

DATAMAX UV-1

**Zgrass PAINT PROGRAM
USER'S GUIDE**

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References are made throughout this documentation to the equipment listed below. We hereby acknowledge use of these names and/or trademarks in this publication.

-ADM 5 Dumb Terminal Video Display Unit	Lear Siegler, Inc. Data Products Div. Anaheim, CA
-Micropolis Disk Drive	Micropolis Corporation Canoga Park, CA
-Bit Pad One Data Tablet/Digitizer	Summagraphics Corporation Fairfield, CT
-Mini-Winchester Disk Drive	International Memories, Inc. Cupertino, CA
-Epson MX 80 Printer	Epson America, Inc. Torrance, CA
-CP/M (Control Program Monitor)	Digital Research Pacific Grove, CA

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ABOUT THIS GUIDE

You are about to experience an interactive painting system that will enable you to immensely expand your creative drawing and image development capabilities. With the help of this guide, you'll find the system simple to use and rich in capabilities.

The Zgrass PAINT PROGRAM USER'S GUIDE has been designed to guide you through an interactive experience with all modules of the Paint Program in a sequence which will prepare you to use each module as you encounter it. If you take the time now to experiment with the Paint Program system as instructed in this guide, you'll minimize the amount of time you spend learning how to use the system to maximum capacity. If you are a neophyte in the world of computers, you'll find this a pleasant and relatively painless introduction to working with computers.

In general, this guide is set up to be followed in a step-by-step manner, explaining what's happening as you engage in new activities in each module. As you become more comfortable with the controls and various means of interacting with the system, you may find repetitive instructions tedious or boring. On the other hand, if you're shaking in your boots because it's the first time you've dealt with a computer, you'll probably find the repetition comforting. To minimize the amount of repetition, those concepts or activities which come into play frequently or require special explanation have been presented in the GENERAL REFERENCE SECTION of this guide and are referred to accordingly within the body of the guide.

DATAMAX UV-1

**Zgrass PAINT PROGRAM
USER'S GUIDE**

GETTING STARTED

To get started using the Zgrass Paint Program, follow these instructions exactly (it is assumed that you have already connected a Summagraphics Bit Pad and its four-button cursor to the UV-1 system). NOTE: Complete all commands typed at the terminal keyboard by pressing the RETURN key.

- 1) After you have powered up the UV-1 system, reset the system by pressing the red RST button on the front panel. If you look at your terminal screen, you'll notice that you've gotten this message:

ERASE ALL? (Y OR N)

Respond by pressing the Y key. This erases or clears all of user memory so that you can get started. By the way, you could have reset the system without pressing the RST button by typing RESTART at the terminal keyboard.

- 2) Insert the Paint Program disk into Drive 0 of your disk drive and if you plan to store any pictures, snaps, or macros, insert a storage disk in Drive .1; then type:

**DS 0
DLOAD**

These commands load the entire contents of the disk into the 256K screen memory. It takes about 90 seconds to load the entire disk, so wait patiently until the > prompt is visible on your terminal screen.

- 3) When you get the > prompt on the terminal, you're ready to enter these commands:

**DGET GPAINT
GPAINT**

The computer will respond with "Setting up for PAINT" and when the Paint Program has been loaded into user memory, you'll get this message on the terminal screen:

GETTING STARTED - Continued

"Zgrass PAINT PROGRAM, February 1, 1982 Release, (C) 1982 Real Time Design, Inc." and you'll be instructed to type in the next command with: "TO START UP THE PAINT PROGRAM, type:

PAINT

- 4) Now that the program has been loaded and executed, you'll note that two things have happened:
 - * a set of instructions appear on the terminal screen
 - * a "menu" of Paint Program modules and a flashing **CHOOSE** cursor appear on the TV screen
- 5) By moving the four-button cursor around your tablet, you'll see that its movement is tracked by the flashing **CHOOSE** cursor on the TV screen.
- 6) Move the four-button cursor on your tablet until the **CHOOSE** cursor on the TV screen covers the module you wish to try.
- 7) Follow the instructions on your terminal screen.
- 8) If things just don't work out or if for some reason you've gotten confused and want to start over again, hold down the **CONTROL** key and press the **C** key at the same time. **NOTE:** As a convention throughout Zgrass documentation, this process is expressed by:

CTRL+C

When the **>** prompt returns to the terminal screen, type:

PAINT

and go back to step 4 of these instructions to proceed.

- 9) If the simple "fix" in 8 doesn't work and you don't get the menu or you get Error 27, type:

RESTART 1

and go back to step 3. This eliminates having to **DLOAD** the disk again.

- 10) If for some reason you get an Error 2, 3, or 4 when you run Paint, you must go back to step 1 and restart the system.

THE PAINT PROGRAM MODULES MENU (YOUR PAINT BOX)

The "menu" that appears on the TV screen after you've loaded the Paint Program serves two purposes:

- o It provides visual labels of the Paint Program modules available to you for drawing pictures and creating animations...allowing you to visually survey the tools and types of brushes you have to choose from.
- o It functions as the paint box from which you select tools or brushes with the CHOOSE cursor in order to paint on your canvas (the TV screen).

HOW YOUR PAINT BOX IS ORGANIZED

The paint box menu has been structured so that similar tools or brushes are grouped together in boxed areas of the menu display on the TV screen. See the menu illustration following this section.

The five groups defined by the boxed areas of the menu are labeled in this guide as follows:

- GROUP 1 - BASIC DRAWING BRUSHES
- GROUP 2 - COLORMAP SELECTION & STORAGE
- GROUP 3 - MAKING & USING SNAPS
- GROUP 4 - LINE & SNAP ANIMATION
- GROUP 5 - UTILITY MODULES

THE TOOLS AND BRUSHES AND HOW TO USE THEM

To select any tool or brush, simply move the tablet cursor until the flashing CHOOSE cursor covers the module you wish to use and then press the yellow button on the tablet cursor. Several things happen when you select a module:

- * the paint box menu will disappear from the TV screen and a flashing cursor (either an upturned arrowhead, a crosshair, or a brush you've selected) will appear on the TV screen
- * if you have previously created a drawing on the TV screen and have not erased it, that drawing will also re-appear on the TV screen

THE TOOLS AND BRUSHES AND HOW TO USE THEM - Continued

* the terminal screen will clear and either you'll be instructed to provide information or a description of the options available to you in the module you selected will appear; in general, you are instructed to select an option for interacting with a module by pressing a corresponding button on the tablet cursor, by sliding the cursor off the bottom of the tablet, by using the joystick, or by inputting data (typing) at the terminal keyboard;

to assist you in relating the information provided in this guide to the information on the terminal screen, the terminal screen text is reproduced at the beginning of each module section as it appears when you select a module;

in addition, the following types of information may also appear on the terminal screen:

- statistical data about the activity on your canvas (current cursor position, dimensions or location coordinates of an object, etc.)
- messages about system limits (not enough memory to make this snap)
- queries about what you want the module to do (what's the name of your snap, how big do you want it, where do you want its center to be, etc.)
- special notes on how to handle problems that might occur (what to do if your fill leaks, etc.)

THE PAINT BOX MENU - Illustration

Lines 	Draw/Fill 	Boxes 	Change Color	Disk Utilities
Circles 	Airbrush 	Ellipses 		
Make Snap	Shrink	Snap Draw	Pattern Fill	Color Bars
Scale Snap Draw	Expand and Detail	Animate		
Save Line Draw	Saved Line Re-draw	Path Save	Path Move	Save Path Sequence

GENERAL REFERENCE SECTION

This section contains information and detailed instructions on Paint Program module options or activities repeated throughout the documentation. The intention is to make this information available without undue repetition and in a manner which integrates all aspects and not just those pertinent to one particular module. Although it is not essential, it is recommended that a new user review this section before beginning experimentation with the system.

BASIC OPERATING INSTRUCTIONS

Control characters are designated by simultaneously pressing the CONTROL key and a specified character key on the terminal keyboard. Throughout documentation for the system, the convention for expressing this instruction is:

CTRL+C

Completion of a command sequence or response typed at the terminal keyboard is accomplished by pressing the RETURN key after the last character has been typed.

When the Zgrass system cursor > appears on the keyboard, this is an indication that the Paint Program must be re-started by typing in the command:

PAINT

Save work in progress frequently. Due to the nature of electronic media, it is important to protect images you're fond of by saving your work on disk frequently...see DISK UTILITIES section for details.

Use DRIVE 0 of your disk drive for the PAINT PROGRAM/UTILITY DISK and DRIVE 1 for either your current storage disk or the disk from which you wish to retrieve files.

DEFINITION OF SPECIAL TERMS

ARRAY a software structure used for organizing computer-stored information (roughly equivalent to a matrix).

BRUSH any picture or shape created in the Paint Program and used as the electronic paint brush equivalent to the tablet cursor.

GENERAL REFERENCE SECTION/DEFINITION OF SPECIAL TERMS—Continued

MACRO a series of Zgrass commands and statements (in other computer languages, this correlates to a program).

PIXEL the basic unit of measure referenced by the Paint Program, representative of the smallest picture element created by the 320 horizontal and 200 vertical subdivisions of the TV screen.

RUBBER

STAMPING a succession of copies of a "brush" displayed in the process of completing a brush stroke.

SNAP a "snapshot" excerpt of a drawing.

NAMING FILES FOR STORAGE

In computer terms, the drawings, snapshots, animations, etc. that you create with the Paint Program are called "files". In the Paint Program, files are sorted, stored, retrieved, and otherwise manipulated by name...which means, naming files is a very important factor in being able to manipulate your files effectively.

Unlike many other computer languages, Zgrass allows you to create filenames of unlimited length, using letters of the alphabet, numbers (0-9), and \$ for composition. NO SPACES are permitted and names must start with either a letter or \$, not a number. Since length is unlimited, it is strongly recommended that you do not skimp in creating names that accurately describe the contents of a file so that you'll later be able to easily differentiate files.

There are certain rules about how the computer handles files based on their names that you should pay attention to. For instance:

-If you use the same name for two files, here's what will happen:

- o In user memory, the new file will replace the old file and the old file will be deleted. It's good practice to check out filenames existing in user memory by using the FILE STATUS module before you name a new file.
- o In disk storage, if you attempt to duplicate a name, either you'll be stopped by getting an Error 31 and be forced to rename your file or, MOST LIKELY, if the file you're naming happens to be of the same type as the file that already given that name, the new file will be stored under that name and the

GENERAL REFERENCE SECTION/NAMING OF FILES - Continued

old file will be stored under that filename as a back-up file (FILENAME.BAK). If this happens, do not despair. You can rename the back-up file by using the RENAME FILE command. See DRENAME in the Glossary. In any event, duplicating names can later create confusion and should be avoided. Use the DISK UTILITIES module to search for a particular filename before you assign it to a new file.

- o If you have a series of snaps you wish to name in a way that reflects a series, avoid using names that may be considered abbreviations. For instance, if you have a series of more than 10 snaps and wish to call them FILE1, FILE2, FILE3...start with 01 instead of 1, since 1 could be considered an abbreviation of 11, whereas 01 cannot be misinterpreted. Better yet, use letters instead of numbers to indicate a series: FILEA, FILEB, FILEC.....

FLOPPY DISK STORAGE (YOUR WORK PORTFOLIO)

When you've completed a session with the Paint Program, you'll need some way to store the drawings, snapshots, animations, etc. that you've created or are in the process of creating. The way you store electronic computer art is by copying your work onto a floppy disk. The procedures for actually storing your work are outlined in detail in the DISK UTILITIES module of the Paint Program.

DISK MANAGEMENT

In order to use the utilities provided in the DISK UTILITIES module, you must first become familiar with floppy disks--how to use them and how they're organized.

PHYSICAL DESCRIPTION:

The disks used by the Micropolis Disk Drive are 5-1/4" double-sided, double-density, soft-sectored floppy disks. Each side will contain over 197,000 bytes of data (referred to as 197K bytes) or about 9-10 full-screen images.

FORMATTING & INITIALIZING DISKS:

Briefly, before a disk can be used in the UV-1 Zgrass system for storing your screen dumps, snaps, arrays, macros, etc. (generally referred to as "files"), it must be formatted into 384 sectors (numbered 0 through 383), each containing 512 bytes. This process imposes an internal structure on the disk compatible with Zgrass and needs to be done only once.

GENERAL REFERENCE SECTION/DISK MANAGEMENT - Continued

After a disk has been formatted, it must be **initialized**, which means a section of space must be reserved on the disk for the Disk Directory.

Full definitions and instructions for formatting and initializing disks are available in the Zgrass Glossary under DFORMAT and DINIT.

WRITE-PROTECTING DISKS:

You'll notice that the PAINT PROGRAM/UTILITY DISK disk has a small adhesive sticker covering a niche in the side of the disk. This sticker serves as a "write protection" device which prevents you from writing over (and thereby destroying) the contents of this disk. In fact, such a sticker prevents anything from being stored on a disk that has one...which means you must check to see that the disk you allocate for storage during a work session is not write-protected...AND when you've used up all the storage space on a disk, protect the work you've done from being written over by applying a write protection sticker to that disk.

DISK HOUSEKEEPING:

From time to time, it's a good idea to review the contents of a disk and get rid of those files (and their back-up files) that you no longer want or need. By doing so, you'll maximize the amount of storage space available to you and minimize the amount of time you spend waiting for files to either be stored or retrieved. Details on procedures for deleting files on disk are covered in this guide under the DISK UTILITIES module section.

SYSTEM LIMITATIONS ON SNAP SIZE & USER MEMORY STORAGE

As a function of limited user memory space, you are limited to the size snap you can make. The largest snap you can make occupies about 1/4 of the TV screen. The total work space available to you in user memory while using the Paint Program is about 22,000 bytes (22K). The balance of user memory is occupied by the Paint Program. The largest snap acceptable to the system is **4064 bytes**. 4064 bytes permits you to make a snap that occupies about 1/4 of the screen area or approximately 4K bytes of memory. In addition to the snap, this allows storage space for a maximum 6 character name associated with the snap.

To give you some idea of the dimensions of a maximum size snap, the following large snap sizes would be acceptable. NOTE: Since 1 byte stores 4 horizontal pixels, a quick calculation of the **approximate** byte size of a snap may be made by dividing the product of the snap's dimensions by 4. For example:

SYSTEM LIMITATIONS ON SNAP SIZES - Continued

125 X 125 = 15625/4 = 3906 bytes (+ snap name)
200 X 80 = 16000/4 = 4000 bytes (+ snap name)
160 X 100 = 16000/4 = 4000 bytes (+ snap name)

Because this method produces approximate byte sizes, occasionally you'll find that things don't fit. If you want to determine a snap's precise byte size, use this formula:

$$(((xsize - 1)/4) + 1) \times (ysize)$$

If you attempt to make a snap of an area whose total number of pixels divided by 4 exceeds 4064, you'll get this message on the terminal screen instead of a request to name your snap:

NOT ENOUGH MEMORY TO MAKE THIS SNAP

Now that you're aware of the total space available to you for storing your snaps, you've probably surmised that you should be able to store about 5 maximum size snaps during any given session. Not true. Due to the way computers organize storage data, memory usually fragments in such a way as to prevent storage of 5 maximum size blocks in one session...which means you must verify that a sufficiently large fragment of memory is available to store your snap. There are two ways to get this information: The simplest is by looking at your terminal screen under the CURRENT SETTINGS section, LARGEST MEMORY FRAGMENT: 0000. A more complex way to get this information, along with some other data you might find helpful, is to type in this system command after you press CTRL+C:

CORE

In response to this command, the computer will print out on the terminal screen a listing of all available blocks of user memory, as well as the size of each block (in bytes). The largest block available will be printed at the top of the list. The total amount of user memory available is printed at the bottom of the list.

If the CORE list is longer than 20 lines and speeds by too quickly for you to read, press CTRL+W before you type in the CORE command again. Since this is a toggle, don't forget to turn it off (by pressing CTRL+W again) before you go back to the Paint Program. As you become more intimate with the system, you'll find this data more useful. To get back to the Paint Program menu, type:

PAINT

CLEANING UP USER MEMORY TO STORE MORE OR LARGER SNAPS:

If you discover that you have a memory fragment inadequate for storage of your snap, you must do some user memory "housekeeping". By choosing the FILE LIST module, you'll get a listing of all files currently maintained in user memory. If you have files you're sure you don't want, delete them with the delete option provided in that module. If you're not sure about whether or not you want to get rid of any file, transfer such files to disk storage by using the DISK UTILITIES module.

Once you've deleted or transferred files from user memory, return to the MAKE SNAP module and check the CURRENT SETTINGS section on the terminal screen to see what the size of the LARGEST MEMORY FRAGMENT is. If it still falls short of the 4064 byte maximum you need to store your snap, you'll need to reset the system and start with full-size memory blocks. **WARNING:** Restarting the system erases all your current work, so make sure you have stored all necessary work on disk before resetting the system. Follow these steps to reset the system:

* Press CTRL+C; when you get the > cursor, type:

RESTART 1

* When you get the >> cursor, type:

DG GPAINT
GPAINT

As explained in the GETTING STARTED section, this is a quick way to restart the system; since you don't have to DLOAD, this process should take you only a few seconds.

Before you type in PAINT to start the Paint Program again, type in CORE to see for yourself that you do indeed now have full-size, unfragmented memory blocks with which to store a large snap.

SCALING

In addition to uniformly enlarging and reducing snaps, scaling allows you to create special effects by spreading, squeezing, flipping, or reversing the contents of your snap to suit your needs. The system default scale factors of any snap are 1,1. In fact, if you type in scale factors of 0,0 (which are not allowed), the computer will automatically assume the default factors of 1,1. Within screen limits, any positive or negative number or fraction may be used for scaling.

The following examples demonstrate some basic applications for scaling:

GENERAL REFERENCE SECTION/SCALING - Continued

- * To uniformly double the size of a snap, increase both the width and height to scale factors 2,2
- * To double the height but not the width, increase the width but not the height to scale factors 2,1
- * To uniformly halve the size of a snap, reduce both the height and the width to scale factors .5,.5
- * To get a "mirror image" (reverse) of a snap, change the scale factors to -1,-1
- * To see the snap flipped upside down, change the scale factors to 1,-1
- * To see the "mirror image" upside down, change the scale factors to -1,1

ROTATION

The rotation feature of the Paint Program allows you to reposition a snap by rotating it counter-clockwise 90, 180, or 270 degrees. You will notice two things are different about a rotated snap:

- * As a cursor, it flashes more slowly and takes a little longer to draw with (since the display of information is more complex, the computer needs more time to calculate pixel locations of a rotated snap).
- * Particularly on very small snaps, when rotated to side views, the content will be slightly distorted due to the fact that pixels are rectangular and not square.

GENERAL REFERENCE SECTION/*CHANGE SIZE MODULE*

*CHANGE SIZE
MODULE*/
WHITE BUTTON

CHANGE SIZE MODULE - BRUSHES

CURSOR BUTTON OPTIONS:

DEFINE SIZE
<YELLOW>

INPUT
NEW CENTER <WHITE>

PRINT
<GREEN> CURRENT X,Y SIZE

<BLUE>
INPUT X AND Y SIZE

CURRENT SETTINGS:

CENTER: 0,0 XSIZE: 00 YSIZE: 00

There are several ways in which you may select or define the size of the BRUSH with which you draw. Having pressed the white button, you will note that a new set of instructions appear on the terminal screen (as reproduced above), presenting the options for choosing the BRUSH size and center position; indicate your option selection by pressing a button on the tablet cursor.

-SUB-OPTION/
BUTTON

ACTIVITY DESCRIPTION

-DEFINE SIZE/
YELLOW

When you press this button, a flashing BRUSH cursor will appear on the TV screen. This flashing BRUSH cursor has a center position fixed at the same coordinates as the last center position occupied by the flashing BRUSH cursor just prior to pressing the white button. As you move the cursor around on the tablet, you will notice that the size of the BRUSH changes but the center location of the BRUSH remains the same.

-SUB-OPTION/
BUTTON

CHANGE SIZE MODULE - BRUSHES
ACTIVITY DESCRIPTION

DEFINE SIZE allows you to visually select the size of the BRUSH centered as described above:

***TALLER/SHORTER:** To increase the height of the BRUSH, move the tablet cursor toward the top of the tablet; to decrease the height, move it toward the bottom.

***WIDER/NARROWER:** To increase the width of the BRUSH, move the tablet cursor toward the right edge of the tablet; to decrease the width, move it toward the left edge.

NOTE: To accomplish width and height changes simultaneously, move the tablet cursor diagonally.

When the size BRUSH you wish to draw with flashes on the TV screen, hold the tablet cursor steady and press the yellow button. You have now defined the new size of the BRUSH and are automatically returned to DRAW WITH BRUSHES mode so that you may draw with your new BRUSH.

-INPUT
NEW CENTER/
WHITE

As explained above, while you are in *CHANGE SIZE MODULE*, you cannot change the center position of the cursor BRUSH by moving the tablet cursor; to aid you in defining the size you want, you may, however, reposition the BRUSH center by inputting new center coordinates at the terminal keyboard. This is particularly useful if you have previously determined the center coordinates of an object and you wish to determine the size of the BRUSH based on some relationship with the center coordinates of that object. Statistics about the current BRUSH cursor are available to you on the terminal screen while you are in *CHANGE SIZE MODULE*.

When you press the white button, you'll note that new print appears on your terminal screen, asking you for the horizontal (X) and vertical (Y) coordinates to which you wish the BRUSH relocated.

GENERAL REFERENCE SECTION/*CHANGE SIZE MODULE* - Continued

-SUB-OPTION BUTTON -----	*CHANGE SIZE MODULE*-BRUSHES ACTIVITY DESCRIPTION -----
-INPUT NEW CENTER/ WHITE	Once you have typed in the new X and Y coordinates, the BRUSH cursor will be recentered at that position. You may then proceed to define the size BRUSH you want at that location.
-INPUT X & Y SIZE/ BLUE	This is the manual method of re-defining BRUSH dimensions to the length and width you specify. When you press the blue button, new print will appear on the terminal screen, requesting the new width (X) and height (Y) dimensions. Once you have typed in the new X and Y dimensions, you'll be returned to DRAW WITH BRUSHES mode so that you may draw with your new BRUSH.
-PRINT CURRENT X, Y SIZE/ GREEN	To get statistics on the dimensions of any BRUSH, hold the tablet cursor steady when that BRUSH flashes on the TV screen and press the green button. The horizontal (X) and vertical (Y) dimensions of that BRUSH will be printed out on the terminal screen. NOTE: When drawing with a very large BRUSH, it will be necessary to hold the buttons a littler longer to insure that options are performed as described...the computer needs a little more time with larger brushes.

CHOOSING YOUR PAINTING PALETTE

DRAWING PALETTE COLORMAP

COLOR NAME	WHITE	RED	GREEN	BLUE
COLOR VARIABLE	0	1	2	3
COLOR VALUE	7	91	164	8

COLOR, MODE, AND COLORMAP SELECTION

CURSOR BUTTON OPTIONS:

CHOOSE DRAWING COLOR (0 1 2 3)
<YELLOW>

CHANGE COLORMAP <WHITE>

<GREEN> RETURN TO DRAWING

<BLUE>
INPUT NEW MODE

CURRENT SETTINGS:

DRAWING COLOR #: 0 + MODE: 00 = COLORMODE: 00
COLORMAP VALUES: COLOR0 = 7 COLOR1 = 91 COLOR2 = 165 COLOR3 = 8

o COLOR CONTROL

The Zgrass system allows you to draw with a total of four colors on the TV screen at any given time. These four colors are referred to as the four **COLOR VARIABLES (0,1,2,3)** illustrated in the diagram at the top of this page. These four color variables are organized and represented by the four-segment **DRAWING PALETTE COLORMAP**. Each color variable may be selected from a system colormap of 256 colors (see **CHANGE COLOR** module).

Internal to each of the **GROUP 1 - BASIC DRAWING BRUSHES** modules is a **COLOR CONTROL** module used in conjunction with each of the brushes. The options available in this module allow you not only to select the color you draw with, but to actually choose a four-color palette to be used in creating your current drawing. You may change any or all colors in the four-color palette during or even after the completion of a drawing, encouraging experimentation with different color schemes for the same drawing. See the **CHANGE COLOR** module for an illustrated system colormap and detailed information on the 256 colors available and their numerical identifications (**COLOR VALUES**).

COLOR CONTROL MODULE - Continued

In addition to choosing colors for your palette, this module also provides you with the opportunity to define the relationships between the four colors of that palette. In total, there are 10 different modes, which when used in conjunction with the four colors of any given palette, produce 22 different relationships, called COLORMODES. Each colormode and the relationship created when you employ a particular mode is defined later in this section.

ACCESSING THE COLOR CONTROL MODULE

This module is accessed by sliding the tablet cursor off the bottom edge of the tablet and then immediately returning the cursor to the tablet. If you are drawing with a large cursor, you must slide the tablet cursor slowly toward the edge so that the screen cursor and the tablet cursor reach and slide off the bottom edge of the TV screen and tablet simultaneously. As you return the cursor to the tablet, you'll notice the four-segment drawing palette "colormap" displaying the four color variables of your palette at the bottom edge of the TV screen and a flashing "COLOR" cursor which is the TV screen counterpart to the tablet cursor. Initially, this procedure may seem awkward and you may have to repeat the process several times to be successful, but after using it several times, you'll discover this movement fits in quite naturally with the fluid movement of free-hand drawing.

OPTION/
BUTTON

ACTIVITY DESCRIPTION

CHOOSE DRAW-
ING COLOR/
YELLOW

This option allows you to choose a color from the palette colormap (0 1 2 3) to draw with. As you move the tablet cursor, your movement will be tracked on the TV screen with the flashing COLOR cursor. Position the flashing COLOR cursor over the colormap segment containing the color you wish to draw with and press the yellow button. The terminal screen will clear and the options available in the current Group 1 module you're working with will re-appear. The palette colormap and flashing COLOR cursor will disappear from the TV screen; the drawing cursor will return, ready to draw with the newly selected color.

NOTE: The first color variable in the colormap (Color 0) also represents the color used for your drawing background. In addition to other methods provided in the Paint Program for erasing, you may choose to erase by screening out with the background color (comparable to using eradication

OPTION/
BUTTON

COLOR CONTROL MODULE/
ACTIVITY DESCRIPTION

fluid on paper drawings). You accomplish this by choosing Color 0 to be your drawing color and then drawing over the lines you wish to erase with that color.

CHANGE
COLORMAP/
WHITE

If you wish to change any or all colors in your palette, this option allows you to do so by inputting the numerical value of the color you desire. When you press the white button, new print will appear on the terminal screen, asking you to input the number of the color variable in the palette colormap that you wish to change (0 1 2 3). You'll also have the opportunity to escape this option by pressing the return key.

Next, you'll be asked to input the numerical value of the color you want that color variable changed to. By inputting your choice (0-255), you will cause not only the designated color variable of the palette colormap displayed on the TV to change to that color, but also any lines or sections of the drawing made in the original color will be changed to the new color. New print will appear on the terminal screen, once again asking you to either input the color variable number of a palette color you wish to change or, if you do not wish to change any other colors, to press the return key and be returned to the COLOR CONTROL options. At this time, note that the CURRENT SETTINGS data have been updated to reflect any changes you've made.

Once you've used this system for awhile and have had an opportunity to familiarize yourself with the colors available and their numerical values, you'll find this option a convenient method for changing your palette while in the process of using one of the Group 1 modules. Until you become familiar with colors and their numerical values, however, you'll probably find it necessary to change your palette colormap by returning to the menu and selecting CHANGE COLOR, which provides you with a simultaneous display of the color and its numerical equivalent printed out below the appropriate colormap color variable on the TV screen.

DEFAULT PALETTE COLORMAP: When you've used the system several times, you'll probably notice that

OPTION

COLOR CONTROL MODULE/CHANGE COLORMAP
ACTIVITY DESCRIPTION

each time you turn the system on, the palette colormap is always the same, no matter what colors were contained in the palette you last used. Every time you restart the system and access the COLOR CONTROL module, this default colormap comes up:

WHITE	RED	GREEN	BLUE
0	1	2	3
7	91	164	8

If you wish to retain a specific palette colormap to be used with a drawing in the future, you must **save** that colormap on disk by using the SAVE COLOR MAP module and then retrieve it when you need it.

COLOR CONTROL - Continued

MODE SELECTION LIST

- 0 IS FOR PLOP WITH COLORS 0 1 2 3
- 4 IS FOR EXCLUSIVE OR WITH COLORS 0 1 2 3
- 8 IS FOR OR WITH COLORS 0 1 2 3
- 12 IS FOR AND WITH COLORS 0 1 2 3
- 16 IS FOR PRIORITY WRITE WITH COLOR 1
- 17 IS FOR PRIORITY WRITE WITH COLOR 2
- 18 IS FOR REVERSE PRIORITY WITH COLOR 1
- 19 IS FOR REVERSE PRIORITY WITH COLOR 2
- 20 IS FOR INCREMENT COLOR
- 21 IS FOR DECREMENT COLOR

WHICH MODE DO YOU WANT?

INPUT NEW
MODE/
BLUE

This option allows you to define drawing relationship between the four colors in your palette colormap. When you press the blue button, the terminal screen will clear and the 10 modes available for you to choose from will be printed on the terminal screen and you'll be asked to input the mode you want.

This unique feature allows drawing colors to interact in interesting ways roughly equivalent to the cellophane or layering effects created by painting with watercolors. Essentially, selecting a particular colormode sets things up so that when particular colors come in contact with one another, specific and predictable results occur. Listed below are the 22 possible colormodes with brief descriptions of the effects produced when they're used. It isn't necessary to understand how these modes work in order to use them, but if you're interested in their technical properties, this information is available to you under COLOR MODES in the Zgrass Glossary.

To make this chart of effects more meaningful, the default palette colormap colors are employed to demonstrate what actual color interactions would be.

CHART OF COLORMODE EFFECTS USING DEFAULT COLORMAP

WHITE	RED	GREEN	BLUE
0	1	2	3

MODE	+	DRAWING COLOR	=	COLOR MODE	(INTERACTIVE COLOR EFFECTS)
PLOP the drawing color on top of the background color:					
0	+	0	=	0	-white draws white on white
0	+	1	=	1	-red draws red on white
0	+	2	=	2	-green draws green on white
0	+	3	=	3	-blue draws blue on white
.XOR:					
4	+	0	=	4	prevents drawing completely
4	+	1	=	5	on white, draws red; on red, draws white; on green, draws blue; on blue, draws green
4	+	2	=	6	on white, draws green; on red, draws blue; on green, draws white; on blue, draws red
4	+	3	=	7	on white, draws blue; on red, draws green; on green, draws red; on blue, draws white
.OR:					
8	+	0	=	8	prevents drawing completely
8	+	1	=	9	on white, draws red; on red, prevents drawing; on green, draws blue; on blue, prevents drawing
8	+	2	=	10	on white, draws green; on red, draws blue; on green or blue, prevents drawing
8	+	3	=	11	on white, red, green, or blue, draws blue (like PLOP with blue)
.AND:					
12	+	0	=	12	on white, red, green, or blue, draws white (like PLOP with white)
12	+	1	=	13	on white and red, prevents drawing; on green, draws white; on blue, draws red
12	+	2	=	14	on white and green, prevents drawing; on red, draws white; on blue, draws green
12	+	3	=	15	prevents drawing completely
.PRIORITY WRITE WITH COLOR 1 (RED)					
-----				16	red has priority over any color with a lower color # (in this case, white)
.PRIORITY WRITE WITH COLOR 2 (GREEN)					
-----				17	green has priority over any color with a lower color # (in this case, white and red)

CHART OF COLORMODE EFFECTS - Continued

MODE	DRAWING + COLOR	=	COLOR MODE	(INTERACTIVE COLOR EFFECTS)
..... -----			18	.REVERSE PRIORITY WITH COLOR 1 (RED) red has priority over any color with a higher color # (in this case, green and blue)
..... -----			19	.REVERSE PRIORITY WITH COLOR 2 (GREEN) green has priority over any color with a higher color # (in this case, blue)
..... -----			20	.INCREMENT COLOR the drawing color is the next color # higher than the background color on which the cursor is resting; NOTE: by moving the cursor slowly, the drawing color itself becomes the background color, applying the next color up in very small increments on the screen
..... -----			21	.DECREMENT COLOR the drawing color is the next color # lower than the background color on which the cursor is resting; same NOTE as INCREMENT COLOR

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GROUP 1 - BASIC DRAWING BRUSHES

LINES	DRAW/FILL	BOXES
CIRCLES	AIRBRUSH	ELLIPSES

DRAW WITH RUBBERBAND LINES

 CURSOR BUTTON OPTIONS:

MOVE
 FIXED POINT <WHITE>

DRAW
 <YELLOW>

<GREEN> BACK TO MENU

<BLUE>
 ERASE LAST LINE

CURRENT SETTINGS:

COLOR: 1 + MODE: 0 = COLORMODE: 1

TO CHANGE COLOR AND/OR MODE SETTINGS:

SLIDE CURSOR OFF BOTTOM EDGE OF TABLET AND RETURN IMMEDIATELY; A COLORMAP AND FLASHING "COLOR" CURSOR WILL APPEAR ON TV SCREEN.

o LINES

LINES allows you to draw with "rubberband lines"...lines that are stretched between two points you designate with the cursor. As you move the tablet cursor, your movement will be tracked on the TV screen with a flashing solid line cursor which has a fixed point at one end.

OPTION/
 BUTTON

ACTIVITY DESCRIPTION

DRAW/
 YELLOW

When you have stretched the free end of the line cursor into position, press the yellow button.

OPTION/ BUTTON -----	LINES/ ACTIVITY DESCRIPTION -----
DRAW/ YELLOW	This brush is particularly handy in drawing straight, diagonal, vertical, and horizontal line segments, as well as any type of geometric object. This compares to drawing with a ruler, with the advantage of being able to see what the line looks like before you actually draw it.
MOVE FIXED POINT/ WHITE	In the event the fixed point of the cursor does not start the line where you want it started, you may relocate the fixed point without drawing a connecting line by stretching the free end to the position where you want the fixed point relocated and then pressing the white button. Once you have relocated the fixed point of the cursor, release the white button and continue drawing.
ERASE LAST LINE/ BLUE	To erase the last line (and ONLY the last line) drawn, press the blue button. Since this erases only the last line drawn, this feature cannot be used on two consecutive lines.
	OR...If you wish to erase any line other than the last line drawn, use this method:
	Change your drawing color to the background color (by choosing Color 0 in the drawing colormap), position the line cursor over the line you wish to erase, press the yellow button to draw over that line with the background color and it will magically disappear!

GROUP 1 - BASIC DRAWING BRUSHES

LINES	DRAW/FILL	BOXES
CIRCLES	AIRBRUSH	ELLIPSES

DRAW/FILL

CURSOR BUTTON OPTIONS:

DRAW
<YELLOW>

ERASER TIP <WHITE> **<GREEN> BACK TO MENU**
<BLUE>
FILL WITH COLOR

CURRENT SETTINGS:

COLOR: 1 + MODE: 0 = COLORMODE: 1

USE JOYSTICK #1 KNOB TO CHANGE SIZE OF ERASER TIP;
PRESS TRIGGER TO RE-DRAW THIS MENU

NOTE: IF YOUR FILL LEAKS, STOP IT BY PRESSING CTRL+E

TO CHANGE COLOR AND/OR MODE SETTINGS:

**SLIDE CURSOR OFF BOTTOM EDGE OF TABLET AND RETURN IMMEDIATELY; A
COLOR MENU AND FLASHING "COLOR" CURSOR WILL APPEAR ON TV SCREEN.**

o DRAW

This feature allows you to draw free-hand, using the tablet cursor as a pen or pencil. As you move the tablet cursor, your movement will be tracked on the TV screen by a flashing arrowhead cursor. The point of the arrow corresponds to the crosshair of the tablet cursor. You may move the arrowhead about freely without drawing until you decide on your starting position.

**OPTION/
BUTTON**

ACTIVITY DESCRIPTION

**DRAW/
YELLOW**

When you are ready to draw, press and hold the yellow button on the tablet cursor as you move it about on the tablet. To stop drawing or reposition the cursor, release the yellow button.

OPTION/
BUTTON

DRAW
ACTIVITY DESCRIPTION

ERASER TIP/
WHITE

To erase any line drawn, place the arrowhead tip where you wish to start erasing, press the white button on the tablet cursor, and use the flashing eraser tip to erase.

FILL WITH
COLOR/
BLUE

This option allows you to fill any designated bounded area on the screen. First, select the color with which you wish to fill. Then, position the cursor so that its tip is within the bounded area you wish to fill and press the blue button. If your fill leaks or you wish to interrupt a fill, press CTRL+E on the terminal keyboard. To correct a fill leak, fill the leak area with the background color to restore it to unfilled status.

ERASER TIP
SIZE/
JOYSTICK#1

The default dimensions of the eraser tip are 5,5. Use the knob on top of Joystick #1 to change the shape and dimensions of the tip by pushing the knob away from its center in a circular motion.

If the terminal screen has filled up and obscured the options menu, press the trigger of Joystick #1 to clear the screen and reprint the menu.

GROUP 1 - BASIC DRAWING BRUSHES

LINES	DRAW/FILL	BOXES
CIRCLES	AIRBRUSH	ELLIPSES

DRAW WITH BOXES

 CURSOR BUTTON OPTIONS:

DRAW - SOLID BOX
 <YELLOW>

*CHANGE
 SIZE MODULE* <WHITE> <GREEN> BACK TO MENU

<BLUE>
 DRAW - OPEN BOX

CURRENT SETTINGS:

COLOR: 1 + MODE: 0 = COLORMODE: 1 WIDTH = 00 HEIGHT = 00

PRESS TRIGGER TO SEE BOX CENTER POSITION

TO CHANGE COLOR AND/OR MODE SETTINGS:

SLIDE CURSOR OFF BOTTOM EDGE OF TABLET AND RETURN IMMEDIATELY; A
 COLORMAP AND FLASHING "COLOR" CURSOR WILL APPEAR ON TV SCREEN.

o BOXES

This is the simplest and most basic of the "rubber stamp" brushes. Selecting this module allows you to define an open or solid box-type brush and then draw with it in a free-hand fashion similar to DRAW. At system start-up and until you change the size of the box brush, a default box will appear on the screen. Note that the center of this flashing box cursor corresponds to the crosshair of the tablet cursor.

OPTION/
 BUTTON

ACTIVITY DESCRIPTION

DRAW/
 YELLOW

If this random cursor is suitable, you may draw with it by pressing the yellow button on the tablet cursor and proceeding as you did in the DRAW module. If, however, you wish to redefine the dimensions or center position of the cursor, this may be done by selecting one or both of the remaining options.

*CHANGE SIZE
MODULE*/
WHITE BUTTON

CHANGE SIZE MODULE - BOXES

CURSOR BUTTON OPTIONS:

DEFINE SIZE
<YELLOW>

INPUT PRINT
NEW CENTER <WHITE> <GREEN> CURRENT X,Y SIZE

<BLUE>
INPUT X AND Y SIZE

CURRENT SETTINGS:

CENTER: 0,0 XSIZE: 00 YSIZE: 00

There are several ways in which you may select or define the size of the box with which you draw. Having pressed the white button, you will note that a new set of instructions appear on the terminal screen (as reproduced above), presenting the options for choosing the box size and center position; indicate your option selection by pressing a button on the tablet cursor.

-SUB-OPTION/
BUTTON

ACTIVITY DESCRIPTION

-DEFINE SIZE/
YELLOW

When you press this button, a flashing box cursor will appear on the TV screen. This flashing box cursor has a center position **fixed** at the same coordinates as the last center position occupied by the flashing box cursor just prior to pressing the white button. As you move the cursor around on the tablet, you will notice that the **size** of the box changes but the **center location** of the box remains the same.

**-SUB-OPTION/
BUTTON**

***CHANGE SIZE MODULE* - BOXES
ACTIVITY DESCRIPTION**

DEFINE SIZE allows you to visually select the size of the box centered as described above:

***TALLER/SHORTER:** To increase the height of the box, move the tablet cursor toward the top of the tablet; to decrease the height, move it toward the bottom.

***WIDER/NARROWER:** To increase the width of the box, move the tablet cursor toward the right edge of the tablet; to decrease the width, move it toward the left edge.

NOTE: To accomplish width and height changes simultaneously, move the tablet cursor diagonally.

When the size box you wish to draw with flashes on the TV screen, hold the tablet cursor steady, press and hold the yellow button. You have now defined the new size of the box and are automatically returned to DRAW WITH BOXES mode so that you may draw with your new box.

**-INPUT
NEW CENTER/
WHITE**

As explained above, while you are in ***CHANGE SIZE MODULE***, you cannot change the center position of the cursor box by moving the tablet cursor; to aid you in defining the size you want, you may, however, reposition the box center by inputting new center coordinates at the terminal keyboard. This is particularly useful if you have previously determined the center coordinates of an object and you wish to determine the size of the box based on some relationship with the center coordinates of that object. Statistics about the current box cursor are available to you on the terminal screen while you are in ***CHANGE SIZE MODULE***.

When you press the white button, you'll note that new print appears on your terminal screen, asking you for the horizontal (X) and vertical (Y) coordinates to which you wish the box relocated.

-SUB-OPTION
BUTTON

CHANGE SIZE MODULE-BOXES
ACTIVITY DESCRIPTION

-INPUT NEW
CENTER/
WHITE

Once you have typed in the new X and Y coordinates, the box cursor will be recentered at that position. You may then proceed to define the size box you want at that location.

-INPUT X &
Y SIZE/
BLUE

This is the numerical method of re-defining box dimensions to the length and width you specify. When you press the blue button, new print will appear on the terminal screen, requesting the new width (X) and height (Y) dimensions.

Once you have typed in the new X and Y dimensions, you'll be returned to DRAW WITH BOXES mode so that you may draw with your new box.

-PRINT CURRENT
X, Y SIZE/
GREEN

To get statistics on the dimensions of any box, hold the tablet cursor steady when that box flashes on the TV screen and press the green button. The horizontal (X) and vertical (Y) dimensions of that box will be printed out on the terminal screen.

NOTE: When drawing with a very large box, it will be necessary to hold the buttons a littler longer to insure that options are performed as described...the computer needs a little more time with larger brushes.

GROUP 1 - BASIC DRAWING BRUSHES

LINES	DRAW/FILL	BOXES
CIRCLES	AIRBRUSH	ELLIPSES

DRAW WITH CIRCLES

CURSOR BUTTON OPTIONS:

DRAW
<YELLOW>

***CHANGE**
SIZE MODULE* <WHITE> **<GREEN> BACK TO MENU**
 <BLUE>
TOGGLE BETWEEN OPEN OR SOLID CIRCLE

CURRENT SETTINGS:

COLOR: 1 + MODE: 0 = COLORMODE: 1

TO GET CENTER COORDINATES: PRESS JOYSTICK TRIGGER

TO CHANGE COLOR AND/OR MODE SETTINGS:

SLIDE CURSOR OFF BOTTOM EDGE OF TABLET AND RETURN IMMEDIATELY; A COLORMAP AND FLASHING "COLOR" CURSOR WILL APPEAR ON TV SCREEN.

o CIRCLES

Barring the essential differences between circles and boxes, CIRCLES works just like BOXES. When you select the CIRCLES module, at system start-up and until you change its size, a default circle cursor will appear on the TV screen. The center of the circle cursor corresponds to the crosshair of the tablet cursor.

**OPTION/
 BUTTON**

ACTIVITY DESCRIPTION

**DRAW/
 YELLOW**

If you like this cursor, you may draw with it free-hand in rubber-stamp fashion by pressing the yellow button and moving the tablet cursor as you would for DRAW. If you wish to change the diameter or type of the circle (open or solid), select one of the remaining options.

OPTION/ BUTTON	DRAW WITH CIRCLES ACTIVITY DESCRIPTION
-------------------	---

DRAW/
YELLOW

NOTE:

When drawing with a very large circle, you'll have to press the buttons a little longer in order to have options be operative...it simply takes longer for the computer to draw the larger circle cursor.

***CHANGE SIZE
MODULE*/
WHITE BUTTON**

***CHANGE SIZE MODULE* - CIRCLES**

CURSOR BUTTON OPTIONS:

DEFINE SIZE
<YELLOW>

INPUT
NEW CENTER <WHITE>

CURRENT
<GREEN> STATISTICS

<BLUE>
INPUT NEW DIAMETER

CURRENT SETTINGS:

CENTER: 0,0 DIAMETER: 00 TYPE: 0

As with BOXES, you may change the size of the drawing cursor (in this case, a circle) either visually or manually. When you press the white button, instructions and options for the ***CHANGE SIZE MODULE* - CIRCLES** will appear on the terminal screen, as reproduced above.

-SUB-OPTION/
BUTTON

ACTIVITY DESCRIPTION

-DEFINE SIZE/
YELLOW

When you press the yellow button, the flashing circle cursor which last appeared on the TV screen will re-appear. As with BOXES, the center of the cursor is fixed. As you move the tablet cursor around on the tablet, you'll notice that the size of the circle changes but the center position remains the same. The DEFINE SIZE option allows you to visually select a larger or smaller circle.

-SUB-OPTION
BUTTON

CHANGE SIZE MODULE - CIRCLES
ACTIVITY DESCRIPTION

-DEFINE SIZE/
YELLOW

*LARGER: To increase the diameter of the circle, move the tablet cursor to the right edge of the tablet.

*SMALLER: To decrease the diameter of the circle, move the tablet cursor to the left edge of the tablet.

NOTE: Since this is a circular (not elliptical) brush, moving the tablet cursor toward the top or bottom of the tablet will have no affect on the size of the circle. You should note, however, that circles appear elliptical as a result of the rectangular shape of the pixels comprising your TV screen; the pixels are taller than they are wide.

When the size circle you wish to draw with appears on the screen, hold the tablet cursor steady and press the yellow button to choose that circle. Once you've selected a new circle, you will be returned to DRAW WITH CIRCLES mode so that you may draw with your new circle.

-INPUT NEW
CENTER/
WHITE

While you are in *CHANGE SIZE MODULE*, the center of the circle cursor is fixed and unchanged by the movement of the tablet cursor. To reposition the center of your circle, input new center coordinates at the terminal keyboard. When you press the white button, you'll notice new print on your terminal screen, asking you for the horizontal (X) and vertical (Y) coordinates of the point where you want to recenter the circle.

After you've typed in the new center location, the circle cursor will be relocated and centered at that position and you may proceed to define the size circle you wish to draw with.

-SUB-OPTION/
BUTTON

CHANGE SIZE MODULE - CIRCLES
ACTIVITY DESCRIPTION

-INPUT NEW
DIAMETER/
BLUE

This is the manual method for redefining the size of your circle. When you press the blue button, you'll see new print on the terminal screen, requesting the new diameter. When you have entered the new diameter, you'll automatically be returned to DRAW WITH CIRCLES mode so that you may draw with your newly defined circle.

-CURRENT
STATISTICS/
GREEN

To get current statistics...size, center coordinates, and type...for any circle, hold the tablet cursor steady at that circle location and press the green button. Statistics for that circle will appear on the terminal screen. If you move the tablet cursor and press the green button once again, you'll get new statistics for the current circle.

OPTION/
BUTTON

DRAW WITH CIRCLES/
ACTIVITY DESCRIPTION

TOGGLE BETWEEN
OPEN OR SOLID CIRCLE/
BLUE

If at any time you wish to change the type of circle you're drawing with, use the blue button to "toggle" (as you would a light switch) between an open or solid circle. Each time you press the blue button, you'll switch the type of circle with which you draw.

GROUP 1 - BASIC DRAWING BRUSHES

LINES	DRAW/FILL	BOXES
CIRCLES	AIRBRUSH	ELLIPSES

DRAW WITH AN AIR BRUSH

CURSOR BUTTON OPTIONS:

DRAW
 <YELLOW>
 CHANGE POINT SIZE <WHITE> <GREEN> BACK TO MENU
 <BLUE>
 DEFINE SPLASH RANGE

CURRENT SETTINGS:

COLORMODE: 0 = COLOR: 0 + MODE: 0
 SIZE: 0,0 SPLASH RANGE: 0,0

TO CHANGE COLOR AND/OR MODE SETTINGS:
 SLIDE CURSOR OFF BOTTOM EDGE OF TABLET AND RETURN IMMEDIATELY; A
 COLOR MAP AND FLASHING "COLOR" CURSOR WILL APPEAR ON TV SCREEN.

o AIRBRUSH

AIRBRUSH allows you to spray paint with points of a size you define within a splash range you also define. This brush is especially useful in developing patterns, trails, and random textures.

When you choose AIRBRUSH, the drawing currently displayed will remain on the TV screen and a flashing arrowhead cursor will appear. Simultaneously, the terminal screen will clear and the above set of options will appear.

OPTION/
BUTTON

ACTIVITY DESCRIPTION

DRAW/
YELLOW

Position the arrowhead cursor at a point on the screen where you wish to start airbrushing. When you press the yellow button, a random number of points will appear at random locations within the splash range defined. Use the remaining options to change the size of the points or splash range or to change your drawing color.

OPTION/ BUTTON -----	AIRBRUSH/ ACTIVITY DESCRIPTION -----
CHANGE POINT SIZE/ WHITE	This option allows you to define the size of the paint point. When you press the white button, new type will appear on the terminal screen. You'll first be asked to type in the width size, choosing from a range of 1-320 pixels. Next, you'll be asked for the height, choosing from a range of 1-200 pixels. If you define a point size of 320 by 200 and then draw with it, you'll notice your entire screen fills up almost instantly. The system default point size is 1,1.
DEFINE SPLASH RANGE/ BLUE	The splash range is a defined area whose perimeter confines the splash of points. To be effective, it should be larger than your point size. When you press the blue button, new type will appear on the terminal screen, asking you to define the splash area by typing in a single value. Since the splash range is a square, only one dimension is needed. Any positive number is acceptable; however, if your splash range exceeds the limits of the screen (320 x 200), you'll lose those points whose random location falls outside screen limits. If you define a splash range of 0, you'll discover a new method for drawing with a box (in this case, the point you've already defined). The system default splash range is -5,5.

OPTION/
BUTTON

ACTIVITY DESCRIPTION

DRAW/
YELLOW

Position the flashing ellipse cursor wherever you wish to begin drawing and press the yellow button to draw with that ellipse. You'll notice this brush draws more slowly than the brushes you've used so far. To get a rubber-stamp drawing effect, you must move the tablet cursor slowly across the tablet. To reposition the cursor or redefine the ellipse, release the yellow button and choose another option.

*CHANGE SIZE
MODULE*/
WHITE

See GENERAL REFERENCE SECTION/*CHANGE SIZE MODULE* for detailed instructions on using this option.

You'll notice that by changing the width or height of the ellipse, you change its horizontal or vertical orientation.

Unlike the other drawing brushes, ellipses are limited as to how small a brush may be defined. The smallest acceptable size for an ellipse brush is 4,4.

NOTE: Just as it takes longer to draw with an ellipse, it also takes a little longer to change its size...just move the cursor a little more slowly and hold the buttons a little longer.

CHANGE TYPE
AND ROTATION/
BLUE

When you press the blue button, new type will appear on the terminal screen, asking you to identify the type of ellipse you want. Type in 0 if you want an open (outline) ellipse or type in 1 if you want a solid (filled in) ellipse.

Next, you'll be asked to type in the position to which you want the ellipse rotated. In this case, you may choose any angle within a full range of 360 degrees.

GROUP 2 - COLORMAP SELECTION & STORAGE

CHANGE	SAVE
COLOR	COLORMAP

CHANGE COLOR/S IN CURRENT DRAWING COLORMAP

CURSOR BUTTON OPTIONS:

CHOOSE NEW COLOR (0-255) OR
COLOR VARIABLE (0-3)
<YELLOW>

FLIP BETWEEN
COLORMAP & IMAGE <WHITE> <GREEN> BACK TO MENU

<BLUE>
LIST CURRENT COLORMAP

CURRENT SETTINGS:

DRAWING COLOR VARIABLE: 0

TO ACCESS HUES, MOVE CURSOR LEFT TO RIGHT;
TO ACCESS GREY LEVELS, MOVE CURSOR TOP TO BOTTOM

o CHANGE COLOR

The UV-1 Zgrass System provides you with a selection of 256 colors from which to choose the four colors contained within any particular drawing palette colormap. As illustrated in the following grid diagram of the system colormap, these 256 electronic paints are created by the interaction of 32 hues at 8 different grey levels. The 8 key colors labeled in the diagram not only correspond to the 8 COLOR BARS used to tune your TV, but are used on this grid to mnemonically signal the progression of color development as the 32 hues interact with the 8 grey levels. These 8 colors are black, white, 3 primaries (red, green, blue), and 3 complementaries (cyan, magenta, yellow). A somewhat less embellished system colormap grid is displayed on your TV in conjunction with the CHANGE COLOR module and allows you to visually select any of the 256 available colors for each of the four color variables of your current drawing colormap.

As you become more familiar with the system, you'll probably find yourself memorizing the numerical equivalents (color values) of those colors you use most often. Although this information and the ability to designate new colors is readily available to you by selecting the CHANGE COLOR module, you'll soon discover the convenience of changing colors by inputting numerical color values via the COLOR CONTROL module internal to each of the GROUP 1 modules. Any color's numerical equivalent is calculated by multiplying the HUE number (0-31) by 8 and then adding the GREY

CHANGE COLOR - Continued

LEVEL number (0-7). Whenever you select a color from the system colormap, the computer automatically calculates this number for you. The COLORMAP KEY beneath the SYSTEM COLORMAP grid on the following page uses the 8 key colors in the colormap to demonstrate the calculation of numerical color values.

SNAP COLORMIXES

Just beneath the system colormap displayed when you choose CHANGE COLOR, you'll notice a series of color boxes numbered P01, P02, P03, P12, P13, and P23. These six boxes represent a set of six color snaps created as sub-sets of the four color variables of your drawing palette and available to you for use in SNAP DRAW and PATTERN FILL as explained below. This feature allows you to create a new color by mixing any two colors of your drawing palette.

Because the horizontal resolution of Zgrass exceeds color NTSC resolution, vertical stripes of different colors laid next to one another on the screen "smear" in such a way that the stripes blend and create what appears to be a new solid color. In reality, this solid color image is actually a stripe pattern which may be snapped and stored in the system for use as a snap in SNAP DRAW and PATTERN FILL. Because the system uses a colormix snap as a snap (composed of two of the four colors displayable on the screen) and not as a color, this feature enables you to expand the number of colors visible on the screen at any given time from four to ten...the four colors of your drawing palette and the six colormixes created by snapping all possible combinations of those four colors.

To facilitate use of this feature, the Paint Program includes snaps of the six possible colormix patterns created by combining stripes of the four color variables (0-3) in all possible combinations. These snaps are named as indicated below each snap segment and stored on the Paint Program disk (Drive 0) under those names as part of the Paint Program. These snaps work just like other brushes you create with the MAKE SNAP module...by using the assigned name and retrieving the snap from disk, you may draw or fill with it in conjunction with the SNAP DRAW or PATTERN FILL modules. While in the CHANGE COLOR module, you'll notice as you change the color value of a color variable (0-3) that any snap including that color variable in its composition also changes value.

For your convenience, the Paint Program provides these two-color combination snaps. Once you've played with these for awhile, you'll probably want to expand on this concept and create your own library of three or four-color combinations or textures (i.e., checkerboard patterns, etc.).

CHANGE COLOR - Continued

When you select the CHANGE COLOR module, the terminal screen will clear and the options available in the module will appear. The TV screen will be temporarily cleared of your current drawing and a grid diagram representing the system colormap of 256 colors will appear, along with a flashing crosshair cursor. In addition, your current four-color drawing colormap will be reproduced at the bottom edge of the screen, along with corresponding color values printed beneath each segment. If you have just started the system, the default colormap (white, red, green, and blue), along with corresponding color values (7, 91, 164, 8) will be used.

OPTION/ BUTTON	CHANGE COLOR/ ACTIVITY DESCRIPTION
-------------------	---------------------------------------

-----	-----
CHOOSE NEW COLOR (0-255) OR COLOR VARIABLE (0-3)/ YELLOW	

To designate the drawing color variable you wish to change, position the crosshair cursor within that segment of the drawing palette colormap at the bottom of the TV screen, and press the yellow button. Now, move the cursor up to the system colormap grid, position the crosshair in the center of the gridbox containing the color you wish to use, and press the yellow button again. When you've pressed the button, you'll notice that the color variable segment of the drawing palette colormap you chose has changed to the color you just chose. You'll also notice that the color value for the new color has been calculated by the computer and replaces the previous color value for that segment printed underneath the segment.

Although the 256 colors do not actually appear in the grid, 8 key color areas are identified by their name's first letter (as decoded in the KEY provided along with the SYSTEM COLORMAP diagram on the previous page). Move the cursor to the color area you're interested in. Then, holding down the yellow button, move the cursor from top to bottom to increase the grey level or from left to right for different hues. Hue is controlled along the horizontal axis and saturation or brightness is controlled along the vertical axis via an 8-step grey scale (black on the bottom and white on top).

When you're satisfied with the color appearing in the color variable you want to change, select a new color variable to be changed and repeat the process of choosing a new color.

OPTION/ BUTTON	CHANGE COLOR/ ACTIVITY DESCRIPTION
-------------------	---------------------------------------

 FLIP BETWEEN
 COLORMAP & IMAGE/
 WHITE

As you select new colors for a palette, it's important to be able to see what your image looks like as a new color is substituted. To flip between the screens containing your image and the system colormap, use the white button as a toggle to flip back and forth. NOTE: Even when you've toggled over to the screen displaying your image, the COLOR CONTROL module is still in effect...so that, if you continue to press the yellow button as you move the tablet cursor within the space of the system colormap, you'll be able to see what your image looks like as you continue to change colors.

LIST CURRENT
 COLORMAP/
 BLUE

At first glance, this option doesn't seem to be too terribly useful; however, once you've used the system for awhile, you'll discover that your proficiency at using the system is highly related to your understanding of how colors are created by the system. The information available when you choose this option breaks down the color creation process and illustrates the relationship between the variables (hue and greyvalue) involved in creating a specific color and assigning a numerical color value to that color.

For instance, when you first start up the Paint Program, if you choose the CHANGE COLOR module, the SYSTEM COLORMAP will appear on the TV screen along with the system default drawing colormap. If you choose this option by pressing the white button, the terminal screen will clear and the following chart of information about the four colors contained in the default colormap will appear:

COLOR #	CURRENT COLOR- MAP VALUE	= (HUE*8) + GREYLEVEL
-----	-----	-----
0 (\$L0)	7	= (0*8) + 7
1 (\$L1)	91	= (11*8) + 3
2 (\$L2)	164	= (20*8) + 4
3 (\$L3)	8	= (1*8) + 0

To graphically decipher this information, use the SYSTEM COLORMAP diagram illustration provided in

OPTION/
BUTTON

CHANGE COLOR/
ACTIVITY DESCRIPTION

this section. The hue number in the above chart represents the column position of a color; the greylevel number represents the row position. You can locate the system default colors in the colormap grid using these coordinates. To verify this, position the crosshair cursor in a corresponding grid location on the TV screen and press the yellow button to see that color and its color value appear in the drawing colormap at the bottom of the screen. For example, try getting Color 1 to appear as color variable 0 on the TV screen by positioning the crosshair cursor in the gridbox that is in column 11, row 3. Color variable 0 of the drawing colormap should be red, value 91 (the same as Sector 1). In addition, since color variable 0 is always your background color, the background color of the screen will also be red.

GROUP 2 - COLORMAP SELECTION & STORAGE

CHANGE	SAVE
COLOR	COLORMAP

USE THIS MODULE TO EITHER CREATE A MACRO TO SAVE THE CURRENT DRAWING COLORMAP PALETTE, OR TO RETRIEVE A COLORMAP MACRO CREATED PREVIOUSLY.

INPUT 0 TO HAVE THE COMPUTER CREATE A MACRO FOR THE CURRENT DRAWING COLORMAP AND SAVE IT IN USER MEMORY OR ON DISK

INPUT 1 TO RETRIEVE A COLORMAP MACRO PREVIOUSLY CREATED AND STORED IN USER MEMORY OR ON DISK

PRESS RETURN TO GO BACK TO MENU

o SAVE COLORMAP

When you have completed and stored a drawing, the drawing color palette must also be saved, since it's not automatically included in the storage file containing your drawing. SAVE COLORMAP instructs the computer to create a macro (a series of Zgrass commands and statements) which defines the current drawing colormap. After the macro has been created, the colormap can be saved for later retrieval.

OPTION	ACTIVITY DESCRIPTION
--------	----------------------

INPUT 0	TO HAVE THE COMPUTER CREATE A MACRO FOR THE CURRENT DRAWING COLORMAP AND SAVE IT IN USER MEMORY OR ON DISK:
---------	---

When you type in 0, you'll be asked to name the new colormap macro. It is recommended that you create a name which is easily associated with the drawing to which it belongs. For instance, if you have a drawing named "Winter", a good name for the colormap macro would be "ColorWinter".

Once you've named the colormap macro, you'll be asked if you want to store it on disk. Respond by typing Y to save your drawing colormap on disk for future use. If you reply negatively, this macro will be stored only in user memory and not on disk...which means, your colormap macro will be lost (forever) when you turn the computer off. This module adds the new file name to the listing of macros provided when you choose FILE STATUS.

OPTION -----	SAVE COLORMAP/ ACTIVITY DESCRIPTION -----
INPUT 1	TO RETRIEVE A COLORMAP MACRO PREVIOUSLY CREATED AND STORED IN USER MEMORY OR ON DISK:

When you type in 1, you'll be asked to provide the name of the colormap macro you wish to retrieve and whether or not it is on disk. When the colormap has been retrieved, you'll notice the paint box menu or the drawing you currently have on the TV screen displayed using the colors of the colormap retrieved.

GROUP 3 - MAKING & USING SNAPS

MAKE SNAP	SHRINK	SNAP DRAW	PATTERN FILL
SCALE SNAP DRAW	EXPAND AND DETAIL	ANIMATE	WORDS

In addition to the basic brushes offered in Group 1, the Paint Program provides you with a powerful tool which enables you to develop complex and unique brushes called **snaps**.

Basically, there are two methods by which snaps (short for snapshots) can be made. You can use **MAKE SNAP**, which allows you to select the section of a drawing you want to excerpt and reserve as a snap; or, alternatively, you can use **SHRINK**, which allows you to reduce a large picture (as much as an entire screen) to snapshot size.

Once you have a snap, other tools in Group 3 allow you to scale it up or down, rotate it, draw or fill with it in rubber-stamp fashion, or create a series of snaps to be displayed one after another to produce animation.

GROUP 3 - MAKING & USING SNAPS

MAKE SNAP	SHRINK	SNAP DRAW	PATTERN FILL
SCALE SNAP DRAW	EXPAND AND DETAIL	ANIMATE	WORDS

PREREQUISITE: It is recommended that you have the image you wish to work with on the screen before selecting this module.

MAKE SNAPSHOT EXCERPT FROM SCREEN (LARGEST SNAP CAN BE 125 X125)

CURSOR BUTTON OPTIONS:

MAKE SNAP
<YELLOW>
CHANGE SIZE MODULE <WHITE> <GREEN> BACK TO MENU
<BLUE>
PRINT SNAP LOCATION

CURRENT SETTINGS:

DISPLAYMODE: 0 SNAP WIDTH:000 SNAP HEIGHT:000
LARGEST MEMORY FRAGMENT: 0000 MEMORY NEEDED FOR A 000X000 SNAP: XXXX

USE JOYSTICK KNOB FOR SMALL CHANGES TO SNAP SIZE;
PRESS TRIGGER FOR CURRENT SNAP SIZE

This module allows you to define an area of the screen as a snap and then associate a name with that snap for later use. When you choose MAKE SNAP, the drawing you have selected will appear on the screen along with a flashing box cursor of random size. This cursor is used as a "framing window".

OPTION/
BUTTON

ACTIVITY DESCRIPTION

MAKE
SNAP/
YELLOW

If the cursor's dimensions are suitable for the area you wish to snap, position the cursor so that it frames the snap as you want it saved, steady the cursor, and then press the yellow button. New type will appear on your terminal screen asking what you'd like to name your snap. Type in the name and press the return key. In the event there is not enough memory to make your snap, you'll get

OPTION/
BUTTON MAKE SNAPSHOT EXCERPT FROM SCREEN
 ACTIVITY DESCRIPTION

MAKE
SNAP/
YELLOW

a message to this effect instead of a request for the name of your snap. See the *CHANGE SIZE MODULE* and the sections on SYSTEM LIMITATIONS ON SNAP SIZE AND USER MEMORY STORAGE and CLEANING UP USER MEMORY TO STORE MORE OR LARGER SNAPS in the GENERAL REFERENCE SECTION for information on the size limitations enforced by the system.

After you've defined and named your snap, you may draw with it by returning to the menu and selecting the SNAP DRAW module. This snap will automatically be saved for you during the session in which it is created for use during that session; however, if you wish to save it for use during future sessions, you must store it on disk by selecting the DISK UTILITIES module of your paint box menu.

***CHANGE SIZE
MODULE*/
WHITE BUTTON**

***CHANGE SIZE MODULE* - SNAPS**

CURSOR BUTTON OPTIONS:

DEFINE SIZE
<YELLOW>

INPUT
NEW CENTER <WHITE>

PRINT
<GREEN> CURRENT X,Y SIZE

<BLUE>
INPUT X AND Y SIZE

CURRENT SETTINGS:

CENTER: 0,0 WIDTH: 00 HEIGHT: 00
LARGEST MEMORY FRAGMENT: 0000

Since the snap cursor is a box, you have exactly the same options for selecting a new size as you do for the BOX module. Accordingly, please see GENERAL REFERENCE SECTION/ *CHANGE SIZE MODULE*.

OPTION/ BUTTON	MAKE SNAPSHOT EXCERPT FROM SCREEN ACTIVITY DESCRIPTION
SNAP LOCATION/ BLUE	<p>Since the box cursor also functions as a framing window for making snaps, it's important to be sure to determine the center coordinates of a potential snap section before you snap it. By pressing the blue button, you'll get the center coordinates of the box cursor at its current location prior to snapping a section. This data will be printed out on the terminal screen.</p>
FINE TUNING/ JOYSTICK #1	<p>To make fine adjustments to the size of the box cursor prior to making a snap, use the Joystick #1 control knob.</p> <p>To get a listing on the terminal screen of the current box cursor dimensions prior to making the snap, press the trigger of Joystick #1.</p>

GROUP 3 - MAKING & USING SNAPS

MAKE SNAP	SHRINK	SNAP DRAW	PATTERN FILL
SCALE SNAP DRAW	EXPAND AND DETAIL	ANIMATE	WORDS

PREREQUISITE: It is recommended that you have the image you wish to work with on the screen before selecting this module.

SHRINK AN AREA OF SCREEN INTO A SNAP

1. DEFINE AREA OF SCREEN TO BE SHRUNK.
2. CHOOSE SNAP SIZE AND INPUT NAME OF SNAP.

CURSOR BUTTON OPTIONS:

1.CHANGE SHRINK SIZE MODULE
<YELLOW>

*2.CHANGE SNAP
SIZE MODULE* <WHITE> <GREEN> BACK TO MENU

<BLUE>
DISPLAY FINAL SNAP

CURRENT SETTINGS:

SHRINK AREA: SIZE: 00,00 CENTER: 00,00
SNAP: NAME: XXXXX SIZE: 00,00 DISPLAY MODE: 00
LARGEST MEMORY FRAGMENT: 0000 MEMORY NEEDED FOR A 000X000 SNAP: XXXX

o SHRINK

As an alternative to taking a snap of a section of a drawing with MAKE SNAP, SHRINK allows you to select an area of the screen (or the entire screen, if you wish) and shrink (reduce) it to a snapshot size you define. Once defined, the shrink area is considered a snap and new type appears on the terminal screen asking you to name the snap. Since the largest section of screen useable by MAKE SNAP is 1/4 of the screen, SHRINK is extremely helpful in allowing you to scale down large areas of the screen for making snaps.

***CHANGE SHRINK
SIZE MODULE*/
YELLOW BUTTON**

***CHANGE SHRINK SIZE MODULE* - SHRINK**

CURSOR BUTTON OPTIONS:

DEFINE SIZE
<YELLOW>

INPUT PRINT
NEW CENTER <WHITE> <GREEN> CURRENT X,Y SIZE

<BLUE>
INPUT X AND Y SIZE

CURRENT SETTINGS:

CENTER: 0,0 XSIZE: 00 YSIZE: 00

***CHANGE SHRINK
SIZE MODULE*/
YELLOW**

This option is the means by which you define the area of the screen you wish to shrink...you are allowed to define as much as a full screen. Again, the framing window cursor is a box, which means you have exactly the same options for changing or re-defining the area framed by the box cursor as you have in the BOX module. Briefly, to review those procedures as they would apply here:

-Position the flashing box cursor that appears when you select SHRINK over the center of the area of the screen you wish to shrink; then, press the yellow button so that you can change the size of the framing window cursor until it frames the entire area you wish to shrink.

-If you've missed the center of that area, observe the center coordinates in the CURRENT SETTINGS section on the terminal screen, press the white button, and input small corrections. NOTE: If you plan to shrink an entire screen, input the coordinates for the center of the screen: 0,0.

-When you are satisfied with both the position and the size of the framing window, press the yellow button to choose that size and location. The area you've defined to be shrunk will be highlighted on the screen in reverse colors.

***CHANGE SNAP
SIZE MODULE*/
WHITE BUTTON**

***CHANGE SNAP SIZE MODULE* - SHRINK**

CURSOR BUTTON OPTIONS:

DEFINE SIZE
<YELLOW>

INPUT PRINT
NEW CENTER <WHITE> <GREEN> CURRENT X,Y SIZE
<BLUE>
INPUT WIDTH & HEIGHT

CURRENT SETTINGS:

CENTER: 0,0 WIDTH: 00 HEIGHT: 00
LARGEST MEMORY FRAGMENT: 0000

***CHANGE SNAP
SIZE MODULE*/
WHITE**

This option allows you to define the size you wish the final snap to be. Once again, the framing window cursor is a box, so the options for selecting a new size are exactly the same as for BOXES under *CHANGE SIZE MODULE*. Briefly, follow these procedures:

-Position the flashing box cursor over the center of the highlighted area of the screen to be shrunk; then, press the white button so that you may change the size of the framing window cursor.

-Although it is not important to the making of the snap, you may reposition the center of the snap by pressing the white button and inputting new center coordinates.

-When it looks like you've gotten the right size and shape, verify the size of the potential snap by pressing the green button; the CURRENT SETTINGS section on the terminal screen will be updated to reflect the dimensions of the current snap; do some quick calculation (divide the product of the snap's dimensions by 4) to determine whether or not you're within the range of the LARGEST MEMORY FRAGMENT (also printed on the terminal screen).

-If the snap fits and you're satisfied with it, press the yellow button to choose it; new print will appear on the terminal, asking you to name this new snap. If the snap doesn't fit, refer to

the section on SIZE LIMITS under MAKE SNAP.

OPTION/
BUTTON

SHRINK AN AREA OF SCREEN INTO A SNAP
ACTIVITY DESCRIPTION

DRAW WITH
SNAP/
BLUE

When you press this button, the TV screen will clear and the snap you've created will be displayed on a clear screen. New type will appear on the terminal, advising you that this is your new snap and to press the blue button to continue. When you do so, you'll be returned to your drawing so that you may continue to shrink additional areas of the screen into snaps or go back to the menu and use SNAP DRAW to draw with the new snap.

GROUP 3 - MAKING & USING SNAPS

MAKE SNAP	SHRINK	SNAP DRAW	PATTERN FILL
SCALE SNAP DRAW	EXPAND AND DETAIL	ANIMATE	WORDS

DRAW WITH A SNAP

CURSOR BUTTON OPTIONS:

DRAW
<YELLOW>

CHOOSE
NEW SNAP <WHITE> <GREEN> BACK TO MENU

<BLUE>
INPUT NEW ROTATION (0,90,180,270)

CURRENT SETTINGS:

SNAP NAME: XXXXX SIZE: 00, 00
ROTATION: 0 DISPLAYMODE: 00
PRESS JOYSTICK TRIGGER FOR CURRENT SNAP POSITION COORDINATES

TO INPUT NEW DISPLAYMODE:

SLIDE CURSOR OFF BOTTOM EDGE OF TABLET AND RETURN; NEW PRINT WILL
APPEAR ON THE TERMINAL SCREEN, ASKING FOR NEW DISPLAYMODE.

o SNAP DRAW

Selecting this module allows you to identify any snap, either in your current work space (user memory) or stored on disk, and then draw with that snap.

When you choose SNAP DRAW, the terminal screen will clear and print will appear, asking for the name of the snap you wish to draw with. After you input the name, you'll be asked whether you want to get it from disk (Y) or not (N). When you've responded, the terminal screen will clear once again and the above-reproduced set of options will appear for your choice.

OPTION/ BUTTON	DRAW WITH A SNAP ACTIVITY DESCRIPTION
-------------------	--

DRAW/
YELLOW

After you've identified a snap, it will appear on the TV screen as a flashing snap cursor and you may draw with it in rubber-stamp fashion or register a single image on the screen for modification with other Paint Program modules.

CHOOSE
NEW SNAP/
WHITE

If you wish to use more than one snap in your drawing, you may put away the current snap and choose a new snap to draw with by pressing the white button. The terminal screen will clear and you'll be asked the name of the new snap and whether or not it's on disk. After you've typed in your responses, the new snap will appear on the TV screen as a cursor, ready to draw.

INPUT NEW
ROTATION
(0,90,180,270)/
BLUE

If you wish to continue drawing with the current snap, but would like to rotate it 90, 180, or 270 degrees, interrupt your drawing process to press the blue button. The current snap will disappear from the TV screen and new type will appear on the terminal screen, asking for the new rotation (0-3). After inputting the new rotation, your snap will reappear on the TV screen, rotated according to your specifications, ready to draw with. See ROTATION section of GENERAL REFERENCE SECTION for details on rotated snaps.

CURRENT SNAP
LOCATION/
JOYSTICK #1

To get a listing of any snap cursor's current position before it's drawn, hold the cursor steady and press the trigger on the joystick. The snap's center coordinates will be printed out on the terminal screen.

PATTERN FILL - Continued

printed out on the terminal screen to guide you in using the PATTERN FILL module. Simultaneously, a flashing crosshair cursor will appear on the TV screen, ready for your fill selection.

OPTION/ BUTTON -----	FILL A BOUNDED AREA WITH A SNAP PATTERN ACTIVITY DESCRIPTION -----
FILL WITH SNAP PATTERN/ YELLOW	If the horizontal and vertical offset settings are suitable (as printed on the terminal screen), you may fill any bounded area with a pattern created with the snap you specified by positioning the tablet cursor so that the crosshair cursor is within the bounded area you wish to fill and then pressing the yellow button. You can change the orientation of the pattern by changing the horizontal and vertical offsets as explained below for that option.
CHOOSE NEW SNAP/ WHITE	If you wish to use more than one snap pattern to fill in your drawing, you may select additional snaps for patterning by pressing the white button. When you press this button, the terminal screen will clear and new type will appear, asking you to input the snap name and whether or not it is on disk. Once you've done this, the screen will clear and the full set of options available for the PATTERN FILL module will re-appear on the terminal screen so that you may proceed to fill with a pattern created with the new snap.
INPUT NEW OFFSETS/ BLUE	This option allows you to change the horizontal or vertical placement of the pattern you fill with in order to achieve fill variations with the same pattern. These variations are effected by offsetting the relative starting position of the patterning process. 0,0 is the default setting. The pattern builds up from this starting point by repeating the snap as many times as the screen limits permit to the left, right, top, and bottom. If you'd like to shift the orientation of the pattern 10 pixels up and 15 pixels to the right of its current position, you'd input a horizontal offset of 15 and a vertical offset of 10. Alternatively, you could shift the pattern down 5 pixels and to the left 20 pixels by inputting a horizontal offset of -20 and a vertical offset of -5. Experimentation is best!

GROUP 3 - MAKING & USING SNAPS

MAKE SNAP	SHRINK	SNAP DRAW	PATTERN FILL
SCALE SNAP DRAW	EXPAND AND DETAIL	ANIMATE	WORDS

PREREQUISITE: To use this module, you must have a snap in the system or on disk. To exit this module now, just press return.

SCALE, ROTATE, AND DRAW WITH A SNAP

CURSOR BUTTON OPTIONS:

DRAW WITH SCALED SNAP
<YELLOW>

CHOOSE
NEW SNAP <WHITE> <GREEN> BACK TO MENU

<BLUE>
INPUT SCALE FACTORS & ROTATION

CURRENT SETTINGS:

SNAP NAME: XXXXX SIZE: 00,00 SCALE: 00,00
ROTATION: 0 DISPLAYMODE: 0

TO INPUT NEW DISPLAYMODE:

SLIDE CURSOR OFF BOTTOM EDGE OF TABLET AND RETURN; NEW PRINT WILL APPEAR ON TERMINAL REQUESTING THE NEW DISPLAYMODE.

NOTE: AN ASTERISK "*" WILL APPEAR ON THE TERMINAL SCREEN TO INDICATE THAT THE SCALED SNAP HAS BEEN DRAWN ON THE TV SCREEN.

o SCALE SNAP DRAW

This module allows you to select a snap from your portfolio (that is, from user memory or from a disk), scale it up or down, rotate it 90, 180, or 270 degrees, and then draw with it. While using this module, you may select more than one snap to interact and draw with.

When you select the SCALE SNAP DRAW module, print will appear on the terminal screen asking for the name of the snap you wish to work with and whether you want to get it from disk (Y) or not (N). If you respond that your snap is on disk, it will be retrieved from the disk and displayed on the TV screen. Simultaneously, the terminal screen will clear and the above outline of options will appear.

OPTION/
BUTTON

SCALE, ROTATE, AND DRAW WITH A SNAP
ACTIVITY DESCRIPTION

DRAW WITH
SCALED SNAP/
YELLOW

After you've input new scale and/or rotation factors, this option allows you to draw with the scaled and/or rotated snap.

NOTE: When drawing with large or rotated snaps, you must hold the button down a little longer in order to complete the drawing process. Continue to press the yellow button until an asterisk * appears on the terminal screen, indicating that the drawing process is complete.

CHOOSE
NEW SNAP/
WHITE

If you wish to use more than one snap while in this module, you may select additional snaps for scaling and/or rotating to draw with by pressing the white button. When you press the button, the terminal screen will clear and new type will appear, asking you to input the snap name and whether or not it is on disk. When you have done so, the screen will clear and you'll be returned to the above set of options so that you may proceed to scale, rotate, and/or draw with the currently selected snap.

INPUT SCALE
FACTORS &
ROTATION/
BLUE

See the GENERAL REFERENCE SECTION/SCALING & ROTATION for details on determining these factors. When you press the blue button, the snap cursor currently displayed on the TV screen will disappear and new type will appear on the terminal screen, asking you to input new scale and rotation factors at the terminal keyboard. After you've input the new scale and rotation factors, the snap cursor will reappear on the TV screen, scaled and rotated per your specifications, ready to draw with.

GROUP 3 - MAKING & USING SNAPS

MAKE SNAP	SHRINK	SNAP DRAW	PATTERN FILL
SCALE	EXPAND	ANIMATE	WORDS
SNAP DRAW	AND DETAIL		

PREREQUISITE: TO USE THIS MODULE, YOU MUST HAVE A SNAP IN THE SYSTEM OR ON DISK. TO LEAVE THIS MODULE, JUST PRESS RETURN.

EXPAND A SNAP FOR MODIFICATION OR DETAIL WORK

INPUT 0 TO EXPAND (SCALE UP) A SNAP FOR DETAIL WORK
 INPUT 1 TO SHRINK MODIFIED IMAGE INTO A NEW SNAP

PRESS RETURN TO GO BACK TO THE MENU

o EXPAND AND DETAIL

EXPAND AND DETAIL is the module you use to enlarge a snap to make touch-up or detail work easier and then return it to its original size (or, if you'd like, a new size), with a new name assigned to the modified snap.

The most critical factor in using this module effectively is assignment of proper scale factors to achieve the effect you want. You must always bear in mind what the modified snap will look like when you return it to its original size. In general, if you're using this module to do detail work, you'll want to scale the height and width uniformly (i.e., 2,2) and avoid distortions created by varying scale factors. Of course, you can also create interesting modifications of a snap simply by varying the scale factors. For detailed information on the effects of scaling, see GENERAL REFERENCE SECTION/SCALING.

SPECIAL NOTE ON SCALING: In scaling up snaps for detail work and then shrinking them back down to their original size, it is important to note that distortions created as a result of losing or gaining a pixel due to round-off error may occur if you use scaling factors other than powers of 2 (2,4,8,16,32...).

OPTION	ACTIVITY DESCRIPTION
--------	----------------------

INPUT 0	TO EXPAND A SNAP FOR MODIFICATION OR DETAIL WORK:
---------	---

When you respond by typing in 0, new type will appear on the terminal screen and you'll be asked a series of questions about what you want to

OPTION

EXPAND AND DETAIL/EXPAND A SNAP - Continued
ACTIVITY DESCRIPTION

do...the name of the snap you want to work on, whether you want to get it from disk or not, and what width and height scale factors you want.

You'll be given the option of clearing the screen or not. If you wish to compare an image to the snap you're modifying, you'll need to have that image displayed on the screen prior to selecting this module and then elect not to clear the screen. The comparison image should have been positioned at the edge of the screen so that it is not covered over by the snap you're scaling, which is always displayed at the center of the screen.

You'll also be asked whether or not you want a border to define the edges of your snap. If you respond by typing Y, your snap will be drawn on the TV screen with a visible border defining the edges of your snap. Only those changes made within the edges of your snap will be included in your new snap. This is also true of modifications you make to a snap drawn without a border, except you won't be able to see the edges.

Finally, after the scaled snap is displayed on the TV screen, you'll be asked to verify that it's ok. If you decide the scale factors are not quite what you want, type in N to go through the scaling procedure again. If you're satisfied with the scaled snap registered on the TV screen, type in Y to retain that snap. Press the return key again to get back to the Paint Program menu so that you may proceed to make changes to the scaled snap you've created with other modules.

INPUT 1

TO SHRINK MODIFIED SNAP INTO A NEW SNAP:

When you've completed the detail work on a scaled-up snap, return to the EXPAND AND DETAIL module to shrink that modified snap into a new snap. Type in 1 and you'll then be asked for new specifications on this snap...the new name, original or new snap size, and scale factors. NOTE: If you use the same name as your original snap, it will be destroyed and replaced by the new modified version given that name.

GROUP 3 - MAKING & USING SNAPS

MAKE	SHRINK	SNAP	PATTERN
SNAP		DRAW	FILL
SCALE	EXPAND		
SNAP	AND	ANIMATE	WORDS
DRAW	DETAIL		

PREREQUISITE: YOU SHOULD HAVE SEVERAL SNAPS IN THE SYSTEM OR ON DISK TO USE THIS MODULE; USE *DISK UTILITIES* TO GET SNAPS AND MACROS OFF DISK. PRESS RETURN TO GO BACK TO MENU.

ANIMATION WITH SNAPS

CURSOR BUTTON OPTIONS:

CHANGE ANIMATE
 SNAP SEQUENCE <WHITE> <YELLOW>
 <GREEN> BACK TO MENU
 <BLUE>
 CHANGE SPEED & MOVEMENT

CURRENT SETTINGS:

SEQUENCE NAME: XXXXXXXXXX DELAY TIME: 00 DISPLAYMODE: 00
 HORIZONTAL MOVEMENT: 00 VERTICAL MOVEMENT: 00

TO CLEAR THE SCREEN, PRESS JOYSTICK TRIGGER

TO INPUT NEW DISPLAYMODE:

SLIDE CURSOR OFF BOTTOM EDGE OF TABLET AND RETURN; NEW PRINT WILL
 APPEAR ON TERMINAL REQUESTING THE NEW DISPLAYMODE.

o **ANIMATE**

ANIMATE provides you with the most simple form of animation by displaying snaps one after another, comparable to "flip book" animation, with the added capability of varying the speed and sequence in which the snaps are displayed. Although user memory limits the number of different snaps that may be used in a particular sequence, there is no limit to the number of times any snap may be repeated in that sequence.

When you choose ANIMATE from the menu, some preliminary questions about the animation sequence you wish to create or run will appear on the terminal screen. You may either create a new animation sequence or run a sequence you've already created, named, and stored either in user memory or on disk. By the way, the structure by which an animation sequence is stored is a "macro" which is automatically written for you when you create and name the animation sequence. If you choose to run a

ANIMATE - Continued

sequence you've already created, the above set of options will appear on the terminal screen. If you wish to create a new animation sequence, you'll be asked to identify the name of each snap and the sequence in which you want it displayed. Naturally, these snaps must be in the system (in user memory). When you have typed in the last snap of a sequence, press the return key twice. A flashing crosshair cursor will appear on the TV screen and the ANIMATE options will appear on the terminal screen, ready for your selection.

OPTION/ BUTTON -----	ACTIVITY DESCRIPTION -----
ANIMATE/ YELLOW	Position the crosshair cursor wherever you'd like your animation sequence to begin. When you press the yellow button, the snaps you've named in the animation sequence you've chosen will be displayed one-after-another in flip-book fashion in the sequence you defined. Your animation will be re-cycled through that sequence until you turn this option off by pressing the trigger on Joystick #1 and holding it down through a complete cycle.
CHANGE SNAP SEQUENCE/ WHITE	To select another animation sequence or create a new one in the same way as you did when you chose ANIMATE, press the white button.
CHANGE SPEED & MOVEMENT/ BLUE	<p>This option allows you to specify the delay time between snap displays. The shortest delay time is set at 0 (also the system default). The larger the number you input for speed, the longer the delay between displays. For instance, at a speed of 30, there will be a 1/2-second delay between display of snaps in an animation sequence; at 60, a full second will elapse between displays. An important factor to take into account when determining speed is the size of your snap...the smaller the snap, the less time it takes to display on the screen.</p> <p>MOVEMENT of an animation sequence on the screen is controllable both horizontally and vertically. For each cycle of a sequence, the display can be moved a defined number of pixels up, down, right, or left. For instance, if you'd like your</p>

OPTION/
BUTTON

ANIMATE/CHANGE SPEED & MOVEMENT-Continued
ACTIVITY DESCRIPTION

sequence to crawl diagonally up the screen from the lower lefthand corner, you'd position the crosshair cursor in the lower lefthand corner, input 10 for horizontal movement and 10 for vertical movement to move 10 pixels diagonally on the screen per cycle of a sequence. If you reposition the cursor, the crawling movement will re-start from that position.

HORIZONTAL MOVEMENT: To move left, use negative numbers; to move right, use positive numbers.

VERTICAL MOVEMENT: To move down, use negative numbers; to move right, use positive numbers.

GROUP 3 - MAKING & USING SNAPS

MAKE SNAP	SHRINK	SNAP DRAW	PATTERN FILL
SCALE SNAP DRAW	EXPAND AND DETAIL	ANIMATE	WORDS

PUT TEXT ON THE SCREEN

CURSOR BUTTON OPTIONS:

PLACE TEXT ON SCREEN
<YELLOW>
CHANGE TEXT <WHITE> <GREEN> BACK TO MENU
 <BLUE>
CHANGE FONT SIZE,
COLOR, SPACING, ROTATION

CURRENT TEXT: XOXOXO OXOXOXO OXOXOXOXOXO OXOXOXOXOXOXO OXOX
CURRENT SETTINGS:

FONT SIZE: 00 SPACING BETWEEN CHARACTERS: 00
SPACING BETWEEN LINES: 00 ROTATION: 00
FOREGROUND COLOR: 00 BACKGROUND COLOR: 00 DISPLAYMODE: 00

TO INPUT NEW DISPLAYMODE SETTING:

SLIDE CURSOR OFF BOTTOM EDGE OF TABLET AND RETURN; NEW TYPE WILL
APPEAR ON TERMINAL, ASKING FOR NEW DISPLAYMODE.

o WORDS

The WORDS module is the method by which you label your drawings, charts, graphs, screen dumps, etc. In addition, it is often used as a "starter" for text animation; i.e., by printing a word on the screen and then snapping it or some altered variation of the word.

This module provides you with not only three sizes of the font, but also the flexibility to change: the spacing between characters or between lines of text, the foreground or background colors, and the position of the text.

Before you select WORDS, make sure you have the image you wish to label or add text to on the TV screen. When you have your drawing on the screen and have selected WORDS, a flashing crosshair cursor will also appear on the TV screen.

OPTION/
BUTTON

WORDS
ACTIVITY DESCRIPTION

PLACE TEXT
ON SCREEN/
YELLOW

Imagine that the first letter of the text you wish to position on the screen is contained by the upper righthand quadrant of the crosshair cursor so that the bottom of the text lines up to the center of the cursor... and then position the cursor where you wish the text to begin and press the yellow button. You'll notice that new print appears on the terminal screen advising you to press yellow to fix text on the screen or to press white to erase the text you have just placed on the screen.

This option allows you to **preview** the placement of text on the screen before fixing it in that position. If you are satisfied with the placement of text, press the yellow button once again to fix it at that location. If you wish to adjust the placement, press the white button. The text just placed on the screen will be erased and the flashing crosshair cursor will re-appear, ready for new placement of your text.

CHANGE
TEXT/
WHITE

By now you've noticed that the system default text is **STARTUP**. Once you've experimented with that, you'll probably want to change the text to something more meaningful. To do so, press the white button. New print will appear on the terminal screen, advising you to type in as many lines of text as you wish and to signify that you've finished by pressing the return key twice.

If you plan to do more than just label, before you go entering a full page of text, there are a few things you should be aware of:

- If you use more characters in a single line than the screen will hold (about 35 characters across using the system default small character font), the excess characters will not register on the screen.
- Within screen limits, you can enter up to an entire TV screenful of text; however, this module is not intended to work as a text editor and if you later wish to change any single character or word in the text, you'll have to re-type the entire body of the text.

WORDS - Continued

CHANGE FONT SIZE, CHARACTER COLOR, SPACING, AND ROTATION

-
- INPUT 1 TO USE SMALL FONT
INPUT 2 TO USE MEDIUM FONT
INPUT 3 TO USE LARGE FONT
- INPUT 4 TO CHOOSE FOREGROUND AND BACKGROUND FONT COLORS (0-3)
- INPUT 5 TO CHANGE PIXEL SPACING BETWEEN CHARACTERS
INPUT 6 TO CHANGE SPACING BETWEEN LINES OF TEXT
- INPUT 7 TO CHANGE ROTATION

PRESS RETURN TO GET BACK TO "WORDS" OPTIONS

OPTION/ BUTTON	WORDS/ ACTIVITY DESCRIPTION
-------------------	--------------------------------

CHANGE FONT SIZE,
COLOR, SPACING,
ROTATION/
BLUE

When you choose this option, the terminal screen will clear and the above set of options will appear. You may continue making changes with these options until you press the return key and get back to the set of options for WORDS. Briefly, here's how each of these options works:

INPUT 1 TO CHANGE FONT SIZE:
INPUT 2
INPUT 3

You select the size font you wish to work with by inputting (typing) 1 for small, 2 for medium, or 3 for large. Due to the fact that the basic font is comprised of proportionally spaced characters which encompass both capital letters and descending letters (that is, letters that descend below the writing line), it is difficult to define specific sizes for 1, 2, and 3. However, as a gauge of the difference in sizes, we can use the height of capital letters as a reference point:

FONT SIZE	HEIGHT OF CAPITAL LETTERS
Small	10 pixels
Medium	20 pixels
Large	30 pixels

NOTE: In order to use the large font, you'll need at least 10K free storage space in user memory.

OPTION	WORDS/FONT CHANGES - Continued ACTIVITY DESCRIPTION
-----	-----
	<p>See SYSTEM LIMITATIONS/USER MEMORY sections of GENERAL REFERENCE SECTION for instructions on freeing up user memory.</p>
INPUT 4	<p>TO CHOOSE FOREGROUND AND BACKGROUND FONT COLORS (0-3)</p> <p>Understanding foreground color is relatively simple...it's the color of the character itself. Background color is a little more complex. The background of a character is the block of blank space surrounding the character that contains pixels not needed to create the character. Any space between words of text is also considered background. In general, you'll define the background color of your text to be the same as the color of the area on which you are writing, which means the background color of your text will not be noticeable. If, however, you choose to write on a color different from the background color of your text, the effects of doing so will become immediately apparent. Your own experience in dealing with this will best teach you how to use it to your advantage.</p> <p>In any event, when you input 4, you'll be asked to type in a color variable number (0-3) from the palette colormap currently residing in the system for both the character and the background.</p>
INPUT 5	<p>TO CHANGE PIXEL SPACING BETWEEN CHARACTERS:</p> <p>This feature allows you to define the number of pixels separating characters of a word. You may spread them further apart or squeeze them together so that they overlap one another. The system default spacing is two pixels between characters.</p>
INPUT 6	<p>TO CHANGE SPACING BETWEEN LINES OF TEXT:</p> <p>This feature allows you to define the number of lines between lines of text. The system default settings are as follows:</p> <p style="margin-left: 40px;">-SMALL FONT: -15 -MEDIUM FONT: -23 -LARGE FONT: -40</p> <p>Using capital letters, these negative number settings represent the number of lines between the top of the first line and the bottom of the second line.</p>

OPTION	WORDS/FONT CHANGES - Continued ACTIVITY DESCRIPTION
INPUT 7	TO CHANGE ROTATION: This feature allows you to change the rotation of your text from the system default of 0 degrees to 90, 180, or 270 degrees.

SAVE LINE DRAW - Continued

control the accuracy of registering endpoints at uniform locations within each gridbox of the grid.

When you choose SAVE LINE DRAW, a series of questions will be asked via the terminal screen. The structure in which all the points of your line drawing's path are saved is called an **array**, so the first thing you'll be asked is the name of the array you wish to work on. This may either be an array you're just starting or one you've created previously that you now wish to modify. To modify an existing array, you need to have re-drawn its path on the TV screen with SAVED LINE RE-DRAW before you choose SAVE LINE DRAW.

DEFINING ARRAY SIZE

If you wish to create a new line-drawing array, you'll be asked to define the maximum number of points needed to complete the drawing. You may define a minimum of 1 and a maximum of 330 points. Do not use 0 or negative numbers. By defining the number of points you expect to have in an array, you actually reserve storage space for that many points. Since you cannot reclaim unused storage space in an array, it is important to estimate the actual number of points as closely as you can. In general, it's wisest to estimate on the low side. If you run out of space in an array, you'll be asked (on the terminal screen) if you want to save more points by creating another array. If you're not finished with your drawing, you should reserve more space in another array with a name closely associated to the first array.

When you've named and defined the maximum number of points in a line-drawing array, the terminal screen will clear and the cursor button options for SAVE LINE DRAW will appear, as reproduced at the beginning of this section. Simultaneously, a flashing line cursor (like LINES) will appear on the TV, ready for you to create the line-drawing being saved by the array you've defined. **NOTE:** After you've completed your line drawing, don't forget to save it on disk for later use. Although it now exists in user memory, if you turn the computer off and haven't saved it on disk, there is no way of retrieving it for later use.

OPTION/ BUTTON -----	ACTIVITY DESCRIPTION -----
----------------------------	-------------------------------

LINE DRAW/ YELLOW	
----------------------	--

	Stretch the free end of the line cursor to where you want the line drawn and press the yellow button. Keep in mind that the lines you draw now will be re-drawn in the same order later when you use the SAVED LINE RE-DRAW module.
--	---

OPTION/
BUTTON SAVE LINE DRAW/
 ACTIVITY DESCRIPTION

MOVE FIXED
POINT/
WHITE

To relocate the fixed point of the line cursor, stretch the free end to the point where you want it re-positioned and press the white button.

ERASE
LINES/
BLUE

When you press the blue button, the path you've created by drawing with lines from point to point will be re-traced and lines will be erased in reverse order for as long as you continue pressing the button. If you have re-located the fixed point, it's path will be re-traced even though a line has not been registered on the screen.

ACCESS ARRGRID
AND CONSTRAIN/
CTRL+Z

DRAWING ON A GRID BACKGROUND

If you wish to have a grid displayed in the background of your TV canvas, press CTRL+Z. A pound sign symbol # will appear on the terminal screen. If you type in ARRGRID and press the return key, you'll be asked to define a grid size by typing in a code for one of the three sizes available:

CODE	GRID SCALE IN PIXELS
----	-----
1	10 X 10
2	20 X 20
3	30 X 30

When you have typed in the code, if you'll look at the TV screen, you'll notice the grid being drawn in and completed when the contrasting horizontal and vertical center lines have been drawn. Another pound sign # will be printed on the terminal screen. If you do not wish to change the constraint variable (CONSTRAIN), simply press the return key and the flashing line cursor will appear on the TV screen, ready to draw with.

The CONSTRAIN variable allows you to accurately limit the placement of points on the grid. For instance, if you type:

CONSTRAIN=10

OPTION/
BUTTON

SAVE LINE DRAW/
ACTIVITY DESCRIPTION

after the pound sign # appears on the terminal screen and then press the return key, you may draw with the flashing line cursor, but you'll notice that the endpoints are uniformly registered ten pixels apart...a terrific help in matching endpoints.

This feature is also useful in manipulating screen resolution. With a constraint of 10, all endpoints are forced to register on the screen at least 10 pixels apart, cutting the 320 X 200 resolution down to 32 X 20. Experiment with this feature and you'll discover how simple it is to create very accurate line drawings, block diagrams, flow charts, bar charts, or any kind of charts.

GROUP 4 - LINE & SNAP ANIMATION

SAVE	SAVED	PATH	PATH	SAVE
LINE	LINE	SAVE	MOVE	PATH
DRAW	RE-DRAW			SEQUENCE

PREREQUISITE: TO USE THIS MODULE, YOU MUST HAVE AN ARRAY CREATED WITH SAVE LINE DRAW IN USER MEMORY; PRESS RETURN KEY TO ESCAPE THIS MODULE AND RETURN TO THE MENU.

NAME OF THE ARRAY TO BE RE-DRAWN?
SCALE WIDTH? (default 1)
SCALE HEIGHT? (default 1)
HORIZONTAL OFFSET? (default 0)
VERTICAL OFFSET? (default 0)
ERASE THE SCREEN? (Y OR N)
DO YOU WANT A DIFFERENT COLORMODE THAN THE ONE STORED?(Y OR N)

o SAVED LINE RE-DRAW

Used in conjunction with SAVE LINE DRAW, this module enables you to create basic real time animation. Because the image created in SAVE LINE DRAW is re-drawn by re-assembling the image line-by-line, the image appears to come to life, recreating the original sequence of drawing steps. Somewhat more sophisticated animation can be created by using SAVED LINE RE-DRAW in conjunction with the ANIMATE module, as follows:

Select an image created in SAVE LINE DRAW, re-draw it on the screen with SAVED LINE RE-DRAW and snap it. Re-draw it again, only this time, change the scale factors. Snap that image (see the GENERAL REFERENCE SECTION for details on naming files in a series). Now, re-draw it, once again using different scale factors and snap that image. Use the ANIMATE module to create the illusion of pulsating motion by flipping through the modified snaps of the same image.

When you choose SAVED LINE RE-DRAW, a series of questions will be asked on the terminal screen, as printed above and commented on below.

NAME OF THE ARRAY TO BE RE-DRAWN?

Just before this question is printed on the terminal screen, you'll notice a message advising that you must have an array created in SAVE LINE DRAW in user memory. SAVED LINE RE-DRAW works only with line drawings whose endpoints have been stored in an array. If you attempt to use this module with any other type of drawing, your attempt will be rejected and you'll be returned to the Paint Program menu. If the drawing array you wish to have re-drawn is stored on disk, you must retrieve it before you

SAVED LINE RE-DRAW - Continued

choose this module; if you don't, you'll get an Error #34 NO SUCH NAME and the system > cursor. Just type in PAINT and press the return key to get back to the Paint Program menu and the DISK UTILITIES module in order to retrieve from disk the drawing array you wish to re-draw.

SCALE WIDTH? (default 1)
SCALE HEIGHT? (default 1)

Whether you're creating modified static images or modifying images for animation, SCALING is a key factor in manipulating images and creating a diversified collection of basic images. See GENERAL REFERENCE SECTION/SCALING for detailed information and instructions on manipulating scale factors to achieve specific results.

HORIZONTAL OFFSET? (default 0)
VERTICAL OFFSET? (default 0)

Changing the offsets allows you to re-position the image on the screen, using the first endpoint drawn in an image as the point of origination (default 0,0) from which offsets are determined. For instance, since your original image has offsets of 0,0, if you wanted the image re-drawn on the screen with the point of origination moved 50 pixels to the right and 10 pixels down, you'd input a horizontal offset of 50 and a vertical offset of -10. To shift left or down, use negative numbers for the horizontal or vertical offsets. To shift to the right or up, use positive numbers.

ERASE THE SCREEN? (Y OR N)

You may choose to either add the image you select to an existing drawing on the screen or clear the screen.

DO YOU WANT A DIFFERENT COLORMODE THAN THE ONE STORED? (Y OR N)

When you saved your image in SAVE LINE DRAW, the colormode used in creating the drawing was saved along with the endpoints composing the drawing. Unless you specify a different colormode, the colormode used in creating your drawing will be used now. If you respond affirmatively to this question, you'll then be asked to input a new colormode. To refresh your memory about the 22 possible colormodes available, refer to the COLOR CONTROL section at the front of this guide.

IMPORTANT

To see your image re-assembled line-by-line, you must look at the TV screen **immediately** upon responding to the colormode question. Particularly for small images, the re-drawing process is so rapid, if you don't look immediately, you'll miss this animation activity.

GROUP 4 - LINE & SNAP ANIMATION

SAVE	SAVED	PATH	PATH	SAVE
LINE	LINE	SAVE	MOVE	PATH
DRAW	RE-DRAW			SEQUENCE

PLOT AND SAVE A PATH OF POINTS IN AN ARRAY

PRESS RETURN KEY TO GO BACK TO MENU

NAME OF THE PATH ARRAY?
IS THIS A NEW PATH ARRAY? (Y OR N)
MAXIMUM NUMBER OF POINTS IN THE PATH?

CURSOR BUTTON OPTIONS:

PATH DRAW
<YELLOW>
<WHITE> <GREEN> BACK TO MENU
<BLUE>
ERASE PATH

CURRENT SETTINGS:

COLORMODE: 00 = COLOR: 0 + MODE: 0
GRID SIZE: 00 RESOLUTION CONTRAINT: 00

TO CHANGE COLOR AND/OR MODE SETTINGS, PRESS JOYSTICK
TRIGGER & "COLOR" CURSOR WILL APPEAR ON TV SCREEN

ARRGRID prints a grid on the TV screen;
CONSTRAN defines drawing constraints on the grid.

PRESS CTRL+Z TO ACCESS ARRGRID AND CONSTRAN
PRESS CTRL+H TO CLEAR THE TV SCREEN
PRESS CTRL+K TO SEE THIS FULL SET OF OPTIONS AGAIN

o PATH SAVE

To develop an animation sequence which moves a snap along a specified path on the TV screen, you must first plot that path and then save it to be used in the PATH.MOVE module where the animation sequence comes to life. PATH SAVE allows you to name, plot, and save that path.

When you select PATH SAVE, you'll be asked a series of questions about the path you wish to work with. You may either create a new path or modify a path previously created. As in SAVE LINE DRAW, the points of your drawing path will be saved in an array structure and you must define a maximum number of points to be contained in that array. Since you cannot re-claim unused storage space in an array, it behooves you to estimate as closely

SAVE PATH - Continued

as possible the number of points required to complete your path. If you run out of room in an array, you'll be given an opportunity to create another array with only minor disruption to your drawing process. See GENERAL REFERENCE SECTION/NAMING FILES for details on naming files in a series. For more details on defining array size, see DEFINING ARRAY SIZE in the SAVE LINE DRAW section.

OPTION/ BUTTON -----	ACTIVITY DESCRIPTION -----
PATH DRAW/ YELLOW	If you press the yellow button as you move the tablet cursor, you'll note that your movement is tracked on the TV screen with little dots (the points of your path). If you move the cursor slowly, the points will be plotted closely together; if you move the cursor quickly, the points will appear further apart.
ERASE PATH/ BLUE	When you press the blue button, the points in the path you've drawn will be erased in reverse order for as long as you continue to press the button.
ACCESS ARRGRID AND CONSTRAIN/ CTRL+Z	To display a grid in the background of your TV screen to guide you in plotting a path, press CTRL+Z and when you get the pound sign #, type in ARRGRID and choose a grid size. To define a drawing constraint on the grid, when a second pound sign # appears on the terminal screen, type in CONSTRAIN=X (X being the constraint you want). See the section discussing DRAWING ON A GRID BACKGROUND in SAVE LINE DRAW for full details on using these features.

GROUP 4 - LINE & SNAP ANIMATION

SAVE	SAVED	PATH	PATH	SAVE
LINE	LINE	SAVE	MOVE	PATH
DRAW	RE-DRAW			SEQUENCE

PREREQUISITE: TO USE THIS MODULE, YOU MUST FIRST HAVE THE FOLLOWING ITEMS IN USER MEMORY: A PATH CREATED IN PATH SAVE, THE SNAPS YOU WISH TO MOVE ALONG THE PATH; IF YOU'RE RUNNING A PATH SEQUENCE PREVIOUSLY CREATED, YOU MUST ALSO HAVE THE PATH SEQUENCE AND SNAP GROUP. USE THE DISK UTILITIES MODULE TO RETRIEVE FILES STORED ON DISK. PRESS RETURN TO GO BACK TO THE MENU.

MOVE A SNAP OR SERIES OF SNAPS ALONG A PATH

NAME OF PATH MOVE ANIMATION SEQUENCE?
 NAME OF PATH?
 NAME OF SNAP GROUP?
 IS THIS A NEW GROUP OF SNAPS? (Y OR N)
 NAME OF PRIMARY SNAP?
 HORIZONTAL SCALE? (default 1)
 VERTICAL SCALE? (default 1)
 HORIZONTAL OFFSET? (default 0)
 VERTICAL OFFSET? (default 0)
 DISPLAYMODE? (default 0)
 ERASE THE SCREEN? (Y OR N)
 DISPLAY SPEED? 1 = 1 STEP AT A TIME
 2 = NORMAL SPEED
 3 = HIGH SPEED

1 STEP AT A TIME:

SNAP NAME: XXXXXXXXXX PATH POSITION: 00 SCREEN POSITION: 00
 PRESS: RETURN=NEXT POSITION C=CHANGE SNAP DISPLAY G=EXIT STEP

o PATH MOVE

Used in conjunction with PATH SAVE, this module allows you to move a snap or series of snaps along the path defined in PATH SAVE. You have the ability to assign a different snap to be displayed at each point of the path or to use a single snap for the entire animation sequence.

Your control over the execution of this type of animation sequence is quite complex and requires that you provide lots of information at the keyboard before you get results on the TV screen. However, by organizing the information in this way, you can save the final result for storage and reproduce the same sequence later. Pay close attention to the PREREQUISITE message printed on the terminal screen when you choose PATH MOVE. You must have all the necessary parts available in user memory. If

PATH MOVE - Continued

you have all the files you need to execute a PATH MOVE, proceed by answering the questions reproduced above and commented on below:

NAME OF PATH MOVE ANIMATION SEQUENCE?

This can be either a new sequence you're creating or a sequence you've created previously and now wish to run or modify. In either case, the named sequence will operate according to the instructions you input at this time.

NAME OF PATH?

This is the name of a path created and saved in PATH SAVE that you now wish to use to guide the movement of a snap or series of snaps on the TV screen.

NAME OF SNAP GROUP? IS THIS A NEW GROUP OF SNAPS? (Y OR N)

This may be a new group or one previously defined and retrieved. It identifies an array which contains all the snaps you wish to use in this particular path animation sequence. Although it is referred to as a group, the group can be as small as a single snap. If this is not a new group, you will not need to identify the primary snap. If it is a new group, you'll get the next question on the screen.

NAME OF PRIMARY SNAP?

This is the snap you intend to use either exclusively or most frequently in the display sequence. If you single-step through a sequence, you'll notice that this snap holds every position until you change the name of the snap displayed at a particular position in a sequence.

HORIZONTAL SCALE? (default 1) VERTICAL SCALE? (default 1) HORIZONTAL OFFSET? (default 0) VERTICAL OFFSET? (default 0)

These options work exactly as they do in the SAVED LINE RE-DRAW module, with additional information available in the GENERAL REFERENCE SECTION under SCALING. For purposes of offsetting, take into account that snaps are displayed so that their center coordinates coincide with the points of the path.

DISPLAYMODE? (default 0)

This option allows you to change the displaymode from the default of 0. See the Glossary and GENERAL REFERENCE SECTION/DISPLAYMODES for details on the 147 different displaymodes available in the system.

ERASE THE SCREEN? (Y OR N)

You may choose to run your pathmove animation sequence either on a clear screen or a background previously created and left on the screen.

**DISPLAY SPEED? 1 = 1 STEP AT A TIME
2 = NORMAL SPEED
3 = HIGH SPEED**

1 STEP AT A TIME:

**SNAP NAME: XXXXXXXX PATH POSITION: 00 SCREEN POSITION: 00
PRESS: RETURN=NEXT POSITION C=CHANGE SNAP DISPLAY G=EXIT STEP**

If you choose 2 or 3 (normal or high speed), the pathmove animation sequence will be displayed on the TV screen using snap/s in an order you've specified previously or, if this is a new sequence, only the primary snap will appear throughout the entire display. High speed runs the sequence about twice as fast as normal.

To change the display of a snap at any path position, you must choose 1 to single-step through the sequence. When you choose 1 STEP AT A TIME, the name of the snap and its corresponding path position will be printed out in chronological order one position at a time on the terminal screen. You may notice that the first position documented on the terminal screen is 12. Positions 0 through 11 are used to provide information about this array structure to the computer.

As you single-step through a sequence, you'll have the opportunity to see each snap displayed in its assigned position and then decide to change the snap assignment by pressing the C key (and RETURN), go to the next position by pressing the RETURN KEY, or if you've finished examining and modifying the sequence, exit single-step mode by pressing the G key (and RETURN). If you choose to change a snap assignment, you'll be asked to name the NEW SNAP FOR THIS POSITION? and then you'll be given the same options for the next snap position. The new snap you've assigned to a position will not be displayed until you run this pathmove animation sequence again.

GROUP 4 - LINE & SNAP ANIMATION

SAVE	SAVED	PATH	PATH	SAVE
LINE	LINE	SAVE	MOVE	PATH
DRAW	RE-DRAW			SEQUENCE

USE PATH SAVE SEQUENCE TO STORE ALL ELEMENTS OF A PATH MOVE ANIMATION SEQUENCE. THIS MODULE CREATES A MACRO THAT WILL ALLOW YOU TO STORE AND EASILY RETRIEVE THESE ELEMENTS. PRESS RETURN TO GO BACK TO MENU.

NAME OF SNAP GROUP?
NAME OF PATH MOVE ANIMATION SEQUENCE?
NAME OF PATH?
WHICH DISK TO STORE YOUR FILES? (4,1,5)

When you choose SAVE PATH SEQUENCE, you'll be asked a series of self-explanatory questions via the terminal screen. After you type in the name of the snap group used in the PATH MOVE animation sequence you're storing, there will be a pause in activity. The computer is in the process of creating and naming a macro to store the information needed to later retrieve this series of files. After a few seconds, new print will appear on the terminal screen, advising you of the name of this macro.

GROUP 5 - UTILITY MODULES

DISK	FILE	COLOR	ERASE
UTILITIES	STATUS	BARs	SCREEN

DISK UTILITIES

- INPUT 0 TO LOOK AT A COMPLETE DISK DIRECTORY (PRESS RETURN TO TO SEE 20 FILES AT A TIME)
- INPUT 1 TO LOOK FOR A PARTICULAR FILE NAME
- INPUT 2 TO SAVE A SCREEN DUMP
- INPUT 3 TO SAVE A SNAP, ARRAY, OR MACRO
- INPUT 4 TO GET A SCREEN DUMP, SNAP, ARRAY, OR MACRO
- INPUT 5 TO GET A SCREEN DUMP, SNAP, ARRAY, OR MACRO BACK-UP
- INPUT 6 TO DELETE A SCREEN DUMP, SNAP, ARRAY, OR MACRO FROM DISK
- INPUT 7 TO DELETE ALL BACK-UP FILES ON A DISK

PRESS RETURN TO GO BACK TO THE MENU

o DISK UTILITIES

This module provides you with the tools you need to do disk housekeeping. DISK UTILITIES allows you to store or retrieve your work from disk and to delete work (or back-up files) you no longer wish to keep. When you save something, its name, file type, and notes associated with it are added to the Disk Directory. This module also allows you to look at an entire Disk Directory or to select a particular entry and look only at that entry's listing in the directory.

OPTION	DISK UTILITIES/ ACTIVITY DESCRIPTION
-----	-----

INPUT 0	TO LOOK AT A COMPLETE DISK DIRECTORY
---------	--------------------------------------

This option allows you to survey a complete listing of all entries made on a particular disk. The informational components of a directory entry listing are organized as listed below:

DISK UTILITIES/DISK DIRECTORY - Continued
ACTIVITY DESCRIPTION

OPTION

- FILE NAME this is the name you associate with the file; it must start with a letter or \$ and may be composed of only letters, numbers (0-9), and \$
- FILE TYPE whether it's a screen dump, array, string, swap, submap, snap, etc. The computer determines this piece of information for you. See the Glossary for definitions of the various file types.
- FILE LENGTH length of the file in bytes; the computer also determines this piece of information for you
- FILE NOTE a descriptive note you input at the time you save a file; it is recommended that you include the date a file is created or revised in this section

When you select this option, new type will appear on the terminal screen, asking you to identify the disk you wish to look at. Choose one of the following (0,1,4,5):

0 = Drive 0, top side 1 = Drive 1, top side
4 = Drive 0, bottom side 5 = Drive 1, bottom side

REMEMBER, the disk in Drive 0 top side (0) is the PAINT PROGRAM; bottom side (4) is the UTILITY DISK. Sides 1 and 5 in Drive 1 are your work storage areas.

When you've identified the disk, the terminal screen will clear and the first page (screenful) of the Disk Directory will be printed on the terminal screen. Press the RETURN key to see subsequent pages through to the end of the listing.

OPTION	DISK UTILITIES/ ACTIVITY DESCRIPTION
-----	-----

INPUT 1	TO LOOK FOR A PARTICULAR DIRECTORY ENTRY
---------	--

By inputting 1 in this module, you can instruct the computer to search for a particular directory entry and then print out its entry information on the terminal screen. This is helpful in determining whether or not you've already used a name; or if you've lost track of a file's disk location, you can speed through your disks until you find the file you're looking for.

After you've input 1, new type will appear on the terminal screen, asking for the entry name. Next, you'll be asked for the disk identification. Choose from 0,1,4,5--per the instructions provided in the previous option section.

Next, the computer will respond on the terminal screen by either printing out the directory entry information or a message indicating that the entry was not found.

In addition to this information, the number of sectors remaining available for storage on the disk will also be printed. Since one sector contains 512 bytes and a full screen dump requires about 20,000 bytes of storage space, approximately 39 sectors are needed to store one full screen dump. By using these numbers and observing what portion of the TV screen is occupied by the file you wish to save, you can determine in advance whether or not enough storage space is available on your current work disk.

As instructed on the screen, press the return key to continue.

OPTION	DISK UTILITIES/ ACTIVITY DESCRIPTION
-----	-----

INPUT 2	TO SAVE A SCREEN DUMP
---------	-----------------------

SCREEN DUMP is the term used for a full-screen picture. This is the option you choose when you wish to store the drawing you currently have on the TV screen. After you've input 2, print will appear on the terminal screen, asking you to provide a name for the screen dump. Be careful to use a new name. If you choose a name that's already been used to store a file on disk, the new screen dump will be associated with that name and the old screen dump will become a back-up file.

Next, you'll be asked for a message to be associated with your screen dump. For quick identification, it's a good idea to give a brief description of the screen content and the date this work was created. For example:

Hll, bestpicture, 3/5/81

Finally, you'll be asked to identify the disk on which you want this screen dump stored. When you have done so, the appropriate disk drive will be activated, and your screen dump will be stored on disk (provided the write-protect label has been removed--see DISK MANAGEMENT in the GENERAL REFERENCE SECTION).

When storage of the screen dump is complete, the terminal screen will clear and the options for this module will re-appear, ready for your next selection.

NOTE: As you approach completely filling a disk, the storage process will take a little longer.

INPUT 3	TO SAVE A SNAP, ARRAY, OR MACRO
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These files are differentiated from screen dumps because the internal commands that perform the storage functions are different. In addition, at the time these files are saved, they are not necessarily displayed on the TV screen; these are files which have been created and named during your current work session and stored in your temporary user memory work space. There are three circumstances under which you would choose this option:

OPTION	DISK UTILITIES/TO SAVE A SNAP, ARRAY, OR MACRO ACTIVITY DESCRIPTION

INPUT 3	<p>-you are in the midst of a long work session and wish to protect yourself by saving work-in-progress</p> <p>-you have completed a work session and wish to preserve some or all of these types of files permanently on disk for future use</p> <p>-you have depleted your user memory storage space (evidenced by having gotten a NOT ENOUGH MEMORY message) and wish to free up this space without having to delete any files ; to do this, transfer files currently stored in user memory to disk and then restart the system to erase all files and clear user memory; don't forget to review files stored on disk at the end of a session and delete those you no longer want or need--see DISK MANAGEMENT section of GENERAL REFERENCE SECTION for details.</p>

Operationally, this option works exactly in the same way that SAVE A SCREEN DUMP works.

INPUT 4	<p>TO GET A SCREEN DUMP, SNAP, ARRAY, OR MACRO</p> <p>This is the option you use in order to retrieve a file of any type stored on disk. After you've input 4, you'll be asked for the name of the file you wish to get. Then, you'll be asked to identify the disk on which it is located.</p> <p>If the file is a snap, array, or macro, the computer will retrieve it from the disk and duplicate it in user memory so that is available for use in conjunction with other modules during the current work session. Names of files retrieved from disk and added to user memory will be added to the appropriate sections in FILE STATUS.</p> <p>If the file is a screen dump, the computer will respond by reproducing the screen dump on the TV screen. WARNING: What this means is that the screen dump image will take priority over any image currently on the TV screen and that image will be completely covered by the screen dump and lost forever. Make sure you're finished with your current drawing before you get a screen dump from disk.</p>
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OPTION	DISK UTILITIES-TO GET A FILE/ ACTIVITY DESCRIPTION
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	<p>When a retrieval is complete, the terminal screen will clear and the options for this module will re-appear.</p> <p>If a file cannot be found as you've identified it, you'll get an error message, along with the Zgrass right arrow cursor (>), which means you'll have to restart the Paint Program by typing in PAINT. This will get you back into the menu where you may proceed to select the DISK UTILITIES module again or choose some other module.</p>
INPUT 5	<p>TO GET A BACK-UP FILE</p> <p>Whenever you retrieve an image or any type of file from disk for modification and then re-save it on that disk, the original, unmodified version of that file automatically becomes a back-up copy of that file named FILENAME.BAK. In the event you discover you're not satisfied with the modified version of your image or file, you can retrieve the original by getting the back-up file off disk with this option.</p>
INPUT 6	<p>TO DELETE A SCREEN DUMP, SNAP, ARRAY, OR MACRO FROM DISK</p> <p>It is good practice to get rid of any files stored on disk that you no longer want or need after each session. This module allows you to do so.</p>
INPUT 7	<p>TO DELETE ALL BACK-UP FILES ON A DISK</p> <p>When you find yourself running short of storage space on a disk, deleting back-up files you no longer need is a quick way of freeing up additional storage space.</p>

DISK	FILE	COLOR	ERASE
UTILITIES	STATUS	BARs	SCREEN

o FILE STATUS

When you select FILE STATUS, a listing of all files currently stored in user memory will be printed out on the terminal screen by category: snaps, arrays, or macros. In addition, you will be given the opportunity to delete any file you no longer need in user memory to free up user memory storage space.

o COLOR BARS

When you select COLOR BARS, the paint box menu will clear from the TV screen; the left half of the screen will be white and the right half will be black. Then, six color bars will appear so that the image appearing on your TV screen is organized as diagrammed below.

W	Y	C	G	M	R	B	B
H	E	Y	R	A	E	L	L
I	L	A	E	G	D	U	A
T	L	N	E	E		E	C
E	O		N	N			K
	W			T			
				A			

These color bars allow you to **standardize** your color palettes by tuning the TV so that these color bars are consistent each time you start the system. This is especially important if you share your system with other users who may make color adjustments to suit their particular needs.

As the new print on your terminal screen indicates, these color bars will remain on the TV screen until you press the return key on the terminal keyboard to return to the menu.

o ERASE SCREEN

To discard a drawing you're unhappy with or to clear the TV canvas after you've saved a completed drawing or snap, choose the ERASE SCREEN module.

