Buildatronics Beginner Kit.

Your first steps into the world of electronics!

What is Buildatronics?

Buildatronics is a hands-on learning system designed to teach you electronics through real components, soldering, and guided projects. Each box is filled with carefully crafted circuit boards and parts to help you understand how electronic systems work—step by step, from the ground up.

Whether you're a curious beginner or a future engineer, this kit will build your confidence, one project at a time.

How Does It Work?

1. **Find the Project Number**
   Each bag inside the kit is labeled with a number. Start with **Project 1** and move forward in order—we designed the sequence to gradually introduce new components and concepts.

2. **Follow the Instructions**
   Use the included instruction manual to build the project. You'll not only assemble a working circuit—you'll also learn **how it works** and **why it works**.

3. **Build. Learn. Repeat.**
   By the end of this kit, you'll be able to recognize, understand, and use key components like resistors, capacitors, transistors, and the famous 555 timer.

Safety Concerns?

Before you begin, please read these safety tips carefully. Electronics and soldering are safe and fun when handled properly, but **neglecting basic safety can result in injury or damage**. Buildatronics is not responsible for any harm caused by improper use of tools or materials. Persons under the age of 18 must have supervision from a trusted adult at all times.

1.

2. **Solder Fumes**
   - **Always work in a well-ventilated area.**

     Solder fumes can be harmful if inhaled over time. Use a **fume extractor fan** or solder near an open window with airflow.

   - **Avoid breathing directly over the work area.**
     Position your head slightly to the side while soldering.

3. **Preventing Burns**

   - **Stay focused.**
     Never solder while distracted, tired, or rushed. The iron tip reaches over 300°C **(570°F) and can cause serious burns instantly.**
   - **Avoid touching metal near the iron.**
     Do not hold any metal object within **10 cm of the iron's tip** while soldering. Heat travels quickly through metal and can burn your fingers even if it seems insulated.

   - **Use tools for short lengths.**
     If the soldering wire is **15 cm (6 inches)** or shorter, hold it with **insulated pliers** instead of your fingers.
   - **Place the iron on a stand.**
     Always return the soldering iron to a heat-resistant stand when not in use.

4. **Working with electricity**

   Even though the circuits in this kit use **low voltages (2V, 5V, and 9V)**, you should still follow these precautions:

   - **Always disconnect power before making changes.**
     Never solder or adjust components while the circuit is powered on.

   - **Do not short-circuit the battery.**
     Never touch the battery terminals together directly — this can cause overheating, burns, or even fire.

   - **Use components as instructed.**
     Misusing certain components can lead to heat, sparks, or failure. Always follow the instructions carefully.

Incase of incident during use, follow these steps:

For **minor burns**, cool the area immediately with cold water and apply a burn ointment.

If **a component heats up unexpectedly**, disconnect power immediately and allow it to cool before inspecting.

Always **keep a fire-resistant surface or mat** under your workspace.

Learning vs experimenting box.

In the main box you should see two plastic boxes, one labeled “Learning” and the other labeled “Experimenting”. In the learning box you will find 10 bags each label with a number these bags contain each project and the required components and a roll of solder. Whereas the Experimenting box contains:

- A breadboard
- A box full of components
- A booklet full of fun project ideas to level up your skills.

Also do note that if this is your first order you will receive a free usb-c soldering iron, if this is in fact your first order and you have not received one shall note that you require an account. If you have an account and this is your first order please contact support@buildatronics.tech and we will do our best to fulfill your request.

Instruction Manual.

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Bag one: Simple LED

In this bag you will find:

- 1x 3mm **blue led**
- 1x 2 pin **battery connector**
- 1x **PCB** for this project

Step-by-Step Instructions:

1. LED

- Insert the **long leg** of the LED into the hole labeled +
- Insert the **short leg** into the adjacent hole
- Flip the board over, **solder both legs**, and **trim the excess lead**

3. Battery Connector

- Place the **2-pin battery connector** into the appropriate holes on the PCB
- Flip the board and **solder both pins securely**

Test the circuit:

Connect the 2v battery found in the main experimenting box then:

- The **LED should light up** immediately

- If it **doesn’t work**, disconnect the battery and check:
    - Are the **LED and battery header securely soldered**? Tug lightly to check.
    - Are the **pins touching** where they shouldn’t be? Make sure there are no accidental shorts.
    - If something seems loose or misaligned, **reheat the solder joint** and adjust gently until it sits properly.

How It Works

This is your very first working circuit—and even though it uses only two components, it introduces two fundamental ideas:

Polarity

Polarity means that a component has a **positive** and **negative** side. If connected the wrong way, components like LEDs can **malfunction, stop working, or even get damaged**.

- Our LED has **two legs**:
    - **Long leg = Positive (+)**
    - **Short leg = Negative (–)**

So, always remember:
Long → Plus | Short → Minus

LEDs

LED stands for *Light Emitting Diode*. Diodes only allow current to flow in one direction, and LEDs emit light when powered correctly. You’ll use them a lot throughout this course.

What's Next?

In the next project, you'll learn about **resistors**—and take your first look at **Ohm’s Law**, the most important formula in all of electronics.

Bag Two: Resistors

In this bag:

- 1× 3mm Blue LED
- 1× **560Ω Resistor**
- 1× 2-pin Battery Connector
- 1× Custom PCB for this project

Step-by-Step Instructions

1. LED

- Insert the **long leg** of the LED into the hole labeled +
- Insert the **short leg** into the adjacent hole
- Flip the board over, **solder both legs**, and **trim the excess lead**

2. Resistor

- Insert both legs of the **560Ω resistor** into the matching holes
  *(Resistors are **not polarized**, so the direction doesn't matter!)*
- Flip the board over, **solder both legs**, and **trim off the excess**

3. Battery Connector

- Place the **2-pin battery connector** into the appropriate holes on the PCB
- Flip the board and **solder both pins securely**

Test the Circuit

1. Connect a 9V battery
2. Observe the LED:
   - It should **light up** just like in project one at about the same brightness but now it's running on 9v instead of 2v.
   - If it doesn't light up, double-check the **LED polarity** and all **solder joints**

How It Works

You just added your **first resistor** to a circuit!

What does the resistor do?

A **resistor limits the amount of current** flowing through the LED. Without it, too much current could flow through the LED, overheating it or burning it out.

> Think of it like a water valve for electricity — it controls the "flow" to keep things safe and balanced.

Why 560 Ohms?

Using **Ohm's Law**:

```
V = I × R
```

Where V is volts, I is amps, and R is resistance. For a 9V battery and a safe LED current of about 15mA (0.015A),
the resistor value should be around:

```
R = V / I = 9V / 0.015A ≈ 600Ω
```

So **560Ω** is a close standard value that gives off a bit more light.

What's Next?

In the next bag, you'll add **a switch** to control your circuit — introducing **interactivity** for the first time.

Bag Three: Switches:

In this bag:

- 1× 3mm Blue LED
- 1× 240Ω Resistor
- 1× 2-pin Battery Connector
- 1x 3 pin **Switch**
- 1× Custom PCB for this project

Step-by-Step Instructions

1. LED

- Insert the **long leg** of the LED into the hole labeled +
- Insert the **short leg** into the adjacent hole
- Flip the board over, **solder both legs**, and **trim the excess lead**

2. Resistor

- Insert both legs of the **240Ω resistor** into the matching holes
- Flip the board over, **solder both legs**, and **trim off the excess**

3. Switch

- Insert the 2 tabs and 3 pins of the **switch** into the matching holes.
- Flip the board over, solder all connections.

4. Battery Connector

- Place the **2-pin battery connector** into the appropriate holes on the PCB
- Flip the board and **solder both pins securely**

Test the Circuit

3. Connect a 5V battery
4. Observe the LED:

- It should **light up** either immediately or once you flip the switch in the right position.
- If it doesn't light up, double-check the **LED polarity** and all **solder joints**

How It Works

You just added your **first switch** to a circuit!

What does the switch do?

A **switch does not allow current flow** through it until you close the switch. We use the terms *open* and *closed* to describe the state of a switch *open* means off and *closed* means on, At first this doesn't make much sense but if you ever take a switch apart you will see a small metal piece connected to the handle that when switched bridges the gap between two pins.

Why 240 Ohms?

Using **Ohm's Law**:

$$V = I \times R$$

Where V is volts, I is amps, and R is resistance. For a 5V battery and a safe LED current of about 15mA (0.015A), the resistor value should be around:

$$R = I\ V = 0.015A\ 5V = 333.33\Omega$$

So **330 OHM** is the closest standard value however to make the **LED** shine a bit brighter i we use a **240 OHM** one**,** or if you make to use Ohm's law in a more efficient manner:

The forward voltage of the led is 2 V. So instead of using 5 V we use 3 V

`R = I V = 0.015A 3V = 200Ω`

And just to be safe we'll use **240 OHM**

What's Next?

In the next bag, you'll add **a button** to control your circuit.

Bag Four: Buttons:

In this bag:

- 1× 3mm Blue LED
- 1× 240Ω Resistor
- 1× 2-pin Battery Connector
- 1x 4-pin **Button**
- 1× Custom PCB for this project

Step-by-Step Instructions

1. LED

- Insert the **long leg** of the LED into the hole labeled +
- Insert the **short leg** into the adjacent hole
- Flip the board over, **solder both legs**, and **trim the excess lead**

2. Resistor

- Insert both legs of the **240Ω resistor** into the matching holes
- Flip the board over, **solder both legs**, and **trim off the excess**

3. Button

- Insert the 4 pins of the button into the holes marked on the pcb
- Flip the board over, **solder all four legs**

4. Battery Connector

- Place the **2-pin battery connector** into the appropriate holes on the PCB
- Flip the board and **solder both pins securely**

Test the Circuit

5. Connect a 5V battery
6. Observe the LED:
    - It should **not light up** immediately, only once you push the button.
    - If it doesn't light up, double-check the **LED polarity** and all **solder joints**

How It Works

You just added your **first button** to a circuit!

What does the button do?

A button works similarly to a switch, but with one key difference: instead of staying in a new state when pressed, it automatically returns to its original state—usually open—once released. However, due to the physical 'bouncing' of the metal contacts inside, the button can momentarily open and close several times within a few milliseconds before settling. This phenomenon is known as 'contact bounce' or 'switch bounce' and can cause unintended multiple signals if not handled properly in a circuit.

What's Next?

In the next bag, you'll add **a capacitor** to **debounce** your button.

Bag Five: Capacitors 1:

In this bag:

- 1× 3mm Blue LED
- 2× 240Ω Resistor
- 1× 2-pin Battery Connector
- 1x 4 pin button
- 1x 100uf ***Electrolytic*** **Capacitor**
- 1× Custom PCB for this project

Step-by-Step Instructions

1. LED

- Insert the **long leg** of the LED into the hole labeled +
- Insert the **short leg** into the adjacent hole
- Flip the board over, **solder both legs**, and **trim the excess lead**

2. Resistor

- Insert both legs of the **240Ω resistor** into the matching holes
- Flip the board over, **solder both legs**, and **trim off the excess**
- Repeat for the other resistor

3. Capacitor

- Like the **LED** electrolytic capacitor is in fact **polarized** and just like an **LED Long → Plus | Short → Minus** or if the legs are the same length the side with the strip of color is negative.
- Flip the board over, **solder both legs**, and **trim off the excess**

4. Button

- Insert the 4 pins of the button into the holes marked on the pcb
- Flip the board over, **solder all four legs**

5. Battery Connector

- Place the **2-pin battery connector** into the appropriate holes on the PCB
- Flip the board and **solder both pins securely**

Test the Circuit

7. Connect a 5V battery
8. Observe the LED:
   - It should **not light up** immediately, only once you push the button.
   - If it doesn't light up, double-check the **LED/Capacitor polarity** and all **solder joints**

How It Works

You just added your **first capacitor** to a circuit!

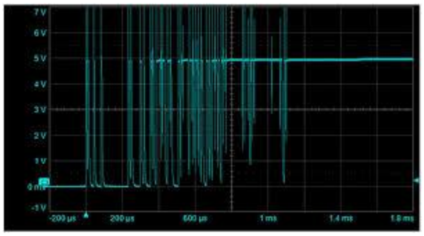
What does the capacitor do?

A **capacitor** works like a **dam**: as "water" (current) flows in, it **fills up** (charges). Once full, it can **release** that stored energy slowly, smoothing out any sudden changes — just like how a dam controls water flow downstream.

In the circuit.

When you press a **mechanical button**, the internal contacts can **bounce**, making and breaking the connection rapidly in milliseconds.

Without a capacitor, this causes **noisy spikes** in the signal — on-off-on-off — which might confuse your LED or microcontroller.



With a **capacitor connected from the switch output to ground**, something cool happens:

- As soon as the button is pressed, the capacitor **starts charging**.
- If the button bounces open for a split second, the **capacitor holds the voltage** — it doesn't drop immediately.
- This means the output stays near **5V**, instead of dipping and spiking.
- The result: a **smooth, clean signal** that eliminates the electrical noise from bouncing.

What’s Next?

In the next bag, you'll add **a transistor** to **isolate** your LED from your button.

Bag Six: Transistors 1:

In this bag:

- 1× 3mm Blue LED
- 1× 240Ω Resistor
- 1× 2-pin Battery Connector
- 1x 4 pin button
- 1x 100uf *Electrolytic* Capacitor
- 1x **BJT NPN Transistor**
- 1× Custom PCB for this project

Step-by-Step Instructions

1. LED

- Insert the **long leg** of the LED into the hole labeled +
- Insert the **short leg** into the adjacent hole
- Flip the board over, **solder both legs**, and **trim the excess lead**

2. Resistor

- Insert both legs of the **2400Ω resistor** into the matching holes
- Flip the board over, **solder both legs**, and **trim off the excess**

3. Transistor

- Insert the 3 legs of the **transistor** (collector, base, emitter) make sure that the **transistor** is facing the right way as depicted on the PCB
- Flip the board over, **solder the legs**, and **trim off the excess**

4. Capacitor

- Like the **LED** electrolytic capacitor is in fact **polarized** and just like an **LED Long → Plus | Short → Minus** or if the legs are the same length the side with the strip of color is negative.
- Flip the board over, **solder both legs**, and **trim off the excess**

5. Button

- Insert the 4 pins of the button into the holes marked on the pcb
- Flip the board over, solder all four legs

6. Battery Connector

- Place the **2-pin battery connector** into the appropriate holes on the PCB
- Flip the board and **solder both pins securely**

Test the Circuit

9. Connect a 5V battery
10. Observe the LED:
    - It should **not light up** immediately only once you push the button.
    - If it doesn't light up, double-check the **LED/Capacitor polarity** and all **solder joints**

How It Works

You just added your **first transistor** to a circuit!

What does the transistor do?

Think back to circuit 3 where we added a switch. A transistor works much like a switch except instead of being controlled by a physical action, it's controlled by applying a current to the base if the current is **LOW** the transistor will be **OPEN** if the current is **HIGH** the transistor will be **CLOSED.**

- **LOW → < 0.5V**
- **HIGH → > 0.5v**

What's Next?

In the next bag, you'll use **capacitors, resistors** and **transistors** to make an oscillator.

Bag Seven: Transistors/Capacitors 2:

In this bag:

- 1× 3mm Blue LED
- 1x 10 kΩ **potentiometer**
- 2× 100 kΩ Resistor
- 2x 1 kΩ Resistor
- 1× 2-pin Battery Connector
- 1x 3-pin Switch
- 2x 100uf *Electrolytic* Capacitor
- 2x BJT NPN Transistor
- 1× Custom PCB for this project

Step-by-Step Instructions

1. LEDs

- Insert the **long leg** of the LED into the hole labeled +
- Insert the **short leg** into the adjacent hole
- Flip the board over, **solder both legs**, and **trim the excess lead**
- Repeat for the other LED.

2. Resistors

- Insert both legs of the **1kOhm resistor** into the matching holes
- Flip the board over, **solder both legs**, and **trim off the excess**
- Repeat for the other **1kOhm** resistor on the other side of the board then for the two **100kOhm** in the middle two holes.

3. Transistors

- Insert the 3 legs of the **transistor** (collector, base, emitter) make sure that the **transistor** is facing the right way as depicted on the PCB
- Flip the board over, **solder the legs**, and **trim off the excess**
- Repeat for the other transistor.

4. Capacitors

- Insert the **long leg** of the Capacitor into the hole labeled +
- Insert the **short leg** into the adjacent hole
- Flip the board over, **solder both legs**, and **trim off the excess**
- Repeat for the other capacitor.

5. Switch

- Insert the 3 pins and two tabs of the switch into the holes marked on the pcb
- Flip the board over, solder all connections legs

6. Battery Connector

- Place the **2-pin battery connector** into the appropriate holes on the PCB
- Flip the board and **solder both pins securely**

Test the Circuit

11. Connect a 5V battery
12. Observe the LEDs:
    - One should light up immediately whilst the other should be off then a few seconds later it should switch.
    - If it doesn't light up, double-check the **LED/Capacitor polarity transistor/potentiometer direction** and all **solder joints**

How It Works

Potentiometers:

A potentiometer is a variable resistor with three terminals. Turning the knob moves a wiper along a resistive track, adjusting voltage output or resistance, commonly used for volume, brightness, or controls.

Oscillators:

A capacitor oscillator with a transistor and resistors creates a simple square wave signal. The capacitor charges through resistors until it reaches a voltage that switches the transistor on or off. When the transistor switches, the capacitor rapidly discharges, restarting the cycle. This charging and discharging creates a continuous oscillation. The frequency depends on resistor and capacitor values. It's commonly used for blinkers, tone generators, or simple clocks in digital circuits.

What's Next?

In the next bag, you'll create a similar circuit using a **555 timer**.

Bag Eight: 555 Timer

In this bag:

- 1× 3mm Blue LED
- 1× 10 kΩ Potentiometer
- 1× 10 kΩ Resistor
- 2× 100 nF Capacitor
- 1× 3-pin Switch
- 1× **LM555 Timer IC**
- 1× 2-pin Battery Connector
- 1× Custom PCB for this project

Step-by-Step Instructions

1. LED

- Insert the **long leg (+)** of the LED into the hole labeled **+**.
- Insert the **short leg (-)** into the adjacent hole.
- Flip the board, solder both legs, and trim the excess lead.

2. Resistor

- Insert the **10kΩ resistor** into its labeled spot on the PCB.
- Flip, solder both legs, and trim excess lead.

3. Potentiometer

- Place the **3 legs of the potentiometer** into the marked holes.
- Ensure it’s facing correctly as shown on the PCB silkscreen.
- Flip, solder all legs securely.

4. Capacitors

- Insert the two **100nF capacitors** into their labeled positions.
- Polarity doesn't matter for these (they're ceramic).
- Flip, solder, and trim.

5. Switch

- Insert the **3-pin switch** and the two side tabs into their holes.
- Flip the board, solder all pins and tabs securely.

6. 555 Timer IC

- Insert the **555 timer IC** into the holes, matching the notch to the PCB marking.
- Solder the pins

7. Battery Connector

- Insert the **2-pin battery connector** into its matching holes.
- Flip the board and solder both pins securely.

Test the Circuit

- Connect a **5V battery**.
- Press the switch.
- The **LED should light up for a few seconds**, then turn off. Pressing the switch again will retrigger the LED.
- If it doesn't work, check:
  - LED polarity
  - IC orientation
  - Potentiometer direction
  - Switch wiring
  - Cold solder joints

How It Works

555 Timer in Monostable Mode

This circuit uses the **555 timer in monostable (one-shot) mode**. Turning the LED on for a set period determined by the resistor and potentiometer (R1 + PR1) and the capacitor (U2).

The **formula for time delay** is:

T=1.1×(R1+Potentiometer)×CT = 1.1 \times (R1 + Potentiometer) \times CT=1.1×(R1+Potentiometer)×C

where C is the 100nF capacitor.

When the time is up, the LED turns off automatically until you press the button again.

What You Learned

- How integrated circuits like the **555 timer** can create delays.
- How resistors, potentiometers, and capacitors work together to control time in circuits.
- This is a key building block for timers, blinkers, tone generators, and logic-based circuits.

What's Next?

In the next bag, you'll use a new type of resistor along with a transistor to control **LEDs** based on perceived light.

Bag Nine: Voltage Dividers.

In this bag:

- 2× 5mm Red LEDs
- 2× 330Ω Resistors
- 1× 10kΩ Potentiometer
- 1× 10kΩ Resistor
- 1× **Photoresistor**
- 1× NPN Transistor
- 1× 2-pin Battery Connector
- 1× Custom PCB for this project

Step-by-Step Instructions

1. Potentiometer

- Insert the 10kΩ potentiometer into the three matching holes.
- Make sure the flat side matches the marking on the PCB.
- Flip, solder all three pins, and trim the legs.

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2. Photoresistor

- Insert the LDR into the two holes marked with the LDR symbol.
- The LDR has no polarity — orientation does not matter.
- Flip, solder both legs, and trim the excess leads.

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3. Resistor (Fixed – 10kΩ)

- Insert the 10kΩ resistor into the spot marked R1 (this is the resistor going to the transistor base).
- Flip, solder both legs, and trim**.**

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4. Resistors (LED Current Limiters – 330Ω)

- Insert the 330Ω resistor into the position labeled R2.
  Insert the second 330Ω resistor into the position labeled R3.
- Flip, solder both, and trim the legs.

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5. Transistor

- Insert the NPN transistor into the three holes marked.
- Make sure the flat side matches the flat side printed on the PCB.
- Flip, solder all three pins, and trim the legs.

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6. LEDs

- Insert the long leg (+) of each LED into the hole marked +.
- Insert the short leg (-) into the hole marked -.
- Flip, solder both legs of both LEDs, and trim the excess.

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7. Battery Connector

- Insert the 2-pin connector (H1) into the PCB header spot.
- Make sure the connector is facing outward for easy cable connection.
- Flip and solder both pins.

Testing

Connect a 5v battery.

1. Cover the **Photoresistor** with your finger **—** the **LEDs** should turn **ON.**

2. Shine a flashlight onto the **LDR —** the **LEDs** should turn **OFF.**

3. Adjust the **potentiometer** to change the **light sensitivity:**

    - Turn it one way to make the **LEDs** turn on when it's brighter.
    - Turn it the other way to make the **LEDs** only turn on when it's darker.

   If the LEDs don't turn on:

    - Check that the transistor is the right way around (flat side matches the PCB).
    - Check the LED polarity (long leg = +, short leg = -).
    - Check for cold solder joints or missing solder.

How It Works

- The LDR and 10kΩ potentiometer form a voltage divider that senses light levels. When it's bright, the LDR has low resistance, keeping the transistor OFF and the LEDs stay OFF.
- When it gets dark, the LDR's resistance increases, sending a voltage to the base of the NPN transistor.
- This turns the transistor ON, which allows current to flow from the collector to the emitter — lighting up both LEDs.
- The 330Ω resistors limit the current through each LED to prevent damage.
- You can fine-tune when the LEDs turn on using the potentiometer.

Bag Ten: Final Project.

Objective:

Design and build a temperature-triggered alarm system using a thermistor sensor. The system should activate an audible buzzer and a flashing LED when the temperature rises above a preset threshold.

We recommend starting with the breadboard included in the experimenting box before moving on to the prototyping board (The board in this bag).

Key Requirements:

- Use a thermistor combined with a voltage divider and a potentiometer to create a temperature-dependent voltage signal.
- This voltage signal will control a transistor switch that enables an oscillator circuit (such as a 555 timer configured in astable mode).
- When activated, the oscillator should alternately flash an LED and sound a buzzer, providing both visual and audible alarms.

Abstract Implementation Guide

1. **Temperature Sensing and Threshold Setting:**
   Connect the thermistor in series with a fixed resistor and a potentiometer to form a voltage divider. This arrangement converts temperature changes into a variable voltage. Adjust the potentiometer to set the voltage corresponding to the desired temperature threshold.

2. **Switch Activation:**
   The voltage from the voltage divider is fed into the base/gate of a transistor (e.g., NPN transistor). When the voltage crosses the threshold (indicating high temperature), the transistor switches ON, supplying power or enabling the oscillator circuit.

3. **Oscillator and Alarm Output:**
   The oscillator circuit (commonly a 555 timer in astable mode) generates a square wave signal that drives both the buzzer and the LED. The LED should flash in sync with the buzzer's sound, alerting to the temperature condition.

How to Test Your Circuit

1. Initial Setup:

- Connect the thermistor, resistor, and potentiometer in a voltage divider configuration.
- Adjust the potentiometer to the mid-range position.

2. Simulate Temperature Rise:

- Gently warm the thermistor (e.g., with your fingers or a heat source).
- Monitor the transistor’s base voltage; it should increase as temperature rises.

3. Check Transistor Activation:

- When the temperature exceeds the threshold, the transistor should switch ON, enabling the oscillator.

4. Verify Oscillator Output:

- Confirm that the LED begins flashing on and off.
- Listen for the buzzer sounding intermittently, matching the LED flash rate.

5. Adjust Threshold:

- Use the potentiometer to fine-tune the temperature level at which the alarm activates.
- Repeat the warming test to verify consistent triggering.

6. Troubleshooting:

- If the LED or buzzer do not activate, check transistor biasing and oscillator wiring.
- Ensure the voltage divider outputs the expected voltage range as temperature changes.

Congratulations! You've just completed the **Buildatronics Beginner Kit**. You've built real electronic circuits, learned how components work together, and taken your first steps into the world of electronics. This is just the beginning — the future is in your hands!

Need help/support: join our discord: https://discord.gg/xQQcvJDWc6.

What's Next:

- Buildatronics Intermediate Kit (recommended)
- Buildatronics Transistor Logic Kit
- Buildatronics Mircocontroller Kit

Learn Online: Go to buildatronics.tech or:

- allaboutcircuits.com
- electronics-tutorials.ws
- learn.adafruit.com
- learn.sparkfun.com/tutorials
- circuitdigest.com

Buildatronics is dedicated to helping beginners explore electronics in a fun, hands-on way. We believe anyone can be a maker.

Designed by Ethan Lagden.

Contact: support@buildatronics.tech or buildatronics.tech/contact.

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