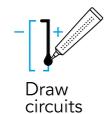


ELECTRIC PAINT

It works like any other water-based paint, except it conducts electricity

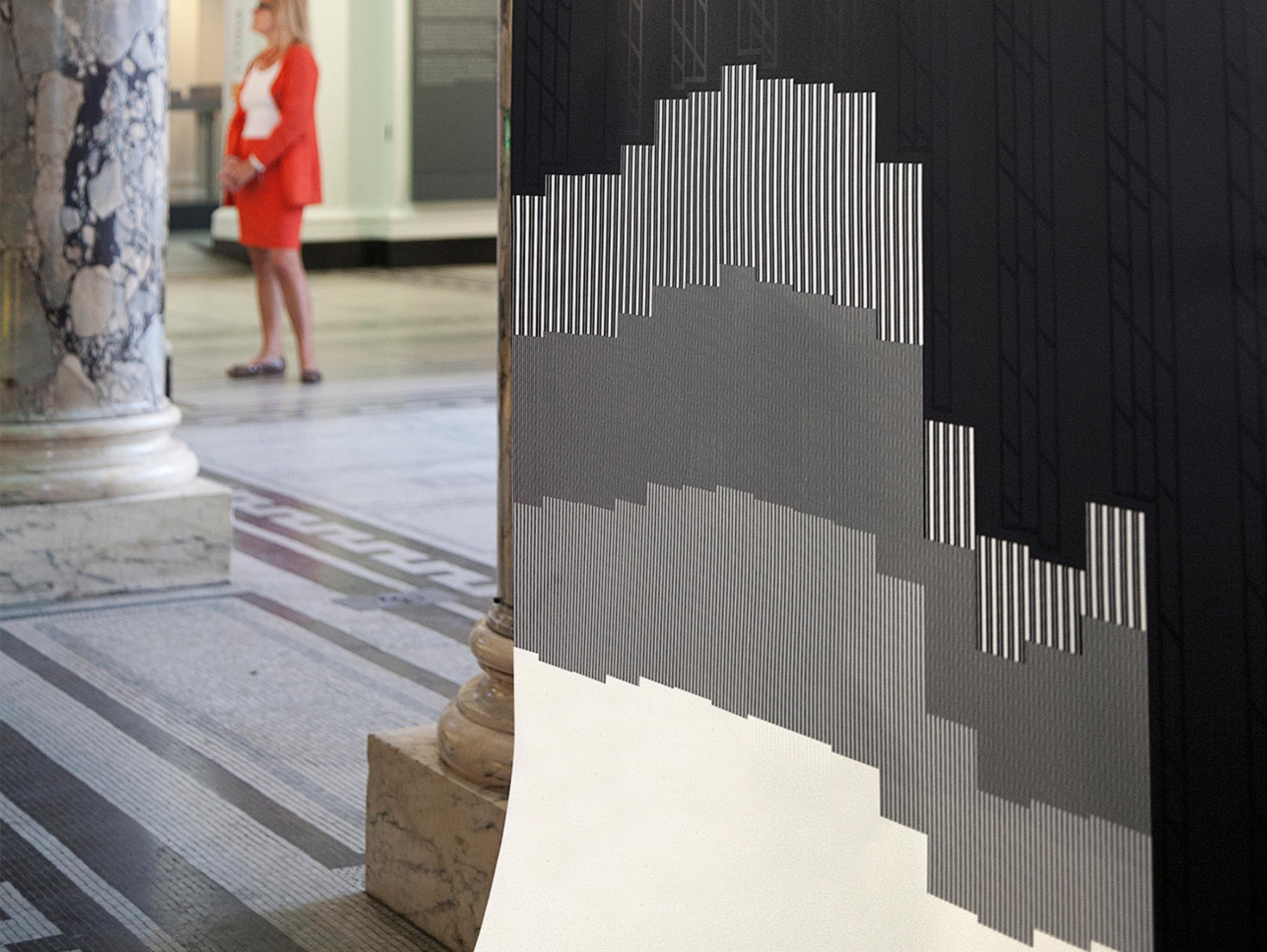


What can it be used for?

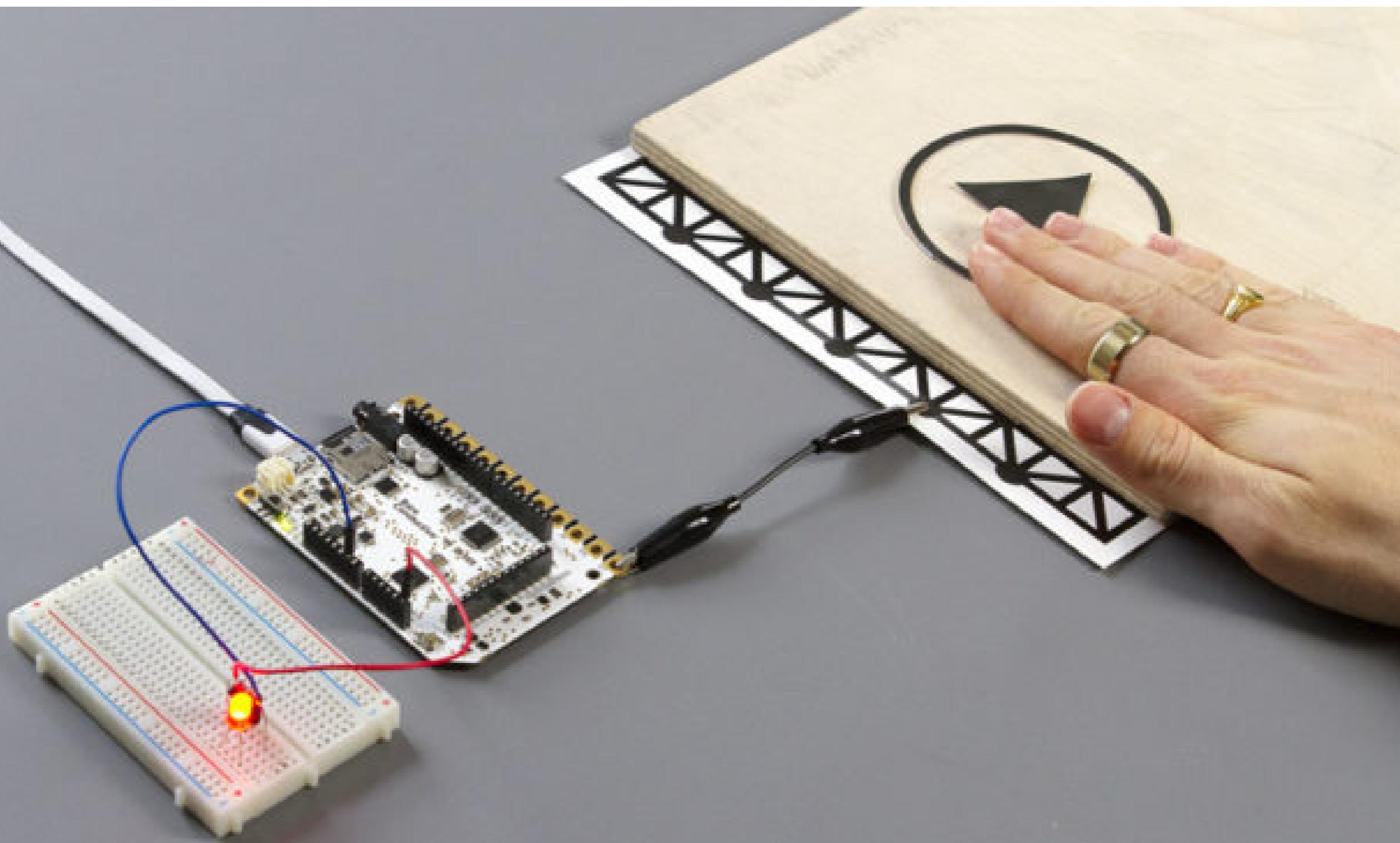
Paint wires or sensors directly onto almost any material, safely and quickly cold solder components, repair small devices and PCBs, or create switches and circuit designs straight onto any material.

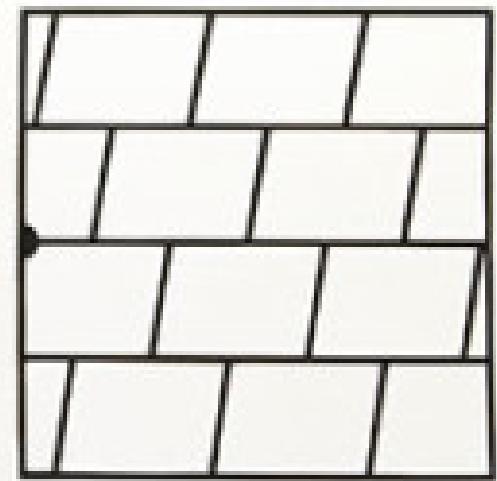
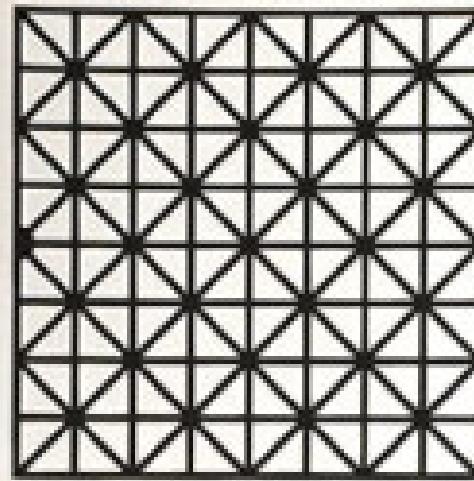
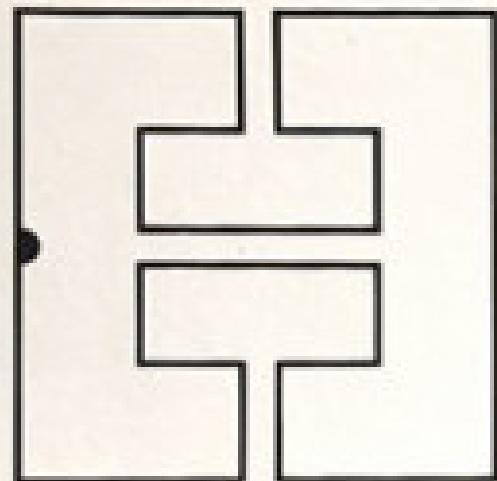
Why is it special?

It's electrically conductive, non-toxic, solvent free and water soluble. You can also stencil and screen print with it, just like a normal paint. Although not as conductive as metal or copper wire, it's a great tool for low-current circuits and sensors.









RESISTANCE SAMPLES VISUAL

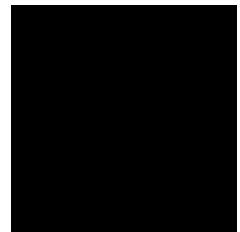
39Ω 20mm x 15mm



61Ω 50mm x 20mm



32Ω 30mm x 30mm



473Ω 70mm x 3mm



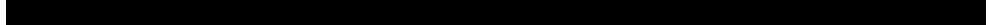
737Ω 110mm x 3mm



869Ω 130mm x 3mm



526Ω 130mm x 5mm



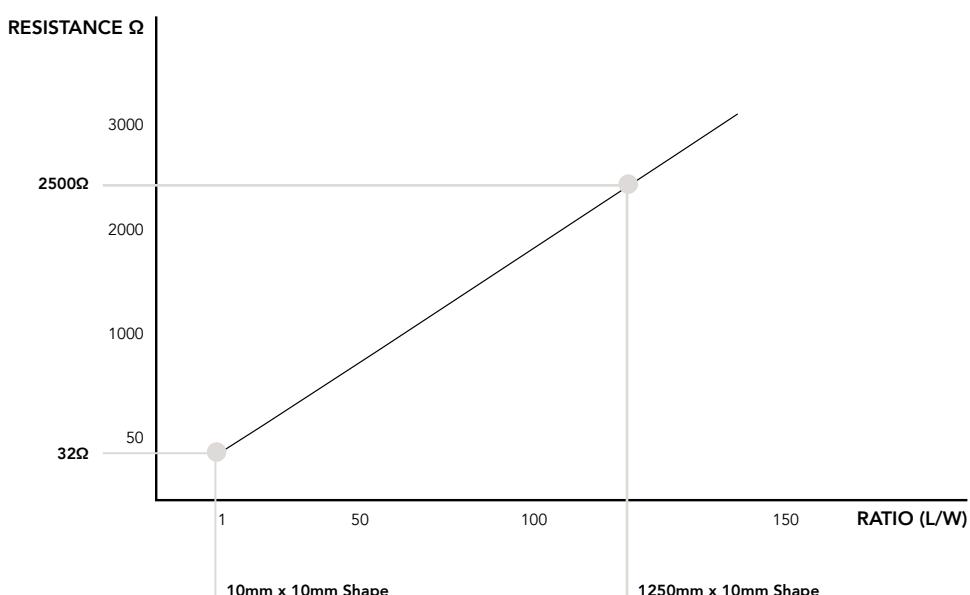
RESISTANCE GRAPH

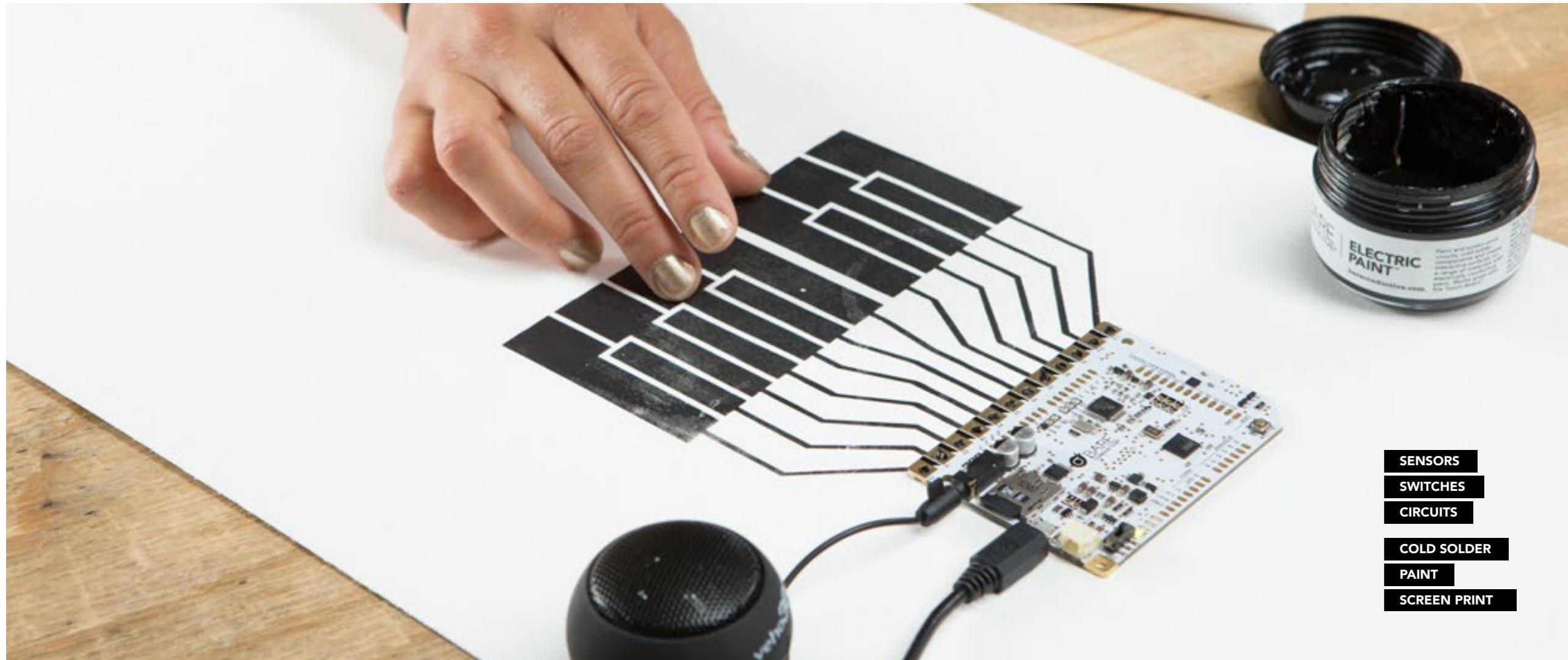
Electric Paint presents a wholly unique way of exploring electrical resistance. In general, the resistance of a sample of conductive material is defined by the dimensions of the sample being tested, and resistance is inversely proportional to cross sectional area (i.e. given a set length and depth, a wider sample will have less resistance than a thin one). Thus, the resistance can be defined by the ratio of length/width.

The diagram below plots the proportional ratio of a sample of **Electric Paint** against its approximate resistance. This diagram assumes that **Electric Paint** has been applied with a brush. You can calculate an estimated resistance for any proportion over 1, based on the equation: **Resistance=19.77(Ratio)+12**

Example one is illustrated by a blue point on the diagram. This point is associated with a shape with a ratio of 1 (dimensions of 10mm x 10mm i.e. $10 \times 10 = 1$). The resistance associated with this ratio is 32Ω. The nature of the ratio number means that this shape could have the dimensions of 100mm x 100mm and the resistance would still be 32Ω.

Example two shows a shape of ratio 125. In this example the shape has the dimensions of 1250mm x 10mm ($1250/10=125$). The resistance associated with this shape is 2500Ω.





TOUCH BOARD

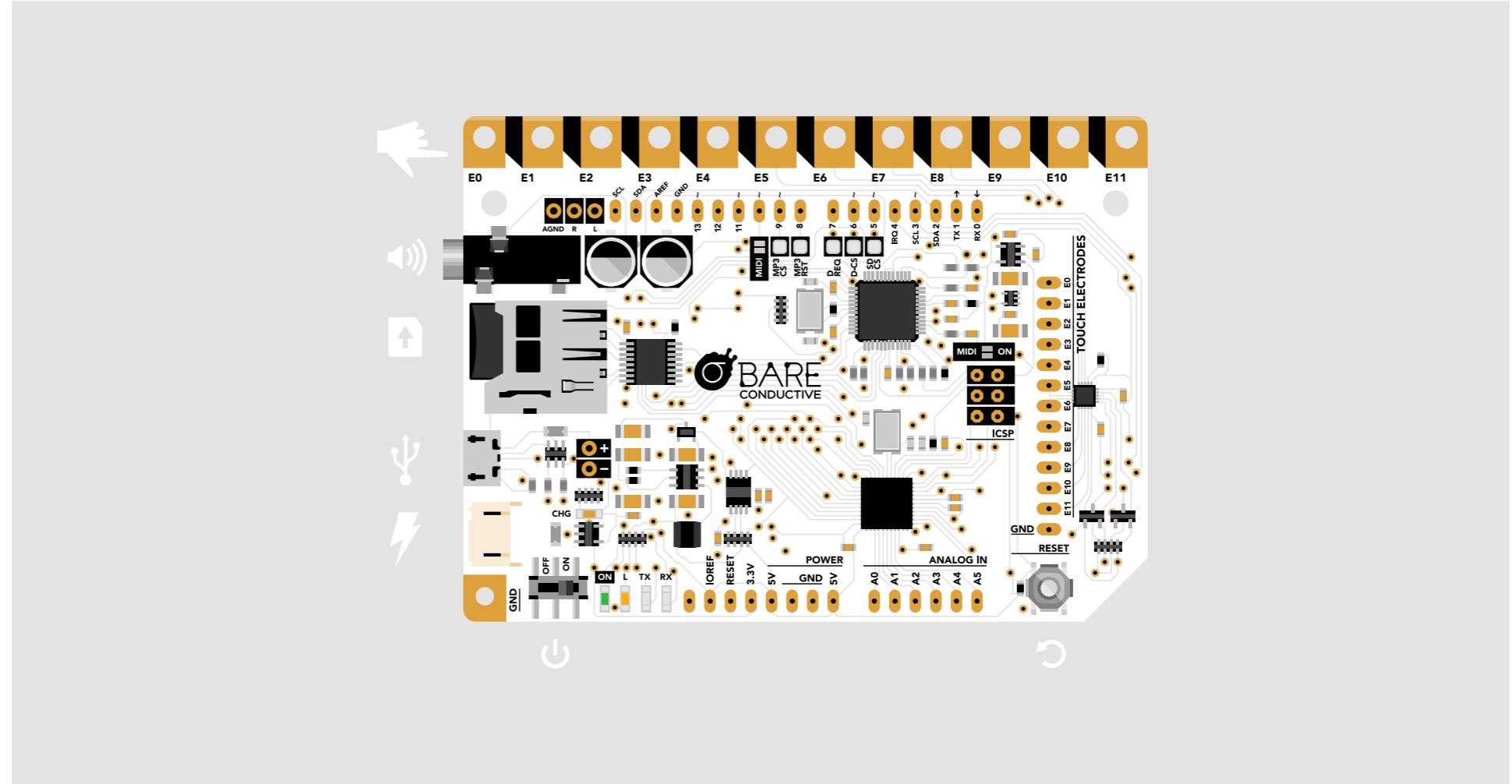
A plug and play microcontroller board which lets you turn almost any material or surface into a sensor

What can it be used for?

Make custom instruments, interactive surfaces, or even light switches. Connect anything conductive to its 12 electrodes to make your own sensors, then make music, control visuals or create alarms — any output you want!

Why is it special?

It uses capacitive sensing, so you can trigger its electrodes without direct contact. Calibrate it to sense touch or distance, or program it just like an Arduino to create lots of projects straight from the box.



What is on my Touch Board

A quick navigation guide to the Touch Board components and features

① ON / OFF SWITCH

② SPEAKER / HEADPHONE JACK

③ USB MINI

Plug in here to power your board through USB or to reprogram it via your computer.

④ 3.7V LIPO BATTERY CHARGER

Don't want your board to be cable connected? Use a rechargeable LiPo* battery for stand-alone projects.

⑤ TOUCH SENSORS / ELECTRODES

The electrodes are mini sensors that detect touch or proximity*. Connect them to anything conductive to turn that object into a sensor. Electric Paint can

be used to make graphical sensors too.

MICRO SD CARD READER

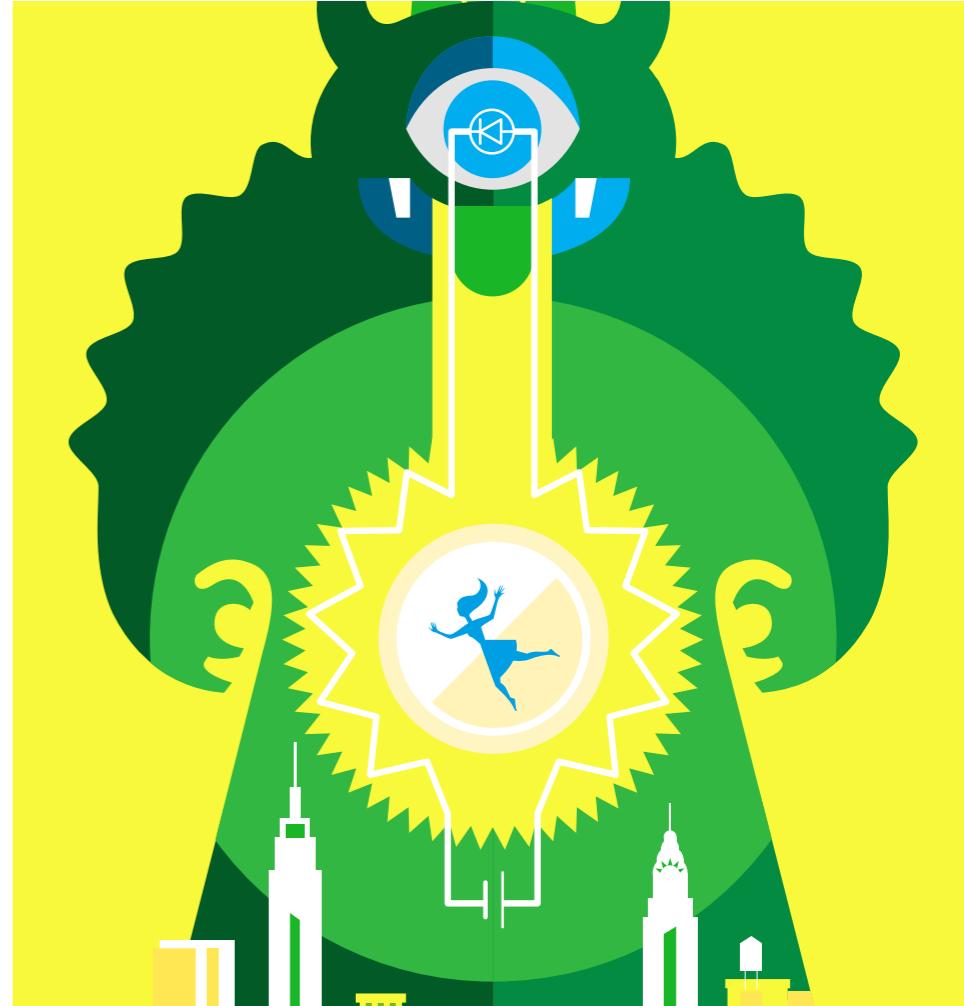
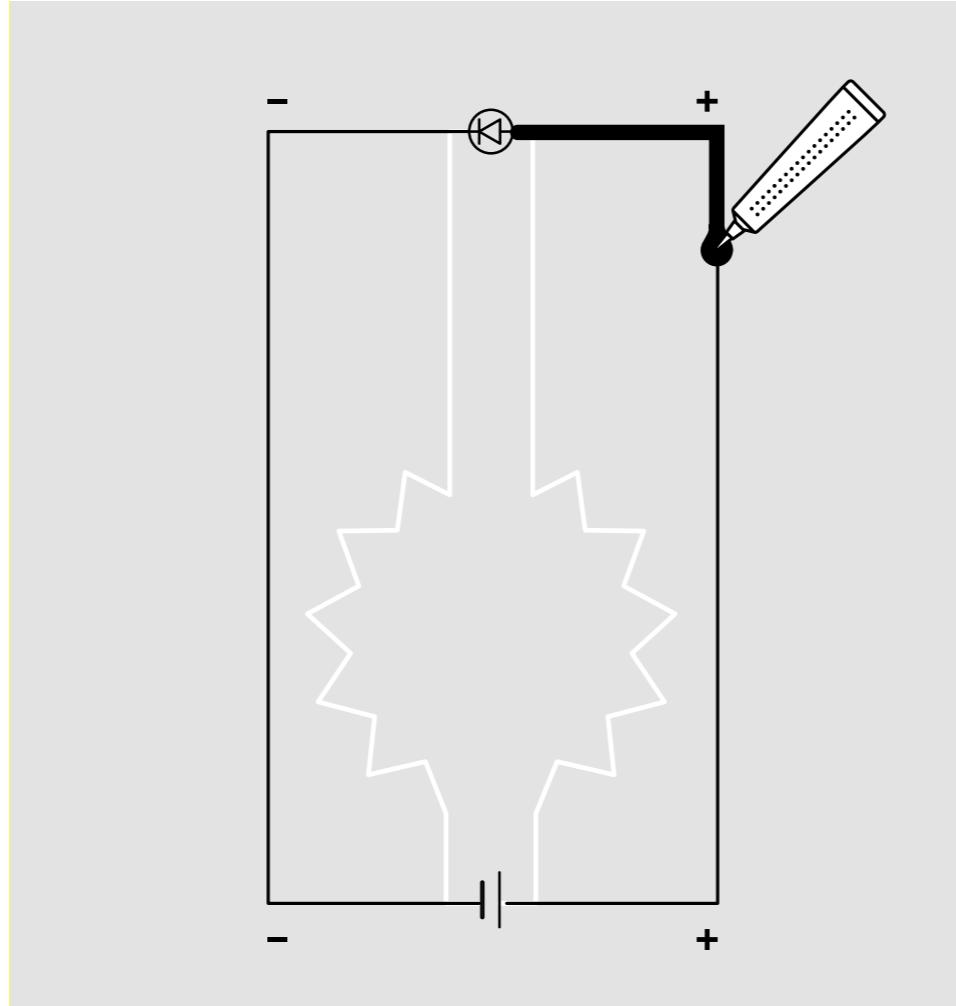
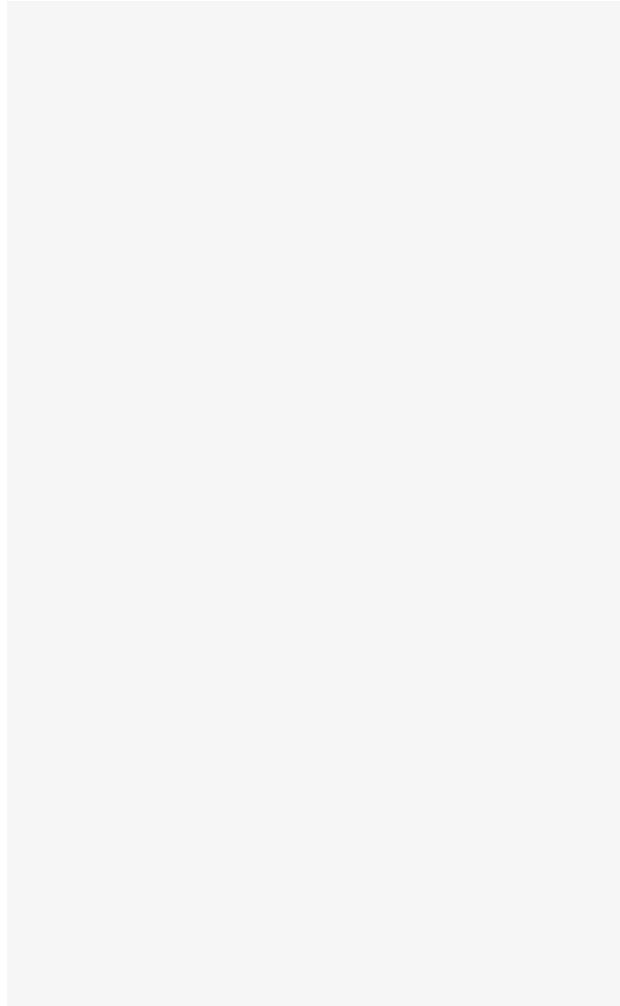
To change your sounds, just replace the MP3 files on the SD card using our track naming system. Remember to always switch off the board before removing the card.

RESET BUTTON

Recalibrate the board each time you connect something new to the electrodes. Press this button and wait for the red light (LED) to stop flashing.

***LiPo** (Lithium Polymer) battery a rechargeable battery of lithium-ion technology. / ***Proximity** Nearness in space. Distance.

DEFINITIONS



What is a circuit

Understanding and creating circuits with Electric Paint

Your circuits don't have to include straight lines or look conventional. With Electric Paint you can write a word or draw a picture to turn conductive pathways into graphics.

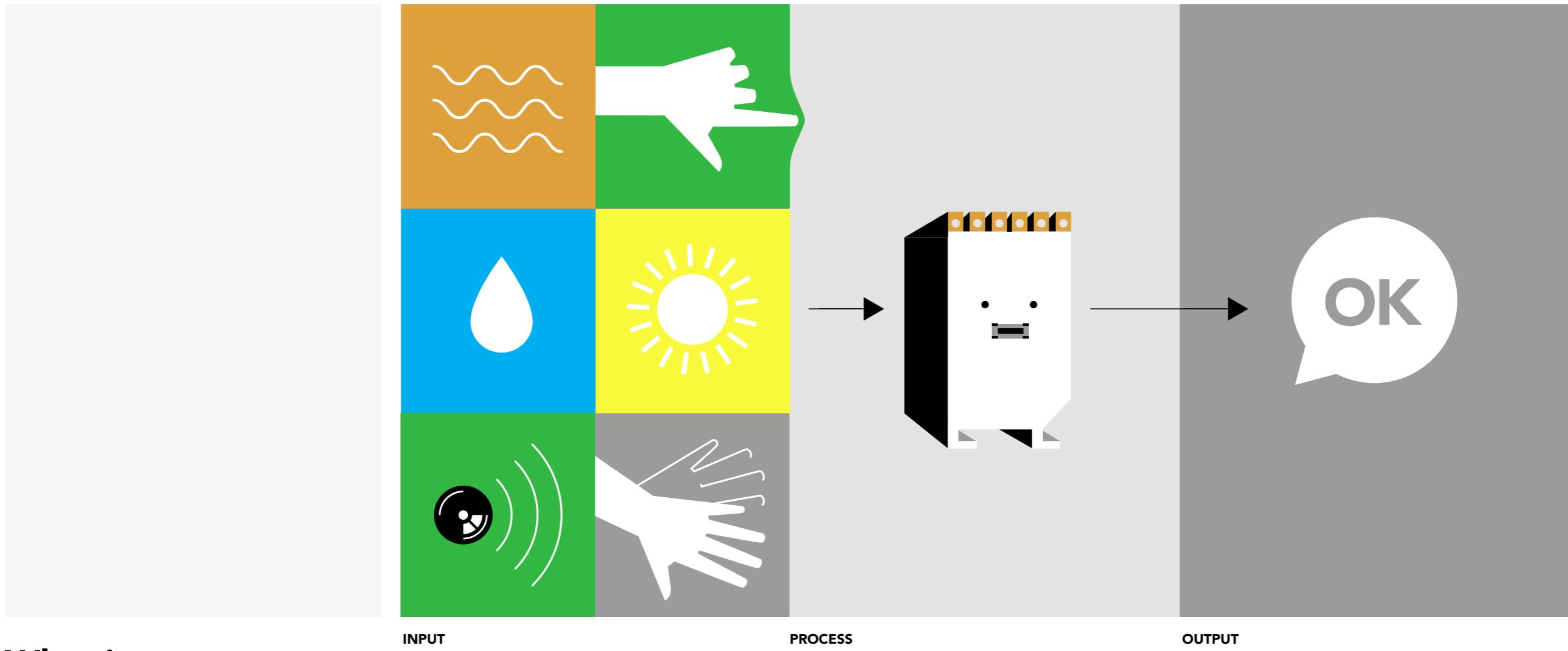
An electrical circuit is a pathway that begins and ends in the same place, passing electricity through it. In a basic circuit there will be components that put this electricity to use as power passes to each component or device.

To be able to flow, electricity needs a conductive material as its pathway. Electric Paint is conductive, so it can provide this. How does it start moving in the first place? Electricity flows from a higher voltage (positive

+) to a lower voltage (negative -). Batteries and some components will have a positive and negative connection (they exhibit **polarity***) so it's important to position them the right way round for electricity to flow through the circuit.

***Polarity** — Electricity flows from a higher voltage to a lower voltage. In a direct current (DC) circuit, the current flows in one direction only.

DEFINITIONS



What is a sensor

Understanding different types of sensors

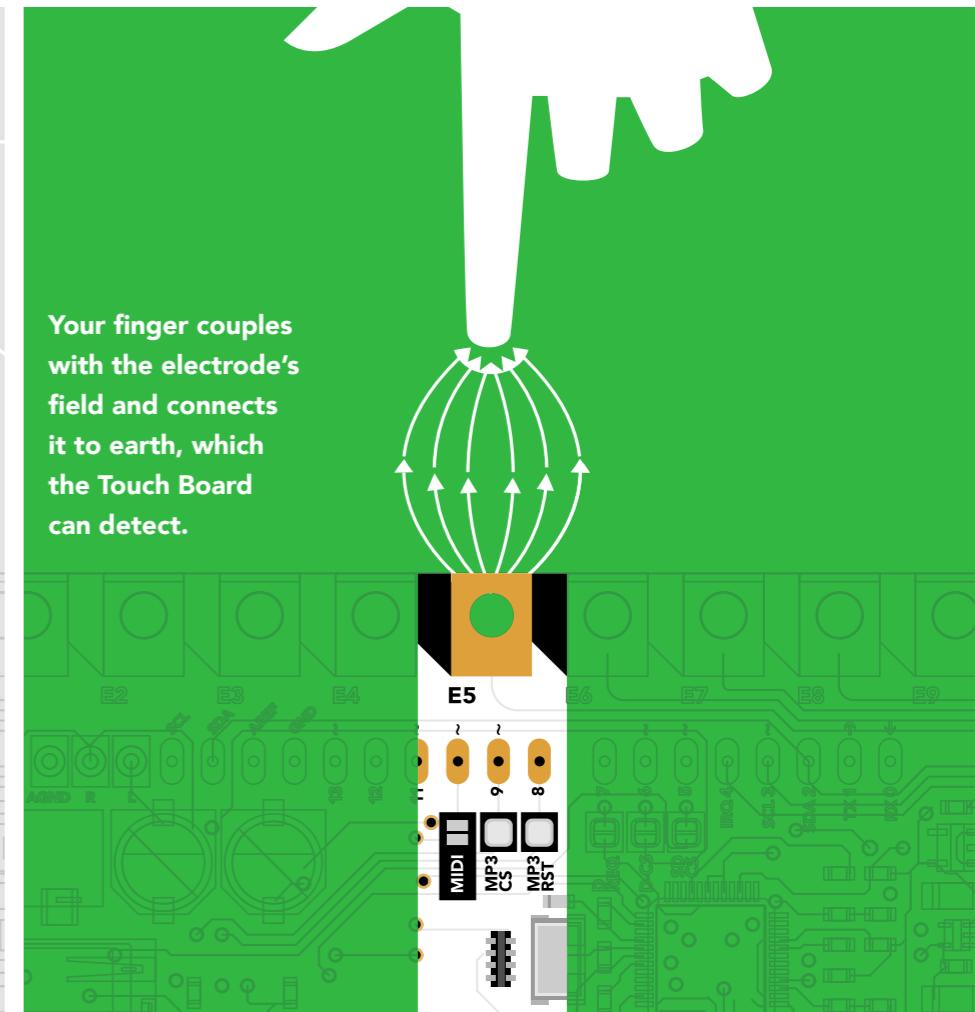
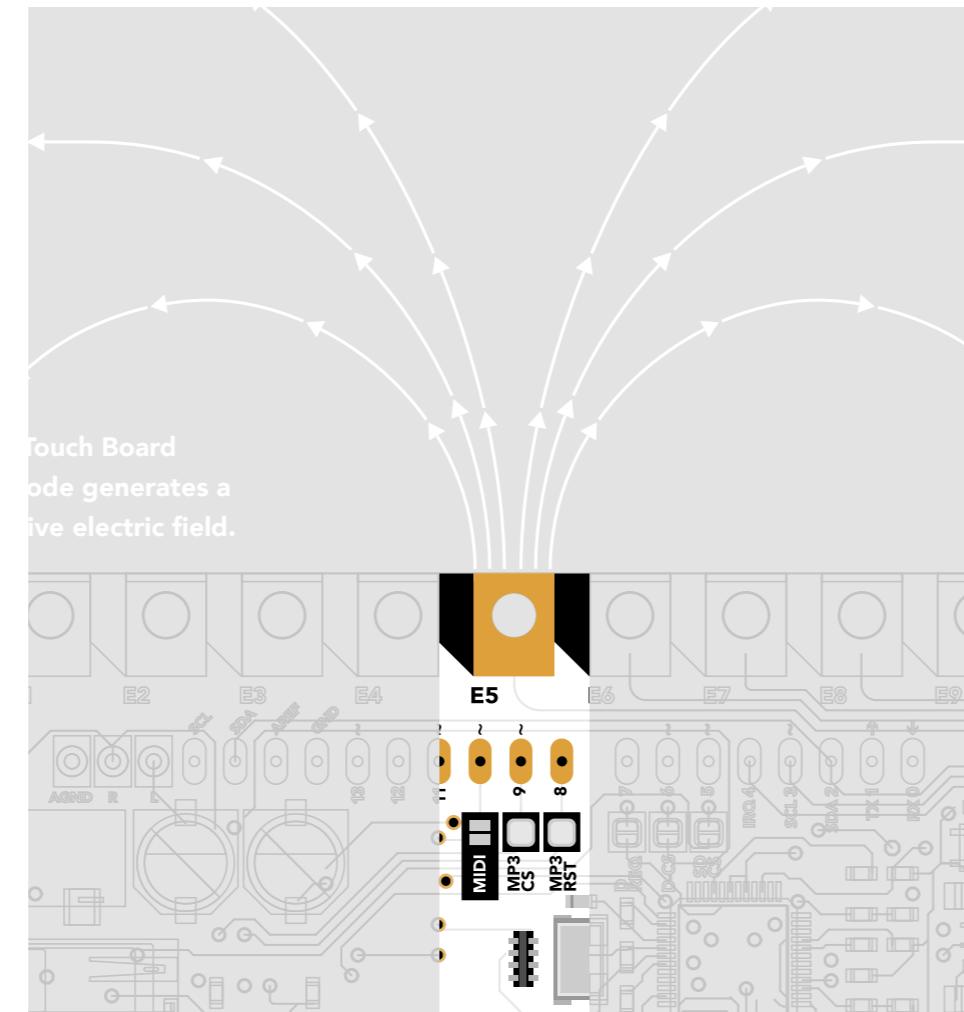
Sensors are hidden everywhere around us, like in fire alarms, security lights or automatic doors in shops.



In the broadest definition, a sensor is an object whose purpose is to detect changes in its environment, which could be light, pressure, touch, heat, sound, moisture, and motion among other things. The sensor then provides an output that we can detect electronically. For example, a light sensor could detect the sun rising and trigger a system to open the blinds in a bedroom.

The Touch Board has 12 sensors that can detect changes in capacitance caused by touch or proximity (distance). So it can translate touch or distance into any output defined by you.

DEFINITIONS



What is capacitive sensing

This is how the Touch Board works, but what does it really mean?

Touch screens on your smart phone or tablet, or the trackpad on your laptop also work with capacitive sensing.



Capacitive sensing is a proximity sensing technology. It detects nearby objects by sensing that the electric field generated by a sensor (in this case one of the 12 electrodes), has been disrupted. It can detect anything that is conductive or that has a significantly different **permittivity*** than that of air, like a human body or hand.

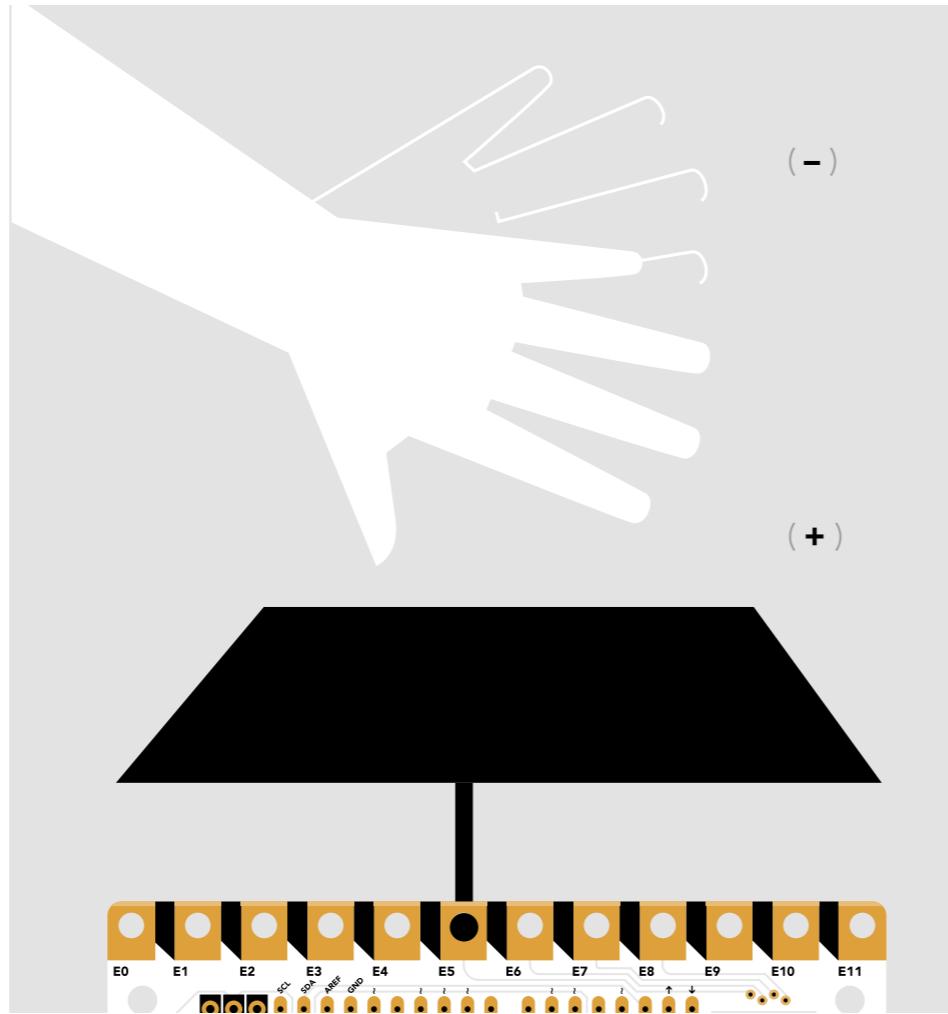
Capacitive sensing is the technology used in smart-phone screens to detect touch. It's also used in other situations where there's a need to detect human touch or proximity.

It's also used when trying to detect something without touching it.

The Touch Board has 12 capacitive sensing electrodes, each of which can individually detect touch and proximity.

***Permittivity** [put-mi-tiv-i-tee] is the measure of the difficulty encountered when forming an electric field in a material. The ability of a substance to store electrical energy in an electric field.

DEFINITIONS



red
yellow
green

touch threshold // (-)

touch threshold // (+)

What is distance sensing

The Touch Board can work without touch too. Try distance sensing (proximity)

Although it's called the Touch Board, what the electrodes are really doing is sensing proximity via capacitive sensing. When you set a sensor's thresholds to be relatively high, the Touch Board only responds to actual contact or touch, rejecting proximity events.

If you want the Touch Board to sense something from further away, or even through an insulation such as

glass or plastic, you can lower each sensor's threshold to increase sensitivity — turning the Touch Board into a 'Proximity Board'.

If you would like to change the sensitivity of one or more of the electrodes on your board, just follow the proximity tutorial on the bareconductive.com website.

Screenprint Induction

A brief introduction to Screenprinting:

Screenprinting works in the same way as any stencil art; the part that you want to be printed allows ink through and the part you don't blocks it.

Screenprinting is often considered to be a relatively modern technique, but is actually one of the oldest forms of printmaking originating in China C. 960 AD as a method of marking out designs onto textiles using paper cut stencils.

This method was then improved upon in Japan by creating a fine woven mesh made from human hair stretched over a rigid frame. They developed this technique to support their paper cut stencils as they stippled ink through them and onto their paper or fabric.

It was then in France in the 18th Century that silk began to be stretched over a rigid frame, hence where we get the name 'Silkscreen' from.

Modern screens are usually made form a synthetic nylon, but the basic principles of screenprinting haven't changed all that much. A big development of course is that we can now use light sensitive emulsion to create highly detailed and photographic stencils.

Equipment

All the equipment you need for your induction is supplied but once you are inducted you will need to purchase certain items in order to print.

- **Screen** – The two smallest sizes are for 1st and 2nd years the largest screens are for 3rd, 4th and Masters Student only.
- **Squeegee** – Various sizes, select the appropriate size for the screen you use.
- **Printing Medium** – To mix with acrylic based paints.
- **Plastic Pots** – A pot to mix your ink in, it is useful if they have an air tight lid for storage. Pound Land stocks these.
- **Rubber Spatula** – To mix your ink with and to take excess ink off screens.
- **Degreaser** – We use a spray bottle of surface cleaner.
- **Bucket & Sponge** – Use these to clean off your screen.
- **Ink** – Conductive
Paper, or card, or anything really that is flat enough, fits on the printing bed and doesn't have any sharp edges that could pierce the screen.
- **Parcel tape** – For taping off areas of the screen where you don't want ink to come through and to attach Newsprint stencils to the screen.
- **Masking tape** – To attach registration markers and acetate to the printing bed.
- **Frisket** – Similar to sticky back plastic, but much more low tack Frisket can be used to make stencils that can be stuck directly onto the screen and repositioned if necessary. Frisket is better than newsprint in some ways as you can cut intricate designs with drop out areas much easier. Also if you are careful when you are cleaning your screen off you can use your stencil again. Just wipe it off and store it on baking paper after use. Amazon stocks this.
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