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JANUARY 1986

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THE #1 MAGAZINE FOR ATARI® COMPUTER OWNERS

ANALOG COMPUTING™

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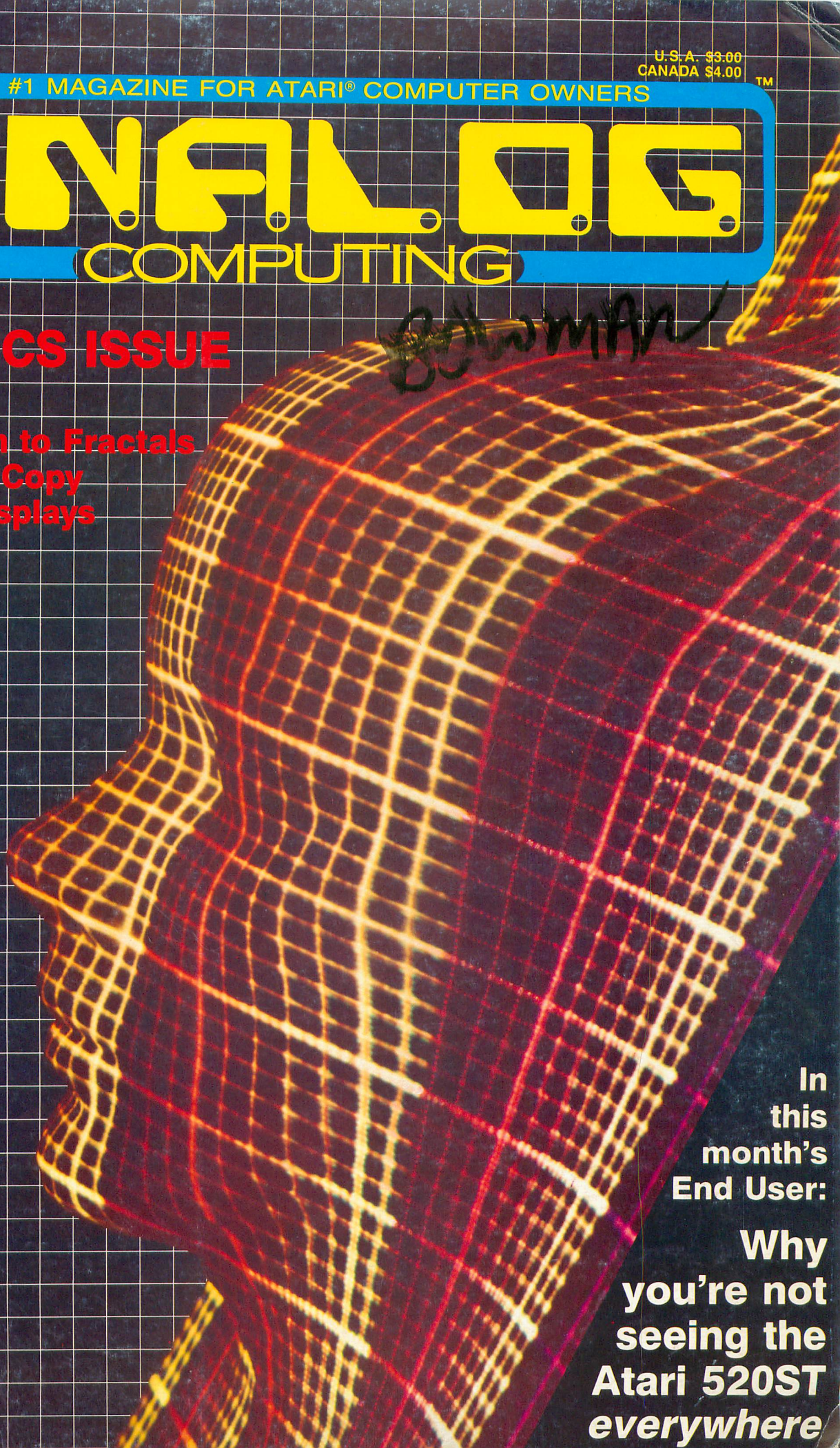

In this month's End User:

Why you're not seeing the Atari 520ST *everywhere*

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"...as innovative in form as it is in content. If they're all as good as Mindwheel, we have a lot to look forward to." —GAMES

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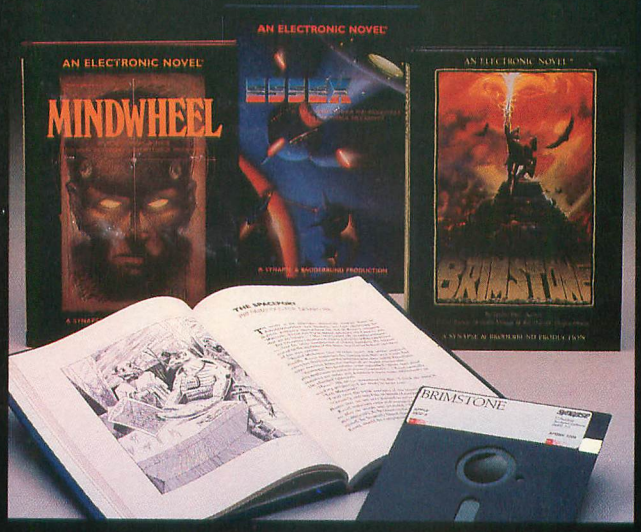

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CIRCLE #101 ON READER SERVICE CARD

NO. 38 JANUARY 1986

THE #1 MAGAZINE FOR ATARI® COMPUTER OWNERS™

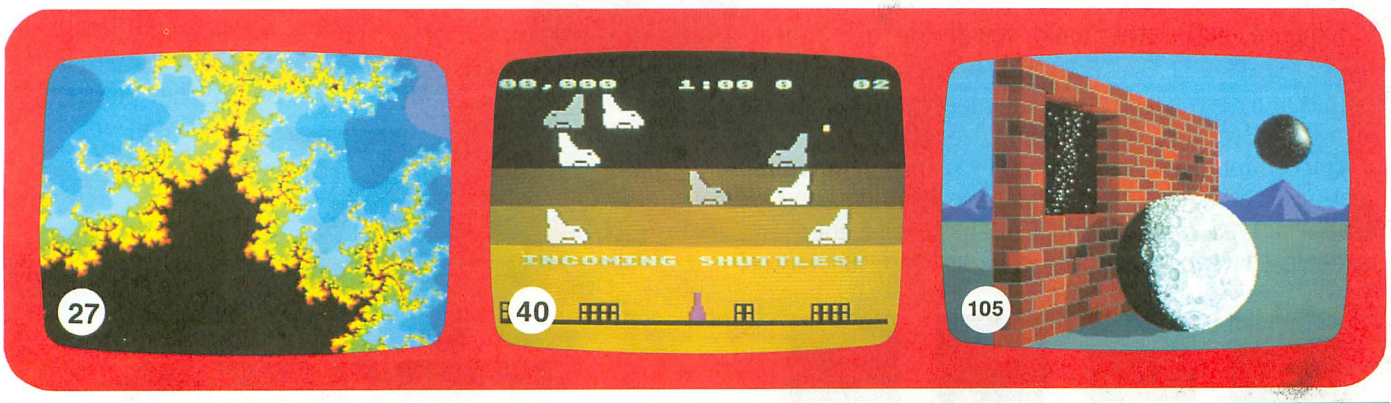
ANALOG COMPUTING

FEATURES

REVIEWS

REVIEWS *continued*

COLUMNS



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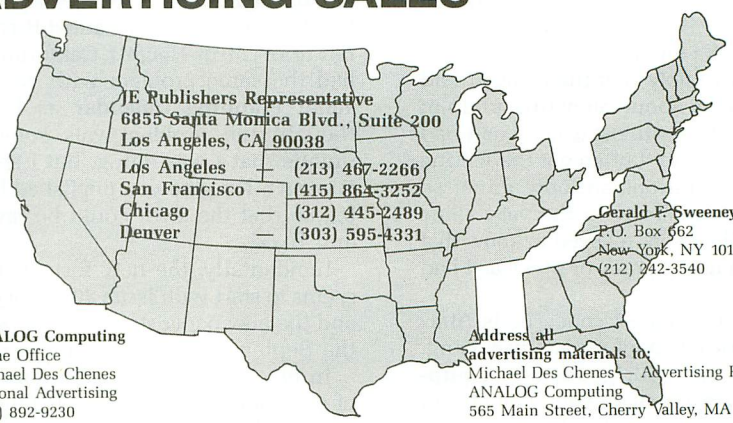

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PERMISSIONS

AUTHORS

When submitting articles and programs, program listings should be provided in printed *and* magnetic form, if possible. Articles should be furnished as typed or printed copy in upper and lower case with double spacing. If a submission is to be returned, please send a self-addressed, stamped envelope.

READER COMMENT

Come out of the shadows, Atari.

I wanted to drop you a line to let you know that I particularly liked the editorial in issue 34, which I just purchased today.

You made a lot of practical sense, and I was glad to note that the things I had been thinking about lately turned up in your editorial—almost exactly as I had considered them! I often get the feeling that my frustrations are only mine; so when I see others with the very same thoughts, then I am relieved to know that maybe I'm not as crazy or picky as I had imagined.

One of my biggest concerns is Atari Corporation's lack of mass advertising. Here they are with good, new equipment, trying to make a solid comeback, and yet only people who already own an Atari or read the computer magazines know about any of it.

Much of the general public thinks that Atari has folded, or has only uninteresting products to offer, for the stores—what few there are left that sell Atari products—have only last year's line and even older things.

Have you seen Sears' offerings? It is embarrassing to me. I did some traveling in June and went into several Sears in different states, and to my surprise, I saw the same situation existing in all the stores there as we find here (i.e., old equipment—the 835 dot-matrix printer at the original price—out-of-date software and uninformed salespeople). Commodore was doing a much better business there, and no wonder. It would be better if Sears just cleared the shelves of the stuff (as J.C. Penney did), than to mislead the public into thinking that what they sold was Atari's best.

You are so right in saying that it is up to us Atari owners to do the advertising. is that what Atari Corp. is expecting or planning? If so, they're never going to succeed financially.

I was also glad to notice in the **Reader Comment** column of the same issue that there was a fellow named Brent Barrett from Citrus Heights, California, who had the same problem with your **Personal Planning Calendar** as I did. I thought the problem was something unique that I was doing, but I see that it wasn't. I'm glad you published his letter, so that the error could be revealed and fixed.

Incidentally, the new format, which seems to start with issue 30, is very nice, and the new paper stock beginning with the September issue (34) looks great.

In closing, I just want to remind all of you that your magazine is much appreciated. You render a great "psychological" service for those of us who own Atari systems, but see little or no support for it, outside of BBSs or the user groups.

Everywhere I turn I see Apple, IBM or Commodore hardware and software, but one has to really dig to see anything for Atari—and then it is old and out of date. Without your magazine and others like it, I probably would have bought an Apple by now. Keep up the good work!

Sincerely yours,
David E. Kay
Honolulu, HI

The digging of the Musorqa.

The **Musorqa** program from issue 34 (September, 1985) purports to have been written solely for the Atari **Touch Tablet**. However, much archeological evidence suggests that the **Musorqa** may have resembled the earlier **KoalaPad**, and the even more primitive Atari Paddle Controllers.

I tried both of these instruments on the **Musorqa** program and found that they do indeed work. Of course, with the paddles, there is no way to really take your hands off the instrument, but you can still exercise the program's options by merely turning the knobs until the sounds stop playing, then making your changes, and moving the control knobs until the sounds begin again.

Sincerely yours,
Carl W. Hundley
Las Cruces, NM

G: whiz.

I just had to write after typing in **G:** from the October issue (35). You have published some fine programs in the past, but this one is, in my opinion, the best one yet.

It is so useful, so easy to use and so versatile, I can hardly believe I got it out of a magazine. I just can't say enough about how much I like it! I am already using it to print out forms created by a graphics program.

Here's a little tidbit to help others in using **G:**. To change the default left margin setting, POKE 10740 with the number you want your margin set at. I set it at 1, so that **G:** prints out an entire 60- or 120-character line.

Again, my thanks to Charles F. Johnson and **ANALOG Computing** magazine.

Yours truly,
Mark A. Storin
Milwaukee, WI

Translator revisited.

Regarding the comments made by Brian Nakata in issue 35, I agree that the key clicks and the bell routine are necessary parts of the old 800 operating system. Therefore, I studied the listings for

(continued on next page)

WE DON'T BUILD MOTOR VEHICLES. IF WE DID, IT WOULDN'T BE A LITTLE, FOREIGN TWO-SEATER.

IT WOULD BE A TOUGH 18-WHEELER WITH LOAD CARRYING CAPACITY.

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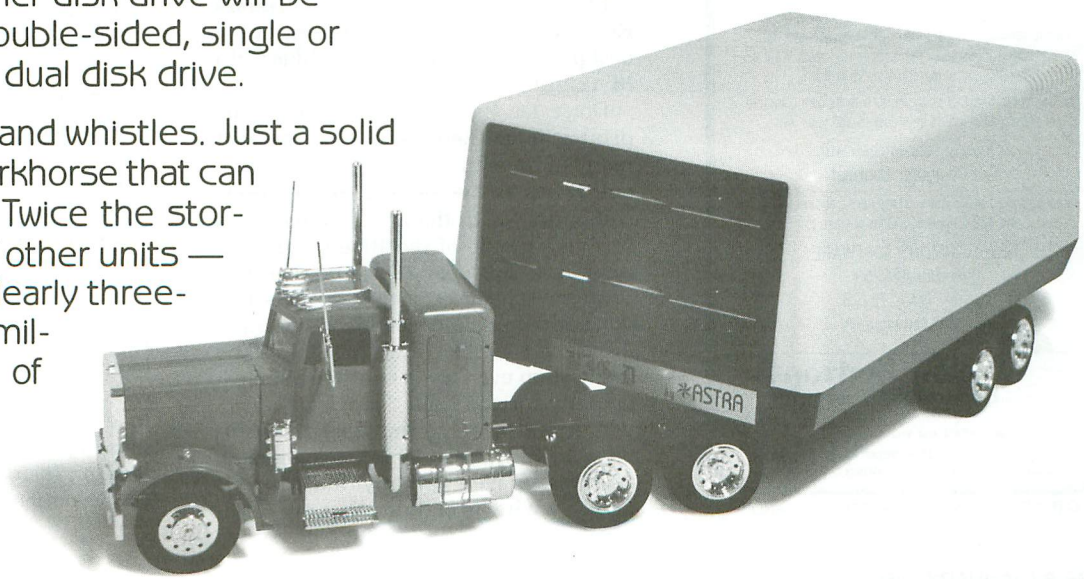


CIRCLE #103 ON READER SERVICE CARD

a while, and made the changes necessary to reinstall them, as follows:

```
190 DATA 255,255,231,70,23
3,70,234,234,234,190,72,19
2,72,76,2,241
220 DATA 249,80
230 DATA 12,81,77,69,77,79
,32,80,65,68,155,173,31,20
8,240,3,108,36,2,76,119,22
8,131,82,133
```

Using this new translator, all features of the original version by Angelo Giambra (issue 32) still work, but the keyclick and bell routines work, and the screen color remains unchanged. For those who want to change screen colors, amend Line 220 as follows:

```
220 DATA 195,94,195,94,X,2
49,80
```

where X = 16 * hue + lum from Table 9.3 of the Atari BASIC Reference Manual.

Thanks, Angelo, for a great program!

Yours truly,
Greg Black
Los Angeles, CA

Another accounting.

I am writing in reference to the review of the **Home Accountant** in issue 35. I read Mr. Kennedy's review with a great deal of (vested?) interest; I've been a user of this program since 1983.

I must assume that the final version of the program Mr. Kennedy received was version 2.1. Based upon that assumption, I must concur heartily with his conclusions. Every time I called Continental to report a problem, I was brushed off, as though they didn't want to be bothered.

One serious bug which Mr. Kennedy didn't mention is that, once you've established your monthly budget figures in any category, you can't change any of them! You may follow the usual sequence of changing the numbers, but when you're ready to enter the R command to record the new figures, the cursor returns to the last figure you've changed! The only exit here is to hit RESET. . .

Another problem is the ridiculous copy protection scheme used; this prevents the user from using a more advanced DOS XL with BASIC XL in an extended memory configuration, to gain memory. When asked for support in this area, Continental again turns a deaf ear.

I heartily agree with Mr. Kennedy's conclusions about the product, and with the thought that they (the company) might be more interested in supporting the IBM and/or Apple markets.

Sincerely,
Stephen G. Roquemore
Concord, CA

A printer worth checking.

I am writing in response to **Printers Revisited**, issue 35. I feel that one of the best printers was left out—the Blue Chip **M 120/10**.

Don't let the name fool you. This printer is packed with features that many of the more expensive units leave out. It has a parallel port, and is 100% compatible with the Epson line and its software. Some of the Blue Chip's features are: 160 cps, 2K buffer, variable print size, near letter quality (this is a dot matrix), true descenders and eight different character fonts built in! The **Print Shop** even has a configuration especially for the Blue Chip.

A friend of mine purchased a Mannesman Tally **Spirit 80** for over $400.00, and was amazed with my Blue Chip after he saw it. He claimed that my printer could do much more than his! The main attraction is its price: Blue Chip retails for $169.00! I have had the Blue Chip for almost one year and haven't had any problems with it yet. I highly recommend it to any Atari owner who is seeking a low-cost alternative to an expensive printer.

Marv Larson
Bakersfield, CA

P.S. The Blue Chip printer works fantastically well with the **G:** program in issue 35 of **ANALOG Computing**!

Trivia follow-up.

Thank you very much for reviewing Xlent Software's **Trivia Mania** in issue 36 of **ANALOG Computing** (November). Xlent believes that Dr. Griffin's points were well taken. However, it must be pointed out that the copy of **Trivia Mania** reviewed was a very early copy, and that the spelling errors have been corrected.

Xlent Software agrees with Dr. Griffin that, if someone designed a trivia game using the trivia editor, they would have an advantage in playing the game. However, teachers and parents can create games that their students or children may use as educational tools. Furthermore, students will be able to design self-help sessions that will make studying much easier.

The Trivia Construction concept was developed so that questions could be added, changed or modified at will. Xlent Software feels that the ability to create trivia questions for a game is a unique and worthwhile feature.

Very truly yours,
Linda K. Kubota-Barnes
Xlent Software
Springfield, VA

Correction for Forem Tutor.

The paragraph in last issue's **Forem Tutor** called "Quitting" (page 94) should have read:

*At the end of a message read, use M to go back to the main menu. At the SELECT: prompt, use the Q (quit) command. You may also use the Z command at the SELECT: prompt, to go directly from one base to another, completely bypassing the *GO prompt. If you've entered or deleted any messages, it may take a bit to exit. The* **Forem** *program must update all your changes to this base on the disk, before loading another. Be patient.*

by Donald Lee

*The **Color Alignment Generator** first appeared in the fall, 1983 APX catalog under Home Management. It won the first place Atari Star Award in Home Management for that quarter. When Jack Tramiel's group took over Atari, they gave the program rights back to the author. Since **ANALOG Computing** is his favorite Atari publication, and since he wants to see those Atari machines doing something other than playing games, here it is—**Color Alignment Generator**, Rev. 1.0, by Donald Lee.*

I've been a fan of **ANALOG Computing** magazine ever since the first issue. It has printed articles and programs for every possible Atari computer use, except one: the home workshop of the electrical engineer, electronics student and hobbyist. The Atari is capable of much more than games. With its graphics and sound capabilities, it could be used as a TV pattern generator to aid in the alignment of black and white or color TV sets and computer monitors. Can you guess what my program does now?

The program **Color Alignment Generator** requires BASIC and 32K of RAM for full operation, but if you don't need the rainbow keyed pattern, it will run in 16K just fine.

The alignment procedure detailed here is a general one that does not require you to remove the back of the TV set. You will, however, need a plastic alignment screwdriver for the adjustments.

If a more detailed alignment is needed, you should go down to your local electronic supply store and order a "Sam's Photo Fact" for your model TV. This will give you exact alignment instructions for your TV receiver.

(continued on next page)

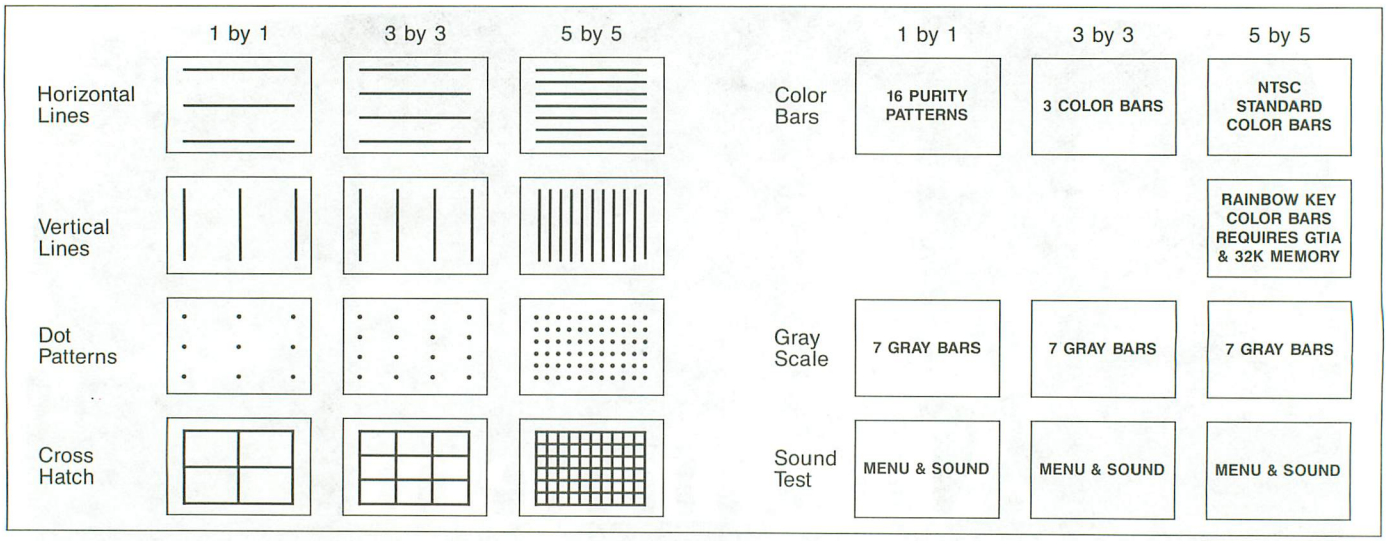


Figure 1.

Getting started.

Type in the program and verify it with Unicheck (see page 14). Correct any errors and, when everything is okay, RUN **Color Alignment Generator**.

The first screen to appear is the main menu. See Figure 1 for easy reference. From this screen, you'll select the required alignment patterns. The OPTION key selects the display modes of 1x1, 3x3, or 5x5. The SELECT key determines the display content or type of display; i.e., cross-hatch or color bars.

Both the OPTION and SELECT keys move the diamond-shaped cursors on the menu display. When the cursors are beside the display mode and content you want, press the START key. The START key has two functions: it gets you into and out of the different display modes. One last note: the Atari attract mode was left in to protect the TV screen; to get out of this mode, just press any alphabetic key.

General alignment.

From the main menu, select the sound test and press START. Turn off the automatic frequency control (AFC) on the front of your TV and turn up the volume. Adjust the fine tuning control on the front of your TV for the best overall picture and sound. Now, turn the AFC back on and press the START key to get back to the main menu.

From the main menu, press the OPTION and SELECT keys to get 5x5 and cross-hatch, and press START. Adjust the height and linearity controls on the back of your TV to make all the rectangles on the screen approximately the same size. Press the START key to get back to the main menu.

Gray scale adjustments.

There's only one gray scale pattern in this program, so press the SELECT key until the cursor is beside *GRAY SCALE*, and then press the START key. After a few seconds, you'll see seven gray bars on a black screen. Adjust the contrast and brightness controls on the front of your TV until you get the best transition from the darkest bar on the left to the lightest bar on the right of the screen. When you're done, press the START key to get back to the main menu.

Pincushion.

From the main menu, press the OPTION key to obtain 5x5 and press the SELECT key to obtain horizontal lines, then press the START key. The lines should look straight and be parallel to each other. If they look bent, as in Figure 2, you have a pincushion problem.

If your display looks like the one in Figure 2, you may want to call a television repairman to make an adjustment. If, however, you have a Sam's for your television, just follow the directions for correcting pincushion. Press the START key to return to the main menu.

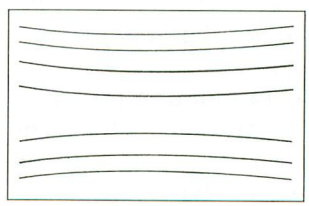


Figure 2. Pincushion.

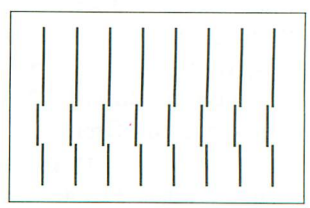


Figure 3. Hum bars.

Hum bars.

From the main menu, press the OPTION key to select 5x5 and use the SELECT key to obtain vertical lines. Then press the START key. If the screen has a thick horizontal bar rolling up or down the screen, as in Figure 3, you have 60-cycle hum in your picture.

If your screen looks as bad as the one in Figure 3, you may want to call your TV repairman to make an adjustment. Press the START key to return to the main menu.

Convergence.

From the main menu, press the OPTION and SELECT keys to obtain 5x5 and dot pattern, then press the START key. Adjust the focus control on the back of your TV for the sharpest picture.

The purpose of this test is to get each of the three electron beams from the guns in the picture tube to hit only its phosphor dot on the screen. Each white dot on the screen is made up of three color phosphors, one red, one green and one blue. If you stand about three inches from the screen, each white dot will look like this:

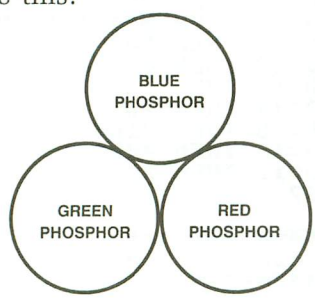


Figure 4.

If you stand about one foot from the screen, the three color phosphors look like this:

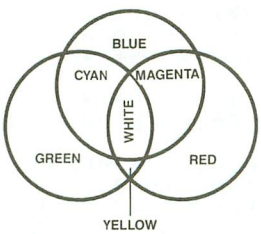


Figure 5.

If everything's working correctly, at a normal viewing distance all the dots on the screen should be white.

If the dots in the center of the screen are colors other than white (Figure 6), you have a static convergence problem.

If the dots in the corners of the screen are colors other than white (Figure 7), you have a dynamic convergence problem.

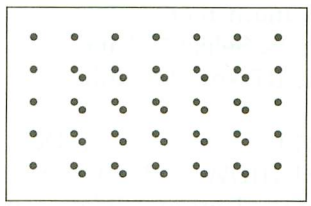


Figure 6.
Static convergence.

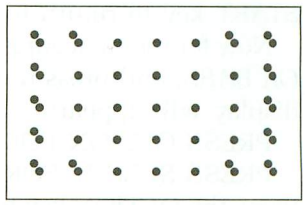


Figure 7.
Dynamic convergence.

If the convergence problem is bad enough, you may want to call a TV repairman to adjust the equipment. Again, if you have a Sam's, just follow the convergence directions. Press START to return to the main menu.

Purity.

We will assume that the picture tube "CRT" is not magnetized, and that all stages of your receiver are working normally.

From the main menu, select 1x1 and *COLOR BAR*, and press the START key. The following prompt will appear:

PRESS SPACE FOR COLOR
PRESS START FOR MENU
BLACK

First, put the COLOR and TINT/HUE controls on the front of the TV to the center of their rotation, then touch up the red, blue and green screen controls on the back of your TV for a black screen. Now, each time you press the SPACE BAR, the name of another color replaces the word *BLACK*, and the screen will change to that color. The following colors appear in order: black, rust, red-orange, dark orange, red, dark lavender, cobalt blue, ultramarine blue, medium blue, dark blue, blue-gray, olive green, medium green, dark green, orange-green and orange.

If the screen color doesn't match what's called out on the bottom of the screen, touch up the red, blue and green screen controls for the best overall match. The colors should look "pure" (i.e., every portion of the screen is the same color). Most older sets become partially magnetized in the corners of the screen. If the magnetism is severe, call a TV repairman, or follow the instructions in the Sam's.

Press START to return to the main menu.

Color adjustments.

Select 3x3 and *COLOR BARS* and press the START key. You should see three vertical color bars, one red, one blue and one green. Turn the Automatic Frequency Control (AFC) off and adjust the color and tint/hue

controls on the front of the TV to get the correct colors. Then turn the AFC back on and press the START key to return to the main menu.

Now for the final adjustments. Select 5x5 and *COLOR BARS*, and press the START key. The following display will appear:

PRESS OPTION FOR NTSC PATTERN
PRESS SELECT FOR RAINBOW PATTERN

Press the OPTION key to get the National Television Service Council (NTSC) color bars. After a moment, you'll see (from left to right) green, yellow or yellow-orange, red, magenta, blue, green and magenta color bars.

Touch up the color and tint/hue controls, so that the colors look close to what they're supposed to be. Note: you may have to adjust the brightness control to get a clean picture. When you're done, press the START key to return to the main menu.

If you have enough memory and a GTIA chip in your Atari, try the rainbow key pattern: a total of twelve color bars that burst from yellow-orange to red to blue to green will appear. Adjust the color and tint/hue controls for a smooth transition from yellow to green.

Congratulations—you've just aligned a TV with your Atari.

Don is an Engineering Aide with Boeing Commercial Airplane Co. He has worked in software development, hardware development, electronic design, instrumentation design and operation. He is currently working in model instrumentation at the wind tunnel in Seattle.

Listing 1.
BASIC listing.

```
1 REM ********************************
2 REM * COLOR ALIGNMENT GENERATOR   *
3 REM * (C) 1983 BY DON LEE 2/15,83 *
4 REM * SEATTLE, WA. 98155          *
5 REM ********************************
6 REM *  (C) 1985 ANALOG COMPUTING  *
7 REM ********************************
8 REM
9 S=53279:YOLD=11:YNEW=Z:ZOLD=11:ZNEW=
Z:QX=Z
10 GRAPHICS Z:SETCOLOR 2,Z,Z:SETCOLOR
4,Z,Z:POKE 752,1
15 GOSUB 4105
20 POSITION 7,4:? "COLOR ALIGNMENT GEN
ERATOR":POSITION 10,5:? "(C) 1983 BY D
ON LEE"
30 POSITION 4,8:? "DISPLAY MODE      DI
SPLAY CONTENT"
40 POSITION 4,9:? "____________      __
_____"
50 POSITION 6,11:? "1 by 1          HOR
IZONTAL LINES"
60 POSITION 6,12:? "3 by 3          VER
TICAL LINES"
70 POSITION 6,13:? "5 by 5          DOT
 PATTERN"
80 POSITION 21,14:? "CROSS-HATCH"
85 POSITION 21,15:? "COLOR BARS"
87 POSITION 21,16:? "GRAY SCALE"
88 POSITION 21,17:? "SOUND TEST"
90 POSITION Z,20:? "    PRESS OPTION F
OR MODE":? "  PRESS SELECT FOR CONTENT
":? "  PRESS START TO BEGIN"
107 POSITION 4,YOLD:? CHR$(96);:POSITI
ON 18,ZOLD:? CHR$(96);
110 A=PEEK(S)
115 IF A=3 THEN 130
120 IF A=5 THEN 140
125 IF A=6 THEN 152
127 GOTO 110
130 YNEW=YOLD+1:IF YNEW=14 THEN YNEW=1
1
131 POKE 77,Z
132 POSITION 4,YOLD:? " ";:POSITION 4,
YNEW:? CHR$(96);:YOLD=YNEW:GOTO 145
140 ZNEW=ZOLD+1:IF ZNEW=18 THEN ZNEW=1
1
141 POKE 77,Z
142 POSITION 18,ZOLD:? " ";:POSITION 1
8,ZNEW:? CHR$(96);:ZOLD=ZNEW
145 FOR X=Z TO 100:NEXT X:GOTO 110
146 REM
147 REM **********************
148 REM * WHAT DO YOU WANT *
149 REM **********************
150 REM
152 POKE 77,0
155 IF YOLD=11 THEN MODE1=80:MODE2=48
160 IF YOLD=12 THEN MODE1=54:MODE2=32
165 IF YOLD=13 THEN MODE1=16:MODE2=16
175 IF ZOLD=11 THEN 505
180 IF ZOLD=12 THEN 605
185 IF ZOLD=13 THEN 803
190 IF ZOLD=14 THEN 705
193 IF ZOLD=15 THEN 2105
195 IF ZOLD=16 THEN 4005
205 IF ZOLD=17 THEN 223
216 GOTO 107
217 REM
218 REM ***************
219 REM * SOUND TEST *
220 REM ***************
221 REM
223 IF QX=Z THEN QX=121:SOUND Z,QX,10,
6:FOR X=Z TO 200:NEXT X:GOTO 107
224 QX=0:SOUND Z,QX,10,Z:FOR X=Z TO 10
0:NEXT X:GOTO 107
229 REM
230 REM ********************
231 REM * THREE COLOR BARS *
232 REM ********************
233 REM
255 GRAPHICS 19:GOSUB 4105
257 POKE 708,66:POKE 709,130:POKE 710,
210
260 COLOR 1:PLOT 7,4:DRAWTO 7,20
261 PLOT 8,4:DRAWTO 8,20
265 COLOR 2:PLOT 20,4:DRAWTO 20,20
266 PLOT 19,4:DRAWTO 19,20
269 COLOR 3:PLOT 31,4:DRAWTO 31,20
270 PLOT 32,4:DRAWTO 32,20
275 FOR X=Z TO 100:NEXT X
280 IF PEEK(S)=6 THEN POKE 712,Z:GOTO
10
285 GOTO 280
300 REM
301 REM **********************
302 REM * 1 BY 1 COLOR BARS *
303 REM **********************
304 REM
310 ? "K";:POKE 752,1:POSITION 4,20:? "
PRESS SPACE FOR COLOR"
```

```
311 POSITION 4,21:? "PRESS START FOR M
ENU"
315 FOR C=Z TO 240 STEP 16:POKE 712,C:
POKE 710,C:POKE 764,255:GOSUB 350
317 IF PEEK(5)=6 THEN 10
320 IF PEEK(764)=255 THEN 317
325 NEXT C
330 GOTO 315
350 POSITION 10,23:? "
        ";:POSITION 10,23
351 IF C=Z THEN ? "BLACK";
352 IF C=16 THEN ? "RUST";
353 IF C=32 THEN ? "RED-ORANGE";
354 IF C=48 THEN ? "DARK-ORANGE";
355 IF C=64 THEN ? "RED";
356 IF C=80 THEN ? "DARK-LAVENDER";
357 IF C=96 THEN ? "COBALT-BLUE";
358 IF C=112 THEN ? "ULTRAMARINE-BLUE"
;
359 IF C=128 THEN ? "MEDIUM BLUE";
360 IF C=144 THEN ? "DARK-BLUE";
361 IF C=160 THEN ? "BLUE-GREY";
362 IF C=176 THEN ? "OLIVE-GREEN";
363 IF C=192 THEN ? "MEDIUM-GREEN";
364 IF C=208 THEN ? "DARK-GREEN";
365 IF C=224 THEN ? "ORANGE-GREEN";
366 IF C=240 THEN ? "ORANGE";
367 RETURN
500 REM
501 REM **********************
502 REM * HORIZONTAL LINES *
503 REM **********************
504 REM
505 GRAPHICS 23:GOSUB 4105:GOSUB 555
509 FOR X=Z TO 100:NEXT X
510 IF PEEK(5)=6 THEN 10
515 GOTO 510
547 REM
548 REM ***************************
549 REM * HORIZONTAL SUBROUTINE *
550 REM ***************************
551 REM
555 FOR Y=Z TO 95 STEP MODE2
560 COLOR 1:PLOT Z,Y:DRAWTO 159,Y:NEXT
 Y:PLOT 0,95:DRAWTO 159,95
570 RETURN
575 REM
576 REM ********************
577 REM * VERTICAL LINES *
578 REM ********************
579 REM
605 GRAPHICS 23:GOSUB 4105:GOSUB 655
610 GOTO 509
647 REM
648 REM ************************
649 REM * VERTICAL SUBROUTINE *
650 REM ************************
651 REM
655 FOR X=Z TO 159 STEP MODE1
660 COLOR 1:PLOT X,Z:DRAWTO X,95:NEXT
X:PLOT 159,Z:DRAWTO 159,95
670 RETURN
700 REM
701 REM ************************
702 REM * CROSS-HATCH PATTERN *
703 REM ************************
704 REM
705 GRAPHICS 23:GOSUB 4105:GOSUB 555:G
OSUB 655
710 GOTO 509
750 REM
751 REM ****************
752 REM * DOT PATTERN *
753 REM ****************
754 REM
803 GRAPHICS 23
804 GOSUB 4105
805 FOR XP=Z TO 159 STEP MODE1
810 FOR YP=Z TO 95 STEP MODE2
815 PLOT XP,YP:PLOT 159,YP:NEXT YP:PLO
T XP,95:NEXT XP:IF YOLD<13 THEN PLOT 1
59,93:GOTO 509
818 PLOT 159,95:GOTO 509
850 REM
851 REM ************************
852 REM * RAINBOW KEY PATTERN *
853 REM ************************
854 REM
901 GRAPHICS 11:GOSUB 4105
905 X=3:Y=Z:Y1=180:FOR C=2 TO 13:COLOR
 C:FOR Q=Z TO 4
907 IF X+1>79 THEN 509
910 PLOT X+Q,Y:DRAWTO X+Q,Y1
915 NEXT Q:X=X+Q+1:NEXT C:GOTO 509
950 REM
951 REM ********************
952 REM * PLAYER-MISSILE *
953 REM ********************
954 REM
1005 A=PEEK(106)-8:POKE 54279,A:P=256*
A:POKE 559,46:POKE 53277,3
1010 FOR I=53248 TO 53255:POKE I,Z:NEX
T I
1015 FOR I=53256 TO 53260:POKE I,2:NEX
T I
1020 FOR I=704 TO 707:POKE I,Z:NEXT I
1025 FOR I=384 TO 1024:POKE P+I,Z:NEXT
 I
1030 FOR X=400 TO 912 STEP 128:FOR I=X
 TO X+95:POKE P+I,255:NEXT I:NEXT X
1055 RETURN
2000 REM
2001 REM ********************
2002 REM * COLOR BAR MENU *
2003 REM ********************
2004 REM
2105 IF YOLD=11 THEN 310
2106 IF YOLD=12 THEN 255
2107 ? "ß":POSITION 2,9:? "PRESS OPTIO
N FOR NTSC PATTERN":POSITION 2,10:? "P
RESS SELECT FOR RAINBOW PATTERN"
2109 FOR X=Z TO 200:NEXT X
2110 IF PEEK(5)=3 THEN ? "ß":POSITION
8,12:? "ONE MOMENT PLEASE.......":FOR
X=Z TO 200:NEXT X:GOTO 3005
2115 IF PEEK(5)=5 THEN 2130
2120 IF PEEK(5)=6 THEN 10
2125 GOTO 2110
2130 IF FRE(Z)<8150 THEN 2140
2135 GOTO 901
2140 ? "ß":POSITION 8,12:? "Sorry...Yo
u don't have enough":POSITION 8,13:? "
memory for this pattern..."
2145 FOR X=Z TO 200:NEXT X:GOTO 2105
2500 REM
2501 REM ********************
2502 REM * NTSC COLOR BARS *
2503 REM ********************
2504 REM
3005 GRAPHICS 19:GOSUB 4105:GOSUB 1005
3010 POKE 704,212:POKE 705,246:POKE 70
6,66:POKE 707,98:POKE 708,130:POKE 709
,212:POKE 710,98
3011 REM
3012 REM ********************
3013 REM * DISPLAY SETUP *
3014 REM ********************
3015 REM
3016 FOR X=Z TO 3:POKE 53248+X,52+X*21
:NEXT X
3017 FOR X=53256 TO 53260:POKE X,1:NEX
T X
3020 FOR X=Z TO 3:FOR I=1 TO 3
3025 COLOR I:PLOT 17+X+I*5,Z:DRAWTO 17
+X+I*5,23
3040 NEXT I:NEXT X:FOR X=Z TO 100:NEXT
 X
```

C.A. Generator *continued*

```
3045 IF PEEK(5)<>6 THEN 3045
3050 FOR X=53248 TO 53255:POKE X,Z:NEX
T X
3055 POKE 559,34:POKE 53277,Z
3060 GOTO 10
3500 REM
3501 REM ***************
3502 REM * GRAY SCALE *
3503 REM ***************
3504 REM
4005 ? "{":POSITION 8,12:? "ONE MOMENT
 PLEASE.....":FOR X=Z TO 200:NEXT X:
GRAPHICS 19:GOSUB 4105:GOSUB 1005
4010 FOR I=1 TO 7:POKE 703+I,I+I:NEXT
I
4015 GOTO 3015
4099 REM
4100 REM ***********************
4101 REM * BREAK KEY DISABLE *
4102 REM ***********************
4103 REM
4105 I=PEEK(16):IF I>127 THEN I=I-128:
POKE 16,I:POKE 53774,I
4110 RETURN
```

CHECKSUM DATA.

(see page 14)

```
1 DATA 746,158,381,152,754,788,758,1,1
66,494,21,679,152,250,589,6089
60 DATA 936,605,558,255,159,318,118,72
9,949,505,508,520,699,405,36,7300
132 DATA 803,429,39,740,769,92,41,76,4
3,89,959,7,0,14,944,5045
180 DATA 946,950,956,152,157,938,701,8
6,531,223,526,83,413,496,91,7249
230 DATA 33,937,35,88,385,876,106,212,
483,392,496,355,690,334,740,6162
300 DATA 78,843,497,845,82,43,275,704,
69,539,731,708,495,211,201,6321
353 DATA 985,202,264,400,228,168,588,9
85,997,687,476,179,461,656,610,7886
500 DATA 82,31,86,33,86,766,679,66,710
,101,315,712,310,98,2,4077
560 DATA 642,610,108,621,438,623,112,7
70,713,103,304,571,299,100,902,6916
660 DATA 789,612,86,287,461,289,90,205
,715,101,362,954,364,105,113,5533
804 DATA 830,926,834,274,225,103,304,5
47,306,107,372,899,949,199,931,7806
950 DATA 105,618,482,620,109,892,74,99
2,86,424,606,794,277,791,474,7344
2003 DATA 795,285,66,84,551,434,855,35
4,299,719,326,906,932,705,292,7603
2501 DATA 45,864,49,300,737,727,282,59
9,365,603,290,623,118,809,892,7303
3040 DATA 622,700,202,523,621,294,359,
839,363,302,715,920,736,308,48,7552
4101 DATA 844,52,290,391,789,2366
```

BASIC XE
OPTIMIZED SYSTEMS
SOFTWARE, INC.
1221B Kentwood Avenue
San Jose, CA 95129
Disk and Cartridge $69.95

by Bob Curtin

There are certain commercial enterprises, establishments and talents, with whom I've dealt in the past or from whom I've bought wares of one sort or another—and have never been sorry. In fact, there are some who get my business out of loyalty to consistent excellence.

For instance, I've never been stung spending my money to see a Paul Newman flick (pun intended). I've never heard anything shoddy from Billy Joel or the late Eugene Ormandy. I've always gotten my money's worth buying Starrett tools, Honda motorcycles, and James Michener novels. The list goes on, but I'm sure you get the idea.

OSS is on the list. Everything I've seen from that software house has been a study in excellence, from the MAC/65 assembler to Action! to **The Writer's Tool** (the word processor, in fact, which I'm using to write this review). Well, they've done it again with **BASIC XE** (**BXE**).

I do a lot of programming in BASIC, simply because it's an easy language to use. Oh sure, I know. It's not the "in" language these days, but it does have tremendous advantages, as well as obvious (and well-documented) limitations. Atari BASIC, in particular, has some severe drawbacks, not the least of which is, shall we say, the rather casual pace at which it goes about its business.

OSS has designed **BXE** especially for the new 130XE computers from Atari, and there are some wonderful goodies in that little cartridge, designed to take advantage of the XE's extra 64K of memory. But, more than that, **BXE** goes a long way toward alleviating or eliminating a lot of the drawbacks of previous BASICs available for the 8-bit Atari computers.

For one thing, it's fast. BASIC programs, even those previously written in Atari BASIC, will run 2 to 6 times faster using **BXE**. OSS has included a Fast command which does a precompile of the program in memory. The precompile changes the line numbers to the address of each of the respective lines in memory. So, instead of the computer having to go through a line number search with each GOTO, FOR, GOSUB, etc., the program simply jumps to the specified address.

BXE is fully compatible with Atari BASIC, with the exception of some previously written programs having a variable name or two which might conflict with some of the **BXE** command names.

BXE has most of the features usually found only in the full-blown interpreters of the "big" machines. I've used the CP/M-80 Microsoft BASIC extensively and have long wished for some of the commands to become available for my Atari. I no longer have to wish.

The Print Using command, for example, formats numerical output to printer or screen in an incredibly flexible and easy method. You need not write separate subroutines for right justification and trailing zeros. This command will do it for you.

BXE includes a full range of input/output commands, including commands for storing and retrieving binary files, blocks of data and records, to and from a disk drive (in addition to the array of I/O commands already available, *a la* Atari BASIC).

There are several file management commands, such as Dir (disk directory), Protect, Unprotect, Rename, and Erase. How often have you needed *those* during a programming session? Don't forget, these commands can be used in immediate mode.

And no longer do you have to defend your Atari against: "No string arrays? Why don't you get yourself a *real* computer?" Yes, Hercule, **BXE** does have string arrays, as well as a host of string manipulation commands: Right$, Left$, Mid$, Hex$ and Find, just to name a few.

There's a nifty little command called Local, which allows you to use temporary arithmetic variables within GOSUB and PROCEDURE subroutines. Essentially, you can change the value of a variable within a subroutine, without affecting any value it contained outside of the subroutine.

What's that? What's PROCEDURE subroutine? **BXE** has included a statement called PROCEDURE, which allows a programmer to create named subroutines, to be called later with the Call command. PROCEDURE uses a string constant to name the subroutine, not a variable.

This alone is handy enough, making your programs much more readable, while at the same time not using up any of the 128 variables to which you're limited in both Atari BASIC and **BXE**. But there are additional advantages. Parameter passing is possible (as well as returning values), and this, tied in with the LOCAL statement, makes for some interesting possibilities.

The PROCEDURE is somewhat reminiscent of the procedure in Pascal, or the macro in assembler. What makes it so nice is that you can write procedures that are usable in any program. You can create libraries of procedures with recognizable names, which, when called in a program, perform specific functions.

This modular approach is germane to the "structured" languages such as C and Pascal, and for good reason. Once libraries of subroutines are created, programming becomes essentially a matter of writing the code which links the subroutines together.

BXE is loaded with those nice little extras that make programming in BASIC so much fun. Full trace capability, renumbering, automatic line numbering, variable listing, and system status and control are all there for your use.

The full range of graphics commands available in Atari BASIC has been augmented with a full range of player/missile graphics commands and functions. PMGraphics, PMColor, PMMove, Missile, PMWidth, PMCLR, Bump (yes, you're right), HITCLR and PMADR finally give you total control of the Atari's remarkable graphics. Short of writing arcade games, **BXE** equips you for just about anything you'd want to do.

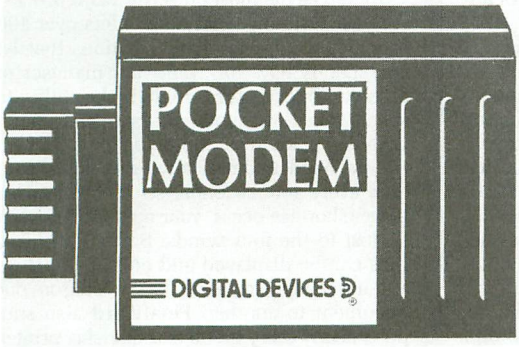
BXE comes with an OSS "Supercartridge," a 143-page reference manual and a disk containing certain of the command and function routines, including the fast math routines, plus an assortment of sample programs to gawk at. The reference manual alone is a work of art, with detailed explanations and program examples to show you the way.

Just for chuckles, I checked the free memory available. The Atari BASIC built into my 130XE leaves 32274 bytes of free memory with DOS 2.5 booted and the ramdisk configured. **BXE** in the same configuration leaves exactly the same: 32274. **BXE** with the extension disk booted up (which does *not* configure the ramdisk) leaves 32418, an additional 144 bytes! Those extra memory banks are available to you through the Extend command and some of the I/O commands, however, so it's certainly not lost.

It's a remarkable package, and I recommend it highly to anyone looking for an extremely powerful, fast and easy-to-use programming language. Considering the dazzling array of functions, commands and statements, coupled with the speed of **BXE**, it's far and away the most powerful BASIC I've ever seen. On a scale of 1-10, I give it a healthy 11.

NEW PRODUCTS

NEW MODEMS FROM DIGITAL DEVICES



Two new **Pocket Modems** from Digital Devices are now available, the **AT300** and the **AT1200**. Both modems connect to the Atari computer without the need for an interface, and each features auto-answer/auto-dial capability, as well as communications software.

The **AT300** runs at 300 baud, is upgradable to 1200 baud and retails for $149.95. Its counterpart, the **AT1200** runs at 1200 baud and sells for $249.95. Manufactured by Digital Devices, makers of **ApeFace**, **U-Print**, **U-Call** and **U-Buff**.

For information, contact Digital Devices Corp., 430 Tenth Street, Suite N205, Atlanta, GA 30318 — (404) 872-4430.

UPGRADE YOUR PERSONAL NET WORTH

Your Personal Net Worth, the home financial management system from Scarborough Systems, has introduced an upgraded version in response to demand from both dealers and consumers.

Changes include: new formatting to the net worth report for a clearer statement, the ability to change the name of the data disk at any time, and the built-in option to back up your data disk in the Atari version.

Current **Your Personal Net Worth** owners can obtain an upgraded version for only $10, by calling Scarborough at (914) 332-4545.

For more information, contact Scarborough Systems, located at 55 South Broadway, Tarrytown, NY 10592.

SPY VS. SPY — II

First Star Software has released the sequel to their hit **Spy vs. Spy**. It's **Spy vs. Spy II: The Island Caper**, which features the two spies in search of buried missile parts on an exotic tropical island.

The screen format is similar to that of the first game, where the players see each other's movements on a split screen. The spies avoid sharks, quicksand, snares, coconut bombs, booby traps, deadly lagoons and cliffs, as they wander here and there.

Priced at $29.95 from First Star Software, 18 East 41st Street, New York, NY 10017 — (212) 532-4666.

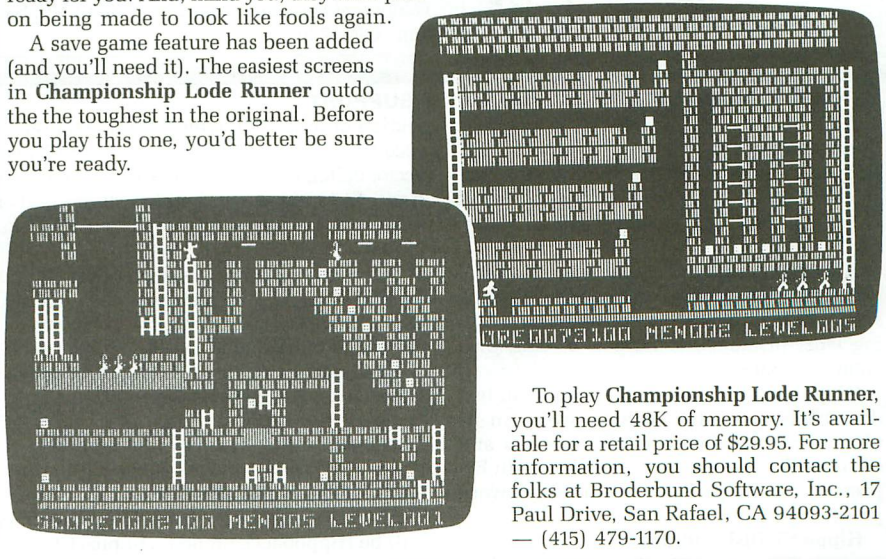
IT'S HERE AND IT'S TOUGH!

Championship Lode Runner is available for Atari 8-bit computers, and, unless you've played the original **Lode Runner** and are a real pro, don't bother!

These fifty screens will have you really going nuts, as you, once again, confront the merciless Bungeling guards of the Bungeling Empire.

You see, all of that gold you recovered as the original **Lode Runner** has been stolen back by the bad guys. Now, you have to return. . . but this time, they're going to be ready for you. And, mind you, they don't plan on being made to look like fools again.

A save game feature has been added (and you'll need it). The easiest screens in **Championship Lode Runner** outdo the the toughest in the original. Before you play this one, you'd better be sure you're ready.



To play **Championship Lode Runner**, you'll need 48K of memory. It's available for a retail price of $29.95. For more information, you should contact the folks at Broderbund Software, Inc., 17 Paul Drive, San Rafael, CA 94093-2101 — (415) 479-1170.

A NEW LINE FROM ARTWORX

Artworx has introduced their "PX" line of low-cost software. The all-original programs cover a wide range of entertainment software, the first being an adventure, **Hotel Alien**.

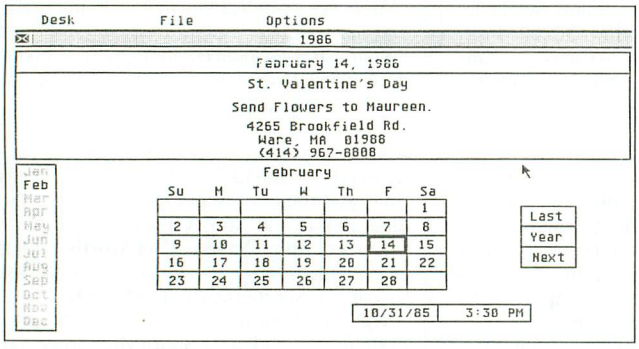
The very reasonable cost of $9.95 should prove popular, and Atari authors are encouraged to send their programs to the Artworx Program Exchange for evaluation.

Contact Artworx Software Co., Inc., 150 North Main Street, Fairport, NY 14450 — (716) 425-2833.

ST NEWS!

ELECTRO CALENDAR

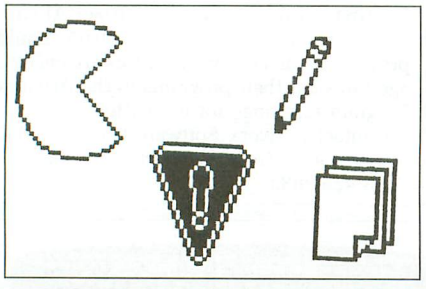
This ST program is an organizational tool capable of displaying or printing a picture of any month between 1776 and 3001. Using **Electro Calendar**'s notepad feature, you can enter a message for an important date, and have it pop up when that day arrives. Those dates are highlighted on the calendar, and the message appears above.



A search feature will scan the calendar for messages entered on a day, month or year. The function can be used for future planning, payment scheduling, appointments, or anytime that a reminder might be necessary.

Electro Calendar is available for $39.95 from Soft Logik Corp., 4129 Old Baumgartner, St. Louis, MO 63129—894-8608.

SHICED



The new **Shape and Icon Editor (SHICED)** for the Atari 520ST will allow you to design and save icons of your own, which can then be utilized in your programs.

Using the mouse on your ST and the detailed documentation that comes with your **SHICED** program, you will instructed on compiling, loading, saving and editing your unique set of icons. A big help for programmers adapting their icons for specialty offerings.

SHICED is available from the Monarch Development company, 3927 Fisher Road NE, Salem, OR 97305.

HIPPOPOTAMUS SOFTWARE — BIG ON ST SUPPORT

A variety of programs from Hippopotamus Software, Inc. are now available for the ST. **Hippo ST Ramdisk** speeds up programs considerably, by allowing the user to partition off an area of RAM to be used, itself, as a ramdisk ($34.95).

HippoSimple is an easy-to-use, powerful home database. Sorting and merging are possible, along with hardcopy printing and mailing label printouts, in formats of your own choice ($49.95).

HippoSpell finds misspelled words in text documents, using the 30,000+ words in its dictionary, including common prefixes and suffixes. This program is compatible with **Express** from Mirage Software and Atari word processors ($39.95).

Hippo ST Disk Utilities are a powerful collection of programs, which allow the user to recover any lost or deleted files. The track and sector editor, memory editor, string search routines, file archive—and other features—give you much greater control over your ST disks ($49.95).

The **Hippo Almanac** contains over 35,000 useful facts, including history, "800" numbers, capitals, sports, geography, unit conversions and much more, and is capable of understanding and answering in plain English ($34.95). **Hippo Jokes & Quotes** boasts over 2500 popular jokes and 1500 quotes on disk, accessed by subject, author or keyword. Categories include PG, R and X jokes, along with ethnic and sexist sections ($34.95).

Also available soon from Hippopotamus will be **Hippobackgammon**, **Hippoart 1**, **Hippo EPROM Burner**, **Hippo-C** Level 1 and Level 2, and **Hippo-Lock**, along with some professional applications packages.

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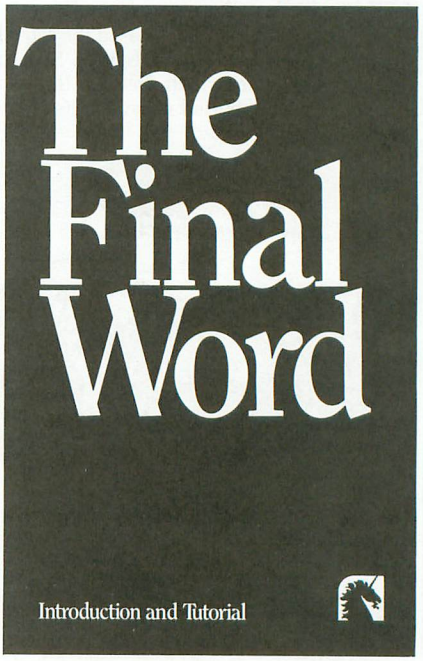

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DLI Maker

Custom DLIs for your BASIC programs

by Greg Anderson

Have you ever wanted to put a display list interrupt (DLI) into your BASIC program, only to give up because you lacked a knowledge of machine language? Your days of despair are over with **DLI Maker**! Your name doesn't have to be Tom Hudson to put multiple custom DLIs in your BASIC programs. **DLI Maker** does it all for you!

DLI Maker is a BASIC program that will create a set of custom DLIs for easy use in your own programs. Just step through the menus and produce a custom DLI in minutes, no assembly required. Even experienced machine language programmers will find **DLI Maker** easier than writing and debugging their own DLIs with an assembler. In fact, **DLI Maker** will automatically LIST a file to disk or cassette, complete with all needed initialization, so there's no need to convert an object file to BASIC-usable code manually.

What, you might ask, is a DLI? Stated simply, a DLI allows you to alter the appearance of the screen partway down. For example, you may want the top ten lines of a graphics 0 screen to be on a blue background, and the bottom fourteen to be on black. Or you may wish to use a custom character set in the graphics 1 part of the screen, with the default Atari character set in the text window.

Of course, there's no need to limit yourself to one change per screen. It's possible to make several changes on every line of the screen. Until now, if you wanted to do anything like this, you had no choice but to write your own DLI in machine language.

No knowledge of machine language is needed to use **DLI Maker**, however: all of the "dirty work" is done for you. A knowledge of PEEKS and POKES is useful in creating a DLI, but not required for simpler ones.

DLI Maker is very easy to use. Just step through several menus. When you're done, it will list your DLI to disk or cassette in a form that BASIC can later ENTER. Line numbers in the range of 10000 to 11200 are used. All your program needs to do is GOSUB 11000 once when initializing, and GOSUB 10000 after the graphics command, to turn on your DLIs.

Caution: the DLIs are stored in a string variable, so they must be disabled (with a graphics command or SYSTEM RESET) before control is returned to BASIC. Strings are stationary as long as your program is running, but BASIC moves them freely when you enter more BASIC lines or execute a command in direct mode. If DLIs are enabled when the strings are moved, your computer will *crash*, and you'll have no choice but to turn it off and start again. To prevent this, exit your program via SYSTEM RESET instead of the BREAK key.

Making a DLI.

When you first run **DLI Maker**, and at the beginning of every step to each DLI, you will be presented with the main menu. This is the first of several menus that you'll use to tell **DLI Maker** exactly what you want your custom DLI to do.

Changing a memory location.

While there are a total of five different selections on the main menu, most DLIs will only use the first,

Change a memory location. While it would be easy enough to simply ask for the memory location you wish to change, **DLI Maker** has several locations memorized for your convenience, such as screen colors and character set pointer.

If **DLI Maker** doesn't know the location you wish to change, you may type it in using either decimal or hex, the latter by typing a $ preceding the value, as in *$D400*.

You may already be familiar with the memory locations from 708 to 712, the playfield colors shadow registers (changed by SETCOLORs 0-4, respectively). These shadow registers directly correspond to the hardware registers from $D016 to $D01A, which also control the playfield colors.

What, then, is the difference between hardware and shadow registers, if both control the same function? *Shadow registers may be read or written to, while hardware registers are read or write only.*

This is a very important concept. Hardware registers actually control the given operation, but, because they cannot be read once written, the Atari OS maintains shadow registers for programming convenience. These locations are copied into their corresponding hardware locations sixty times a second, at the beginning of the screen-drawing cycle.

In a DLI, you must be sure to change the appropriate hardware register, because if you change its shadow, you'll alter the appearance of the entire screen, not just the area beneath the DLI. The greatest advantage of shadow registers is that you can change the screen color in the middle of the screen, and the shadow register will maintain a constant color on top.

Unfortunately, not all hardware registers have shadows; one example of this is the player/missile horizontal position registers, from $D000 to $D007. If you change these at one place in the screen, you must also have a DLI on the first line, so that your players will not be incorrectly positioned above your first DLI.

More often than not, you'll want to change the memory location selected to a constant (the same number every time). Again, the number can be entered in decimal or hex, or, if a screen color is being changed, **DLI Maker** will show you the list of the sixteen Atari colors, followed by their eight luminances.

Occasionally, it's more convenient to change a memory location to the same value stored at some other address, instead of using a constant. You may, for example, want to change the color of the bottom half of the screen dynamically within your BASIC program. When selecting to copy one address to another, you have no choice but to type in the value of the memory location in question, as all of the values **DLI Maker** knows are hardware registers.

If you put more than one step on the same DLI, you'll be given the additional option of changing a memory location to the same value as the last step.

This is useful if you want to change the background and the border of a graphics 0 screen to the same color. Note that this only works for changing or adding to a memory location. Incrementing, decrementing and waiting for horizontal sync do not in any way affect the 6502 Accumulator, which is what holds the last value stored. Therefore, changing the background to green, followed by an increment, followed by a change border to the value of the last step will change both the border and background green. The border won't pulse, as may be expected from the preceding increment.

Adding to a memory location.

In some rare instances, you may wish to do some addition or subtraction within a DLI. Subtraction is performed by adding a negative; **DLI Maker** will automatically convert negative numbers into their two's complement equivalents.

Adding memory locations is more complex than other DLI functions. It's similar to changing a location, but you must also specify two values to be added, one of which will always be a memory location. The first thing that add will ask will be the address in which to save the result.

Next, the constant (or second address of an add) is requested, followed by the memory location to which it is added. Press RETURN at the last parameter to use the same location as the result. Two other questions are also asked: *Binary or BCD?* and *Clear carry?*

These are included for the machine language programmers who may not want to use default conditions. You do. Press RETURN when asked these questions.

Be especially careful not to add from a hardware register. Remember, the value read from a hardware register is different from the last value stored there.

Incrementing and decrementing.

Incrementing and decrementing (adding or subtracting one to or from a memory location) is also possible. Again, remember that hardware registers cannot be incremented directly. You must instead reserve a location somewhere, increment it and change the hardware register to its value on the next step.

When using extra money as variables in a DLI, you must be selective about which addresses you use. It's important that you choose a location you know won't be changed by any other routine. You shouldn't use any page 0 (memory locations between 0-255) variables, as there aren't enough of them unused.

Also, page 6 (memory from 1536 to 1791) should be avoided. While this area is technically free, too many BASIC programs fill it with nonrelocatable machine language subroutines. So leave page 6 free whenever possible, to avoid conflicts.

The best place for DLI variables is in the 6502 stack memory area (256-511). The 6502 stack starts at location 511 and builds downwards. It rarely becomes as much as half full, so you have more than 100 bytes free, starting at address 257. Hey, what about 256? The DLIs that **DLI Maker** creates use memory location 256 as a counter, so *do not modify it or your DLIs will not function properly*!

Wait for horizontal sync.

The wait for horizontal sync command simply compiles a STA WSYNC ($D40A) into your DLI. This has the effect of stopping the 6502 microprocessor until the electron beam that draws the screen image reaches the far right edge. This command used to ensure that color and other changes occur cleanly off the screen where they aren't visible. The end result is that your next DLI change will occur one scan line lower (which is the same width as one graphics 8 mode line). **DLI Maker** automatically places a STA WSYNC at the beginning of every DLI, so you should only rarely need this command.

What did I just do?

At nearly any prompt, you can respond with *X* to review the DLI that you're working on. (The exceptions are the 1-character questions *Clear carry* and *Binary or BCD* asked in add.) The listing will pause after every page and wait for you to press a key, so nothing will be lost off the top when reviewing long DLIs.

Finishing a DLI.

After you've completed each step in your DLI, you'll need to tell **DLI Maker** what you want to do next. Your choices are the following:

First, you may add another step to this DLI. Every step in each DLI will occur on the same screen line (unless you insert wait commands).

Second, you may do another DLI. Additional DLIs occur farther down on the same screen. **DLI Maker** will not automatically create several DLIs for different screens.

Your third choice is to save the DLI that you've just finished. **DLI Maker** will then ask which mode or graphic line(s) to place your DLI(s) on (see below) and list your DLI to disk or cassette.

The last two options are for correcting mistakes. You may redo the DLI you're currently on (all steps), or you may start completely from scratch. No other editing is supported.

Positioning DLIs on the screen.

After you've created your custom DLIs, there still remains the problem of positioning them on-screen. For the greatest possible flexibility, **DLI Maker** gives you the choice of selecting the position of each DLI in either BASIC graphics line numbers or ANTIC display list byte numbers.

When entering DLI positions using the former methods, all numbers represent the first line that the change will occur on. For example, if you create a DLI that changes color 1 red and place it on Line 10 of a graphics 7 screen, then all of the color 1 pixels

plotted from Lines 0 to 9 will be yellow (unless SETCOLORed to something else), and all on Line 10 and below will be red.

The second method is only useful if you're using a custom display list. All byte numbers entered are the exact byte on which the DLI bit will be set, so the DLI will occur on the *next* mode line. To achieve the same effect as in the above example, the DLI would be placed on byte 13 (the first byte is number 0).

DLIs are perhaps the most powerful feature of Atari home computers (with the possible exception of player/missile graphics). You'll find that DLIs open a whole new world in programming. With them, you can double or triple the number of colors displayed on-screen, or even display all 128 colors at once! The difference that more colors can make in a program is amazing. **DLI Maker** is sure to find a permanent place in your utility library.

Example DLIs.

Follow the instructions to create a DLI, then ENTER it from disk. Add the code listed below the DLI, RUN the program, and be amazed.

A. Mixed character set:
1. Change memory location
2. The character set
3. To a constant
4. $E2
5. Save DLI and quit
6. Use graphics mode
7. 18
8. Place on Line 5

```
10 GOSUB 11000
20 GRAPHICS 18:POKE 708,0:GOSUB 10000
30 POSITION 5,1:? #6;"upper case"
40 POSITION 5,6:? #6;"lower case"
50 GOTO 50
```

B. Pulsing line:
1. Increment memory location
2. Address $101
3. Add another step
4. Change a memory location
5. A screen color
6. Graphics 0 and 8 luminance
7. To the value of another address
8. $101
9. Do another DLI
10. Change a memory location
11. A screen color
12. Graphics 0 and 8 luminance
13. To the value of another address
14. 709
15. Save DLI and quit
16. Use graphics mode
17. 0
18. Place on Lines 8 and 9

```
10 GOSUB 11000
20 GRAPHICS 0:LIST
30 GOSUB 10000
40 GOTO 40
```

C. Mirror, mirror:
1. Change a memory location
2. Some other address

```
10 GOSUB 11000:POKE 559,0
20 D=(PEEK(561)-2)*256
30 FOR I=0 TO 2:POKE D+I,112:NEXT I
40 FOR I=6 TO 16:POKE D+I,2:NEXT I
50 POKE D+3,66:A=PEEK(88):B=PEEK(89)
60 POKE D+4,A:POKE D+5,B:S=A+B*256
70 FOR I=0 TO 11:X=S+(11-I)*40
80 B=INT(X/256):A=X-B*256
90 POKE D+17+I*3,66
100 POKE D+18+I*3,A:POKE D+19+I*3,B
110 NEXT I
120 POKE D+53,65
130 POKE D+54,0:POKE D+55,D/256
140 POKE 560,0:POKE 561,D/256
150 GOSUB 10000
160 LIST:GOTO 150
```

Listing 1.
BASIC listing.

```
100 MAXD=2500:MAX5=72:K1=1:K2=2:K3=3:K
4=4:K5=5
110 GRAPHICS Z:POKE 710,128:POKE 709,1
5:POKE 82,K2:POSITION 10,10:? "Initial
izing...■€";
120 DIM DLI$(MAXD),EX$(K2),TD$(MAX5),I
N5$(4),AT$(K2),CMP$(K3),LA5$(K5),I$(20
),B(MAXD),F$(20),L5$(40),DLIL5T$(250)
125 DIM PARM(100)
130 OPEN #K1,K4,Z,"K:":DLIL5T$="B":NXP
R=Z
140 DNUM=Z:DTL=5000:RESTORE 5000
141 GOSUB 4000:DLI$=I$
142 GOSUB 4000:EX$=I$
143 GOSUB 4000:IN5$=I$
144 GOSUB 4000:AT$=I$
145 GOSUB 4000:CMP$=I$
146 GOSUB 4000:LA5$=I$
160 DNUM=DNUM+Z
170 5TP=Z:LA5=Z:TD$="":IF LEN(DLI$)+MA
X5>=MAXD THEN ? "Fatal error - too man
y DLIs!":STOP
180 5TP=5TP+K1:IF 5TP>6 THEN ? "Too ma
ny steps!!!  Re-do this DLI.■■■":GOTO
170
190 ? "■"
200 ? "                    ■"
210 ? "    DLI Maker by Greg Anderson
■"
220 ? "       ANALOG COMPUTING
■"
230 ? "                    ■↓↓"
240 ? "DLI Number ";DNUM;", Step ";5TP
;":↓"
250 ? "A. Change a memory location↓"
260 ? "B. Add to a memory location↓"
270 ? "C. Increment a memory loc.↓"
280 ? "D. Decrement a memory loc.↓"
290 ? "E. Wait for horizontal sync.↓"
300 M=5:GOSUB 1650:IF A=-K1 THEN 190
305 IN5=A:IF IN5=5 THEN TD$(LEN(TD$)+K
1)=DLI$(8,10):GOTO 1010
310 IF IN5>K2 THEN 740
320 IF IN5=K2 THEN ? "■↓Deposit result
 in:";:GOTO 340
330 ? "■↓5elect letter to change:";
340 GOSUB 1300
350 ? "A. A screen color↓"
360 ? "B. The character set↓"
370 ? "C. A player position↓"
380 ? "D. Some other location↓"
390 M=4:GOSUB 1650:TRAP 350:ON A GOTO
400,510,520,740
400 ? "■↓5elect a color to change:";:G
OSUB 1300
410 ? "A. Player/missle 0↓"
420 ? "B. Player/missle 1↓"
430 ? "C. Player/missle 2↓"
440 ? "D. Player/missle 3↓"
450 ? "E. Color 1↓"
460 ? "F. Color 2    (Gr. 0&8 luminanc
e)↓"
470 ? "G. Color 3    (Gr. 0&8 backgrou
nd)↓"
480 ? "H. Color 4 / Fifth player↓"
490 ? "I. Background (Gr. 0&8 border)↓
"
500 M=9:GOSUB 1650:IF A=-K1 THEN 400
505 AD5=53265+A:GOTO 810
510 AD5=54281:GOTO 810
520 ? "■↓5elect Pm to move:";:GOSUB 13
00
530 ? "A. Player 0↓"
540 ? "B. Player 1↓"
550 ? "C. Player 2↓"
560 ? "D. Player 3↓"
570 ? "E. Missile 0↓"
580 ? "F. Missile 1↓"
590 ? "G. Missile 2↓"
600 ? "H. Missile 3↓"
610 M=8:GOSUB 1650:IF A=-K1 THEN 520
615 AD5=53247+A:GOTO 810
620 IF B THEN 640
630 ? :? "Value of constant";:GOTO 650
640 ? :? "Memory location";
650 NEG=Z:TRAP 620:INPUT I$:IF I$="X"
THEN GOSUB 2600:GOTO 620
655 IF I$="" AND B=2 THEN H=AD5:RETURN
660 IF I$(K1,K1)="-" THEN I$=I$(K2):NE
G=K1
670 TRAP 40000:IF A5C(I$)>47 AND A5C(I
$)<58 THEN H=VAL(I$):GOTO 720
680 IF I$(K1,K1)<>"$" THEN 620
690 H=Z:FOR I=K2 TO LEN(I$):K=A5C(I$(I
))-48:IF K>9 THEN K=K-7
700 H=H*16+K:NEXT I
720 IF NEG THEN H=256-H
725 IF H<Z THEN 620
730 RETURN
740 B=K1:GOSUB 620:AD5=H:IF IN5<K3 THE
N 810
750 IF AD5<53248 THEN 810
760 ? :? "Can't INC/DEC a Hardware reg
ister!■■■"
770 ? :? "HINT: INC/DEC a memory locat
ion, and"
780 ? "  then change the hardware regi
ster"
790 ? "  to the value stored in memory
 on"
800 ? "  the next step.":GOTO 740
810 IF AD5>57343 THEN ? "Can't change
ROM!■■■":GOTO 190
820 IF IN5>K2 THEN 1000
830 IF IN5=K2 THEN ? "■↓Add:";:GOTO 85
0
840 ? "■↓Change to:";
850 GOSUB 1300:? "A. A constant↓":M=K2
860 ? "B. The value in another memory"
:? "    location↓"
870 IF IN5=K1 AND LA5 THEN ? "C. The v
alue of the last step↓":M=K3
880 GOSUB 1650:IF A=-K1 THEN 830
885 IF A=K3 THEN PM2=-1000:GOTO 1000
890 IF A=K2 THEN 930
900 IF AD5>53265 AND AD5<53275 AND IN5
=K1 THEN GOSUB 1310:GOTO 920
910 B=Z:GOSUB 620:IF H<Z OR H>255 THEN
 ? :? "Value out of range (0-255).":GO
TO 910
920 L=LEN(TD$):TD$(L+K1)=CHR$(169):TD$
(L+2)=CHR$(H):PM2=H-500:GOTO 950
930 B=1:GOSUB 620:K=H:PM2=H:GOSUB 1680
:K=LEN(TD$)
940 TD$(K+K1)=CHR$(173):TD$(K+K2)=CHR$
(L):TD$(K+K3)=CHR$(H)
950 IF IN5<>K2 THEN 1000
960 ? :? "Add this to which":B=K2:GOSU
B 620:PM3=H
970 ? :? "Clear carry?Y€";:GET #K1,K:?
 CHR$(K):IF K<>78 THEN TD$(LEN(TD$)+K1
)=CHR$(24)
980 ? :? "Binary or BCD?B€";:GET #K1,K
:? CHR$(K):TD$(LEN(TD$)+K1)=AT$(K1+(K=
68))
990 K=H:GOSUB 1680:K=LEN(TD$):TD$(K+K1
)=CHR$(109):TD$(K+K2)=CHR$(L):TD$(K+K3
)=CHR$(H)
1000 K=AD5:GOSUB 1680:K=LEN(TD$):TD$(K
+K1)=IN5$(IN5,IN5)
```

```
1005 TD$(K+K2)=CHR$(L):TD$(K+K3)=CHR$(
H)
1010 K=LEN(DLILST$):DLILST$(K)=CHR$(IN
S-K1):DLILST$(K+K1)="B":IF INS=K5 THEN
 1020
1012 PARM(NXPR)=AD5:NXPR=NXPR+K1:IF IN
S)K2 THEN 1020
1014 PARM(NXPR)=PM2:NXPR=NXPR+K1:IF IN
S=K1 THEN 1020
1016 PARM(NXPR)=AD5:PARM(NXPR-K2)=PM3:
NXPR=NXPR+K1
1020 ? "ß↓Select:";:GOSUB 1300
1030 ? "A. Add another step to this DL
I↓"
1040 ? "B. Do another DLI↓"
1050 ? "C. Save this DLI & Quit↓"
1060 ? "D. Re-do this DLI↓"
1070 ? "E. Re-do all DLIs↓"
1075 ? "X. List DLIs entered↓"
1080 M=K5:LA$=LA$+(INS<K3):GOSUB 1650:
IF A=-K1 THEN 1020
1085 IF A=K1 THEN 180
1090 IF A=K4 THEN 170
1100 IF A=K5 THEN RUN
1110 TD$(LEN(TD$)+K1)=EX$:IF A=K3 THEN
 1150
1120 L=LEN(DLI$):DLI$(L+K1)=CMP$:DLI$(
L+K2)=CHR$(DNUM-K1):DLI$(L+K4)=CHR$(LE
N(TD$))
1130 DLI$(L+K5)=TD$
1140 DLILST$(LEN(DLILST$))="AB":GOTO 1
60
1150 IF DNUM=K1 THEN DLI$(K2)=DLI$(8):
GOTO 1180
1160 DLI$(LEN(DLI$)+K1)=LA$
1180 DLI$(LEN(DLI$)+K1)=TD$:GOSUB 2000
1190 ? :? "Filename to list DLI to";:T
RAP 1190:INPUT I$:TRAP 1640
1200 IF I$(K2,K2)<>":" AND I$(K3,K3)<>
":" THEN F$=I$:I$="D:":I$(K3)=F$
1210 LIST I$,10000,10999
1220 CLOSE #K1:OPEN #K1,9,Z,I$
1230 ? #K1;"11000 DIM DLI$(";LEN(DLI$)
;")"
1240 FOR I=Z TO INT((LEN(DLI$)-K1)/40)
:L=I*40+K1:H=L+39:IF H>LEN(DLI$) THEN
H=LEN(DLI$)
1250 ? #K1;11010+I+I;" DLI$";:IF I THE
N ? #K1;"(";L;")";
1260 ? #K1;"=";CHR$(34);DLI$(L,H);CHR$
(34):NEXT I
1270 ? #K1;"11095 RETURN":? #K1;"11100
 DATA ";DNUM;
1280 FOR I=K1 TO DNUM:? #K1;",";B(I);:
NEXT I:? #K1
1290 CLOSE #K1:? :? "NEW and then":? "
ENTER ";CHR$(34);I$;CHR$(34):? " to us
e.":END
1300 POKE 85,27:? "(#";DNUM;" Stp ";ST
P;")↓":RETURN
1310 ? "ß↓Choose a color:";:GOSUB 1300
1320 ? "A. Black/White"
1330 ? "B. Brown/Yellow"
1340 ? "C. Orange"
1350 ? "D. Red/Orange"
1360 ? "E. Red/Pink"
1370 ? "F. Purple"
1380 ? "G. Purple-Blue"
1390 ? "H. Blue"
1400 ? "I. Blue"
1410 ? "J. Light Blue"
1420 ? "K. Turquoise"
1430 ? "L. Green-Blue"
1440 ? "M. Green"
1450 ? "N. Yellow-Green"
1460 ? "O. Orange-Green"
1470 ? "P. Brown/Yellow↓"
1480 M=16:GOSUB 1650:IF A=-K1 THEN 131
0
1485 H=16*(A-K1)
1490 ? "ß↓Select Luminance:";:GOSUB 13
00
1500 ? "A. 0 Very dark"
1510 ? "B. 2     ."
1520 ? "C. 4     ."
1530 ? "D. 6     ."
1540 ? "E. 8 (average)"
1550 ? "F. 10    ."
1560 ? "G. 12    ."
1570 ? "H. 14 Very light↓"
1580 M=8:GOSUB 1650:IF A=-K1 THEN 1490
1590 H=H+A+A-K2:RETURN
1640 ? :? "Error - ";PEEK(195);". Try
again.":GOTO 1190
1650 ? "Your choice?";:TRAP 40000
1660 POKE 694,Z:POKE 702,64:GET #K1,K:
IF K=ASC("X") THEN A=-K1:GOTO 2600
1665 A=K-64:IF A<K1 OR A>M THEN 1660
1670 ? CHR$(K):RETURN
1680 H=INT(K/256):L=K-H*256:RETURN
2000 ? "ß↓Select type of Display List:
↓"
2005 ? "A. Standard BASIC GRAPHICS"
2010 ? "B. Custom (self-made) Display
List↓"
2015 M=K2:GOSUB 1650:IF A=K1 THEN 2000
2017 IF A=K2 THEN 2100
2020 ? :TRAP 2020:? "Which GRAPHICS mo
de (0-31)";:INPUT G
2025 IF (G<Z OR G>31) OR G=16 OR (G>24
 AND G<28) THEN ? "Bad Mode!ßßß":GOTO
2020
2028 RESTORE 2200+G:READ BOT,TEX,SKP:T
W=(TEX<999)
2030 IF TW THEN ? :? "Enter 'T0' to pu
t DLI change on top":? "of text window
,'T1' for next line,etc":?
2035 ? :? "Enter first mode line to be
 changed":? :B(Z)=-K1
2040 FOR I=K1 TO DNUM
2042 ? "by DLI #";I;
2045 TRAP 2065:INPUT I$:A=VAL(I$):IF A
>BOT THEN ? "Lowest line = ";BOT;"!ßßß
":GOTO 2042
2050 A=A+K4:IF A=K5 THEN A=K3
2052 IF A=K4 THEN A=K2
2054 A=A+K2*(A>SKP)
2055 IF A<=B(I-K1) THEN ? "DLIs must b
e entered top to bottom!ßßß":GOTO 2042
2060 B(I)=A:NEXT I:RETURN
2065 TRAP 2085:IF I$(K1,K1)<>"T" OR  N
OT TW THEN 2085
2070 A=VAL(I$(K2)):IF A<Z OR A>K3 THEN
 ? "Text lines range from 0-3!ßßß":GOT
O 2042
2075 IF A THEN A=A+K2
2080 A=A+TEX-K1:GOTO 2055
2085 ? "Bad input!ßßß":GOTO 2042
2100 ? :? "Enter byte of DLIST to put
each DLI:":? :B(Z)=-K1
2110 FOR I=K1 TO DNUM:? "DLI #";I;
2120 TRAP 2120:INPUT A
2130 B(I)=A:NEXT I:? :TRAP 40000
2140 RETURN
2200 DATA 23,999,999
2201 DATA 19,25,999
2202 DATA 9,15,999
2203 DATA 19,25,999
2204 DATA 39,45,999
2205 DATA 39,45,999
2206 DATA 79,85,999
2207 DATA 79,85,999
2208 DATA 159,167,94
2209 DATA 191,999,94
```

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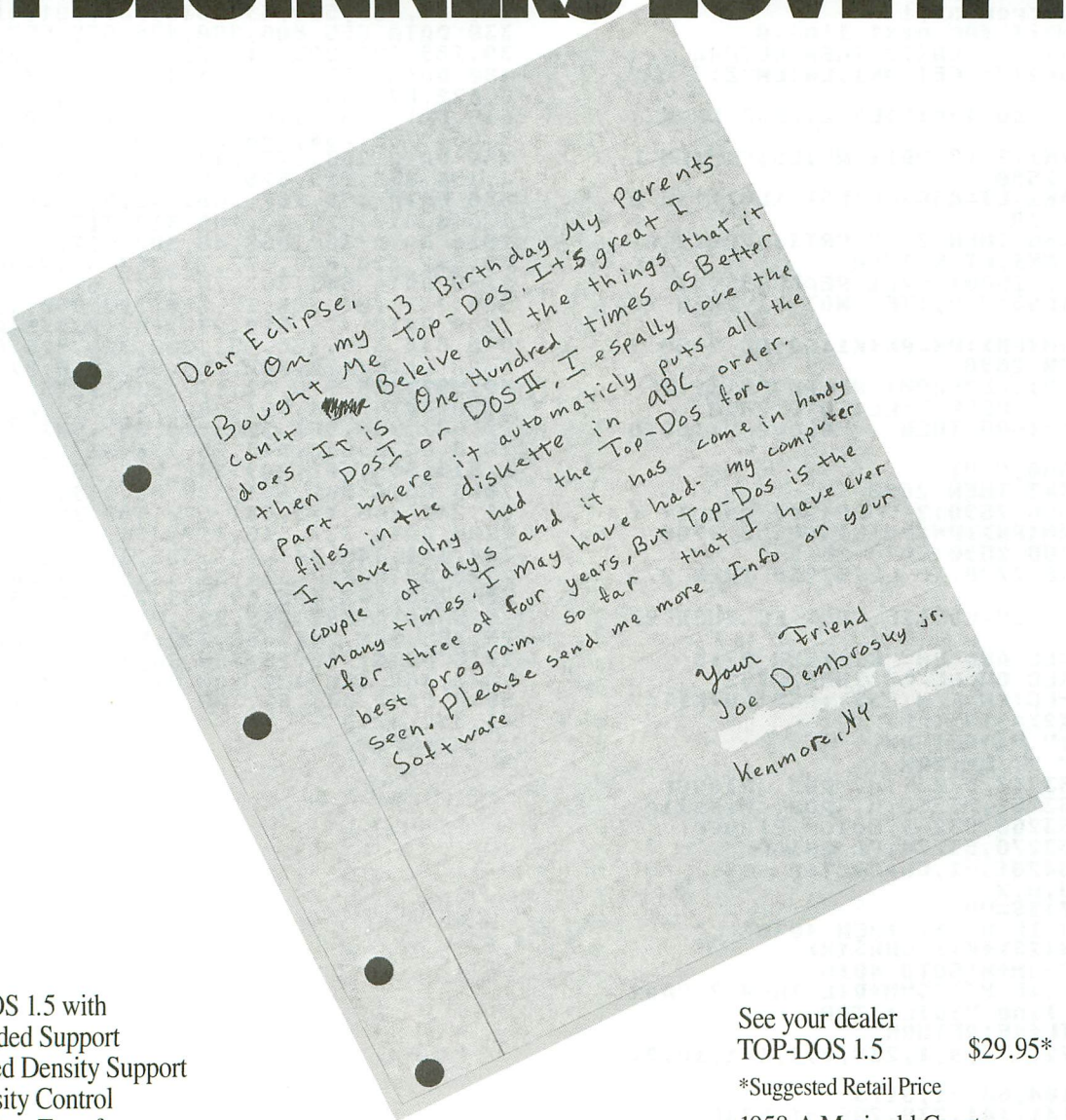

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An advanced version is available to TOP-DOS licensees (at additional cost), which doubles the number of files, and adds sector read, write and compare, and other features.

```
2210 DATA 191,999,94
2211 DATA 191,999,94
2212 DATA 19,25,999
2213 DATA 9,15,999
2214 DATA 159,167,94
2215 DATA 159,167,94
2217 DATA 23,999,999
2218 DATA 11,999,999
2219 DATA 23,999,999
2220 DATA 47,999,999
2221 DATA 47,999,999
2222 DATA 95,999,999
2223 DATA 95,999,999
2224 DATA 191,999,94
2228 DATA 23,999,999
2229 DATA 11,999,999
2230 DATA 191,999,94
2231 DATA 191,999,94
2500 DATA Change,2
2520 DATA Add PEEK,3
2540 DATA Increment,1
2560 DATA Decrement,1
2580 DATA Wait for next line,0
2590 LN=LN+K1:IF LN<22 THEN RETURN
2592 ? "[More]";:GET #K1,LN:LN=Z:? "□"
;:RETURN
2600 ? "□Dli so far:":L5=Z:LB=Z:LN=K2:
PN=Z
2610 L5=L5+K1:? :? "Dli #";L5;":":LN=L
N+K1:GOSUB 2590
2615 LB=LB+K1:LI=ASC(DLIL5T$(LB)):IF L
I=65 THEN 2610
2620 IF LI=66 THEN ? :? "RTI; Press a
key:";:GET #K1,LI:RETURN
2625 RESTORE 2500+20*LI:READ L5$,LI
2630 ? " ";L5$;" ";:IF  NOT LI THEN 26
90
2635 LL=PARM(PN):PN=PN+K1:GOSUB 2700:I
F LI<K2 THEN 2690
2640 ? "to ";:LL=PARM(PN):PN=PN+K1:IF
LL>=Z THEN ? "PEEK ";LL:GOTO 2650
2642 IF LL=-1000 THEN ? "above ";:GOTO
 2650
2645 ? LL+500;" ";
2650 IF LI<K3 THEN 2690
2655 ? :GOSUB 2590:? "  Place result i
n ";:LL=PARM(PN):PN=PN+K1:GOSUB 2700
2690 ? :GOSUB 2590:GOTO 2615
2700 RESTORE 2720:IF LL<53248 THEN 271
8
2702 READ LC,LH,L5$:IF  NOT LC THEN 27
18
2704 IF LC=LL AND LH=-K1 THEN 2715
2706 IF LL<LC OR LL>LH THEN 2702
2708 LL=LL-LC:LH=LEN(L5$):L5$(LH+K1)="
":L5$(LH+K2)=STR$(LL)
2715 ? L5$;" ";:RETURN
2718 ? LL;" ";:RETURN
2720 DATA 53248,53251,H. pos. Player
2725 DATA 53252,53255,H. pos. Missile
2730 DATA 53266,53269,Color Player
2735 DATA 53270,53274,PF color
2740 DATA 54281,-1,Character set
2745 DATA 0,0,x
4000 CSUM=Z:I$=""
4010 READ X:IF X=-K1 THEN 4030
4015 I$(LEN(I$)+K1)=CHR$(X)
4020 CSUM=CSUM+X:GOTO 4010
4030 READ X:IF X<>CSUM+DTL THEN ? "Dat
a error in line ";DTL:STOP
4040 DTL=DTL+K5:RETURN
5000 DATA 72,173,0,1,238,0,1,141,10,21
2,-1,5848
5005 DATA 104,64,-1,5173
5010 DATA 141,141,238,206,-1,5736
5015 DATA 216,248,-1,5479
5020 DATA 201,32,208,-1,5461
5025 DATA 169,0,141,0,1,-1,5336
```

```
10000 POKE 559,Z:RESTORE 11100:READ DN
UM
10010 D=PEEK(560)+256*PEEK(561)
10020 FOR I=K1 TO DNUM:READ B:POKE D+B
,PEEK(D+B)+128:NEXT I
10030 B=INT(ADR(DLI$)/256):A=ADR(DLI$)
-B*256:POKE 512,A:POKE 513,B
10040 POKE 54286,192:POKE 256,Z:POKE 5
59,34:RETURN
```

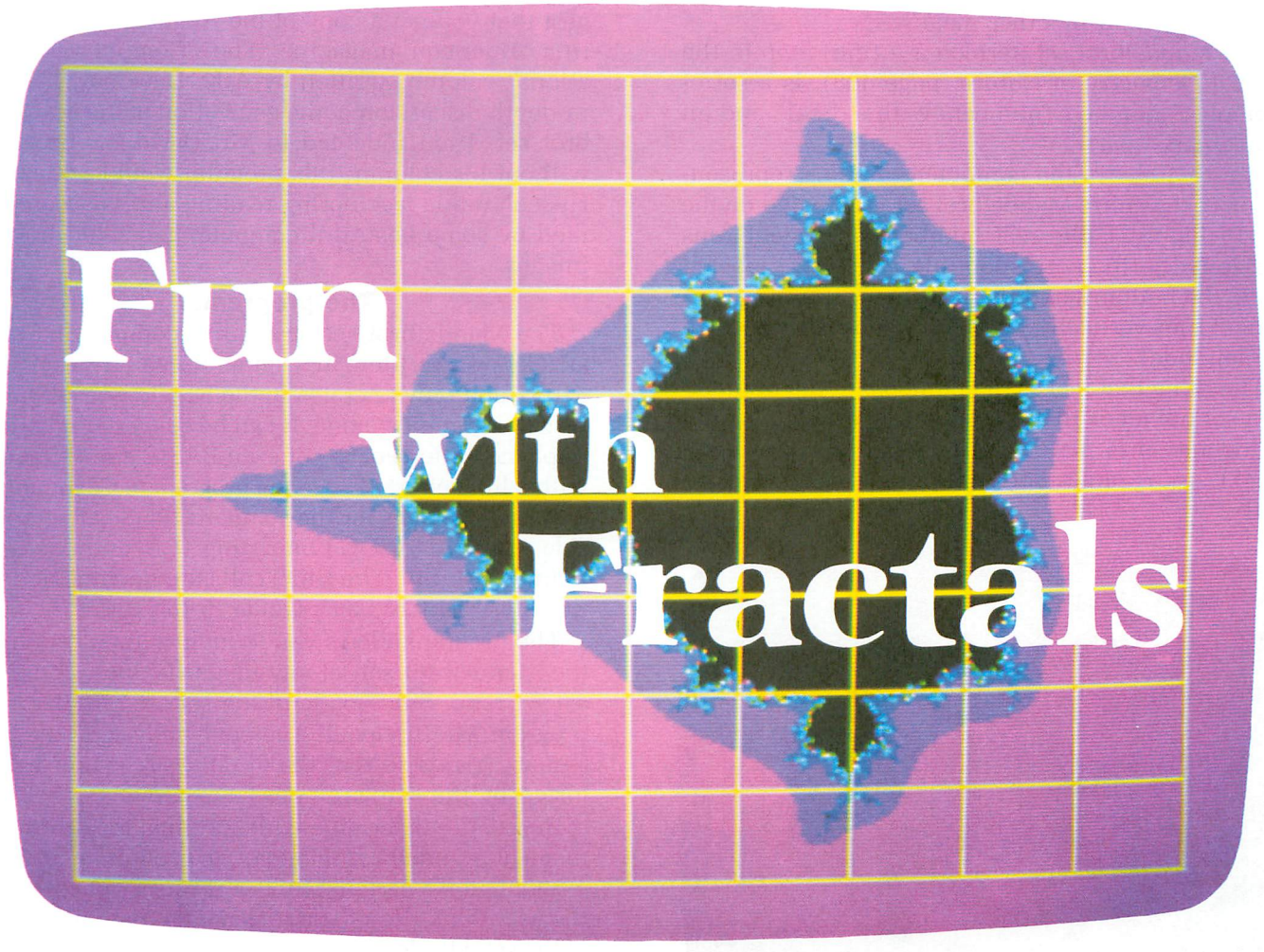
●

CHECKSUM DATA.

(see page 14)

```
100 DATA 992,219,132,74,412,249,14,838
,42,820,26,12,254,906,711,5701
190 DATA 389,266,217,573,231,155,820,6
21,486,468,559,593,836,989,901,8104
330 DATA 855,806,900,486,650,557,330,5
30,189,197,205,213,729,763,119,7529
480 DATA 268,844,584,100,14,313,658,66
5,672,679,83,91,99,79,595,5744
615 DATA 107,115,793,410,778,988,23,45
9,654,785,764,894,632,602,700,8704
750 DATA 263,373,318,744,410,89,565,81
4,198,356,119,579,855,981,438,7102
890 DATA 499,167,208,690,500,18,127,22
1,644,618,226,57,705,317,313,5310
1014 DATA 302,965,40,308,667,734,485,5
79,542,820,686,677,77,353,63,7298
1130 DATA 643,303,703,629,624,697,861,
869,737,701,565,33,896,927,996,10184
1290 DATA 476,520,238,187,730,540,372,
670,616,351,256,251,280,310,315,6112
1440 DATA 172,802,719,969,806,87,158,1
49,962,966,970,22,1,7,435,7225
1580 DATA 464,991,280,717,712,435,28,3
62,672,704,981,529,918,597,933,9323
2028 DATA 648,945,75,796,337,617,547,1
1,619,593,402,249,246,716,457,7258
2085 DATA 581,681,349,86,939,788,329,4
61,241,465,479,481,507,509,322,7218
2209 DATA 332,315,317,464,244,315,317,
344,341,348,341,343,358,360,324,5063
2228 DATA 347,344,317,319,704,567,406,
384,133,402,415,69,559,722,497,6185
2625 DATA 393,765,224,734,635,82,685,1
75,705,921,244,466,792,540,805,8166
2718 DATA 986,25,390,56,78,705,944,143
,843,360,480,422,188,879,752,7251
5010 DATA 633,62,300,584,443,911,493,9
41,352,4719
```

●



by Tom Hudson

Want to have some fun with math? Back in high school, if someone had uttered the words *fun* and *math* in the same sentence, I would have said they were crazy. With algebra grades hovering in the "D" range, the last thing I wanted to have "fun" with was math.

All that changed in 1983. Manning the **ANALOG Computing** booth at the West Coast Computer Faire, I happened to notice that the booth next to **ANALOG**'s was festooned with a multitude of stunning computer graphics posters. Little did I know what was behind these images.

At one break in the show, I walked over to see what they were selling. Besides the posters, they had a book entitled *The Fractal Geometry of Nature*, written by Benoit B. Mandelbrot. Inside were diagrams and incredible color computer graphics illustrations (similar to the posters decorating the booth), along with instructions on how to generate them—I bought it on the spot.

Almost three years later, I still can't understand half of the material in the book (my high school hatred for advanced mathematics prevented me from taking calculus), but the parts I have deciphered have proved to be worth the price of the book. This article is only one extremely small part of the book, implemented on the Atari 520ST.

The what set?

Many readers may have heard of the word *fractal* before. Coined by Benoit Mandelbrot, this term is the name of a new branch of geometry, which can be

(continued on next page)

used to describe natural phenomena that cannot be easily described by other means.

The *Mandelbrot set* (termed a μ (mu) *map* in the *Fractal Geometry of Nature*, page 188), is a set of "complex" numbers (numbers with a "real" and an "imaginary" part).

Figure 1 shows the computer-graphics representation of the entire Mandelbrot set, as created on the ST. In Figure 1, the real number component runs horizontally (the corresponding values are labeled along the bottom), and the imaginary number component runs vertically (with the values labeled along the left side).

The thing that makes the numbers in the Mandelbrot set unique is that most values, when a particular operation is performed repeatedly upon them, quickly grow larger and larger, moving toward infinity.

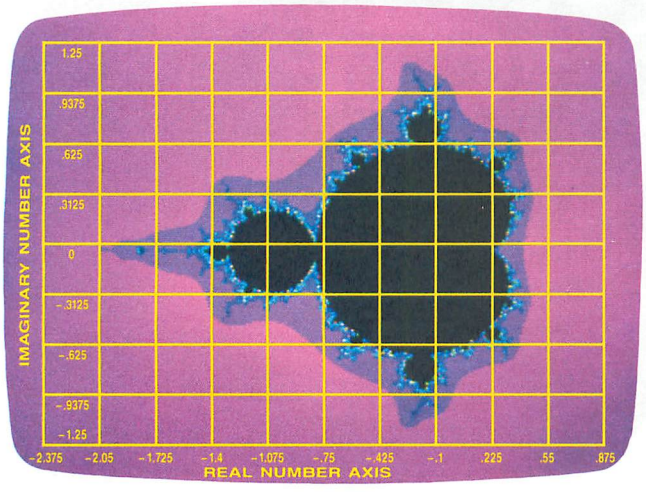


Figure 1.

The values in the Mandelbrot set, on the other hand, never grow larger than 2. These points are represented in computer-graphic form by black points. Computer graphics would get rather boring if we just had black and white points, so we count the number of times each complex number has the operation performed on it before its value exceeds 2, and change that count into a color. Points that exceed the limit of 2 quickly are colored violet; those that take a long time to exceed the limit are colored red. The intermediate points are colored from blue to green to yellow.

I'm not going to go into the complex mathematics required to generate the Mandelbrot set—most readers wouldn't really understand it, and knowledge of the process is not essential to the use of the program. If you're seriously interested in the algorithm, I suggest that you get a copy of the August, 1985 *Scientific American* magazine. The "Computer Recreations" column, written by A.K. Dewdney, has an in-depth discussion of the generation of the Mandelbrot set. I am indebted to Mr. Dewdney, because without his column, this program would not exist. His column is fascinating reading and is accompanied by some beautiful computer-generated fractal images.

The program.

The Mandelbrot set program accompanying this article was written in Digital Research C on the 520ST and only operates in the ST's low-resolution, 16-color graphics mode. It can be converted to other implementations of C—or even BASIC and LOGO—with a little effort. To use the program in C, you must have the bindings for the standard BIOS calls (available on the **ANALOG Computing** TCS) and floating-point capability. The BIOS calls are documented in the Atari "Hitchhiker's Guide to the BIOS".

The program allows you to look at any portion of the Mandelbrot set, at any magnification, and any aspect ratio. Since parts of the set are circular, the program will (optionally) automatically scale the imaginary Y-axis so that the circular areas aren't distorted by the screen's nonsquare dimensions.

In order to determine which points lie within the magical Mandelbrot set area, the program performs a calculation a certain number of times, specified by the user. This allows you to generate "quickie" maps of the set with low repetitions, or detailed maps with high repetition values.

After generating each fractal image, the program can save the image to disk in a picture file called FRACTAL.PI1, which may be viewed with Batteries Included's **DEGAS** art program or the SHOPIC.PRG program found in CompuServe's Atari Special Interest Group's data library.

The program has several points of interest:

The 16-value table PALETTE contains the sixteen 2-byte words of data representing the colors used in the fractal map image. The first value, 707, is the color violet (7 red, 0 green, 7 blue); the last 000, or black, for the points in the Mandelbrot set. See the **ST Color Palette** on page 72 of this issue, which lets you pick the colors for this table.

The COFSET array, sixteen words of data, is a special table used to change the GEM color numbers to the proper ST system color values.

For some reason, the designers of GEM chose to change the order of the pixel values; this table allows the program to plot the pixels in the proper order, so that the color palette numbers correspond to those of the pixels.

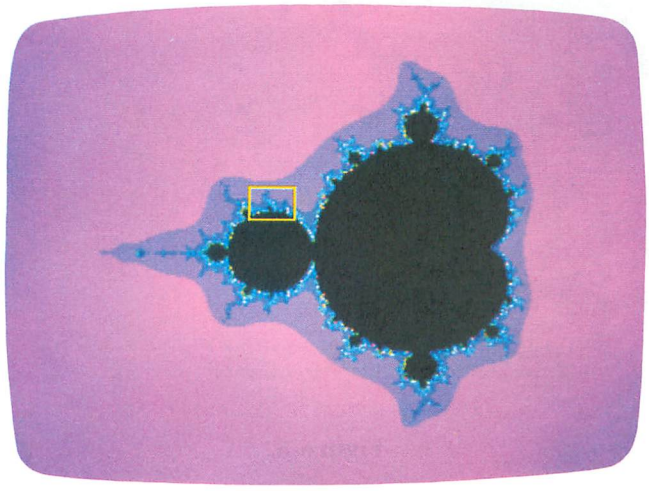


Figure 2.

After initializing, the "Input map parameters" section accepts values from the keyboard for plotting the map. This routine uses the getflt() function to accept the number from the keyboard and convert it into floating-point format. The program doesn't need to test for data entry errors—the getflt routine masks all input to verify that it's numeric.

Actual processing of the map is done by the short program loop labeled "Process the pixel map," which performs the fractal algorithm on each of the 64,000 pixels on the screen, until the complex number exceeds 2 or the count exceeds the user-defined limit. The pixel color is calculated, and the pixel plotted. If a key is pressed *(BCONSTAT)*, the map plot is aborted.

After the plot is complete, the program waits for a key to be pressed. If the key is a RETURN, the program returns to the GEM desktop. If the key is the function key, F1, the picture is saved to disk and the program exits to the desktop, so that you can rename the FRACTAL.PI1 file or copy it to another disk. Note: be sure, beforehand, that your disk has enough room to save the file. Otherwise, it may not be written properly. Each fractal picture file requires 32034 bytes of disk space.

The file format is quite simple. The first 2 bytes are an integer value indicating the resolution of the picture—0 for low resolution, 1 for medium resolution and 2 for monochrome. In this case, the header is the variable *lowhead*, set to 0 for low resolution.

The next part of the file is the color palette for the picture, 32 bytes long, made up of sixteen 2-byte integers. This program simply writes the palette table to disk.

The last part of the file is a 32000-byte block made up of the actual picture data, written from the system's screen RAM.

Pressing any other key will return you to the coordinate entry stage for a new plot.

The functions print, prompt and crlf are functions which are used to print messages to the screen.

The yesno function waits for a *Y* or *N* response from the keyboard, returning a 1 or 0, respectively. No other keys are accepted.

The getflt routine is a handy function which allows bug-free entry of numeric values. It will only allow numerals, the decimal point and minus sign (hyphen) to be entered. The hyphen must be the first character, if used, and the decimal point may only be entered once. This can limit the necessity of error-checking in the main program. Due to the nature of some floating-point routines, values returned may be subject to truncation error (3.00001 could be rounded to 3.000015, for example). However, this is usually of little consequence.

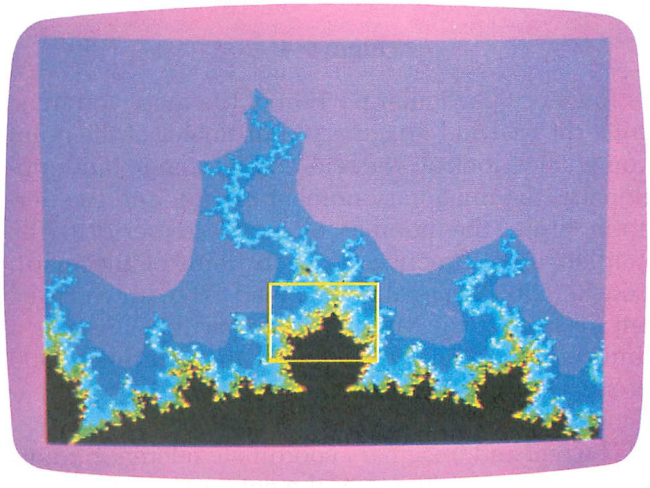


Figure 3.

Exploring the map.

In order to demonstrate the abilities of this program, I have provided five sample fractal pictures, shown in Figures 2 through 6. Each of these pictures

shows a magnified view of the previous one; Figure 3 is a magnified view of the portion indicated by a box in Figure 2, and so on. As you can see, Figure 6 is a miniscule portion of Figure 2, and yet it contains even more detailed structures—which may be further magnified!

This is the fascinating property of the fractal: you may look closer and closer, even under infinite magnification, and more and more complex detail will come into view. I don't know the limits of this program as far as magnification is concerned—it's limited only by the precision of the floating-point math package you're using.

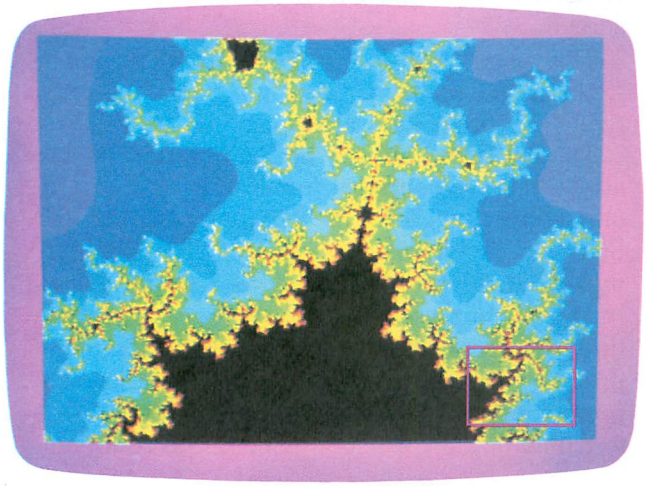


Figure 4.

To view a particular portion of the map, you must enter the real and imaginary coordinates of the point you wish to look at, the real number range (and, optionally, the imaginary number range), and the iteration limit (the number of times to perform the mathematical function on each point of the map). Low iteration values allow the map to be drawn faster, but lose accuracy. Mr. Dewdney's article suggests a limit of 1000, but I have found that a limit of 100 produces satisfactory results without taxing your patience.

The real and imaginary coordinate reference points may be found on Figure 1, the entire Mandelbrot set map, and the values used to generate the images in Figures 2 through 6 are listed in Table 1.

After entering the real number center and range, you must enter the imaginary number center. You then have the option of having the computer autoscale the imaginary Y-axis for you. I suggest that you have the computer do this, as it produces the most satisfactory images. You can, however, experiment, trying your own imaginary axis range values by answering *N* to the autoscale prompt.

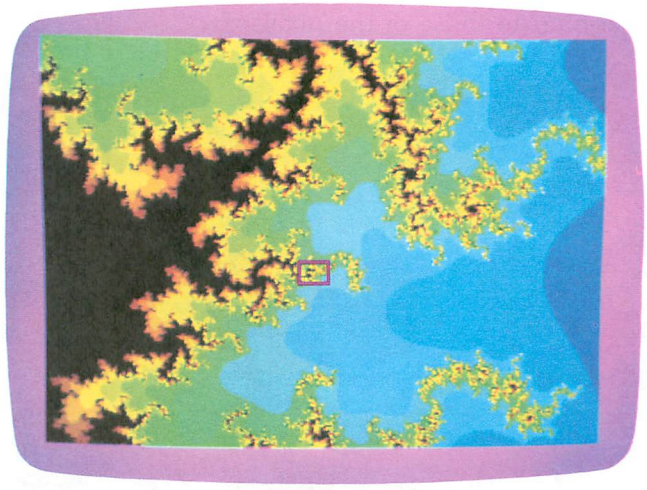


Figure 5.

Photo Number	Real Center	Real Width	Imaginary Center	Imaginary Width	Iteration Limit
2	-.75	3.25	0	(Auto)	100
3	-1	.25	.32	(Auto)	100
4	-1	.0583	.29	(Auto)	100
5	-.9786	.01166	.27317	(Auto)	100
6	-.97889	.000583	.2728785	(Auto)	100

Table 1.

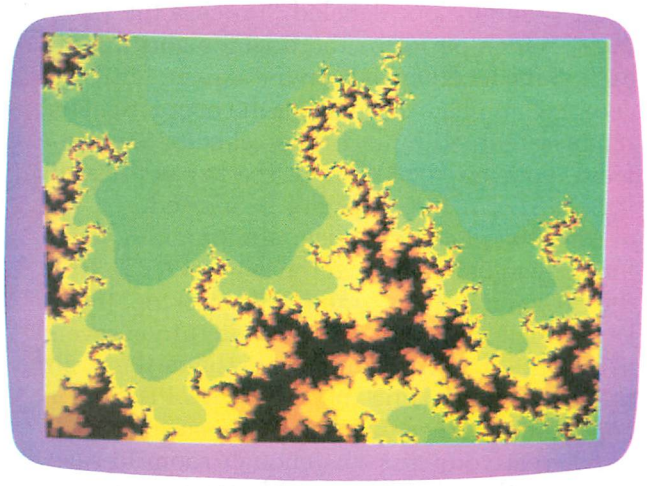


Figure 6.

As I mentioned earlier, a good iteration limit for most maps is 100. The average map generated with this value takes from 20 to 45 minutes to generate.

If you want to get more detail in close-up images, try larger iteration counts, up to 1000 (or even higher, if you aren't in a hurry). The higher iteration counts will only slow things down on points near the Mandelbrot set area (the black points on Figures 1 through 6).

I've found it to be an awe-inspiring experience to look ever more closely at the filaments of the Mandelbrot set, revealing more and more detail the farther I go. One thing is for sure—it'll take you a while to explore every nook and cranny of the Mandelbrot set.

Perhaps an eternity.

References:

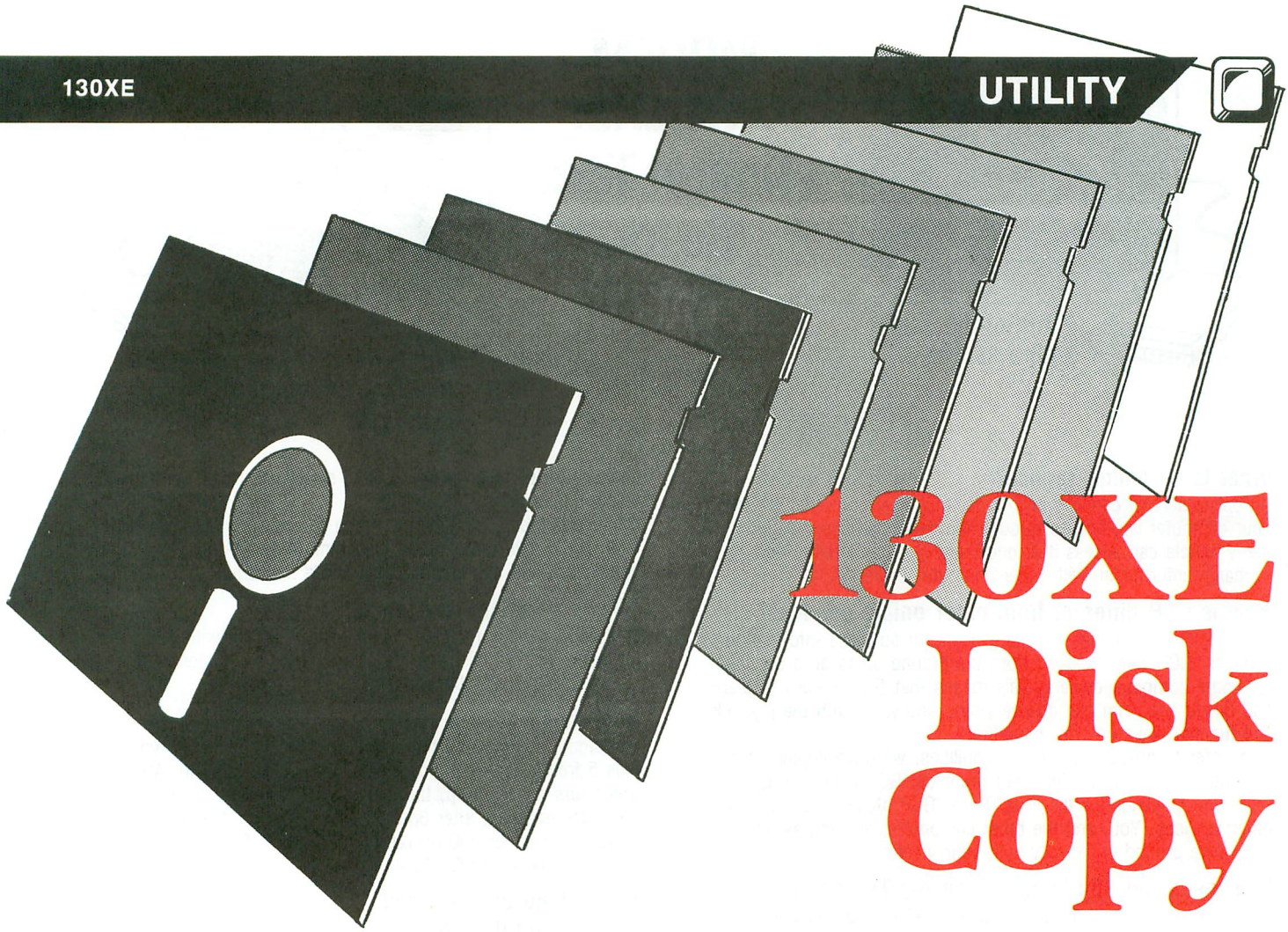
Mandelbrot, Benoit B., *The Fractal Geometry of Nature*. W.H. Freeman & Company, 1982, ISBN 0-7167-1186-9.

Dewdney, A.K., "Computer Recreations," *Scientific American*, August 1985, pp. 16-20.

Listing 1.
C listing.

```
/*  Fractal Mandelbrot set generator  */
/*            by Tom Hudson           */
/*  Copyright 1985 ANALOG Computing   */

#include "portab.h"

extern double sqrt();
extern long bconin();
extern long physbase();
extern long f_create();
extern long f_open();
extern long f_close();
extern long f_write();

int contrl[12],intin[128],ptsin[128],
    intout[128],ptsout[128],handle,
    whand,chstat,wchar,alldone,pcolor,
    asca,oldpal[16],plot[2];

int lowhead = 0;

/* Define fractal map colors */

int palette[16] =
{
0x0707,0x0507,0x0307,0x0007,
0x0037,0x0057,0x0075,0x0072,
0x0070,0x0370,0x0570,0x0770,
0x0750,0x0730,0x0700,0x0000
};

static int cofset[16] =
{
0,2,3,6,4,7,5,8,9,10,11,14,12,15,13,1
};

double sqin,sqout;

long fhand,lchar,siphys;

char decimal[20];

/* Main processing routine */

main()
{
float getflt();

int i,l_intin[11],l_out[57],
    gr_1,gr_2,gr_3,gr_4,l_ptsin[20],
    count,climit,xp,yp,cdivfac;

float x,y,xs,xe,xstep,ys,ye,ystep,at,bt,az,bz,
      ac,bc,size,tsiz,rrange,irange;

/* Start the program! */

appl_init();

handle=graf_handle(&gr_1,&gr_2,&gr_3,&gr_4);

/* open workstation */

for (i = 0; i < 10; i++)
  l_intin[i] = 1;
l_intin[10] = 2;
v_opnvwk(l_intin, &handle, l_out);
v_hide_c(handle);
for (i=0; i<16; i++)
 oldpal[i] = setcolor(i,-1);
siphys=physbase();
vsm_type(handle,1);

/* main program loop */

alldone=0;
while(alldone == 0)
 {
 v_clrwk(handle);
 setpallete(oldpal);

/* Input map parameters */

 crlf();
 prompt("Real number center");
 xs=getflt();
 prompt("Real number range");
 rrange=getflt();
 xs=xs-rrange/2;
 xe=xs+rrange;
 xstep=(xe-xs)/319;
 crlf();
 prompt("Imaginary number center");
 ys=getflt();
 prompt("Autoscale Imaginary axis (Y/N)?");
 asca=yesno();
 if(asca == 0)
  {
  prompt("Imaginary number range");
  irange=getflt();
  ys=ys-irange/2;
  ye=ys+irange;
  }
 else
  {
  ys=ys-(rrange*.77)/2;
  ye=ys+rrange*.77;
  }
 ystep=(ye-ys)/199;
 crlf();
 prompt("Iteration limit");
 climit=getflt();
 cdivfac=climit/16;

 v_clrwk(handle);
 setpallete(palette);

/* Process the pixel map! */

 xp=0;
 for(x=xs; xp<320; x=x+xstep,xp++)
  {
```

```
    yp=199;
    for(y=ys; yp > -1; y=y+ystep,yp--)
     {
     az=0; bz=0; ac=x; bc=y;
     count=0; size=0;
     while((count < cliMit) && (size < 2))
      {
       at=az*az-bz*bz; bt=az*bz*2; az=at+ac; bz=bt+bc;
       tsiz=az*az+bz*bz;
       sqin=tsiz;
       sqout=sqrt(sqin);
       size=sqout;
       count++;
      }
     pcolor=count/cdivfac;
     if(pcolor > 15)
      pcolor=15;
     vsm_color(handle,cofset[pcolor]);
     plot[0]=xp; plot[1]=yp; v_pmarker(handle,1,plot);
     chstat=bconstat(2);
     if(chstat != 0)
      {
       xp = 320; yp = -1;
      }
     }
    }

/* Map done, wait for key */

 chstat=0;
 while(chstat == 0)
  chstat=bconstat(2);
 lchar = bconin(2);
 wchar = lchar & 0x00FF;

/* Check for RETURN */

 if(wchar == 0x000d)
  {
   alldone=1;
  }
 else

/* Check for function key F1 */

 if(lchar == 0x003b0000)
  {
   fhand=f_create(&"fractal.pi1",0);
   if (fhand >= 0)
    {
     whand=fhand;

/* Write resolution flag (1 word) */

     f_write(whand,2L,&lowhead);

/* Write color palette (16 words) */

     f_write(whand,32L,&palette);

/* Write picture data (32000 bytes) */

     f_write(whand,32000L,s1phys);
     f_close(whand);
     alldone=1;
    }
  }
 }

/* Close the workstation. */

v_clsvwk(handle);
setpallete(oldpal);

appl_exit();
_exit(0);

}

/* Print string w/ CR & LF */

print(string)
char *string;
{
c_conws(string);
crlf();
}

/* Print string (no CR/LF) */

prompt(string)
char *string;
{
c_conws(string);
}

/* Output CR/LF to screen */

crlf()
{
c_conout(13);
c_conout(10);
}

/* Accept Y/N response */

yesno()
{
int exit,yorn;

exit = -1;
while (exit < 0)
 {
 yorn = bconin(2);
 if ((yorn == 0x004e) || (yorn == 0x006e))
  {
   print("No");
   exit = 0;
  }
 else
 if ((yorn == 0x0059) || (yorn == 0x0079))
  {
   print("Yes");
   exit=1;
  }
 }
return(exit);
}

/* Accept floating-point number */

float getflt()
{
int i,getfx,inct,negct,decct,decfnd;
float work,mfac,innum;
static int fltwk[20];

c_conout('?');
negct=0;
decct=0;
inct=0;
getfx=0;
while(getfx == 0)
 {
 chstat=0;
 while(chstat == 0)
  chstat=bconstat(2);
 lchar = bconin(2);
 wchar = lchar & 0x00FF;
 if((wchar == 0x0008) && (inct > 0))
  {
   c_conout(8);
   c_conout(32);
   c_conout(8);
   inct--;
   if(fltwk[inct] == 98)
    {
     decct=0;
    }
   else
   if(fltwk[inct] == 99)
    {
     negct=0;
    }
  }
 else
 if(wchar == 0x000d)
  {
   if((inct-decct-negct) > 0)
    {
     crlf();
     fltwk[inct] = -1;
     getfx=1;
    }
  }
 if(inct < 19)
  {
   if((wchar > 0x002f) && (wchar < 0x003a))
    {
     fltwk[inct]=wchar-48;
     inct++;
     c_conout(wchar);
    }
   else
   if((wchar == 0x002d) && (negct == 0) && (inct == 0))
    {
     negct++;
     fltwk[inct]=99;
     inct++;
     c_conout(wchar);
    }
   else
   if((wchar == 0x002e) && (decct == 0))
    {
     decct++;
     fltwk[inct]=98;
     inct++;
     c_conout(wchar);
    }
  }
 }
decfnd=0;
innum=0;
mfac = 10;
for(i=0; i<inct; i++)
 {
  if(fltwk[i] == 98)
   {
    decfnd = 1;
   }
  else
  if(fltwk[i] < 10)
   {
    if(decfnd == 0)
     {
      innum=innum*10;
      innum=innum+fltwk[i];
     }
    else
     {
      work=fltwk[i];
      work=work/mfac;
      innum=innum+work;
      mfac=mfac * 10;
     }
   }
 }
if(negct == 1)
 innum = -innum;
return(innum);
}
```



130XE Disk Copy

by William W. Tan

If you're like me, and own just one disk drive, you probably find backing up your disks a boring, time-consuming task with few rewards. If you own a 48/64K machine, Brian Moriarty's **The Black Rabbit** (**ANALOG Computing**, issue 9) is one of the better copy programs, but if you're an owner of Atari's new 130XE, there is a better way.

130XE Disk Copy allows you to back up any single-density disk at machine language speed right from BASIC, without having to reboot or go to DOS. In addition, the program takes advantage of the 130XE's extra memory, allowing you to back up the disk in just one read/write pass. The program will work with any 130XE with DOS and BASIC installed.

How it works.

The program itself is very short and needs little explanation. Lines 100-150 initialize the program, and prompt the user when it's time to swap disks. Lines 170-190 contain the data statements for the assembly language routine.

Line 160 is the bulk of the program. The USR statement calls the disk I/O routine stored in page 6. Its parameters are the command (82 = read, 87 = write), the first sector, the number of sectors and the buffer location. The routine will then either read from the disk to the buffer, or write from the buffer to the disk.

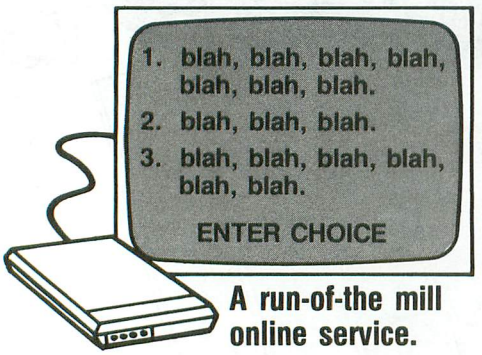
The POKEs into location 54017 tell the computer to use its "extra" memory, which is distributed as four 16K banks, and is accessed through a window at $4000 to $7FFF. A complete description of how to access this memory is contained in your 130XE owner's manual.

Operation of the program is very simple. It will ask for the source disk, which you insert into drive 1. After you press START, the entire disk will be read into memory.

It will then ask for the destination disk. Insert a blank disk into drive 1 and press START. The disk will be formatted and a copy of your source disk made. When the screen clears, you're done and can return to what you were doing.

William W. Tan is a computer science student in Berkeley, California. He's had an Atari 800 for five years and recently got a 130XE. He enjoys computer applications in sports and helping others understand computers.

(Listing starts on page 35)



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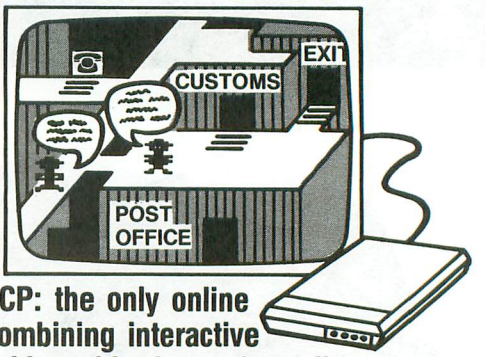
MODEM OWNERS: Tired of Text? Go for Graphics!



GCP: the only online service combining interactive graphics with electronic mail, downloads, AND games!

What is an online service?

An online service consists of a large, multiuser computer which your computer can access through the telephone lines. Since many people can access it at one time, you can interact and exchange information with other computer owners.

How is GCP different from other online services?

All other online services are out-growths of business information services. GCP was designed from the ground up to be a service for home computer owners. This means that GCP is easy to learn and fun to use. You can do everything you want with the joystick and function keys on your computer.

In order to provide all these capabilities, we have implemented the entire system using full color graphics. GCP is set up as a City, with buildings for the Post Office, GCP offices, Games and other services. You, and the other customers, are figures which you move around in the City with your joystick.

You mean the City is shown on my TV screen?

Yes, indeed. Not only the City, but the inside of the buildings and the games are shown on your screen in full color graphics. Additionally, the other customers are shown on your screen as they move around the City and buildings.

Isn't it slow downloading the graphics?

No, because we do not download the graphics. All the pictures of the City, buildings and games are supplied on disk. When you go from one building to another, the graphics are accessed at disk drive speeds.

Do I need special software?

Yes, very special. But don't worry, we provide it with your signup.

Can I download public domain programs?

Yes, GCP has a public domain archive in its Post Office with about a Megabyte of Atari programs you can download.

What games do you have?

At the moment, we have BioWar, CyberTank and CyberShip. Lords of Space is under development and may be done by the time you read this. All the games are played online against other customers, so you are matching wits with humans from all over the country.

BioWar is a multi-player adaptation of Conway's game of Life. Each player has a cell colony which he tries to expand, often at the expense of the other players, while contending with the problems of under- and over-population.

CyberTank and CyberShip are tactical design and combat games set on the CyberWorld, an artificial battleground for cybernetic machines. You design your own tank or ship and battle it out with up to 15 other players on a scrolling map.

Do the games use graphics also?

Extensively. For example, in CyberTank, when you design your tank, the hull is shown on the screen, as are all the equipment choices, in full color graphics. You select and place the items by using your joystick.

In the combat phase, your screen shows the status of your tank, the 1 mile area around your tank (only a part of the larger battlefield), and any enemy tanks inside that area.

What equipment do I need?

GCP supports any member of the 8 bit Atari line with 48K of memory. You will also need a disk drive and a modem. We support all the available modems for the Atari.

How much does it cost?

The signup kit includes the software and documentation you need, plus 5 free hours at standard rates. This kit costs $30. After the free hours are used up, the standard rates are $6 per hour (weekday evenings after 6pm local time and all day Saturday and Sunday) for either 300 or 1200 baud access. Daytime hours during the week are $15/hour.

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[hint: keep it short]

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130XE Disk Copy *continued*

Listing 1.
BASIC listing.

```
100 GRAPHICS 2:SETCOLOR 2,2,2:? " BACK
UP 130XE     by William W. Tan":?
110 FOR I=1600 TO 1664:READ A:POKE I,A
:NEXT I:B=256*(PEEK(145)+1):M=54017
120 ? "INSERT SOURCE DISK, PRESS START
":C=82:GOSUB 140
130 ? :? "INSERT DESTINATION DISK, PRE
SS START":C=80:GOSUB 140:GRAPHICS 2:EN
D
140 IF PEEK(53279)<>6 THEN 140
150 IF C=80 THEN XIO 254,#1,2,2,"D:"
160 POKE M,253:X=USR(1600,C,1,220,B):F
OR I=2 TO 3:POKE M,225+4*I:X=USR(1600,
C,221+125*I,125,16384):NEXT I:RETURN
170 DATA 104,104,104,141,2,3,104,141,1
1,3,104,141,10,3,104,133,204,104,133,2
03,104,141,5,3,104
180 DATA 141,4,3,32,83,228,173,4,3,24,
105,128,141,4,3,173,5,3,105,0,141,5,3,
238,10,3,208,3,238,11,3
190 DATA 198,203,208,224,198,204,16,22
0,96
```

●

CHECKSUM DATA.
(see page 14)

```
100 DATA 399,795,395,312,826,435,495,7
01,93,657,5108
```

●

Listing 2.
Assembly listing.

```
; DISK I/O SUBROUTINE
; by William W. Tan
;
;X=USR(1600,COMND,START,LENGTH,BUFFER)
;
;Equates
;
TEMPLO  =   $CB     ;sector count
TEMPHI  =   $CC
DCOMND  =   $0302   ;disk command
DBUFLO  =   $0304   ;disk buffer
DBUFHI  =   $0305
DAUX1   =   $030A   ;sector number
DAUX2   =   $030B
DSKINV  =   $E453   ;disk SIO routine
;
        *=  $0640
;
        PLA         ;throw away
        PLA
        PLA
        STA DCOMND  ;save command
        PLA
        STA DAUX2   ;save 1st sector
        PLA
        STA DAUX1
        PLA
        STA TEMPHI  ;save sector cnt
        PLA
        STA DBUFHI  ;save buffer pntr
        PLA
        STA DBUFLO
;
LOOP    JSR DSKINV  ;get sector
;
        LDA DBUFLO  ;increment buffer
        CLC
        ADC #128
        STA DBUFLO
        LDA DBUFHI
        ADC #0
        STA DBUFHI
;
        INC DAUX1   ;increment sector
        BNE COUNT
        INC DAUX2
;
COUNT   DEC TEMPLO  ;decrement count
        BNE LOOP
        DEC TEMPHI
        BPL LOOP
        RTS         ;all done
```

●

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- Unique multi-scan mode provides realistic grey scale images in 24 seconds, and up for more detail scans.
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- Print pictures with full shading for a level of realism even better than your TV screen
- Take your Computer Eyes images and modify them with your Koala Pad, Atari Touch Tablet, Micro Illustrator program, or Magniprint's special touch-up feature
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- Supports all Magniprint II+ features

MAGNIPRINT II+

"Magniprint II is a versatile and powerful program which will meet most, if not all your print out needs."
ANALOG MAGAZINE

The plus is in the shading — now Magniprint lets you print the highest quality reproductions of your screens available anywhere. It lets you choose the shading you want for the different colors and shades on the screen. It allows you to adjust the shades while your picture is displayed on the screen, so what you see is what you get. Magniprint prints the shades on your standard printer and paper by using specially designed dot patterns, yielding better looking output than you get on your screen.

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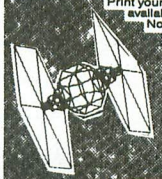

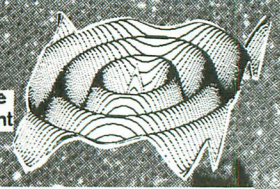

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Fractals
An Introduction

by Alex Leavens

We see them in clouds, coastlines and the edges of a leaf. They can be used for building staggeringly real—but quite imaginary—mountain ranges. In the early part of the century they were called "grotesque" and "abominations" by the foremost mathematicians of the day, while a handful of wild-eyed geniuses struggled to make sense of them.

Today, they're used to generate beautiful images, even if we're not quite sure how. What are they? Fractals. And, although for the most part they've been confined to mainframe computers with huge image buffers, this article and the accompanying program will give you a chance to play around with them.

The fractal facts.

What, really *is* a fractal? Well, everyone knows from fourth-grade geometry about the concept of dimensions. A straight line has one dimension; a plane (such as a page from this magazine) has two; and a volume of space (like a cube) has three. Each dimension is an integer value (1, 2 and 3).

But fractals are actually FRACTionAL dimensionS (hence the name), where the dimensional value is something other than a nice round integer. For example, a perfectly legitimate fractal dimension could be 1.2487. This dimension corresponds to a line that is "slightly crinkly" in appearance.

The more crinkly the line becomes, the more space it occupies, until it becomes "infinitely crinkly," filling an entire plane and reaching a fractional dimension of 2. So a straight line has a dimension of 1; a curvy or squiggly line (such as the edge of a coastline, or a doodle on a piece of paper) has a dimension somewhere *between* 1 and 2 (depending upon how "squiggly" it is); and a plane has a dimension of 2.

Fractals also have another characteristic: they look as complex at a macro level as they do at a micro level. That's a very complicated-sounding way of saying something very simple, which is this: if you magnify a portion of a fractal greatly, *it will still be as complex as the original fractal*. Think about that for a second. That's a truly bizarre concept.

If you take a square and look at it, it *looks* like a square. If you look at a very small section of the square under very high magnification, what do you see? Just a piece of a line. Nothing complex at all. But if you look at a fractal pattern, then choose a piece of it, and magnify that piece, that magnified piece will look every bit as complex as the original fractal!

You can experiment with this yourself, using the program. When you run it, enter the X,Y pair (3.0001,1.0001), and look at the fractal pattern that's generated under different levels of magnification. If you choose a low magnification, you'll note what appear to be two "whirlpools" of light, each with three arms and a center section.

If you now magnify this fractal, you'll begin to see that each arm of the original whirlpool is *itself* a whirlpool composed of three arms and a center section. And each of those three arms is (you guessed it) a smaller whirlpool, composed of three arms and a center section. Even more amazing, this nonsense goes on forever! At any level of magnification the fractal looks the same as it does on the original, macro level. Astounding.

Using Fractals.

Now that I've piqued your interest, let's go on to the program. The program itself is based on the fractal equation:

$$f(z) = \text{lambda} * z * (1 - z)$$

where lambda and z are complex numbers, or numbers involving the square root of −1. The program works in graphics mode 8, and will generate very pretty three-color fractals. When you run the program, it will ask you for input values for X and Y. These numbers do not have to be integers and are usually small. Very beautiful fractals can be obtained from the following combinations of X and Y:

```
X=3.00001, Y=1.00001
X=2.01,    Y=.001
X=4.01,    Y=1.02
```

Even small changes (on the order of .00001) in the value of one input or the other will drastically alter the shape and structure of the resultant fractal, so play around. Once you've entered X and Y, the program will then ask you for a window size.

This value is the degree of magnification that you want the program to use in examining the fractal. The smaller the number you use, the larger the degree of magnification, and the "closer" to the

Fractals Introduction *continued*

fractal you'll get. Similarly, the larger the number you use, the smaller the degree of magnification, and the "farther away" from the fractal you'll be.

Again, this number does not have to be an integer. Generally, numbers between 0.5 and 2.5 work well. Remember though, fractals are infinitely complex—so even if you magnify one to a high degree, it will *still* look very complex. If you do magnify the fractal to a large degree, the window may miss it entirely. If this happens, decrease the magnification until you can see the fractal.

Be warned: the program *does* take a while to run. An average fractal can take anywhere from 3 to 30 minutes to calculate—some can take as long as 6 hours! The program is laid out rather oddly, in order to help speed things up, but there are a number of other factors that affect the speed of the program as well.

One is the degree of magnification chosen for a particular fractal. That is, the higher the magnification (the smaller the window number), the smaller the section of the fractal you're examining, and the longer it'll take the program to calculate the points.

Another factor is the math chip that you have installed in your computer. If you have an Atari 800, then the Newell Fastchip (a ROM chip that you can buy to replace your floating point OS ROM chip) can significantly increase the program's speed.

But even if you don't have the Newell chip, I urge you to try the program. Fractals, calculated at whatever speed, are beautiful and amazing creatures that are worth the wait.

*Next month, **ANALOG Computing** will publish **Bonsai**, a program using fractals in an art form.*

Listing 1.
BASIC listing.

```
10 CX=160:CY=96
20 X=0.50001:GOTO 100
30 REM PLOT X,Y
40 M=SC*(X-0.5)+CX:J=CY-SC
*Y:TRAP 60
50 PLOT M,J
60 RETURN
100 GOSUB 260
110 GRAPHICS 24:SETCOLOR 2
,0,0:COLOR 1
120 FOR I=1 TO 10:GOSUB 14
0:NEXT I
130 GOSUB 40:GOSUB 160:GOT
O 130
140 REM FUNCTION OF X,Y
150 REM X,Y TIMES L
160 TX=X:TY=Y:X=TX*LX-TY*L
Y:Y=TX*LY+TY*LX:X=1-X
170 REM SQUARE ROOT OF X,Y
180 T=Y:S=SQR(X*X+Y*Y):Y=S
QR(ABS((S-X)/2)):J=S-X:IF
J<0 THEN Y=-Y
190 X=SQR(ABS((S+X)/2)):J=
S+X:IF J<0 THEN X=-X
200 IF T<0 THEN X=-X
210 IF RND(0)<0.5 THEN X=-
X:Y=-Y
220 X=1-X:X=X/2:Y=Y/2
230 RETURN
240 END
250 REM GET VALUES
260 ? "K":? "FABULOUS FRAC
TIONS";:? "By Alex Leavens"
270 ? "Exclusively for ANA
LOG Computing.":?
290 ? "Please input values
 for X and Y."
300 ? "X and Y do not have
 to be integers.":?
320 ? "Please enter X,Y";:
INPUT LX,LY
330 S=LX*LX+LY*LY
340 LX=4*LX/S
350 LY=-4*LY/S
360 ? "How big is the wind
ow";:INPUT SC
370 SC=(CX+CX)/SC
380 ? "O.K.!  Screen will
go black...":? "Please wai
t...":FOR I=1 TO 500:NEXT
I
390 RETURN
```

CHECKSUM DATA.
(see page 14)

```
10 DATA 104,716,255,739,55
5,762,962,910,674,223,103,
909,34,565,433,7944
190 DATA 206,624,27,939,59
2,40,642,810,181,909,57,69
1,629,100,898,7345
360 DATA 365,244,602,612,1
823
```

KARATEKA
by Jordan Menchner
BRODERBUND SOFTWARE
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48K Disk $29.95

by Patrick J. Kelley

There are few things in life that match the pleasure of discovering a new thing or experience, especially if it's unexpected. While many may not consider a computer game one of the finer things in life, I beg to differ. An exceptional computer game can fulfill many roles from simple amusement to outright therapy.

A fine program is like a work of art—it's a tribute to the author and a shared experience among all who partake. Occasionally, one of these will emerge from the fold, and, surprisingly enough, will change the way you view the very medium. **Karateka**, from Broderbund, is the newest effort in the evolution of the computer game, and was a revelation to me. It shows just how much can be accomplished by a competent technician and an exceptional machine.

As games go, **Karateka** is one of the best all-around products to be written for the Atari since its inception. With **Karateka**, you begin a journey of excitement, action and frustration the moment you boot the game—a journey of heroism and bravery, strategy and combat, and a quest in the battle of good against evil.

Your weapon in this combat is your body, honed to perfection. As a **Karateka**, you are a master of the ultimate martial art, learned through years of servitude in seclusion. Now you must put your training to the ultimate test, as you challenge the evil warlord Akuma to a battle to the death. The prize: the safety of your village and the return of your beautiful betrothed, Princess Mariko, kidnapped by the vile Akuma. As the drama unfolds, you enter the world of **Karateka**.

At this point, I must admit that some of the charm of this game is the fact that it really makes you *feel* like an Eastern warrior. Prior to this game, my only experience with the martial arts was in watching *Enter the Dragon*, and *Shaolin Kung-Fu Mystagogue* on "Kung Fu Theatre." But, after a few moves with my computer-controlled surrogate, I felt ready to get it on with Bruce Lee himself.

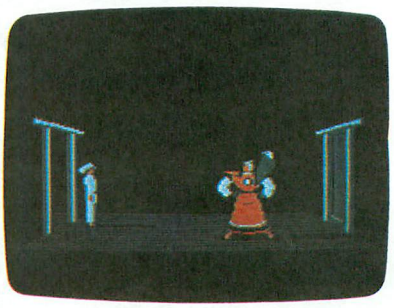
The playfield of **Karateka** is a beautifully executed area, with a fine-scrolling courtyard and palace, plus the snow-capped peak far off in the distance.

The object of the game is simple: attack the palace of Akuma, engage and defeat his guards in hand-to-hand combat, and free the princess from her dungeon. While the object may seem simple, realizing the end of your quest is most assuredly not.

Akuma is a tough customer, and his cronies play for keeps. You must use all of your skill and cunning just to survive, let alone press on the attack. As you move through the ranks of Akuma's fallen guards, you find each one progressively harder to defeat, every blow more telling.

As you approach your destiny, Akuma (and all of his treachery) awaits. Win or lose, you'll never be the same after an encounter in the wonderous world of **Karateka**. By that, I mean that the standards by which you judge other games will forever be altered.

Playability of this game is superb, and you can choose between keyboard or joystick controls to select your method of attack (hint: use the keyboard). But by far the most exceptional feature of **Karateka** is its graphics. In my opinion, these set a new standard for the industry. Never have I seen such realistic animation and character design in any game, arcade or otherwise. Combatants parry, kick and jab with fluid ease, their features well defined, even down to the shadows beneath the figures.



Karateka.

The evil Akuma is a sight, resplendent in Samurai armor and traditional robes, his "pet" close by. Even Akuma's men are detailed, each wearing a distinctive headdress or helmet, decorated in traditional feudal Japanese designs. And, for the valiant **Karateka**, we have a crisp, white GI with a full head of blonde hair. Your lovely Mariko is a striking goddess in a long gown.

Quite simply, **Karateka** is an instant classic, combining action, suspense and a filmic narrative that progresses with the story. Broderbund, with this product, has redefined the term "graphics adventure" and has drawn a line that all others must cross in the future.

If it seems that I am being overly generous with my praise, I must defend myself by saying that it *is* well deserved. **Karateka** was a most pleasant, unexpected surprise. It should not be missed by anyone who loves good computer gaming.

32K Cassette or Disk

Incoming!

by Conrad Tatge

In **Incoming!** you must protect your city from wave after wave of incoming helicopters and space shuttles.

The helicopters drop fleets of paratroopers who attempt to land on the rooftops of your city. To land safely, a paratrooper must retain his parachute until he touches ground.

The shuttles release tiny "building bombs" that expand as they fall and build a new city block when they hit something. Shuttles and helicopters alternate waves.

The only defense against all of this is one semi-stationary rapid-fire gun. The gun can shoot up to sixteen steerable rounds at a time. To aim your shots, move the joystick left or right. If you have all sixteen shots in the air at one time, the gun will light up as a warning that you can no longer shoot, until a shot goes off the screen or hits something. Each shot you take will subtract ten points from your score.

The parachutes of the paratroopers can be shot off, which causes the paratrooper to plummet helplessly to the ground, destroying anyone below him. In addition, the helicopters and shuttles must be shot repeatedly to be destroyed. The more hits they take, the faster they fly, until they finally blow up. The debris from any explosion will kill surrounding objects.

Typing it in.

Before typing anything, look at the listings accompanying this article.

Listing 1 is the BASIC data and data checking routine. This listing is used to create both cassette and disk versions of **Incoming!**. The data statements are listed in hexadecimal (base 16), so the program will fit in 16K cassette systems.

Listing 2 is the assembly language source code for the game of **Incoming!**, created with the OSS MAC/65 assembler. You *don't* have to type this listing to play the game! It is included for those readers interested in assembly language.

Follow the instructions below to make either a cassette or disk version of **Incoming!**

Cassette instructions.

1. Type Listing 1 into your computer using the BASIC cartridge and verify your typing with **Unicheck** (see page 14).

2. Type *RUN* and press RETURN. The program will begin and ask:

```
MAKE CASSETTE (0), OR DISK (1)?
```

Type *0* and press RETURN. The program will begin checking the DATA statements, printing the line number of each as it goes. It will alert you if it finds any problems. Fix any incorrect lines and re-RUN the program, if necessary, until all errors are eliminated.

3. When all of your DATA lines are correct, the computer will beep twice and prompt you to *READY CASSETTE AND PRESS RETURN.* Now, insert a blank cassette in your recorder,

press the RECORD and PLAY buttons simultaneously and hit RETURN. The message *WRITING FILE* will appear, and the program will create a machine language boot tape version of **Incoming!**, printing each DATA line number as it goes. When the *READY* prompt appears, the game is recorded and ready to play. CSAVE the BASIC program onto a separate tape before continuing.

4. To play, rewind the tape created by the BASIC program to the beginning. Turn your computer OFF and remove all cartridges. Press the PLAY button on your recorder and turn ON your computer while holding down the START key. If you have a 600 or 800XL computer, you must hold the START and OPTION keys when you turn on the power. The computer will "beep" once. Hit the RETURN key, and **Incoming!** will load and run automatically.

Disk instructions.

1. Type Listing 1 into your computer using the BASIC cartridge and verify your typing with **Unicheck** (see page 14).

2. Type *RUN* and press RETURN. The program will ask:

```
MAKE CASSETTE (0), OR DISK (1)?
```

Type 1 and press RETURN. The program will begin checking the DATA lines, printing the line number of each statement as it goes. It will alert you if it finds any problems. Fix incorrect lines and re-RUN the program, if necessary, until all errors are eliminated.

3. When all the DATA lines are correct, you will be prompted to *INSERT DISK WITH DOS, PRESS RETURN*. Put a disk containing DOS 2.0S into drive #1 and press RETURN. The message *WRITING FILE* will appear, and the program will create an AUTORUN.SYS file on the disk, displaying each DATA line number as it goes. When the READY prompt appears, the game is ready to play. Be sure the BASIC program is SAVEd before continuing.

4. To play the game, insert the disk containing the AUTORUN.SYS file into drive #1. Turn your computer OFF, remove all cartridges and turn the computer back ON. **Incoming!** will load and run automatically.

Game over.

The game will end as a result of a few situations. Having half of your buildings occupied by paratroopers at the end of the one-minute wave will kill you. Another way to die is to have the base hit by a bomb or to have a paratrooper safely on the gun. You may SELECT a level with the console key. Pressing START or the trigger button will start the game.

Advanced strategy.

Possible strategies to winning at **Incoming!** can be learned by playing a few times, but I'll tell you the obvious ones.

A paratrooper without a parachute is deadly. They can be used to remove paratroopers who've already landed on rooftops. In addition, bombs will kill landed paratroopers.

Since every other level is a shuttle level, one can usually remove mistakes made on the previous level by allowing select bombs to kill men. However, don't let too many bombs land, as the city will grow to extremes. When there are too many buildings, the chances of a paratrooper landing on a building are increased dramatically. Too many buildings can also hinder the effectiveness of the gun—the buildings will stop your bullets.

Use explosions to your advantage. Pixels from an exploding object are just as effective as a shot from

your gun. Also, spread out your shots across the length of the shuttles and the choppers. As one is hit, you'll hear a tone that indicates how close it is to demise. The tone rises as shots hit the object.

Many more strategies exist, but must be learned through trial and error.

Writing the game.

Three sleepless nights caused by an antibiotic for my cold left me with nothing to do but write a game. Six months later it was complete: my largest machine language game to date, **Incoming!** It represents a lot of trial and error at the keyboard.

I found that the best way to write these games is to try something new, and then write down what needs to be fixed. When you return to the editor, follow the list of changes, checking them off as you go along.

I used the archaic Atari Macro Assembler (AMAC) and Editor to create **Incoming!** MAC65 is a *much* faster assembler, but I can't deal with that line number-type editor. I encountered a problem in AMAC which caused the assembler to lock up during the second pass for no apparent reason. Two days later, I realized that it was caused by a disk access problem. If this happens to you, simply copy the offending source code to a new disk. The Macro Assembler has problems dealing with source files that run all over a disk.

At another point, I received the humorous message *Memory Overflow stopped the ACT!* Of course, it wasn't that humorous at the time, but I simply went back to previously saved version without incident.

Have fun and watch out for **Incoming!**

---

*Conrad Tatge is a Computer Science major at Union College in Schenectady, New York. He has worked for PDI in Greenwich, Connecticut and is the author of **TwoGun**, a two-player shootout that appeared in **ANALOG Computing's** issue 28. He has enjoyed working with Ataris since his first 800, back in 1981.*

Listing 1.
BASIC listing.

```
10 REM *** INCOMING ***
20 TRAP 20:? "MAKE CASSETTE (0), OR DI
SK (1)";:INPUT DSK:IF DSK>1 THEN 20
30 TRAP 40000:DATA 0,1,2,3,4,5,6,7,8,9
,0,0,0,0,0,0,0,10,11,12,13,14,15
40 DIM DAT$(91),HEX(22):FOR X=0 TO 22:
READ N:HEX(X)=N:NEXT X:LINE=990:RESTOR
E 1000:TRAP 120:? "CHECKING DATA"
50 LINE=LINE+10:? "LINE:";LINE:READ DA
T$:IF LEN(DAT$)<>90 THEN 220
60 DATLIN=PEEK(183)+PEEK(184)*256:IF D
ATLIN<>LINE THEN ? "LINE ";LINE;" MISS
ING!":END
70 FOR X=1 TO 89 STEP 2:D1=ASC(DAT$(X,
X))-48:D2=ASC(DAT$(X+1,X+1))-48:BYTE=H
EX(D1)*16+HEX(D2)
80 IF PASS=2 THEN PUT #1,BYTE:NEXT X:R
EAD CHKSUM:GOTO 50
90 TOTAL=TOTAL+BYTE:IF TOTAL>999 THEN
TOTAL=TOTAL-1000
100 NEXT X:READ CHKSUM:IF TOTAL=CHKSUM
 THEN 50
110 GOTO 220
120 IF PEEK(195)<>6 THEN 220
130 IF PASS=0 THEN 170
140 IF  NOT DSK THEN 160
150 PUT #1,224:PUT #1,2:PUT #1,225:PUT
 #1,2:PUT #1,121:PUT #1,54:CLOSE #1:EN
D
160 FOR X=1 TO 23:PUT #1,0:NEXT X:CLOS
E #1:END
170 IF  NOT DSK THEN 200
180 ? "INSERT DISK WITH DOS, PRESS RET
URN";:DIM IN$(1):INPUT IN$:OPEN #1,8,0
,"D:AUTORUN.SYS"
190 PUT #1,255:PUT #1,255:PUT #1,0:PUT
 #1,44:PUT #1,192:PUT #1,61:GOTO 210
200 ? "READY CASSETTE AND PRESS RETURN
";:OPEN #1,8,128,"C:":RESTORE 230:FOR
X=1 TO 40:READ N:PUT #1,N:NEXT X
210 ? :? "WRITING FILE":PASS=2:LINE=99
0:RESTORE 1000:TRAP 120:GOTO 50
220 ? "BAD DATA: LINE ";LINE:END
230 DATA 0,36,216,43,255,43,169,0,141,
47,2,169,60,141,2,211,169,0,141,231,2,
133,14,169,56,141,232,2
240 DATA 133,15,169,121,133,10,169,54,
133,11,24,96
1000 DATA 00000000000696E636F6D696E6741
41000000000000000000000048634900111918
15000000000000000000627900,532
1010 DATA 00636F6E72616400746174676500
00F3E5ECE5E3F400696E697469616C006C6576
656C707265737300F3F4E1F2,897
1020 DATA F400746F00626567696E00686967
680073636F72651A0000000C00000000000000
000067616D6500006F766572,733
1030 DATA 00000000000696E636F6D696E67
00000000000000000041007070 70C6D13C4D00
600D0D0D0D0D0D0D0D0D0D0D0D,769
1040 DATA 0D8D0D0D0D0D0D0D0D0D0D0D0D0D
0D8D0D0D0D0D0D0D0D0D0D0D0D0D0D0D8D0D0D0D
0D0D0D0D0D0D0D0D0D0D0D0D8D0D,866
1050 DATA 0D0D0D0D0D0D0D0D0D0D0D0D0D0D
0D0D0D0D0D0D0D0D0D0D0D0D0D0D0D0D0D41A02CA9
008580A9608581A200A5809D,81
1060 DATA FD40A5819D5341E8E056F010A580
18692885 80A581690085814C0B2D60A9004820
9C2D68A02791808810FB60A2,118
1070 DATA 55202B2DCA10FAA253A9FF202D2D
E8A9FF202D2D60A206A9009D01D2CACA10F960
A27FA9009D805D9D005E9D80,298
1080 DATA 5E9D005F9D805FCA10EE60BE5940
209C2DB91D402918AA980AA8A906858C18BD17
3D9180C8BD373D9180986927,87
1090 DATA A8E8C68CD0EC60BDFD408580BD53
41858160A683209C2DA582484A4AA8682903AA
B1806020A72D3DCA2D918060,680
1100 DATA 030C30C0FCF3CF3F3FCFF3FC20A7
2D3DCA2D1DDA2D9180604010040 1C0300C0320
A72D3DDE2D488A4903AA68CA,352
1110 DATA 30054A4A4CEE2D6020E22DC90290
43A8A5824A4A4AAAA58338E906DD6D40B02FC0
03D01BA9019D1D40A5974A4A,102
1120 DATA 9D45409D3140A905205F33A90985
C94C3E2E20553 0A582858 4A5838585A90720AC
2EA9006020CE2DA90160C6A0,595
1130 DATA F00160A5A185A0A20F868EBDAD3F
F045BDBD3F8582BDCD3F858320B92DA68EBDDD
3F1865879DDD3FBDBD3F6586,583
```

```
1140 DATA C9A0B02B9DBD3F8582BDED3F1865
899DED3FBDCD3F6588C955B0149DCD3F858320
F72DA68E9DAD3FC68EA68E10,597
1150 DATA B060A9009DAD3FF0F2858CA68ABD
AD3DF005200C2FA68AAD0AD2259E9D6D3FA584
9DED3DA5859D2D3E20062F9D,26
1160 DATA 6D3E20062F9DAD3EA9009DED3E9D
2D3F20062F259D9DAD3DE68AA58A293F858AAA
C68CD0BBA90F85A9A903859E,132
1170 DATA A907859CA93F859D60AD0AD2059C
60BDED3D8582BD2D3E858320B92D60C69AF001
60A59B859AA23F8696BDAD3D,761
1180 DATA F023200C2FA696DEAD3DF019BD6D
3E187DED3E9DED3EBD6D3F2901D00BBDED3DE9
004C572F4C912FBDED3D6900,840
1190 DATA C9A0B03F9DED3D8582BDAD3E187D
2D3F9D2D3FBD6D3F2902D008BD2D3EE9004C7E
2FBD2D3E6900C955B0189D2D,591
1200 DATA 3E858320F72DD005A6969DAD3DC6
96A696300A4C272FA9009DAD3DF0F06099165E
99245E99325E99405E609996,740
1210 DATA 5E99A45E99B25E99C05E6099165F
99245F99325F99405F6099965F99A45F99B25F
99C05F60A599C599F0FC60A2,655
1220 DATA 08A90095C4CA10FB60868D8A0AA8
BD5940AA209C2DA9009180C8918088A68DFE59
40BD5940DD6D409045BD1D40,74
1230 DATA 2908D01D205530BD6D40DD8140F0
38BD6D40186905 9D6D409D594020553 04C5230
BD6D404838E9059D6D40A918,355
1240 DATA 9D1D40203A34A68D68DD8140D007
C94DF003200E34A48D20732DA68D60868FA910
9D1D408AA820732DA68FA900,994
1250 DATA 9D1D408A0A0A0A1869038584BD59
40186903858 5A90A20AC2EA906205F33A90C85
C4A68F60A90085A885AAA213,200
1260 DATA BD1D402901F038E6A8BD1D402908
D009BD5940C5AA900285AADE3140D021BD4540
9D3140BD5940C591D011A909,179
1270 DATA 9D1D40A5979D45409D3140A90585
CA20E72FCA10BEA5AA85C660A90085A4A5B6C9
02D004A207D006A5924A0901,300
1280 DATA AA869020C631A690BDA140DD9740
D028A5B5F02420BD31B01FA5B6F073C902F017
BDBF4038E930C990B00DA592,328
1290 DATA 4A4AAABDDD40F006CA10F84CAF31
A490B9A53DD96D40B0F348204432681869149D
ED40A9009DF1409DF54095BC,27
1300 DATA AD0AD2290318690 29DE9409DE540
A490B9BF401869049DE14038EDC7402907F009
A9002A4901A8B9583D9DF940,936
1310 DATA FEDD40A90585CBD033BDBF4038E9
284A4A4AAAE014B025BD1D402901D01EA490B9
A53DDD6D40B0149D5940A597,363
1320 DATA 4A9D45409D3140A9019D1D4020E7
2FC6903005A6904CEF30A5A485A560AD0AD20D
0AD2C59560BDC940F053E6A4,757
1330 DATA DE9740D021BDA1409D97408A2901
A8B9583D187DBF409DBF40D00BA5B6C902F055
A9009DC940A5B6C902F04ABD,457
1340 DATA D3401045BDBF4038E9288584BDA5
3D8585A9009DBF409DC940A91920AC2EA90620
5F3360A5B5F021A599290FD0,633
1350 DATA 1B20BD31B016AD0AD2290F18658B
9D97409DA1404A4A9DD340FEC94060BDED40A8
88205F32205F32205F32205F,242
1360 DATA 32205F32205F32205F3260B9805D
3DC62D99805DC860B9805D1DC22D99805D60C6
B1F00160A5B085B185B1A900,285
1370 DATA 85AAA20386B2BDDD40D0034C3A33
B5BC290EF030BDE14038E92D4A4A4AAAE014B0
14BD6D40DD8140F00F186905,456
1380 DATA 9D6D409D594020553 04C28338AA8
20B533A91985CBD063B5BC2901D043FEF140BD
F140187DF5409DF540901AFE,922
1390 DATA ED40BDED40A8C5AA900285AA205F
32BDED40186904A8206A32DEE540D041BDE940
9DE540BDF940187DE140C930,766
1400 DATA 9004C9CA9029BDE14038E92D8584
BDED4038E9148585A91420AC2EA905205F33A9
00A6B29DE1409D04D09DDD40,205
1410 DATA 95BC9DE140C6B23005A6B24C8732
A5AA85C660A5C105C0F02CF8A5C138E90185C1
A5C0E90085C04C6B33F81865,367
1420 DATA C185C1A5C0690085C0A001A204B9
C000209333CA8810F6D860E692A592290F8592
0A0A0A0A85BB8DC802A492B9,739
1430 DATA A533A21348290F209E33684A4A4A
4A09509DD13CCA60010203040506070809101 1
121314151698203334F02DB9,653
1440 DATA 8140CDAB3D902548AA209C2D6838
E906998140996D40AA980AA8A20518BDE93391
80C89180986927A8CA10F160,939
1450 DATA C3C3FFC3C3FFA205AD0AD2291FC9
14B0F7A8B96D40C94DD0EF8E093420B533A200
CA10E460A90685AD85C560A2,996
1460 DATA 13A000BD8140C94DF008C8DD6D40
F0028888CA10EE881004A90185B760C909F002
C90A608A203334D0F986B786,325
1470 DATA 93A90085B58DC740A901859EA907
859CA9FF859DA94F8584A9508585A9204CAC2E
A90285B68593A90085B520DD,24
1480 DATA 2F20502DA27F9D805DCA10FA8DC7
40A904859BA91385B9A6B9BD6D40C94DF01618
690385858A0A0A0A69038584,926
1490 DATA A901859EA90320AC2EC6B910DD30
2A204B34A9808599D028AD0AD2297F18691085
828584AD0AD2293F85838585,770
1500 DATA 20E22DC902B0E4A91020AC2EAD0A
D2090185992 0D62FAD1FD0C907D016201A2FA5
9910EFAD0AD20D0AD24AB0BE,691
1510 DATA 4AB0894AB0AFA90A859B204B3420
4B34204038A97885AB8D7736A5C0C5C2901CA5
C1C5C3901685C3A5C085C2A2,357
1520 DATA 05BDD13C9D712CCA10F7A9648D77
364C0437A90085B5A90120FD39A5922901208A
38A5B60A0A0AA8A207B9FF35,98
1530 DATA 9D962CC8CA10F6A98C8D7736200F
3620DD2F20502DA9808599 20D62FA599F00B0A
0A0A490FF0F285C6D0EE85C6,447
1540 DATA 200F36A692BD7B3D8595BD6B3D85
8BBD5B3D859B859A8A4AAABD8B3D8597BD933D
85B085B18A4AAABD9F3D8591,200
1550 DATA 8A4AAABDA33D85A185A0A900A213
9D1D40CA10FAA2039DDD409DE140CA10F7A20F
9DAD3FCA10FAA23F9DAD3DCA,24
1560 DATA 10FAA2079DC9409DBF409DD340CA
10F4A2078A18690605BB49F09DB540CA10F2A9
00858A8593607372657070 6F,477
1570 DATA 6863736 56C747475687320D62FA5
A2490685A2AAA005BD6D3699E42CE88810F6A5
A2F01AA207AD0AD2297F1869,760
1580 DATA 379DBF40AD0AD2290F090A9DB540
CA10E860ADE52CC5AB900A200E34A9008DE52C
F017A21320D62FEEE52C8A29,719
1590 DATA 010A00A08D01D28E00D2CA10EB60
0D0D0D0D0D0D6A004D2C0046A9008D2F028D08
D2A24C9580CA10FB2065E420,473
1600 DATA 012D203A2D205C2D206B3320FB39
208C33201A3A20F92EA95085ABA905859FA901
8593A9698D0002A9398D0102,275
1610 DATA A9A08D3002A92C8D3102A95C8D07
D4A9038D1DD0A9118D6F02A23AA035A906205C
E4A205BD113D9D615ECA10F7,18
1620 DATA A9C08D0ED4A9008DC402A9CE8DC5
02A9428DC602A92E8D2F02A9008D7736A90085
B785B885B520502D20DD2FA9,175
1630 DATA 348DC702A207AD0AD2290F09039D
C9409D97409DA140CA10EDA902208A38200F36
A207BD54399D975DCA10F7A9,862
1640 DATA 008599AD0AD2297F18693AA20318
9DE1406902CA10F88D1ED020D62FAD1FD02902
D017A93C8DE52CA900859920,592
1650 DATA 7B33A91085C8AD1FD02902F0F9AD
1FD029012D8402F00FA599297FD0CF2044364C
59374C0437A90085C085C120,378
```

CDY Has A Hot New Product
Just In Time For Christmas!

OMNIVIEW XL/XE & OmniWriter 80

WARNING: No 800XL/130XE owner should read this ad unless they have 60 bucks to invest in their computer! Due to the outstanding value of this product, you may find it too irresistible to be without.

OK, don't say you were not warned. We are now going to entice you with some of OMNIVIEW XL/XE's bountiful features:

★**800 compatible operating system** that runs virtually every piece of commercial ATARI software. Press a console switch to copy the OS into RAM and free up the $C000 page (i.e., a built-in translator disk).

★The**resident ramdisk handlers** can be used by XE owners with many popular programs and DOS's to treat the extra 64K of RAM as an ultra-fast disk drive.

★The **FASTCHIP** floating point package is provided for significantly faster and more accurate math operations.

★**80 columns operation** under many environments including Letter/Data Perfect, BASIC, MAC65, and ATR8000 CPM.

★**And here comes the real teaser!** For a long time people have been asking if OMNIVIEW can be used to give ATARIWRITER 80 column screen output. Regretfully we have always had to say no. In fact, we must still say no, but we have got something even better to offer! OmniWriter 80 is a wonderful new word processor designed for use with OMNIVIEW. It is as easy to use as ATARIWRITER and much more powerful! And CDY will provide OmniWriter 80 with every OMNIVIEW at no extra charge! Current OMNIVIEW owners can purchase OmniWriter 80 directly from us for only $10.

Of course, 400/800 owners can also enjoy the power and convenience of OMNIVIEW (including OmniWriter 80)by adding the 4K or 8K OMNIVIEW to the OMNIMON piggyback board or the Ramrod OS board. These OMNIVIEWs also include resident ramdisk handlers for use with the AXLON Ramdisk. If you are serious about enhancing the performance of your computer, you will be delighted with the unique features of OMNIVIEW!

Feature Comparision Chart

	OMNIMON Piggyback	Ramrod OS board	-----Upgrades for----- ---OMNIMON or Ramrod---			Ramrod XL Add-on for Piggyback Ramrod XL	
	400/800	800	8K OMNI	8K VIEW	4K VIEW	800XL	VIEWXL/XE
Enhanced OS		★				★	★
Includes FASTCHIP FP						★	★
80 Column Emulation				★	★		★
Ramdisk Handlers			★	★	★		★
OMNIMON Features:							
A:Alter Memory	★	★	★	★		★	
B:Boot (Ram) disk			★	★	★		
C:CPU Registers	★	★	★	★		★	
D:Display Memory	★	★	★	★		★	
E:Single Step Execution	★	★	★	★		★	
F:Fill Program Buffer			★			★	
G:Binary Load/Directory			★			★	
H:Hex Conversion			★	★		★	
H:Hex Arithmetic			★			★	
I:Install Ramdisk Handlers			★	★	★		
J:Jump Subroutine (JSR)	★	★	★	★		★	
L:Drive Selection/Control	★	★	★	★		★	
M:Move Block of Memory			★			★	
N:Relocate 6502 Code			★			★	
O:Operate from Prog. Buffer			★			★	
P:Printer Control	★	★	★	★		★	
R/Read Sector(s)from Disk	★	★	★	★		★	
S:Search Mem. for Sequence	★	★	★	★		★	
T:Tog. Hex Char Display Mode	★	★	★	★		★	
U:User's Custom Command			★				
V:Verify 2 Blocks of Memory			★	★		★	
W:Write Sector(s) to Disk	★	★	★	★		★	
X:Disassemble Memory	★	★	★	★		★	
Y:Line Assembler			★			★	
Z:Exit Monitor			★				
Lockup Recovery			★	★		★	
Redirection of Printer I/O			★	★		★	
Talk to Happy Ram Buffer			★	★		★	
80 Column ATRMON for	ATR8000						★
Includes OmniWriter 80				★	★		★

How To Order

Add $2.00 shipping ($4.00 for 2 day delivery). We accept Visa or Master Card orders but would prefer to send COD (cash or M.O. only). We will gladly pay all shipping charges for COD orders over $20.00.

256K Upgrade for 800XL!

There are more and more companies putting out products to take advantage of the extra RAM in the 130XE, including OSS (BASIC XE), Synapse, and CDY (OMNIVIEW XL/XE). 800XL owners can now enjoy all the power of these programs because the 256K RAM upgrade we sell (256KXL) will turn an 800XL into a souped up 130XE with an extra 128K of banked memory! Available both with and without RAM chips, the 256KXL is installed internally and does not tie up the expansion bus. Altough some soldering is required, the 256KXL installation is quite easy, especially if the 8 RAM chips are socketed. And the best feature of all is the price! Check it out below!

FREE OMNIVIEW FOR YOUR 400/800!

OMNIVIEW has been steadily gaining in popularity, especially since the introduction of OmniWriter 80 (see left column of this ad). CDY now makes beautiful 80 column screen output even more affordable by providing a 4K OMNIVIEW (including OmniWriter 80) free of charge with every OMNIMON piggyback board sold! And since this OMNIVIEW also has resident ramdisk handlers, it is especially powerful in conjunction with the AXLON Rampower 128, allowing you to interface it with almost any DOS. However, OMNIMON piggyback boards are in limited supply, so order soon to take advantage of this great opportunity. Remember, Christmas is right around the corner! Avoid the rush!

OMNIMON Resident Monitor

We make an OMNIMON for every 8 bit ATARI except the 1200XL. **This is the most powerful machine language available!** It gives you a wealth of tools for program development and customization of existing programs and it has the unique ability to interrupt, examine and manipulate any program in memory. In other words, it gives you **complete control** over your machine! Thousands of OMNIMON owners swear by them for years and wouldn't dream of having an ATARI without one. If you are a programmer or are interested in learning more about your machine, you can make no better investment!

Pricing

400/800: Piggyback board plugs into existing OS board. Inexpensive and easily disabled.

OMNIMON piggyback board & OMNIVIEW	**$69.95**
OMNIMON piggyback board & 8K OMNIVIEW	$109.95
OMNIMON piggyback board & 8K OMNIMON	$109.95
Add FASTCHIP floating point to any of the above	$15.00
FASTCHIP floating point package by itself	$19.95
OMNIVIEW for piggyback or Ramrod OS board	$29.95
8K OMNIVIEW or 8K OMNIMON for piggyback or Ramrod	$44.95

800: Ramrod OS board replaces existing OS board and comes with enhanced OS in EPROMs. It has 2 sockets for OMNIMON/OMNIVIEW enhancements which can be selected with a switch.

Ramrod OS & OMNIVIEW	$89.95
Ramrod OS & 8K OMNIVIEW	$104.95
Ramrod OS & 8K OMNIMON	$104 95
Ramrod OS & 8K OMNIMON & OMNIVIEW	$129.95
Add FASTCHIP floating point to any of the above	$15.00

600XL/800XL/130XE: Replace existing OS chip or add Ramrod XL to select between 3 possible OS's.

OMNIVIEW XL/XE (includes FASTCHIP & 800 compatible OS)	$59.95
Ramrod XL & OMNIMONXL (includes FASTCHIP & 800 compatible OS)	$79.95
Bare Ramrod XL(for use with OMNIVIEW XL/XE)	$39.95

Other fine products:

OSS BASIC XL, MAC 65 or ACTION orBASIC XE	$69.95
OSS BASIC XL, MAC 65 or ACTION tool kit	$34.95
AXLON Rampower 128 (Ramdisk)	CALL!
OmniWriter 80 (for current owners of OMNIVIEW)	$10.00
SD/DD Sector Copier	$17 95
256KXL (RAM upgrade for 800XL)	$99.95

CDY Consulting
421 Hanbee
Richardson, Tx 75080
(214) 235-2146

DEALERS INQUIRIES SOLICITED

CIRCLE #121 ON READER SERVICE CARD

```
1660 DATA 6B33200F36AD1FD04A90FA203A2D
A97D8DC740A9068594A900A2079D975DCA10FA
A92E8DC702A213A94D9D6D40,327
1670 DATA 9D8140CA10F7A947A2019D76409D
8A40CA10F720EF33203635A90185B5AD1FD0C9
07F008A93C8D77364C043720,231
1680 DATA D93020472E201A2FA5B6D009208A
30205D384C133820743 2A5B8F0034C6434A5B5
D0CDA2031DDD40CA10FA05A8,761
1690 DATA 05A4D0BFA90A859B85A185932040
38201534A5B7D006207B334CDD374C64342047
2E201A2FA900A20F1DAD3FCA,42
1700 DATA 10FAA23F1DAD3DCA10FAC900D0E4
60C6AFD028A91785AFA5AE186901290385AEAA
A000BD4C3920A22FBD503920,189
1710 DATA AF2FBD443920BC2FBD483920C92F
6085B6A8BEB138A000BDCC3820A22FBDD83820
AF2FBDB43820BC2FBDC03820,318
1720 DATA C92FE8C8C00C90E2600030600700
00C0FF3F07010000000 1FF2078E4E2E2E2E2FC
7811FEFF041E27474747473F,195
1730 DATA 1E887FE0000003FFFCE080000000
80E0F0F0F8FC7E7FFFFFFFFC7B000000000000
F8E4FEFF1FEC000000000000,551
1740 DATA 1F277FFFF837070F0F1F3F7EFEFF
FFFF3FDE000000000C1F1F0F3FFE00000030
78FDFFFFFEFFFFEC0000000C,216
1750 DATA 1E5FFFFF7FFFFF37000000000000
30F8F8F0FC7F000406030171 1C06C38EC36038
2080C0603C7EFFFFFFFF7E3C,391
1760 DATA A203BD00D015BC95BCCA10F66048
8A489848D8A698A000B904D01905D02901F00E
DED140BD9F4085CC38E9029D,882
1770 DATA 9F40E8C8C8C00490E1205C39A598
18690205BB8D0AD48D1AD08D1ED0A698A000BD
B5409912D09913D0BDBF4099,508
1780 DATA 00D0186908C89900D0E8C8C00490
E48698E006A5B32A290385B3490385B4A203A5
B30A0A05B385B3CA10F58D0A,700
1790 DATA D48D0CD0A20318BDE14065B49D04
D0CA10F568A868AA6840A90048A205A900202E
3ACA202E3A202E3ACA68202E,338
1800 DATA 3A60ADDB3C495A8DDB3CADDE3C49
4E8DDE3C60DEDA3CBDDA3C290FC90A6009509D
DA3CCA60D8A900859885B3E6,16
1810 DATA 99A5B5F03DC694D039A906859 4A2
0520233A902EA909202E3A20123ACA20233A90
20A909202E3A20233A9016A9,64
1820 DATA 05202E3ACA20233A900BA90085B5
20FB39A93085C8A5992903D044AD78024A4A49
03AABD573D1865A3C90BB032,450
1830 DATA 85A3AA0A0A0A0A09088DBD40BDA5
3C8587BDB03C8586BDBB3C8589BDC63C85888A
0A0AA8A203B9E53C9D5D5EC8,672
1840 DATA CA10F63053C69FD04FA905859FA5
93F00CA5B6C902D04120D9304C1C3BAD8402D0
36854DA20FBDAD3FF008CA10,71
1850 DATA F88EBD403025ADC74049018DC740
38E92C9DBD3FA94D9DCD3FA9009DDD3F9DED3F
FEAD3FA91085C7204833A203,520
1860 DATA A5B81D08D0CA10FA290185B8205C
398D1ED0A5992903F013A5C7F009C6C7A5C78D
00D209208D01D24C623BA5A9,807
1870 DATA F0F68DC40209408D01D2AD0AD229
1F1869288D00D2C6A9A5C5F039A5992901D03F
A5AC09A08D03D2C6AC1034C6,195
1880 DATA AD100AA90085C585AC85ADF01AA6
ADBD993B8D02D2A205C93CD002A20A86ACD012
3C483C485B79A5C6F0058D02,432
1890 DATA D2A9A88D03D2A5B638E902F043A5
CCF00E8D04D2A9A88D05D2A90085CCF034A5A5
F02DA5B6F014A5A54809C08D,713
1900 DATA 05D2680A0A0A1869788D04D2D018
E6A7A5A7290F85A7AABD653C8D04D2A5A5187D
953C8D05D2A9008D07D2A5CA,828
1910 DATA F00FAABD7E3C8D06D2BD783C8D07
D2C6CAA5C9F00C8D06D2AABD6E3C8D07D2C6C9
A5C4F00FAABD643C8D06D2BD,54
1920 DATA 5A3C8D07D2C6C4A5CBF00D0A0A0A
8D06D2A9A68D07D2C6CBA5C8F010A9508D06D2
C6C8A5C8290F09A08D07D24C,707
1930 DATA 5FE4A3A4A5A7A9A8A7A6A8AA0406
090B0F0C110D130E0C0A0806050403020201 45
47494B4D4F0A0E12161A1E0A,444
1940 DATA 0B0C0D0E0D0C0B0A090807060708
0903020100030201000201000202000 1001F23
4C80BE004280B4DDE1FFFFFF,659
1950 DATA FFFF000000000000BE804C231F00
1F234C80BEFFFFFFFFFFFFFFFFFFFFFF00004C
0000500000000000 5A00004E,218
1960 DATA 0000000000F8F8000078F0400038
7060003870702038387070383838383838 1C1C
381C1C08381C0C003C1E0400,752
1970 DATA 3E3E0000387C7CFEFEFE0000022A
022800000F3F302A022800000000000000000
000000220A022800000000 80,452
1980 DATA A880280000F0FC0CA88028000000
0000000000000000000088A08028000000FF0100
465A41505050504650505A50,293
1990 DATA 28461E32461E411E322D28231E19
15120E0B08050A141E1E282832323C3C464650
5A646EFFC0B0A0907050 3023,92
2000 DATA 1E19140F0A0503BF3F1F1414222C
36120B0808161624243232000000000000000
0000000000000000000000000,918
2010 REM * 4545 BYTES
```

●

CHECKSUM DATA.

(see page 14)

```
10 DATA 739,351,496,811,423,729,200,60
3,555,573,694,613,29,205,198,7219
160 DATA 743,198,962,629,491,30,155,12
4,274,789,611,88,347,182,85,5708
1060 DATA 634,165,43,876,69,897,571,34
7,414,392,295,101,330,269,918,6321
1210 DATA 974,171,725,922,777,808,758,
834,123,815,60,877,73,911,795,9623
1360 DATA 749,82,872,69,877,873,700,38
3,818,147,679,112,907,876,996,9140
1510 DATA 853,114,32,335,492,839,812,1
05,986,705,19,992,8,980,871,8143
1660 DATA 982,790,842,967,169,305,797,
967,346,93,957,33,729,864,502,9343
1810 DATA 828,763,250,183,320,969,166,
8,165,53,620,181,706,449,18,5679
1960 DATA 225,106,124,707,902,634,2698
```

●

Due to the extreme length of the assembly language listing for ***Incoming!*** *and lack of space this issue, it has been omitted from the issue. The listing can be found on the* ***ANALOG Computing TCS*** *and CompuServe, on the Atari SIG.* —*Ed.*

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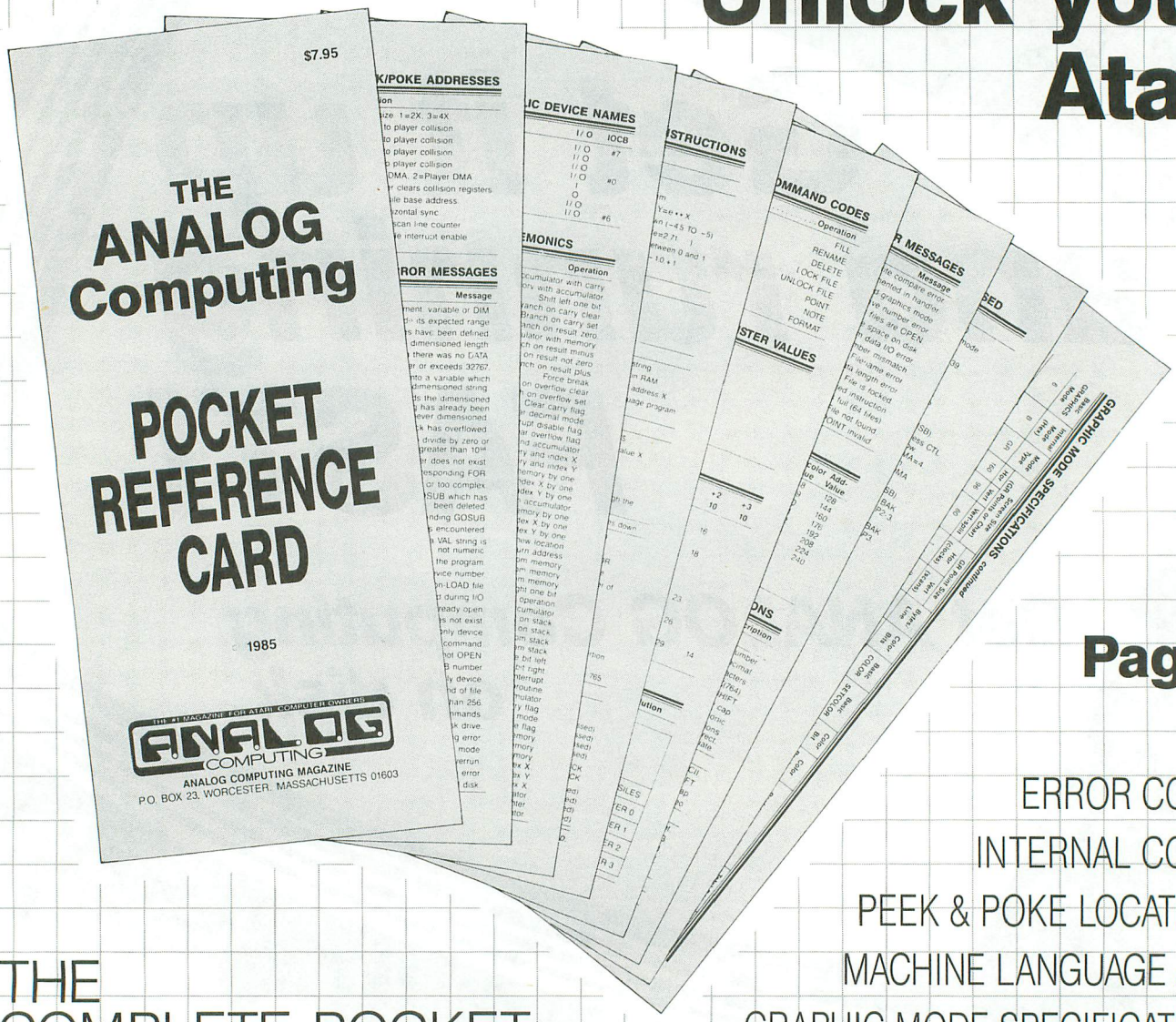

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by Arthur Leyenberger

In the last ten years, I've used more word processors than I can remember, to process hundreds of thousands of words. I've used Atari, CP/M, MS-DOS and minicomputer programs, ranging from the powerful to the ridiculous. Of all of these, about a handful have been useful, workhorse performers that have met the majority of my needs. One of the best all-around word processors is **Wordstar** from Micropro.

I've used it on my ATR8000 CP/M system, a Kaypro 10 and an AT&T 6300 PC. Why do I mention **Wordstar** in a review about an Atari word processing program? Because **PaperClip** from Batteries Included is almost as powerful as —and definitely easier to use than — **Wordstar**.

This ease of use is important, for both the novice (or casual writer) and the more experienced user. When a program is simple to use, the mechanics of writing—whether a letter to your sister in Florida or that short story for *Harper's* magazine—don't interfere with the writing process.

PaperClip was created by Steve Ahlstrom and Dan Moore, the same folks who wrote **SynFile** for Synapse. It will run on all Atari computers with at least 48K memory. The program uses a special plug, called a "dongle," that has to be inserted into joystick port 2 when the program's used.

However, the disk can be backed up. Some people don't like having to use a dongle, but I find this form of copy protection to be superior to noncopyable, protected disks.

PaperClip is written entirely in machine language and uses the Action! screen editor. Since it uses ANTIC mode 3 and a redefined character set, the letters on the screen are large and sharp, and have true descenders. The program is also fast, much faster than other word processors for the Atari.

PaperClip has two entry modes: insert and regular. In the regular mode, the characters you type appear at the cursor's position as it moves across the screen. In the insert mode, the characters you type are inserted into the text just before the cursor's position.

What I like best about **PaperClip** is the way in which its authors paid attention to important details. There are a number of exceptionally useful features not found in any other word processor. For example, I'm a fast four-finger typist. That means I can machine-gun in text, but I make an awful lot of mistakes. The majority of these are transposed letters within a word—such as *hte* instead of *the*. With **PaperClip**, I don't need to retype the word. I use the letter toggle to exchange the two letters, with just one command.

Two other useful toggles are case and word toggle. The case toggle allows you to change a capital letter to lower case and vice versa, with one command. Similarly, the word toggle lets you switch the position of two adjacent words.

A unique feature of **PaperClip** is its ability to display two different files onscreen at the same time. Using the dual text windows, one file can be displayed in each window, and you can easily move blocks of text between the windows.

PaperClip automatically remembers the name of the last file read into each window, so saving your work (from either window) is as simple as moving to that window and giving the Write command. Also, each editing window can be set to a specific size, cleared (with a built-in *are you sure?* check) and scrolled.

Another feature unique to **PaperClip** is its built-in word count. Students and authors will appreciate the ability to determine instantly the number of words in the file currently in memory. This can be done at any time. The program actually counts the spaces between the words, to get a fairly accurate estimate of the number.

PaperClip has several time-saving and powerful capabilities, too. One-key macros can be defined and used to add a letter, word or phrase with the touch of a single key. Words, phrases, or even paragraphs that you constantly use in your writing, are called *boilerplate*.

Macros allow you to store boilerplate in a special buffer and enter them into text with a single keystroke. These macro definitions are stored in separate files

and can be loaded or changed at any time.

For example, using **Paperclip** to write this review, I saved the words ***PaperClip***, *Batteries Included* and *Atari* as keyboard macros. Then, as I need to insert one of these words, I simply press the START key and the designated macro key, and my word or phrase appears instantly. No need to type the entire word or phrase each time I want to use it.

There's an auto-save feature that will automatically save the text file you are currently working on, after a predescribed number of keystrokes. The number of characters can range from 100 to 32000, and this feature can be turned off, if you like. The program even warns you ten characters before performing the autosave action. If you've ever had your computer lose power before you had a chance to save your work, you'll certainly appreciate this feature.

Another time-saving feature of **PaperClip** is the ability to use DOS commands from within the word processor. You can do a directory listing on any disk in your system, lock, unlock, erase and rename files with simple commands. Disks can even be formatted from within the program. **PaperClip** uses MachDOS for disk input/output, so different density disk drives can be used with the program.

A host of editing commands are available in **PaperClip**. Text can be inserted, deleted, and cut and pasted. If you accidently delete a portion of text, there's an undo command to get it back.

In addition, tags can be placed anywhere in your text. Tags act like bookmarks, so that you can return to a specific place within your text with a single keystroke. This is very handy when you need to temporarily refer to an earlier portion of your work. It also helps avoid losing your place as you move around within your file.

PaperClip contains the usual find and replace functions found in other word processors, but it goes one step further. You can perform a global substitution, not just in the file you're currently using, but in other files located on up to four different disk drives. Since files may be linked together for chain printing, **PaperClip** uses the linking information for the find and replace operation as well.

What else can **PaperClip** do? Perhaps a better question would be, what can't it do? The **PaperClip** master disk contains printer configuration files for most of the popular printers used with Atari computers. If your off-the-wall printer is not already included in the thirty-plus drivers on the disk, you can create your own configuration file. You can also send printer control codes to your printer from within the body of your text.

Of course, you can set margins and page length, screen colors, underline and center text, and print boldface and italic (if your printer supports them). Superscripts, subscripts, headers, footers and page numbering can also be performed. There's a built-in math calculator for quick computations. You can print two-column output to your printer and perform a mail-merge with data in **SynFile**.

There's also a print preview option, that lets you see how your printed text will appear on the screen. This lets you scroll vertically and horizontally, to see exactly how your words will fit on the page.

Did someone say *help*?

PaperClip contains a series of help files, available for on-line use, that contain listings of the commands. One help file contains information necessary for file manipulation commands. Another lists printer control codes, and the third presents all of the program editing commands. Not only did Batteries Included think to provide help files, they've allowed you to manipulate the help files.

Each of these files can be read into **PaperClip** as a regular text file, then edited and saved on the disk. This technique can be used to tailor the help information for yourself, or for someone else who may be using the program.

The documentation that accompanies the package is well written and easy to understand. In addition to the sections on editing, options and special commands, the manual contains an index and glossary. Again, attention to detail makes **PaperClip** an attractive package.

As you've seen, **PaperClip** is a complete word processor. In many ways, it rivals **Wordstar**—and often goes beyond. I've previously recommended three Atari word processors, in **ANALOG Computing** and elsewhere. They are: **AtariWriter** (Atari Corp.), for general, casual use; **Letter Perfect** (LJK), for more sophisticated use; and **The Writer's Tool** (OSS), for heavy-duty needs. I hereby amend my list, adding **PaperClip**, for both general writing needs and heavy-duty use.

Dynamic Displays

Animation for your screen

by Clayton Walnum

A few months ago, I was in the process of designing a text adventure. Being the incredibly creative guy that I am (modest, too), I wanted to come up with a screen display different from anything I'd seen in this type of game. I sat down with some graph paper, a pencil and a head full of marvelous possibilities, and started scribbling. I tried all kinds of borders and windows and modified display lists, but nothing was exactly what I wanted. Finally, an idea occurred to me: why not use some simple animation to spice things up?

It might look neat, for instance, to have a fancy screen border filled with pulsating and spinning globes. Snatching up the graph paper, I proceeded to wear down my pencil a bit more and, at last, came up with a rough idea of what I wanted.

Nothing is ever simple.

The trouble was that there were almost 100 characters I wanted to animate in the border. How was I going to accomplish that? Player/missile graphics were out. There was no way I was going to get 100 players on-screen at once. That left me to use a redefined character set.

A simple animation method in text mode is to redefine several characters, then print them one on top of the other in rapid succession. Unfortunately, I was going to be writing this game in the notoriously slow BASIC. I was never going to have time to print 100 characters every quarter of a second.

Well, suppose I created not one, but *several* new character sets? I could compose each "frame" of the animation in a different set using a single character, then simply flip between the sets to create the animation. For instance, I could take the number sign (#) in the first set, redefine it to look like a small globe, then redefine the # in the second set as a medium-sized globe and, finally, change the # in the third set to a large globe. This would give me three-frame animation, using only one character.

Now I was getting somewhere! Using this method, I would only have to print the characters to the screen once. It wouldn't matter if there were 1 or 901. I could fill the entire screen with dancing, spinning globes—with no effort at all.

Well, maybe a *little* effort. I still had to find a way to flip between the character sets without bogging down the program. Life is tough.

A short technical lecture.

Believe it or not, there are times—even when running something as slow as BASIC—when your computer has nothing to do but sit around and wait. One of those times is during the vertical blank (VB) period.

What's a VB? The image on your screen is actually made up of many vertical lines, stacked one upon the other. These lines are drawn one by one, from the top of your screen to the bottom. When the last line is drawn, the screen is blanked, and the beam is returned to the top. This process is completed sixty times a second. The time it takes for the electron

beam to move from the bottom of the screen to the top is the VB.

It only takes a split second for the beam to start drawing the next screen image, but, to your computer, it seems like an eternity. After all, the only thing it has to do during this period is update the hardware registers (over a dozen of them) from their shadows, decrement the system timers, get a character from the keyboard register, handle the keyboard debounce counter, take care of the keyboard auto-repeat routines, process the attract mode registers, read the game controller hardware registers and increment the real-time clock. Any self-respecting microprocessor can handle these minor annoyances in a few microseconds or so. After that it's boredom city—nothing to do but hang around for a century or so, waiting for the VB to end.

I decided to cure my computer's VB blues by giving it something to do. and what task do you suppose I picked? Flipping character sets, of course!

Enter the VBI.

The clever people who designed our machines were concerned about computer boredom, too, so they supplied us with a little thing they call the vertical blank interrupt (VBI).

The VBI allows us to get our computer's attention and keep it occupied during the VB. What's really special about the VBI is that, since it's performed at a time specially allotted for system use, it doesn't affect our program at all. In other words, my adventure game wouldn't even know it was there!

There is, however, one minor problem (nothing is ever simple, remember?) in utilizing the VBI. The routine that you wish executed must be written in machine language. But don't panic! If you don't understand machine language, you haven't read all this for nothing. I'll supply you with everything you need to get started.

Not only must the routine we want to run during the VB be written in machine language, but the VBI initialization must be, too. If you don't have experience with machine language, you might want to skip ahead to the next section, since I'm going to quickly explain how to get a VBI up and running.

Initializing the VBI is really quite simple. All you have to do is place the MSB of the routine you want executed in the X-register, the LSB in the Y-register, and a 6 or 7 in the accumulator, depending on whether you want deferred or immediate mode. In a deferred mode VBI (7), your routine isn't executed until the system housekeeping has been completed. In the immediate mode (6), your routine will be executed first thing on entering the VB.

After setting up the registers, just perform a JSR through SETVBV ($E45C), followed by an RTS. Make sure your routine is in place and ready to run before you initialize the VBI, because as soon as you perform that JSR, the computer is going to start running your code—at the address you specified, sixty times a second. If you haven't installed it yet, you're in for a system crash.

When writing your VBI routine, there are a couple of things you should be aware of. First of all, when you initially enter the routine, be sure to save any registers you'll be working with, and remember to restore them before you exit. That way, when the computer resumes normal processing, nothing will have changed. Second, you must exit your routine by performing a JMP through XITVBV ($E462) if you're in the deferred mode, or through SYSVBV ($E45F) if you're using immediate mode.

It works (sort of)!

After writing the VBI routine, I had everything I needed to make that animated text-adventure screen a reality. A few minutes later, I forced my wife into the desk chair. She stared at all those throbbing globes for a minute and said, "Well, it looks pretty nice, but it's awfully distracting. It's hard to concentrate on the text."

Of course, I argued the point for a while, but only to save face. She was absolutely correct. There was no way a player would be able to concentrate on the game with all that motion going on. So I scrapped the whole animation idea, and finished the game with a static display. (For those of you who are interested, the end result was **Nightshade** in **ANALOG Computing**'s issue 36.)

What's this all about, then?

You're probably wondering, and rightly so, why I went to all this trouble to tell you about one of my failures. Okay, so it didn't work well with **Nightshade**, but the fact is that it *does* work, and you can get some great effects—with a little experimentation.

To show you some of the possibilities, I did up a demo program and created a subroutine that you can use in your own programs.

Typing time.

Listing 1 is the body of the demo program. Type it in, then use **Unicheck** (see page 14) to find any errors. When you've corrected all typos, SAVE a copy of the program to disk or cassette. If you're using a disk, type the command *SAVE "D:DEMO.BAS"* and

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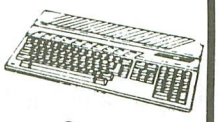

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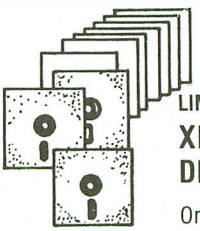

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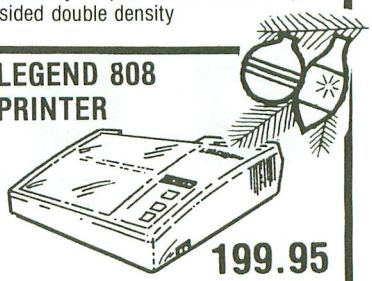

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CIRCLE #124 ON READER SERVICE CARD

press RETURN. Cassette users should ready a blank tape, then type *CSAVE*, followed by two RETURNs.

Listing 2 is the subroutine that creates the VBI routine and sets up memory for the character sets. Clear Listing 1 from your computer by typing *NEW*, followed by RETURN. Now type in Listing 2. Use **Unicheck** to make sure everything's okay, then LIST a copy to disk or cassette, using the commands *LIST "D:VBISUB.LST"* or *LIST "C:"*, respectively. Now you're ready to see some of the great stuff you can do with redefined character sets and VBIs.

LOAD the demo program into your computer (*LOAD "D:DEMO.BAS"* or *CLOAD*), then ENTER the subroutine (*ENTER "D:VBISUB.LST* or *ENTER "C:"*). Now type *RUN* and press RETURN.

Listing 3 is the assembly language source code, created with the OSS MAC/65 assembler. You don't need to type this listing; it's included for readers interested in assembly language.

The screens.

The first demo screen was created using four character sets for the animation. Only the ampersand (*&*) character in each set is being used.

The second demo screen uses two character sets. The open parenthesis (*[*) and apostrophe (*'*) characters have been redefined in such a way as to cause screen artifacting. Graphics 0 in color!

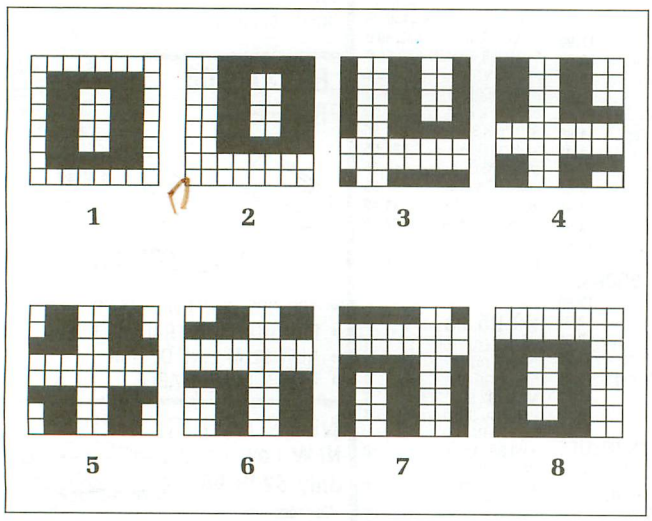

Figure 1.
Redefined characters.

Screen three demonstrates a form of animation you've probably seen a lot. It utilizes four character sets. **Space Invaders**, anyone?

Screen four is my personal favorite. This is a simulation of fine scrolling, accomplished by flipping between eight (that's right, eight!) character sets. Believe it or not, it uses only the number sign character. Since this display is the most complicated and intriguing, I've included some diagrams illustrating how the character sets were redefined (see Figure 1). I wish I could take full credit for this one, but the idea for this screen came from Charlie Bachand, who also designed the character set (thanks, Charlie).

Got any ideas?

Now that you've seen some of the things you can do with this technique, you're probably anxious to try some experiments of your own.

You can use the subroutine I've provided to build your own animated screens. Start by loading the subroutine (Listing 2) into your computer. Set the variable NUMSETS in Line 10 equal to the number of character sets you wish to use, then place the data for your redefined characters into data statements, starting at Line 31000. Be sure to start each character's data with the character's location within the set (starting with *0*), and end the data for each set with *-1*. Now, a simple GOSUB 30000 will set up your character sets and install the VBI.

For those of you who have had no experience with redefined character sets, I refer you to **Create-A-Font** from issue 16, and **Create-A-Font Datamaker** from issue 22. These articles will give you a basic (no pun intended) understanding of character sets, as well as provide you with excellent utility programs for designing your own. I used both programs for the character data found in the demo program.

Once you've got your character sets and VBI routine in place, you get the whole thing hopping with the statement *A=USR(1547,N,T,A)* where *N* is the number of character sets to be used, *T* is the length of time (in sixtieths of a second) you wish between each frame of the animation, and *A* is the address of the first character set. The BASIC subroutine automatically stores this address in the variable CHSET.

It's all yours.

One word of warning: this method of animation can use a good deal of memory. Each character set takes 1024 bytes, so if you use eight character sets, you can kiss 8K goodbye. If you're writing a lengthy program, you may find that you can't spare this much memory.

Also, the VBI routine takes up the first 100 bytes of page 6, so don't try to use this in your own program. If you do, you'll be in for a nasty surprise. ■

(Listing starts on page 56)

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CIRCLE #125 ON READER SERVICE CARD

Listing 1.
BASIC listing.

```
20 A=USR(1547,4,10,CHSET)
30 GRAPHICS 0:POKE 710,0:POKE 752,1:PO
KE 559,0:? CHR$(125):? :?
40 ? "  ┌──────────────────────────────
┐"
50 ? "  |& & & & & & & & & & & & & & &
|"
60 ? "  | ┌──────────────────────────┐
|"
70 ? "  |&|                          |&
|"
80 ? "  | |                          |
|"
90 ? "  |&|   A LITTLE ANIMATION     |&
|"
100 ? "  | |                          |
 |"
110 ? "  |&|    CAN REALLY SPICE      |
&|"
120 ? "  | |                          |
 |"
130 ? "  |&|      UP A SCREEN!        |
&|"
140 ? "  | |                          |
 |"
150 ? "  |&|                          |
&|"
160 ? "  | └──────────────────────────┘
 |"
170 ? "  |& & & & & & & & & & & & & & &
&|"
180 ? "  └──────────────────────────────
┘":POKE 559,34
190 FOR X=1 TO 1500:NEXT X:POKE 559,0
200 A=USR(1547,2,10,CHSET):? CHR$(125)
210 ? "┌──────────────────────────────
──┐"
220 ? "|((((((((((((((((((((((((((((((
((((((|"
230 ? "|(┌──────────────────────────────
──┐(|"
240 ? "|(|'0'0'0'0'0'0'0'0'0'0'0'0'0'0'0
'0'|(|"
250 ? "|(|0'0'0'0'0'0'0'0'0'0'0'0'0'0'0'
0'0|(|"
260 ? "|(|'0┌──────────────────────────
┐0'|(|"
270 ? "|(|0'|''''''''''''''''''''''''''
|'0|(|"
280 ? "|(|'0|'                         '
|0'|(|"
290 ? "|(|0'|' COMBINING ARTIFACTING '
|'0|(|"
300 ? "|(|'0|'WITH MULTIPLE CHARACTER'
|0'|(|"
310 ? "|(|0'|'    SETS CAN YIELD     '
|'0|(|"
320 ? "|(|'0|' SOME STRANGE EFFECTS  '
|0'|(|"
330 ? "|(|0'|'                         '
|'0|(|"
340 ? "|(|'0|''''''''''''''''''''''''''
|0'|(|"
350 ? "|(|0'└──────────────────────────
┘'0|(|"
360 ? "|(|'0'0'0'0'0'0'0'0'0'0'0'0'0'0'0
'0'|(|"
370 ? "|(|0'0'0'0'0'0'0'0'0'0'0'0'0'0'0'
0'0|(|"
380 ? "|(└──────────────────────────────
──┘(|"
390 ? "|((((((((((((((((((((((((((((((
((((((|"
400 ? "└──────────────────────────────
──────┘":POKE 559,34
410 FOR X=1 TO 1500:NEXT X
420 GRAPHICS 2:POKE 559,0:POKE 752,1:P
OKE 710,166:POKE 711,106:A=USR(1547,4,
10,CHSET)
430 POSITION 2,2:? #6;"$ $ $ $ $ $ $ $
":POSITION 2,4:? #6;"z z z z z z z z"
440 POSITION 2,6:? #6;"▒ ▒ ▒ ▒ ▒ ▒ ▒ ▒
":POSITION 2,8:? #6;"g g g g g g g g"
450 ? :? " SOME SIMPLE FOUR-FRAME ANIM
ATION":POKE 559,34
460 FOR X=1 TO 1500:NEXT X
470 GRAPHICS 17:POKE 559,0:POKE 752,1
480 A=USR(1547,8,1,CHSET)
490 FOR X=0 TO 6:? #6;"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒
▒▒▒▒▒▒":NEXT X:FOR X=15 TO 22:POSITION 0
,X:? #6;"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒":NEXT X
500 POSITION 4,8:? #6;"HOW ABOUT A":PO
SITION 3,10:? #6;"SIMULATION OF"
510 POSITION 2,12:? #6;"FINE SCROLLING
@":POKE 559,34
520 FOR X=1 TO 1500:NEXT X:POKE 559,0:
GOTO 20
31000 REM ******* FONT 1 DATA *******
31010 DATA 3,0,126,102,102,102,102,126
,0
31020 DATA 4,56,56,16,56,84,186,40,40
31030 DATA 5,0,0,0,135,252,48,48,0
31040 DATA 6,0,0,0,24,60,24,0,0
31050 DATA 7,84,170,254,170,170,254,17
0,84
31060 DATA 8,170,170,170,170,170,170,1
70,170
31070 DATA 49,0,0,90,184,60,36,36,0
31080 DATA 56,36,36,60,52,44,60,36,36
31090 DATA 58,0,126,66,90,90,66,126,0
31100 DATA -1
31110 REM ******* FONT 2 DATA *******
31120 DATA 3,63,51,51,51,51,63,0,0
31130 DATA 4,56,56,16,254,16,56,68,68
31140 DATA 5,0,0,0,135,252,0,0,0
31150 DATA 6,0,0,60,126,126,126,60,0
31160 DATA 7,42,85,127,85,85,127,85,42
31170 DATA 8,85,85,85,85,85,85,85,85
31180 DATA 49,0,0,219,60,60,36,66,0
31190 DATA 56,0,102,60,44,52,60,102,0
31200 DATA 58,255,129,189,165,165,189,
129,255
31210 DATA -1
31220 REM ******* FONT 3 DATA *******
31230 DATA 3,153,153,153,153,159,0,0,1
59
31240 DATA 4,186,186,84,56,16,56,68,13
0
31250 DATA 5,0,48,48,183,252,0,0,0
31260 DATA 6,60,126,255,255,255,255,12
6,60
31290 DATA 49,0,129,90,60,60,165,66,0
31300 DATA 56,0,0,255,52,44,255,0,0
31310 DATA 58,0,126,66,90,90,66,126,0
31320 DATA -1
31330 REM ******* FONT 4 DATA *******
31340 DATA 3,204,204,204,207,0,0,207,2
04
31350 DATA 4,56,56,16,254,16,56,68,68
31360 DATA 5,0,0,0,135,252,0,0,0
31370 DATA 6,0,60,126,126,126,126,60,0
31400 DATA 49,129,129,90,60,189,165,66
,0
31410 DATA 56,0,102,60,44,52,60,102,0
31420 DATA 58,255,129,189,165,165,189,
129,255
31430 DATA -1
31440 REM ******* FONT 5 DATA *******
31450 DATA 3,102,102,231,0,0,231,102,1
02,-1
31460 REM ******* FONT 6 DATA *******
31470 DATA 3,51,243,0,0,243,51,51,51,-
1
```

```
31480 REM ******* FONT 7 DATA *******
31490 DATA 3,249,0,0,249,153,153,153,1
53,-1
31500 REM ******* FONT 8 DATA *******
31510 DATA 3,0,0,252,204,204,204,204,2
52,-1
```

●

CHECKSUM DATA.

(see page 14)

```
20 DATA 377,899,313,547,584,861,833,23
7,748,999,754,618,760,787,605,9922
170 DATA 581,550,922,469,300,499,35,53
4,921,935,726,30,65,836,471,7874
320 DATA 588,401,335,334,542,929,68,52
2,761,360,456,865,668,159,375,7363
470 DATA 874,392,222,4,608,750,292,418
,190,888,539,571,606,741,153,7248
31090 DATA 172,819,296,889,198,361,883
,78,63,735,122,906,822,300,486,7130
31240 DATA 339,908,570,191,699,159,825
,304,442,204,367,22,558,109,912,6609
31430 DATA 828,308,693,313,200,318,768
,304,713,4445
```

●

Listing 2.

```
10 NUMSETS=8:GOSUB 30000
30000 FOR X=0 TO 85:READ A:POKE 1547+X
,A:NEXT X
30010 DATA 104,104,104,141,8,6,104,104
,141,10,6,160,0,104,153,0,6,200,204,8,
6,240,5,24,105
30020 DATA 4,208,242,104,169,0,141,9,6
,133,20,169,7,162,6,160,57,32,92,228,9
6,72,138,72,165
30030 DATA 20,205,10,6,208,24,169,0,13
3,20,174,9,6,189,0,6,141,244,2,232,236
,8,6,208,Z
30040 DATA 162,0,142,9,6,104,170,104,7
6,98,228
30050 REM * 86 BYTES
30060 REM ******* LOAD CHAR SETS******
*
30070 POKE 106,PEEK(106)-NUMSETS*4-1:G
RAPHICS 0:CHSET=(PEEK(106)+1)*256:? "O
NE MOMENT"
30080 CHI=CHSET/256
30090 DIM XFR$(28):RESTORE 30100:FOR N
=1 TO 28:READ ML:XFR$(N,N)=CHR$(ML):NE
XT N
30100 DATA 104,169,0,133,205,168,169,2
24,133,206,177,205,145,203,200,208
30110 DATA 249,230,204,230,206,165,206
,201,228,208,239,96
30120 FOR X=0 TO NUMSETS-1:POKE 203,0:
POKE 204,CHI+X*4:XFR=USR(ADR(XFR$)):NE
XT X
30130 RESTORE 30180:FOR X=0 TO NUMSETS
-1
30140 READ A:IF A=-1 THEN NEXT X:RETUR
N
30150 FOR Z=0 TO 7:READ J:POKE CHSET+(
1024*X)+A*8+Z,J:NEXT Z
30160 GOTO 30140
```

CHECKSUM DATA.

(see page 14)

```
10 DATA 382,897,159,479,730,88,577,581
,639,727,45,480,35,235,556,6610
30140 DATA 435,540,203,1178
```

●

Listing 3.
Assembly language listing.

```
;DYNAMIC.SRC
;
;*****************************
;*                           *
;*        VBI ROUTINE        *
;*           for             *
;*    "DYNAMIC DISPLAYS"     *
;*                           *
;*****************************
;
;SYNTAX: A=USR(1547,N,T,A)
;
;"N" is # of character sets
;"T" is timer value (1 - 255)
;"A" is adr of 1st char set
;
        .OPT OBJ
;
        *=  $0600
;
;       EQUATES
;       -------
;
TABLE   *=  *+8
NUMSETS *=  *+1
INDEX   *=  *+1
TIME    *=  *+1
;
RTCLOK  =   $14
CHBAS   =   $02F4
SETVBV  =   $E45C
XITVBV  =   $E462
;
;      INITIALIZE
;      ----------
;
        PLA             ;# of arguments
        PLA             ;ignore HI byte
        PLA             ;# of char sets
        STA NUMSETS     ;store it
        PLA             ;ignore HI byte
        PLA             ;get timer value
        STA TIME        ;and store it
        LDY #0          ;initialize table index
        PLA             ;HI byte of char set adr
LOAD
        STA TABLE,Y     ;put in table
        INY             ;increment table index
        CPY NUMSETS     ;all done loading?
        BEQ SETVBI      ;not yet
        CLC             ;prepare for addition
        ADC #4          ;+4 to adr in A
        BNE LOAD        ;go store it
SETVBI
        PLA             ;ignore LO byte
        LDA #0          ;zero accumulator
        STA INDEX       ;initialize index
        STA RTCLOK      ;initialize timer
        LDA #$07        ;deferred mode VBI
        LDX #$06        ;MSB of VBI handler
        LDY #$39        ;LSB of VBI handler
        JSR SETVBV      ;initialize VBI
        RTS             ;back to BASIC
;
;    VBI HANDLER
;    -----------
;
        PHA             ;save accumulator
        TXA             ;load A from X
        PHA             ;save X register
        LDA RTCLOK      ;get timer value
        CMP TIME        ;time to make switch?
        BNE OUT1        ;nope
        LDA #0          ;yep!
        STA RTCLOK      ;reinitialize clock
        LDX INDEX       ;initialize table pointer
        LDA TABLE,X     ;get adr of char set
        STA CHBAS       ;and switch 'em
        INX             ;increment pointer
        CPX NUMSETS     ;at end?
        BNE OUT         ;not yet
        LDX #0          ;reinitialize pointer
OUT
        STX INDEX       ;store pointer
OUT1
        PLA             ;get value for X
        TAX             ;and restore it
        PLA             ;restore accumulator
        JMP XITVBV      ;all done!
```

●

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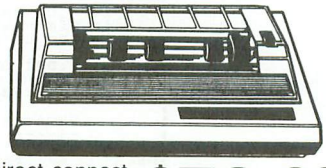

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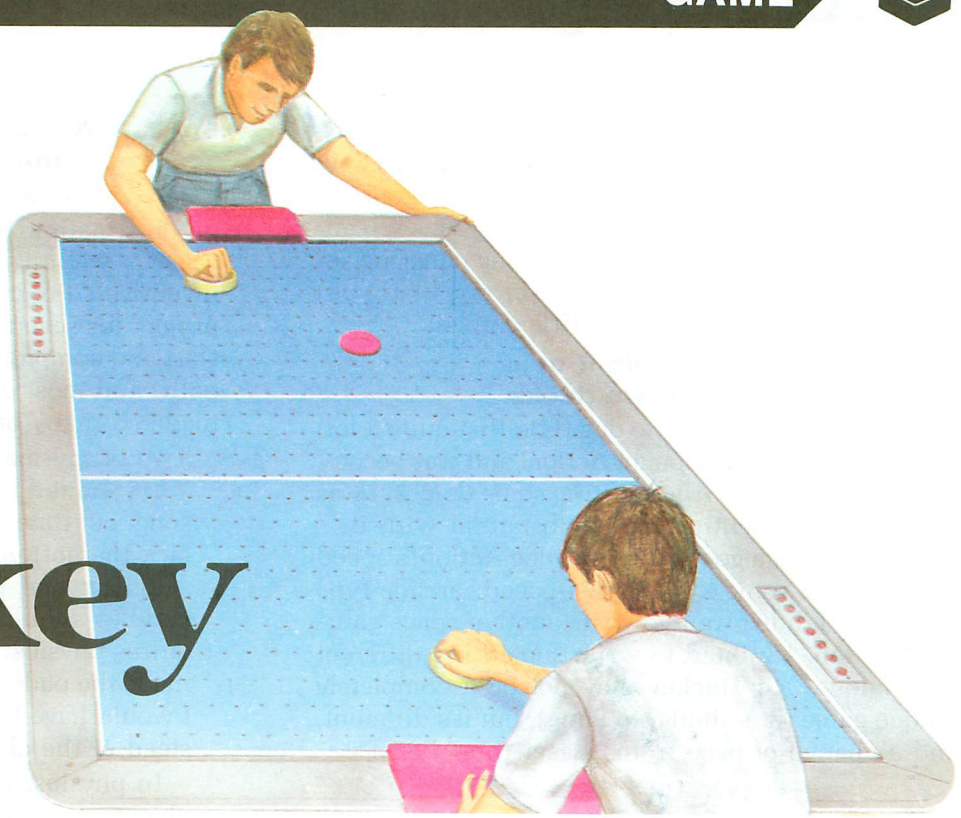

Air Hockey

by Chris Page

Air Hockey is written in Action! and must be compiled off of a disk or tape (the source and object code won't fit in memory together). So type it in, SAVE it, clear the editor, go to the monitor and RUN it, thusly: R "FILENAME" (substituting the device and filename you saved it under for "FILENAME"—I used *"D:AIRHOCKE.Y"*).

Once you have it running properly, you should see the title screen and hear the title music (the "Peter Gunn" bass line). Press START.

Now you should see the options screen (it has the word *OPTIONS* at the top). You can use the OPTION key to highlight a different option, SELECT to change the option and START to play the game.

The options available in **Air Hockey** are:

Friction — This can be ON or OFF. If the friction is on, the puck will have a tendency to slow down while travelling across the board. You may notice that it sometimes curves as it slows down. This is because I used integer values instead of floating point. This means that the motion is not 100 percent accurate, resulting in the curved motion of the puck.

Velocity — This can be 2 through 9 and indicates the maximum velocity of the puck. Option 2 is slowest; 9 is fastest.

Bounce — This can be 0 through 9, indicating the amount of "bounce" to the puck, or how well it retains velocity after hitting the side of the board. A 9 means that the puck will not slow down on collision; 0 indicates very little bounce and will cause the puck to slow down considerably if it hits the sides.

Win — This is the score up to which the player(s) will play. It can be from 10 to 90, in increments of 10.

Players — Either 1 or 2. If one player is selected, then the player should use joystick port 1 and control the top player; the computer will control player two, the bottom player. If two players are selected, then it's the same, except that player two will be controlled by joystick port 2.

Playing.

Once your options are set (or left alone, if you like the default settings) you may press START to play. You'll then see a vertical air hockey board with the scores displayed at the top, along with the score necessary to win the game. The puck will appear in front of the serving player's paddle. That player must hit the puck to start the game.

The game is something like **Pong**, with forward motion as well as side-to-side. Players control the paddles by moving the joystick in the direction they wish to move. The buttons do nothing. A score is made when the puck goes into the yellow goal area of a player, and the other player becomes the server.

If the puck gets stuck between players, as it can in real air hockey, you may re-serve by pressing the SPACE BAR. Also, while in the play mode, you may

press the ESCape key to exit the program. Finally, if you want to restart the game, press START anytime during the game (except during the goal sequence), and you'll be returned to the options screen.

When the game is over, there's a long cheering sequence with whistling fans (if the crowd likes you) before you're returned to the title screen.

Why I did it or a tail of two ducks.

I was sitting around one day (I do that quite a lot) last summer, had just bought Action! and was becoming familiar with it. After writing some demos, I was ready to do something more substantial with it.

I figured that a good way to utilize Action!'s speed was to write some kind of fast-paced, arcade-type game. But I didn't want to write another space game or **Pac-Man**. I wanted to write something different and unique. **Air Hockey** may not be a completely unique game (it *is* similar to **Pong**), but it's different, and a change of pace from "Laser the Aliens!"

A lesson in compromise or the quacker in the rye.

This program is an example of inventiveness, procrastination and compromise. "Inventive" because. . .well, it's a matter of opinion, but *I* think it's inventive. "Procrastination" because I dropped the project for several months at a time (check out the start and completion dates in the source listing). Finally, and most decidedly, "compromise" because I made so many of these concerning **Air Hockey**.

Two of my main compromises were:

1) I wanted more options and a complete title song, but time and a willingness to work (or the lack thereof) got in the way.

2) Everyone, including myself, thought that the paddles should have been round. But that requires physics. . .I barely passed physics. If I'd made the paddles round, as they are in real life, I would have had to resort to "real" physics instead of the chintzy method I did use.

In physics, you use vectors to describe how objects move, but this is a difficult thing in integers (well, difficult for me), which is what I was stuck with in Action! So I simply gave a horizontal and vertical speed and a horizontal and vertical direction.

These two compromises, however, were not as difficult or as important as my final compromise. I had to compromise on the one aspect, the most difficult thing, that every programmer must: completion of my goal. I had to stop work on a program which I felt was incomplete and short of my goals, and call it finished.

I realized this when I was telling my friends that I'd have to add the treble line to the title music before I'd submit it for publishing. As I told them this, I realized that the game is rather simple (as it was supposed to be) and that a full-blown song was superfluous. I then realized that other things I wanted to add were also not needed.

Actually, I had already met my goal (design a simple game as an exercise in Action!), but in the process, I'd created other goals—like adding the treble line.

I realized that I would continue creating goals as long as I was working on it; I would *never* finish the game. I'd sit, perma-bonded to my video screen, for the next ten years working on **Air Hockey** until it was 3-D, talked and had instant replay, a high score list, a theme song to put "Flight of the Valkyries" to shame, and a thousand other things. . .and I would still want to change something.

Program design and some ducks thrown in for effect.

I think the important thing here is to realize that, when you want to write a program, you should decide exactly what it will be like, so that you can say it is finished when it meets the description. I certainly did not. I designed and wrote it as I went along (this is painfully evident to me in the lack of unity and consistency in the program, the "patchwork quilt" look).

This has also led to my big problem: because the program is so disorganized, I invariably come to some sort of dead end and drop the project. I completely gave up on **Air Hockey** many months back, but, at the urging of two of my friends (D.S. and D.B.), I picked it up again and trudged through the tangled code to finish it. . . finally. This is what has kept me from finishing the other hundred or so projects I have stored away in dusty disk files.

I'm sure that if it were not for this fact, there would be thousands more programs available for computers through other users, magazines and distributors. Next time you start to put something off because it seems too difficult, back up and try again.

Oh yes, the ducks.

The ducks? Well, I thought I'd try to be a little different from the other articles gracing this magazine's fine pages. (*You* wondered about them, didn't you?) Have a duck, you'll feel better.

Chris Page is an eighteen-year-old from San Diego, who's studying for an A.A. degree in electronics at I.T.T. Technical Institute. He has worked with computers for seven years and owned an Atari 800 for four. His primary computing interests are in sound, graphics and human interfacing.

Listing 1.
Action! listing.

```
; ================
; =  Air Hockey  =
; =      by      =
; =  Chris Page  =
; ================

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; Special Thanks to:
; David Sullivan & David Becker

DEFINE
  OPTION="3",SELECT="5",START="6",
  NONE="7",LEFT="96",RIGHT="60",
  TOP="56",BOT="144"

BYTE
  NINDEX,VOLUME,FRICTION=[1],
  BOUNCE=[90],WIN=[10],PLAYERS=[2],
  HUE,LUM,OPT,PUCKXD,PUCKYD,HITFLAG,
  SERVER,GAMEOVER,SERVEIT,SDMCTL=559,
  CONSOL=53279,CHACT=755,WSYNC=54282,
  VCOUNT=54283,CRSINH=752,
  COLOR0=53270,COLOR1=53271,
  COLOR2=53272,COLOR3=53273,
  COLOR4=53274,RTCLOK=20,
  DMACTL=54272,LMARGN=82,RMARGN=83,
  CHBAS=756,PMBASE=54279,
  HITCLR=53278,P2PL=53262,
  GRACTL=53277,GPRIOR=623,
  RANDOM=53770,COLPM0=53266,
  COLPM1=53267,CH=764,RAMTOP=106,
  AUDCTL=53768,ATRACT=77,KEY

BYTE ARRAY
  DLIST,SCRMEM,RAMFONT,PMMEM($800),
  BAR(0)=[$FF$FF],
  PUCK(0)=[$60$F0$F0$F0$F0$F0$F0$60],
  TTOP(0)=['Q'R'R'R'R'R'R'S'S'S'S'R
           'R'R'R'R'R'E],
  TMID(0)=['R'T'T'T'T'T'T'T'T'T'T'T
           'T'T'T'T'T'R],
  TBOT(0)=['Z'R'R'R'R'R'R'S'S'S'S'R
           'R'R'R'R'R'C],
  NOTE(0)=[243 243 217 243 204 243
           193 204],
  YTOP(0)=[6 80],YBOT(0)=[62 144],
  SCORE(2),PDLX(2),PDLY(2),OSTIK(2),
  ROMSET($400)=$E000,HPOSP(4)=53248,
  HPOSM(4)=53252,PCOLR(4)=704

CARD
  PUCKXV,PUCKYV,PUCKX,PUCKY,
  MAXV=[500],DLISTL=560,SAVMSC=88,
  XITVBV=$E462


; --- Miscellaneous Procedures ---

PROC SETVBV=$E45C(BYTE CMD,VBIHI,
                  VBILO)


PROC VBI()
; VBI to play music
  SOUND(0,NOTE(NINDEX),10,VOLUME)
  SOUND(1,NOTE(NINDEX)-2,10,VOLUME)
  VOLUME==-1
  IF VOLUME=0 THEN
    VOLUME=15
    NINDEX==+1
    IF NINDEX=8 THEN
      NINDEX=0
    FI
  FI
; JMP XITVBV
  [$4C XITVBV]
RETURN


PROC INITVBI()
; Initialize music VBI
  NINDEX=0
  VOLUME=15
  SNDRST()
 ; set deferred vbi vector
  SETVBV(7,VBI RSH 8,VBI)
RETURN


PROC DEBOUNCE()
CARD I
; Debounce console keys
  FOR I=0 TO 5000 DO
    OD
    UNTIL CONSOL=NONE
    OD
```

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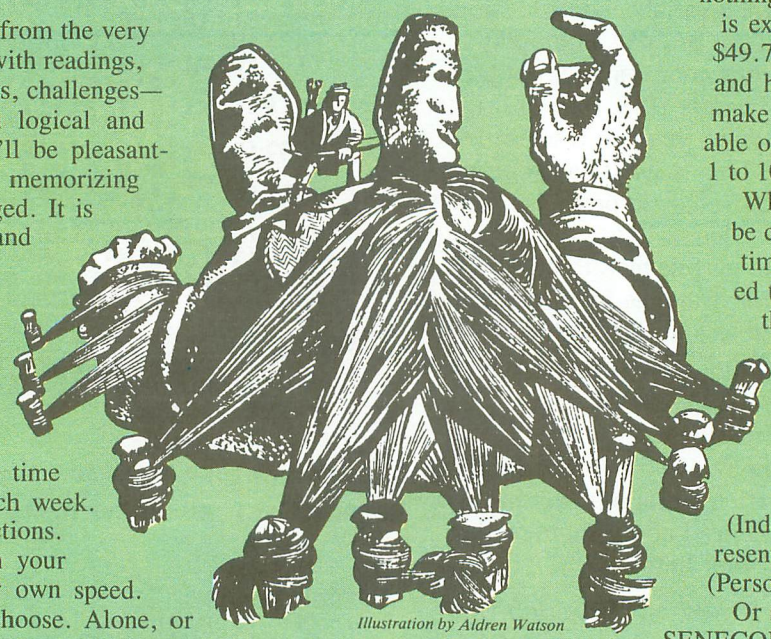

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City, State_____ Zip:_____

```
  OD
RETURN

; --- Title Screen ---

PROC INITTITLE()
BYTE I
; Initialize title screen
  GRAPHICS(0)
  GPRIOR=17
  GRACTL=0
  SDMCTL=0
  CRSINH=1
  HUE=0
  DLIST=DLISTL
  DO
    UNTIL VCOUNT=0
  OD
  FOR I=3 TO 5 DO
    DLIST(I+7)=DLIST(I)
  OD
  SETBLOCK(DLIST,10,$70)
  FOR I=13 TO 25 STEP 2 DO
    DLIST(I)=0
  OD
  SETBLOCK(DLIST+27,2,$70)
  SETCOLOR(1,0,14)
  SETCOLOR(2,0,8)
  POSITION(11,0)
  PRINT("Air Hockey")
  POSITION(1,1)
  PRINT("By: Chris Page")
  POSITION(29,1)
  PRINT("Thanks: D.S. and D.B.")
  POSITION(17,2)
  PRINT(
   "June 30, 1984 - August 9, 1985")
  POSITION(7,4)
  PRINT("Copyright (c) 1984")
  POSITION(34,5)
  PRINT("Press  START")
  SDMCTL=33
RETURN

PROC TITLECOLORS()
BYTE I
; Mid-screen color changes
  HUE==+2
  IF HUE&2 THEN
    CHACT==+1&3
  FI
  FOR I=0 TO 30 DO
    DO
      WSYNC=0
      COLOR4=VCOUNT LSH 1+HUE
      IF VCOUNT=48 THEN
        COLOR1=0
      FI
      UNTIL VCOUNT&128
    OD
  OD
RETURN

PROC TITLE()
; Display title screen
  INITTITLE()
  INITVBI()
  DO
    TITLECOLORS()
    UNTIL CONSOL=START
  OD
  SDMCTL=0
RETURN

; --- Game Options ---

PROC INITOPTIONS()
; Initialize procedure OPTIONS()
  GRAPHICS(17)
  SDMCTL=0
  GRACTL=0
  DO
    UNTIL VCOUNT=0
  OD
  DEBOUNCE()
  SCRMEM=SAVMSC
  DLIST=DLISTL
  DLIST(3)==+1
  SETCOLOR(0,3,14)
  SETCOLOR(2,0,14)
  PRINTDE(6,"    GAME OPTIONS")
  POSITION(0,2)
  PRINTD(6,"OPTION - NEXT OPTION")
  PRINTDE(6,"SELECT - CHOOSE")
  PRINTDE(6," START - PLAY GAME")
  POSITION(3,6)
  PRINTD(6,"FRICTION: O")
  IF FRICTION THEN
    PRINTD(6,"N")
  ELSE
    PRINTD(6,"FF")
  FI
  POSITION(3,8)
  PRINTD(6,"VELOCITY: ")
  PRINTBD(6,MAXV/100)
  POSITION(3,10)
  PRINTD(6,"BOUNCE   : ")
  PRINTBD(6,BOUNCE/10)
  POSITION(3,12)
  PRINTD(6,"WIN AT   : ")
  PRINTBD(6,WIN)
  POSITION(3,14)
  PRINTD(6,"PLAYERS  : ")
  PRINTBD(6,PLAYERS)
  SDMCTL=34
  OPT=0
RETURN

PROC OPTIONCOLORS(BYTE OPT)
; Mid-screen color changes
; OPT=option line to hi-light
  DO
    WSYNC=0
    UNTIL VCOUNT=15
  OD
  LUM=0
  WSYNC=0
  DO
    WSYNC=0
    COLOR0=LUM&$0F%$20
    LUM==+2
    UNTIL VCOUNT=25
  OD
  WSYNC=0
  COLOR0=0
  COLOR4=6
  DO
    WSYNC=0
    UNTIL VCOUNT=40
  OD
  COLOR0=$F8
  OPT==LSH 3+41
  DO
    WSYNC=0
    UNTIL VCOUNT=OPT
  OD
  COLOR0=$FE
  DO
    WSYNC=0
    UNTIL VCOUNT=OPT+8
```

```
  OD
  COLOR0=$F8
RETURN

PROC OPTIONS()
CARD I
; Get game options from player(s)
  INITOPTIONS()
  DO
    FOR I=0 TO 10 DO
      OPTIONCOLORS(OPT)
      UNTIL CONSOL=START
    OD
    IF CONSOL=OPTION THEN
      OPT==+1
      IF OPT=5 THEN
        OPT=0
      FI
    FI
    IF CONSOL=SELECT THEN
      IF OPT=0 THEN
        FRICTION==!1
        IF FRICTION THEN
          SCRMEM(134)=46
          SCRMEM(135)=0
        ELSE
          SCRMEM(134)=38
          SCRMEM(135)=38
        FI
      ELSEIF OPT=1 THEN
        IF MAXV=900 THEN
          SCRMEM(173)==-7
          MAXV=200
        ELSE
          SCRMEM(173)==+1
          MAXV==+100
        FI
      ELSEIF OPT=2 THEN
        IF BOUNCE=90 THEN
          SCRMEM(213)==-9
          BOUNCE=0
        ELSE
          SCRMEM(213)==+1
          BOUNCE==+10
        FI
      ELSEIF OPT=3 THEN
        IF WIN=90 THEN
          SCRMEM(253)==-8
          WIN=10
        ELSE
          SCRMEM(253)==+1
          WIN==+10
        FI
      ELSE
        IF PLAYERS=2 THEN
          SCRMEM(293)==-1
          PLAYERS=1
        ELSE
          SCRMEM(293)==+1
          PLAYERS=2
        FI
      FI
    FI
    UNTIL CONSOL=START
  OD
  SDMCTL=0
  SNDRST()
RETURN

; --- Play Air Hockey ---

PROC MAKEFONT()
BYTE I
CARD J
; Change character set

BYTE ARRAY
  CDAT(8)=[$55$55$55$55$54$54$50$40],
  EDAT(8)=[$40$50$54$54$55$55$55$55],
  QDAT(8)=[$01$05$15$15$55$55$55$55],
  RDAT(8)=[$55$55$55$55$55$55$55$55],
  SDAT(8)=[$FF$FF$FF$FF$FF$FF$FF$FF],
  TDAT(8)=[$AA$AA$2A$AA$AA$AA$A2$AA],
  ZDAT(8)=[$55$55$55$55$15$15$05$01]

  RAMFONT=(RAMTOP-8)*$100
  MOVEBLOCK(RAMFONT,ROMSET,$400)
  ZERO(RAMFONT+536,192)
  CHBAS=RAMTOP-8
  SDMCTL=61
  FOR I=0 TO 7 DO
    FOR J=0 TO 3000 DO OD
    RAMFONT(536+I)=CDAT(I)
    RAMFONT(552+I)=EDAT(I)
    RAMFONT(648+I)=QDAT(I)
    RAMFONT(656+I)=RDAT(I)
    RAMFONT(664+I)=SDAT(I)
    RAMFONT(672+I)=TDAT(I)
    RAMFONT(720+I)=ZDAT(I)
  OD
RETURN

PROC POSPLAYER(CARD PLAYER
               BYTE X,Y,LENGTH
               BYTE ARRAY SHAPE)
; Position Player
  HPOSP(PLAYER)=X+LEFT
  PLAYER==*$100+$400
  MOVEBLOCK(PMMEM+PLAYER+Y+TOP,
            SHAPE,LENGTH)
RETURN

PROC POSPDL(BYTE PADDLE,X,Y)
; Position paddle
  POSPLAYER(PADDLE,X,Y,2,BAR)
RETURN

PROC POSPUCK(CARD X,Y)
; Position puck
  X==/100
  Y==/100
  POSPLAYER(2,X,Y,8,PUCK)
RETURN

PROC ERASEPDL(CARD PADDLE  BYTE Y)
; Erase paddle
  PADDLE==*$100+$400
  ZERO(PMMEM+PADDLE+Y+TOP,2)
RETURN

PROC ERASEPUCK(CARD Y)
; Erase puck
  Y==/100+TOP
  ZERO(PMMEM+$600+Y,8)
RETURN

PROC ERASEALL()
; Clear Player memory
  ERASEPDL(0,PDLY(0))
  ERASEPDL(1,PDLY(1))
  ERASEPUCK(PUCKY)
RETURN

PROC INITPMG()
; Initialize PMG
  PMMEM=(RAMTOP-16)*$100
  Zero(PMMEM,$800)
```

```
  PCOLR(0)=$76
  PCOLR(1)=$76
  PCOLR(2)=$36
  PMBASE=RAMTOP-16
  GRACTL=3
RETURN


PROC INITPLAY()
CARD I
; Initialize game
  GRAPHICS(0)
  SDMCTL=0
  DO
    UNTIL VCOUNT=0
  OD
  SETVBV(7,$E4,$62)
  SNDRST()
  DEBOUNCE()
  INITPMG()
  SCRMEM=SAVMSC
  SCORE(0)=0
  SCORE(1)=0
  OSTIK(0)=15
  OSTIK(1)=15
  SERVER=0
  GAMEOVER=0
  CRSINH=1
  DLIST=DLISTL
  DLIST(2)=DLIST(3)+4
  DLIST(3)=DLIST(4)
  DLIST(4)=DLIST(5)
  DLIST(5)=$30
  DLIST(7)=$30
  SETBLOCK(DLIST+8,21,4)
  SETCOLOR(0,3,6)
  SETCOLOR(1,0,14)
  SETCOLOR(2,0,4)
  SETCOLOR(3,2,14)
  SETCOLOR(4,0,6)
  POSITION(3,0)
  PRINTE("air hockey")
  SAVMSC==+16
  POSITION(0,0)
  PRINTF(
   " One : 00 | Win : %B | Two : 00",
   win)
  MOVEBLOCK(SCRMEM+55,TTOP,18)
  FOR I=87 TO 663 STEP 32 DO
    MOVEBLOCK(SCRMEM+I,TMID,18)
  OD
  MOVEBLOCK(SCRMEM+695,TBOT,18)
  MAKEFONT()
  SOUND(3,0,0,3)
  KEY=0
  CH=$FF
RETURN


PROC SERVE(BYTE PLAYER)
CARD I
; Initialize positions
  ERASEALL()
  PDLX(0)=28
  PDLX(1)=28
  PDLY(0)=YTOP(0)
  PDLY(1)=YBOT(1)
  PUCKX=3000
  PUCKY=4000+6800*PLAYER
  PUCKXV=0
  PUCKYV=0
  POSPDL(0,PDLX(0),PDLY(0))
  POSPDL(1,PDLX(1),PDLY(1))
  POSPUCK(PUCKX,PUCKY)
  HITCLR=0
  HITFLAG=0
  VOLUME=0
RETURN


PROC MOVEPADDLE(BYTE P)
BYTE STIK
; Move paddle
  ERASEPDL(P,PDLY(P))
  STIK=STICK(P)
  ; move puck 2 for one player game
  IF PLAYERS=P THEN
    STIK=$F
    IF PDLX(1)+2<PUCKX/100 THEN
      STIK==-8
    ELSE
      STIK==-4
    FI
    IF PDLY(1)-6<PUCKY/100 THEN
      STIK==-2
    ELSEIF PDLY(1)-8>PUCKY/100 THEN
      STIK==-1
    ELSE
      STIK==-2
      IF RAND(2) THEN
        STIK==+1
      FI
    FI
  FI
  ; save stick position
  OSTIK(P)=STIK
  ; move paddle verticaly
  IF (STIK&1)=0 THEN
    PDLY(P)==-2
    IF PDLY(P)<YTOP(P) THEN
      PDLY(P)=YTOP(P)
    FI
  ELSEIF (STIK&2)=0 THEN
    PDLY(P)==+2
    IF PDLY(P)>YBOT(P) THEN
      PDLY(P)=YBOT(P)
    FI
  FI
  ; move paddle horizontaly
  IF (STIK&8)=0 THEN
    PDLX(P)==+2
    IF PDLX(P)>RIGHT-4 THEN
      PDLX(P)=RIGHT-4
    FI
  ELSEIF (STIK&4)=0 THEN
    PDLX(P)==-2
    IF PDLX(P)>240 THEN
      PDLX(P)=0
    FI
  FI
  POSPDL(P,PDLX(P),PDLY(P))
RETURN


PROC REVERSEPX()
; Reverse horizontal puck direction
  VOLUME=14
  PUCKXD==!1
  IF PUCKXV<(90-BOUNCE) THEN
    PUCKXV=0
  ELSE
    PUCKXV==-(90-BOUNCE)
  FI
RETURN


PROC REVERSEPY()
; Reverse vertical puck direction
  VOLUME=14
  PUCKYD==!1
  IF PUCKYV<(90-BOUNCE) THEN
    PUCKYV=0
  ELSE
    PUCKYV==-(90-BOUNCE)
  FI
RETURN
```

```
PROC MOVEPUCK()
BYTE PADDLE,XDIF,YDIF,STIK,ABOVE
CARD ARRAY
  XVELOC(0)=[400 140 100  80  40  0
             40  80 100 140 400]
; Move the puck
  ERASEPUCK(PUCKY)
; check for paddle collisions
  PADDLE=0
  IF PUCKY/100>70 THEN
    PADDLE=1
  FI
  STIK=OSTIK(PADDLE)
  IF P2PL THEN
    IF HITFLAG=0 THEN
      VOLUME=14
    ; new x velocity & direction
      XDIF=PUCKX/100+3-PDLX(PADDLE)
      PUCKXV=XVELOC(XDIF)
      PUCKXD=0
      IF XDIF>5 THEN
        PUCKXD=1
      FI
    ; new y velocity & direction
      YDIF=PUCKY/100-PDLY(PADDLE)
      ABOVE=0
      IF PADDLE THEN
        IF PUCKY/100<PDLY(1) THEN
          ABOVE=1
        FI
      ELSE
        IF PUCKY/100+8<PDLY(0) THEN
          ABOVE=1
        FI
      FI
    ; paddle not moving
      IF (STIK&3)=3 THEN
        PUCKYD==!1
    ; puck not moving
      ELSEIF PUCKYV=0 THEN
        PUCKYV=200
        PUCKYD=0
        IF (STIK&3)=1 THEN
          PUCKYD=1
        FI
    ; puck and paddle equal y coord
      ELSEIF PUCKY/100+3=PDLY(PADDLE)
       THEN
      ; do nothing
      ELSE
      ; moving puck and paddle down
        IF PUCKYD=1 AND (STIK&3)=1
         THEN
          IF ABOVE THEN
            PUCKYV==-200
            IF PUCKYV>200 THEN
              PUCKYD==!1
            FI
          ELSE
            PUCKYV==+200
          FI
        ELSEIF PUCKYD=0 AND
               (STIK&3)=2 THEN
          IF ABOVE=0 THEN
            PUCKYV==-200
            IF PUCKYV>200 THEN
              PUCKYD==!1
            FI
          ELSE
            PUCKYV==+200
          FI
        ELSEIF PUCKYD=1 AND
               (STIK&3)=2 THEN
          IF ABOVE THEN
            PUCKYD==!1
            PUCKYV==+200
          FI
        ELSEIF PUCKYD=0 AND
               (STIK&3)=1 THEN
          IF ABOVE=0 THEN
            PUCKYD==!1
            PUCKYV==+200
          FI
        FI
      FI
    FI
    HITFLAG=1
  ELSE
    HITFLAG=0
  FI
  HITCLR=0
; move horizontaly
  IF PUCKXV>MAXV THEN
    PUCKXV=MAXV
  FI
  IF PUCKXD THEN
    PUCKX==+PUCKXV
  ELSE
    PUCKX==-PUCKXV
  FI
; check boundaries
  IF PUCKX>24000 THEN
    REVERSEPX()
    PUCKX=0
  ELSEIF PUCKX>RIGHT*100 THEN
    REVERSEPX()
    PUCKX=RIGHT*100
  FI
  IF PUCKYV>MAXV THEN
    PUCKYV=MAXV
  FI
; move verticaly
  IF PUCKYD THEN
    PUCKY==+PUCKYV
  ELSE
    PUCKY==-PUCKYV
  FI
; check boundaries
  IF PUCKY>24000 THEN
    REVERSEPY()
    PUCKY=0
  ELSEIF PUCKY>BOT*100 THEN
    REVERSEPY()
    PUCKY=BOT*100
  FI
; handle friction
  IF PUCKXV THEN
    PUCKXV==-FRICTION
  FI
  IF PUCKYV THEN
    PUCKYV==-FRICTION
  FI
; fading collision sound
  IF VOLUME THEN
    VOLUME==-2
    SOUND(0,10,8,VOLUME)
    SOUND(1,10,10,VOLUME)
  ELSE
    SOUND(0,0,0,0)
    SOUND(1,0,0,0)
  FI
  POSPUCK(PUCKX,PUCKY)
RETURN

PROC GOAL(BYTE PLAYER)
BYTE I
CARD J
; Inc score, check for a winner
  SNDRST()
  ERASEPUCK(PUCKY)
  VOLUME=0
  SERVEIT=1
  SERVER=PLAYER
  SCORE(PLAYER)==+1
  IF SCORE(PLAYER)=WIN THEN
```

```
    GAMEOVER=1
  FI
; flash score
  FOR I=0 TO 5 DO
    SETBLOCK(SCRMEM+23+22*PLAYER,2,0)
    FOR J=0 TO 5000 DO OD
    SCRMEM(23+22*PLAYER)=
          16+SCORE(PLAYER)/10
    SCRMEM(24+22*PLAYER)=
          16+SCORE(PLAYER) MOD 10
    SOUND(0,20,10,8)
    FOR J=0 TO 5000 DO OD
    SOUND(0,0,0,0)
  OD
; cheering
  IF GAMEOVER=0 THEN
    FOR I=0 TO 30 DO
      FOR J=0 TO 1000 DO OD
      SOUND(0,10,8,I RSH 1)
    OD
    FOR J=0 TO 40000 DO OD
    FOR I=0 TO 30 DO
      FOR J=0 TO 1000 DO OD
      SOUND(0,10,8,15-I RSH 1)
    OD
  FI
  SNDRST()
  SOUND(3,0,0,3)
RETURN

PROC MOVEALL()
; Move paddles and puck
; keep attract mode at bay
  ATRACT=0
; check for goal
  IF PUCKX>2400 AND PUCKX<3700 THEN
    IF PUCKY=0 THEN
      GOAL(1)
    ELSEIF PUCKY=BOT*100 THEN
      GOAL(0)
    FI
  FI
  IF GAMEOVER=0 THEN
    MOVEPUCK()
    MOVEPADDLE(0)
    MOVEPADDLE(1)
  FI
RETURN

PROC ENDGAME()
BYTE I
CARD J,K
; Cheer profusly and end game
  SNDRST()
  FOR I=0 TO 30 DO
    FOR J=0 TO 1000 DO OD
    SOUND(0,10,8,I RSH 1)
  OD
  FOR J=0 TO 200 DO
    FOR K=0 TO 500 DO OD
    IF RAND(130)=0 THEN
      FOR I=0 TO 15 DO
        FOR K=0 TO 1200 DO OD
        SOUND(1,30-I,10,I)
      OD
      FOR I=0 TO 15 DO
        FOR K=0 TO 1200 DO OD
        SOUND(1,15+I,10,15-I)
      OD
    FI
  OD
  FOR I=0 TO 30 DO
    FOR J=0 TO 1000 DO OD
    SOUND(0,10,8,15-I RSH 1)
  OD
  FOR J=0 TO 40000 DO OD
RETURN

PROC PLAY()
; Play Air Hockey
  INITPLAY()
  SERVE(SERVER)
  DO
    DO
      UNTIL VCOUNT=100
    OD
    IF CH<>$FF THEN
      KEY=GETD(1)
    FI
    IF KEY=32 OR SERVEIT=1 THEN
      SERVE(SERVER)
      KEY=0
      CH=$FF
      SERVEIT=0
    FI
    MOVEALL()
    UNTIL GAMEOVER=1 OR KEY=27 OR
          CONSOL=6
  OD
  IF KEY<>27 AND CONSOL<>6 THEN
    ENDGAME()
  FI
  SNDRST()
RETURN

; --- Main Procedure ---

PROC MAIN()
  LMARGN=0
  CLOSE(1)
  OPEN(1,"K:",4,0)
  DO
    TITLE()
    WHILE CONSOL=6 DO
      OPTIONS()
      PLAY()
    OD
    UNTIL KEY=27
  OD
  CLOSE(1)
  GRAPHICS(0)
  GRACTL=0
RETURN
```

●

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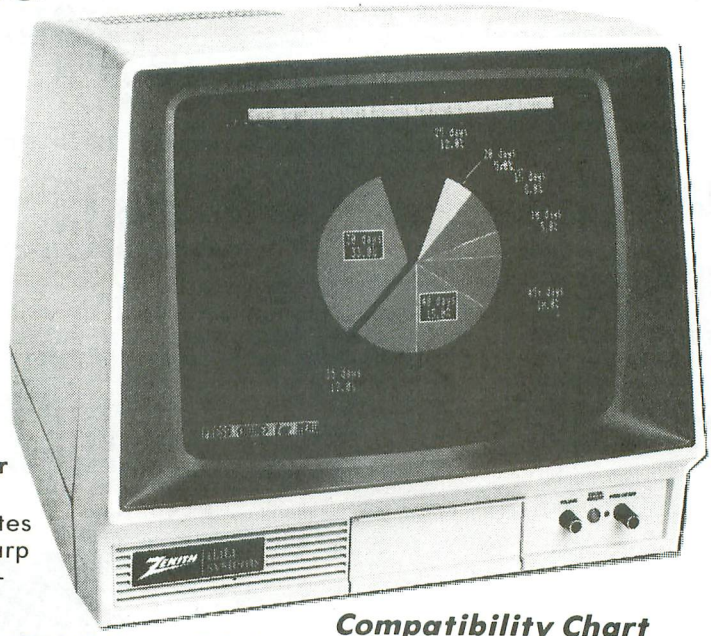

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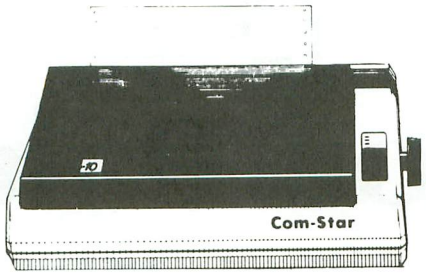

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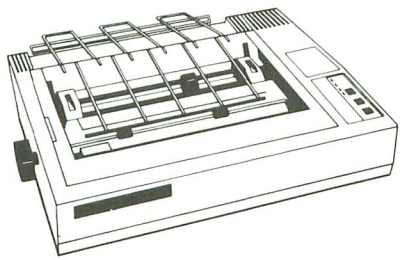

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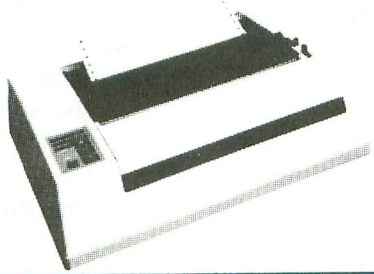

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ST Color Palette

Displays all 512 ST colors at once

by Tom Hudson

Most new Atari 520ST owners, if they're like me, want to see what kind of fancy graphic "tricks" their computer can do. Here's a short program, written in Digital Research C and 68000 assembly language, which displays all the ST's 512 colors on your computer screen at once. The **ST Color Palette** (**STCP**) also allows you to determine the color register settings needed to use that color in your own programs, by simply moving the mouse. If you don't have a C compiler or assembler, don't worry—the compiled program will be available on the **ANALOG Computing** (TCS).

The colors of the ST.

Inside the ST computer are sixteen hardware "registers," each of which contains a code for producing a particular color on the monitor. The code is very simple. Each color seen by the human eye is made up of various amounts of red, green and blue light, which are produced by the ST's RGB (Red-Green-Blue) monitor.

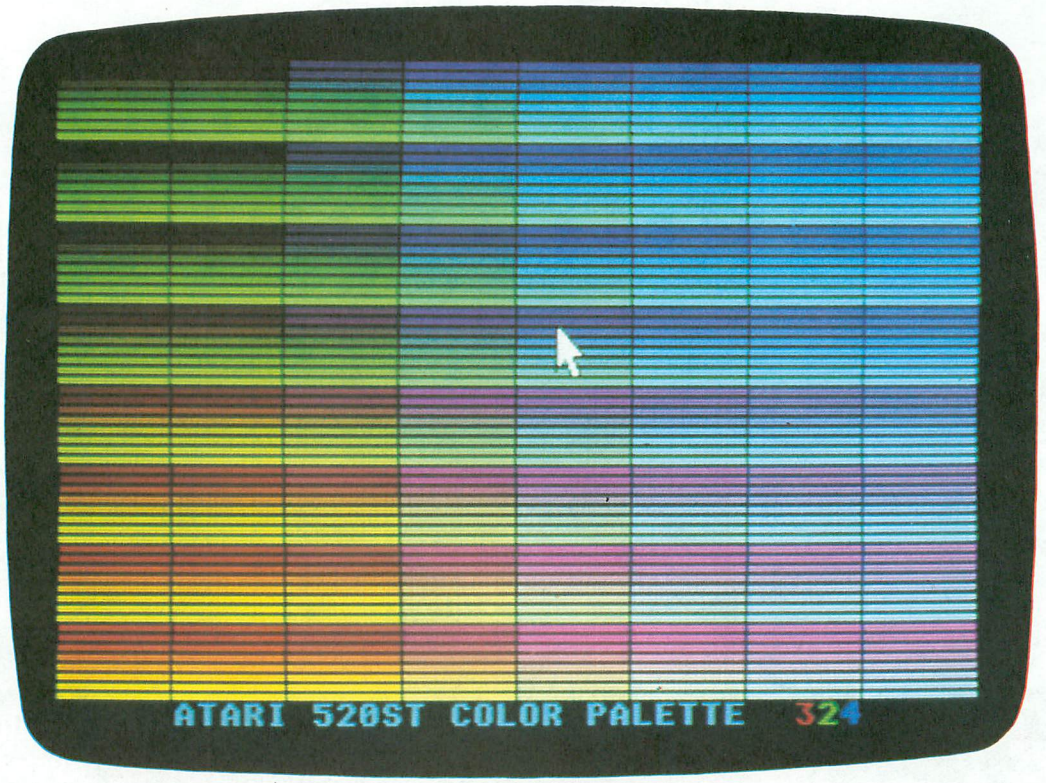
The ST is able to set each of the red, green and blue color components to one of eight levels, numbered from 0 through 7. A level of 0 indicates that the color is not present; a level of 7 indicates that the color is at its brightest setting. The three colors, with eight values each, give the ST 8x8x8, or 512, colors.

Normally, the ST can display only sixteen colors on the screen at one time (there are only sixteen color registers in the computer). The user must pick the sixteen colors he or she needs most and set the color registers accordingly.

Fortunately for game designers and graphics *aficionados* like myself, the ST has an interesting ability hidden under that gray exterior—an ability similar to the display list interrupts (DLIs) of the 8-bit Atari computers. By using it, the advanced programmer can change the ST color registers at any point on the screen, giving the ST the power to display far more than 16 colors on the screen at one time—even up to the system's limit of 512!

Before I go any further, I must explain that the **STCP** was developed by trial and error, working with the hardware registers in the ST, and some of the functions of the machine language subroutine cannot be fully documented without complete information from Atari.

However, the machine language routine is documented enough for you to change it to suit your needs. As more information about this capability is released by Atari, **ANALOG Computing** will report it. I don't recommend using this procedure in com-



mercial programs, for some of the memory locations used are not yet documented by Atari and may change in future revisions of the ST.

The full palette.

If you have a C compiler and assembler, type in, compile and link the programs in Listings 1 and 2. If not, the **ANALOG Computing** TCS will have the compiled program available to TCS subscribers.

This program must be executed in the 16-color, low-resolution mode, or it won't work properly.

After loading the program, you'll see the 512 colors of the ST displayed on the screen in 8 columns of 64 boxes. You can move the arrow on the screen, using the mouse, and point to any color you like. That color's red, green and blue settings will be shown in the lower right corner.

The program may be stopped at any time, and you can return to the GEM desktop by pressing the SPACE BAR.

If you're not an advanced programmer—and don't want to be—enjoy the **STCP**. If you are, read on for the details on how the ST can display its true colors.

It takes two.

As mentioned earlier, this program is made up of two parts: C language initialization and control program and an assembly language section, which contains special interrupt routines to enable the 512-color display.

The C control program, shown in Listing 1, gets everything started. Let's look at the program and note the points of special interest.

GEM Color Number	ST Pixel Value	GEM Color Number	ST Pixel Value
0	0	8	7
1	15	9	8
2	1	10	9
3	2	11	10
4	4	12	12
5	6	13	14
6	3	14	11
7	5	15	13

Figure 1.

Take a look at Figure 1. In the ST, the value of a pixel indicates which color register is to be used for that color. To use color register 5, the pixel's value should be 5.

Because GEM's color register numbering is not the same as the ST's pixel numbers (GEM's color 5 gives a pixel value of 6, which uses color register 6), it's necessary to translate the pixel values we want into their GEM counterparts.

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This is done with the 8-member COFSET array. If we want the pixel value to be 1, we tell GEM to use the first color index in the array, which is 2. If we want a pixel value of 3, we use the third index in the array, or 6. This is a confusing way to set up the color registers, but the authors of GEM must have had a good reason for doing it this way. Once this is done, though, we don't have to worry about it anymore.

In order to tell the user the level of red, blue and green light present in each color, we next set up the REDVAL, GRNVAL and BLUVAL text areas. Each of these fields is two characters long, allowing for one digit and a terminating character, the ASCII null (*0*). The null is the standard End-Of-Line (*EOL*) character in ST text-handling routines.

A little further down, we SAVE the settings of the color palette so that they may be restored before returning to the GEM desktop. I suggest that you always do this, if you're going to change the colors in your programs—the user will appreciate having the normal desktop colors restored. This operation uses the BIOS SETCOLOR call, which, along with the other calls used in this program, is documented in the "Hitchhiker's guide to the BIOS" manual from Atari. The routines to call the BIOS are included in the machine language program in Listing 2.

The next section of the program initializes the CIABLE array, which contains the 512 2-byte integer values that define all the various colors available on the ST. The **STCP** goes through three FOR loops to initialize the table, each loop altering the red, green or blue component.

Note that the color values are added together with various multiplication factors, to form a number such as $707 (*7* red, *0* green, *7* blue), then added to $F888. The resulting value is ready to be loaded into the ST's hardware color register, and ranges from $F888 (black) to $FFFF (white). The CTABLE table is externally defined, in the machine language portion of the program.

The next section of **STCP** draws 512 boxes on the screen, starting with color 1 on the left and ending with color 8 on the right. You'll see the columns of boxes drawn on the screen, all the boxes in the same column being the same color. When the machine language routine is called, the screen colors will be changed every three scan lines, resulting in 512 colors on the screen instead of 8!

After changing the colors to white for the arrow, and red, green and blue for the color number readouts, the title message is printed and the arrow is shown on the screen. We're now ready to start the colors!

To start the 512-color display, **STCP** issues a call to the machine language GO. This initializes and starts the 512-color display.

The next portion of the program reads the position of the arrow with the VQ_MOUSE routine and gives a constant readout of the color register settings of the color the arrow's pointing at. This is a handy way to figure out which colors you want to use in a program—just point to the color you want, and the red, green and blue digits in the lower right corner of the screen will tell you what color settings to use.

The color register setting values are printed whenever the mouse moves to a new color on-screen. When this happens, the digits representing the red, green and blue values are placed in the REDVAL, GRNVAL and BLUVAL text messages, and are printed to the screen in the corresponding color with the VST_COLOR and V_GTEXT calls.

The keyboard is constantly monitored by the BCONSTAT and BCONIN functions—if the SPACE BAR is pressed, the program exits.

Before exiting, **STCP** calls the machine language routine labeled STOP, shutting off the routines we started earlier and restoring the system to normal operation.

Finally, the color palette is returned to normal by using the SETPALLETE (that's the way it's spelled in the "Hitchhiker's Guide. . .") routine to reset the color registers to the values we saved when the program started.

The machine language routine.

Without adequate documentation from Atari, I can't guarantee the accuracy of some of the assumptions I've made in the explanation of this machine language routine. Many of the locations' functions listed are educated guesses, made by removing the instructions and observing the results. This code is, however, useful in exploring the use of horizontal blank interrupts on the ST, a function similar to the DLI structure on the 8-bit Atari machines.

Unlike the 8-bit Atari computers, the 520ST doesn't have a "display list," the special program that tells the display how to act. It does, however, have a powerful ability to generate an interrupt which will perform a set of instructions at various points on the screen. This interrupt can be programmed to occur on every scan line, every two scan lines, every three scan lines, and so forth. This is termed a horizontal blank (HBLANK) interrupt. We will also use the ver-

tical blank (VBLANK) interrupt ability to handle the control of the HBLANK.

Listing 2 shows the machine language code used for the **STCP**. It consists of four main routines: the initialization and startup code for the VBLANK and HBLANK routines, the shutdown code for the VBLANK and HBLANK routines, the HBLANK and VBLANK routines themselves, and the BIOS calls used by the C program.

There are several equates defined at the start of the program. VBVEC is the location of the vertical blank interrupt vector, a LONG (4-byte) location which contains the address the system JMPs to on a vertical blank interrupt. HBVEC, also a LONG value, tells the system where to JMP to on a horizontal blank interrupt.

KEYVEC is apparently the vector used when the ST's intelligent keyboard generates a message to the system (for a keyboard, mouse or joystick event). The COLOR0-COLOR9 equates are the addresses of the color registers. COLOR0 is at $FF8240, COLOR1 at $FF8242, and so on.

The first section of **STCP**, labeled GO, calls the SETUP routine in SUPERVISOR MODE, a special configuration of the 68000 processor. In this mode, the program may access any portion of memory, without restriction. Normally, a user's program cannot access memory outside itself.

SETUP changes the background color (COLOR0) to black ($F888). It then saves the registers we're going to alter in the HOLD locations and the SAVE locations.

After saving the important registers, **STCP** alters the registers we need. The keyboard vector is altered to point to KEYVEC, the HBLANK vector (HBVEC) is altered to point to our HBLANK routine, and the VBLANK vector (VBVEC) is altered to point to VBLANK.

Several other registers are also changed, including $FFFA09, which shuts off the keyclick to avoid interfering with the interrupt timing. The functions of $FFFA07 and $FFFA13 are not yet understood, but the masking of $FFFA07 before and after changing HBVEC seems to indicate that its low-order bit is an HBLANK enable bit.

After setting up these registers, SETUP performs an RTS to return to the calling program.

The next routine, STOP, once again calls a routine in supervisor mode. This time, it calls RESTORE. RESTORE is responsible for replacing the values we changed earlier, when we installed our own VBLANK and HBLANK routines. This is an important operation, as it restores the original system configuration, preventing system crashes when new programs are loaded into memory later. After restoring the registers, RESTORE returns to the calling program with an RTS.

The next routine, MYKEY, is a short routine of one instruction added to the start of the keyboard interrupt handler. It simply changes the 68000 status register to $2500, setting the priority of the keyboard handler to a lower level, 5. This prevents keyboard or mouse events (key pressed or mouse moved) from interrupting the HBLANK interrupt. Try removing this instruction, and you'll see glitches on the color palette whenever you move the mouse or anytime you press a key!

Note that the KEYSAVE location follows this routine—when the keyboard interrupt occurs, it will set the status register to $2500, then use the $4EF9 as a JMP instruction to the address in KEYSAVE, which was the old keyboard interrupt routine. We simply forced the system to execute our instruction before performing its normal duties. This same technique is used on the VBLANK routine.

The HBLANK routine is a simple routine, similar to a DLI routine on the 8-bit Ataris. First, it saves the registers used (interrupts *must* do this), then gets eight color values from the CTABLE [8 2-byte integers (WORDs) = 4 4-byte LONG values, or 16 bytes], and places them into the color registers 1 through 8.

By moving the data in 4-byte LONG chunks, the interrupt needs fewer instructions (4 LONG moves vs. 8 WORD moves). Afterward, it increments the CTABLE pointer, CIX, by 16 for the next interrupt. It then restores the saved registers and clears bit 0 in register $FFFA0F (presumably, to clear the interrupt status), finally exiting the interrupt with the RTE (Return from Exception) instruction.

The VBLANK routine, while also simple, contains a very important construct. The first six lines are essential to setting up the HBLANK control. Remember how I said we're executing an HBLANK interrupt every three scan lines? Well, this is the code that determines that interval. The third and fourth lines tell the system how often to generate the HBLANK interrupt, with the #3 value. Change both of these to #4, and the interrupt will occur every four scan lines; change them to #1, and the interrupt will occur every scan line. The surrounding code, MOVE.B #0,$FFFA1B through MOVE.B #8,$FFFA1B, is necessary for proper operation.

The next six lines of code grab the first eight color values from the CTABLE array and place them in

the color registers. This sets the color for the first line of boxes on the screen. Afterward, CIX is set to 16, ready for the HBLANK routine. Remember, this code is executed every time the electron beam of the monitor is at the top of the screen.

Finally, the VBLANK code adds 1 to color register 9, causing the title message printed by the C program to cycle through various colors. The VBLANK code then JMPs to the normal system VBLANK code, by using the $4FE9 (the JMP instruction) followed by the saved VBLANK vector, VBSAVE.

The last portion of **STCP** is the code which allows the C program to call the various BIOS routines via the 68000 TRAP statement.

After the program code is finished, the .DATA section defines the variables and tables used by the program.

Have fun!

Although I'm not entirely sure of some of the functions of the registers used by this program, I hope that it will encourage ST programmers to try experimenting with the HBLANK feature of the 520ST. Like its counterpart on the 8-bit machines, this feature may be used to add color to many programs.

If you're not an advanced programmer, you can still use the **ST Color Palette** to find color register settings and impress your friends with the colorful 520ST.

Listing 1.
C listing.

```
* Atari ST 512-color demo VBLANK & HBLANK *
*              by Tom Hudson              *
*    Copyright 1985 ANALOG Computing      *

.globl _go
.globl _stop
.globl _ctable
.globl _setcolor
.globl _bconstat
.globl _bconin
.globl _setpallete

vbvec: .equ $70          ;VBLANK vector
hbvec: .equ $120         ;HBLANK vector
keyvec: .equ $118        ;keyboard vector (?)
color0: .equ $ff8240     ;color register #0
color1: .equ $ff8242     ;color register #1
color9: .equ $ff8252     ;color register #9

.text

* Call SETUP in supervisor mode *

_go:
move.l #setup,-(sp)      ;put addr on stack
move.w #38,-(sp)         ;SUPER mode command
trap #14                 ;execute SETUP!
addq.l #6,sp             ;restore stack pointer
rts                      ;and exit!

* Start the VBLANK & HBLANK *

setup:
move.w #$f888,color0     ;background black

* Save misc. registers *

move.b $fffa09,hold1     ;save...
move.b $fffa07,hold2     ;altered...
move.b $fffa13,hold3     ;registers
move.l hbvec,hold4       ;save...
move.l keyvec,keysave    ;altered...
move.l vbvec,vbsave      ;vectors

* Now alter the registers! *

move.l #mykey,keyvec     ;alter kbd vector
andi.b #$df,$fffa09      ;mask off keyclick
andi.b #$fe,$fffa07      ;mask off (?)
move.l #hblank,hbvec     ;alter HBLANK vector
ori.b #$01,$fffa07       ;mask on (?)
ori.b #$01,$fffa13       ;mask on (?)
move.l #vblank,vbvec     ;change VBLANK vector
rts                      ;and exit!

* Call RESTORE in supervisor mode *

_stop:
move.l #restore,-(sp)    ;put addr on stack
move.w #38,-(sp)         ;SUPER mode command
trap #14                 ;execute RESTORE!
addq.l #6,sp             ;restore stack
rts                      ;and exit!

* Restore old HBLANK, VBLANK *

restore:
move.b hold1,$fffa09     ;restore...
move.b hold2,$fffa07     ;all the...
move.b hold3,$fffa13     ;altered...
move.l hold4,hbvec       ;registers and...
move.l keysave,keyvec    ;vectors to...
move.l vbsave,vbvec      ;previous values
rts                      ;and exit!

* Keyboard interrupt *

mykey:
move #$2500,sr           ;set interrupt mask to 5,
.dc.w $4ef9              ;'JMP'...
keysave: .ds.l 1         ;to old vector

* My HBLANK code *

hblank:
movem.l d0-d0/a0-a0,-(sp)     ;save registers
move.w cix,d0                 ;get color index
move.l #_ctable,a0            ;get table addr.
move.l 0(a0,d0.w),color1      ;move 8 words...
move.l 4(a0,d0.w),color1+4    ;from table...
move.l 8(a0,d0.w),color1+8    ;to system...
move.l 12(a0,d0.w),color1+12  ;color registers
addi.w #16,cix                ;point to next group
movem.l (sp)+,d0-d0/a0-a0     ;restore registers
bclr #0,$fffa0f               ;clear interrupt(?)
rte                           ;and return!

* My VBLANK code *

vblank:
move.b #0,$fffa1b             ;???
verify:
move.b #3,$fffa21             ;set HBLANK for...
cmpi.b #3,$fffa21             ;every 3 scan lines!
bne verify
move.b #8,$fffa1b             ;???
move.l _ctable,color1         ;place the initial...
move.l _ctable+4,color1+4     ;color palette...
move.l _ctable+8,color1+8     ;for first color...
move.l _ctable+12,color1+12   ;group!
move.w #16,cix                ;reset index counter
addq.w #1,color9              ;cycle color 9
.dc.w $4ef9                   ;"JMP"...
vbsave: .ds.l 1               ;to old VBLANK!

* Miscellaneous OS calls *

_setcolor:
link a6,#-6                   ;create stack frame
move.w 10(a6),(sp)            ;push parameters...
move.w 8(a6),-(sp)            ;onto stack
move.w #7,-(sp)               ;setcolor command
trap #14                      ;set it!
unlk a6                       ;undo stack frame
rts                           ;all done!

_bconstat:
link a6,#-4                   ;create stack frame
move.w 8(a6),(sp)             ;device # on stack,
move.w #01,-(sp)              ;status command
trap #13                      ;call os!
unlk a6                       ;undo stack frame
rts                           ;exit!

_bconin:
link a6,#-4                   ;create stack frame
move.w 8(a6),(sp)             ;device # on stack,
move.w #2,-(sp)               ;input command
trap #13                      ;call os!
unlk a6                       ;undo stack frame
rts                           ;and exit!

_setpallete:
link a6,#-6                   ;create stack frame
move.l 8(a6),(sp)             ;palette addr on stack
move.w #6,-(sp)               ;command on stack
trap #14                      ;call os!
unlk a6                       ;undo stack frame
rts                           ;and exit!

.data
```

```
cix: .ds.w 1            ;color table index
_ctable: .ds.w 512      ;512-entry color table
hold1: .ds.w 1          ;hold...
hold2: .ds.w 1          ;areas...
hold3: .ds.w 1          ;for registers...
hold4: .ds.l 1          ;and HBLANK vector
```

●

Listing 2.

```
/*      512-color demo driver      */
/*          by Tom Hudson          */
/* Copyright 1985 ANALOG Computing */
/*      For low-rez use only!      */

#include "portab.h"

extern go();
extern stop();
extern int ctable[512];

int contrl[12],intin[128],ptsin[128],
    intout[128],ptsout[128];

int handle,chstat;

main()
{

int i,j,dum,l_intin[11],l_out[57],
    r,g,b,rx,gx,bx,cx,x,y,wchar,
    gr_1,gr_2,gr_3,gr_4,l_ptsin[20],
    oldpal[16],box[4],rgb[3],
    mousex,mousey;

long regval;

char lastr = -1,lastg = -1,lastb = -1;

static int cofset[8] =
{
2,3,6,4,7,5,8,9
};

static char redval[2] = {0,0};
static char grnval[2] = {0,0};
static char bluval[2] = {0,0};

/* Start the program! */

appl_init();

handle=graf_handle(&gr_1,&gr_2,&gr_3,&gr_4);

/* open workstation */

l_intin[0] = 1;
for (i = 1; i < 10; i++)
  l_intin[i] = 1;
l_intin[10] = 2;
v_opnvwk(l_intin, &handle, l_out);
v_hide_c(handle);
v_clrwk(handle);

/* Save system color palette */

for (i=0; i<16; i++)
 oldpal[i] = setcolor(i,-1);

/* Initialize 512-color table */

cx=0;
for(rx=0; rx<8; rx++)
 {
 for(gx=0; gx<8; gx++)
  {
  for(bx=0; bx<8; bx++,cx++)
   {
   regval=0x0000f888 + (rx * 256) + (gx * 16) + bx;
   ctable[cx]=regval & 0xffff;
   }
  }
 }

/* Draw 512 boxes for colors */

vsf_interior(handle,1);
for(x=0,cx=0; x<319; x=x+40,cx++)
 {
 vsf_color(handle,cofset[cx]);
 for(y=1; y<192; y=y+3)
  {
  box[0]=x;
  box[1]=y;
  box[2]=x+38;
  box[3]=y+1;
  v_bar(handle,box);
  }
 }

/* Set other fixed colors */

rgb[0]=1000; rgb[1]=1000; rgb[2]=1000;
vs_color(handle,1,rgb);
rgb[0]=1000; rgb[1]=0; rgb[2]=0;
vs_color(handle,11,rgb);
rgb[0]=0; rgb[1]=1000; rgb[2]=0;
vs_color(handle,14,rgb);
rgb[0]=0; rgb[1]=0; rgb[2]=1000;
vs_color(handle,12,rgb);

/* Print title message */

vst_color(handle,10);
v_gtext(handle,40,199,"ATARI 520ST COLOR PALETTE");
graf_mouse(0,&dum);
v_show_c(handle,0);

/* Start VBLANK & HBLANK code */

go();

/* Main program loop */

wchar=0;
while(wchar != 32)
 {
 chstat=bconstat(2);
 if(chstat != 0)
  wchar=bconin(2);

/* Get mouse X and Y locations */

 vq_mouse(handle,&dum,&mousex,&mousey);

/* Convert to R, G & B values */

 if(mousey < 192)
  {
  redval[0]=mousey / 24 + 48;
  grnval[0]=((mousey/3) & 0x0007) + 48;
  bluval[0]=mousex / 40 + 48;
  if((lastr != redval[0]) || (lastg != grnval[0]) ||
                              (lastb != bluval[0]))
   {
   v_hide_c(handle);
   vst_color(handle,11);
   v_gtext(handle,256,199,redval);
   vst_color(handle,14);
   v_gtext(handle,264,199,grnval);
   vst_color(handle,12);
   v_gtext(handle,272,199,bluval);
   v_show_c(handle,0);
   lastr=redval[0];
   lastg=grnval[0];
   lastb=bluval[0];
   }
  }
 }

/* Stop JBLANK & HBLANK */

stop();

/* Restore original color palette */

setpallete(oldpal);

/* Close the workstation. */

v_clsvwk(handle);

appl_exit();
_exit(0);

}

/* That's all, folks! */
```

●

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CIRCLE #159 ON READER SERVICE CARD

THE PRINT SHOP
BRODERBUND SOFTWARE
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48K Disk $49.95

by Arthur Leyenberger

What do you do with your Atari computer when you're not writing BASIC programs? Play games? How about when you're not playing games? Maybe you use a word processor a lot. Or perhaps you use a database, spreadsheet or other productivity program.

How would you like to do something a little different with your computer? Does making signs, banners, greeting cards—or just about anything you like—on your printer interest you? Well, you've got it! The **Print Shop** from Broderbund will let you do all this, and much more.

Print Shop will let you view, select and assemble the assorted elements of a personalized message on your screen, then use your dot-matrix printer to print the results on regular computer paper. You can create letterheads, signs, banners and greeting cards. All of this can be done in minutes, and it's a ball to use.

The program contains fonts, graphic symbols and forms, to allow you to easily make any kind of design you want. You don't have to be a van Gogh or even a Salvador Dali, because the program does all of the work for you. It's menu-driven, so all you have to do is step through the various menus, choose the options that appeal to you, and, before you can say "Broderbund," you've created a masterpiece.

Print Shop supports a number of printers, including the Epsons, Okidatas, Prowriter, Microline, etc. Since all of the supported printers are listed on the packaging, check to see if yours is on the list before you buy the program. Three interfaces can be used: the Atari 850, the **ApeFace** and the Microbits **1150/Microprint**. For the most part, color printers are not supported.

The **Print Shop** package consists of a double-sided disk, the manual and a quick reference card, which lists commands, fonts and graphic symbols. You also get a plentiful supply of colored paper and envelopes. The paper is high-quality, heavy bond with microperf edges. After the pinfeed strips are removed, it looks almost like single sheets. There's also an order form for additional paper, envelopes and ribbons.

The program is installed by selecting the type of printer you have, then running a simple check to see if the printed output is aligned correctly. Once this is done, you're ready to begin having fun.

The program is actually divided into several segments, corresponding to what you want to create. From the main menu, the choices are: greeting card, sign, letterhead, banner, screen magic, graphic editor and setup.

Each segment lets you create and print items, and you can participate in the creative process as much as you want. For example, the greeting card command will allow you to print a ready-made greeting card, personalized only with the name of the person receiving it. Or you can totally design the card, from front to back, with whatever graphics and words you desire.

After you choose and assemble the graphic elements of your piece by means of the step-by-step menus, you write and edit the message. From the built-in text editor you can select line-by-line the size, position and form of your words.

There are eight fonts in two sizes. Three forms (solid, outline and 3-D shading) let you further customize your words. There are nine border designs and ten abstract background patterns for lots of design options. Sixty graphic symbols—ranging from cats and dogs to teddy bears, hearts, flowers and robots—let you customize your work for whatever mood you want to convey.

The **Print Shop** lets you call up the graphic and patterns either by name or number. The handy quick reference guide shows all the options and their corresponding numbers. Graphics are available in three sizes, and there's even a graphic editor that lets you modify an existing graphic or create your own. However, you cannot create your own borders and fonts.

A greeting card, for example, is printed on one pass of the printer. The inside/outside messages and the artwork are printed in their correct location. All you do is fold the paper twice to create your card. I normally print a greeting card first on standard computer paper, to ensure that it's exactly the way I want it. Once satisfied, I load in a piece of colored paper, and my final creation is done in about five minutes. I can also put a credit line on the back of the card, such as "designed by Art's studios."

Mention should also be made of the manual. It's clearly written and presented in a logical format. Plenty of examples are given to illustrate the various stages of your creation, but, frankly, the program is so easy to use you'll rarely need the manual.

My only criticism of the **Print Shop** is that you can't save your design to disk. Each time the program is loaded, you must repeat all of the steps to create your message.

Being able to save your designs on a disk would save a little time when attempting to duplicate a message and allow you to share the design components with a friend.

Broderbund is currently working on additional graphics symbols, borders and fonts, to be released as a companion disk to **Print Shop**. Maybe they'll include a "save-design" feature in their next product.

The **Print Shop** is definitely a fun program. It lets anyone—even those without artistic talent—create nifty graphic output on a dot-matrix printer. David Balsam and Martin Kahn have made an excellent design and programming effort. And Broderbund has a hit on their hands!

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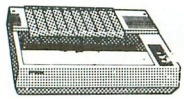

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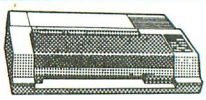

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CIRCLE #132 ON READER SERVICE CARD

Boot Camp

by Tom Hudson

We've been examining the use of the Atari central I/O routines for the last few installments of **Boot Camp**. This time, we'll write a file utility program which will copy any text file to the computer screen. It will also demonstrate the use of a simple subroutine which can save computer memory (and typing time).

Using subroutines.

We discussed the concept of subroutines some time ago in **Boot Camp**, but so far haven't really written any. A subroutine is a set of instructions capable of being executed by other parts of a program. When a section of the main program calls the subroutine with the JSR instruction, the 6502 processor jumps to the subroutine, but remembers where it left the main program.

The subroutine code then executes. When finished, the subroutine executes an RTS instruction, and the 6502 returns to the place in the main program where it left off.

Subroutines are complex structures, but, fortunately for us lazy programmers, the microprocessor does all the work—isn't that what computers are for?

You've probably been using subroutines for years in your BASIC programs, utilizing the GOSUB and RETURN statements. The JSR and RTS instructions perform the same functions, but in assembly language.

For the last few issues, in our discussions of the CIO system, we've been using the JSR instruction to call the central I/O routine. CIO performs the requested task, and control returns to our program. So, as you can see, you've been using subroutines all along, and there's nothing scary about them. They're just another tool for the assembly language programmer to master.

In last issue's program, we had to print a number of error messages to the user. To do this, we coded each print operation separately; it took eleven instructions each time we did a print. Those eleven instructions took 30 bytes of memory each time they were used, as well as a lot of typing. In a situation where you want to save memory—and do a lot of printing—a subroutine can save a bunch of RAM and hunt-and-peck typing!

The heart of a subroutine is its ability to perform a certain operation for many different parts of the main program. In many cases, a subroutine accepts various parameters which are used in calculations.

For example, you may have a BASIC subroutine which calculates the sum of two numbers. To be sure that the subroutine gets the values it needs, you set up a fixed set of parameters that are used as input to the subroutine. In the BASIC sum subroutine, we could set up the variables A and B as input to the subroutine, with the subroutine placing the result of the addition in the variable C. In BASIC, the code necessary to set up, call and print the result of the subroutine would look like this:

```
10 A=10
20 B=7
30 GOSUB 1000
40 PRINT C
```

In assembly language, we have several options for passing parameters to subroutines. We can place them in specific locations in memory (as is done with CIO via the Input/Output Control Blocks, or IOCBs), or we can pass them by placing the values in the 6502 A-, X- or Y-registers before performing the JSR instruction. The registers can be used if there are just a few parameters to be passed, while the fixed-memory parameter passing must be used if there are many parameters.

The subroutine we'll use in this program is a simple print routine, which accepts the address of a string in memory as the only parameter. This value is a 16-bit address, which can be easily split into two 8-bit values. We'll use the 6502 Accumulator and Y-register to pass the high and low portions of the address to the subroutine, since the X-register will be used by the subroutine itself, to index into the IOCB tables used by CIO.

One word of warning here: be sure that you preserve any registers which you don't want destroyed by the subroutine. When subroutines are called, they usually alter one or more 6502 registers, including the status register, so don't count on your register data being there after the subroutine returns. This is one of the most common errors made by the new assembly language programmer, and it can be very frustrating. Remember—if in doubt about whether or not a subroutine preserves register contents, save the registers before calling the subroutine and restore them after the JSR.

In this subroutine, the Accumulator will be used to pass the high portion of the address to the subroutine, and the Y-register will be used to pass the low portion of the address. The subroutine takes these values and places them in the buffer address of IOCB #0, for the screen editor, and executes a PUT RECORD command to print the string. The address you place in these registers must point to a string that is terminated with the ATASCII End-Of-Line (EOL) character.

Each subroutine call looks like this:

```
LDA #STRING/256
LDY #STRING&255
JSR PRINT
```

The LDA instruction loads the Accumulator with the high-order 8 bits of the string's address (don't forget the # symbol), and the LDY instruction loads the Y-register with the low-order 8 bits of the string's address. The JSR calls the PRINT subroutine, which prints the specified string on the screen. This set of instructions uses only 9 bytes. Compare this with the 30 bytes used by the individual PUT RECORD operations, and you can see that we'll save quite a bit of memory by using the subroutine!

Of course, the subroutine still takes around 30 bytes, but it's only coded one time. If a program does ten print operations, using individual PUT RECORD operations will take 10*30, or 300 bytes. The same ten print operations with the subroutine approach takes only 30+(9*10), or 120 bytes. Not bad, huh?

Some assembly language "speed freaks" will point out that the subroutine approach is slower than using separate operations, and they're correct. If you're writing a real-time application that needs all the speed it can get, it may help to use in-line code instead of subroutines.

With today's 128K-plus computers, lack of memory is rarely an obstacle, so if you feel you need the speed, by all means, use the in-line code method. Subroutines, however, do have the advantage that, if a change needs to be made, it only has to be made in one place, instead of in every piece of code that performs the operation.

The program.

The program in Listing 1 uses principles we covered in earlier installments of **Boot Camp**, to read and print the contents of a file. The file can be a cassette or disk file, and can even be the screen editor (E:) itself, thanks to the device-independence of CIO.

We've covered CIO to the point where I'll no longer explain every line of code in detail. Instead, groups of code will be summarized by their function, and the comments in the program listing provide the details.

As was mentioned last issue, our programs are now getting so large that they won't fit in page 6 of system RAM any more, so we must set the initial program counter to a point higher in memory. In this listing, the program starts at $6000 (Line 240). Depending on the memory in your system, you may have to change this value to a lower memory location.

Lines 300-320 set up the parameters as described above, and print the PROMPT string by calling the PRINT subroutine (Lines 1280-1400). This string, defined in Lines 1450-1470, instructs the user to enter the name of the file they want to display.

Lines 360-470 use the GET RECORD function of CIO to accept the name of the file to be displayed. You must include the device specifier (D:, C:, etc.), so that CIO can determine the device to be used.

Line 480 loops back to re-try the filename entry if any errors occurred.

Lines 520-630 attempt to open the file just entered for input.

Line 640 branches to READIT to process the file, if the file was opened successfully.

If there was an error in opening the file, Lines 650-670 print the error message, using the PRINT subroutine as described earlier, then Lines 680-710 close IOCB #1. If the IOCB is not closed after such an error, it remains in use and cannot be opened later. After the file is closed, the program loops back, so the user can re-enter the filename.

Now that the file is open, we can read all the records in the file and print them to the screen.

Lines 770-880 use the GET RECORD command to read records from the file. The input buffer area, BUFFER, holds 1000 characters, which is usually long enough for most text files. If an error occurs during the GET RECORD operation, Line 890 branches to BADREC to handle it.

If the record was read successfully, Lines 930-960 print the record that was just read (contained in BUFFER) and loop back to READIT to get the next record from the file.

Lines 1000-1110 handle errors when reading the file. If the error is an end-of-file (EOF) error, a value of 136 in the Y-register, an appropriate message is printed. If the error was another error, such as a truncated record, a general error message is printed. Both routines then go through the QUIT routine, to complete processing and exit.

Lines 1150-1200, labeled QUIT, close the input file (IOCB #1) and terminate the program with the BRK (break) instruction.

Lines 1280-1400 are the PRINT subroutine, used whenever a string is to be printed to the screen.

Line 1290 sets the X-register to point to IOCB #0, indicating that the operation will use the screen editor.

Line 1300 moves the Accumulator, which contains the high portion of the string's address, the the high buffer address for the operation.

Lines 1310-1320 move the contents of the Y-register (the low portion of the string's address) to the low buffer address for the CIO operation. Note that the 6502 won't allow a STY ICBAL,X operation, so we must first transfer the Y-register to the accumulator and store it from there.

Lines 1330-1380 perform the other setup operations necessary for a PUT RECORD operation and call CIO to print the string.

After printing, if there was an error, the subroutine branches to the FATAL routine, to change the screen color to indicate the error.

Line 1400, an RTS instruction, returns to the part of the program which called the subroutine.

Lines 1410-1440 are used if it's impossible to print to the screen. They change the screen's border to red and terminate the program with the BRK instruction.

Lines 1450-1570 are the various data items for the program, including prompts and data buffers. Note that the text prompts don't have to be defined on a single line—multiple lines may be used, as long as the EOL character ($9B) is used as the last character.

When you RUN the program, try entering various types of filenames—disk, cassette, even the screen editor (E:). With the editor, the computer will echo every line you type back to you.

The End-Of-File (EOF) for the screen editor is generated when you press CTRL-3 (CTRL and 3 keys pressed simultaneously). The great thing is, we didn't have to write any special code to allow the program to read from all these devices. CIO's device independence takes that worry away from us!

Next month...

Next issue, we'll play around with creating disk files and copying data, using CIO. Until then, experiment with this program. Try adding descriptive error messages to all the errors you could get when reading a file. Working with programs is an excellent way to get comfortable with the assembly language.

Listing starts on next page

Listing 1.
Assembly listing.

```
0100  .OPT NOLIST
0110 COLOR4 = $02C8
0120 ICCMD = $0342
0130 ICSTA = $0343
0140 ICBAL = $0344
0150 ICBAH = $0345
0160 ICBLL = $0348
0170 ICBLH = $0349
0180 ICAX1 = $034A
0190 ICAX2 = $034B
0200 CIOV = $E456
0210 ;
0220 ;SET STARTING ADDRESS
0230 ;
0240  *= $6000
0250 ;
0260 ;PRINT FILENAME ENTRY PROMPT
0270 ;
0280  CLD              ;BINARY MODE!
0290 GETFN
0300  LDA #PROMPT/256 ;HI PART IN A
0310  LDY #PROMPT&255 ;LO PART IN Y
0320  JSR PRINT       ;PRINT PROMPT!
0330 ;
0340 ;ACCEPT FILENAME FROM EDITOR
0350 ;
0360  LDX #$00         ;EDITOR: IOCB #0
0370  LDA #$05         ;GET RECORD...
0380  STA ICCMD,X     ;COMMAND
0390  LDA #FNAME/256  ;POINT...
0400  STA ICBAH,X     ;TO...
0410  LDA #FNAME&255  ;FILENAME...
0420  STA ICBAL,X     ;BUFFER
0430  LDA #20         ;MAXIMUM NAME...
0440  STA ICBLL,X     ;= 20 CHARS
0450  LDA #0          ;(20 IN LO,
0460  STA ICBLH,X     ;0 IN HI)
0470  JSR CIOV        ;GET RECORD!
0480  BMI GETFN       ;RETRY IF ERROR
0490 ;
0500 ;TRY OPENING FILE FOR INPUT
0510 ;
0520  LDX #$10         ;USE IOCB #1
0530  LDA #$03         ;SET UP...
0540  STA ICCMD,X     ;OPEN COMMAND
0550  LDA #FNAME/256  ;POINT...
0560  STA ICBAH,X     ;TO...
0570  LDA #FNAME&255  ;USER'S...
0580  STA ICBAL,X     ;FILENAME
0590  LDA #$04         ;OPEN FILE...
0600  STA ICAX1,X     ;FOR INPUT
0610  LDA #$00         ;AUX2...
0620  STA ICAX2,X     ;NOT USED
0630  JSR CIOV        ;OPEN IT!
0640  BPL READIT      ;OPENED OK!
0650  LDA #OPNERR/256 ;UH-OH, PRINT...
0660  LDY #OPNERR&255 ;ERROR MESSAGE
0670  JSR PRINT       ;USING SUBROUTINE
0680  LDX #$10         ;BETTER...
0690  LDA #$0C         ;CLOSE...
0700  STA ICCMD,X     ;IOCB #1...
0710  JSR CIOV        ;TO PLAY IT SAFE
0720  JMP GETFN
0730 ;
0740 ;NOW READ AND PRINT FILE!
0750 ;
0760 READIT
0770  LDX #$10         ;IOCB #1
0780  LDA #$05         ;SET TO...
0790  STA ICCMD,X     ;GET RECORD
0800  LDA #BUFFER/256 ;POINT...
0810  STA ICBAH,X     ;TO...
0820  LDA #BUFFER&255 ;INPUT...
0830  STA ICBAL,X     ;BUFFER
0840  LDA #1000/256   ;MAXIMUM...
0850  STA ICBLH,X     ;READ...
0860  LDA #1000&255   ;1000...
0870  STA ICBLL,H     ;CHARACTERS
0880  JSR CIOV        ;READ IT!
0890  BMI BADREC      ;ERROR!
0900 ;
0910 ;RECORD'S OK, PRINT IT!
0920 ;
0930  LDA #BUFFER/256 ;POINT TO...
0940  LDY #BUFFER&255 ;INPUT BUFFER,
0950  JSR PRINT       ;PRINT IT!
0960  JMP READIT      ;LOOP FOR MORE!
0970 ;
0980 ;CHECK ON ERROR CONDITION
0990 ;
1000 BADREC
1010  CPY #136        ;EOF?
1020  BNE NOTEOF      ;OTHER ERROR!
1030  LDA #EOFMSG/256 ;PRINT...
1040  LDY #EOFMSG&255 ;EOF...
1050  JSR PRINT       ;MESSAGE
1060  JMP QUIT        ;AND QUIT!
1070 NOTEOF
1080  LDA #RECERR/256 ;GOT AN ERROR,
1090  LDY #RECERR&255 ;PRINT ERROR...
1100  JSR PRINT       ;MESSAGE
1110 ;
1120 ;NOW WE MUST CLOSE THE INPUT
1130 ;FILE (IOCB #1) AND EXIT!
1140 ;
1150 QUIT
1160  LDX #$10         ;IOCB #1
1170  LDA #$0C         ;SET CLOSE...
1180  STA ICCMD,X     ;COMMAND
1190  JSR CIOV        ;CLOSE IT!
1200  BRK              ;AND EXIT
1210 ;
1220 ;PRINT SUBROUTINE:
1230 ;
1240 ;INPUT:
1250 ;ACCUMULATOR: HI ADDR OF STRING
1260 ;Y REGISTER:  LO ADDR OF STRING
1270 ;
1280 PRINT
1290  LDX #$00         ;USE EDITOR
1300  STA ICBAH,X     ;MOVE A TO HI
1310  TYA              ;PUT Y IN A REG.
1320  STA ICBAL,X     ;MOVE IT TO LO!
1330  LDA #$09         ;SET UP...
1340  STA ICCMD,X     ;PUT RECORD
1350  LDA #$FF         ;SET BUFFER...
1360  STA ICBLL,X     ;LENGTH...
1370  STA ICBLH,X     ;TO MAXIMUM
1380  JSR CIOV        ;PRINT IT!
1390  BMI FATAL       ;ERROR!
1400  RTS              ;OK, RETURN
1410 FATAL
1420  LDA #$34         ;CHANGE...
1430  STA COLOR4      ;BORDER COLOR
1440  BRK              ;AND EXIT
1450 PROMPT
1460  .BYTE "ENTER FILENAME "
1470  .BYTE "(INCLUDE D:)",$9B
1480 OPNERR
1490  .BYTE "CAN'T OPEN FILE! "
1500  .BYTE "-- TRY AGAIN",$9B
1510 RECERR
1520  .BYTE "*** ERROR READING "
1530  .BYTE "FILE! ***",$9B
1540 EOFMSG
1550  .BYTE "*** END-OF-FILE ***",$9B
1560 FNAME *=*+20
1570 BUFFER *=*+1000
1580  .END
```

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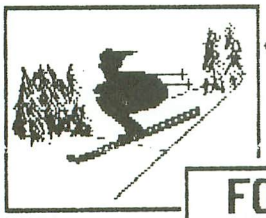

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```
10 A="LUre
20 ? "help"
```

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by Arthur Leyenberger

Writing a review of a product like **ST-Talk** is, at once, difficult and easy. It's difficult, because there really isn't all that much I can say about this telecommunications program. It doesn't have a lot of bells and whistles. It doesn't use icons, drop-down menus or windows.

It's easy to write this review, because —well, the product works as advertised. Simply, **ST-Talk** for the Atari 520 ST is a useful, easy-to-use, bug-free program that will satisfy the telecommunication needs of the majority of ST users. For $17.95, the program can't be beaten. My recommendation: buy it, use it and tell your friends!

ST-Talk is a complete modem communications program that allows you to access bulletin boards and information services, such as CompuServe, Delphi and the **ANALOG Computing** TCS. File transfer can be done with Xon/Xoff (ASCII file capture and send) and Xmodem up- and download. **ST-Talk** also has a provision for transferring and translating files from your Atari 8-bit 130XE computer.

The program is *very* easy to use. You first have to set up your RS-232 configuration from the GEM desktop. **ST-Talk** requires full duplex, no parity, 8-bit protocol, with the strip bit off. As with any program on the 520ST, double-clicking on the **ST-Talk** program icon immediately runs the program and displays the information screen for a few seconds.

ST-Talk's main screen consists of four areas: the top status line, which shows the time and current baud rate; the message and prompt line (second from the top); the 21-line main window; and the help line at the bottom of the screen. You can get help at any time by pressing the HELP key on the ST's keyboard.

Most of the functions within the program are accessed by pressing the function keys across the top of the keyboard. The help screen presents a list of how these function keys are defined. Pressing the UNDO key exits the program and sends you back to the GEM desktop.

There are a few additional features and functions of the program, that are called by pressing the ALTERNATE key at the same time as you press another key. These commands include: duplex toggle, quick DOS commands, macro utilities and type-ahead window. See the photo for the function key command assignments.

ST-Talk was written in **4xFORTH**, by John DeMarr and George Mamos. Another application program, **Express** by Mirage Concepts, was also written in this particular version of the FORTH language. Many people feel that **Express** has given **4xFORTH** a bad name. The problems that **Express** has, such as slow disk input/output and loss of entered characters, are functions of the coding, not the code.

Unlike the authors of **Express**, who spent about three weeks translating their FORTH code for the Macintosh to the Dragon Group's **4xFORTH**, the authors of **ST-Talk** wrote their code from scratch. Thus, they could take more complete advantage of the Atari ST's capabilities, accessible through the language as written in **4xFORTH**, but not fully utilized by **Express**.

ST-Talk is not only a good terminal program for the ST computer and an excellent value for the money. QMI, the company who publishes the program, is also a good company to deal with. Prior to the release of version 1.0 of **ST-Talk**, John DeMarr of QMI uploaded prerelease versions of the program to CompuServe and other information services.

First there was release .95, and then release .97. These versions of the program were distributed as public domain software, for ST users to try out, then give feedback to the program designers. This is an excellent way for a company to do business, and I wish more companies would follow suit.

ST-Talk is not copy protected, so you can make backup copies for your own use. Again, this is a sane way of doing business. Please honor their request that you not give out or receive copies of the program. For less than $20, every ST owner should order a copy of the program from QMI today.

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THE END USER

THIS MONTH:

Of GEMs, gems and diamonds in the rough.

by Arthur Leyenberger

Do you believe it? It's January already! Not just any January, but 1986. Whatever happened to 1985, or, for that matter, 1984? You know, the year of Big Brother. The year that we all had to fear as the year that we'd lose our identity, our individuality.

Well, step right up, because I'm going to tell you a tale of how Apple Computer Company thinks it's 1984—and that they're Big Brother. Yup, all this and more, this month in the **End User**.

Turn the "way-back" machine to January, 1984. The Superbowl. An amazing commercial was shown, which launched a number of things, including the Apple Macintosh. A man of the people hurled a hammer through the giant, Big Brother TV screen.

This commercial was a hit. Apple was an anti-monopolistic, anti-Big-Brother and anti-big-blue-computer company. Apple was the computer company for the *rest* of us.

It's kind of ironic that Apple Computer showed its true colors recently, when it attempted to bring legal action against Digital Research, Inc. for GEM. It seems that Apple is upset because it feels that GEM looks a little too much like the Macintosh desktop interface. Apple claims that GEM is a copyright infringement to their "visual copyright."

Similar to the Mac, GEM uses icons, windows and a trash can for deleting files. However, GEM has *drop*-down menus, not *pull*-down menus, and the trash can doesn't work the same way in both systems: on the Mac, you can go digging through the garbage and retrieve files. GEM's trash can is more like an incinerator. Once you throw out a file, it's history!

Nonetheless, both the Mac desktop and the GEM desktop owe a lot to the Xerox Palo Alto Research Center (PARC), whose staff invented all of this stuff during the mid-seventies, anyway. The bottom line, in case you haven't heard, is that DRI gave in to Apple, making certain concessions to give GEM a different "look and feel."

The three main changes concern the trash can icon, the close button on the top left corner of the windows, and the "desk" drop-down menu. DRI also has to give Apple a half-million dollars, in money and services.

DRI wisely chose not to battle Apple in court, as they have scarce financial resources, and there was a possibility of Apple getting a court injunction to stop all shipments of GEM. GEM's just beginning to take off—something like this could kill it really quickly, since few of the software developers would be willing to develop applications for a system that may have no future. DRI may or may not have been able to win a court case against Apple, but waiting for their day in court would certainly destroy GEM's chances in the marketplace.

Of course, the main concern of the Atari community is: how will this settlement affect the ST? At this time, Atari

Corp. is taking the position that the Apple/DRI settlement will have no effect on the ST. However, Atari's crystal ball is only as good as anyone else's; time will tell. By the time you read this, we'll all probably know the outcome.

The real loser in this interface battle is you and I. For a while, it looked as if we were approaching the point where a common user interface was to be available, regardless of what computer you were using. Certainly GEM on a PC an GEM on an ST were virtually identical.

Even the Commodore Amiga and the Apple Macintosh had similar enough user interfaces that a person familiar with one system could easily use the other. Not since the widespread acceptance of something like Microsoft **BASIC** have we had a standard that was as useful.

With the loss of Steve Jobs and Steve Wozniak, Apple moved from being an innovating computer company to the "big business" computer company category. With the action brought against Digital Research, Apple moved from its big computer company designation to a big bully style. Apple, enjoy the battle you've won while you can. The war's not over. Regardless of what minor changes are made to GEM, the Atari ST is still a threat to your corporate Maclife. Atari's "Power without the Price," with a little good software for the ST, will continue to haunt you.

Other ST news.

One of the particularly nice aspects of Atari 8-bit computers is their ability to let you simply put a disk in the drive, boot up the computer and have the application program immediately execute. As we all know, this is done using an AUTORUN.SYS file on the disk. When DOS loads on an Atari 8-bit computer, it checks for this file. If present, it is run.

I recently discovered how to make a self-booting application disk for the Atari 520ST. Assume you have something like the excellent ramdisk program **M-Disk** from Michtron. It would be very useful if, when TOS boots up, the ramdisk program would automatically run. This is easy to do; simply create a new folder called AUTO. Then, copy the ramdisk (or any other) program into that folder. Make sure that the program you want to have run automatically has a filename extension of *.PRG*.

Now, when the TOS disk is inserted into the drive and the computer's turned on, TOS will load, followed by the immediate execution of whatever program is contained in the AUTO folder. I understand that, if you have more than one .PRG file in the AUTO folder, they will each be run in succession. Also, when TOS becomes available on ROM, the use of an AUTO folder will work exactly the same way. Enjoy!

Gosh, I almost forgot.

How could I forget to mention this? This month's **End User** column is being written on my Atari 520ST. How? Using **AtariWriter**, of course. Well, I need to explain a little first.

Atari recently released **ST-Writer** for the 520ST. It's a clone of **AtariWriter**. The main menu is the same; the commands are nearly identical; and the feel of the program is quite, well, familiar.

Not only does **ST-Writer** use the same commands, there are additional commands that take advantage of the ST. For example, text is displayed in 80 columns, both in the edit window and in the print preview window. If you're using the high-resolution monochrome monitor, you have a choice of displaying either twenty-one rows or thirty-six rows. You can also choose to have white text on a black background or black text on a white background.

The main difference is that, unlike the 8-bit **AtariWriter**, which uses START, SELECT and OPTION, the ST uses the FUNCTION, CONTROL and ESCAPE keys. Some further features have also been added. You can print your text file to the screen, the disk or the printer. You can also receive **AtariWriter** files directly from an 800, via an 850 interface.

Now, here's the best part of the news: it's free. That's right, Atari is *giving* **ST-Writer** away, so that users will have something to get them through, until the real word processors appear (the **HabaWriter**, **HomePak**, etc. are supposed to be available by the time you read this).

Anyway, if you don't have **ST-Writer**, check with your local user group or retail computer store. It's not a bad deal.

More freebies.

Atari is also giving out a painting program called **NEO-Chrome**. This is a graphics drawing program that works in low-resolution mode only. Although it isn't as sophisticated as **DEGAS** from Batteries Included, **NEO**'s claim to fame is that it can "animate" colors. Many of you have seen the waterfall ST demo picture.

With **NEO**, you can select a range of colors to cycle through—and get the illusion of animation. In the case of the waterfall, the light, medium and dark blue colors of the water continually cycle at a speed that you select, to give the picture apparent motion. It's really quite impressive.

NEO-Chrome is being given out by Atari, through the same channels as **ST-Writer**. Get your copy today.

Still Mad After All These Years department.

Old-time Atari computer users are not unfamiliar with feeling defensive. Over the years, we've had to put up with the likes of Apple, Commodore and who knows what other kinds of computer users, who looked down their noses at us and our Ataris. Okay, so we kind of got used to it, but we knew that we had—still have—a superior machine.

I am *not* going to repeat here the reasons why our 8-bit Atari computers are superior hardware. We all know those. However, I do want to mention that, with the introduction of the ST computer, it's happening *all over again*. Let me briefly explain.

The facts: the Atari 520ST and the Commodore Amiga are very similar computers. Both use the 68000 processor, run at about the same speed, use the same kind and capacity disk drives, etc. The ST is approximately a $1000 computer system (color) and the Amiga is a $2000 system (color). Okay, 'nuff said about that.

Now, the Atari ST was shipped on July 8, 1985. I know, because I bought mine the following week, when they arrived on the East Coast (New Jersey *is* on the East Coast). The Amiga was officially announced in mid-September in New York City, and shipped soon after that.

Given these facts, why do I keep reading things like "the Amiga . . . is hitting the market . . ." and the ". . . Atari ST is finally starting to ship after missing several 'firm' deadlines . . ." (*BYTE* magazine, November, 1985, page 408). Gimme a break; the ST had been out for at least two months before the Amiga was even officially announced.

How about this quote? "While priced roughly $450 below the Apple machine [Macintosh], the Amiga is still double the $1000 price tag many experts think is the most marketable price for a fast-selling home computer." (*Newsweek*, October 14, 1985, page 66). Ah, come on. No mention of the Atari ST *at all*, here.

Finally, *InfoWorld*, in their September 16, 1985 issue, reviewed the Atari 520ST. However, they said there was no software for it and, therefore, gave it a less than enthusiastic review. Their review was written the first week of September, when I *know* there were at least thirteen programs available for the ST. If you don't believe me (as *InfoWorld* doesn't), I'll introduce you to my local Atari dealer, who can show you dated invoices of ST products he had on hand at the time.

It's easy to see why I have high blood pressure. It's happening all over again. and did you see the coverage that the Amiga got in all the big magazines, like *Creative Computing*, *Personal Computing*, *Compute!* etc.? At the time they were writing hype about preproduction Amiga computers, those same magazine editors could have walked into their local Atari dealer and said, "I wanna drive this baby (the ST) home tonight."

I think it's time that I told you *why* this is happening. Yes, it's the power of the advertising dollar. It's no secret that Commodore has roughly a $40-million ad budget to launch their Amiga computer. Ole Jack only has a couple of bucks in his pocket to launch the ST. Who do you think is gonna get the attention of the media?

Muckraking? Me?

Sometimes when I sit down at this keyboard, I really don't know what's going to come out. This month, I didn't *plan* to get on a soapbox. Muckraking isn't my style. But for some reason, I felt possessed, and all of this "stuff" has come spewing out of me. Please allow me one more pronouncement. Thanks.

There's a magazine known as *Amiga World*, published by CW Communications. They're the same folks who bring you *InfoWorld*, *Mac World* and *PC World*. Anyway, *Amiga World* is a fluffy book. It could even be thought of as a rather thick brochure. Why? Because Commodore has supposedly paid CW Communications several million dollars to publish the first half-dozen or so issues.

That means that, if the Amiga's a flop, CW can walk away and not have risked a penny on the deal. If the Amiga takes off, then they'll keep on publishing the magazine. According to an inside source at Atari, CW Communications approached Atari with the same deal for an ST magazine. Jack Tramiel said no dice. Just thought you might like to know.

It's time to fold up our tents again. I was just getting started, too. I won't give you a teaser about next month's **End User**, because it always seems to change. I'll just get off the soapbox, shuffle off down the road and see you next month again, right here.

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Print Shop File Converter

by Mike McCuen

After I'd bought Broderbund's **Print Shop**, what caught my eye first was the Screen Magic option. Since I'd already seen the printing capabilities of the program, but not the graphics routines, I chose to start with this option.

After half an hour of dabbling with fonts and kaleidoscopes, I saved a few screens, intending to use them as title pages for my own programs. I booted up DOS and tried to call up the directory of my **Print Shop** data disk. I was shocked to find that, instead of a directory, I got a lot of garbage. I got angry—**Print Shop** is incompatible with Atari DOS! All my nice title pages were inaccessible, unless I wanted to print them. That's all **Print Shop** will let you do with saved screens.

Well, being the stubborn person that I am, I wouldn't give in that easily. I booted a sector editor, examined the "garbled" directory, and found out where my screens were. This was a tedious operation, to say the least. A program, I thought, would be much more efficient.

So, after about three or four hours, Listing 1 emerged. The **Print Shop File Converter** (**PSFC**) will convert any screens saved with **Print Shop** to DOS 2.0 files, to be loaded and used in your own programs. Listing 2 is a sample screen load subroutine using CIO. For more about using CIO to load data, see **ANALOG Computing's** issue 13, **CIO Utilities** by Richard Groszkewicz.

How to use PSFC.

I tried to make **PSFC** as user friendly as **Print Shop**, but you still have to read the following instructions, in order to understand the program's features fully.

Type in Listing 1. Find and correct any errors in typing with **Unicheck** (see page 14), then SAVE it on disk. After you get the program up and running, you'll be prompted to insert your **Print Shop** data disk and press RETURN. The program can't discern a **Print Shop** disk from any other disk, so check the disk to make sure it's the right one before you press RETURN.

After you hit RETURN, the program should display a list of screens currently saved on this disk. Next to each name is a number. Select the screen you want by typing the corresponding number and pressing RETURN. If the screen shows two lines instead of filenames, you probably don't have the right disk in the drive. If this is the case, type a 0 in response to the prompt. This will start the program over, so you can change disks.

After you've made your choice, a set of instructions will be displayed. Read them carefully. These are the loading instructions. Press RETURN after you read them. The screen should turn white, and the program will begin loading your screen.

When the load is complete, the screen will turn

from white to red. This is your cue to insert a formatted DOS 2.0 disk in the drive and press the START key to save the screen. It will be saved under the name with which it was loaded. If the screen isn't the right one, and you want to load a different one, press the OPTION key.

It's very important that the disk be relatively empty, because **PSFC** will not interpret a disk full error, and things could get *ugly!* Also, the program won't stop on a read error while loading the picture, so some of it may be garbled if an error situation occurs. One last warning (where will it end?)—make sure that the disk to be written on is formatted. The program will come to a screeching halt if it's not.

I hope this sheds new light on **Print Shop**, and lets you give your programs a more "polished" appearance, using **Print Shop**'s excellent fonts.

Mike McCuen is a senior in high school, active in art, writing and computer work. He's had an Atari for about four years and has also done graphic work for Microprose, soon to be seen in ***Gunship****.*

Listing 1.
BASIC listing.

```
10 REM PRINT SHOP IMAGE CONVERTER
20 REM (PICTURE LOADER/CONVERTER)
30 REM BY MIKE MCCUEN
40 REM
50 REM (C) 1985 ANALOG COMPUTING
60 REM
100 GOSUB 1400:GOSUB 1500:REM INIT
105 GOSUB 1300:REM TITLE/MENU
110 GOSUB 4000:REM KEYPRESS
115 GOSUB 1200:REM SET UP OPTIONS
120 GOSUB 2000:REM READ DIRECTORY
125 GOSUB 3000:REM PRINT DIRECTORY
130 GOSUB 1100:REM GET SCREEN NUMBER
135 GOSUB 1000:REM INSTRUCTIONS
140 GOSUB 4100:REM LOAD SCREEN
145 GOSUB 4200:REM WAIT START/OPTION
150 GOSUB 4400:REM CHECK FILENAME
155 GOSUB 5000:REM SAVE SCREEN
160 CLR :POP :RUN
165 REM
170 REM
175 REM
1000 REM INSTRUCTIONS FOR LOAD
1005 GRAPHICS Z:POKE 710,Z
1010 ? "INSTRUCTIONS:":?
1015 ? "After the picture loads, the b
ack-"
1020 ? "ground will turn red.  This is
 the"
1025 ? "prompt for you to insert a DOS
 2.0"
1030 ? "disk in the drive and press ST
ART to"
1035 ? "save the screen.  The filename
 will"
1040 ? "be the same as the one used on
 the"
1045 ? "Print Shop disk."
1050 ? :? "If the screen is the wrong
one, you"
1055 ? "can abort the save by pressing
 the"
1060 ? "OPTION key when the screen tur
ns red."
1065 ? :? "PRESS RETURN TO CONTINUE...
":GOSUB 4000
1070 RETURN
1100 REM GET SCREEN # TO LOAD
1105 ? "──────────────────────────────
":? "SCREEN # TO LOAD";:INPUT P
1110 IF P>N5 THEN ? "{CLR}":? "{↑↑↑}";:GOTO
 1105
1115 IF P<=0 THEN RUN
1120 S=ST(P):F=S+60
1125 RETURN
1200 REM CLEAR SCREEN TO DISPLAY
     OPTIONS
1205 GRAPHICS Z:POKE 710,Z:? "DIRECTOR
Y OF SCREENS:":? "──────────
─"
1210 RETURN
1300 REM SET UP TITLE PAGE/MENU
1305 GRAPHICS Z:POKE 710,Z:POKE 82,1
1310 ? :? "      PRINT SHOP IMAGE CONVE
RTER"
1315 ? "                VER. 1.0"
1320 ? "              BY MIKE MCCUEN"
1325 ? "      (C) 1985  ANALOG COMPUTIN
G"
1330 ? :? "┌──────────────────────────
──────────┐";
1335 ? "│INSERT YOUR PRINT SHOP DATA D
ISK AND │";
1340 ? "│PRESS THE RETURN KEY...
          │";
1345 ? "└──────────────────────────
──────────┘";
1350 RETURN
1400 REM INITIALIZE VARIABLES
1410 DIM A$(20),F$(224),DIR$(512),ST(1
6):DIR$="♥":DIR$(512)="♥":DIR$(2)=DIR$
1415 F$=" ":F$(224)=" ":F$(2)=F$
1420 RETURN
1500 REM SET UP DISK I/O CALL
1505 FOR T=1536 TO 1540:READ A:POKE T,
A:NEXT T
1510 DATA 104,32,83,228,96
1515 RETURN
2000 REM READ THE DIRECTORY
2005 POKE 770,82:POKE 769,1:FOR SECTOR
=362 TO 365
2010 POKE 779,INT(SECTOR/256):POKE 778
,INT((SECTOR/256-INT(SECTOR/256))*256)
2015 ADDRESS=ADR(DIR$)+(SECTOR-362)*12
8
2020 HI=INT(ADDRESS/256):LO=ADDRESS-HI
*256
2030 POKE 772,LO:POKE 773,HI
2040 X=USR(1536):NEXT SECTOR
2045 RETURN
3000 REM PRINT DIRECTORY, STORE NAMES
3005 I=Z:FOR T=1 TO LEN(DIR$) STEP 32
3010 IF DIR$(T+18,T+19)<>"PA" THEN 304
0
3015 ? I+1;")";DIR$(T,T+15);"START:";A
SC(DIR$(T+16)):I=I+1:ST(I)=ASC(DIR$(T+
16))
3020 A$="D:":A$(3)=DIR$(T,T+15):FOR J=
1 TO LEN(A$):IF ASC(A$(J))=Z THEN A$=A
$(1,J-1):GOTO 3030
3025 NEXT J
3030 F$(I*14-13,I*14)=A$
3040 NEXT T:N5=I
3045 RETURN
4000 REM WAIT FOR RETURN KEY
4010 OPEN #1,4,Z,"K:":GET #1,A:CLOSE #
1:IF A<>155 THEN 4010
4015 RETURN
```

```
4100 REM SET UP RESIDENT DISK HANDLER,
4110 REM READ SECTORS AND LOAD SCREEN
4120 GRAPHICS 24:POKE 710,14:POKE 709,
0
4125 POKE 764,Z
4130 SC=PEEK(88)+256*PEEK(89)
4140 BUFFER=SC:C=Z
4150 POKE 770,82:POKE 769,1
4155 FOR SECTOR=5 TO F
4156 IF PEEK(764)=28 THEN RUN
4160 POKE 779,INT(SECTOR/256):POKE 778
,INT((SECTOR/256-INT(SECTOR/256))*256)
4165 ADDRESS=BUFFER+C
4170 HI=INT(ADDRESS/256):LO=ADDRESS-HI
*256
4175 POKE 772,LO:POKE 773,HI
4180 X=USR(1536):C=C+126:NEXT SECTOR:S
ETCOLOR 2,4,Z:POKE 709,14
4185 RETURN
4200 REM WAIT FOR START OR OPTION
4210 IF PEEK(53279)=6 THEN RETURN
4215 IF PEEK(53279)=3 THEN POP :CLR :R
UN
4220 GOTO 4210
4300 REM ERROR DETECTED
4310 GRAPHICS Z:POKE 710,Z:? "ERROR #"
;PEEK(195):? :? "Restarting..."
4320 FOR T=Z TO 500:NEXT T:CLR :POP :R
UN
4400 REM CHECK FOR A VALID FILENAME
4405 F$=F$(P*14-13,P*14)
4410 FOR T=1 TO LEN(F$):IF F$(T,T)=" "
 THEN 4420
4415 NEXT T:RETURN
4420 F$=F$(1,T-1):RETURN
5000 REM * SAVE SCREEN TO FILENAME
5001 REM * SELECTED AT BEGINNING
5005 OPEN #1,8,Z,F$
5010 RAM=PEEK(106)*256:DL=PEEK(88)+256
*PEEK(89):ADD=DL:NUMBER=RAM-DL+1
5015 IOCB=832+16:POKE IOCB+2,11:ADRHI=
INT(ADD/256)
5020 ADRLO=ADD-ADRHI*256:POKE IOCB+4,A
DRLO:POKE IOCB+5,ADRHI:NUMHI=INT(NUMBE
R/256):NUMLO=NUMBER-256*NUMHI
5025 POKE IOCB+8,NUMLO:POKE IOCB+9,NUM
HI
5030 I=USR(ADR("hhh■LV■"),16):CLOSE #1
:REM 3 LOWER-CASE H, INVERSE *, L, V,
INVERSE LOWER-CASE D
5040 RETURN
```

●

CHECKSUM DATA.

(see page 14)

```
10 DATA 887,731,21,257,110,261,700,960
,788,484,555,914,913,560,79,8220
145 DATA 185,441,141,510,97,95,100,281
,426,523,368,470,57,601,366,4661
1040 DATA 259,121,412,987,856,407,786,
763,513,106,54,683,794,606,959,8306
1210 DATA 786,523,691,634,73,848,755,5
,518,440,718,793,58,444,176,7462
1420 DATA 793,831,125,874,805,765,165,
650,971,677,676,978,795,368,898,10371
3010 DATA 556,304,177,503,702,505,797,
133,730,796,183,143,801,954,423,7707
4140 DATA 598,290,384,737,662,958,689,
697,159,806,809,505,100,723,229,8346
4310 DATA 387,366,756,723,688,927,280,
647,166,461,918,176,210,579,272,7556
5040 DATA 791,791
```

Listing 2.

```
5000 REM * LOAD A GRAPHICS 8
5002 REM * SCREEN USING CIO
5005 GRAPHICS 24:POKE 710,0:POKE 709,0
:OPEN #1,4,0,"D:FILENAME.EXT"
5010 RAM=PEEK(106)*256:DL=PEEK(88)+256
*PEEK(89):ADD=DL:NUMBER=RAM-DL+1
5015 IOCB=832+16:POKE IOCB+2,7:ADRHI=I
NT(ADD/256)
5020 ADRLO=ADD-ADRHI*256:POKE IOCB+4,A
DRLO:POKE IOCB+5,ADRHI:NUMHI=INT(NUMBE
R/256):NUMLO=NUMBER-256*NUMHI
5025 POKE IOCB+8,NUMLO:POKE IOCB+9,NUM
HI
5030 I=USR(ADR("hhh■LV■"),16):CLOSE #1
:REM 3 LOWER-CASE H, INVERSE *, L, V,
INVERSE LOWER-CASE D
5040 RETURN
```

●

CHECKSUM DATA.

(see page 14)

```
5000 DATA 835,728,481,918,307,210,579,
272,791,5121
```

●

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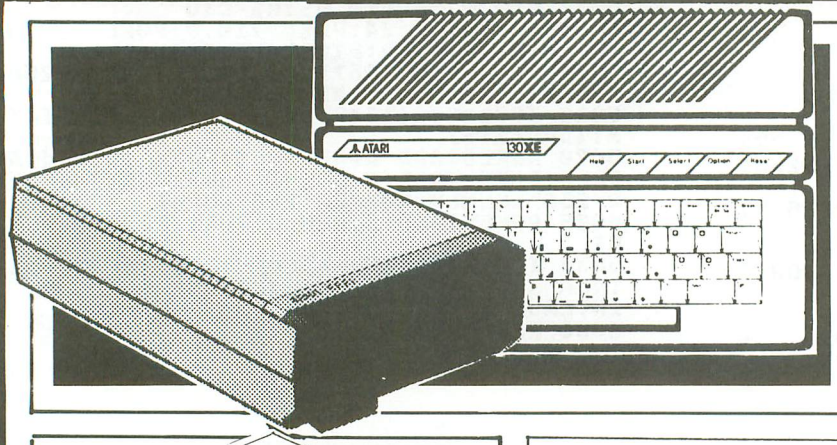

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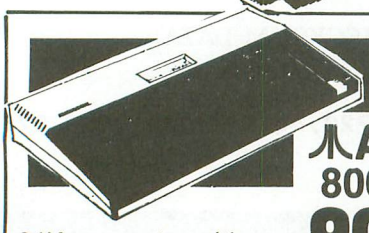

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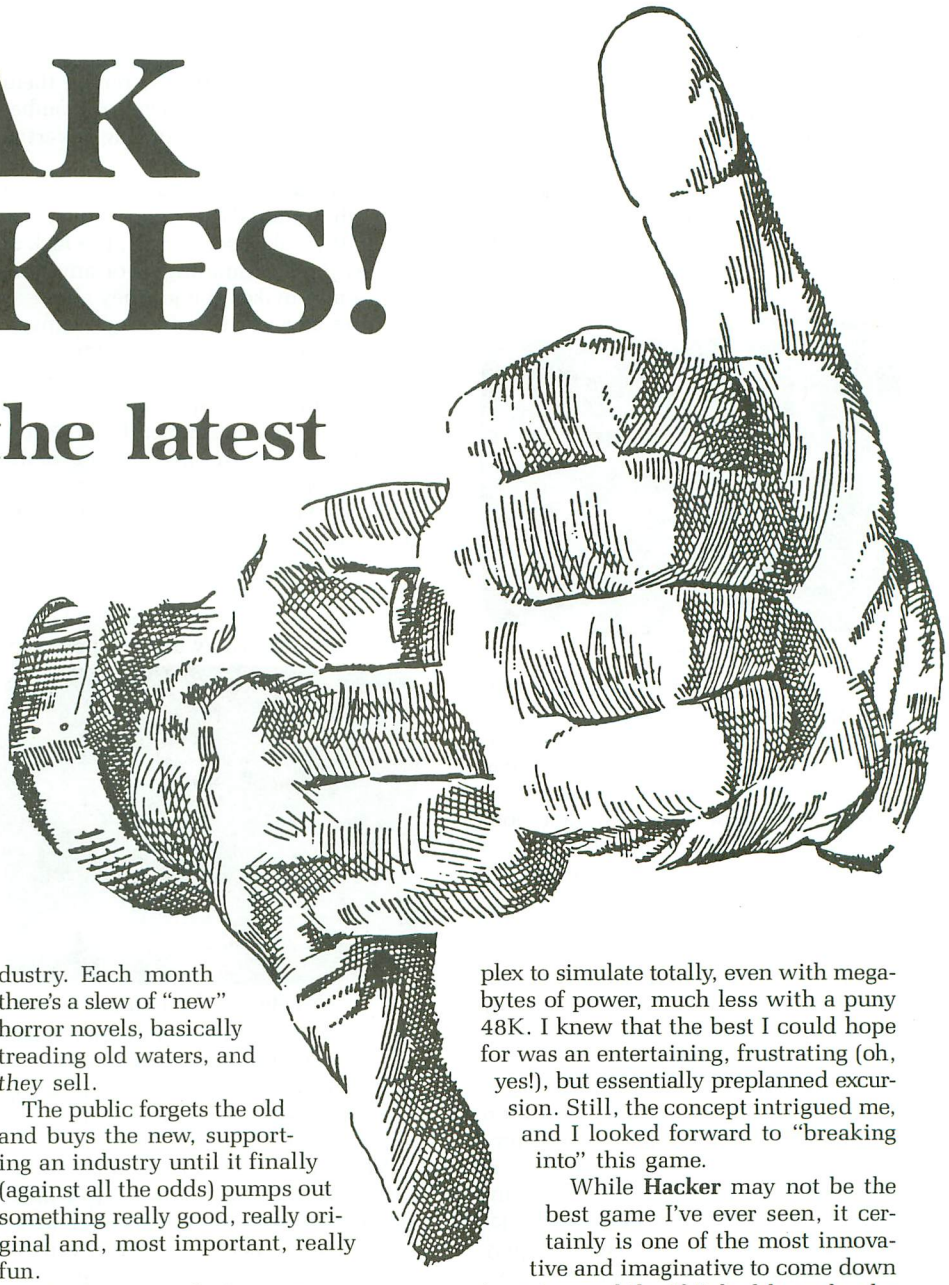


by Steve Panak

I've got a lot of housekeeping to do this month, so let's get right to it.

The 520ST. Saw my first game on it, and the graphics are spectacular. That's an understatement; it yields true arcade quality, on a medium-resolution color monitor. Next month should bring you, faithful readers, a 520 game review.

The Amiga. After months of publicity, I finally saw one. First impression: I'm not the least bit worried for Atari.

Infocom. It seems they've deserted all of us 8-bit owners. They'll make their new games only for the Atari ST series and comparable equipment. I guess I knew it would have to happen, as their games required more and more memory. I look at it as another reason to get myself an ST. My poor old 800 lacked the power to play (at least to their full capacity) three of the last five games I tested.

Games, in general. Although I see a vast number of games rehashing old, worn themes, this must be seen in perspective. Look at the book publishing industry. Each month there's a slew of "new" horror novels, basically treading old waters, and *they* sell.

The public forgets the old and buys the new, supporting an industry until it finally (against all the odds) pumps out something really good, really original and, most important, really fun.

I think it's worth the wait.

HACKER
by Steve Cartwright
MASTER OF THE LAMPS
by Lieblich and Kaminski
ACTIVISION, INC.
Box 7287
Mountain View, CA 94039
48K Disk $29.95 each

Somewhere, some time ago, I initially heard of this game. The challenge was to be issued by a blank screen, with a simple *LOGON:* prompt. From then on, it was to be up to you.

I knew at the time that this would not be completely the case; life is too complex to simulate totally, even with megabytes of power, much less with a puny 48K. I knew that the best I could hope for was an entertaining, frustrating (oh, yes!), but essentially preplanned excursion. Still, the concept intrigued me, and I looked forward to "breaking into" this game.

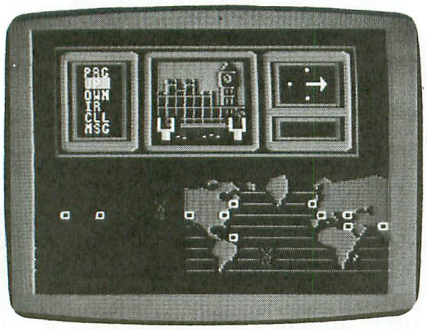
While **Hacker** may not be the best game I've ever seen, it certainly is one of the most innovative and imaginative to come down in quite a while. If it had been harder to get into, I would have been less likely to tell you all about the game. Since it's a giveaway, I may as well give, too.

It's true—all you get to start with is a prompt, but the problem is that a computer access code program "malfunctions," and the resultant failure allows you to walk right into the vault. The guards have all but deserted their posts.

Once you're in, you discover an international plot, and your role becomes that of a courier. Using a robot, you can streak through the tunnels which we *know* secretly connect every major city on the globe, searching for foreign contacts. Once found (believe me, it's not

hard), you negotiate with them for shreds of a valuable document, offering money and other valuables that you pick up on the black market.

To frustrate you, the computer notices the intrusion. You must pass a number of electronic checkpoints, most of which shoot you down—until the second time around, so obvious are the solutions.



Hacker.

The graphics were excellent, although the agents themselves were indistinct, perhaps to keep their identities hidden.

Documentation? Well, there was none, only the booting instructions (does *anyone* not know how to boot an autoboot disk?) and an address to send to for a hint book, which I doubt anyone with half the intelligence of an I/O cable would need. Indeed, it was the lack of instructions that provided the most entertaining aspect of **Hacker**. There's a perverse joy here, which is familiar for anyone who inserts their first quarter before reading the instructions.

So, while **Hacker** did not live up to my expectations, it was very original—a fun game to play. Ethical considerations prevent me from expressing an opinion as to whether such hacking would be fun, but through this game, I can feel what it must be like to break in and play around where you're not supposed to be. Forgive me; I liked it.

Master of the Lamps I didn't like. This poor excuse for a game—from a fine company—failed to satisfy even the most primitive urges within my gaming soul.

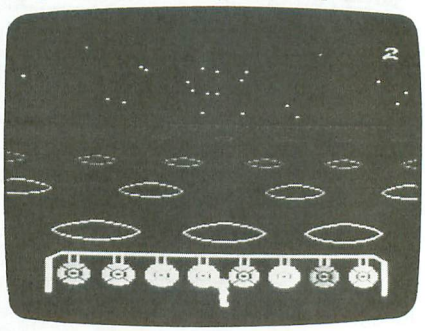
According to the game container (which, by the way, is identical to the design used by Electronic Arts—is something going on here?) **Master** summons you to the far reaches of fantasy. You ride a magical roller coaster and solve mystical riddles.

Well, the magical roller coaster is better left at the station, and, as for the riddles, they're a simple conversion of the old Simon game. Memorize the colored light and sound patterns; repeat them back to Simon. I can't even remember that game's Saturday morning advertising jingle.

In **Master**, you fly your magic carpet through diamonds suspended in space. While this takes some skill, the lack of interesting surroundings—or anything to fire at—makes the journey about as exciting as a car ride through Kansas.

Once you survive the tunnel trip, you summon the genie. Then you must hit gongs, which correspond to the colors and tones the genie emits. If you're successful, the genie awards you one of the seven pieces of a missing lamp. The game is over when you've collected all three lamps.

There are twenty-one increasingly difficult tunnels to fly, and the genie's challenge also increases, as he begins to emit only colors, then only tones. Upon com-



Master of the Lamps.

pletion of the tunnels, you reach the palace. Striking the gong three times will, according to the manual, bring pleasing results. I hope that means the disk will self-destruct within your drive.

Additional game features allow you to enter a practice mode, to let you practice (memorize) the twenty-one tunnels. A beginner's mode, in which you fly simple tunnels and complete only one lamp, rounds out the features.

The **Master**'s graphics are really pretty good, although not very spectacular. Simply good, distinct images, without much of interest. The manual is adequate, and more than describes just what you're getting yourself into.

So, while the **Master of the Lamps** sounds great, it is a major disappointment.

LODE RUNNER'S RESCUE
by Josh Scholar
SYNAPSE
17 Paul Drive
San Rafael, CA 94903
48K Disk $29.95

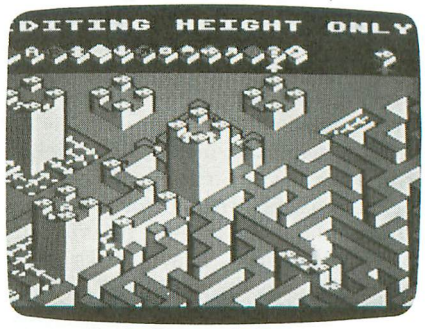
This game, although definitely not one of the all-time best, includes an option which has been absent from a good many games I've tested lately. I'll keep that a secret until I've told you about the rest of the game.

In **Lode Runner's Rescue**, the **Lode Runner** has been captured by the evil Bungeling Empire, and you, his brave daughter (notice **Rescue** is not discriminatory), must rescue him. This is only possible by passing through a labyrinth of forty-six mazes, collecting keys which will open the cell. Thwarting your progress are (not surprisingly) Bungeling guards, whose touch is deadly. If you complete the journey, you win the game.

That's right, win—very unusual in video games, where the machine generally wins. This is possible because of the special feature, but more on that later.

Basically, **Rescue** is an adaptation of Atari's **Crystal Castles** (which I never really understood or liked)—which, in turn, is a variation on the old **Pac-Man** theme. You move around a predefined path, collecting dots. When all are collected, you move on to the next maze. Unlike **Pac-Man**, your adversaries are invincible.

Movement with the joystick is tough to get used to, because of the diagonal orientation of the screen. It's always hard to perfect a diagonal move, but —with practice—anything is possible. The graphics are poor. I was rather disappointed, in fact, with their lack of quality. Everything seemed to blend together.



Lode Runner's Rescue.

I guess I've toyed with you long enough. The special feature (drum roll, please) is the ability to create your own mazes. I'm sorry if you're not moved with emotion, but this is one of my favorite features. It never fails to keep a game (even a marginal one) off the shelf and in your drive a little longer.

Through a series of menus, you reach a screen editor that uses icons to allow

you to design your own screen. You're in control of every facet of play: the movement of the guards; the placement of bonuses, elevators, trapdoors, exits, keys, etc.; and you can even format a disk to save your creation.

The manual is complete and, although written very scientifically (just the facts, ma'am), it accurately describes the program, allowing rapid play. The short opening paragraph fails to carry the weight of the premise behind the game, though. Without a foundation to interest you, the program is simply a screen full of randomly moving, flashing enemies.

So, **Lode Runner's Rescue** is a balancing act that pits old themes and mediocre graphics against the versatility of its screen editor. It had me thinking for a couple of weeks, but the fact that the editor at least forces you to use your imagination, tips the scale toward my favoring this game.

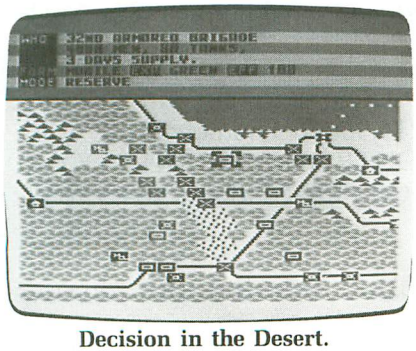
DECISION IN THE DESERT
by Sid Meier
and Ed Bever, Ph.D.
MICROPROSE
120 Lakefront Drive
Hunt Valley, MD 21030
48K $39.95

We have a vast rift in the marketplace —two divergent groups, almost diametrically opposed: the arcade enthusiasts and the simulation lovers.

The two tribes are as fiercely loyal as one would ever imagine. Their members rarely defect to the other side.

I have a friend on the arcade side. I can't even get him to *try* an Infocom game, let alone a full-blown simulation requiring time and dedication. He demands the instant gratification that only arcade action can supply.

Imagine my surprise when he told me that he liked **Decision in the Desert**. It wasn't "okay," or even "good;" it was "great." I took his temperature and pulse, after calling the paramedics.



Decision in the Desert.

Actually, what might have sold him was the realism and historical accuracy (due to one of his other passions—he's often known as "Mister History"). While both of us are less expert than the doctor who helped design this game, he more than I felt some sort of subconscious twang of *deja vu*.

What helps you feel this is the ease with which the game is played. Unlike so many other simulations, where you often mop your brow (not from tension, but from the frustration and agony of trying to issue your commands), **Desert** made the leader's role a snap. This is due, not to handy reference cards, but to a program that's well thought out.

It's broken down into four basic command types: action, objective, information and utilities. Action commands tell a unit what to do—attack, move, defend or reserve (rest). When using the joystick, the choices are menu driven, while the keyboard allows rapid, straightforward input.

The objective command tells units where to go. While the otherwise superb manual forgetfully leaves out what the information command does, I assume it supplies information. Finally, a utility command allows you to alter various game control parameters, save games and perform other general housekeeping selections.

Action icons (which, unfortunately, don't appear on the reference sheet, but whose form is distinct) keep you updated on whether your units are attacking or attacked, advancing or retreating, winning or dying. Status reports keep you on top of troop statistics, important developments and whether or not you're winning the game.

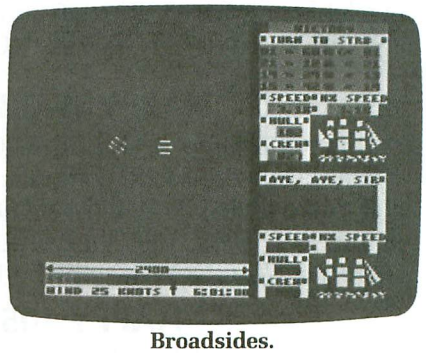
Play moves forward in real time. This means that time flows, rather than just advancing a certain amount whenever you enter a command. It makes rapid input more necessary than desirable. If you follow the manual and play along (building experience) as it suggests, you'll quickly be using even its most advanced simulation features (such as morale, experience and effectiveness factors).

Unfortunately for me, the program is bigger than my old 800. A number of features (game replay and the general's characteristics) can only be enjoyed on the 800XL or 130XE. But we old-timers can play the game, nonetheless.

If I weren't running out of room, I'd tell you about how complete and historically accurate the manual is, and how you might even learn something from it. But, since I'm out of time, I'll just leave you with the reflection that **Decision in the Desert** is one of the smoothest simulations around.

BROADSIDES
by Wayne Garris
SSI
883 Stierlin Road, Bldg. A-200
Mountain View, CA 94043-1983
48K Disk $39.95

After a couple of months in the parching desert, what could be better than a little water? How about a lot of water? How about an ocean?



Broadsides.

As long as we're going this far, we might as well throw in a couple of ships, making sure that their crews have violently opposing goals. We'd have action on the high seas. We'd have **Broadsides**.

SSI, king of the simulation games (although MicroProse is becoming a worthy opponent), has created one of the most original and fun simulations I've seen in some time.

Broadsides recreates the action of high sea battles between old sailing ships. Through the joystick, it allows you to command a ship and crew against either the computer or a human partner.

There are two levels to this game—an arcade level and a tactical level. The only difference between the two is the amount of commands available to you. The arcade game provides fast action, while the tactical version allows the same speed and highly detailed strategy.

The two ships start out alongside one another. From then on, it's up to you. You steer the ship around, aiming and firing the cannons. You must determine what kind of shot to use (cannonballs for the hull, chain for the sails, grapeshot to annihilate the crew). But remember,

(continued on page 103)

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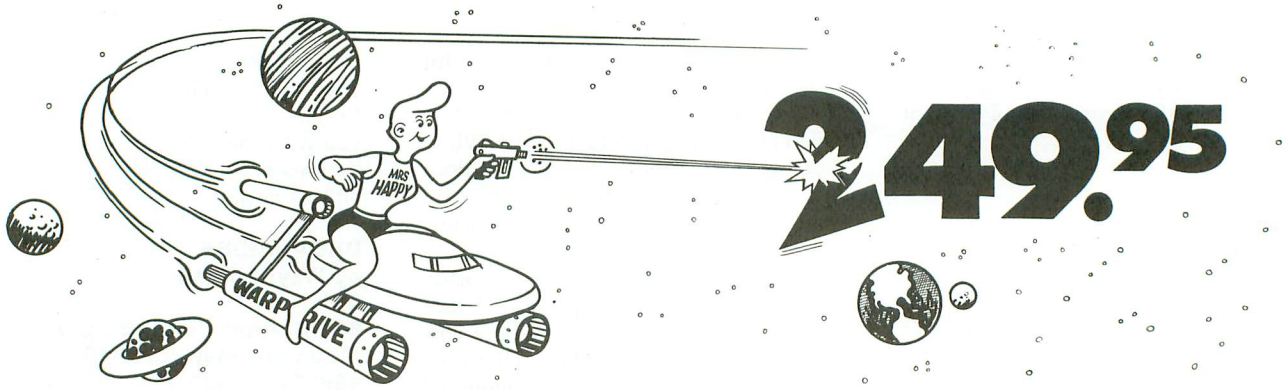

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loading the guns takes time—you don't rapid-fire this game.

The wide range of commands offered is easily accessed by the joystick (although you may use the keyboard, as well). Moving the stick up and down changes the command line, while the fire button executes the displayed command. Right and left turn the ship. As if this isn't enough, the action intensifies when the ships collide.

The display changes, showing the decks of the ships, as individual crew members do battle. Using the keyboard, you're in control of swordsmen and snipers in a duel to the death. When the grappling lines are cut, the game again converts to sailing mode.

Broadsides ends when a number of different conditions occur (sinking the ship, killing the crew), or at the end of twelve game-hours. You can also win by accumulating the points awarded for various acts of death and destruction.

The manual is superb, to be expected from SSI. It details the game simply, allowing you to start right in. It also provides details. It lets you use the customizing screens to create any of a number of historic ships of the Napoleonic era, in addition to many stored on the game disk.

The option screen allows you to set game parameters (number of players, difficulty, etc.), and you can also change the pace of the game to give yourself more time to make decisions. Most of these commands can also be entered during play, should you change your mind. And, although you can pause the game, you cannot save it for later.

The screen is set up nicely. Detailed graphics are more than adequate to keep you on top of the action. Casualties (of crew, ship and guns) are easily kept track of. Though sometimes the ships seem to turn too slowly, I had no trouble issuing rapid commands. I enjoyed the sailing portion of the game more than the boarding phase, because I was more in control. Still, overall, the game was most enjoyable.

In fact, it was so good that I'll have to recommend it, especially for budding sailors. **Broadsides** sinks its competition and sails into port as one of the better simulations of the year.

It's been a really good month—only two out of five games were mediocre, with no truly *horrible* ones and three that were actually good. However, due to its originality, I'll have to say that **Hacker** was the best (but not quite as good as I think it could have been). The two simulations are even; it really depends on whether you're an Army or a Navy man.

Next month we'll take a look at a 520ST game, as well as a couple from Lucasfilm. Until then, reserve a joystick for me.

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

DEGAS
by Tom Hudson
BATTERIES INCLUDED
30 Mural Street
Richmond Hill
Ontario, L4B 1B5 Canada
(416) 881-9941
520ST $39.95

by Arthur Leyenberger

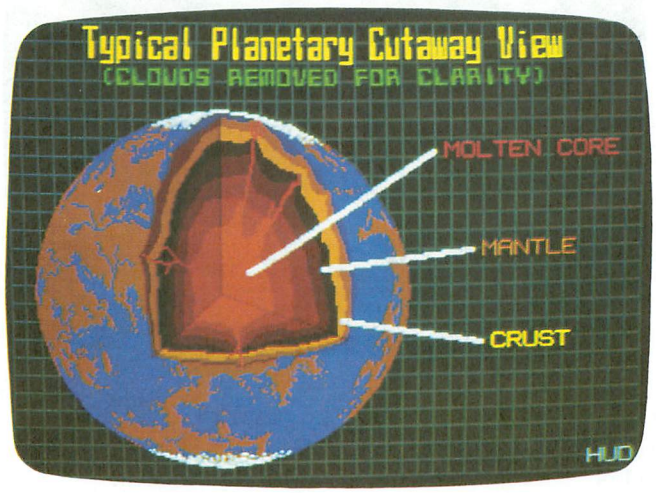
Imagine a world without color. Think about it—a black and white New England autumn, with black and white foliage; a black and white Pacific shore; or a black and white Grand Canyon. You get the point. Color is extremely important in our world.

If your world happens to include computers, color's equally important there. I'm not talking about the color of your Lexan keyboard or your floppy disk holder. I'm talking about color on your monitor screen—bright, brilliant, beautiful color. The Atari 520ST with its RGB color monitor is capable of delivering this kind of color directly from the picture tube to your brain.

With sixteen colors available at once in low resolution, the 520ST was begging for software that would allow it to strut its stuff. That software is now here. **DEGAS**, from Batteries Included, is a full-featured graphics "painting" program that's simply superb. Let me tell you some more about it.

DEGAS means "Design and Entertainment Graphics Arts System." It's a graphics program that allows you to create art and drawings, then save them to disk. The pictures generated by the program can be shown on-screen with the included slide show program, and/or printed on your printer. Also, **DEGAS** works with either one or two disk drives.

DEGAS also means Tom Hudson, the programmer extraordinaire who wrote it (see box at the end of this review). **DEGAS** is Batteries Included's first program for the Atari ST. A company very familiar to most Atari users, they've published such excellent programs as **HomePak**, **Paper Clip** and **B/Graph**.



DEGAS is a "two-screen" drawing program, which means that one screen displays the menu of options and the other screen displays your work of art. Clicking on the right mouse button is all that's necessary to flip between the two screens. At first, this may seem cumbersome, especially compared to a one-screen drawing program like **MacPaint**. But in use, you'll easily adapt to it—and may prefer to have your drawing unobscured by little icons.

Speaking of icons, I might as well let you know, up front, that icons, drop-down menus and multiple windows are not used in this program. The menu (see photo) contains all of the drawing selections available to you. If you make a choice that requires an additional selection, another, smaller menu appears on-screen. If you choose Set Drive, a list of drives appears on-screen. Point and click the mouse to make your selection.

DEGAS works in all three of the 520 ST's screen resolution modes, so, regardless of which monitor you have, you can use **DEGAS** to produce both art and graphics. In the low resolution mode, sixteen colors are available on the 320x200-pixel screen at once. In medium resolution mode, you can have four different colors and a 320x400-pixel screen. In high resolution mode, just two colors (black and white) are available. But your screen is a sharp 640x400-pixels.

When **DEGAS** is run, it determines what resolution mode you're currently in and uses that as the default mode. When files are saved, a file extender name of *pi1*, *pi2* or *pi3* is used to denote the resolution mode that the file was created in. And you *cannot* load a file into **DEGAS** that's in a different mode than you're currently using.

The mouse selects all drawing features while in the program. As mentioned before, the menu screen allows you to select a feature by pointing and clicking. When in the drawing screen, the mouse is used to draw, anchor the cursor and cancel an operation. Surprisingly, all of these mouse movements seem very natural to the hand and intuitive to the mind. If you've never drawn with a mouse before, you're in for a treat.

DEGAS has a plethora of features. I'll do my best to describe them here, but, to really get a feeling for this program, you have to use it in person. Once you select the brush size, style and color, drawing can be done in a number of ways. Freehand drawing can be done with continuous lines, or with individual points placed on the screen. A cross hair appears on-screen as you draw, to help you align your images.

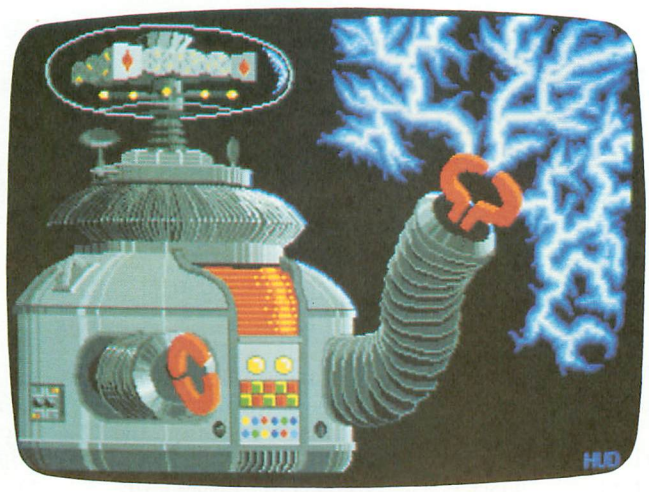
The airbrush is a special mode that lets you paint a swatch of color on the screen, as if you were using a can of spray paint. The faster you move the mouse, the fewer drops of paint hit the screen. The slower you move, the thicker the paint will be. Airbrush has its own brush shapes to choose from.

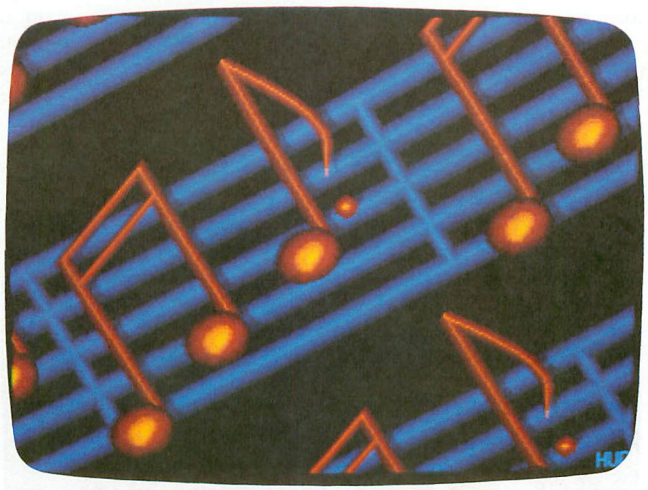
Three types of lines can be created. Regular lines are made by specifying starting and ending points. K-lines are continuous lines that are similar to regular lines, but each new one begins at the exact point where the previous line ended. Rays are straight lines that have a common starting point.

In addition to the type of line, you have the ability to select the way the line will look on the screen. Dashed, dotted, solid, thick and thin lines can be easily chosen. You can even create, edit and save your own kind of line.

DEGAS allows you to draw with "mirrors." Vertical, horizontal, diagonal, or any combination; can be selected. Like a real mirror, whatever you draw is reflected somewhere else on the screen. Mirrors are useful in creating symmetrical shapes—and are fun.

A number of geometric shapes can be created by the program. Circles or discs (filled circles) of any size can be created. Using the freehand feature allows you to choose round or oval circles, but a perfect circle can also be made. Similarly, a square or rectangular outline—a frame—can be created. A filled frame or box is just as easy to make, and you can choose to have rounded or square corners on your shapes.





Irregular shapes can also be made with the polygon feature. Polygons are similar to the K-line drawing feature, except these are automatically filled in when you finish the shape. If you have an enclosed area of the screen that you want to fill in, you can choose a solid color or any of a variety of fill patterns. You can even create your own pattern.

Two special features of **DEGAS** permit you to carefully create a true work of art. Slow draw mode allows precision drawing, so that you can align geometric shapes more easily. The other useful feature is the magnify mode, which expands a selected drawing area to almost the full screen size. This allows you to work on that section of your drawing in more detail. Each square in the magnified picture is one pixel large, regardless of the screen resolution. The top left of the screen shows the relative position of the magnified area that you're working on.

Using the slow draw and the magnify modes together gives you the capability to clean up your pictures and add the detail that distinguishes great from merely good art. Extremely fine drawing and filling can be done, to produce the example pictures you see here.

Another exciting feature of **DEGAS** is its "shadow" capability. Shadow duplicates each plotted point you draw. You have control over the color, direction of the shadow and how many pixels away from the original points the shadow points are drawn. This feature works with the draw, point, line, shape and text modes. Three-dimensional effects are easy to create with shadowing, and using the technique with text is a lot of fun.

Text can be created in either X-ray or block modes. In block text, your text is printed over the background, and anything below it is overwritten. With the X-ray text, the background is left intact when text is placed on-screen.

Other features of the program include copying and moving any portions of the screen. Once you have defined a section, you can move or copy it to another area of the screen. Copying a section of the screen can be done in either X-ray or block mode. These work the same way as the X-ray and block text modes.

I have just a couple of minor complaints about **DEGAS**. The HELP key on the ST keyboard ought to be brought into play. Although just about all of the functions in the program are easy to use, it would be nice if you could point to one of the menu choices, press HELP and see a couple of sentences about that feature. Another minor point: the current picture filename isn't displayed on the menu screen. There's room, and seeing the filename would be a reminder.

My last gripe concerns the fill box. You point to and click the mouse button to cycle through the choices. However, you can only go forward, not backward. Sometimes I find that I've overshot the fill pattern I was looking for—and having to go all the way around again.

DEGAS is written primarily in the C language, with some assembly language subroutines. The program will continually be enhanced. Driver programs will become available for color printers and plotters. A capability to cut and paste art between screens is just around the corner. Also, the use of graphics tablets for input will be supported. As these additional printer drivers become available, they will be made available through CompuServe and other sources. So **DEGAS** is just beginning.

Batteries Included has a policy of not copy-protecting their software for the 520ST. They took the same bold stand with **HomePak** for the 8-bit Atari computers, and it worked. Please honor their copyright and *do not give, lend, loan or make copies of the program* for anyone but yourself. The program's author, Tom Hudson, suffers if you do; Batteries Included suffers; and, most of all, users of ST computers suffer—because software will no longer be made for our computer.

All in all, **DEGAS** is a wonderful program and a real value. For $40, you get the drawing program itself, a font-editor program, a slide show program, sample picture files and continuing support from the program's author, via CompuServe. I can't think of a reason why anyone who owns an Atari ST would *not* want this program. It's truly a graphics masterpiece for your 520ST.

Tom Hudson has had an affair with machine language programming from the beginning. He began working with 8080 systems at first, but took up the 6502 processor soon after the Atari 800 came out. To use his own words, "I just went bananas over the graphics when I first saw the Atari 800." His interest in graphics over the years has now culminated in **DEGAS**.

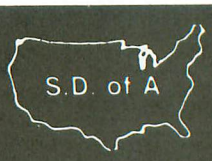
With an academic background in data processing—and a yen to be a good artist—Tom enjoys what he's doing now: working on exciting projects like **DEGAS** and a few others we can't yet talk about. Tom recently told us that writing **DEGAS** resulted in several surprising outcomes.

He said that, usually, by the time a lengthy programming project is completed, he's tired of working with it, and wants nothing to do with the final product. Not true for **DEGAS**. Also, he's found that **DEGAS** has allowed him to be creative in another area—art. **DEGAS** is so natural to use that he's enjoying the ability to express some of his artistic ideas on the electronic canvas. All of the pictures in this review were drawn by Tom.

He's looking forward to seeing the results of people using **DEGAS**. He finds it very satisfying to open up an outlet for creativity for people and their computers.

Tom finds the Atari 520ST to be a value breakthrough, just as the original Atari 800 was a graphics breakthrough. Says Tom, "Consider this: you can buy a complete RGB color ST system today for less money than I paid for my 16K Atari 800 a few years ago."

Software Discounters of America



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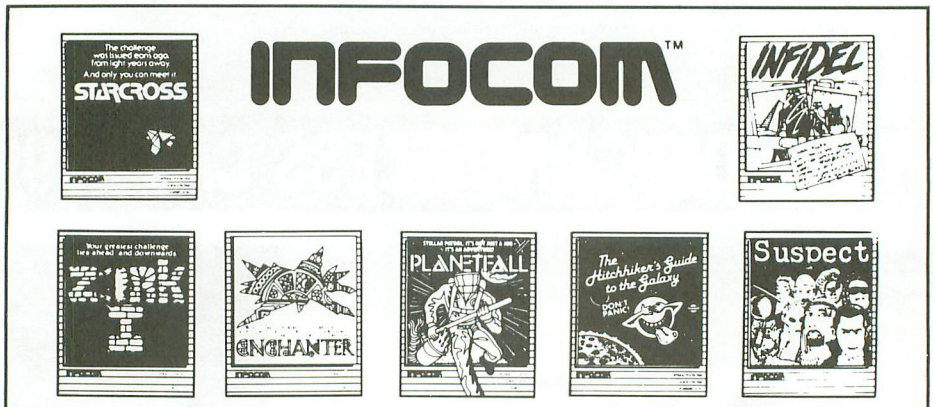

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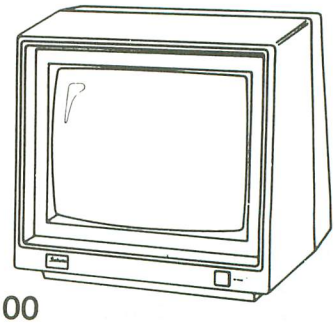

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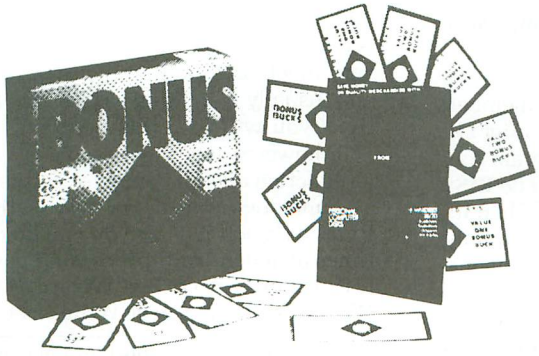

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by Bernard W. Palmer, M.D.

I was intrigued by the advertisement: a simple, easy-to-use word processor in a cartridge for only $14.95. Furthermore, the ad said that it was designed for "Beginners, Children, and the Occasional User."

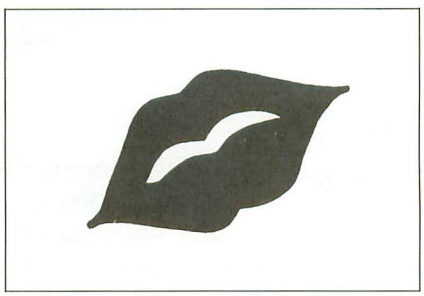
The lipstick imprint and the acronym for Keep It Simple, Stupid! didn't hurt anything, either. I picked up my phone, called the "800" number, and gave the nice lady my MasterCard number. I still think it was a very good ad.

Now, as a matter of fact, this is certainly not fraudulent advertising: all the claims are true. To be sure, by the time handling and shipping charges were added, my account was debited by almost $19.00, and unless your children are a lot smarter than my children, they'll find many other word processors simpler and easier to use.

The **KISS** word processor program comes as a cartridge that fits in the right-hand slot of my Atari 800 (it's the only cartridge I own, except for the **Monkey Wrench II**, also from Eastern House.)

Fundamentally, this is simply a program to strip line numbers off of a BASIC program. That is, text is fed into the computer in REM form: you type a line number, REM (or two periods), and then you type text until you come to the end of the sentence or the keyboard buzzer sounds. Then you type another line number, followed by two periods, and resume typing your text.

There are only thirteen macro commands which can be imbedded in the text (margins, single or double spacing, justification, indentation and page numbers.) This is both a strength and a weakness of the program.



The macro commands are impossible to remember: margins are set by *.m*, *.n*, *.p*, *.q*, etc. Well, perhaps I should say they're impossible for *me* to remember; there are only a baker's dozen, after all.

Text is saved as a BASIC program consisting entirely of REMARKS. The **KISS** program comes into play only when it's time to output the text—to screen only, or to screen and printer simultaneously. Simply type *X=USR(32772)*, and presto! Your text (*sans* line numbers and macro commands) will appear on your monitor and printer paper. If you don't like what you see, rearrange your REMs and commands, and try again.

Editorial functions are confined to the keyboard editor. There's no quick way to go to the bottom or top of the text.

I've grown accustomed to the word wrap-around feature of most word processors, so those word fragments on the screen are disconcerting.

Inserting text requires line numbers, such as *43* and *78*; moving text involves thinking and renumbering. Replacing a sentence is done simply by typing the line number(s) of the offending sentence, then the new text, just as it's done in BASIC programming.

If you have an Atari 825 printer, underlining and elongated printing are available to you. Otherwise, there are no printer codes in this program.

If you're accustomed to writing BASIC programs, this cartridge will allow you to use your Atari 800, 600XL or 800XL like a typewriter. If your budget is a limiting factor, and you don't put out very much text, and are not in a hurry, and usually get things right the first time, you will love this program.

If, however, word processing is a major function of your computer, this is not a sound investment. For two or three times as much money, you can buy ten times as much word processing power. (Try **Letter Perfect**, **Text Wizard**, **AtariWriter**, or **Bank Street Writer**.)

Doctor Palmer has had an ENT practice for twenty years. For the last four, he's been using his Atari 800 in games, word processing and finances.

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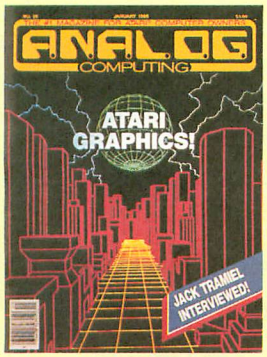

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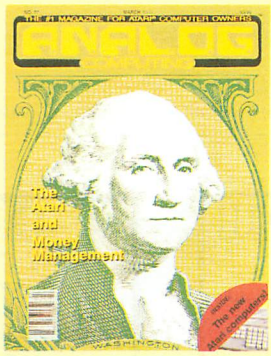

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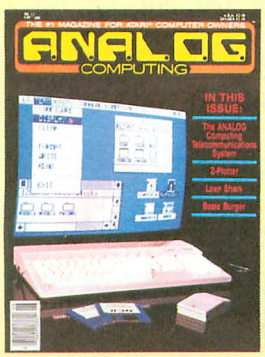

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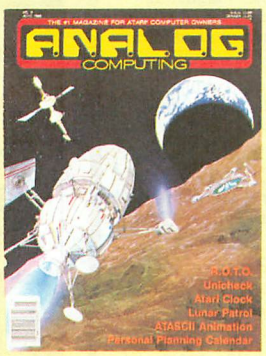

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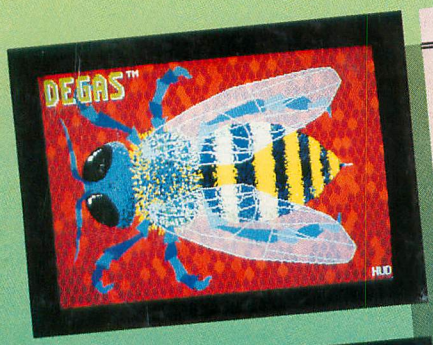

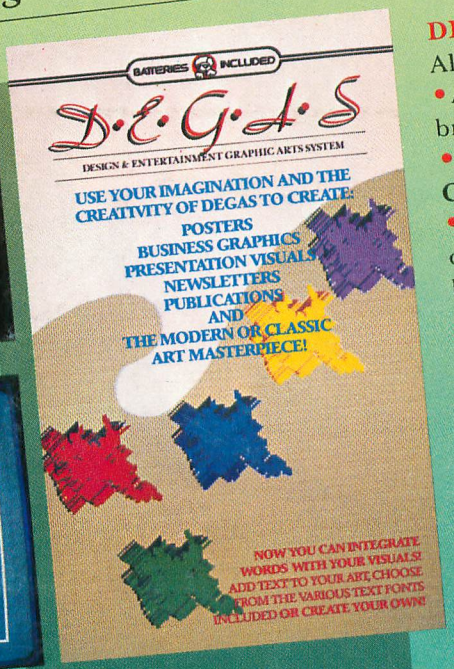

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