



# Soldering & Electricity

## Goals:

- Understand how electricity works
- Understand when, why, and how to solder and desolder components

### Key Terms

**Soldering station:** soldering device composed of three parts: iron stand, power unit and the hand piece.

**Iron stand:** Piece used to hold the hot iron. This is made up of a heavy-duty metal base and a reinforced spring iron holder.

**Power Unit:** Component that provides power to the iron via an outside power source.

**Hand piece/iron:** tool that has a heated metal tip and an insulated hand grip. The iron transmits heat between two pieces for the purpose of transmitting heat and soldering.

**Soldering helping hands:** A stand with two flexible clips ("hands") to assist in holding pieces in place.

**Soldering wire:** Material commonly used to solder in electronics. The wire must have a core with flux, a chemical agent that improves contact and strength.

**Soldering paste:** Material used to connect component and board surfaces during the soldering process.

**Desoldering pump or solder sucker:** Device that removes solder from a printed circuit board.

**Desoldering wick, braid or wire:** Finely braided, copper wire used to remove solder. The braid is pressed against the connection, and when heated, removes the solder.



## Key Questions:

### What is electricity?

Electricity is a flow of electrons from one atom to another.

- Electrons move across atoms based on **electric charge**, or the positive or negative properties that cause either attraction or repulsion.
- The difference in the electric charge between two materials is known as the **voltage**, which is what causes electric charges to move.
- The flow of the electric charge is known as a **current**. These currents flow from one material to another, with some materials being easier to pass through.
- A **conductor** is any material that allows the current to flow to another material.

### How do electrical circuits work?

An electric circuit can be thought of as the highway of conductive materials that an electric current flows through in order to power an object. Important elements and functions of an electrical circuit include:

- **Grounding** is a process that allows electric current to return to the earth/ground if something goes wrong with a circuit. For example, if an object's insulation fails, the electrons can be transferred to the ground safely rather than risk electrocution.
- **Capacitors** store energy as an electrostatic field. They are commonly used in electric circuits to block direct currents and allow alternate currents to pass.
- An **amplifier** is a device that increases the power of a signal. Different types of these devices amplify voltage, current, or power.
- A **resistor** is anything that electricity cannot travel through easily. When energy does pass through a resistor, it is often released through another form (for example, changing from electricity to light or heat).

### What is soldering?

Under the soldering process, items are joined by heating, melting, and adding a filler material in the joint. In soldering, the work pieces being connected are not melted to connect. Instead, the solder is the metal alloy and connection that creates a strong electrical bond.



## Why do we need to solder?

Soldering allows us to connect different pieces in order to create an electrical bond. Soldering creates a permanent connection, but it can be undone through the desoldering process. You would want to desolder when correcting an electrical circuit or removing a component.

## Additional Resources:

- [Introduction to Electricity](#)<sup>19</sup> video
- [Electric current](#)<sup>20</sup> video
- [What Is Electricity](#)<sup>21</sup> video
- [Circuit Playground](#)<sup>22</sup> interactive definitions
- [Learn to Solder](#)<sup>23</sup> video

## Exercise: Soldering a resistor to a circuit board

**Goal:** In this exercise we'll learn how to solder to make a permanent connection. Even though we'll be working on resistors and a circuit board, soldering skills can be transferred across many different components, including capacitors, LEDs, head pins, etc. Here, we'll be using a resistor as our example since virtually any circuit has a resistor.

To successfully solder, we're going to divide the process into several phases:

- **Phase 1:** Learn how to place the soldering board or wires in a firm state.
- **Phase 2:** Learn how to connect the soldering iron with the soldering wire to place a soldering point to the component we want to solder.
- **Phase 3:** Practice how to feed the soldering wire to create stable and neat solder points.

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<sup>19</sup> <https://www.youtube.com/watch?v=EJeAuQ7pkpc>

<sup>20</sup> <https://www.youtube.com/watch?v=HXOok3mfMLM>

<sup>21</sup> <https://www.youtube.com/watch?v=ru032Mfsfig>

<sup>22</sup> <https://learn.adafruit.com/series/circuit-playground>

<sup>23</sup> [https://www.youtube.com/watch?v=v4D\\_Rdp1uh8](https://www.youtube.com/watch?v=v4D_Rdp1uh8)



- **Phase 4:** Learn how to desolder components using desoldering pump and soldering iron.