

# **Electronics 3**

## **Soldering**

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# Overview

- What is soldering?
- Equipment
- Safety
- How to...
- Desoldering methods

# Soldering overview

- In this lecture we'll cover the basics of soldering and finish with a demo.
- Solderless breadboards are great for prototyping, but sometimes you need to permanently fix leads to a component or commit your circuit to a board.
- Soldering is a method used to join metal items together by melting and flowing filler metal (solder) into the joint to create efficient, electrical connections.
- It takes some practice to get a perfect joint, but you'll eventually get it.

# Solder

- Solder is basically metal wire with a "low" melting point, meaning its low enough to be melted with a soldering iron.
- Depending on the mix, solder typically has a melting range of 190 to 840 °F.
- For electronics, lead free solder is the most common. Other varieties can contain lead and flux (a cleaning agent to help remove oxidation and improve connections).
- Lead free solder is often made of tin, copper, and silver. For example: 96.35% Sn (Tin), 3.0% Ag (Silver), and 0.5% Cu (Copper).
- Leaded solder is traditionally a mix of tin and lead. Lead has a lower melting point than tin, so more lead means a lower melting point.
- Most common lead-based solder will be 60Sn/40Pb (60% tin, 40% lead). Sometimes it varies, such as 63Sn/37Pb, but for general hobbyist purposes 60/40 is pretty common.

# Soldering Irons





# Soldering Irons

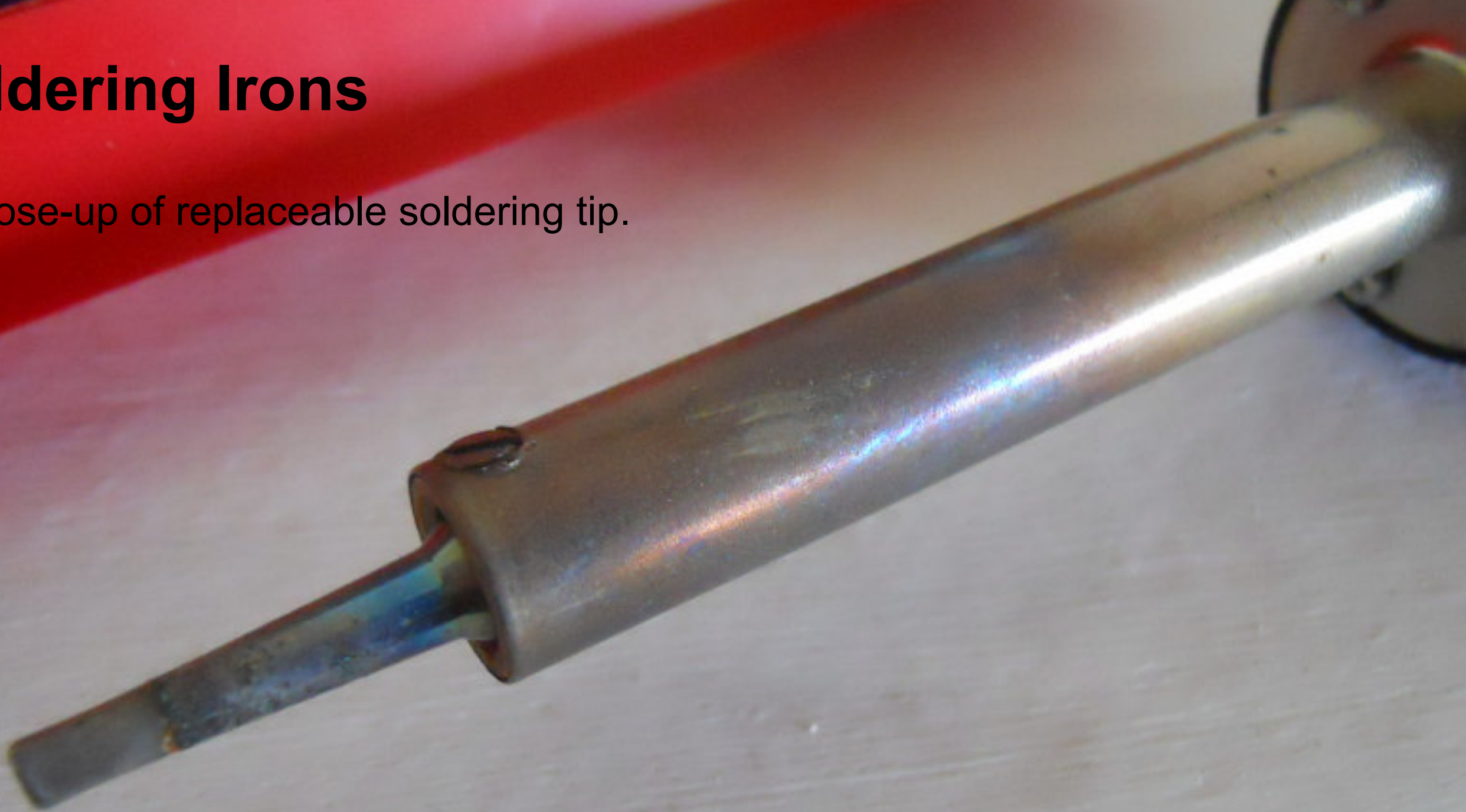
- Basic Weller WLC100 Soldering Station: base with holder, sponge, variable power control, lightweight iron.





# Soldering Irons

- Close-up of replaceable soldering tip.



# Helping hands

- Alligator clips hold the metal items together while you flow solder into the joint(s).





# Safety

- **Never touch the element or tip of a soldering iron.** They are very hot and will give you a nasty burn.
- **Avoid touching plastics and burnable materials** with the tip of the iron.
- Always **return the soldering iron to its stand** when not in use. Never put it down on your workbench, even for a moment!
- **Work in a well-ventilated area.** The materials in solder can be hazardous to your health. Avoid breathing them by putting a small fan near your work station and keeping your head to the side of, not above, your work.
- **Wash your hands** after using solder. Some solder contains lead which is a poisonous metal.

# First Aid for Burns

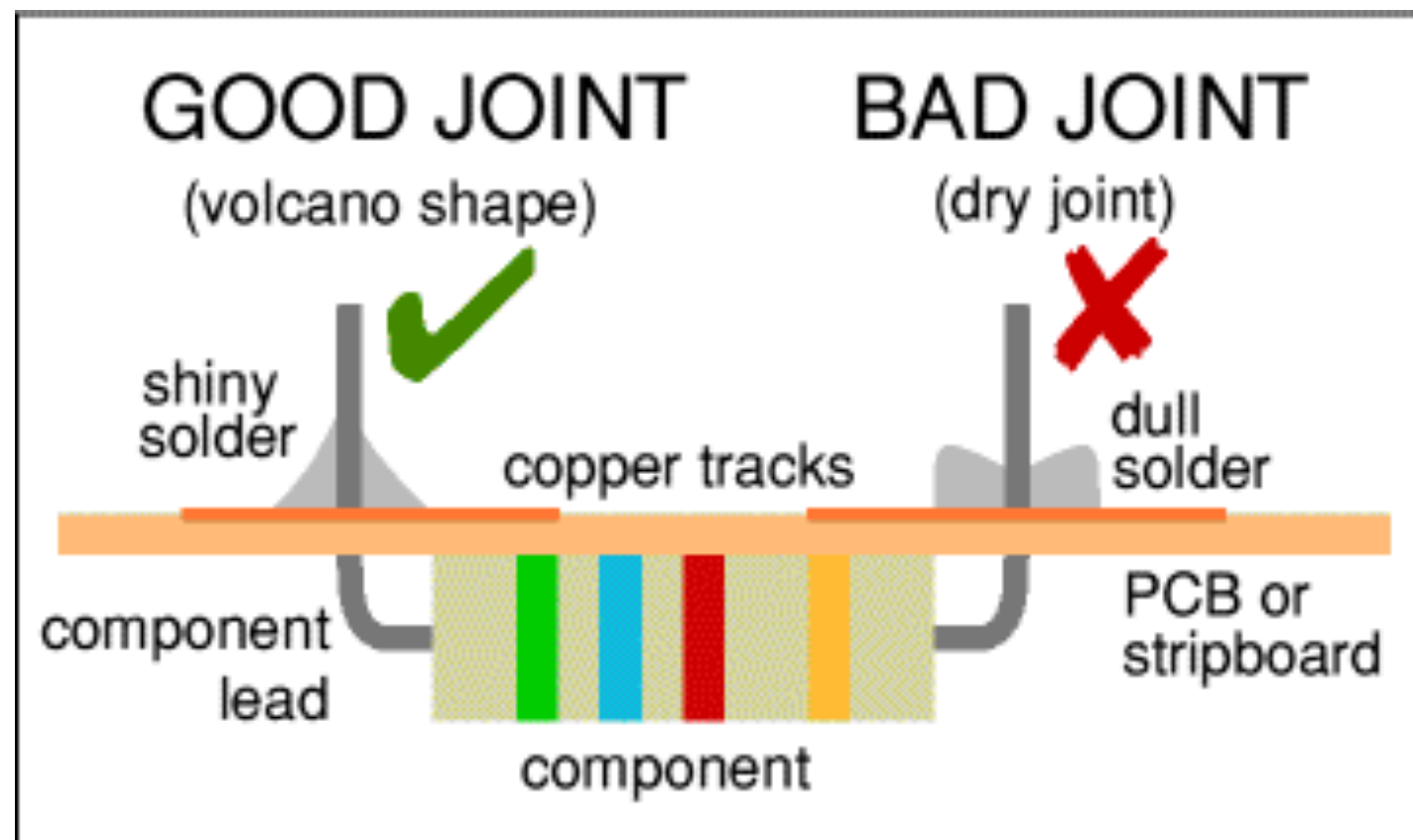
- Most burns from soldering minor and treatment is simple:
- Immediately cool the affected area under gently running cold water. Keep the burn in the cold water for at least 5 minutes (15 minutes is recommended). If ice is readily available this can be helpful too, but do not delay the initial cooling with cold water.
- Do not apply any creams or ointments. The burn will heal better without them. A dry dressing, such as a clean handkerchief, may be applied if you wish to protect the area from dirt.
- Seek medical attention if the burn covers an area bigger than your hand.
- To reduce the risk of burns:
- Always return your soldering iron to its stand immediately after use.
- Allow joints and components a minute or so to cool down before you touch them.
- Never touch the element or tip of a soldering iron unless you are certain it is cold.

# Preparing the soldering iron

- **Put the iron in its stand and plug it in.** It will take just a few minutes to reach its operating temperature.
- **Dampen the sponge** in the stand. Lift it out of the stand and hold it under a cold tap for a moment, then squeeze to remove excess water. It should be damp, not dripping wet.
- **Wait** a few minutes for the soldering iron to warm up. You can check if it is ready by trying to melt a little solder on the tip.
- **Clean the tip** by wiping on the damp sponge.
- **Tin your iron:** Melt a little solder on the tip of the iron to help the heat flow from the iron's tip to the joint. It only needs to be done when you plug in the iron, and occasionally while soldering if you need to wipe the tip clean on the sponge.

# Start soldering

- **Hold the soldering iron like a pen**, with your thumb and first two fingers, near the base of the handle.
- **Touch the soldering iron onto the joint**. Make sure it touches both the component lead and the track. Hold the tip there for a few seconds and...
- **Feed a little solder onto the joint**. It should flow smoothly onto the lead and track to form a volcano shape as shown in the diagram. Apply the solder to the joint, not the iron.





# Start soldering

- **Remove the solder, then the iron**, while keeping the joint still. Allow the joint a few seconds to cool before you move the circuit board or components.
- **Inspect the joint** closely. It should look shiny and have a 'volcano' shape. If not, you will need to reheat it and feed in a little more solder. This time ensure that both the lead and track are heated fully before applying solder
- Some components, such as transistors, can be damaged by heat when soldering. It is wise to use a heat sink clipped to the lead between the joint and the component body.

# Desoldering

There are two ways to desolder a joint to remove or re-position a wire or component.

Using a desoldering pump (solder sucker)

1. Set the pump by pushing the spring-loaded plunger down until it locks.
2. Apply both the pump nozzle and the tip of your soldering iron to the joint.
3. Wait a second or two for the solder to melt.
4. Press the button to release the plunger and suck the molten solder into the tool.
5. Repeat if necessary to remove as much solder as possible.
6. The pump will need emptying occasionally by unscrewing the nozzle.



# Desoldering

Solder remover wick (copper braid)

1. Apply the end of the wick and the tip of your soldering iron to the joint.
2. As the solder melts most of it will flow onto the wick, away from the joint.
3. Remove the wick first, then the soldering iron.
4. Cut off and discard the end of the wick coated with solder.

After removing most of the solder from the joint(s) you may be able to remove the wire or component lead straight away (allow a few seconds for it to cool).

If the joint will not come apart easily apply your soldering iron to melt the remaining traces of solder at the same time as pulling the joint apart, taking care to avoid burning yourself.

