

# Assembly Instructions



## Wrist Calculator

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Designed by Four Seasons of East Anglia Limited (Graphics Division)

## PARTS LIST

Printed circuit board (PCB)

Integrated circuit (IC): Flat black package with 28 lugs

Display: Glassy 'bubbled' package

18 k resistor: BROWN GREY ORANGE

4.7 k resistor: YELLOW VIOLET RED

Keyboard Separator: Perforated plastic sheet

Keyboard contact sheet: Black rubber sheet

Batteries (6)

Connector wires (2)

Tinned wire

Switch contacts (2): Small metal 'C' shapes

Battery contacts (2)

Solder

'Soder wick' (for correcting errors)

'Electrolube' grease capsule

Case upper

Case lower

Switch buttons (2)

Keyboard button assembly

Keyboard panel

Strap

Check the components against the list to identify them and ensure that they are all present.

## INTRODUCTION

The Sinclair Instrument Wrist calculator will present no difficulty as long as you have a small soldering iron, a steady hand and good eyesight.

Before starting read the instructions right through carefully and make sure you understand them. A few minutes here may save expensive mistakes later. Remember the assembly of this kit is not a race against time. There is a general assembly and layout drawing for your reference, also to help you familiarize yourself with the components and their assembly.

## SOLDERING

The instructions that follow assume you are able to solder and have the necessary tools to work on small electronic assemblies. Make sure that your soldering iron bit is small enough and that it is not too hot or cold or poor joints or damage to the components may occur. Use only the solder provided. Apply the solder and iron to the joints simultaneously. Do not melt the solder on the iron and then transfer to the joint. This will only vaporise the flux in the solder and give rise to poor joints.

If a joint is found to be bad and you wish to remove the solder then use the 'Soder wick' braid provided. To use, lay the braid over the joint and apply a clean, solder-free iron on top of the braid and joint. The braid will soak up the solder leaving the joint ready to be remade. Cut off the soldered end of the braid ready for further use.

## TOOLS REQUIRED

### 1. Soldering Iron

A subminiature iron is required with a small bit 1.6 mm or smaller.

A suitable instrument is the ANTEX CN15 watt. Whatever iron is used it must be correctly earthed and of the correct voltage for your mains supply. It is a good idea to keep a piece of damp felt at hand to wipe the bit on from time to time.

### 2. Wire Cutters

A pair of wire cutters for electronic work are required. Alternatively a pair of nail clippers will suffice.

### 3. Pliers

A pair of fine nosed pliers are necessary. You may be able to make do with a pair of tweezers.

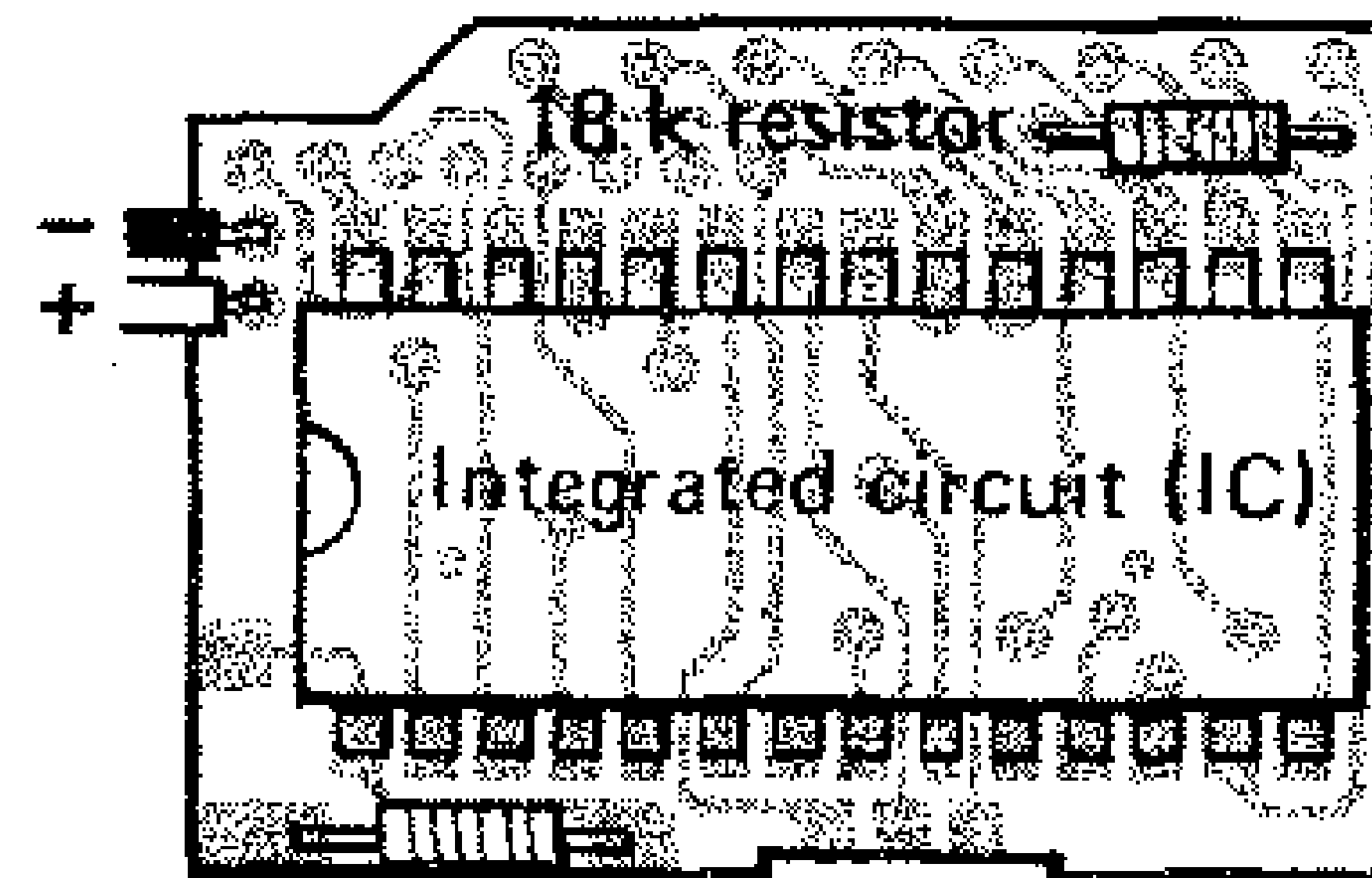
## PRECAUTIONS

Take care not to overheat components. Although modern components are not as easily damaged by heat as is commonly supposed do not linger unduly over joints. Take extra care with the display. If the plastic lenses become scratched or marked with hot solder or flux splashes it will need replacing which will involve unnecessary expense.

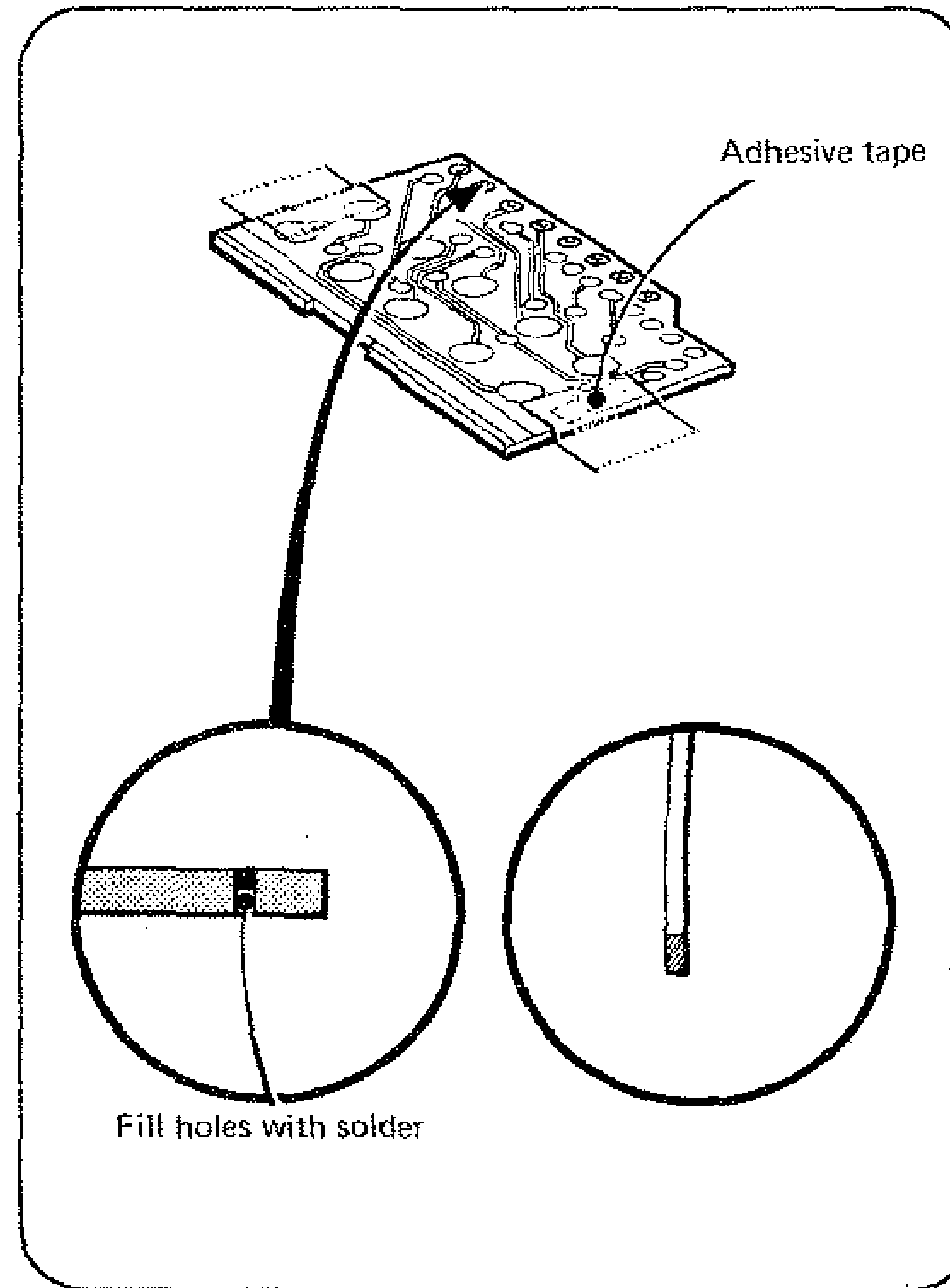
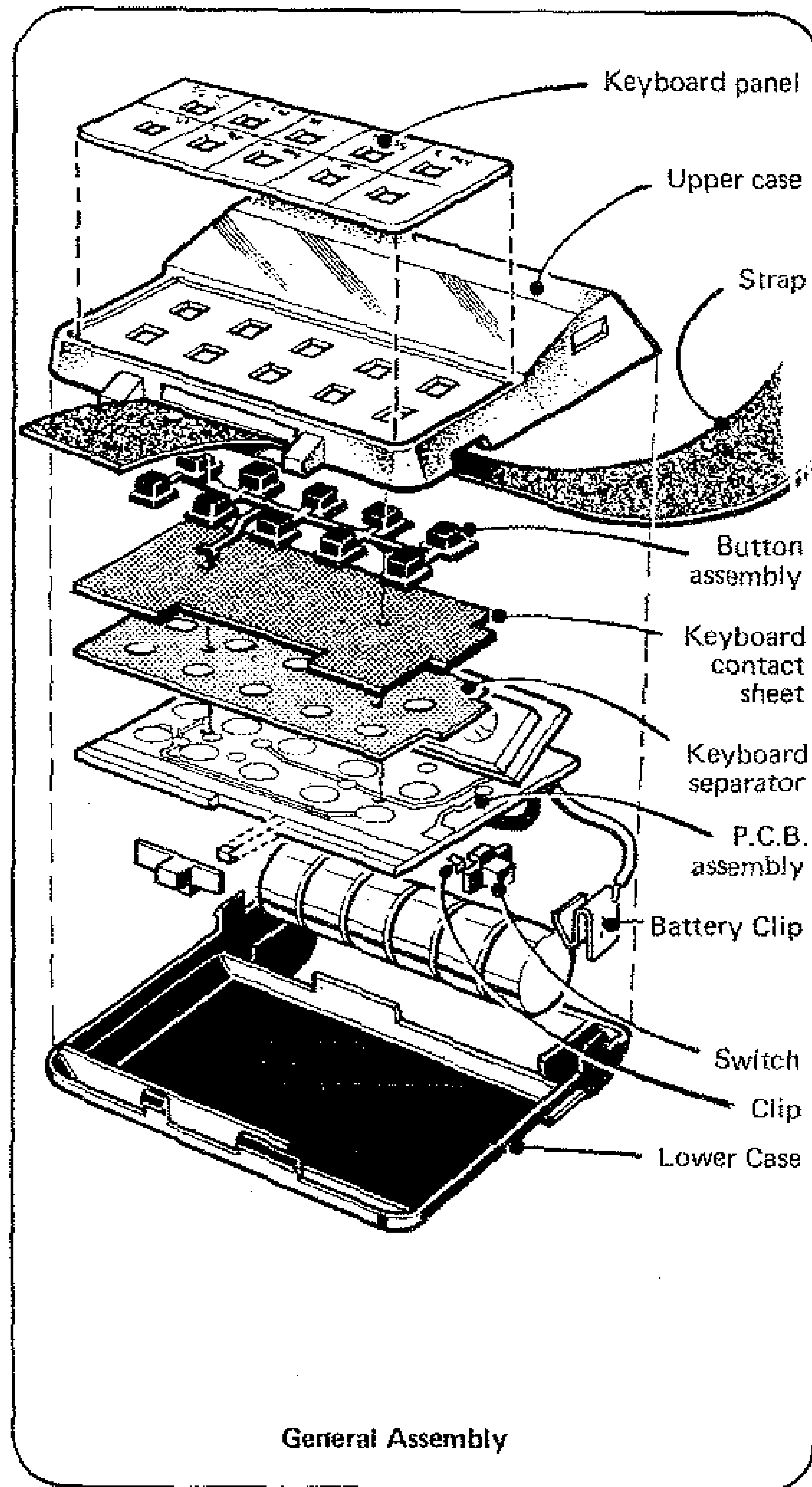
The integrated circuit can be damaged by static electricity. It is supplied on a conductive rubber. Leave it until required. As a precaution when assembling the kit work on a metal surface such as a metal tray or tin lid. A sheet of cooking foil is also a good work surface. Before starting assembly hold the metal and touch it with the bit of your soldering iron. This will short any static electricity to earth. Do this from time to time and also if you leave the work for any reason.

Check that the components are in the correct position and are the right way round. It can be difficult to rectify mistakes once soldered.

Now start to assemble.

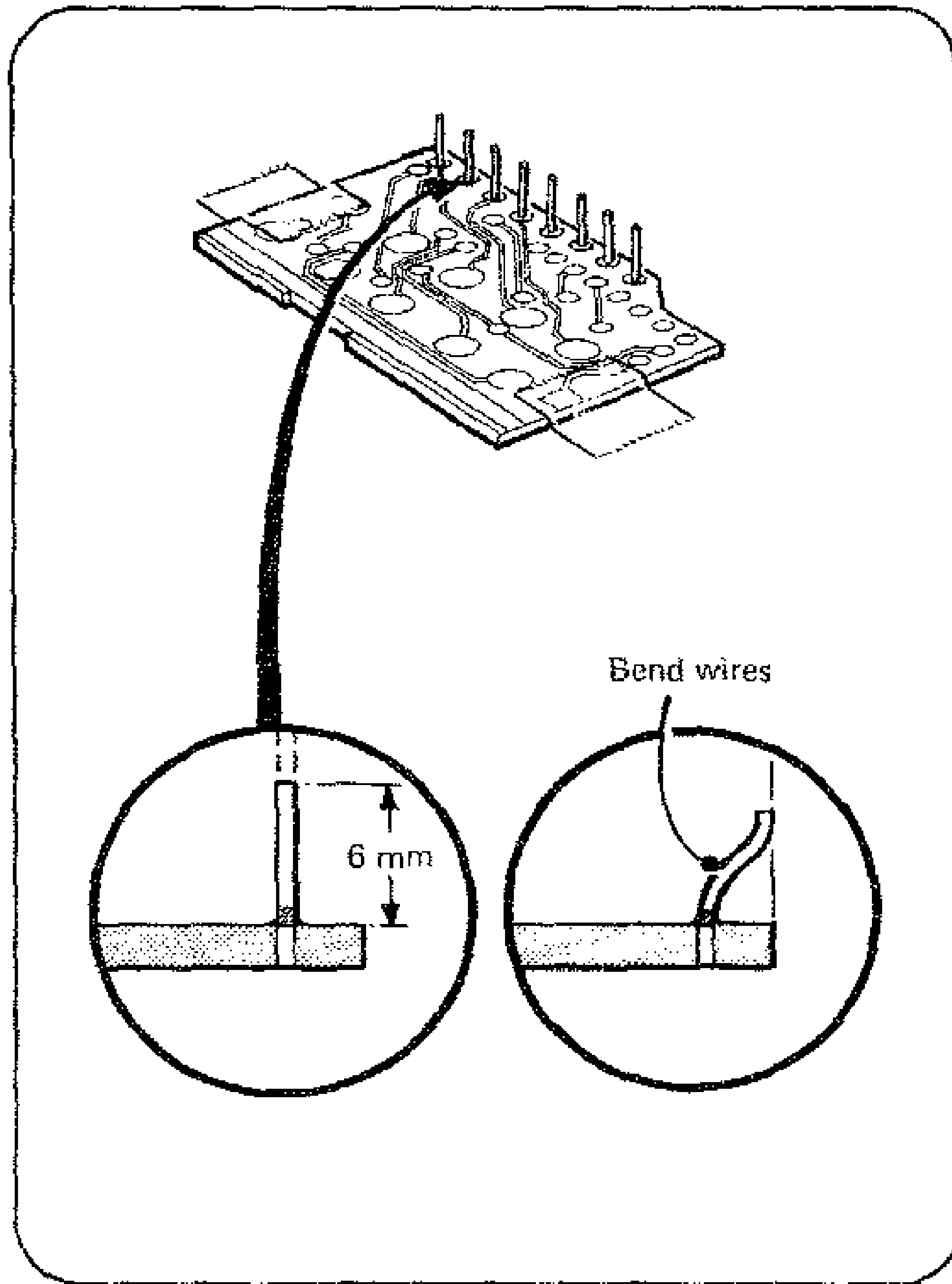


Layout Drawing

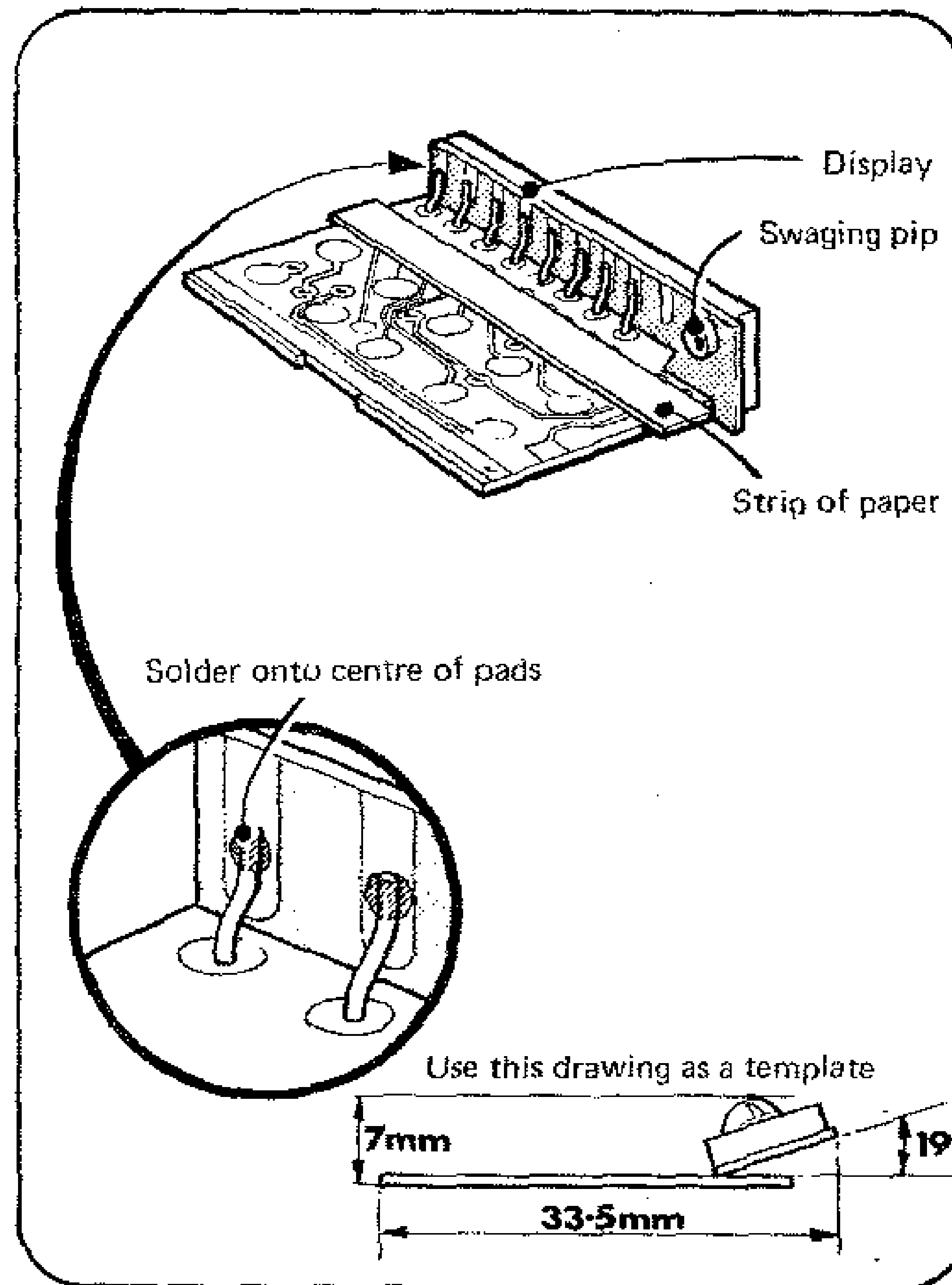


### 1. Wires for Attaching Display

Using adhesive tape, stick down the P.C.B. onto a flat surface as shown. To hold the display in place, eight wires have to be soldered to the P.C.B. (see next illustration). To do this it is necessary firstly to fill each of the eight holes with solder. Next tin the tip of the wire, do this each time the wire is cut.

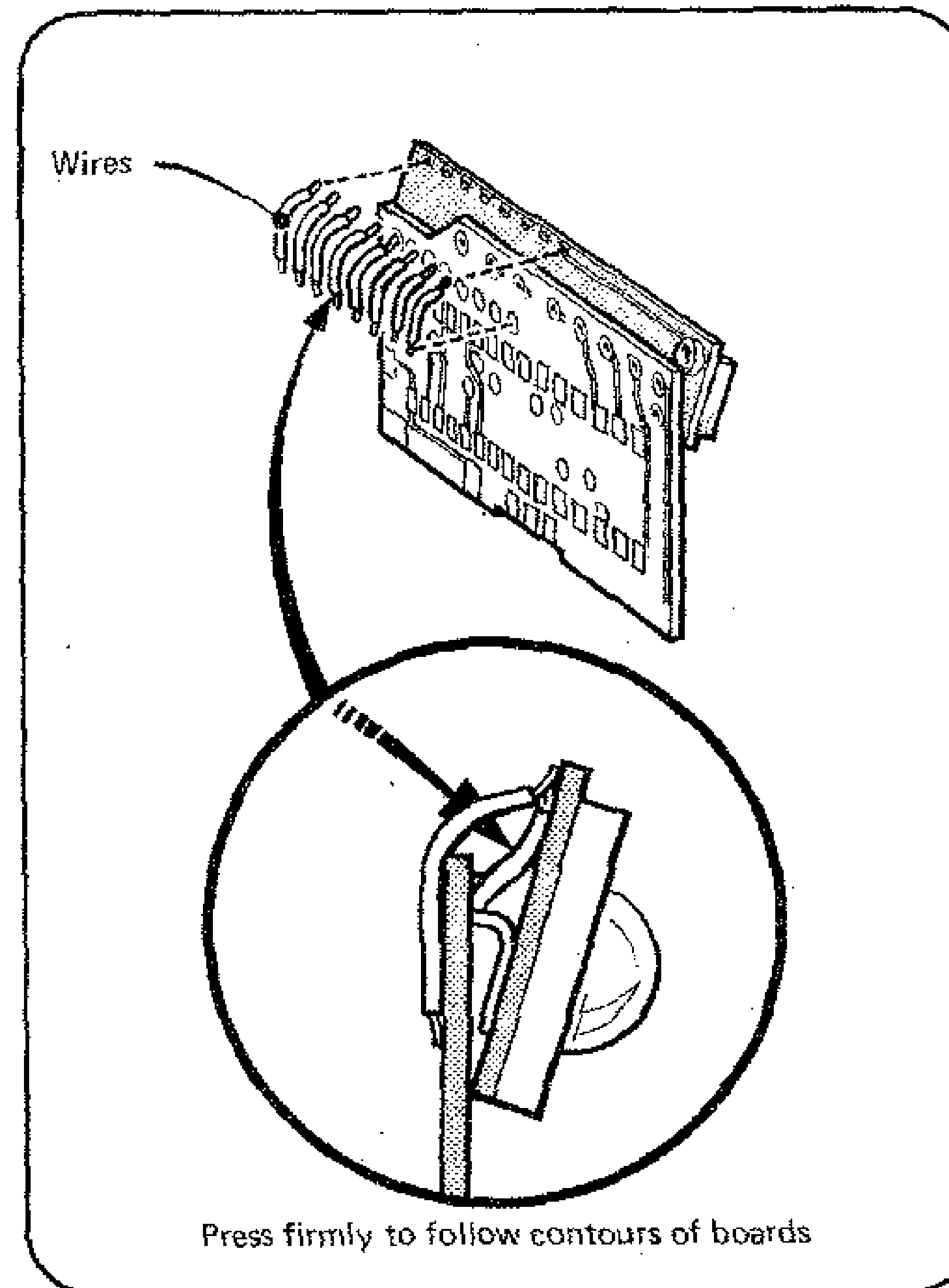


2. Insert the tinned wire into its hole and solder, do not let the wire penetrate completely through to the underside of the P.C.B. Trim the wires to height 6 mm. Continue and complete the eight wires, ensure the wire is tinned each time before inserting into its hole. Bend the wires as shown above.



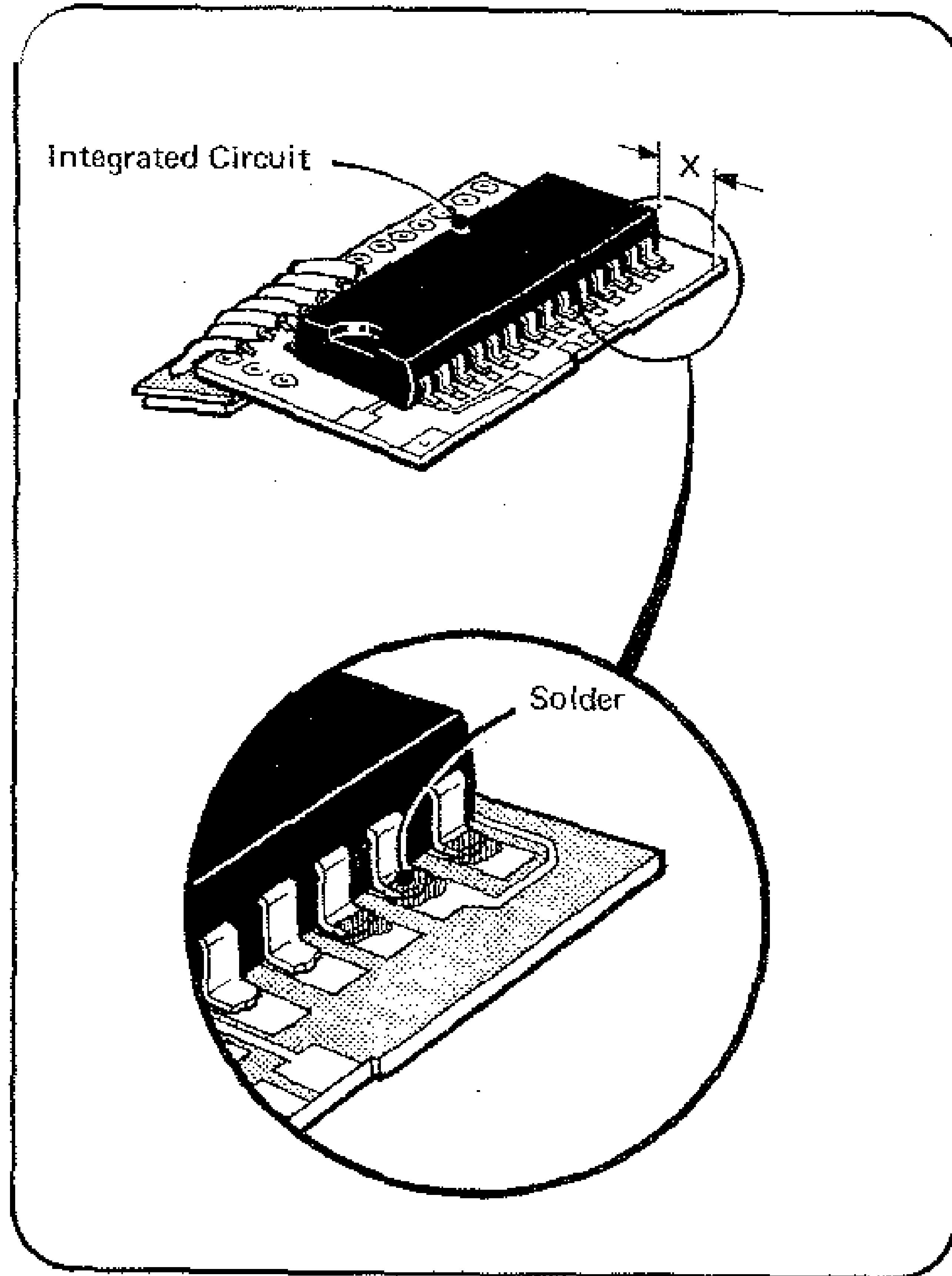
### 3. Display

Place the display as shown ensuring the connection on the display line up with the eight wires soldered to the P.C.B. Quickly solder each wire onto the centre of the pads on the display (a friend's help is useful here). Cut a small strip of paper or tape and place as shown (the paper of these instructions is suitable). Carefully bend the display until it matches the above drawing (this is life size to enable you to use it as a template). **TAKE GREAT CARE NOT TO DAMAGE THE SURFACE OF THE PLASTICS LENS OF THE DISPLAY.** Check the measurements of your board and display with the above drawing. If necessary carefully correct your assembly. To acquire the correct angle and measurements it may be necessary to file down the swaging pip on the top right hand corner of the display (a nail file could be used for this).



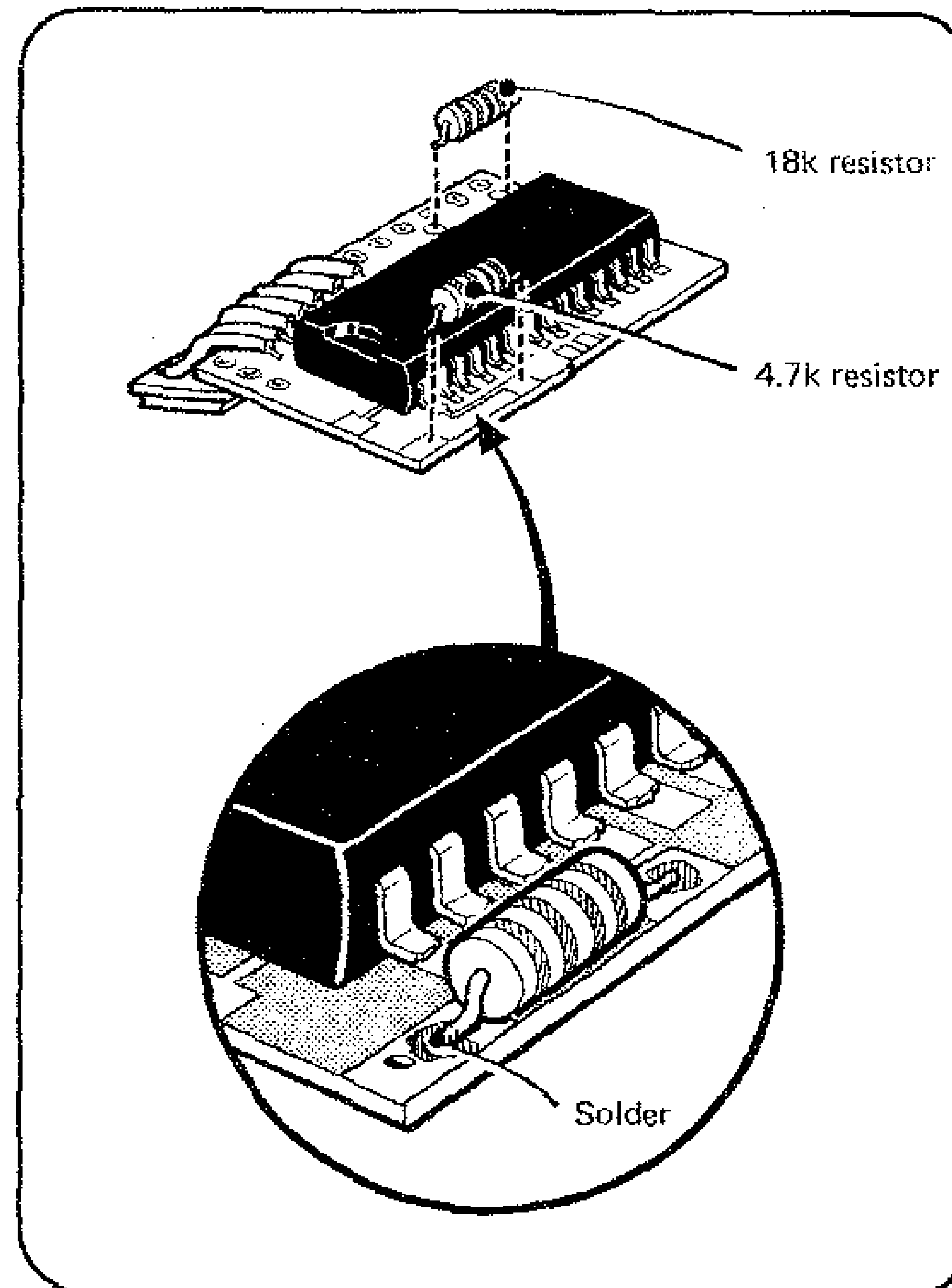
### 4. Segment Connection

Using the black length of wire, cut exactly to length and in turn carefully solder to the P.C.B. and display as shown. The wires must firmly follow the contours of the boards. Note that wires do not enter holes on the display and P.C.B. but just touch the surface.



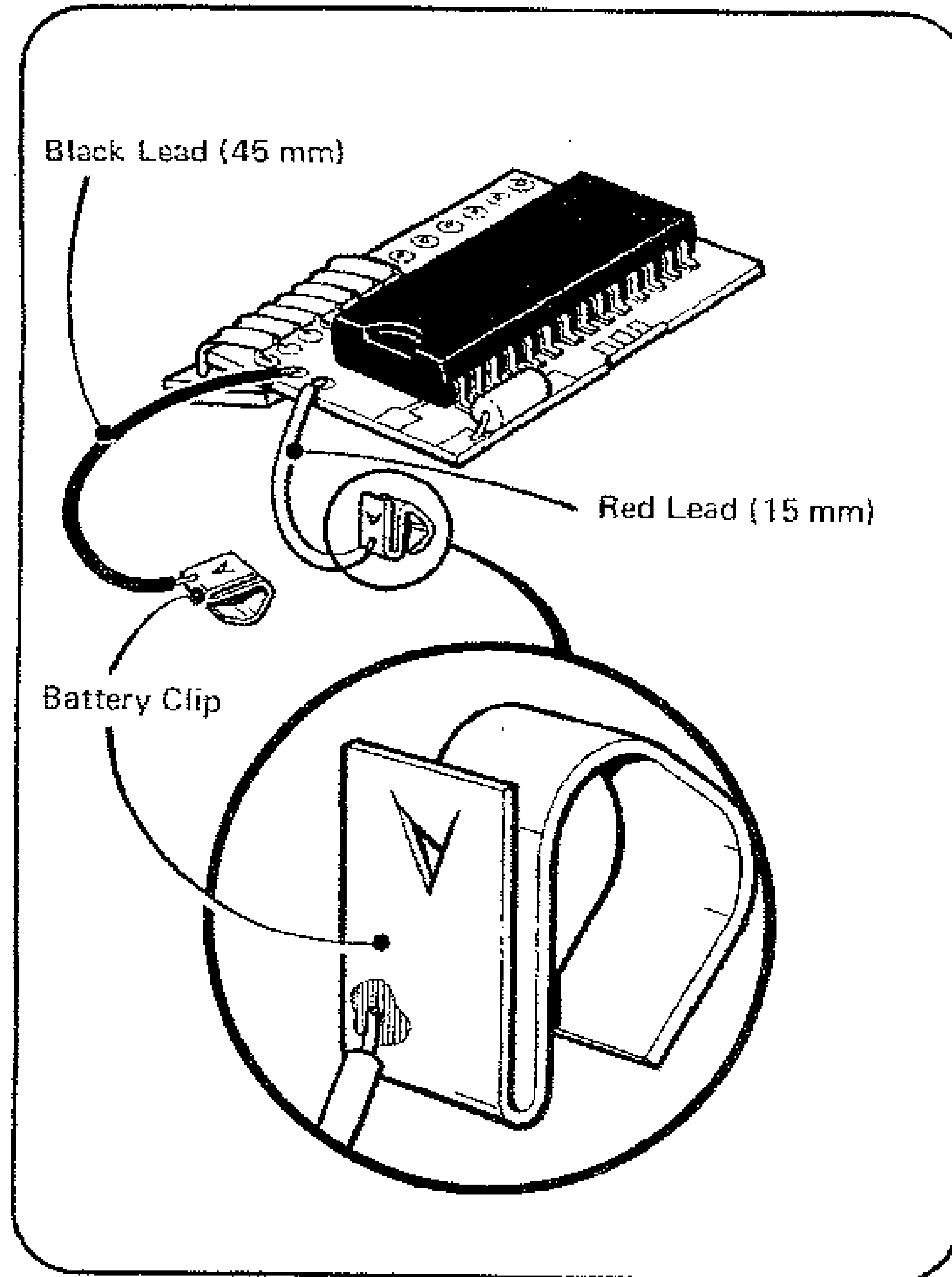
### 5. Integrated Circuit

Place the IC as shown ensuring that dimension 'x' is as large as possible while making sure each tag on the IC sits on its respective PCB pad. Solder each tag in turn using the minimum amount of solder.



### 6. Resistors

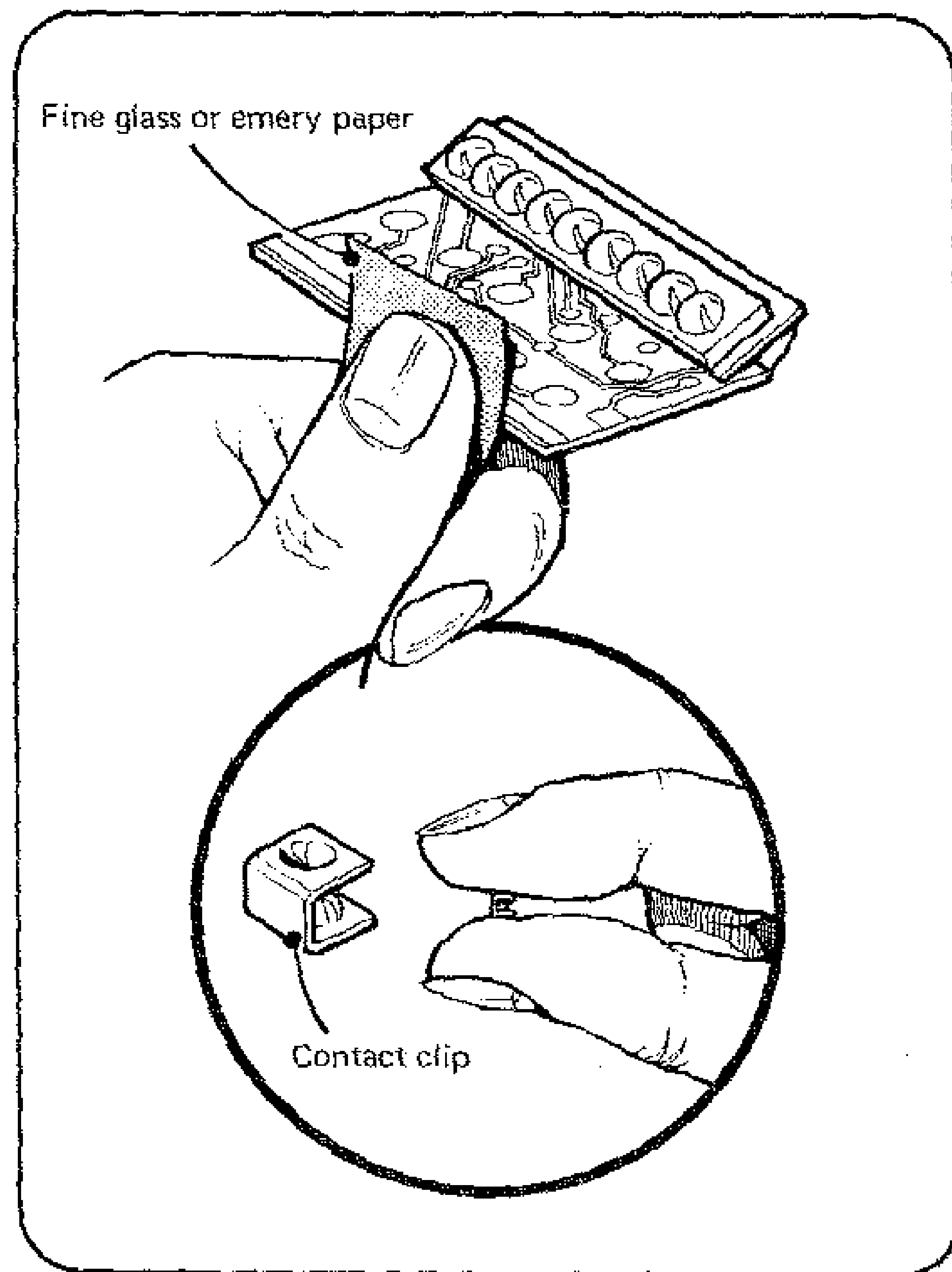
Prepare the resistors to the shape shown and solder in place. Solder only to the top surface of the PCB. The 18 k resistor may be varied between 0 and 27 k to achieve the desired brightness versus the battery life.



### 7. Battery Leads

Take the red lead and cut to a length of 15 mm. Solder onto the PCB and solder the other end to one of the battery clips as shown.

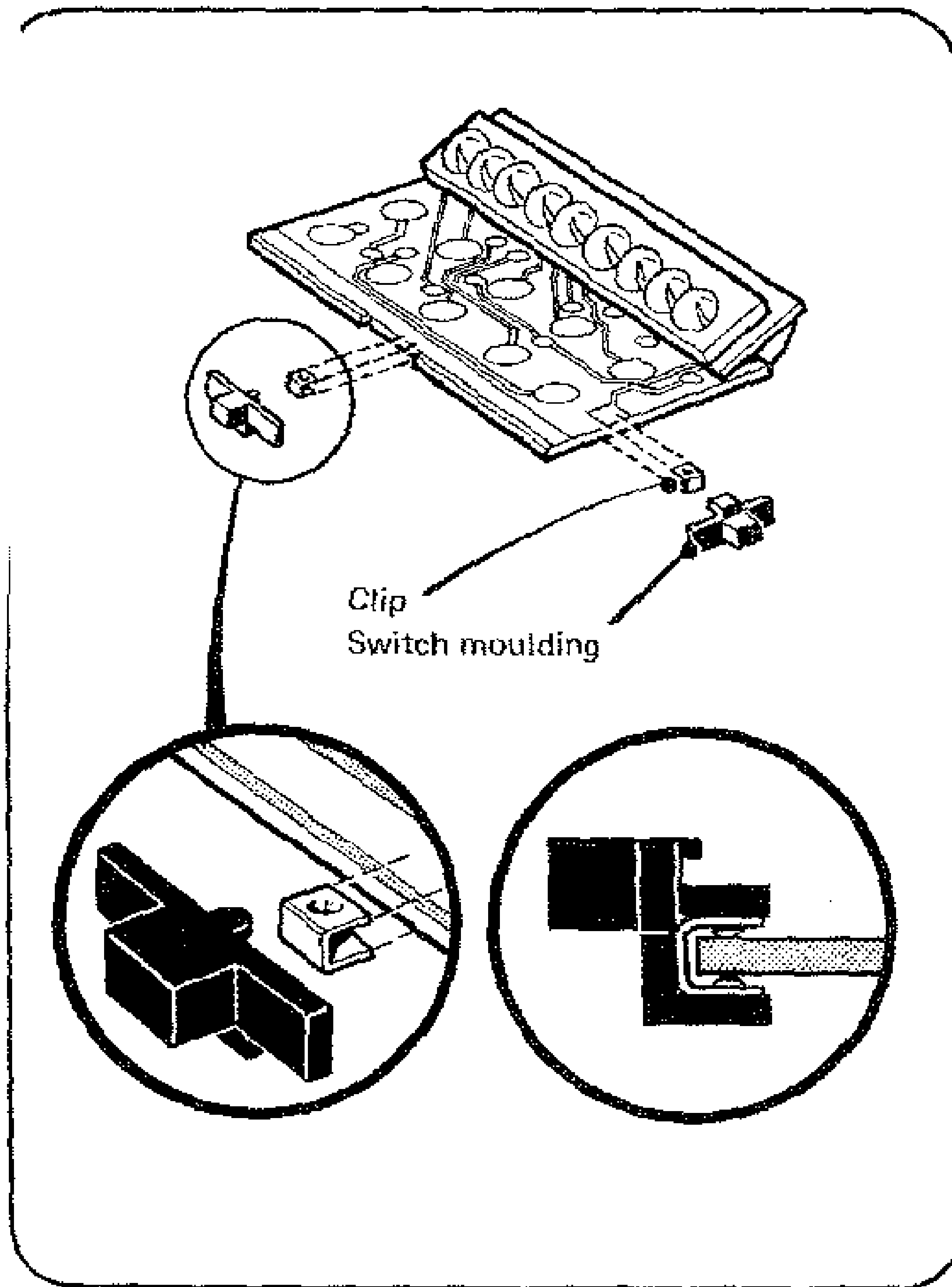
Cut the black lead to a length of 45 mm and repeat the soldering to PCB and battery clip.



### 8. Board Preparation

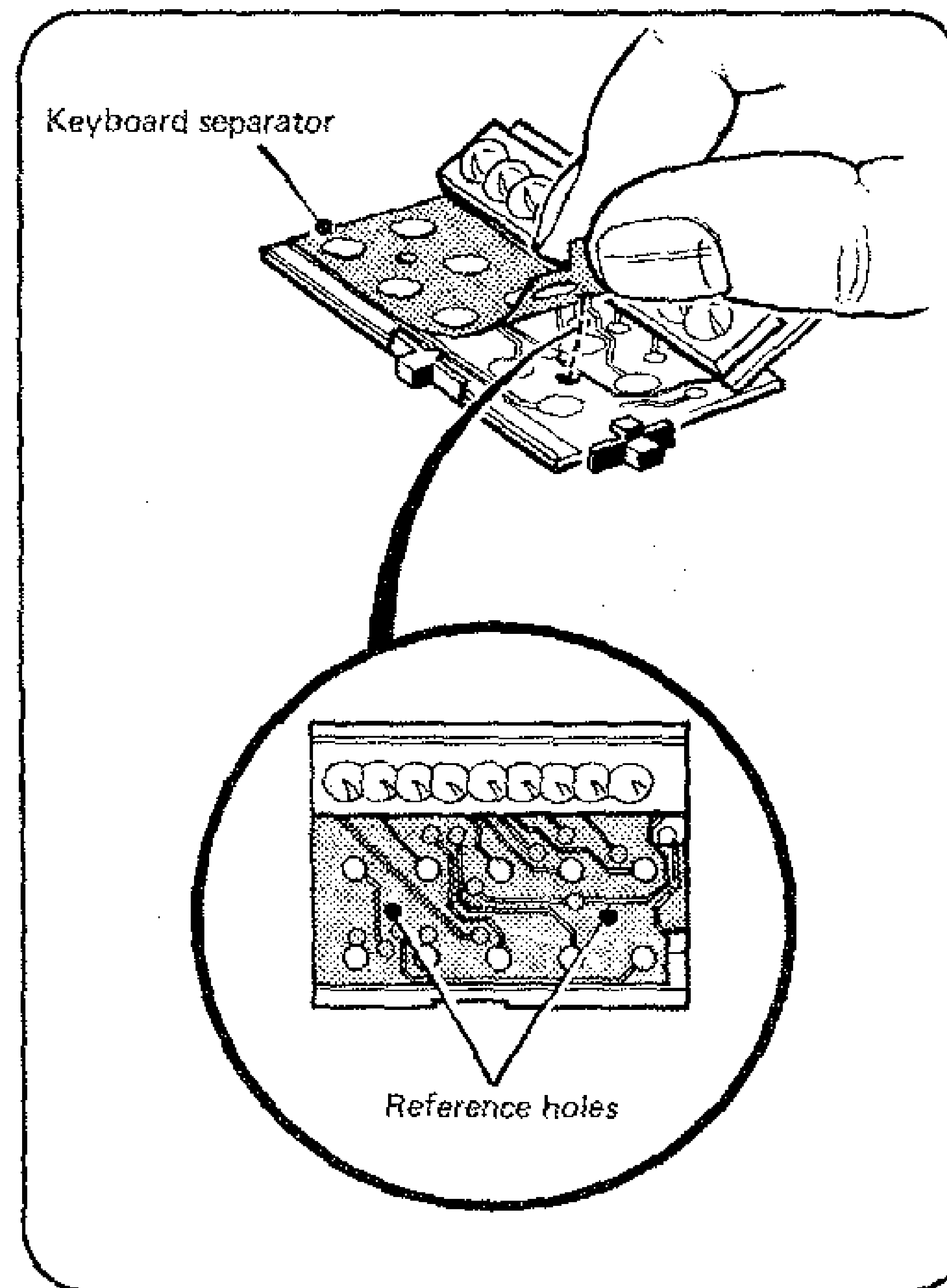
Remove any rough edge from the PCB with a piece of fine glass or emery paper. The small contact clips should be squeezed until they just fit over the board with slight tension.





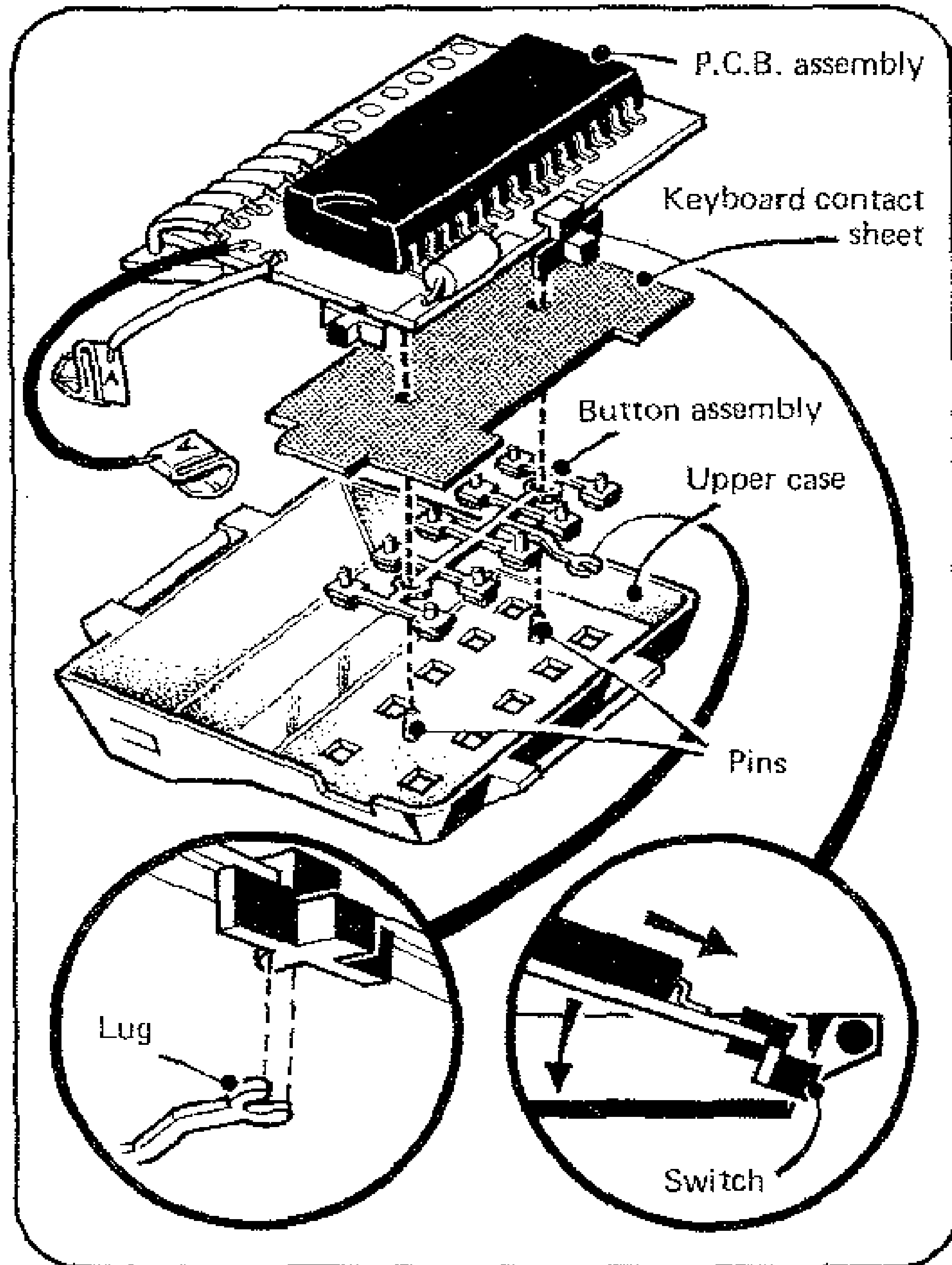
### 9. Switches

Fit each clip to the board and fit the switch mouldings over the clips as shown. Smear a film of grease on the PCB switch contacts.



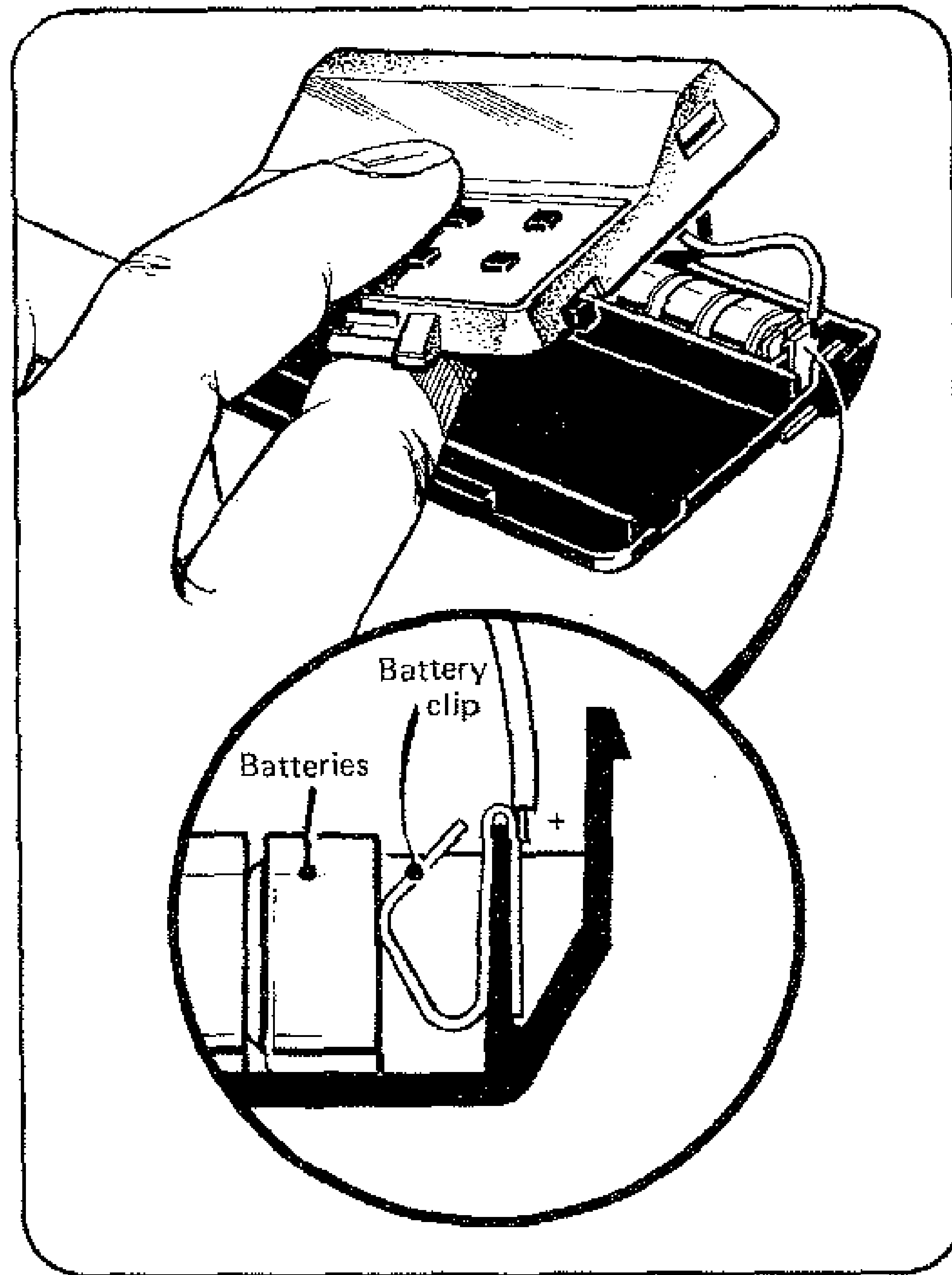
### 10. Keyboard separator

Remove the protective backing paper from the keyboard separator to reveal the sticky backing. Make sure the PCB is clean and grease-free then. Lay the separator onto the PCB ensuring the reference holes in the separator line up with corresponding holes in the PCB. Rub down flat.



### 11. Fitting into Upper Case

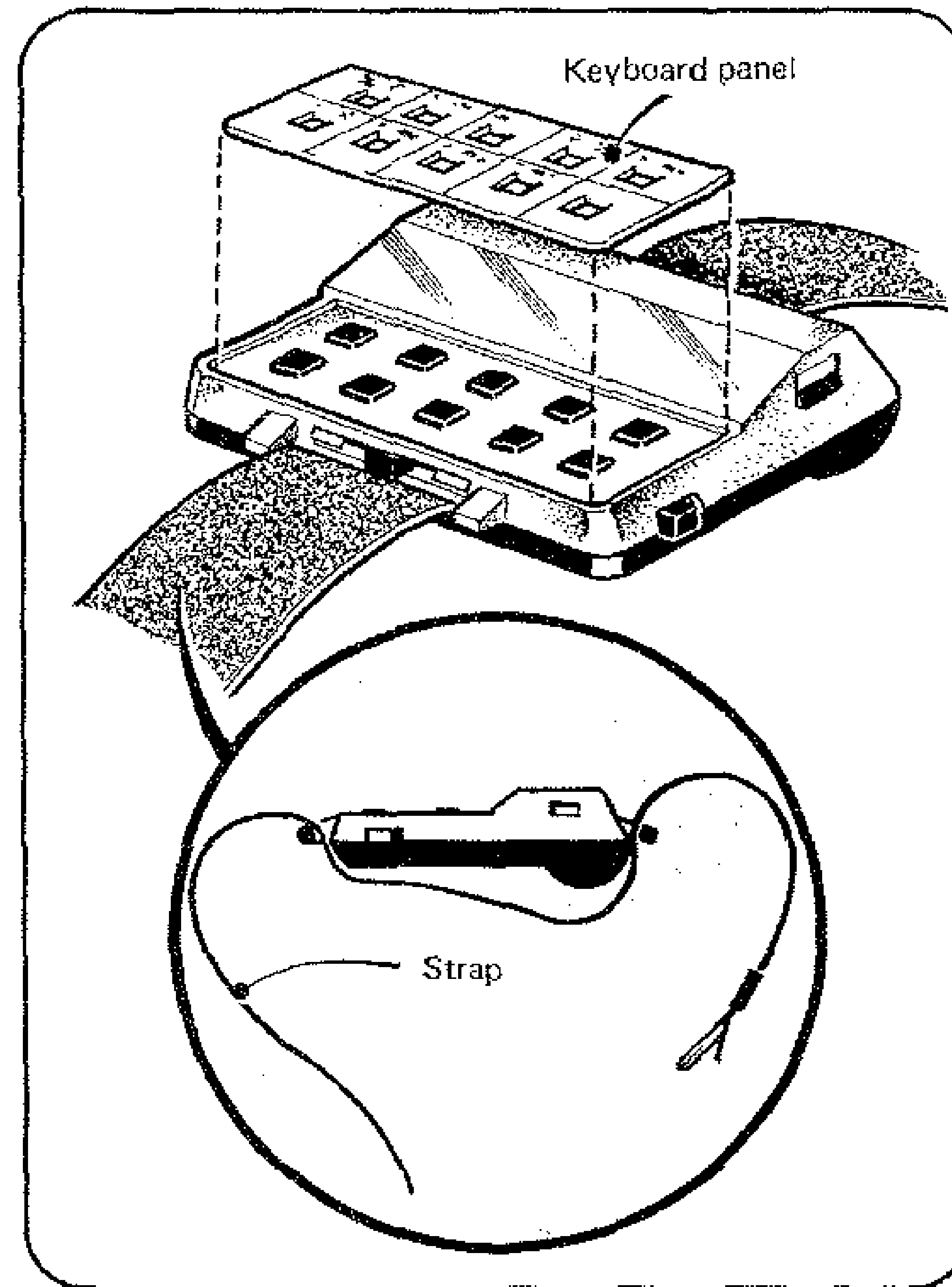
Place the upper case upside down then fit the button assembly over the pins followed by the keyboard contact sheet. Ensure the dull black surface is uppermost and that everything is sealed correctly. Check that the lug attached to the button assembly fits onto the front switch contact as shown. Next insert the PCB assembly into the case starting with the switch as shown and then fitting the PCB over the pins and pressing it flat into the upper case.



### 12. Case lower

Fit the battery clips into the case lower over the retaining walls. Take each of the 6 batteries in turn and smear a thin film of grease on the flat surfaces and then fit into place between the clips as shown. The positive side of the battery is identified by a + stamped on the battery case. Clip the two halves of the case together making sure the battery leads are not trapped.

Switch on by pushing the switch on the right-hand side towards display. A number of numbers should appear on the display. If nothing appears undo the case and check the assembly and also that the batteries are inserted correctly. Check for short circuits between the lugs of the IC in particular. When all is well reassemble into the case.



### 13. Final assembly

Remove the protective backing paper from the keyboard panel. Place in position over the buttons ensuring that the buttons are still free to move. Thread the strap through the lugs on the case as shown above. This completes your Wrist Calculator.

## TESTING

Switch on by using the right hand switch. The display should again light. Clear the display by pushing the front switch to the left (shown hereafter) as (●●●) and press 'C'. A single 0 should be showing in the display. Place the front switch in the central position (●●●), and then do the following sum:

Press key (●●●) 123	Display shows 123
Press key (●●●) ÷	Display shows 123
Press key (●●●) 456	Display shows 456
Press key (●●●) x	Display shows 0.2697368
Press key (●●●) 789	Display shows 789
Press key (●●●) =	Display shows 212.82233
Press key (●●●) M+	Display shows 212.82233
Press key (●●●) C	Display shows 0
Press key (●●●) MR	Display shows 212.82233

This fully checks out the correct functioning of the calculator.

## FAULT DIAGNOSIS

Fault	Check
No display	Integrated circuit is right way round and soldered correctly. On/off switch is making contact. Batteries are inserted correctly and making contact. Battery leads are not broken and are soldered correctly. Look for short circuits caused by solder or wire clippings. Batteries may be 'flat' — replace all six if necessary (never one at a time).
One digit or part of all digits missing	Soldering of IC. Soldering and wires to display.
One or a few functions or numbers will not enter	Soldering of IC. Could be dirt or dust under keyboard — dismantle and clean keyboard contact sheet and PCB surface.
One complete set of functions will not enter	Soldering of IC. Front switch is not making contact.
Random display and/or erratic calculation	Replace batteries. Replace IC (see later).

*Note: It is important that the batteries are correctly inserted and that the six batteries are replaced as a set when necessary. Replacement of a single battery can be dangerous.*

*Use 'Mallory' type RM 13H.*

## SERVICE REPLACEMENT

If any component or part is found or known to be faulty Sinclair Instrument Ltd. will replace the item free of charge if a request is made enclosing an SAE. In the case of the display, integrated circuit and batteries the faulty item must be returned together with the voucher cut from these instructions in order to gain a replacement.

If, after replacing the suspect or faulty parts, the calculator still does not work please contact Sinclair Instrument Ltd. at the address below.

## GUARANTEE

Sinclair Instrument Ltd. will replace any part or parts if defective in labelling, manufacture or packaging (see above).

If, after examining the kit, you feel unable to attempt construction then return the kit undamaged to Sinclair Instrument Ltd., postage paid, and your purchase price will be refunded.