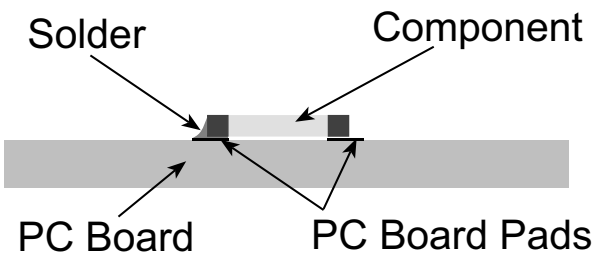
Surface Mount Soldering Procedure

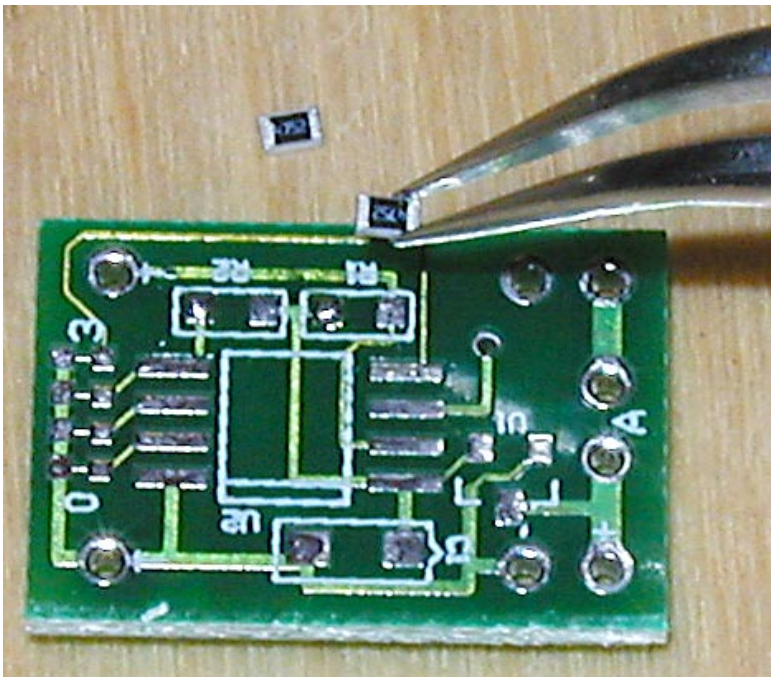
We believe that the following procedures describe the simplest way to reliably assemble surface mount components without special tools. The only tools required are a pair of fine-tip tweezers, a rosin based flux pen, rosin core solder (.025" dia. preferred), and a soldering iron with a small, clean tip. A spool of fine (0.075") solderwick will come in handy if you need to rework connections. You will need isopropyl alcohol, cotton balls, and cotton swabs for cleanup. If you have access to hot air rework tools and the skill to use them, feel free to use them instead.



A proper solder joint with fillet

Proper joints

Poor joints



Placing the component

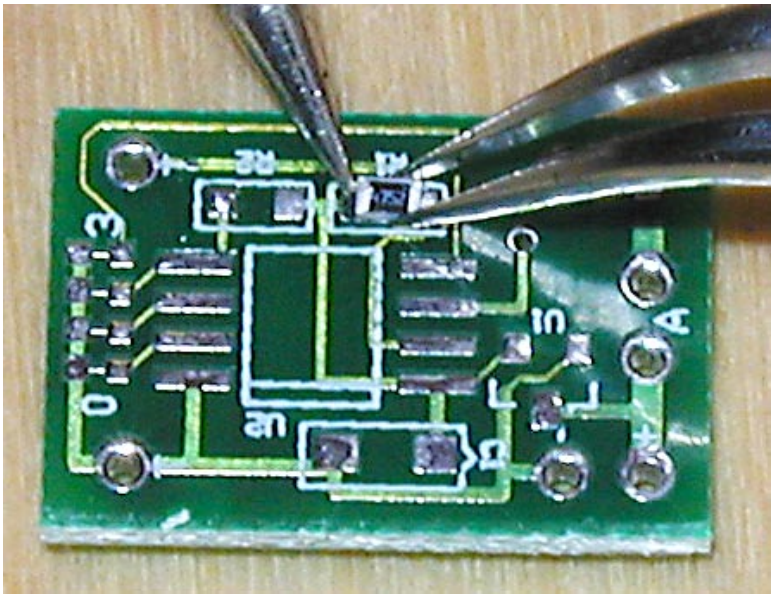
Soldering surface mount components is not difficult, but it does require good eyes, a steady hand, and a soldering iron with a small, clean tip. The illustrations at the left show a proper and a poor solder joint. In the proper joint, the flux has "wetted" both mating surfaces, allowing the molten solder to adhere to both the printed circuit board pad and the component lead. In the illustration of the poor connection, insufficient heat or flux has forced the solder to ball up on the end of the component, without making it to the PCB pad. The component is not attached properly, and the electrical connection will be intermittent at best. This connection can be salvaged by applying flux and heat to the PCB pad to get the solder to flow to the area between the pad and the component.

The most important characteristic of your soldering iron is that it must be equipped with a *small, clean* tip. If the tip is too large or is covered with oxidation, creating a well-flowed solder joint will be nearly impossible. Wipe your tip on a sponge before each joint - it must be shiny and well-tinned in order to transfer its heat properly.

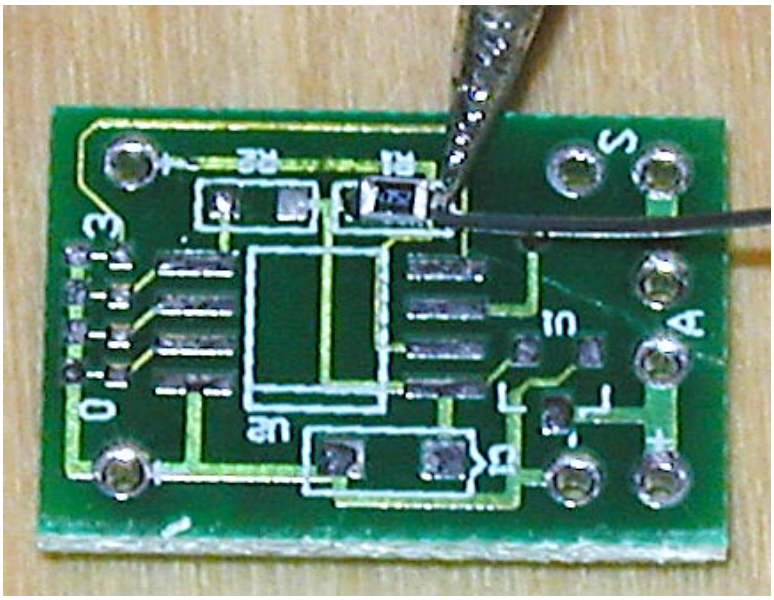
You will find it easiest to work on your board if you clamp it in a moveable vise or stick it to a small block of wood with double-stick tape. This will allow you to rotate the board to whatever angle is most comfortable for access to the component being installed. If you try to hold the tiny parts at awkward angles, you will not have good results!

The first step is to apply a small bead of solder to <u>one</u> of the PCB pads for the component to be installed (the left-hand pads of R1 and R2 in the photo at right). The bead should be approximately 0.020" to 0.030" high (you may want to reevaluate your bead size after you have completed several joints). Apply some liquid *rosin based* flux from a flux pen to the solder bead and to the other pad(s) for the component.

Next, using a pair of tweezers, pick up the component to be installed and place it over the appropriate pads.



Affix the part by reflowing the first solder bead



With the part in position, solder the other end

With the part in position, move the soldering iron to the solder bead on the PCB pad. Apply a small amount of heat from the iron to flow the bead, simultaneously lowering the part against the board and correcting for any rotational misalignment. Remove the iron and allow the solder to cool. Inspect the joint -- at this point you are not concerned about the quality of the actual solder joint, just the positioning of the component. The part should be flush against the PCB, with both ends properly contacting the pads. The part should be straight, and centered between the two pads.

Apply a liberal amount of liquid flux (again, a flux pen is the ideal applicator) to both ends of the component. Heat the currently unsoldered end of the component and the adjacent pad with the soldering iron, and carefully wipe on a small amount of solder. You want a small fillet as shown in the earlier illustration, not a large glob of solder. Make sure that the solder has flowed onto the pad as well as the component lead - don't be fooled by a lump of solder on the end of the component that doesn't flow under the component and onto the PCB pad.

After the second end is soldered, go back to the original solder joint and reheat the solder. The flux will allow the solder to flow freely, and a good fillet should be observed. If there seems to be insufficient solder, add a little more. If either of the ends appears to have an excessive amount of solder (a large blob sticking up above the part) it can be removed with solder wick. Apply flux to the blob and the wick, position the wick over the blob, and press lightly on the wick with your iron. As the heat is conducted through the wick the solder blob will melt and be drawn off by the wick. You may end up removing too much of the solder, in which case you can reapply a *small* amount of fresh solder to the joint.

After the joints have cooled, inspect them carefully to make sure that they are solid and make contact with the board. If you have any doubt about the quality of the connections, apply more flux and reflow the joints until you are satisfied.

The same procedure is also used for installing components with three or more leads (transistors, ICs, etc.). Start with a bead of solder on one pad, position and "tack" the part, then add more flux and solder the remaining leads. Don't forget to reflow/improve the first "tacked" connection if necessary.