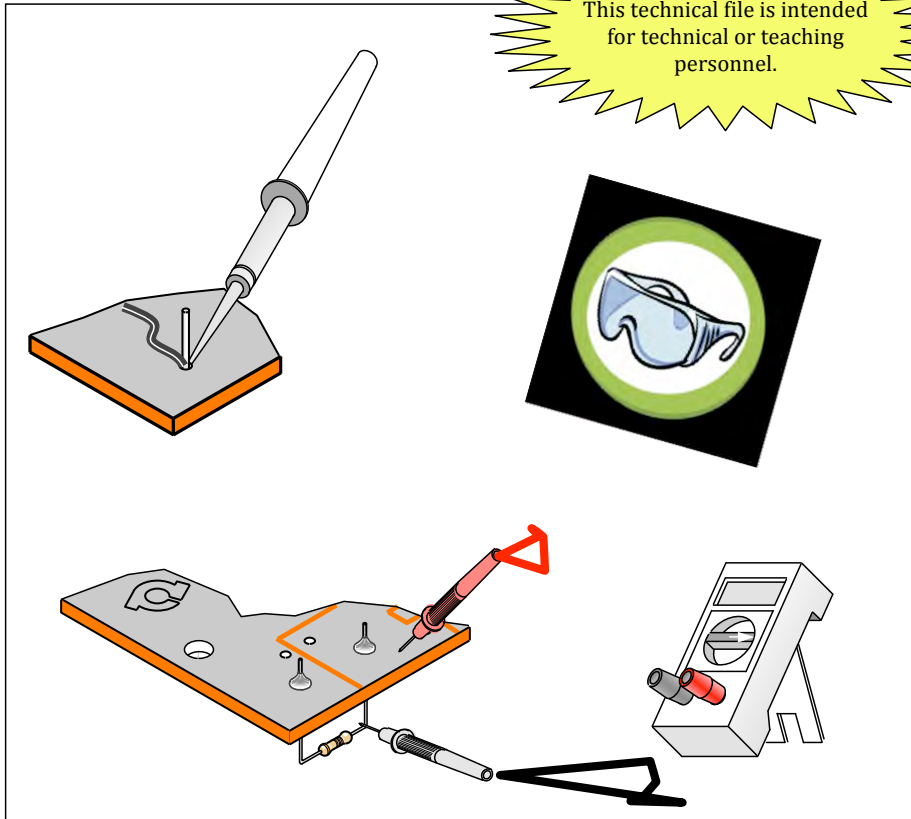


TIN SOLDERING

This technical file is intended
for technical or teaching
personnel.



APRIL 2012

TIN SOLDERING

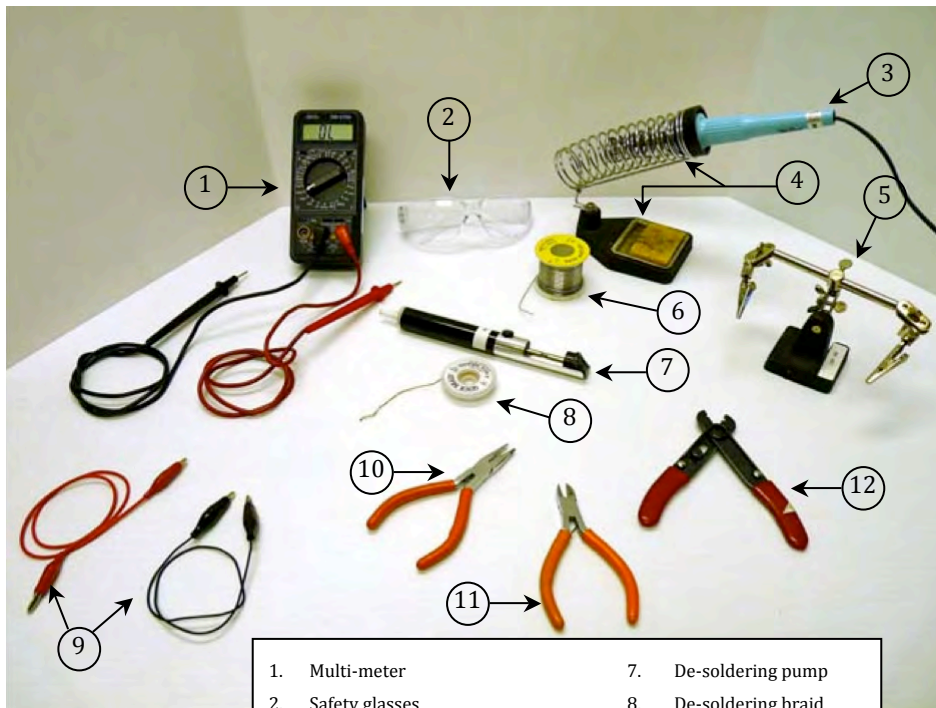


Tin soldering is based on a few basic principles. Its primary aim is to ensure excellent electrical conductivity between various conductors (metallic electrodes of a component, printed circuit, wire...).

To carry out a perfect solder, you must always keep one thing in mind: **the temperature of the two conductors must be superior to the fusion point of the solder.** To attain the required temperature, we need to promote the transfer of heat from the hot iron to the conductors. In the case of solders on a printed circuit, we need to verify the state of its conductivity **before placing the components.**



Equipment used for soldering and validation



- | | |
|--------------------------|-------------------------|
| 1. Multi-meter | 7. De-soldering pump |
| 2. Safety glasses | 8. De-soldering braid |
| 3. Soldering iron | 9. Alligator clip wires |
| 4. Iron stand and sponge | 10. Needle nosed pliers |
| 5. Soldering vise | 11. Wire cutters |
| 6. Flux (tin) | 12. Wire strippers |

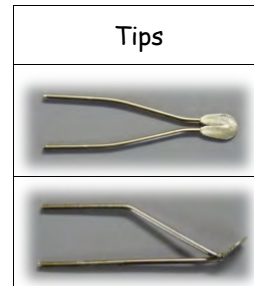
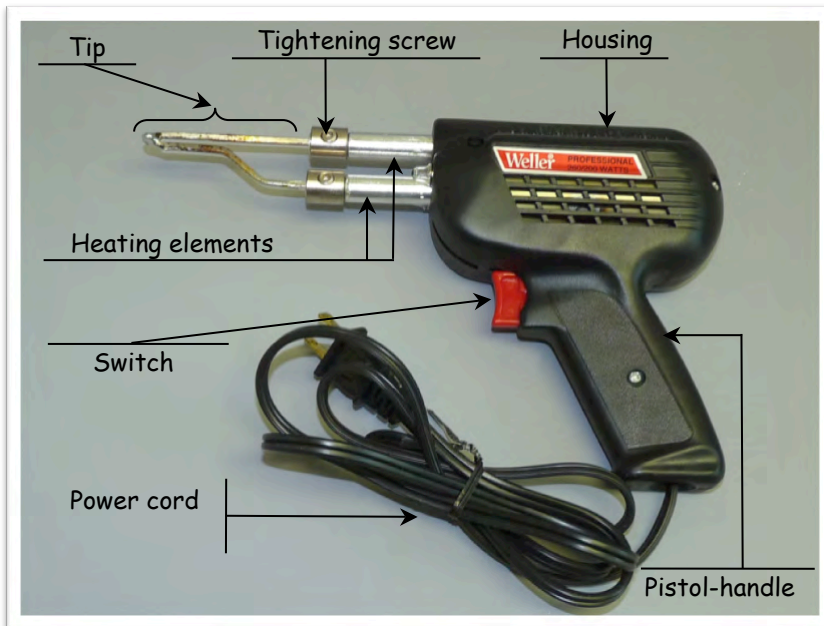
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Commentaire: Pourquoi la pagination débute à 18?

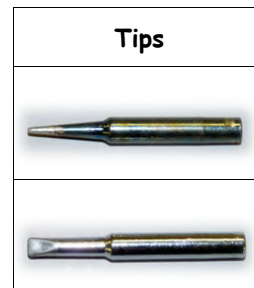
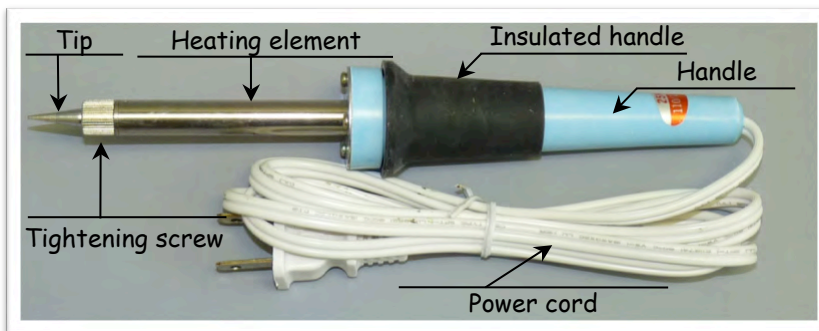
Details regarding some of the tools

Soldering iron (#3): The purpose of the iron is limited to **heating the parts** (electrodes of the components and tinned surface) in order to obtain the ideal temperature to **make the solder melt**. There are various types of irons, of which two examples are shown here: the pistol and the fixed temperature pencil. The power of the iron must be chosen in relation to the type of solder to be carried out and the type or diameter of wire used. Irons have tips of various shapes and sizes, depending on the type of work required.

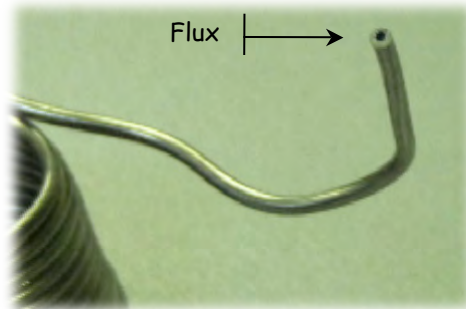
"Pistol" type soldering iron



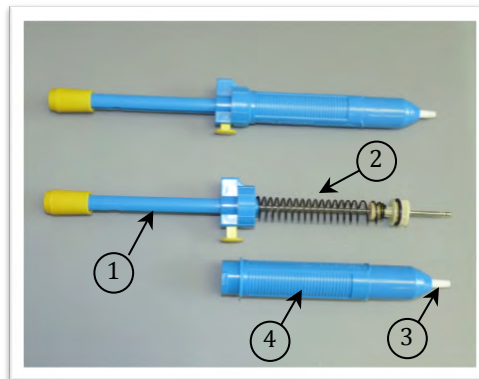
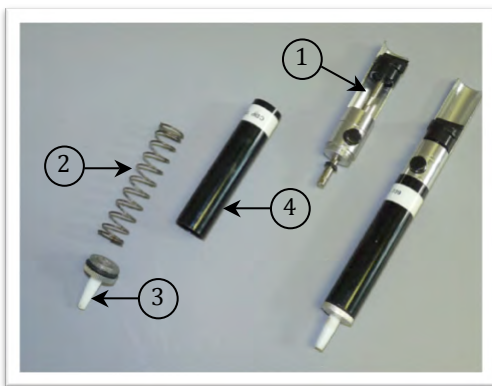
Fixed temperature "pencil" type soldering iron



Soldering wire (#6): There are wires made from various tin alloys. The melting temperature varies from one alloy to the other and depending on whether or not it contains lead. (e.g.: with lead $\pm 180^{\circ}\text{C}$ and without lead $\pm 220^{\circ}\text{C}$). Soldering wire usually contains soldering flux. This acid product allows for parts to be cleaned properly and promotes adhesion of the solder to these parts. Soldering wire with a diameter between 0.5 and 0.8 mm is ideal for solders carried out in class.

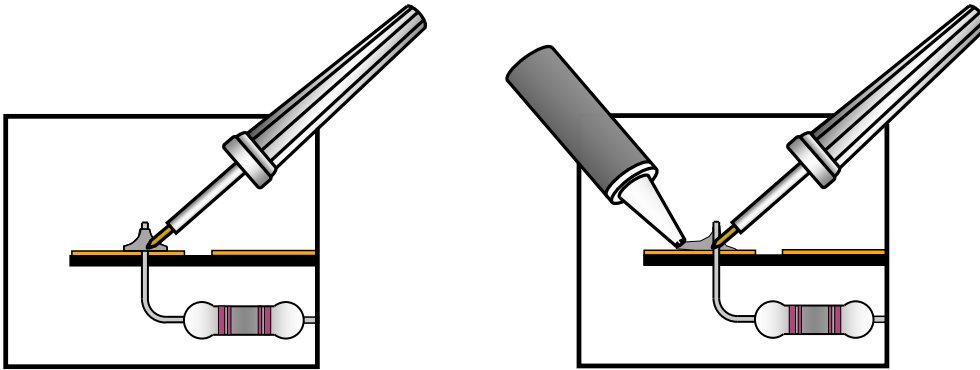


De-soldering pump (#7): The pump is made up of a piston, a recall spring and a tip. The tip is Teflon coated, allowing it to be heat-resistant. The tip may be changed when it becomes worn.



1	Piston
2	Recall spring
3	Teflon tip
4	Reservoir

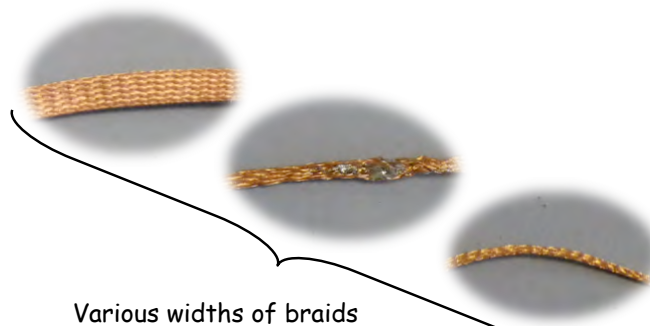
Before using the pump, it must be loaded by firmly compressing the piston. The tip of the pump must be very close to the solder when it is melted. When the tin melts, the piston is released, producing a vacuum effect on the solder.



- 1- Lean the tip of the soldering iron at the joint of the electrode and the solder.
- 2- At the same time, place the pump close to the solder.
- 3- Melt the tin.
- 4- As soon as it melts, release the pump to vacuum up the tin.
- 5- Repeat steps 1 to 4 if necessary.

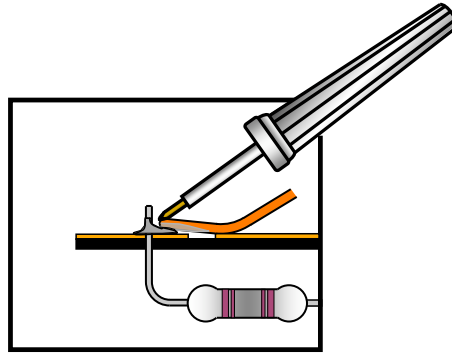
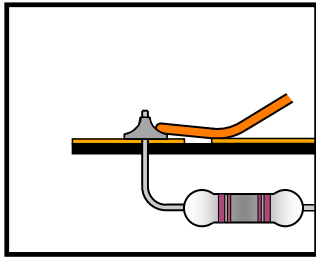
Important: Don't forget to empty the pump from time to time.

De-soldering braid (#8): As its name implies, the braid is made up of braided strands of copper. It can be found in several widths. To use it, place the braid on the solder you want to withdraw, then put the tip of the iron on top of it to make the solder melt. The melted tin is "sucked" into the braid by capillarity. The section used to absorb the tin must be cut off, since it can only be used once.



Various widths of braids

De-soldering braid (#8) (continued):



- 1- Place the braid on the joint.
- 2- Place the iron on the braid and melt the tin.
- 3- As soon as it melts, the tin will be absorbed into the weave of the copper strands.
- 4- Repeat steps 1 to 3 if necessary.

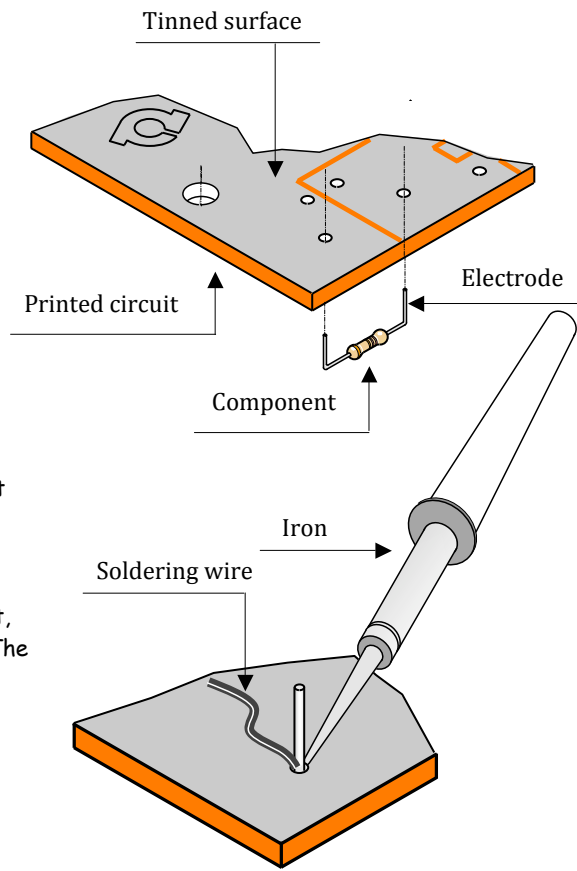
Important: Don't forget to cut off the used part of the braid.

Various accessories:

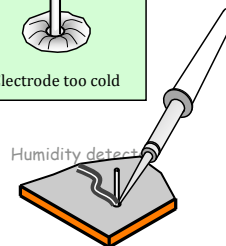
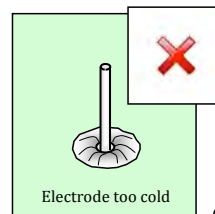
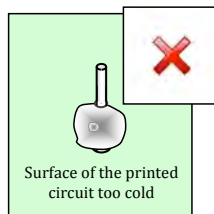
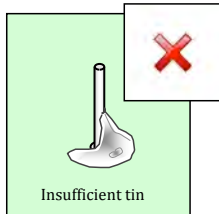
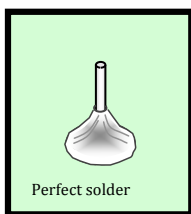
- **Heat dissipater:** Avoids the heat being transferred to the component and damaging it.
- **Soldering paste (cleaner) - before soldering:** Allows parts to be cleaned (by chemical reaction) and promotes adhesion of the tin on the parts.
- **Flux cleaner - after the solder:** Allows traces of various products (acid and others) to be cleaned off printed circuit plates and components.

HOW TO CARRY OUT A GOOD SOLDER

1. Connect the iron and wait (5 to 10 minutes) until it attains its operating temperature.
2. Prepare the component to be soldered by inserting its electrodes into the holes in the circuit.
3. Clean the hot iron on a wet sponge.
4. Tin the iron, that is melt a little solder onto it. This liquid tin will increase the contact surface between the iron and the conductors to be soldered.
5. Lean the iron onto the joint between the electrode and the tinned surface of the printed circuit (see drawing at right). Tinning the soldering iron allows for better thermal conduction.
6. Apply the solder onto the same joint, without touching the iron directly. The solder must melt onto the electrode and onto the tinned surface. If you don't succeed in doing so, the necessary temperature was not attained and your solder will not be satisfactory.
7. After a satisfactory solder (volcano shaped, image at bottom left), cut the electrodes just above the solder. (Cutting in the solder could damage it. Do not twist the electrode after soldering, fissures could appear)

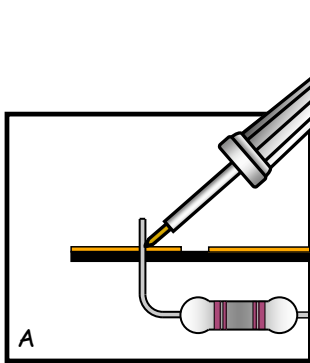


If the solder becomes dull, it is a sign of oxidation (reaction of oxygen with air) due to being heated too long. In this case, the solder will not be of good quality. You will need to heat it again, remove the old solder and start again. See below for proper solders.

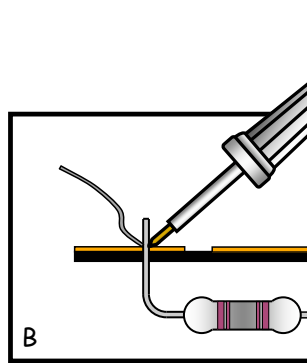


HOW TO MAKE THE PERFECT SOLDER

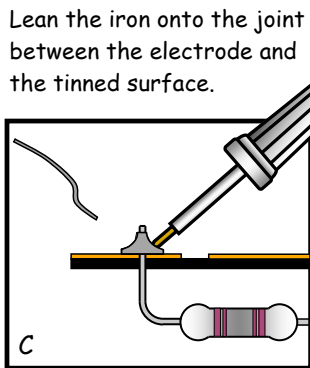
Here are a few drawings that show the correct execution of steps 5 and 6 described on the previous page.



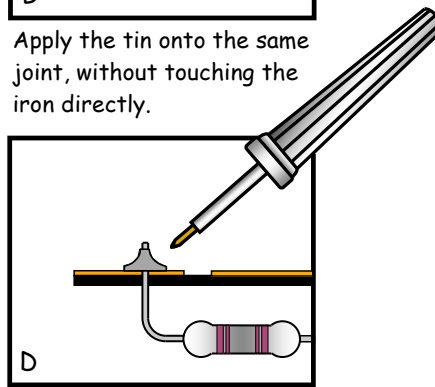
Lean the iron onto the joint between the electrode and the tinned surface.



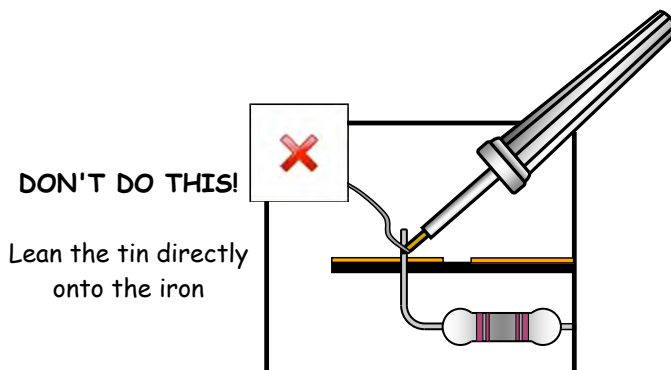
Apply the tin onto the same joint, without touching the iron directly.



The tin melts on the electrode and the tinned surface.

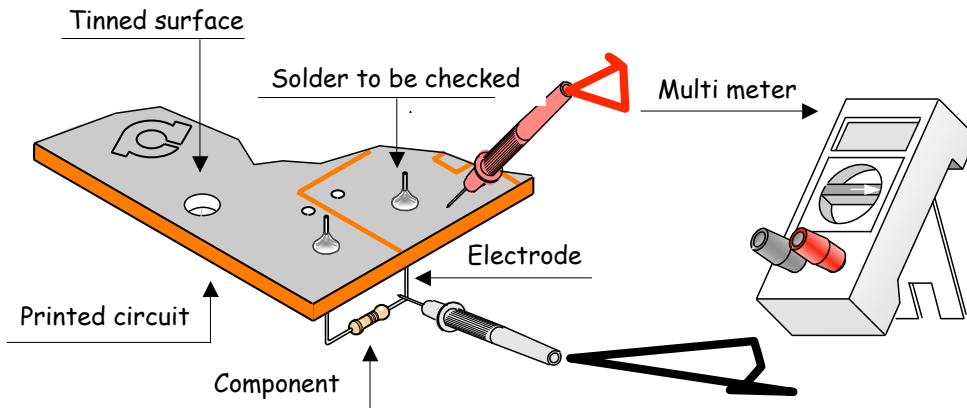


Here is a satisfactory solder (volcano shaped).



CHECKING THE SOLDERS ON THE PLATE

Even if the solders seem fine, poor contacts may be hidden. Here is how to proceed to find these faulty solders. Note that the circuit must not be powered during these checks.



Manipulations

1. Adjust the multi meter to conduction mode (buzzer or ohmmeter).
2. Firmly press one of the multi meter connectors onto the component electrode.
3. Place the other multi meter connector on the tinned surface close to the solder to be checked.
4. Apply pressure (in several directions) on the component in order to test the solder.
5. If the multi meter sounds continuously, the solder is indeed good.
6. If the multi meter cannot be heard, or if it is intermittent, the solder must be repaired by adding a little solder.
7. Repeat steps 2 to 6 for all the other solders in the assembly.

TROUBLE SHOOTING COMMON PROBLEMS
(while soldering)

Problem	Cause of the problem	Solving the problem
The tin is dull	1. Heated too long, causing the tin to oxidise.	<ul style="list-style-type: none"> ▪ Heat for a shorter amount of time.
The solder doesn't adhere (forms a solder ball that will not adhere)	1. Oxidised tip.	<ul style="list-style-type: none"> ▪ Clean the tip with a file or steel wool (cold cleaning). ▪ Heat the iron and apply solder (tinning - hot cleaning).
	2. The electrodes of the components are oxidised or dirty.	<ul style="list-style-type: none"> ▪ Clean the electrodes in the same way as the tip.
	3. The tinned surface is dirty.	<ul style="list-style-type: none"> ▪ Check to see that there are no finger prints (the oil prevents the tin from adhering). Clean the surface.
The solder is crackled and forms "peaks".	1. The temperature of the electrode and the tinned surface is too low.	<ul style="list-style-type: none"> ▪ Heat longer.
		<ul style="list-style-type: none"> ▪ Use a more powerful iron.

Cold solder:

- Circuit or component electrode or both insufficiently heated.
- Iron not hot enough.
- Iron not powerful enough.

CAREFUL: It is important to check that the tip is adequately tightened before starting to work. If the tip is not tight enough, poor thermal connectivity may result.

INSTALLING THE COMPONENTS

Here are a few points to be considered when installing the components:

1. The direction of the plate during installation and soldering.

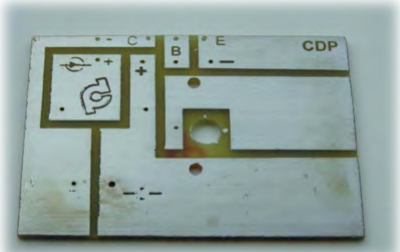


Plate - tinned side

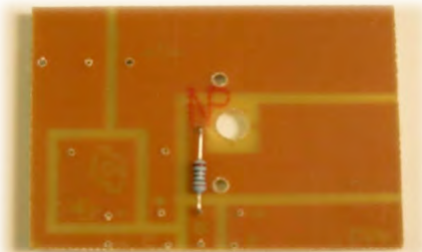
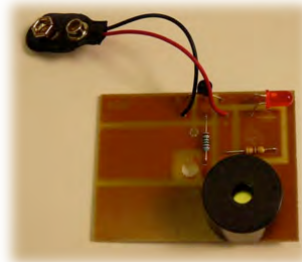
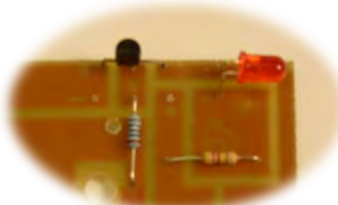
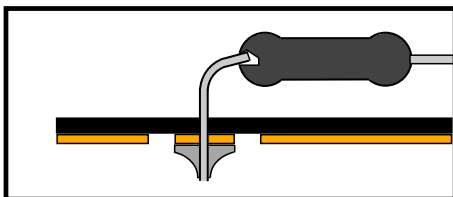


Plate - insulated side

2. Install the components from the smallest to the biggest.

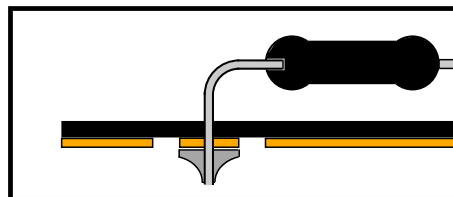


3. Center the component in the space allotted to it.
4. Ensure that the polarity of the component is respected when it is put into place.
5. Bend the electrodes at a 90° angle with needle nosed pliers. Using the pliers prevents the electrode from becoming detached inside the component.



Electrode detached (not visible to the naked eye since inside the component)

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05_humidity_detector_tin_soldering.doc



Correctly bent electrode

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Humidity detector
April 2012

