

A GUIDE TO SOLDERING

What is soldering?

Soldering is a technique for joining certain metal types together to form an electrical and mechanical bond. It can be used to join wires to terminals, electronic components to circuit boards or other components, and generally any metal which can be 'wetted' to any similar material. An easily melting metal alloy, known as solder, is fed in to flow and surround the join of the two metal parts by application of a strong heat source to them. The heat source most often used is called a soldering iron. Solder is usually in the form of a reel of special flexible alloy wire which has central cores of 'flux'. Flux is a corrosive resin, which itself melts and helps the molten solder to adhere and flow across the metals by priming the surfaces, and lowering the surface tension of the molten material. If the solder properly adheres to the metals, it is said to 'wet' them.

What do you need for electronic soldering?

To be able to make soldered electronic joints, you will need a soldering iron, some flux cored solder and some shaping/cutting/cleaning tools. Tools such as side-cutters, radio pliers, wire strippers and a scalpel or craft knife are typical. Eye protection is also strongly recommended. A stand for the soldering iron is a useful addition, as is a dampened soldering iron sponge with which to clean the iron tip.

What are the hazards?

Burns - A soldering iron operates at several hundred degrees Centigrade. If the hot parts of the iron, a freshly made solder joint, or falling molten solder come into contact with the human body, serious localised burns can result. Great care needs to be taken to avoid such contact. The iron may also damage property and surfaces, particularly plastics, and should be put to rest in a safe condition.

Fumes - Fumes arising while melting solder can be irritating to the skin, eyes, and respiratory system. Ideally fumes should be expelled using a fan. A well ventilated area, and avoiding working with the face directly above a soldering job is a minimum recommendation.

Tools - Hazards associated with cutting tools and blades are to also be anticipated with preparation and finishing off solder work. Be aware that wires and freshly cut component leads may be sharp, and can pierce the skin. Flying component cuttings, and flicked solder blobs, may present a serious risk to the eyes.

How do you prepare a joint for soldering?

The absolute golden rule for soldering is to ensure that the surfaces to be soldered are scrupulously clean down to shiny metal. Scraping component leads or terminals thoroughly with a knife blade, to remove tarnish or deposits, is good practice. Some components are supplied as a string of taped parts, and the tape can leave residue on the component leads when removed.

A process called 'tinning' may be used on some components and circuit boards, where a thin layer of solder is already applied to the surface. With practice you can 'tin' stripped wire ends and components for yourself to make even better solder joints possible.

You should also pay close attention to the condition of the soldering iron tip during soldering operations. The tip should be regularly cleaned, once hot, by rubbing into a damp sponge designed for the purpose. Alternatively, a special dry pad made from abrasive brass shreds may be used.

Once clean, fresh solder should be applied to 'tin' the tip of the iron so it will interact best with the solder joints to be made. Never try to solder with anything other than a clean iron tip, as the impurities will end up being incorporated into the solder joint.

A good solder joint should start with a sound mechanical anchoring of the two or more parts first. For instance:-
Passing a wire end through a pierced terminal and wrapping the wire around.
Creating a loop around a 'pin' or 'post' style terminal, and squashing it tight.
Twisting wires or component leads together.
Bending over a component lead after inserting into a circuit board hole.

These parts should all be cleaned first where appropriate.



How do you make a good solder joint?

Soldering is a skill, and it is strongly advised that one practices with scrap parts first so as not to stress parts you really want to use. There is a balance between the amount of heat, solder, and time employed in order to make a good joint. *It cannot be stressed enough that contaminated parts or iron tip will spoil the joint straight off.* Too much heat, or applied for too long, may result in a 'dry' or crystalline joint where the flux has ceased to be active way before the joint was completed. Too much heat also runs the risk of damaging the electronic parts themselves, or causing the copper tracks to detach from a circuit board. The soldering iron also needs to operate at the right temperature for the solder type being used. Too little heat will not allow the solder and flux to flow properly. One should always aim for just enough time for the joint to flow properly and complete in one hit. Large solder joints or components may require the use of a larger capacity soldering iron to be able to make a good joint. The joint must not be moved during the soldering operation, as a 'dry' joint may also result this way. This is the main reason for good anchoring of parts in the first place. The actual soldering process is as follows:-

1. When the joint has been properly prepared, take the clean iron and apply a little solder to the tip. The purpose of this is to give a small blob of solder which will adapt the iron tip to make better thermal contact with the joint parts. Try to think generally of applying solder to the joint rather than the iron apart from in this one case.
2. Quickly apply the iron tip to a good symmetrical position upon the joint to get the heat in.
3. Apply the solder only to the parts to be joined so it starts to flow into them easily. Make sure the joint is properly 'filled'. You should not need to apply solder to the iron unless it is not showing signs of flowing into the joint itself.
4. When sufficient solder has flowed in, take the iron quickly away to avoid overheating the components. This will hopefully take just a few seconds to complete. Do not disturb until properly cooled.
5. Trim off any long component or wire 'tails'.

What is the purpose of tinning?

Tinning is a surface preparation which guarantees that solder will 'wet' to the parts of the joint immediately. It is also useful to make stranded wire ends into a solid mass which can then be formed into suitable joint shapes. Simply treat the object as if it is a solder joint to be made, and apply just sufficient solder to cover the surface or absorb sparingly into the wire strands. Again, practice makes perfect. Regular tinning of the soldering iron tip prevents oxidation and will ensure best longevity.