

Soldering Basics

- 1 Safety first. Your soldering iron is going to be 500 degrees to over 1000 degrees Fahrenheit. Take a few minutes and familiarize yourself with it and your work area before you attempt to turn it on or use it. Plan how you will use it so that you reduce your chances of being burned. How would you get first aid if you did burn yourself? The soldering process can produce hot spatters of solder and flux. Be sure the area is cleaned of paper and combustible materials. Always wear glasses, either regular glasses or safety glasses. Avoid breathing fumes from the soldering process. While lead in solder is not especially hazardous in the form used for soldering always wash you hands after completing the soldering process.**
- 2 Soldering is the process of using solder to make a solid mechanical and electrical joint between the electrical leads or parts of an electronic component and a printed circuit board or some other electrical component such as a connector. Solder is a soft metal alloy composed of lead and tin. When used in wire form such as from a coil or roll it has a rosin flux core. The ratio of tin and lead is usually 60/40. That is 60 parts tin to 40 parts lead. Another popular ratio is 63/37. The later ratio tends to melt and flow better than the earlier mention variety. However, it may be harder to remove should desoldering be necessary. Some solders may have a small amount of silver. The silver is added to add flow and produce a more consistent joining of metals. Again, it is more difficult to remove that the more common 60/40 and it is more expensive. Only rosin core solder should be used on electronic equipment. Water soluble and acid fluxes should not be used. Water soluble flux is conductive and is used for mass produced printed circuit boards that are washed one or more times after soldering to remove the flux. Acid fluxes are suitable only for plumbing as it is corrosive to electronic components. No lead solders should not be used on electronic equipment unless specifically authorized by the manufacture. Mixing leaded and no lead solders can lead to eventual corrosion.**
- 3 The function of flux in soldering is to clean the surfaces to be soldered. It is usually included as a core inside the solder wire and flows onto the surfaces to be soldered as the solder is melted. A side benefit is they improve the appearance of the soldered joint. Rosin flux is not conductive and when used in moderation there is not need to remove it from the soldered components or printed circuit board. More damage can result from cleaning attempts than simply leaving the flux on the components. If you feel you must clean the flux use completely 100 percent denatured alcohol only. Isopropyl alcohol and rubbing alcohol contain water and will lead to corrosion.**
- 4 60/40 solder melts at 368 degrees Fahrenheit. 63/37 solder melts at 361 degrees Fahrenheit. Solder with silver 62Sn-36Pb-2Ag melts at 354 degrees Fahrenheit. As can be seen there is little actual difference in their melting point. The main difference is in their workability and appearance after melting. Solder is measured by it's diameter. For small delicate work 0.020 inch is good, for larger work 0.030 is acceptable. For RF connectors 0.040 and larger is acceptable.**
- 5 Soldering irons and guns are available in electrical wattage's ranging from 15 watts to several hundred watts. Their tip temperatures range from about 600 degrees up to over a thousand degrees. Tip temperature that you select should be influenced by the physical mass of the item you will soldering and the mass of the soldering iron or gun**

that you select. For small and delicate soldering such as surface mount technology electronics 15 watts with a tip as small as 1/32 should be used. These will produce a temperature of 500 degrees or more depending on whether they are temperature regulated. PCB's with thru hole components should be soldered with a 30-40 watt iron with a 1/16 tip at about 700 degrees. Coax connectors should be soldered with a 100-300 watt iron with a 3/16 –1/4 inch flat tip at 900 plus degrees. Larger wattage and larger tips will contain more heat in their larger mass and allow it to flow more quickly into the items being soldered. This will assure a quicker solder process thereby insuring the delicate and heat sensitive components have less possibility of damage from over heating.

- 6 Assure your soldering iron is completely heated before you attempt to start. Turn it on 10 to 15 minutes prior to needing the iron. If adjustment is available set the temperature when you turn it on.
- 7 Soldering guns were popular many years ago when discrete electrical components were large and widely spaced. They heated quickly to facilitate soldering. However, their tips do not contain sufficient size to contain sufficient heat to solder most connectors and larger items. The large size of their tips prohibits works inside most modern electronic items.
- 8 The single biggest factor that prohibits good soldering is contamination. That is contamination of component leads and PCB pads and, yes, the tip of your soldering iron. Flux alone cannot clean all these in the instant that solder flows. You must do you part to assure proper cleanliness.
- 9 Some soldering irons are equipped with a sponge that should be wetted for tip cleaning. Leave the sponge in it's holder and wipe the iron's tip in a rotating motion after it is hot to remove contamination, old flux and solder. Do this before starting to solder each joint.
- 10 A good way to clean component leads is to split and artist eraser about an inch length ways. Place the component leads one at a time in the split and holding the sides of the eraser against the lead draw them thru.
- 11 Most PCB's solderable pads and plated thru holes should be received clean and should require no further cleaning. If you are resoldering, use solder wick or hand operated solder sucker to remove solder. Flow a small amount of solder on the pad afterwards to prepare the surface for further soldering.
- 12 Immediate prior to touching the soldering tip to the components to be soldered carefully touch your solder to the tip to melt a small amount of solder onto the tip. Next, touch the tip to both the component lead and the PCB pad. Within one to two second touch the junction of these three with the your solder and allow a small amount of solder to flow. Remove the solder and tip within 3-4 seconds. The result should be a smooth, grayish surface that is slightly concave. Solder lumps, grainy and very dull surfaces should be cleaned and resoldered.
- 13 Practice, practice and more practice is to only way to gain proficiency in soldering. Have a friend help you and check your work as you gain proficiency.