

REFERENCE

TWO DOLLARS  
VOLUME ONE  
NUMBER 2  
1980

# nibble

THE REFERENCE FOR PERSONAL COMPUTING

Reference

## SPECIAL GAMES ISSUE!

### ☐ APPLE STAR ATTACK!

Very High Speed Arcade Action.  
7 Hi-Res Targets! Multi Shots!  
Friends and Foes!

### ☐ AIR-SEA BATTLE!

Join The Navy! Join The Air Force!  
Low Resolution, High Action Conflict  
Using Apple-Shape-Writer!

### ☐ WRITING GAMES THAT LAST!

10 Methods/Techniques To Give  
Your Games Staying Power!

### ☐ LOW RESOLUTION APPLE-SHAPE-WRITER!

Simple, Fast Shape Generation and Use  
with Assembly Language Drivers.





INTRODUCES

## ELECTRONIC DESIGN FOR THE APPLE

It's been a long time coming, but it's finally here!  
Free yourself from the tedious and time consuming calculator calculations  
involved with the design of electronic circuits.  
The following are a list of the calculations supported in the package.

High-Resolution graphics representations of all the filter circuits are shown

OHM'S Law Formulas (find any variable)  
DC Power Formulas (find any variable)  
Kirchhoff's Voltage Law  
Kirchhoff's Current Law  
Total Resistance (up to 10 resistors)  
Total Capacitance (up to 10 capacitors)  
Charge Stored in a Capacitor  
Energy Stored in a Capacitor  
For Voltage Across Series Capacitors  
Total Inductance (up to 10 inductors)  
Voltage Regulation

Capacitive Reactance  
Inductive Reactance  
Impedance and Phase Angle for Resistance & Inductance in Series  
Impedance and Phase Angle for Resistance & Capacitance in Series  
Impedance and Phase Angle for Inductance & Capacitance in Series  
Impedance and Phase Angle for Resistance & Inductance in Parallel  
Impedance and Phase Angle for Resistance & Capacitance in Parallel  
Impedance and Phase Angle for Resistance, Inductance, &  
Capacitance in Series  
Impedance and Phase Angle for Inductance & Capacitance in Parallel  
Impedance and Phase Angle for Resistance, Inductance &  
Capacitance in Parallel  
Impedance and Phase Angle for Inductance & Series Resistance in  
Parallel with Resistance  
Impedance and Phase Angle for Inductance & Series Resistance in  
Parallel with Capacitance  
Impedance and Phase Angle for Capacitance & Series Resistance in  
Parallel with Inductance & Series Resistance

Mutual Inductance  
Coupled Inductance of Inductance in Parallel (with Fields Aiding)  
Coupled Inductance of Inductance in Parallel (with Fields Opposing)  
Coupled Inductance of Inductance in Series (with Fields Aiding)  
Coupled Inductance of Inductance in Series (with Fields Opposing)  
Coupling Coefficient for 2 Inductively Coupled Coils  
Energy Stored in an Inductor  
Q of a Coil where Resistance & Inductance are in Series  
Q of a Capacitor where Resistance & Capacitance are in Series  
Q of a Capacitor where Resistance & Capacitance are in Parallel  
Resonance  
Admittance of a Series Circuit  
Susceptance of a Series Circuit  
Power Factor  
Average, RMS, Peak, & Peak-Peak Conversions  
Time Constants (on charge or discharge)  
Transformer Formulas

Constant - K Lowpass T - Section Filter  
Constant - K Lowpass L - Section Filter

Constant - K Lowpass PI - Section Filter  
Constant - K Highpass T - Section Filter  
Constant - K Highpass L - Section Filter  
Constant - K Highpass PI - Section Filter  
Constant - K Bandpass Filter  
Constant - K Bandreject Filter  
Series M - Derived Lowpass T - Section Filter  
Series M - Derived Lowpass L - Section Filter  
Series M - Derived Lowpass PI - Section Filter  
Series M - Derived Highpass T - Section Filter  
Series M - Derived Highpass L - Section Filter  
Series M - Derived Highpass PI - Section Filter  
Shunt M - Derived Lowpass T - Section Filter  
Shunt M - Derived Lowpass L - Section Filter  
Shunt M - Derived Lowpass PI - Section Filter  
Shunt M - Derived Highpass T - Section Filter  
Shunt M - Derived Highpass L - Section Filter  
Shunt M - Derived Highpass PI - Section Filter

### (VACUUM TUBE FORMULAS)

Amplification Factor  
AC (Dynamic) Plate Resistance  
Mutual Conductance (Transconductance)  
Gain of an Amplifier Stage

### (TRANSISTOR FORMULAS)

Input Resistance  
Current Gain  
Voltage Gain  
Output Resistance  
Power Gain  
Alpha (Current Gain of the Common-Base Configuration)  
Beta (Current Gain of the Common-Emitter Configuration)  
To find (Alpha) with Beta given, or to find (Beta) with Alpha given

Impedance of a Coaxial Line  
Attenuation of a Coaxial Line  
Impedance of a Parallel Conductor  
Percent of Amplitude Modulation  
Side Band Power of an A-M Carrier  
Total Radiated Power  
Percent of Modulation in an F-M Carrier  
Modulation Index of an F-M Carrier  
Number of Decibels corresponding to a given power ratio  
Number of Decibels corresponding to a given voltage or current when the  
impedances across which the signals are being measured are equal.  
Number of Decibels corresponding to a given voltage or current when the  
impedances across which the signals are being measured are unequal

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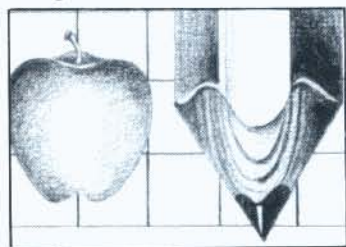
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Simple, Detailed Instructions for Building Full Game Control into your System!

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## APPLE STAR ATTACK!

Very high speed Arcade Action. 7 Hi-Res Targets! Multi-Shots! Friends and Foes!

☐ PADDLE READING IN ASSEMBLY LANGUAGE  
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☐ INSIDE RANDOM NUMBERS  
Generating and Managing Randomness in Assembly Language.  
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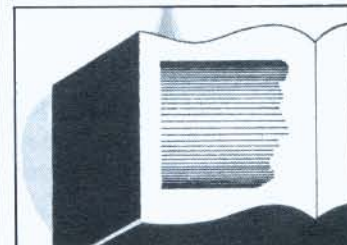
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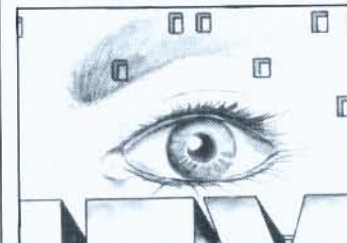
☐ NEW APPLE PRINTING FOR "WHATSIT"  
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nibble

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The other day, I had a call from one of the executives of another magazine for micro-computing. During the course of our conversation he asked the question:

"Isn't NIBBLE a direct competitor to my magazine, 'XYZ MICRO'?"

Let me tell you my answer.

Taken from one perspective, everyone in the micro-publishing field is in competition with everyone else for the attention of you, our readers and subscribers. From a different point of view, however, all of us are trying to expand the industry. I believe, for example, that there is no monopoly on creative problem-solving with microcomputers. Furthermore, as the growth of the industry continues, there will be no monopoly on the sources of quality software for micros and other computers. In other words, there is "Room for One More software source". There is probably room for a great many more.

Software/Publishing is a unique business. Competent and professional software development calls upon all of the business and technical disciplines of the hardware industry. Development, Documentation, Testing, Maintenance, and Marketing skills are virtually indistinguishable between hardware and software (although the physical production methods for software are clearly easier).

If you are an "industry observer", you'll notice that computer hardware is going the way of the electronic calculator. Over time, it will become increasingly hard to tell the difference between the hardware offerings of different manufacturers. Software will become the basis for product-differentiation. Software will literally define the hardware.

It's indicative, in the large-scale main-frame business, that more than 600 software companies operate profitably by providing quality products for IBM, Univac, Burroughs, Honeywell, etc. computer systems.

Before the founding of Micro-SPARC and NIBBLE, I was at one time, the president of a \$35 million computer software and services company. I went on to become president of a \$70 million international data terminals company. I worked for IBM for more than 5 years and, in one year, had the top sales record in the company. I worked for Xerox for nearly 7 years and during one of the several jobs I had at Xerox, I did the long-range planning for the Office-of-the-Future. All of this is simply to say that I've seen our industry grow from nothing to something significant and I've seen software consistently at the leading edge.

*"There is no monopoly  
on creative problem-solving  
with microcomputers,  
and there is room for  
one more software source"*

NIBBLE's dominant thrust is in providing competent professional software — inexpensively — to add value to your investment in microcomputing. Also, since a great many of you will hopefully contribute your talents and skills to helping our industry to grow, NIBBLE's first attention is to YOU — our Subscribers!

We are competing with other magazines, in a sense, for your attention, support, and subscriptions. But at the same time, NIBBLE is in a different market "niche" from our "competitors".

NIBBLE's philosophy is to provide complete and professional software — both programs and techniques. NIBBLE also is a reference for hardware, new products, and other news, but it is principally Software which drives our industry. It is software which principally drives NIBBLE.

Taking this approach carries with it, some degree of risk. When we print a program of significant size, you simply may not want to take the time and effort to enter it into your system. In those cases, we will generally offer the key programs in each issue on Disk for a nominal charge. We are also acutely aware and sensitive to the fact that if and when you DO take the time to enter a NIBBLE program into your system, you'd better have a program which *works* and one that delivers sufficient value to have made it "*worth the effort*." At NIBBLE we understand that. We will not arbitrarily turn away program submissions because "they are too long". If an article and program deliver value and if they show evidence of having been tested (as well as having been tested on our own systems), we will seriously consider publishing it.

There IS room for one more.

In this issue, for example, there are two relatively lengthy and comprehensive game programs — one in high-resolution and the other in low-resolution graphics. Each is worth the effort to enter into your system.

STAR ATTACK is an extremely fast hi-res game which "space-ifies" one of the popular arcade games. It makes use of the programming methods and disciplines described in the article "How To Write Games That Last", in order to make it an enduring part of your library.

A second game, AIRSEA BATTLE, makes use of a new "Low-Resolution Shapewriter" to overcome the tendency of low-res graphics to slow down the action (drawing and erasing game shapes). It too, should provide hours of enjoyment to the user.

Almost as important, is the array of articles which describe How To Use the programming techniques in your own programs. Therein, is our uniqueness. New programs. New methods. Reviews. And views. That's ADDING VALUE to your investment in microcomputing. It complements, rather than fighting, the offerings of other publications.

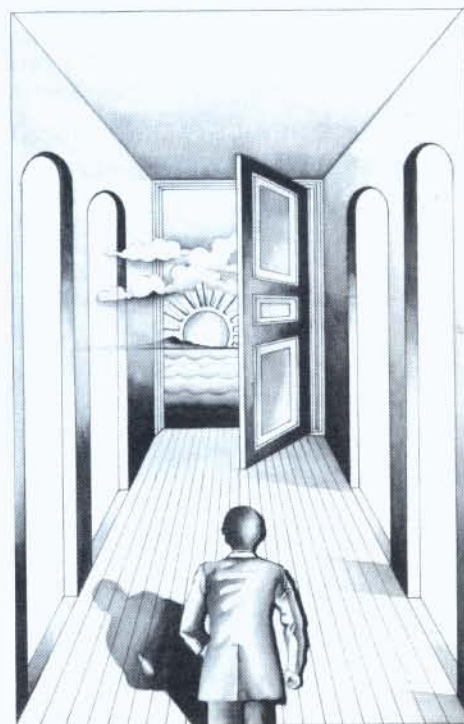
In our Hardware Section of this issue, we're showing the novice HOW TO BUILD two inexpensive (approx. \$15) JOYSTICKS for the Apple. There have been articles on this subject in other magazines over the years. What makes this one worthwhile is that we show you literally how to wire the devices (without having to read electrical schematics).

"HOW TO WRITE GAMES THAT LAST" gives tips and methods for substantially enhancing your game programs and projects. It gives some insights into game theory and how people play games. Armed with that knowledge, your game programs should be richer, more lasting, and more interesting to the people who play them.

The "message" is this: We are at the threshold of micro-computing potential. We are in an applications-oriented world in which USING technology is the driving force for future growth. We are limited only by our own imaginations and creativity.

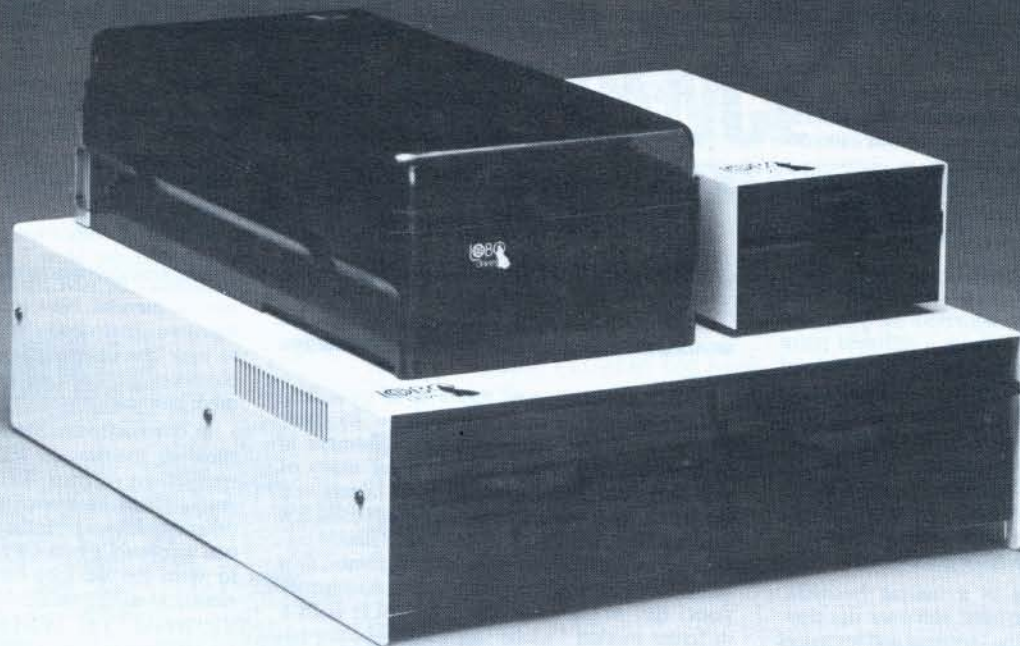
There IS room for one more!

Mike Harvey





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# LETTERS

Dear Mike,

*Congratulations!* With all the new publications proliferating our industry trying to ride the tide and make a few bucks at our expense, littering our mail boxes and round files, it was certainly a pleasure to receive the first issue of NIBBLE. It has been read and reread by myself, my co-workers and was star attraction at our recent club meeting. I was impressed not only by the magazine layout, graphics, illustrations, but equally by the content and selection of the articles.

This issue will certainly go on my reference shelf along with all future issues as long as you keep up to the fine standards you have set for yourself.

As far as suggested contents are concerned, I would like to see product review articles on new products being introduced for the first time and product comparison articles on similar items of hardware or software. I would also like to see a section on news (or rumors) which could effect us as users and consumers of personal computer products.

Keep up the good work — you have a good start.

Sincerely,

John W. Spencer  
Computer Case Company  
Columbus, Ohio

Dear Mike:

The first few attempts to run SPACE MAZE (NIBBLE Jan./Feb.) really frustrated me until I discovered that you have to have the paddle "centered" when you start. For your readers' information, the paddle values should lie between 75 and 150 (lines 210-240) at the beginning of the game.

Adding the following program statements will hold everything in equilibrium until the player has adjusted the paddles to the center position.

```
203 VTAB 21: PRINT "CENTER THE FIRST  
PADDLE": IF PDL(2)<75 OR PDL(2)>  
150 THEN 203  
204 VTAB 22: PRINT "CENTER THE SEC-  
OND PADDLE": IF PDL(1)<75 OR  
PDL(1)> 150 THEN 204
```

When each paddle has been centered, the program will start automatically.

Incidentally, I think NIBBLE is really good.

Lynn Smith,  
New York, N.Y.

**ED.** Thank you! SPACE MAZE was written on a system with spring-loaded joysticks (which automatically return to the center position at rest). Your additional statements answer the problem caused by the oversight.

Dear Mike:

I was quite impressed with your premier issue and will try to send you something from time to time. I certainly wish you the best of luck in your endeavor, and have enclosed a check for a subscription.

I sympathize with your annoyance with the difficulty in getting going with a Language Card system. I do not have a Pascal system but had the use of one for awhile, and discovered that I could leave the normal DOS ROM on the card. When Pascal was to be loaded, I loaded a boot routine from a standard disk and ran that. Of course, that doesn't solve the problem, merely transfers it to a use in which the extra step is less annoying to me. Furthermore, I have not used Pascal enough to be sure that the program ROM will never be needed. The program ROM is the lower of the two ROM chips that are changed when a language card is purchased, the one with the leads directly down to the connectors. The other controls some internal formatting; the Pascal version should be retained.

To solve the problem, it should be possible to write a version of RWTS to read and write Pascal sectors. Then a copy program could be written to copy thirteen sector disks onto a sixteen sector disk with a modified DOS. I rather expect we will see some such program soon, but I haven't heard anything about such efforts.

Again, the best of luck to you and your journal.

Richard F. Suitor  
Newton, MA

**ED.** Thanks Dick. We're still looking for a creative answer, but your insights give clearer understanding of the problem. The kind words about NIBBLE were also appreciated, and I look forward to the chance to see some of your work in NIBBLE.

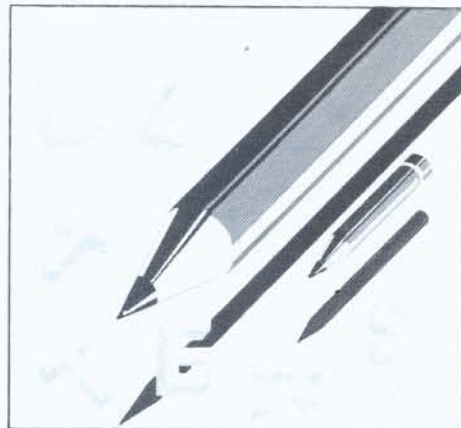
Dear NIBBLE:

You should have pointed out that "Six Hi-Res Colors" (your Construction Project in the first issue) is appropriate only to older Apple II's. New machines have 6 Hi Res colors as a standard feature.

S. Jenkins  
Los Angeles, Ca.

**ED.** We did mention it, but you're right. The fact is that "6 Colors" has been incorporated into current production Apples and it should have been better high-lighted. Here's a little program to test for the presence or absence of 6 colors.

```
10 HGR: FOR X=0 TO 7  
20 HCOLOR=X  
30 HPLLOT 0,X*3 TO 100, X*3  
40 NEXT X: END
```



Dear Mike:

What sort of things are you looking for in NIBBLE? How should I format an article and submit it? Do you pay an "Honorarium" or what?

P.R. WHITE  
Dallas, Texas

P.S. I like the magazine!

**ED.** I'm glad you like NIBBLE, and I'm glad you asked the question. As you can see from the first issue, NIBBLE is formatted with one or more "Major", "Medium", and "Short" programs. A Major program will typically involve a feature article about "How It Works" and "How to Use It". Then there should be a number of shorter, "sub-articles" describing how to Customize the program and how the programming methods can be used in other kinds of applications.

Medium and Short programs should follow the same general outline, only they will obviously be shorter.

Other kinds of articles can center on Hardware projects, Languages, Reviews, and generic subjects of broad interest and value to our readers.

We try to focus on a major theme in each issue. Some of the themes we'll feature this year are:

GAMES  
TEXT PROCESSING  
SIMULATION  
DATA BASE MANAGEMENT

Articles should be typed, double-spaced. Program Listings should be on white paper, and should be printed with a new dark ribbon.

If your "Major" or "Medium" program is accepted for publication, we may ask you to send a copy on tape or diskette (for which we will compensate you).

In answer to your question on Author compensation, we believe our Author rates are comparable to the big magazines in the personal computing field. In brief, we will pay well for high quality.

I hope this helps. We would like very much to see your articles and programs!



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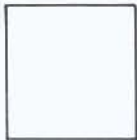
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INDUSTRIES





# GRAPHICS

## Low Resolution APPLE Shape-Writer

Graphic display is one of the Apple II's most distinctive and powerful features. While High-Resolution software exists for all kinds of Shape creation and manipulation, don't overlook the power of Low-Resolution Shape Management for speeding up and making your games more interesting. With the Basic and the Assembly Language program contained in this article, you can easily and quickly create Lo-Res Shapes, store them in memory, and scan them across the screen to demonstrate the speed of "Erase" and "Draw". It's fast!

In loading the programs, note that the Assembly Language program resides in Hex memory locations \$800-86F (2048-2159 decimal).

A suggestion is to set LOMEM to 4096 to reserve space for the program and for the Shapes themselves.

A further suggestion is to store the shapes in the memory block beginning with Hex \$900 (2304 decimal) but more about this later.

For the time being, simply set:  
LOMEM:4096  
and  
LOAD LO-RES SHAPEWRITER. Then load the Assembly Language beginning at \$800.

### HOW IT WORKS

Lo-Res Shapewriter, the Basic program, begins with instructions on the screen as follows:

#### LOW RESOLUTION SHAPE WRITER

THIS PROGRAM ALLOWS YOU TO USE THE KEYBOARD TO CREATE LO-RES GRAPHIC SHAPES.

U=UP D=DOWN R=RIGHT  
L=LEFT F=FINISH

YOU CAN TURN PLOT ON/OFF BY PRESSING P.

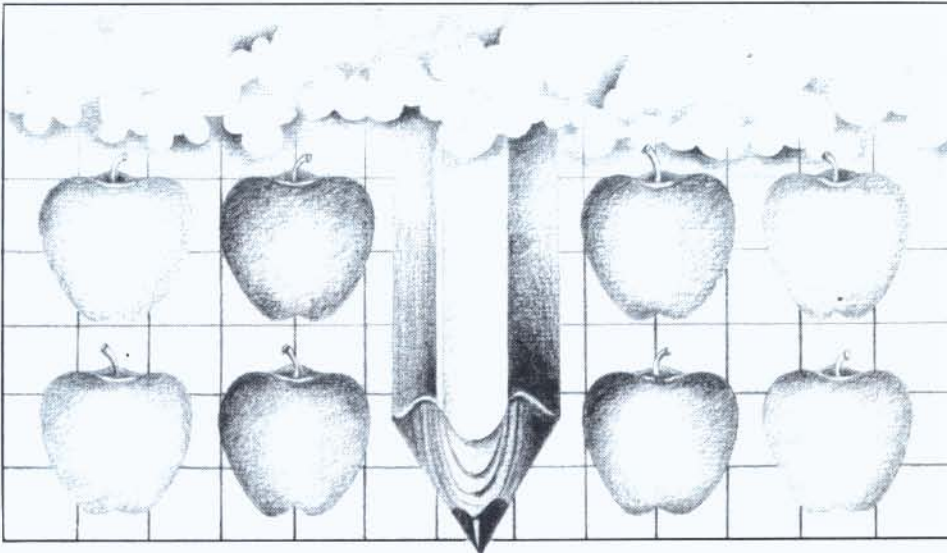
AFTER ENTERING THE SHAPE, THE PROGRAM GIVES INSTRUCTIONS FOR SAVING IT, AS WELL AS THE ADDRESS OF THE SHAPE FOR USE IN YOUR OWN PROGRAM.

ENTER STARTING ADDRESS IN DECIMAL: 2304

In this case, we have entered starting address 2304 (Hex \$900) since that area has been blocked off and protected.

Now it is simply a question of plotting your shape using the instructions. The program uses a very simple code to POKE the shape moves into memory.

ACTION	NO PLOT	PLOT
UP	1 (\$1)	10 (\$A)
DOWN	2 (\$2)	11 (\$B)
RIGHT	3 (\$3)	12 (\$C)
LEFT	4 (\$4)	13 (\$D)



The Shapewriter will automatically plug the shape codes into memory as the shape is plotted on the screen. Shape plots can be erased by turning off the plot and back-spacing (but this is, of course, inefficient and time-consuming). It's a good idea to test your shape and then try to enter it in a smooth continuous plot.

When the shape has been created, pressing 'F' causes several things to happen. First the program puts a '0' in memory as the final position of the shape. Next, it calculates and formats a BSAVE statement for you to save the shape on Disk. For the example above, assuming a 20 point shape, the screen would look like this:

SHAPE COMPLETED. TO SAVE ON DISK,  
USE:  
BSAVE (NAME) ,A 2304 ,L 21  
SHAPE ADDRESS: LO= 0 HI= 9

The length of the shape is 21 because of the '0' as the final character in the shape table. Typing in the Disk statement will cause the shape table to be immediately stored.

Note also, that the Lo and Hi addresses have been given. These addresses are the Decimal Equivalents of the Lo Order Byte and the Hi Order Byte which start the shape table. These addresses will have to be POKEd into the shape writing Assembly Language program to tell it where to find the shape in memory. They should be written down for reference in your own graphics program later.

Now, you'll observe that the Shape you have created will scan across the screen 4 times before coming to rest in the lower right corner of the screen. This is to demonstrate the speed of the Shapewriter as well as to verify that the shape has been entered as you planned.

### THE ASSEMBLY LANGUAGE PROGRAM

The Assembly Language program for Shapewriter is what actually plots the Shape on the screen. This program will be used WITH YOUR BASIC GAME PROGRAMS to draw

the shapes you need. It's useful to think of it as a Lo-Res counterpart to the Hi-Res Routines which came with your Apple.

#### Here's how it works.

The starting address of your Shape Table is stored in Hex \$803 and \$804 (2051 and 2052 decimal). You will POKE the Shape addresses into these locations with the LOW address going into 2051 and the HIGH address going into 2052 in order to DRAW your shape on the screen.

There are three other important POKES to consider now: X coordinate, Y coordinate, and COLOR. The Shape Assembly Language program uses memory location 5 for 'X', location 6 for 'Y', and location 8 for COLOR. Poking memory 5 and 6 establishes the position on the screen where you want to draw the shape.

Poke the X and Y positions with the standard 0-39 screen positions.

COLOR designation is a little tricky. For some reason, the Apple Monitor routines need to have the color code duplicated in the low and high order positions of the color byte in order to work properly. In other words the color 7 needs to be stored in memory location 8 so that it appears as a Hex 77 to the Monitor. The color 10 must appear as 'AA' (Hex equivalent to 10:10) and so on. The decimal equivalents of these color designations is given in the table below:

#### COLOR POKE COLOR POKE COLOR POKE

1	17	6	102	11	187
2	34	7	119	12	204
3	51	8	136	13	221
4	68	9	153	14	238
5	85	10	170	15	255

These POKE numbers are the decimal equivalents of the Hex numbers \$11, \$22, \$33 . . . \$EE, \$FF. Again, the color should be poked into memory location 8 in order to draw your shape. Color 0 is still Black.

continued on next page



Here's an example of the whole thing brought together in a program to DRAW and ERASE your shape.

```
10 X=15:Y=15:COL=102:
   GOSUB 100:REM DRAW SHAPE
20 X=15:Y=15:COL=0:GOSUB 100:
   REM ERASE
30 GOTO 10
100 POKE 5,X:POKE 6,Y:POKE 8,COL
110 POKE 2051,0:POKE 2052,
    9:CALL 2048
120 RETURN
```

This program will cause the shape to be drawn and erased repeatedly starting the drawing at X / Y coordinates 15/15 creating a blinking effect.

Try experimenting with incrementing and decrementing X and Y to test the positioning. (Note: You will need to plan your game so that the drawing of your shape stays within the 0-39 boundaries of the screen. If you go outside these bounds the program may "wrap-around" or give a Range Error.)

The "CALL 2048" initiates a scan of your shape table from the starting address. It compares each character in the table to the codes 1-4 and A-D and INCREMENTS or DECREMENTS the X and Y coordinates (Memory locations 5 and 6) accordingly.

The actual plotting of points is done in the subroutines \$856-861 (No Plot) and \$864-86F (Plot). The Color is moved from memory \$8 to memory \$30. The X coordinate is stored in Index Register Y. The Y coordinate is stored in the Accumulator. Finally, a JSR \$F800 accomplishes the Plot/Move. \$F800 is the Monitor Routine for Plotting Low Resolution Graphics.

When a point has been plotted, the program loops back to get the next character by the fact that the X Index Register has now been incremented to the next memory location in the Shape Table.

When the program finally hits a '0', it returns to your Basic program, having completed its job.

## USING THE PROGRAM

It's easy to see in the program example above, that all of the controlling elements of Low Resolution Shape Writing can be assigned to Variables to draw Multiple Shapes with Multiple Colors in Multiple Locations. To summarize the use of the program:

1. Shape Table:  
POKE 2051, TABLE LO BYTE  
POKE 2052, TABLE HI BYTE
2. Screen Posn:  
POKE 5, X  
POKE 6, Y
3. Color:  
POKE 8, COL (From the Color Table)
4. Draw:  
CALL 2048

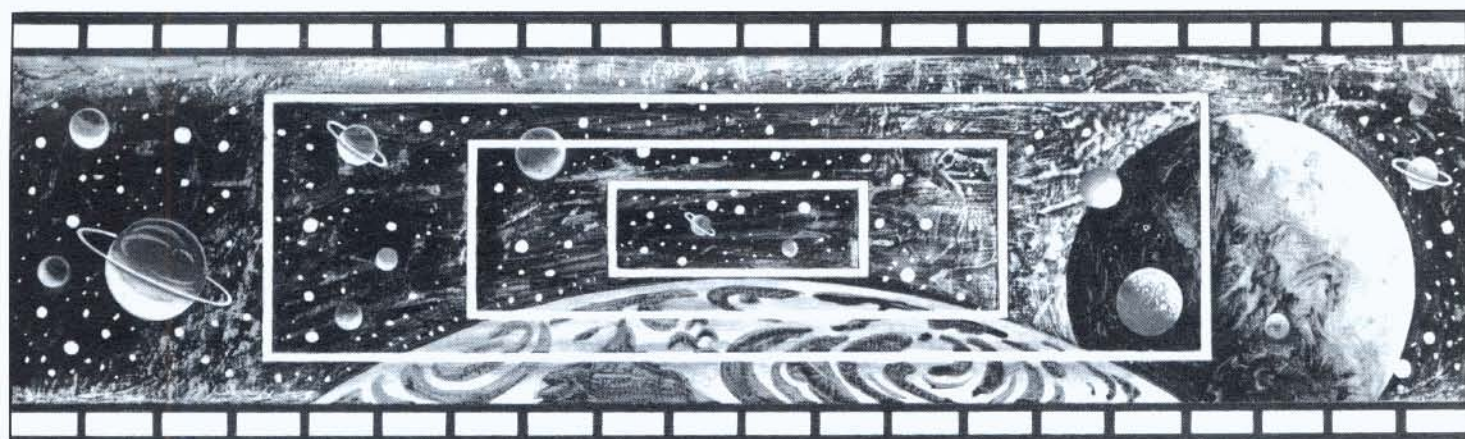
The Lo-Res Shapewriter is used extensively in the AIRSEA BATTLE Game in this issue. AIRSEA BATTLE uses 7 different simple shapes (2 Planes, 2 Ships, Splash, Flak, and an Explosion) which, as you'll see are drawn at high speed to give the game proper animation. The Assembly Language program in this article must be used with AIRSEA BATTLE (as you will use it with your own graphics programs) to do the job.

Don't PLOT! DRAW! LO-RES SHAPE-WRITER will add much more Zip to your programs.

```
4 REM *****
5 REM ** LOW-RES SHAPEWRITER **
6 REM ** MICRO-SPARC **
7 REM ** P.O. BOX 325 **
8 REM ** LINCOLN, MASS 01773 **
9 REM ** COPYRIGHT ©1979 **
10 REM ** ALL RIGHTS RESERVED **
11 REM *****
13 PRINT "":PT=1
15 PRINT "":PRINT " "
20 CALL -936:VTAB 5: TAB 4: PRINT "** LOW RESOLUTION S
   HAPE WRITER **"
21 PRINT :PRINT "THIS PROGRAM ALLOWS YOU TO USE THE KEY-":
   PRINT "BOARD TO CREATE LO-RES GRAPHIC SHAPES."
22 PRINT :PRINT "U=UP D=DOWN R=RIGHT L=LEFT F=FINISH"
24 PRINT :PRINT "YOU CAN TURN PLOT ON/OFF BY PRESSING P,"
25 PRINT :PRINT "AFTER ENTERING THE SHAPE, THE PROGRAM
   ":PRINT "GIVES INSTRUCTIONS FOR SAVING IT, AS "
27 PRINT "WELL AS THE ADDRESS OF THE SHAPE FOR ":PRINT
   "USE IN YOUR OWN PROGRAM."
29 PRINT :INPUT "ENTER STARTING ADDRESS IN DECIMAL"
   ,LOC:ST=LOC:GR
30 XD=15:YD=15:PLOT X,Y:XE=XD:YE=YD
35 VTAB 21:PRINT "U=UP D=DOWN R=RIGHT L=LEFT F=FINISH"
510 K= PEEK (-16384):IF K<128 THEN 510
515 POKE -16368,0
520 IF K= ASC("U") THEN GOSUB 1000
530 IF K= ASC("D") THEN GOSUB 1100
540 IF K= ASC("R") THEN GOSUB 1200
550 IF K= ASC("L") THEN GOSUB 1300
560 IF K= ASC("P") THEN PT=-PT
595 IF K= ASC("F") THEN 700
600 IF XD<0 THEN XD=0:IF XD>30 THEN XD=30:IF YD<0
   THEN YD=0:IF YD>30 THEN YD=30
605 COLOR=6:PLOT XD,YD:IF PT<0 THEN COLOR=0:PLOT
   XE,YE:XE=XD:YE=YD
650 VTAB 22:IF PT>0 THEN PRINT "PLOT ON ":IF PT<0
   THEN PRINT "PLOT OFF":GOTO 510
700 POKE LOC,0:LOC=LOC+1:POKE LOC,0
702 CALL -936:PRINT "SHAPE COMPLETED. TO SAVE ON DISK,
   USE:":PRINT "BSAVE (NAME),A":ST:,"L":LOC-ST
705 FOR Y=5 TO 20 STEP 5:H=ST/256:L=ST MOD 256:POKE
   2051,L:POKE 2052,H
710 FOR X=5 TO 33:POKE 8,0:POKE 5,XOLD:POKE 6,YOLD:CALL 2048
730 POKE 5,X:POKE 6,Y:POKE 8,119:CALL 2048:XOLD=X:YOLD=Y
750 NEXT X,Y
752 PRINT "SHAPE ADDRESS: LO=":L:HI=":H
755 GOTO 755:REM ENDING LOOP, PRESS CTL C TO BREAK
1000 IF PT>0 THEN 1050:POKE LOC,1:LOC=LOC+1:YD=YD-1:RETURN
1050 POKE LOC,10:LOC=LOC+1:YD=YD-1:RETURN
1100 IF PT>0 THEN 1150:POKE LOC,2:LOC=LOC+1:YD=YD+1:RETURN
1150 POKE LOC,11:LOC=LOC+1:YD=YD+1:RETURN
1200 IF PT>0 THEN 1250:POKE LOC,3:LOC=LOC+1:XD=XD+1:RETURN
1250 POKE LOC,12:LOC=LOC+1:XD=XD+1:RETURN
1300 IF PT>0 THEN 1350:POKE LOC,4:LOC=LOC+1:XD=XD-1:RETURN
1350 POKE LOC,13:LOC=LOC+1:XD=XD-1:RETURN
```

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## SPACE ANIMATION Make Games Come Alive

SPACE ANIMATION puts you at the console of a Scanner Screen on a Starship. Your Apple Scanner puts a border on the display. Then it draws two large planets contained in your current space sector. It reconstructs the stars ahead of your ship. And finally, it simulates the movement of your starship through space with the movement of 4 stars toward you, as well as a mysterious Space Panel that moves toward you, growing larger and larger, until it disappears (just before impact). The panel is then replaced with another panel outline that repeats the process.

Danger? No. But rather, an interesting exercise in creating the setting, background, and supporting animation for your high-resolution games. The routines in this program can be extracted singly or together to add considerably more interest to your Hi-Res games.

First, the routine in line 57 draws the border window on your scanner. Fairly standard.

Next, the routines in Lines 60-65 and 70-80 draw two large Planets on your scanner. Actually, these are routines for drawing Circles in Hi-Res. The Z variable is the arc of the circle in degrees (The first 'half planet' is a circle drawn from 1-180 degrees on the left half of the screen). The first constant in the equation in Line 62 is the X position on the screen where the circle is to be drawn. In other words the circle is drawn at X coordinate 10 and Y coordinate 96 (Line 62 and 65). The second planet is drawn at X coordinate 275 and Y coordinate 60 (Line 75 and 80). The R variable specifies the size or Radius of the planet. These routines can be worked in a variety of ways for full circles, bulls-eyes, tunnels, etc. Circles can add spectacular background graphics when used with other figures.

The routine in line 87 draws 100 background stars, keeping them within the limits of your scanner.

Finally the routines in lines 100-150 create 4 Stars and the Space Panel which zoom toward you. The X/Y coordinates of the stars are contained in the pairs of variables — A/B, C/D, E/F, and G/H. They move from the center of the screen toward the outer perimeter.

The Space Panel is drawn in Line 123, tested for its limits in lines 122 and 124, and then erased in line 126. It's an interesting visual effect and one that you might want to consider including in your next Journey through Space.

### LIST

```

1 PRINT "."
2 REM *****
3 REM ** SPACE ANIMATION **
4 REM ** MICRO-SPARC, INC. **
5 REM ** P.O. BOX 325 **
6 REM ** LINCOLN MASS 01773 **
7 REM ** COPYRIGHT (C) 1980 **
8 REM *****
55 HGR : HCOLOR= 3: HOME : VTAB 23: FLASH : PRINT "D
    RAW THE FIRST PLANET!"
57 HPLLOT 9,0 TO 276,0 TO 276,159 TO 9,159 TO 9,0
60 FOR Z = 1 TO 180
62 R = 25: X = 10 + SIN (Z / 180 * 3.1415) * R
65 Y = 96 - COS (Z / 180 * 3.1415) * R: HPLLOT X,Y: NEXT Z
70 VTAB 23: PRINT "NOW THE SECOND PLANET!"
71 FOR Z = 180 TO 360
75 R = 20: X = 275 + SIN (Z / 180 * 3.1415) * R
80 Y = 60 - COS (Z / 180 * 3.1415) * R: HPLLOT X,Y: NEXT Z
85 HOME : VTAB 23: PRINT "NOW ADD A FEW STARS!"
87 FOR I = 1 TO 100: X = RND (1) * 260 + 10: Y = RND
    (1) * 140 + 5: HPLLOT X,Y: NEXT I
100 HOME : VTAB 23: PRINT "NOW THE STARS AND SPACE PANEL
    ZOOM IN!": NORMAL
105 X = 138: Y = 77: J = 1: Z = 3
110 A = 135: B = 75: C = 145: D = 75: E = 145: F = 85: G = 135: H = 85
120 HCOLOR= 7: HPLLOT A,B: HPLLOT C,D: HPLLOT E,F: HPLLOT G,H
121 L = X: M = Y: K = P: X = X - 2: Y = Y - 2: J = J + 2
122 IF J = 75 THEN 124
123 P = 2 * J: HCOLOR= Z: HPLLOT X,Y TO X + F,Y TO X +
    P,Y + P TO X,Y + P TO X,Y
124 IF J = 75 THEN J = 1: X = 138: Y = 77: P = 2: Z = RND
    (1) * 7 + 1
126 HCOLOR= 0: HPLLOT L,M TO L + K,M TO L + K,M + K TO
    L,M + K TO L,M
130 A = A - 7: B = B - 5: C = C + 7: D = D - 5: E = E + 7
    : F = F + 5: G = G - 7: H = H + 5
135 N = N + 1
140 HCOLOR= 0: HPLLOT A + 7,B + 5: HPLLOT C - 7,D + 5:
    HPLLOT E - 7,F - 5: HPLLOT G + 7,H - 5
145 IF N = 15 THEN N = 0: HPLLOT A,B: HPLLOT C,D: HPLLOT
    E,F: HPLLOT G,H: GOTO 110
150 GOTO 120

```



# MicroNET

## It's off and running. And delivering as promised.

### What is MicroNET?

It is the personal computing service of CompuServe, Incorporated. CompuServe is a nationwide commercial time sharing computer network with large-scale mainframes. MicroNET allows the personal computer user access to CompuServe's large computers, software and disc storage during off-peak hours (from 6 PM to 5 AM weekdays, all day on Saturdays, Sundays and most holidays).

### What do I get?

You can use our powerful processors with X-Basic, Fortran, Pascal, Macro-10, AID or APL. You get 128K bytes of storage free (just access it at least once a month). Software includes games—including networking multi-player games—personal, business and educational programs.

In addition, there is the MicroNET National Bulletin Board for community affairs,

for sale and wanted notices and the MicroNET Electronic Mail System for personal messages to other MicroNET users. You can even sell software via MicroNET.

**NEW!** MicroQUOTE, a security information system for corporate stocks and public debt.

**NEW!** MicroNET Software Exchange with dozens of new programs available for downloading to your personal computer at a specified charge.

**NEW!** Executive programs for TRS-80, Apple II and CP/M systems (so your machine and ours can talk to each other error-free). You can switch between terminal and local mode while on line.

### What do I have to have to use MicroNET?

The standard 300 baud modem. MicroNET has local phone

service in most major cities (see below) and a reduced phone charge in over a hundred others.

### What is the cost?

We've saved the best for last. There is a one-time hook-up charge of only \$9.00! Operating time—billed in minutes to your VISA or MasterCard card—is only \$5.00 an hour.

### Want more information?

Good. Write to us at the address below. We'll send you a full packet of information about MicroNET.

### CompuServe

Personal Computing Division  
Dept. N  
5000 Arlington Centre Blvd.  
Columbus, Ohio 43220

MicroNET is available via local phone calls in the following cities: Akron, Atlanta, Boston, Canton, Chicago, Cincinnati, Cleveland, Columbus, Dallas, Dayton, Denver, Detroit, Houston, Indianapolis, Los Angeles, Louisville, Memphis, West Caldwell (NJ), New York, Philadelphia, Pittsburgh, San Francisco, Stamford (CT), St. Louis, Toledo, Tucson and Washington, D.C.

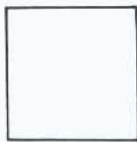
Access to the MicroNET service is available in 153 other cities for an additional charge of \$4.00 per hour.



*"... but the really impressive stuff is in the back room."*



# TIPS AND TECHNIQUES



## GUIDED MISSILE Game

In the GUIDED MISSILE GAME, you will use your Joystick to control the course of a mini-missile to a series of shrinking box-like targets. Each time you hit one, it will explode and the fragments will scatter (similar to many arcade games). At the beginning of the game, you can elect whether to simply move the missile, or move it and have it leave a "tracer" path as you move it along its course. The "tracer" option makes the game harder, but more interesting.

The important thing about GUIDED MISSILE is that it demonstrates (during the game) the 3½ ways to use your Joystick(s) in all games. They are called:

1. Controlled motion
2. Accelerated Motion
3. Constant Motion

Each of the control methods recognizes that your Joystick has fairly coarse resolution and concentrates on controlling the DIRECTION and SPEED of the missile.

**Controlled Motion** reads the game controls and moves the missile UP, DOWN, RIGHT or LEFT 2 positions depending on the extremes of your paddle positions. This is shown in lines 220-270 of the program. In addition, this option allows you to STOP the missile's motion by centering the Joystick. This is a method you'll use for a great many games involving smooth, even movement of your targets, ships, etc. under Joystick Control.

With controlled motion, you can hold the Joystick in position and the missile will continue to move at a constant speed across the screen. You can change the values of H and V in the program to speed up or slow down.

**Accelerated Motion**, by contrast, drives the missile faster and faster as you hold the Joystick in position. This is done by adding another unit of speed to the speed which already exists. This is shown in lines 305-350 of the program and, as you can see, the H and V directions keep increasing or decreasing depending on the Joystick position. If you keep on accelerating toward a target box, you may skip right over it (and reset the missile to the center of the screen). The proper strategy is to accelerate to a point which is close to the target, then stop, and then slowly approach the target to hit it. This approach does allow the missile to be stopped in order to change direction.

The **Constant Motion** approach is perhaps the most fun and interesting. Constant Motion randomly adds a number -1, 0, or +1 to your Joystick direction, trying to throw you off course. (That is method 3). It also removes the opportunity to STOP the missile in place. (That is method 3½). With this approach, the missile fires automatically and starts moving! You need to use the Joystick to continuously adjust and correct its course to the target. (If you're using the "Tracer" option, you'll get some interesting and weird patterns as you try to keep the missile on course). The constant motion approach is handled as an addition to the normal controlled

direction, and is shown in line 280 of the program.

If you have ever seen Bob Bishop's Star Wars program, you'll recognize that the Constant Motion is the method used to position the Tie Fighter in the gunsight of your ship. It has many many applications.

The Joystick is read in line 1010. You should note that the multiplication and division in the reading routine is an intentional time delay to allow each game control to settle down before reading the next one.

The missile is plotted in subroutine 1100 and you'll notice that the new position is drawn before the old one is erased. This produces a smoother non-flickering display and it's something to remember for your own game programming. Note also, that the limits of the screen are tested in lines 1110 and 1120 before you attempt to plot the new missile position. If you are about to go off the screen, the program skips the PLOT statements and erases the last point plotted. Then it resets the missile to the center of the screen and you have to start over. Be careful of this since it uses up valuable time. That's right, you have 60 time units in which to hit each target. If your time runs out, it scores as a MISS and you'll lose a point.

The Explosion of the target is produced in the subroutine at line 1300. This is an interesting one to play around with and it will have many applications to your own games. The segments of the box-target literally blow apart and scatter before disappearing.

The GUIDED MISSILE game gives you 10 targets (which shrink in size with each target) to shoot at with Controlled Motion. Then the game automatically switches to Accelerated Motion and gives you 10 more targets. Finally, (you guessed it), it gives the last 10 targets to fire at with Constant Motion control. A perfect score is 30 points and the game will carry forward the previous high score to try to beat.

One additional "goodie": You can convert the program into a high-resolution Sketch-Pad by removing the GOSUB 1200 in line 360. Doing this will remove the scoring tests and will continue drawing (using the Tracer option) under controlled motion.

Have fun!

*Listing on page 44*

## Re-Inking Your Printer

If you own a printer which has Re-Inking rollers (such as the IDS 440 Paper Tiger), here's a tip which will dramatically extend the useful life of your printer ribbons. Try Re-Inking the Re-Inking Rollers! Use standard Stamp Pad Ink (Sanford makes Stamp Pad Inkers which Roll-On or Paint-On for about \$1.00).

Remove the cover from your IDS 440 (or consult the manual for your own printer). Carefully lift the ribbon off the Re-Inking rollers so that they're accessible and rotate freely. Then simply apply the Stamp Pad Ink evenly to the roller until it is saturated. Replace the ribbon and you're in business. With new ribbons costing \$10-12 these days, a \$1.00 of Stamp Pad Ink can give you 2-4 times the ribbon life, or more!

## Quick And Easy Decimal Alignment

Unless you are a recent and new Apple II owner, you'll remember the Decimal-Alignment routine from CONTACT 3, Apple Computer's Newsletter. Here's a quick and easy way to use it.

```
10 B=5
20 X=10.11: P=X: GOSUB 100:
PRINTTAB (10+B-C-1) X
30 Y=100.11: P=Y: GOSUB 100:
PRINTTAB (10+B-C-1) Y
40 Z=1000.11: P=Z: GOSUB 100:
PRINTTAB (10+B-C-1) Z
50 END
100 C=(P>=10) + (P>=100)
+ (P>=1000) + (P>=100)
+ (P>=10000) + (P>=100000): RETURN
```

The variables 'B' and 'C' position the right-most character in relation to any column you choose (For example, column 10 above). By making 'P' a Universal Variable you can assign whatever value you want to align, to P, and then by branching to the subroutine, you'll return with the proper alignment.

This routine makes use of the Apple's Logic Instructions. In the example above, Z=1000.11. The expression C=(Z>=10) gives C a value of '1' since it is a TRUE statement. Stepping through the entire subroutine leaves C with a value of 3, since the first three arguments evaluate as TRUE. The value C is then decremented by ONE MORE POSITION (B-C-1) to offset 4 positions to the left for printing the Z in the correct position... the 1000's position.

## Short And Sweet File Names

It's not clear from the DOS Version 3.2 Manual, but you CAN use String variables for Disk File NAMES. You can also use Numeric variables for BYTE, RECORD, and (Record) LENGTH designations. Just remember to put a SEMICOLON in between the constants and variables in your disk statements. As an example:

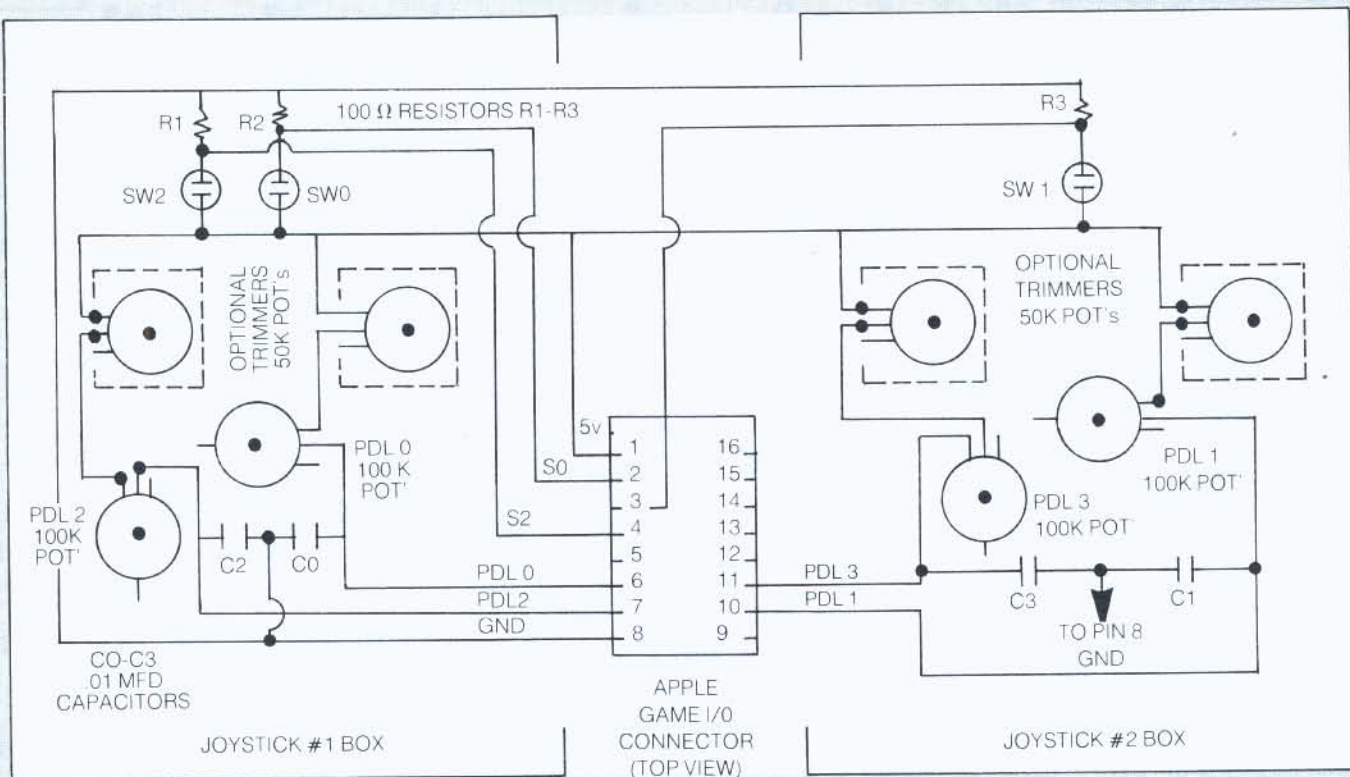
```
10 D$=CHR$(4):FN$="MY FILE":
L=40: B=15: R=12
20 PRINT D$: "OPEN": FN$: "L": L
30 PRINT D$: "READ": FN$:
"B": B: "R": R
40 INPUT A
```

This will attempt to read the file "MY FILE" (in which the records are 40 bytes long), beginning at Byte 15 of Record number 12.

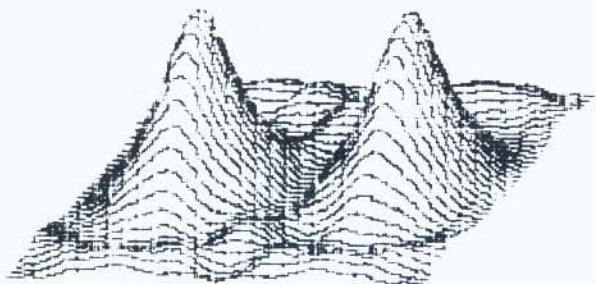
Using "Symbolic" File variables can allow you to write ONE file handling routine for each access method (Random and Sequential) and then make them do Double or Triple (or more) Duty.



## Wiring Diagram For Dual Joysticks



## TRENDCOM 100 GRAPHICS



- ★ Version 1 — for printers with self-test jumper
- ★ Version 2 — for printers with self-test switch
- ★ Apple II hires dump software
- ★ \$59.95

NOTE: Requires partial disassembly of printer.

## EIGHT CHANNEL A/D

- ★ 8 bits
- ★ Selectable interrupt on end of conversion
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- ★ 65 $\mu$ s conversion time
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# CONSTRUCTION PROJECT

## Dual Joysticks For Under \$15.00!

The Apple II's Graphic and Game Input/Output controls give it unusual versatility for game programming. The addition of Joysticks to the Apple expands the scope and variety of your games tremendously!

A Joystick puts the horizontal (side-to-side) and the vertical (up-and-down) action of your old Game Control Paddles under a single control. With 2 Joysticks, you and a game opponent have the full movement of the screen for war-games, drawing sketches, dog-fight, flying airplanes, and on and on.

This article will tell and show you how to build your own Joystick(s) — which you can do for \$6-7.00 apiece. It will describe the wiring to connect 2 Joysticks to the Game I/O socket. Finally on page 11 we show 3½ different techniques for controlling your missiles/shots/ships/etc. with your new Joystick.

## How To Build, And Wire Joysticks

Actually, the best part of building a Joystick for the Apple is that you can buy the 'Guts' of one, already built! For \$4.95 you can buy a "raw" Joystick from most of the electronics distributors. Jameco Electronics, and other distributors, for example, offers a micro-miniature version measuring 1" x 1-3/16" x 1-3/16" for that price. Jameco is at 1355 Shoreway Road, Belmont, CA 94002.

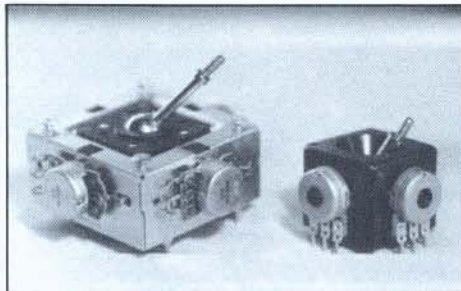
The "Guts" consists of a small box, with the stick connected to two potentiometers which control the voltage going to your Game I/O connections. The Addition of two or three push-button switches (buy the kind that are "Normally Open" such as Radio Shack's part #275-1547) and you're in business. The only other thing you'll need are 3 resistors in the range of 100-200 ohms (Radio Shack #271-1312 — \$.39 for a pack of 5), and four .01 mfd capacitors (Radio Shack #272-1065 — \$.49 for a pack of 2).

The wiring diagram (left) shows how they all wire together. One Header Socket (Radio Shack #276-1980 for \$1.29) makes the job even easier. The Header Socket can be plugged right into the Apple Game I/O Connector when you've finished.

The diagram above shows the wiring for Two Joysticks . . . double your pleasure! They're cheap. (on left, on right)

If you want to get a little fancier, you can also wire two 50K "Trimmer" potentiometers (Radio Shack #271-219 at \$.49 each) to "tune" the range of your Joysticks.

When you have finished wiring, you have only to mount your Joysticks in a box to complete the project. You may select a metal box from the many available or else use a plastic box from around the house. Or let this be your chance to show off by building a custom wood grain housing.



## Hints On Wiring Strategy

You'll notice that the Joysticks in the diagram above are assigned as follows:

**Joystick #1**  
controls PDL 0 and PDL 2

**Joystick #2**  
controls PDL 1 and PDL 3

There's method in the madness. Most Apple computers come wired for PDL 0 (in one game controller) and PDL 1 (in the other). By keeping them separated — each in a separate Joystick — you'll preserve all of your two-player games such as Pong without having to re-program them. In other words, all of your old programs will run just as they always have.

**Note:** If you're buying two joysticks from a commercial source, you'll probably discover that they're both wired for PDL 0 and PDL 1. You may have to re-wire them (that is, take their sockets apart and wire them into a single socket). The diagram above will apply to that job as well. In taking apart the sockets of commercial Joysticks, do it carefully so that you keep track of the six important wires: 5 Volts; Ground; PDL 0;



PDL 1; Switch 0; and Switch 1. These six wires will generally be the same on each Joystick. When you disassemble the sockets you can then solder the wires to the Game I/O as shown above and you'll be home free.

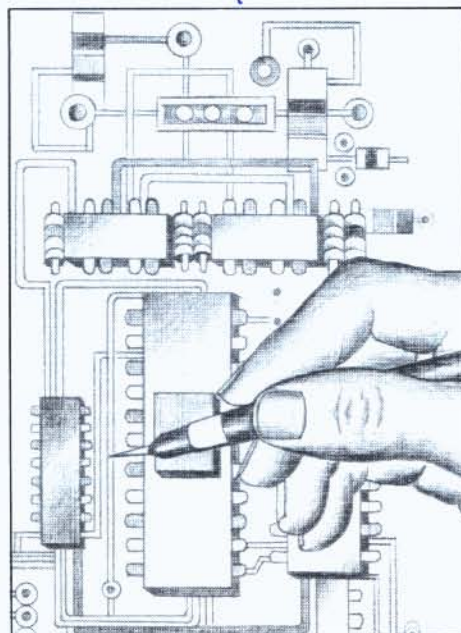
**Note:** You can use the short program below to display the Joystick outputs (and switches) to check for any peculiarities. Some of the low-cost Joysticks have "dead spots" you need to be aware of. Others do not span the full Apple range of 0-255 (The .01 mfd capacitors wired to each potentiometer should correct this). Running the following program (while moving the Joysticks) will tell you the characteristics of your controls.

```
PO=PDL(0)*50/50
P1=PDL(1)*50/50
20 P2=PDL(2)*50/50: P3=PDL(3)*50/50
30 S0=PEEK(-16287): S1=PEEK(-16286)
40 S3=PEEK(-16285)
50 VTAB23:CALL-868:PRINT
"PO=";"P0:
60 PRINT "P1=";"P1:" "P2=";"P2:" "P3=";"P3:
70 PRINT "S0=";"S0:" "S1=";"S1:" "S2=";"S2
80 GOTO 10
```

Each of your Joysticks should cause the screen to display a number range from 0 to 255 when moved from one extreme to the other. Each pushbutton switch should show random numbers which are less than or equal to 127 until they're pushed. When they're pushed, the number(s) should be greater than 127. If the paddles don't give the proper range you can try rotating the "Trimmers" to balance the Joysticks. If the switches don't do their thing, try a resistor of a different value.

You'll probably notice that as you move your Joysticks slowly through their range of numbers, they sometimes skip over a few numbers or seem stuck on a few numbers. For \$4.95, you're getting fairly coarse gradations on the number range. Don't worry about it. This doesn't make any difference. In the Guided Missile Game in this issue we demonstrate how to use your new Joysticks for fine-resolution drawing, plotting, and shooting.

There you have it! For approximately \$15.00 you can upgrade to full dual-Joystick game programming. If you want to buy commercial Joysticks, you may want to try the ones which are spring-loaded and automatically return to center (they're particularly well-suited to the programming methods used in this article). The wiring diagrams will show you how to add that second commercial Joystick to your system.









# Star Attack!

## HIGH RESOLUTION MISSILES ... SHIPS ... WARP SPEED ACTION!

You are on attack maneuvers aboard the Starship MAXIMUS I. This mission is the final test of your qualifications for Star-Fleet Command. The stakes are high. The competition is fierce. The on-board computer has been readied for the simulated firing maneuvers. You're at the control, firing sequences prepared, finger on the trigger button. The first ship appears. You FIRE! A hit! And you discover you have just destroyed a TWA Space Freighter, a friendly ally. In the process, you have lost 40 points. You're in your own Black Hole.

The sky fills with ships — friends and aliens! You squeeze off 1 torpedo ... then a second ... now a third! You're on the STAR ATTACK!

You'll have 4000 Time Intervals and 100 torpedo/missiles to make your best score! The theoretical maximum score is 5000! You know that the highest score ever reached was 1100. Perhaps this is your day!

STAR ATTACK is an extremely fast, High-Resolution shooting game. It simulates one of the more popular Arcade games and exercises a series of Assembly Language routines which you'll find useful for your own game development.

## BASIC VS. ASSEMBLY LANGUAGE

In STAR ATTACK, more than 90% of the action is in Assembly Language (for speed). You will find Basic used principally for evaluating the Hits and printing the scores in real-time.

After the initialization (STAR ATTACK uses the Hi-Res program routines stored at Hex \$800 — the routines referenced in your Red Book), the game jumps back and forth between Assembly Language and Basic so that each language is used to its maximum utility.

All of the firing, "hit-sensing", and graphics control is in Assembly Language. As a "Hit" is made, a code (1-7) is put into memory location 17226 (labeled HTFL — for Hit Flag) by the Assembly Language program. In each pass of the main line program loop, location 17226 is examined and tested for a hit. If there is a hit, (Lines 26-28 in Basic), the appropriate routine is executed to reset the Hit Flag and score the hit.

During the same pass, the Timer is decreased by 1 and the number of Shots Fired is tested (to see if it has exceeded the allowable 100 missile/torpedos). STAR ATTACK also keeps a running tally of the number of ships shot down by each type of ship. This tally permits a "Post-Game Analysis" of who-did-what-to-whom.

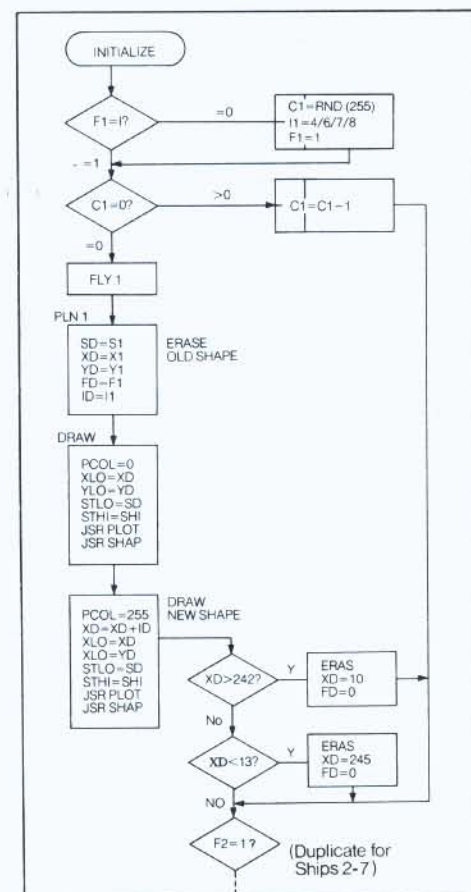
## STAR ATTACK VARIABLES

X1-X7 X coordinates  
Y1-Y7 Y coordinates  
H1-H3 Shots X coordinates  
V1-V3 Shots Y coordinates  
C1-C7 Countdown Timers  
F1-F7 Ship Flags  
XD, YD, STD  
ID, CD, FD, SD Common Drawing Variables  
RNLO, RNHI Random Number Low/High  
HIX Pdl Read assign +6 to -6  
H11-H13 X Increments for Shots 1-3  
SW2 Button #2 to Fire Shells  
FS1-FS3 Flags for Shots in Progress  
GX Old Paddle Read position  
HIZ, VZ X/Y Common Var for Shell Draw  
HIZ +6 to -6 Shell X increments  
FSZ Flag in Shell Draw  
SZ1-SZ7 X value for each Ship  
SCOR Hit count  
SW0 Button 0  
HTFL Hit Flag read by Basic to determine which ship was it. Scores accordingly.  
SHCT Shot Count  
SNDL Duration of Sound Routine  
TEN, TWTY ... Y vectors for 7 Ships  
S1-S7 Low Byte Shape Addresses  
SHI Hi Byte Shape Address  
SHEX Explosion Shape Low Byte  
I1-I7 Ship Speeds (Incr/Decr X)  
INIT, CLR, PLOT, POSN, LINE, SHAPE, XLO, XHI, YLO, STLO, STHI, ROT, SCAL, and PCOL correspond to the Call Addresses for the High-Resolution Apple sub-routines stored beginning in memory \$800. These are the standard Hi-Res routines referred to in the Red Book.

## THE ASSEMBLY LANGUAGE ROUTINES

The Block Diagram below illustrates the program flow for Target Ship #1. This structure is repeated 6 times, for a total of 7 different ships. Each ship has its own unique identity, value, and status as a friend or foe.

## STAR ATTACK TARGET SHIP(S) STEERING ROUTINE(S)



continued on next page



## The Major Routines and their Functions as follows:

**T** — Initializes the Hi-Res graphics, clears screen, and sets the key variables to their initial values.

**RT** — Begins by testing the "In-Flight" Flag ship #1. If F1=0 the ship is not currently flying and the flag is set to 1. A Random Number is generated and put into a "Countdown timer" (C1). This will be decremented in each frame until it hits '0'. At that point, the ship will be launched by executing subroutine PLN1.

This sequence is repeated for each ship.

**NI-PLN7** — These are the subroutines which fly the planes. The Shape Addresses are added into Hi-Res, as are the other variables (color, X and Y Coordinates, and Plane Speed), the old position is erased while the new one is drawn.

**AW** — This is a generalized Drawing routine which uses the Hi-Res graphics. It services the drawing of all the space ship shapes in the program.

**T1-SHT3** — Each of the three Shot-routines is for a shot in progress (Flag FS1-3). If no shot is currently in progress, then the routine is the firing button and, if it is pressed, a shot is initiated. If a shot is in process, it goes to the next shot, SHT2, and tries the same test. In like fashion, it goes to SHT3 if the first two are already operative.

**DL** — This routine reads the Game Paddle position and sets the shot vector between -6 and 6. (This is described fully in the article "Paddle-Reading in Assembly Language" in this issue).

**GN** — Draws the Gun/Missile Launcher.

When a shot is initiated, the position of the missile is used to set an X increment/decrement for the missile/torpedo. (This is described in the article "Firing Hi-Res Missiles - Aiming and Control" in this issue).

After each move of the ships, their positions are checked (in Lines 8065-8080) to make sure they are still within the screen boundaries. If they are outside the boundaries (at the end of a "miss"), they are reset in subroutines RLO (for ships moving from left to right) and RHI (for ships moving from right to left).

**AS** — Erases each shape at the end of its current pass across the screen.

**D** — Generates a 16-Bit Random Number on demand from the FLY1-FLY7 Steering routines. By making the Random Number generator resident in the Assembly Language, multiple random numbers can be generated on a single program loop (without the loss of speed which results if you go back to Basic to get a random number). The use of Assembly Language Random Numbers is described in the article "Inside Random Numbers" in this issue.

**HL** — Erases and Draws the missile/torpedos then tests for the end of a shot (EOS).

**S** — The end of a shot resets the shot flags, erases the missile, prepares the shot vector positions for a new firing.

**IT** — Tests for a Hit on one of the targets. VZ obtains the current Y Coordinate for the shell. If it falls exactly on the vector of one of the targets, a further test is made of the X coordinate of the shell and the target.

**I-TH7** — Tests whether the missile/torpedo coordinate is within +/- 6 positions of the X

coordinate of the target ship. If it falls within these boundaries, it signals a Hit! SZ1-SZ7 is the X coordinate of the target. HZ is the X coordinate of the shell. Minus 6 is first added to the target ship's X coordinate. A comparison and additional test is made if the shell's X coordinate is greater than that of the target ship. The additional test adds +6 to the target ship's X coordinate. In the subsequent comparison, if the shell's X position is less than that of the target ship, a Hit is scored.

**HITA-HITG** — On a Hit, the ship is erased and an explosion is drawn. Then the target ship's X and Y positions are reset, and the countdown timer is initiated for the next pass.

In addition, a ship code 1-7 is stored in the Hit-Flag HTFL. This code will be picked up on the next return to Basic, to be used for scoring and printing the hit.

**SND** — This is a tone subroutine used for generating shot sounds and explosions of varying durations. The duration is controlled by loading the variable SNDL with a value between 0 and 255.

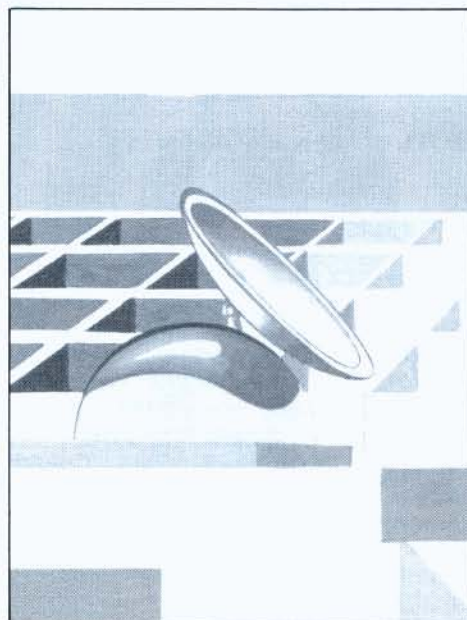
**EXPL** — Draws the explosion after the ship is hit, sounds the crash, and then clears the explosion debris from the screen.

## ENTERING THE PROGRAMS

There are four program segments which must be entered. They are: 1. Hi-Res Graphics; 2. Shape Tables (from Table 1); 3. STAR A/L and finally, 4. STAR Basic program. The Assembly Language can be loaded directly from Tables 1 and 2 by putting your Apple into the Monitor mode and typing in the Hex Code for the Shapes and the Assembly Language. Then, after returning to Integer Basic, execute the following SAVE instructions:

BSAVE HI-RES, A\$COO,L\$3FF  
BSAVE STAR A/L, A\$4000,L\$FFF  
SAVE STAR ATTACK (Basic)

The Tape counterparts of these commands can also be used to save the programs. (These are defined in the next section).



## OPERATING STAR ATTACK

STAR ATTACK needs an Apple II with at least 24K of memory. The set-up sequence is as follows:

**1. BLOAD HI-RES.** This is the set of Hi-Res Graphics routines described in the Red Book. They load into memory locations COO-FFF (Hex).

**2. BLOAD STAR A/L.** This is the Assembly Language of the program. It loads with the SHAPE TABLES into memory locations \$4000-\$4FFF, ABOVE the PAGE 1 Graphics.

**3. Set LOMEM:4000 and HIMEM:8192**

**4. LOAD STAR BASIC.** This sandwiches the Basic program in between the Hi-Res Graphics routines and the Page 1 graphics.

If you can afford the Disk space, the first time you get all of the components of STAR ATTACK loaded, you may want to do a sweeping BSAVE STAR A/L, A\$C00,L\$4200 to save all of the Assembly Language under one label. (It's probably best not to do the "sweep-save" with tape. It will take forever to load). If you lack a disk, the SAVE's and LOAD's can be accomplished with the following:

C00.FFFW To save Hi-Res Graphics  
4000.4E00W To save the Shapes and A/L.

The loading of these routines can then be done with the "Read" counterparts of the above statements.

The positioning of the Missile Launcher (Gun) is under control of Pdl 0 (Line 8350 in the program). The Firing Switches are SW 0 and SW 1. Firing multiple missiles requires that the first shot be fired using SW 0, the second using SW 1, and the third using SW 0 again.

## SUMMARY

This looks like a lot of work. Actually, the program itself is fairly straightforward. Adding the multiple ships, shells and shapes is what takes up the space. You can probably enter the Assembly Language in less than 90 minutes (if you're careful).

If you enter, play with, and understand the structure of STAR ATTACK, it will help you to program Assembly Language games with the best of them. (If you would just rather play STAR ATTACK without loading it, \$12.95 plus \$1.50 for shipping will bring you a copy of STAR ATTACK and AIRSEA BATTLE on a fresh Diskette — that's close to our cost at Micro-SPARC).

STAR ATTACK uses the principles in the article "How To Write Games That Last" (in this issue).

The all-time record score so far is, truly 1100. Try to beat it!  
Go on the STAR ATTACK!



# PADDLE READING IN ASSEMBLY LANGUAGE

Reading Paddles in Assembly Language is a snap. It is accomplished by loading the X Register with the Number of the Paddle to be read. Then do a JSR to \$FB1E. When you return from the subroutine, the value of the Paddle will be in the Y Register. It's that simple.

Be careful though, of multiple Paddle Reads in quick succession. The results are very strange and unpredictable. If you want to do multiple reads, put a DELAY LOOP in between each read to allow your Apple to settle down. Here's an example:

LDX #\$0	PADDLE 0
JSR \$FB1E	READ
STY PDLO	STORE RESULT
JSR DLAY	
LDX #\$1	PADDLE 1
JSR \$FB1E	READ
STY PDL2	STORE
JSR DLAY	DELAY LOOP
.	
LDX LDA #\$FF	LOAD 255
LOOP DEX	SUBTRACT 1
TXA	
TAX	"BUSY WORK"
TXA	
TAX	
BNE LOOP	LOOP 255 TIMES
RTS	RETURN TO READ

That's all there is to it. The Paddle Read will return a value between 0 and 255 which is useable exactly as you would use it in Basic.

The RPDL subroutine in STAR ATTACK begins in Line 8350. After Paddle 0 has been read, the value is transferred from the Y-Register to the Accumulator. There, it is compared to a range of values to find the paddle position. After a CMP (Compare) instruction, the BCC determines that the value in ACC is LESS THAN the value it was just compared to. If it is less than that value, the branch is taken. In STAR ATTACK, the branch uses the paddle position to set a value between -6 and +6 for the X coordinate of the missiles being fired at the screen targets.

Paddle reading in Assembly Language ... another way to speed up your games!

# INSIDE RANDOM NUMBERS

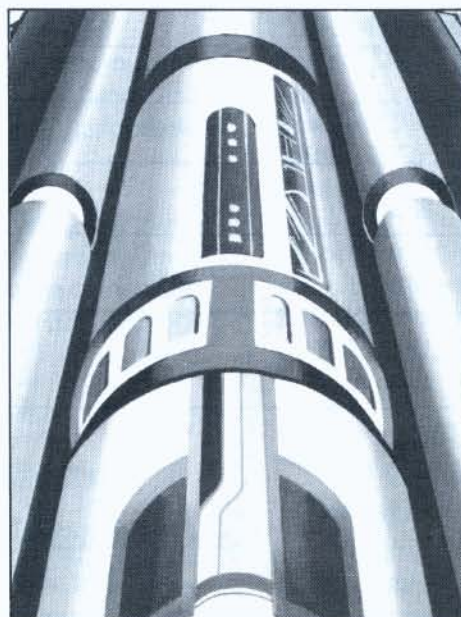
Randomness in computer games is like Spice in your soup — not enough, and it's bland; too much, and you don't want to eat it. The key point, particularly in Arcade Games, is to put in "Just Enough" randomness to allow skill to predominate, but to make that skill constantly challenged to respond to unpredictability.

If you've ever watched someone play an elementary target game without random variables, you'll see them eventually pick up the "rhythm" of the game as Targets appear at predictable times and at predictable speeds. Then they'll play a few games and win devastatingly, and quit for good.

In STAR ATTACK, the challenge is to derive random numbers in Assembly Language. These are used to delay the appearance of the targets on the screen and also to vary the speed of various targets on each pass. At some moments, the screen will literally be filled with targets — both friendly and unfriendly. At other times, only one or two will be present.

At the end of each pass across the screen a random number from 0 to 255 is assigned to the particular Space Ship. A countdown is then performed and the counter must reach zero before the target can reappear. The same countdown is performed each time a target is hit and explodes on the screen.

Using the same Random Number (RNLO), the speed of the top two ships (on the screen) is varied from pass to pass. This is done in Line 2021 with a jump to the subroutine RSPD (located at Line 2700). RSPD successively tests for ranges: 181-255, 120-180, 60-120, and 0-60. On the basis of the range in which the Random Number lies, a new speed is assigned to the variable IX. When the Return from the subroutine is executed, the new speed, IX, is assigned to the Speed Variable I1 (in Line 2023). This randomizing of speed, which is done for ships 1 and 2, could be expanded to all seven ships quite easily (if you have an Assembler). In the routine for each ship, simply repeat the three Lines 2021-2023 for each ship (after storing RNLO in the countdown timer for that ship).



STAR ATTACK has its own Random Number Generator (Lines 8200-8317). This is to allow each ship to request its own random number during the course of a single pass through the program. This routine is adapted from William Barden's routine in his book "How to Program Microcomputers". The routine actually generates a 16-bit Random Number by multiplying the last pseudo-random number by 5. In the routine, only the least significant 16 bits are saved, and STAR ATTACK uses only the least significant 8 bits (giving 0-255).

In using RND in Assembly Language, be aware that you must "plant a random seed" in the program. This is done in Lines 1957 and 1966 of STAR ATTACK.

As an alternative to using RND, you could generate a random number each time the assembly language returns to Basic. Then you could POKE that number into a memory location where it could be picked up by the Assembly Language. The disadvantage of this approach in STAR ATTACK is that only 1 random number could be generated in each execution of the main line program loop. This would tend to make all the ships coming to the end of a pass assume the same delay time and speed (in the case of ships 1 and 2). Therefore, the RND routine in STAR ATTACK is a useful one to tuck away in your library.

42...63...78...HIKE! Randomness adds the Spice to your games when used in the right dosage. (See "Writing Games that Last" in this issue).

# HOW TO CUSTOMIZE STAR ATTACK

The STAR ATTACK game (this issue) was written with the assumption of use in systems having Apple Game Paddles, not Joysticks. As such the game is written for PDL (0) and uses Button Switches 0 and 1 for firing. To change the PDL to another number, use the statement: POKE 18793, P where P is the Paddle number 0, 1, 2, or 3.

To change Button 0 to another number, you will need to type in the following:

To change to Button #1  
POKE 17954, 98

To change to Button #2  
POKE 17954, 99

To change Button #1 to another number:

To change to Button #0  
POKE 17861, 97 and POKE 18123, 97

To change to Button #2  
POKE 17861, 99 and POKE 18123, 99

Using these Pokes you can customize the placement of the controls to your own system. This is particularly useful if you have installed joysticks with multiple Button controls wired into one joystick enclosure.

continued on next page



# FIRING HI-RES MISSILES — AIMING AND CONTROL

One of the shortcomings of Hi-Res graphics is the absence of an IF SCRN(X,Y) = COLOR function. This function (which is in Integer Basic) permits the sensing of the presence/absence of a plotted dot and returns the color of the dot sensed. It is an extremely useful command for writing games (detecting shots, hits, bouncing balls, etc.).

The SCRN function can be simulated with a complex formula to locate the coordinates of the shell being tested, but the calculation significantly slows down whatever game uses it.

All of this is simply to say: "There's a better way." It requires PLANNING in setting up the trajectory of your missiles, and the intercept points with your targets. This is demonstrated in the STAR ATTACK game in the firing and aiming of missiles.

In STAR ATTACK, the Missile Launcher is located at X=130 and Y=154 (See the DGUN routine beginning in Line 8500 of the Assy language source code).

The Missile Launcher is under Paddle Control and ranges over 12 firing positions (from -6 to +6 units). As the PDL's are read, their position selects a number from -6, in which the Missile Launcher points to the extreme left of the screen, -6 to aim all the way to the extreme right of the screen. To position the Missile Launcher, a line is drawn between the tip of the launcher and the base (and the old position of the gun is erased). The tip of the launcher may then be positioned (ranging from left to right) at X=124, X=123, X=124 ... X=130 ... X=134, X=135, X=136. The Y coordinate is 147, and the line is drawn from X, 147 to 130, 154 (the base of the launcher).

The same method is used to plot the missiles and their trajectories. Let's name the trajectories -5, -5, -4 ... 0 ... +4, +5, and +6. Each missile travels a path which decrements 'Y' by 7 units on each plot. The 'X' coordinate for the plot is then calculated in the routine DSHL (line 80). When the paddle button is pushed/fired, the -6 to +6 is stored (depending on the paddle position) and successively added to the X coordinate as the missile moves up the screen. For example, if the gun is pointed to the extreme left:

The Tip of the Launcher is at X=124, Y=147  
The X decrement is -6)

The first shell position is X=118, Y=140. The second shell position is X=112, Y=133. At each plot, X is decremented by 6 and Y is decremented by 7 positions.

The TARGETS (Space Ships) are travelling across the screen on straight vectors at the following Y positions:

- Target 1: Y=14
- Target 2: Y=21
- Target 3: Y=35
- Target 4: Y=49
- Target 5: Y=63
- Target 6: Y=77
- Target 7: Y=91

At some point during the movement of the missile, it will land squarely on the path of EACH target. (You may have noticed that the target vectors are multiples of 7 for the Y decrement).

When a missile crosses the path of a target, it is a fairly simple and fast process to see how "close together" the X coordinate of the missile is to the X coordinate of the target. If they are within +6 or -6 X positions of each other, a HIT is scored. This process of testing begins on Line 8700 and tests all 7 ships for hits with the 'THIT' subroutine.

To summarize so far, STAR ATTACK fires shots and tests hits by comparing X and Y coordinates of the ships and shells (rather than by physically sensing a SCRN plot/no plot). The Hits are then handled in the routines beginning with Line 8780 HIT1 and progressing through to HIT7.

The end of each shot is sensed in Line 8622 and is then erased with the plots and counter resets which immediately follow in the EOS routine (Line 8640).

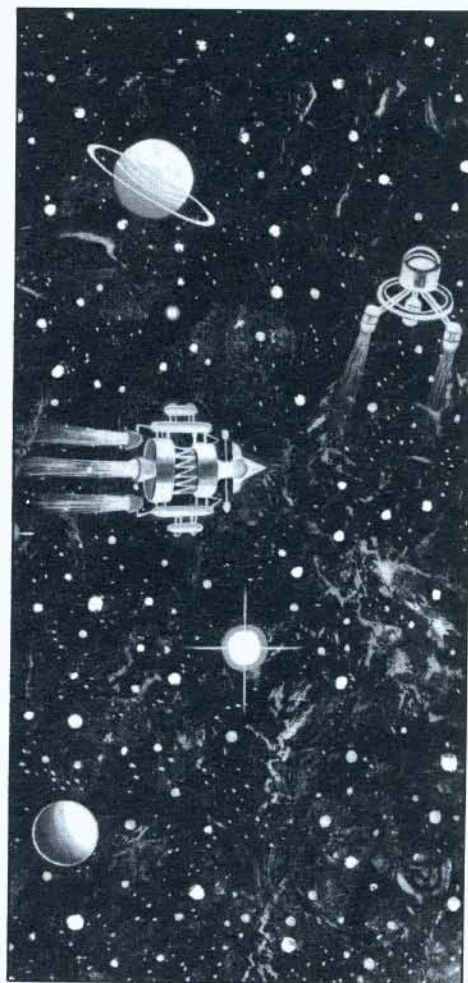
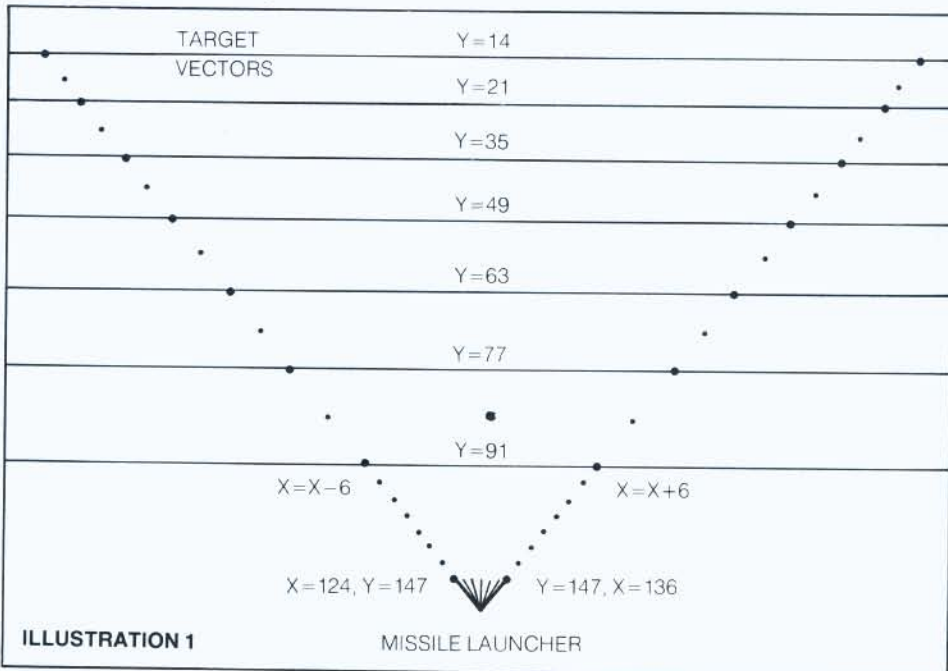
These same techniques can be used for other games like SPACE INVADER, PINBALL, etc. The key points to remember in Shots, Balls, Pucks, and the like, are:

1. Keep the projectile on the screen with limit checks.
2. Plan ahead and make sure your projectile actually does have the chance to intercept the target.
3. Score hits by allowing a range of proximity between the shell and the target.
4. Allow easy or hard games by tightening or loosening the target proximities.

**FIRE AWAY!**

## PLANNING MISSILE PATTERNS AND TRAJECTORIES

(STAR ATTACK EXAMPLE)



continued on page 29



**"When you have eliminated the impossible, whatever remains, however improbable, must be the truth." — Sherlock Holmes**



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the truth is, Hayden  
publishes the finest  
software available!**

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8 programs that give the user the ability to perform computations of complex numbers in BASIC rather than in FORTRAN. #01201, PET; #01203, TRS-80 Level II; #01204, Apple II; each \$14.95.

**ENGINEERING MATHEMATICS-1** (Gilder)

Contains 8 programs useful to the engineer such as: Integration by Simpson's Rule, Quadratic Equations (covering all 3 root cases), etc. #01301, PET; #01303, TRS-80 Level II; #01304, Apple II; each \$14.95.

**GENERAL MATHEMATICS-1** (Gilder)

Provides 15 programs useful to anyone who wishes to improve their math skills and accelerate their computations. #01101, PET; #01103, TRS-80 Level II; #01104, Apple II; each \$14.95.

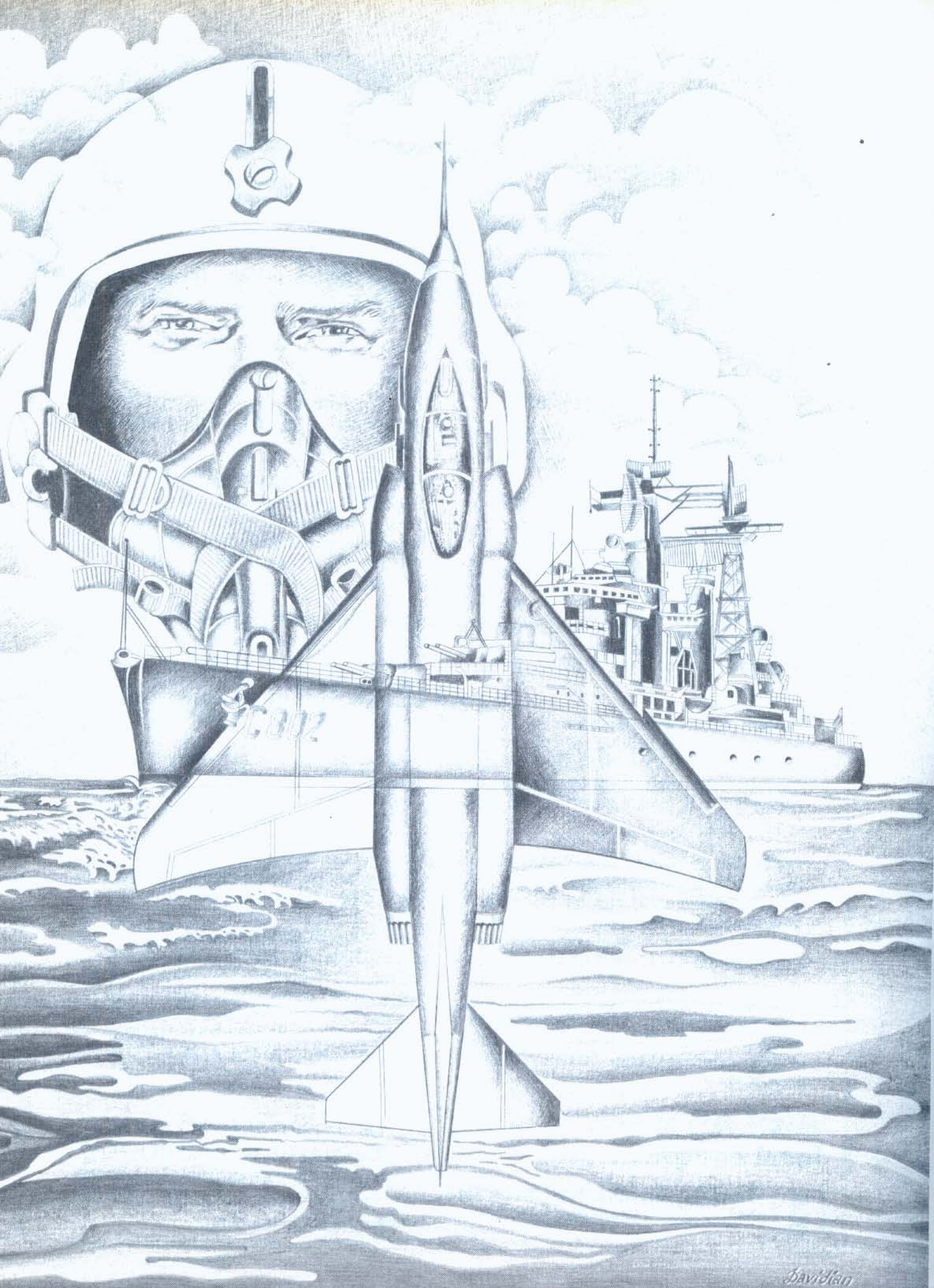
**SARGON II** (Spracklens) Winner of the recent European Microchess Tournament. "Buy this program when it becomes available — ...an evaluation routine that enabled it to beat the giants!...unequaled in the end game..." Personal Computing. #03403, TRS-80 Level II; #03404, Apple II; each \$29.95. #03409, Apple II Disk Version, \$34.95.

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# AIRSEA BATTLE

Join the Navy! Join the Air Force! Win AIRSEA BATTLE and win a promotion to Admiral or General!

As the Bombardier or Missileman in the conflict, you'll control the firing of missiles/bombs for a Bomber and Fighter (if you're the Air Force), and you'll control a Destroyer and Submarine (if you are the Navy).

You have a choice of playing AIRSEA BATTLE with an opponent or playing against the Apple! **Warning!** If you play against the Apple, every second missile/bomb it fires is a Heat-seeking missile which tracks a deadly path to its targets. Every second missile/bomb that you have in the air comes under direct control of your Game Control Paddle and becomes a "Guided Missile".

You have 15 Missiles/Bombs and a Time Limit (So don't try to wait for the other guy to use up his ammunition before you start firing).

The "Targets" track across your screen at random intervals and at changing speeds to throw off your aim. The Bombs will Splash as they hit the water. The Missiles will detonate with a Flak explosion when they reach the proper altitude. And a HIT on any target blows it away with a Red Explosion!

AIRSEA BATTLE allows you to choose new sides after each game, keeps track of the previous high score, and evaluates each player's performance at the end of each Battle. Watch the Bombs! Watch the time! And Watch Out!

**NOTE:** If you would rather play the games than enter them into your system, \$12.95 plus \$1.50 for shipping will bring you a copy of AIRSEA BATTLE and STAR ATTACK on a fresh Diskette. (That's close to our cost at Micro-SPARC).

## How AIRSEA BATTLE Works

AIRSEA BATTLE makes use of the Low-Resolution Shapewriter (in this issue) to erase and draw the 7 low resolution shapes in the game at very high speed. The Erase and Draw routines are in Lines 10-14, and are called as subroutines throughout the program. This represents an interesting programming challenge in handling the submarine (in particular) because of the need to change the background color as projectiles enter and leave the water.

AIRSEA BATTLE is designed to run in a 16K Apple with Game Paddles 0 and 1. The Assembly Language routines and Shape Tables are contained in memory Hex \$800-FFF, so be sure to set LOMEN: 4096 each time when loading the Basic program.

### The principal variables are:

PXN, PYN	Fighter new Coordinates
PXO, PYO	Fighter Old Coordinates
BXN, BYN	Bomber New Coordinates
BXO, BYO	Bomber Old Coordinates
DXN, DYN	Destroyer New Coordinates
DXO, DYO	Destroyer Old Coordinates
SXN, SYN	Submarine New Coordinates
SXO, SYO	Submarine Old Coordinates
FXN, FYN	New Draw/Erase Coordinates
FXO, FYO	Old Erase/Draw Coordinates
BX1, BY1	Bomb #1 Coordinates
BX2, BY2	Bomb #2 Coordinates
MX1, MY1	Missile #1 Coordinates
MX2, MY2	Missile #2 Coordinates
ASC, NVY	Air Force & Navy Scores
BMS, SHS	Bombs & Missiles Remaining

### The Shape Tables for the AIRSEA BATTLE Shapes are as follows:

\$900	Fighter
\$910	Bomber
\$920	Destroyer
\$930	Sub
\$940	Splash
\$950	Flak/Explosion

The Addresses are hexadecimal. The Sound Routine is in Hex \$980-995. These are all shown on page 42 and should be typed into memory by hitting Reset (to get into the Monitor Mode) and then successively putting them into their respective slots. When they are all in memory, Type BSAVE AIRSEA MACH LANG, \$800, L\$200 for Disk, or \* 800.A00W for Tape Cassette.

The principal Assembly Language Shape writer is IDENTICAL to the Assembly Language Shapewriter described and listed in the "Low Resolution Apple Shape-Writer" article in this issue. In particular, note the handling of Color designation in handling shape-writing. The Color-coding is completely described in the article and is used extensively in AIRSEA BATTLE.

Programming the shape movement is a matter of first Erasing the Old Shape and then Drawing

the New Shape at its new position. Doing this in reverse (Draw-then-Erase) produces chewed-up figures (You can change the sequence of Lines 10 and 11 to test this).

Each time a shape goes off the screen, it is assigned a random "count-down" number which must be worked off for the shape to reappear. The Fighter and Sub will also be assigned a new random Speed for the next pass at the targets. You can set changing speeds for the Bomber by substituting a Variable for "-1" in the statement  $BXN = BXN - 1$  in Line 50. Then give the Variable a random value between 1 and 3 in the Reset Routine in line 90. The same thing can be done for the Destroyer in Lines 95 and 185 respectively.

HITS on the targets are triggered by the IF SCRN (X,Y) = COLOR commands in Lines 235, 240, 325, 425, and 520.

If you have two full-range Joysticks, the game can be improved by putting ALL Bombs and Missiles under Guided Missile/Bomb control. This would increase the control challenge considerably. (The Bomb #2 control Routine is in Line 317). By putting the Number 1 Bomb under Paddle Control in Line 215 (Add paddle control to vary BX1), you will accomplish this. Similarly, you can change the control of Missile #1 in Line 400 by adding paddle control to MX1. Remember to put limits on the Range (2-37) of the Bomb/Missile or you'll go off the screen with a Range Error.

A word about the idiosyncracies of the game. The Bombs and Missiles won't fire unless BOTH planes or ships are on the screen.

You'll notice that AIRSEA BATTLE has been programmed with multiple statements per line. This is done to increase the speed of the program. Also, the most frequently used subroutines for drawing and erasing the shapes have been placed early in the program, again for speed. A good project which will probably yield additional speed increments is to put the Bomb and Missile plotting "up front" (i.e. earlier in the program). These plots occur in lines 215, 300, 320, 400, 500, and 520.

## Summary

To summarize, here are the steps to get ready for BATTling!

1. Type in the Basic Program and Save.
2. Hit Reset (or CALL - 151 with Autostart) and type in the Machine Code for:
  - A. Low-Resolution Shapewriter
  - B. Tone Subroutine
  - C. Low-Resolution ShapesThen SAVE the machine language.
3. To USE AIRSEA BATTLE:
  - A. Type LOMEM: 4096
  - B. LOAD AIRSEA BATTLE
  - C. BLOAD AIRSEA MACH LANG
  - D. Type RUN

And you're off on your first Mission!

continued on page 39



# HOW TO WRITE GAMES THAT LAST

There's a very old story about the early use of computers to optimize complex mixtures — in this case, Cattle Feed. As the story goes, Government Researchers were searching for a Cattle Feed which would optimize everything. It would take very little land to grow it. It would have a short growing season, a high yield, a low cost, high nutritional value to the cows, and be able to be stored efficiently. The land was studied. The nutrition of various grains was studied. Farming techniques were studied.

After all the studies were completed, formalized, and fed into the computer, the system cranked out the recipe for the "Perfect Cattle Feed". Only one problem: The cows wouldn't eat it!

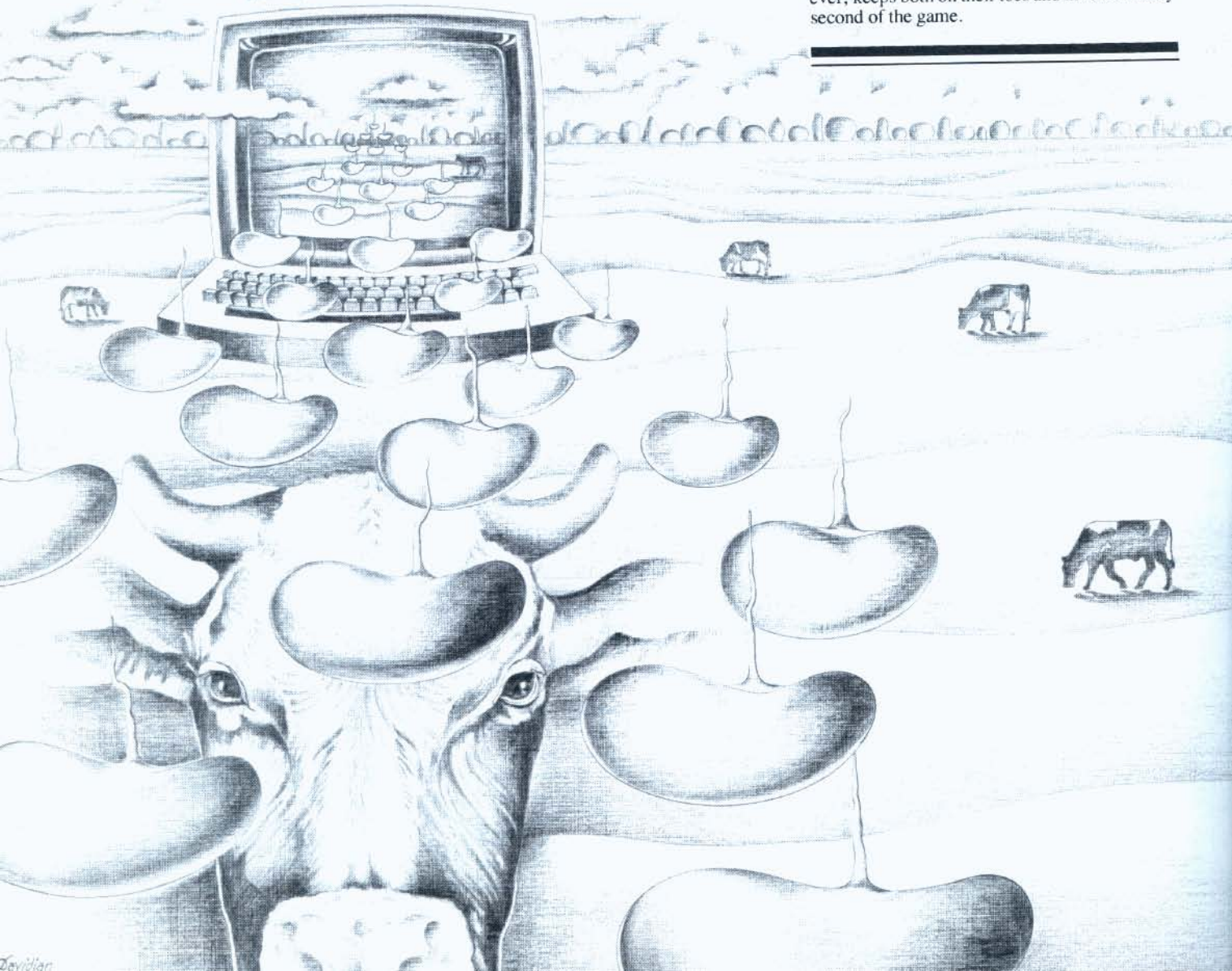
After considerable despair, head-scratching, and puzzlement, a young researcher made the wild-eyed suggestion that they consult a cattle farmer for the answer. After listening to the whole story, the farmer asked one question: "Does your feed have any Alfalfa in it?" The answer, "No", brought the reply: "Put in some Alfalfa. Cows will eat almost anything if it has Alfalfa in it."

The moral of the story is that technical perfection doesn't necessarily "fly" if the "Cows won't eat it." The same principle applies in writing and "Kid-testing" computer games.

This article is an effort to define the "Alfalfa" to make your games more fun and lasting, and interesting.

**SET LIMITS!** Even the most innovative game becomes boring if it goes on and on and on. If you're writing a shooting gallery, hockey, or some other game involving pieces which are used up during the game, limit the number of shells available, the amount of fuel for the flight, etc. Most kids quickly lose interest in the "process" if the process is all there is to it. Even better, set a combination of limits. If you have set a limited number of shots in a two-player shooting game (like AIRSEA BATTLE in this issue), without setting a countdown, eventually one of the players will lay back, waiting for the other to use up his shots. When the first player has used up his shots, the second will then fire at leisure and usually with more accuracy (a game playing strategy). This usually proves infuriating to the first player who throws the game control on the floor and storms out of the room (this has been "kid-tested" with my two boys).

The presence of the countdown timer, however, keeps both on their toes and involved every second of the game.





---

**SET DYNAMIC GOALS!** One of the tastiest "Alfalfa" game improvements is the PREVIOUS HIGH SCORE report. This is a very easy feature to install and it is a particularly potent addition to single-player games. Carrying the Previous High Score forward from round-to-round (of the game) gives a constantly rising goal to shoot for. Some kids also look on it as a way to test the "limits of the game". It allows the player to measure his/her progress and improvement in skill and will bring them back to play again and again.

---

**MULTI-LEVEL PLAY!** Most of your games can be structured for "Easy" and "Hard" play by inserting random variables that tend to draw the player toward disaster. The SPACE MAZE game in the Jan/Feb issue included this element. Also, you may want to add a feature that automatically switches to the "Hard" version after some number of "Easy" games have been played.

---

**LET THE APPLE COMPETE!** Give your multi-player games the option to be played solitaire by having the Apple become the other player. This is illustrated in AIRSEA BATTLE, in which the Apple can be assigned as the opponent (and can play either the Air Force or Navy side at the player's option).

In having the computer compete, give it some elementary "smarts" to play a decent opposing game. You can program the game to shift probabilities dynamically to equalize the game as it progresses, or as in AIRSEA BATTLE, allow the Apple to seek out the closest target (to its shell) and then to automatically track to the target.

---

**MAKE YOUR GAME UNPREDICTABLE!** Introduce random variables to throw the player off stride as he/she tries to "psych out" the game. In one of my early target games, I found one of my boys staring intently at the screen and rhythmically squeezing off shots which hit every target. He had a "feel" for the rhythm of the targets and was about to play for the last time. A random variable that required a "countdown" before the target reappeared, as well as a random pattern of "speed" changes in the target re-kindled his interest.

While you're inserting randomness, don't over-do it! If your game is totally random — that is, it lacks a Skill-Factor — your players will quickly discover they are "Observers" and have no real control over the outcome.

---

**KEEP THE ACTION FAST!** I've seen my boys play "Break Out" (newer versions are being called "Little Brick Out") so intently that they hardly blink their eyes. The "Speed Effect" can be achieved in two ways. First, just physically make it run fast using the tips in your Applesoft or Integer Basic manual. Place the most frequently used subroutines and variables early in the program (each time you use a GOTO or a GOSUB it must scan the whole program to find the Line #). Use multiple statements per line, 1-letter variables, Assembly Language subroutines, etc.

A second method for "speeding the action" is to introduce a lot of different player responses into a visually slow game. A good example of this is in the suggested enhancement to AIRSEA BATTLE which puts each of 4 Projectiles (2 Bombs and 2 Missiles) under paddle control. Four moving targets and 4 projectiles, together with explosions, splashes, etc. makes an otherwise slow-moving game seem to go very fast, with high player challenge. Another example of this approach can be used to spice up the good old "Hockey Game" which is so familiar to many of you. Try making Hockey run with 10 Controllable Players!

Ten Player Hockey can be accomplished by "Enabling/Disabling" each pair of players as the Puck moves into their segment of the playing arena. In a sense, it's a challenge of mental coordination — like patting - your - head - while - rubbing - your - stomach - standing - on - one - foot. It is an approach that works!

Don't ignore the potential for programming ALL the slow graphics routines totally in Assembly Language. Depending on the type of program, an Assembly Language version may run 10-100 times faster than its Basic counterpart. (The STAR ATTACK game featured in this issue is an excellent example of this. It is extremely fast and action-filled. The programming methods described in the Feature Section will help you toward that goal.)

---

**SET GREATER REWARDS FOR WINNING THAN LOSING!** One of the seductive traps in game programming is to concentrate the creative effort in making spectacular explosions, etc. as you lose the game. If your game is too heavily weighted in this direction, you'll abort the very purpose of the game. The same principle is particularly true in another field, Computer Assisted Instruction (CAI). One of my early CAI programs found my sons eagerly making mistakes to bring out the computer responses and help statements — where their correct answers did nothing but go on to the next problem. Spend some effort to program Bonus Points, Extra Balls, More Shots, for exceeding different score thresholds and they'll keep coming back for more. Player "Evaluation" is a good technique to apply here. At the end of the game, evaluate the scores and bring out a "Player Rating" and you'll find the kids trying like mad to become a "Pinball Wizard", an "Admiral of the Fleet", a "Starship Commander", and so on.

Consider adding an "artificial" reward which exists for itself (i.e. doesn't really tie in to the game). For example, you might program a Fireworks Display to the Winner; Play the STARWARS Music; Run up and down the Music Scale; "Flash-Print" your messages, etc. The possibilities are mind-boggling.

---

**PLAN A GAME ANALYSIS/WRAPUP.** You can keep game statistics as the game progresses. Then, at the conclusion, print out a summary analysis which shows "Who-did-What". This can include things like the number of shots taken; the ships hit (by type of ship, enemy or friendly, etc); the number of first-downs; fuel used; and so forth. Not only will this tend to resolve disputes it has even greater advantage in allowing the player to study his/her performance, the game itself, and the methods for improving the performance (to beat the PREVIOUS HIGH SCORE — which you added earlier).

---

**CRITIQUE AND TUNE YOUR FINISHED PRODUCT.** Many of the best computer games have "evolved" by repeated play and "tuning."

When you're working with a number of game variables such as the number of shots, countdown timers, etc. you'll need to inspect how they all work together. Then you should make adjustments to integrate them and make them consistent. To exaggerate the point, if you are allowing 50 shots to be fired at targets and your countdown fuel timer only allows 25 shots to be squeezed-off before time runs out, that's an obvious "Glitch", and is easy to change. But when you're going through complex evaluations of scores, reward messages, and the like, you should make sure that your "Top Reward" is actually ATTAINABLE by a skilled player — but not too easily attainable. Test it yourself and with other players. If the Top Prize never comes up, then the scoring should be re-tuned.

---

**ASK FOR SUGGESTIONS!** Above all, don't charge out of your study, drag in the kids, and say "Play this new game. You're going to LOVE IT!" Kid-testing is very low-ley and my boys have had tremendous ideas for improving game programs over the last couple years. Listen! And Tune!

---

#### TO SUMMARIZE:

- SET LIMITS!
- SET DYNAMIC GOALS!
- PROGRAM MULTI-LEVEL! PLAY
- LET THE APPLE COMPETE!
- MAKE YOUR GAME UNPREDICTABLE!
- KEEP THE ACTION FAST!
- MAKE WINS BETTER THAN LOSSES!
- PLAN A POST-GAME ANALYSIS!
- TUNE AND RE-TUNE YOUR GAME!
- AND INVITE SUGGESTIONS!

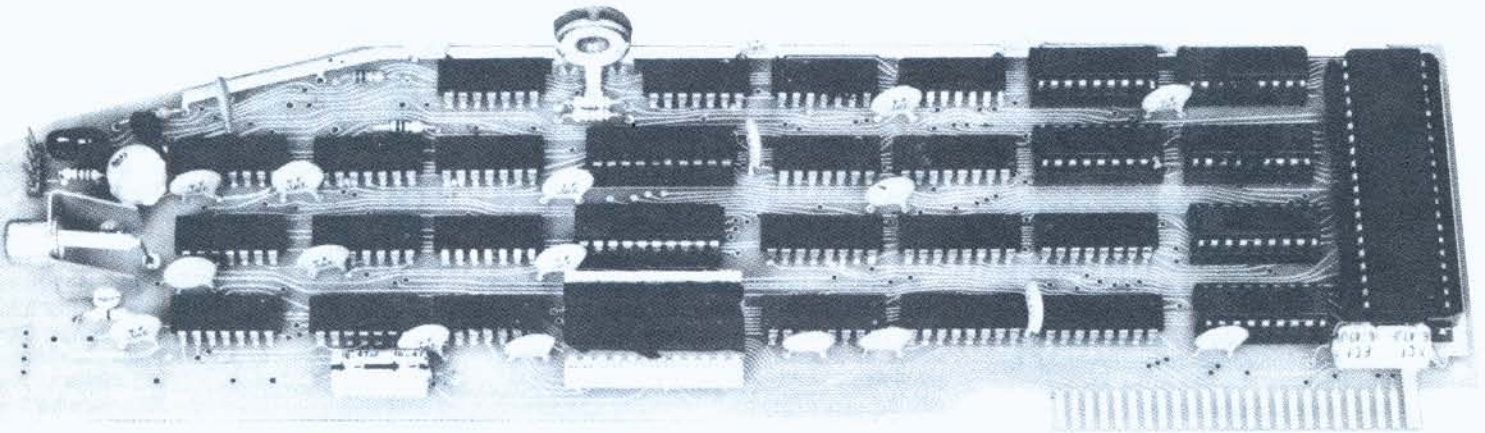
You'll discover your programs are chock full of delectable "Game Alfalfa".  
The kids will love it!

---





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## New Apple Printing For Whatsit?

**WHATSIT?** (Wow! How'd All That Stuff get In There?) is an interactive file and inquiry program which, in its newest version, supports conversational Apple storage and retrieval.

**WHATSIT?**'s main features center on its ability to handle very large files—more than 2000 entries on a single 5 inch diskette. It is also known for its open-ended inquiry ability, i.e. it's ability to cross-reference disk entries and answer questions written in simple "Pidgin English".

In the new Apple Model a feature called "Soundex" allows information to be retrieved by phonetic matching. Soundex allows approximate spelling of data keys (where the user may have forgotten the exact spelling), whereupon **WHATSIT?** will dutifully search out the file information. Response time is announced in a range of 2-10 seconds.

The new Apple version also includes a feature called "What's Next", which switches on a self-prompting sub-system for entering or adding new data.

**Prices** for **WHATSIT?** start at \$100, and more information is available from its producer, Computer Headware, P.O. Box 14694, San Francisco, CA. 94114

## Machine Language Apple SORT Coming!

**MATRIX** has announced development of an Apple-version of its **6502 SORT**. The current product, which runs on a 16K or 32K PET, is being written for the Apple in machine language.

The **SORT** code will occupy approximately 1K bytes of high memory, and is set with a series of **POKE** commands to specify the sort parameters. It can be used for sorting Arrays and can be set to search/sort on up to 20 keys.

The company claims very fast performance, with a sort on the first item of an array **A%(2,999)** requiring about 3 seconds, and a comparable sort on the middle item requiring about 6 seconds.

For pricing and delivery, contact **MATRIX SOFTWARE**, 1041 N. Main St., Ann Arbor, Mich. 48104.



## New "Teacher" Programs For The Apple!

**Charles Mann and Associates** has announced two comprehensive teaching programs for learning Applesoft and Integer Basic. The programs are available in versions which support the Apple II and the Apple II Plus systems.

**"The Teacher Plus"** is a 17-lesson program which covers the most frequently used Basic commands and is keyed to the Apple's own Reference Manuals. It covers arithmetic options, String manipulation, Loops, High and Low Resolution Graphics, machine language and logical relationships.

The lessons are designed as interactive self-reinforcing segments which make use of extensive program examples to illustrate the instructions in action.

The various "flavors" of program Pacs are appropriate to both the beginning and the advanced programmer. They range in price from \$19.95 for a 12 lesson Integer Basic program on tape, up to \$59.95 for the full "Plus Teacher Pac" on two diskettes. For more information, contact **Charles Mann and Associates**, 7594 San Remo Trail, Yucca Valley, CA 92284.



## Apple Software Debugger For Machine Language Programs!

**Microproducts** has announced **APPLEBUG** for the Apple II computer. **APPLEBUG** has been designed to operate either as a stand-alone debugging aid or in conjunction with the **Microproducts 6-Character Label Editor Assembler**.

Operating in the stand-alone mode, **APPLEBUG** is said to be able to **STEP** and **TRACE** the execution of existing machine language programs, including the Apple Monitor, DOS, and Applesoft! Also, since the **TRACE** and **SINGLE STEP** operations have been deleted in the Apple II Plus, the **APPLEBUG** system can be used to replace those functions.

**STEP** will single-stop through a program and display the executed instructions and the associated registers. In addition, the program permits display of user-specified memory locations as Hex locations or Labels.

**TRACE** will trace the execution of a program instruction-by-instruction and will display the associated registers. In addition, it will log each JSR and RTS instruction.

**APPLEBUG** is priced at \$29.95 on diskette and is available through computer stores and from **Microproducts**, 2107 Artesia Boulevard, Redondo Beach, CA. 90278

## Apple Video-Tape Computer Assisted Instruction Announced By CAVRI Systems

**Computer Assisted Instruction (CAI)** has a new dimension with the integration of Video-tape sight and sound with the Apple. The new package includes a computer/video-tape interface, cables and connectors, an instruction manual, and a starter cassette of subroutines for creating CAI programs.

The system works by presenting a segment of the topic on videotape. The Apple is programmed to then automatically pause at the end of the segment and switches control to the Apple. At that point, the Apple can be programmed to visually present the CAI materials, accept a variety of responses, and then control progress (and scoring) through the session.

For those who prefer not to write their own programs, **CAVRI Systems** has announced a service to do the job for a fee. For more information, write **CAVRI Systems**, 26 Trumbull Street, New Haven, Conn. 06511.



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**FILEMASTER II** Has all the same features of FILEMASTER I plus allows for totaling, advanced math routines, more powerful print formatting, larger data fields, and disk-to-disk transfers ..... \$99.50

**+Space** (Edu-Ware) Six programs form a unique epic game series. Multi-faceted simulation of life in interstellar society. You and opponents must make life & death decisions. Keeps track of your progress from one game to next. Needs 48K and Applesoft ROM. Disk ..... \$29.95

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**+Adventure** This original, full-function game is the same as the one developed for large mainframes. Fight off pirates and vicious dwarfs. 700 travel options, 140 locations, 64 objects. Needs Applesoft ROM & 48K. Disk ..... \$29.95

**32K Disk Inventory:** Use stock numbers, description, vendor, record of purchase and sales date, amount on hand, cost & sell price, total value. Holds up to 300 items.

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+ With Bill of Materials: Disk ..... \$50

**32K Data Base** Cross file for phone lists, bibliographies, recipes. Run up to 9 lines of 40 columns each. Search by item anywhere.

Disk ..... \$20

**24K Hi-Res Life Simulation** Conway's equations on 296x180 screen. A mathematical simulation to demo population growth with birth, death and survival as factors. Tape ..... \$10

**16K Rainbow's Casino** 9 gambling games: Roulette, Blackjack, Craps, Horserace, Yahtzee, Keno, Slot Machine, Poker, and Acey-Ducey. Needs 16K. Tape ..... \$29.95      Disk ..... \$34.95

**16K Space War:** You in your space capsule battle against the computer's saucer ... in hi-res graphics. Tape ..... \$12

**16K Memory Verify** Diagnostic routine to check range of memory. Indicates faulty addresses, data in memory cell, and faulty data. Tape ..... \$5

**16K Appledion** Music synthesis composes original Irish jigs. Enter your own music and save on tape or disk. Includes 3 Bach fugues.

Tape ..... \$10

**+48K Edu-Pack** (Edu-Ware) This package combines COMPU-READ—five speed reading programs; three PERCEPTION games where random shapes and sizes must be matched; and STATISTICS for computing Mean, Variance, Standard Deviation, and much more! Needs Applesoft ROM. Disk ..... \$39.95

**+32K Sargon II** (Hayden) Here's the program that came in third against the big machines (mainframes and maxis) at the 9th North American Computer Chess Championship and placed first in the European Microcomputer Chess Championships! Has seven levels of play with Levels 0 - 3 playing in tournament time. Need a challenge? This is it!!

Tape ..... \$29.95      Disk ..... \$34.95

**16K Hi-Res Baseball** (Programma International) This animated simulation of a major league baseball game is for two players. The scoreboard is in the lower left of screen with the "throw pointer" for directing a throw in the lower right corner. Written entirely in machine language, the action is quick and smooth, making it the finest simulation of its kind.

Tape ..... \$15.95

### OTHER SPECIAL ITEMS FOR YOUR APPLE II

**VERSAWRITER** This digitizer drawing board, complete with a powerful software package on disk, lets you create any picture in color with high-resolution graphics. It's ideal for mass graphics. You can trace, edit, save and recall what you draw. It's a simple-to-use system for students, artists, engineers and graphic programmers. Has an 8½"x11" working area. New applications added include: •Text Writer adds text to your pictures. You control size, color and direction of text; •Electronic Drawing lets you create schematics and includes commonly used symbols for transistors, OPAMPS, and FETS; •Distance/Area lets you compute distances on maps or area of any frame. Applesoft ROM and 32K required. .... \$249.95

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## "DOUBLEVISION" Produces 80 Character Apple Display!

By Diana Pachin

With the increased uses of APPLE II and APPLE II PLUS in applications such as WORD PROCESSING, BUSINESS and PASCAL, a great need has been felt for an 80 Column Video Display.

Computer Stop Corp. (Lawndale, CA) has stepped in to fulfill this need with the introduction of their Video Display Board, Double Vision (TM) . . . and 80 column x 24 line video display board that plugs into one of the APPLE I/O slots.

### Hardware:

The main function of displaying is performed by Motorola's MC6845 CRT controller (CRTC) . . . a 40-pin chip. All the Integrated Circuits are socketed as is a common practice of all APPLE equipment and other manufacturers that make peripheral equipment compatible with APPLE. The Video output jack is a three pin mini plug on the end of the DoubleVision board that is closer to the back of Apple providing easy out from the APPLE via the cutouts at the back. The two outside pins are ground and the middle pin provides the video signal thus effectively polarizing the connector and preventing one from plugging it backwards. Pads have been provided for connecting a wire from the SHIFT key to DoubleVision thus permitting the use of APPLE Keyboard for direct lower casetyping. Another pad has been provided for connecting the light pen. The rest of the board is professionally laid out with symmetrical traces horizontal on one side of the printed circuit board and vertical on the other.

The CRTC is a fully programmable device. The number of rows, columns, cursor format, blinking, nonblinking and blink rate can all be programmed for any special application by altering the contents of the sixteen registers provided in the CRTC. The location of these bytes has been provided in the software and the formulae for calculating the values for any special application other than 80 x 24 is provided in the specification sheet of the CRTC. This programming capability also permits the use of DoubleVision in countries where the main power is other than 50 Hz.

In addition to the CRTC, the video board consists of 2K of its own refresh RAM and a full ASCII character ROM. The 2K RAM is capable of holding more than 80 x 25 for example. The output is composite Video similar to that of APPLE.

The lower case has been implemented by making a one wire connection from the SHIFT Key to a wire on the Video board; SHIFT LOCK FEATURE HAS ALSO BEEN IMPLEMENTED. Alternatively for those people that do not wish to make this wire connection, an ESCape Key feature has been provided that effectively performs the same function.



The CRTC contains LIGHT PEN registers and a pad has been provided on DoubleVision for hooking up the light pen. As of the date of evaluation of this board, the software for using the LIGHT PEN, has not been implemented. All information on the use of this device is provided in the spec sheet for MC6845 for those ambitious enough to start using this facility.

Finally, this board is selected when writing into it. Thus it does not interfere with any other board occupying the \$C800-\$CFFF RAM space.

### Software:

All the software for running DoubleVision has been integrated into DOS 3.2. A diskette is furnished which when booted, displays the appropriate prompt character (> Integer; JApplesoft). At present, the software for operating with APPLE II and APPLE II PLUS has been implemented. In general, all comands that do not make use of the APPLE monitor for performing the output will work with this video board without any modifications. All the outputs must be through the hooks in DOS 3.2.

### Word Processing

PROGRAMMA INTERNATIONAL'S APPLE PIE V2.0 is being specifically written to run with DoubleVision. Reportedly, it will have advanced features of Word Processing systems, such as imbedded variables to permit customized form letter generation. Both DoubleVision and APPLE PIE 2.0 were on display at the West Coast Computer Faire in San Francisco in March.

### Pascal:

As of the date of this review, the software to interface with PASCAL has not been debugged. However, according to Computer Stop Corp. the software will be identical to that presently used in displaying 80 columns on SOROC or ADM-3.

### Conclusion:

The board is well designed and the software to run it has been written in such a way that it is transparent to the user.

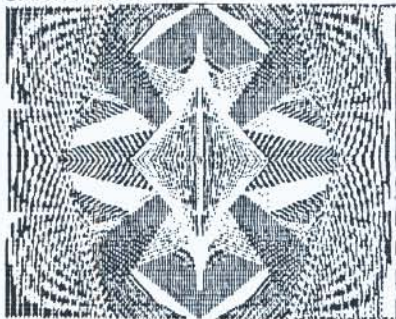
Simply plug the board in, boot the disk and you are on your way. No more seeing split lines at 40.

Since DoubleVision has its own refresh RAM, with additional programming, one could use the regular APPLE video to display graphics and DoubleVision to display the 80 cloumns of text. I predict a great number of programs using this capability. My favorite first would be SARGON. We would no longer have to flip pages to see the moves.



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P66



# STAR ATTACK BASIC LIST

```

>LIST 24k INTEGER BASIC
1 REM *****
2 REM ** STAR ATTACK BASIC **
3 REM ** MICRO-SPARC **
4 REM ** P.O. BOX 325 **
5 REM ** LINCOLN MASS 01773**
6 REM ** COPYRIGHT © 1979 **
7 REM *****
8 REM
9 PRINT ""
10 REM USE LOMEM:4000 AND HIMEM:8192
15 GOSUB 2000: POKE 17227,0
17 TEXT
20 CALL 17434
21 GOSUB 2050: GOTO 26
24 CALL 17563
26 X= PEEK (17226): IF X>0 THEN GOSUB X*100
31 S= PEEK (17227): IF S<>T THEN GOSUB 800:T=S
40 N=N-1: VTAB 21: TAB 16: PRINT N
45 IF N=1000 OR N=100 THEN GOSUB 5000
50 IF S>100 OR N=0 THEN 3000
55 GOTO 24
100 POKE 17226,0: VTAB 23: TAB 10: PRINT A$;: TAB 37: PRINT "+50":X=0
105 SC=SC+50: VTAB 22: TAB 36: CALL -868: PRINT SC:A=A+1: RETURN
200 POKE 17226,0: VTAB 23: TAB 10: PRINT B$;: TAB 37: PRINT "+40":X=0
205 SC=SC+40: VTAB 22: TAB 36: CALL -868: PRINT SC:B=B+1: RETURN
300 POKE 17226,0: VTAB 23: TAB 10: PRINT C$;: TAB 37: PRINT "-50":X=0
305 SC=SC-50: VTAB 22: TAB 36: CALL -868: PRINT SC:C=C+1: RETURN
400 POKE 17226,0: VTAB 23: TAB 10: PRINT D$;: TAB 37: PRINT "+30":X=0
405 SC=SC+30: VTAB 22: TAB 36: CALL -868: PRINT SC:D=D+1: RETURN
500 POKE 17226,0: VTAB 23: TAB 10: PRINT E$;: TAB 37: PRINT "+20":X=0
505 SC=SC+20: VTAB 22: TAB 36: CALL -868: PRINT SC:E=E+1: RETURN
600 POKE 17226,0: VTAB 23: TAB 10: PRINT F$;: TAB 37: PRINT "-40":X=0
605 SC=SC-40: VTAB 22: TAB 36: CALL -868: PRINT SC:F=F+1: RETURN
700 POKE 17226,0: VTAB 23: TAB 10: PRINT G$;: TAB 37: PRINT "-20":X=0
705 SC=SC-20: VTAB 22: TAB 36: CALL -868: PRINT SC:G=G+1: RETURN
800 VTAB 21: TAB 32: CALL -868: PRINT S: RETURN
1000 END
000 DIM A$(20),B$(20),C$(20),D$(20),E$(20),F$(20),G$(20),X$(2),M$(40),BB$(4)
005 BB$=" ":A$=" TIE FIGHTER ":B$=" KLINGON CRUISER":C$=" HOSPITAL SHIP "
010 D$=" KLINGON FIGHTER":E$=" TIE SUPPLY SHIP":F$=" TWA FREIGHTER "
015 G$=" COMM SATELLITE ": CALL -936:N=4000: RETURN
050 VTAB 21: PRINT "TIME LEFT,":; TAB 26: PRINT "SHOTS USED,."
055 PRINT "PREV HIGH SCORE=";HS;: TAB 26: PRINT "SCORE="
065 VTAB 23: PRINT "LAST HIT=";: TAB 27: PRINT "SCORING,."
070 POKE 812,255
072 FOR I=1 TO 100:XX= RND (250):YY= RND (120)
074 POKE 800,XX: POKE 802,YY: CALL 3780: NEXT I
078 POKE 800,0: POKE 802,0: CALL 3780
080 POKE 800,255: POKE 802,0: CALL 3786
082 POKE 800,255: POKE 802,159: CALL 3786
084 POKE 800,0: POKE 802,159: CALL 3786
086 POKE 800,0: POKE 802,0: CALL 3786
088 POKE 800,0: POKE 802,130: CALL 3780
090 POKE 800,124: POKE 802,154: CALL 3786
092 POKE 800,136: POKE 802,154: CALL 3786

```

continued on next page



```

2094 POKE 800,255: POKE 802,130: CALL 3786
2096 POKE 800,0: POKE 802,140: CALL 3780
2098 POKE 800,124: POKE 802,156: CALL 3786
2100 POKE 800,136: POKE 802,156: CALL 3786
2102 POKE 800,255: POKE 802,140: CALL 3786
2200 RETURN
3000 TEXT : CALL -936
3005 IF SC>HS THEN GOSUB 3500: GOSUB 4000
3008 VTAB 21: INPUT "ANOTHER MISSION? HIT RETURN",X$:
      GOSUB 2015
3015 SC=0: POKE 17227,0: REM RESET SCORE AND # OF SHOTS
3020 A=0:B=0:C=0:D=0:E=0:F=0:G=0: GOTO 20
3500 PRINT "YOUR SCORE OF ";SC;"HAS BEATEN THE": PRINT
      "PREVIOUS HIGH SCORE OF, ";HS
3505 PRINT "CONGRATULATIONS!"
3510 HS=SC: RETURN
4000 VTAB 6: TAB 5: PRINT "YOU SHOT DOWN....."
4005 VTAB 7: TAB 16: PRINT A;"",A$
4006 VTAB 8: TAB 16: PRINT B;"",B$
4008 VTAB 9: TAB 16: PRINT C;"",C$
4010 VTAB 10: TAB 16: PRINT D;"",D$
4012 VTAB 11: TAB 16: PRINT E;"",E$
4014 VTAB 12: TAB 16: PRINT F;"",F$
4016 VTAB 13: TAB 16: PRINT G;"",G$
4020 IF SC<100 THEN 4100: IF SC<200 THEN 4120: IF SC<300
      THEN 4130: IF SC<500 THEN 4140 4030 IF SC<650 THEN 4150:
      IF SC<750 THEN 4160: IF SC<850 THEN 4170: IF SC<1000
      THEN 4180
4040 GOTO 4190
4100 M$="LOUSY": GOTO 4500
4120 M$="POOR": GOTO 4500
4130 M$="FAIR": GOTO 4500
4140 M$="NOT BAD..APPRENTICE RATING"
4142 GOTO 4500
4150 M$="GOOD..PROMOTED TO EXEC OFFICER."
4152 GOTO 4500
4160 M$="VERY GOOD..PROMOTED TO 1ST OFFICER"
4162 GOTO 4500
4170 M$="EXCELLENT! PROMOTED TO CAPTAIN!"
4172 GOTO 4500
4180 M$="OUTSTANDING! PROMOTED TO REAR ADMIRAL"
4182 GOTO 4500
4190 M$="SPECTACULAR! PROMOTED TO FLEET ADMIRAL"
4192 GOTO 4500
4500 VTAB 18: PRINT "YOUR SCORE OF, ";SC;" WAS RATED:"
4505 VTAB 19: TAB 4: PRINT M$: RETURN
5000 VTAB 21: TAB 16: PRINT BB$
5005 RETURN

```

# STAR ATTACK SHAPE TABLES

(Type directly into the memory location shown)

## SHIP 1

4000- 2C 2E 25 24 36 36 36 26  
4008- 24 3F 3E 3C 37 36 24 24  
4010- 24 34 36 2E 2C 00

## SHIP 2

4020- 28 2D 35 2D 3D 37 37 3F  
4028- 3F 3C 3C 3F 2D 2D 2C 00

## SHIP 3

4030- 24 2C 35 35 35 3E 3E 3E  
4038- 27 24 3F 3F 2C 2C 2C 06  
4040- 28 36 2E 2D 3F 3F 3F 7F  
4048- 2E 2E 2E 2D 00

## SHIP 4

4050- 3D 3F 2F 2D 2C 2D 3D 37  
4058- 2E 3D 3F 27 07 00

## SHIP 5

4060- 2D 2D 3F 27 3F 3F 2D 35  
4068- 3E 3F 2D 2D 2C 05 00

## SHIP 6

40A0- 3F 3F 2C 2C 2C 2D 35 2C  
40A8- 2D 2E 2E 3E 3F 3F 2F 2D  
40B0- 3E 3E 36 36 24 24 27 27  
40B8- 07 00

## SHIP 7

40C0- 2C 24 34 36 35 2D 2D 3F  
40C8- 3F 3E 36 26 24 27 3F 3F  
40D0- 2D 05 00

## EXPLOSION

4070- 25 27 34 3E 3C 2F 35 3E  
4078- 2F 35 37 27 2D 35 36 24  
4080- 2C 26 2D 2E 3E 3C 2D 3C  
4088- 27 2C 2E 24 25 35 3E 27  
4090- 34 36 3D 2E 2D 2E 3E 3C  
4098- 00



**NOTE:**  
**NIBBLE "TRAC" GRAPHICS CONTEST**  
**CLOSING DATE**  
**ANNOUNCED IN**  
**JANUARY / FEBRUARY ISSUE**  
**HAS BEEN EXTENDED TO MAY 1, 1980**





# STAR ATTACK SOURCE PROGRAM

:LIST

```
1000 X1 .EQ $4300
1003
1005 X2 .EQ $4301
1010 X3 .EQ $4302
1015 X4 .EQ $4303
1020 X5 .EQ $4304
1025 X6 .EQ $4305
1030 X7 .EQ $4306
1035 Y1 .EQ $4307
1040 Y2 .EQ $4308
1045 Y3 .EQ $4309
1050 Y4 .EQ $430A
1055 Y5 .EQ $430B
1060 Y6 .EQ $430C
1065 Y7 .EQ $430D
1070 INIT .EQ $C00
1075 CLR .EQ $C0E
1080 PLOT .EQ $EC4
1085 POSN .EQ $EB1
1090 LINE .EQ $ECA
1095 SHAP .EQ $EDD
1100 XLO .EQ $320
1105 XHI .EQ $321
1110 YLO .EQ $322
1112 STLO .EQ $324
1113 STHI .EQ $325
1115 ROT .EQ $327
1120 SCAL .EQ $326
1125 PCOL .EQ $32C
1130 H1 .EQ $4310
1135 H2 .EQ $4311
1140 H3 .EQ $4312
1155 V1 .EQ $4315
1157 V2 .EQ $4316
1160 V3 .EQ $4317
1167 C1 .EQ $431A
1170 C2 .EQ $431B
1172 C3 .EQ $431C
1175 C4 .EQ $431D
1177 C5 .EQ $431E
1178 C6 .EQ $431F
1180 C7 .EQ $4320
1182 F1 .EQ $4321
1185 F2 .EQ $4322
1187 F3 .EQ $4323
1189 F4 .EQ $4324
1190 F5 .EQ $4325
1192 F6 .EQ $4326
1195 F7 .EQ $4327
1197 XD .EQ $4328
1199 YD .EQ $4329
1201 STD .EQ $432A
```

```
1203 ID .EQ $432B
1205 CD .EQ $432C
1207 FD .EQ $432D
1209 SD .EQ $432E
1211 RNLO .EQ $432F
1213 RNHI .EQ $4330
1215 HIX .EQ $4331
1216 HI1 .EQ $4332
1217 HI2 .EQ $4333
1218 HI3 .EQ $4334
1221 SW1 .EQ $C062
1222 FS1 .EQ $4338
1223 FS2 .EQ $4339
1224 FS3 .EQ $433A
1227 GX .EQ $433D
1228 HZ .EQ $433E
1229 VZ .EQ $433F
1230 HIZ .EQ $4340
1231 FSZ .EQ $4341
1232 SZ1 .EQ $4342
1233 SZ2 .EQ $4343
1234 SZ3 .EQ $4344
1235 SZ4 .EQ $4345
1236 SZ5 .EQ $4346
1237 SZ6 .EQ $4347
1238 SZ7 .EQ $4348
1239 SCOR .EQ $4349
1240 SWO .EQ $C061
1241 HTFL .EQ $434A
1242 SHCT .EQ $434B
1243 SNDL .EQ $434C
1300 .OR $4400
1305 WHT .HS FF
1310 ZRO .HS 00
1315 TEN .HS 0E
1320 TWTY .HS 15
1325 THTY .HS 23
1330 FRTY .HS 31
1335 FVTY .HS 3F
1340 SXTY .HS 4D
1345 SVTY .HS 5B
1355 MAX .HS F4
1360 S1 .HS 00
1362 S2 .HS 20
1364 S3 .HS 30
1365 S4 .HS 50
1367 S5 .HS 60
1369 S6 .HS A0
1371 S7 .HS C0
1372 SHI .HS 40
1373 SHEX .HS 70
1375 I1 .HS 04
1377 I2 .HS 06
1379 I3 .HS F8
1381 I4 .HS FC
1383 I5 .HS 02
1385 I6 .HS FA
1387 I7 .HS 08
1800 SET JSR INIT
1802 JSR CLR
```

```
1805 LDA ##82
1807 STA H1
1810 STA H2
1812 STA H3
1820 LDA ##93
1822 STA V1
1823 STA V2
1824 STA V3
1827 LDA ##0
1828 STA FS1
1829 STA FS2
1830 STA FS3
1956 LDA ##64
1957 STA RNLO
1960 LDA ##1
1962 STA ROT
1965 STA SCAL
1966 STA RNHI
1967 LDA ##0
1970 STA XHI
1971 LDA TEN
1972 STA Y1
1973 LDA TWTY
1975 STA Y2
1976 LDA THTY
1977 STA Y3
1978 LDA FRTY
1979 STA Y4
1980 LDA FVTY
1981 STA Y5
1982 LDA SXTY
1983 STA Y6
1984 LDA SVTY
1985 STA Y7
1986 LDA TEN
1987 STA X1
1988 STA X2
1989 STA X5
1990 STA X7
1991 LDA MAX
1992 STA X3
1993 STA X4
1994 STA X6
2000 STRT LDA F1
2002 CMP ##0
2005 BEQ RND1
2007 JMP N1
2010 RND1 LDA ##1
2012 STA F1
2015 JSR RND
2017 LDA RNLO
2020 STA C1
2022 N1 LDA C1
2025 CMP ##0
2027 BEQ FLY1
2030 DEC C1
2032 JMP P2
2035 FLY1 JSR PLN1
2050 P2 LDA F2
2052 CMP ##0
```

```
2055 BEQ RND2
2057 JMP N2
2060 RND2 LDA ##1
2062 STA F2
2065 JSR RND
2067 LDA RNLO
2070 STA C2
2072 N2 LDA C2
2075 CMP ##0
2077 BEQ FLY2
2080 DEC C2
2082 JMP P3
2085 FLY2 JSR PLN2
2100 P3 LDA F3
2102 CMP ##0
2105 BEQ RND3
2107 JMP N3
2110 RND3 LDA ##1
2112 STA F3
2115 JSR RND
2117 LDA RNLO
2120 STA C3
2122 N3 LDA C3
2125 CMP ##0
2127 BEQ FLY3
2130 DEC C3
2132 JMP P4
2135 FLY3 JSR PLN3
2150 P4 LDA F4
2152 CMP ##0
2155 BEQ RND4
2157 JMP N4
2160 RND4 LDA ##1
2162 STA F4
2165 JSR RND
2167 LDA RNLO
2170 STA C4
2172 N4 LDA C4
2175 CMP ##0
2177 BEQ FLY4
2180 DEC C4
2182 JMP P5
2185 FLY4 JSR PLN4
2200 P5 LDA F5
2202 CMP ##0
2205 BEQ RND5
2207 JMP N5
2210 RND5 LDA ##1
2212 STA F5
2215 JSR RND
2217 LDA RNLO
2220 STA C5
2222 N5 LDA C5
2225 CMP ##0
2227 BEQ FLY5
2230 DEC C5
2232 JMP P6
2235 FLY5 JSR PLN5
2250 P6 LDA F6
```

continued on next page



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The intention of Avant-Garde Creations is to change that. We have the knowledge and techniques, and now we have the programs. The first is called "The Life Dynamic Transformation Experience", and the second is "The Relationship Life Dynamic". Both are available on disk at this time. Over the next year 9 more life dynamic areas programs will be developed in the following areas: physical, creativity, environment, meaning, conditioning, sexuality, normalcy, aliveness, and responsibility.

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2252	CMP #0	2407	STA V1	2568	STA SZ5	7042	STA SD
2255	BEQ RND6	2410	LDA FSZ	2570	LDA X6	7045	LDA X2
2257	JMP N6	2412	STA FS1	2572	STA SZ6	7047	STA XD
2260	RND6 LDA #1	2414	JSR LODX	2574	LDA X7	7050	LDA Y2
2262	STA F6	2450	SHT2 LDA FS2	2576	STA SZ7	7052	STA YD
2265	JSR RND	2452	CMP #0	2580	JSR THIT	7055	LDA I2
2267	LDA RNLO	2455	BEQ TS2	2582	RTS	7057	STA ID
2270	STA C6	2457	JMP CS2	2600	SHTA LDA FS3	7060	LDA F2
2272	N6 LDA C6	2460	TS2 LDA SW0	2602	CMP #0	7062	STA FD
2275	CMP #0	2462	BMI SS2	2604	BEQ TS3	7065	JSR DRAW
2277	BEQ FLY6	2465	JMP SHT3	2606	JMP CS3	7067	LDA XD
2280	DEC C6	2467	SS2 LDA #1	2608	TS3 LDA SW1	7070	STA X2
2282	JMP P7	2470	STA FS2	2610	BMI SS3	7072	LDA FD
2285	FLY6 JSR PLN6	2471	INC SHCT	2612	JMP RETA	7074	STA F2
2300	P7 LDA F7	2472	LDA HIX	2614	SS3 LDA #1	7076	RTS
2302	CMP #0	2473	STA HI2	2616	STA FS3	7100	PLN3 LDA S3
2305	BEQ RND7	2474	LDA #40	2618	INC SHCT	7102	STA SD
2307	JMP N7	2475	STA SNDL	2620	LDA HIX	7105	LDA X3
2310	RND7 LDA #1	2476	JSR SND	2622	STA HI3	7107	STA XD
2312	STA F7	2477	LDA #F0	2623	JSR SHSN	7110	LDA Y3
2315	JSR RND	2478	STA SNDL	2624	CS3 LDA H3	7112	STA YD
2317	LDA RNLO	2479	CS2 LDA H2	2626	STA HZ	7115	LDA I3
2320	STA C7	2480	STA HZ	2628	LDA V3	7117	STA ID
2322	N7 LDA C7	2482	LDA V2	2630	STA VZ	7120	LDA F3
2325	CMP #0	2485	STA VZ	2632	LDA HI3	7122	STA FD
2327	BEQ FLY7	2487	LDA HI2	2634	STA HIZ	7125	JSR DRAW
2330	DEC C7	2490	STA HIZ	2636	LDA FS3	7127	LDA XD
2332	JMP CONT	2492	LDA FS2	2638	STA FSZ	7130	STA X3
2335	FLY7 JSR PLN7	2495	STA FSZ	2640	JSR DSHL	7132	LDA FD
2337	CONT NOP	2500	JSR DSHL	2642	LDA HZ	7135	STA F3
2340	JSR RPD	2502	LDA HZ	2644	STA H3	7137	RTS
2350	JSR DGUN	2505	STA H2	2646	LDA VZ	7150	PLN4 LDA S4
2355	SHT1 LDA FS1	2507	LDA VZ	2648	STA V3	7152	STA SD
2357	CMP #0	2510	STA V2	2650	LDA FSZ	7155	LDA X4
2360	BEQ TS1	2512	LDA FSZ	2652	STA FS3	7157	STA XD
2362	JMP CS1	2515	STA FS2	2654	JSR LODX	7160	LDA Y4
2365	TS1 LDA SW1	2517	JSR LODX	2656	RETA RTS	7162	STA YD
2367	BMI SS1	2518	SHT3 LDA FS3	2660	SHSN LDA #40	7165	LDA I4
2370	JMP SHT2	2519	CMP #0	2662	STA SNDL	7167	STA ID
2372	SS1 LDA #1	2520	BEQ FTY	2664	JSR SND	7170	LDA F4
2373	STA FS1	2521	JMP CS3	2666	LDA #F0	7172	STA FD
2374	INC SHCT	2522	FTY LDA FS1	2668	STA SNDL	7175	JSR DRAW
2375	LDA #40	2523	CMP #1	2670	RTS	7177	LDA XD
2376	STA SNDL	2524	BEQ FTX	7000	PLN1 LDA S1	7180	STA X4
2377	JSR SND	2525	RTS	7002	STA SD	7182	LDA FD
2378	LDA #F0	2526	FTX LDA FS2	7005	LDA X1	7185	STA F4
2379	STA SNDL	2527	CMP #1	7007	STA XD	7187	RTS
2380	LDA HIX	2528	BEQ SHTX	7010	LDA Y1	7200	PLN5 LDA S5
2381	STA HI1	2529	RTS	7012	STA YD	7202	STA SD
2382	CS1 LDA H1	2530	SHTX JSR SHTA	7015	LDA F1	7205	LDA X5
2385	STA HZ	2532	RTS	7017	STA FD	7207	STA XD
2387	LDA V1	2550	LODX LDA X1	7020	LDA I1	7210	LDA Y5
2390	STA VZ	2552	STA SZ1	7022	STA ID	7212	STA YD
2392	LDA HI1	2554	LDA X2	7025	JSR DRAW	7215	LDA I5
2395	STA HIZ	2556	STA SZ2	7027	LDA XD	7217	STA ID
2396	LDA FS1	2558	LDA X3	7030	STA X1	7220	LDA F5
2397	STA FSZ	2560	STA SZ3	7032	LDA FD	7222	STA FD
2398	JSR DSHL	2562	LDA X4	7035	STA F1	7225	JSR DRAW
2400	LDA HZ	2564	STA SZ4	7037	RTS	7227	LDA XD
2402	STA H1	2566	LDA X5	7040	PLN2 LDA S2	7230	STA X5
2405	LDA VZ						

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7232	LDA FD	8058	JSR PLOT	8272	BCC NOC2	8452	POS6 LDA ##FF
7235	STA F5	8060	JSR SHAP	8275	LDA RNLO	8454	STA HIX
7237	RTS	8065	LDA XD	8277	ORA ##80	8456	RTS
7250	PLN6 LDA S6	8067	CMP ##F2	8280	STA RNLO	8458	POS7 LDA ##1
7252	STA SD	8070	BCS RLO	8282	NOC2 CPY ##0	8460	STA HIX
7255	LDA X6	8072	LDA XD	8285	BEQ LOOP	8462	RTS
7257	STA XD	8075	CMP ##0D	8287	LDA RNHI	8464	POS8 LDA ##2
7260	LDA Y6	8077	BCC RHI	8290	ORA ##80	8468	STA HIX
7262	STA YD	8080	RTS	8292	STA RNHI	8470	RTS
7265	LDA I6	8100	RLO JSR ERAS	8295	BMI LOOP	8472	POS9 LDA ##3
7267	STA ID	8102	LDA TEN	8297	LFSH DEX	8474	STA HIX
7270	LDA F6	8105	STA XD	8300	LOP1 INX	8476	RTS
7272	STA FD	8107	LDA ZRO	8302	BEQ DONE	8478	POSA LDA ##4
7275	JSR DRAW	8110	STA FD	8305	LDA RNLO	8480	STA HIX
7277	LDA XD	8112	RTS	8307	ROL	8482	RTS
7280	STA X6	8125	RHI JSR ERAS	8310	ROL RNHI	8484	POSB LDA ##5
7282	LDA FD	8127	LDA MAX	8312	ROL RNLO	8486	STA HIX
7285	STA F6	8130	STA XD	8315	JMP LOP1	8488	RTS
7287	RTS	8132	LDA ZRO	8317	DONE RTS	8490	POSC LDA ##6
7300	PLN7 LDA S7	8135	STA FD	8350	RPDL LDX ##0	8492	STA HIX
7302	STA SD	8137	RTS	8352	JSR \$FB1E	8494	RTS
7305	LDA X7	8150	ERAS LDA ZRO	8355	TYA	8500	DGUN LDA ##82
7307	STA XD	8152	STA PCOL	8357	CMP ##15	8502	STA XLO
7310	LDA Y7	8155	LDA XD	8360	BCC POS1	8505	LDA ##9A
7312	STA YD	8157	STA XLO	8362	CMP ##2A	8507	STA YLO
7315	LDA I7	8160	LDA YD	8365	BCC POS2	8510	LDA ##0
7317	STA ID	8162	STA YLO	8367	CMP ##3F	8512	STA PCOL
7320	LDA F7	8165	LDA SD	8370	BCC POS3	8515	JSR PLOT
7322	STA FD	8167	STA STLO	8372	CMP ##54	8517	LDA GX
7325	JSR DRAW	8170	LDA SHI	8375	BCC POS4	8520	STA XLO
7327	LDA XD	8172	STA STHI	8377	CMP ##69	8522	LDA ##93
7330	STA X7	8175	JSR PLOT	8380	BCC POS5	8525	STA YLO
7332	LDA FD	8177	JSR SHAP	8382	CMP ##73	8527	JSR LINE
7335	STA F7	8180	RTS	8385	BCC POS6	8530	LDA ##FF
7337	RTS	8200	RND LDA RNHI	8387	CMP ##83	8532	STA PCOL
8000	DRAW LDA ZRO	8202	PHA	8390	BCC POS7	8535	LDA ##82
8003	STA PCOL	8205	LDA RNLO	8392	CMP ##A8	8537	STA XLO
8005	LDA XD	8207	PHA	8395	BCC POS8	8540	LDA ##9A
8007	STA XLO	8210	LDX ##FE	8397	CMP ##BD	8542	STA YLO
8010	LDA YD	8212	JSR SHFT	8400	BCC POS9	8545	JSR PLOT
8012	STA YLO	8215	LDA RNLO	8402	CMP ##D2	8547	LDA ##82
8015	LDA SD	8217	AND ##FC	8405	BCC POSA	8550	CLC
8017	STA STLO	8220	STA RNLO	8407	CMP ##E7	8552	ADC HIX
8020	LDA SHI	8222	PLA	8410	BCC POSB	8555	STA GX
8022	STA STHI	8225	CLC	8412	JMP POSC	8557	STA XLO
8025	JSR PLOT	8227	ADC RNLO	8420	POS1 LDA ##FA	8560	LDA ##93
8027	JSR SHAP	8230	STA RNLO	8422	STA HIX	8562	STA YLO
8030	LDA WHT	8232	PLA	8424	RTS	8565	JSR LINE
8032	STA PCOL	8235	ADC RNHI	8426	POS2 LDA ##FB	8567	RTS
8035	LDA XD	8237	STA RNHI	8428	STA HIX	8580	DSHL LDA HZ
8037	CLC	8240	RTS	8430	RTS	8582	STA XLO
8040	ADC ID	8250	SHFT CPX ##0	8432	POS3 LDA ##FC	8585	LDA VZ
8042	STA XD	8252	BMI LFSH	8434	STA HIX	8587	STA YLO
8044	STA XLO	8255	LOOP DEX	8436	RTS	8590	LDA ##0
8046	LDA YD	8257	BMI DONE	8438	POS4 LDA ##FD	8592	STA PCOL
8048	STA YLO	8260	LDY ##0	8440	STA HIX	8595	JSR PLOT
8050	LDA SD	8262	LSR RNLO	8442	RTS	8597	LDA HZ
8052	STA STLO	8265	BCC NOC1	8446	POS5 LDA ##FE	8600	CLC
8054	LDA SHI	8267	INY	8448	STA HIX	8602	ADC HIZ
8056	STA STHI	8270	NOC1 LSR RNHI	8450	RTS		



8605	STA XLO	8775	BCC HIT1	8960	TH6 LDA SZ6	9156	STA YD
8607	STA HZ	8777	RTS	8962	CLC	9158	JSR EXPL
8610	LDA VZ	8780	HIT1 JSR HITA	8964	ADC #6	9160	LDA S2
8612	CLC	8782	RTS	8966	CMP HZ	9162	STA SD
8615	ADC #F9	8790	TH2 LDA SZ2	8968	BCS TN6	9164	LDA F2
8617	STA YLO	8792	CLC	8970	RTS	9166	STA FD
8620	STA VZ	8795	ADC #5	8972	TN6 LDA SZ6	9168	JSR RLO
8622	CMP #7	8797	CMP HZ	8974	CLC	9170	LDA XD
8625	BCC EOS	8800	BCS TN2	8976	ADC #-6	9172	STA X2
8630	LDA #FF	8802	RTS	8979	CMP HZ	9174	LDA FD
8632	STA PCOL	8805	TN2 LDA SZ2	8980	BCC HIT6	9176	STA F2
8635	JSR PLOT	8807	CLC	8982	RTS	9178	LDA #2
8637	RTS	8810	ADC #-6	8984	HIT6 JSR HITF	9180	STA HTFL
8640	EOS LDA #0	8812	CMP HZ	8986	RTS	9182	JMP DISP
8642	STA FSZ	8815	BCC HIT2	8990	TH7 LDA SZ7	9200	HITC LDA X3
8645	LDA #82	8817	RTS	8992	CLC	9202	STA XD
8647	STA HZ	8820	HIT2 JSR HITB	8994	ADC #6	9204	LDA Y3
8650	LDA #93	8822	RTS	8996	CMP HZ	9206	STA YD
8652	STA VZ	8830	TH3 LDA SZ3	8998	BCS TN7	9207	JSR EXPL
8655	RTS	8832	CLC	9000	RTS	9208	JSR EXPL
8700	THIT LDA VZ	8835	ADC #6	9002	TN7 LDA SZ7	9210	LDA S3
8702	CMP #5C	8837	CMP HZ	9004	CLC	9212	STA SD
8705	BCC TST	8840	BCS TN3	9006	ADC #-6	9214	LDA F3
8707	RTS	8842	RTS	9008	CMP HZ	9216	STA FD
8710	TST LDA VZ	8845	TN3 LDA SZ3	9010	BCC HIT7	9218	JSR RHI
8711	CMP #5B	8847	CLC	9012	RTS	9220	LDA XD
8712	BEQ G07	8850	ADC #-6	9014	HIT7 JSR HITG	9222	STA X3
8713	JMP TST6	8852	CMP HZ	9016	RTS	9224	LDA FD
8714	G07 JMP TH7	8855	BCC HIT3	9025	SND LDY #1	9226	STA F3
8715	TST6 CMP #4D	8857	RTS	9027	LDB #0	9228	LDA #3
8716	BEQ G06	8860	HIT3 JSR HITC	9030	LPTX TXA	9230	STA HTFL
8717	JMP TST5	8862	RTS	9032	CLC	9232	JMP DISP
8718	G06 JMP TH6	8875	TH4 LDA SZ4	9034	AGN SBC #1	9250	HITD LDA X4
8719	TST5 CMP #3F	8877	CLC	9036	BNE AGN	9252	STA XD
8720	BEQ G05	8880	ADC #6	9038	STA #C030	9254	LDA Y4
8721	JMP TST4	8882	CMP HZ	9040	INX	9256	STA YD
8722	G05 JMP TH5	8885	BCS TN4	9042	CPX SNL	9258	JSR EXPL
8723	TST4 CMP #31	8887	RTS	9044	BNE LPTX	9260	LDA S4
8724	BEQ G04	8890	TN4 LDA SZ4	9046	RTS	9262	STA SD
8725	JMP TST3	8892	CLC	9100	HITA LDA X1	9264	LDA F4
8726	G04 JMP TH4	8895	ADC #-6	9102	STA XD	9266	STA FD
8727	TST3 CMP #23	8897	CMP HZ	9104	LDA Y1	9268	JSR RHI
8735	BEQ TH3	8900	BCC HIT4	9106	STA YD	9270	LDA XD
8737	CMP #15	8902	RTS	9107	JSR EXPL	9272	STA X4
8740	BEQ TH2	8905	HIT4 JSR HITD	9108	LDA S1	9274	LDA FD
8742	CMP #7	8907	RTS	9110	STA SD	9276	STA F4
8745	BEQ TH1	8925	TH5 LDA SZ5	9112	LDA F1	9278	LDA #4
8747	RTS	8927	CLC	9114	STA FD	9280	STA HTFL
8750	TH1 LDA SZ1	8930	ADC #6	9116	JSR RLO	9282	JMP DISP
8751	CMP #0E	8932	CMP HZ	9118	LDA XD	9300	HITE LDA X5
8752	BEQ SKIP	8934	BCS TN5	9120	STA X1	9302	STA XD
8753	CLC	8936	RTS	9122	LDA FD	9304	LDA Y5
8755	ADC #6	8938	TN5 LDA SZ5	9124	STA F1	9306	STA YD
8757	CMP HZ	8940	CLC	9126	JSR SND	9308	JSR EXPL
8760	BCS TN1	8942	ADC #-6	9128	LDA #1	9310	LDA S5
8762	SKIP RTS	8944	CMP HZ	9130	STA HTFL	9312	STA SD
8765	TN1 LDA SZ1	8946	BCC HIT5	9132	JMP DISP	9314	LDA F5
8767	CLC	8948	RTS	9150	HITB LDA X2	9316	STA FD
8770	ADC #-6	8950	HIT5 JSR HITE	9152	STA XD	9318	JSR RLO
8772	CMP HZ	8952	RTS	9154	LDA Y2	9320	LDA XD

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9322 STA X5
9324 LDA FD
9326 STA F5
9328 LDA ##5
9330 STA HTFL
9332 JMP DISP
9350 HITF LDA X6
9352 STA XD
9354 LDA Y6
9356 STA YD
9358 JSR EXPL
9359 JSR EXPL
9360 LDA S6
9362 STA SD
9364 LDA F6
9366 STA FD
9368 JSR RHI
9370 LDA XD
9372 STA X6
9374 LDA FD
9376 STA F6
9378 LDA ##6
9380 STA HTFL
9382 JMP DISP
9400 HITG LDA X7
9402 STA XD
9404 LDA Y7
9406 STA YD
9408 JSR EXPL
9410 LDA S7
9412 STA SD
9414 LDA F7
9416 STA FD
9418 JSR RLO
9420 LDA XD
9422 STA X7
9424 LDA FD
9426 STA F7
9428 LDA ##7
9430 STA HTFL
9432 JMP DISP
9800 EXPL LDA WHT
9802 STA PCOL
9804 LDA SHEX
9806 STA STLO
9808 LDA XD
9810 STA XLO
9812 LDA YD
9814 STA YLO
9816 JSR PLOT
9818 JSR SHAP
9820 JSR SNO
9822 JSR SNO
9824 LDA ZRO
9826 STA PCOL
9828 JSR PLOT
9830 JSR SHAP
9832 RTS
9960 DISP INC SCOR
9962 LDA SCOR
9965 RTS

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# STAR ATTACK MEMORY LISTING

\*400.4D30

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4418- FA 08 20 00 0C 20 0E 0C
4420- A9 82 8D 10 43 8D 11 43
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4440- 43 A9 64 8D 2F 43 A9 01
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4470- 44 8D 0B 43 AD 07 44 8D
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4580- F0 06 CE 1F 43 4C 8B 45
4588- 20 08 48 AD 27 43 C9 00
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4598- 27 43 20 07 49 AD 2F 43
45A0- 8D 20 43 AD 20 43 C9 00

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45D0- 43 EE 4B 43 A9 40 8D 4C
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45E0- 43 AD 31 43 8D 32 43 AD
45E8- 10 43 8D 3E 43 AD 15 43
45F0- 8D 3F 43 AD 32 43 8D 40
45F8- 43 AD 38 43 8D 41 43 20
4600- 2C 4A AD 3E 43 8D 10 43
4608- AD 3F 43 8D 15 43 AD 41
4610- 43 8D 38 43 20 92 46 AD
4618- 39 43 C9 00 F0 03 4C 44
4620- 46 AD 61 C0 30 03 4C 74
4628- 46 A9 01 8D 39 43 EE 4B
4630- 43 AD 31 43 8D 33 43 A9
4638- 40 8D 4C 43 20 7E 4B A9
4640- F0 8D 4C 43 AD 11 43 8D
4648- 3E 43 AD 16 43 8D 3F 43
4650- AD 33 43 8D 40 43 AD 39
4658- 43 8D 41 43 20 2C 4A AD
4660- 3E 43 8D 11 43 AD 3F 43
4668- 8D 16 43 AD 41 43 8D 39
4670- 43 20 92 46 AD 3A 43 C9
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4680- 43 C9 01 F0 01 60 AD 39
4688- 43 C9 01 F0 01 60 20 C0
4690- 46 60 AD 00 43 8D 42 43
4698- AD 01 43 8D 43 43 AD 02
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46AB- 45 43 AD 04 43 8D 46 43
46B0- AD 05 43 8D 47 43 AD 06
46B8- 43 8D 48 43 20 76 4A 60
46C0- AD 3A 43 C9 00 F0 03 4C
46C8- E3 46 AD 62 C0 30 03 4C
46D0- 13 47 A9 01 8D 3A 43 EE
46D8- 4B 43 AD 31 43 8D 34 43
46E0- 20 14 47 AD 12 43 8D 3E
46E8- 43 AD 17 43 8D 3F 43 AD
46F0- 34 43 8D 40 43 AD 3A 43
46F8- 8D 41 43 20 2C 4A AD 3E
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4718- 43 20 7E 4B A9 F0 8D 4C
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```



4780-	44	8D	2E	43	AD	02	43	8D	4968-	A2	00	20	1E	FB	98	C9	15	4B50-	01	60	AD	47	43	18	69	FA
4788-	28	43	AD	09	43	8D	29	43	4970-	90	2B	C9	2A	90	2D	C9	3F	4B58-	CD	3E	43	90	01	60	20	92
4790-	AD	15	44	8D	2B	43	AD	23	4978-	90	2F	C9	54	90	31	C9	69	4B60-	4C	60	AD	48	43	18	69	06
4798-	43	8D	2D	43	20	64	48	AD	4980-	90	33	C9	73	90	35	C9	83	4B68-	CD	3E	43	B0	01	60	AD	48
47A0-	28	43	8D	02	43	AD	2D	43	4988-	90	37	C9	A8	90	39	C9	BD	4B70-	43	18	69	FA	CD	3E	43	90
47A8-	8D	23	43	60	AD	0D	44	8D	4990-	90	3B	C9	D2	90	3D	C9	E7	4B78-	01	60	20	C7	4C	60	A0	01
47B0-	2E	43	AD	03	43	8D	28	43	4998-	90	3F	4C	DF	49	A9	FA	8D	4B80-	A2	00	8A	18	E9	01	D0	FC
47B8-	AD	0A	43	8D	29	43	AD	16	49A0-	31	43	60	A9	FB	8D	31	43	4B88-	8D	30	C0	E8	EC	4C	43	D0
47C0-	44	8D	2B	43	AD	24	43	8D	49A8-	60	A9	FC	8D	31	43	60	A9	4B90-	F1	60	AD	00	43	8D	28	43
47C8-	2D	43	20	64	48	AD	28	43	49B0-	FD	8D	31	43	60	A9	FE	8D	4B98-	AD	07	43	8D	29	43	20	F9
47D0-	8D	03	43	AD	2D	43	8D	24	49B8-	31	43	60	A9	FF	8D	31	43	4BA0-	4C	AD	0A	44	8D	2E	43	AD
47D8-	43	60	AD	0E	44	8D	2E	43	49C0-	60	A9	01	8D	31	43	60	A9	4BA8-	21	43	8D	2D	43	20	C2	48
47E0-	AD	04	43	8D	28	43	AD	0B	49C8-	02	8D	31	43	60	A9	03	8D	4BB0-	AD	28	43	8D	00	43	AD	2D
47E8-	43	8D	29	43	AD	17	44	8D	49D0-	31	43	60	A9	04	8D	31	43	4BB8-	43	8D	21	43	20	7E	4B	A9
47F0-	2B	43	AD	25	43	8D	2D	43	49D8-	60	A9	05	8D	31	43	60	A9	4BC0-	01	8D	4A	43	4C	2A	4D	AD
47F8-	20	64	48	AD	28	43	8D	04	49E0-	06	8D	31	43	60	A9	82	8D	4BC8-	01	43	8D	28	43	AD	08	43
4800-	43	AD	2D	43	8D	25	43	60	49E8-	20	03	A9	9A	8D	22	03	A9	4BD0-	8D	29	43	20	F9	4C	AD	0B
4808-	AD	0F	44	8D	2E	43	AD	05	49F0-	00	8D	2C	03	20	C4	0E	AD	4BD8-	44	8D	2E	43	AD	22	43	8D
4810-	43	8D	28	43	AD	0C	43	8D	49F8-	3D	43	8D	20	03	A9	93	8D	4BE0-	2D	43	20	C2	48	AD	28	43
4818-	29	43	AD	18	44	8D	2B	43	4A00-	22	03	20	CA	0E	A9	FF	8D	4BE8-	8D	01	43	AD	2D	43	8D	22
4820-	AD	26	43	8D	2D	43	20	64	4A08-	2C	03	A9	82	8D	20	03	A9	4BF0-	43	A9	02	8D	4A	43	4C	2A
4828-	48	AD	28	43	8D	05	43	AD	4A10-	9A	8D	22	03	20	C4	0E	A9	4BF8-	4D	AD	02	43	8D	28	43	AD
4830-	2D	43	8D	26	43	60	AD	10	4A18-	82	18	6D	31	43	8D	3D	43	4C00-	09	43	8D	29	43	20	F9	4C
4838-	44	8D	2E	43	AD	06	43	8D	4A20-	8D	20	03	A9	93	8D	22	03	4C08-	20	F9	4C	AD	0C	44	8D	2E
4840-	28	43	AD	0D	43	8D	29	43	4A28-	20	CA	0E	60	AD	3E	43	8D	4C10-	43	AD	23	43	8D	2D	43	20
4848-	AD	19	44	8D	2B	43	AD	27	4A30-	20	03	AD	3F	43	8D	22	03	4C18-	D2	48	AD	28	43	8D	02	43
4850-	43	8D	2D	43	20	64	48	AD	4A38-	A9	00	8D	2C	03	20	C4	0E	4C20-	AD	2D	43	8D	23	43	A9	03
4858-	28	43	8D	06	43	AD	2D	43	4A40-	AD	3E	43	18	6D	40	43	8D	4C28-	8D	4A	43	4C	2A	4D	AD	03
4860-	8D	27	43	60	AD	01	44	8D	4A48-	20	03	8D	3E	43	AD	3F	43	4C30-	43	8D	28	43	AD	0A	43	8D
4868-	2C	03	AD	28	43	8D	20	03	4A50-	18	69	F9	8D	22	03	8D	3F	4C38-	29	43	20	F9	4C	AD	0D	44
4870-	AD	29	43	8D	22	03	AD	2E	4A58-	43	C9	07	90	09	A9	FF	8D	4C40-	8D	2E	43	AD	24	43	8D	2D
4878-	43	8D	24	03	AD	11	44	8D	4A60-	2C	03	20	C4	0E	60	A9	00	4C48-	43	20	D2	48	AD	28	43	8D
4880-	25	03	20	C4	0E	20	DD	0E	4A68-	8D	41	43	A9	82	8D	3E	43	4C50-	03	43	AD	2D	43	8D	24	43
4888-	AD	00	44	8D	2C	03	AD	28	4A70-	A9	93	8D	3F	43	60	AD	3F	4C58-	A9	04	8D	4A	43	4C	2A	4D
4890-	43	18	6D	2B	43	8D	28	43	4A78-	43	C9	5C	90	01	60	AD	3F	4C60-	AD	04	43	8D	28	43	AD	0B
4898-	8D	20	03	AD	29	43	8D	22	4A80-	43	C9	5B	F0	03	4C	8B	4A	4C68-	43	8D	29	43	20	F9	4C	AD
48A0-	03	AD	2E	43	8D	24	03	AD	4A88-	4C	62	4B	C9	4D	F0	03	4C	4C70-	0E	44	8D	2E	43	AD	25	43
48A8-	11	44	8D	25	03	20	C4	0E	4A90-	95	4A	4C	46	4B	C9	3F	F0	4C78-	8D	2D	43	20	C2	48	AD	28
48B0-	20	DD	0E	AD	28	43	C9	F2	4A98-	03	4C	9F	4A	4C	2A	4B	C9	4C80-	43	8D	04	43	AD	2D	43	8D
48B8-	B0	08	AD	28	43	C9	0D	90	4AA0-	31	F0	03	4C	A9	4A	4C	0E	4C88-	25	43	A9	05	8D	4A	43	4C
48C0-	11	60	20	E2	48	AD	02	44	4AA8-	4B	C9	23	F0	45	C9	15	F0	4C90-	2A	4D	AD	05	43	8D	28	43
48C8-	8D	28	43	AD	01	44	8D	2D	4AB0-	25	C9	07	F0	01	60	AD	42	4C98-	AD	0C	43	8D	29	43	20	F9
48D0-	43	60	20	E2	48	AD	09	44	4AB8-	43	C9	0E	F0	08	18	69	06	4CA0-	4C	20	F9	4C	AD	0F	44	8D
48D8-	8D	28	43	AD	01	44	8D	2D	4AC0-	CD	3E	43	B0	01	60	AD	42	4CA8-	2E	43	AD	26	43	8D	2D	43
48E0-	43	60	AD	01	44	8D	2C	03	4AC8-	43	18	69	FA	CD	3E	43	90	4CB0-	20	D2	48	AD	28	43	8D	05
48E8-	AD	28	43	8D	20	03	AD	29	4AD0-	01	60	20	92	4B	60	AD	43	4CB8-	43	AD	2D	43	8D	26	43	A9
48F0-	43	8D	22	03	AD	2E	43	8D	4AD8-	43	18	69	05	CD	3E	43	B0	4CC0-	06	8D	4A	43	4C	2A	4D	AD
48F8-	24	03	AD	11	44	8D	25	03	4AE0-	01	60	AD	43	43	18	69	FA	4CC8-	06	43	8D	28	43	AD	0D	43
4900-	20	C4	0E	20	DD	0E	60	AD	4AE8-	CD	3E	43	90	01	60	20	C7	4CD0-	8D	29	43	20	F9	4C	AD	10
4908-	30	43	48	AD	2F	43	48	A2	4AF0-	4B	60	AD	44	43	18	69	06	4CD8-	44	8D	2E	43	AD	27	43	8D
4910-	FE	20	2C	49	AD	2F	43	29	4AF8-	CD	3E	43	B0	01	60	AD	44	4CE0-	2D	43	20	C2	48	AD	28	43
4918-	FC	8D	2F	43	68	18	6D	2F	4B00-	43	18	69	FA	CD	3E	43	90	4CE8-	8D	06	43	AD	2D	43	8D	27
4920-	43	8D	2F	43	68	6D	30	43	4B08-	01	60	20	F9	4B	60	AD	45	4CF0-	43	A9	07	8D	4A	43	4C	2A
4928-	8D	30	43	60	E0	00	30	26	4B10-	43	18	69	06	CD	3E	43	B0	4CF8-	4D	AD	00	44	8D	2C	03	AD
4930-	CA	30	34	A0	00	4E	2F	43	4B18-	01	60	AD	45	43	18	69	FA	4D00-	12	44	8D	24	03	AD	28	43
4938-	90	01	C8	4E	30	43	90	08	4B20-	CD	3E	43	90	01	60	20	2E	4D08-	8D	20	03	AD	29	43	8D	22
4940-	AD	2F	43	09	80	8D	2F	43	4B28-	4C	60	AD	46	43	18	69	06	4D10-	03	20	C4	0E	20	DD	0E	20
4948-	C0	00	F0	E4	AD	30	43	09	4B30-	CD	3E	43	B0	01	60	AD	46	4D18-	7E	4B	20	7E	4B	AD	01	44
4950-	80	8D	30	43	30	DA	CA	E8	4B38-	43	18	69	FA	CD	3E	43	90	4D20-	8D	2C	03	20	C4	0E	20	DD
4958-	F0	0D	AD	2F	43	2A	2E	30	4B40-	01	60	20	60	4C	60	AD	47	4D28-	0E	60	EE	49	43	AD	49	43
4960-	43	2E	2F	43	4C	57	49	60	4B48-	43	18	69	06	CD	3E	43	B0	4D30-	60							



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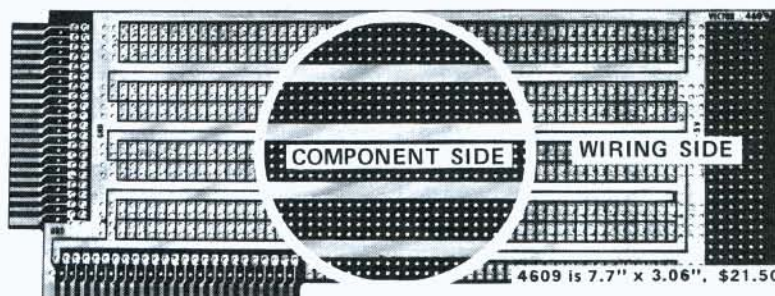
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# AIR-SEA BATTLE LISTING

>LIST 16K INTEGER BASIC

```
0 PRINT " ": PRINT " ": PRINT " "
1 REM *****
2 REM ** AIR/SEA BATTLE **
3 REM ** MICRO-SPARC **
4 REM ** P.O. BOX 325 **
5 REM ** LINCOLN MASS, 01773 **
6 REM ** COPYRIGHT © 1979 **
7 REM *****
8 CALL -936: GOSUB 7000: CALL -936: GR : GOSUB 6000: IF Z$="Y" THEN GOSUB 8000
9 VTAB 24: IF PHS>0 THEN PRINT "PREV HI SCORE=";PHS;: TAB 20: PRINT "TIME LEFT =" ;CTD;
: VTAB 20: GOTO 25
10 POKE 8,0: POKE 5,FX0: POKE 6,FY0: POKE 2051,SHAPE: CALL 2048: REM ERASE OLD SHAPE
11 POKE 8,COL: POKE 5,FXN: POKE 6,FYN: POKE 2051,SHAPE: CALL 2048: RETURN : REM DRAW NEW S
HAPE
12 POKE 8,0: POKE 5,FXN: POKE 6,FYN: POKE 2051,SHAPE: CALL 2048: RETURN : REM ERASE-END OF
LINE
13 POKE 8,COL: POKE 5,FX0: POKE 6,FY0: POKE 2051,SHAPE: CALL 2048: GOTO 11: REM ERASE OLD L
ITE BLUE
14 POKE 8,COL: POKE 5,FX0: POKE 6,FY0: POKE 2051,SHAPE: CALL 2048: RETURN : REM ERASE OLD L
ITE BLUE
23 REM ** FIGHTER PLANE ROUTINE
25 IF PCT>0 THEN 45:SHAPE=0:COL=CF:FX0=PX0:FY0=PY0:FXN=PXN:FYN=PYN: GOSUB 10:PX0=PXN:PXN=
PXN+PS: IF PXN>=34 THEN GOSUB 85
45 IF PCT>0 THEN PCT=PCT-1
48 REM ** BOMBER ROUTINE
50 IF BCT>0 THEN 75:SHAPE=16:COL=CB:FX0=BX0:FY0=BY0:FXN=BXN:FYN=BYN: GOSUB 10:BX0=BXN:
BXN=BXN-1: IF BXN<=2 THEN GOSUB 90
75 IF BCT>0 THEN BCT=BCT-1
80 GOTO 95
84 REM ** RESET FIGHTER AND COUNTDOWN
85 PXN=3:PCT= RND (10): GOSUB 12:PS= RND (3)+1:FXN=FX0:FYN=FY0: GOSUB 12: RETURN
89 REM ** RESET BOMBER AND COUNTDOWN
90 BXN=34:BCT= RND (10): GOSUB 12:FXN=FX0:FYN=FY0: GOSUB 12: RETURN
94 REM ** DESTROYER ROUTINE
95 IF DCT>0 THEN 125:SHAPE=32:COL=CD:FX0=DX0:FY0=DY0:FXN=DXN:FYN=DYN: GOSUB 10:DX0=DXN:
DXN=DXN+1: IF DXN>=34 THEN GOSUB 185
125 IF DCT>0 THEN DCT=DCT-1
144 REM ** SUBMARINE ROUTINE
145 IF SCT>0 THEN 175:SHAPE=48:COL=CS:FX0=SX0:FY0=SY0:FXN=SXN:FYN=SYN: GOSUB 13
146 SX0=SXN:SYN=SYN-SS: IF SXN<=0 THEN GOSUB 190
175 IF SCT>0 THEN SCT=SCT-1: GOTO 200
180 REM ** RESET DESTROYER AND COUNTDOWN
185 DXN=1:DCT= RND (10): GOSUB 12: RETURN
188 REM ** RESET SUB AND COUNTDOWN
190 FX0=SX0: GOSUB 14:SCT= RND (10):SXN=35:SS= RND (3)+1: RETURN
199 REM ** FIRING SEQUENCE
200 BMB= PEEK (-16287):SHL= PEEK (-16286): IF BMS=0 THEN 207: IF A$="N" AND PXN>4 AND PXN<
35 AND BXN>4 AND BXN<34 THEN GOSUB 900
205 IF BMB>127 AND PXN>5 AND BXN<34 THEN GOSUB 1000
207 IF SHS=0 THEN 215: IF A$="A" AND DXN>7 AND DXN<35 AND SXN>7 AND SXN<35 THEN GOSUB 950
208 IF A$="A" AND RND (10)>7 AND DXN>7 AND DXN<35 AND SXN>7 AND SXN<35 THEN GOSUB 950
210 IF SHL>127 AND DXN>3 AND SXN<34 THEN GOSUB 1050
214 REM ** BOMB NUMBER 1
```

continued on next page



```

6005 COLOR=7: FOR Y=23 TO 29: HLIN 0,39 AT Y
6010 NEXT Y
6015 COLOR=2: FOR Y=30 TO 39: HLIN 0,39 AT Y: NEXT Y
6020 FOR Y=30 TO 39: HLIN 0,39 AT Y: NEXT Y
6022 COLOR=8:CTD=275
6023 HLIN 0,39 AT 0: VLIN 0,39 AT 0: VLIN 0,39 AT 39: HLIN 0,39 AT 39
6025 BY1=0:BY2=0:MY1=0:MY2=0:BX0=33:BY0=5:BXN=33:BYN=5:FX0=3:FY0=3:FXN=4:FYN=3
6027 PX0=3:PY0=3:PXN=3:PYN=3
6030 DX0=0:DY0=22:DXN=1:DYN=22:SX0=35:SY0=29:SN=34:SYN=29
6035 CF=68:CB=34:CD=170:CS=255:CL=119:CX=58
6038 LT=7:DK=2:DJ=10:SJ=15:EXPL=17
6040 PS=1:SS=1:PCT= RND (5):BCT= RND (5):DCT= RND (5):SCT= RND (5):ASC=0:NVY=0:BMS=15:SHS=
15: RETURN
7000 CALL -936: REM ** INTRODUCTION
7005 TAB 5: PRINT "THIS IS AIR/SEA BATTLE!!"
7010 TAB 5: PRINT "AIR FORCE VS. THE NAVY"
7015 TAB 7: PRINT "A BOMBER IS WORTH 1 HIT"
7020 TAB 7: PRINT "A DESTROYER IS WORTH 1 HIT"
7030 TAB 7: PRINT "SUBS AND FIGHTERS ARE WORTH 2"
7031 PRINT : PRINT "FIRING TWO MISSILES OR DROPPING"
7032 PRINT "TWO BOMBS AT THE SAME TIME MAKES"
7033 PRINT "THE SECOND ONE A 'GUIDED' MISSILE"
7034 PRINT "AND PUTS IT UNDER PADDLE CONTROL"
7035 PRINT : PRINT "EACH SIDE WILL BE JUDGED AT THE END"
7040 PRINT "OF THE MISSION"
7045 PRINT : PRINT "GOOD LUCK AND GOOD SHOOTING!!"
7050 PRINT : PRINT "IF YOU WANT TO PLAY AGAINST THE"
7055 PRINT "COMPUTER THEN TYPE 'Y'."
7060 PRINT "OTHERWISE, TYPE ANY LETTER AND"
7065 INPUT "HIT RETURN",Z$
7075 RETURN
8000 CALL -936: PRINT "WHICH SERVICE WILL YOU JOIN ?"
8005 PRINT "ENTER 'A' FOR AIR FORCE OR": INPUT "ENTER 'N' FOR NAVY ",A$: CALL -936
8020 RETURN

```

## SHAPE TABLES

### Fighter

0900- 0A 0B 0C 0C 00

### Bomber

0910- 0C 0C 0C 0C 0A 0B 00

### Destroyer

0920- 0C 0C 0A 0B 0C 0A 0A 0A  
0928- 0B 0B 0B 0C 00

### Sub

0930- 0C 0C 0C 0D 0A 00

### Splash

0940- 0D 01 0D 01 0D 03 03 03  
0948- 0C 02 0D 00

### Explosion

0950- 0C 03 0C 01 0D 01 0C 04  
0958- 0D 00

## SHAPE WRITER

0800- A2 00 BD 30 09 E8 C9 01  
0808- F0 24 C9 02 F0 25 C9 03  
0810- F0 26 C9 04 F0 27 C9 0A  
0818- F0 28 C9 0B F0 29 C9 0C  
0820- F0 2A C9 0D F0 2B C9 00  
0828- F0 03 4C 02 08 60 C6 06  
0830- 4C 56 08 E6 06 4C 56 08  
0838- E6 05 4C 56 08 C6 05 4C  
0840- 56 08 C6 06 4C 64 08 E6  
0848- 06 4C 64 08 E6 05 4C 64  
0850- 08 C6 05 4C 64 08 A9 00  
0858- 85 30 A4 05 A5 06 20 00  
0860- F8 4C 02 08 A5 08 85 30  
0868- A4 05 A5 06 20 00 F8 4C  
0870- 02 08 00

## SOUND ROUTINE

0980- A0 01 A2 00 8A 18 E9 01  
0988- D0 FC 8D 30 C0 E8 E0 96  
0990- 80 F2 88 D0 ED 60



# APPLE II\* CIF FROM MICRO-SPARC SOLVES BUG-A-BOO'S OF OTHER PERSONAL DATA FILE SYSTEMS



## IF — CENTRAL INFORMATION FILE SYSTEM

ives you flexible, powerful, and perfectly formatted REPORTS, AUTOMATICALLY (WHERE MOST OTHER MICRO-COMPUTER DATA BASE SYSTEMS FALL DOWN ON THE JOB!) THE FIRST TIME — EVERY TIME! All it takes is a simple checklist!

## IF — CENTRAL INFORMATION FILE SYSTEM

ould be used for Birthday Lists, Investments, Record Libraries, Book Indexes, Tool Inventories, Sales Analysis, Grade Reporting, Auto Mileage, Histories and more! You can let your imagination go!

## IF — OPTIONS LIST

- ☐ CREATE FILE ☐ STORE/ADD DATA ☐ CREATE REPORT (Where most other Micro-Computer Data Base systems fail on the job) ☐ RETRIEVE REPORT ☐ LIST FILE ☐ EDIT/CHANGE DATA  
☐ LIST FILE DIRECTORIES ☐ DELETE AND REPACK ☐ SORT A FILE

## IF — PRINTING OPTIONS

- ☐ SCREEN OR PRINTER ☐ PRINT DENSITY 12 OR 16.5 CHAR/INCH

## IF — ARITHMETIC OPTIONS

	SELECT COLS.	SELECT ROWS	SELECT FIELDS	SELECT +/-	SELECT COMPARE
<input type="checkbox"/> TOTALS BY COLUMN	X				
<input type="checkbox"/> TOTALS BY ROW		X		X	
<input type="checkbox"/> AVERAGES BY COLUMN	X				
<input type="checkbox"/> EACH LINE ITEM % OF TOTAL	X				
<input type="checkbox"/> SUBTOTALS AND GRAND TOTALS	X		X		X
<input type="checkbox"/> MULTIPLY TWO COLUMNS	X				
<input type="checkbox"/> TOTALS BY ROW AND COLUMN	X	X		X	
<input type="checkbox"/> TOTALS AND MULTIPLY TWO COLS.	X		X		
<input type="checkbox"/> COL SUBTOTALS & TOTALS BY ROW	X		X	X	X

## IF — RECORD SELECTION OPTIONS

- ☐ PRINT ALL DATA  
☐ PRINT RECORDS WITHIN NUMBER RANGE (SELECT LOWER & UPPER LIMIT)  
☐ PRINT SELECTED RECORDS (SELECT FIELD AND DATA TO SEARCH ON)

## IF — FORMAT OPTIONS

- ☐ ENTER REPORT HEADING  
☐ CHANGE COLUMN PRINTING ORDER  
☐ CHANGE COLUMN HEADINGS  
☐ SUPPRESS DETAIL PRINTING IN SUBTOTALS  
(FOR SUMMARY REPORTS)

**CIF does all the report spacing, column spacing, and decimal alignment AUTOMATICALLY!** Once created, a CIF report format can be stored on Disk and re-used again and again!

**FULL EDITING! Sort on any field! Automatic File Creation and initialization! Auto-dimensioning of Variables (for efficient memory use) and many more! Solid reasons for making CIF a part of your program library!**

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\$39.95 Brings CIF to your home on Diskette, complete with a 30 + page user manual. (CIF requires a 48K Apple II System with Applesoft, Disk II, and a parallel printer)

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Recreational Computing Sep/Oct '79

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80 Software Critique Issue No. 1

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80-US Journal, Sept/Oct '79

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## GUIDED MISSILE Game Listing

### LIST

```

1 PRINT ""
2 REM *****
3 REM * GUIDED MISSILE GAME *
4 REM * MICRO-SPARC, INC *
5 REM * P.O. BOX 325 *
6 REM * LINCOLN MASS 01773 *
7 REM * COPYRIGHT (C) 1980 *
8 REM *****
10 HOME : VTAB 10: PRINT TAB( 10)"GUIDED MISSILE GAME"
11 PRINT : PRINT "ENTER THE NUMBER OF THE PADDLES YO
   U": PRINT "ARE USING, ENTER THE HORIZONTAL CONTR
   OL": PRINT "FIRST, AND THEN THE VERTICAL CONTROL"
12 INPUT "SEPARATED BY A COMMA - A,B :";A,B
13 PRINT : PRINT "** A PERFECT SCORE IS 30 **"
15 PRINT : PRINT "NOW SELECT STANDARD MISSILE MOTION
   (1)": INPUT "OR THE 'TRACER' OPTION (2) ";ZZ
18 IF SC > HS THEN HS = SC
19 XX = 0:SC = 0:Q = - 16336
20 T = 60:TT = T:TD = 13:XX = XX + 1
30 X = 140:Y = 80
150 HGR : HCOLOR= 3: HPLLOT 0,0 TO 279,0 TO 279,159 TO
   0,159 TO 0,0
160 GOSUB 1250: REM DRAW FIRST TARGET
170 IF HS > 0 THEN VTAB 23: PRINT "PREV' HIGH SCORE=";HS
175 VTAB 21: CALL - 868: INVERSE : PRINT "GUIDED MI
   SSILE": NORMAL
180 IF XX = 1 THEN VTAB 21: HTAB 20: PRINT "CONTROL
   LED MOTION"
185 IF XX = 2 THEN VTAB 21: HTAB (20): INVERSE : PRINT
   "ACCELERATED MOTION": NORMAL
190 IF XX = 3 THEN VTAB 21: HTAB (20): INVERSE : PRINT
   "CONSTANT MOTION": NORMAL
200 REM CONSTANT SPEED
210 GOSUB 1000: REM READ PADDLES
215 IF XX = 2 THEN 300
220 IF PA > 200 THEN H = 2
230 IF PA < 50 THEN H = - 2
250 IF PB > 200 THEN V = 2
260 IF PB < 50 THEN V = - 2
262 REM CONTROLLED MOTION
265 IF XX = 1 AND PA > = 50 AND PA < = 200 THEN H = 0
270 IF XX = 1 AND PB > = 50 AND PB < = 200 THEN V = 0
275 REM CONSTANT MOTION
280 IF XX = 3 THEN H = H + INT ( RND (1) * 3 - 1):V
   = V + INT ( RND (1) * 3 - 1)
290 GOTO 360
300 REM ACCELERATED MOTION
305 IF PA > 200 THEN H = H + 1
310 IF PA < 50 THEN H = H - 1
320 IF PA > = 50 AND PA < = 200 THEN H = 0
330 IF PB > 200 THEN V = V + 1
340 IF PB < 50 THEN V = V - 1
350 IF PB > = 50 AND PB < = 200 THEN V = 0
360 GOSUB 1100: GOSUB 1200: GOTO 210
1000 REM READ PADDLES
1010 PA = PDL (A) * 50 / 50:PB = PDL (B) * 50 / 50:RETURN
1100 REM PLOT POINTS

```

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```

110 IF X + H > 278 OR X + H < 1 THEN HCOLOR= 0: HPLLOT
X,Y:X = 140:Y = 70:H = 0:V = 0: GOTO 1160
120 IF Y + V > 158 OR Y + V < 1 THEN HCOLOR= 0: HPLLOT
X,Y:X = 140:Y = 70:H = 0:V = 0: GOTO 1160
140 HCOLOR= 3: HPLLOT X + H,Y + V
145 IF ZZ = 2 THEN 1160
150 HCOLOR= 0: HPLLOT X,Y
160 X = X + H:Y = Y + V: RETURN
170 REM TEST HIT
180 IF X > TX AND Y > TY AND X < TX + TD AND Y < TY
+ TD THEN SC = SC + 1: VTAB 22: CALL - 868: PRINT
"A HIT! SCORE =" ;SC:S = 50: GOTO 1300
190 IF T = 0 THEN SC = SC - 1: VTAB 22: CALL - 868
: PRINT "A MISS! SCORE =" ;SC:S = 10: GOTO 1250
200 VTAB 23: HTAB 22: CALL - 868:T = T - 1: PRINT
"TIME LEFT=" ;T: RETURN
210 HCOLOR= 0: HPLLOT X,Y:X = 140:Y = 70:H = 0:V = 0
220 T = TT:TX = RND (1) * 200 + 20:TY = RND (1) *
100 + 30
230 FOR P = 1 TO 5:R = PEEK (Q) - PEEK (Q) + PEEK
(Q) - PEEK (Q) + PEEK (Q): NEXT P
240 TD = TD - 1: IF TD = 2 AND XX = 3 THEN TEXT : GOTO
1500
250 IF TD = 2 AND XX < 3 THEN 20
260 HCOLOR= 3: HPLLOT TX,TY TO TX + TD,TY TO TX + TD
,TY + TD TO TX,TY + TD TO TX,TY
270 RETURN
280 REM EXPLOSION
290 HCOLOR= 0: HPLLOT TX,TY TO TX + TD,TY TO TX + TD
,TY + TD TO TX,TY + TD TO TX,TY
300 X1 = TX:X2 = TX + TD:X3 = X1:Y1 = TY:Y2 = TY + T
D:Y3 = Y1
310 FOR I = 1 TO 5
320 L = 3
330 HCOLOR= 3: IF I = 5 THEN 1380
340 HPLLOT X3,Y1 - L TO X3 + TD,Y1 - L
350 HPLLOT X2 + L,Y3 TO X2 + L,Y3 + TD
360 HPLLOT X3,Y2 + L TO X3 + TD,Y2 + L
370 HPLLOT X1 - L,Y3 TO X1 - L,Y3 + TD
380 HCOLOR= 0: HPLLOT X3,Y1 TO X3 + TD,Y1
390 HPLLOT X2,Y3 TO X2,Y3 + TD
400 HPLLOT X3,Y2 TO X3 + TD,Y2
410 HPLLOT X1,Y3 TO X1,Y3 + TD
420 X1 = X1 - L:X2 = X2 + L:Y1 = Y1 - L:Y2 = Y2 + L
430 NEXT I
440 S = 50: GOTO 1250
450 REM END OF GAME
460 HOME : PRINT "YOUR SCORE FOR THIS GAME IS " ;SC
470 IF SC = 30 THEN PRINT "A PERFECT SCORE! YOU'RE
QUITE A PLAYER!"
480 IF SC < 30 AND SC < HS THEN PRINT "TRY TO BEAT
THE BEST SCORE OF" ;HS
490 IF SC > HS THEN PRINT "YOU BEAT THE PREVIOUS H
IGH SCORE OF" ;HS
500 INPUT "TO PLAY AGAIN, HIT RETURN " ;X#: GOTO 18

```

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0805-	E8	INX	
0806-	C9 01	CMP	##01
0808-	F0 24	BEQ	\$082E
080A-	C9 02	CMP	##02
080C-	F0 25	BEQ	\$0833
080E-	C9 03	CMP	##03
0810-	F0 26	BEQ	\$0838
0812-	C9 04	CMP	##04
0814-	F0 27	BEQ	\$083D
0816-	C9 0A	CMP	##0A
0818-	F0 28	BEQ	\$0842
081A-	C9 0B	CMP	##0B
081C-	F0 29	BEQ	\$0847
081E-	C9 0C	CMP	##0C
0820-	F0 2A	BEQ	\$084C
0822-	C9 0D	CMP	##0D
0824-	F0 2B	BEQ	\$0851
0826-	C9 00	CMP	##00
0828-	F0 03	BEQ	\$082D
082A-	4C 02 08	JMP	\$0802
082D-	60	RTS	
082E-	C6 06	DEC	\$06

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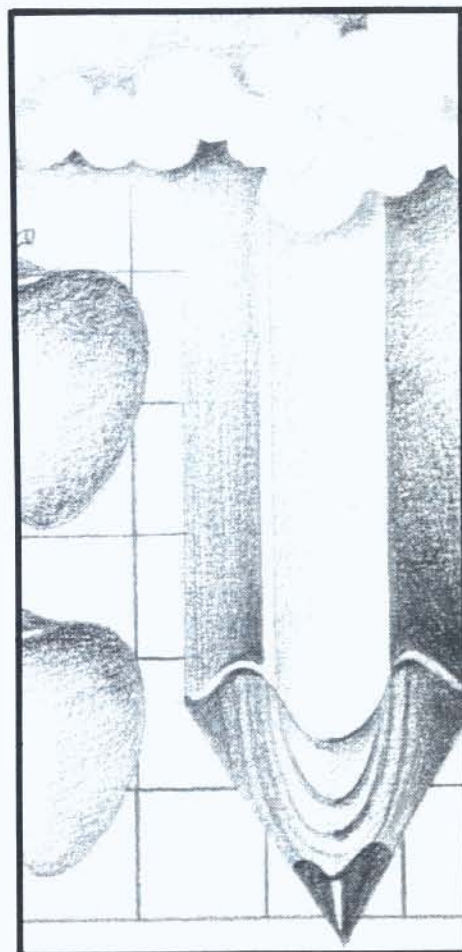
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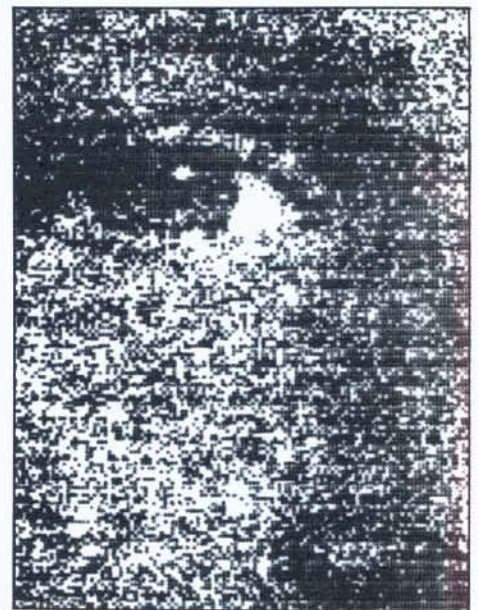
Text \*  
\* Amaz  
xt \* A  
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Amaz-A-  
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0830-	4C 56 08	JMP	\$0856	0866-	85 30	STA	\$30
0833-	E6 06	INC	\$06	0868-	A4 05	LDY	\$05
0835-	4C 56 08	JMP	\$0856	086A-	A5 06	LDA	\$06
0838-	E6 05	INC	\$05	086C-	20 00 F8	JSR	\$F800
083A-	4C 56 08	JMP	\$0856	086F-	4C 02 08	JMP	\$0802
083D-	C6 05	DEC	\$05	0872-	00	BRK	
083F-	4C 56 08	JMP	\$0856	0800-	A2 00 BD 30 09 E8 C9 01		
0842-	C6 06	DEC	\$06	0808-	F0 24 C9 02 F0 25 C9 03		
0844-	4C 64 08	JMP	\$0864	0810-	F0 26 C9 04 F0 27 C9 0A		
0847-	E6 06	INC	\$06	0818-	F0 28 C9 0B F0 29 C9 0C		
0849-	4C 64 08	JMP	\$0864	0820-	F0 2A C9 0D F0 2B C9 00		
084C-	E6 05	INC	\$05	0828-	F0 03 4C 02 08 60 C6 06		
084E-	4C 64 08	JMP	\$0864	0830-	4C 56 08 E6 06 4C 56 08		
0851-	C6 05	DEC	\$05	0838-	E6 05 4C 56 08 C6 05 4C		
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0856-	A9 00	LDA	\$F00	0848-	06 4C 64 08 E6 05 4C 64		
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085A-	A4 05	LDY	\$05	0858-	85 30 A4 05 A5 06 20 00		
085C-	A5 06	LDA	\$06	0860-	F8 4C 02 08 A5 08 85 30		
085E-	20 00 F8	JSR	\$F800	0868-	A4 05 A5 06 20 00 F8 4C		
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Introl/X-10 comes with complete software to control devices on pre-determined schedules, and features:

- Control devices at a specific time.
- Select a daily or weekly schedule.
- Specify a day of the week, or an exact date for a particular event.
- Specify an interval of time for an event.
- Rate device wattages for a running account of power consumption during your schedule for energy management.
- Used with our Apple Clock™ your schedules may run in "background" while other programs may run at the same time in "foreground."

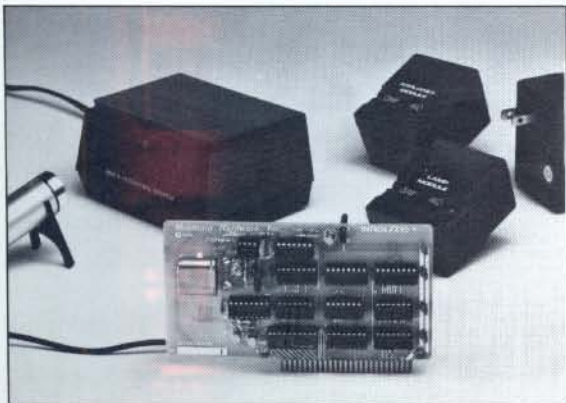
### EVERYTHING YOU NEED.

The Introl Controller board plugs into a peripheral slot of your Apple. With an ultrasonic transducer it transmits control signals to the BSR/X-10 Command Console which may be plugged into any convenient AC outlet near your computer. On command, signals are sent to remote modules located at the devices you wish to control. Up to 16 remote module addresses may be controlled from your Apple. Software requires Applesoft firmware.

### AVAILABLE NOW.

The Introl/X-10 System consists of the Introl Controller board with timer and ultrasonic transducer, the X-10 Command Console and three remote modules. Complete and tested. If you already have a BSR System X-10, the Introl Controller board is available separately. Additional remote modules are available. See your computer dealer for a demonstration.

\*Apple is a trademark of Apple Computer Inc.  
BSR/System X-10 is a trademark of BSR, Ltd.



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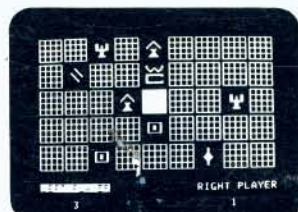
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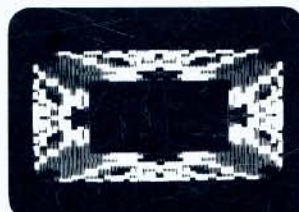
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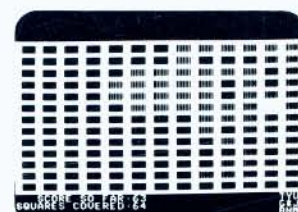
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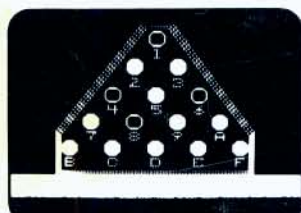
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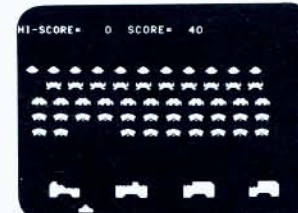
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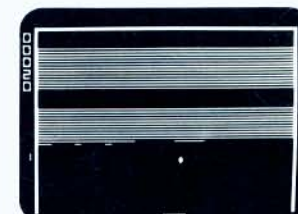
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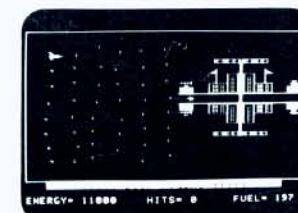
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