

# STACK

## LIGHTPEN+

For

# BBC

Model B

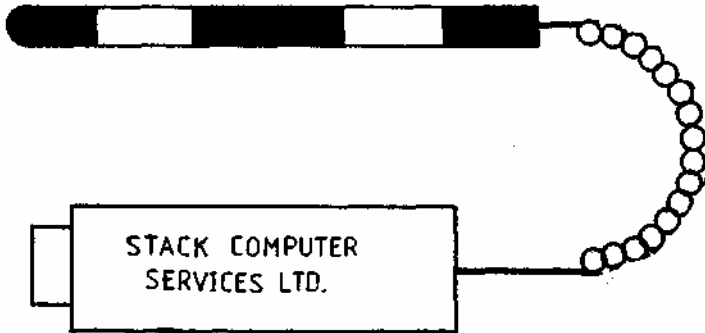
personal computer

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## INTRODUCTION

The LIGHT PEN for the BBC Model B consists of a light sensor cased in a Pen. This is linked via a flexible lead to a connector which fits into the 'Analogue in' port at the rear of the computer. The Principal behind the LIGHT PEN is quite simple and is explained in the following pages.



Your STACK LIGHT PEN Package should contain the following items. If there is anything missing, please return the complete package unused to your local dealer for a replacement.

## PACKAGE CONTENTS

Stack Light Pen

Demonstration cassette

Warranty registration card.

## TAPE INDEX

### 1. Stack LITEWRITER

Hills ; draw demo

House ; draw demo

IMPORTANT: This program requires the  
OS1.2 up grade ROM.

### 2. SIMON

IMPORTANT: This program requires the  
OS0.1 up grade or above.

The object of this game is to repeat the computers sequence of squares and sounds, each sequence becomes faster with less time to repeat it in.

### 3. GO

This is a game of strategy, the idea being to surround your opponents pieces, thereby capturing them. Whoever finishes with the most pieces is the winner.

### 4. CONCENTRATION

This game is a test of memory where each player has to turn over two cards in the hope of making pair. Played with a standard pack of playing cards, the person with the most pairs at the end is the victor.

### 5. DRAUGHTS

A computerised version of the old classic game of Draughts or checkers.

### 6. LOST IN THE LABYRINTH

The object of this game is to trap the soldiers before they get either you or your gold by locking them away one at a time.

7. SHUFFLER

Either use a grid of numbers or a grid of colours to test your logic and organisation ability.

8. CROSSWORD TWISTER

There are no clues in this game, only letters to fit into the grid making this harder than it appears.

9. OTHELLO

Trap your opponents pieces and make them your own. A game of skill and logic.

10. SEEK AND DESTROY

Based on the game BATTLESHIPS, this is simple to learn but not quite as simple to play well.

11. LIFE

The object of this game is to study the development of small colonies of organisms which you place on the screen via your Light Pen.

All the above programs are loaded with the command

CHAIN""

And by pressing <RETURN>.

## HOLDING THE PEN

The most effective way of holding your lightpen is the same way as holding any normal pen. For the touch contacts to be used properly, the metal band nearer the lead should be touching the area of skin between your thumb and index finger, so that all you have to do to make a contact is touch the other metal band with the end of your index finger. If you are having difficulty with the contacts registering please see the appendix.

## GENERAL MAINTENANCE

Your TV screen should be kept as clean as possible since dust or static accumulates on its surface and this will gradually clog or degrade the Light Pen. If this occurs cleaning the screen and blowing across the tip of the pen will restore the response.

Always store your Light Pen and cassettes away from strong magnetic fields.

## INFORMATION

In order to provide the user with as much support as is practical, we would appreciate it if any useful hints or comments could be forwarded in writing to

PRODUCT DEVELOPMENT  
STACK COMPUTER SERVICES LTD  
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## DISCLAIMER

Whilst every effort has been made to provide a flexible, reliable and above all low cost product, STACK COMPUTER SERVICES LTD wish to point out that no claim is made for complete compatibility with any other equipment or program. The information given is believed to be accurate but no liability can be accepted for the consequences of any error. Ours is a policy of continued development and we therefore reserve the right to alter the design or specifications without prior notice.

# LIGHT PEN MANUAL

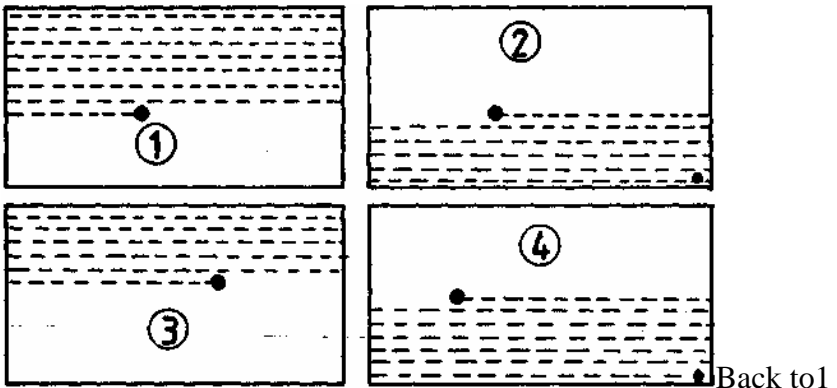
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## YOUR TV PICTURE

The picture on your television set is made up of the traces of light caused by a fast moving 'spot' of illumination. This spot begins in the top left corner of the screen and moves across to the right, then it flies back to the left and down a line, and so on until it reaches the bottom right of your screen when the process is repeated.

This 'spot' is the trace of light that the light Pen detects.

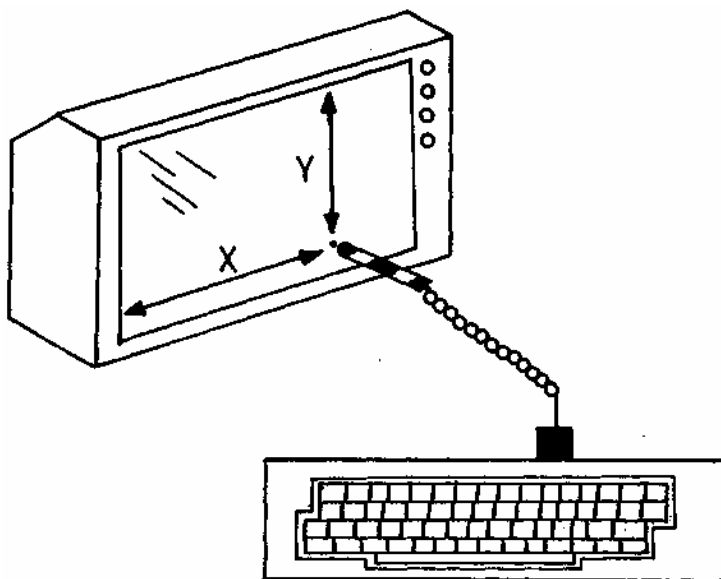
Every second line 1 & 2



Every first line 3 & 4

## THE LIGHT PEN AND DISPLAY

In the end of the Light Pen is a light sensor which detects when the 'spot' is passing the tip of the pen and tells the BBC that it has 'seen' it. The BBC then records the location of the spot in its CRTC chip. This location is recorded in two registers in the form X,Y.

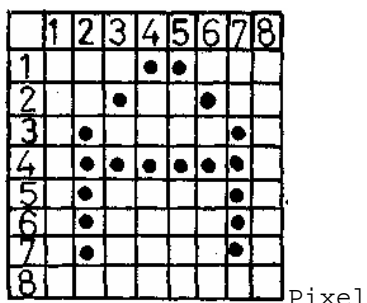


How the light pen sees the display.

#### LIGHT PEN SENSITIVITY

Each letter or number that can be displayed by your BBC on the TV screen consists of points of light called pixels.

So each character looks something like this, (depending on the Mode):



This means that you can plot squares of character size in Low-Resolution, or single pixels in High-Resolution. Stack LITEWRITER, included free in this package, enables the user to plot points, lines circles, etc. in High-Resolution.

## USE OF COLOUR

As you know the Light Pen produces a reading taken from the pulse of light that builds your TV picture. However the sensitivity of the pen depends largely on the colours used. For example, BLACK and RED do not emit-sufficient light for the pen. As a general rule use only the lighter colours.

## CHAPTER TWO

### WORKING AREA

Within the BBC computer the 6845 CRT Controller chip receives the light pen signal. This chip has two registers which keep a running record of the number of characters, or parts of characters, scanned since the spot left the top left corner of the screen. As soon as the CRTC chip receives the signal from the light pen this record is frozen to reflect the position of the light pen.

The state of these registers, (registers 16 and 17 in the CRTC), can be read using the following short program

```
10 ?&FE00=16:REM Set Address Req. to 16
20 LH=?&FE01: AND 63:REM READ 7 M.S.B.
30 ?&FE00=17:REM Set Address Reg. to 17
40 LL=?&FE01:REM Read 8 L.S.B.
```

The number of characters since the start to the scan is then calculated using

```
50 P = INT ((256*LH+LL-PO)/D)
```

Where

PO is an offset which depends on the MODE, the type of monitor, the response time of the light pen and whether the display has been scrolled since the current MODE was initialise

C is the number of characters per line.

D is the number of the register increments per character.

Table 1 below shows the suggested values of PO, C and D for each MODE.

MODE	DISPLAY LINES	DISPLAY COLUMNS	REGISTER INCREMENTS PER CHARACTER	OFFSET	COLOURS	GRAPHICS RESOLUTION
		C	D	PO		
0	32	80	1	1623	2	640 x 256
1	32	40	2*	1623	4	320 x 256
2	32	20	4*	1623	16	160 x 256
3	25	80	1	2134	2	TEXT ONLY
4	32	40	1	2860	2	320 x 256
5	32	20	2*	2860	4	160 x 256
6	25	40	1	3116	2	TEXT ONLY
7	25	40	1	10287	8	TELETEXT

\* IN MODES 1,2 and 5 THE REGISTERS ARE INCREMENTED EVERY 1/2 ,1/4 and 1/2 CHARACTER RESPECTIVELY GIVING IMPROVED RESOLUTION WHEN USING THE LIGHT PEN FOR GRAPHICS.

## USING THE TOUCH CONTACT

A feature of the Light Pen is a touch contact which allows you to control the light sensor. Without this feature the Light Pen could not be used to take selective readings, as all readings would register in your programs, and the pen would be uncontrollable.

The following short statements demonstrate the use of the touch contacts:

```
10 IF (ADVAL(0) AND 1) = 1 THEN 10
```

```
20 IF (ADVAL(0) AND 1) = 0 THEN 20
```

Line 10 tells the BBC to wait until the contacts are touched, and line 20 waits until the finger has been removed again.

If you are having trouble making a contact with the pen please see the Appendix.

## DEMONSTRATION

The following program illustrates the use of the Light pen to select a character anywhere on the screen, and to flash that character on and off when the touch contact is operated:

```
10 MODE 1 : P0=1623 : C=40 : D=2
20 FOR Z = 1 TO 1280
30 PRINT"+";: NEXT Z
40 PROCreadLP
50 IF (ADVAL(0) AND 1) = 1 THEN 40
60 PRINT TAB(Y,X);" "
70 PROCdelay
80 PRINT TAB(Y,X);"+"
90 GOTO 40
100 :
110 DEF PROCreadLP
```

```
120 ?&FE00=16:LH=?&FE01:LH=LH AND 63
130 ?&FE00=17:LL=?&FE01
140 P=INT((LH*256+LL-PO)/D)
150 X=INT(P/C):Y=P-X*C
160 IF P>1238 THEN 120
170 ENDPROC
180 :
190 DEF PROCdelay
200 FOR Z = 1 TO 150 : NEXT Z
210 ENDPROC
```

If the wrong character flashes when you touch the contact it will be necessary to change the variable PO : if a cross to the right of the one that you are pointing at flashes, then increase PO, if to the left, decrease PO.

## APPENDIX

### COMMON ERRORS

When programming with a Light Pen for the first time, some errors are bound to occur. This section hopes to deal with the most common errors.

<u>Fault</u>	<u>Cause</u>	<u>Remedy</u>
Pen not functioning at all	Pen not in port	Plug pen into 'Analogue in' port
Pen giving incorrect readings.	(1): offsets incorrect	See Chapter Two, Section One, 'working Area'.
	(2): Colours too dark	Use lighter colours in your program.
	(3): Brightness or colour controls not high enough	Adjust TV controls to enable pen to see colours better
	(4): Light from an external source falling on the screen.	Reposition TV in relation to other light sources
	(5): Dirty pen or screen, or static on screen	Clean both pen and screen

Pen giving incorrect readings.	(1): pen being incorrectly held	See diagram on page one
	(2): Hands too dry, good bridge not being made between contacts	Moisten hands slightly

# LITEWRITER MANUAL

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## STACK LITEWRITER

### COPYRIGHT

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### CONCEPT

The stack LITEWRITER has been especially written by STACK COMPUTER SERVICES. This program will help to enter into the fascinating world of the Light pen. The program is written almost entirely in BASIC and has been structured such that it is simple to follow, expand, or remove in part.

Just like drawing on paper, use of the Light pen is something of an art, but a lot easier to master than pencil and paper!

When you have loaded LITEWRITER, you will notice as you use the program that there is a small offset between the pen and the pixel being plotted. This is intentional. Were the pixel to be exactly under the pen would be hard to see and to follow.

## SYSTEM REQUIREMENTS

STACK LITEWRITER requires:

BBC Model B with OS1.2 ;

NOTE: If your machine does not have this up  
grade contact your BBC dealer who will  
sell the up grade kit.

A suitable colour TV or monitor;

Cassette Recorder ;

Stack Light Pen ;

## LOADING LITEWRITER

To load LITEWRITER simply type

CHAIN" "

And press <RETURN>.

## LITEWRITER FEATURES

Stack LITEWRITER has facilities for the following  
features:-

DRAW  
LINE  
RECTANGLE  
TRIANGLE  
CIRCLE  
TEXT  
FILL  
CLEAR  
COLOUR  
BRUSH  
PAINT  
LOAD  
SAVE  
ESCAPE

## DEMONSTRATION PICTURES

There are two demonstration pictures included in this kage, HILLS and HOUSE. To load either of these load EWRITER and then type 'Q'.

When asked either SAVE or LOAD screen, type 'L'. The ture will then load onto the screen from tape.

## COMMANDS

- L DRAW LINE will appear in red, as do all messages in this area. DO NOT TOUCH THE CONTACT! Move the pixel to the point required and touch the contact. Move to another point and touch the contact. A line is drawn between the points. If this line is not desired hit delete to remove it. Prior to entering the second point you may change the colour with the left and right arrow keys.
- R DRAW RECTANGLE. Use this in the same way as for line with the exception that the diagonal line is not drawn but used to construct the rectangle.
- T DRAW TRIANGLE. Again, as for draw line. The line that you draw is the base of the triangle. Then you will be asked for the APEX, so plot a point where you want the tip of the triangle to be.
- C DRAW CIRCLE. The same as draw line except that the first point you draw is the edge of a radius and the second is the centre of the circle. BOTH POINTS MUST BE ON THE X AXIS AS THE DIFFERENCE BETWEEN THEM IS THE RADIUS. If you plot two points at the same X position a circle will not be drawn.
- F FILL. This is a very simple fill routine using PLOT77 and therefore requiring OS1.2 To use fill. position the pixel as near to the centre of the area as you can and touch the contact.
- D DRAW. The prompt will change to DRAW, (in blue). DO NOT TOUCH THE CONTACT! You may change colour and move pixel when required. When the contact is touched, the pen starts to draw. Exit this mode with <RETURN>.

<SPACE> CLEAR. This will clear the screen, but only when MODE? is displayed.

<- & -> Move the colour pointer and thus change the colour.

< & > Move the brush pointer in PAINT mode and thus change the type of brush.

P PAINT. DO NOT TOUCH THE CONTACT! You may move as normal, select colour and brush. Touch the contact to paint. Area can be filled using a large brush. Exit with <RETURN>.

W TEXT or WRITE. You may type in any text you require, but do not type to the bottom of the screen or the window will scroll. Do not try to change colour until you have hit <RETURN> to enter your text. Move the pixel to the point where you want the text and touch the contact.

Q QUIT. Only from MODE? You will be asked SAVE or LOAD SCREEN? Reply with S or L. After either of these you are returned to MODE?

ESCAPE The program is escaped from in the usual manner by just hitting <ESC>. You can look at variables and can use \*FX4,0 to reset the copy keys. No error trapping has been used on purpose.

## BACKUP PROCEDURE

To copy Stack LITEWRITER follow this procedure:-

```
Type
LOAD""
When TITLE has loaded type
SAVE"TITLE"
Next, type
LOAD""
When INTRO has loaded type
SAVE"INTRO"
Now type
PAGE=&l200
and
LOAD""
When STACKMC has loaded type
SAVE"STACKMC"
```

```
SIMON
GO
CONCENTRATION
DRAUGHTS
CROSSWORD TWISTER
OTHELLO
SEEK AND DESTROY
LIFE
```

All the above programs are in BASIC and can therefore be saved in the normal manner.

eg. Type

```
LOAD"SIMON"

When SIMON has loaded type

SAVE"SIMON"
```

PLEASE NOTE that DRAUGHTS is in two parts and must be loaded and saved twice.

To copy LOST IN THE LABYRINTH type

LOAD"LOST"

When it has loaded type

\*SAVE"LOST"E00 36FD

To copy SHUFFLER type

LOAD"SHUFFLER"

When it has-loaded type

\*SAVE"SHUFFLER"E00 2905

#### ACKNOWLEDGEMENTS

Litewriter written by Mike Houghton

Daughts written by Greg McCormack

Other Games written by David Reece and Graham Woan