



Creating A Quality Solder Joint: A Simple How-To-Guide

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Topic: A basic understanding of the soldering techniques that are required for achieving a good quality solder joint.

Soldering: Soldering is the process that uses solder (a metal alloy usually consisting of tin mixed with other metals) for the metallurgical joining of metal components to form an electrical, mechanical or hermetically sealed bond at temperatures (less than 840° Fahrenheit) that are well below the melting temperature of the individual components that are being joined.

The soldering equipment (used to create the required heat) and other materials (solder, fluxes, heat sinks, fixturing, etc.) should always be properly matched to the intended soldering application. The equipment and materials used may vary, but the basic soldering techniques that are required will usually remain the same.

One of the most important rules to remember about soldering is **"keep it clean"**. This includes, not only the items being soldered, but also the materials used. Choose quality solders and fluxes without unnecessary impurities. Surface oxidation, contaminants and other impurities are some of the most common reasons for poor quality solder joints. The use of fluxes does not necessarily eliminate the need for pre-cleaning the surfaces you are joining, especially if heavy oxidation or large amounts of grease, oil or dirt are present.

1. **Clean:** Thoroughly clean all surfaces to be joined, removing any dirt, grease, oil, oxidation, paint, coatings or other impurities that may exist before attempting to solder. Proper wetting can only occur when the intended solder joint area has been properly cleaned. Soldering should be performed as soon as possible after cleaning to eliminate the possibility of re-oxidation or contamination of the items being soldered.
2. **Flux:** Apply flux sparingly to each of the intended joint surfaces (this step may not be required when using rosin or acid core solder, or when performing flux free applications like

ultrasonic soldering). Flux is primarily used for the removal of light oxidation and to protect against re-oxidation during the actual soldering process. Make sure you have the right flux for the application being performed.

3. **Heat:** Apply heat directly to the intended joint area. The correct application of heat is important and should be consistent with the operating requirements determined by the type of equipment being used. Fast and accurate heating will minimize the risk of thermal damage to heat sensitive components. Heat sinks are sometimes used as an added precaution against thermal damage to heat sensitive components that need soldered.
4. **Solder:** Add solder to the heated surfaces you are joining (do not apply solder directly to the tip, or other heat source being used). The solder should flow uniformly over all of the surfaces that are being connected. Stop feeding solder as soon as you have applied an adequate amount and then remove the heat source. The amount of solder is important because too much will create unnecessary waste and can cause bridging on a PCB, while too little can affect the mechanical strength and conductivity of the finished solder joint.
5. **Cool:** Allow the finished solder joint to remain undisturbed until it has completely cooled. You should **never** attempt to speed up the cooling process by blowing on the solder joint. Even minor vibrations or disturbances during cooling, can cause micro fractures or other types of damage that may severely weaken the solder joint.
6. **Inspect:** Check all finished joints for proper wetting, the right amount of solder, a good physical appearance, the required mechanical strength and the necessary current carrying capacity

Quality: A quality solder joint is not achieved solely by the equipment and techniques being used, but also by the operator being trained to use them properly. An operator should know how the physical appearance of a finished solder joint helps to determine possible flaws that may exist. A quality solder joint appears bright, shiny and smooth with all components appearing well soldered. The surface of a finished connection should never look rough, grainy, dull, or flaky (these are signs of

what is commonly referred to as a cold solder joint). Problems with proper wetting (solder balling up and not adhering to the components surface) are sometimes associated with too much heat, but are more often related to cleanliness issues.

It is important to know that quality soldering is rarely achieved by using inappropriate (or inadequate) tools, materials, or equipment.