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ART OF SOLDERING

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One is surely to have seen someone repair a device by means of soldering iron in some workshop. The procedure does not seem to be complicated. However, the ongoing operation of the device depends dramatically on the soldering, to be more precise, on one who assembles the device. There exist some rules to be obligatory followed in the soldering process and which provide the device long-termed operation. Otherwise it is doomed to break down. The article is going to show the soldering process order that is able to ensure the soldering to be perfect and to provide a reliable contact with a part.

The basic material used is a metal, to be more precise, it is an alloy of lead and tin. Thus, the alloy is conventionally called lead-tin solder, or LTS. Each solder has the proper characteristics. Here one can find some:

alloy name	alloy composition	melting temperature, ° C	tensile strength, kg*mm^2	Application
LTS - 90	tin-90%, mica – 0.15%, lead – 9.85%	222	4.3	to solder parts or nodes intended to be golden or silvered further
LTS - 60	tin - 60%, mica – 0.8%, lead – 39.2%	190	4.1	to solder highly precise connections radio engineering ones included
LTS - 50	tin - 50%, mica – 0.8%, lead – 49.2%	222	3.6	to solder the most important parts that allow being highly heated
LTS - 40	tin - 40%, mica – 2%, lead 58%	235	3.2	to solder less important current-conducting parts
LTS - 30	tin - 30%, mica – 2%, lead – 68%	256	3.3	to solder and tin less important mechanical parts of copper and its alloys and also steel
LTS - 18	tin - 18%, mica – 2.5%, lead -79.5%	277	2.8	to solder joints of lower strength requirements and to tip before soldering as well.
LTS – 4 - 6	tin - 4%, mica – 6%, lead – 90%	265	5.8	used in dip-soldering

Table1. Lead-tin solder alloys characteristics

Thus, if one has to solder a power wire conducting high current, he should choose a solder of low tin concentration.

Another binding component is a flux. There exist different kinds of fluxes. However, the most common is resin. Yes, it is that one used by violinists to polish the fiddlestick. It possesses a great advantage making the soldering flow smoothly and preventing cavities (holes). Besides, resin is able to keep the temperature longer compared to metals that tend to cool fast. Though resin is added in some kinds of solders, it is still necessary to use it.

The soldering process is not hard but tedious work. It requires some experience and skills. It is no good expecting to get a nice, smooth and reliable joint for the first time. To master soldering is going to take time and more knowledge. Moreover, one should make the work area safe, comfortable and helpful. The most important assistant is the extractor fan above the workplace. The metals and resins' vapors are known to be very harmful for health. So if the workplace is not equipped with an extractor fan, the window must be open or a respirator must be worn. The following assistant is light. The workplace well-lit will keeps the eyesight. The special goggles would also be of great advantage. The next commonly used device is so-called “pump” that makes unsoldering fast. It enables one to take the heated solder off a part keeping the plating and tracks safe. The special pincers will aid to avoid a burnt. The amplifying lens will also be helpful to examine the tiniest cracks.

So, how to solder? Solder irons greatly differ and are intended for a special soldering kind or parts. The thermal dryer is applied for vapor – phased soldering, other soldering irons are widely used for all kinds of works and vary in power and sizes. If one has to solder a casserole, he needs a big, powerful device. Meanwhile if one has to solder a light diode, for example, a 35 watts instrument will be enough.

The important factor to be taken into account is the solder iron heating. If it is not heated well enough, the solder sticks to the iron’s tip and a reliable joint cannot be expected. On the other hand, if it is left being switched on for a long time, it gets overheated, the solder and resin can even boil and close up the iron’s tip hole. Nowadays various modern soldering sets are offered. They automatically keep a chosen temperature, therefore, preventing overheating and allowing soldering for hours. A temperature being chosen should be 60°C more than the melting one. That permits the soldered surfaces to be well heated. Though, the temperature can be hotter in some cases. For instance, to heat a thin wire requires lower temperature than to do a copper one of bigger cross-section. As for wires, to connect them reliably, they have to be tinned. It can be accomplished the following way: using the solder iron, pick up a little amount of the solder, then plunge the iron’s tip into the melted resin and rub the wire with it. Thus, the tinned tough solder-like color wire is formed. Finally the tipped wire ends are overlapped and soldered. Another case is when one has to solder microcircuits; he had better apply a thin wire or pincers as a heat dissipater. Microcircuits are susceptible to overheating. When soldering them the distance between a part and the solder iron should be no less 3mm.

The right materials chosen and some simple rules to follow are certain to make the soldering neat and reliable. However, perfection tends to be infinite.