if DUR > 6. Six will be our maximum volume of each of three SOUND commands. In any case, we continue on to execute three SOUND commands, then go back to line 210 and check the value in our countdown timer again. We stay in this loop until we find that our countdown timer has reached zero.

When PEEK(540)=0, we GOTO line 240 where all sounds are turned off, and we can finally go back to where this whole thing started, line 120.

Remember line 120? That's the main program loop. We have played one note and have nine to go. But what if the PITCH is a 0? When we want no sound for a period of time (a REST), we enter a zero as the pitch, and use the routine beginning at line 170 to rest for the period of time specified by DUR. By the way, 60ths of a second are also known as "jiffies."

By using DUR as the volume value in the SOUND commands, we get a slight decay or decreasing volume at the end of each note. By using two additional SOUND channels, and setting their frequency levels slightly higher and lower than the desired pitch, we achieve a richer, fuller sound.

This program demonstrates only one method of playing music on your computer. BASIC can be used to play true four-part harmony and even display the lyrics of your songs on the screen at the same time. This is demonstrated by Swifty Software's Singalong Sound &

Music Tutorial package.

ATARI's Music Composer provides another way to play music and displays musical notes on your screen. Unfortunately, you can't put the Music Composer Cartridge and BASIC in at the same time. But I found a way around that problem too.

P.D.I.'s Music Box will convert your Music Composer files and play them for you using Vertical Blank Assembler Subroutine. This is done while the BASIC cartridge is installed. The best part is that once the music begins, BASIC is at your disposal. You can even write a BASIC program while the music continues to play.

The possibilities provided by your computer's audio channels are almost limitless. Take advantage of this and let us know what you come up with.

```

10 REM ATARI BASIC MUSIC b
4 Jerry White 5/4/82
20 GOTO 310
30 REM MAIN PROGRAM LOOP
40 IF NP=PLAY THEN 420
50 READ PITCH,DUR:NP=NP+1
60 IF PITCH=0 THEN 90
70 GOTO 130
80 REM REST TIME DELAY SUB
ROUTINE
90 POKE 540,DUR
100 IF PEEK(540)<>0 THEN 10
0
110 GOTO 40
120 REM PLAY NOTE SUBROUTIN
E
130 POKE 540,DUR:P1=PITCH+1
:P2=PITCH-1
140 DUR=PEEK(540):IF DUR=0
THEN 170
150 IF DUR>6 THEN DUR=6
160 SOUND 0,PITCH,10,DUR:SOUND
UND 1,P1,10,DUR:SOUND 2
,P2,10,DUR:GOTO 140
170 SOUND 0,0,0,0:SOUND 1,0
,0,0:SOUND 2,0,0,0:GOTO
40
180 REM DATA FOR POP GOES T
HE WEASEL
190 DATA 121,6,91,6,0,6,91,
6,81,6,0,6,81,6,72,6,60
,6,72,6,91,6,0,6
200 DATA 121,6,91,6,0,6,91,
6,81,6,0,6,81,6,72,18,0
,6,91,6,0,6
210 DATA 121,6,91,6,0,6,91,
6,81,6,0,6,81,6,72,6,60
,6,72,6,91,6,0,18
220 DATA 53,12,0,12,81,12,0
,6,68,6,72,18,0,6,91,12
230 REM DATA FOR TEN LITTLE

```

INDIANS  
240 DATA 121,18,121,6,121,6
,121,18,121,6,121,6,96,
18,81,6,81,6,96,6,96,6,
121,18

250 DATA 108,18,108,6,108,6
,108,18,108,6,108,6,128
,18,108,6,108,6,128,6,1
28,6,162,18
260 DATA 121,6,121,6,121,6,
121,6,121,18,121,6,121,
6,96,18,81,6,81,6,96,6,
96,6,121,18
270 DATA 108,18,108,6,108,6
,162,6,162,6,162,18,121
,48
280 REM DATA FOR EXIT ROUTI
NE

290 DATA 91,12,0,6,121,6,12
8,6,121,6,108,24,121,24
,0,24,96,24,91,24
300 REM SETUP/DISPLAY/OPTIO
NS

310 GRAPHICS 0:SETCOLOR 2,R
ND(0)\*16,0:POKE 752,1:PO
KE 82,5:POKE 201,7:NP=
0

320 ? :? :? :"ATARI BASIC M
USIC"
330 ? :? :" by Jerry White"
?:? :

340 ? :? :"Type 1 for POP GO
ES THE WEASEL"
350 ? :? :"Type 2 for TEN LI
TLE INDIANS"
360 ? :? :"Type 3 for PROGRA
M EXIT":POKE 764,255

370 IF PEEK(764)=31 THEN PO
SITION 10,8:? "1":POKE
764,255:PLAY=43:GOTO 4
0
380 IF PEEK(764)=30 THEN PO
SITION 10,10:? "2":PLA
Y=44:RESTORE 240:GOTO 4
0
390 IF PEEK(764)=26 THEN PO
SITION 10,12:? "3":POK
E 764,255:PLAY=10:RESTO
RE 290:EXIT=1:GOTO 40

400 GOTO 370
410 REM EXIT/RERUN
420 IF EXIT THEN POKE 82,2:
POKE 752,0:? ?:? :"BAS
IC":? :"IS":END
430 RUN

Variable checksum = 153160

Line num	range	Code	Length
10	- 120	JT	275
130	- 210	NH	521
220	- 310	GO	602
320	- 410	DS	509
420	- 430	RE	76



# ZOUNDS!

by ED ROTBERG

**S**ince this issue of ANTIC delves into the mysteries of computer-generated sound, I will share with you some of the inner workings of a major project of mine, the Rotberg Synthesizer. I will have to assume a reasonably high level of programming competency on your part.

The Synthesizer does a pretty good job of shaping POKEY sounds into approximations of real musical instruments. It works much better, in my opinion, than the Atari Music Composer cartridge. The most important reason why is that it can provide "envelopes" for the frequencies, and an amplitude for each note.

The term "envelope" refers to the temporal variation of some aspect of a sound. In this case, the aspects to be varied are frequency and amplitude. The code "ADSR" is the standard way of specifying an amplitude envelope, and the code stands for "Attack, Decay, Sustain and Release."

Figure 1 will give an idea of what these terms mean in the case of a harpsicord-like amplitude envelope. The rest of the article will present an approach to creating such envelopes in a music generating program like the Rotberg Synthesizer.

The whole project started as a gag while I was working at the Atari Coin-Op Division. One of our colleagues, a

disco freak, was compounding his bad judgment by getting married. Such was the birth of the Synthesizer, which was used to compose our congratulatory lament, the Disco Dirge, written by Dan Pliskin, another ex-Atarian.

Some stubbornness prevents me from just listing the program for you. I guess I'd rather lead you to an understanding of how to do it for yourself. I will be referring to various registers in the POKEY chip, and certain functions of the POKEY, but I will in no way describe that chip. Also, I will not be relating any of this to BASIC techniques, which are hopelessly slow for this kind of work. Nor will I discuss any sound editing techniques, but only the means of generating the musical sounds.

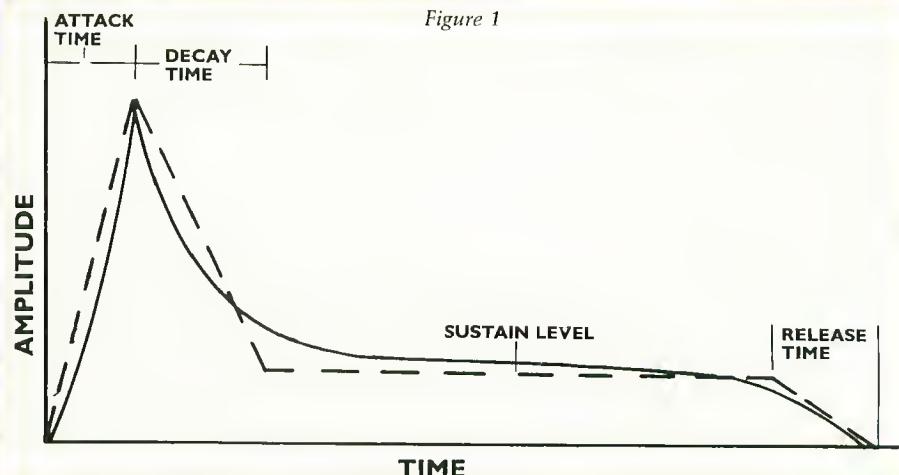
There are basically two major classes of sound generation used: static and dynamic. The first consists of nothing more than storing a few values to the various POKEY registers, and sitting back and listening. The capabilities of this approach are quickly exhausted. More useful, and far more interesting, are the dynamic sounds, in which the values stored to the POKEY are con-

stantly changed during the duration of the sound. Three approaches to dynamic sound generation are:

- 1) Algorithmic. A short routine calculates the values to be stored. The possibilities are limited only by the imagination of the programmer.
- 2) Table driven. A short program keeps an index into a lookup table to determine what values are to be stored into POKEY during that time interval. New sounds can be generated very quickly by slopping some new values into the tables.
- 3) Interpretive. A small interpreter program reads instructions and data from a command stream, causing the sounds to be generated by a few preset rules. This method keeps the data tables short, compared to a pure table-driven approach.

Let's go over just what the Synthesizer is capable of. It has the ability to produce sound on all 4 channels of the POKEY simultaneously. The basic unit of sound is called a NOTE, since this program was intended to be primarily a *music* synthesizer, though it is capable of generating a wide variety of sounds. The frequency of the NOTE is specified

continued on page 37



*Ed Rotberg is an Electrical Engineer with many years of computer programming experience. He was with Atari, Inc. from 1979 to 1981 as a software developer and consultant on the ATARI 800 project. Among his programs are the Rotberg Scrolling Marquee and the Rotberg Synthesizer. He helped create sound effects, using the ATARI, for the movie TRON, and is a partner in Videia, Inc., a new electronic entertainment firm in Sunnyvale, CA.*

# The Adventures of PROFESSOR VON CHIP & ORBIE



## TRICKY TUTORIALS (tm)

There are many things that the ATARI computers can do either better, or easier than other small computers. The following series of programs is designed for anyone who is at least familiar with BASIC programming. What each tutorial offers is similar to an extensive magazine article with all discussion in as simple language as possible, plus you get MANY examples already typed in and running. The instruction manuals range from 10 to 50 pages, and some tutorials fill up a complete tape or disk. There is little overlap in what is taught, so anyone wanting to know all they can should buy them all (my banker thanks you). ATARI buys these from us to use in training their own people! Rave reviews have been published in ANTIC, ANALOG, CREATIVE COMPUTING, and even INFOWORLD. You trust INFOWORLD, don't you?

**TT #1: DISPLAY LISTS**—This program teaches you how to alter the program in the ATARI that controls the format of the screen. Normally, when you say "Graphics B", the machine responds with a large Graphics B area at the top of the screen and a small text area at the bottom. Now, you will be able to mix various Graphics modes on the screen at the same time. The program does all of the difficult things (like counting scan lines). You will quickly be able to use the subroutines included in your own programs.

\$19.95  
16K Tape or 24K Disk.

**TT #2: HORIZONTAL/VERTICAL SCROLLING**—The information you put on the screen, either GRAPHICS or TEXT, can be moved up, down, sideways, or diagonally. We provide the basic methods and leave the rest up to your skill and imagination. Includes 18 examples to get you started, with several using a small machine language subroutine for smoothness.

\$19.95  
16K Tape or 24K Disk.

**TT #3: PAGE FLIPPING**—Now you don't have to redraw the screen every time you change the picture or text. You will learn how to have the computer draw the next screen you want to see while you are still looking at the previous screen, then flip to it instantly. You won't see it being drawn, so a complicated picture can seem to just appear. Depending on your memory size and which graphics or text modes you are using, you can instantly look at up to 50 pages. The basic method takes only 9 lines and the usefulness is infinite.

\$19.95  
16K Tape or 24K Disk.

**TT #4: BASICS OF ANIMATION**—This program shows you how to animate simple shapes (with some sound) using the PRINT and PLOT commands, and it also has a nice little PLAYER/MISSILE GRAPHICS game you can learn from. The P/M example is explained and will get you started on this complicated subject (more fully explained in TT #5). This would be an excellent way to start making your programs come alive on the screen with movement!! Recommended for beginning users.

\$19.95  
16K Tape or 24K Disk.

**TT #5: PLAYER/MISSILE GRAPHICS**—Learn to write your own games and other animated applications! The tutorial begins with many small examples that compliment the 50 page manual, then gradually builds up to a complete game where everything you need to know is fully explained. Also included are two machine language utilities that you can use to animate Players from BASIC. Next we include two of the best editors currently available: one for editing playfield shapes (backgrounds); and one to edit your players, and all in glorious Technicolor!! Everything except the two editors run in 16K Tape or 32K Disk.

\$29.95

**TT #6: SOUND AND MUSIC**—Unless you have spent many years experimenting with the four voice channels, you will learn a lot from this one! Learn to play standard notes, chords, and whole songs using some simple "tricks". One of the nicest parts are the examples of special sound effects that you can refer to whenever you need a sound for a program or to impress a friend. This program will be of interest to all ages and levels of experience!

\$19.95

### SPECIAL DISCOUNT

Order the first six tutorials in a 3-ring binder for \$99.95, a \$30.00 savings!

**TT #7: DOS UTILITIES**—We at Educational Software have been shocked by some of the prices others are charging to offer you small utilities to help in the use of your Disk Drive. We now offer you all of the following plus explanation as to how each was written, and how to use them: A UNIQUE MENU PROGRAM, AN AUTORUN.SYS BUILDER, DISK INSPECTOR (LOOK AT SECTORS), DISK JACKET PRINTER, AUTOMATIC FORMATTER, RECORD SAVE AND LOAD UTILITY.

\$29.95  
32K Disk Only.

### MASTER MEMORY MAP (lm)

This book is the most valuable source of information for your ATARI you can buy. It starts out by explaining how to PEEK and POKE values into memory, so that even new computer owners can use many of these "Tricks". Then you are given 32 pages of the memory locations that are the most useful, along with hints on how to use many of the locations. Finally, it includes hints on problems you may be having with the computer and discusses the new Graphics modes 9 to 11. Even ATARI buys this book from us!

\$6.95

## CONTACT YOUR LOCAL DEALER or ORDER BELOW

We have other line programs for ATARI computers.

Write for a catalog.  
Send us your programs to sell too!

## USER SUBMITTED PROGRAMS

**MINI-DATABASE/DIALER**—stores and edits up to B lines of information such as names & addresses, phone numbers, messages, inventories, or anything you want. It has the usual sort, search, and print options, but it also has an unusual feature: If your file includes touch-tone phone numbers and your phone company allows touch-tone phone signals, the program will DIAL THE PHONE NUMBER FOR YOU! 16K Tape or 24K Disk. \$24.95

**THE GRAPHICS MACHINE**—allows the ATARI to act like more expensive graphics computers using simple commands like line, box, circle, polygon, fill, and savescreen to get a high resolution picture you can save on disk in only five seconds! Many more features! 48K Disk Only. \$19.95

**BOB'S BUSINESS**—14 small business type programs accessed from a common menu. 16K Tape or 32K Disk. \$14.95

**MINI WORDPROCESSOR**—A simple text editor to write, save, and print several pages at a time. 32K Tape or Disk. \$19.95

**KID'S #1**—Includes a MATH QUIZ, a children's TREASURE HUNT, and a DIALOGUE program. 16K Tape or 24K Disk. 3 for . . . \$14.95

**KID'S #2—SPELLING BEE, WORD SCRABBLE, and TOUCH**. 16K Tape or 24K Disk. 3 Educational games for . . . \$14.95

**PLAYER PIANO**—Turns your keyboard into a mini-piano and more. 24K Tape or 32K Disk. \$14.95

**DOG DAZE**—Two cute little doggies race for the fire hydrants, shoot their bones, and just have a lot of fun! A fast action program for all ages. 8K Tape or 16K Disk, in machine language. \$16.95

**GRAPHIC SYMBOL LABELS**—for your keyboard to remind you of the built-in Graphics symbols. 2 complete sets for . . . \$2.95

## OUR NEWEST PROGRAMS

\* OUR BEST GAME \*  
**SPACE GAMES**—Our family is being attacked by ALIENS, and only you can save us. A comic book manual will guide you through three games that test your ability in space skills. Includes ALIENS, SURVIVE, and ROBOT ATTACK, and is for all ages. The first two games require 16K I/O Tape. The last game and all Disk users need 32K. \$24.95

**MATHS FOR FUN**—Another ENGLISH import teaching basic math skills. Very colorful and enjoyable to use. For ages 5 to 16. 16K Tape or 24K Disk. \$19.95

**TT #10: SOUND EFFECTS**—From laser blasts to ringing phones, this tutorial will show you how to make unique sound effects in all of your programs! 16K Tape or 24K Disk. \$19.95

**MARATHON**—This is a unique math quiz for one or two players. You are in a race to move your runner across the screen first! There are four levels of play with live modes of operation for each. The game uses joysticks for all input, so play is easy for young children. This wonderful learning tool is imported from ENGLAND for your learning pleasure. Your kids will never even notice they are playing an EDUCATIONAL program. 16K Tape or 24K Disk. \$19.95

**TT #5: CHARACTER GRAPHICS**—Character Graphics is the best way to animate your ATARI! Make letters look like space monsters, gunfighters, or a myriad of other shapes. Use our editor to create these multicolor shapes and then we'll show you how to move them around the screen. This tutorial even shows how our Space Games were written! 16K Tape or 24K Disk. \$19.95

To order COD, VISA or MasterCard call — (408) 476-4901

By mail include \$3.00 postage (USA only) or \$1.50 Memory Map only—  
California residents add 6.5% TAX.—Specify Tape or disk.



Educational  
Software inc.

4565 Cherryvale Avenue  
Soquel, Ca. 95073  
(408) 476-4901

800-692-9520  
Dept. AT-1

PCA  
PRESENTS

# LABYRINTHS

FOR ATARI® 400/800

A  
MAGICAL,  
MYSTICAL,

AND THOROUGHLY ENTERTAINING WORLD OF  
MONSTERS, DEMONS & TREASURES

THAT IS COMPLETELY

**DIFFERENT EVERYTIME YOU PLAY!**

YOU WILL START AS A FIGHTER, THIEF, CLERIC OR MAGIC-USER.  
TRY TO GAIN EXPERIENCE & POWER TO ADVANCE TO  
HIGHER LEVELS OF **POWER.**

Discover GOLD, WEAPONS, ARMOR, and MAGIC SCROLLS among the  
TREASURES of those you defeat. But **BEWARE...**

Your power leads you to more deadly monsters who may have magic powers!  
A wide choice of COMMANDS combined with SOUND EFFECTS  
makes for unparalleled computer melee!  
OVER 35 completely different types of monsters

.... LABYRINTHS ....

CASSETTE - \$24.95  
(32K required)

DISK - \$28.95  
(48K required)

**P**rogressive **C**omputer **A**pplications  
is setting new standards of quality in microcomputer software.

In this tradition, we are also presenting  
another supreme simulation ...

**COMPUTER EXCHANGE**

An OUTSTANDING STOCK MARKET simulation  
Solitaire, or up to 4 players trade stocks in  
a fictional stock market.

One joy stick required per player

.... COMPUTER EXCHANGE ....

CASSETTE - \$21.95                    DISK - \$24.95  
(16K required)                        (32K required)

ORDER FROM :

P.C.A.

P.O. BOX 46

BURTONSVILLE, MD. 20866

# # Dealer inquires welcome # #



by 8 bits which may either be a pointer into a table of frequencies, or the actual frequency itself. This is an implementation decision, and each method has its merits and drawbacks. If the actual frequency is stored, the NOTE must also specify the "noise content or distortion" value to be stored in the control register along with the "sustain" volume for each channel. Each NOTE can specify a 4-bit value for its sustain volume, and can have a duration specified by 16 bits.

This duration is relative to the current TEMPO. The TEMPO is specified by an 8-bit value, which is used as a delay loop counter. The TEMPO can only be changed relative to its current value by a 2's complement add of any 8-bit value. Note that in versions of the Synthesizer that run during the vertical blanking interval, such as the Atari POP Demo program, the TEMPO feature is not implemented, as the timing interval is fixed at 60 hertz. Each channel can specify its own current ENVELOPE table which controls the attack/decay of either amplitude, frequency, or both. Attack and decay are not specified as rates or times, but rather as a table of digitized amplitudes during the attack/decay period. This period can cover a span of a few milliseconds to a few seconds.

Care must be taken not to wrap either of these values, unless of course that is the intended result. At the present time, "Release" is not implemented. The Synthesizer has the ability to REPEAT a section of music up to 100 (hex) times. These REPEATS may be nested without any restriction except that the total number of REPEATS in a piece of music must not exceed 100 (hex). The Synthesizer can also play PHRASES. I have chosen not to implement the four separately tracking stacks necessary to allow for nesting of PHRASES, although this is certainly simple enough to do. Each PHRASE must specify its own RETURN. In addition, any channel's instruction stream can cause AUDCTL to be changed on the fly. That's about it.

In its current form, THE ROTBERG SYNTHESIZER supports 7 instructions:

- 1) Repeat
- 2) Set / change Envelope
- 3) Set / change AUDCTL Register
- 4) Play Phrase
- 5) Return from Phrase
- 6) Change Tempo
- 7) Play 1 note

The Synthesizer processes 4 sets of these instructions simultaneously, one for each channel in POKEY. Each instruction stream is made up entirely of these instructions, in addition to a STOP directive that is only valid when encountered in channel 1's instruction stream.

The data structure format for each instruction follows, where each cell represents one byte. All value/ranges are given in hexadecimal.

#### REPEAT: op-code = FF

FF
nn
ll
hh
ii

FF = REPEAT op-code

nn = repeat count (0 = 100, 1 = NOP, count indicates number of times section is to be played)

ll = low byte of address of 1st instruction of section

hh = hi byte of address

ii = index into ram table for this section's repeat counter

This instruction has the effect of conditionally repeating a section of the instruction stream a specified number of times. Because each REPEAT instruction has its own loop counter in a RAM table 100 (hex) bytes long, any amount of nesting of these REPEAT instructions is allowed, as long as the total number of REPEATS in any composition is 100 or fewer. Each REPEAT can play its section up to 100 times. This instruction appears at the end of the section to be repeated, and refers to the first instruction of that section in its operand field.

#### SET ENVELOPE: op-code = FE

FE
ll
hh

FE = SET ENVELOPE op-code

ll = low byte of address of envelope table

hh = hi byte of address

This instruction sets the pointer to the current ENVELOPE table for that channel. A SET ENVELOPE instruction MUST precede the first note instruction on any channel. ENVELOPES may be changed at any time.

#### CHANGE AUDCTL: op-code = FD

FD
cc

FD = CHANGE AUDCTL op-code

cc = new audctl value

This instruction is used to change AUDCTL on the fly. This represents powerful, dynamic control of the POKEY. It may be used from any channel, but in practice, it is best only altered from one channel within a piece, as AUDCTL can affect ALL channels.

#### CALL PHRASE: op-code = FC

FC
cc
hh

FC = CALL PHRASE op-code

ll = low byte of address of 1st instruction of phrase

hh = hi byte of address

This instruction will transfer control to a PHRASE which can be "called" any number of times. In the current implementation, there is NO nesting of PHRASE calls (i.e. only 1 level of calling a PHRASE). PHRASES themselves, may therefore use any instructions other than CALL PHRASE, and must terminate with a RETURN instruction. Note, that while possible, it is dangerous to have 2 channels use the same PHRASE, especially if that PHRASE

continued on next page



contains REPEAT instructions.

RETURN FROM PHRASE:  
op-code = FB

FB

FB = RETURN op-code

This instruction is used to return from a PHRASE.

CHANGE TEMPO

FA

tt

FA = CHANGE TEMPO op-code

tt = 2's complement delta change to TEMPO

This instruction is used to change the current TEMPO by a 2's complement delta value. This instruction can appear in any channel, and obviously affects all channels.

NOTE: op-code = < FA

ca

ff

dd

ee

c = control nibble (upper nibble of volume)

a = sustain volume

ff = sustain frequency or pointer to freq. table

dd = low byte of 16 bit duration

ee = hi byte of 16 bit duration

Duration is relative to TEMPO.

For convenience, a value of 100 (hex) is usually used to represent a whole note. This means that for long durations, the high byte (ee) of the duration represents a measure count in 4/4 time.

All instructions not having an op-code for FA or greater are NOTE instructions. ENVELOPES will be applied to all NOTE instructions with one exception! If the first two bytes (ca,ff) are zero, then the NOTE is considered a rest, and no envelope is applied. Note that in processing the instruction stream for each channel, all

non-NOTE instructions are processed immediately, until a NOTE instruction is encountered. In other words, all non-NOTE instructions take up NO duration time, and a NOTE instruction MUST be processed for each channel every cycle through the interpreter. Also, when a rest (NOTE ca,ff = 0) of duration zero is encountered in channel 1, it is evaluated as a global STOP instruction, and the piece is over.

Various data structures are used by the interpreter for processing the instruction streams. A brief description of each follows.

PNTR - 8 bytes

Two bytes per channel. This table maintains the current "program counter" for each channel.

NRPT - 8 bytes

Two bytes per channel. This structure contains the duration remaining on the current NOTE of each channel.

RPTBLK - 100 (hex) bytes

There is a one-to-one correspondence between each REPEAT instruction and a unique byte in this table. These bytes contain the counts remaining in each repeat section. When a REPEAT instruction is encountered, this byte is checked. If it is zero, it is then initialized to the value specified in the REPEAT instruction and decremented immediately. If it is non-zero, then it is merely decremented. The interpreter will then execute the REPEAT only if the decrement does not bring the value to zero. Thus, a 1 for a repeat count is an effective NOP, and the repeat count represents the number of times a section is actually played. Obviously, this entire table MUST be erased prior to starting to play a piece.

TREG - 8 bytes

Two bytes per channel. This is a staging area for the values to be stored to all 8 frequency and control registers for the four POKEY voices. Since the processing time for each of the 4 channels in a single interpreter cycle may vary, the POKEY values generated are saved in a holding register until all are

calculated, and can be stored to POKEY with a single move loop.

ENVL - 8 bytes

Two bytes per channel. This table maintains the pointer to the current ENVELOPE table.

EINDX - 4 bytes

One byte per channel. This is the current index into the ENVELOPE table. It counts up by 2 from an initial value of 2. The reason for this will become evident in the discussion of the ENVELOPE table itself. EINDX is reset to 2 by the start of each new note.

RTNADR - 8 bytes

Two bytes per channel. This table contains the return address to a main instruction stream from a PHRASE. It is zero when in the main instruction stream so that RETURNS and CALL PHRASES can check for validity. Because these return addresses are not stacked, there is no nesting of PHRASE calls allowed.

ENVELOPE tables -  
4 to 100 (hex) bytes

The first byte has the table length, a maximum of FE (hex). The EINDX value is compared against this first byte to determine whether the NOTE value is to be modified by the ENVELOPE, or whether the duration has exceeded the attack/decay period and the sustain values for frequency and amplitude are to be used. Each 2 bytes in the table represent both frequency and amplitude modifiers for one duration count. Since a maximum EINDX of FE is allowed, this means that durations longer than 7F cannot be modified by an envelope past that point. The hi byte of each 2 byte value modifies the amplitude (low nibble only), and the low byte modifies the frequency, both by 2's complement addition.

The remaining data structures used are the instruction streams themselves. There must be one per channel, even if the channel is dormant.

There it is, in the proverbial nutshell. This should be enough to get the more adventuresome of you started.

# 25

of The Hundreds of Reasons  
You Ought To Be A **COMPUTE!**  
Magazine Subscriber:

From "The Editor's Feedback" Card, a monthly part of our continuing dialogue with readers of **COMPUTE!**. These are responses to the question,

"What do you like best about **COMPUTE!**?"

1. "It is written so a beginner can read and understand it... it's layman oriented..."
2. "Clear, clean layout, good presentation..."
3. "The Atari game programs..."
4. "Best and most information on PET..."
5. "Cover to cover, and all in between..."
6. "Reviews of software and hardware..."
7. "Good balance of application and technical articles..."
8. "It is the best source of info about various levels of VIC/PET/CBM machines and applications..."
9. "The BASIC and machine language programs..."
10. "I like programs that can be typed into a computer, run, and then used right away (a program without bugs!)"
11. "That it is organized well, and covers a broad range of information concerning Atari. Keep it up! please, I'm learning..."
12. "Table of contents listings and computer guide to articles is a great idea. Best magazine for personal home computer users..."
13. "Best I have found for VIC info..."
14. "Informative articles: 'Secrets of Atari', Game programs, especially programs that teach the reader about the Atari..."
15. "I like all the articles and programs for my computer, the PET. I've learned and found out things about it that I never even thought existed. Other magazines don't have too much material for the PET and, for that reason, I find **COMPUTE!** invaluable..."
16. "The up-to-date hardware reviews..."
17. "Machine language utilities for Atari..."
18. "Articles are terse but understandable and accurate. Utility and applications program listings very helpful..."
19. "The April, '82 issue is my first. I am impressed that you not only acknowledge the VIC-20, you even have applications for it..."
20. "I really enjoy (since I am one) the Beginner's Page..."
21. "The attention it gives to Atari and the easy-to-understand language it's written in..."
22. "It is concerned with explaining programs, not just listing them. It is the best VIC magazine I could buy..."
23. "The new table of contents 'Guide to Articles and Programs' is excellent, particularly the indication of 'multiple computer' items..."
24. "Broad range (sophistication) of programs..."
25. "You don't speak over the average user's head..."

Whether you're just getting started with personal computers, or very advanced, you'll find useful, helpful information in every issue of **COMPUTE!** Magazine. We specialize in supporting the Atari, PET/CBM, VIC-20, and Apple computers. Editorial coverage is expanding to include the TI-99/4A, the Sinclair ZX-81, and the Radio Shack Color Computer.

Every issue of **COMPUTE!** brings you user-friendly articles, applications programs, and utilities you can type right into your computer and use. To subscribe to **COMPUTE!**, or to order a sample issue, use the attached reply card or call our toll-free number. **COMPUTE!**... We're the resource for thousands and thousands of home, educational, and small business computer users. Shouldn't you be one of them?

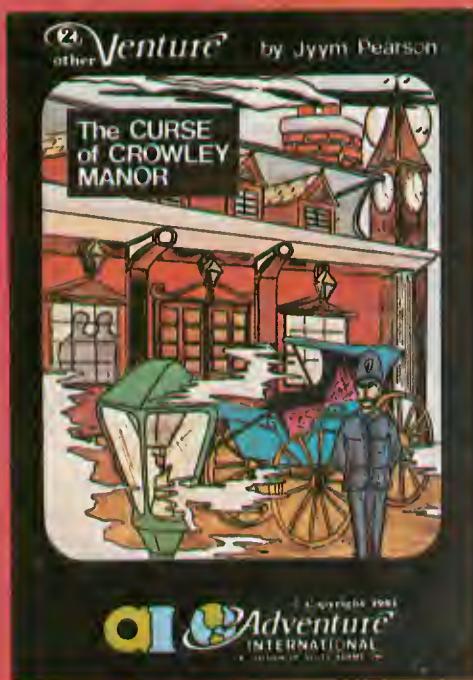
1 year, twelve issue subscription: \$20.00 in the US.

**Call Toll Free in the US 800-334-0868**  
**In NC call 919-275-9809**

**COMPUTE!** Magazine is a publication of Small System Services, Inc.  
625 Fulton Street. P.O. Box 5406. Greensboro, NC 27403.

# OTHER WORLDS. OTHER REALITIES.

(FOR EXPERIENCED ADVENTURERS ONLY!)



## THE CURSE OF CROWLEY MANOR

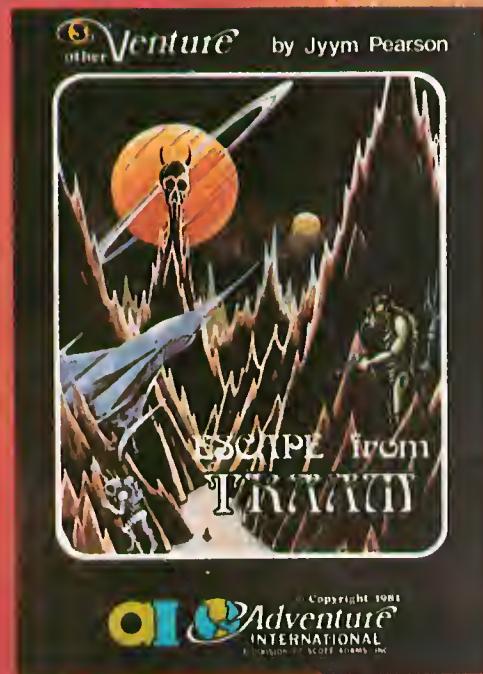
by Jyym Pearson

You've sensed it before: nameless, unreasoning fear. Fear of the unseen — of things that scurry and scrabble through the shadows when the lights have been put out. How then will you fare when you face the Ultimate Evil; how will you possibly survive — THE CURSE OF CROWLEY MANOR?

Jyym Pearson, author of ESCAPE FROM TRAAM and many other fine programs, explores a new dimension in fright with a macabre tale of things that go bump in the night. THE CURSE OF CROWLEY MANOR is an excursion into mind-wrenching terror as you enter the dreaded Crowley Estate in search of answers to some pretty grisly questions. Fear fans take note: This is the stuff that nightmares are made of, so think twice before you approach...

THE CURSE OF CROWLEY MANOR features Adventuring the way YOU like it, with plenty of clever plot twists, and a scenario that'll roll your socks up and down your legs! If Adventuring has become a bit tame for you lately, this is one sure-fire cure! THE CURSE OF CROWLEY MANOR will run on any ATARI 400 or 800 with ample memory. We supply the software; you supply the atmosphere. (A well-lit room is optional, but recommended!)

ATARI 16K TAPE ..... 050-0108 \$24.95



## ESCAPE FROM TRAAM

by Jyym Pearson

As soon as your small space cruiser began losing altitude, you knew you were in for serious trouble. You somehow walked away from a fiery landing that would've spelled certain death for a less fortunate man, but as one may quickly learn, there are fates far worse than a rapid death...

You've managed to walk away intact from the awesome Curse of Crowley Manor. So far, so good. But will even your finely tuned Adventuring skills give you the necessary edge to ... ESCAPE FROM TRAAM?

ESCAPE FROM TRAAM is a detailed Adventure for the ATARI 400 or 800 computer that defies the player to successfully search a bizarre alien world for a means of escape. The perils are many and the opportunities for survival are few. But for the clever Adventurer, a single opportunity is all that might be needed for a speedy exit from this hellish world. Are you up to the challenge?

All of the traditional Adventure elements are in ESCAPE FROM TRAAM, including two-world command input, game save feature, and an extensive vocabulary. Add to this the impact of a dynamic storyline that'll give even the most experienced Adventurer a real workout! ESCAPE FROM TRAAM — a fine addition to any Adventure collection.

ATARI 16K TAPE ..... 050-0109 \$24.95

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) 430-5194

# SPEED DEMON

by JOHN MAGDZIARZ

*A slick way to circumvent player/missile programming.*



SPEED DEMON! is a one-player car-racing game using a joystick in Port One. You are given a high-performance stock car which leaks oil every now and then. At the start your car is warming up at the gate waiting for the count down. In the text window you see a prompt for the skill level you wish. There are two levels, and pressing '1' starts you at the beginners level. Pressing '2' starts you at the pro level, in which your car has a severe oil leak. Once the

```

90 REM SPEED DEMON BY JOHN
    MAGDZIARZ 1982
100 GRAPHICS 1+16
110 POSITION 3,8?:#6;"JOHN
    MAGDZIARZ"
120 POSITION 6,10?:#6;"pre
    sents"
130 POSITION 4,12?:#6;"spe
    ed demon!"
140 FOR LOOP=1 TO 1000:NEXT
    LOOP
150 POSITION 3,16?:#6;"ple
    ase wait...":FOR T=1 TO
    600:NEXT T
160 GOTO 180
170 FOR LOOP=1 TO 10:NEXT L
    OOP:RETURN
180 GRAPHICS 0:POKE 559,0:R

```

## APOLOGY

The game PAC-INVADERS, published in this department in Issue #3, was the original work of Sheldon Leemon and not Vince Scott as we indicated. Mr. Leemon's version, titled, Outer Space Attack, appeared in Softside Magazine, March 1982.

Mr. Leemon is the author of INSTEDIT, a character editor program from APEX, as well as an upcoming GTIA tutorial from Educational Software.

Softside is a monthly magazine featuring information and programs for users of Apple, TRS-80 and ATARI computers.

We apologize to all concerned for any misrepresentation or confusion.

```

EM SHUT OFF SCREEN TEMP
ORARILY
190 OPEN #1,4,0,"K?":REM OP
EN KEYBOARD FOR DIRECT
INPUT
200 A=PEEK(106):POKE 106,A-
$:REM ROOM FOR NEW CHAR
ACTER SET
210 CP=PEEK(106)+1:POKE 756
,CP:REM GIVE NEW LOCATI
ON OF CHARACTER SET
220 CHAR=CP*256
230 FOR M=0 TO 1023
240 POKE CHAR+M,PEEK(57344+
M):REM COPY CHARACTER S
ET FROM ROM TO RAM
250 NEXT M
260 FOR NC=1 TO 9:READ OLD
270 DIF=(OLD+4+64)*8
280 FOR M=0 TO 7:READ LINE:
REM POKE DATA FOR ALTER
ED CHARACTERS SET
290 POKE CHAR+DIF+M,LINE:NE
XT M
300 NEXT NC:REM DATA FOR NE
W CHARATERS
310 DATA 1,136,136,255,255,
255,255,136,136
320 DATA 2,60,60,190,190,60
,60,190,190
330 DATA 3,34,34,191,191,19
1,191,34,34
340 DATA 4,190,190,60,60,19
0,190,60,60
350 DATA 9,0,0,20,20,20,20,
0,0
360 DATA 10,204,204,51,51,2
04,204,51,51
370 DATA 11,255,85,255,170,
60,20,60,0
380 DATA 12,0,60,20,60,170,
255,85,255
390 DATA 13,8,42,168,42,170
,170,168,40
400 GRAPHICS 0:POKE 756,CP:
POKE 559,0
410 DL=PEEK(560)+PEEK(561)*
256:REM ALTER DISPLAY
LIST
420 POKE DL+3,68
430 FOR I=6 TO 23:POKE DL+I
,4:NEXT I
440 POKE DL+28,4
450 FOR I=0 TO 4:READ COL:R
EM SET SCREEN COLORS, R
EGISTERS 0-4
460 POKE 708+I,COL:NEXT I
470 DATA 26,0,198,72,5
480 ?">":DIM HOR$(40),VERT
$(30):DIM CR1$(4)
490 POKE 559,0:? "3":RESTOR
E 550:S1=7
500 FOR I2=1 TO 39:HOR$(I2,
I2)=CHR$(13):NEXT I2
510 FOR I=1 TO 30 STEP 3:VE
RT$(I,I)=CHR$(13):VERT$(
I+1,I+1)=CHR$(29):VERT
$(I+2,I+2)=CHR$(30):NEX
T I
520 POKE 82,0
530 REM DRAW PLAYFIELD
540 FOR LOOP=1 TO 8:READ I,

```

continued on next page

# IN THE PUBLIC DOMAIN

```

J,K,L:POSITION I,J:? HO      800 REM          170:POSITION 20,21:? L
R$(K,L):NEXT LOOP           810 GOSUB 1280     AP1
550 DATA 0,0,1,39,28,3,1,9,   820 FOR G=5 TO 1 STEP -1:PO
3,6,1,20,25,6,1,8,0,9,1     SITION 23,21:?:G:SOUND
,19,3,12,1,13,15,15,1,2    0,40,10,4:FOR T=1 TO 10
2,0,18,1,39                 :NEXT T:SOUND 0,0,0,0:
560 FOR LOOP=1 TO 27:READ I  GOSUB 170:NEXT G
,J,K,L:POSITION I,J:? V     830 POSITION 23,21:?" "
ERT$(K,L):NEXT LOOP          840 SOUND 0,85,6,5
570 REM DATA FOR PLAYFIELD  850 POKE 20,0:POKE 19,0:REM
580 DATA 0,0,1,30,0,10,1,22  RESET REAL TIME CLOCK
,3,1,1,1,3,3,1,12,6,3,1    860 REM START OF GAME ROUTI
,9,9,1,1,9                  NE
590 DATA 13,3,1,9,17,1,1,12  870 POSITION 15,21:?:PEEK(1
,21,3,1,9,25,1,1,28,25,    9):IF PEEK(19)>98 THEN
11,1,6,29,9,1,18            480
600 DATA 32,7,1,18,36,4,1,6  880 IF PEEK(53279)=6 THEN 4
,35,6,1,21,36,13,1,6,38   90
,1,1,30                     890 IF OK1=1 THEN 870
610 DATA 38,11,1,24,19,10,1  900 IF AG=1 THEN 1200
,6,15,13,1,6,12,14,1,12   910 S=STICK(0):IF S=15 OR S
,9,13,1,9                  =10 OR S=6 OR S=5 OR S=
620 DATA 6,14,1,12,3,13,1,9  9  THEN S=S1
,22,7,1,6,21,9,1,12,22,    920 S1=S
13,1,6                     930 REM READ JOYSTICK
630 POSITION 3,19:?"! DRIV  940 ON S-4 GOTO 960,970,980
ER !TIME|LAP1"               ,0,990,1000,1010,0,1030
640 POSITION 3,20:?"        ,1040
"                           950 GOTO 910
650 POSITION 3,21:?"!PLAYE  960 GOTO 870
R #11 0 | 0 |"              970 GOTO 870
660 POSITION 3,22:?"        980 X1L=X1+1:Y1L=Y1:P1=1:GO
"                           TO 1070
670 POSITION 24,19:?:CHR$(1  990 GOTO 870
24);CHR$(29);CHR$(30);C  1000 GOTO 870
HR$(124);CHR$(29);CHR$(  1010 X1L=X1-1:Y1L=Y1:P1=3:IF
30);CHR$(124);CHR$(29);  (X1=24 OR X1=25) AND (
CHR$(30);CHR$(124)         Y1=16 OR Y1=17) THEN 87
680 POSITION 26,20:?:CHR$(1  0
4);;" SPEED ";CHR$(14)
690 POSITION 26,21:?:CHR$(2  1020 GOTO 1070
);;" DEMON ";CHR$(22)
700 POSITION 24,15:?:CHR$(1  1030 X1L=X1:Y1L=Y1+1:P1=4:GO
5):POSITION 24,18:?:CHR  TO 1050
$(16)
710 FOR I=1 TO 4:CR1$(I,I)= 1040 X1L=X1:Y1L=Y1-1:P1=2
CHR$(I+132):NEXT I:LAP1  1050 IF (S=14 OR S=13) AND (
=-1:OK=0:AG=0:TIME1=0:L  (X1=24) AND (Y1=16 OR Y
P=1                         =17)) THEN S=7:GOTO 940
720 POSITION 23,16:?:CR1$(1  1060 REM CHECK COLLISIONS
,1):X1=23:Y1=16             1070 LOCATE X1L,Y1L,Z1:POSIT
730 POKE 559,34:POKE 752,1:  ION X1L,Y1L:PUT #6,Z1:IL
POKE 53279,0                X=X1:LY=Y1
740 SOUND 0,170,4,4          1080 IF Z1=17 THEN POSITION
750 POSITION 26,19:?"WHAT   X1,Y1:?" :"X1=X1L:Y1=Y1
LEVEL?":GET #1,LEV          1090 IF Z1<>32 THEN 1170
760 IF LEV=49 THEN SC=45:GO  1100 REM MOVE CAR
TO 790                      1110 POSITION X1,Y1:?" :"PO
770 SC=10                     SITION X1L,Y1L:?:CR1$(P
780 IF LEV<>1 AND LEV<>50 T 1, P1):IF P1<>LP THEN GO
HEN 750                      SUB 1350
790 POSITION 26,19:?"        1120 LP=P1:X1=X1L:Y1=Y1L
"                           1130 IF X1=24 AND (Y1=16 OR
Y1=17) THEN LAP1=LAP1+1
:SOUND 2,50,12,10:GOSUB

```

Variable checksum = 1029818

Line num	range	Code	Length
90	- 200	TB	539
210	- 320	KN	432
330	- 440	MV	425
450	- 550	OX	545
560	- 660	RE	543
670	- 730	PS	543
740	- 850	AF	516
860	- 970	WD	406
980	- 1090	BQ	464
1100	- 1190	PL	524
1200	- 1310	FO	353
1320	- 1360	HZ	211

A

2

# ACEY-DEUCY

By LARRY SHERMAN

Two variations of an exciting new game with detailed graphics. Challenge your friends or the computer to see who can win the pot or break the bank.

ONLY

**\$29.95**

PLEASE SPECIFY  
ATARI 400/800, 16K  
DISK OR CASSETTE  
APPLE II/II+  
48K, 3.3 DOS



L &amp; S COMPUTERWARE

1589 FRASER DRIVE  
SUNNYVALE, CA. 94087  
(408) 738-3416

VISA/MC...\$2.00 shipping  
Ca. residents add 6% tax

By LARRY SHERMAN

Supply words using ANY subject and watch CROSSWORD MAGIC interconnect them with lightning speed. Print professional quality puzzles with any one of 24 graphics printers or play them on the screen.

At computer stores or:

ONLY

**\$49.95**

PLEASE SPECIFY  
ATARI 800, 40K  
DISK ONLY  
APPLE II/II+  
48K, 3.3 DOS



Artwork by Dick Davies...Apple is a trademark of Apple Computer Inc...Atari is a trademark of Atari Inc.

# RAM

For ATARI  
**48K RAM BOARD FOR THE 400**  
with Lifetime Warranty

- Highest quality available
- Reduces power consumption
- Reduces heat

<b>48K Board</b>	(400)	<b>\$175</b>
<b>32K Board</b>	(400/800)	<b>\$ 90</b>
<b>16K Board</b>	(800)	<b>\$ 60</b>

FREE SHIPPING ANYWHERE IN U.S.A.

INTEC

PERIPHERALS  
CORP

906 E. Highland Ave.  
San Bernardino, CA 92404  
(714) 881-1533



ATARI, 400, 800 are Trademarks of ATARI, Inc.

CROSSWORD									
H	O		P	I		A	I	M	S
I	N		P	U	T	S	F	E	A
P			I	N	S	E	R	T	G
S	A	C	K		T	I		P	I
S	A	Y		S	O	L	A	C	E

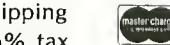
Supply words using ANY subject and watch CROSSWORD MAGIC interconnect them with lightning speed. Print professional quality puzzles with any one of 24 graphics printers or play them on the screen.

ONLY

L &amp; S COMPUTERWARE

1589 FRASER DRIVE  
SUNNYVALE, CA. 94087  
(408) 738-3416

VISA/MC...\$2.00 shipping  
Ca. residents add 6% tax



Artwork by Dick Davies...Apple is a trademark of Apple Computer Inc...Atari is a trademark of Atari Inc.

## PRESCHOOL FUN

Develops fundamental skills for children  
preschool to grade 1.  
Color - Graphics - Sound  
APPLE II DISK 48K Applesoft  
\$25.00  
ATARI cassette 16K  
\$17.50  
ATARI disk 24K  
\$25.00

## FISHING FOR HOMONYMS

Colorful word game designed to improve spelling and vocabulary for grades 3-6.  
APPLE II disk 48K Applesoft  
\$25.00  
ATARI cassette 16K  
\$20.00  
ATARI disk 24K  
\$25.00

## WORD SCRAMBLE

Challenging word game for children  
grades 1-4.  
Large Color Letters  
Graphics - Sound  
APPLE II disk 48K Applesoft  
\$25.00  
ATARI cassette 16K  
\$20.00  
ATARI disk 24K  
\$25.00

Available at leading computer stores throughout the world.

**R.H.E.S.I.S.**  
P.O. Box 147  
Garden City, MI 48135  
(313) 595-4722

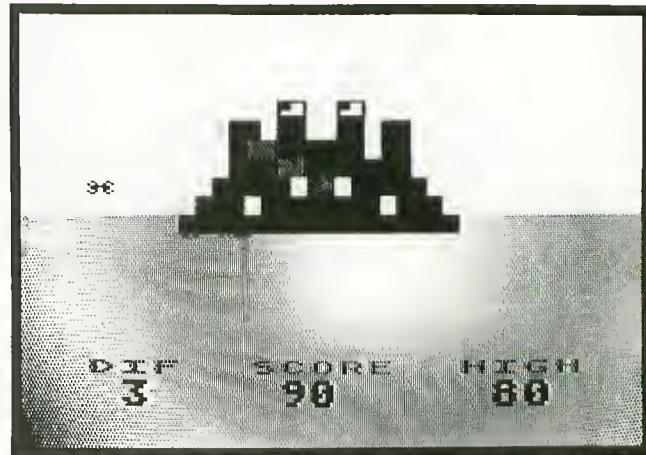
Please add:  
\$2.00 shipping/handling  
\$1.50 C.O.D.  
Write for Free Catalog  
Dealer Inquiries Welcome

# frog

by STAN OCKERS

*Lick up the blinking bugs.*

You may be a Prince at heart, but in this game you are only a hungry Frog, sitting in the middle of a Dismal Swamp. Swarms of blinking bugs fly by. Use the joystick and fire-button to stick out your tongue and catch them. But don't let them sting you, their bite is fatal! Your score is related to



the number of bugs you eat before getting stung.

There are two levels of difficulty in this game, and paddle controllers will work instead of the joystick. There are several special touches too, including a Vertical Blank Interrupt routine that makes the bugs blink on and off.

```

20 REM *** FROG ***
30 REM *** STAN OCKERS ***
40 REM *** 6/82 ***
49 REM VBI AND DLI ROUTINE
S
50 FOR I=1536 TO 1613:READ
A:POKE I,A:NEXT I:POKE
206,4:POKE 207,4:A=USR
(1536)
60 DATA 104,160,10,162,6,1
69,7,76,92,228,173,199,
2,205,200,2,240,16,198,
207,208,25,169,5,133,20
6
70 DATA 173,200,2,141,199,
2,208,13,198,206,208,9,
169,10,133,207,165,208,
141,199,2,169,0,133,20
,76,98,228
80 DATA 72,138,72,166,209,
189,75,6,141,10,212,141
,26,208,232,134,209,104
,170,104,64,155,152,24
89 REM CHANGE CHARACTER SE
T
90 GOSUB 3000
99 REM STRINGS HOLDING PRI
NT POS.
100 DIM C$(7),X$(7),Y$(7),X
5$(7),Y5$(7),X7$(7),Y7$(
7),X6$(7),Y6$(7),X14$(
7),Y14$(7),X10$(7),Y10$(
7)
105 DIM X11$(7),Y11$(7),X9$(
7),Y9$(7),BX(7),BY(7)
110 FOR I=1 TO 7:X5$(I)=CHR
$(8+I):Y5$(I)=CHR$(8+I)
:X7$(I)=CHR$(8+I):Y7$(I)
)=CHR$(9):X6$(I)=CHR$(8
+I)
115 Y6$(I)=CHR$(10-I):X14$(I)
=CHR$(9):Y14$(I)=CHR$(
10-I):X10$(I)=CHR$(10-
I):Y10$(I)=CHR$(10-I)
120 X11$(I)=CHR$(10-I):Y11$(I)
=CHR$(9):X9$(I)=CHR$(
10-I):Y9$(I)=CHR$(8+I)
129 REM CHOOSE INPUT DEVICE
130 GRAPHICS 18:POKE 756,ST
ART/256:NEXT I:POSITION
6,3:? #6;"choose":POSI
TION 4,5:? #6;"1 paddle
"
131 REM 'paddle' & 'joystick'
IN INVERSE CHAR.
135 POSITION 8,6:? #6;"or";
POSITION 4,7:? #6;"2 Jo
ystick":OPEN #1,4,0,"K"
140 GET #1,A:IF A<49 OR A>5
0 THEN 140
150 POSITION 9,9:? #6;CHR$(A)
:INDEV=A-48
199 REM PROGRAM INITIALIZAT
ION
200 DIM F(7),ST$(10),BP$(4)
:BP$="burp":MAXWAIT=6:MX
BUG=30
210 RESTORE 220:FOR I=1 TO
10:READ A:ST$(I)=CHR$(A)
:NEXT I
220 DATA 7,5,6,0,1,3,2,0,0,
4
280 POKE 208,37:S=1:REM 208
IS BUG COLOR
285 REM INITIAL DIFFICULTY
SELECTION
286 GRAPHICS 1:POKE 708,229
:POKE 712,155:GOSUB 700
:GOSUB 400
289 REM RESTART GAME
290 FOR I=1 TO 7:F(I)=0:NEX
T I:SCORE=0:NUMBUG=0:BO
NUS=50
300 GRAPHICS 1:POKE 756,STA
RT/256:GOSUB 700:X$=X5$(
Y$=Y5$):POKE 708,229:PO
KE 709,54:POKE 710,227:
POKE 712,155
305 REM DRAW FROG
306 GOSUB 2000:POSITION 8,5
:GOSUB 905
308 REM MAIN LOOP
309 IF INDEV=2 THEN GOSUB 5
00:GOTO 320
310 S=INT((PADDLE(0)-45)/20
):IF S>7 THEN S=7
312 IF S<1 THEN S=1
314 S=8-S
320 POSITION 8,5:GOSUB 900+
S
325 IF INDEV=2 AND STRIG(0)
=0 THEN GOSUB 1000
330 IF INDEV=1 AND PTRIG(0)
=0 THEN GOSUB 1000
339 I=0:IF WAIT>1 THEN WAIT
=WAIT-1:GOTO 350

```

# BONUS GAME

```

340 WAIT=MAXWAIT
341 I=I+1:IF I=8 THEN 350
342 IF F(I)=0 THEN 341
345 IF F(I)=2 THEN 347
346 RESTORE 800+I:READ DX,D
Y,BX,BY:POSITION BX,BY:
? #6;CHR$(129):F(I)=2:B
X(I)=BX:BY(I)=BY:GOTO 3
41
347 RESTORE 800+I:READ DX,D
Y:POSITION BX(I),BY(I):?
? #6;"":BX(I)=BX(I)+DX
:BY(I)=BY(I)+DY
348 POSITION BX(I),BY(I):?
#6;CHR$(129):IF BX(I)>5
AND BX(I)<13 AND BY(I)
>5 AND BY(I)<11 THEN 37
0
349 GOTO 341
350 IF BUG>1 THEN BUG=BUG-1
:GOTO 360
352 BUG=MAXBUG:IF NUMBUG=7
THEN 360
354 I=INT(RND(0)*7)+1:IF F(
I)>0 THEN 354
356 F(I)=1:NUMBUG=NUMBUG+1
360 GOTO 309
369 REM BUG GOT TO FROG
370 POSITION 8,5:? #6;" . "
:FOR I=1 TO 6:POKE 708,
38:SOUND 0,100,12,10:FO
R J=1 TO 50:NEXT J
375 POKE 708,36:SOUND 0,150
,12,10:FOR J=1 TO 10:NE
XT J:NEXT I:SOUND 0,0,0
,0
398 GOSUB 400:GOTO 290
399 REM PROMPT FOR NEW GAME
400 POSITION 4,13:? #6;"PRE
SS start":POSITION 6,14
?:#6;"TO PLAY":REM USE
IN INVERSE CHAR. IN TH
ESE TWO LINES
401 POSITION 4,16:? #6;"PRE
SS select":POSITION 3,1
7?:#6;"FOR DIFFICULTY"
402 POKE 53279,8:K=PEEK(532
79):IF K=6 THEN 420
404 IF K=5 THEN MAXWAIT=MAX
WAIT-1:MAXBUG=MAXBUG-5:
IF MAXBUG<5 THEN MAXBUG
=3:MAXWAIT=6
406 POKE 656,0:POKE 657,3:??
7-MAXWAIT
408 FOR I=1 TO 100:NEXT I
410 GOTO 402
420 POSITION 5,16:? #6;""
":POSITION 3,17:?
? #6;""
430 IF SCORE>MAXSCORE THEN
MAXSCORE=SCORE
440 RETURN
499 REM JOYSTICK SUBROUTINE
500 S0=STICK(0):IF S0=15 OR
S0=13 THEN RETURN
510 S=ASC(ST$(S0-4)):RETURN
599 REM BURP SUBROUTINE
600 POKE 77,0:X=1:Y=0:FOR K
=1 TO 4:X=X+1:Y=Y+1:POS
ITION X,Y:? #6;BP$(K,K)
:NEXT K
620 FOR K=250 TO 150 STEP -
3:SOUND 0,K,2,10:NEXT K
630 X=1:Y=0:FOR K=1 TO 4:X=
X+1:Y=Y+1:POSITION X,Y:?
#6;"":NEXT K:RETURN
699 REM CHANGE DISPLAY LIST
700 A=PEEK(560)+256*PEEK(56
1):POKE A+3,198:POKE A+
15,134:POKE A+24,134
710 IF PEEK(A)<>66 THEN A=A
+1:GOTO 710
720 POKE A,71:POKE A+3,7:PO
KE A+4,65:POKE A+5,PEEK
(A+7):POKE A+6,PEEK(A+8
)
722 POKE 512,54:POKE 513,6:
POKE 54286,192
730 POKE 656,0:POKE 657,3:??
7-MAXWAIT:POKE 656,0:P
OKE 657,15:? MAXSCORE
740 POSITION 2,19:? #6;"dif
score high":RETURN
800 REM X-Y INCREMENTS & ST
ARTING POS.
801 DATA 1,-1,0,18
802 DATA 1,0,0,9
803 DATA 1,1,0,0
804 DATA 0,1,9,0
805 DATA -1,1,18,0
806 DATA -1,0,18,9
807 DATA -1,-1,18,18
900 REM PRINT EYES ON FROG
901 X$=X9$:Y$=Y9$:? #6;"") )
":RETURN
902 X$=X11$:Y$=Y11$:? #6;"()
":RETURN
903 X$=X10$:Y$=Y10$:? #6;""
?":RETURN
904 X$=X14$:Y$=Y14$:? #6;""
$":RETURN
905 X$=X6$:Y$=Y6$:? #6;"% "
":RETURN
906 X$=X7$:Y$=Y7$:? #6;"&
":RETURN
907 X$=X5$:Y$=Y5$:? #6;"' "
":RETURN
999 REM TONGUE ROUTINE
1000 I=0
1001 I=I+1:IF I=8 THEN 1010
1002 POSITION ASC(X$(I)),ASC
(Y$(I)):GET #6,A:C$(I,I)
)=CHR$(A)
1004 POSITION ASC(X$(I)),ASC
(Y$(I))?:#6;CHR$(13):S
OUND 0,7-I,8,8:IF A=129
THEN GOTO 1050
1005 GOTO 1001
1010 I=I-1:IF I=0 THEN 1020
1012 POSITION ASC(X$(I)),ASC
(Y$(I))?:#6;C$(I,I):S0
UND 0,7-I,8,8:GOTO 1010
1020 IF BURP=1 THEN GOSUB 60
0:BURP=0
1022 SOUND 0,0,0,0:RETURN
1049 REM GOT A BUG
1050 F(S)=0
1060 SCORE=SCORE+10*(7-MAXWA
IT):POKE 656,0:POKE 657
,8:? SCORE;"":NUMBUG=
NUMBUG-1
1070 IF SCORE>BONUS THEN MAX
WAIT=MAXWAIT-1:MAXBUG=M
AXBUG-5:BONUS=BONUS+100
*(7-MAXWAIT):BURP=1
1072 IF MAXBUG<5 THEN MAXBUG
=5:MAXWAIT=1
1080 POKE 656,0:POKE 657,3:??
7-MAXWAIT
1090 C$(I,I)="":I=I+1:GOTO
1010
1999 REM PRINT FROG SUBROUTI
NE
2000 POSITION 6,6:? #6;"*-
-*":POSITION 6,7:? #6;
"+*---*+":POSITION 6,8:?
#6;"-----*"
2010 POSITION 6,9:? #6;"--*
+-":POSITION 5,10:? #6;
";+-+-*-*"
2020 POSITION 5,11:? #6;"---
---":RETURN :REM INV
ERSE CHAR. IN THIS LINE
2999 REM CHANGE CHAR. SET SU
BR.
3000 DIM ZZ$(32):RESTORE 301
0:FOR I=1 TO 32:READ A:
ZZ$(I)=CHR$(A):NEXT I
3010 DATA 104,104,133,204,10
4,133,203,104,133,206,1
04,133,205,162,4,160,0
3020 DATA 177,203,145,205,13
6,208,249,230,204,230,2
06,202,208,240,96
3030 POKE 106,PEEK(106)-5:GR
APHICS 0:START=(PEEK(10
6)+1)*256:POKE 756,STAR
T/256:POKE 752,1? "INI
TIALIZING ...."
3040 A=USR(ADR(ZZ$),57344,ST
ART):RESTORE 3100:FOR I
=START+8 TO START+119:R
EAD A:POKE I,A:NEXT I

```

continued on next page

# BONUS GAME

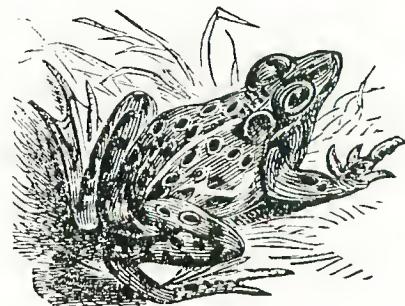
```

3050 RETURN
3100 DATA 0,34,85,62,54,85,3
      4,0,0,102,102,102,0,0,0
      ,0,255,241,241,241,129,
      129,255,255
3110 DATA 255,189,189,189,12
      9,129,255,255,255,143,1
      43,143,129,129,255,255,
      255,129,143,143,143,129
      ,255,255
3120 DATA 255,129,129,143,14
      3,143,255,255,255,129,2
      41,241,241,129,255,255,
      255,129,129,241,241,241
      ,255,255
3130 DATA 240,240,240,240,24
      0,240,240,240,15,15,15,
      15,15,15,15,0,0,0,0,
      0,24,24,48
3140 DATA 255,255,255,255,25
      5,255,255,255,255,145,1
      45,255,145,145,255,255

```

Variable checksum = 1738191

	Line num	range	Code	Length
	20	- 90	PQ	511
	99	- 120	XE	554
	129	- 210	MM	545
	220	- 309	PL	509
	310	- 346	ZC	473
	347	- 370	ZX	516
	375	- 404	PR	520
	406	- 620	RH	502
	630	- 730	JI	520
	740	- 902	AD	285
	903	- 1010	SR	446
	1012	- 1999	TI	515
	2000	- 3020	LK	506
	3030	- 3130	LW	577
	3140	- 3140	FM	69



FROG was first published in the A.C.E. newsletter of Eugene, Oregon. We would like to thank Stan Ockers for an excellent program and Mike Dunn, editor of the A.C.E. newsletter for permission to re-print.

## THE MONKEY WRENCH™ FOR ATARI



\$49.95

(See the many reviews.)

The monitor contains 15 commands used to interact with the 6502. Some are display memory/register, disassemble, hunt, compare, hex/dec convert, transfer memory. Uses screen editing.

## MACHINE LANGUAGE MONITOR FOR ATARI USERS

A must for anyone interested in machine language and wanting to know more about how the computer works. Provides 21 easy to use commands. Uses screen editing. Cassette - \$24.95 Diskette - \$29.95

## TYPING EXERCISE

A great educational program. Consists of typing drills and timed typing tests. Diskette - \$12.95

## 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 BOARD FOR ATARI

The EPROM board plug into the cartridge slots. Uses 2716, 2532, and other EPROMs. May contain up to 8K. A must for making your own machine language programs. \$19.95

## EPROMS - HIGH QUALITY, NOT JUNK

Use with PET, APPLE, ATARI, SYM, AIM, etc. 450 ns. \$6.50 for 2716, \$12.50 for 2532. We sell EPROM programmers for PET and ATARI - see above.

## 5 1/4 INCH SOFT SECTORED DISKETTES

Highest quality. We use them on our PETs, APPLES, ATARIs, and other computers.

\$22.50/10 or \$44.50/20



## MAE SOFTWARE DEVELOPMENT SYSTEM FOR PET, APPLE, ATARI

### "The Compatible Assembler"

- Professional system for development of Machine Language Programs. 31 Characters per label.
- Macro Assembler/Text Editor for Disk-based systems.
- Includes Word Processor for preparation of Manuals, etc.
- Standard Mnemonics - Ex.: LDA (LABEL), Y
- Conditional Assembly, Interactive Assembly.
- Editor has string search/search and replace, auto line numbering, move, copy, delete, uc/lc capability.
- Relocating Loader to relocate object modules.
- Designed with Human Factors Considerations.

\$169.95

BEFORE YOU BUY THAT OFF-BRAND ASSEMBLER,  
WRITE FOR OUR FREE DETAILED SPEC SHEET.

## ATARI ASSM/TED

The ASSM/TED (Assembler and Text Editor) is the best cassette based assembler. Send for details. Cassette and manual - \$49.95

## MEMORY TEST

Avoid problems with ATARI RAM cartridges. Don't let your guarantee run out without a test. Cassette - \$6.95, Disk - \$9.95

# EASTERN HOUSE

3239 Linda Dr.  
Winston-Salem, N.C. 27106  
(919) 924-2889 (919) 748-8446  
Send for free catalog!



# GONE



ATARI  
400/800

This disk and program  
was destroyed by a simple spill of milk.

#### NOW YOU CAN PREVENT A TOTAL LOSS

The Replica 1+1 Backup and Utilities Systems Package makes it possible for the user to build a complete reserve library to replace a damaged or faulty disk when necessary.

#### PROGRAM FEATURES

**DISK BACKUP:** Copies the sections of the disk which contain data, and also permits read and write without verify, speeding up the backup process considerably. Copies 'bad' sectors' with ease. **UTILITIES PACKAGE:** Scans any ATARI disk, providing the user with information as to which sectors contain data, which are empty and which are 'bad'. Includes a sector editor which allows the user to see and modify data within a sector. Disassembles a sector into machine language op codes. Searches for a series of bytes or a string within a section of a disk. Includes a custom format scan and patch analysis enabling the user to backup any presently available\* ATARI computer disk. And much more. . . .

To receive the Replica 1+1 package and documentation fill out the coupon below and send \$50 to:

NUDMEHI SOFTWARE  
495 Old York Road Suite 425  
Jenkintown, Pa. 19046

Visa and Mastercard Phone Orders: 215-635-2722

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

MY CHECK FOR \$50 IS ENCLOSED

BILL BY VISA # \_\_\_\_\_

EXPIRATION DATE \_\_\_\_\_

BILL MY MASTERCARD # \_\_\_\_\_

EXPIRATION DATE \_\_\_\_\_

CARDHOLDER'S SIGNATURE \_\_\_\_\_

\*As of 8/15/82. Subsequent updates will become available at a nominal fee.  
Please Note: It may be necessary to adjust your drive speed when backing up certain disks.

THE REPLICA 1 + 1 IS NOT INTENDED FOR THE ILLEGAL  
DUPLICATION OF COPYRIGHTED MATERIALS

ATARI is a trademark of ATARI, INC.

# TUNING YOUR ATARI

by LINDA M. SCHREIBER

**T**here's something about music that fascinates kids. Give them a small piano, drums, harmonica, and they will sit for hours creating their own melodies. A few years ago there was a toy piano on the market that contained a tape recorder. This was a big hit with my daughter. Now, she could not only make her own music, but listen to it afterward.

TUNING YOUR ATARI uses this idea. It is a musical game for children. Type it in and run it, and you will see a simple menu. Choice #3 demonstrates the program. Choice #1 allows you to compose a tune, and Choice #2 will play it back. The tones appear to be made by little figures jumping on a bellows.

Above each figure is the letter name of the tone which that bellows will produce. To operate the bellows, press 1, then press any number from 1-8 on the keyboard. Key one corresponds to the low C; eight to high C. When a number is pressed, the character will jump down on the bellows, flapping his arms as the bellows is compressed. Once the tone is played, he bounces back up to his original position. The program can hold up to 100 notes. If your melody is less than 100 notes, press the escape key and the menu will reappear on the screen. Press #2 to hear your melody.

Young children will enjoy this program just to see the characters jump up and down while they are playing the tunes. Slightly older children will enjoy listening to the tunes that they have created. The letters above the characters do not attract attention, but are a subtle reminder of the names of the notes. After a while, children will begin to associate the letters with the tones of the character. Don't be surprised if you hear your child singing 'A-G-F-G-A-A-A'!

Once again, in this program, we will move the character set out of ROM and into RAM so that we can change some of the characters. In line 70, P1\$ should equal h, reverse quotation marks, control D, reverse space, control comma,

reverse 1, reverse M, reverse control Q. The characters from K to r are all in reverse. The last character in the string is control period. This string is the machine language subroutine that moves the characters.

## VARIABLES USED

P1\$	— machine language subroutine
M\$	— string holds the melody played
A	— location of the new character set. This value is POKEd into 756 to change to the new character set.
TONE	— line number that starts the tone for the key pressed.
WAIT	— line number for the timing routine.
Q	— no function
CHBS	— first decimal location of the new character set.
X	— no function — used in FOR . . . NEXT loops.
C	— used in READ for new character set, used for value of key pressed, and for position of character.
K	— counter for the note being entered or played.
T	— value of the tone to be played.
TL	— value used in timing loop.
ROUTINE	— the line number that the program goes to when entering the melody, or playing one back.

```

10 REM TUNING YOUR ATARI      160 K=0:POKE 710,100:REM RE
20 REM BY L.M.SCHREIBER      STORE THE MENU
30 REM FOR ANTIC OCTOBER 1    170 POSITION 2,0?: #6;"1. P
982                                LAY KEYBOARD"
40 DIM M$(101),P1$(20)        180 POSITION 2,2?: #6;"2. R
50 GRAPHICS 18:POKE 711,PE EPEAT MELODY"
EK(710):POKE 710,100
60 A=PEEK(106)-8:POKE 204,
A:POKE 206,224:REM STOR E THE BEGINNING OF NEW
& OLD CHARACTER SETS
70 P1$="h" 1MKHPyfNfLJP
r'":TONE=430:WAIT=500:REM P1$ IS A MACHINE LAN
GUAGE SUBROUTINE TO MOV E THE CHARACTER SET
80 Q=USR(ADR(P1$)):CHBS=A$ 256:POKE 756,A:REM CHAN
GE TO THE NEW CHARACTER SET
90 FOR X=CHBS+8 TO CHBS+71 :READ C:POKE X,C:NEXT X
:REM CHANGE THE CHARACTERS FROM ! TO $
100 DATA 0,254,124,254,124, 254,124,254,108,0,254,2
54,124,254,124,254,40,1 08,0,254,254,254,124,25
4
110 DATA 186,40,108,0,254,2 54,254,254,56,108,56,16
,254,56,40,108,0,56,108 ,56,146,124,56,40
120 DATA 0,0,56,108,56,16,2 54,56,0,0,0,56,108,56,1
6,124
130 OPEN #2,4,0,"K":REM OP EN THE KEYBOARD FOR READ
140 POSITION 2,9?: #6;"! ! ! ! ! !":POSITION 2 ,8?: #6;"% % % % % %":REM THE ! AND % ARE THE NEW CHARACTERS
150 POSITION 2,6?: #6;"c d e f g a b c":REM PLAC E THE TONE NAMES
160 K=0:POKE 710,100:REM RE
STORE THE MENU
170 POSITION 2,0?: #6;"1. P
LAY KEYBOARD"
180 POSITION 2,2?: #6;"2. R
EPEAT MELODY"
190 POSITION 2,4?: #6;"3. P
LAY EXAMPLE"
200 GET #2,C:POKE 710,0:REM
GET THE KEY PRESSED-RE
MOVE THE MENU
210 IF C>127 THEN C=C-128:P
OKE 694,0:REM INVERSE F
LAG IS ON RESET IT TO N
ORMAL
220 IF C<49 OR C>52 THEN 16
0:REM NOT A NUMBER FROM
1 TO 4
230 C=C-48:REM GET THEN NUM
BER
240 ON C GOTO 250,540,520,5
60
250 M$="":REM REMOVE CONTEN
TS OF THE STRING
260 ROUTINE=260:K=K+1:IF K=
101 THEN 160:REM ONLY A
CCEPT 100 NOTES
280 GET #2,C:REM GET THE KE
Y PRESSED-RETURN TO MEN
U ON ESCAPE KEY
290 IF C>127 THEN C=C-128:P
OKE 694,0:REM INVERSE F
LAG IS ON RESET IT TO N
ORMAL
300 IF C<49 OR C>56 THEN 16
0:REM NOT A NUMBER FROM
1 TO 8
310 C=C-48:M$(K,K)=STR$(C):
REM GET THEN NUMBER-PUT
IT IN THE STRING
320 C=C*2:REM OFFSET IT FOR
THE PROPER POSITION
330 ON C/2 GOSUB 350,360,37
0,380,390,400,410,420
340 GOTO ROUTINE
350 T=121:GOTO TONE:REM 'C'
360 T=108:GOTO TONE:REM 'D'
370 T=96:GOTO TONE:REM 'E'
380 T=91:GOTO TONE:REM 'F'
390 T=81:GOTO TONE:REM 'G'
400 T=72:GOTO TONE:REM 'A'
410 T=64:GOTO TONE:REM 'B'
420 T=60:REM 'C'
425 REM LINES 430-450 MAKE
THE CHARACTER APPEAR TO
PUSH DOWN ON THE BELLO
W AND MAKE THE TONE
430 TL=10:POSITION C,8?: #6;
CHR$(134):POSITION C,9
?: #6;CHR$(130):SOUND 0
,T,10,6:GOSUB WAIT
440 POSITION C,8?: #6;CHR$(135):POSITION C,9?: #6;
CHR$(131):SOUND 0,T,10,
8:GOSUB WAIT
450 POSITION C,8?: #6;CHR$(136):POSITION C,9?: #6;
CHR$(132):GOSUB WAIT
460 SOUND 0,T,10,10
470 POSITION C,8?: #6;CHR$(135):POSITION C,9?: #6;
CHR$(131):SOUND 0,T,10,
8:GOSUB WAIT
475 REM LINES 470-490 RETUR
N THE CHARACTER AND BEL
LOW TO THE CORRECT POSI
TION
480 POSITION C,8?: #6;CHR$(134):POSITION C,9?: #6;
CHR$(162):SOUND 0,T,10,
6:GOSUB WAIT
490 POSITION C,8?: #6;"%":P
OSITION C,9?: #6;"!":SO
UND 0,0,0,0:RETURN
500 FOR X=1 TO TL:NEXT X:RE
TURN :REM TIMING LOOP
510 REM PLAY A SAMPLE TUNE
520 M$="11556654433221"
530 REM ROUTINE TO PLAY BAC
K THE MELODY ENTERED
540 ROUTINE=540:K=K+1:IF K<
=LEN(M$) THEN C=VAL(M$(K,
K)):GOTO 320:REM KEEP
PLAYING UNTIL THE END
OF THE STRING
550 M$(K,K)="0":C=VAL(M$(K,
K)):M$=M$(1,K-1):GOTO 1
60
560 CLOSE #2:END

```



Variable checksum = 225145

Line num	range	Code	Length
10	- 90	QA	529
100	- 150	SI	504
160	- 250	LD	539
260	- 350	YQ	521
360	- 450	SJ	554
460	- 530	TI	537
540	- 560	QP	187

### S.A.M.

Don't Ask Computer Software  
2265 Westwood Blvd., #B-150  
Los Angeles, CA 90064  
(213) 397-8811  
\$59.95 diskette; 32K  
*Reviewed by Jerry White*

Computer speech synthesis has just been revolutionized by a product called SAM, the Software Automatic Mouth. Unlike all the other systems, SAM requires no special hardware. That's right, SAM provides the highest-quality computerized speech currently available for ATARI computers, and does it with software only. All you need is an ATARI 400 or 800 with at least 32K RAM and one disk drive.

Also unlike all the others, SAM is inexpensive. The SAM software on diskette including demonstration programs and a well-written 38 page manual, costs only \$59.95. That's a small fraction of the cost of most hardware speech systems currently available.

SAM, when combined with the companion program RECITER, will pronounce nearly 90% of the English language properly. Using RECITER, speech from BASIC is as easy as placing your text into a string called SAM\$, and issuing the command A=USR(8199).

If you don't use the RECITER program, you save 6K of RAM, and you can still make SAM pronounce all words properly by using the phonetics system. You can tell SAM to use any of eight different stress factors on each syllable, no more monotone monotony. You are also in control of the pitch of SAM's voice, as well as the rate of speed at which he speaks.

Of course it takes a bit more work to master the phonetic systems, but the manual provides about 1500 example words in normal and phonetic spellings. If you're having any problems, DON'T ASK support is only a tele-

phone call away.

The only drawback other than the RAM requirements is that SAM will blank the screen when he speaks. You can use SAM with the screen left on, but this will cause distortion in SAM's voice. Since computer speech is generally used for short phrases, the blank screen is a small price to pay in most cases.

Adventure type games and educational software are obvious applications for computer speech. I put SAM to work answering my telephone when I'm not available. In order to provide the highest quality speech for my 20 second recording, I used phonetics. The numbers you see in the phonetically spelled words in my sample program, indicate the stress factor. The number 1 would indicate a very emotional stress on the preceding syllable, while 8 would indicate an extreme pitch-dropping stress. Most punctuation is used to insert a pause. The period will also cause the pitch to fall while the question mark will cause the pitch to rise.

### VOICE BOX

The Alien Group  
27 West 23rd Street  
New York, N.Y. 10010  
\$169.00 includes diskette  
*Reviewed by Benton J. Elkins*

"ATARI says its the first word," the ad from the Alien Group began. That hooked me enough to read that the VOICE BOX is a speech synthesizer that plugs into the serial port of the ATARI and routes all speech sounds to the television speaker. Synthesis is accomplished with phoneme analysis. I called for information, but Bob Ezzard, an Alien, convinced me to accept COD shipment on 10 day approval.

In a few weeks the VOICE BOX arrived. The disk loaded without problem, and the program instructed me to

connect the unit. Immediately a voice came out of the TV, "Please teach me to speak." A backup message of the words was printed on the screen. I was amazed that it worked the first time I tried it!

I entered some words on the keyboard, pressed return, and was amused at the literalness of the pronunciation. I tried some phonetic variations, by changing the spelling of the words. The screen displays the controls used for examining the vowels, consonants and defined words in the program's dictionary files. Everything I tried worked. All that was missing was syllable emphasis.

The VOICE BOX disk contains three dictionaries, 16K and 32K versions of the programs in BASIC, a stripped down list version of the program to be used in adding vocal capability to other programs, and an object code of the phoneme pronouncer.

The BASIC program incorporates a random sentence recitation program using a standard sentence vocabulary, or it invites on input another learned vocabulary which may be saved later. New words or portions may be learned by typing the spelling variation and the phonetic spelling, then connecting the two with an = sign.

The 32K version has a "talking head" whose lips are synchronized to the pronounced syllables. The drawing is sketchy but the effect is impressive. There may be some potential for developing lip reading skills, if the graphics are improved.

There are two pronunciation and one spelling dictionaries. The first dictionary is to be used with the 16K version and the others with the larger version. The spelling dictionary spells out the input strings. Dictionaries contain strings of symbols that translate hexadecimal phoneme equivalent codes to the VOICE BOX itself. The source for the assembly level code is not included on the disk.

continued on page 52

# WIN \$5,000 Plus Royalties!\*

For the best  
Talking Game



For the  
Atari®

## Using the VOICE BOX

Now you can make your Atari® 400/800 games and other programs come alive with the VOICE BOX™ by the Alien Group — the first low-cost, smart speech synthesizer with unlimited vocabulary.

Add jokes to your programs. Insults. Compliments. Help messages. Stories. Alien voices. Animal roars. Have your computer talk to the fire department or police in emergencies. To kids. Or blind people. Teach touch typing with immediate spoken feedback. Or just about any other subject — the fun way. Or help a speech-impaired friend communicate ... the possibilities are limitless.

The VOICE BOX plugs into your Atari's serial port. And talks directly through your TV set. No speaker, amplifier, power supply, special interfaces, or cables needed.

Just select from its simple screen menu. A dictionary with thousands of common words (on diskette or cassette) automatically translates your text into speech. It's that easy.

But don't let its friendliness fool you. The VOICE BOX has all 64 phonemes (basic sounds, like "ah") built in. So you can precisely create any word or sound you can imagine. And store it all on diskette or tape. Names or foreign language words, for example. Or weird non-human languages.



## Speech Synthesizer

The VOICE BOX is creative too. It will crack you and your friends up with non-stop random, grammatically correct sentences, using words you specify. It also has an amusing talking face with lip-sync animation — a real crowd-stopper. Best of all, you can call the VOICE BOX from any BASIC program and make your program really hum — literally!

Don't confuse the VOICE BOX with "dumb" speech synthesizers that can't learn new words. Or software-based ones with lower speech quality — and an annoying tendency to blank out the display when they talk. The VOICE BOX is a true breakthrough in speech synthesis. Small wonder thousands of Atari owners have already bought the VOICE BOX.

The VOICE BOX is available now at leading computer stores throughout the world. Or direct from the Alien Group, with 10-day money back guarantee if you're not completely satisfied.

VOICE BOX For Atari. \$169.00  
16K and 32K versions included  
(Specify diskette or cassette).

Enclose check or money order. Visa or Mastercard #. Please include expiration date.

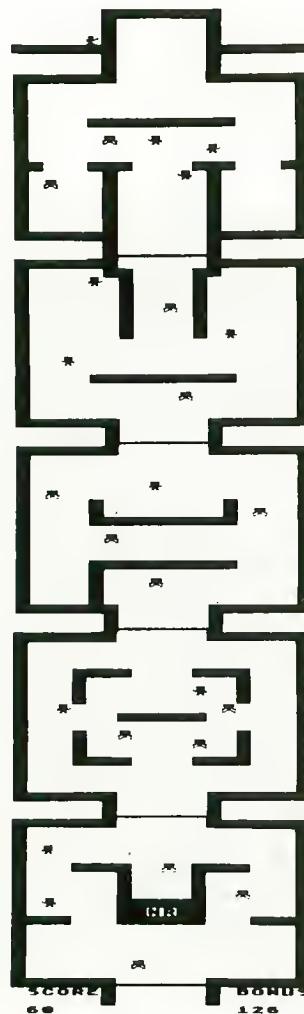
CHECK YOUR LOCAL COMPUTER STORE FOR TALKING "VOICE BOX" VERSIONS OF YOUR FAVORITE GAMES FROM LEADING GAME COMPANIES

\*Win a \$5,000 prize — plus royalties — for the best Atari 400/800 game using the VOICE BOX. Deadline May 30, 1983. Write for contest details.

Please mail to: The Alien Group, Department AT-2, 27 W. 23 St., N.Y., N.Y. 10010  
Or call in order to (212) 741-1770

# ANDROID ATTACK

FOR  ATARI



Fight your way down through the Top-Secret underground laboratory to save the runaway nuclear reactor, then try to save yourself before the Androids get you!

16K cassette, 32K disk (SPECIFY!!)

Ask for ANDROID ATTACK at your local dealer or send \$18.95 + \$2.00 shipping. Write for our illustrated list of games for your ATARI.

**PRETZELLAND SOFTWARE**  
2005 C WHITTAKER RD  
YPSILANTI, MI 48197

## PRODUCT REVIEWS

The verbal quality and understandability of the VOICE BOX is not the greatest thing about it, it definitely will not be mistaken for a human voice. "Intelligible" is the operative word to use when describing the characteristics of the VOICE BOX.

The box itself is a 3" x 4" x 1½" box with a large knob on the side and a cable and serial port connector attached. It must attach last in the daisy chain, where the cassette recorder is usually connected. Because of this, all programs from a cassette must be read in before the VOICE BOX is hooked up. The knob control changes both the frequency and speed of utterances. No additional external power is needed.

Here are three program ideas for using the VOICE BOX. They are enhancements to already existing programs that will add a new dimension to them.

### 1. Talking Menu Program

This program will read the disk and announce the programs on it, then accept input to select one for loading, and indicate any loading errors and recycling if this is the case.

### 2. Error Diagnostic Program

The program will trap to a verbal indication of what the error was and which sentence, rather than stopping with an error number at the encounter point.

### 3. Program List Speller using Dictionary 2

This program will accept another program as list input and spell it out for aid in checking & debugging input. It can also be used as an aid by handicapped individuals.

There is also a great potential for teaching children to spell and for an added dimension to games. Overall, I believe, the VOICE BOX is well worth the price tag.

## NAUTILUS

Synapse Software  
5237 Jacuzzi St., Suite 1  
Richmond, CA 94804  
\$29.95 diskette and cassette  
*Reviewed by Gordon Miles*

Nautilus is a strategy game with an arcade feel. The Nautilus is a submarine that scores points by destroying underwater cities to steal their energy cores. Meanwhile, it must avoid depth charges and other hazards. The Collosus, a surface ship, is the opponent, directed either by the computer or another player.

The graphics in Nautilus are excellent. The submarine has a little propeller at the stern. The oceanscape, with its underwater cities and subterranean passages, is also well done. The realistic tumbling of the depth charges, the predatory helicopter that patrols the surface, the fish and the tenacious limpet mines all make this a visually rich game.

The most innovative graphics feature is the use of a split-screen to depict the two commanders' views. A scoreboard is positioned just above mid-screen. Above the board is the Collosus commander's view on the ocean's surface; below the board is the sub commander's view. Both views scroll independently of one another. The sub commander can be to the far right of the ocean (and deep down); and the Collosus commander can be on the surface to the far left. When the two ships are in the same part of the ocean, they are both realistically shown in both views. The split-screen's main asset is an illusion of quasi-hidden movement which is so essential in a sub/destroyer type of game.

Play begins after choosing the number of players, the time limit, and the playing difficulty. Joysticks allow rapid movement and quick responses especially needed at the higher difficulty

levels where the depth charges and homing mines move much faster.

Nautilus is more a strategy game than an arcade game. Destroying and rebuilding of underwater cities is the sole scoring criterion in the game. No sort of hunter/killer scoring is done. This is unfortunate since an arcade game could readily develop at the higher levels where the action is fast. While the sub commander has plenty to do, the Collosus commander just goes from right to left picking up and delivering city repair crews, every once in a while dodging the helicopter, and occasionally, dropping depth charges in its haste from one shore to the other. This can get tedious in a short time. Most decisions stem from whether to continue dealing (repair/destroy) with the cities or where and when to delay your opponent — the difficulty is found in striking the right balance between these options.

Nautilus is an excellent graphics showpiece, well worth the price. Mike Potter, the programmer, conceived it as a strategy game, and as such it is a fair

one — however, with a revision in the scoring, it could easily be a very exciting arcade game.

## KRAZY ANTIKS

K-BYTE

1755 Austin Road  
Troy, MI 48009  
\$49.95 cartridge

*Reviewed by Jerry White*

K-BYTE has released three new games on ROM cartridges for ATARI 400/800 computers called K-STAR PATROL, K-RAZY KRITTERS, and K-RAZY ANTIKS. All three are the high quality arcade-type games you'd expect from K-BYTE. Although they are a bit expensive, it's certainly a pleasure to just pop in a cartridge and not have to wait for a program to load.

Of these three new releases, my favorite is K-RAZY ANTIKS. The object of this one-player game is to guide your white ant through a maze of tunnels

while avoiding hostile enemy ants, an anteater, and torrential rain floods. You have six mazes from which to choose, and each has 99 levels of play. I seriously doubt that anyone will see level 99 in this decade.

Using a joystick, you guide your ant around the maze laying eggs along the way, and picking up enemy eggs. When an enemy ant is hot on your trail, you can drop an egg that explodes the enemy.

While all this is going on, an anteater will occasionally stick its long tongue into the top of the maze. If you can position your white ant just ahead of the tongue, you can lure enemy ants into the danger area.

When it rains, the bottom of the maze fills with water, drowning all ants in the lower levels. Floods can be used to your advantage if you can lead the enemy ants toward the bottom as the rain begins, then retreat to the safety of higher levels.

I am not what you'd call an "arcader". I did however find this game to be addictive as well as challenging.

## Attack at EP-CYG-4<sup>®</sup>

a space adventure from **BRAM** Inc.

For the ATARI 400/800

You have just been revived from four years of stasis. Your burst-drive interstellar transport is now orbiting the fourth planet of Epsilon Cygnus. Your enemy, the Tartillians, are a brutal machine race that have destroyed their humanoid creators and have sworn the destruction of all humanoids. Your mission is to destroy the Tartillians and their production facilities. It won't be easy as the Tartillians fight back with cleverly placed ground batteries,

cruise ships and deadly interceptors. How will you choose to face these brutal enemies? Board a graviton attack ship/Uni-class and your fate is your own. You will have complete control of weapons, shields and the ship itself. Or will the mission demand the graviton attack ship/Bi-class with your skills as a pilot guiding the ship and controlling the shields as your gunnery officer fires the lysis-blast weapon, and shares your fate.

*No matter what ship type or mission you choose, Attack at EP-CYG-4 offers arcade action on a new level.*

100% machine language: HI-RES graphics with sound  
One player or co-operative two player operation  
2 different missions on cassette (16K)  
3 different missions on diskette (24K)

\*Atari is a trademark of Atari, Inc.  
©Art Copyright R.L. Kothenbeutel

Available at your local dealer  
Direct orders add \$1.50 postage and handling  
Mastercharge Visa Personal Check  
Diskette \$32.95 Cassette \$29.95  
3 levels of difficulty  
Advanced joystick control capabilities

© Copyright 1982 **BRAM** Inc.  
18779 Kenlake Place N.E.  
Seattle, Washington 98155  
(206) 644-3425

# PUBLIC DOMAIN SOFTWARE

We at Antic are pleased to present the first of our collections of public domain software for the ATARI computers. Our first offering includes an extensive selection of programs from the libraries of the ATARI Bay Area Computer Users' Group, The ATARI Computer User Group of Dallas, the Brockport ATARI Computer Junior Users' Group, and the Eugene, Oregon ACE. On the first two disks we have compiled the best of the BASIC games programs from these libraries. Any one of these will keep you and your family absorbed for hours. One disk also includes an automatic BASIC line numbering utility and two BASIC assemblers. Other disks feature music programs, utilities, and educational programs. These disks are packed with useful information and represent an excellent value at \$10.00 each, plus \$1.50 per order shipping/handling. Send check or money order, indicating disk number(s) to:

Public Domain Software  
ANTIC Publishing  
297 Missouri Street  
San Francisco, CA 94107

## ANTIC UTILITY DISK #1

1. Doc: program allows you to accompany programs with separate documentation on disk
2. Microassembler: allows you to create USR routines-assembler, more
3. Assembler-Editor: BASIC, slow but versatile
4. Num: automatic line numbering utility in BASIC
5. Memtest: runs without BASIC cartridge, to test all memory
6. Pattern: graphics demo, documented
7. Color: 128 colors at once
8. Printnop: connect parallel printer from jacks 3 & 4

## ANTIC GAME DISK #1

1. Chicken: a great game from ANTIC #1
2. Attack On the Death Star: from ANTIC #2
3. Hangman: the traditional word game
4. Barricade: for two players (sticks)
5. Reverse: order a string of numbers
6. Othello: for two, one or zero player — the computer plays itself.
7. Monopoly: computerized!
8. Lunar lander: select terrain (stick)
9. Escape: guide ships thru maze, skill levels (stick)
10. Zonex: discover hidden color patterns in large grid
11. Clewso: detective text adventure, graphics
12. Puff: version of Life
13. Star Destroyer: game of agility and speed (stick)
14. IQ: traditional peg-jumping game
15. Alien: target game, keyboard or sticks
16. Devil Dungeon: text adventure
17. Again: Simon-type memory game
18. Blaster: challenging Invaders-type (stick)

## ANTIC GAMES DISK #2

1. Boing: trampoline game, simple but fun (stick)
2. Miner: get all the gold to the bank before the mine collapses
3. Convoy: a great WW2 strategy and action game (stick)
4. Meteor Storm: dodge the meteors and blow them up
5. Blackjack: you are in Vegas (doubling allowed)
6. Civil War: a strategic simulation
7. Artillery: firing strategy game
8. Golf: great simulation, with graphics, by David Bo
9. Super Wumpus: text adventure — find the Wumpus!
10. Reckless Driving: avoid collisions (stick)

ANTIC presents these programs in diskette form for the convenience of the ATARI community, in the belief that all of the programs offered are in the Public Domain and that no proprietary interests or rights to these programs are claimed by anyone. These diskettes are not copyprotected, nor does ANTIC claim rights to the programs themselves. The price of the diskettes is based on the cost of making them available.

## Atari® Users!!

NOW AVAILABLE...

### MIGHTY BYTE™ Disk Copier

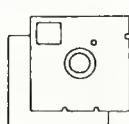
A backup copier that allows you to select sectors, identify and write bad format. Copy almost any disk. The most powerful copy system available today on Atari® 400/800 computers.

Only \$29.95 + \$1 shipping

VISA & MASTERCARD call now (815) 968-2228 for fast delivery

or send payment to:

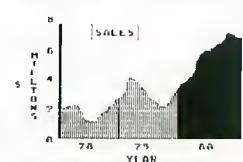
**MIGHTY BYTE**  
828 Green Meadow Ave., Dept. AP  
Rockford, Illinois 61107



## ATARI® GRAPHICS HARDCOPY

Dumps anything on screen of ATARI 400/800 to printer. All graphics and text modes. Players/Missiles/scaling/grey scale/GTIA/more! Works with EPSON, Centronics 739, IDS and Trendcom.

\*ATARI is a registered trademark of ATARI Computer Inc.



# A SPEECH SYNTHESIZER ON A DISK!



That's why Apples and Ataris are saying:  
**"Talk Is Cheap"**

#### IT'S CALLED THE SOFTWARE AUTOMATIC MOUTH, S.A.M. FOR SHORT

It's a high quality speech synthesizer created entirely in software. You use it as a software utility, load it into RAM, and then use your machine as usual, except now you can make your programs talk. It generates the speech sounds on demand, so there is no limit to what it can say.

When you hear S.A.M., you'll probably agree that it sounds better than all the hardware speech synthesizers for Apple or Atari computers. And, it has a truly remarkable price.

#### YOU CONTROL INFLECTION, PITCH AND SPEED

With its user-variable inflection, S.A.M. can accent words on the right syllable and emphasize the important words in a sentence.

You can also make S.A.M.'s speech higher or lower, and faster or slower, over a wide range of settings.

#### USE EASY PHONETIC INPUT OR PLAIN ENGLISH TEXT

S.A.M. understands a simple phonetic spelling system, not a mysterious alpha-numeric code. S.A.M. helps you learn phonetic spelling by showing you your mistakes, and the owner's manual gets you started with an English-to-phonetics dictionary of 1500 words. So it's easy to make S.A.M. produce exactly the sounds you want.

But suppose you want to type ordinary English, or you want your machine to read a word processor file aloud. The S.A.M. disk comes with RECITER, an English text-to-speech conversion program that lets S.A.M. speak from plain English text.

#### ADD SPEECH TO YOUR PROGRAMS WITH EASE

In a BASIC program, you add speech with just a couple of commands. In a machine language program, it's just as easy. S.A.M. comes with four demonstration programs to show off its distinctive features and help to write your own talking programs. Write adventure games with talking characters, educational programs that explain aloud, or utilities with spoken prompts — put your imagination to work.

## S.A.M.



S.A.M. programmed by Maximation

**S.A.M. for the Apple II/II+**  
Includes an 8-bit digital-to-analog converter and audio amplifier on a board. Only \$124.95

Requires 48K, disk. (S.A.M. takes up to 9K; RECITER 8K.) You will also need a speaker.

**S.A.M. for the Atari 800/800XL**  
S.A.M. talks through your television speaker. No additional hardware is required. Only \$59.95

Requires 32K, disk. (S.A.M. takes up to 9K; RECITER 8K.) Note: To produce the highest quality speech, S.A.M. automatically blanks the screen during vocal output; the display is preserved. S.A.M. can talk with the screen on, but the speech quality is reduced.

**DON'T ASK** COMPUTER SOFTWARE INC.

2265 Westwood Boulevard, Suite B-150  
Los Angeles, California 90063  
Telephone (213) 297-8211

Hear S.A.M. at your favorite computer store today!  
Dealer inquiries welcome.

Apple is a trademark of Apple Computer, Inc. • Atari is a trademark of Atari, Inc.

© 1984 Maximation Computer Systems, Inc.

# TURTLE Graphics

## part 2

by GORDON SMITH

This is the second of two articles on implementing a Turtle Graphics system in Forth. The first one appeared in ANTIC issue #3. It discussed Turtle Graphics in general, explained why Forth is a particularly hospitable environment for a Turtle Graphics system, and gave nine screens worth of "foundation" words.

With this article are 17 more screens of pns-Forth source code which complete the system. I'll give an overview of the system's features; a glossary of Turtle commands, and give a few suggestions on using the system.

### THE INHABITANTS AND LANGUAGE OF TURTLELAND

Four independent turtles live in Turtleland. Multiple turtles open up interesting possibilities, like having turtles chase each other. With four turtles, each can draw in a different color (there are only four colors possible at one time). If you want a different number, you can change the value of the constant #TURTLES on screen 2 before loading. One turtle at a time can be designated the "active turtle" with the SET ACTIVE command. She is the one who will respond when we type a command like "10 DRAW."

Each turtle carries a pen. The active turtle's pen can be lowered with the PENDOWN command, leaving a trail when she moves, or raised with the PENUP command. The more general

SET PEN command can be used to do either.

The SET INK command fills the active turtle's pen with various colors of ink, depending on the Graphics Mode used. (Modes 3 through 8 can be selected with the SET MODE command.) In all modes, ink of type 0 is erasing ink. It is black, the same color as the background, except in Mode 8 when it is light blue. The command, ERASING, is the same as 0 SET INK. Both choose erasing ink. In Modes 3, 5, and 7, there is also ink of type 1 (gold), type 2 (light green), and type 3 (dark blue). In Modes 4, 6, and 8, types 2 and 3 are not available. The number of ink types is determined by the color video capabilities of the CTIA or GTIA chip. The colors are established by the Operating System when it opens the screen. You can use pns-Forth SET-COLOR word to change them.

Each turtle has a position and a heading. The heading is the number of degrees clockwise from the vertical that she is facing. The active turtle's heading can be changed directly to any value with SET HEADING, also known as TURNTO, or it can be changed incrementally by the commands RIGHT (or TURN) and LEFT.

The system keeps track of each turtle's position with X and Y coordinates. These are *not* the same as the screen column and row numbers. The SET MODE command arranges these



coordinates so that the turtle's home at X=0 and Y=0 is the center of the screen, and so that there are one hundred X or Y units per pixel. This means that if a turtle is at X=1000 and Y=500 she will appear ten pixels to the right and five pixels up from the center. You can arrange the coordinates differently if you wish.

The active turtle's coordinates can be individually or jointly set with the commands SET X, SET Y, or SET POSITION (also known as GOTO). They cause the turtle to leave a track only if her pen is down. MOVETO can be used to temporarily raise the pen, or DRAWTO to lower it, before changing position. The pen is restored to its original state after the change.

The most interesting way to move the active turtle is with FORWARD, BACKWARD, DRAW, and MOVE commands. These move her a specified number of steps in whatever direction she is currently heading. FORWARD and BACKWARD draw a line only if the pen is down; DRAW always draws; MOVE never does. Each step normally moves the turtle one pixel, a distance of 100 units in XY coordinates, unless you use the SET SIZE command to alter the step size. By changing the step size you can use the same word to draw the same shape in different sizes.

A turtle's heading and her XY coordinates are always integers. The maximum range for X and Y is from -32768 to 32767. If you drive a turtle

beyond this range you may see unwanted tracks as she "jumps" to the other edge of Turtleland.

Usually you can't see all of Turtleland on the screen. For example: in Mode 7 the screen displays only the part of Turtleland from  $X=15900$  to  $X=15800$  and from  $Y=-7900$  to  $Y=7800$ . You can select your own "window" into Turtleland with SET WINDOW command. Any tracks beyond the edges of the window won't be visible. Changing the window will affect the number of X or Y units per pixel. An alternate way to set the window (and the step size) is with the PER-PIXEL command.

The reason that the system defaults to 100 units per pixel is to let the turtle sit "between" pixels. If we used a coordinate system as coarse as the screen pixels, then every time we moved a turtle at some angle, her new position would get "rounded" to the nearest pixel. We wouldn't be able to do a series of moves without errors accumulating. Using one hundred XY units per pixel gives us increased precision.

The SET MODE command establishes the whole screen as the "viewport". This means that the view of Turtleland visible through the window will be projected onto all of the screen. You can select any rectangular piece of the screen to be the viewport with the SET VIEWPORT command. When you experiment with this, use the FRAME or NEW commands to draw a frame around the new viewport so you can see where it is.

So far, four commands — MODE, SIZE, WINDOW, and VIEWPORT — relate to Turtleland as a whole, and seven of them — ACTIVE, PEN, INK, HEADING, X, Y, and POSITION — relate to the turtles. It is also possible for you to determine the current value of any of these parameters, by leaving out the word SET or by changing it to SHOW. For example, the command X by itself (i.e., not preceded by SET) leaves the active turtle's current X coordinate on the stack, where it can be used by any word for any purpose. So,

the command SHOW X will display some message like "Turtle #1 is at  $X=300$ ".

The system also has miscellaneous commands like CLEAR for clearing the screen, FRAME for drawing a frame around your picture, and HOME, START, and NEW for starting over. The command BYE leaves Turtleland and returns to pns-Forth.

Of course, all the usual Forth words are still available while you're in Turtleland, in case you need to do arithmetic, comparisons, branching, looping, or whatever. You can use the more compact loop syntax (...) and (... +) in place of the structures 0 DO ... LOOP and 0 DO ... +LOOP.

The important command DEFINE ... AS ... END allows you to add new words to the turtle's vocabulary. This makes it very easy to change any of my command names that you don't like.

As an interesting example, you might want to

```
DEFINE HILDA
    AS 1 SET ACTIVE END
DEFINE GILDA
    AS 2 SET ACTIVE END
DEFINE MATILDA
    AS 3 SET ACTIVE END
```

so that you can talk to a turtle simply by invoking her name.

## USING THE SYSTEM

To start turtle-ing, just use the SET MODE command. If you want to have Turtleland displayed in Graphics Mode 7, for example, type 7 SET MODE. After this you can immediately move the turtles around with 10 DRAW, 45 TURN, etc. SET MODE initializes the system as follows:

- All four turtles are home at  $X=0$  and  $Y=0$ , with heading 0 degrees.
- They all have their pens down.
- Their pens are filled with various ink types as described under the START command in the glossary.
- Turtle #1 is active.
- The window is such that  $X=0$ ,

$Y=0$  is in the center of the screen and there are 100 X or Y units per pixel.

- The viewport is the whole screen.

After you get acquainted with the various commands, you'll want to start extending the system by defining your own. Here is an example of a new command:

```
VALUE STEPS
VALUE INCREMENT
VALUE ANGLE
DEFINE POLYSPI AS
    TO ANGLE
    TO INCREMENT
    0 TO STEPS
BEGIN
    STEPS INCREMENT + TO STEPS
    STEPS FORWARD
    ANGLE TURN
AGAIN
END
```

POLYSPI can make all sorts of interesting polygonal spirals. It expects to find two numbers on the stack. It stores the top one in ANGLE; this will be how many degrees the turtle will turn between each move. The one below gets stored in INCREMENT; this will be how many more steps the turtle will take each time compared to the previous time. Next STEPS is initialized to 0 and we enter a Forth BEGIN ... AGAIN loop. The words between BEGIN and AGAIN will be executed indefinitely. (You must press a yellow console button to stop POLYSPI.) Each time through the loop, STEPS is incremented by INCREMENT, and the turtle takes the number of steps in STEPS and turns the number of degrees in ANGLE. Thus POLYSPI is just an automated sequence of FORWARDS and TURNS. For example, 2 90 POLYSPI is really the same as

```
2 FORWARD 90 TURN
4 FORWARD 90 TURN
6 FORWARD 90 TURN
```

and so on.

The three VALUE words POLYSPI uses make it easy to see what's going

# FORTH FACTORY

on. However, another definition of POLYSP! is possible which uses no variables at all:

```
DEFINE POLYSP! AS
  0
  BEGIN
    3 PICK +
    DUP FORWARD
    OVER TURN
    AGAIN
  END
```

This version keeps everything on the stack, using the Forth words PICK, DUP, and OVER for stack manipulation. You can make a variety of patterns with this one command by changing its two parameters.

Pressing a yellow console button will break out of an indefinite loop of turtle moves. In fact, every time a turtle changes position, the system checks the console buttons and returns to command level if one is depressed. This makes it easy to regain control.

As mentioned in Part I, ten of the words used in my screens are pns-Forth words which won't be available (at least not with the same meanings) in

other Forth systems. Two of these, 1- and TABLE, are common Forth extensions whose high-level definitions are

```
: 1- 1 - ;
and
: TABLE <BUILDS DOES>OVER
  + + @ ;
```

The others are highly system-specific. Four of them — SETUP S, CLOSE S, SPLIT-SCREEN, and GR. — were used in the word GRAPHICS in Part I. Their definitions are quite complex, as these words are part of pns-Forth's interface to the CIO routines in the Operating System. Their joint effect in the word GRAPHICS, however, is quite simple. Any Forth system sold for the ATARI will probably have words for opening the screen for graphics. Simply use whatever your system provides to define your own GRAPHICS, which takes one number from the stack and opens the screen in that mode, with a text window at the bottom.

The last four words specific to pns-Forth are CL#, COLOR, PLOT, and DRAWTO. These are used by LINE (in Part I), FRAME, and POSITION. The

first two are simple to define; just use  
0 VARIABLE CL#

and

```
: COLOR DUP CL# ! PAD C! ;
```

CL# is a variable which is used to keep track of the color data used to plot a pixel. COLOR takes a number from the stack and stores it both in CL# and at PAD, for later use by PLOT and DRAWTO. The definitions of PLOT and DRAWTO are complicated because these words result in calls to CIO. Again, however, their functions are simple and your system probably provides similar words. Define a PLOT which takes a column and a row number from the stack, moves the screen cursor to that position, and plots a pixel there using whatever byte is at PAD as the color data. Similarly, define a DRAWTO which takes a column and a row number from the stack, and draws a line from the current position of the screen cursor to this specified position, using the byte at PAD as color data.

I believe that all the other words I've used in this system are either standard fig-Forth words or new words that I've defined.

## GLOSSARY OF TURTLE COMMANDS

### MODE Commands

**SET MODE [ mode --- ]**  
Opens the screen in the Graphics Mode specified by mode , which should be 3-8. Sets up a default viewport, window, and step size by executing WHOLE-SCREEN SET VIEWPORT and 100 PER-PIXEL. Draws a frame around the viewport with ink of type 1. Initializes the turtles by executing START.

**MODE [ --- mode ]**  
Leaves the number of the current Graphics Mode on the stack.

### SHOW MODE [ --- ]

Displays a message indicating the current Graphics Mode.

### ACTIVE Commands

**SET ACTIVE [ turtle# --- ]**  
Makes the turtle whose number is turtle# the active turtle. Future commands will be directed to her.

**ACTIVE [ --- turtle# ]**  
Leaves the number of the active turtle on the stack.

**SHOW ACTIVE [ --- ]**  
Displays a message

indicating the currently active turtle.

### PEN Commands

**SET PEN [ state --- ]**  
Lowers the active turtle's pen if state is nonzero and raises it if state is zero.

**PEN [ --- state ]**

Leaves 1 on the stack if the active turtle's pen is down and 0 if it is up.

**SHOW PEN [ --- ]**

Displays a message indicating whether the active turtle's pen is up or down.

### INK Commands

**SET INK [ ink# ]**  
Fills the active turtle's pen with ink of type ink#. Type 0 ink is erasing ink. Types 1, 2, and 3 are colored. Types 2 and 3 are not available in modes 4, 6, or 8.

**INK [ --- ink# ]**  
Leaves on the stack the type of ink in the active turtle's pen.

**SHOW INK [ --- ]**

Displays a message indicating the type of ink in the active turtle's pen.

**HEADING Commands****SET HEADING**

[ degrees --- ]

Makes the active turtle head in the direction specified by degrees . Directions are measured clockwise from the vertical.

**HEADING**

[ --- degrees ]

Leaves the active turtle's heading on the stack.

**SHOW HEADING** [ --- ]

Displays a message indicating the active turtle's heading.

**X Commands****SET X** [ x --- ]

Changes the active turtle's X coordinate to x . Draws a line if her pen is down.

X [ --- x ]

Leaves the active turtle's X coordinate on the stack.

**SHOW X** [ --- ]

Displays a message indicating the active turtle's X coordinate.

**POSITION Commands****SET POSITION**

[ x y --- ]

Changes the active turtle's coordinates to X = x and Y = y . Draws a line if her pen is down.

**POSITION** [ --- x y ]

Leaves the active turtle's X and Y coordinates on the stack.

**SHOW POSITION** [ --- ]

Displays a message indicating the active turtle's X and Y coordinates.

**SIZE Commands****SET SIZE**

[ distance steps --- ]

Sets the step size so that the number of steps given by steps will cover a distance in XY coordinates given by distance .

**SIZE**

[ --- distance steps ]

Leaves the current size parameters on the stack.

**SHOW SIZE** [ --- ]

Displays a message indicating the current step size.

**WINDOW Commands****SET WINDOW**

[ xmin xmax

ymin ymax --- ] Sets the window to be the region from X = xmin to X = xmax and from Y = ymin to Y = ymax .

**WINDOW** [ --- xmin

xmax ymin ymax ] Leaves the current window parameters on the stack.

**SHOW WINDOW** [ --- ]

Displays a message indicating the current window.

**VIEWPORT Commands****SET VIEWPORT** [ left

right top bottom --- ] Sets the viewport to extend from screen column left to screen column right and from screen row top to screen row bottom .

**WHOLE-SCREEN SET****VIEWPORT** [ --- ]

Sets the viewport to extend from column 1 to the next to the last column and from row 1 to the next to the last row.

**VIEWPORT** [ --- left

right top bottom ] Leaves the current viewport parameters on the stack.

**SHOW VIEWPORT** [ --- ]

Displays a message indicating the current viewport.

**Y Commands**

Similar to X Commands

**Other Commands****CLEAR** [ --- ]

Clears the graphics screen without affecting the turtles.

**FRAME** [ ink# --- ]

Draw a frame around the viewport, using ink of type ink# .

**HOME** [ --- ]

Moves the active turtle to X = 0 and Y = 0 with heading 0, without drawing a line, and then lowers her pen.

**START** [ --- ]

HOMEs all the turtles first.

Then fills their pens with ink. (In mode 3, 5, or 7, the Nth turtle's pen is filled with ink of type N. In mode 2, 4, or 6, turtle's 0's pen is filled with type 0 ink while the pens of turtles 1, 2, and 3 are filled with type 1 ink, the only colored ink available in these modes.) Finally, makes turtle 1 the active turtle.

**NEW** [ --- ]

Clears the screen, draws a frame with type 1 ink, and initializes the turtles by executing START.

**PER-PIXEL**

[ distance --- ] Sets the window so that the point X = 0, Y = 0 is the center of the viewport, and so that the distance in XY coordinates given by distance will be the size of one pixel. Also, sets the step size so that each step is distance units long.

**FORWARD** [ steps --- ]

Moves the active turtle forward the number of steps specified by steps . The movement is in the direction she is currently heading if steps is positive and in the opposite direction if steps is negative. The turtle's heading is unaffected. A line is drawn if her pen is down.

**BACKWARD** [ steps --- ]

Like FORWARD except in the opposite direction.

**DRAW** [ steps --- ]

Lowers the active turtle's pen so that a line will definitely be drawn as she moves forward the number of steps given by steps . Then her pen is returned to its previous state.

**MOVE** [ steps --- ]

Raises the active turtle's pen so that a line will definitely not be drawn as she moves forward the number of steps given by steps . Then her pen is returned to its previous state.

**RIGHT** [ degrees --- ]

Turns the active turtle the specified number of degrees, to the right if degrees is positive and to the left if negative.

**LEFT** [ degrees --- ]

Like RIGHT except in the opposite direction.

**TURN** [ degrees --- ]

The same as RIGHT.

**GOTO** [ x y --- ]

The same as SET POSITION.

**DRAWT0** [ x y --- ]

Lowers the active turtle's pen so that a line will definitely be drawn as she moves to X = x and Y = y . Then her pen is returned to its previous state.

**MOVETO** [ x y --- ]

Raises the active turtle's pen so that a line will definitely not be drawn as she moves to X = x and Y = y . Then her pen is returned to its previous state.

**TURNT0** [ degrees --- ]

The same as SET HEADING.

**PENDOWN** [ --- ]

Lowers the active turtle's pen. This is the same as 1 SET PENSTATE.

**PENUP** [ --- ]

Raises the active turtle's pen. This is the same as 0 SET PENSTATE.

**PENDOWN?** [ --- flag ]

Leaves a 1 on the stack if the active turtle's pen is down and a 0 if it is up. This is the same as PEN.

**PENUP?** [ --- flag ]

Leaves a 1 on the stack if the active turtle's pen is up and a 0 if it is down. This is the opposite of PEN.

**ERASING** [ --- ]

Fills the active turtle's pen with type 0 ink (the erasing type.) This is the same as 0 SET INK.

**( . . . )** [ #loops --- ]

Executes the words between the left parenthesis and the right parenthesis the number of times given by #loops .

**DEFINE . . . AS . . . END**

Defines the word between DEFINE and AS to be a new turtle command which will execute the words between AS and END.

**BYE** [ --- ]

Leaves Turtleland and returns to pns-Forth.

# FORTH FACTORY

```

( Turtle Graphics II, screen 1      ) .WHICH ." is active " CR ;
DECIMAL : VALUES ROOT: ACTIVE WHICH ACTIVE! ACTIVE? ;
: BUILDS 0 DO
    0 , LOOP
DOES> OVER + +
TO-FLAG @ IF
0 TO-FLAG ! ! ELSE
@ THEN ;
VALUE PREFIX
: SET ( --- ) 2 TO PREFIX ;
: SHOW ( --- ) 4 TO PREFIX ;
: ROOT: ( --- )
    <BUILDS SMUDGE ]
DOES> PREFIX + @ EXECUTE
    0 TO PREFIX ;
-->

( Turtle Graphics II, screen 2      ) : MODE# ( --- n ) 87 C@ ;
4 CONSTANT #TURTLES
VALUE WHICH
( The number of the active turtle )
: ACTIVE! ( n --- ) TO WHICH ;
: .WHICH ( --- )
." Turtle #" WHICH . ;
: ACTIVE? ( --- )
-->

( Turtle Graphics II, screen 3      ) : MODE? ( --- )
    ." This is graphics mode "
    MODE# . CR ;
TABLE MAX_COL# ( n1 --- n2 )
    39 , 19 , 19 , 39 , 79 , 79 ,
    159 , 159 , 319 ,
TABLE MAX_ROW# ( n1 --- n2 )
    19 , 19 , 9 , 19 , 39 , 39 ,
    79 , 79 , 159 ,
: WHOLE-SCREEN ( --- n1 n2 n3 n4 )
    1 MODE# MAX_COL# 1-
    1 MODE# MAX_ROW# 1- ;
-->

( 44 Turtle Graphics II, screen 4      ) : VIENPORTE ( --- n1 n2 n3 n4 )
    CLIPPING LEFT RIGHT TOP BOTTOM ;
: VIENPORT? ( --- ) CLIPPING
-->

( Turtle Graphics II, screen 5      ) : ORIGIN! ( --- ) CLIPPING
    XMIN MINUS RIGHT LEFT -
    XMAX XMIN - */ LEFT + TO OCOL
    YMAX MINUS TOP BOTTOM -
    YMAX YMIN - */ TOP + TO OROW ;
: VIENPORT! ( n1 n2 n3 n4 --- )
    CLIPPING
    MODE# MAX_ROW# MIN TO BOTTOM
    0 MAX TO TOP
    MODE# MAX_COL# MIN TO RIGHT
    0 MAX TO LEFT
    ORIGIN! ;
: WINDOW! ( n1 n2 n3 n4 --- )
    TO YMAX TO YMIN TO XMAX TO XMIN
    ORIGIN! ;
-->

```

**WANTED**

**SOFTWARE AUTHORS!**  
for Apple, Atari, TRS-80, NEC, Hitachi...

Broderbund Software is looking for new authors to join its international team of programmers. If you have a product for the micro market, let us show you the advantages of working with our team of design, production and distribution specialists.

Call or write for our free Authors Kit today or send us a machine readable copy of your work for prompt review under strictest confidence.

Brøderbund Software

1938 Fourth Street, San Rafael, CA 94901 • (415) 456-6424

```

( Turtle Graphics II, screen 6      )
ROOT: VIENPORT
VIENPORTE VIENPORT! VIENPORT? ;
ROOT: WINDOW
WINDOW! WINDOW! WINDOW? ;
: LEFT- ( --- n )
    CLIPPING LEFT 1- 0 MAX ;
: TOP- ( --- n )
    CLIPPING TOP 1- 0 MAX ;
: RIGHT+ ( --- n ) CLIPPING
    RIGHT 1+ MODE# MAX_COL# MIN ;
: BOTTOM+ ( --- n ) CLIPPING
    BOTTOM 1+ MODE# MAX_ROW# MIN ;
: FRAME ( n --- ) COLOR
    LEFT- TOP- PLOT
    RIGHT+ TOP- DRAFTO
    RIGHT+ BOTTOM+ DRAFTO
    LEFT- BOTTOM+ DRAFTO
    LEFT- TOP- DRAFTO ;
-->

```

# FORTH FACTORY

```

( Turtle Graphics II, screen 7      ) ( Turtle Graphics II, screen 11      ) PEND SWAP PENUP FORWARD PEN! ;
*TURTLES VALUES PEN() ; : X>COL ( n1 --- n2 ) CLIPPING : DRAH ( n --- )
: PEN0 ( --- flag ) WHICH PEN() ; RIGHT LEFT - XMAX XMIN - */ OCOL + ; PEN0 SWAP PENDOWN FORWARD PEN! ;
: PENDOWN? ( --- flag ) PEN0 ; : Y>ROW ( n1 --- n2 ) CLIPPING -->
: PENUP? ( --- flag ) PEN0 0= ; TOP BOTTOM - YMAX YMIN - */ OROW + ;
: PEN! ( flag --- ) : SCALE ( n1 n2 --- n3 n4 ) ( Turtle Graphics II, screen 15      )
: 0= 0= WHICH TO PEN() ; SWAP X>COL SWAP Y>ROW ; : PER-PIXEL ( n --- )
: PENDOWN ( --- ) 1 PEN! ; : ?CONSOLE ( --- flag ) CLIPPING >R
: PENUP ( --- ) 0 PEN! ; 53279 C! 7 = NOT ; RIGHT LEFT - 2 /
: PEN? ( --- ) .WHICH : POSITION! ( n1 n2 --- ) DUP MINUS R * SWAP 1+ R *
." has her pen " PEN0 IF : ?CONSOLE IF BOTTOM TOP - 2 /
: ." down " ELSE : SP! CR ." ok." QUIT THEN DUP MINUS R * SWAP 1+ R *
: ." up " THEN : INK0 COLOR SET WINDOW R> 1 SET SIZE ;
CR ; OVER OVER SCALE POSITION0 SCALE ( Make SURE you typed the >R and R> )
ROOT: PEN PEN0 PEN! PEN? ; : LINE THEN ( in this correctly. )
--> : SCREEN-DEFAULTS ( --- ) WHOLE-SCREEN SET VIEWPORT
                               100 PER-PIXEL ;
                               TABLE GR-BYTES ( n1 --- n2 )
                               960 , 400 , 200 , 200 , 400 ,
                               800 , 1600 , 3200 , 6400 ,
                               : CLEAR ( --- ) 88 @ MODE@ GR-BYTES ERASE ;
-->

( Turtle Graphics II, screen 8      ) --> ( Turtle Graphics II, screen 12      )
*TURTLES VALUES INK() ; : GOTO ( n1 n2 --- ) POSITION! ;
: INK0 ( --- n ) WHICH INK() ; ROOT: POSITION
: INK! ( n --- ) WHICH TO INK() ; POSITION0 POSITION! POSITION? ;
: ERASING ( --- ) 0 INK! ; : X! ( n --- ) YE POSITION! ;
: INK? ( --- ) : Y! ( n --- ) X# SWAP POSITION! ;
                               ROOT: X X# X! X? ;
                               ROOT: Y YE Y! Y? ;
                               : MOVETO ( n1 n2 --- ) : MOVETO ROT ROT PENU POSITION! PEN! ;
                               : DRAUTO ( n1 n2 --- ) : DRAUTO ROT ROT PENDOWN POSITION! PEN! ;
-->

( Turtle Graphics II, screen 9      ) ( Turtle Graphics II, screen 13      )
*TURTLES VALUES HEADING() ; VALUE SIZE_N VALUE SIZE_D : MODE! ( n --- )
: HEADING0 ( --- n ) : SIZE0 ( --- n1 n2 ) GRAPHICS SCREEN-DEFAULTS
: WHICH HEADING() ; : SIZE_N SIZE_D 1 FRAME START ;
: HEADING? ( --- ) .WHICH : SIZE* ( n1 --- n2 ) SIZE0 */ ; : MODE MODE MODE! MODE? ;
: ." has heading " HEADING0 . CR ; : SIZE! ( n1 n2 --- ) TO SIZE_D TO SIZE_N ; : NEW ( --- ) CLEAR 1 FRAME START ;
: HEADING! ( n --- ) : SIZE? ( --- ) SIZE_D DUP . 1 = IF : BYE ( --- ) 0 GRAPHICS
360 MOD WHICH TO HEADING() ; : ." step is " ELSE 0 710 C! 68 712 C! ;
: TURNT0 ( n --- ) HEADING! ; : ." steps are " THEN -->
: HEADING0 HEADING! HEADING? ; : ROOT: MODE MODE MODE! MODE? ;
: TURN ( n --- ) : SIZE_N SIZE0 SIZE! SIZE? ; : NEW ( --- ) CLEAR 1 FRAME START ;
: HEADING0 + HEADING! ; : BYE ( --- ) 0 GRAPHICS
: RIGHT ( n --- ) TURN ; : 0 710 C! 68 712 C! ;
: LEFT ( n --- ) MINUS TURN ; -->

( Turtle Graphics II, screen 10     ) ( Turtle Graphics II, screen 14      )
*TURTLES VALUES X() ; : VECTOR ( n --- n1 n2 ) : DEFINE [COMPILE] : ; IMMEDIATE
*TURTLES VALUES Y() ; : DUF HEADING0 SIN# X# +
: X# ( --- ) : SWAP HEADING0 COS# Y# + ; : AS ; IMMEDIATE
: WHICH ." is at X=" X# . CR ; : FORWARD ( n --- ) : END [COMPILE] ; ; IMMEDIATE
: Y? ( --- ) : SIZE# VECTOR POSITION! ; : \ ( ignores rest of line )
: WHICH ." is at Y=" Y# . CR ; : BACKWARD ( n --- ) MINUS FORWARD ; : IN @ C/L / 1+ C/L * IN ! ; IMMEDIATE
: POSITION0 ( --- n1 n2 ) X# Y# ; : MOVE ( n --- ) : (
: POSITION? ( --- ) .WHICH : ." is at X=" X# . ." and Y=" Y# . CR ; : COMPILE 0 [COMPILE] DO ; IMMEDIATE
--> : ) [COMPILE] LOOP ; IMMEDIATE
                               : +) [COMPILE] +LOOP ; IMMEDIATE
                               : S

```

# A MESSAGE ON THE MEDIUM

by CARL EVANS

The ATARI 410 Program Recorder, sometimes called the cassette drive, has a mixed reputation. Many users have had exasperating problems with it that have driven some of them straight to diskettes. Still, the 410 is a popular device, especially among ATARI users with tight budgets. The 410 can be more efficient and reliable if you learn something about its quirks.

The kind and quality of tape used with the 410 are important factors contributing to successful use. You might assume that the best quality, highest priced tapes, perhaps the so-called "computer" tapes, are what you should use, but that is not necessarily so. A good brand of music tape is usually sufficient.

You should avoid really cheap tapes, or tapes with strange brand names, and also avoid the "chromium dioxide" tapes, and "digital data recording" tapes advertised for use with some computers. Short tapes are often better than long ones, and there are some cassettes out now with as little as three minutes of tape on them. Really long tapes, like the C-90 and C-120, are unnecessary and have special problems that disqualify them for computer use.

Cassette tape is made of a tough, flexible plastic, coated with a magnetic material, usually ferrous oxide. When you record a program on a tape, the recorder generates a magnetic field that leaves a magnetic trace at a certain spot on the coating. The tape is pulled past the recording heads of the recorder at a

constant speed, leaving a series of magnetized traces. The strength of the traces depends on many things, but the nature of the coating, its formulation and the evenness of its distribution are important.

In general, the price and quality of a tape will reflect these factors. Very expensive tapes will have highly responsive coatings securely bonded to the plastic in very carefully controlled thicknesses. Medium priced tapes, like music tapes, sacrifice some of this quality. Cheap tapes have inferior coatings and quality control, and are really suitable only for non-critical purposes.

The ATARI computers record data on the tape using a method known as *frequency shift keying*, or FSK. This means that the computer actually generates sound frequencies and sends them to the recorder. The frequencies generated by the ATARI are very precise at 3995 Hz (for zero) and 5327 Hz (for one). The 410 receives these signals from the computer and leaves the appropriate magnetic traces on tape. This means that the trace on the tape is approximately the same as generated by the computer, but not quite. Variation within components of the 410 may throw the frequency off, or the speed of the capstan motor may vary enough to change the frequency of the trace. The amount of electrical energy to the recording heads may fluctuate too, so the traces written by the 410 may stray somewhat from their intended values.

Although the ATARI computer

writes sound frequencies to the tape, it does not respond to these frequencies when reading from tape. The 410 actually listens to the tape, interprets the frequencies as either low or high, and passes a voltage to the computer. Zero voltage equals zero, and approximately 5 volts equals one. The computer does not hear the frequencies, it reads voltage changes coming from the 410. This is the crux of the problem. If the 410 does not properly interpret the frequencies and pass the right voltage, the computer gets bad data.

Tape can be responsible for these errors. Look at Figure 1. In this normalized figure we find 3995 Hz and 5327 Hz as they might appear on an oscilloscope. Pretend that they represent two bits of data on tape. The amplitude (height) of each is equal, indicating the traces have equal signal strength. Tapes prepared by the ATARI Program Exchange (APEX) come close to this ideal. Tapes recorded by other vendors, or by the 410 itself most often do not. They look more like the waveforms in Figure 2, where the higher frequency has less amplitude, or signal strength. This loss of strength for higher frequencies is called attenuation and is a normal condition.

If attenuation causes the higher frequency to be recorded at a strength lower than the threshold for recognition by the 410, or the components of the 410 are not operating up to their specifications, the 410 will fail to recognize a one, and "drop" a bit. The com-

puter is monitoring the load, and if it senses an improper sequence it will issue a loading error message. But the bad bit(s) may be in data statements about which the computer cannot judge, and so some problems won't show up till later.

Highly responsive computer tape might seem a solution to this problem, but in fact it catches us going the other way. Being highly responsive, it does not attenuate certain non-signals, like the switching current that makes a "spike" every time the recorder is started. Spikes are often interpreted by the 410 as signals, so a one is passed to the computer when none is supposed to be there. This, of course, gives a bad load. If you have this problem, you can get around it by positioning your tape on CLOADS so you start just past the point where the leader tone begins. Other intermittent electrical noises can creep onto high grade tape in a low grade recorder, and that's why medium grade tapes are better with the 410. They will tend to attenuate spurious signals to strengths below threshold.

The problem with chromium dioxide tape is that it is very abrasive to recording heads and the 410 is not built to take it. Beware of companies offering software for the ATARI recorded on chrome tape. Head wear is another cause for distortion and loss of signal.

Other things that can cause the 410 to misread a signal include "fade out" and distortion. Fade out is the loss of strength of a trace on tape due to thin spots, perhaps caused by loss of coating from repeated playing. Music buffs claim they can hear this loss after about fifty plays. That is about the point at which fade out begins to affect data too. After about fifty reads, medium grade tape may lose enough coating to lower the trace strength below threshold for higher frequencies. Running tape on Fast Forward or Reverse does not damage the coating since the heads are not engaged.

Sometimes distortion results from the physical stretching of tape. If a tape

Figure 1

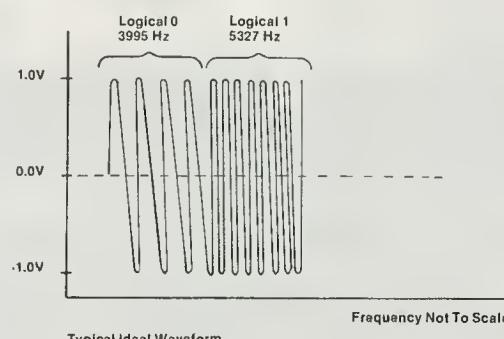
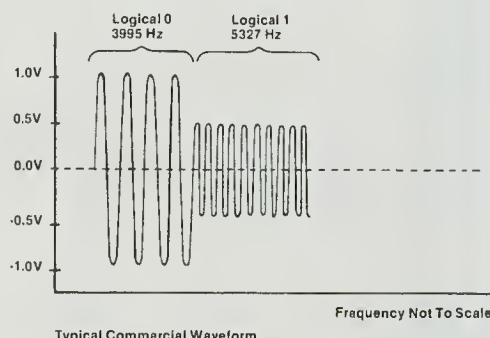


Figure 2



is stretched, a high frequency signal will become lower, and may not be recognized by the circuitry as a high signal. Stretching takes place most often near the beginning and end of tapes, near the hubs. Allow plenty of leader to reduce this problem. Thin tape stretches easier than thick tape, and thin tape is used with long tapes, so avoid any tape longer than 30 minutes per side.

Good practice suggests using short tapes of good quality from a manufacturer whose products give satisfaction. I usually put only one program on a tape and repeat the save a couple of times on that tape. I might also save it with other programs on a longer tape for archival purposes. Keep your tapes away from magnetic forces and environmental hazards.

This covers the main points of the tape medium as they pertain to the

ATARI system. Next month we will look at the 410 machine itself. Your comments and questions are invited. Please send them to ANTIC for my attention.

*Carl Evans is an electronics engineer who earned both BSEE and MSEE at Georgia Institute of Technology. He now works at Aerojet Electronics Systems, and was formerly with General Dynamics. In 1979 he bought a TRS-80 and used only tape for mass storage. When lured to the ATARI 800 in 1980 he continued to use tape with the 410 Program Recorder. He has written many programs for the ATARI, including several tape utilities, and has formed a new company, VERVAN Software, to market some of them. ANTIC readers should be pleased to learn that Carl will be coordinating this department of the magazine.*

# EASY.



Letterhead? Multicopy cut forms? Plain bond paper? Ditto masters? Try the Easy Feed single sheet paper load option with MPI's 88G and 99G printers. Just feed the paper in the front and watch it come out the top. No round platens to bend around or complicated paper paths to worry about. All this in addition to the standard adjustable width tractor drive, dot graphics, 1,000 character buffer, dual parallel/serial interface, dual fonts and much more. Another good reason to select an MPI printer.



**Micro Peripherals, Inc.**

4426 South Century Drive, Salt Lake City, Utah 84107

Telephone (801) 263-3081

**The Printer People**

**Arizona** PLS Associates (482) 246-6477 • **California** VITEK (714) 744-8355 • Computer Potentials (608) 738-1740 • **Colorado** PLS Associates (303) 773-1216 • **Florida** Computer Village (305) 266-5955 • **Georgia** Micro Graphics (404) 757-5771 • **Illinois** CW Electronic Enterprises (312) 276-4830 • **Massachusetts** Butler Associates (517) 555-1080 • Consumer Computer Marketing (517) 443-5123 • **Minnesota** Brilleg & Associates (612) 922-7011 • **New Jersey** Hansen & Hughes (201) 652-7055 • **Ohio** EDS (216) 725-2222 • **Oregon** Microware (503) 620-8150 • **Pennsylvania** CED Electronics (215) 674-5800 • **Texas** Computer Wares (214) 373-4443 • Thersun Distributors (214) 233-5744 • **Utah** PLS Associates (801) 455-9729 • **Washington** Microware (206) 451-8586 • **International: Europe** Russet Instruments, Ltd. 107341 656197 Telex: 845721 • **Australia** Datatel Pty. Ltd. 590-4000 Telex: AA35906 • **Canada** Niranjan (416) 493-5332 Telex: 05955710 • **Mexico, Central and South America** Sicom-tral (905) 559-12-09

**ON HAVING A GOOD TIME**

continued from page 23

clear it again afterwards, getting a nice uncorrupted reading.

The timekeeping routine needs to be inserted in the interrupt service chain, and we also have to ensure that it is not erased. A number of countermeasures are necessary, including, a harmless patch to DOS.

**Putting the pieces together**

I have placed the module in the cassette buffer. If you don't run the cassette, this area is unused. Two points of caution about its present location: although the cassette buffer extends from 3FD hex to 4FF, "SYSTEM RESET" clears all of pages two and three so our code can't actually begin below 400; also the module slightly overflows the top end of the buffer into locations used by BASIC. Fortunately the initialization code — which only runs when the module is first loaded — can be put there, so there is no great problem.

We can partition the code as follows. The user communication area [TIMLOK, SECS...DAYS] is placed at the very beginning, so that it can be easily referenced. Then, after some local storage, comes the code to handle the RESET button, followed by the interrupt handler itself [CLOCK]. At the end — and extending into BASIC's space — is the initialization code [WINDIT]. Notice the start-address is location 2E2 (not 2E0).

Now, I'll define some of the terminology. First of all, clock "ticks" are actually VBLANK interrupts. When a VBLANK interrupt occurs, the operating system jumps to the service routine through the "immediate VBLANK vector" location VVBLKI. The service routine is normally within the operating system [SYSVBV], but we can change the contents of the vector to point to our own routine.

The vector is a two-byte address, and there would be a reasonable possibility of an interrupt happening just after one byte of the two had been changed, with disastrous results. To circumvent this hazard, the operating system provides a special routine SETVBV that should

always be used to alter this. The particular vector to change is selected by the value passed in the accumulator (6 in this case). The operating system will always restore the vector to its original value on RESET, so we in turn must immediately re-fix it.

The reset code in the module is executed after the operating system's reset sequence has been initiated. This sequence occurs whenever the system has been bootstrapped (*not* simply loaded) from cassette. This CASINI vector points to the code that performs the reset sequence, and may be used for our own purposes. If the CASINI vector does happen to be already in use, the startup-time code [WINDIT] will store the current value as part of a JSR instruction [INITON] in the reset code so that it is still executed. The operating system is informed that CASINI is enabled by setting bit 1 of the flag BOOTE.

Caution! don't try to load the module more than once without a cold-start! If you do so it will find its own address in CASINI and go into an infinite loop at the next RESET.

Once the VBLANK vector is set up, our interrupt service routine [CLOCK] will go into action at each clock tick. There is little more than needs to be said about this section, except to note how the CRITIC flag is used. This flag is set non-zero by the system to inhibit deferred VBLANK processing, and we too must bypass most of the normal sequence at such times. We actually combine the CRITIC flag with our own TIMLOK, freezing the clock if either is non-zero, so that we can avoid reading a running clock. Don't leave TIMLOK set for more than ten minutes, though. If the number of 13-second adjustments needed become greater than 60, the count-down timer [CNT60] will overflow and take several seconds to get back in step. TIMLOK is set initially to 255, as a signal to the user that the clock has never been run. But the user program, when setting the time of day, should always initialize the seconds-counter CSECS to zero and the count-down timer CNT60 to sixty im-

mediately before releasing TIMLOK, thus ensuring that the clock starts in sync.

**Doing it to DOS**

That about covers the code itself. Now all we have to do is make the DOS patch. Under DOS 2, when you return to a cartridge program from DUP.SYS with the "B" command, the VBLANK interrupt vectors will be reset to their original system values. I have never fathomed the intention behind this. In any case, suppressing the action has absolutely no detrimental effect on normal usage.

The patch is trivial, a jump to avoid that section of code, but a little messy to install, because DUP.SYS usually goes away when not in use. It seems best to present it as a recipe; the one that follows is probably the shortest reasonable path.

1. Install the Assembler / Editor cartridge and boot up with DOS-2
2. Insert the disk you intend to patch. It should have DUP.SYS on it — and I suggest it be a scratch disk!
3. Use the editor to generate the patch:

```
10 * = $272A
20 JMP $1912
30 .END
```

4. Assemble it to a disk file with:  
ASM,,#D:DOSPATCH.OBJ
5. Got to the DOS menu.
6. Give the "C" command, and in response to the file-spec query enter:

DOSPATCH.OBJ,DUP.SYS/A

At this point the patch has been tagged on to the end of the save file, making it one sector longer.

7. Use the "B" command to return to the editor, and then go back to DOS. This brings in the modified system.
8. Re-install the new system on your disk drive with the "H" command. DUP.SYS will return to its original length.

You should, of course, copy the modified system onto any disk you are going to use while the clock module is

continued next page

# SYSTEMS GUIDE

running. (In fact I never use anything but the patched version.) For this you can use either the "H" command to install a complete DOS, or "C" or "O" to update DUP.SYS alone.

## Where we came in

If you've stuck with me this far, you probably don't need to ask "What can I use it for?". You must have desperate

need for it. However, as an example of how to couple the module to BASIC, a simple digital clock is given in listing 2. Take it and go from there.

```
10 ;"ACCURATE" CLOCK MODULE
20 ;Copyright Pete Goodeve, 1982
30 ;=====
40 ;
50 ;occupies cassette buffer
60 ;
70 ;Atari OS references:
80 SETVBV=$E45C set-vector entry
90 SYSVBV=$E45F OS VBLANK service
0100 VVBLKI=$222 immed. VBLANK vector
0110 CRITIC=$42 critical section flag
0120 CASINI=$2 "cassette" init vector
0130 BOOTF=9 boot mode flag for init
0140 ;
0150 ;
0160 *=#400 cass. buffer(1024 dec)
0170 ;
0180 TIMLOK .BYTE $FF
0190 SECS .BYTE 0
0200 MIN .BYTE 0
0210 HRS .BYTE 0
0220 DAYS .BYTE 0
0230 ;
0240 CNT60 .BYTE 60 VBLANK ticks
0250 CSECS .BYTE 0 contin. count
0260 ASECS .BYTE 13 adjustment count
0270 ;s
0280 ;
0290 INITON=**+1
0300 ;Comes this way on RESET Button
0310 ;via "Cassette Init" vector;
0320 RESET
0330 JSR NUTHIN -- filled before use
0340 SETINT
0350 LDX #CLOCK/256
0360 LDY #CLOCK&$FF
0370 LDA #6 "immediate VBLANK" code
0380 JSR SETVBV set up interr. vect.
0390 NUTHIN
0400 RTS
0410 ;
```

```
0420 ;
0430 ;Immed VBLANK interrupt service
0440 ;comes through here first!
0450 ;
0460 CLOCK
0470 DEC CNT60 count 60 ticks
0480 BNE XIT before doing anything
0490 INC CSECS keep track of seconds
0500 LDX #60 (kept around for later)
0510 STX CNT60 reset count
0520 LDA CRITIC check if critical
0530 ORA TIMLOK or if locked by user
0540 BNE XIT gotta stop here
0550 ;continue on if not critical
0560 ;or locked...
0570 ;repeats if seconds were missed
0580 CLKLP
0590 DEC ASECS 13 second count down
0600 BNE TICK
0610 LDA #13
0620 STA ASECS reset 13-sec count
0630 DEC CNT60 and skip one tick
0640 TICK
0650 INC SECS user's time
0660 CPX SECS,reached 60 yet?
0670 BNE TOK nope
0680 LDY #0
0690 STY SECS reset seconds
0700 INC MIN and bump minutes
0710 CPX MIN over the hour?
0720 BNE TOK not yet
0730 STY MIN and so on...
0740 INC HRS
0750 LDA #24
0760 CMP HRS
0770 BNE TOK
0780 STY HRS
0790 INC DAYS
0800 ;...etc. if needed
0810 TOK
0820 DEC CSECS were any missed?

0830 BNE CLKLP round again if so
0840 VVON=**+1
0850 ;continue with VBLANK chain:
0860 XIT
0870 JMP SYSVBV altered at setup
0880 ;
0890 ;
0900 ;
0910 *** INITIAL ENTRY HERE
0920 ;gets overwritten by BASIC
0930 WINDIT
0940 LDY CASINI+1 Cassette Init vect
0950 BEQ NOINI zero if not used
0960 LDY CASINI rest of current vect
0970 SETON
0980 STX INITON+1 set up JSR address
0990 STY INITON so stuff gets done
1000 LDA #RESET/256 plug in our own
1010 STA CASINI+1 reset sequence
1020 LDA #RESET&$FF
1030 STA CASINI
1040 LDA VVBLKI current immed VBLANK
1050 STA VVON will be done after us
1060 LDA VVBLKI+1
1070 STA VVON+1
1080 LDA BOOTF bootstrap mode flag
1090 ORA #2 must include "cassette"
1100 STA BOOTF
1110 JMP SETINT go set VBLANK vector
1120 ;
1130 NOINI
1140 LDY #NUTHIN&$FF dummy for JSR
1150 LDX #NUTHIN/256
1160 BNE SETON
1170 ;
1180 ;
1190 ;Autostart addr,
1200 *=#2E2 "init" vector
1210 .WORD WINDIT
1220 ;
1230 .END
```

```
10 GRAPHICS 2
20 REM set up mnemonics fo
r module locations:
30 TIMLOK=1024:SECS=1025:M
IN=1026
40 HRS=1027:CNT60=1029:CSE
CS=1030
50 REM
60 REM if clock not set, s
o do it:
70 IF PEEK(TIMLOK)>1 THEN
GOSUB 210
80 POKE TIMLOK,0:REM just
in case...
90 REM
```

```
100 REM *** main time displ
ay loop:
110 IF PEEK(SECS)=OLDSECS T
HEN 110
120 POKE TIMLOK,1
130 VHRS=PEEK(HRS):VMIN=PEE
K(MIN):VSECS=PEEK(SECS)
140 OLDSECS=VSECS
150 POKE TIMLOK,0
160 POSITION 3,5
170 ? #6;"time:";VHRS;"::";V
MIN;"::";VSECS;"      "
180 GOTO 110
190 REM
200 REM *** subroutine to s
et time:
```

```
210 ? "ENTER HRS,MIN,SEC:";
220 INPUT VHRS,VMIN,VSECS
230 POKE TIMLOK,255:REM so
it can be called from e
lsewhere
240 POKE HRS,VHRS
250 POKE MIN,VMIN
260 POKE SECS,VSECS
270 REM reset module's inte
rnal timers:
280 POKE CNT60,60
290 POKE CSECS,0
300 POKE TIMLOK,0
310 RETURN
```

**PRODUCTS FOR ATARI® 400/800  
FROM ELCOMP**

**BOOKS:**

**ATARI BASIC - Learning by using**  
An excellent book for the beginner. Many short programs and learning exercises. All important features of the ATARI computers are described (screen drawings, special sounds, keys, pixels, joysticks, specialized screen routines, graphics, sound applications, peaks, pulses, and special stuff). Also suggestions are made that challenge you to change and write program routines.  
Order #164 \$7.95

# PILOT YOUR ATARI

**PILOT** continued from page 27

```
50 R: PILOT COMPOSER
60 R: ANTIC, VOL 1 # 4
70 R:
100 R:      INIT
110 *INIT
120 R:
130 C:$NOTEVALUES=
140 C:$PLAYVALUES=
150 C:$END=!
155 R: REMEMBER THE SPACE BETWEEN EACH SET OF CHARACTERS
160 C:$GOODNOTES=C D E F G A B O
170 C:$GOODDURATION=1 2 4 8 S O
180 C:$NOTETABLE=C. 1/ D. 3/ E. 5/ F. 6/
G. 8/ A. 10/ B. 12/ O. 0/ I. 1/ 2. 2/ 4
. 4/ B. 8/ S. 16/
300 R:      FILE
310 *FILE
320 R:
330 T:ENTER DEVICE TO SAVE MUSIC ON
340 T:D=DISK, C=CASSETTE
350 A:$D
360 R:NEXT, CHECK TO SEE IF CASSETTE
370 M: C
380 CY:$FILESPEC=C:
390 JY:*FILEDONE [IF CASS JUMP OUT
400 M: D
410 TY:ENTER FILE NAME
420 AY:$FILE [GET FILE NAME
430 CY:$FILESPEC=$D:$FILE
440 TN:I DON'T KNOW THAT DEVICE
450 JN:*FILE
460 *FILEDONE
470 T:} [ESC-CTRL-CLEAR .. CLEARS SCREEN
500 R:      INSTRUCTIONS
510 *INSTRUCTIONS
520 R:
530 T:
540 T:NOTES ARE: C D E F G A B
550 T:      AND O FOR OFF
560 T:
570 T:DURATIONS ARE:
580 T:      1=WHOLE      2=HALF
590 T:      4=QUARTER    8=EIGHTH
600 T:      S=SIXTEENTH  O=NONE
610 T:
620 T:ENTER & TO QUIT
630 T:
700 R:      ENTER
710 *ENTER
720 R:
730 C:#A=#A+1
740 POS: 1,12
750 T:ENTER 4 NOTES + DURATION FOR CHORD
#A [SPACE, ESC-CTRL-LEFT
760 POS: 17,15
770 A:$NOTES
780 M:&
790 JY:*ENDER
```

```
800 EY:
810 U: *CHECKNOTES
820 SO:20 [BEEP ON COMPLETION
830 PA:7
840 SO:0
850 WRITE(#A=10):$FILESPEC,$PLAYVALUES
860 C(#A=10):#A=0
870 J: *ENTER
900 R:      ENDER
910 *ENDER
920 R:
930 C:$PLAYVALUES=$PLAYVALUES!
940 WRITE:$FILESPEC,$PLAYVALUES
950 CLOSE:$FILESPEC
960 T:
970 T:      SAVED IN FILE $FILESPEC
980 T:
990 T:      SESSION ENDED
1000 E:
1100 R:      CHECKNOTES
1110 *CHECKNOTES
1120 R:
1130 A:=$NOTES [MOVE $N. TO ACCEPT
1140 MS:,      [MATCH ON 1ST BLANK
1150 A:=$RIGHT!/ [ADD/, MOVE TO ACCEPT
1160 C:#C=0      [SETS NOTE COUNTER TO 0
1170 C:$NOTEVALUES=
1180 C:#G=0
1190 *LOOP
1195 R: TWO RIGHT ARROWS AND COMMA
1200 MS:,      [SKIP 2 SPACES TYPE ESC-CTR
L-R. ARROW
1210 CN(#G=0):$PLAYVALUES=$PLAYVALUES$NO
TEVALUES
1220 POSN(#G=0):2,22
1225 R: 38 BLANKS UP ARROW NEXT LINE
1230 TN(#G=0):
[ESC-CTRL-UP
1240 EN:
1250 MS:$RIGHT[MATCH W/O 1ST LETTER
1260 C:$SAVE=$MATCH [SAVE ALL
1270 A:=$LEFT  [$L. HAS BLANK+LETTER
1275 R: RIGHT ARROW & UNDERLINE NEXT LIN
E
1280 MS:_      [SKIP BLANK & LETTER
1290 R:$LEFT HAS THE LETTER WE NEED
1300 C:$NOTE=$LEFT
1310 U: *TRANSLATE
1320 A:=$SAVE [PUT ALL IN BUFFER
1330 J: *LOOP
1400 R:      TRANSLATE
1410 *TRANSLATE
1420 R:
1430 C:#C=#C+1
1440 E(#C=7):
1450 A(#C<5):=$GOODNOTES
1460 A(#C=5):=$GOODDURATION
1470 M:$NOTE
1480 POSN:2,22
1490 TN:ERROR IN THIS VALUE: $NOTE
```

```

50 R:PILOT PLAYER
60 R:ANTIC, VOL 1, # 4
70 R:
80 R:
300 R: FILE
310 *FILE
320 R:
330 T:ENTER DEVICE TO PLAY MUSIC FROM
340 T:D=DISK, C=CASSETTE
350 A:$D
360 R:NEXT, CHECK TO SEE IF CASSETTE
370 M: C
380 CY:$FILESPEC=C:
390 JY:*FILEDONE [IF CASS JUMP OUT
400 M: D
410 TY:ENTER FILE NAME
420 AY:$FILE [GET FILE NAME
430 CY:$FILESPEC=$D:$FILE
440 TN:I DON'T KNOW THAT DEVICE
450 JN:*FILE
460 *FILEDONE
470 T:} [ESC-CTRL-CLEAR .. CLEARS SCREEN
1000 R: TEMPO & PLAY
1010 R:
1020 R: TEMPO
1030 *TEMPO
1040 T:} [ESC-CTRL-CLEAR CLEARS SCREEN
1050 POS:9,5
1060 T:PLEASE ENTER A TEMPO
1070 T:
1080 T: 256 = Adagio
1090 T: 128 = Andante
1100 T: 64 = Allegro
1110 POS:17,11
1120 *RESTART
1130 A:#T
1140 J(#T=256)+(#T=128)+(#T=64):*READ
1150 T:PLEASE ENTER NUMBER AGAIN
1160 J:*RESTART
1170 R: READ
1180 *READ
1190 T:
1200 T: PLAYING FILE $FILESPEC
1210 READ:$FILESPEC,$PLAYVALUES
1220 R:THIS DEMOS WORD PARSING
1230 *LOOP1
1240 C:#N=0
1250 *LOOP2
1260 C:#N=#N+1
1270 A:=$PLAYVALUES
1275 R:NEXT LINE ESC-CTRL-LEFT THEN UNDE
RLINE
1280 MS:_
1290 JN:*READ
1300 C:$PLAYVALUES=$RIGHT
1310 A(#N=1):#A=$LEFT
1320 A(#N=2):#B=$LEFT
1330 A(#N=3):#C=$LEFT
1340 A(#N=4):#D=$LEFT
1350 A(#N=5):#L=$LEFT
1360 A:=$LEFT

```

```

1370 M:!
1380 EY:
1390 J(#N<5):*LOOP2
1400 SO:#A#B#C#D
1410 PA:#T/#L
1420 J:*LOOP1
1500 R:SET G FLAG FOR BAD NOTE
1510 CN:#G=1
1520 EN:
1530 A(#C=6):=$NOTE
1540 M(#C=6):!
1550 EY(#C=6):
1560 POSN(#C=6):2,22
1570 TN(#C=6):TOO MANY VALUES:$NOTE
1580 CN(#C=6):#G=1
1590 EN(#C=6):
1600 POS(#C>6):2,22
1610 T(#C>6):TOO MANY VALUES: $NOTE
1620 C(#C>6):#G=1
1630 E(#C>6):
1640 A:=$NOTETABLE
1650 MS:$NOTE.
1660 A:=$RIGHT
1670 MS:/
1680 C:$NOTEVALUES=$NOTEVALUES$LEFT
1690 E:

```

## MAKE YOUR 810 A HAPPY DISK DRIVE

- READ ALL DISKS FASTER
- COPY ANY ATARI\* EXECUTABLE DISK
- HAPPY 810 MODIFICATION
  - Read all format types of disks at the same FASTER rate. HAPPY 810 MODIFICATION does not require reformatting of disks to read FASTER. Read disks even faster than scheme which requires disk reformatting with so called fast format chip.
  - Compatable with existing ATARI 400/800 software.
  - Reduces wear on disk drive mechanism.
  - FASTER disk initialization.
  - Allows running intelligent programs such as HAPPY BACKUP.
- HAPPY BACKUP PROGRAM
  - Completely automatic program for personal or business use, copies all types of ATARI disks quickly, including specially copyguarded disks. Disk formatting and copying are performed in one operation.
  - May be used with single or multiple drives. With more than 1 drive, the source and destination drives operate truly in parallel, effectively making up to three copies in less time than it now takes for one copy.
  - Each drive used with HAPPY BACKUP PROGRAM requires HAPPY 810 MODIFICATION.

HAPPY 810 MODIFICATION per disk drive only . . . \$179.95  
 HAPPY 810 MODIFICATION and HAPPY BACKUP . . . \$249.95

For ordering and additional information please send self addressed, double stamped legal size envelope to:

HAPPY COMPUTING  
 P.O. Box 32331  
 San Jose, CA 95152



\* note ATARI, ATARI 400, ATARI 800, and ATARI 810 are registered trade marks of Atari, Inc.

# NEW FOR ATARI

FROM  
MMG MICRO SOFTWARE

## \*\*\*\*\*NECESSITIES\*\*\*\*\*

**DISK COMMANDER** - Just save this program on your BASIC disks and it will autoboot and automatically list all programs from the disk into your screen. Simply run any program by typing in a number.

Requires 16K, Disk Only ..... \$24.95

**BASIC COMMANDER** - This all machine language program is an absolute requirement for ATARI BASIC programmers. Single keystroke DOS and BASIC commands, plus; AUTONUMBER, RENUMBER, BLOCKDELETE and much more!

Requires 16K, Disk Only ..... \$34.95

**RAM TEST** - The most thorough and fastest memory test available for the ATARI. This all machine language program takes 4 min. to test 48K. It's the only program that tests the cartridge area of RAM. Good for new 400/800 computer owners and for testing new RAM boards.

Requires 8K - Disk or Cassette ..... \$24.95

## \*\*\*\*\*BUSINESS/HOME\*\*\*\*\*

**MAILING LIST** - Extremely fast BASIC and machine language program. Each data disk holds over 500 files. Sort on any of 6 fields at machine language speed. Use any size labels or envelopes.

Requires 48K, Disk Only ..... \$39.95

## \*\*\*\*\*TUTORIALS\*\*\*\*\*

**ASTEROID MINERS** - A unique game tutorial. A 32K BASIC game utilizing over 25 players in player-missile graphics, machine language subroutines, a redefined character set, multiprocessing utilizing the vertical blank interrupt interval, and much more! Comes with book documenting each part of the entire program, and fully documented source code for both the BASIC and assembly language parts of the program. Use these routines in your own programs. These examples will make it easy.

Requires 32K, 1 Joystick - Cassette or Disk ..... \$34.95

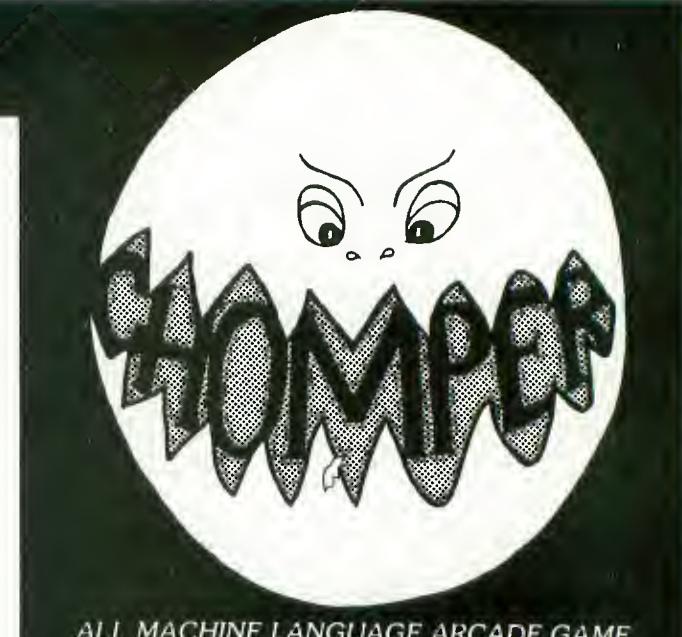
Dealers and Distributors Contact:

**CLASSIC SOFTWARE, INC.**

RD1 • 3D • HIGHWAY 34 • MATAWAN, NJ 07747

(201) 566-5007

ATARI is a registered trademark of ATARI, INC. N.J. Residents add 5% sales tax.



## ALL MACHINE LANGUAGE ARCADE GAME WITH INTELLIGENT MONSTERS!

This arcade style game is sure to become an ATARI classic.

Chomper requires 16K RAM, 1 joystick and nerves of steel.

Available on Disk or Cassette ..... \$29.95

Available at your favorite computer store or  
Send a check or money order directly to:

**MMG MICRO SOFTWARE**

P.O. BOX 131 • MARLBORO, NJ 07746

or call (201) 431-3472

for MasterCard, Visa or COD deliveries

## CHOPPER RESCUE

Zip up your flying suit and strap yourself into your sleek assault chopper: CHOPPER RESCUE challenges your skill and daring. Pilot your nimble craft through the treacherous underground labyrinth. Search out and rescue the captives trapped inside. Danger approaches from all sides as defenders fire winged missiles and sparkling energy bursts at your fragile craft. But you are not defenseless, your explosive tipped rapid-fire missiles dart out to blast a path through the dense minefields. Thread your bomb directly into the heart of their pulsating nuclear furnace. And just when you think the path is clear, a swift patrol drone appears from behind a ledge, spitting missiles as you scramble for a firing position. Immerse yourself in the non-stop excitement of CHOPPER RESCUE, you'll keep coming back for more!



CHOPPER RESCUE is a brand new game from MicroProse Software. Fully animated graphics, music, sound effects, and scrolling make this a showpiece for the ATARI's leading edge capabilities. CHOPPER RESCUE features three scenarios, multiple skill levels, and competition for 1 or 2 players. No two games are ever alike. MicroProse is dedicated to bringing you games which challenge you far beyond the first few plays. We promise you hours of excitement and pleasure.

CHOPPER RESCUE (ATARI 32K, disk) ..... \$29.95

Other MicroProse games . . .

**HELLCAT ACE** - A real time, three dimensional WWII flying simulation with a unique pilot's eye view \$29.95

**FLOYD OF THE JUNGLE** - A fun game for up to four players. Guide Floyd through the jungle hazards and reunite him with lovely Jänice ..... \$29.95

To Order C.O.D., Visa or Master Card Call:  
(301) 357-4920 or Send Check or Money Order To:

**MicroProse Software**

One Caribou Court

Parkton, MD. 21120

(Add \$2.00 for Postage & Handling for Each Order)

ATARI is a Register Trademark of ATARI, Inc.

# ATARI® Christmas Music!

- Compare! 1. Glorious Four Part Harmony  
 2. Accurate Song Reproduction  
 3. Requires Only Basic Cartridge

Volume I: Silent Night, Angels From Realms of Glory, We Three Kings, Go Tell It On The Mountain, Joy To The World, O' Come, O' Come Emmanuel, Good Christian Men Rejoice, Bring A Torch, Coventry Carol, It Came Upon A Midnight Clear.

Volume II: The First Noel, What Child Is This, Hark The Herald Angels Sing, There's A Song In The Air, O' Little Town Of Bethlehem, Angels We Have Heard, Away In A Manger, While Shepherds Watched, O Come All Ye Faithful, God Rest Ye Merry Gentlemen.

Volume III: Jingle Bells, All Through The Night, Please Put A Penny, We Wish You A Merry Christmas, O' Sanctissima, Wassailing Song, Deck The Halls, O Christmas Tree, Good King Wenceslas, I Saw Three Ships.

Specify: Version 1 (8/24K Tape - 16/32K Disk)  
 Version 2 (32K Tape - 40K Disk)

* Prices:	Any Single Volume	Any Two Volumes	All Three Volumes
Tape -	\$12.95	\$21.95	\$29.95
Disk -	14.95	25.95	34.95

Add \$2.00 per volume ordered for lyrics.

### B.I.G. Software

533 Airport Blvd. #518  
 Burlingame, Ca. 94010  
 (415) 347-1063

ATARI is a registered trademark of Atari, Inc.  
 \* California residents add 6 1/2% sales tax.  
 Dealer inquiries invited.

# VERVAN

10072 Balsa St., Cucamonga, Ca 91730



CASDIS - machine language program that allows you to transfer most "boot" tapes and cassette data files to disk. No special programming knowledge required. Programs that normally read cassette files during execution may be up-loaded to disk and operate normally without software modifications. Only difference is the program is on disk and loads at disk transfer speeds  
 Diskette only \$25

### Utility Programs for the ATARI 400/800

CASDUP - machine language program that allows you to copy most "boot" tapes and cassette data files as easily as you normally copy a BASIC tape  
 Cassette only \$20

FULMAP - (avail. late '82) machine language utility package for developers of BASIC programs. Features: variable cross reference generator lists all program variables alphabetically with line numbers which reference them; line number cross reference generator which tells you how and where all line numbers are used; address utility which lists all indirect address references and tells you where they are used. This program resides in high memory and accessed from BASIC by entering "MAP". All outputs can be dumped to a printer  
 Cassette or Diskette \$40

DISASM - machine language program that allows you to disassemble machine language programs. You can load a file from cassette or disk and the program will display all the file's addresses and their contents in hex, ASCII (if any), and 6502 op code mnemonics. All outputs can be dumped to a printer  
 Specify Cassette or Diskette \$25

DISDUP - machine language program for sector level copying of disk information. User may specify single sector, range of sectors or all sectors on a disk to be copied. Copies may be made with or without a read verify. Sectors which cannot be read from or written to are displayed on the screen and optionally to a printer  
 Diskette only \$25

# GETTING SERIOUS ABOUT PROGRAMMING YET?!



## UNLOCK YOUR ATARI

WITH THE WORLD'S MOST COMPLETE POCKET PROGRAMMING AID.

16 comprehensive pages



- error codes
- basic commands with abbreviations
- peek and poke locations
- internal codes
- machine language aides
- much, much more!!

**Get Yours Now only \$9.95**  
 (dealer ad space available)

**ORDER NOW-CASH, CHARGE OR C.O.D.**

ADVANCED COMPUTING ENTERPRISES  
 5516 ROSEHILL A-2  
 SHAWNEE MSN., KS 66216  
 (913) 262-2875 • (913) 631-4180

MasterCard      VISA

ATARI IS A REGISTERED TRADEMARK OF ATARI INC.

## Memory Expansion Boards for the ATARI\* Computer

Completely compatible with ATARI hardware and software

No modifications necessary

Fully assembled and tested

User installable - simply plug it in Gold connector tabs and sockets

One year warranty

**16K Memory board — \$ 49.95**

**32K Memory Board — \$ 99.95**

**48K Memory Board — \$199.95**

### Build Your Own Memory

16K board - no components - \$12.50

32K board - no components - \$30.00

48K board - no components - \$50.00

Add \$2 Shipping and handling per board

\*ATARI is a trademark of Atari Inc.

Dealer Inquiries Welcome

**Tiny Tek, Inc.**

P.O. Box 820249 • Dallas, TX 75382-0249  
 214-373-8926

Please add \$2 shipping & handling per program. California residents add 6% sales tax

**Back-up policy:** Our disks are protected against casual copying, but we appreciate your potential need for a back-up copy. If you add \$10 to your order for a program, we will send you two (2) copies of the program disk. Our normal replacement guarantee applies to both copies. This offer does not apply to dealer sales.

ATARI 400/800 is a trademark of Warner Communications, Inc. Dealer Inquiries Welcome

# The Demand For ATARI Software Reaches Further Than You Think!

Maybe not *this* far yet, but the market for Atari software has proven itself in the U.K.—and it's still growing. Calisto Software Ltd. is the largest Atari Software distributor in the U.K., with offices in England and the U.S. If you'd like your software distributed in the U.K., go with the proven professionals—Calisto Software Ltd. Contact us at either address below. Do it now!

## IN ENGLAND:

Mike Woodroffe  
Calisto Software Ltd.  
119 John Bright Street  
Birmingham B1 1BE  
011-44-21-832-6458

## IN U.S.:

Jake Commander  
Calisto Software Ltd.  
P.O. Box 495  
Peterborough, N.H. 03458  
603-525-3598

**Calisto Software Ltd.**

## ERRATA

NEC 8023A does not work  
with ATARI WORD  
PROCESSOR as indicated in  
Vol. 1, Issue 3.

TYPO program page 52,  
Vol. 1, Issue 3 mis-print line  
32260. QLINF should be  
QLINE.

# I LOVE IT...80-COLUMN CAPABILITY FOR MY ATARI®



NOW YOU DON'T NEED TO BE LIMITED BY 40 COLUMNS  
FOR YOUR ATARI BUSINESS APPLICATIONS.

The **FULL-VIEW 80** Display Card combines the best of two worlds—  
80-column capability with normal ATARI 40 column/graphics mode.  
80-column mode provides upper and lower case characters with  
full descenders.

Price: \$349.00

Add the **32K MEMORY PLUS** with the FULL-VIEW 80 to  
achieve a 48K, 80-column system. The 32K MEMORY PLUS  
card operates with both the ATARI 400 and ATARI 800

Price: \$179.00

CONTACT YOUR ATARI DEALER OR BIT 3.

**BIT 3**  
COMPUTER CORPORATION

8120 Penn Avenue South, Suite 548  
Minneapolis, Minnesota 55431  
(612) 881-6955



ATARI is a registered trademark of ATARI, Inc.; FULL-VIEW 80 and MEMORY PLUS are registered trademarks of BIT 3

**KBL Marketing**  
**528 Larkfield Road**  
**E. Northport, N.Y. 11731**  
**(516) 368-0380**

**SPECIALIZING IN**  
**COMPUTER PRODUCTS AND VIDEO TAPE**  
**OPENING SPECIAL THIS MONTH**

Private label package, exceptional product warranty!

Call for Prices.

Lucite computer monitor or TV stands —  
 a must for each computer sale  
 (minimum order, three pieces)

New accounts welcomed. Credit terms available.  
 Send for complete product list.

**The First and Only System to**  
**Backup Diskettes Protected**  
**By Bad Sectoring.**

**Superclone**  
**ATARI DISK BACKUP**  
**SYSTEM**

Superclone is the *only* ATARI diskette copier system that lets you backup just about ANY diskette...including those protected by 'bad sectoring.' Bad tracks and sectors are created *without* modifications to your hardware. Each backup diskette generated by Superclone functions *exactly like the original*. . .self-booting, etc. (In fact, we suggest that you use the backup and save the original.)

Superclone includes:

SCAN ANALYSIS - map of diskette contents  
 (location of data, bad sectors, etc.)

FORMATTING/BAD SECTORING -  
 Non-ATARI OOS formetting and bad track/  
 sector creation.

BACKUP - copies just about everything we can  
 find...regardless of protection scheme.

Superclone is user-friendly and simple to use. (Superclone only allows two copies to be made of any specific diskette...Sorry!!!) Requires 32K.

Available at your computer store or direct from FRONTRUNNER.  
 Includes \$2.00 Shipping for each system.

DEALER INQUIRIES ENCOURAGED

#### ATARI SOFTWARE EXCHANGE

We are gathering public domain Software to be exchanged among users. Programs are distributed for only a trivial handling charge. Categories include: Games, Education, Home, Business, Utilities, Special Languages, etc. Handling charges waived for program contributors. Please send programs on tape or disk only. For latest listing send \$1.00 and SASE.



100 W. Grove, Suite #115  
 Reno, Nevada 89509  
**(702) 825-4300**

#### TOLL FREE ORDER LINE:

1-800-648-4780  
 In Nevada or for questions  
 Call (702) 825-4300

For fast delivery, send certified or cashiers checks, or money orders. Personal checks allow 2 to 3 weeks to clear. M/C and VISA accepted. Be sure to include shipping. (Nevada residents add tax)

ATARI is a Trademark of ATARI, Inc.

# MODEM

for the ATARI 400/800™ Computer

- NO ATARI 850™ INTERFACE MODULE NEEDED
- SMART TERMINAL SOFTWARE
- 16K TAPE/DISK
- DIRECT CONNECT
- CONNECTS TO JOYSTICK PORT

**"Everything you need to plug in and use"**

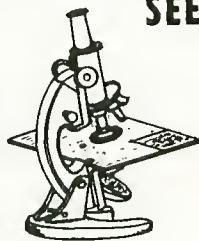
MODEM. The inexpensive communications package for Atari computers. State-of-the-art electronics and advanced programming make it easy to use and dependable. The smart choice for Atari owners. Ask for it by name: MODEM.

## MICROBITS

434 W. 1st  
 Albany, OR 97321  
 (503) 967-9075

**ONLY**  
**\$199.00**

**TAKE A CLOSER LOOK AT YOUR DISKS**  
**SEE WHAT'S REALLY THERE**



**WITH**  
**DISKED**

(disk'ēd)

by Mark Logies

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.

Runs in 24K . . . . . ONLY \$89.95

Call or write for more information on all of our software.

**GET MORE OUT OF YOUR INVESTMENT**  
**EXPAND YOUR ABILITIES WITH DISKED**

TO ORDER SEND CHECK OR MONEY ORDER TO:



**Amulet**  
 ENTERPRISES

P.O. BOX 25612  
 GARFIELD HEIGHTS, OH 44125  
 (216) 475-7766  
 ORDERS MUST INCLUDE \$1.50 SHIPPING AND HANDLING.



# EXPAND YOUR ATARI 400®

BOOST YOUR ATARI 400® MEMORY FROM  
16K OR 32K UP TO 48K

## FEATURES:

- Less power consumption
- Professional quality
- Allows long sophisticated programs to be run on the Atari 400®
- Easy installation
- Gold plated edge connector
- 90 day guarantee

FOR ONLY  
**\$149.95**

INTRODUCTORY  
OFFER

## SEND CHECK OR MONEY ORDER

Plus \$2.50 Shipping and Handling  
New York State Residents add 7% Tax

# SAR-AN

## COMPUTER PRODUCTS

12 Scamridge Curve  
Buffalo, New York 14221  
(716) 632-3441

Atari® and 400™ are trademarks of ATARI, Inc.

**ATTENTION  
ATARI 400  
& 800  
OWNERS !**  
Upgrade



your system with the  
"Sidewriter" a modular key-

**SCREEN SONICS® SIDEWRITER**

board that gives 400 owners a full typewriter keyboard, 800 owners can now have an extension keyboard that will allow you to sit back with the "Sidewriter" on your lap and type away.

**HURRY ORDER YOUR "SIDEWRITER" TODAY!**

Sidewriters installed complete for \$249.00 (plus shipping)  
Sidewriters for the do-it-yourself owners \$169.00 (conversion kits \$69.00) plus shipping

DEALER INQUIRIES INVITED

FOR MORE INFORMATION

SEND \$1.00 TO:

**SCREEN SONICS INC.**

14416 S. OUTER 40 RD. • CHESTERFIELD, MO. 63017  
OR CALL (314) 434-0433

Orders outside the United States must be in U.S. currency

**"400" OWNERS  
48K RAM upgrade  
installed**

ONLY

**\$159**  
plus shipping

## ATARI 400/800 OWNERS: THERE'S A MICROCONNECTION™ FOR YOU! —

Now you can direct-connect to the telephone with or without the 850™ interface, there's also a serial port to drive a printer, optional autodial and autoanswer, and smart terminal software! Prices start at \$199.50 For more details write or phone:

***the microperipheral corporation***



2643A - 151st Pl. N.E.  
Redmond, WA 98052  
(206) 881-7544



16K

32K

# 48K

RAM KIT FOR THE ATARI 400/800

USES EXISTING ATARI 8K OR 16K RAM BOARD  
KIT INCLUDES ALL PARTS REQUIRED AND COMPLETE  
INSTRUCTIONS WITH DIAGRAMS

## 124 95\*

SEND CHECK OR MONEY ORDER TO:

**NTI** NEOTECHNIC INDUSTRIES INC.  
P.O. BOX 277  
REDONDO BEACH, CA. 90277

INDICATE ATARI 400 OR 800 WITH 8K OR 16K RAM

\*Calif. residents add 6% sales tax

ATARI, 400, 800 are Trademarks of ATARI, Inc.

Beat the clock! Outsmart your friends!



The high-speed dictionary game

At last, an educational game that's really fun to play! You start each turn with a word, 6 definitions, and a counter set to 600 points. As time passes the points tick away. The sooner you pick the **correct** definition, the more points you get, but the sooner you guess wrong, the more points you **lose**.

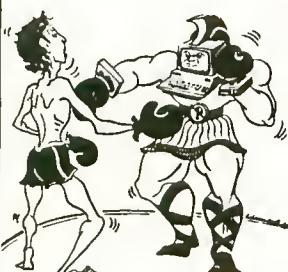
3 levels of play on one disk:

- Beginner (ages 9-14)
  - Regular
  - Challenge
- 2000 words and definitions

\$24.95

ATARI: 32K — disk — BASIC

Now available on cassette for the ATARI 400/800    \$19.95  
Features: Beginner's and Intermediate WORDRACE



Try **ABUSE**  
The insult program.

- Funny
- Unpredictable
- Interactive
- Guaranteed to call you something you've never been called before!

\$19.95

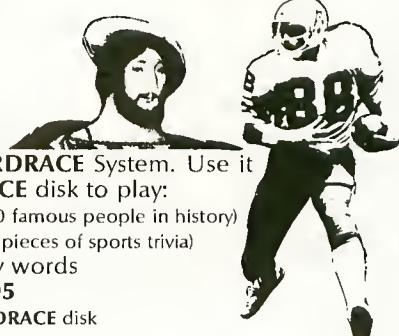
ATARI: 40K — disk — BASIC

Available at your computer store or direct from DON'T ASK  
Include \$2.00 shipping for each program (Calif. residents add 6% tax)

ATARI is a trademark of ATARI INC.

## YOU CAN PLAY 3 NEW GAMES WITH YOUR WORDRACE

### DISKETTE:



The next disk in the WORDRACE System. Use it along with your WORDRACE disk to play:

- CLAIM TO FAME (600 famous people in history)
- SPORTS DERBY (600 pieces of sports trivia)
- Plus more vocabulary words

\$19.95

Requires WORDRACE disk

## WORDRACE ACCESSORY #1

**DON'T ASK**  
COMPUTER SOFTWARE  
INC.

2265 Westwood Blvd., Ste. B-150  
Los Angeles, California 90064.  
(213) 397-8811

Dealer inquiries welcome

**ATARI OWNERS**  
have insatiable appetites  
for TASTY NEW TILOBITS—and—

**1 STOP**

**SOFTWARE STORES**  
for the ATARI 400/800\*

has JUST the CUISINE!!

**DEALER INQUIRIES INVITED**

**BYTE INTO**



is a professional Business Package which for a period of six months has been used by retailers throughout the United States and Canada.

**REPORTS**

- COST AVERAGING
- PROFITS
- COST OF GOODS SOLD
- PHYSICAL CHECK LIST
- RETAIL PRICE LIST
- TURN REPORT
- CUSTOMER BACK ORDER
- VENDOR BACK ORDER
- PURCHASE ORDERS
- RECEIVING RECORDS

**FEATURES**

- DEFINABLE PASSWORD OPER.
- 40 COLUMN CASH RECEIPT
- 80 COLUMN CASH RECEIPT
- MACH. LANG. ROUTINES
- SUPPORTS 1 OR 2 DRIVES
- COMPLETE INV. CONTROL
- INVOICE NUMBERING
- 48K - 700 ITEMS
- 32K - 350 ITEMS

**\$199.95**

**65,132 BYTES OF**



**ACCESSIBLE MEMORY**  
for the ATARI 400/800  
personal computer

- Utilizes 64K RAMS
- Plug In Installation for the 800 Provides up to 96K RAM
- Compatible With All Languages and the New B-ROMS
- Access is as Simple as a Poke or Store Command

**\$349.95**

**Orderline: (303) 427-9036**

VISA And MC Accepted  
\$2.00 Shipping and Handling  
Please add \$1.50 for COD

COLO. RES., PLEASE ADD 6.5% TAX

\*ATARI is a registered trademark  
of ATARI, INC.

**CRUNCH ON  
SHERLOCK**



**ALL THIS IN ONE  
POWERFUL PACKAGE**

**FEATURES:**

- Disk-Disassembler
- Mach. Language Speed
- Sector Dump in HEX or ASCII Formats
- Change/Delete Bytes in Sectors
- Complete Map of Standard and Non Standard Sectors
- Works With All Formats
- Byte Search Capabilities
- Sector by Sector Disk Copy Utility

by THE **4<sup>th</sup> Works**  
ONLY **\$49.95**

**COPYCAT**

**High Performance  
Disk Copier**

- Handles Non-Standard Formats
- All Machine Language
- Super-Fast Execution
- Supports 1 or 2 Drives

**\$29.95**

**Cassette  
Checkbook**

**Balancer Program**

- Multiple Accounts
- Creative Use of Graphics

**\$14.95**

**FIRST BORN IN 1978!**



the original & continuously updated

**CCA  
Data Management  
System**

Now Available For Atari Computers	\$ 99.50
For Apple Computers	150.00
For CPM Based Computers	225.00

**CCA Data Management System**

**Uses**

- Long record lengths
- Up to 24 fields per record
- Not Copy Guarded
- Alpha numeric items
- Numeric only items
- Add, update, scan, etc. files
- 10-Level sort ascending, descending, allows alphabetizing data file.
- Contact your local dealer for details or write us for our catalog



DIVISION OF CUSTOM ELECTRONICS, INC.  
**SOFTWARE**

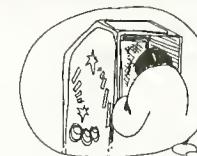
238 Exchange St., Chicopee, Massachusetts 01013  
(413) 592-4761

Mastercard & VISA Accepted

- Dealer And Distributor Inquiries Invited
- Closed Mondays — Open Daily 'Til 5:30 — Fridays 'Til 8

Introducing the

**BAYLIS BIG STICK**



- Arcade tough
- Left or right hand models available
- 7"x8"x3"
- \$59.95 suggested retail



The BAYLIS BIG STICK for Atari® and Vic-20® computers by R. Allen Baylis.

Available at Computer Store Int'l. Glendale, CA and other fine dealers.



Released through Torrey Engberg Smith Co.  
P.O. Box 1075, Glendale, CA 91209 (213) 247-6484.  
Dealer and distributor inquiries welcome.

**HIGH  
COUNTRY  
MICROSYSTEMS**

P. O. Box 21147  
DENVER, CO. 80030

## CALIFORNIA

### THE SOFTWARE STORE

11768 West Pico  
Los Angeles, CA 90064  
213-473-1136

*Software for ATARI computers. APX—third party—ATARI books—magazines.*

### HW COMPUTERS

19511 Business Center Drive  
Northridge, CA 91324  
213-866-9200

*Full line of personal computers. Atari, TRS-80, Fortune, NEC, California Computer Systems. Complete line of software and hardware. Authorized Service Center. Other locations: Westwood, Redondo Beach and Palm Springs.*

### FOOTHILL COMPUTER

949 West Foothill Blvd.  
Upland, CA 91786  
714-985-3278

*ATARI computers & software—peripherals—books—magazines.*

### DIMENSIONAL SOFTWARE

3954 Clairemont Mesa Blvd.  
San Diego, CA 92117  
714-275-4243

*Software/books/peripherals/hardware*

### SOFTWARE EMPORIUM

4500 El Camino Real  
Los Altos, CA 94022  
415-941-8788

1800 S. Bascom Ave.  
Campbell, CA  
408-377-9311

*Complete software selection for ATARI, Apple, Tandy, IBM, CP/M, books, magazines, games.*

### SUNSET COMPUTERS

2329 Irving  
San Francisco, CA 94122  
415-665-7378

*ATARI hardware, software, peripherals. Repairs—Northstar, Franklin, Osborne, Kaycomb. Books, magazines.*

### DATA BANKS

3820 Peralta Blvd.  
Fremont, CA 94536  
415-790-1060

*Hardware/software/services/peripherals and a full line of supplies for all ATARI products.*

### 3E SOFTWARE AND SYSTEMS

22708 Mission Blvd.  
Hayward, CA 94541  
415-537-3637

*Complete ATARI support center for hardware and software. ATARI, AXLON, OKIO DATA, BIT 3, ALIEN, GROUP, BMC, PID, SYNAPSE, ON-LINE, SWIFTY, EPYX, GEBELLI, DATASOFT, BRODERBUND, OS, SIRIUS, OSS, EPSON, ARTWORKX, & MORE.*

### P.C. COMPUTERS

10166 San Pablo Ave.  
El Cerrito, CA 94530  
415-527-6044

*Software/books.*

# GOTO DIRECTORY

### COMPUTERLAND

1815 C Ygnacio Valley Rd.  
Walnut Creek, CA 94590  
415-935-6502

*Wide selection of software for ATARI. Programming seminars. IBM & Altos computers. Books, magazines.*

### ELECTRONIC FANTASY

2078 Vallo Fashion Park  
Cupertino, CA 95014

*ATARI computers & large selection of software. Repairs.*

### THE SOFTWARE CENTER

4720 Geary Blvd.  
San Francisco, CA 94118  
415-751-2231

*An authorized ATARI dealer with the largest selection of ATARI software in S.F. Cartridges, tapes, discs, memory cards, joysticks, books, magazines, games.*

### CONNECTICUT

#### THE COMPUTER CENTER

Milrock Rd.  
Old Saybrook, CT 06475  
203-385-1587

*ATARI hardware & software. Programming seminars, books, magazines, T.I., Northstar & Altos. Programmers wall chart available. Call or write for details.*

### EASTERN ELECTRONICS

1207 Meriden-Watby Rd.  
Middletown, CT 06467

*ATARI hardware & software, games, business applications, magazines and books. User group meets here.*

### FLORIDA

#### ORANGE BLOSSOM HOBBIES

1975 N.W. 36th St.  
Miami, FL 33142  
305-633-2522

*Hardware/software/peripherals.*

### IOWA

#### COMPUTER COUNTRY

725 14th St.  
Marion, IA 52302  
319-377-9437

*ATARI hardware, peripherals, software, games, business applications. magazines, books.*

### ILLINOIS

#### COMPLETE COMPUTING

890 E. Roosevelt Rd.  
Lombard, IL 60148  
312-620-0808

*Best selection of ATARI software in western suburbs. 10% discount software club. Superb selection of books, magazines. Basic and advanced programming classes. Excellent technical support for ATARI. Loves bad puns.*

### MARYLAND

#### A-BIT-BETTER SOFTWARE

Post Office Box 28  
Laurel, MD 20707  
301-953-7256

*A-Bit-Better Software offers you an extensive variety of exciting programs for your Atari 400/800. Quality is a must, and our reasonable prices give us the edge. Write for free catalog.*

#### FREDERICK COMPUTER PRODUCTS

5726 Industry Lane  
Frederick, MD 21701  
301-694-8884

*ATARI hardware & great selection of software from many manufacturers. ATARI & other peripherals.*

### MICHIGAN

#### BINARY CORP.

3237 Woodward Ave.  
Berkeley, MI 48072  
313-548-0533

*ATARI hardware & software. FASTCHIP and The Terminal program. ATARI & other peripherals. Books & magazines.*

### NEVADA

#### COMPUTER CENTER

3310 S. Jones, Suite D  
Las Vegas, NV 89102  
702-873-5055

*ATARI computers, peripherals. Large selection of business applications & game software.*

### NEW JERSEY

#### EARTHRISE COMPUTER CENTER

6 Green Village Rd.  
Madison, NJ 07940  
201-377-4084

*ATARI, NEC, Franklin computers. Complete software selection. Computer classes.*

#### SOFTWARE ASYLUM, INC.

626 Roosevelt Ave.  
Carteret, NJ 07008  
201-969-1900

*Also Old Bridge  
201-536-1401*

*We ARE ATARI! NJ's largest retailer of Atari programs for 400/800 models; over 400 programs available from more than 60 manufacturers. Send for our latest catalog — only \$2.00 (refundable as credit with purchase).*

### NEW YORK

#### LEIGH'S COMPUTER WORLD

212 E. 85th St.  
New York, NY 10028  
212-879-6257

*ATARI hardware, software, books. Magazines, programming classes. Apple & Sinclair.*

### THE VIDEO CONNECTIONS

27 Merrick Ave.  
Merrick, NY 11566  
516-576-5050

*ATARI software, books, magazines. Mention this listing for a special discount on ATARI software.*

### OHIO

#### BARNHART STORES

548 N. Main  
Urbana, OH 43078  
513-653-7257

*Hardware/software/service/peripherals.*

#### VIDEO DEPOT

1278 Euclid Ave.  
Cleveland, OH 44115  
216-696-3588

*ATARI computers. Excellent selection of ATARI software. Books & magazines.*

#### COMPUTER CORNER

5104 Mayfield Rd.  
Lyndhurst, OH 44124  
216-473-5010

*ATARI hardware & software for games & business applications. Basic and advanced programming classes. Authorized service center for ATARI, Commodore, Eagle and Epsom.*

#### DATA MANAGEMENT SYSTEM

2979 West Market St.  
201 S. Main St.  
Akron, OH 44308  
216-666-3226

*Factory authorized dealer/repairs. Software development marketing.*

### OKLAHOMA

#### THE COMPUTER MART

9726 East 42nd St.  
Tulsa, OK 74145  
918-664-8452

*ATARI computers & software. Northstar & Victor computers. Books & magazines.*

### UTAH

#### THE SOFTWARE HUT

470 E. 200 South  
Salt Lake City, UT 84111  
801-355-0066

*Hardware/software/peripherals.*

### WASHINGTON

#### PROGRAMS PLUS

16874 Southcenter Pkwy.  
Tukwila, WA 98188  
206-575-1375

*Software, books & peripherals.*

#### ROB ROY COMPUTER

1109 W. Yakima Ave.  
Yakima, WA 98902  
509-575-7704

*Hardware, software, repair. ATARI & Northstar computers. Business, applications & game software. Authorized ATARI service.*

# SUBSCRIBE

# Antic™

The ATARI® Resource

I would like to subscribe to ANTIC for

- 1 Year (6 issues) Please enclose \$15.
- 2 Years (12 issues) Please enclose \$27.

Make check or money order payable to:

ANTIC Publishing  
297 Missouri Street  
San Francisco, CA 94107

Please check where appropriate:

I own:

- |                                |                                    |                                   |
|--------------------------------|------------------------------------|-----------------------------------|
| <input type="checkbox"/> 400   | <input type="checkbox"/> Cassette  | <input type="checkbox"/> Printer  |
| <input type="checkbox"/> 800   | <input type="checkbox"/> Disk      | <input type="checkbox"/> K Memory |
| <input type="checkbox"/> Modem | <input type="checkbox"/> Interface | Start with issue # _____          |

Foreign rates via air mail payable in U.S. dollars are:

	6 issues	12 issues		6 issues	12 issues
CANADA	\$25	\$46	SOUTH AMERICA	\$33	\$63
MEXICO	\$27	\$50	AUSTRALIA	\$40	\$76
EUROPE	\$33	\$63	NEW ZEALAND	\$40	\$76

Foreign rates via surface payable in U.S. dollars are  
\$21 for six issues, \$39 for twelve issues.

Single copy back issues available at \$4.00.

Name \_\_\_\_\_

Street \_\_\_\_\_

City, State \_\_\_\_\_

Zip \_\_\_\_\_

## !!COMING NEXT ISSUE!!

### HOLIDAY ISSUE

BUYERS GUIDE

PRODUCT SURVEY

CHRISTMAS GREETING FOR YOUR SCREEN

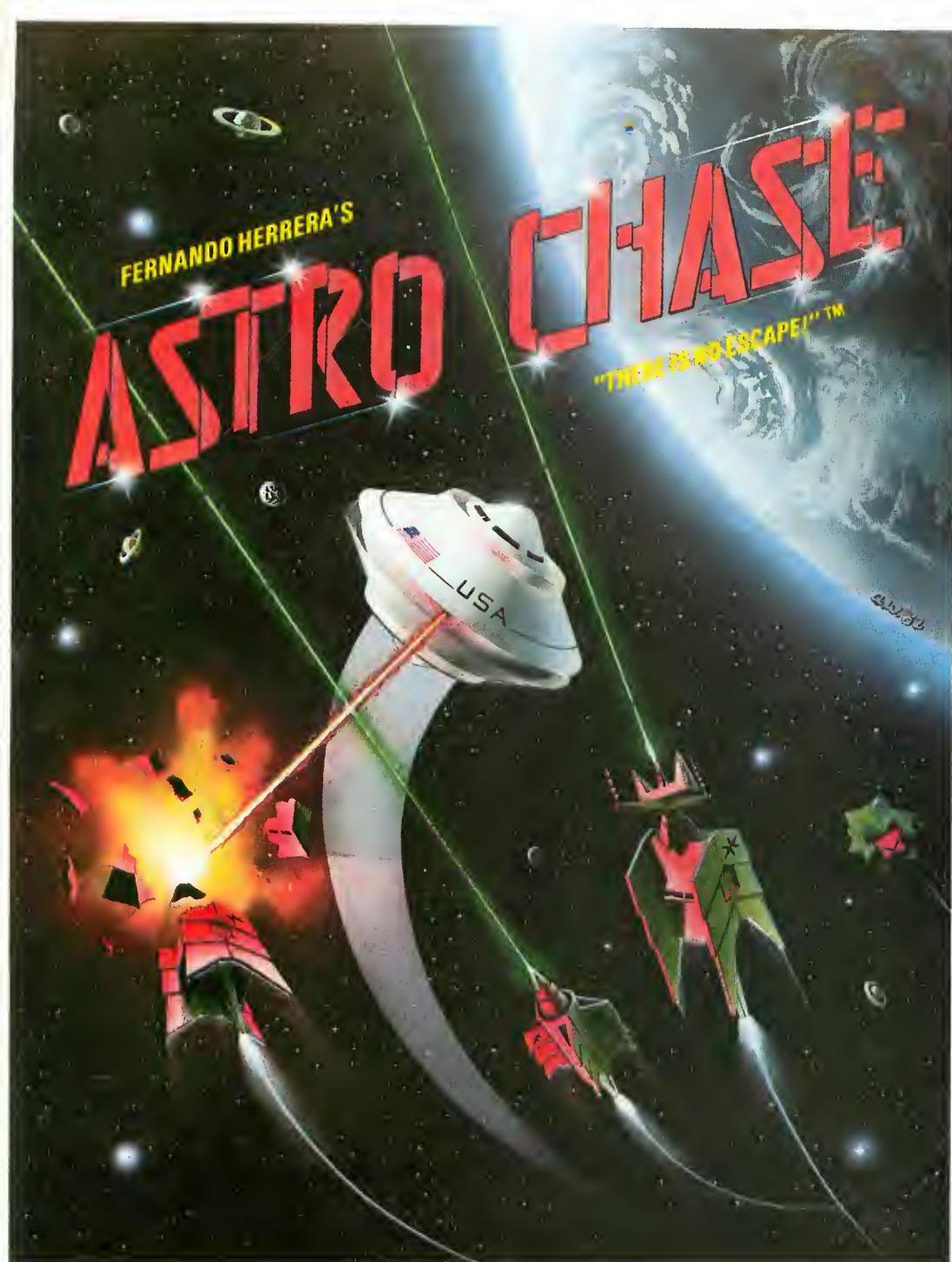
HOLIDAY LIGHT SHOW

DRAGON SMOKE BY BOB ALBRECHT

## ADVERTISERS

ACE .....	71
ADVENTURE INTERNATIONAL .....	7,40
AMULET .....	73
ALIEN GROUP .....	51
ATARI .....	IFC
BIG .....	71
BINARY .....	21,22
BIT-3 .....	72
BRAM .....	53
BRODERBUND .....	60
CALISTO .....	72
C.E. ELECTRONICS .....	76
COMPUTE .....	39
DON'T ASK .....	55,75
EASTERN HOUSE .....	46
EDUCATIONAL SOFTWARE .....	35
EL COMP .....	67
FIRST STAR .....	IBC
GREENBRIAR .....	13
HAPPY COMPUTING .....	69
HIGH COUNTRY .....	76
FRONTRUNNER .....	73
INTEC .....	43
KBL .....	73
LJK .....	17
L&S .....	43
MACROTRONICS .....	54
MED SYSTEMS .....	26
MICRO BITS .....	73
MICROPERIPHERAL .....	75
MICROPROSE .....	70
MIGHTY BYTE .....	54
MILLIKEN .....	31
MMG .....	70
MPI .....	64
MOSAIC .....	3
NEOTECHNIC .....	75
NUDMEHI SOFTWARE .....	47
ON-LINE SYSTEMS .....	BC
OPTIMIZED SYSTEMS SOFTWARE .....	24
PCA .....	36
PERCOM .....	5
PRETZEL .....	52
RESTON PUBLISHING .....	8
SCREEN SONICS .....	74
SAR-AN .....	74
STREET ELECTRONICS .....	29
SWIFTWARE .....	20
T.H.E.S.I.S. .....	43
TINY TECH .....	71
TORRE SMITH .....	76
VERVAN SOFTWARE .....	71
WESTON SOFTWARE .....	30

**NEW**



### Fernando Herrera Strikes Again!

In **ASTRO CHASE**, his first program since winning the ATARI® STAR AWARD, Fernando delivers: Fast, Super, ARCADE GRAPHICS ★ 100% MACHINE LANGUAGE ★ SMOOTH SCROLLING UNIVERSE (different for each new game) ★ AWESOME SOUND EFFECTS ★ NON-STOP ACTION ★ MULTI-DIRECTIONAL FIRING ★ INTELLIGENT ENEMY ATTACK SHIPS ★ SINGLE THRUST PROPULSION™ ★ INVISIBLE FORCE FIELDS ★ MULTIPLE SKILL LEVELS ★ Many more INNOVATIVE and UNIQUE features.

FOR THE

**ATARI®**  
HOME COMPUTER  
**32K**  
"When being first counts...we're number one"

**"THERE IS NO ESCAPE!"**

Ask for FIRST STAR SOFTWARE at your local dealer.  
Retail and Distribution inquiries invited.

**DISK AND TAPE \$29.95\***  
(CARTRIDGE COMING SOON)

**COSMIC SQUEEZE™**  
by Jason Pomerantz  
graphics by Fernando Herrera

To Order:  
Call TOLL FREE 800-223-1545  
nationwide except in New York  
phone 212-889-1073



When using your MASTER CARD or VISA please have ready:  
your card number & expiration date.

Send your check or money order  
for \$29.95\* plus \$2.00  
shipping and handling to:  
First Star Software, Inc.  
22 East 41st Street  
New York, NY 10017

When ordering, please specify  
DISK or TAPE

\*New York residents please add  
7% sales tax.

**FIRST**  
**STAR**  
SOFTWARE INC

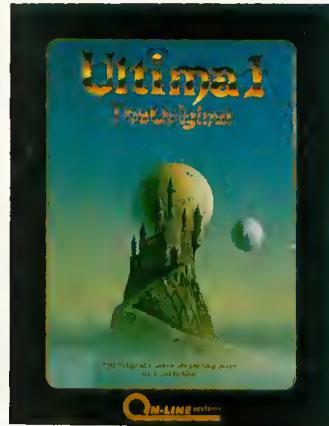
ATARI® is a registered trademark of Ateri, Inc.

Single Thrust Propulsion™ is a registered trademark of First Star Software, Inc.

**ASTRO CHASE**, "there is no escape!"™ is a registered trademark of First Star Software, Inc.

**COSMIC SQUEEZE™** is a registered trademark of First Star Software, Inc. ©, 1982 First Star Software, Inc.

# ULTIMA COMES TO ATARI



## ULTIMA COMES TO THE ATARI!

Now you can follow the same path that thousands of Apple adventurers have explored and loved! Travel over land and sea, explore deep dark dungeons, and journey the vastness of space. When you have battled all the evil monsters and foes in your path, then your biggest conflict will begin... You will need all of your strength, knowledge and wisdom to

overcome the mighty wizard MONDAIN! Lord British welcomes all Atari owners into his magical realm, and wishes you the best of luck.

ULTIMA is available at your local computer store for \$39.95 or order directly from SIERRA ON-LINE INC, 36575 Mudge Ranch Rd. Coarsegold, CA 93614, (209) 683-6858.

## SIERRAVENTURE

Sierra  
ON-LINE INC