

Resistance Soldering

Model Shipwrights of Niagara

September 2019 meeting presentation by Ron Campbell

What is Solder

Solder is a low-melting alloy, originally based on lead and tin or (for higher temperatures) on brass or silver, used for joining less fusible metals.

World directive is to get rid of lead so today we have lead free solder. The reason that lead was combined with tin is that the resulting alloy has a lower melting temperature. Basically all metals can be soldered, but we are looking for a low melting point soft solder and a flux. With the soft solders and a zinc chloride flux (most common), these metals will bond very easily: copper, tin, and brass. These metals will NOT bond: Iron, stainless steel, steel, and aluminum (today there are methods for doing aluminum soldering).

A type of lead-free solder made from tin and copper. SnCu is a commonly used type of lead-free solder. A metal alloy, with a melting point or melting range below 840°F (450°C), which is melted to join metallic surfaces. Lead-free soldering wire is comprised of various combinations of tin, copper, silver and antimony. Pure tin wire has the highest melting point of 449°F. Other combinations of metals melt in a range between 419°F and 441°F. Soldering iron tips are made of copper core plated with iron.

Different Types

Solid - plumbing/cars

Acid Core – plumbing

Rosin Core – electronics / hobby

Solder Paste – lan boards- printed circuit boards / hobby / Resistance Soldering

Silver Solder – Tin/Silver – high temp, very strong

Silver Solder comes in Easy, Medium, Hard.

Aluminum Solder - Tin/Zinc or Zinc/Aluminum

Gold – Jewelery – used by jewelers to repair

Rosin / Flux

In metallurgy a **flux** (derived from Latin *fluxus* meaning "flow") is a chemical cleaning agent, flowing agent, or purifying agent. Fluxes may have more than one function at a time. They are used in both extractive metallurgy and metal joining.

In soldering of metals, flux serves a threefold purpose: it removes any oxidized metal from the surfaces to be soldered, seals out air thus preventing further oxidation, and by facilitating amalgamation improves wetting characteristics of the liquid solder. Some fluxes are corrosive, so the parts have to be cleaned with a damp sponge or other absorbent material after soldering to prevent damage. Several types of flux are used in electronics.

How to Solder

Most common method for hobbyists are soldering irons and soldering guns. They usually have different temperatures which you can select for different jobs. Tips should be clean. Clean with paste/flux.

Heat the material NOT the solder. When the material is hot, the solder will flow.

A good solder joint will be shiny. A bad or cold joint will be dull.

The material must be clean and dry, free of grease, paint, plastic etc.

Use cooling clips to disperse the heat so the heat does not melt the work. For example, if you wanted to solder a plastic coated wire, you do not want the plastic to melt during the solder process. Third hand tool is great help.

Be careful on printed circuit boards. The copper is very thin and heat will warp the copper.

Resistance Soldering

If you have two pieces of metal together there will be a resistance between where the two metals connect. If we pass a high current from the top to the bottom of the metals then the resistance creates a high heat which will melt the metals and create a bond. The best example is spot welding which is used to build cars. We can create the same thing for solder. Resistance Soldering uses a high current and not a high voltage. 4 or 8 volts is sufficient, it is the current that melts the solder. Resistance solder comes as a paste. You would put a small dab of soldering paste where you want the connection. Resistance Soldering requires a special tool which can be very expensive. You connect a ground wire and then the tip of tool is the other connection point. By touching where the solder paste is, then pressing the weld switch (usually a foot control) for a second, a high current will melt the solder creating a bond. Because the current is brief and concentrated, the heat does not spread to other parts of the work which means this method is great for a hobbyist.

During my research, I came across this document which I highly recommend for further information on Resistance Soldering. You might also want to check out the fellows web site for some really interesting stuff.

<http://www.raymondwalley.com/pdf/misc/tools/rsu.pdf>

Desolder

There are commercial products that will suck the solder away when melted. Check Amazon or ebay for the latest versions. What they usually are, are a vacuum device so that when you melt the solder it gets sucked up into the device. I built one using a shop vac and then some small rubber hose on the nozzle.

END

