



GLOWED UP GLOVES

ELECTRONIC CRAFTS KIT



WELCOME TO YOUR MAKERBOX!

This kit introduces you to building electronic circuits through creativity!

In this kit you'll find everything you need to make a battery-powered, light-up winter glove.

As well as these instructions, you can find an online guide and videos to follow at tinderboxcollective.org/tinderbox-makerbox

If anything isn't working or you have any questions along the way, please get in touch with us at admin@tinderboxcollective.org

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KIT INFO

Age rating:

Time to make:

One glove: 1 - 2 hours

Two gloves: 2 - 3 hours

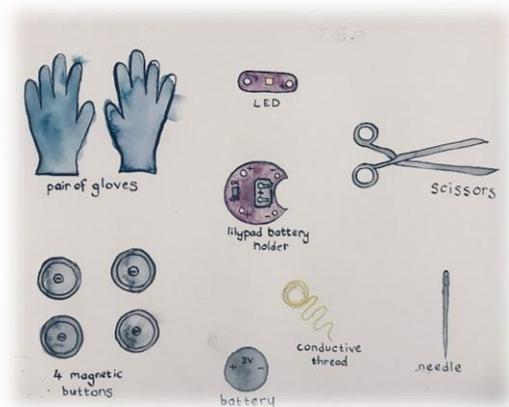
Safety precautions:

- Choking danger, Kit contains small parts and components
- Kit contains 3V lithium cell batteries
- Ages __ require adult supervision
- Keep components clean and dry
- If components ever smoke turn off immediately and cease using

KIT CONTENTS

Here's what your kit comes with:

- LilyPad battery pack - to power your circuit
- CR2032 3V lithium coin cell battery - to power your circuit
- LilyPad LEDs x 2 (Light Emitting Diodes) - tiny lights
- Conductive thread
- Pair of wool gloves
- Magnetic sewable buttons x 4



Websites for parts:

- shop.pimoroni.com/products/lilypad-coin-cell-battery-holder-switched-20mm
- shop.pimoroni.com/products/cln-lithium-3v-coin-cell-cr2032-pack-of-5
- shop.pimoroni.com/products/lilypad-led-5pcs

ELECTRONICS BASICS

What is electricity?

A type of energy or power fueled by the transfer of electrons from positive and negative points within a conductor.

Electricity is measured in power units called Watts (W).

Current is the rate at which an electric charge flows. Imagine the charged electrons as a river - current is how quickly the river is flowing.

Current is measured in Amperes/Amps (A).

Voltage is what makes electric charges move - it is the 'push' or pressure from the circuit's power source that moves charged electrons (current) through a conductor. As a river, voltage would be its force or power.

Voltage is measured in Volts (V).

Resistance is a measurement of how much the component will reduce the current flow. Resistance is like a pipe that current flows through - a bigger resistance means a smaller pipe, so the current flow is less.

Resistance is measured in ohms (Ω).

What is a circuit?

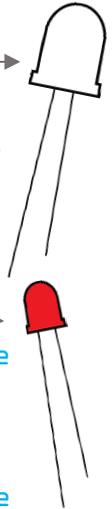
An electrical circuit is a path in which electrons from a voltage or current source flow.

An electrical circuit includes a device that gives energy to the current, such as a battery; devices that use current, such as lights or motors; and the connecting wires between devices.

Direct current (DC) is one-directional. The positive charge flows away from the positive terminal of the power supply (e.g. the battery) towards the negative terminal, moving through the circuit to get there.

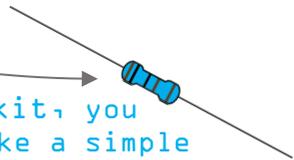
This is why some components need to be connected in a certain way, for example batteries, which have positive and negative markings to show you.

Some components, like LEDs (Light Emitting Diodes) have one long 'leg' or (the positive pin, or anode) and one short pin (negative, cathode), so that you know which way they are "facing" in the circuit and what direction the current should flow through them. Other components may also have an anode/cathode but will be marked a different way.



Some components, again like LEDs, require extra resistance to be added to circuits too (in the form of resistors) to limit the current through the LED and prevent it burning out.

In your Tinderbox Makerbox kit, you have all the components to make a simple circuit and they are marked by the manufacturer to show you how to connect them.



Always be careful when working with electronics and practicing circuits.

BEFORE GETTING STARTED

Here are the extra materials you'll need:

- A sewing needle
- A pair of scissors

Here's what you'll need to do before starting the kit:

Test the battery and battery pack:

1. Make sure the LilyPad battery pack is switched off.
2. Insert the 3V coin cell battery into the LilyPad (positive (+) side up).
3. Connect the LED (tiny light) to the LilyPad like so:
 - wind some conductive thread around the positive terminal (+) of the LED and then around the positive (+) terminal on the battery pack
 - wind some conductive thread around the negative terminal (-) of the LED and then around the negative (-) terminal on the battery pack

4. Turn the LilyPad switch on. If it's working correctly, the LED will turn on and start to glow!
5. If nothing happens, check the connections between the LilyPad and the LED, or try changing the battery or swapping the LED.

(Contact admin@tinderboxcollective.org if you need help).
6. When you're done testing, remember to switch off the LilyPad and take out the battery, to preserve the battery life.
7. Finally, thread the sewing needle with conductive thread.



YOU'RE GOOD TO GO!

BLANKET STITCH GUIDE

The gloves use an adapted version of the blanket stitch to link the components together using conductive thread to carry the current. By using this technique, the thread doesn't make contact with the skin.

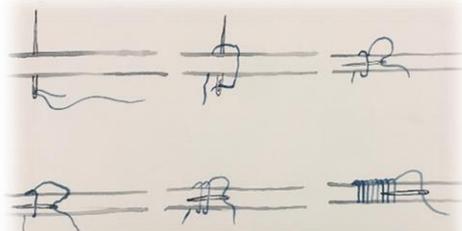
To begin the blanket stitch, push the needle under and through one of the threads of wool on the surface of the glove.

Then pull through, leaving just a little tail of thread at the end.

Pull until there is just a little loop left, then push the needle through the loop and pull tight to secure a knot.

Now push the needle under and through again adjacent, then once again leave a little loop to push the needle through, then pull tight to tie.

Continue this technique repeatedly. On the gloves, the stitches will be a little more spread out than on the diagram. Once you're about three stitches in, you can trim the tail off from the beginning.



INSTRUCTIONS

OPTION ONE: ONE GLOVE

STEP 1

Take one of the gloves and place the Lilypad in the centre. Then take the needle threaded with conductive thread and push it through the wool and under the top positive tab (as demonstrated on the diagram). Pull it nearly all the way through but leave a little tail on the end. Then loop back round, push through the glove and under the tab again, pull round and repeat once more. Now you can pull tight and the thread should be attached firmly.



Step 2

Refer back to the blanket stitch guide (see page 11). This is an adapted blanked stitch, but works in the same

way. Loop the needle around a thread of wool on the surface of the glove, pull nearly to completion until there's just a small loop, then push the needle back through this small loop until tight. Now repeat this all the way up towards the thumb.



Step 3

Now we will attach the magnetic button to the thumb. Push the needle from the bottom of the needle up through one of the button holes, then, once pulled tight, push the needle back down through the other hole. Push the needle back up through the opposite holes, and repeat these steps again until the button is secure. To finish it



off, make sure the needle is pulled through the underside of the bottom, push it through a previous stitch until there is a little loop, push the needle through the loop, and pull tightly to knot, then cut the thread.

Step 4

Now, we have to attach the LED tab. Make sure the positive side is on the side closest to the index finger and then just push the needle through the positive tab and then loops it around a few more times to secure. To finish, push the needle through a previous stitch until there is a loop, push the needle through the loop, pull tight to knot, and then cut the thread. Starting again, attach the thread to the negative tab using the method used at the beginning, then use the blanket stitch to lead down to the negative tab of the Lilypad, push the needle through a few times, then finish the same way as the beginning of this step.



Step 5

Now you just need to use the fundamentals to attach the bottom of the LilyPad: start by creating a tail and then securing safely, then push through a previous stitch, ceate a loop, pull through, tie and cut off. Repeat for both positive and negative tabs. Then push the 3V battery in with the + sign being pushed inwards.

Step 6

Turn the LilyPad switch on. If you touch the thumb and index finger together, the LED should turn on since you have now completed the circuit.

Tip: Remember to switch off your LilyPad when you are done admiring your gloves, to preserve the life of your circuit.

INSTRUCTIONS

OPTION TWO: TWO GLOVES

STEP 1

Follow steps 1 - 3 in the Option One instructions (see page 12).

STEP 4

Now repeat steps 1-3 again but beginning on the top negative tab of the Lilypad and lead the blanket stitch all the way up to the tip of the index finger before attaching the magnetic button there.



STEP 5

Now put the left glove to the side and move to the right glove. We will repeat steps 1-4 on the right hand glove except we will place the LED in the centre, again with the positive



tab on the left and the negative tab on the right. Repeating the steps, make a blanket stitch from the positive tab up to the thumb, attach the magnetic button and tie off. Then, make a blanket stitch from the negative tab up to the index finger, attach the

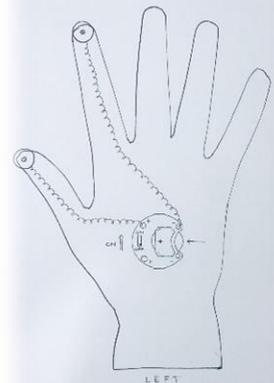
magnetic button and tie off.

STEP 6

Now you just need to use the fundamentals to attach the bottom of the Lilypad: start by creating a tail and then securing safely, then push through a previous stitch, create a loop, pull through, tie and cut off.

Repeat for both positive and negative tabs.

Then push the 3V battery in with the + sign being pushed inwards.



STEP 7

Now switch the button to ON. If you touch the two thumbs together and the two index fingers together, the LED should turn on since you have now completed the circuit.

You can make a triangle, a diamond, or a love heart shape with your fingers!

Make sure to turn off once finished.



ABOUT TINDERBOX

From grass-roots youth work to award-winning music productions, Tinderbox is building a vibrant and eclectic community of young musicians and artists in Scotland. We have a number of programmes that cross over with each other and come together wherever possible. They are open to children and young people aged 10 - 25, from complete beginners to young professionals and all levels in between.

The Tinderbox Makerbox kits are part of our Tinderbox Lab, a physical & online makerspace and collection of digital arts & creative tech projects, courses, and opportunities.

The Tinderbox Makerbox kits were designed by:

- Rhona Sword
- Saskia Singer
- Dominika Jackowska
- Liam Dempsey
- Luci Holland

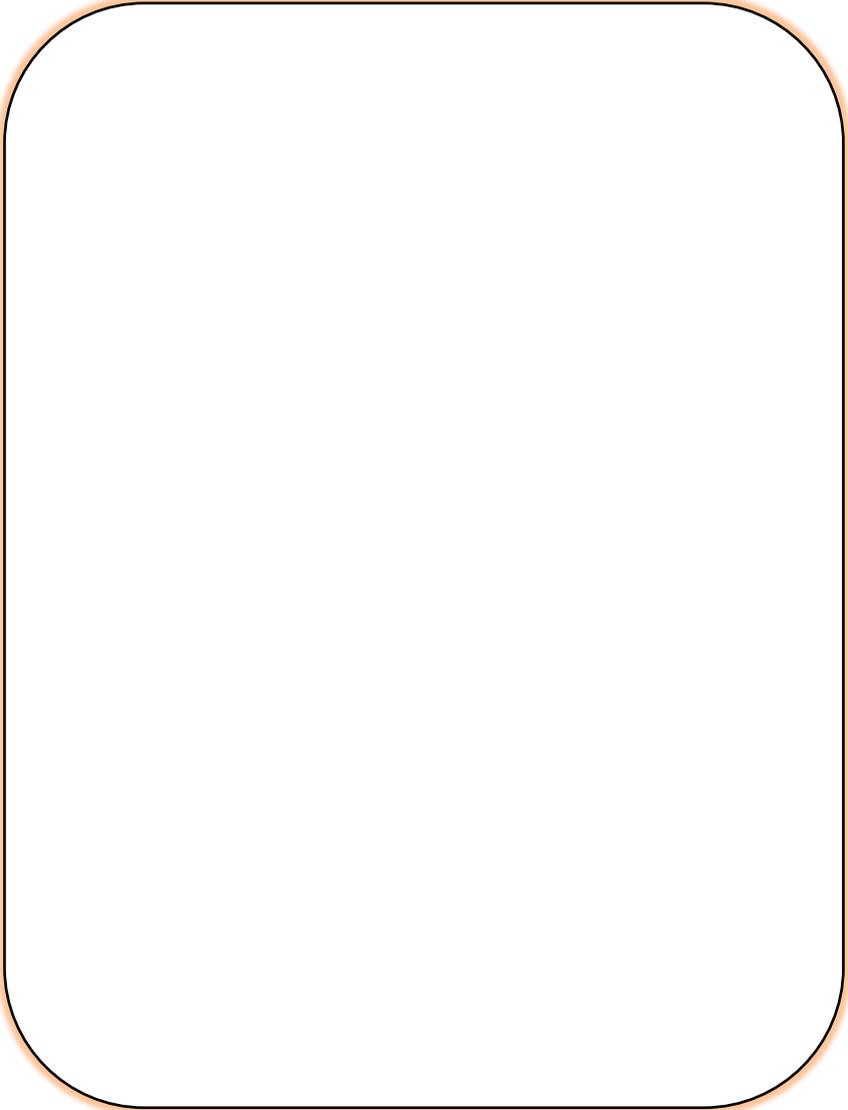
With special thanks to

- Helen Leigh
- The University of Edinburgh Local Community Grant
- Creative Scotland

MY NOTES

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MY NOTES





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Illustrations by Oana Stanciu & Rhona Sword

Makerbox Logo by Saskia Singer

*With thanks to Rhona Sword, Saskia Singer,
Dominika Jackowska, Liam Dempsey, and Helen
Leigh*

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