# INSTRUCTIONS FOR UPGRADING YOUR SPECTRUM FROM 16K TO 48K

Please note that Fox Electronics Limited cannot accept responsibility for any damage or injury caused, accidentally or otherwise, while fitting the upgrade kit if you make a mistake in following these instructions.

**IMPORTANT** Before touching the chips supplied with this kit, please perform the following steps to ensure that the kit is suitable for your Spectrum. Disconnect all leads. Hold the two h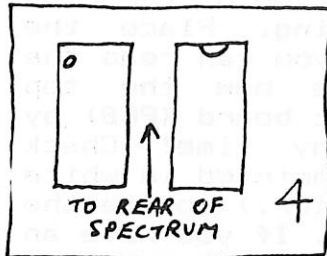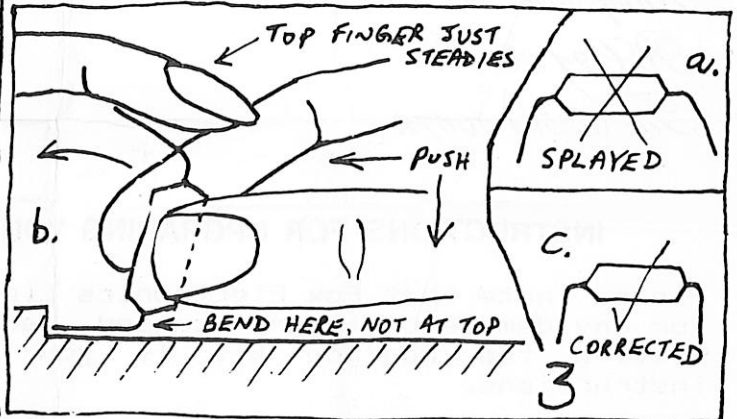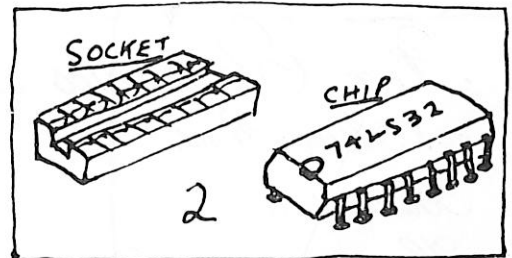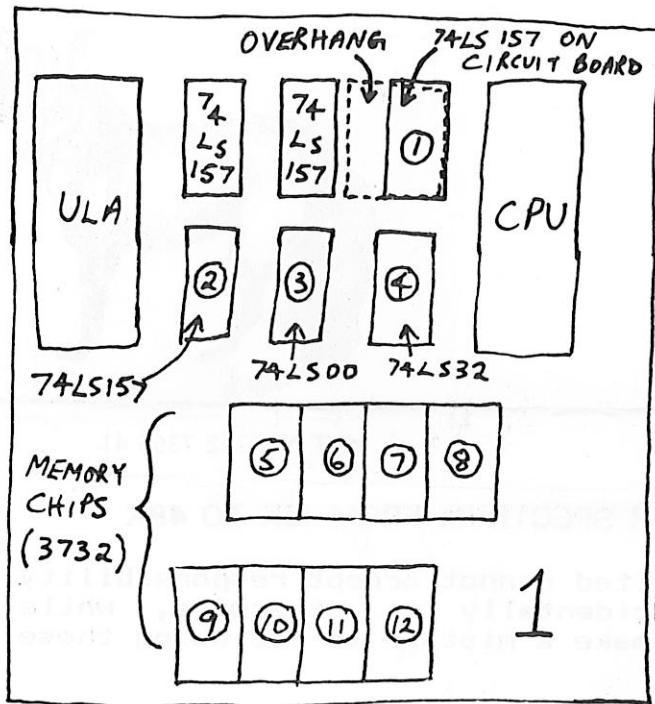alves of the case together, and remove the five screws in the bottom casing. Place the Spectrum on the table in the normal position, so that you can read the keyboard. Gently raise the top casing a little. Notice how the top casing (keyboard) is connected to the printed circuit board (PCB) by two flexible cables. Do not strain these cables at any time! Check that you have an Issue 2 machine; the issue number is printed in white ink on the PCB. (If you don't, ring your upgrade supplier.) Locate the twelve chip positions on the PCB shown in Diagram 1. If you have an older Spectrum, you may find that you have a 14-pin chip fitted onto a piece of circuit board and connected to the PCB by wires. This is the "mod". It may be fitted on top of the CPU or suspended over position 1; it may be covered with a strip of black tape. If you don't have the mod, you will probably have a transistor (three leads) somewhere near the CPU; don't worry about this. Using Diagram 2, check that you have twelve empty sockets. If not, this kit will not fit, so please return it to your supplier for a full refund.

**Preparations** Before opening the plastic box, please note that the chips supplied in the kit can be damaged by static electricity when you handle them; the problem should not occur if you take these simple precautions: Wear nothing on your forearms; sit still at the table for a minute before starting; and don't shuffle your feet on the carpet.

**Procedure** Now open the box and remove the chips from the foam. Using Diagram 3, check for and correct any splayed pins; grip the chip ends with thumb and forefinger, and press down firmly, and across gently, while the forefinger of the other hand helps in the middle. Identify the different chips by looking at their type numbers; note that extra letters may be printed before and after the type number, for example a 74LS00 may be marked SN74LS00N. Note that all the chips use one or other of the methods shown in Diagram 4 to show the direction they should be inserted into the chip socket. ALL the chips must be fitted so that the small hollow or the open-ended hollow is away from you (that is, toward the back of the Spectrum). When fitting the chips, press gently and evenly, gripping the chip as shown in Diagram 5; if the chip starts to tilt in the socket, press on the opposite side or end to even it up again. Before pushing it fully home, check that no pins have become bent under the chip.

**First,** fit the 74LS157 chip on the small circuit board into socket No. 1, so that the overhanging chip is on the left (that is, away from the CPU). (If you have the mod, remove the black tape if you need to. If the mod is near position 1, feed the 74LS157 in under it. If the connecting wires are very short, it may be necessary for them to pass

OVERHANG   74LS 157 ON CIRCUIT BOARD

ULA   74 LS 157   74 LS 157   ①   CPU

② ③ ④

74LS157   74LS00   74LS32

MEMORY CHIPS (3732)

⑤ ⑥ ⑦ ⑧

⑨ ⑩ ⑪ ⑫

1

SOCKET   CHIP   74LS32

2

TOP FINGER JUST STEADIES

PUSH

b.   BEND HERE, NOT AT TOP

a. SPLAYED

c. CORRECTED

3

0

TO REAR OF SPECTRUM   4

5

SEE TEXT

6
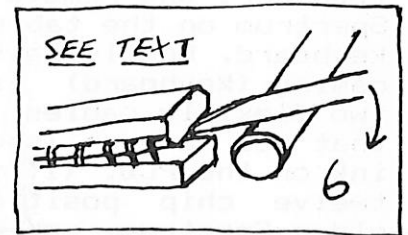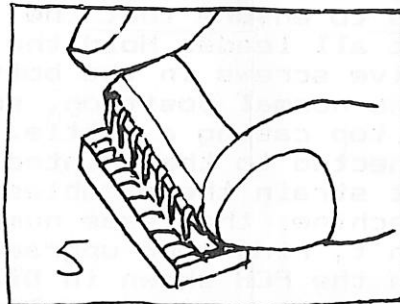
between the pins of the 74LS157; make sure that the wires are not damaged. Check that no pins on the mod chip can touch the 74LS157; use some tape to stop any contact. Replace the tape.) Fit all the other chips as shown in Diagram 1. Note that all the memory chips (3732s) are the same and each can be fitted in any of the sockets 5 to 12. Now carefully check that all the chips are in the correct sockets and are fitted the right way round. If you need to remove a chip, lever it out a very small distance at a time, working from one end and then the other, keeping the chip as level as possible. The best way is to use a screwdriver and a ballpoint pen as in Diagram 6. Return the top casing to its normal position, and replace the five screws in the bottom casing.

**Testing**   Watch the TV and power on the Spectrum. If you don't get the copyright notice on the screen within four seconds, power off FAST and recheck everything. If all is O.K. enter PRINT PEEK 23733; you should get the answer 255. If you don't, power off and repeat it a few times. Recheck the chips, and if you can't get 255, send the kit back to your supplier. You probably have a faulty Spectrum, but he will send you another kit for you to try. To test your RAM thoroughly, enter this program (it takes 16 minutes to run):

```
10 CLEAR 32000: FOR a=32768 TO 65535: POKE a,0: NEXT a: PAUSE 50
20 FOR a=32768 TO 65535: IF PEEK a<>0 THEN GO TO 60
30 POKE a,255: NEXT a: PAUSE 50
40 FOR a=32768 TO 65535: IF PEEK a<>255 THEN GO TO 60
50 NEXT a: PRINT "RAM O.K.": STOP
60 PRINT "Error at ";a
```

If this program runs, your kit is definitely working; any problems with 48K software, etc. are being caused by your Spectrum or tape recorder or by the program tape, and you should ring your supplier for advice.

**Guarantee**   Your kit is guaranteed for 12 months (your normal statutory rights are not affected.) There is also a 14-day money-back guarantee.

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