

SOFT SOLDER PRACTICE

TEACHER/TUTOR NOTES & WORKSHEETS



The practice will probably take one session and should be carried out before any projects which require soldering. May be combined with Resistor Chart project.

Background

- Soft soldering is generally used to join two similar or different metals together where the strength of the joint is unimportant. A low melting point solder (less than 300degrees C) is used to make the joint and bridge the gap between the components. It is used extensively for making electrical connections.
- Hard soldering may also be used where a higher strength joint is necessary such as in jewellery, and uses solder with a melting point greater than 400 degrees C.
- The components to be joined are heated to a temperature above the solder melting point, molten solder is floated between them and when cooled and solid makes the joint.
- The surfaces to be joined have to be absolutely clean for the solder to bond to the component. A film of metal oxide which can be present on the surfaces prevents this bond. A flux is used to keep the surfaces clean and dissolve the oxide whilst they are heated. This is a chemical like zinc chloride solution or a resin. Metals like aluminium and stainless steel which form a very tough oxide film as soon as they are exposed to air are very difficult to solder in the conventional way because the flux cannot dissolve their oxides
- The soft solder we use is a wire with a resin flux core or thread. The flux when heated can make a little smoke and affect some people and therefore the soldering must be done in a well ventilated room. The flux when cool is hard, non corrosive and does not need to be removed.
- Generally electrical components already have a very thin coating of solder on the surfaces and do not require to be cleaned. The process of coating with a film of solder is called tinning
- Solders are usually alloys of a number of metals such as tin and lead for soft solder and copper and silver for hard solder. Tin and lead soft solder is perfectly safe if used correctly but because of the poisonous nature of the lead we recommend the use of lead free soft solder. It is good practice to make the pupils wash their hands after soldering. Typically lead free solder used in industry is tin [99.3%] with a trace of copper [.07%]. There are other alloys.

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- Just as salt in a solution of water causes the water to freeze at a lower temperature so copper in a solution of tin does the same and lowers the melting point of the alloy. The melting point of all alloy solders is lower than the constituent metals.
- The heat required to heat the components and the soft solder is generally provided by an electrically heated soldering iron.
- The technique for making a joint is first to make sure the surfaces are clean with a piece of emery cloth and heat them up by pressing the soldering iron on to them. When hot enough the flux cored solder is fed into the joint and then left to cool. The end or “bit” of the soldering iron must be coated in solder or tinned before use. Please remember that soldered parts stay hot for some time after the soldering has taken place.

BLACKBOARD

Health and Safety Revision

- Pupils no nearer than 2 metres from the person soldering
- Wash hands after soldering
- Use an open space / window and a small fan to disperse fumes
- Pupils not to take bits of solder away
- Solder hot enough to burn holes in cloth or flesh
- An RCD should be fitted in the circuit to prevent accidental shocks.
- Solder is an alloy of two metals. **Tin and Copper**
- Melting point is less than either of parent metals.

Tin	231°C
Copper	1083°C
Solder	227°C

- Surfaces to be soldered must be chemically clean. Use Emery cloth.
- Flux to keep surfaces clean when heated.
- Thread of flux in solder. It is the melting flux which smells when it is hot.
- Cannot solder aluminium or stainless steel because they form an oxide film as soon as they are cleaned.
- Tinning of surfaces before joining with solder
- Heat the component with the soldering iron before applying the solder.
- Cleaning, Tinning and Joining wire.

Websites

- How to solder www.aaroncake.net/electronics/solder.htm
- How to solder <http://www.instructables.com/id/Soldering/>
- How to solder <http://www.mediacollege.com/misc/solder/>

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WORKSHEET

1. How near must anyone else be when you are soldering?

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2. How hot is solder when it melts?

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3. What do you have to do to the metal before you solder it?

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4. What does the Flux do?

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5. Why can you not solder Aluminium or Stainless steel easily?

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6. Write a short story about a boy who did not apply the safety rules when soldering

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