McPEN™

HIGH RESOLUTION LIGHT PEN

User Manual

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McPen is a product of:

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McPen — Instructions

Introduction and Product Description

McPen, which operates with the Commodore 64, VIC-20, Atari and IBM personal computers, allows you to interact with your computer without using the keyboard. You can answer questions, choose options, or make drawings all by just pointing the pen at the screen. It can be used in many ways:

- Educational demonstrations
- Programs for preschoolers too young for the keyboard
- Drawing programs
- Games of all types
- Utility programs
- Menu programs
- Any situation requiring input without the keyboard

Unlike other models on the market, Madison Computer's McPen makes full use of the light pen capabilities built in to your computer. McPen always knows where it is on the screen and it knows the difference between the light coming from your computer monitor and other sources of extraneous light such as the sun or lamps. Further, the intensity control on McPen lets you fine tune its reaction to suit your needs or personal preference.

McPen attaches to your computer via the joystick port. The pen rests on an attractive stand, attached by a comfortably long and lightweight cord to permit freedom of movement. We also provide some sample programs to get you started using the Light Pen and to give you some programming ideas of your own.

This manual includes a detailed explanation of how the McPen works, plus important information you will need to write programs that make use of it. Programming McPen is made much easier by the fact that it uses the light pen registers of your computer's microprocessor — you don't have to program

a blinking character in order to read McPen's position, as with some light pens. And, positioning of McPen is more stable and accurate than virtually any other pen on the market. Because of its stability, McPen does not require an activating button. Through software, its position is recorded after the pen is held over the same screen location for a given length of time *(this time can be varied to suit your needs).* Finally, while using McPen you retain complete use of your keyboard *(including Commodore models).*

Parts and Installation

In your McPen package you should find:

—McPen stand and detachable pen

—manual

—demonstration disk or cassette

Installation of your McPen is quite simple. Plug the cord attached to the stand, into the control port *(the same port used for joysticks).* Use control port 1 when running demonstration software for Commodore and Atari models *(in your own programs, Atari can use any control port).* The pen is detachable from its stand through a jack located on the side of the stand. Be sure the pen is securely plugged in. You are now ready to either start programming or run some of the programs included with your McPen.

Using your McPen

Try out McPen by running one or more of the programs, described below, that have been included on your demonstration disk. But first, adjust the sensitivity of McPen's response: using the wheel on the top of the case, adjust the sensitivity to its lowest setting. Then, hold the pen about 1/2 inch from the screen on a bright area of the screen and turn up the sensitivity until the light on the lower left hand corner of the case goes out. If the light doesn't go out, consult the section on **'common problems'.**

The demonstration programs included with McPen are individually described below, however not all programs are pro-

vided for all computers. Run the program "**MENU**" first *(see below),* and you will be able to see which ones run on your machine, and even select the one you want to run first using your McPen.

As you experiment with the demonstration programs, you may notice two shapes appearing on the screen: a light colored solid round shape bordered by a circle, and a darker colored octagon *(stop sign shape).* These are there for you to choose whether you wish to continue *(the circle)* or quit *(the stop sign).* Position McPen over your choice and hold until the desired action is carried out.

Demonstration program descriptions

1. Menu

This is an entry program which shows up at the top of the directory. When you run this program, a shape for calibrating McPen is first displayed; point McPen at the shape as directed and after the calibration is completed, a menu of your demonstration programs will appear. Select the one you wish to sample by pointing McPen at the square block to the left of the desired program. More information on '**calibration**' can be found in the section on programming tips which follows.

2. Balloon

Use McPen to move the balloon sprite around on the screen, or quickly reposition it by pulling the pen away and putting it back on the point at which you want the balloon to appear.

3. Othello

This is a light pen adaption of the Othello board game where you take turns with the computer or with another player, placing markers on the checkered board. Each time you border some of your opponent's markers with two of your own *(horizontally, vertically or diagonally),* you gain possession of those markers. The one with the most markers when the board is filled wins the game.

4. QB graphics

This program simply draws a continuous line wherever McPen is guided over the screen. This is one application where McPen acts as a true pen. While you are drawing, the space bar acts as an on-off switch for McPen so that you can draw non-continuous lines. Also, when McPen is turned off *(using the space bar)* you can change its color using the number keys, as designated on the front of the keys. When you turn McPen back on, the color will be changed.

5. Hangman

The letters of the alphabet are displayed across a platform which supports a doomed man sporting a noose. Only that short platform stands between him and his demise, and only you can save him, by figuring out the letters that make up the hidden word on the left. Guess a letter by positioning the arrow over it using McPen. If that letter makes up part of the mystery word, it is transferred into its position in the word and replaced by a dash in the platform. If the letter you guess is **NOT** in the word, it is removed and the platform grows just a little shorter. If you identify all of the letters in the word while the platform is still long enough to support the man, he is spared. Spared, that is, until the next time you fail to guess the letters before the platform shrinks away from under the feet of the victim.

6. Tic Tac Toe

Take turns with the computer playing tic tac toe simply by placing McPen over the square that you choose for your next move.

7. Copy Files

Files that you want to copy from one disk to another can be transferred using a display of the directory and then marking the file or files to be copied. Follow the directions in the program, inserting the source diskette, the disk that holds the programs you want to copy. To mark a file, stroke McPen over the entire length of the file name, as if to draw a line through it. A solid diamond shape will appear in front of the file name to indi-

cate that it has been chosen for copying. A line on the bottom of the screen will appear, which reads "**OK (xx blocks)**". As you select files to copy, the total number of blocks that you will need on the receiving disk to accommodate those files is displayed. Make sure you have enough room on the disk that you plan to copy to. If you change your mind about copying a file, stroke McPen across that file name and the diamond disappears. You can choose as many files as you want for copying. When you have made your choices, stroke McPen over the "**OK (xx blocks)**" statement and your computer will start reading in files, until it is done, or until it has filled the available space in its memory.

Next, insert your formatted destination disk and wait for all of the files in memory to be copied onto it. Now, if all desired files were copied, the program will return you to the beginning. If not *(the machine ran out of memory before it loaded all the files you picked),* it will request that you insert the source diskette again so that it can continue reading in files that you have chosen for copying.

Follow the process above until all files are copied. If you should fill up your diskette, the Copy File program will stop and display the last file that it was in the process of copying. The best way to continue is to start with the one that you left off with *(inserting a different destination disk, of course).*

Finally, remember that the Copy Files program will copy either Program, Relative or Sequential files *(these are designated by P, R and S following the file name in the directory display).* Also, for relative files only, Copy Files can copy a file larger than the amount that will fit in the computer at one time *(it can load part, copy part, then go back and load the next part, and so on).*

8. Menu Frame

This is an example of how to create a menu, or other types of selection routines using McPen. The program is not intended to perform a specific purpose when you run it, but rather, it is included for you to list out and see how the light pen port is read, how calibration is done, and how this information is translated into a screen position for use in directing the activities of your program.

List the program to your screen or better yet, to a printer. The lines contain many remarks to help explain their function. Try writing a selection program of your own to see how its done.

Programming tips for McPen

1. General Properties and Calibration of McPen

The picture on a color TV set or monitor is made by a set of three beams of current, one each for red, blue and green, which converge at a spot. The spot scans left to right, top to bottom, in a fixed pattern. In order to display a picture, the intensity and color of the beam are varied as it traverses the screen.

When the beam strikes the screen at a particular point, the phosphors begin to glow, and after a short while the glow fades away. The risetime of the phosphor is usually given as the time it takes to reach 90% of full brightness. Color TV phosphors almost always have short risetimes and falltimes. A short falltime is partly responsible for flicker. Some green-screen monitors use phosphors with very long falltimes. Such phosphors flicker very little, but they do show ghosting effects.

The spot travels horizontally about one character cell per microsecond *(millionth of a second).* Since the phosphor risetime is usually 5 to 20 microseconds depending on the make of the TV set, it takes several character-cell-times for the glow to get to the light pen, plus a few more character cell times to process the pulse and send it back to the computer.

The result is that different computer systems using different makes of color TV sets or monitors will give different LPEN X *(horizontal location)* readings for the same position of the light pen relative to the screen display. A calibration display of some kind must therefore be used to provide your program with the LPEN X value of a known position on the screen. By placing a shape in a known position on the screen and then reading the position recorded in the LPEN X and LPEN Y registers, the correction needed in your program to accurately position McPen can be found. The LPEN Y register is quite consistent, reading the raster count of the first line the light pen saw *(typically slightly above the tip of the pen opening).* The LPEN X register

is also quite consistent, but typically reads out an address about fifty pixels higher than the picture address directly underneath the pen. Note that on the Commodore 64 LPEN X must be multiplied by two to get a pixel address. Note that on the Atari, 227 is the highest number returned, and it **"wraps around"** to 0.

One possible calibration display is a narrow, vertical white bar on a black background. However, make sure there is a light colored border of some sort at the edge of the screen, because some TV sets adjust the picture intensity so that the overall average intensity is a medium grey **("poor DC restoration").** If this happens, the software can't tell whether the pen is pointing to the bar or to the nearby wishy-washy grey background, and the calibration may be useless.

The light pen X and Y registers *(listed below)* provide the coordinates where the light pen was last triggered, but they provide no indication of whether the light pen is still being triggered. Use the POT x paddle input on the game port to determine this. The reading is 255 if the pen is not being triggered, and some number less than 128 if not. The joystick BUTTON input is not used for this because on some computers it unfortunately interferes with the keyboard.

If you use the light pen to move a sprite around on the screen *(for example, a pencil which draws lines)* program the sprite so that contrasting edges in the sprite will not fall directly under the Light Pen. The Light Pen is more sensitive to light colors than dark ones, and furthermore, the risetimes for red, green and blue are not exactly the same. What can happen is that the sprite edge will fall just under the pen, altering the X or Y reading. The sprite may then be displayed, next time, just away from under the pen, altering the X or Y again, and restoring the sprite to its original position, starting the cycle over again. The victim of this will notice an unpleasant jitter.

2. Identification of light pen registers

A. VIC 20

decimal	36870	horizontal position
	36871	vertical position
	36872	pen down (paddle x)
hex	9006	horizontal
	9007	vertical
	9008	pen down (paddle x)

B. Commodore 64

decimal	53267	horizontal
	53268	vertical
	54297	pen down (paddle x)
hex	D013	horizontal
	D014	vertical
	D419	pen down (paddle x)

C. Atari

decimal	54284	horizontal
	54285	vertical
	53760	pen down (paddle O)

*(In basic use paddle (O) function; in machine language the number you peek from this port is not always valid. See Atari 400/800 hardware manual pp 3-21 for details on how to read port properly).

hex	D40C	horizontal
	D40D	vertical
	D200	pen down (paddle O)

3. More information on programming with McPen

Information that you need to incorporate McPen into your programs is provided in your computer reference guide. One of the best ways to get familiar with different types of functions you can program using McPen, is to list out the programs on your demonstration disk. However, File Copy, Othello and Hangman contain machine code and do not list.

Common Problems and some solutions

1. McPen indicator light does not go on when McPen is plugged in.
   —be sure that your computer is on, and all connections are securely made. For Commodore 64 computers, McPen should be plugged in to control port 1. For the Atari, control port 1 should be used for demonstration programs.
2. McPen does not trigger (light doesn't go out when pointed)
   —slightly reposition McPen and hold it squarely on target (especially for large target shapes).
   —check to make sure that the pen is plugged in to McPen's base.
   —be sure that you have a white or bright colored object (cursor block or other shape) on the screen.
   —increase the brightness level of your screen.
   —McPen will not work with some long persistence monitors: these are generally amber/black and green/black types.
3. McPen triggers an unwanted response when held at a distance from the intended portion of the screen.
   —decrease McPen sensitivity.
   —point McPen squarely on the screen.
4. Problems running demonstration programs
   —turn the disk or cassette over and try again.
   —if a program appears not to function, check to be sure that the pen is set up properly as described above (the light should go out as the pen is placed over the screen at the desired location).
   —if pen doesn't trigger when running a demo program, hold pen close to a background area and readjust the sensitivity to the minimum that will turn the light out.