Electronic Kit Soldering Tutorial

Introduction

To assemble any electronic kit, you just need a few basic tools. This simple tutorial contains all of the information you need to start soldering. There are also hundreds of other soldering tutorials on the web, many with video.

Required Tools

- **Soldering Iron:** You will need an iron designed for electronics, not plumbing. It should be 30-40 watts and have a fine, pencil-like tip.
- **Damp Sponge:** This is for cleaning the tip of your iron. Most soldering stations include a holder for the iron and a sponge.
- **Rosin Core Solder:** For electronics work, 60/40 solder (60% tin, 40% lead) is the most common. Thin, about 1mm, solder is best. Thicker solder can be harder to work with for small joints.
- **Pliers:** Small flush-cutting pliers are needed to clip the leads off of components after soldering them.

Optional Tools

- **Vice or Clamp:** This will hold the board in place while you solder it. A "third hand" is a device that has little clips to hold the board and, often, a magnifying glass.
- **Magnifying Glass:** Soldering is fine work and can be much easier when magnified. It also helps when reading the numbers on tiny components. A lighted magnifying glass is even better.
- **Desoldering Braid:** If you insert a part backwards or in the wrong hole, you may need to desolder it and remove it. When placed over the joint and heated with the iron, the braided copper draws the solder out of the joint.
- **Voltmeter:** This is useful for troubleshooting circuits.

Definitions

- **Component:** The individual parts of the kit that get soldered to the circuit board.
- **Lead:** The wires attached to components like resistors, capacitors, diodes and transistors.
- **Pin:** The short bit of metal that sticks out of components like integrated circuit chips, switches, buttons and jacks.
- **Pad:** The round or square metal area on the circuit board that surrounds each hole.
- **Joint:** The point where the lead and pad are soldered.

Preparation

- Work in an area with good lighting.
- Watch out for static electricity. Some integrated circuit chips are static sensitive and can be damaged.
- Tighten the tip of the soldering iron while it is cold. The tip is either threaded or has a retaining screw depending on your model of iron.
- Let the soldering iron get hot. A warm iron will not work.
- "Tin" the tip. When the iron is hot, coat the tip with solder then clean it off on a damp sponge. The tip should be shiny.

Soldering

- Bend the leads of the component if necessary. Resistors and diodes have the leads pointing straight out and need to be bent over into a U-shape.
- Insert the component's leads or pins into the appropriate holes on the circuit board.
- To keep a component in place while soldering it, turn the board over and bend the leads away from each other at a 45° angle. For components with pins, you can bend one or two pins inward to hold the component in place. Some components snap into place and it is not necessary to bend the pins.
- Touch the tip of the soldering iron to both the lead/pin and the pad to heat them both for about two seconds.
- Touch the solder right at the point where the lead/pin, pad and tip meet to melt the solder.
- Remove the solder and hold the soldering iron in place for another second until solder flows into the hole and onto the pad and makes a small shiny bead.
- Lift the soldering iron away from the joint.
- Inspect the joint. It should be shiny and have a rounded shape. Dull solder is a sign of a bad joint. Too little solder will not make a good electrical connection.
- Clip the excess lead length right at the solder joint. Pins are usually short enough and should not be clipped.

Tips

- Components are typically inserted on the top of the circuit board (the side with writing on it) and soldered on the bottom of the circuit board, unless the kit instructions say otherwise.
- Every lead or pin of every component needs to be soldered unless the kit instructions say otherwise.
- Double check component orientation. Many components are polarized (have a positive and negative lead). Examples are electrolytic capacitors, diodes, LEDs, transistors, voltage regulators and integrated circuit chips. Inserting a polarized component backwards will prevent it from working, and can damage it and/or other components on the circuit board.
- Clean the tip of your soldering iron frequently by wiping it on a damp sponge.
- Take your time.

Safety

- Work in an area with good ventilation. When solder melts, the rosin core produces fumes. Avoid breathing the fumes.
- Wash your hands after soldering. The lead in solder is poisonous and you should not ingest it.
- Soldering irons get very hot! The tip can be as much as 400° F. Do not touch the metal parts of the iron. Avoid accidentally touching the soldering iron to anything. Be especially careful not to touch the iron to its power cord.

Troubleshooting

Once you get some experience, you will be able to assemble a kit quickly and it will usually work as soon as you power it on. However, sometimes even experienced kit builders encounter problems. The most common problems are:

- **Bad Solder Joints:** This is, by far, the most common reason for non-functioning kits. Solder makes both a mechanical and an electrical connection. A component may be physically soldered in place, but have a bad electrical connection. Double check all of your solder joints. They should be shiny, smooth little mounds. Reheat bad solder joints and add a little more solder. You can also check the circuit against the schematic to ensure that power is getting to all the right places. This helps to isolate a bad joint.
- **Solder Bridges:** This is when solder flows across two pads, making an unwanted electrical connection. The fact that solder "sticks" to metal and not to the circuit board makes this rare unless you use too much solder. If you find a bridge, use desoldering braid to remove the excess solder.
- **Component Orientation:** Double check that you have not inserted any components backwards. If you have, then desolder and remove them, then solder them correctly. When removing components be careful not to break off the leads.
- **Bad Component:** This is pretty rare, and should not be your first conclusion if your kit is not working. It is also possible that you have damaged a component by inserting it backwards, applying heat for too long while soldering or through a static shock.