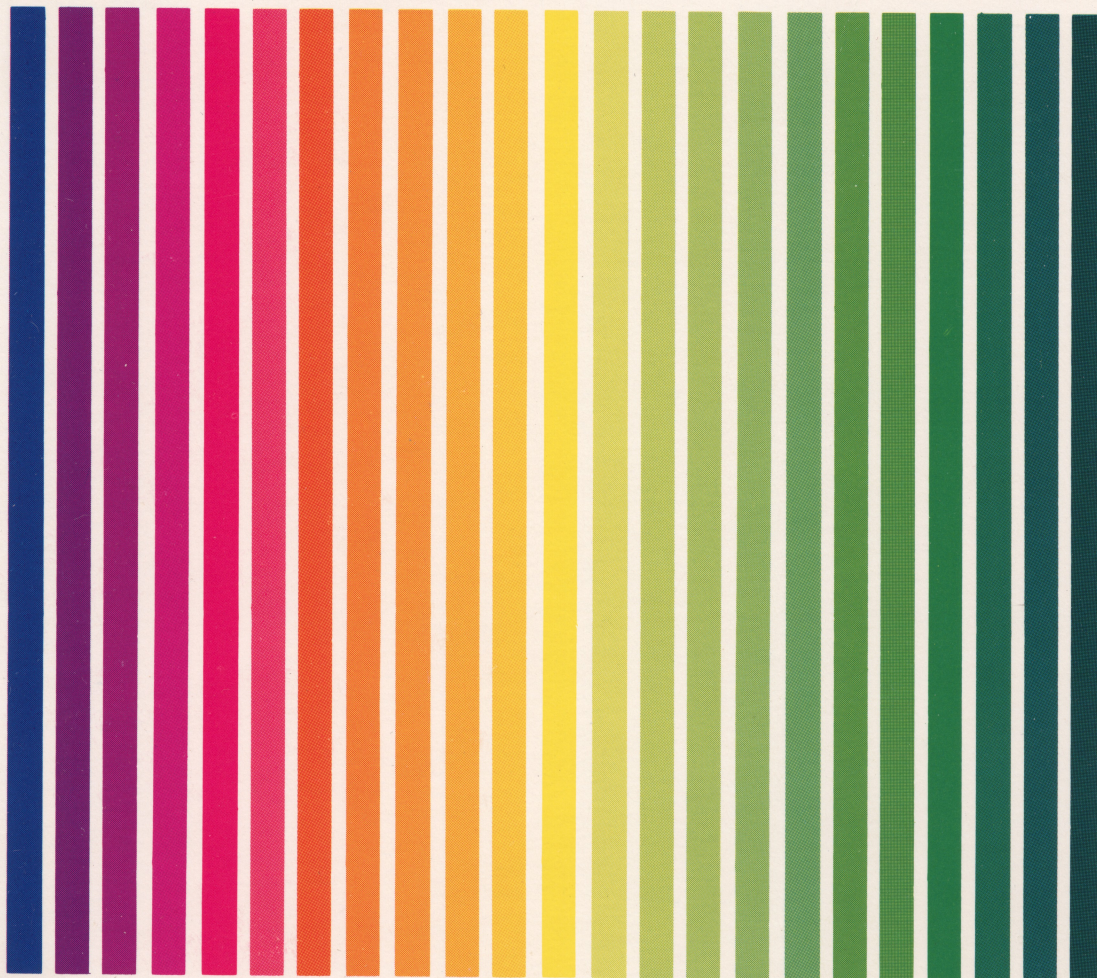


APX ATARI® PROGRAM EXCHANGE



DUANE L. KING MARCH 1982

SKETCHPAD

CASSETTE (APX-10107)

REQUIRES: 16K RAM

DISKETTE (APX-20107)

REQUIRES: 24K RAM

User-Written Software for ATARI Home Computers

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SKETCHPAD

by

Duane L. King

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INTRODUCTION

OVERVIEW

SKETCHPAD is a drawing tool for creating designs on your ATARI Home Computer. You use a Joystick Controller to position a cursor in the drawing area of the TV display. Then you type one- and two-letter commands in a command window to specify the design element. The program has 25 commands for drawing, coloring, and merging designs. You can draw points, lines, boxes, circles, lines radiating from a common point, and solid areas. You can create mirror images of designs in several ways--from left half to right half, upper half to lower half, or within the drawing area's four quarters. You can change the hue and intensity of four pen colors (one background and three foreground). All the colors in ATARI BASIC's 128-color palette (16 hues and 8 luminosities) are available, but your design displays in only four colors at a time. You can copy the design elements in one area to another area, and you can merge a design on the screen with one stored on cassette or diskette.

REQUIRED ACCESSORIES

ATARI BASIC Language Cartridge
One ATARI Joystick Controller
Cassette tapes or DOS 2-formatted diskette(s) for storing pictures

Cassette version

16K RAM
ATARI 410 Program Recorder

Diskette version

24K RAM
ATARI 810 Disk Drive

CONTACTING THE AUTHOR

Users wishing to contact the author about SKETCHPAD may write to him at:

4509 Triana Boulevard, Lot 94
Huntsville, Alabama 35805

GETTING STARTED

LOADING SKETCHPAD INTO COMPUTER MEMORY

1. Insert the ATARI BASIC Language Cartridge in the cartridge slot of your computer.
2. Plug the Joystick Controller into the first (leftmost) controller jack at the front of the computer console.
3. If you have the cassette version of SKETCHPAD:
 - a. Have your computer turned off.
 - b. Slide the SKETCHPAD cassette into the program recorder's cassette holder and press REWIND on the recorder until the tape rewinds completely. Then press PLAY to prepare the program recorder for loading the program.
 - c. Turn on the computer while holding down the START key.
 - d. When you hear a beep, release the START key and press the RETURN key. SKETCHPAD will load into computer memory and start automatically.

Note. A beep sounds after the title page displays, indicating that the main program loading has begun. You needn't press the RETURN key this time.

If you have the diskette version of SKETCHPAD:

- a. Turn on your disk drive.
- b. When the BUSY light goes out, open the disk drive door and insert the SKETCHPAD diskette with the label in the lower right-hand corner nearest to you. Close the door.
- c. Turn on your computer and TV set. The program will load into computer memory and start automatically.

FIRST DISPLAY SCREEN

The display screen contains a black drawing area with a pink cross-hair cursor in the upper quarter and a blue command window at the bottom of the screen. A status line at the top of the command window indicates the initial position of the cursor, N(40,20), and the initial pen, (P1).

SAMPLE SESSION

Use this sample session to become familiar with some of SKETCHPAD's features. Read each command's notes before executing the command. Type in the commands exactly as they appear (except for TRIGGER, which is explained below) and press the RETURN key after each command.

The screen origin (0,0) is at the upper left-hand corner of the drawing area. The x-coordinate goes from 0 to 159 across the screen; the y-coordinate goes from 0 to 79 down the screen. Control the cross-hair cursor by moving the Joystick in the direction you want to move the cursor (hold the Joystick with the trigger button to your upper left). Cursor movements are represented in the sample session as:

TRIGGER (x,y)

When you have the cursor positioned at the specified x-y location, press the trigger button (pressing the RETURN key isn't necessary in these cases).

COMMANDS	NOTES
TRIGGER (40,20)	The status line at the top of the command window indicates the cursor is 40 columns across the drawing area and 20 rows down the drawing area--N(40,20). It also indicates you're using Pen 1. Press the TRIGGER button without moving the cursor. You'll hear a "click".
TRIGGER (50,20)	Now use the Joystick to move the cursor horizontally to the right. When the status line displays "(50,20)", press the TRIGGER button. The program draws an ORANGE line from (40,20) to (50,20).
TRIGGER (50,20)	Now we want to draw another line segment that's attached to the ORANGE one we just drew. To do so, press the trigger again at (50,20) without moving the cursor, to specify the starting point of the next segment.
P2	We'll change to pen 2, which is green, before moving to the end point of this segment of the line.
TRIGGER (60,10)	Move the cursor to (60,10) to draw a GREEN line.
TRIGGER (60,10)	Press TRIGGER again at the same location to start another segment.
TRIGGER (40,10)	Move the cursor to (40,10) to draw the third segment.

F3 Change to pen 3 to draw in BLUE.

C Activate the CIRCLE command.

TRIGGER (40,10) Notice the word CIRCLE in inverse video in the status line of the command window, and the prompt following the line. The prompt is asking you to position the cursor at the location where you want the center of the circle. Press the TRIGGER button without moving the cursor to center the circle at (40,10).

TRIGGER (40,0) Another prompt now asks you to position the cursor at the coordinate location where you want the outer edge of the circle to extend. Move the cursor to position (40,0), and press the trigger button to cause the program to draw a SOLID BLUE CIRCLE.

F1 Change back to pen 1 in ORANGE.

B Activate the BOX command.

TRIGGER (60,33) A prompt appears below the status line asking you to position the cursor where you want the lower left-hand corner of the box. Move the cursor to (60,33) and press the trigger button.

TRIGGER (70,22) Now a prompt asks you to position the cursor at the upper right-hand corner of the box. Move the cursor to (70,22) and press the trigger button.

H5 Change all design elements of the current pen (P1) from the current color (ORANGE) to LIGHT PURPLE (H5).

F0 Now change to the background pen, which is 0.

H7 Change the background to HARD BLUE, a hue (H) of 7.

F3 Change to pen 3.

H3 Change all BLUE to RED.

I2 Darken the red by lowering the intensity with the I command.

F2 Change to pen 2.

I6 Darken the green of pen 2.

- D Display the new values of all the pens with the D command. After you check these values, press the RETURN key to return to command mode.
- Q Leave SKETCHPAD.

This example uses only 8 of the 25 available commands, but you now have some background and experience for reading the details in the next sections, which describe all the commands.

COMMANDS

INTRODUCTION

Entering commands

Type all SKETCHPAD commands on the computer keyboard, and press the RETURN key after each command. Some commands display prompts requesting you either to enter more information from the keyboard or to position the cursor and then press the Joystick's trigger button.

Command mode

You can enter commands only when you're in command mode, which is the normal mode of SKETCHPAD. In command mode, you see the pink cross-hair cursor in the drawing area and the status line indicates you're in one of the symmetric modes (explained below).

When you start the program, the status line reads:

```
N(40,20)P1
```

The "N" indicates you're in "no symmetry" mode. "(40,20)" indicates the current location of the cursor. "P1" indicates you're using pen 1. The rest of the command window is blank, which also denotes command mode. When you activate a command, the name of the command displays in the status line and any accompanying prompts display on the following line. The format of the status information is:

```
<symmetry mode>(x,y)P<pen number>
```

Symmetry mode is indicated by one of these single letters:

```
B  design element symmetric about both axes  
N  no symmetry  
X  design element symmetric about X-centerline  
Y  design element symmetric about Y-centerline
```

Pen number is indicated by one of these digits:

```
0  Initial color is BLACK (background)  
1  Initial color is ORANGE  
2  Initial color is GREEN (intensity of the letters  
   in the command window)  
3  Initial color is BLUE (also command window color)
```

Figure 1 approximates the initial display.

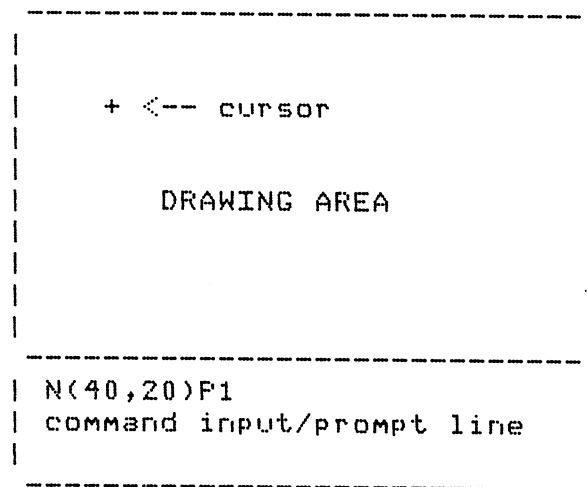


Figure 1 SKETCHPAD Display

Screen Dimensions

The origin (0,0) of the axes is at the upper left corner of the drawing area. The x-axis goes from left to right, and the y-axis from top to bottom, as shown in Figure 2.

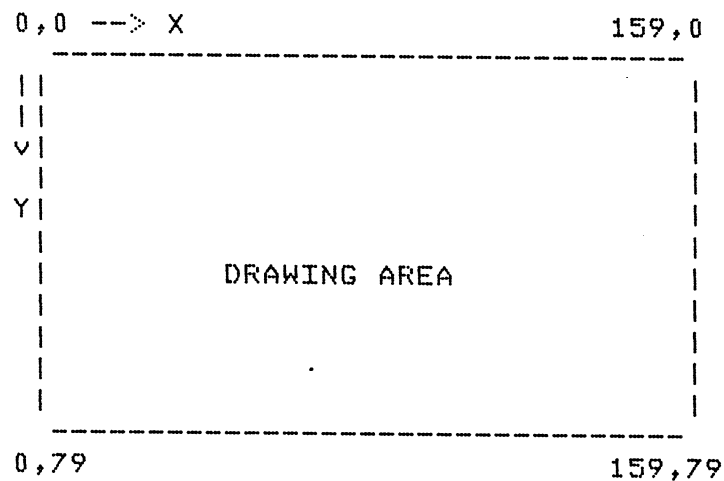


Figure 2 Screen Dimensions of Drawing Area

Cursor position and symmetry

Each symmetry mode limits you as to the drawing area in which you may move the cursor. The mode and permitted area are as follows:

- B--the upper left quarter of the drawing area
- N--the entire drawing area

X--the upper half of the drawing area
Y--the left half of the drawing area

When you're working in a limited area, each item you draw is mirrored in the remainder of the screen.

You can change the symmetry mode at any time you're in command mode without changing the elements already drawn on the screen.

Entering screen coordinates

You specify x-y coordinates required for a command by moving the cursor around the screen with your Joystick and then pressing the trigger button until you hear a "click", which indicates the current position of the cursor has passed to the command. Each time you press the trigger button, you'll hear the click through the computer console's speaker.

The longer you move the cursor in a direction, the faster it travels. This acceleration is canceled when you put the Joystick back in "neutral", that is, when you stop moving the cursor. This feature lets you move the cursor across the width of the screen in less than five seconds.

LINES AND POINTS

You can draw lines and points very simply by positioning the cursor at a point and then pressing the trigger button. To draw a point, you press the trigger button twice at the same cursor location. To draw a line, first you position the cursor at the starting point and press the trigger button. Then you reposition the cursor at the ending point and press the trigger button again.

You can draw a line string by triggering the starting point of the second line of the segment at the same location as the ending point of the first line. The steps are as follows:

```
Position cursor at start of line string
TRIGGER start point
Position cursor at end of first segment
TRIGGER end point of first segment
TRIGGER start of second segment
Position cursor at end of second segment
TRIGGER end point of second segment
TRIGGER start of third segment
Position cursor at end of third segment
TRIGGER end point of third segment
  ⋮
  ⋮
TRIGGER start of last segment
Position cursor at end of last segment
TRIGGER end point of last segment
```

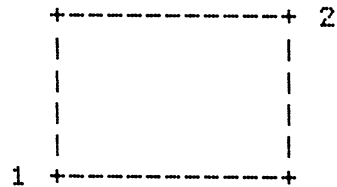
Erasing lines

To erase a line:

1. Use the P0 command to change to the background pen color.
2. Redraw the line in the same direction.
3. Change the pen color back to the previous one.

B - DRAW A BOX

Use the B command to draw solid boxes. The command prompts you for two points that describe the box's diagonal, extending from the lower left-hand corner to the upper right-hand corner:



Position the cursor at the appropriate location and enter the points by pressing the Joystick trigger button. A prompt displays for each point:

- 1 - TRIGGER LLC (lower left-hand corner)
- 2 - TRIGGER URC (upper right-hand corner)

The B command ignores the case of a box with a zero-length diagonal (that is, both points are triggered at the same location). Actually, this command works with any diagonal. You can specify the diagonal left to right, top to bottom, and so on, as long as it's a diagonal.

C - DRAW A CIRCLE

Use the C command to draw solid circles. The command prompts you for two points describing the circle's center point and radius:



Enter the two points by positioning the cursor at the appropriate location and pressing the Joystick trigger button. A prompt displays for each point:

1 - TRIGGER center point

2 - TRIGGER radius

The C command ignores the case of the circle with a zero-length radius (that is, both points are triggered at the same location).

To overcome the "vertical stretch" characteristic of TV screens, the circle is scaled. That is, circles drawn by SKETCHPAD are 20 percent wider than they are tall. Increasing the width of circles drawn gives them a more circular appearance. If you specify the radius of circles horizontally from the center, they'll be wider than your edge point (point 2 in the diagram above) specified by 20 percent. If you specify the radius vertically from the center, the circle will pass through the edge point and not beyond it.

CS - CLEAR SCREEN

Use the CS command to clear the screen without affecting the current pen, the current screen mode, the pen colors, or the cursor position. This command has no prompts.

D - DISPLAY PEN COLOR VALUES

Use the D command to check the current pen colors. SKETCHPAD has an initial color for each pen. If you use the D command to display these initial colors, the information looks like this:

P0	P1	P2	P3	
0	2	12	9	HUE
0	8	10	4	LUM.

press RETURN to exit?

For each pen number (P0, P1, P2, P3), the display indicates the hue number (HUE) and the intensity (LUM.). The display remains on the screen until you press the RETURN key to return to command mode.

See the Intensity (I) and Hue (H) commands for descriptions of hue and luminosity values. Also see the Display Reference Page (M) command for a TV display summarizing the hue and intensity settings of all pens.

DD - DISK DIRECTORY

Use the DD command to display a complete diskette directory in the same format as that used by DOS 2.0S. See Chapter 4 of the Disk Operating System II Reference Manual for a complete explanation of the directory. This command displays the directory only for disk drive 1 (D1:), and it doesn't apply to cassette-only systems.

Once the directory displays on the screen, the prompt:

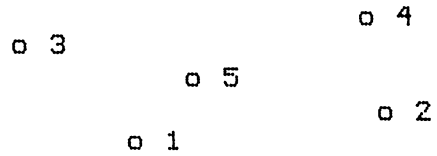
```
press RETURN to exit?
```

displays following the directory. The directory listing remains on the display screen until you press the RETURN key. After you locate the file name you're looking for, press the RETURN key and then use the R or W commands to read from or write to your desired file.

If the directory listing is longer than the display screen area, the display will scroll, causing the file names to disappear off the top of the screen. You can stop the scrolling temporarily by holding down the CTRL key and pressing "1", and then releasing both keys. To continue the display, repeat the CTRL-1 sequence.

E - DRAW AN ELASTIC LINE STRING

Use the E command to draw lines that radiate from a common point. The points defining the line string are as follows:



Position the cursor at the center point (1) and press the Joystick trigger. All following points will connect from the center point to the triggered cursor location, as illustrated above. The two prompts displayed are:

- 1 - TRIGGER center point
- 2 - TRIGGER next point

End elastic string mode by triggering twice at the last point.

F - FILL AN AREA

Use the F command to fill areas with the current pen color. The F command displays these prompts:

- 1 - TRIGGER start point
- 2 - TRIGGER end point

After you position the cursor at the start and end points and trigger each point, the area bounded vertically by the start and end points right fills, line by line. Fill is done on each line defined by these two points to the right, until a colored area is encountered, or until the fill wraps around the screen and meets the starting point. At each point, the fill command then begins to fill the next line, and so on, until the line with the end point has been filled.

The fill command doesn't obey your current symmetry mode. You must fill symmetric figures in individual segments. Also, this command doesn't fill the line the starting point is on.

H - CHANGE THE COLOR (HUE) OF CURRENT PEN

Use the H command to change the color of your current pen. This command is a single-line command, H#, where "#" is the number representing the color to which you want to change your current pen. The values of the hue number are:

H#	COLOR
0	Gray
1	Light orange
2	Orange
3	Red-orange
4	Pink
5	Purple
6	Purple-blue
7	Blue
8	Blue
9	Light blue
10	Turquoise
11	Green-blue
12	Green
13	Yellow-green
14	Orange-green
15	Light orange

The H command changes the color of all items drawn on the screen in the current pen color. This limitation is a hardware characteristic. Change a pen color as follows:

1. Use the P command to select the pen for which you want to change the color (e.g., P3).
2. Use the H command to change the pen's color (e.g., H12).

The intensity of the hue is controlled by the I command.

I - CHANGE COLOR INTENSITY (LUMINOSITY)

Use the I command to change the intensity of all items drawn on the screen in the current pen color. This command is a single-line command, I#, where "#" is an even integer between 0 and 14. The values and meanings of the luminosity number are as follows:

I#	BRIGHTNESS
0	Darkest
2	.
4	.
6	.
8	.
10	.
12	.
14	Brightest (off-white)

Change the intensity of a pen color as follows:

1. Use the P command to select the pen for which you want to change the intensity (e.g., P3)
2. Use the I command to change the pen color's intensity (e.g., I2).

If the luminosities of pens 2 and 3 are the same, the text in the command window at the bottom of the screen will be invisible. This anomaly is a hardware characteristic.

K - COPY AN AREA

Use the K command to copy a rectangular area to another area of the screen. Specify the area to be copied by positioning the cursor at the lower left-hand corner and upper right-hand corner and pressing the trigger button each time. The prompts displayed are:

- 1 - TRIGGER LLC (lower left-hand corner)
- 2 - TRIGGER URC (upper right-hand corner)

Select the destination area by positioning the cursor at the upper left-hand corner of the destination rectangle in response to the third prompt and then pressing the trigger button:

- 3 - TRIGGER target ULC (upper left-hand corner)

The K command doesn't clip at the screen mode boundaries, regardless of symmetry mode. In modes X, Y, and B, overlap can occur if you copy areas near the symmetry axis of the screen. You can use this characteristic effectively with the copy methods described in the Advanced Commands section.

M - DISPLAY REFERENCE PAGE

Use the M command to obtain an quick reference display of SKETCHPAD commands. When you press the M key, SKETCHPAD immediately displays the reference page. Don't press the RETURN key. This display contains most of the summary information on the SKETCHPAD QUICK REFERENCE SHEET, located at the back of these instructions. The screen display is formatted differently owing to space limitations.

When you've finished checking the reference page, press the RETURN key to redisplay your design.

The M command doesn't work if:

1. You've activated the D, DD, R, or W commands (because they require keyboard input), or
2. You've already pressed some other key and SKETCHPAD is waiting for you to complete the command and press the RETURN key.

P - CHANGE DRAWING PEN

Use the P command to change your current pen. SKETCHPAD provides four pens, which lets you create drawings having from one to four colors. The command is a single-line command, P#, where "#" is the pen number (0 - 3) you want to use for subsequent drawing. For example, type P3 to draw with pen 3. See the Introduction to this section for information about initial pen colors.

The P command is special in that you can use it in command mode, or at any time a prompt for input displays. For example, you can enter the P command instead of indicating the second point (URC) for the BOX command to cause SKETCHPAD to change colors. Then you can trigger the second point to draw the box in the new pen color.

The R (Restore display) and W (Save display) commands ignore the P command, because changing pen color during these actions has no bearing on the activity.

Q - QUIT SKETCHPAD

Use the Q command to end your SKETCHPAD session. Once you use the Q command, you can restart SKETCHPAD only by turning off your computer and then turning it on again with SKETCHPAD in disk drive one.

R - LOAD DISPLAY FROM CASSETTE OR DISKETTE

Use the R command to retrieve a previously saved copy (see the W command) of a screen display from cassette or a data diskette for viewing or modification. The command displays the prompt:

filename?

Your response depends on where the screen to be loaded into computer memory resides.

For screens on cassette, respond with:

C

and press the RETURN key. The prompt

cue tape- push RETURN

appears and beeps once to indicate you should place in the program recorder the tape containing the screen to be loaded, press PLAY, and then press the RETURN key. After about 15 seconds, the screen starts loading on top of the current screen's contents. Loading takes about 2 1/2 minutes. Another beep sounds upon completion of the command and returns you to command mode.

For screens on diskette, have your data diskette inserted in the disk drive and then respond with the DOS filename (e.g., D1:GARDEN.PIC). Limit your total filename to 15 characters; otherwise, SKETCHPAD can't locate the file. (DOS allows filenames longer than 8 characters and simply truncates the name to the first 8 characters. The same procedure is true to the 3-character extender. SKETCHPAD doesn't do this.) SKETCHPAD immediately begins loading the screen on top of the current screen's contents. The load takes about 10 1/2 seconds.

Note. The program interprets the first character of the filename as the device code (D for diskette, C for cassette, or S for screen). If you omit the device code and use a filename starting with "S", the screen will be read into itself, causing the screen to turn one color. If you run into this problem, you'll lose the current picture. If you have the diskette version of SKETCHPAD, press the SYSTEM RESET key to reload SKETCHPAD into computer memory and continue your work. If you have the cassette version, reload SKETCHPAD into computer memory, following the steps in "Getting Started".

Sm - SCREEN SYMMETRY MODE COMMANDS

Control the behavior of the screen while drawing by using the S command. You can change symmetry mode during a drawing session, and subsequent drawing will be in the new mode, while previous work remains unchanged. The symmetry mode commands are:

COMMAND	DESCRIPTION
SB	Draw symmetrically about both horizontal and vertical center lines
SN	Draw with no symmetry
SX	Draw symmetrically about the horizontal center line
SY	Draw symmetrically about the vertical center line

The axes have their origin (0,0) at the upper left corner of the drawing area. The x-axis runs from left to right, and the y-axis from top to bottom. The maximum screen dimensions are 0 - 159 columns across the screen (the x-axis) and 0 - 79 rows down the screen (the y-axis). The actual drawing area is determined by the symmetry mode of the screen, as shown in Figure 3 below. Characteristics of each mode are as follows:

B

The cursor is restricted to 0-79 along the x-axis and 0-39 along the y-axis. Every item drawn in this mode is mirrored around the center of the screen to create a bi-axially symmetrical picture.

N

The cursor can move across the full screen (0-159 along the x-axis and 0-79 along the y-axis). What you draw is what you get.

X

The cursor is restricted to 0-159 along the x-axis and 0-39 along the y-axis. Every item drawn is mirrored about the horizontal center axis of the screen.

Y

The cursor is restricted to 0-79 along the x-axis and 0-79 along the y-axis. Every item drawn is folded about the vertical center axis of the screen.

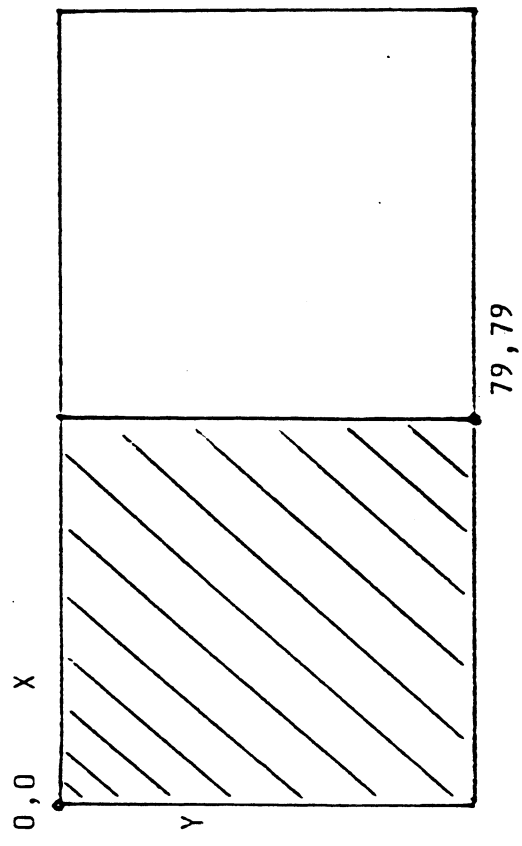
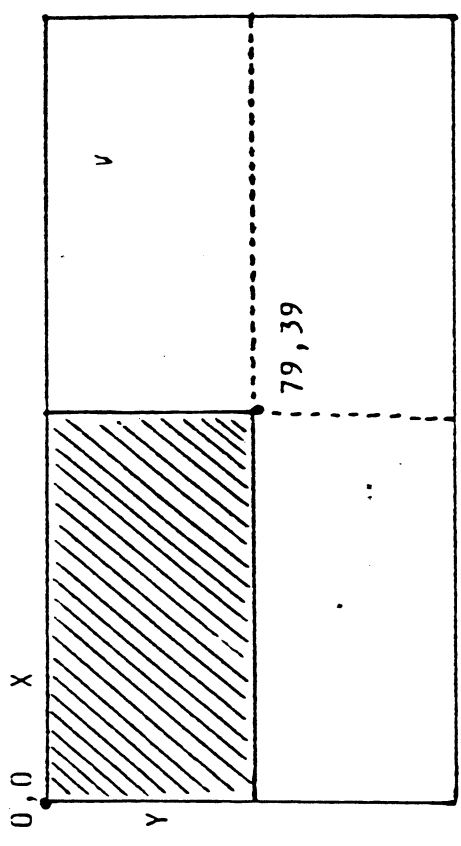
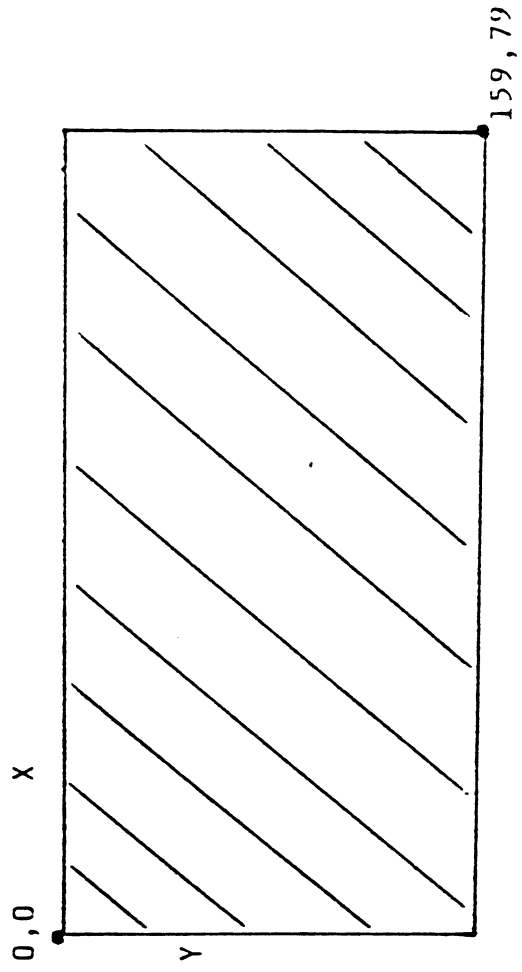
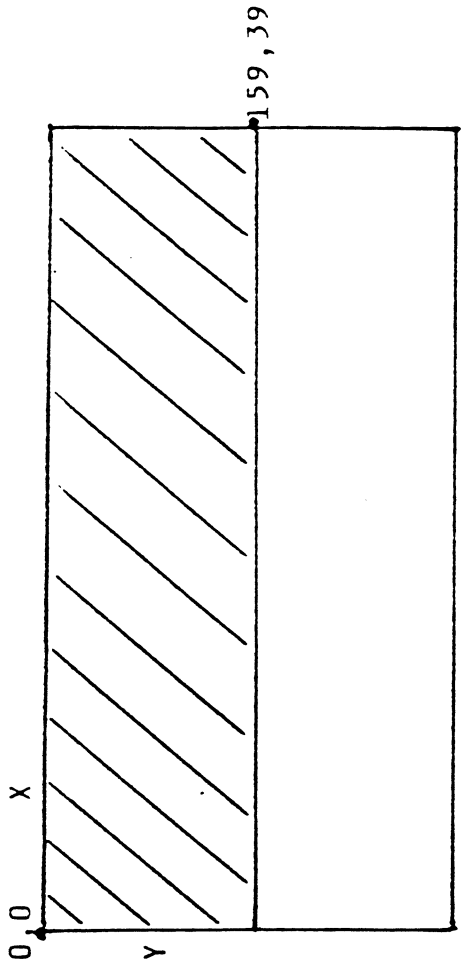


FIGURE 3

W - SAVE DISPLAY ON CASSETTE OR DISKETTE

Use the W command to store a copy of your screen design on a data diskette for future use. The command displays the prompt:

```
filename?
```

Your response depends on the device on which you want to store your screen.

To save screens on cassette, respond:

```
C
```

and press the RETURN key. The prompt

```
cue tape- push RETURN
```

appears and beeps twice to indicate you should place in the program recorder the tape for storing the display, press RECORD and PLAY, and then press the RETURN key. After about 15 seconds, the message:

```
DISPLAY BEING SAVED
```

displays in the command window and recording begins. Saving a screen takes about 2 1/2 minutes. A long beep sounds upon completion of the command and returns you to command mode.

For screens on diskette, have your data diskette inserted in the disk drive and then respond with the DOS filename (e.g., D1:DESIGN.PIC). Limit your total filename to 15 characters; otherwise, SKETCHPAD can't locate the file. (DOS allows filenames longer than 8 characters and simply truncates the name to the first 8 characters. The same procedure is true to the 3-character extender. SKETCHPAD doesn't do this.) SKETCHPAD immediately begins saving the screen on diskette. The saving process takes about 15 seconds.

The W command saves the following screen settings for later retrieval by the R command:

1. screen symmetry mode
2. current pen number
3. all current pen colors (both hue and luminosity)

You can save about twenty screens on one diskette. Each picture file requires 26 sectors of diskette space.

Note. The program interprets the first character of the filename as the device code (D for diskette, C for cassette, or S for screen). If you omit the device code and use a filename starting with "S", the screen will be written to itself, causing garbage to appear on the screen and the status line to display at the top of the screen. If you run into this problem, you'll lose the current picture. If you have the diskette version of SKETCHPAD, press the SYSTEM RESET key to reload SKETCHPAD into computer memory and continue your work. If you have the cassette version, follow the steps under "Getting Started" to reload SKETCHPAD into computer memory.

ADVANCED COMMANDS

The advanced commands are extensions of the copy command (K) and the read command (R). These extensions allow shapes on the screen to interact with other shapes, either on the screen or in a cassette or disk file. The interaction is governed by three rules of logic:

- AND - intersection
- OR - union
- EOR - NOT(intersection)

As a source area is copied to a destination or as a screen is read in under control of one of these three rules, the rule operates on the two pixels under consideration to determine the color of the pixel to be placed on the screen.

For example, a display may be created and then a stored display may be read in under control of the AND rule. The first pixel is read from the stored display, and the pixel at location (0,0) on the screen is ANDed with it to determine the color of the pixel that will be placed at location (0,0). Then the second pixel is taken from the display and ANDed with the pixel at location (1,0) to make a new pixel for that location. This process moves from left to right from the top of the screen to the bottom until the entire display is read in from storage and ANDed with the screen contents. So, the two pictures are combined, one pixel at a time, according to the AND rule.

The extensions of the copy command work exactly like the extensions to the read command, as described above. The copy command obtains its input from a rectangular area of the screen that is defined by the user of the copy command and copies this area according to the specified rule to a destination area on the screen.

These extensions to the R and K commands are invoked by:

Rn -or- Kn

where n is

1 to AND the source and the destination pixel

2 to OR the source and the destination pixel

3 to EOR the source and the destination pixel

while SKETCHPAD is in the command mode.

In order to apply these rules for drawing more sophisticated displays, you must become familiar with the three tables describing the source and destination pixel colors (pen color numbers) and pixel color (pen number again) produced by the rule.

Rule 1 (AND)

		source/stored			
		∅	1	2	3
destination	∅	∅	∅	∅	∅
	1	∅	1	∅	1
	2	∅	∅	2	2
	3	∅	1	2	3

Rule 2 (OR)

		source/stored			
		∅	1	2	3
destination	∅	∅	1	2	3
	1	1	1	3	3
	2	2	3	2	3
	3	3	3	3	3

Rule 3 (EOR)

		source/stored			
		∅	1	2	3
destination	∅	∅	1	2	3
	1	1	∅	3	2
	2	2	3	∅	1
	3	3	2	1	∅

As an example of how these tables work, we can assume that we want to use the copy command and apply the EOR rule (K3). Going across the top of the Rule 3 table, we pick the source pixels. Going down the left side of the Rule 3 table, we pick the pixel values that are already on the screen. Now we move our finger to the right on the destination row until we meet the source column. The pixel value at the point is the value that will be left on the screen by the application of rule 3 (EOR) on those two pixels.

If the source pixel is color 2 and the destination pixel is color 3, then we can follow row 3 of the Rule 3 table to the right (from the left side) until we are in column 2 and find that the resulting pixel color will be 1. Note that with rule 3, whenever identical pixel colors are EORed the result is always color 0.

Draw a circle with pen 1 (P1) with its center at (40,20) and its radius at (50,20). Use the K3 command to copy the rectangle whose diagonal is described by the coordinates (50,30) and (30,10) to the target area whose upper left corner is described by the coordinate (20,0). Where these two circles overlap, the color will be the background color.

CURSOR CONTROL KEYS

The three keys on the right-hand side of the console that are below the SYSTEM RESET key are used by SKETCHPAD to control the cursor color and its speed of motion across the screen.

Color control is handled by the OPTION and SELECT keys. The OPTION key will increase the number in the cursor color register by 2 for each time it is pressed. The effect of this is to increase the intensity of the cursor. When pressed repeatedly, the intensity of the cursor will increase to its maximum, and then bump up to the next color and the lowest intensity value for this new color. Pressing the SELECT key has the opposite effect--the color value in the cursor color register is decreased by two for each press of the SELECT key.

Cursor speed is controlled by the START key. Pressing this key once will erase the status display at the bottom of the screen. SKETCHPAD is still in command mode but the status is not displayed. Pressing this key a second time will cause the status line to re-appear. Disabling the status line display will speed up cursor motion by about 25%. The only disadvantage to this mode of operation is the inability to know where on the screen the cursor is (in absolute coordinates), the pen number, or the current screen mode. Since the START key toggles the status line, this isn't a real handicap.

It may be desirable to photograph the TV screen. In this case, it is very handy to be able to turn off the status line with the START key to prevent its appearance in the photo.

ADVANCED TECHNIQUES

INTRODUCTION

Use this section to supplement the basic descriptions in the Command section. You should already have read the command descriptions and be generally familiar with command operations. This section (1) illustrates novel uses of individual commands--uses not necessarily apparent from the basic descriptions in the Command section, and (2) describes combinations of commands that provide a capability or feature not available through a single command.

ADVANCED SKETCHPAD TECHNIQUES

PRODUCING A SYMMETRIC FIGURE FROM AN ASYMMETRIC ONE

One major restriction exists. Any asymmetric figure that is to be made symmetrical must reside in that portion of the screen that is accessible in the mode having the desired symmetry characteristic. If you want to make a figure symmetric about the Y-axis, then the asymmetric part of the figure must have been drawn in the area of the screen defined or bounded by (0,0) and (79,79). If this one unsurmountable requirement can be met, then the technique is straight forward:

- 1 - place the screen in the desired symmetry mode,
- 2 - activate the K2 command (copy with OR),
- 3 - specify the lower right-hand corner as the first coordinate,
- 4 - specify the upper left-hand corner as the second coordinate,
- 5 - specify the target ULC without moving the cursor.

The effect of this technique is to cause SKETCHPAD to copy the asymmetric portion of the figure on top of itself and simultaneously mirror the figure about the axis of symmetry specified by the screen mode.

As an example, put the screen in the no symmetry mode (SN) and draw a circle with pen one (P1) whose center is at (20,20) and whose radius is at (30,20). Use the SB command to place the screen in the bi-axial symmetry mode. Activate the K2 command and specify the source rectangle by the coordinates (30,30) and (10,10). Also specify the upper left-hand corner of the target rectangle at (10,10). SKETCHPAD will mirror the contents of the rectangle about both center axes to produce a symmetric figure. Naturally this technique will work for more complex figures and can also be adapted to produce symmetric fills.

COLOR FILL FOR COMPLEX SYMMETRIC FIGURES

One of the problems with producing complex solid figures is converting the outlines into solids. One method for filling these symmetric figures is to:

- 1 - draw the figure in the desired symmetry mode using line segments or what ever,
- 2 - use the fill command (F) to fill in the asymmetric portion of the figure,
- 3 - activate the K2 command (copy with OR),
- 4 - specify the lower right-hand corner as the first coordinate,
- 5 - specify the upper left-hand corner as the second coordinate,
- 6 - specify the target upper left-hand corner without moving the cursor,

Steps three through six of this fill technique are identical to the steps given for producing symmetric figures from asymmetric ones.

PRODUCING COMPLEX REPETITIVE PATTERNS

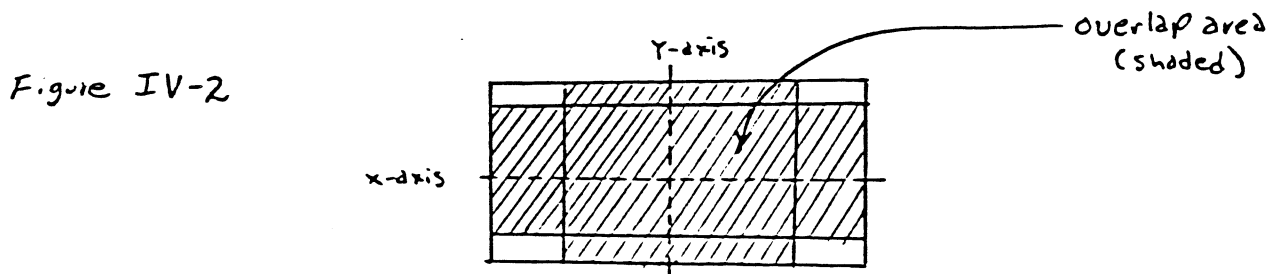
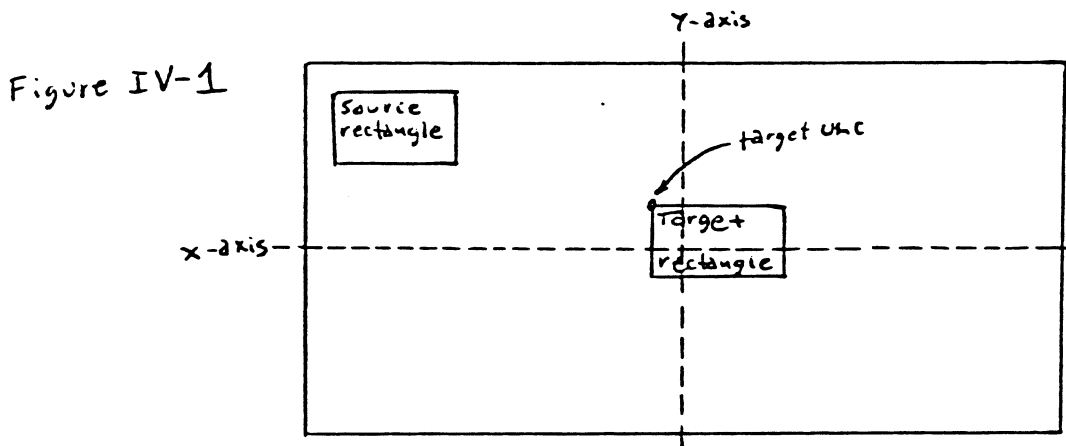
There are two good methods for producing repetitive patterns. If the repeat portion of the pattern must be symmetrical, the best way to make it is in the center of the screen in the appropriate symmetry mode. After the repeat portion is completed, place the screen in the no symmetry mode and use the K command to copy the pattern to the location you want to start the repeating pattern at. If the original pattern in the middle of the screen is in the way, you can erase it by drawing a box in the background color on top of it. Once the pattern has been created and placed at the desired location on the screen, successive K commands can be used to repeat the original pattern. If the repeat portion of the pattern is not symmetric, draw the original at the desired location and just use successive K commands to clone it around the screen. Typically, the copying is done in the no symmetry mode.

SYMMETRIC OVERLAP IN FIGURE CREATION

The copy command (K) has one distinguishing characteristic: it does not clip at the screen boundaries. This sometimes irritating feature can be used to create complex symmetric figures. The general technique is:

- 1 - place the screen in no symmetry mode (SN)
- 2 - draw a figure in the rectangular area defined by (0,0) and (79,39)
- 3 - place the screen in bi-axial symmetry mode
- 4 - use the K3 command (copy with EOR) to copy this figure to a target rectangle located near the center of the screen in such a way as to cause the rectangle to cross both axes of symmetry. This causes folding to occur and the EOR function will produce unexpected results. Figure IV-1 illustrates the source and target rectangles.

Figure IV-2 represents the resulting overlap pattern for Figure IV-1. For maximum effect, use all 3 foreground colors or pens in the source rectangle. The K1 and K2 commands will also produce interesting results when used in this way.



SEPARATING MERGED DISPLAYS

The R3 command is commonly used to merge a stored display with the current screen contents. This merging may be done with several stored displays, one after the other, to produce a sandwich. As long as all merging was done with the R3 command, the affect of any merged display may be reversed. To reverse the merge of any display, simply read in the stored display that you merged in the first place using the R3 command again. This works because whenever you EOR a source twice with a destination pixel, the result is always the destination pixel (original screen).

SKETCHPAD DISPLAY STORAGE FORMAT

All SKETCHPAD display files are 3208 bytes long.
The format is:

<u>byte #</u>	<u>description</u>
0	the current pen number (0-3) when the display was saved
1	the screen mode (1-4) when the display was saved. 1=mode X, 2=mode Y, 3=mode B, 4=mode N
2-6	color registers 0-4
7-3207	display data for a BASIC mode 7 display (with split screen). Pixels are 2 bits wide, packed 4 to a byte, from left to right.

A DISK-RESIDENT DISPLAY LOADER ROUTINE

In order to incorporate a display in an application a method to rapidly load the display must be available. This machine-code routine is designed to be called from BASIC. Loading a display from disk takes about 4½ seconds. Here is the assembly listing of the display loader routine:

```

        *=$600
;
; DSPLOAD
;
; QUICK LOADER FOR DISK-RESIDENT
; SKETCHPAD 2.0 FILES
;
; A=USR(1536,HUN,BUFADR,COUNT)
;
; WHERE LUN IS THE UNIT NUMBER
; BUFADR IS THE ADDRESS TO LOAD
; THE SCREEN INTO MEM. AT. TYP.
; ADDRESS IS CONTENTS OF LOC
; 88 AND 89 (DECIMAL) -7
; COUNT IS THE NUMBER OF BYTES
; TO LOAD FROM THE DISK. TYPICAL
; IS 3208 DECIMAL.
;
;
; GETCH = $07 ;GET CHARACTERS
; ICCOM = $0342 ;COMMAND BYTE
; ICBAH = $0345 ;BUFF ADDR MSB
; ICBAL = $0344 ;BUFF ADDR LSB
; ICBLH = $0349 ;BUFF LEN MSB
; ICBLL = $0348 ;BUFF LEN LSB
; CIOV = $E456 ;CIO ENTRY VECTOR
;
;
; REMOVE ARG COUNT
; MUST BE 3 ARGS
; OR QUIT
; REMOVE UNIT NUMBER MSB
; GET UNIT NUMBER LSB
; CONVERT TO INDEX FOR CIO
;
; ROLA
; ROLA
; ROLA
; ROLA
; SAVE FOR INDEX
; GET BYTES COMMAND
; STA ICCOM,X
; GET BUF ADDR MSB
; STA ICBAH,X
; GET BUF ADDR LSB
; STA ICBAL,X
; GET COUNT MSB
; STA ICBLH,X
; GET COUNT LSB
; STA ICBLL,X
; READ IN DISPLAY
EXIT RTS

```

A DISPLAY LOADER DEMO PROGRAM IN BASIC

Here is an ATARI BASIC program that uses the display loader routine (DSPLOAD) to read in a display from drive one. The display file is named "D1:DREAMS.PIC". You should substitute the name of a display that exists on one of your disks for this filename that appears in line 20.

```
5 GOSUB 500
10 GRAPHICS 7
12 FOR X=708 TO 712:POKE 0,X:NEXT X
20 OPEN #1,4,0,"D1:DREAMS.PIC"
30 B=PEEK(88)+256*PEEK(89)-7
40 A=USR(1536,1,B,3208)
50 X=708:FOR A=B+2 TO B+7:POKE X,PEEK(A):X=X+1:NEXT A
60 CLOSE #1
70 STOP
500 FOR U=1536 TO 1573:READ A:POKE U,A:NEXT U:RETURN
1000 DATA 104,201,3,208,32,104,104,24,42,42,42,42,170,169,7,157,66,
        3,104,157,69,3,104
1002 DATA 157,68,3,104,157,73,3,104,157,72,3,32,86,228,96
```

AN EXPLANATION OF THE DISPLAY LOADER DEMO PROGRAM

- LINE 5 - calls the subroutine that will load the machine-code display loader routine (DSPLOAD) into memory. This machine-code is relocatable- it may be loaded anywhere in memory without affecting it.
- LINE 10 -put the screen in mode 7 with split screen
- LINE 12 -put a zero in all 5 of the color registers. This has the affect of blacking out the screen during the load.
- LINE 20 -open the appropriate file for read-only access using an unit number (1-5)
- LINE 30 -calculate the load address for the display file. This formula is based on the undocumented fact that memory locations 88 and 89 decimal will always contain the the LSB and MSB of the address of the start of the display data (the actual screen information or pixels). Seven is subtracted from this address because seven bytes of information precede the pixel information in the display file on disk. Refer to section 6. This works because in graphics mode 7 96 unused bytes separate the display list (ANTIC instructions) from the display data. The seven information bytes are going to be loaded into the unused area.
- LINE 40 -call DSPLOAD to read in the display
- LINE 50 -copy the last five of the seven header bytes into the color registers. These are the actual colors of the display that was read into memory. Now the display is visible. POOF!
- LINE 60 -close the display file
- LINE 70 - stop
- LINE 500-load the 37 byte machine-code routine into memory starting at hex address \$0600 (1536 decimal). It can actually be loaded anywhere.
- LINES 1000 and 1002 - the data statements representing the machine code DSPLOAD routine.

Note that the first argument in the DSPLOAD call is the address of the routine and must be the same as the value used as the beginning index of the FOR loop in line 500. The second argument in the DSPLOAD call is the unitnumber used in the OPEN and CLOSE statements (20 and 60).

A DISPLAY VIEWER FOR DISK-RESIDENT DISPLAYS

(VIEW does not exist on the cassette version)

The VIEW program (Dn:VIEW.BAS) is a more elaborate extension of the demonstration program DSPLOAD.BAS. VIEW expects you to type in the name of the diskette file you want to display (pressing the RETURN key after the file name). Use the full DOS syntax: Dn:ffffff.xxx . To use VIEW, you'll need to load in DOS 2.0S from a diskette other than the SKETCHPAD diskette; for example, use the DOS 2.0S Master Diskette. Insert the DOS 2.0S diskette in the disk drive, turn off your computer, and then turn it back on. When the READY prompt displays, load VIEW.BAS into computer memory with the command:

```
RUN "Dn:VIEW.BAS"
```

where n is the number of the drive that the program is on. VIEW knows the more common errors and will respond with English explanations for the ones it knows. If you make an error in the file name, you may use the cursor control keys to move up and correct the file name instead of retyping it. After correction, press the RETURN key as usual.

The actual loading logic is represented a little differently here than it was in DSPLOAD.BAS. In VIEW an additional routine, a BASIC one this time, does the reading in. This BASIC routine calls the machine-code routine (DSPLOAD) and additionally does error handling for the input file name. The file name resides in the string array F\$. An error flag--A--is returned to the main routine. If A is 0, then no error was detected; if A is not 0, then an error was detected and acted upon by the basic routine. The variable B is expected to be set by the main routine to the buffer address for reading in the screen. The variable X is the only scratch variable used by this routine (lines 200 through 280).

The next page contains a complete listing of the VIEW program. To use VIEW to read in the three demonstration programs provided on the SKETCHPAD diskette, follow these steps:

1. Insert a diskette with DOS 2.0S on it (do not use the SKETCHPAD diskette for this purpose) and then load DOS 2.0S into computer memory by turning off the computer and turning it on again.
2. Re-insert the SKETCHPAD diskette, containing the VIEW.BAS program.
3. When the READY prompt displays, type

```
RUN "Dn:VIEW.BAS"
```

4. Now you can look at any of the three demonstration pictures by entering its file name. You can look at only one display at a time. For example, type

```
Dn:DREAMS.PIC
```

Have fun!


```

5 DIM F$(16):OPEN #2,12,0,"E:"
10 GOSUB 500:GRAPHICS 7
15 B=PEEK(88)+256*PEEK(89)-7
20 ? #2;"PICTURE VIEWER"
25 ? #2;"ENTER DISK FILE NAME":F$="":INPUT #2;F$
30 IF F$="" THEN 20
35 IF LEN(F$)>15 THEN ? #2;"FILE NAME TOO LONG- FORMAT IS
    Dn:ffffffff.xxx":GOTO 25
37 IF F$(1,1)="Q" THEN CLOSE #2:DOS
40 IF F$(1,1)<>"D" THEN ? #2;"PLEASE ENTER A DISK FILE NAME":
GOTO 25
45 GOSUB 200:IF A THEN 25
50 GOTO 20
200 TRAP 250
205 OPEN #1,4,0,F$
210 FOR X=708 TO 712:POKE X,0:NEXT X
215 A=USR(1536,1,B,3208)
220 X=708:FOR A=B+2 TO B+7:POKE X,PEEK(A):X=X+1:NEXT A:A=0
225 CLOSE #1
230 TRAP 40000:RETURN
250 TRAP 230
255 A=PEEK(195)
260 IF A=130 THEN ? #2;"NO SUCH DEVICE":GOTO 225
265 IF A=138 THEN ? #2;"MAKE DISK READY":GOTO 225
267 IF A=160 THEN ? #2;"DRIVE NUMBER IS TOO BIG":GOTO 225
270 IF A=165 THEN ? #2;"IMPROPER FILE NAME- PLEASE TRY AGAIN":
GOTO 225
275 IF A=170 THEN ? #2;"NO SUCH FILE- PLEASE TRY AGAIN":GOTO 225
280 ? #2;"ERROR - ";A;" PLEASE RETRY":GOTO 225
500 FOR U=1536 TO 1573:READ A:POKE U,A:NEXT U:GOTO 225
1000 DATA 104,201,3,208,32,104,104,24,42,42,42,42,170,169,7,
157,66,3,104,157,69,3,104
1002 DATA 157,68,3,104,157,73,3,104,157,72,3,32,86,228,96

```

OVERRIDING STORED DISPLAY COLORS

When you're combining stored displays experimentally, it can be annoying to have to reset the colors continually after loading a display that uses colors other than those you want in your resulting display. The R commands (R, R1, R2, and R3) provide a method for loading in a display while retaining the colors you've set up. Follow these steps to override the stored display colors:

1. Activate the R, R1, R2, or R3 command.
2. Type in the name of the file or device to load from without pressing the RETURN key.
3. Hold down the trigger button on the joystick and press the RETURN key.
4. When you see the display loading on the screen, release the trigger button.

This procedure overrides the stored display colors only, not the stored symmetry mode or current pen number.

QUICK REFERENCE SHEET

COMMAND SUMMARY

<u>COMMAND</u>	<u>DESCRIPTION</u>
B	Draw a box
C	Draw a circle
CS	Clear the screen
D	Display the pen colors
DD	Display disk directory
E	Draw a radial line string (to exit, TRIGGER twice without moving)
F	Fill an area
H#	Change hue of current pen
I#	Change intensity of current pen
K	Copy a source area to a destination area
K1	Copy a source area, ANDing with the destination
K2	Copy a source area, ORing with the destination
K3	Copy a source area, EORing with the destination
M	Display reference page
P#	Change pen
Q	Quit SKETCHPAD
R	Load a display from cassette or diskette
R1	Load a display, ANDing with the current screen
R2	Load a display, ORing with the current screen
R3	Load a display, EORing with the current screen
SB	Change screen symmetry mode to B (both axes)
SN	Change screen symmetry mode to N (no symmetry)
SX	Change screen symmetry mode to X (x-axis)
SY	Change screen symmetry mode to Y (y-axis)
W	Save a display on cassette or diskette

(Note. "#" is a number, e.g., H12, I6, P3)

HUE NUMBERS

<u>H#</u>	<u>Color</u>
0	Gray
1	Light orange
2	Orange
3	Red-orange
4	Pink
5	Purple
6	Purple-blue
7	Blue
8	Blue
9	Light blue
10	Turquoise
11	Green-blue
12	Green
13	Yellow-orange
14	Orange-green
15	Light orange

INTENSITY NUMBERS

<u>I#</u>	<u>Brightness</u>
0	Darkest
2	.
4	.
6	.
8	.
10	.
12	.
14	Brightest
	(off-white)

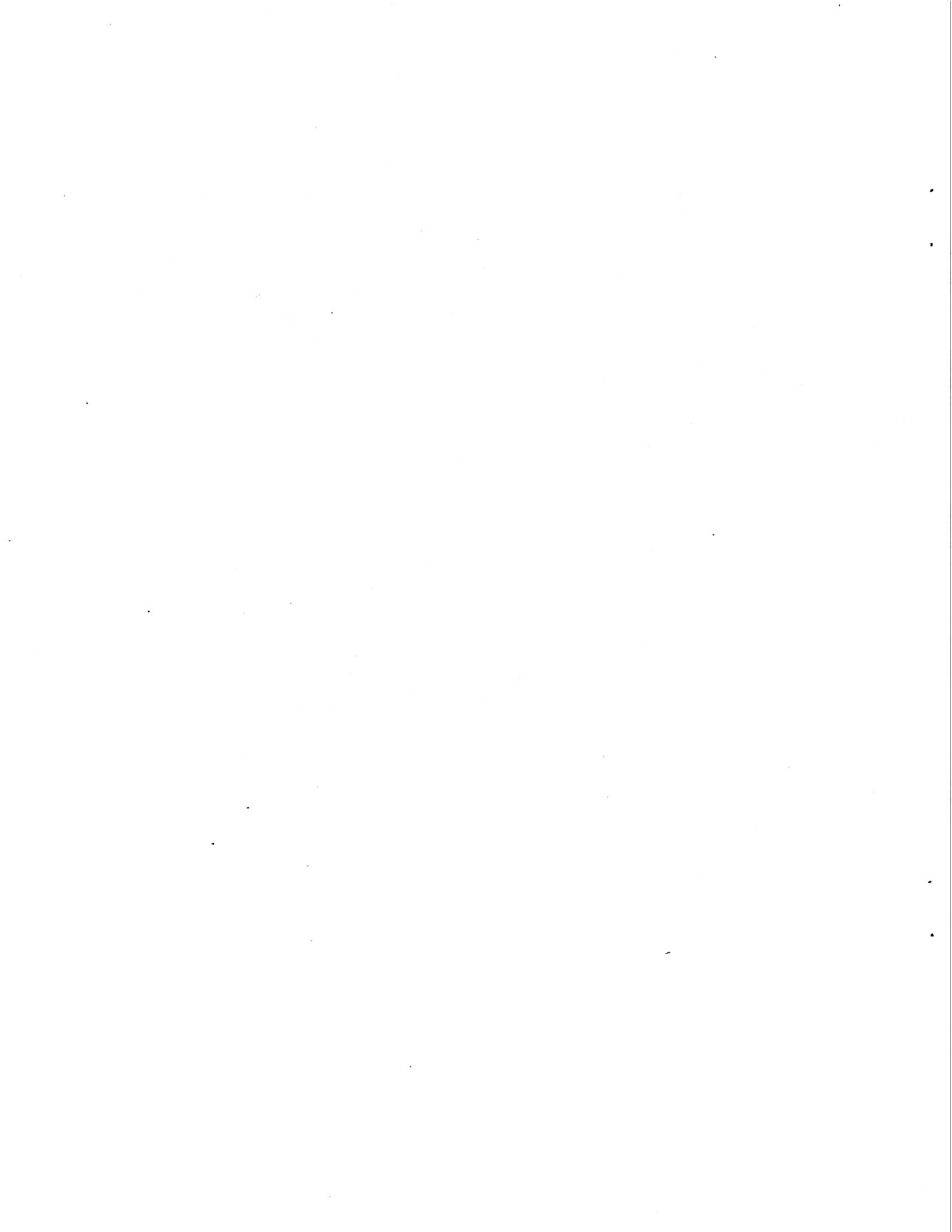
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1. Name and APX number of program _____

2. If you have problems using the program, please describe them here.

3. What do you especially like about this program?

4. What do you think the program's weaknesses are?

5. How can the catalog description be more accurate and/or comprehensive?

6. On a scale of 1 to 10, 1 being "poor" and 10 being "excellent", please rate the following aspects of this program?

- _____ Easy to use
- _____ User-oriented (e.g., menus, prompts, clear language)
- _____ Enjoyable
- _____ Self-instructive
- _____ Useful (non-game software)
- _____ Imaginative graphics and sound

7. Describe any technical errors you found in the user instructions (please give page numbers).

8. What did you especially like about the user instructions?

9. What revisions or additions would improve these instructions?

10. On a scale of 1 to 10, 1 representing "poor" and 10 representing "excellent", how would you rate the user instructions and why?

11. Other comments about the software or user instructions:

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