

TechyTron STEM Electronics

Classes 5-6 · Ages 10–12

Ten guided electronics experiments. Typical school-age ranges vary by learner.

Each kit is supplied separately with the components listed in its guide.

- Voltage Explorer Kit
- Capacitor Countdown Kit
- Blink Beat Kit
- Transistor Light Switch Kit
- Touch Pad Light Kit
- Tilt Alarm Lab Kit
- Sound Trigger Light Kit
- Rain Drop Alarm Kit
- Soil Moisture Signal Kit
- Heat Sense Alarm Kit

Voltage Explorer Kit

Classes 5-6 · Ages 10–12

Measure voltage and discover how a resistor divider works.



Activity engagement: 45–60 minutes. Explore 5–10 min · Build 15–20 min · Test and discuss 25–30 min. Times are estimates for guided use.

You will need: No computer required. An adult helps inspect connections.

What you learn

- Voltage is measured across two points; resistance is measured with power disconnected.
- Equal series resistors divide a voltage approximately in half.
- A potentiometer produces an adjustable voltage.

Included components

- Small Breadboard / Mini Solderless Board - 400 points — 1 breadboard
- Jumper Wire Combo - Male to Male, Male to Female and Female to Female Breadboard Connecting Wires (10 Qty Each) — 1 set
- Illustrated Activity Guide and Observation Sheets — 1 set
- Fitted Headers and Labelled Connection Leads — 1 set
- 4 CELL AA BATTERY HOLDER WITH SWITCH / COVER — 1 holder
- AA BATTERY — 4 battery (batteries)
- Regulated 5 V Power Supply with Short-Circuit Protection — 1 power supply
- DT9205A Digital Multimeter with Probes and Battery — 1 multimeter · Includes probes and meter battery. Used only on isolated low-voltage circuits.
- 10 K POTENTIOMETER — 1 potentiometer
- 10K Ω 1/4 Watts (10 PCS) — 2 resistor(s) · Quantity is individual resistors; catalogue pack is divided by 10.

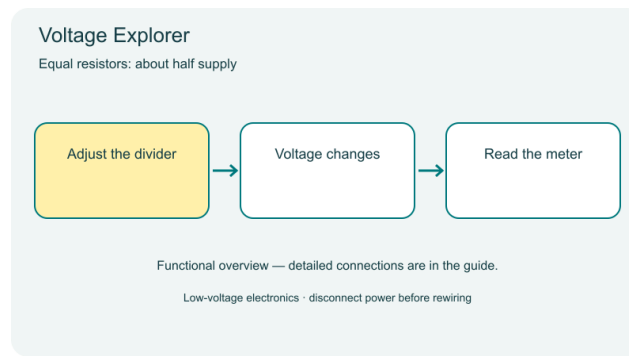
Connection guide

- Meter black lead → COM; red lead → V/ohm socket. Select DC volts, never the current socket for this activity.
- Two 10 kOhm resistors in series: regulated +5 V → R1 → midpoint → R2 → GND.
- Potentiometer outer pins → +5 V and GND; centre wiper is the adjustable output.

Steps to make it

1. Disconnect all power and identify the supplied part labels and pinouts before wiring.
2. With the supply disconnected, measure each resistor on the ohms range and write its value.
3. Build the two-resistor divider. Select DC volts before connecting the supply.
4. Measure across +5 V/GND, then midpoint/GND; compare midpoint voltage with half the measured supply.
5. Disconnect power, replace the divider with the potentiometer, reconnect and measure its wiper voltage at five positions.
6. Return the supply switch to OFF and remove the probes.

How this experiment works



Test challenge

Predict the midpoint voltage, measure it three times, then compare the five potentiometer settings.

Observation task

Table: resistor values, supply voltage, predicted midpoint, measured midpoint, and potentiometer position.

Expected result

The equal-resistor midpoint is near half the supply; the wiper moves between near-zero and near-supply voltage.

If it does not work

Check meter mode and sockets first. A floating midpoint or broken breadboard rail gives inconsistent readings.

Try next

Use the potentiometer as one divider arm and draw the measured voltage curve.

Use and supervision

Use only the supplied low-voltage DC parts. Disconnect power before rewiring; check polarity and labelled pinouts. No soldering or exposed mains connections. Adult guidance is recommended.

Cover images illustrate component types. Flow animations explain principles and are not recorded prototype tests. Use the exact connection labels supplied with the kit.

Capacitor Countdown Kit

Classes 5-6 · Ages 10–12

Build a one-shot electronic timer with a 555 chip.



Activity engagement: 60–90 minutes. Explore 10–15 min · Build 20–30 min · Test and discuss 30–45 min. Times are estimates for guided use.

You will need: No computer required. An adult helps inspect connections.

What you learn

- A capacitor stores charge and changes voltage over time.
- A 555 monostable makes a single pulse after a trigger.
- The approximate pulse length is $1.1 \times R \times C$.

Included components

- Small Breadboard / Mini Solderless Board - 400 points — 1 breadboard
- Jumper Wire Combo - Male to Male, Male to Female and Female to Female Breadboard Connecting Wires (10 Qty Each) — 1 set
- Illustrated Activity Guide and Observation Sheets — 1 set
- Fitted Headers and Labelled Connection Leads — 1 set
- 4 CELL AA BATTERY HOLDER WITH SWITCH / COVER — 1 holder
- AA BATTERY — 4 battery (batteries)
- Regulated 5 V Power Supply with Short-Circuit Protection — 1 power supply
- 555 Timer IC (LM555 / NE555 / SE555) - 8 Pin DIP Package — 1 IC
- Tactile Push Button Switch 12x12x8mm 4-Pin — 1 button
- 100 μ F CAPACITOR (5 PCS) — 1 capacitor · Quantity is individual capacitors; catalogue pack is divided by 5.
- 100K Ω 1/4 Watts (10 PCS) — 1 resistor · Quantity is individual resistors; catalogue pack is divided by 10.
- 10K Ω 1/4 Watts (10 PCS) — 1 resistor · Quantity is individual resistors; catalogue pack is divided by 10.
- 5mm LED - Red Color — 1 LED
- 330 Ω 1/4 Watts (10 PCS) — 1 resistor · Quantity is individual resistors; catalogue pack is divided by 10.
- 0.01 μ F CAPACITOR (5 PCS) — 1 capacitor · Quantity is individual capacitors; catalogue pack is divided by 5.
- 0.1 μ F CAPACITOR (5 PCS) — 1 capacitor · Quantity is individual capacitors; catalogue pack is divided by 5.

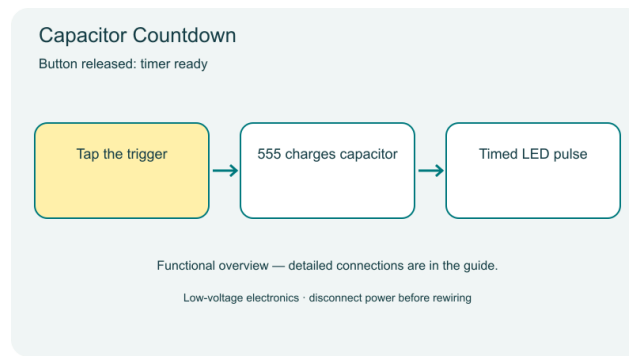
Connection guide

- NE555 pin 1 → GND; 8 and 4 → +5 V. Add 100 nF across pins 8/1 and 10 nF from pin 5 to GND.
- Pins 6 and 7 → timing node; 100 kOhm from +5 V to that node; 100 μ F capacitor positive to node and negative to GND.
- Pin 2 → +5 V through 10 kOhm; push button from pin 2 to GND. Pin 3 → 330 Ohm → LED anode; cathode → GND.

Steps to make it

1. Disconnect all power and identify the supplied part labels and pinouts before wiring.
2. Place the DIP chip across the breadboard centre gap; locate pin 1 from its notch/dot using the connection card.
3. Connect the supply and control pins, then the timing network, checking electrolytic capacitor polarity.
4. Add the trigger button and current-limited LED. Ask an adult to inspect the rails.
5. Apply regulated 5 V, tap and release the button, and time the LED pulse with a clock.
6. Repeat five trials, allowing the LED to go out before triggering again.

How this experiment works



Test challenge

Compare the measured LED-on time with $1.1 \times 100000 \times 0.0001$, approximately 11 seconds.

Observation task

Five pulse lengths, mean time, predicted time, and percentage difference.

Expected result

A short button press produces a much longer LED pulse; capacitor tolerance means timing is approximate.

If it does not work

Switch off and check pin numbering, pin 4 at +5 V, capacitor polarity and the trigger pull-up. Do not hold the button down while timing.

Try next

Explain why a larger timing resistor would lengthen the pulse.

Use and supervision

Use only the supplied low-voltage DC parts. Disconnect power before rewiring; check polarity and labelled pinouts. No soldering or exposed mains connections. Adult guidance is recommended.

Cover images illustrate component types. Flow animations explain principles and are not recorded prototype tests. Use the exact connection labels supplied with the kit.

Blink Beat Kit

Classes 5-6 · Ages 10–12

Make an adjustable-rate LED oscillator without a computer.



Activity engagement: 60–90 minutes. Explore 10–15 min · Build 20–30 min · Test and discuss 30–45 min. Times are estimates for guided use.

You will need: No computer required. An adult helps inspect connections.

What you learn

- An oscillator repeats without repeated button presses.
- Resistance and capacitance set the flashing period.
- Frequency is cycles per second, the inverse of period.

Included components

- Small Breadboard / Mini Solderless Board - 400 points — 1 breadboard
- Jumper Wire Combo - Male to Male, Male to Female and Female to Female Breadboard Connecting Wires (10 Qty Each) — 1 set
- Illustrated Activity Guide and Observation Sheets — 1 set
- Fitted Headers and Labelled Connection Leads — 1 set
- 4 CELL AA BATTERY HOLDER WITH SWITCH / COVER — 1 holder
- AA BATTERY — 4 battery (batteries)
- Regulated 5 V Power Supply with Short-Circuit Protection — 1 power supply
- 555 Timer IC (LM555 / NE555 / SE555) - 8 Pin DIP Package — 1 IC
- 10 μ F CAPACITOR (5 PCS) — 1 capacitor · Quantity is individual capacitors; catalogue pack is divided by 5.
- 100 μ F CAPACITOR (5 PCS) — 1 capacitor · Quantity is individual capacitors; catalogue pack is divided by 5.
- 1K Ω 1/4 Watts (10 PCS) — 1 resistor · Quantity is individual resistors; catalogue pack is divided by 10.
- 47K Ω 1/4 Watts (10 PCS) — 1 resistor · Quantity is individual resistors; catalogue pack is divided by 10.
- 5mm LED - Red Color — 1 LED
- 330 Ω 1/4 Watts (10 PCS) — 1 resistor · Quantity is individual resistors; catalogue pack is divided by 10.
- 0.01 μ F CAPACITOR (5 PCS) — 1 capacitor · Quantity is individual capacitors; catalogue pack is divided by 5.
- 0.1 μ F CAPACITOR (5 PCS) — 1 capacitor · Quantity is individual capacitors; catalogue pack is divided by 5.

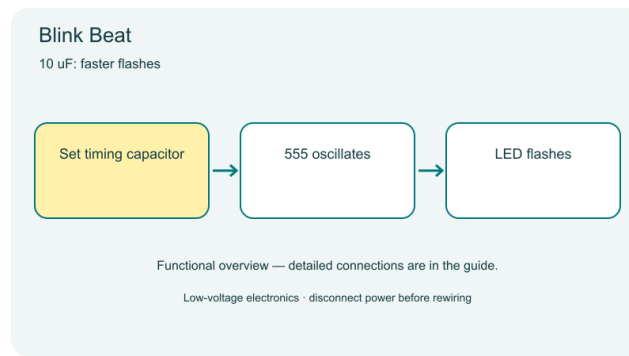
Connection guide

- NE555 pins 1 $\rightarrow$ GND; 8 and 4 $\rightarrow$ +5 V; 100 nF supply decoupling and 10 nF pin 5 $\rightarrow$ GND.
- Tie pins 2 and 6 together. Connect 1 kOhm from +5 V to pin 7 and 47 kOhm from pin 7 to pins 2/6.
- Timing capacitor positive $\rightarrow$ pins 2/6 and negative $\rightarrow$ GND. Pin 3 $\rightarrow$ 330 Ohm $\rightarrow$ LED $\rightarrow$ GND.

Steps to make it

1. Disconnect all power and identify the supplied part labels and pinouts before wiring.
2. Identify the chip pins, then build the supply and resistor network with power off.
3. Fit the 10 μ F timing capacitor with the correct polarity and add the LED branch.
4. Power on and count ten flashes; divide the elapsed time by ten to estimate period.
5. Switch off, discharge the timing capacitor through the resistor network, and replace 10 μ F with 100 μ F.
6. Repeat the count, compare periods and disconnect power.

How this experiment works



Test challenge

Does increasing capacitance tenfold increase the period by approximately tenfold?

Observation task

Capacitance, time for ten cycles, period and calculated frequency.

Expected result

The larger capacitor produces slower flashes; nominal periods are about 0.66 s and 6.6 s.

If it does not work

Check that pins 2 and 6 are joined and pin 7 is between the two resistors; confirm both capacitors are individual parts, not whole packs.

Try next

Use $T \approx 0.693 \times (R1 + 2R2) \times C$ to compare predicted and measured periods.

Use and supervision

Use only the supplied low-voltage DC parts. Disconnect power before rewiring; check polarity and labelled pinouts. No soldering or exposed mains connections. Adult guidance is recommended.

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Transistor Light Switch Kit

Classes 5-6 · Ages 10–12

Control an LED using a transistor and a small input current.



Activity engagement: 45–60 minutes. Explore 5–10 min · Build 15–20 min · Test and discuss 25–30 min. Times are estimates for guided use.

You will need: No computer required. An adult helps inspect connections.

What you learn

- A transistor can switch a load from a control signal.
- Base current needs a limiting resistor.
- Emitter, base and collector positions depend on the supplied package.

Included components

- Small Breadboard / Mini Solderless Board - 400 points — 1 breadboard
- Jumper Wire Combo - Male to Male, Male to Female and Female to Female Breadboard Connecting Wires (10 Qty Each) — 1 set
- Illustrated Activity Guide and Observation Sheets — 1 set
- Fitted Headers and Labelled Connection Leads — 1 set
- 4 CELL AA BATTERY HOLDER WITH SWITCH / COVER — 1 holder
- AA BATTERY — 4 battery (batteries)
- Regulated 5 V Power Supply with Short-Circuit Protection — 1 power supply
- 2N2222 NPN (5 PCS) — 1 transistor · Use the labelled emitter/base/collector map for the supplied transistor package.
- Tactile Push Button Switch 12x12x8mm 4-Pin — 1 button
- 1K Ω 1/4 Watts (10 PCS) — 1 resistor · Quantity is individual resistors; catalogue pack is divided by 10.
- 10K Ω 1/4 Watts (10 PCS) — 1 resistor · Quantity is individual resistors; catalogue pack is divided by 10.
- 5mm LED - Red Color — 1 LED
- 330 Ω 1/4 Watts (10 PCS) — 1 resistor · Quantity is individual resistors; catalogue pack is divided by 10.

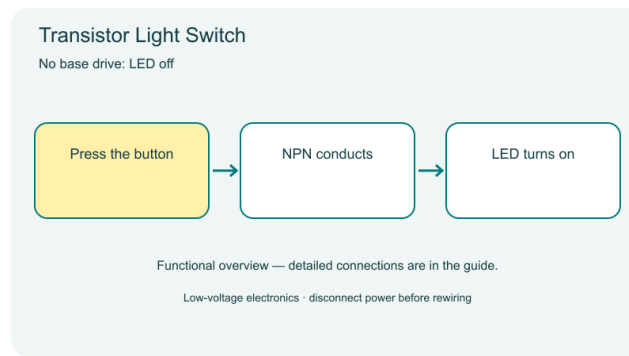
Connection guide

- Use the supplied 2N2222 pinout labels. Emitter → GND; collector → LED cathode.
- LED anode → +5 V through 330 Ohm. Base → +5 V through push button and 1 kOhm.
- Connect 10 kOhm from base to GND so the transistor turns off when the button is released.

Steps to make it

1. Disconnect all power and identify the supplied part labels and pinouts before wiring.
2. Read the transistor package pinout before inserting it into separate breadboard rows.
3. Wire the LED collector branch, then the button/base resistor and pull-down.
4. Inspect the circuit with power off and confirm the LED resistor is present.
5. Apply regulated 5 V; press and release the button ten times and record the LED state.
6. Disconnect power and draw separate control-current and LED-current paths.

How this experiment works



Test challenge

Predict what happens when the base signal is absent, then test repeated presses.

Observation task

Input OFF/ON, predicted LED state, observed LED state and transistor pinout sketch.

Expected result

Pressing the button supplies base current and switches the LED on; releasing it switches the LED off.

If it does not work

Wrong transistor pin order is the first check. Never bridge the LED resistor or connect the base directly to +5 V.

Try next

Compare this switching role with a relay, focusing on moving parts and input current.

Use and supervision

Use only the supplied low-voltage DC parts. Disconnect power before rewiring; check polarity and labelled pinouts. No soldering or exposed mains connections. Adult guidance is recommended.

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Touch Pad Light Kit

Classes 5-6 · Ages 10–12

Use a capacitive touch sensor to control a light.



Activity engagement: 40–60 minutes. Explore 5–10 min · Build 10–20 min · Test and discuss 25–30 min. Times are estimates for guided use.

You will need: No computer required. An adult helps inspect connections.

What you learn

- Touch can be detected through a change in capacitance.
- A digital output has two logic states.
- The LED still needs its own current-limiting resistor.

Included components

- Small Breadboard / Mini Solderless Board - 400 points — 1 breadboard
- Jumper Wire Combo - Male to Male, Male to Female and Female to Female Breadboard Connecting Wires (10 Qty Each) — 1 set
- Illustrated Activity Guide and Observation Sheets — 1 set
- Fitted Headers and Labelled Connection Leads — 1 set
- 4 CELL AA BATTERY HOLDER WITH SWITCH / COVER — 1 holder
- AA BATTERY — 4 battery (batteries)
- Regulated 5 V Power Supply with Short-Circuit Protection — 1 power supply
- TTP223 Capacitive Touch Module — 1 sensor module
- 5mm LED - Red Color — 1 LED
- 1K Ω 1/4 Watts (10 PCS) — 1 resistor · Quantity is individual resistors; catalogue pack is divided by 10.

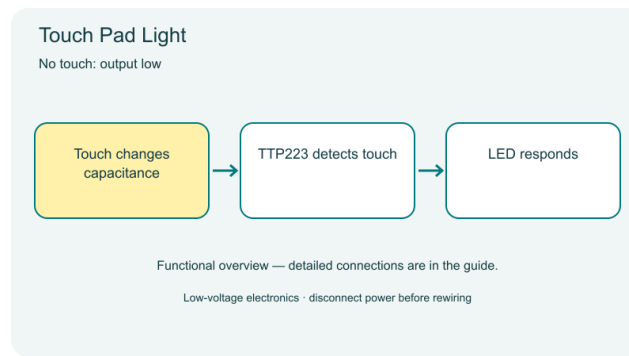
Connection guide

- TTP223 VCC → regulated +5 V; GND → GND; OUT → 1 k Ω → LED anode.
- LED cathode → GND. Use the touch pad only; do not bridge supply terminals.

Steps to make it

1. Disconnect all power and identify the supplied part labels and pinouts before wiring.
2. Leave the module in its supplied momentary active-high configuration; identify VCC, GND and OUT.
3. Wire the sensor and the 1 k Ω LED branch with the supply off.
4. Power on without touching the pad for two seconds to let the sensor settle.
5. Touch and release with a dry finger; then try through one thin dry paper sheet.
6. Repeat the same test ten times and turn the supply off.

How this experiment works



Test challenge

Compare touch detection with a bare pad and with a thin insulating sheet.

Observation task

Surface, number of touches, successful detections and false triggers.

Expected result

Touch normally raises OUT and lights the LED; the thin-sheet response depends on thickness and contact.

If it does not work

Check the supplied module mode and keep the pad dry. Allow settling after power-up and use the specified 1 kOhm resistor.

Try next

Explain why capacitive sensing can sometimes work through an insulating cover.

Use and supervision

Use only the supplied low-voltage DC parts. Disconnect power before rewiring; check polarity and labelled pinouts. No soldering or exposed mains connections. Adult guidance is recommended.

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Tilt Alarm Lab Kit

Classes 5-6 · Ages 10–12

Make an alarm that responds when its sensor tilts.



Activity engagement: 45–65 minutes. Explore 5–10 min · Build 15–20 min · Test and discuss 25–35 min. Times are estimates for guided use.

You will need: No computer required. An adult helps inspect connections.

What you learn

- A ball/contact tilt sensor changes its digital state with orientation.
- A comparator turns a changing sensor signal into a digital threshold output.
- A separate output driver keeps the sensor signal separate from its load.

Included components

- Small Breadboard / Mini Solderless Board - 400 points — 1 breadboard
- Jumper Wire Combo - Male to Male, Male to Female and Female to Female Breadboard Connecting Wires (10 Qty Each) — 1 set
- Illustrated Activity Guide and Observation Sheets — 1 set
- Fitted Headers and Labelled Connection Leads — 1 set
- 4 CELL AA BATTERY HOLDER WITH SWITCH / COVER — 1 holder
- AA BATTERY — 4 battery (batteries)
- Regulated 5 V Power Supply with Short-Circuit Protection — 1 power supply
- SW520D Tilt Sensor Module — 1 sensor module
- 5 V Active Buzzer — 1 buzzer
- 5 V Sensor Output Driver with Trigger Selector — 1 interface circuit

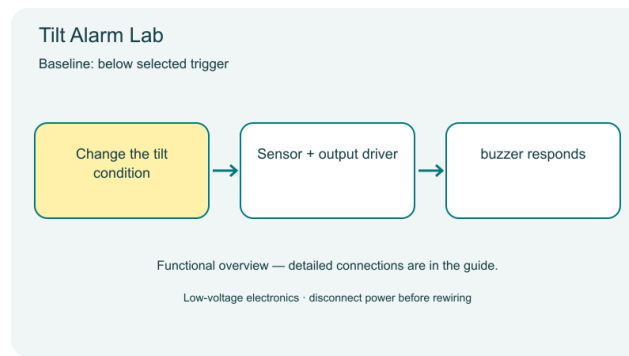
Connection guide

- tilt sensor VCC/GND → regulated +5 V/GND; its labelled DO output → driver IN.
- Driver VCC/GND → the same supply; use its supplied active-low/high trigger selector to match the module.
- Buzzer positive → driver labelled load +; buzzer negative → driver labelled load –.

Steps to make it

1. Disconnect all power and identify the supplied part labels and pinouts before wiring.
2. Switch the supply off and identify the sensor DO terminal; do not confuse it with AO.
3. Connect the sensor, preassembled labelled driver and output using the connection card.
4. Power on and adjust the sensor sensitivity at the baseline condition until the output is stable.
5. Slowly tilt the sensor from level to each side; return it to level between trials.
6. Repeat five controlled trials, changing only one condition, then switch off and dry/clean the sensing surface as appropriate.

How this experiment works



Test challenge

Slowly tilt the sensor from level to each side; return it to level between trials.

Observation task

Angle category, predicted alarm state and observed state.

Expected result

A ball/contact tilt sensor changes its digital state with orientation. The driver makes that change visible or audible.

If it does not work

Check the DO pin, shared ground, sensitivity setting and driver trigger selector. A brief sensor pulse gives only a brief output; this is not a latching alarm.

Try next

Try mounting the module in a different orientation and compare the trigger point.

Use and supervision

Use only supplied 5 V DC. Keep fingers away from the buzzer opening and use a comfortable sound level. Disconnect power before rewiring.

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Sound Trigger Light Kit

Classes 5-6 · Ages 10–12

Turn a sound event into a visible electronic signal.



Activity engagement: 45–65 minutes. Explore 5–10 min · Build 15–20 min · Test and discuss 25–35 min. Times are estimates for guided use.

You will need: No computer required. An adult helps inspect connections.

What you learn

- A microphone signal crossing the comparator threshold produces a short output pulse.
- A comparator turns a changing sensor signal into a digital threshold output.
- A separate output driver keeps the sensor signal separate from its load.

Included components

- Small Breadboard / Mini Solderless Board - 400 points — 1 breadboard
- Jumper Wire Combo - Male to Male, Male to Female and Female to Female Breadboard Connecting Wires (10 Qty Each) — 1 set
- Illustrated Activity Guide and Observation Sheets — 1 set
- Fitted Headers and Labelled Connection Leads — 1 set
- 4 CELL AA BATTERY HOLDER WITH SWITCH / COVER — 1 holder
- AA BATTERY — 4 battery (batteries)
- Regulated 5 V Power Supply with Short-Circuit Protection — 1 power supply
- LM393 Sound Sensor Module — 1 sensor module
- 5 V Sensor Output Driver with Trigger Selector — 1 interface circuit
- 5mm LED - Red Color — 1 LED
- 330 Ω 1/4 Watts (10 PCS) — 1 resistor · Quantity is individual resistors; catalogue pack is divided by 10.

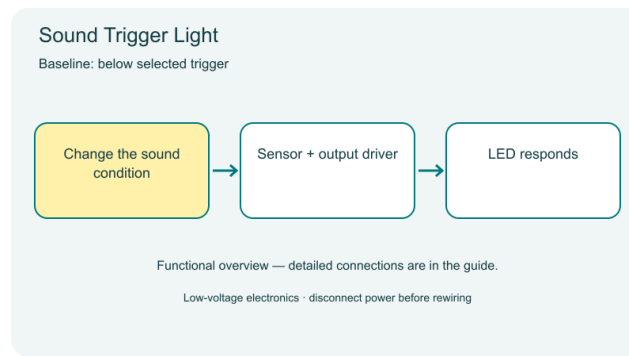
Connection guide

- sound sensor VCC/GND → regulated +5 V/GND; its labelled DO output → driver IN.
- Driver VCC/GND → the same supply; use its supplied active-low/high trigger selector to match the module.
- Driver OUT → 330 Ohm → LED anode; LED cathode → GND.

Steps to make it

1. Disconnect all power and identify the supplied part labels and pinouts before wiring.
2. Switch the supply off and identify the sensor DO terminal; do not confuse it with AO.
3. Connect the sensor, preassembled labelled driver and output using the connection card.
4. Power on and adjust the sensor sensitivity at the baseline condition until the output is stable.
5. Make gentle claps at 10, 30 and 60 cm; keep background sound similar.
6. Repeat five controlled trials, changing only one condition, then switch off and dry/clean the sensing surface as appropriate.

How this experiment works



Test challenge

Make gentle claps at 10, 30 and 60 cm; keep background sound similar.

Observation task

Distance, sensitivity setting, five trials and successful detections.

Expected result

A microphone signal crossing the comparator threshold produces a short output pulse. The driver makes that change visible or audible.

If it does not work

Check the DO pin, shared ground, sensitivity setting and driver trigger selector. A brief sensor pulse gives only a brief output; this is not a latching alarm.

Try next

Discuss why a threshold microphone module cannot measure calibrated decibels.

Use and supervision

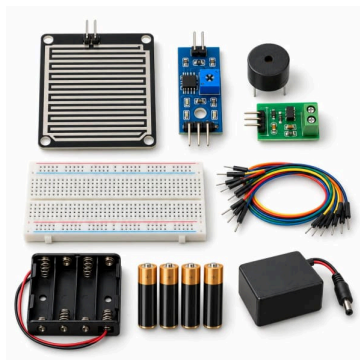
Use only supplied 5 V DC. Keep fingers away from the buzzer opening and use a comfortable sound level. Disconnect power before rewiring.

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Rain Drop Alarm Kit

Classes 5-6 · Ages 10–12

Detect droplets with a low-voltage sensing plate.



Activity engagement: 45–65 minutes. Explore 5–10 min · Build 15–20 min · Test and discuss 25–35 min. Times are estimates for guided use.

You will need: No computer required. An adult helps inspect connections.

What you learn

- Conductive moisture changes the plate resistance and can cross the selected threshold.
- A comparator turns a changing sensor signal into a digital threshold output.
- A separate output driver keeps the sensor signal separate from its load.

Included components

- Small Breadboard / Mini Solderless Board - 400 points — 1 breadboard
- Jumper Wire Combo - Male to Male, Male to Female and Female to Female Breadboard Connecting Wires (10 Qty Each) — 1 set
- Illustrated Activity Guide and Observation Sheets — 1 set
- Fitted Headers and Labelled Connection Leads — 1 set
- 4 CELL AA BATTERY HOLDER WITH SWITCH / COVER — 1 holder
- AA BATTERY — 4 battery (batteries)
- Regulated 5 V Power Supply with Short-Circuit Protection — 1 power supply
- Rain Drop Sensor Module — 1 sensor set
- 5 V Active Buzzer — 1 buzzer
- 5 V Sensor Output Driver with Trigger Selector — 1 interface circuit

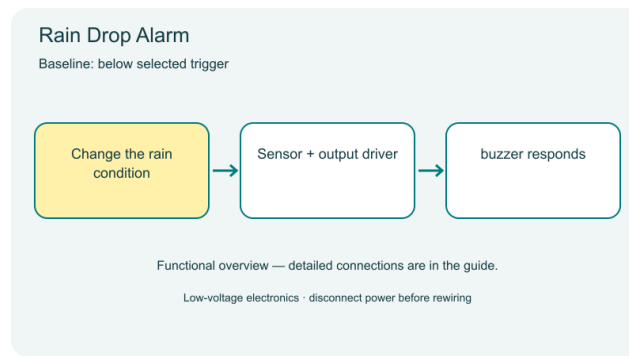
Connection guide

- rain sensor VCC/GND → regulated +5 V/GND; its labelled DO output → driver IN.
- Driver VCC/GND → the same supply; use its supplied active-low/high trigger selector to match the module.
- Buzzer positive → driver labelled load +; buzzer negative → driver labelled load –.

Steps to make it

1. Disconnect all power and identify the supplied part labels and pinouts before wiring.
2. Switch the supply off and identify the sensor DO terminal; do not confuse it with AO.
3. Connect the sensor, preassembled labelled driver and output using the connection card.
4. Power on and adjust the sensor sensitivity at the baseline condition until the output is stable.
5. Place one drop, then three drops of clean water on the detached sensing plate; dry it between trials.
6. Repeat five controlled trials, changing only one condition, then switch off and dry/clean the sensing surface as appropriate.

How this experiment works



Test challenge

Place one drop, then three drops of clean water on the detached sensing plate; dry it between trials.

Observation task

Number of drops, plate condition, threshold setting and alarm state.

Expected result

Conductive moisture changes the plate resistance and can cross the selected threshold. The driver makes that change visible or audible.

If it does not work

Check the DO pin, shared ground, sensitivity setting and driver trigger selector. A brief sensor pulse gives only a brief output; this is not a latching alarm.

Try next

Compare spaced droplets with a thin continuous film using the same water.

Use and supervision

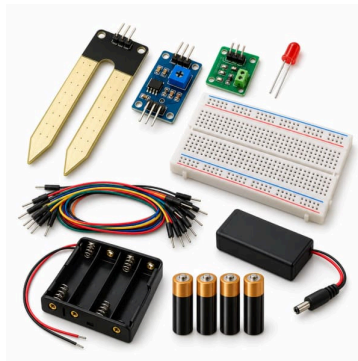
Use only supplied 5 V DC. Keep the breadboard, power unit and driver dry; only the removable probe/plate contacts the sample. Disconnect power before handling wet parts. Clean and dry after use. Adult guidance is recommended.

Cover images illustrate component types. Flow animations explain principles and are not recorded prototype tests. Use the exact connection labels supplied with the kit.

Soil Moisture Signal Kit

Classes 5-6 · Ages 10–12

Compare dry and damp soil using a sensor threshold.



Activity engagement: 45–65 minutes. Explore 5–10 min · Build 15–20 min · Test and discuss 25–35 min. Times are estimates for guided use.

You will need: No computer required. An adult helps inspect connections.

What you learn

- Dampness usually changes probe conductivity enough to alter the threshold output.
- A comparator turns a changing sensor signal into a digital threshold output.
- A separate output driver keeps the sensor signal separate from its load.

Included components

- Small Breadboard / Mini Solderless Board - 400 points — 1 breadboard
- Jumper Wire Combo - Male to Male, Male to Female and Female to Female Breadboard Connecting Wires (10 Qty Each) — 1 set
- Illustrated Activity Guide and Observation Sheets — 1 set
- Fitted Headers and Labelled Connection Leads — 1 set
- 4 CELL AA BATTERY HOLDER WITH SWITCH / COVER — 1 holder
- AA BATTERY — 4 battery (batteries)
- Regulated 5 V Power Supply with Short-Circuit Protection — 1 power supply
- Soil Moisture Sensor Module — 1 sensor set
- 5 V Sensor Output Driver with Trigger Selector — 1 interface circuit
- 5mm LED - Red Color — 1 LED
- 330 Ω 1/4 Watts (10 PCS) — 1 resistor · Quantity is individual resistors; catalogue pack is divided by 10.

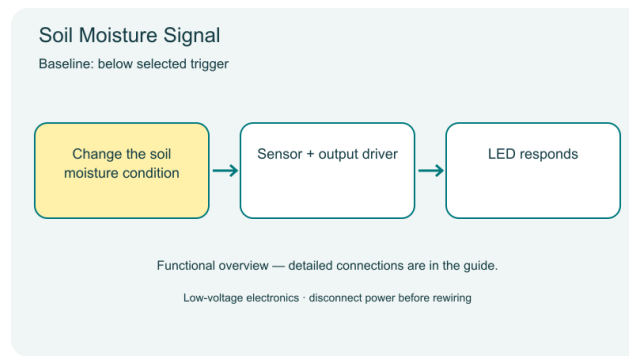
Connection guide

- soil moisture sensor VCC/GND → regulated +5 V/GND; its labelled DO output → driver IN.
- Driver VCC/GND → the same supply; use its supplied active-low/high trigger selector to match the module.
- Driver OUT → 330 Ohm → LED anode; LED cathode → GND.

Steps to make it

1. Disconnect all power and identify the supplied part labels and pinouts before wiring.
2. Switch the supply off and identify the sensor DO terminal; do not confuse it with AO.
3. Connect the sensor, preassembled labelled driver and output using the connection card.
4. Power on and adjust the sensor sensitivity at the baseline condition until the output is stable.
5. Insert the probe to the same depth in dry and lightly damp soil samples, powering it only during readings.
6. Repeat five controlled trials, changing only one condition, then switch off and dry/clean the sensing surface as appropriate.

How this experiment works



Test challenge

Insert the probe to the same depth in dry and lightly damp soil samples, powering it only during readings.

Observation task

Sample label, insertion depth, threshold setting and LED state.

Expected result

Dampness usually changes probe conductivity enough to alter the threshold output. The driver makes that change visible or audible.

If it does not work

Check the DO pin, shared ground, sensitivity setting and driver trigger selector. A brief sensor pulse gives only a brief output; this is not a latching alarm.

Try next

Explain why salt content and soil type prevent treating this as an accurate water-percentage meter.

Use and supervision

Use only supplied 5 V DC. Keep the breadboard, power unit and driver dry; only the removable probe/plate contacts the sample. Disconnect power before handling wet parts. Clean and dry after use. Adult guidance is recommended.

Cover images illustrate component types. Flow animations explain principles and are not recorded prototype tests. Use the exact connection labels supplied with the kit.

Heat Sense Alarm Kit

Classes 5-6 · Ages 10–12

Detect a temperature change using a thermistor.



Activity engagement: 45–65 minutes. Explore 5–10 min · Build 15–20 min · Test and discuss 25–35 min. Times are estimates for guided use.

You will need: No computer required. An adult helps inspect connections.

What you learn

- Temperature changes the NTC resistance; the comparator switches at its adjusted threshold.
- A comparator turns a changing sensor signal into a digital threshold output.
- A separate output driver keeps the sensor signal separate from its load.

Included components

- Small Breadboard / Mini Solderless Board - 400 points — 1 breadboard
- Jumper Wire Combo - Male to Male, Male to Female and Female to Female Breadboard Connecting Wires (10 Qty Each) — 1 set
- Illustrated Activity Guide and Observation Sheets — 1 set
- Fitted Headers and Labelled Connection Leads — 1 set
- 4 CELL AA BATTERY HOLDER WITH SWITCH / COVER — 1 holder
- AA BATTERY — 4 battery (batteries)
- Regulated 5 V Power Supply with Short-Circuit Protection — 1 power supply
- NTC Thermistor Temperature Sensor Module — 1 sensor module
- 5 V Active Buzzer — 1 buzzer
- 5 V Sensor Output Driver with Trigger Selector — 1 interface circuit

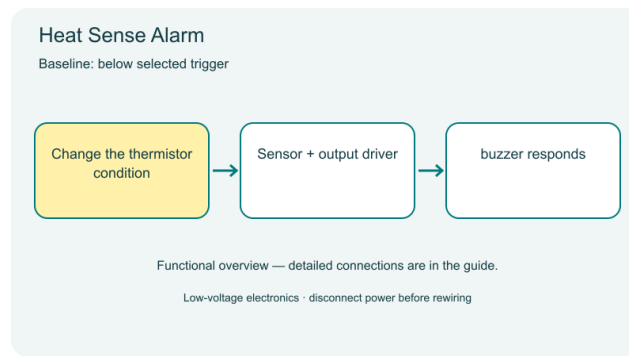
Connection guide

- thermistor sensor VCC/GND → regulated +5 V/GND; its labelled DO output → driver IN.
- Driver VCC/GND → the same supply; use its supplied active-low/high trigger selector to match the module.
- Buzzer positive → driver labelled load +; buzzer negative → driver labelled load –.

Steps to make it

1. Disconnect all power and identify the supplied part labels and pinouts before wiring.
2. Switch the supply off and identify the sensor DO terminal; do not confuse it with AO.
3. Connect the sensor, preassembled labelled driver and output using the connection card.
4. Power on and adjust the sensor sensitivity at the baseline condition until the output is stable.
5. Gently warm the sensor between dry fingertips, then allow it to return toward room temperature.
6. Repeat five controlled trials, changing only one condition, then switch off and dry/clean the sensing surface as appropriate.

How this experiment works



Test challenge

Gently warm the sensor between dry fingertips, then allow it to return toward room temperature.

Observation task

Room/warmed/cooling condition, threshold position and alarm state.

Expected result

Temperature changes the NTC resistance; the comparator switches at its adjusted threshold. The driver makes that change visible or audible.

If it does not work

Check the DO pin, shared ground, sensitivity setting and driver trigger selector. A brief sensor pulse gives only a brief output; this is not a latching alarm.

Try next

Discuss the difference between a threshold alarm and a calibrated thermometer.

Use and supervision

Warm the sensor only with dry fingertips. No flame, hot plate or boiling water. Use the supplied 5 V DC power unit and switch off before rewiring.

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