

# Soldering Basics – Lesson Plan

## Introduction

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This is a general lesson plan guide to soldering that can be used as the basis to solder a variety of simple electronics kits.

Please also see/use the accompanying video that goes with the notes below. It is recommended that you should practice soldering a little before delivering the lesson.

The video is intended to accompany the explanations in the lesson. So feel free to pause or repeat sections to further describe the processes.

For simple kits, it is generally recommended that between 1 hour 30 mins to 2 hours be set aside. For smaller groups it may be possible to reduce the lesson time. If this is being taught to a group of more than eight participants, two or three helpers may be needed to distribute support across the group.

## Safety Precautions

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For practical soldering exercises, please inculcate safety as a priority. As with most tools, soldering irons and associated tools can be used completely safely with a few precautions. Here are the main safety points to convey:

- An obvious point, but the end of soldering irons gets very hot! It should be respected like any tool.
- Only hold the soldering iron by the handle, ensure that fingers are kept well away from the hot end.
- It is recommended that participants wear goggles. This prevents accidents, not only with the soldering iron itself, but in the rare situation of solder splashing.
- The soldering iron should always be returned to the stand when not in use. This prevents accidental burns. Also note that some parts of the stand can get hot. E.g. some stands have a 'spring' for holding the iron - this gets hot too.
- If a wide-open space isn't available, ensure that the work area is well ventilated. A fume extractor can also be used to reduce the smoke. While only small amounts of smoke are produced, encourage the participants to not breath it in.
- When trimming the leads of components, place one hand over the leads in case they fly off.
- When feeding in solder to the joint, ensure that there is a good amount (about 6cm) of solder straightened out so that fingers don't need to get too close to the tip of the soldering iron.

The objective of the safety precautions is not to instil worry, but rather to convey the idea that the tools should be respected and used with mindful and deliberate workflows.

## Identifying the Tools

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A few tools will be needed in addition to any kits that are being soldered. Show and describe each one:

- **Soldering Iron and Stand:** Used for making solder joints
- **Side Cutters:** Used to trim the leads from components once soldered
- **Fume Extractor:** Optional – used to remove any excess smoke from the air. Particularly good to use in smaller workspaces or where there isn't good ventilation.
- **Solder Wire:** The wire used to solder. In general, lead-free (Pb-free) solder should be used.
- **Blu Tack:** Optional – can be used to hold down the PCB while soldering
- **Solder Sucker:** A simple suction tool that can be used to desolder – useful when fixing mistakes

## Confidence Building

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Sometimes young participants can be nervous about using tools that are perceived as dangerous. After the first few soldering joints are made, confidence is built up. Explain that the tools are safe to use when the safety rules are followed.

Discuss that mistakes are normal and can often be corrected. Explain that it takes practice to get good at soldering electronics and that they should take their time. It's better to encourage participants to build as neatly as possible - discourage any racing to finish first!

While it is the goal to have a working project at the end, the main purpose here is to demystify the process, "You can do this too!".

## Describe and Demonstrate the Preparation of the Soldering Iron

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A good, clean iron makes all the difference when soldering. Ensure that the soldering iron tip is clean and tinned. Tinning the tip means applying some solder directly to the tip of the iron and then wiping it away on a damp sponge (or brass wool) that's usually built into the soldering iron stand. A thin layer of solder is left on the tip, leaving a shiny silver appearance. Demonstrate this process.

**Tip:** When the soldering iron is not in use, turn it off. This prevents soot buildup on the tip of the iron that can make it difficult to use/clean. If you are having problems tinning the tip because it has become blackened, a tip cleaner/tinner can be used to rejuvenate it.

## Teaching the Process of Soldering

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The main principle of soldering is relatively simple, provided the steps of making a solder joint are followed in the correct order. Virtually all parts are soldered in the same way.

Describe the process of soldering (use video for demonstration):

1. Insert the part (component) into the board (as per the step in the instructions).
2. Flip over the board and secure it if possible. Blu Tack can help here.
3. Apply the tip of the soldering iron to the pad (ring) of the PCB, where it meets the lead (leg) of the part. Leave for about 2 seconds to heat up the pad and lead.
4. Apply solder to the pad from the opposite side and once melted, leave for a second or so.
5. Remove the soldering iron and solder and allow the joint to cool.
6. Inspect the joint to make sure it has a good connection and is secure on the board.
7. If the joint isn't good, repeat the above steps.

**Tip:** Try not to leave the soldering iron on for too long as that can damage the board or component.

**Tip:** A common mistake is to apply solder to the tip of the iron and then to 'wipe' the solder onto the board. This won't work, always apply solder to the pad and lead being soldered while the soldering iron is heating the pad and lead.

## Following the Instructions / Guide

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Different kits will have different instructions, but the general rule is that parts should be soldered in height order. That is, the lower height (profile) parts should be soldered first. Encourage the participants to follow any instructions available and to ask/confirm if they are unsure about any given part of the process.

## Fixing Mistakes

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It's possible to desolder a joint using a tool called a solder sucker (see video for demonstration). To use this, secure the board and then apply the tip of the soldering iron to the solder joint to melt it. While still melted, activate the solder sucker to suck up the still melted solder. Repeat as needed, but leave time for the board and part to cool between retrying, to prevent the board or part from becoming damaged.

## **Good Luck!**

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As with many building activities, soldering can be fun. Convey the notion that this is a new skill they're learning and that the end result is a bonus and doesn't need to be perfect.