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What's Sinclair driving at?

BRITAIN'S BIGGEST MICROCOMPUTER MAGAZINE

LET BATTLE COMMENCE

Commodore and Atari micros previewed

Light fantastic

Participate in an experiment with PCW *and* Channel 4 — *it involves a new method of software transmission. The circuit has been conceived and implemented by Mike Daley and Richard Theodossiades, and the programs by David Atkins; all three are from University College, Cardiff.*

The new *Channel 4* computer news and current affairs programme for serious computer users currently being broadcast (Monday 5.30-6.00pm from 11 February) offers its viewers a unique opportunity to participate in an experiment. We're all used to transmitting software by making electrons run up and down a wire, but now it's the turn of the photons.

During the broadcast of *4 Computer Buffs*, a flashing white square will appear on the screen roughly where the *TV AM* clock usually sits. If you make a receiver by following the instructions below, you'll be able to pick up free software for the Commodore 64, BBC or Spectrum 48k micros, transmitted via the flashing white square.

Sounds crazy? At least one company we know of, Firstquad Ltd, has applied for a patent for a system which offers commercial data transfer rates and data security levels. If you're interested the

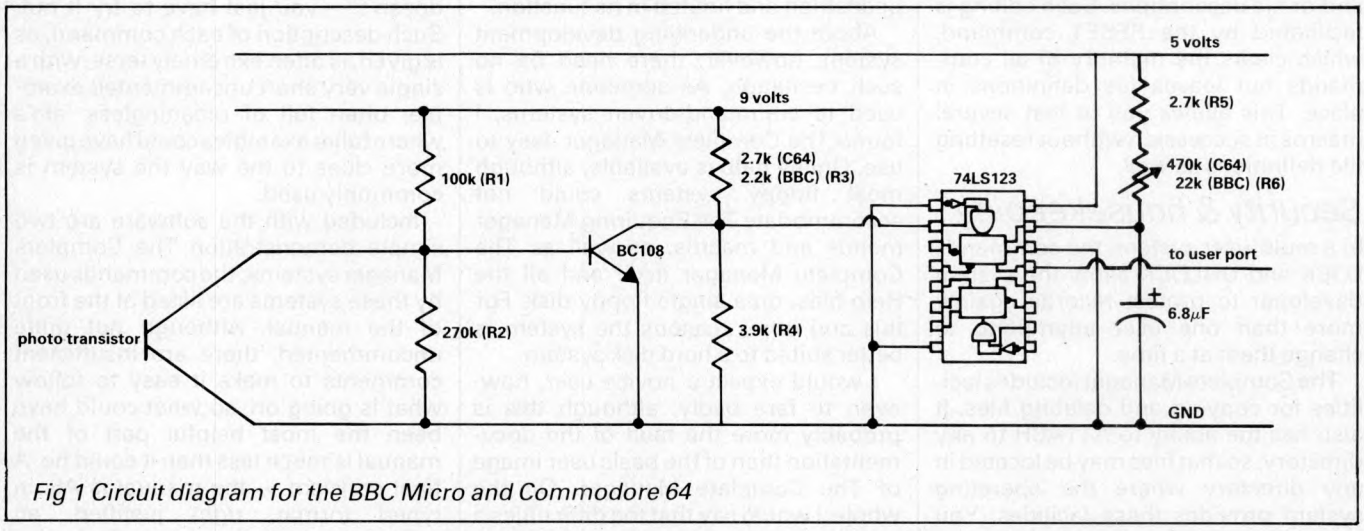

Fig 1 Circuit diagram for the BBC Micro and Commodore 64

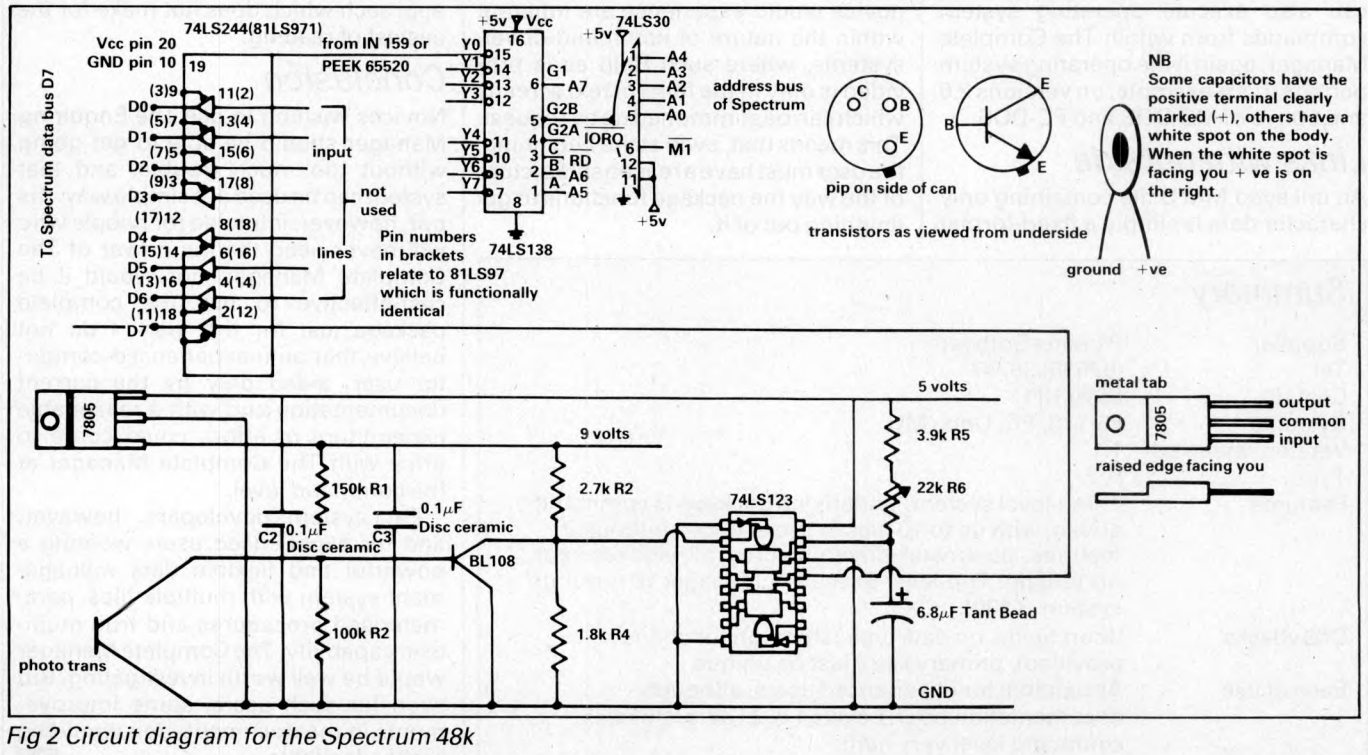

Fig 2 Circuit diagram for the Spectrum 48k

company is on (0222) 752189.

Having constructed a receiver, you need to calibrate it for your particular TV set using the calibration program for your micro. Picking up software is then easy. Tune into *4 Computer Buffs*, connect the receiver, load and run the receiver software, and press the space bar when told to. By the end of that edition of *4 Computer Buffs* you'll have a program in memory which you can save to tape or disk and run in the normal way. Note that the receiver board will only work with the 48k version of the Spectrum. Unfortunately the 16k Spectrum doesn't allow the necessary control over timing.

The actual light detection is done by a phototransistor mounted in a sucker, which is fixed to the screen over the flashing white square.

Construction

To construct the circuit you'll need a piece of veroboard, approximately 60mm × 40mm. The 74LS123 chip is mounted in a 16-pin DIL socket, rather than soldering it in directly. Care should be exercised when soldering the transistors to ensure that excess heat is not applied. Ensure also that the capacitor is put in the right way round, as it is of the electrolytic type and will blow up if connected backwards. The rest of the components are inserted as shown on the circuit diagrams (Figs 1, 2).

The phototransistor is mounted in the centre of the rubber sucker. The best type of sucker is that sold with hooks for the cups (Fig 3).

Try to make as small a hole as possible to achieve an air-tight fit. If necessary a blob of silicon rubber can be put over the hole to seal it (Fig 3).

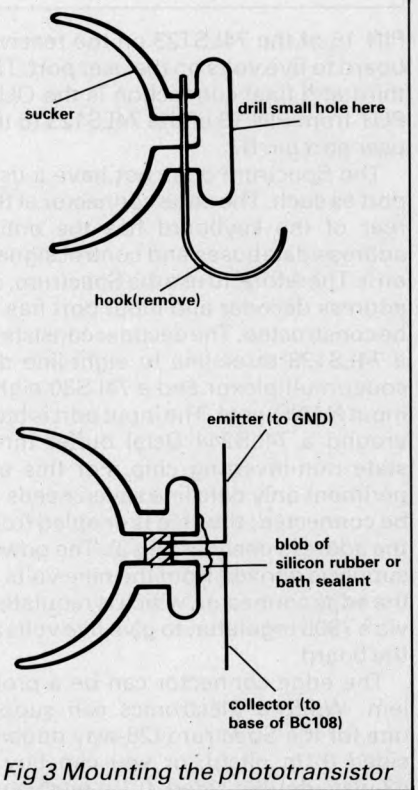

Fig 3 Mounting the phototransistor

Procedure for tuning the receiver board ready for the software broadcast

The following steps should be carried out in a room with low lighting and definitely no direct light on the television screen.

The Basic programs should be typed in and saved onto tape or disk before carrying out the tuning or receiving procedures. The instructions for these procedures assume that the tuning program has been saved with the name TUNE. And that the receiving program has been saved with the name REC.

First set up your computer as normal, using the television set that will be used for the broadcast. Make sure the receiver board is plugged into the computer's port correctly before you switch on.

Then load and run the tuning program:

BBC	CHAIN 'TUNE'
	CALL & 900
Spectrum	NEW
	LOAD 'TUNE'
	RUN
Commodore 64	LOAD 'TUNE'
	RUN
	SYS 49152

Adjust brightness and contrast, so that the writing on the screen is a clear white on a steady dark background. Make sure there are no streaks of light across the screen.

Place the sucker over the solid white block in the bottom right-hand corner of the screen. Make sure that it is firmly stuck to the screen.

If there is not also a '*' on the display inbetween the two pointers −> and <−, adjust the variable resistor's value so that one appears. Each time you change the value of the variable resistor, press the space bar afterwards. *This is very important.*

Now adjust the resistor in small steps, so that the '*' just disappears. Again, remember to press the space bar after every adjustment of the variable resistor. Before you can be sure that you have correctly tuned in the board, the tuning program should be left to run for as long as possible after you have made the star disappear. A time of 15 minutes should be adequate. If the '*' reappears during this time then repeat this step again.

Once the board has been tuned in, you are ready to receive the broadcast of software. Now read the procedure for doing so.

Once you have tuned in the receiver board, do *not* alter the value of the resistor on the board, or the brightness, or contrast controls on the television.

The input to the BBC Micro is via the user port and is a 20-way (female) IDC connector. The user guide is misleading about the orientation of this plug. Check with a volt meter if you have one — look for GND and +5v. One wire must go from ground on the receiver board to one of the ground pins; another from

Procedure for receiving a program transmitted during *4 Computer Buffs*

The following steps should be carried out in a room with low lighting — definitely, no direct light on the television screen.

Before *4 Computer Buffs* is due to start, set up your computer as you would do normally, with the receiver board plugged into the port.

Load and run the receiving program:

BBC	*RUN BBCREC
	CHAIN 'REC'
	CALL 900
Spectrum	NEW
	LOAD 'REC'
	RANDOMISE USR 45056
Commodore 64	LOAD 'REC'
	RUN
	SYS 49152

Your computer is now ready to receive the software.

Switch on the television and tune into *4 Computer Buffs.* When it starts, place the receiver sucker over the solid white block in the corner of the screen. Make sure that it is firmly stuck to the screen.

Just before the software is transmitted, you will be told to press the space bar on your computer. After this, the computer will start downloading the program. When the transmission has finished, save the program onto tape or disk using the usual instructions for saving a Basic program.

Before you try to run the software, it is advisable to switch the computer off and on again so that it is completely reset. Load the program back into your computer using the normal instructions for loading a Basic program, and run it.

If you are using the same television set for your computer and for watching the television program, take care that you don't accidentally knock any of the leads when connecting, or disconnecting, the television.

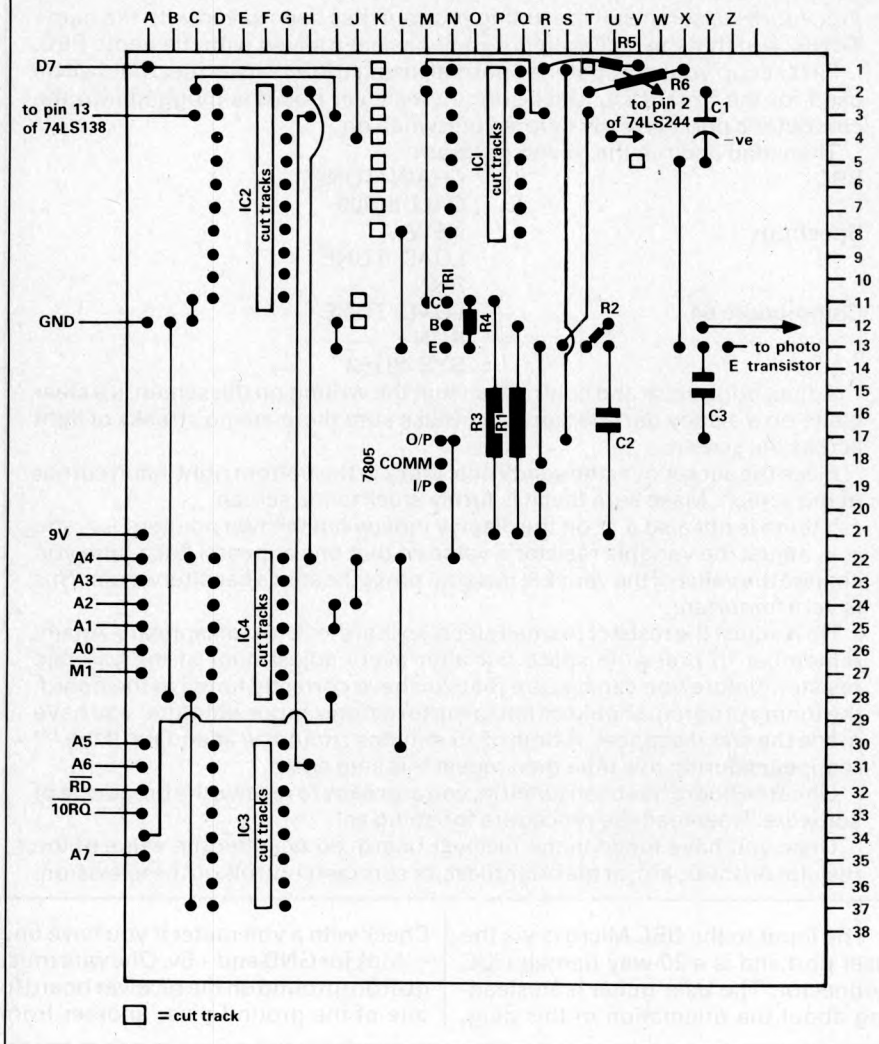

Fig 4 Component mounting for the Spectrum 48k

Component list

Spectrum

Resistors

1 of	150k	R1	¼-watt carbon
1 of	100k	R2	¼-watt carbon
1 of	2.7k	R3	¼-watt carbon
1 of	1.8k	R4	¼-watt carbon
1 of	3.9k	R5	¼-watt carbon
1 of	22k Preset	R6	¼-watt carbon

Capacitors

1 of	6.8µF Tant bead C1
2 of	0.1µF Disc ceramic C2,C3

Semiconductors

1 of	7805	
1 of	74LS123	1C1
1 of	74LS244	1C2
1 of	74LS138	1C3
1 of	74LS30	1C4
1 of	BC108	TR1
1 of	FPT100	From Tandy stores: Cat No 276-130 or 2N5777 (Phototransistor)

Miscellaneous

Rubber sucker from any ironmonger or DIY shop
28-way double-sided edge connector 1.90
Pair PP3 snap battery connectors
1-14 pin DIL socket, 2-16 pin DIL socket, 1-20 pin DIL socket

```
 10 REM RECEIVER PROGRAM FOR COMMODORE 64
 20 A=49152
 30 READ N:IF N<0 THEN 60
 40 POKE A,N:A=A+1
 50 GOTO 30
 60 END
 70 DATA 165,43,133,252,165,44,133,253,169,0
 80 DATA 141,3,221,32,228,255,201,0,240,249
 90 DATA 32,77,192,32,117,192,133,254,32,77
100 DATA 192,32,117,192,201,0,208,4,165,254
110 DATA 240,25,32,77,192,32,117,192,32,77
120 DATA 192,32,117,192,32,77,192,32,117,192
130 DATA 201,0,208,246,76,20,192,96,160,124
140 DATA 136,208,253,202,208,248,96,169,9,133
150 DATA 251,173,1,221,41,128,208,249,162,15
160 DATA 32,68,192,169,0,72,173,1,221,10
170 DATA 104,106,162,30,32,68,192,198,251,208
180 DATA 240,162,30,32,68,192,96,-1
```

```
 10 REM TUNING PROGRAM FOR COMMODORE 64
 20 A=49152
 30 READ N:IF N<0 THEN 60
 40 POKE A,N:A=A+1
 50 GOTO 30
 60 END
 70 DATA 169,0,141,3,221,169,0,141,32,208
 80 DATA 141,33,208,169,147,32,210,255,169,5
 90 DATA 32,210,255,174,126,192,172,127,192,32
100 DATA 103,192,162,36,160,22,32,92,192,169
110 DATA 113,32,210,255,173,1,221,10,176,12
120 DATA 162,5,160,3,32,92,192,169,42,32
130 DATA 210,255,32,228,255,240,233,201,3,240
140 DATA 15,162,5,160,3,32,92,192,169,32
150 DATA 32,210,255,76,44,192,169,147,32,210
160 DATA 255,96,152,72,138,168,104,170,24,32
170 DATA 240,255,96,134,251,132,252,160,0,177
180 DATA 251,240,12,32,210,255,230,251,208,243
190 DATA 230,252,76,107,192,96,128,192,13,65
200 DATA 68,74,85,83,84,32,82,69,83,73
210 DATA 83,84,65,78,67,69,32,85,78,84
220 DATA 73,76,32,34,42,34,32,68,73,83
230 DATA 65,80,80,69,65,82,83,46,13,13
240 DATA 32,32,45,62,32,32,32,60,45,13
250 DATA 13,84,79,32,82,69,83,69,84,32
260 DATA 82,69,65,68,73,78,71,32,80,82
270 DATA 69,83,83,32,65,78,89,32,75,69
280 DATA 89,46,13,13,80,82,69,83,83,32
290 DATA 60,82,85,78,47,83,84,79,80,62
300 DATA 32,84,79,32,69,88,73,84,32,80
310 DATA 82,79,71,82,65,77,46,0,-1
```

```
 10 REM * tuning program for ZX Spectrum *
 20 CLEAR 45055
 30 LET a=45056
 40 READ n: IF n<0 THEN GO TO 50
 45 POKE a,n: LET a=a+1
 46 GO TO 40
 50 BORDER 0: PAPER 0: CLS : INK 7
 55 PRINT AT 21,31;"■"
 60 PRINT AT 1,0;"Adjust resistance"
 70 PRINT AT 3,0;"until '*' disappears"
 80 PRINT AT 5,2;"->   <-"
 90 PRINT AT 7,0;"To reset reading press any key."
100 PRINT AT 9,0;"press <break> to exit program."
120 LET x=USR 45056
130 IF x=0 THEN PRINT AT 5,5;"*": GO TO 120
140 IF x=1 THEN PRINT AT 5,5;" ": GO TO 120
160 DATA 62,0,50,8,92,219,159,230,128,32,5,6,0,14,0,201
170 DATA 58,8,92,254,0,40,238,6,0,14,1,201,-1
180 STOP
```

PIN 16 of the 74LS123 on the receiver board to five volts on the user port. The third and final connection is the OUTPUT from PIN 13 of the 74LS123 to the user port pin B7.

The Spectrum does not have a user port as such. The edge connector at the rear of the keyboard has the entire address/databuses and control signals on it. Therefore, to use the Spectrum, an address decoder and input port has to be constructed. The decoder consists of a 74LS138 three-line to eight-line decoder/multiplexor and a 74LS30 eight-input NAND-gate. The input port is built around a 74LS244 Octal buffer three state non-inverting chip. For this experiment only data line seven needs to be connected; the chip is enabled from the address decoder (Fig 2). The power supply is derived from the nine volts at the edge connector, which is regulated, via a 7805 regulator, to give five volts to the board.

The edge connector can be a problem. Watford Electronics can supply one for the Spectrum (28-way double-sided 0.1in pitch), or you can buy a 43-way, double-sided, 0.1in pitch con-

```
10 REM * receiver loader program for ZX Spectrum *
20 CLEAR 45055
30 LET a=45056
40 READ n: IF n<0 THEN GO TO 210
50 POKE a,n: LET a=a+1
60 GO TO 40
80 DATA 62,0,50,8,92,42,83,92,58,8
90 DATA 92,254,0,40,249,205,76,176,205,113
100 DATA 176,230,128,32,37,205,76,176,205,113
110 DATA 176,205,76,176,205,113,176,79,205,76
120 DATA 176,205,113,176,71,205,76,176,205,113
130 DATA 176,11,62,0,184,32,244,185,32,241
140 DATA 24,209,43,34,75,92,201
150 DATA 30,128,29,32,253,21,32,248,201
160 DATA 197,6,9,219,159,230,128,32,250,22
170 DATA 17,205,67,176,14,0,219,159,203,39
180 DATA 203,25,22,34,205,67,176,16,243,121
190 DATA 22,34,205,67,176,193,201
200 DATA 119,35,201,-1
210 STOP
```

```
10 REM TUNING PROGRAM FOR BBC
20 A%=&900
30 READ N%:IF N%<0 THEN 60
40 ?A%=N%:A%=A%+1
50 GOTO 30
60 END
70 DATA 169,0,141,98,254,162,7,32,92,9
80 DATA 32,102,9,162,180,160,9,32,157,9
90 DATA 162,36,160,20,32,143,9,169,255,32
100 DATA 227,255,173,96,254,10,176,12,162,5
110 DATA 160,3,32,143,9,169,42,32,227,255
120 DATA 162,0,160,0,169,129,32,244,255,152
130 DATA 208,15,162,5,160,3,32,143,9,169
140 DATA 32,32,227,255,76,32,9,201,27,208
150 DATA 207,169,126,32,244,255,162,7,32,92
160 DATA 9,96,169,22,32,227,255,138,32,227
170 DATA 255,96,169,23,32,227,255,169,0,32
180 DATA 227,255,169,10,32,227,255,169,32,32
190 DATA 227,255,169,0,32,227,255,32,227,255
200 DATA 32,227,255,32,227,255,32,227,255,32
210 DATA 227,255,96,169,31,32,227,255,138,32
220 DATA 227,255,152,32,227,255,96,134,112,132
230 DATA 113,160,0,177,112,240,12,32,227,255
240 DATA 230,112,208,243,230,113,76,161,9,96
250 DATA 13,65,100,106,117,115,116,32,114,101
260 DATA 115,105,115,116,97,110,99,101,32,117
270 DATA 110,116,105,108,32,39,42,39,32,100
280 DATA 105,115,97,112,112,101,97,114,115,46
290 DATA 13,13,32,32,45,62,32,32,32,60
300 DATA 45,13,13,84,111,32,114,101,115,101
310 DATA 116,32,114,101,97,100,105,110,103,32
320 DATA 112,114,101,115,115,32,97,110,121,32
330 DATA 107,101,121,46,13,13,80,114,101,115
340 DATA 115,32,60,101,115,99,97,112,101,62
350 DATA 32,116,111,32,101,120,105,116,32,112
360 DATA 114,111,103,114,97,109,46,13,0,-1
```

```
10 REM RECEIVER PROGRAM FOR BBC
20 A%=&900
30 READ N%:IF N%<0 THEN 60
40 ?A%=N%:A%=A%+1
50 GOTO 30
60 END
70 DATA 169,0,133,113,165,24,133,114,169,0
80 DATA 141,98,254,32,224,255,32,61,9,32
90 DATA 101,9,32,61,9,32,101,9,41,128
100 DATA 208,19,32,61,9,32,101,9,32,61
110 DATA 9,32,101,9,201,13,208,246,76,22
120 DATA 9,96,160,0,136,208,253,202,208,248
130 DATA 96,169,9,133,112,173,96,254,41,128
140 DATA 208,249,162,15,32,52,9,169,0,72
150 DATA 173,96,254,10,104,106,162,30,32,52
160 DATA 9,198,112,208,240,162,30,32,52,9
170 DATA 96,160,0,145,113,230,113,208,2,230
180 DATA 114,96,-1
```

nector with pin position 37 fitted with a polarising key and cut it down to size so that there are 23 connectors before the key. The input to the Commodore 64 is via the user port, which is a 12-way edge connector with 0.15in pitch contacts.

Circuit operation

Light falling on the base of the phototransistor switches the transistor on, causing conduction which pulls the voltage at the base of Tr1 low, thus switching it off and putting five volts on pin 2 of the 74LS123. Darkness has the opposite effect, so pin 2 goes low.

The 74LS123 is a retriggerable monostable. With pin 1 tied low, a rising edge on pin 2 will cause the output on pin 13 to go high. It will revert to low after a time determined by the RC network (R5, R6 and C1), and is adjustable by means of R6. If the pulses arrive at such a rate that the next pulse arrives before the output goes low, the monostable retriggers so that it simply stays high the whole time.

Readers can obtain a photocopy of connector diagrams by sending an SAE to the *PCW* offices. **END**

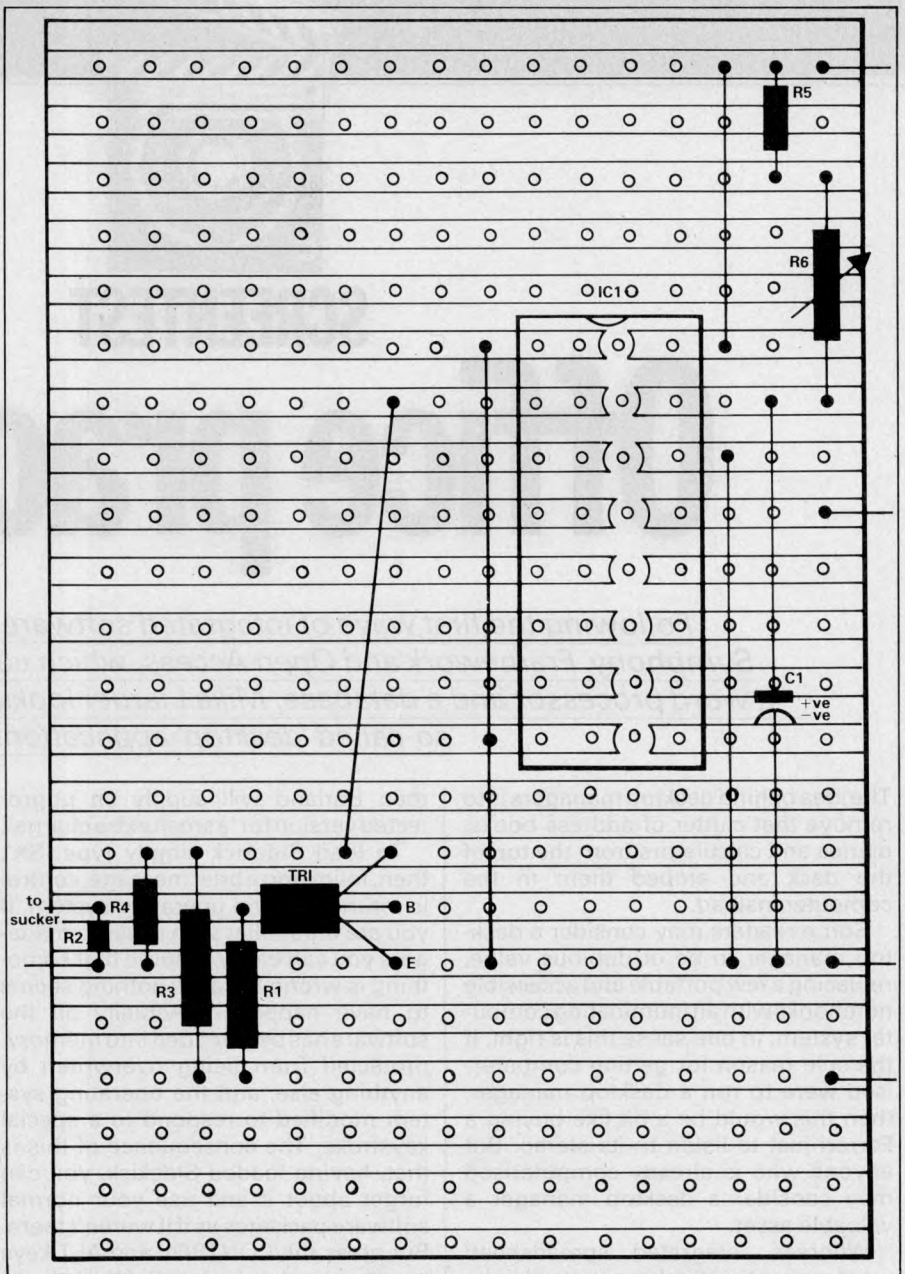

Fig 5 Component mounting for the Commodore 64 and BBC Micro

Component list

Commodore 64 and BBC Micro

Resistors

1 of	100KΩ	R1	¼-watt carbon
1 of	270KΩ	R2	¼-watt carbon
1 of	2.2KΩ*	R3	¼-watt carbon
1 of	3.9KΩ	R4	¼-watt carbon
1 of	2.7KΩ	R5	¼-watt carbon
1 of	22KΩ† Preset	R6	¼-watt carbon

*2.7KΩ for Commodore 64 †470KΩ for Commodore 64

Capacitors

1 of	6.8µF	Tant bead C1

Semiconductors

1 of	74LS123	1C1
1 of	BC108	TR1
1 of	2N5777	(Phototransistor) or
	FPT100 from Tandy stores: Cat No 276-130	

Miscellaneous

Rubber sucker from any ironmonger or DIY shop
20-pin IDC connector (for user port) (female) (BBC micro)
12-way edge connector (0.15in pitch) double-sided (Commodore 64)
Pair PP3 snap battery connectors
1-16 pin DIL socket