Activating Origami guidebook
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WHAT IS INCLUDED IN YOUR KIT

**2x COINCELL BATTERIES**

This small battery can provide power and fit in tight places. You can connect this to your circuit for power—just make sure that the positive side connects to the positive end and the negative side (or ground) connects to the negative end.

**1x COINCELL BATTERYBOARD**

You also have a Teknikio batteryboard in your kit, with conductive holes marked as positive and negative. When inserting your battery in the board make sure the side with the “+” is facing up and the unmarked side (sometimes perforated) is facing down.
**WHAT IS INCLUDED IN YOUR KIT**

**1x MOTIONBOARD**

These mini motors are usually found in pagers and cell phones that have a “vibrate” feature. They have an offset weight on their shaft that makes them vibrate as the motor spins.

**10x PAPER FASTENERS**

These small fasteners bind your boards to the origami paper. They are commonly used in arts and craft for scrap-booking here we use them as connectors for our electronic circuit.

**2x LEDS**

LEDs are the most popular way to test a circuit. When electricity is flowing through them they turn “on” and produce light. They have a positive end (longer leg) and negative end (shorter leg).
WHAT IS INCLUDED IN YOUR KIT

10x ORIGAMI PAPER

This is the same paper that has been traditionally used in the art of origami. It folds very well so that you can unfold and refold as much as you want.

1x PIECE OF CONDUCTIVE TAPE

They tape is made of a conductive material meaning it let electrons pass through it. It can be used to carry or transmit power and signals through a circuit.
**Additional Tools and Materials**

Here is a list of tools and supplies that complement your set. We also encourage you to combine this set with other Teknikio sets.

**Materials and Tools**
- Paper
- Glue/hot glue
- Fabric and Thread
- Cardboard
- Scissors

**Optional Materials**
- Velcro
- Fabric and Thread
- Cotton Stuffing
- Scrap metal and plastic
- Beads and sequins

**Optional Tools**
- Wire cutters/stripers
- Sewing needle/machine
- Multimeter
This guidebook show you how to attach circuits to paper!

Basic Origami
ORIGAMI VOCABULARY

1. **FLIP MODEL**
   
   Turn the whole model over so that the underside now faces you. Origami paper is colored on one side, white on the other.

2. **VALLEY FOLD**
   
   Fold the paper towards yourself, along the dashed line.

3. **MOUNTAIN FOLD**
   
   Fold the paper away from yourself (underneath) along the dashed line.
**ORIGAMI VOCABULARY**

4. **ROTATE MODEL**

   Turn the model while keeping the same side facing you. The angle of rotation is shown inside the symbol.

5. **FOLD AND UNFOLD (CREASE)**

   Make a fold (valley or mountains as indicated by the line style) and then unfold to leave a crease line.

6. **REPEAT BEHIND**

   Perform the same step on the underside of the model. The number of bars across the arrow indicates the number of times to repeat the step; in this case, once.
The next section will provide a review of basic electronics and how a circuit works.

Things to remember:

- **A CIRCUIT IS ALWAYS A LOOP.**
- **ELECTRICITY FLOWS FROM POSITIVE TO NEGATIVE AROUND THE LOOP.**
- **EVERYTHING IN THE CIRCUIT MUST BE ORIENTED IN THE SAME DIRECTION FOR THE CIRCUIT TO WORK.**
- **ANYTIME A COMPONENT IS PUT INTO THE CIRCUIT BACKWARDS, IT CAUSES A BREAK IN THE CIRCUIT, MEANING IT BREAKS THE LOOP.**
- **ELECTRICITY WILL ALWAYS TAKE THE PATH OF LEAST RESISTANCE.**
BASIC CIRCUITS

CIRCUIT
The flow of electrons across the circuit, carried by conductive materials measured in amps.

OUTPUT
The output, or part that is powered in a circuit. The LEDs and buzzer are loads in your kit.

RESISTANCE
Restricts the rate at which electrons flow through the circuit. Materials have different resistances.

POWER SOURCE
Provides power to the circuit. Yours is the coin cell battery.

SWITCH
Closes and opens a break in the circuit.
This will drain or "burn out" your battery very quickly. You should always make sure there are no short circuits in your design.
HOW TO USE PAPER FASTENERS

Take the paper fastener and push it straight through the hole in the Batteryboard or motionboard and through the paper. If you are using Conductive Tape, the tape should be sandwiched between the board and the paper.

To close the paper fastener after you have pushed it through everything, take the two legs and separate them until you start to feel them bend. Push them down so that they are flush to the back of the paper.
Project Guide

Want to make something else? Find more ideas and tutorials @ www.teknikio.com/learn
HOW TO FOLD YOUR PENGUIN

1. Fold outside
2. Fold inside
3. Fold outside
4. Fold inside
5. Fold outside
6. Fold inside
7. Fold outside
8. Fold inside
9. Fold outside
10. Fold inside
11. Fold outside
12. Fold inside
13. Fold outside
14. Fold inside
15. Fold outside
16. Fold inside
Once you have folded your origami penguin, figure out where you want to place your Motionboard and place 2 parallel pieces of conductive tape on your penguin, about 2 inches in length. Align the tape so that one piece starts under one of the conductive silver holes on the motor board, and the second piece is under the other hole.
Using the paper fasteners, attach the Motionboard to your Penguin. Poke the fasteners through the hole on the board, then the tape, and finally through the paper. Then turn your penguin over and fold the legs open as shown on page 13, to lock the fastener in place.
Now place your battery board on the other ends of the tape like in the diagram. Make sure one piece of tape is under the hole marked positive and the other piece is under the hole marked negative on the batteryboard. Take 2 more pushpins and secure that batteryboard in place the same way you did for the motionboard. If you'd like you can use additional pushpins in the other 2 holes of the batteryboard.
Fold your penguin back up. You can place googly eyes or draw eyes onto his head if you want. Place the Battery into the Batteryboard (side marked with "+ facing up). If your penguin is vibrating, you’re all done! Place your penguin on a table or flat surface and watch him move around!

If your penguin is not moving, refer to page 21 for troubleshooting tips.
In your kit, you have two LED lights. You can use these for the eyes if you want.

The LED lights have one short leg and one long leg. The long leg is the positive side and the short leg is the negative side. Punch the legs of the LED through the paper so that the light is on the outside and the legs are on the inside.

To attach the lights, use the conductive tape to connect to the batteryboard than the motion board. Make sure to connect the positive side of the batteryboard to the positive leg of the LED.
If your LEDs light up when you put the battery into the Batteryboard, you're all done!

Using both the Motion Board and the LEDs at the same time on the same battery will kill your battery very quickly. If you do not want to kill your battery but want both lights and motion, use another battery to connect the LEDs.

In your kit, you only have one Batteryboard. If you want two batteries on your penguin, you can tape the battery straight onto the penguin with the plus side facing up.

The smooth side is positive and the bottom is textured.
To make a corner pinch the tape at a 45 degree angle and turn the other side of the tape perpendicular like in the diagram above.

To “patch” 2 paths of tape you can take another piece of copper tape and place the non-sticky side across the gap you want to patch and then stick another piece over the top of it.