

**T H E  
GIBSON  
LIGHT PEN SYSTEM**

**OWNER'S  
MANUAL**

# TABLE OF CONTENTS

FOREWORD .....	1
INTRODUCTION	
What is a Light Pen Anyway? .....	2
CRT Display Operation .....	3
How Light Pens Work .....	3
Light Pen Applications .....	4
INSTALLATION AND CHECKOUT	
Hardware Installation .....	5
Software Installation .....	9
System Checkout .....	9
Configuring Your Printer Driver .....	11
Notation .....	12
Keyboard Information .....	12
Light Pen Information .....	12
Software Overview .....	14
PENTRAK 2.0 .....	14
Applesoft Applications .....	14
MULTIDRAW .....	14
FILER .....	15
APPLESOFT APPLICATIONS	
Applesoft Overview .....	17
MENU .....	18
SKETCH .....	19
BOXES .....	21
TEXT .....	22
GRID DRAW .....	24
FONT EDITOR .....	25
GEOMED II .....	27
Penpainter Overview .....	29
PATTERN EDITOR .....	30
PENPAINTER .....	36
Animator .....	40
MULTIDRAW	
MULTIDRAW Overview .....	50
MULTIDRAW Modes .....	51
Command Mode .....	51
Zoom mode .....	53
Draw Mode .....	55
Cards Mode .....	57
Frame Mode .....	59
MULTIDRAW Filer .....	62
Printing .....	64



# TABLE OF CONTENTS

PENTRAK 2.0 REFERENCE GUIDE	66
INIT .....	66
SCREEN MODE SELECTION .....	67
CHP/CHS .....	67
DHP/DHS .....	67
NEG .....	68
TRACK .....	68
PEN .....	70
ESCAPE OPTIONS	
KEY .....	70
ZERO VELOCITY .....	71
NO HITS .....	72
TRACKING OPTIONS	
NO CURSOR .....	73
ROUGH TERRAIN .....	73
LINES .....	75
HLO/VLO .....	75
DRAWING OPTIONS	
SKECTH .....	76
RUBLINES .....	76
RUBRECT .....	77
WRITE .....	77
FRAME .....	78
OFFSET .....	81
XLINES .....	81
ZOOM .....	81
CLEANUP .....	82
CLICK .....	82
HMO/VMO .....	82
HTM/VTM .....	83
DOTS .....	84
MAP <sub>n</sub> .....	84
MIXED .....	85
NOMIX .....	85
GF <sub>n</sub> .....	85
FACE <sub>n</sub> .....	86
MIRROR .....	87
HPLOT .....	87
XPLOT .....	87
WHERE .....	88
AMPER .....	88
DOSBUFF <sub>n</sub> .....	89
PENTRAK 2.0 ERROR MESSAGES .....	89

PRINTER ROUTINES .....	APPENDIX A
APPLESOFT PROGRAM COMMAND SUMMARY .....	APPENDIX B
MULTIDRAW COMMAND SUMMARY .....	APPENDIX C
ASCII/KEY CHARACTER CODES .....	APPENDIX D
PROGRAMMING ASSISTANCE .....	APPENDIX E
HARDWARE COMPATIBILITY .....	APPENDIX F
DIFFERENCES PENTRAK 1.1 - PENTRAK 2.0 .....	APPENDIX G

F O R E W O R D

Many years ago the first digital computer was invented. The result was a revolution in the way we think about information and machines. Using these first monstrous machines we learned how to use computers to solve the problems of the government and large corporations. Then, as technology moved forward, the physical size and expense of computer power dropped incredibly. The dawning of the age of the PERSONAL COMPUTER has made this information handling power available to small businesses and the individual!

Just as the first room-filling digital computers revolutionized and streamlined government and big business organization, the PERSONAL COMPUTER promises to revolutionize the way we, as individuals, perform the tasks which make up our day. While small computers have seen application in all forms of financial management and text processing, it is our belief at Gibson Laboratories that GRAPHICS will be one of the next major application areas to be revolutionized by the Personal Computer. It has been said that "a picture is worth ten thousand words." The Personal Computer can be our tool of expression, handling the details of picture design. Soon a complete environment of compatible Personal Computer Graphics applications will exist to aid in the creation of graphic images.

Gibson Laboratories is committed to achieving a leadership position in this new field of Personal Computer Graphics. Our first product, the Gibson Light Pen System for use with Apple or compatible computers may be the most significant product ever designed for this marketplace ... but this is just the start. As you shall see, a properly designed light pen system with software support is the superior tool for graphic system interaction.

We believe the Gibson Light Pen System provides more value for the dollar than any previous Apple peripheral. We're sure you will agree.

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To our new customers, please be sure to return the enclosed Owner's Registration Card. In this way we can keep you informed of future software products which will be used with the Gibson Light Pen System.  
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## Introduction

### What is a Light Pen Anyway?

Seen for the first time, a true operating light pen system appears to command the powers of magic. With a light pen you can actually write on the display screen of a computer using something that looks like an ordinary pen !! If you don't like what you've drawn, you can use the pen to erase all or part of the drawing. If you would like to finish it later, you can have the computer store it on a disk. You can draw the notes of a short musical composition, and have the computer immediately play the composition for you. You can draw a picture freehand, or draw very structured diagrams like those used in mechanical engineering or electronics, and have the computer straighten all of your lines and make your hand-drawn circles perfect. You can even select a symbol to be used from a 'menu' of available symbols. You can use your pen to select from options presented to you in a list, or use the pen to point at text that you wish edited. The power of the light pen is almost magical indeed.

The Gibson Light Pen System makes all this possible with nothing more than a standard Apple Computer or any Apple compatible computer with 64k bytes of memory, Applesoft, Disk II with DOS 3.3 and your imagination.

The Gibson Light Pen System is called a light pen SYSTEM because a useful light pen requires powerful supporting software to be fully useful and easily adapted to the individual needs of the user. This software is provided in the form of the powerful PENTRAK Driver. Included on the DOS 3.3 diskette, the PENTRAK Driver is a machine language program which is loaded into memory automatically along with the Disk Operating System. PENTRAK uses Applesoft's ampersand hook (&) to add a variety of Light Pen System commands to the Applesoft language. These short, powerful, easy to remember commands, reduce the task of generating effective, interactive graphics applications to simple Applesoft programming.

This section of the manual is intended as an introduction to light pen usage and application. In the remainder of this introduction we will examine light pens more closely. If you are not interested in the technical aspects of the light pen, then you should skip right to Section 2, (Installation and Checkout).

## CRT Display (TV Tube) Operation

Understanding how a CRT displays information is the key to understanding the operation of the light pen.

A CRT display (TV Screen) which appears to us as a sheet of information, is actually formed by a single, rapidly-moving dot of light. It constantly sweeps over the entire screen, turning on and off as it moves. This constant sweeping motion is called Video Refresh, and the on/off pattern determines what image is seen by the viewer. The rapidly-moving dot of light always starts at the upper left hand corner of the screen and moves in a straight horizontal line to the right. When it gets to the right-hand side of the screen, it starts again on the left-hand side, but this time a little lower down. This pattern is repeated until the dot reaches the bottom of the screen, having traced out a RASTER of successive horizontal lines. This sequence of actions is known as a Raster Scan. The computer which is driving the CRT display controls the on/off switching of the dot. This dot intensity information is called the VIDEO signal. In order for this information to be seen clearly, the CRT's dot's position must be synchronized with the on/off video data coming from the computer. The computer tells the CRT when to start at the top of the screen with a signal called VERTICAL SYNC, and also when to start each horizontal line with a signal called HORIZONTAL SYNC. The three signals generated by the computer, Video Data, Vertical Sync, and Horizontal Sync are all combined into one signal called COMPOSITE VIDEO. This Composite Video is available from the connector at the rear of the Apple Computer and may be connected to any CRT monitor equipped to accept a standard Composite Video signal.

## How Light Pens Work

Knowing how a CRT displays information we can readily comprehend the operation of the light pen.

As the name implies, the light pen has the shape of a pen or pencil, and responds to light. It functions by detecting and precisely timing the passage of the CRT's dot of light. The light pen monitors the Horizontal Sync signal generated by the computer to determine when each horizontal line is started. The time from the last Horizontal Sync signal to the instant the dot passes the pen's point determines the pen's horizontal position on the screen, and the number of Horizontal Sync pulses received since the last Vertical Sync signal determines which line the pen is on.

Since all standard CRT displays are 'refreshed' sixty times each second, a light pen system is able to determine the pen's location sixty times each second. This frequent position readout allows for tremendous freedom in the range of applications suited to light pen solution.



## Light Pen Applications

A light pen is a device which allows a unique form of graphic interaction with a digital computer. It stands alone among graphic input devices. It is extremely small, portable, accurate, inherently interactive, highly reliable, easy to use, AND inexpensive. No other device available today offers this combination of benefits.

Light pens have been used effectively for years with big, expensive computer systems. They can be used anywhere a human operator needs to respond to, or direct, the operation of a computer system. Because of their obvious graphical uses, we find light pens in most Computer Aided Design and Computer Aided Manufacturing systems. Integrated Circuit Design, Printed Circuit Design, Process Control and Monitoring and all forms of graphical computer interaction are greatly enhanced through the use of a light pen ... but so would be the composition of a musical score, or the selection of the correct answer from a menu of choices. Even text processing and typesetting systems can use a light pen as an interactive editing device. Educational applications with young children abound, as do the uses of the light pen in simple interactive non-keyboard applications. A business application package, for example, might ask the operator to select his options or functions with a light pen. This can greatly shorten the learning cycle time for any computer system. Being a very general purpose graphical interaction tool, a light pen's applications are limited only by the imagination of the user.

## INSTALLATION AND CHECKOUT

### Installation.

The Gibson Light Pen System will work with any Apple II, II+, Apple //e, Apple ///, Franklin, Basis 108, and Bell & Howell computers. The installation instructions are similar for most except for the Apple ///. Below are the simple STEPs to install the Gibson Light Pen System in any of the above computers. (Apple /// owners please follow all the AP/// STEPs also.)

STEP 1. TURN OFF the power of the computer, monitor, and anything else connected to your computer. We recommend that you remove the power cord. This will insure that the machine will not go on accidentally.

STEP 2. If you plan on installing the Gibson Light Pen System in a slot other than seven, you have a rev A motherboard in your Apple //e, or you are installing the module into an Apple ///, you MUST complete this STEP. If not, go to STEP 3. (You can tell if your machine is a rev A by looking at the plate at the top of the motherboard. The top of the plate says "APPLE COMPUTER INC.". Beneath the plate there should be a number followed by a letter signifying the revision of your Apple//e). The LPSII requires a signal which Apple Computer puts in slot seven, but the signal is not present at slot 7 in the rev A motherboard. This STEP will allow the LPSII to acquire that signal in another location on the motherboard.

- A. Remove the green jumper wire from it's bag.
- B. Insert the black female end of the wire into the pin protruding from the Light Pen circuit board.

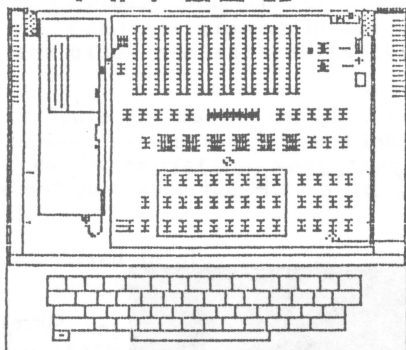
---

AP/// Apple /// owners must now cut the trace that is located on the LPSII module. To do this, please follow this next STEP exactly. With the LPSII lying on its back with the label up and the pin on the underside, examine the bottom of the LPSII module. You will notice a copyright notice that reads: COPYRIGHT c 1982 GIBSON LABORATORIES IRVINE CA. Notice below the 'CA' there are two small solder pads. Between the two pads is a very small trace. THIS TRACE MUST NOW BE CUT. We suggest a very sharp exacto knife to make the cut. Now cut the trace by placing the edge of the knife between the two pads, and pulling back while applying pressure to the edge of the knife. We suggest you cut the trace at both points where it touches the solder pads. Use the enclosed diagram to find the trace.

---

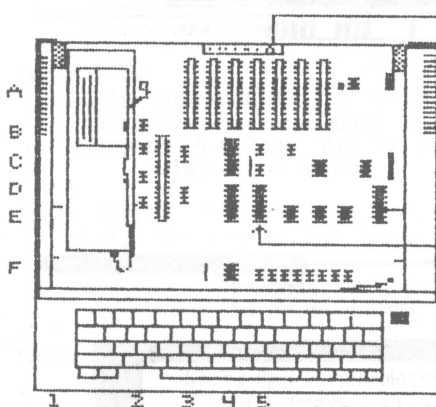


# APPLE II



THIS IS 'CB'  
74LS51

# APPLE //e

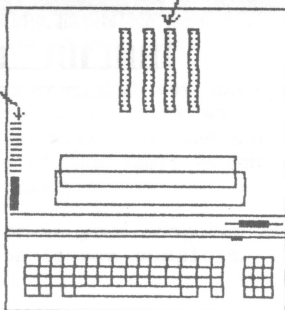


ID TAG

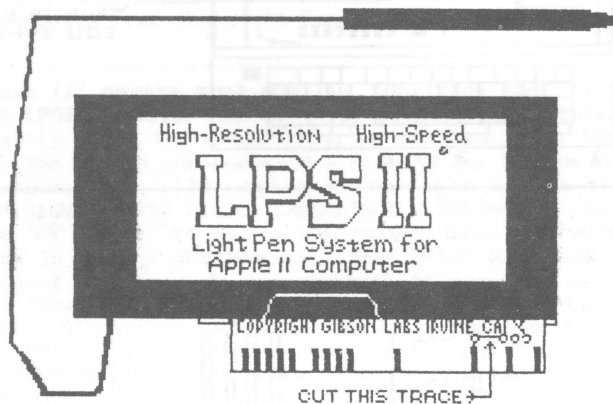
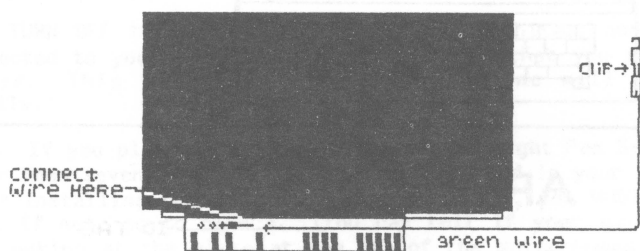
THIS IS 'ES'  
IOU 844-0020-A

SLOTS

CLIP WIRE  
TO  
PIN 1  
OF  
J20



### BACK SIDE LPS II





STEP 3. Now, carefully plug the LPSII module into the chosen slot. Make sure the module is plugged in the slot tightly. Also, check to make sure the black pen wire exits the circuit card toward the keyboard.

AP/// NOTE. Apple /// owners can plug the pen in any slot. Remember, since the Gibson Light Pen System only works in emulation mode there is no need to reconfigure your software.

If you are installed in slot seven and did not connect the wire to the pin on the module, go to STEP 5.

STEP 4. Now, any installations that required STEP 2 will also require this STEP (Be sure to notice the differences in the installation for your own computer.)

Apple II, II+, Franklin, and Bell & Howell computers:

Clip the end of the wire to pin 8 of the chip at location C-13. The chip here is an LS51. Pin 8 has the video sync signal.

Apple //e:

Clip the end of the wire to pin 39 of the chip at location E-5. The chip at E-5 is a 40 pin chip, with number 344-0020A. Pin 39 is the second from the bottom on the left-hand side.

Apple ///:

Clip the end of the wire to pin 1 of the auxiliary connector. The auxiliary connector is on the left side of the motherboard, and is at location H-1, which is just above the power supply connector.

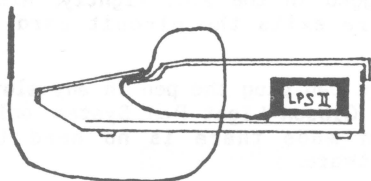
BASIS 108

Clip the end of the wire to pin 8 of the LS51 at location H-16. Pin 8 of this chip has the video sync signal.

STEP 5. Now run the black wire that leads to the pen out the front of the computer. Put the cover on the computer making sure that the shrink wrap protector over the wire is sitting on the edge of the cover. The shrink wrap was put here to absorb some of the shock the wire takes as the cover is opened and shut.

NOTE: Some of the earlier pens did not have the shrink wrap. If your pen did not come with the shrink wrap installed on the wire, you can put electrical tape on the section of the cable which will be in contact with the Apple's cover.

STEP 6 Now close the cover to your computer and plug the unit back in. The physical installation is now complete.



## SOFTWARE SETUP

The first and most important step is to make a copy of the distribution diskette using any one of the many copy programs available. If you do not know how to copy diskettes turn to page 38 of your DOS manual and follow the directions to use the COPYA program on the System Master diskette. Make sure you make at least one copy of the software.

**NOTE:** Our software is totally copyable and does not employ any NON-DOS 3.3 protection on the disk. Feel free to copy it as many times as you like.

After you have copied the distribution diskette put it away in a safe place and work with the copies from now on. The diskette sent to you is very nearly full, so it would also be advisable at this time to initialize several diskettes to be utilized as picture file diskettes. (Follow the procedure in the DOS manual on page 24 on initializing diskettes.)

**NOTE:** You cannot initialize a diskette after you have booted our software. The reason for this is we change the DOS somewhat after we quick charge. Therefore, when initializing, use the System Master.

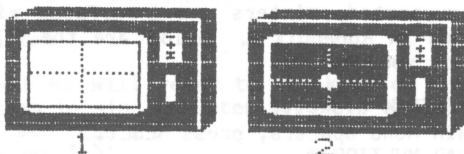
Now we will try two experimental programs. These programs will verify that the system is functional. So let's boot the disk and check for the MENU program. If the MENU program does not come up, try repeating the installation steps. When the MENU does come up, press the RESET key.

### PROGRAM 1

```
NEW
10  & INIT,CHP,DHP,NEG
15  X=140 : Y=92
20  & TRACK(X,Y,KEY,LINES)
30  & TP : PRINT "EVERYTHING OK"
```

### PROGRAM 2

```
NEW
10  & INIT,DHP,CHP
15  X=140 : Y=92
20  & TRACK(X,Y,KEY,LINES)
30  & TP : PRINT "EVERYTHING OK"
```



The syntax and commands of PENTRAK will be discussed at length in the chapter PENTRAK 2.0 REFERENCE GUIDE. In this section, we simply want to verify that the basic light pen functions are working, and that the Pen has been installed properly. Type in and RUN program 1. You will notice that the screen changes to the Hi-Res screen, it is all white (green or amber on green and amber monitors), and there are flashing dotted lines in the center of the screen. Point your pen to these lines and move your pen around. If the lines move, you are all set to run program 2. If the lines do not follow the pen point, turn the intensity up on your monitor. You can experiment with the color level, brightness, and contrast. Experiment with each of these controls until the lines follow the pen point, and the monitor is not too bright to watch. When you are satisfied with how the lines follow, go on to program 2.

Now type in and run program 2. The screen should turn black, a "tracking cursor" can be seen in the center with flashing lines as before. Pointing the Pen to the square should result in the tracking cursor locking onto the Pen's location and tracking its position around the screen. If the lines are flashing and the cursor is tracking the Pen's location, the Pen has been installed correctly, is calibrated, and is working properly. The intensity of the computer's monitor may need adjustment for reliable tracking. If the lines do not flash or the cursor will not track the Light Pen's point, backup and recheck everything you have done so far.

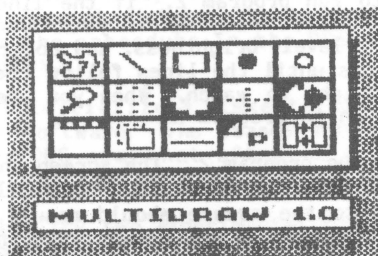
If the cursor does respond to the Pen's presence, but jumps violently to one side, it needs calibration. Refer to the MENU program in the following section. The calibration process is now part of the MENU system. Now that you are convinced the pen and software are functional and you have copies of the distribution diskette and extra diskettes to hold pictures on, we are ready for the final STEP in configuring the software for your system.

## Configuring your printer driver

Since there are many different printers and interfaces available on the market, we thought it would be easier for the user to configure the software himself. We have supplied the protocol for most of the popular printers and interfaces.

A list of supported printers and interfaces with the proper protocol can be found in Appendix A. Below are the STEPS to follow to modify the code for your system.

- STEP 1. Boot your PENTRAK diskette.
- STEP 2. When the Main Menu appears, press RESET.
- STEP 3. Now type LOAD MULTIDRAW.
- STEP 4. When the cursor returns type "LIST 100,900".
- STEP 5. You will notice there is not much on those lines except a ":", and a message saying "PRINTER NOT CONFIGURED".
- STEP 6. Look at APPENDIX A and find your interface. If it is not present, you may insert your own routine. There is not much room in the memory so be brief when typing in your routine.
- STEP 7. Now type the line or lines that correspond to your system configuration. After typing the lines of code, please be sure to delete the line with the error message. LINE 103: TYPE 103 then hit 'RETURN'.
- STEP 8. After you have typed in the lines for your system, type SAVE MULTIDRAW, press return and type LOCK MULTIDRAW.
- STEP 9. Now type "RUN".



The MULTIDRAW program will now load its files and run. Once the program is up and running, draw something on the screen and point your pen to the printing symbol. Your printer should now print what is on your Hi-Res Screen. If the printing is correct, press RESET again, reboot with your System Master and copy the MULTIDRAW file onto all your other copies. If your printer is not working properly try again.

When your software is set up for your printer, you have completed all the necessary STEPs to use the system. You are now ready to run your Gibson Light Pen System. Have fun!!!

(You can now use your FID program to copy the file onto all your other diskettes. The FID program is explained in detail in the DOS manual on page 183 APPENDIX J.)

## NOTATION

The following are a few notes that we hope will help you understand the system. If you take note of these very important points before you read the rest of the manual it will be a lot easier for you to learn how to use the system.

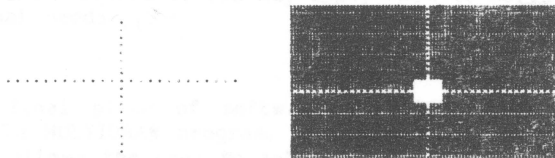
## Keyboard information

1. In this manual we will refer to the keys on the keyboard by enclosing them in single quotes (').
2. ESCAPE key === 'ESC'.
3. Right arrow === '->'
4. Left arrow === '<-'
5. CONTROL key === 'CTRL'

On most user interaction with the keyboard, it is not necessary to press the 'RETURN' key. Only when you are entering filenames do you need to press the 'RETURN' key. The exceptions to this rule are in the BOXES and TEXT programs. These will be explained in their respective sections.

## Light pen information

1. The word "lines" refers to the flashing dotted lines that follow the pen's point around the screen.
2. The word "cursor" refers to the white box that often follows the pen's point.



3. The word "point" means to quickly point your pen at the screen. You will be pointing the pen to make menu selections. The pen will pick up the light within a fraction of a second. Since the computer is looking for the pen elsewhere, keeping your pen pointed to the selection spot will result in a PENTRAK sound.
4. The word "track" means pointing your pen to the screen and moving it around. Tracking the cursor or lines around the screen means that they follow the pen's point.

5. The word "stretch" means to track your pen around the screen while a PENTRAK generated line or rectangle follows the pen's point around.
6. The word "pixel" refers to an individual dot on the screen. One bit of information.
7. There are many different sounds available from PENTRAK. You will find that a small click is a friendly sound, and means that the program liked what you did and is now responding. Other sounds, like the one you will hear when you press a key other than 'C' in the MENU program, are complaining sounds. These sounds mean that the program did not understand what you did.

Try to remember how these words are used in the manual and in the software. This will help you understand the manual and communicate with the software much more efficiently.





## SOFTWARE OVERVIEW

There are three major software components which make up the Gibson Light Pen System. These components are the PENTRAK 2.0 driver, the Applesoft application programs, and the MULTIDRAW package. Each piece of software has a specific function in the system. These software components are included on the DOS 3.3 distribution diskette supplied with the system.

### PENTRAK 2.0

The PENTRAK 2.0 driver is the most important part of the Light Pen System. The PENTRAK driver takes commands that are understandable to us and translates these high level commands to low level machine code necessary to the operation of the Light Pen. PENTRAK drives the Light Pen electronics. This means that the programmer does not need to worry about the intricacies of the Light Pen operation. In addition to simply controlling the pen, the PENTRAK driver has many sophisticated features which significantly ease serious Applesoft graphics programming. The PENTRAK driver is fully programmable, has easy to learn syntax, and its own error messages which aid the debugging of software. A complete guide to programming the PENTRAK driver is located in section 4:

PENTRAK 2.0 REFERENCE GUIDE.

### APPLESOFT APPLICATIONS

Included on the distribution diskette is an assortment of Applesoft application software. These programs demonstrate the various operating modes of the Light Pen System. They are all written in Applesoft and may be listed and modified at any time. Most of the routines are very simple and can be incorporated into your own software. We highly recommend that you understand the various functions of the routines so you may apply them to software that fits your individual needs.

### MULTIDRAW

The final piece of software included on the distribution diskette is the MULTIDRAW program. MULTIDRAW is a complete drawing system which allows the user to set up symbols and images he uses in many drawings and store these symbols away in what we call 'CARDS'. These symbols may then be used to make many other drawings which include the same symbols. MULTIDRAW also has a very powerful zoom feature which allows the user to specify their pictures down to one individual pixel. We feel you will find MULTIDRAW an invaluable tool.

## FILER

One additional item to discuss before we get into the system is the FILER. The FILER is a concept which allows easy access to the disk and supplies a common area for common routines. The FILER will allow you to save pictures, load pictures, erase the screen, negate the screen, get help, and change your disk configuration. There are three different filers in the Gibson Light Pen System. Each one demonstrates a different way to access files, and each one has its own unique form. For example, one of the FILERS is located in the MULTIDRAW program. This FILER is a window on the Hi-Res page which appears and allows you to choose the option by pointing your pen to the different symbols in the window. Another FILER is located in the Applesoft application programs. This FILER uses the text page. It has little boxes to the left of each function. Point to the box and the function will be initiated. The third FILER is the INFO-FLOW diagram. This FILER shows a graphic representation of information flow. With this FILER all you have to do is point your pen to the arrow representing the direction you want the information to go. For example, pointing to the arrow from the disk to the picture will allow the user to load a picture from the disk into the picture memory. In this section we will only discuss the text page FILER found in the Applesoft programs. The other FILERS will be explained in their respective sections.

The text page FILER is a quick menu-based FILER which allows the user to select options by pointing to the white box to the left of that option. The options available are: cataloging the data disk, loading a picture, saving a picture, erasing a picture, getting help, negating the screen, returning to the main menu, changing your disk configuration, and returning to the program you are working with at that time. You choose a function by pointing your pen to the box to the left of the function. When the FILER sees the pen is pointed to one of its functions, it will then execute that function. If the function will make a drastic change, (like erasing the picture or returning to the menu), the FILER will show you choice boxes on the bottom of the screen. To accept the option, point to the box containing the option name. To abort the operation, point to the abort box. Pretty simple!!!

When you point to the boxes to load and save a file, the FILER will wait until you enter a filename, then press 'RETURN'. If you press return without entering a filename, you will be returned to the picture on the Hi-Res page and allowed to continue your drawing. You can change the configuration of your system by pointing to the configuration box. You may then tell the FILER which slot and drive your data will be using as a storage device. You can get to the help page by pointing to the help box, negate the screen by pointing to the negate box. All the functions are easy to use and simple to understand.

NOTE: When pointing to the boxes it is not necessary to hold you pen up to the box. Just point the pen until you hear a click. When you here the click you will know that the FILER has understood your command and is now processing it. If you hear a complaining noise you will know that the FILER did not understand your command. This usually means that you pointed your pen to an area the FILER does not understand. If this happens, the FILER will ask you to point to the boxes. Don't be alarmed by these sounds and noises. They are just the way the programs communicate with you.

After a little practice, you will find that the FILER is a quick and easy way to access these common functions. The code for FILER is located in most of the Applesoft programs and may be listed. The FILER starts with a line that says "TEXT:HOME:PRINT "G I B S O N L A B O R A T O R I E S". The remaining lines in that program relate to the FILER. You can use the FILER in any of your own programs because the FILER is a stand alone module with only a few line numbers that must be changed.

#### The filer menu

G I B S O N L A B O R A T O R I E S

PROGRAM SLOT --> 6      DATA SLOT -->6  
DRIVE --> 1              DRIVE -->2

■ LOAD PICTURE	■ SAVE PICTURE
■ CATALOG	■ RETURN TO MENU
■ NEGATE	■ ERASE PICTURE
■ HELP	■ RETURN TO PROGRAM
■ CHANGE SYSTEM CONFIGURATION	

ABORT

MENU

USE PEN TO SELECT

## APPLESOFT APPLICATION PROGRAMS

There are a variety of Applesoft Application programs included on the distribution diskette. Each one demonstrates a different feature of the PENTRAK driver. For example, the SKETCH program will allow the user to do freehand drawing, while the GEOMED II program will allow the user to plot a point and then stretch lines, rectangles, triangles, and parallelograms. With the GRID DRAW program you can draw graphs on the screen with the program finding all the grid points for you. Using the TEXT program you can type Hi-Res characters on your screen. You may also caption your drawings in any of the character sets from the DOS TOOLKIT. With the FONT EDITOR you can create and edit your own type fonts, and use them with the TEXT or BOXES program. The PENPAINTER and PATTERN EDITOR programs allow you to create beautiful full color patterns which are used for painting and filling in your drawings. The ANIMATOR program allows you to create 20 frames of an animation sequence then "play" them in rapid succession to create smooth flowing motion.

All of these programs are open for modification and can be copied and listed freely. If you are going to program the Pen with the PENTRAK driver you might want to list some of these application programs and see what makes them tick. Since there is not much room left on the distribution diskette, it would be advisable to copy the program you are going to modify onto a separate diskette and work from that copy.

G I B S O N      L A B O R A T O R I E S  
 MAIN            MENU

■ MULTIDRAW	■ GEOMED II
■ SKETCH	■ GRID DRAW
■ BOXES	■ PENPAINTER
■ CIRCLES	■ PATTERN EDITOR
■ PARALLELOGRAMS	■ ANIMATOR
■ TEXT	■ RETURN TO BASIC

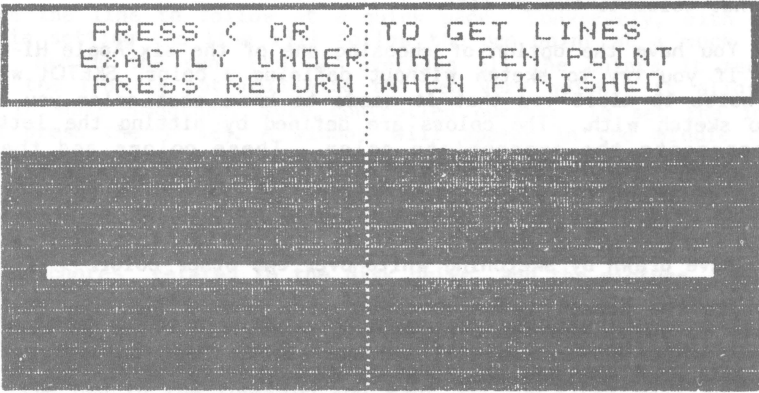
USE PEN TO SELECT

ABORT

MULTIDRAW

## MENU

The MENU program is the first program you encounter when you boot up the diskette. Using the MENU program you can select a program by pointing your pen to the white box next to the program name. The first step when you get the MENU program up is to press the letter 'C' on your keyboard. This will enable you to calibrate your PENTRAK software. Upon pressing 'C' the MENU disappears and a small line appears in the middle of the screen. As you move your pen in front of the line you should see crosshairs following the tip of your pen. If the crosshairs are present, but are not following the pen's point, raise the intensity of your monitor. Increasing the contrast is the best way to adjust for this. If adjusting the contrast on your monitor is not successful, try altering the brightness level, and if you have a color set you can adjust the color level. Once the crosshairs are moving back and forth on the screen you can adjust the calibration of PENTRAK. To do this, hold your pen up to the line and press either '(' or ')' to line the crosshairs up with the pen point. Hitting these keys, the crosshairs will jump in the direction the parenthesis is pointing. Press either key until the crosshairs are directly under the pen point and then press the 'RETURN' key. Upon pressing the 'RETURN' key the menu will reappear. Your pen is now calibrated.



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PRESS ( OR ) TO GET LINES
EXACTLY UNDER THE PEN POINT
PRESS RETURN WHEN FINISHED

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From the MENU, point the pen to the box to the left of the program you would like to run. When the "INSERT PENTRAK DISKETTE" message comes up, pull your pen away from the screen. At this point the MENU program will display two boxes. One box will contain the name of the program you selected, and the other will have the word ABORT. Pointing to the ABORT box enables you to select another program. Pointing your pen to the box with the name will result in the MENU program loading your selected program from the disk and subsequently executing it.

## SKETCH

The SKETCH program will permit you to draw freehand sketches on the screen. These sketches may be drawn in any of the Apple's Hi-Res colors. An exciting feature of the SKETCH program is the mirror option. This option allows the user to define mirroring sections on the screen, meaning that any drawing, in any color, drawn on one section of the mirror, will automatically appear in the same color on the other side of the mirror. Another option of the SKETCH program is the inertia option. This option allows the user to tell the program how closely he/she wants the sketch to follow the pen point. This feature is useful when drawing a smoother curve or increasing the sensitivity while sketching. By using a combination of these functions you can create some very impressive drawings.

To use the SKETCH program, point your pen to the box to the left of the word SKETCH in the MENU. When the SKETCH box appears at the bottom of the screen, point your pen to the box and the program will be executed. Contained on the screen you will find all the instructions you need to use the SKETCH program. The other programs, with the exception of MULTIDRAW, also have this first page help screen. The help page contains a box that says, "POINT PEN HERE TO CONTINUE". After pointing the pen to the box, the program will display the Hi-Res screen. Once the graphic screen is displayed you may tell SKETCH what color to sketch with.

You have the option of choosing one of the six Apple Hi-Res colors. If you try to sketch without defining a color, SKETCH will make a noise to alert you that it needs to know what color you are going to sketch with. The colors are defined by hitting the letter that represents the appropriate color. These colors and their respective keys are displayed on the help page of each program. For example, pressing 'W' will allow you to sketch in white, while pressing 'G' will allow you to sketch in green. If you happen to make a mistake you can sketch over the mistake with white. This will erase what you have drawn by sketching white over the other color. If you negate the screen you must use black to erase the other color lines. Also, while the screen is negated you will have a tracking cursor available to guide the pen over dark screen areas. If you sketch white on a white screen you will see no results. Same holds true if you should sketch with black on a black screen.

Once you have defined the color, you are ready to start sketching. If you press the '1' or '<-' key you will see a line following your pen in the color you specified. This is called "Putting the pen down". Should you want to move the pen without sketching press the '2' or '->' key. When you press either of these keys you are "Picking the pen up". This will allow you to move the pen without drawing. Although the pen is no longer drawing, the program continues to know where the pen is pointed. You can now "Put the pen down" and SKETCH will resume drawing from the point at which you pressed the '1' or '<-' key.



The mirror option has the advantage of being both fun to use and serves as a means of constructing symmetrical drawings. The mirror may be horizontal, vertical, or both. With a horizontal mirror, what you draw on the top of the screen will appear at the bottom of the screen. With a vertical mirror, anything you draw on the right or left will appear on the opposite side of the screen. When both mirrors are active, whatever you draw will be dynamically drawn on all axis' of the mirror. (In other words, anything you draw in one corner will appear in the other three corners.) The mirror option is activated by pressing the 'M' key. Choosing the 'M' key brings up a window on the Hi-Res screen which displays three different mirror options. Select the option you want by pointing your pen to the desired mirror. Once the mirror is set, SKETCH asks where you want the mirror to be located. To place the mirror on the screen, move your pen until the crosshairs indicate where you want the mirror to be. Press ANY key to set the mirror. To cancel the mirror option press the 'M' key again and point your pen somewhere other than the mirror symbols. Pointing somewhere other than the symbols will cancel the mirror.

The final option available in the SKETCH program is the inertia level. This is a value between 0 and 5 and represents the amount of realtime averaging that PENTRAK performs while evaluating the pen's location. An inertia level with a low setting such as zero causes the line to follow at a quick pace. Conversely, with a high inertia setting the line will follow the pen point at a much slower rate. Behind the pen, PENTRAK averages all the points it receives. Since the line is not following the pen very quickly it allows the user to make smoother, more controlled curves. To set the inertia level press the 'I' key. A window will appear in the middle of the screen asking you to set the inertia level. Type in a number from 0 to 5 and explore the results.

Most of the Applesoft programs have what is called the FILER. This is a routine incorporated into each of the programs, and handles all the chores related to the disk drive and the picture. With the FILER you can erase, save and load pictures, set the data slot and drive, negate the picture, get help, and return to the MENU. To access the FILER press the 'ESC' key. This will immediately display a MENU of options that are now available to you. As with the MENU, point the pen to the function you want and the FILER will set it up. For the user's protection on anything of importance, the FILER will inquire if you are sure you want to go through with the operation. For example, if you tell the FILER you want to erase the picture or return to the MENU, the FILER will present choice boxes at the bottom of the screen. The box on the left will be the ABORT box and the box on the right will say ERASE or MENU. In the event you point to 'LOAD' or 'SAVE' from the disk and you later decide not to follow through with the operation, just hit 'RETURN'.

## BOXES

BOXES can be utilized for the construction of 3-D-like boxes, which may be positioned anywhere on the Hi-Res screen. The boxes consist of a user-defined rectangle with a bottom and side added to give it a 3-D appearance. Additionally, once you define the box you can then label the boxes with self centering text. The text may be the standard Apple text, text you create with the FONT EDITOR, or any of the character sets located in the DOS toolkit.

To execute the BOXES program from the MENU, use your pen to point to the white box to the left of the word 'BOXES'. Again, you will be presented with the choice boxes at the bottom of the screen. Point to the box that reads 'BOXES'. The disk will spin for a moment and the 'BOXES' program will be run. When the BOXES program is executed, a help page will appear. Read the instructions on the page, then point your pen to the white bar at the bottom. The Hi-Res display will be shown. Track your pen around the screen to the point where you want one corner of the box. When you arrive at your desired point, press the '->' key. The program will set this point as point one of an imaginary rectangle. This will be the first corner of the box. Now stretch the rectangle around the screen to the point where the opposite corner of the box will be. Now press the '->' key again. Once the '->' key has been pressed a second time, the program will generate a 3-D box. You can generate as many boxes as you like. This program will not allow a substitute key for the '->' (right-arrow) key. This is because we need the other keys to type text.

Once you have a box on the screen you may then type Hi-Res characters inside the box. Each line of text will be centered using the two sides of the MOST RECENTLY DRAWN box as its margins. To correct a mistake press the '<-' key. Pressing this key deletes the character last typed, and resets the cursor in that position. The program will allow you to erase all the characters if you decide you do not want the lettering after all. To reset the margins for typing into another box, simply draw another box. If you want to type without the boxes, use the TEXT program supplied on the distribution diskette. You may use the fonts located in the DOS toolkit by first loading these fonts into the system. The fonts are loaded into the system through the TEXT or FONT EDITOR programs. The instructions for loading the fonts are in the TEXT section of this manual. However, once the fonts are loaded they can be used in any program, whether it be BOXES, TEXT, or any of your own programs.

While in the BOXES program you can access the FILER by pressing the <ESC> key. (There is no need to specify color before setting the corners of the boxes, as there is no color support in the BOXES program.)

## TEXT

The TEXT program is a Hi-Res text writing program. You may use TEXT to type letters on the Hi-Res screen. These letters are either the standard Apple character set or any of the character sets located on the DOS toolkit disk. The TEXT program will allow you to set a left and right margin. When your text hits the right margin, or right edge of the screen, it will wrap around and the next letter will appear at your left margin. The letters are "XORed" onto the screen, which means, if any of the pixels where the letter is to be placed are black, the letter will cover that pixel with a white pixel; if any of the pixels to be covered up are white, the letter will cover that pixel with black.

The TEXT program also has an option for loading and setting up a character set file to work with the PENTRAK driver. The loading is accomplished by pressing the 'CTRL-F' key. At which point, the program will display the text screen and allow you to enter the name of the character set and which drive it is on, or allow you to catalog the disk. To see the catalog, point your pen to the word "CATALOG" on the top of the screen. Up to four alternate typefaces may be loaded into the system. To change between sets press the CTRL-S key. This will display a selection window. You must use your pen to select the typefaces. The numbers that appear represent the order in which the faces were loaded. The zero set is the default ASCII set. More information regarding the setup of alternate character sets is located in the PENTRAK 2.0 REFERENCE GUIDE.

To use the TEXT program, use your pen to point to the white box to the left of the TEXT box. Choice boxes will be presented on the bottom of the screen. Point to the box which contains the word TEXT. When the TEXT program is executed, the first thing you will see is, once again, the help page. The help page will give you all the necessary instructions to use the program. After reading the help page, point your pen to the white line at the bottom of the screen. The Hi-Res page will appear enabling you to set margins if you desire. To set the left margin, point your pen to the position on the screen where you want the margin, then press the 'L' key. To set the right margin, point the pen to indicate where you want the right margin, then press the 'R' key. You may reset either margin by pressing the appropriate key ('L' or 'R') while in the track mode. You cannot reset the margins while in the typing mode. (Typing mode is active when you press the space bar ...tracking mode is active when you press the return key.) Now that your margins are set, press the 'space' bar to start typing. A message will appear telling you that you are in typing mode. As the words reach the right margin they will wrap around to the left margin. The next character typed will appear at the left margin and then scroll right. Should you want to reset the margin press the 'RETURN' key. This will release the margin and allow you to track around the screen, in order to set new margins, return to the MENU, or get help by pressing '?'.

Pressing the '<-' key while entering text will erase the last character typed. Pressing the '<-' again will delete the character positioned to the left of the last character, and so on. After you delete a character, the next character typed will appear where the deleted character was. Once you press the 'RETURN' key TEXT forgets all the characters that were typed in. This means you may not use the '<-' (left arrow) to delete characters that were typed before the 'RETURN' key was pressed.

You may erase any random character by pressing 'CTRL-A'. This will display the instructions for erasing characters. Any character on the screen can be erased using this mode. To erase the character, point your pen at the character to erase then press the 'SPACE BAR'. The character you are pointing at will disappear. You may erase as many characters as you like. When you are done press any other key. A message will appear saying that you are back in tracking mode.

Instructions may be obtained at any time by pressing the '?' key. If done while in the typing mode the command will not work. The computer does not know whether you want help or you want to type a '?'. Therefore, when in the typing mode, if you need help while typing, press 'RETURN' then press the '?' key. You may then view the help page. To return to the main MENU press the 'ESC' key.

To load a character set, press the 'CTRL-F' key. This will signal the TEXT program to prompt the user for the name of the character set and the drive where the set is located. The drive must be in the same slot as the program. For example, if you ran the program from slot 6 the character set drive can be either slot 6, drive 1 or slot 6, drive 2. Make sure when entering the name you remember to type in the ".SET" suffix. The program WILL NOT add the suffix to the name. Also, when entering the drive just a number will suffice. Pressing 'RETURN' will default to the drive the last call was made to. In other words, if you just came from the MENU in slot 6, drive 1 and you press 'RETURN' to the drive prompt, the drive will default to slot 6, drive 1. However, if you have already loaded one set from drive 2, and are going to load another set from that drive, pressing 'RETURN' to the drive prompt will default to the drive where last access was made, in this case drive 2. If the file is misspelled, not found, or another error occurs with the disk, TEXT will alert you with a message and a request that you correct the problem and acknowledge the prompt. You may also point to the word "CATALOG" with your pen. This will cause the program to display the files on the disk of your choice.

To select a set to type with, press 'CTRL-S'. This will display a selection window. Point your pen at one of the numbers in the display window. These numbers represent the order in which the faces were loaded into the TEXT program. If you point away from the display window the system will alert you that no character set has been selected. When you are finished with your selection, the window will disappear and you may resume typing.

## GRID DRAW

Functionally, the GRID DRAW program is very interesting. With the aid of this program the user can draw as if he were using a T-square. The GRID DRAW program utilizes what we call a mapping function. No matter where the user points the pen, the mapping function locates and substitutes the coordinates of the nearest grid point. As you plot lines, GRID DRAW will make sure that each line falls on the grid points. The GRID DRAW program also demonstrates the screen lifter function.

To access the GRID DRAW program, point your pen to the white box to the left of the word GRID DRAW. Choosing from the choice boxes at the bottom of the screen, point your pen to the box with the word GRID DRAW. The MENU program will load and execute the GRID DRAW program. When GRID DRAW comes up, you will notice the help page. After you read the help page, point your pen to the white box which reads, "POINT HERE TO CONTINUE". Pointing your pen to the box will change the screen to the Hi-Res screen. You may now begin drawing with the GRID DRAW program. Begin by plotting a starting point on the screen. The program will then allow you to stretch a line from that starting point to any other GRID point on the screen. Find the place where you want the line to fall, and a line with the color you specified will be HPLOTted onto the current Hi-Res screen. Here is how the GRID DRAW works:

The first step in using GRID DRAW is to select a color by pressing the key that corresponds to the color chart on the help page. After the color is selected you may track your pen around the screen until you are pointing at the location or your first point. Once you are satisfied with your first point, press either the '1' or '<-' key. This will set point one. Now stretch the rubber-banding line around the screen until you get to the point where you want the line to end, then press the '2' or '->' key. This will lock the line into place and HPLOT the line in the desired color on the screen. On moving the pen, notice another line following the pen from the second point of the original line. Stretch this line anywhere you want it, and by pressing '2' or '->', you can lock the line into place. Should you choose not to continue from the last point, just press the '1' or '<-' key and the line will start to stretch from the area where you were pointing when you pressed the '1' or '<-' key.

The GRID DRAW program demonstrates another feature of the PENTRAK driver, called the SCREEN LIFTER option. If you point your pen within 12 pixels from the screen's right edge you will notice that you can see the text page underneath. This is called the SCREEN LIFTER. It is accessed by pointing your pen into what is called the trigger margin. With your pen pointed in the trigger margin, the tracking stops and the Hi-Res screen is "lifted" up over the screen underneath. You can also incorporate the SCREEN LIFTER in your own programs. These features are explained in the TRACK section of the driver software.

While in the GRID DRAW program, you can access the FILER system by pressing the 'ESC' key. In addition, you may select any of the Apple's Hi-Res colors to plot lines. Be aware that although you may specify a color other than black or white, you can only stretch a black or white line. When you set it down, however, it will be plotted on the screen in the appropriate color you specified.

The other options available to the GRID DRAW user include pressing 'N' to negate the screen, pressing 'H' for help, and pressing '.' which will map dots on the screen. Each dot is mapped eight pixels apart. The dots are XORed onto the screen, so be careful when drawing lines over the dots and then turning the dots, off and, of course, 'ESC' to access the FILER. Experiment with the '.' key before beginning a serious drawing.

## FONT EDITOR

The FONT EDITOR allows the user to edit existing fonts, or to create their own type fonts. These fonts can be used in any of the Gibson Light Pen Application programs. The fonts may be any size up to seven pixels across and eight pixels down. The font editor will allow the user to load a set of fonts from the DOS TOOLKIT or use the standard Apple character set. Once the sets are loaded into the system, you may edit the fonts any way you like, providing you keep within the seven by eight size limit.

To use the FONT EDITOR, simply point, from the MENU, to the white box to the left of the word "FONT EDITOR". When the choice boxes appear at the bottom of the screen, point to the box with the program name. When the MENU program sees the pen pointed to the program box, it will load and execute the FONT EDITOR program.

When the FONT EDITOR program begins, you will be viewing the help page. After reading the help page, point to the white box at the bottom of the screen. The program will now display the Hi-Res screen. At the bottom of the screen is a graphic menu. This menu has boxes with the words, EDIT, LOAD, SAVE, HELP, and MAIN MENU. You may select the applications by pointing your pen to the appropriate box. By now, the help and main menu boxes should be familiar to you. The help box, when selected, will show you the help page, and the main menu box will return you to the main menu.

### Font editor menu





Use the LOAD box to enter a character set name and load that character set into the Apple's Hi-Res screen where characters may be edited. Upon choosing the LOAD box the text screen will be displayed and you will be able to enter the name of the character set to load. You may point to the catalog box and view the diskette's directory. Once you have loaded a set, that set will be used to display all the Hi-Res messages. Should you decide that you do not want to load a set, pressing 'RETURN' at the filename prompt will return you to the Hi-Res screen, with the previous characters intact. Once you load a set, that set may be edited.

Pointing to the SAVE box will display a prompt asking you to name the set you want to save on disk. Type in the name of the set to save and press return. The program will ask what drive you would like that set saved on. If you press 'RETURN' to this prompt, the drive will default to the last active drive. Pressing return to the filename prompt, the Hi-Res screen will again be displayed. You will now be able to make a selection from the menu.

The final box to be discussed in this section is the EDIT box. Pointing to this box will cause the menu to disappear, and if no set was previously loaded, the default Apple set will be displayed. To edit the characters, point your pen to the middle of the character you want to edit, then press the 'SPACE' bar. The screen now zooms in on the character. Now, notice when you point your pen to the screen, any pixel that was black will turn white and any pixel that was white will turn black. Remember, it is very important not to go over the seven by eight boundaries, or the character will not be completely saved. When you have the characters edited as you wish, hit the space bar to zoom out. You can now position your pen to edit another character. Hitting the 'ESC' key will return you to the menu. The characters can now be saved to disk. You will notice a slight delay between pointing to the save box and actually typing in a filename. This delay is caused by the program loading all the letters and setting them up in the format for the disk.

There is a black border around each character. This border illustrates the outer bounds of each character. Please do not change this border, for the set will not be saved correctly. Also, note that the border will not be saved with the set.

NOTE: DO NOT MAKE CHARACTERS THAT ARE BIGGER THAN THE SEVEN BY EIGHT BOUNDARIES. DOING SO WILL NOT GIVE ANY VISIBLE EFFECT, AS THE CHARACTERS WILL BE TRUNCATED AT THE BOUNDARIES.

## GEOMED II

GEOMED II is now the ALL NEW GEOMED III!! With the aid of this program the user will be able to create triangles, rectangles, circles, parallelograms, and lines. The GEOMED II program works on the RUBBER-BANDING principle. All the figures, with the exception of the circle, are made by stretching lines, rectangles, triangles and so forth, across the screen. When the figure meets your approval, set it down in place.

Access to the GEOMED II program is acquired from the MENU, by pointing to the white box to the left of the program. Then point to the box containing the word "GEOMED II". Once the pen is pointed to this box, the MENU program will load and execute the GEOMED II program.

The first page help screen will then appear. Point to the white line at the bottom of the screen. There is a small symbolic menu centered in the upper portion of the screen. This menu includes symbols representing all the options available to the GEOMED II user. The symbols include: rectangles, lines, triangles, parallelograms, circles, the FILER, and black and white symbols. If you point to the FILER symbol, which in this case is a picture of a diskette, the FILER system will be activated and you will be able to access all FILER functions. You should be quite familiar with these options, so let's investigate the other functions.

The first thing available to the user is the grid and map functions. To activate the grid function use the '.' (period) key as a toggle switch. When the dots are on, all drawing points will be mapped onto an 8 pixel wide grid. Pressing the '.' key again will return you to the default mode (no grid).

The two boxes to the right are the color boxes. The white box is represented by the 'W', while the black box contains a 'B'. You may select the color by pointing to either of the two boxes. Note that drawing white on a white screen, and black on a black screen will not be visible.

As you proceed, you will notice that there is a black box displaying the message "POINT TO BOXES". This box is visible if, and only if, the pen does not see light for 25 CRT cycles. If you wave your pen quickly across the screen, you will notice that the box goes away. Point your pen to an area of the screen that is not part of the boxes, and the computer will complain with a funny sound. While the menu is being displayed, your only option is to point your pen at one of the function boxes, or press the '.' key to activate the grid.

Point to the box containing the RECTANGLE. When you point to this box, you will notice the menu rolls out of the way giving you either a blank screen or a screen with information on it from one of the other programs. Additionally, there are now lines and a cursor following the pen's point. You may begin drawing when the tracking cursor and the lines are following the pen.

Point to an area of the screen and press either the '1' or '<-' key. As soon as either one of these keys are pressed, the program will begin to generate a rubber-banding rectangle. Move your pen around the screen and notice that one corner of the rectangle is following the pen point. This is called stretching. Now stretch the rectangle around the screen until it is in the place where you want to lay it down. Press the '2' or '->' key to lock the rectangle into place. In the event you want to change your starting point, you can do this by pressing the '1' or '<-' key again. This will reset point one, and allow you to stretch from the new point.

While dealing with any shape, should you decide you want a different shape, hitting the 'ESC' key at any time will recall the menu and allow you to make another selection.

The next function is the LINES box. Use this function exactly like the RECTANGLE function.

The next box is the TRIANGLE box, which is utilized for the construction of triangles. Initiate TRIANGLES by pointing to the screen and hitting the '1' or '<-' key. This will set point one. Stretch a line out to create a second point. When you decide on a second point, (for one edge of the triangle) hit the '2' or '->' key. This will lock the original line into place. You may now stretch the triangle around the screen. When you get to where you want the final point to go, again hit the '2' or '->' key. This will lock the triangle into place. Remember, you can always press the '1' or '<-' key to reset the starting point of the triangle, or press 'ESC' to redisplay the menu.

Following the TRIANGLE box is the PARALLELOGRAM box. The procedure for creating parallelograms is almost identical to that for triangles, the difference lies in the final step. Instead of stretching the two lines together, it stretches two parallel lines and a third line connects the two stretching lines. This third line will always be parallel to the original line. A point to be aware of is, while stretching the parallelogram, if any of the lines would exceed the screen boundaries the line will adjust itself to stay within the those boundaries. This is true in both the TRIANGLES and PARALLELOGRAMS functions.

The final function available in GEOMED II is the CIRCLES function. It is accessed by pointing to the CIRCLES symbol. To make a circle, point your pen to the point you have chosen as the center, then hit the '1' or '<-' key. When the center has been established, stretch the circle out until you are comfortable with it. When the circle is in the location you specified, press the '2' or '->' key. The circle will now be locked in and plotted on the screen.

You will find the GEOMED II program extremely simple to use. Keep in mind that 'ESC' will redisplay the menu, and hitting the '1' or '<-' at any time while drawing will allow you to move the first point.

NOTE: THE FOLLOWING DESCRIPTIONS REQUIRE THAT YOU SIT DOWN WITH YOUR COMPUTER AND FOLLOW ALONG WITH THE TEXT. DOING SO WILL INCREASE YOUR UNDERSTANDING TREMENDOUSLY!

The PENPAINTER System is a Hi-Res drawing / graphics system without peer. The PENPAINTER System supports freehand sketching, a new concept which we call PATTERNED FILL, an exciting, easy-to-use graphic PATTERN EDITOR, and a new idea in graphic interaction which we call the SYMBOLIC INFO-FLOW MENU. The PENPAINTER System consists of three Applesoft programs, several machine language drivers, and the PENTRAK 1.1 driver.

The PENPAINTER System REALLY shines with a color display ... in fact, the results are so stunning that, if you do not have a color monitor or TV hookup, you should put this manual down, and immediately purchase a Radio-Frequency Modulator (The Super-Mod) to allow your home TV to be connected to the Apple. IT WILL BE WORTH IT !!!!! (Remember -- when changing display monitors you may need to RE-CALIBRATE the Gibson Light Pen for operation with the new monitor or TV) We're serious, you MUST see PENPAINTER in color.

What is PENPAINTER?

PENPAINTER is an incredible color drawing and painting system. Using PENPAINTER you will be able to sketch a simple black and white line drawing, or load one from the disk, and paint the white areas enclosed within the black border lines. This is known as AREA FILL in the graphics industry. Two features make PENPAINTER unique, and sets it apart from the rest: First, areas colored may be RE-COLORED over and over as many times as desired. Secondly, The "paint" is not a simple color, or color mixture, but is any colored PATTERN of your own design!!! You have to see it to believe it.

As mentioned above, the PENPAINTER System is composed of two programs, PENPAINTER and PATTERN EDITOR. As you might guess, PENPAINTER does the painting, while the PATTERN EDITOR allows you to create large collections of your own patterns.

Let's begin by looking closely at PATTERN EDITOR. Since the best way to learn is by doing, we suggest you "HOP IN" (Hands-On Push-It-Now) and follow along with your computer ... WITH a color display of some sort !!!



The flow-chart-like diagram is called an INFO-FLOW<sup>tm</sup> diagram (a trademark of Gibson Laboratories, Inc.). It is a very exciting concept!!! Once you get used to the idea behind INFO-FLOW, you'll find that the documentation and memorization required for the use of the computer is greatly reduced ... making the computer much more friendly!!!

The INFO-FLOW diagram works on the idea of information transfer within an application program or system. The diagram shows and labels the major information-containing blocks, while the arrows connecting these blocks show legal information paths. Any system can be reduced to its essentials in this manner. In this instance, there are three major info-containing blocks: DISK STORAGE, PALETTE SCREEN and PATTERN EDITOR. Each is shown with its own box. Arrows connect the DISK STORAGE to the PALETTE SCREEN, and the PALETTE SCREEN to the PATTERN EDITOR. To activate an information transfer between any two boxes, you simply TOUCH THE ARROW WHICH INDICATES THE CORRECT TRANSFER!!!! Right now the prompting line below the INFO-FLOW diagram is telling us to select an operation from the diagram, so let's do it!

Using the Light Pen, touch the arrow which would indicate a transfer of information FROM the disk storage TO the PALETTE SCREEN. After a moment of confirming delay, the computer will "boop" in acknowledgment of your selection, and will ask if you wish to "LOAD: PATTERNS ?" Although patterns are what will be loaded, the computer means the FILENAME "PATTERNS". Since this is the name of the pattern file which is included on the disk, simply hit the "Y" key on the Apple to load this file. The disk will whirl, and indicate information being (in this case) read, and the upper portion of the display screen will fill-up with an entire array of vivid color patterns. (If you still haven't purchased an RF Modulator for your home color television

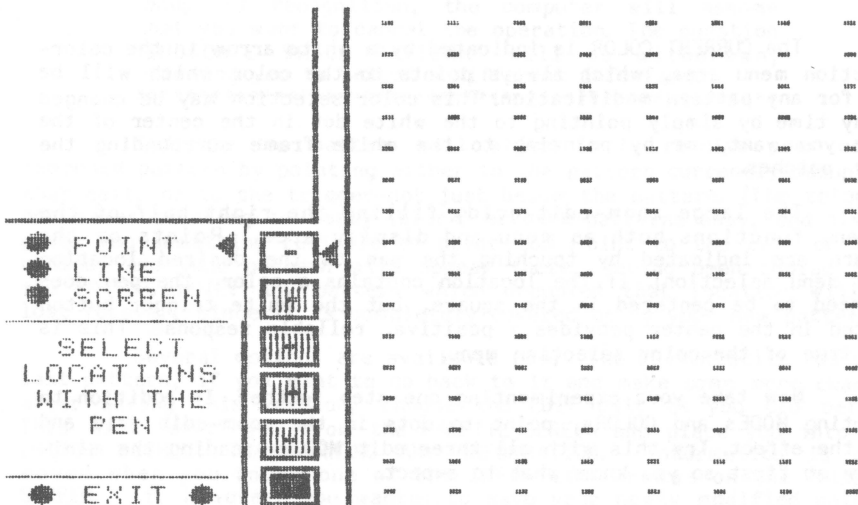
You are looking at a 13 by 7 array of PATTERNS. Ninety-One in all. These were all created using the program in front of you right now ... and within ten minutes, you'll be creating and editing your own. Since you may be using this array of patterns frequently, we'll point out several things about the provided PATTERNS file:

All four Apple solid colors appear in the upper left of the screen. Below they've been mixed with white, and below that with black. Solid white and black are present, as are various mixtures of the basic colors. The rest of the pattern array is filled with a creative variety of different patterns. These have been provided to stimulate your own imagination, as well as to give you something to paint with right from the start. Using this PATTERN EDITOR, any or all of these patterns may be modified or replaced with patterns of your own design. You can name the resulting new pattern array anything you want and store it onto the disk for later use or further editing.



Now that the provided PATTERNS file has been loaded onto the PALETTE SCREEN, let's take a look at editing a pattern:

Under the column labeled EXITS, the last option is EDIT. Select the EDIT exit now with the Pen. After the usual confirming pause the computer will "boop" and the screen will change to show the actual PATTERN EDITING area. There is a blank area in the upper left of the screen, and a grid of white dots filling the right half. Two arrowheads appear, one pointing to the words POINT MODE, and the other pointing to the BLACK box in the color-selection menu. Also, the mini-screen above the " \* EXIT \* " now contains a message for you. Your screen should look like this:



Experiment with changing the EDIT MODE and CURRENT COLOR by touching the mode selection buttons next to the words POINT, LINE and SCREEN, and by pointing to the centers of the six color-filled color-selection boxes. Notice how the mini-screen changes as the EDIT mode is changed, always suggesting a possible course of action.

The three EDIT MODES have the following functions:

**POINT:** Individual pattern dots pointed to on the Zoom-edit grid are immediately set to the current color. This provides a very simple and direct method for pattern editing.

**LINE:** A straight line of the current color is drawn between any two specified endpoints. The mini-screen will prompt you for the endpoints.

**SCREEN:** After selecting SCREEN mode, the mini-screen will ask for the color which the ENTIRE screen will be CLEARED to. SCREEN mode will automatically switch to POINT mode after completion. This is like an erase function, though the screen may be cleared to any color.

The CURRENT COLOR is indicated by a white arrow in the color-selection menu area, which always points to the color which will be used for any pattern modification. This color selection may be changed at any time by simply pointing to the white dot in the center of the color you want, or by pointing to the white frame surrounding the color patches.

The large zoom-edit grid, filling the right half of the screen, functions both as menu and display area. Points on the pattern are indicated by touching the pen to the desired location (like menu selection). If the location contains a color, the pen does not need to be centered in the square, but the white trigger button located in the center provides a positive, reliable response. This is also true of the color selection menu.

Now take your experimenting one step further. In addition to selecting MODEs and COLORs, point to dots in the zoom-edit grid and note the effect. Try this with all three edit MODEs, reading the mini-screen at first so you know what to expect.

As you begin filling the zoom-edit grid with colors, you'll notice that the upper left corner of the screen has been busy too. You'll see that anything and everything drawn in the zoom-edit grid is echoed immediately 30 times. These are "life-size" images of the pattern, and allow you to preview the final, painted appearance of any pattern you're editing. This is exactly how it will appear when PENPAINTER uses your pattern for filling in (painting) an area of a picture!

When you've created the pattern you wish, leave the EDIT MODE by touching one of the two EXIT buttons. The display will immediately switch back to show the PALETTE SCREEN. At this time, your newly created pattern is still in the EDITOR. It must be moved over to the PALETTE SCREEN before it may be saved to disk, or used by PENPAINTER. (You'll note that the INFO-FLOW diagram implies this ... that the disk ONLY saves from the PALETTE SCREEN.) Looking at the INFO-FLOW, you probably already know how to move the EDITOR's current pattern over to the PALETTE SCREEN. Simply touch the lower right-most arrow which indicates an "info-flow" from the PATTERN EDITOR to the PALETTE SCREEN. The lower prompting line will ask where on the palette the new pattern is to be placed.

```
*****  
NOTE: If you point to the lower arrow after the  
"boop" of recognition, the computer will assume  
that you want to cancel the operation. The question  
"INDICATE WHICH PATTERN" will be withdrawn,  
allowing you to select a different info-flow.  
*****
```

Indicate the pattern cell which is to receive your newly composed pattern by pointing either to the pattern currently occupying that cell, or to the trigger-dot just below the pattern. (The trigger-dot makes pointing to empty (black) or dark patterns easy, and always gives you something reliable to point to.) Point to the cell of your choice, and your pattern will appear there, having been copied from the EDITOR. NOTE: Any pattern which occupied that location will be lost forever, since it is completely covered up by your new pattern.

Several options are available now. The EDITOR still has your last pattern, if you want to go back to it and make some more changes after saving this version, choose the EDIT exit as you did before. This will "exit" you from the PALETTE SCREEN and place you into the EDITOR WITHOUT TRANSFERRING ANY INFORMATION. Information is only moved when you touch one of the INFO-FLOW arrows on the PALETTE SCREEN. If, however, you wanted to save your newly modified palette onto the disk, point to the lower left-most arrow. The system remembers the name you most recently used, and offers to save the new palette into that filename. When this is done, you can may continue.

A NOTE ABOUT DISK TRANSFERS: Every Gibson Light Pen System application program allows you to completely cancel any disk load or save operation by simply hitting the RETURN key in response to the prompt for a filename. Remember -- you need only to hit RETURN to back-out of any disk transfer. Also, for the sake of speed and simplicity, most of the applications do not ask for a drive number (1 or 2) or a slot number (if more than one controller). The applications will always use whichever drive and controller that were last used unless you specify otherwise. THE ONE EXCEPTION TO THIS IS FOR RETURNING TO THE MAIN MENU, AND FOR ACCESSING OTHER PROGRAMS FROM THE MENU. THE MAIN DISK WITH "MENU" MUST ALWAYS BE IN DRIVE 1 OF THE SLOT 6 CONTROLLER WHENEVER YOU ARE RETURNING TO THE MENU. For loads and saves in the PENPAINTER and PATTERN EDITOR applications, you are always allowed to specify which drive you wish to use by adding the ",D1" or ",D2" at the very end of the filename. If you're unfamiliar with this, see page 22 of your DOS 3.3 MANUAL for a more complete explanation. We decided to use many different ways for disk input/output to demonstrate different types of filers. The INFO-FLOW diagram is a very great example of this concept. Remember, all of our Applesoft programs are listable, which gives you, the user, a chance to see what makes them tick.

If you wish to view or modify any of the patterns provided on the diskette, just touch the upper right-most info-flow arrow to specify transfer from the PALETTE SCREEN into the PATTERN EDITOR, then indicate which pattern to view and edit. You'll be switched into the EDITOR, with the pattern being scanned and read onto the zoom-edit grid and onto the life-size array area. In this way, existing patterns may be edited and re-saved whenever desired.

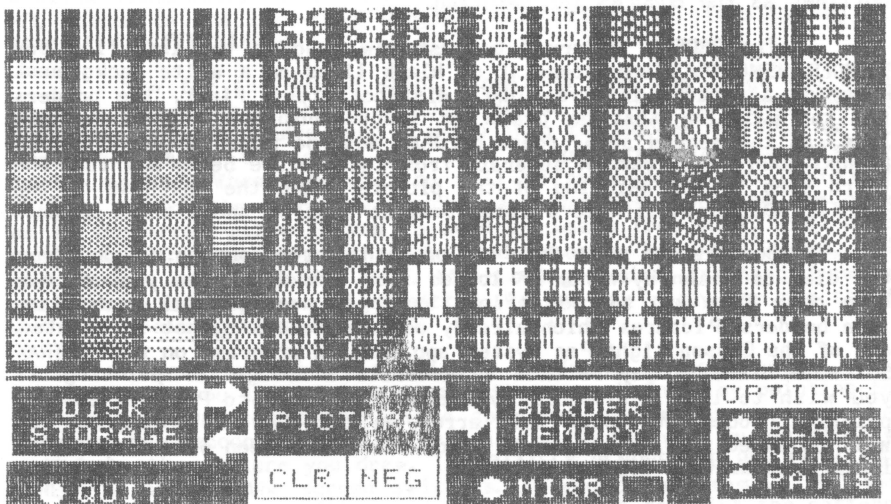
Once you've edited and created all the patterns you want, you MUST SAVE the resulting palette of patterns to the disk. Any modifications made to the pattern array are strictly temporary until stored on the disk for later use.

When you are finished editing patterns, you may exit the program to the main MENU, or to the PENPAINTER. If you choose to go directly to the PENPAINTER to use the patterns you have just created, simply hit the light-button to the left of the word "PAINT" on the EXIT MENU of the PALETTE SCREEN. PENPAINTER will be loaded and run with your latest array of patterns still intact and ready to be used.

## PENPAINTER

To run the PENPAINTER from the menu, point to the box to the left of the word PENPAINTER. The appearance of PENPAINTER's INFO-FLOW diagram will look rather familiar to you by now, and you probably won't need much instruction (the beauty of INFO-FLOW), however, several aspects of PENPAINTER are not obvious from the info-flow diagram, so there are several points to be made:

First, the INFO-FLOW diagram implies the flow of PICTURES, NOT PATTERNS. PENPAINTER does not manipulate patterns, (that's the domain of the PATTERN EDITOR), its pattern handling abilities are limited to the loading of a pre-existing pattern file onto its PALETTE SCREEN (like PATTERNS provided on the disk). This PALETTE SCREEN loading is accomplished by touching the menu button next to the word PATTS on the OPTION MENU area. When you point to this button, the program will prompt you for the pattern's name. Answer this prompt with the pattern's name, and that file will be loaded.



Between the DISK STORAGE and the PICTURE are the normal two-way arrows indicating that the PICTURE may be loaded and saved to the disk. The PICTURE referred to here is NOT the one you're looking at now (not the PALETTE SCREEN), but rather another which actually contains the image being painted by PENPAINTER. Notice that only one arrow is pointing from the PICTURE towards a box called BORDER MEMORY. This obviously implies that picture information may be moved INTO the border memory (which will be explained later), but that it may not be moved out again. This is true.

Second, there are several concepts to keep in mind. The box contains two Light Pen buttons: CLR and NEG. As you might guess, these are abbreviations for CLEAR and NEGATE, and again refer NOT to the PALETTE SCREEN directly above, but rather to the PICTURE which we have not yet seen.

There are a few things not pertaining to INFO-FLOW which must be understood: At all times, hitting the <SPACE> bar of the computer will flip your view back and forth between the PALETTE SCREEN and the PICTURE. Just as the PATTERN EDITOR contained two screens, PENPAINTER also uses two. Try hitting the SPACE bar now several times and see the effect. You'll note that the drawing screen starts out completely white. This is the screen upon which you and PENPAINTER will be drawing. PENPAINTER always paints on a white screen, using black outlines as the BORDERS for painting.

The BORDERS referred to just now, and in the info-flow box "BORDER MEMORY", always consist of black lines on a white background. Painting a picture involves THREE distinct steps. First, the borders for the painting must be drawn or loaded onto the PICTURE screen. Then, as the second step, these borders must be moved into the BORDER MEMORY where they remain separate from the picture being painted. The third step is the painting of the picture using the patterns on the PALETTE SCREEN. We'll take a close look at each of these three steps:

Borders can come from one or both of two sources: Loaded from the disk or drawn by hand. If loaded from the disk, the picture may have come from any source as long as it is mostly white with black line borders. Pictures which already contain colors cannot be painted. Any of the Gibson Light Pen System application programs on the PENTRAK Software diskette may be used to generate an image for painting. If you wish to load a previously created image into PENPAINTER for painting, touch the upper left arrow on the INFO-FLOW diagram. You will be asked for a filename to load, then the screen will flip to the image area so that you may watch.

The alternative to loading an image from disk is drawing the image freehand. To draw freehand, hit the SPACE bar to view the all-white PICTURE page. Then hit the '<->' or the "1" key to start drawing and the '->' or the "2" key to stop. This is identical in operation to the simple SKETCH program on the diskette. Under the BORDER MEMORY box of the INFO-FLOW you'll notice the word MIRR with a dot to the left and a small empty box to the right. Touch the MIRR dot and watch the small box. This box shows the type of mirroring in effect at any time. Leave the small box with both horizontal and vertical lines inside, then flip over to the PICTURE page and draw something. MIRR stands for MIRROR image drawing.

If you make a mistake while drawing the picture, and want to correct it, you can do one of two things. You can touch the CLR word in the PICTURE box. This will erase the entire image and allow you to begin again. If you want to only erase a small mistake, there is an alternative. In the OPTIONS box in the lower right of the screen is the word BLACK. This is the current color which will be drawn by the Pen. Touching the dot to the right of the word will change it to WHITE. Holding the pen there will cause the color to change back and forth until you remove the pen. With the word saying WHITE you can "sketch-out" any mistake you may have made.

The word below the current color word is NOTRK. That stands for No Tracking Cursor. The tracking cursor is normally useful during the third step of painting, but can also be handy in erasing a mistake. Pointing to its dot causes it to change to TRACK and back again. Normally, NOTRK is the best setting during drawing on a white background.

If an image was loaded from the disk, it can be enhanced with direct sketching following the load, but the image would have to be loaded first and the freehand sketching performed afterwards.

If the image loaded from the disk is a white-line drawing on a black background, rather than black-line on a white background, the NEG button on the INFO-FLOW diagram will NEGATE it, thus making it correct for PENPAINTER.

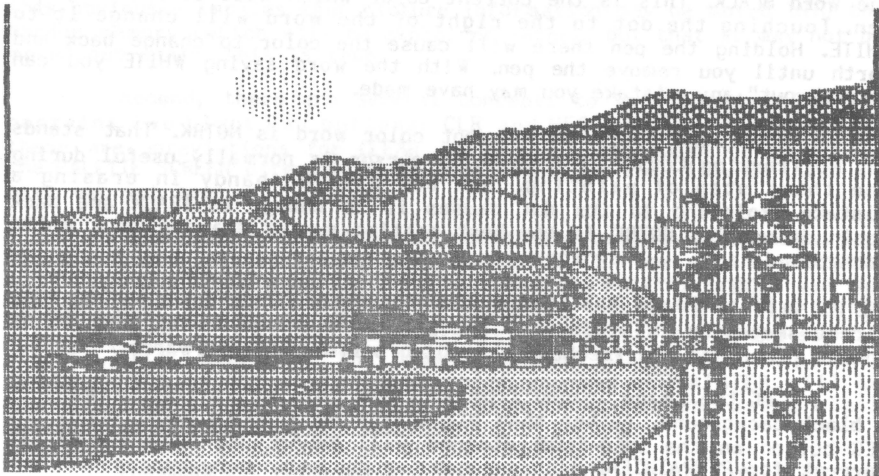
Now for the second step... When you have the image you wish to paint, flip over to the INFO-FLOW diagram and touch the arrow which moves the picture you've been drawing into the border memory. As the transfer is made, the screen will show the picture being scanned into border memory. When complete you will be returned to the INFO-FLOW display. Notice the arrow you touched and the MIRR word are now gone as is the arrow allowing you to load an image from disk. They have been removed to remind you that the border memory has been loaded, and that it can only be loaded ONCE. After being loaded, freehand drawing and picture loading are not permitted. We are now ready for the third and most exciting step: PAINTING!

Selecting from the palette in front of you, point to a pattern which you like. Select that pattern, as before, by pointing to it, or better yet, to the white dot just below. As soon as the computer has recognized your selection, the screen will automatically switch to the picture you drew. IMMEDIATELY REMOVE THE PEN FROM THE SCREEN as soon as the screen switches. If you do not remove the pen quickly, the computer will assume that you wish to paint the pattern you chose at the same area of the picture you drew.

Now, decide which one of the areas in your picture to paint with your chosen pattern, and point to it. After the usual programmed delay, the computer will fill the entire area you pointed to, no matter what the shape, with the pattern you have chosen!!!!



You can fill-in another area of the picture with the same pattern by pointing again, or change the painting-pattern any time by flipping to the PALETTE SCREEN and selecting another. In this way, the entire picture may be painted using patterns from the palette. Even the palette can be changed at any time by loading another with the PATTS option. Pictures like this one are easily created:



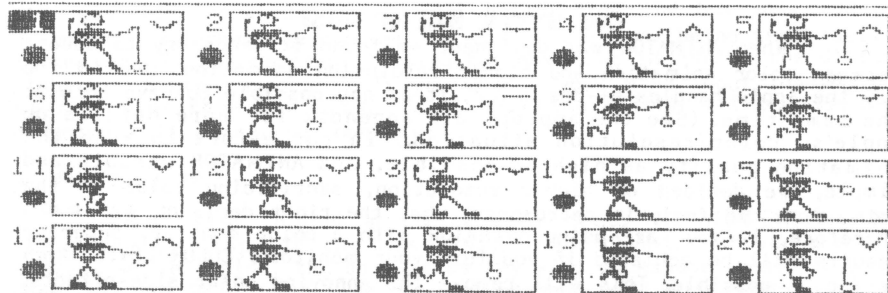
One of the most powerful and useful features of PENPAINTER is the ability to re-fill any previously painted area. If a color or pattern doesn't look right, simply select another and paint right over the old, wrong one!

There may come a time when you need to point to a black area for painting, or to a dark pattern which the pen cannot easily read. If so, a tracking cursor may be brought into use. Flip to the OPTIONS menu on the PALETTE SCREEN and select the NOTRK option. As the computer reads your selection, the word NOTRK will be changed to TRACK. With the word set to TRACK, flip back to the picture. Somewhere on the picture will be a TRACKING CURSOR. It looks like a white square with little points on the sides. If you can't find it, point to ANYTHING bright and the tracking cursor will immediately lock onto the pen's point. Move the cursor to the area you wish to paint and hold it motionless. After a confirmation delay, PENPAINTER will paint the area you've selected. The tracking cursor will continue to function until you remove it in the same manner it was created.

Once you've achieved artistic bliss, the resulting image may be saved onto the disk. Just touch the proper arrow, then think of a name for the picture file. Any of the standard screen-dump programs may then be used to produce a paper copy of the image ... even in color!! (with a color screen-dump program and a color printer).

Remember -- you must save your drawing to the disk if you ever want it back.

Finally, use the QUIT button on the INFO-FLOW screen to exit from PENPAINTER.



- FIRST: 1
- LAST :20
- DISK
- TEMP
- ⏪ / ⏩ STEP FWD/BACK
- ⏮ ANIMATE
- <SP> ZOOM EDIT Y/N
- MAIN MENU ● QUIT

Overview-

The ANIMATOR program provides the Gibson Light Pen System owner with a simple method for experimenting with animation. High-quality animated sequences can be easily created, edited, saved, and recalled.

Animation is the illusion of motion which occurs when we see a series of rapidly changing, but non-moving images. Our human brain and vision system fill in the gaps between the separate "frames" of an animated sequence, giving the impression of smooth and continuous motion. As you may already know, the images generated by the television in your home do not actually move, but are really composed of single still "frames" displayed at a high rate. A characteristic called PERSISTENCE OF VISION causes this illusion of motion. Standard broadcast television displays sixty separate frames in each second. Research has shown that this is much faster than is required for motion. Movies in the theatre are seen at only 24 frames per second, and a lower limit of eight frames per second has been found acceptable. ANIMATOR operates at a frame rate of 18 frames per second, thus the animation is of very high quality. If you have not already done so, run ANIMATOR, and respond with "Y" to the demo question. You will quickly see just how good the illusion of motion can be.

Program operation-  
ANIMATOR, Program operation

In keeping with our HOP IN (Hands-On, Push-It-Now) approach to learning about Light Pen operation, you should now be seated in front of the computer with a COPY of the Gibson Light Pen System software in drive one. We assume that you've already calibrated your pen once for this computer and display monitor, and your monitor's brightness and contrast controls have been set for the best operation of the pen.

### TAKE SPECIAL NOTE OF THIS:

When ANIMATOR was designed, we found it necessary to choose between color animation and higher resolution animation. Due to the way the Apple handles hi-res color, it is not possible to have both at the same time. (See the appropriate appendix for more details on Apple's color/resolution situation.) In our effort to keep the animation quality as high as possible, and ANIMATOR useable and simple, we decided on higher resolution, sacrificing color in the animations. We feel, in retrospect, that the right decision was made. Therefore, if you are using ANIMATOR with a color monitor, superior results will be achieved if you turn your monitor's COLOR LEVEL down as far as possible. This will remove the annoying color side-effects. Owners of the Electrohome Supercolor II RGB board should see the Supercolor II appendix for a modification to ANIMATOR which will suppress color automatically.

Now, start ANIMATOR running. You do this by pointing to the white box to the left of the word ANIMATOR. The MENU program will load and execute the animator program. When the program is run, a question asks if you want the demo animation to run. Respond "N" to the question "DEMO ?" We will now walk through the various ANIMATOR operations while you HOP IN and try it as we go.

### Loading Animation Sequences-

We'll begin by loading a previously composed animation sequence from the Gibson Light Pen System software disk. If you're already familiar with the INFO-FLOW™ concept of light pen control, you can guess how that might be done: In the lower left of the display screen you'll see a box containing the words "DISK STORAGE". This is the symbol representing the floppy disk storage on your computer. Two arrows are graphically connecting the box to the larger array of empty frames above. The arrow on the left points from the disk storage toward the array above, while the arrow on the right is pointing from the array above down into the disk storage. Since we wish to load an animation sequence FROM the DISK STORAGE into the ARRAY, we will point and hold the Light Pen at the center of the LEFT arrow, the one which indicates a flow of information from the disk to the array. Hold the pen stationary until the audible "boop" is heard, indicating that the computer has registered your selection. Immediately take the pen away from the screen.

The LOAD FILE: message will now be seen in the center of the screen. The space to the right of the LOAD FILE: message is provided for you to type the name of the floppy disk file you wish to load. ONLY SPECIAL ANIMATOR-type FILES SHOULD BE LOADED. These are files containing animation sequences which have been generated and saved using ANIMATOR. Loading other kinds of files (like pictures or programs) will not make sense to ANIMATOR. A sample animation file has been included with the Gibson Light Pen System for use with ANIMATOR. To help us tell animation files apart from all the other types of files, we have put the special ending ".ANI" onto all animation files. The .ANI is short for ANImator. You are free to name animation files anything you wish, but we suggest you help yourself by following this simple rule.

Meanwhile, the computer is still waiting patiently for a file name to be typed. Before we do that though, without typing anything at all, just hit the RETURN key. You'll notice that the box and message disappear, and that you can see the screen that was being temporarily covered up. It is important for you to know that in ANY of the Gibson Light Pen System programs, if you change your mind about loading or saving to or from the disk, simply hitting RETURN without typing anything will cancel the operation.

#### Animation Files-

Now, time to look at the animator demo, ANIMATORDEMO.ANI. To the prompt, type in the name ANIMATORDEMO.ANI. If you make a mistake while typing, the back-arrow key will backspace as usual. When done, hit the RETURN key. The box and message will disappear, and the disk drive will light up and begin making those scratching sounds which means the file is loading. When the file has been loaded, you will hear a warbling tone indicating successful operation completion.

If you had asked for a non-existent file, or had mistyped the filename, the appropriate error message would come onto the screen accompanied by a rather discouraging error noise. Then, in a second or so the FILE NAME: message will return and wait for you to try again. You can abort the whole thing as usual by just hitting RETURN, or try typing the name again.

#### ANIMATOR Interaction -

As the disk grinds to a halt, having loaded the ANIMATORDEMO file, the FRAME ARRAY will fill with the single frame images of a walking person with a yo-yo, accompanied by a bird and a buzzing bee.

Notice several things:

First, the individual FRAMES are each numbered. The numbering goes from 1 to 20, across the top row from left to right, then down one row, and so on to the lower right corner. Notice that underneath every frame number is a light pen FRAME SELECTION BUTTON (the big, round, white dot). Also notice that the first frame, frame #1, has its number in reverse, a black number on a white background. This is because frame number one is the CURRENT FRAME. The CURRENT FRAME is the frame which the computer is working with at the moment. Frames can be selected at random by pointing the light pen at the chosen frame's selection button, or sequentially, by single-stepping forward or backward with the arrow keys. The other method of frame selection is automatic during actual animation. When the computer is animating a frame sequence, the frames are selected in the FORWARD direction only.

### Single-Stepping Animation Frames -

Put the Light Pen down for a moment - we'll need it in a minute, but not yet. Now watch what happens each time you press the forward arrow ( -> ) key. Experiment with both the forward and back-arrow keys. Watch the current frame indicator change, while the contents of the currently selected frame is also shown at the top of the screen. You are changing the CURRENT FRAME by advancing it or retarding it one frame at a time. The forward-arrow advances the frame number and current frame, while the back-arrow reverses this sequence. All the while, the image contained within the selected CURRENT FRAME is being shown at the top of the screen in slow-motion animation. You'll also see, when going in the forward direction, each successive frame is drawn ONE DOT POSITION TO THE RIGHT OF THE LAST FRAME. This is obviously necessary, or the overall animated sequence would not appear to travel across the screen. Actually, a frame being drawn is placed on top of the last frame drawn, shifted by one dot position, thus covering up most of the image which was there before.

\*\*\*\*\* SPECIAL NOTE FOR ADVANCED ANIMATORS \*\*\*\*\*

If any frame of an animated sequence has dots turned on in its left-most column, the next frame (which will be placed down one dot position to the right) will NOT remove those left-most dots from the screen. This can be used to great advantage to allow animated action over a fixed or moving background.

The forward-arrow and back-arrow keys are invaluable aids for developing and debugging good animated sequences. You will probably use this "single-step" mode frequently. In ANIMATOR, as with all Light Pen applications programs, we have attempted to provide for both left-handed and right-handed people. Just as with SKETCH and GRID DRAW, the "1" and "2" keys may be substituted for the back-arrow and forward-arrow keys, respectively. This is more convenient for right-handed people.

### Zoom-Editing Mode -

Hang onto your seat! Hit the SPACE BAR once. The current frame will ZOOM-IN for a VERY close look. Notice the frame number, shown in the lower right corner of the screen. Now, even while zoomed-in, the forward and back-arrow keys will allow you to single-step through the animation sequence. Experiment for a while with a mixture of the space bar and the arrow keys, zooming in and out and moving forward and backward from frame to frame.

### Animating the sequence -

Let's add another key to the growing list of commands you're mastering. The sequence of frames could be animated by hitting the forward-arrow key over and over, but there's an easier way. First, zoom-out so you can see the entire frame array. Now just hit "A" (for Animate), do so now. Again, we'll call your attention to several things:

First, (and most obvious) there is now a man walking leisurely across the top of your screen from left to right. There is no provision for causing him to walk backward automatically, nor is there any way to control the speed of the animation. One of the main goals we set during the construction of these Light Pen applications was ease of use. By intentionally leaving out many options which have occurred to us, we have managed to get the most function with the least confusion. Minimizing learning time is good for everyone. If you feel a strong need for something which is not here, remember - that almost all Light Pen applications, including ANIMATOR, are written in simple Applesoft. With a little study, you can make any changes you may desire.

You will also perceive that the current frame indicator disappears while the animation is running. This happens because attempting to scan every number in the frame array with the frame number would slow the main animation too much. As soon as the animation is stopped, the frame indicator will appear at the current frame, indicating the exact frame at which the animation was halted. To stop the animation, simply hit ANY key on the keyboard. (The space bar tends to be hit often for this since it is right up in front, and hard to miss.)

Now try zooming in (with the space bar) and then pressing "A" to animate WHILE ZOOMED-IN! That works too, and just as before, ANY key hit will stop the animation at the exact frame being viewed. Experiment with all four keys: the two arrows, the "A" and space bar, in all combinations, until you feel comfortable with their effect.

#### Random Access to Frames -

Pick up the pen and Zoom-out so you are looking at the entire frame array. Pointing the pen to any frame's selection button immediately selects that frame as the current frame. Actually, you may point the pen anywhere in the area of the frame, even at the figure inside, or at the frame number, but the selection button gives a solid, always present and easily hit target. The animation area at the top of the screen does not change as you randomly select frames. It is only changed by the sequential motion produced by the arrows or the "A" key. Try selecting a frame, then zooming in for a close look ... then out again for another selection. Experiment with this for a while.

So far, we've tried just about everything except the actual drawing or composition of the animated figures. Now's the time.

## Editing Animation Frames -

Freehand drawing is very impractical for images as small and detailed as these. ANIMATOR images are not drawn freehand for that reason. Zoom-in to any frame of your choice. Choose a frame either by stepping to it with the arrow keys, or by pointing to it with the pen while zoomed-out, and then zoom-in. While zoomed-in on any frame, the Light Pen can be used to alter the image of the zoomed-in frame. Experiment in an empty area of the zoom screen. Pointing to an "OFF" dot turns it "ON", and pointing to an "ON" dot turns it "OFF". This action is known as toggling. (This is named after the familiar toggle switch which has only two states, on and off. The only thing you can do with a toggle switch is flip it the other way.) This toggling effect lets you draw any image you wish without requiring you to take your eyes from the screen to hit keys.

Notice several things:

If you continue to point to a single location, the dot will alternate on, then off, then on and so on. The delay between these successive dot togglings, while you hold the point in the same location, is longer than if you were to move the pen to different points on the screen. This lets you toggle dots quickly as you move the pen, and has the good effect of not re-toggling the same point too soon if you were to leave the pen momentarily at a point you have just toggled.

Also notice, if you don't wish to be drawing with the pen while zoomed-in, it MUST be removed from the screen ... otherwise you WILL be drawing with the pen!

To see the new image in its real size, simply hit the space bar. The new image will already be inside the proper frame in the frame array. It is normally easier to look at the animation area at the top of the screen for the newly edited frame, rather than search for it in the frame array. This is easily accomplished while zoomed-out, just hit the back-arrow key then the forward arrow. This will step the current frame one backward, then one forward. This leaves us where we were (at the frame we were editing), but since the single-step was used, the image in the animation area at the top of the screen will be updated with the new frame's contents.

You will observe how easily successive frames may be compared and edited by single-stepping forward and backward while zoomed-in. By doing so, it will be easy to smooth-out the motion of any animated sequence. Remember that the "1" and "2" keys may be used in place of the back-arrow and forward-arrow keys.



### Short Animation Sequences -

The only animation we've seen so far has been the ANIMATORDEMO.ANI sequence. It consists of 20 frames numbered 1 to 20. When animated, ANIMATORDEMO.ANI cycles through every frame from 1 through 20, and then repeats. Some simpler animations may not require as many as 20 frames to be shown in sequence. For these animations, ANIMATOR provides a way for limiting the animation to ANY sequential series of frames in the frame array. By specifying which frame is to be the FIRST frame displayed, and also which is to be the LAST, the animation may be of any length desired as well as any sub-sequence in the frame array.

Note the two words, FIRST and LAST in the lower left area of the menu. Following each is a frame number. At the moment the FIRST frame displayed in the animation sequence is frame 1 while the LAST frame to be shown is 20. These can be changed to any number in the range 1 through 20. Go ahead now and touch the light button next to the word FIRST. After the usual pause, the computer will "boop" and whatever number was showing after the word FIRST, is changed into "??". This shows the computer has cancelled the old choice, and is waiting for you to specify a replacement. Now select frame number 10 as the new FIRST frame to be displayed. Do so in the usual manner, by pointing to frame 10 (we recommend pointing to the selection button just below the number 10). After the pause, the computer will again "boop" and the number 10 will appear after the word FIRST indicating THE COMPUTER WILL JUMP TO FRAME 10 AFTER IT SHOWS THE LAST FRAME. Now, Single-step the animation and watch the frame indicator step from 20 (the LAST frame) directly to 10 (the new FIRST frame). Hit "A" and watch the animated result.

Stop the animation (by hitting any key) and change the LAST frame to 11. Now hit "A" and watch the result. Experiment with various settings of the FIRST and LAST frame numbers. Try one where the FIRST frame to be shown is a number LARGER than the LAST frame to be shown. Notice what happens, the animation does not run in reverse, but rather the animation sequence goes from the FIRST up to 20, then wraps around to 1 and continues up to the LAST frame ... then back to the FIRST and so on.

Besides allowing short animation sequences, the FIRST and LAST controls let you place several short animations in the same animation file. You could select which one you wish to work with by setting FIRST and LAST appropriately, then the single-step and "A" animation would keep the frames within that area.

### Creating Animations from Scratch -

In our effort to keep the controls, commands, and program operations simple, we have not provided a command which clears the animation frame array to all blank, but doing so is simple. First stop the program by hitting your computer's RESET key, then type RUN. Respond with "N" to the demo question. The entire frame array is now blank, and ready to receive YOUR own animated sequences! (Before proceeding with these instructions, clear the array as indicated above.)

Several command tools have been provided to aid the creation of ANIMATOR's frame-animated sequences. Their use will be explained and demonstrated here. In most animations, a large portion of the image in the animation frame is duplicated from frame to frame. The ANIMATORDEMO.ANI animation is a good example of this: Throughout the animation sequence, the legs, arms, head and other accessories are in constant motion, but the man's body never moves. You could zoom-in on him and hit "A" to see this. His body is the REFERENCE POINT for all of the other actions. This being the case, it would be needlessly tedious to draw the same, non-changing body, into every frame of the animation sequence (after all, that's what computers are for). ANIMATOR provides a simple and elegant solution to this situation:

#### TEMP -

Before experimenting with frame duplication, you will need to have something to duplicate. With your entire frame array now blank, select frame number 1 as the current frame, and zoom-in. Now draw an image of any kind. If you are not currently consumed by a burning urge to express yourself in animation, and can't think of anything to draw, start with a simple four-sided, empty, square box. Place it on the "ground", with about the same distance from the left edge as from the right, and with a height of about one third the height of the frame. Make it roughly square. When you have completed the box (or hopefully a creation of your own), read on...

Zoom-out so that the entire frame array is in view. Point to the light button next to the word TEMP in the lower left area of the screen. After the usual confirming pause, the computer will "boop" and the symbol for the DISK STORAGE will change into a symbol for the TEMPORARY FRAME STORAGE REGISTER. This will be all white, with the word TEMP in the center. For practice, hit the light button called DISK, to see that you are free to change your mind anytime. Now go back to TEMP mode by again pointing to the TEMP light button.

As a result of your artistic experimentation, frame 1 should now contain an image. In order to see it move, set the LAST frame to 1, (same as the FIRST frame), and hit "A". Your masterpiece will slide along the top of the screen from left to right, until you hit any key. Stop the animation now by pressing ANY key.

You saw your creation move across the screen, but it didn't have any motion of it's own. This motion is created by sequencing through many DIFFERENT frames, rather than by simply redisplaying the same one over and over. First, you will need to place copies of your first frame into many of the frames after it. The TEMPORARY FRAME STORAGE REGISTER is itself a storage frame. It is a place into which a frame may be copied. To place your first frame into TEMP, touch the arrow pointing down into the TEMP box. The computer will "boop" to indicate recognition of this action. The computer will wait to be told which frame to copy. Indicate frame 1 by pointing to the light button below the number 1. After the usual "boop" you will see the image you designed in frame 1 appear inside the TEMP register! At all times you can see the contents of the TEMPORARY REGISTER. To copy that image into the other frames, touch the arrow which points OUT of the TEMP box. After the "boop", indicate which frame is to receive the TEMP image. The image in TEMP will then appear in the frame of your choice.

Additional copies of the TEMP image may be copied into the animation frames above by repeating the process. Touch the OUT-going arrow of the TEMP box (the one on the left), then indicate where the TEMP image is to be placed. This process may be repeated as often as required.

To create an animated sequence from here, use the zoomed-in edit mode to modify each image in some way. REMEMBER --- reset LAST to some frame number other than 1 or you will not be able to single-step to other frames.

Use everything you have learned so far to create a multi-frame animated sequence. Use the TEMP storage register to make several copies of your original frame, put them into frames 2, 3, 4, 5, 6, etc. Modify each to create a flowing animation. We will conclude this discussion of ANIMATOR by illustrating how your animated sequences may be saved onto the floppy disk for later recall and use.

#### Saving Animations to Disk -

Once a page of animation frames have been created, the entire page may be saved onto one of your own floppy disks. This allows you to create collections of animated sequences, or save some unfinished work for completion at a later date. We will assume the frame array now contains an animated sequence to be saved onto the disk. First, the DISK STORAGE symbol must be present in the lower left corner of the screen. If you've been using the TEMP register, you will need to switch back to DISK STORAGE mode by pointing to the word DISK near the symbol box. When the computer has recognized your selection, the image in the box will be replaced by the words DISK STORAGE.

As you may have already guessed, touch the arrow which is pointing FROM the frame array INTO the DISK STORAGE symbol. After the confirmation pause and "boop", the words SAVE AS: will appear in the center of the screen. With the proper diskette in your disk drive, type the filename which you wish to use for saving your animated sequence. Remember to put the ending ".ANI" onto the name as a clue to yourself about the type of data stored in this file. If you do not wish to use the disk drive which was last used (the default disk drive), add the final ending ",D1" or ",D2" to the filename to specify drive-one or drive-two. (See your DOS 3.3 manual for more on filenames, slots and drives.) End this filename construction by hitting RETURN. The specified drive will light-up, spin and make all those clanking and scratching noises which indicate data is being saved. When successfully completed, the happy warble noise will sound, and your entire animation screen (with whatever it contains), will be saved into a 12-sector, 3K, file. If you've been slaving for long hours toward the perfection of your animation, it may be wise to save a backup copy of the animation screen to another diskette, or save a second copy with a different name to the same diskette. For example, if the first filename was MY OWN PICTURE.ANI, you could save a second copy on the same diskette as MY OWN PICTURE.ANI.BAK where .BAK is short for BAcKup.

If DOS 3.3 has any problem saving the animation images, you will receive the appropriate error message, and be given the chance to correct the problem. As always, if you decide to abort the file save, simply hit the RETURN key before typing any file name.

#### Animation Screen Menu -

Nothing has been said about the lower right area of the screen. The images there serve two functions. They are both a reminder of the keys which may be hit to command ANIMATOR's various actions, and they are, themselves, light buttons which may be hit instead of the keyboard keys. The MAIN MENU and QUIT buttons function as labeled: MAIN MENU immediately returns control to MENU, from where you can select any other application program. The QUIT selection exits ANIMATOR, leaving you in command mode of Applesoft.

The ANIMATOR program DOES have limitations ... and they would be crippling liabilities for a general purpose animation tool package introduction. Never before has the magic of true animated action been created so easily. Never has animation been available to so many. We feel that ANIMATOR serves its purpose beautifully, but at the same time, we're not unaware of the possible extensions to this idea. Remember that ANIMATOR is written entirely in Applesoft and PENTRAKtm. We, therefore, faced some strict limitations, but you do not have the same restrictions. To use the ".ANI" files that you created with the ANIMATOR EDITOR in your own programs, see APPENDIX E. There are some tips for setting up the file for use with your own program.

This concludes the section on Applesoft application programs. The next chapter will cover what we've all been waiting for:

#### MULTIDRAW.

# MULTIDRAW 1.0

## MULTIDRAW

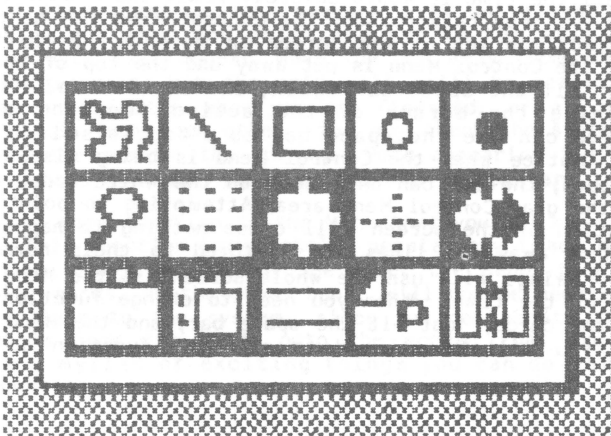
The MULTIDRAW program is a complete, Hi-Res drawing tool which simplifies the creation of complex schematic diagrams, flow diagrams, electrical, logical, and architectural drawings. You can use MULTIDRAW to build symbols that you use in your everyday diagrams, and save these symbols in a 'card deck' to be used in all your other drawings. When you need to use these images again, just load the specific card deck into the MULTIDRAW system, and 'float' the images into place on your drawings. The number of card decks available is limited only by the number of diskettes you have.

Run the MULTIDRAW program from the MENU by pointing to the white box to the left of the word "MULTIDRAW". When the MENU program sees the pen pointed to the MULTIDRAW box it will show you the two choice boxes at the bottom of the screen. One of the boxes has the name "MULTIDRAW", while the other has the word "ABORT". If you point to the ABORT box, you will be allowed to run any of the other available programs, but if you point to the MULTIDRAW box, the MENU program will load and execute the MULTIDRAW program.

The MULTIDRAW program first loads all the necessary files into the computer's memory. These files include all the files on the disk with the suffix ".MD". When all the files are loaded, MULTIDRAW will display the Hi-Res page with the Control Menu showing. You will notice that the function Menu is on the top right corner of the Hi-Res page. The left side of the gray area is empty and will remain empty until you signal MULTIDRAW to display the CARDS.

NOTE: DO NOT REMOVE ANY OF THE FILES WITH THE SUFFIX ".MD" FROM THE DISK. IF YOU DO, YOU WILL BE UNABLE TO RUN THE MULTIDRAW PROGRAM.

NOTE: MULTIDRAW REQUIRES YOUR COMPUTER TO HAVE 64K OF RAM MEMORY AND APPLESOFT IN ROM. APPLE /// OWNERS WILL NOT BE ABLE TO RUN MULTIDRAW.



## MULTIDRAW MODES

MULTIDRAW supports many different drawing modes. Each of these has a specific function. By combining the different modes a user can create almost any drawing conceivable. Drawings may be saved on disk, or printed on paper. Images created can also be saved, and text may be applied to that drawing in many different type fonts, or creative individualized fonts.

There are six major states in MULTIDRAW: Command, Cards, Frame, Draw, Zoom, and finally, I/O. Each has one or more functions. Many of these functions are alterable. Some modes work alone, some join together with others to perform more sophisticated tasks, and finally, one state is used to call up all the other major states. This is the Command mode.

### COMMAND MODE

The backbone of the MULTIDRAW system is the Command mode or Main Menu. While here, the user can access all other states. The Command mode is active when the Control Menu is being displayed on the top half of the MULTIDRAW screen. The user can select various functions and options from the Control Menu by pointing the pen to the specific function and holding it there until the border around the symbol starts to flash. Notice that only functions will have flashing borders. When you point to an option it will make a polite click, but will not flash the border. You need only point the pen at the symbol for a short time. MULTIDRAW will sense the pen within a fraction of a second. The user can tell which functions are active by looking at the Menu and seeing which symbols have flashing borders. If no symbols are active the complete Menu area will have a flashing border. This is to alert you that there is no active mode, and one must be selected. Functions are activated by pointing to the appropriate symbol.

The Command mode is always active. This way you can change from one mode to the other very easily. If the Control Menu were to be displayed all the time it would severely limit the amount of screen you could draw on. For this reason, the Control Menu can be put away if the user needs the top of the screen to work on. By hitting the space bar once the Control Menu is put away and the top of the screen is displayed. Hit the space bar again, and the Control Menu will appear, flashing the border of the active function or mode. Therefore, you can use the space bar as a toggle switch for the Control Menu. Notice when the Control Menu is being displayed the lines are clipped, the pen can only draw on the white area, and will not track on the gray Control Menu area. Attempting to point the pen at a gray section of the screen will cause nothing to happen. When you put the Menu away the lines are restored to their normal size. Most of your drawings will use the whole screen, so the Menu will be put away most of the time. When you need to change functions or get an image off the cards, just hit the space bar, and the Menu will be displayed and you will be allowed to select a function or use the cards.

There is another way to access the section of the screen which lies underneath the Control Menu and utilizes the screen slew located in the middle box on the bottom row of the Menu. Point to the top third of this symbol to view the top half of the page below the Control Menu. Point to the middle of the symbol to view the middle of the Hi-Res screen. This section of the screen will be displayed below the Control Menu. And finally, point to the bottom of the slew symbol to view the bottom of the screen. This is the default setup and is the way you see it when the system is booted up.

It does not matter what section of screen is set for viewing when you toggle the Control Menu. Whenever the Menu is put away, the screen is set to normal. As soon as the Menu is called by the space bar, the current viewed area will be displayed below the Menu.

While the Menu is being displayed you can change functions, modes and options. The options are the same as those used in the TRACK Command in the PENTRAK system. These options include: cursor on/off, lines on/off, grid on/off and so on. Each of these options are toggles and will not have a flashing border. When MULTIDRAW sees the pen pointed to one of the TRACKING options it will make a polite click, signaling to the user that it has understood your command. When you return your pen to the white screen you will notice that the option you chose is now active. For example, if you point to the cursor symbol on the Menu the cursor will be toggled on and off. This is useful if you need to use the lines for lining your symbols up, yet you do not need the cursor because you are on a white screen. If you should point the pen at the lines symbol, the lines will be toggled on and off. When you point the pen at these symbols the borders will not flash, yet you will here a clicking sound. This sound indicates the option you chose has been implemented.

Another feature you are all familiar with is the grid feature. This option allows the user to set up a grid for drawing perfectly straight lines. This option enables you to draw as if you were drawing with a T-Square. Each point will be automatically lined up with the closest pixel in the grid. The grid dots are mapped 8 pixels from each other. When you point to this option, like the cursor and lines options, the borders will not flash, yet you will here a click and when you point the pen to the white area of the screen, the dots will appear. Move the pen away from the CRT and the dots will disappear, yet the grid will still be active. Be sure to toggle the grid switch when you are finished, or all lines will be mapped 8 pixels from each other. You may check the status of the grid by pointing the pen on the screen. Dots appearing indicate the grid is on. No dots symbolize the grid and map options are turned off.

One more function in the Menu that you all know is the negate function. This function immediately negates any image on the drawing screen. Even though you cannot see under the Menu, that area is also negated. The cards, on the other hand, will not be negated. This adds a certain flair to the system, since you can negate the screen and move symbols from the cards onto the screen that are not negated. There are a myriad of exciting things you can do while using the negate function.



The last two options which will be discussed are the color options. These options, like the previous ones, will not flash the borders. They will make the polite click, similar to the click the cursor and lines option buttons make. With your color set to white as you draw lines or rectangles on the white screen, you will notice that the lines are black. This is true only until you hit the '2' or '->' key. Hit the second key, and the color turns to the color you specified in the Menu. Therefore, be very careful when using white.

- ZOOM MODE -

The next mode we will discuss is the Zoom mode. This mode is excellent for working on fine details. For example, you can design your own character fonts, or work on one individual pixel, or even move one pixel around the screen!!! The Zoom mode in effect, is an enlarged view of the area of memory where the pen was pointed. Zoom takes this section of memory and quickly replaces the 40 pixels by 24 pixels of Hi-Res screen with 40 x 24 large pixels on the text page. We will discuss this mode first because many of the other modes will also work while in Zoom mode.

There are basically two Zoom modes. One with which you should already be familiar. This is the 'EASYEDIT' mode. Those of you familiar with the old EASYEDIT program will find the new 'EASYEDIT' mode simple to use. To access this mode, point your pen to the Zoom symbol (the magnifying glass). By pointing to this symbol, like the other functions, the border around the symbol will flash and you will be in the EASYEDIT mode. To use this mode, simply point your pen to the area you want to edit, and then press the 'Z' or '?' key. These are called the Zoom toggles. When you press one of these keys, you will be shown a 40 pixel by 24 pixel representation of that area of the Hi-Res screen. Press either of the Zoom toggles again and you will be zoomed out, back to the Hi-Res screen. While in the "EASYEDIT" mode, point to the area of the screen that you want to work with and press either of the Zoom toggles. As soon as you do this you will be zoomed into that area and will be allowed to edit the pixels one by one. While in Zoom mode you will have a small cursor which will mark your place on the screen. This cursor is a plus sign (+). The plus sign will follow the pen around the screen like the Hi-Res cursor. Move the pen around the screen, and this cursor will follow the pen and position itself in the exact pixel that it is pointed to.

To toggle (or change the state of) a pixel, point your pen to the pixel you want to change. While your pen is pointed to a pixel the plus sign will be displayed on that pixel. Should you desire to change its state, press the '1', '2', '<-', or '->' key. This will change the pixel from black to white or from white to black. While in Zoom, each pixel has only two states, black or white. Change from one to the other by hitting one of these toggle keys. Unlike the old "EASYEDIT" program where you pointed to the pixel and it automatically changed, the 'EASYEDIT' option of MULTIDRAW is much too fast and requires that you hit one of the keys to toggle the pixel. To leave the Zoom mode hit the 'Z' or '?' key. You will now be viewing the Hi-Res screen.

The other Zoom mode is used while in other functions, like Sketch, Frame, Lines and so on. While in the other modes, you may hit the 'Z' or '?' toggle keys and you will then be able to Sketch or Frame, etc. in Zoom. This Zoom function will be discussed in each of the respective sections.

While in Zoom you can display a different section of the screen in one of two ways. One way, naturally, is to leave Zoom by the Zoom toggle keys and then reZoom. The other way is called slewing.

Since there will be times when you might want to look at an area very close to where you are, yet it would be difficult to jump out of Zoom, move the pen to where you want it, and then reZoom. For this reason we added a Zoom screen moving function. This is called slewing. This function will allow you to move the screen around inside the Zoom mode. To do this, simply point your pen to a section of the screen and HOLD down your shift key. Now move the pen around. Notice while you are holding the shift key, the screen actually seems to move around. If you release the shift key the screen will again lock into place, and you can work on that section of screen in Zoom mode. To move from one side of the screen to another, just point the pen, hold the shift key, move the pen, release the shift key, and repeat. You can repeat this operation from one side to the other, or up and down.

Many computers do not have shift key modifications. For this reason, we have incorporated another method of using the slew feature. For those without the shift key mod, you can hit the space bar once. This will activate the slew function. When you hit the space bar again the slew function will be turned off. Try to move the screen around with the space bar for practice. By the way, those of you who do have the shift key mod, can also use the space bar or your open apple key, or a paddle button.

NOTE: Although it is necessary to point to the Zoom symbol in the Menu when using the EASYEDIT function, you MUST NOT point to the symbol if you want to do other Zoom work. Doing so while in other functions deactivates the original function. For example, if you want to Sketch or move in Zoom, DO NOT point to the Zoom symbol.



- DRAW MODE -

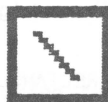
Draw mode can be accessed by pointing the pen to any of the Drawing functions. There are three Drawing functions available to the user in the Control Menu. These functions are Sketch, Lines, and Rectangles. Each of these functions take a different approach to drawing. The Sketch function will allow freehand drawing, while the lines will generate what we call rubber-banding lines, and the rectangles generate rubber-banding rectangles. You can select each one by pointing to that function.

- SKETCH -

The first one is the Sketch function. This function allows freehand Sketching to be done on the MULTIDRAW screen. Pointing to the Sketch symbol causes the border around the symbol to flash and the Sketch function will be active. While in the Sketch mode, the pen is either down (like an ink pen on paper), or up, which is like lifting your ink pen off the paper. To put the pen down press either the '1' key or the '<-' key. These keys are toggle switches and it is not necessary to hold them down. With the pen down, you can move it around the screen and a line will follow the pen's point around the screen. The line will continue to follow the pen point until the pen is picked up by pressing the '2' key or the '->' key. Should you lift the pen away from the CRT and then put it close enough to the CRT, a line will be drawn from where the pen was when you lifted it, (the point where you hit the '1' or '<-' key), to where you just pointed it. Therefore, be very careful when moving the pen away from the CRT screen unless you hit the '2' or '->' key.

The Sketch function can also be used while in Zoom mode. To use the Sketch function while in Zoom mode, select the Sketch function with the pen, and then point to the area you want to Sketch. When you are pointing to that area, press the 'Z' or '?' key. These are the Zoom toggle switches. When you press one of these keys you will be Zoomed into a 40 by 24 pixel area, showing the area where you were pointing as you hit one of the Zoom toggle switches. If you press one of these keys again you will be back to the Hi-Res screen in the same place where you were originally pointing. The Sketch function is identical whether in Zoom or on the Hi-Res screen. When in Zoom you can easily Sketch over both black and white pixels. The same keys work to lift the pen up or put the pen down. Always stop sketching (press the '2' or '->') before toggling into and out of zoom mode.



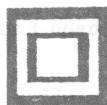


## - LINES -

The second function is the Line function. This function can be activated by pointing the pen to the Line symbol until the border around the symbol flashes. While the Line function is active, like the Sketch function, the '1' or '<-' keys are used to put the 'pen down'. When the pen is put down it uses that point on the screen as the starting point for the line. When you move the pen around the screen you will notice that a black straight line follows the pen point. This line does not stay down, but can be moved all over the screen. This line is called a rubber-banding line, because it seems to be stretching like a rubber band. The line will continuously follow the pen's point. This is called stretching the line. In other words, after you set the starting point, you can stretch the line anywhere on the screen. The line will not be permanent until the user hits either the '2' or the '->' key. At this point, the line will be drawn in the current color from your starting point (where you hit 1) to your ending point (where you hit 2). You can repeat this operation as many times as you like. If you are stretching a line and decide that you do not want to stretch from the original point, you can hit '1' again and the line will reset its starting point to your new '1' coordinate.

Like the Sketch function, you may also use the Lines function in Zoom mode. To initiate the Zoom Lines, point to the Lines symbol on the Menu. Point your pen to the area of the screen you want to Zoom in on. Press the 'Z' or '?' toggle keys to then Zoom in on the area. You will notice while Zooming with lines, you will see crosshairs following your pen around, not a cursor. These crosshairs will help you place your lines while in the Zoom mode. You make lines in Zoom exactly as you would while on the hires screen, using the '1' and '2' keys to set the starting and ending points of the lines. There is no need to worry about jumping out of Zoom while the Lines feature is on, because the lines will not be permanent until you hit either the '2' or '->' key.

Remember, while drawing white on a white screen, the lines will stretch in the opposite color of the screen, yet they will be drawn in the current color.



## - RECTANGLES -

The third and final function in the Drawing mode is the Rectangle function. This function, like all the others, is activated by pointing the pen to the Rectangle symbol until the border around the symbol is flashing. Again, like the other drawing functions, you must use the '1' or '<-' to initiate the starting point. When you hit the '1' key, the first point of the rectangle is established. Once the first point is established you can use the pen to move the rectangle around the screen. This is called stretching the rectangle. It is exactly like the Lines function above. The black rectangle that follows the pen is changing its shape as you change the position of the second corner. The position of the rectangle is changed each time you move the pen. The position will continue to be relative to the original point (the point where you hit the '1' key) until you set the rectangle down. When you get the rectangle to where you want it, press the '2' or '->' key. This will lock the coordinates of the rectangle's opposite corners and place a rectangle in that spot in the current color. Like the other functions, this one is deactivated by pointing the pen to another symbol.

You can make rectangles in Zoom as well as on the Hi-Res screen. The procedure is the same in Zoom as it is on the Hi-Res page. Like the Lines function, you do not need to worry about going in and out of Zoom because the rectangle is not permanent until you hit the '2' or '->' key.

## - CARDS MODE -

One of the most useful and unique features of MULTIDRAW is the Cards concept. In this mode the user has the advantage of having four file cards on which to hold images and symbols. Together these four cards make up a deck. The cards were developed for two main reasons. First, to give the user ample room to work rather than just on the Apple Hi-Res page. Secondly, to allow one to customize his system for one or more particular tasks. The cards are actually specific sections of memory which can be used to store images and symbols that are used frequently. For example, a user can put electrical logic-gate symbols in one card, different resistors and capacitors on a second card, and type fonts on another card.

To "open" the Cards, point the pen to the Cards symbol. You will notice when MULTIDRAW sees the pen pointing to this symbol, it will immediately display the cards to the left of the Control Menu. You are in the Cards mode once you observe the cards being displayed. By pointing the pen once again to the cards symbol the cards will be put away, which means they will not be displayed. Not displaying the cards does not erase them in any way. They are simply not visible on the Control panel. While in the Cards mode the user may choose to have the cards shown along with the Control Menu, or like the Control Menu, he can put the cards away by hitting the space bar. The cards are located on the left side of the Control Menu and work with the same space bar toggle.

The user can access any of the current cards by pointing the pen to the card's tab. For example, if the user needs an image from card 'C', all he has to do is point the pen to the tab of card 'C' and card 'C' will become visible. The user may determine which card is being displayed by looking at the card and seeing which tab is connected to it. To change from card 'C' to a different card, point the pen to the card tab for the card you need.

As mentioned before, there are four cards in a deck available for use. There is no limit to the number of cards a user can have because he can load and save any deck of cards from the disk. To access a different set of cards, you must first activate the Filer mode, and then specify loading or saving cards. This procedure will be discussed in detail in the Filer section, which concerns disk I/O.

The power of the cards becomes apparent when the user sets up specific images that he uses frequently and copies the image from the cards to his drawing. This way he does not have to redraw each image. He can reach into the cards, pull the image he wants, and place it anywhere in his drawing. For example, an electronics designer can build most of his symbols at one time. He can then save these symbols as a card deck until he needs them in a drawing. Once the cards have drawings on them, they should be saved to disk.

NOTE: Unless the cards are saved to disk they will not be permanently saved. The cards being displayed by the program are in memory only and will be erased as soon as the computer is turned off. So please remember to save those cards that you want to use again.

You are free to draw on the cards (and in Zoom too!) just as on the main screen. If the symbols you are using are bigger than the cards, it is very easy to save the symbol in pieces on the card, and then reassemble the pieces when you are ready to use them. The next section on Framing will explain how to move images from the picture to the cards, and recall images from the cards.



- FRAME MODE -

We will now look at the most powerful feature of the MULTIDRAW system, the Framing Mode. The Framing mode has many variations. One of the functions is to take an image and float (move) that image anywhere on the screen. Another function allows you to frame an image and move it over an existing image. Still another function allows you to use the frame to stretch or shorten an image. There are many other things you can do while in Frame mode. We will discuss each one in detail.

The first concept to grasp is the frame. On the screen of the computer are images you have created. When you frame an image, you tell MULTIDRAW exactly where the image starts and where it ends. A frame is an area of the screen in the shape of a rectangle. It has four sides and four 90 degree angles. By telling MULTIDRAW where two opposite corners are, it can calculate what is in that frame and remember that image. The way to do this is simple. First, we must activate the Frame mode. Point the pen to the Frame symbol until the border flashes. Once the border is flashing we can begin our frame.

Choose the beginning of the frame by pointing the pen to one corner of an imaginary rectangle enclosing the image. After you are satisfied with the placement of the point, press the '1' or '<-' key. This will mark the first point of your frame. MULTIDRAW leaves dotted lines there to assist you in marking your framed area. Point to the opposite corner of the frame. Press the '2' or '->' and MULTIDRAW will remember the dimensions and the image contained in the frame. To release the frame you must press the '1' or '<-' key. This will release the frame and MULTIDRAW will forget the image that was in that frame.

After you have established a frame, there are several things you can do with it. First of all, you can move the frame one pixel at a time and line it up anywhere you want. By using four keys you can move the frame in any direction. The keys are the Apple Edit Keys I, J, K, and M. Pressing the I key moves the frame up one pixel. Pressing the M key moves the frame down one pixel. By pressing the J or K key the user can move the frame left or right, respectively. Note when you move the frame around, it will erase whatever image the frame is being moved over. Also, when using the keys to move the frame, if there are black pixels on the border of the frame they will be replacated along the path of the frame. We will look at these two by-products of the Frame mode later in this section.



The second operation you can perform with a frame is floating the image to another section of the screen. Do this by first setting up the frame, then instead of pressing one of the directional keys, press the '2' or '->' key again. This will lock the frame to the pen point. As you move the pen the frame will lock its bottom right point to the point of the pen. While the frame is locked onto the pen point you can move it anywhere on the drawing screen. You can also move frames from drawings to cards, and from cards to drawings. To set the image down, point the pen so the frame is exactly where you want it, then press the '2' or '->' key. Doing this sets the image down at that point on the screen. When you hit the '2' key the second time, not only does the frame lock into place, but MULTIDRAW also forgets the frame. In the event you want to move that same image again you will have to reframe it. Notice that you did not actually MOVE the image, you just copied the image to the new area. Also notice, when you take an image from the cards to the drawing, you will not see the image as the pen crosses the Control Menu, but will recover the image when the MULTIDRAW sees the pen in the drawing area. This same rule applies when the user is taking an image from the drawing area to the cards area. Should the pen be pointed to an invalid area on the screen, it will not show you the framed image.

You cannot set an image down in any of the gray areas or in any part of the Control Menu. If by chance you frame an image and then decide you do not need that image, just press the '1' or '<-' key again and the frame will disappear and MULTIDRAW will forget the image that was in that frame.

Although the frame may meet your needs it may not be in perfect alignment. If this is the case, pull the pen back so that MULTIDRAW does not see the pen; you can then use the directional keys to place the image exactly where you want it. Once it is perfectly aligned press the '2' or '->' key. This will lock the frame into place. If perhaps, you decide you do not need the frame after all, just press the '1' or '<-' instead of the '2' or '->' key, and the frame will disappear.

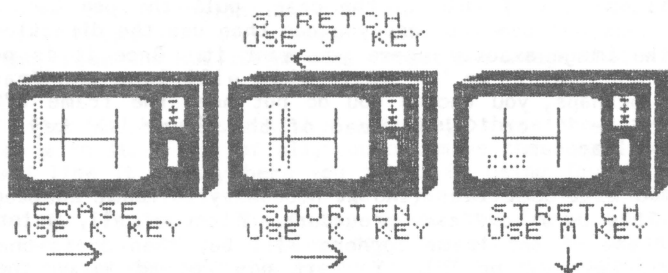
You will sometimes find it necessary to frame an image while in Zoom. This is a very easy procedure. First of all, point to the area where one of the frame corners will be, then press one of the Zoom toggle keys ('Z' or '?'). You are now Zoomed in on the image, and you will notice that the crosshairs are still following the pen point. Point to the exact corner of the frame and press '1' or '<-'. This will set the first corner and leave lines to designate the frame corner. Now move your pen to the other corner of the frame. Remember, you can move the screen if you need to by using your shift key (or space bar for those without shift keys). When you get to the other point, hit the '2' or '->' key. This will lock the frame in place and allow you to move or float the frame.

You may want to frame an image in Zoom and then float it onto the Hi-Res page. This is also effortless. Frame the image as you did in the example above, and after framing, hit the '2' or '->' key to float the image. After you hit the '2' or '->', you can hit the Zoom toggle switch and you will be floating the image on the Hi-Res screen. To place the image down in Zoom, hit one of the Zoom toggle keys, and then use any of the other framing options while in Zoom.

Some points to watch out for while floating and moving images are: 1. When using the keyboard, the image being moved will erase any image it is being moved over; and 2. When an image is being floated with the pen, it will not erase the image that it is being floated over, but will XOR itself onto the area where you press the '2' key.

Some of the by-products of the Framing Command produce surprising results. One adaptation with the Frame mode is to stretch or shorten an image. For example, if you have a picture of a ship and you would like to see what the ship would look like if it were longer, you can frame half the ship and by using the directional keys you can actually stretch the image up, down, right or left. This can be a very useful feature in the creation of diagrams because if a line does not fit in its place you can stretch or shorten it to fit.

The shortening feature works in the following manner. Let's assume we have a black horizontal line in the middle of the screen, and there are two black vertical lines perpendicular to the horizontal line. Our problem is that we need the horizontal line to be thinner. The first thing to do is frame the left vertical line, making sure to include at least one white pixel to the left of the line. By including the extra white pixels in the frame we will be sure to keep the background color white. Now that the frame is established, press the 'K' key to make the frame move right. As the frame moves the horizontal line continues to get shorter. You can use this routine to make images fit in places, or to elongate an image.



Another interesting by-product of the Framing mode, is the erasing feature. By framing a section of white and moving that frame with the directional keys, you can erase an image from the screen without having to erase the whole screen. This is easily accomplished. For instance, using the above example, we can frame a long vertical line to the left of the image. The frame should be as high as the image or higher. Once the frame is established, you will be able to move the white frame with the 'K' key. As you move the frame you will see that the frame is erasing the image to the right of it.

Using the same principle, we can also stretch an image. We can make lines, boxes, and rectangles longer, and much more. For example, to make a line higher, first frame a part of the line at the top. Make sure to include pixels that belong to the line at the bottom of the frame. Now press the 'I' key. This will stretch the line going up. You can do the same thing on the bottom, by framing the bottom of the line, making sure that one of the pixels in the line is at the top of the frame.

As you become more familiar with Frame you will find many other uses for this versatile function.



## MULTIDRAW FILER

The FILER mode enables the user to save and load cards and pictures (images). The FILER allows the user to erase the cards and image, to get a catalog of the disk, and to change the current disk configuration. The FILER is a simplified graphic representation of the flow of information within the MULTIDRAW system. When the FILER is activated it will create a window on the Hi-Res screen. In that window will be a flow diagram. This diagram includes a box with the word "CATALOG", a box with the word "MAIN MENU", a box with the word "ERASE", and other boxes. Two of these boxes are the choice boxes. One of the choice boxes has the word "GO" in it, while the other box has an "X" in it. The "GO" box is the box to point to when you want to proceed with the operation. The "X" box will allow the user to abort the operation.

To access the FILER, point your pen to the small diagram at the bottom right of the Menu. Pointing your pen to this symbol will produce a Hi-Res window and then show you the INFO-FLOW diagram, and the other boxes. You will note that there are two boxes on the left side of the window. These two boxes represent the image (picture) and the cards. The top box is the image box, while the bottom box is the cards box. To the right of the boxes are two arrows. One of the arrows is pointing left to the cards and image boxes, while the other arrow points from the cards and image boxes to the slot and drive boxes. These boxes control what slot and drive the information will be coming from or going to. The two boxes on the bottom are the "CATALOG" and "MAIN MENU" boxes.

To use the INFO-FLOW diagram, simply point to the various things you want to do. For example, with your pen, point to the drive box. When you point to the drive box the box changes the drive number. The drive number will always change between one and two. There is no reason to have other numbers because most users have only two drives per slot. If you point to the box with the word "SLOT #" in it, you will notice that the "SLOT" box will show slots four through seven. This will allow those of you with many disk drives access to any of them.

Now that you know how to change the disk configuration, we will try an experiment. Set the boxes to the proper slot and drive for your configuration. Point to the box with the word "CATALOG" in it. Upon doing this, you will notice that the "CATALOG" box has changed from black letters in a white box to white letters in a black box. White letters on the black background represents the activated function. So far we have set the slot and drive boxes, and have activated the catalog box, but nothing has happened. You must first point to either the "GO" box or the "X" box, (abort box). Now point to the "GO" box. You will see the text screen displayed, and a message will appear at the top that reads "MULTIDRAW CATALOG of S#, D#". The disk will spin and the catalog will be displayed. After the catalog has finished scrolling, another message appears. This message says "PRESS ANY KEY TO RETURN TO MULTIDRAW". When you see this message, press any key. This will reset the FILER window and allow you to continue with your work.

You now know how the FILER works. Simply point to the things you want to do and then point to the "GO" box. If you make a mistake while pointing, you can point to the "X" box and the FILER will reset, enabling you to reset the slot and drive or any of the other boxes. The "MAIN MENU" box works in the same way as the "CATALOG" box. As you point to the "MAIN MENU" box, you will see that box change from black letters in a white box, to white letters in a black box. A box containing white letters is activated and you are ready to go back to the MAIN MENU program (the one that you booted up to). Remember to point to the "GO" box or nothing will happen.

NOTE: Although the slot and drive boxes can have any number in them, the MENU will always be run from the slot MULTIDRAW was loaded from, and drive 1 on that slot. The MENU MUST ALWAYS BE ON DRIVE 1

We have explored the catalog and Main Menu functions of the FILER mode. Next we will examine the IMAGE and CARDS boxes. Both of these boxes start out with black letters on a white screen. When you point to one of the boxes, that box will toggle, making the inside of the box black with white lettering. If you should then point to the other box, the one you just pointed to will now be toggled on and the other one will be toggled off. Obviously, you cannot load both the cards and the image at the same time. You can toggle these boxes all you want, but nothing will happen until two things occur. You must point to the "GO" box, but before that you must choose in which direction the information is to flow. Will it come from the cards or image and go to the drives, or will it come from the drives and go to the cards and image? As you have probably guessed the arrows will serve this function. The arrow toggles to become a black arrow. The arrow that is black is active. If you have a black arrow already and then point to the white arrow, the black arrow will toggle white before the other arrow toggles black. Again, because the computer can only do one operation at a time it cannot send information to the disk at the same time it is receiving information.

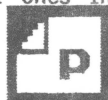
Let's take a look at the "ERASE" box. Point to the "ERASE" box. Like the other boxes, it toggles from white to black, showing that function to be active. You cannot just point to the "ERASE" and point to the "GO" box. You must first decide what you are going to erase. To do this you must point to either the image or the cards box before you point to the "ERASE" box. Once you point to the image or cards, you may then point to the "ERASE" box. Remember, nothing will happen until you point to the "GO" box. If you decide you do not want to erase, point to the abort box (the "X" box).

Now we will load and save. To load from the disk into the system, we must first tell the system exactly what we want to do. First of all, let's load the card deck that came with the MULTIDRAW system. Point to the box with the word "CARDS" in it. When you point to this box, it will change from black to white to white on black. The cards are now in the active mode. We must point to the arrow going from the disk and pointing to the cards box. Point to this arrow and it will turn black. This is now the active arrow. We have selected the cards, and the arrow pointing to the cards, and now we must make sure the slot and drive boxes are set correctly for your system. Any setting that is incorrect must now be changed. After completing your corrections point to the "GO" button and another window will appear in the center of the screen. This window is prompting you for the name of the card deck to load. In this case type "SAMPLE DECK", and press 'RETURN'. Always remember to press 'RETURN' during filename prompts. Pressing return without entering a filename will return you to the FILER. Once you press 'RETURN' the disk will spin and a moment later the system will make a funny noise. This noise signals that the cards have been loaded. To leave the FILER at this time just point to the "X" box.

A similar procedure is followed to load a picture from disk. However, instead of pointing to the "CARDS" box, you must point to the "IMAGE" box. This will load an image from the disk onto the Hi-Res screen. To save pictures and cards use the same procedure, except point to the arrow that is pointing from the image and cards to the disk drives.

The last operation of the FILER is escaping and returning to the MULTIDRAW program. Should you wish to leave the FILER, pointing to the "X" box will first nullify all active functions. Pointing again to the "X" box will return you to MULTIDRAW. If there are no active functions, the "X" box will immediately return you to the MULTIDRAW program. You will find this FILER, like the other ones in the system, very simple to use and easy to work with.

#### PRINTING



The last symbol to cover is the printing symbol. This is the symbol to the left of the FILER symbol. When you point your pen to this symbol, MULTIDRAW will raise the Control Menu and print the contents of the Hi-Res screen. The printing size, proportion, and rotation are all user definable by setting up the specific driver you want to use in the MULTIDRAW program. A list of supported printer and interface combinations are listed in APPENDIX A. The installation procedure is described in the section covering Installation and Checkout.

This concludes the MULTIDRAW documentation. You will find a quick reference at the end of this manual in APPENDIX C. You may use this for quick questions and procedures.

Now we will load and save. To load, you must first call the system ready. When we want to do a revision, we must first call the system ready. When we want to do a revision, we must first call the system ready. When we want to do a revision, we must first call the system ready.

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## PENTRAK 2.0... Reference Guide

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### ----- OVERALL SYNTAX RULES -----

1. BEGIN each PENTRAK statement with the ampersand (&).
2. END each statement with a carriage return (CR) or colon (:).
3. COMBINE any combination of COMMANDS and OPTIONS.
4. SEPARATE each COMMAND and OPTION with a comma (,).
5. SPELL every COMMAND and OPTION exactly.
6. You may ABBREVIATE any COMMANDS which use parentheses.

### ----- COMMANDS -----

#### INIT

##### Initialize:

Presets various PENTRAK options to a known initial state as follows:

- 1> Turns off Click-On-Escape mode
- 2> Sets Mapping to MAP1
- 3> Sets NOMIX
- 4> Sets Vert and Horz Trigger Modes to 0
- 5> Sets the default LINES on and off times
- 6> Sets Glitch Filter coefficient to 10
- 7> Sets Click duration and frequency to 10,20
- 8> Sets Hi-Res Typeface to 0

It is a good idea to INIT at the beginning of every program. Many of the Options to PENTRAK are 'sticky', that is, once specified, the option keeps its value until changed. This was done so that constant option specification would not be necessary. The INIT option essentially tells PENTRAK that a new program is running, and that all options should be reset to their initial values.

10 &INIT :REM SETS ALL VALUES TO DEFAULTS



TP            **Screen Mode Selection:**

TS		
LP	T - Text Pages	P - Primary
LS	L - Low Res Pages	
HP	H - Hi Res Pages	S - Secondary
HS		

These six, two-character commands have two functions: When used outside of the TRACK function parentheses, they cause an immediate switch to that screen display mode. When used within a TRACK function, they activate the Screen-Lift Function and specify which screen is to be viewed behind the main screen. It is now important to realize that there is a difference between the "VIEWED PAGE" and the "CURRENT PAGE". The viewed page is the one that you are visually seeing. The current page is the page where the drawings are taking place. There will be times where the viewed page and the current page are the same. There will also be times when the viewed page and the current page will not be the same. These concepts will be discussed in more detail as we go along.

**CHP / CHS**

**Clear Hi-Res Primary / Secondary:**

Immediately clears the entire Hi-Res page to black. This command erases the complete Hi-Res page, without saving any of the data. Use caution when issuing these commands.

20 &CHS,CHP:REM CLEARS BOTH HIRES SCREENS TO BLACK

**DHP / DHS**

**Draw Hi-Res Primary / Secondary:**

Specifies which Hi-Res page the Applesoft Hi-Res and PENTRAK functions will be working with. Be forewarned that the current page and the viewed page are not necessarily the same thing.

Throughout the discussion of PENTRAK functions and options we refer to the "current Hi-Res page". This has NOTHING to do with which page of memory is currently being displayed and hence seen, but rather refers to which area of screen memory is being DRAWN upon by the various commands. This a VERY important concept, which may be a bit difficult for Applesoft programmers because Applesoft never makes a distinction. With Applesoft, the page you see is the page drawn upon by H PLOT and DRAW. PENTRAK changes this by allowing specification of the VIEWED PAGE (via TP,HP,HS,etc.) separate from specification of the "current Hi-Res page".

30 &DHS:REM DO ALL DRAWS ON HIRES PAGE 2

The Applesoft commands HGR and HGR2 can be used for this function, however HGR and HGR2 also force clearing of the respective Hi-Res page and switch that page into view. For this reason DHP and CHP exist. They do nothing other than specify which screen will receive the attention of the computer's drawing functions whether they be HPLOTS, DRAWS or the PENTRAK functions: TRACK, XLINES, FRAME, WRITE, ZOOM, CLEANUP, and NEG. Note, you can view one page while simultaneously hplotting, xplotting, framing and using other PENTRAK commands on the other non-viewed page. Therefore, be aware of which is the CURRENT page.

## NEG

### Negate:

Immediately negates the entire current Hi-Res Page. By negating the screen we speak of changing the color of each pixel. Black pixels change to white pixels, blue pixels to green, and red pixels turn to violet pixels.

```
40 &NEG :REM TURNS HI-RES PAGE 2 TO WHITE
```

## TRACK(h,v,opt,opt,...)

### Track Function:

This is the main PENTRAK function. It automatically generates a Hi-Res Tracking Cursor on top of the current-drawing Hi-Res screen. This cursor tracks the pen's point and allows pen positioning even on a black screen. The OPTIONS outlined below may all be used with the TRACK mode function and alter its operation accordingly. The full 60 cycle rate allows complete animation and sketching similar to the functioning of the graphics tablet. The first two arguments to the TRACK function, shown as h and v above, are Applesoft variables which deal with the horizontal and vertical position of the pen. The values of the variables MUST be legal Hi-Res coordinates at the time of the TRACK call ( $0 \leq h \leq 279$  and  $0 \leq v \leq 191$ ). The Tracking Cursor initially appears centered at this Hi-Res location and remains there until the Light pen sees CRT light. At that time the cursor immediately moves to the exact position of the PEN HIT. This process repeats and gives the illusion of the Tracking Cursor being locked to the point of the pen.

Tracking must be terminated in some way so that the calling Applesoft program may receive the final coordinate value and proceed with its task. This is accomplished with a technique called ESCAPE MODES. There are many escape modes available with the TRACK and PEN functions. The KEY Escape Mode returns control to Applesoft when any keyboard key is pressed or when either of the paddle buttons are pressed or released. The ZV (Zero Velocity) Escape Mode returns control when the pen has been relatively motionless for the duration specified by the user. The final escape mode is the No Hits escape mode. This mode returns program control when the pen sees no light for a specified amount of screen cycles. When the TRACK mode ends the Hi-Res screen is left as it was and the variables being used for h and v contain the new location of the pen at the instant of the escape.

The exhaustive array of options can be used together in almost limitless combinations. Options exist for showing blinking crosshair lines through the center of the Tracking Cursor; for making the Tracking Cursor dim so the image underneath may be seen through and yet still allow tracking; for specifying only horizontal or vertical lines or horizontal or vertical motion only of the Tracking Cursor; for ignoring erratic electrical noise impulses if the pen must be operated in a noisy environment; for specifying that the resolution of the Hi-Res page should be lowered to allow precise point placement (as on graph paper); for specifying that the right and/or bottom margins of the screen will be reserved for Light Buttons which may be punched at any time by the Light pen for program response; for issuing an audible click upon escaping for the function; and even for eliminating the Tracking Cursor if the screen data will be mostly white with black lines. The various options are described separately below. The word TRACK may be abbreviated 'T'.

An example Track call is:     &TRACK(X,Y,KEY,LINES,CLICK)

This will display a Tracking Cursor at the initial X,Y coordinate, track the pen until any keyboard key is depressed, and there will be a flashing dotted crosshairs passing through the center of the cursor. As soon as a key is depressed, the Tracking Cursor and flashing lines will disappear from the Hi-Res screen, an audible click will be generated, and the variables X and Y will contain the Hi-Res screen coordinates where the pen was pointed when the key was hit. The Applesoft variable KEY will contain the ASCII code of the key which was hit to cause the escape from the TRACK function.

PEN(h,v,opt,opt,...)

**Pen Function:**

The PEN function differs from the TRACK function in that PEN operates in ANY of the Apple screen modes. Unlike TRACK, it assumes that something will be on the screen to be seen by the pen. PEN does not generate a Tracking Cursor, but is a sophisticated method for returning pen locations to Applesoft. The syntax for the PEN function is similar to that of TRACK, and the Escape modes may all be applied in a similar fashion. Essentially, PEN waits for a PEN HIT and returns with the current location of the Light pen. Alternatively, PEN may wait for a keypress or zero pen velocity before returning to Applesoft (see escape options KEY and ZVn). PEN may be abbreviated &P( ... ). PEN uses the same escape options as the TRACK function.

50 &P(X,Y,KEY):REM RETURN X AND Y WHEN A KEY IS HIT

or 50 &P(X,Y,ZV0):REM RETURN X AND Y WHEN FIRST LIGHT IS SEEN

**ESCAPE OPTIONS**

**KEY**

**Key Escape Mode:**

As discussed in the description of the TRACK function above, the optional specification of Escape Modes provides the "triggers" which terminate the PENTRAK function in process and returns control to Applesoft. Escape modes are absolutely essential in TRACK. Without an Escape mode specified, TRACK will NEVER quit. Hitting RESET would be the only out, and this aborts Applesoft's execution as well.

KEY is the most used and useful Escape mode.

-----  
WHEN USED IN THE PEN OR TRACK FUNCTIONS, KEY MUST BE THE THIRD PARAMETER SPECIFIED. IT MUST APPEAR IMMEDIATELY AFTER THE HORZ. AND VERT.VARIABLES. (THIS IS THE ONLY RESTRICTION ON THE PLACEMENT OF OPTIONS TO THE FUNCTION CALLS.)  
-----

The use of the KEY argument, as the third argument to the TRACK or PEN functions, returns to the calling Applesoft program as soon as a key is hit, or the paddle buttons change from the state they were in when the function was started. When control is returned to Applesoft, the variable KEY will have been created, and will have a value which uniquely specifies the reason for the escape.

If KEY is less than 128, a key hit caused the return to Applesoft, and the value of KEY is the ASCII code for the key which was hit.

IF KEY is 128, 129, 130 or 131 then a paddle button change caused the return. The value of KEY can be interpreted as follows:

KEY	BUTNO	BUTN1
----	----	----
128	0	0
129	1	0
130	0	1
131	1	1

The button combinations shown are the new combinations as of the exit time from PENTRAK.

IF KEY equals 255, a key hit did not trigger the escape from PENTRAK, but the ZVn mode returned control. This happened because the pen was held motionless for the specified period of time.

If KEY equals 254, then the No Hits Escape mode triggered the return to the calling program. These last two Escape modes will be explained in detail below.

## ZVn

### Zero Velocity Escape Mode:

The Zero Velocity Escape Mode is the second of the three PENTRAK escape modes. It frees the user from the need to hit ANY keys or buttons to escape back to Applesoft, but merely requires a succession of screen coordinates be received at a single location. In other words, the pen's velocity must be zero for a specified time interval to trigger an escape from the function.

For example, since the coordinates are always being received at the rate of sixty per second, if we require thirty to be received at one location, then the pen would have to be held stationary for one-half second to trigger a return.

This mode of return finds great use in menu selection ... you would not want the computer to pick up the first thing it sees, but would want the pen to come to rest before triggering a menu selection.

Specification of the ZV option takes the following form:

&TRACK(X,Y,ZV30) ...or... &PEN(X,Y,ZV30)

... where the number immediately following the ZV option is the number of screens (at 60 per second) required for escape mode qualification. The general syntax of the specification would be:

&<TRACK or PEN> (h,v,ZVn) : 0 <= n <= 255

... where "n" can be any legal expression which evaluates between 0 and 255. For example, the following call allows the specification of ZV delay in seconds. The number of seconds, or fractions of seconds, is in the variable T:

&PEN(X,Y,ZVT\*60)

PENTRAK will see the ZV, and will then interpret the following formula no matter how complex.

IF, after returning to Applesoft, KEY = 255 then the ZV mode triggered the escape.

NHn

#### No Hits Escape Mode:

The final ESCAPE option available is the No Hits option. Using this option, the user can tell PENTRAK to escape from the track function when it has cycled n times without getting a pen hit. The parameter is the same as the Zero Velocity Escape mode. If the NO HITS escape option is present in the TRACK or PEN function call, PENTRAK counts the number of screen refresh cycles which occur without the pen seeing any coordinates. If this count ever equals the value of the NH expression, PENTRAK will set the Applesoft variable KEY equal to 254 and will return to Applesoft. No Hits options can be used when the programmer wants to make a note to the user to specify that the program is waiting for the user to point the pen at the screen.

IF, after returning to Applesoft, KEY =254, Then the No Hits mode caused the escape.

## TRACKING OPTIONS

Since some drawings are white lines on black background, and other drawings are black lines on white background, there is a need for an adjustable cursor. There are four main tracking options available to the PENTRAK programmer. These options allow the user to change the format of the tracking cursor. While on a white background the pen does not generally need a white cursor following the point around. Therefore, we have the No Cursor option (NC). When NC is used in the tracking command there is no cursor following the pen. Another of our options is the ROUGH TERRAIN cursor. This RT option allows the programmer to have a flexible cursor. The final option is having crosshairs follow the pen point. Each of these options will now be discussed in detail.

## NC

**No Cursor:**

When tracking on a white screen there is no need for a white tracking cursor. When NC is included in the a TRACK function the white Tracking Cursor is eliminated.

```
&T(X,Y,KEY,ZV10,NC):REM TRACK WITH NO CURSOR UNTIL THE PEN IS
MOTIONLESS FOR 1/6TH OF A SECOND (10 HITS) OR ANY KEY IS
PRESSED
```

## RT

**Rough Terrain Track Mode:**

One of the problems with using the Tracking Cursor on a substantially black screen is that much of the picture underneath it is covered. The Tracking Cursor HAD to be this size to allow a reasonable tracking rate across the surface of the CRT, when the CRT is not all white. To prove this to yourself, while on the Apple's text page, hit a series of <RETURN>s until the screen is scrolling up and you are at the bottom, then type the following PENTRAK command line:

```
&INIT,HP,MIXED,CHP,DHP,T(140,96,KEY)
```

This will INIT PENTRAK, switch to the Hi-Res primary screen, specify mixed Hi-Res and text, clear the primary page, and specify that drawing (tracking) is to occur on the primary page. Next, TRACK's Tracking Cursor will appear in the center of the screen and will track the pen until you hit any key. Don't hit a key yet, just watch the position of the cursor as you track across the screen at increasing speeds. You will notice that the cursor begins to lag behind the pen's point. Remember, the cursor's position is being updated at the full screen rate 60 times per second. Even so, if you move the pen too fast, you'll LOSE the Tracking Cursor. We conducted many tests with cursor size before arriving at this size. You would not want the cursor to require any slower tracking than it does currently, but any decrease in size would result in



the pen losing the Tracking Cursor at a much lower velocity.

However, we found an answer!!!!

#### ROUGH TERRAIN TRACKING

The real problem is not the size of the cursor, but the amount of screen covered. If the terrain over which the pen is being drawn is rough, that is, if there is a lot of information there, it becomes necessary to see underneath the cursor WHILE you point at some detailed location. TRACK's Rough Terrain Tracking option solves this problem.

If the pen is being pointed at some detail on the screen, it is not being tracked anywhere near full velocity. This means that the cursor does not really need to be present all of the time. If it went away for a short time, then came back to see if the pen had moved, the user could see the picture most of the time, and the pen could see the cursor only when it really needs to. If the pen started moving fast, the cursor would need to be on more, and possibly on steadily. But, when the pen slowed down, and if it seemed that it was slowed down to stay, the cursor could again begin flickering. Believe it or not, we did all that!!! It's called Rough Terrain Tracking, and it is triggered by an "RT" in the TRACK command:

```
&TRACK(X,Y,KEY,RT)
```

If you hit a key now to exit that last tracking experiment, you'll notice that the computer is unhappy about something you typed. We specified the h and v to TRACK with numbers rather than with the variables TRACK requires. We did this so we would not have to say: X = 140 : Y = 96 first to setup the starting position for the Tracking Cursor. When PENTRAK tried to store the final coordinates of the pen into the NUMBERS 140 and 96 it naturally had a problem. You can try out the RT option in a similar manner as above.

We like setting up the screen as above, because you can see what you're typing and its effect on the Hi-Res screen at the same time.

The result achieved with the RT option is all anyone could desire given the constraints and tradeoffs.

```
&T(X,Y,KEY,NH200,RT):REM TRAC' OVER BUSY SCREEN
```

**LINES****LINES(on,off)****Lines Option Mode:**

Frequently, the Light pen needs to be aligned with some other point on the screen of the Apple. By providing precise horizontal and vertical dotted flashing lines running through the center of the cursor, the alignment task is made much simpler. By specifying LINES, PENTRAK will do all this for you.

&T(X,Y,KEY,LINES)

This will generate the lines, flashing at the default rate of 4 screens ON and 2 screens OFF. The cycle time is then 6 screen times, which at 60 screens per second would be 10 flashes per second. This too may be altered by the programmer. Whenever the LINES option is followed by parentheses, the ON time and OFF time is set. This allows the flashing rate or the relative ON to OFF time to serve as a visual cue to the user. Both these formats are acceptable:

&LINES(10,10) ...or... &TRACK(X,Y,ZV30,LINES(1,1))

There is a special case for the LINES option which allows the lines to remain ON until they must move to another location. If the OFF time is set to zero, the lines will not flash, but will stay visible continuously.

Once the flashing rate has been specified, it remains until explicitly changed. Thus, once the command &LINES(1,0) has been given, the non-spec usage &TRACK(X,Y,KEY,LINES) will have non-flashing lines. This is an example of a good reason to issue the &INIT command at the start of every program. &INIT resets all of the 'sticky' options to their initial default values and conditions.

LINES generates very sharp looking, professional displays. (It wasn't easy to do either !!!)

&T(X,Y,KEY,LINES,NC):REM TRACK WITH CROSSHAIRS AND NO CURSOR

**HLO / VLO****Horizontal / Vertical Lines Only:**

Specifies that only one of the normal two lines (either the horizontal or the vertical) is to be drawn. This option is useful in both TRACK and XLINES functions.

&T(X,Y,KEY,LINES,NC,HLO):REM TRACK WITH NO CURSOR AND JUST A HORIZONTAL LINE

## DRAWING OPTIONS:

## SKETCHn:

&amp;TRACK(X,Y,KEY,SKETCHn)

The SKETCH option instructs PENTRAK to draw a continuous line wherever the Light pen is tracked. The line is drawn in the current color as set by the Applesoft HCOLOR= statement. If the color selected for sketching is neither black or white, the sketched lines are drawn in such a way as to guarantee correct sketching with contiguous (non-broken) lines. The SKETCH option REQUIRES an argument in the range 0 to 5. This specifies the amount of realtime POINT AVERAGING to apply to the received coordinates prior to actually drawing the line. Experience has shown better sketching results from averaging across a history of Light pen locations. The new SKETCH program included with the PENTRAK 2.0 software demonstrates this better than words.

(Try it)

The argument following the SKETCH is the log base 2 of the averaging history length. Use the following table:

n	Length
----	-----
0	- 1
1	- 2
2	- 4
3	- 8
4	- 16
5	- 32

RUBLINE  
RUBRECT&TRACK(X,Y,KEY,RUBLINE)  
&TRACK(X,Y,KEY,RUBRECT)

There are two rubber-banding options available to the tracking function. They are Rublines and Rubrect. Rublines allows the user to 'stretch' a line from one point to the other and see how the line would look at all points between. For example, you tell PENTRAK where the first point is located, then use the pen to tell PENTRAK where the other point is, PENTRAK will draw a line from the original point to the point where the pen is now pointed. PENTRAK will continuously draw a line each CRT cycle. Basically, Rublines works like this: You tell PENTRAK where the original X and Y coordinates are located. You then let X and Y equal the starting coordinates. Then you issue an &TRACK command like the one in the example above. When PENTRAK sees the RUBLINE option it will generate an Xored line coming from the original X,Y and stretching to the new X,Y coordinate (where the pen is presently pointing).

```

Ex.      10 &T(X,Y,KEY,LINES):X1=X:Y1=Y
          20 &T(X,Y,KEY,RUBLINE):X2=X:Y2=Y
          30 &HPLLOT X1,Y1 TO X2,Y2

```

This program will first track around the screen until you press a key. As soon as you press a key an XORed line will be stretched from the first key hit to the point of the pen. When you press a second key the line will be HPLOTTED onto the HIRES screen in the current HCOLOR.

#### RUBRECT

Rubrect works in the similar fashion, the only difference being PENTRAK will XOR a rectangle onto the Hi-Res page as opposed to a line. The beginning of the rectangle is again, the original X and Y coordinates. The rectangle can be stretched by moving the pen around the screen. An example of this process is in the BOXES program and also shown below.

```

Ex.      10 &T(X,Y,KEY,LINES):X1=X:Y1=Y
          20 &T(X,Y,KEY,RUBRECT):X2=X:Y2=Y
          30 &HPLLOT X1,Y1 TO X2,Y1 TO X2,Y2 TO X1,Y2 TO X1,Y1

```

This program works much like the one above. The only difference being a rectangle will be plotted, not a line.

#### WRITE(h,v,string)

##### Write Hi-Res Text Function:

Unlike the preceding functions, TRACK and PEN, WRITE has nothing to do with Light Pen functions. It has been provided to ease the creation of meaningful graphics applications. WRITE places text onto the Hi-Res page by XORing the text into the existing image. This means that text automatically appears white on a black background and black on a white background. The FACE function/option allows the specification/selection of multiple character sets which may be used interchangeably.

The characters are completely compatible with the DOS Tool Kit Hi-Res Text, and occupy seven bits horizontally by eight bits vertically. The h and v variables specify the starting upper left-hand coordinate of the first character typed in the string. The string may be any legal, complex Applesoft string expression. The default typeface, FACE0, is loaded with PENTRAK, and is always available without loading. It is built-in. An additional advantage of the XORing operation, is that anything again XORed removes itself from the screen, thus text may be erased in this fashion ... but there is a better way ... (see the FRAME command below).

Examples of the WRITE function are:

```
10      M$ = "NOW IS THE TIME FOR ALL GOOD"
20      &WRITE(140-3.5*LEN(M$),92,M$)
```

This will place the message set in M\$ in the exact center of the Hi-Res screen.

or

```
10      X=100 : Y=100
20      &W(X,Y,"HELLO THERE")
```

This will place the message "HELLO THERE" at Hi-Res coordinates (100,100). (It is not necessary to have a string value in the write command; you can also use literals.) In your programs you can use the write command to type character by character by using this formula:

```
X=X+7 : REM moves output cursor over one character position
Y=Y+8 : REM LINE FEED moves cursor down one character line
```

#### FRAME:

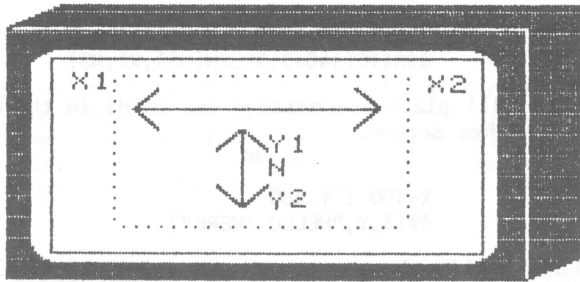
```
Example 1  FRAME(X1 TO X2 AT Y1 FOR n,memloc)
Example 2  FRAME(memloc,X1 TO X2 AT Y1 FOR n)
Example 3  FRAME(B,X1 TO X2 AT Y1 FOR n)
Example 4  FRAME(W,X1 TO X2 AT Y1 FOR n,memloc)
Example 5  FRAME(X,memloc,X1 TO X2 AT Y FOR N)
```

(where memloc is the first address of enough successive memory locations to store the frame)

#### Frame Function:

The frame function, like the WRITE function above, does not have any direct connection to Light pen function, but greatly eases the creation of significant Applesoft Hi-Res graphics programs. Essentially, FRAME allows rectangular windows to be created in the Hi-Res screens of the Apples. Into these windows or frames text or other graphics may be placed. When finished, the window can be 'closed', thus removing the text and restoring the image to its initial condition.

Here is where we will show you the power and flexibility of this very useful command. As noted before, you can use the frame command to make a rectangle one solid color, like black or white. You can use the frame command to store information in and recall that information at a later time. However, in addition to these features, you may also use the frame command to achieve high quality animation, to store image segments and recall them in other portions of your drawing or even on the other Hi-Res page. This is where the sophistication and flexibility of this useful command really shines.



```
&FRAME(X1 TO X2 AT Y1 FOR N, MEMLOC)
MEMLOC= ANY NON USED MEMORY AREA
N=ABS(Y1-Y2)
```

The concept is simple: A Frame is specified by four parameters (see the picture above), X1 is the left-most horizontal coordinate of the frame; X2 is the right-most horizontal coordinate. Y1 is the starting vertical point at the top of the frame, and n is the vertical line count of the frame. Once specified, the data contained within this frame may be moved to any other area in memory, or recalled from a memory area. In the first example (see example 1 above), the frame described is transferred to the linear memory area starting at location memloc. The frame is not changed, it is merely saved. In the second example, a linear memory area is transferred into the specified frame, restoring an image that was previously framed and stored. The third instance above shows the frame's contents being made completely black (the B or W) without its data being saved. The fourth example shows the frame being made white while the data overwritten is being saved starting at location memloc. This would allow text or any other image to be drawn in, and later erased with the original frame data restored by using the second example above. In other words, if a memloc is specified AFTER the frame parameters, the frame is stored at the location specified by memloc. Conversely; if memloc is specified BEFORE the frame parameters, the frame is restored by having the contents of memloc read into the image plane (the frame area).

As can be seen by examination, the "B" and "W" are triggers which specify the frame to be filled with black or white respectively. If a non B or W argument precedes the frame domain specification (as in example 2) the Apple's memory is read out starting at location memloc into the frame and onto the image plane (the CURRENT Hi-Res page). If an argument FOLLOWS the frame specification, the contents of the frame is stored starting at location memloc. It is stored before being optionally made black or white.

Another syntax that is supported is &FRAME(X,memloc,X1 TO X2 AT Y1 FOR N)...(see example 5). Without the preceeding 'X' the command is identical to example 2. The addition of the preceeding 'X' instructs PENTRAK to Exclusive-Or the memory contents into the specified screen area rather than to overlay. This means to XOR the contents of the frame onto the screen, which will turn all white pixels black and all black pixels white.

The PENTRAK 1.0 version of FRAME does not allow complete freedom in the choice of the X location variables (they had to fall on BYTE boundaries) during the restore operation. PENTRAK 2.0 has been enhanced to support all combinations, and complete freedom of X coordinate selection.

The following is an example using the frame command:

First we must define a frame. Using the diagram above, locate the dotted lines. These will be used as the boundaries of our frame. X1,Y1 is the top left coordinate; X2,Y1 is the top right coordinate; X2,Y2 is the bottom right, and the bottom left is calculated if necessary (although in this case it is not important). In our first example we want to save an image on the screen to an area of memory for recall later. We use the third example above to illustrate: &FRAME (B,X1 TO X2 AT Y1 FOR n,memloc). This example saves the image including the boundaries of that frame starting at memloc (an address in memory which has enough room for the frame). You can calculate the length of the frame using the formula in APPENDIX E. Then the inside of the boundaries turn black. Upon inserting the actual coordinates you will see the frame turn black. The information has been saved because the save takes place before the frame turns black. Once our frame is saved off, and colored black, we can write information onto the screen using the &WRITE command. Now that the information is stored safely away, we can recall the information by using the second framing example. &FRAME(memloc, X1 to X2 at Y1 for n). This will restore the picture. Try the same restore but change the X1 to = X1+14 and the X2 to X2+14. The frame will come back 14 pixels over to the right. Now try some more examples. With a little experimentation you will find this command very easy to use.



**OFFSET(X,Y):**

PENTRAK 1.0 did not provide a clean method for the calibration of the horizontal coordinate of the Light pen. In addition, very old Rev.0 Apple motherboards generate a video vertical sync signal which differs significantly from later revs. A provision for setting the vertical Light pen offset is therefore required. The new OFFSET function provides this service.

X=0 : Y=0 : &OFFSET(X,Y) ... example 1.

The PENTRAK driver normally operates with non-zero offsets for both X and Y axis. When, as in example 1 above, the OFFSET is called with variables which are BOTH equal to zero, PENTRAK 2.0 stores the current X and Y offsets into the first and second variables respectively. This allows you or an Applesoft program to readout the current offsets before they are changed.

X=X+1 : &OFFSET(X,Y) ... example 2.

When EITHER of the two variables in the OFFSET function are non-zero, PENTRAK assumes the current X and Y axis offsets are to be set to values of the variables. If the statement in example 2 above were to follow example 1, the result would be an increment by one of the horizontal offset. The Y offset would not be changed.

The CALIBRATE routine included in the MENU program has been updated to provide for REV.0 motherboards and European 50 cycle operation, and is a very good example of using the OFFSET command.

**XLINES(h,v,opt,opt,...)****Xor Lines Function:**

Draws horizontal and vertical dotted lines crossing at any Hi-Res location specified. Lines are drawn by Exclusive-Oring and are erased by a second XLines at the same location. Abbreviate &X(...).

Ex. &X(140,92)

This command will XOR dotted lines precisely in the middle of the screen. A second identical command will remove the lines.

**ZOOM(h,v)****Zoom Function:**

Very quickly zooms any 40h by 24v area of either Hi-Res screen onto the primary text page. Abbreviate &Z( ... ).

Ex. &ZOOM(140-20,96-12)

This command will zoom in right in the center of the screen.

## CLEANUP

### Cleanup:

Removes any 'debris' which the TRACK function of PENTRAK may have left on the Hi-Res screen if RESET was hit by mistake while TRACKING. If the Tracking Cursor or the blinking lines were on the Hi-Res screen at the time, they may be removable. CLEANUP cannot guarantee removal of Tracking debris because it is unable to discern where the program is when the RESET is hit. However, if an image is damaged in this way, CLEANUP represents a ray of hope. In general, always use applications which exit from TRACK mode gracefully, as with KEY or ZV.

## CLICK!(dur,freq)

### Click Mode Function:

Frequently, polite audible feedback helps coordinate complex tasks. CLICK requests that PENTRAK functions TRACK and PEN give an audible Click sound upon exiting (escaping). The default duration and frequency are set for an audible but pleasing response. If the exclamation point is present as shown above, then the Click-on-exit mode is not engaged, but rather an immediate click sound is generated. This can be used for producing an array of special sound effects from Applesoft programs. The Click call may be abbreviated "C" when a duration and frequency are being specified, otherwise it must be spelled out in full.

## HMO / VMO

### Horizontal / Vertical Motion Only:

Occasionally, tracking in only one direction, either horizontal or vertical, can be useful. The two options: HMO and VMO restrict the allowable motion of the Tracking Cursor in either the horizontal or vertical direction. In use, the Tracking Cursor will appear at its initially specified location, and will not move in one of the directions.

The HMO and VMO options are usable with the PEN function. With these options, the range of qualifying pen hits is restricted to a specific horizontal or vertical band across the screen. For details on this see the Glitch Filter discussion below.

10 X=140:Y=170

20 &T(X,Y,KEY,LINES,VLO,HMO,NC):REM TRACK HORIZONTALLY ONLY  
WITH A VERTICAL LINE FOLLOWING THE PEN WITH NO CURSOR

## HTM / VTM

**Horizontal / Vertical Trigger Margin:**

A frequent technique for achieving effective interaction with light pens involves the use of on-screen menus in the form of "Light Buttons". These are ever present visible blocks containing text. They sit out of the way in the margin areas of the graphics screen but can be "punched" with the Light pen as one would punch a button on the panel. The advantages of Light Buttons are clear.

- 1> The light buttons are in the main vision area of the operator and do not require attention to be diverted away from the screen to search for a switch.
- 2> The light buttons are software definable/redefinable. Rather than being assaulted by a confusing array of hardware buttons, the application displays only those choices immediately relevant to the task. They are thus mode dependent and guide the operator through the proper sequences.
- 3> Being defined in software, the button selections can change as the application's evolution dictates.

With Light Buttons being as useful as they are, PENTRAK should hardly be without a provision to facilitate light button interaction. The HTM / VTM options provide this facility.

The HTM option provides a horizontal zone along the bottom of the display screen wherein the Zero-Velocity Escape Mode functions. The HEIGHT of the trigger zone is specified by the value of the argument following the HTM. For example:

```
&TRACK(X,Y,KEY,ZV15,HTM8)
```

This command will activate the TRACK function with KEY Escape Mode active for the majority of the screen area. A Zero Velocity Escape zone will also be created along the bottom of the screen, one character in height. Normal drawing can proceed over the surface of the screen, but if the pen enters the ZV zone, and is motionless for the ZV time (1/4 second), the TRACK function will terminate with KEY set equal to 255. The value for X can be used to determine the point on the bottom of the screen where the pen was pointed.

PENTRAK's built-in Hi-Res text capabilities via the WRITE and FRAME functions, provide a complete facility for the operation and generation of Light Buttons.

The VTM (Vertical Trigger Margin) functions in a like manner to the HTM but the margin is along the right side of the display screen.

The HTM / VTM margins are potentially difficult to keep track of. INIT sets them to zero, but nothing else will if Applesoft does not. To turn the Light Button / Trigger Margins off, simply issue the command: &HTMO, VTMO.

Additionally, the Vertical Trigger Margin also sets the LIFT MARGIN WIDTH for the Screen Lifter option. If the Screen Lifter option is specified, vertical margin zero velocity triggering will not occur. Rather, the VTM option controls the width of the Screen Lifter trigger margin. Therefore, the following:

&TRACK(X,Y,KEY,VTM12,TP)

will activate the Screen Lifter (due to the TP inside of the TRACK parentheses) with a lift margin width of 12 Hi-Res points. Specification of any screen switch command (TP, TS, LP, LS, HP, HS) within the bounds of the TRACK function parentheses activates the Screen Lifter. The instant the pen point is seen, the screen mode is changed to that which was specified.

## DOTS

### &DOTS

By utilizing the &DOTS command you can put mapping dots on the current Hi-Res screen. The dots are placed eight pixels apart. Each dot is XORed onto the screen which means issuing a second &DOTS command will in effect cause the dots to disappear.

Pay close attention when drawing across dots and subsequently removing the dots. Since the dots are XORed they will turn any black pixel in your drawing that falls on the dot to a white pixel, and any white pixel to black. Therefore, use this command cautiously.

## MAPn

### Mapping Option:

Many real-world graphics applications are much more structured than simple freehand sketching. One of the first things seen is the need to reduce the input resolution of the Light pen. This is the equivalent of drawing on graph paper. The graph line intersections are used as registration points, and as endpoints for all images drawn. This has the effect of cleaning up the freehand drawing, since only aligned points are returned from PENTRAK. Imagine yourself drawing with a T-square ... without one.

The MAP option takes an argument which is a power of 2. Acceptable arguments are then 1,2,4,8,16,32,64, and 128. With a MAP setting of n, the points returned by PENTRAK all fall on exactly even multiples of n. No matter where the pen is pointed on the screen, PENTRAK returns the coordinate of the grid intersection NEAREST to the pen's point. The resolution of the grid is n.

The MAP function is very 'sticky'. INIT sets it to MAP1.

## MIXED

### Mixed Mode:

Specifies that mixed text and graphics will be shown whenever the primary Hi-Res page is selected. Using the mixed function you can view the Hi-Res primary page while having four lines of text available to use at the bottom of the screen. You can type commands on the text screen and see the results drawn on the Hi-Res screen. If used with pagetwo, you will see the bottom of text page two, which is nothing but flashing garbage.

20 &DHS,MIXED,HP:REM DISPLAYS HI-RES PAGE WITH FOUR LINES OF TEXT AT THE BOTTOM

## NOMIX

### No Mixed Mode:

Specifies that the primary Hi-Res page will be viewed without four lines of text at the bottom.

30 &NOMIX:REM TURNS OFF THE ABOVE &MIXED COMMAND.

## GFn

### Glitch Filter:

There is no other Light pen System for the Apple currently marketed because Light pen Systems demand intricate design. One of the problems to be solved involves the handling of completely erroneous data points. Any real-world system picks up a certain amount of extraneous noise. In the Light pen System we call these "Glitches". Handled correctly, the user need never be aware of the existence of these glitches. The Glitch Filter is the technique which shields the user from the glitch. This filtering system is so effective and inoffensive that it is active by default at all times. The degree of filtering is continuously variable over the range 0 to 255. The default setting made by INIT is 10. Bigger numbers will cause less filtering and allow more points to be valid.

The only negative effect that might surface with very small glitch filter settings (less than 5) is slowed recognition of the pen's motion. This would affect tracking on both a black and all white screen. The Glitch Filter will refuse to keep up with the pen, confusing the rapid motion with noise, due to its extreme sensitivity at such a low GF setting.

In general, there is little reason to bother with the Glitch Filter. There is only one exception to this rule.

With the HMO or VMO options in use, the target area of the Glitch Filter is artificially locked in the dimension specified. pen hits outside of this target region will be completely ignored. The center of the target area is the location initially specified in the function call. For example:

```
X=20 : Y=0 : &GF4,PEN(X,Y,ZV5,VMO)
```

will create a vertical sensitive bar running down the screen. The bar will begin at X=16 and stop at X=24 and will extend from the top to the bottom. If the pen is within the bar, and with zero velocity for only 1/12th of a second, the PEN function will terminate. This feature can be advantageous for menu option selection on the text page, implementing a vertical line of light buttons centered at X=20.

## FACE<sub>n</sub>

### Typeface Select:

This command simply informs the WRITE function which typeface to write. The default is FACE0. FACE is 'sticky' and is set to 0 (the default built-in face) by INIT. The alternate typefaces may be loaded using the TEXT program, or by using a routine such as the following:

```
10 &FACE1: REM set type pointer to next location
20 TF$="FILENAME"
30 TL=PEEK(37577)+PEEK(37578)*256:REM set TL= to
   starting location of text
40 PRINT CHR$(4);"BLOAD ";TF$;"A";TL :REM load
   typeface into memory
50 REM The following statements rebuild the DOS
   buffers
60 POKE 40192,PEEK(37577):POKE 40193,PEEK(37578)
70 CALL 42964: REM buffers rebuilt
```

This example illustrates how to load the typeface into memory. The first line sets the typeface pointer (TL) to the first alternate typeface (FACE1). Line 20 sets typeface (TF\$) to the name of any typeface. Line 30 finds out the location where the typeface will be located. The next line 40 does the actual loading of the file into memory location TL. And finally, line 60 rebuilds the buffers with new locations under the alternate typeface. Since the typefaces are loaded into memory over the buffers you must remember to rebuild them.

When using more than one alternate set, be aware of the amount of memory used. You can overwrite variables by loading a set in a large program. The default set (FACE0) has only uppercase letters. The alternate sets can have both upper and lower case letters.

NOTE: When using this routine any file that is open at the time of the call will be destroyed.

**MIRROR****Mirror command**

Using the mirror command you can draw on one side of the screen while PENTRAK draws the same image on the other side of the screen. With a vertical mirror you can draw on the right half of the screen and PENTRAK will draw on the left. If you have a horizontal mirror anything that you draw on the top half of the screen, PENTRAK will draw on the bottom. If you specify both mirrors, whatever you draw in one corner PENTRAK will draw in the other three corners.

The mirror command uses the following syntax: `&MIRROR(X,Y)`. The X stands for the X coordinate of the mirror, and the Y stands for the Y coordinate. For example, a command such as: `&M(140,96)` creates a mirror which is both horizontal and vertical with the axis' directly in the middle of the screen. The command `&M(70,0)` causes a vertical mirror at location  $X=70, Y=0$ . This makes a vertical mirror approximately one third of the way across the screen.

To turn the mirror off in all directions, issue the following command: `&M(0,0)`.

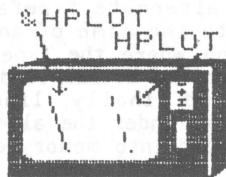
**HPLLOT**

`&HPLLOT expr1,expr2`

`&HPLLOT TO expr1,expr2`

`&HPLLOT expr1,expr2 TO expr3,expr4 [TO expr5,expr6]`

The `&HPLLOT` command is similar to the HPLLOT command of Applesoft. You will find a complete description of this command on page 89 of the Applesoft Basic Programming Manual. The `&HPLLOT` has the same syntax as the Applesoft HPLLOT and they may be used interchangeably. The difference in the `&HPLLOT` command is that the `&HPLLOT` will plot two pixels next to each other when the lines are on different vertical pixels (see diagram).

**XPLLOT**

`&XPLLOT expr1,expr2`

`&XPLLOT TO expr1,expr2`

`&XPLLOT expr1,expr2 TO expr3,expr4 [TO expr5,expr6]`

The `&XPLLOT` command also resembles the HPLLOT command of Applesoft. The difference between the XPLLOT and the HPLLOT command is that the `&XPLLOT` will XOR the line onto the screen. The advantage to this is that anything `&XPLOTTED` onto the screen can be `&XPLOTTED` off the screen using the same command, leaving the screen the same as it was before the original `&XPLLOT`.



## WHERE

**&WHERE X**

The &WHERE X is useful for finding an open section of memory to store temporary data. This is used frequently for inter-program communication. PENTRAK 2.0 has a specific place in memory where it holds 13 bytes open for user storage. To use this storage you must first find the location by issuing an &WHERE command. Issuing the command will cause PENTRAK 2.0 to return an open memory location in the X argument. You can poke data that is to be used from one program to the other.

Ex.

```
10 &WHERE LOC
20 FOR M= LOC TO LOC + 4
30     I=I+1
40     POKE M,A%(I)
50 NEXT
```

## AMPER

**&AMPER X**

The &AMPER command is useful to link your own Ampersand commands with PENTRAK. Should PENTRAK see a command it does not understand, it will send the command and arguments to the routine located at X. This will enable you to have extra machine language commands in memory. PENTRAK will try to parse them. If it is unable to understand these commands it will jump to your X for the second set of routines instead of issuing an error message.

It is best to locate your routines in low memory. This way they will not get over-written by pictures and data. Assuming the routine is small enough, you can put it below PENTRAK and the DOS buffers and then move HIMEM down. However, we recommend you use page 3 of memory 768 to 960 (\$300 to \$3C0 hex).

With the Amper command in use, PENTRAK will not issue an error message if the command is incorrect. It will attempt to parse the command, and if unsuccessful, call the routine in the location you specified. By issuing an AMPER call with no routine in that location, control will most likely fall into the monitor, or cause the computer to "hang".

The AMPER command uses location zero as a special case. If zero is the argument to the AMPER call, PENTRAK will then parse all the commands, and issue a message if it does not understand. This command disconnects your other routine from PENTRAK. This is the default setting of the AMPER command.

## DOSBUFF

### &DOSBUFF X

The &DOSBUFF command allows the user to set the number of buffers he will have available to the system. The &DOSBUFF command is almost identical to the maxfiles command. The only difference is DOSBUFF will allow zero (0) as an argument and Maxfiles will not. This is useful should you require those extra bytes of memory under PENTRAK.

## PENTRAK 2.0 ERROR MESSAGES

The PENTRAK Driver cannot locate the LPS II  
or UNABLE TO LOCATE LPS II

If either of these error messages comes up, the LPS II module is not getting the proper Vertical sync signal. To clear it up:

1. Make sure the gold fingers on the bottom of the LPS II module are clean.
2. If the jumper wire is to be used, make sure that it is clipped to the proper chip and plugged into the pin on the LPS II.
3. Review your work using the Installation guide provided with this manual.

### - COMMAND NEEDS HI-RES MODE

1. Before issuing any of the Hi-Res commands, such as FRAME, TRACK, etc. a DHS or DHP must be issued so PENTRAK 2.0 will know on what page to do these functions.

### - ILLEGAL FRAME PARAMETERS

1. One or more of the arguments in the FRAME command was invalid.
2. Be sure that the left X is less than the right X
3. Be sure that together they do not exceed 279 bits across.
4. Be sure the X arguments are legal Hi-Res X coordinates.
5. Be sure the Y argument is a legal Hi-Res Y coordinate.
6. The n parameter must be less than 192-Y

### - PENTRAK 2.0 SYNTAX ERROR

1. One of the calls or arguments were spelled wrong.
2. One of the calls or arguments were not punctuated properly.
3. Any thing that has an ampersand (&) as the first character, is not a PENTRAK 2.0 command, and the PENTRAK 2.0 AMPER command is off will trigger this message.
4. This message follows the same rules as Applesoft and DOS.

This concludes the chapter on the PENTRAK driver. Generally speaking, the functions are easy to use. However, some require more attention to detail. For safety sake issue an &INIT at the beginning of each program, unless you want the conditions to remain the same from program to program.

----- E N J O Y -----

## PRINTER ROUTINES

=====

There are various print routines available on the market. In this appendix we will describe the lines of code necessary to print the picture should you point to the print symbol from MULTIDRAW. Below you will find various print routines. Locate the one that corresponds with your printer or interface and fits your printing needs from MULTIDRAW. Since there is limited space available in the Apple's memory, copy only that routine which is most used into the MULTIDRAW program. You will have access to all of the others in the MENU program printing routine. After copying the routine into the program, you MUST resave the program back to the disk.

For further information and steps regarding installing the print routine into the MULTIDRAW program, review the procedure titled, Software Installation in the section: INSTALLATION AND CHECKOUT.

NOTE: WORK ON A BACKUP COPY ONLY

The following routines are for any of the these interface cards: GRAPPLER PLUS or SUPER-MX card or MICROBUFFER or any compatible interface with any dot matrix printer.

For standard picture dump normal size no rotation:

```
101 PRINT CHR$(13);CHR$(4);"PR#1":PRINT CHR$(9);"GI":PRINT
CHR$(4);"PR#0":PRINT:GOTO 900
```

For double size picture dump with no rotation:

```
101 PRINT CHR$(13);CHR$(4);"PR#1":PRINT CHR$(9);"GDI":PRINT
CHR$(4);"PR#0":PRINT:GOTO 900
```

For double size with rotation:

```
101 PRINT CHR$(13);CHR$(4);"PR#1":PRINT CHR$(9);"GDIR":PRINT
CHR$(4);"PR#0":PRINT:GOTO 900
```

For standard size with rotation:

```
101 PRINT CHR$(13);CHR$(4);"PR#1":PRINT CHR$(9);"GIR":PRINT
CHR$(4);"PR#0":PRINT:GOTO 900
```

These next routines are for the PKASO card with any dot matrix printer; or any PKASO compatible interface card.

For standard size no rotation:

```
101 PRINT CHR$(13);CHR$(4);"PR#1":PRINT CHR$(9);"32H":PRINT
CHR$(4);"PR#0":PRINT :GOTO 900
```

For medium size with no rotation:

```
101 PRINT CHR$(13);CHR$(4);"PR#1":PRINT CHR$(9);"34H":PRINT
CHR$(4);"PR#0":PRINT :GOTO 900
```

For large size with no rotation:

```
101 PRINT CHR$(13);CHR$(4);"PR#1":PRINT CHR$(9);"36H":PRINT
CHR$(4);"PR#0":PRINT :GOTO 900
```

For standard size with rotation:

```
101 PRINT CHR$(13);CHR$(4);"PR#1":PRINT CHR$(9);"40H":PRINT
CHR$(4);"PR#0":PRINT :GOTO 900
```

For medium size with rotation:

```
101 PRINT CHR$(13);CHR$(4);"PR#1":PRINT CHR$(9);"42H":PRINT
CHR$(4);"PR#0":PRINT :GOTO 900
```

For large size with rotation:

```
101 PRINT CHR$(13);CHR$(4);"PR#1":PRINT CHR$(9);"44H":PRINT
CHR$(4);"PR#0":PRINT :GOTO 900
```

---

## APPENDIX B

## APPLESOFT APPLICATION PROGRAMS COMMAND SUMMARY

PROGRAM	KEY/PEN FUNCTION	FUNCTION	
Menu	C	Allows the user to calibrate PENTRAK	
	< , (	Moves the lines to the left in calibrate	
	> . )	Moves the lines to the right in calibrate	
	RETURN	Returns to menu after calibrate	
	Pointing to a box	Allows selection of a menu item also selects from choice boxes	
	Pointing to Print	will print the current picture with a GRAPPLER or PKASO type cards.	
Sketch	Point to box	Removes help display and displays Hi-Res page	
	<- 1	Puts pen down (start sketching)	
	-> 2	Picks pen up (stop sketching)	
	T	Toggles cursor (on/off)	
	N	Negates the screen	
	I	Allows the user to set pen's inertia	
	M	Allows the user to select mirror option	
	H	Displays help page	
	ESC	Accesses filer system	
	COLORS		
	W	Sketch white	
	D	Sketch black	
	B	Sketch blue	
	R	Sketch red	
	V	Sketch violet	
G	Sketch green		
Boxes	Hit any key	Removes help display and displays Hi-Res page	
	1	Sets first point (set one corner)	
	2	Sets second point (set the other corner)	
	any key	Displays the key's character on the Hi-Res screen	
	ESC	Accesses filer system	
GRID DRAW	Point to box	Removes help display and displays Hi-Res page	
	<- 1	Sets first point (start of line)	
	-> 2	Sets second point (end of line)	
	N	Negates the image	
	H	Displays help page	
	ESC	Accesses filer system	
	.	Toggles Grid function	
	COLORS		
	W	Sketch white	
	D	Sketch black	
Pointing pen to right portion of screen	B	Sketch blue	
	R	Sketch red	
	V	Sketch violet	
	G	Sketch green	
		Activates the screen lifter option	

TEXT

Point here	Removes help page and displays Hi-Res page
Track pen	Allows setting of the margins
L	Sets left margin
R	Sets right margin
SPACE	Commence typing text
Sets typing mode	
RETURN	Enables user to track to reset margins or change and load sets
Sets tracking mode	
ESC	Returns to the menu
any key	Will display the key's character on the Hi-Res screen
<-	Removes character to the left
?	Displays help page
CTRL-F	Loads character set
CTRL-S	Sets typeface to use
CTRL-A	Enables erasing mode

GEOMED II

Pointing to menu	Sets up specific function
<- 1	Sets starting point
-> 2	Select second or final point
ESC	Re-displays menu
.	Toggles Grid function

FONT EDITOR

Pointing to menu	Selects function
SPACE bar	Zooms in on character for edit
ESC	Re-displays menu
Point to pixel to toggle its state	

## APPENDIX C

### MULTIDRAW COMMAND SUMMARY

=====

The following is a complete summary of the procedures required for the MULTIDRAW system:

Space Bar: Toggles the display of the control menu...allows user to make a selection from the menu

Calibrate:

Press '(' for left calibration (offset)  
Press ')' for right calibration (offset)

Sketch:



Press '1' or '<-' to begin sketching  
Press '2' or '->' to stop sketching  
Press 'Z' or '/' to zoom

Lines:



Press '1' or '<-' key for starting Point of line  
Press '2' or '->' key for ending Point of line;  
the line will now be plotted in the current color  
Press 'Z' or '/' to zoom

Rectangles:



Press '1' or '<-' key for starting Point of rectangle  
Press '2' or '->' key for ending Point of rectangle;  
the rectangle will now be plotted in the current color  
Press 'Z' or '/' to zoom

Color changing:



Point to either the black or white color symbol to change the current color (black is the default color)

Zoom (Easyedit) mode:



Press 'Z' or '/' to zoom

Press '1' or '2' or either arrow to toggle the color of the pixel to which you are pointing.

Zoom in any mode:

Press 'Z' or '/' to zoom;

Press the same keys to end zoom

Holding the shift key will allow you to slew the screen

With no shift-mod; toggle the space bar for slewing the screen

Cursor, Lines, Grid, and Negate options:



Point to the option that you want until you hear a click

Cards Mode:



Point to the cards symbol on the main menu

To display other cards...Point to that card's tab

Point again to card symbol and the cards are put away  
(no cards displayed is the default setting)

Frame mode:



Press 'Z' or '/' to zoom

Press '1' or '<-' key to initiate first corner of frame

Press '2' or '->' key to set other corner of frame

'I' will move frame up one pixel

'M' will move frame down one pixel

'J' will move frame right one pixel

'K' will move frame left one pixel

Pressing the '2' or '->' key again will allow you to float the image to another section of the screen...or onto the cards

Pressing the '2' or '->' key once more will set the image down

Pressing the '1' or '<-' key again will eliminate previous frame and MULTIDRAW will forget the image.



Viewing screen:



- Point to the top of view symbol  
...view top of screen under control menu
- Point to the middle of view symbol  
...view middle of screen under control menu
- Point to the bottom of view symbol  
...view bottom of screen under control menu (this is the default condition)

Printing:



Point to the printing symbol and the routine that you typed in to the program will print the image onto the paper (default is no printer)

I/O:



Point to the INFO-FLOW symbol to access the filer  
Pointing to the symbols in the filer instructs the program where and what to do:



APPENDIX D

ASCII CHARACTER CODES

value of KEY Ascii Code	Key	value of KEY Ascii Code	Key	value of KEY Ascii Code	Key
1	CTRL-A	43	+	85	U
2	CTRL-B	44	,	86	V
3	CTRL-C	45	-	87	W
4	CTRL-D	46	.	88	X
5	CTRL-E	47	/	89	Y
6	CTRL-F	48	0	90	Z
7	CTRL-G	49	1	91	[
8	Left arrow	50	2	92	\
9	TAB	51	3	93	]
10	CTRL-J	52	4	94	^
11	CTRL-K	53	5	95	_
12	CTRL-L	54	6	96	~
13	RETURN	55	7	97	a
14	CTRL-N	56	8	98	b
15	CTRL-O	57	9	99	c
16	CTRL-P	58	:	100	d
17	CTRL-Q	59	;	101	e
18	CTRL-R	60	<	102	f
19	CTRL-S	61	=	103	g
20	CTRL-T	62	>	104	h
21	Right Arrow	63	? ?	105	i
22	CTRL-V	64	@	106	j
23	CTRL-W	65	A	107	k
24	CTRL-X	66	B	108	l
25	CTRL-Y	67	C	109	m
26	CTRL-Z	68	D	110	n
27	ESC	69	E	111	o
28		70	F	112	p
29		71	G	113	q
30		72	H	114	r
31		73	I	115	s
32	SPACE	74	J	116	t
33	!	75	K	117	u
34	"	76	L	118	v
35	#	77	M	119	w
36	\$	78	N	120	x
37	%	79	O	121	y
38	&	80	P	122	z
39	'	81	Q	123	{
40	(	82	R	124	
41	)	83	S	125	}
42	*	84	T	126	~

Please note that some of the character codes may be different depending on the computer you are using.

The ASCII value is equal to the Applesoft variable KEY when the variable KEY < 128

If KEY > 128 and KEY < 133 then the paddle buttons caused the escape.

There will be times when this escape is caused by the shift key if there is a shift key mod, or some other piece of equipment that uses the buttons of the game paddle I/O.

If KEY = 254 then the escape was caused by the NO HITS escape mode

If KEY = 255 then the escape was caused by the ZERO VELOCITY escape

## APPENDIX E

## SPECIAL NOTES TO ASSIST THE PENTRAK PROGRAMMER

=====

1. Calculating memory area required for frame  
Formula --  $MEMAREA = INT(((X2-X1)+1)/7)*(Y2-Y1)+1$   
using this formula you will be able to calculate how much memory will be used by the frame command.
2. Calculating character positions on the text screen  
Formula --  $HORZPOS = INT(X/7)$   
          --  $VERTPOS = INT(Y/8)$   
HORZPOS is now equal to the HTAB amount  
VERTPOS is now equal to the VTAB amount
3. Text writing routine  
Routine:  
10 X=X+7:IF X>263 THEN X=1:Y=Y+8  
20 GET A\$:IF ASC(A\$)<32 OR ASC(A\$)>128 THEN 80  
30 &W(X,Y,A\$):GOTO 10
4. Finding Text location for Hi-Res fonts in FACE0  
Routine:  
TLOC=PEEK(37577)+PEEK(37578)\*256  
You can now BLOAD your type fonts into TLOC
5. Making other fonts usable with &WRITE  
Routine:  
10 P1=PEEK(37577):P2=PEEK(37578)  
20 TLOC=PEEK(37577)+PEEK(37578)\*256  
30 PRINT CHR\$(4);"BLOAD TYPEFACE,A";TLOC-768  
40 POKE 40192,P1:POKE 40193,P2:CALL 42964  
      REM REBUILD BUFFERS  
50 &FACE1:REM NOW WRITE WITH SECOND TYPEFACE

NOTE: When using the built in typeface, there is only provision for upper case. The alternate faces on the other hand allow both upper and lower case.

6. Using the animator routine inside your program  
Routine: First BLOAD the .ANI file into A\$6000  
Now set up addresses  
20 FOR I = 1 TO 20  
30 AD(I)= 24436 +(I\*140)  
40 NEXT I  
These lines load AD(I) with the addresses of the frame  
  
Now make a loop to move the frame across the screen  
100 FOR I=1 TO 20:HT=HT+1  
110 &F(AD(I), HT TO HT+39 AT Y FOR 23)  
120 NEXT I  
Here you are framing the image across the screen one pixel at time. You may change Y at any time for vertical positioning.

7. Setting the MENU program for automatic calibration.

This routine should be done by those with experience in Applesoft programming.

The following are the steps necessary to set the calibration automatically in MENU:

1. After calibrating the first time Press RESET
2. type PRINT QX,QY
3. write these numbers down on a piece of paper
4. Now list the MENU program by typing 'LIST',105"
5. Notice two lines were listed
6. Now change line 105 to read:  
105 QX=(your number):QY=(your number):&O(QX,QY)
7. Now save the MENU back on the disk by typing:  
UNLOCK MENU,D1  
SAVE MENU  
LOCK MENU

Now each time the MENU runs it will set the offset to your original QX,QY variables.

## APPENDIX F

=====

The Gibson Light Pen System requires the following hardware for complete use of the system.

- 1 Apple or Apple compatible computer (not LISA) minimum 48k
  - Applesoft is needed for all applications
  - 64k and Applesoft in ROM is required to run the MULTIDRAW package
- 1 Disk Drive w/ controller
  - up to eight disks drives are supported
  - Hard disks may be used, but volumes are not supported
- 1 Display Monitor or Television with RF modulator
- 1 Gibson Light Pen System LPSII module (light pen) included
- 1 Gibson Light Pen System PENTRAK driver included

Optional equipment:

Printer using a GRAPPLER type or PKASO type interface card.  
Color Monitor  
    RGB monitors will work fine.

The following monitors are known not to work with the Gibson Light Pen System:

MONITOR /// from Apple Computer Inc.  
AMDEK /// from AMDEK Corp.  
PI 3 from USI.

These monitors do not work because they use long persistant phosphoror.

--- NOT BECAUSE THEY ARE GREEN ---

Here are a few notes that will assist you in using the system.

1. If you have an Apple //e with an 80 column board, make sure the board is turned off. Hitting reset before booting our software will accomplish this. (If you are getting a 'j' instead of inverse spaces the card is not off. This will not affect the system, yet the characters will not be the same.
2. When using MULTIDRAW or GEOMED II turn the color level off. This will eliminate the funny colored lines.

## APPENDIX G

## Differences between PENTRAK 1.1 and PENTRAK 2.0

PENTRAK 2.0	PENTRAK 1.1	EXPLANATION
N/A	&START	There is no need to &START PENTRAK 2.0 knows when to look.
MIRROR &M(X,Y)	&T(X,Y,KEY,SKETCHn,MIRRn)	The mirror command is now a complete stand alone command
&HPLOT		Plots a point or line on the current screen.
&XPLOT		XORs a point or line on the current screen.
&AMPER		Links your machine language routines into PENTRAK.
&WHERE		Returns open area of PENTRAK where you may store variables.
&DOSBUFF		Allows setting of <u>DOS</u> buffers.
RUBLINE RUBRECT		Allows TRACK command to stretch a line or rectangle from one point to another
NoHits NHn		Escape mode that escapes when the screen has cycled a number of times without seeing a pen hit.

## Also:

PENTRAK 1.1 erased the current Applesoft program when called, PENTRAK 2.0 does not erase the Applesoft program when called.

PENTRAK 2.0 DOES NOT support the REM statement input.

## Warranty and Service Policy

### GIBSON LIGHT PEN SYSTEM WARRANTY

Gibson Laboratories, Inc. ("LABS") warrants to the original purchaser of the Gibson Light Pen System that it shall be free from defects resulting from faulty manufacture, faulty components or faulty software for a period of one hundred and eighty (180) days from the date of sale of the Gibson Light Pen System. LABS shall correct any such defects covered under the terms of this warranty, and may elect to repair or replace the Gibson Light Pen System or any of its component parts. In the event replacement is elected by LABS, any replacement unit shall be warranted under the terms of this warranty for the remainder, if any, of the original one hundred and eighty (180) day period.

LABS' entire obligation under the terms of this warranty shall be the repair or replacement of any defective Gibson Light Pen System hardware or software, and LABS shall in no event be liable for any incidental or consequential damages arising from the use or possession of the Gibson Light Pen System.

For any warranty claims, return the defective Gibson Light Pen System and all supplied software in its original packaging, postage prepaid to Gibson Laboratories, Inc. 23192-D Verdugo Drive, Laguna Hills, CA. 92653. All warranty claims will be handled promptly by Gibson Laboratories.

THERE ARE NO WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THOSE OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WHICH EXTEND BEYOND THE DESCRIPTION AND DURATION SET FORTH HEREIN.

Some states do not allow either limitations on the length of an implied warranty, or the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

### SERVICE POLICY

For service requirements during the warranty period, promptly return the Gibson Light Pen System, and all supplied documentation and software and proof of purchase to Gibson Laboratories at the above address. Should the Gibson Light Pen system require repair after the warranty period has expired, it will be repaired or replaced for a flat fee of \$55.00, prepaid. This does not cover damage due to negligence or misuse. Return the Gibson Light Pen System, post paid, with full payment to Gibson Laboratories.





**GIBSON LABORATORIES, INC.**

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