teknikio®

SHIVERS THE PENGUIN INVENTION GUIDE

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YOUR MATERIALS

1X BATTERYBOARD
When inserting your battery in the board make sure the smooth side with the "+" is facing up. The conductive pads on the corners are labeled as positive and negative.

1X COINCELL BATTERIES
This small battery can provide power and fit in tight places. Make sure that the positive side connects to the positive end and the negative side (or ground) connects to the negative end.

1X SPOOL OF CONDUCTIVE THREAD
This thread has silver strands which are conductive. The silver in the thread lets electrons pass through the thread and allows it to carry or transmit power and signals through a circuit. Steel is another metal commonly used to make conductive thread.

1X MOTIONBOARD
These mini motors are usually found in phones that have a "vibrate" feature. They have an offset weight that makes them vibrate as the motor spins.

1X PENGUIN PACK
This kit includes eco-felt, pre-cut penguin pieces to assemble the plushie penguin.

1X SEWING NEEDLE
This is what you will use to sew your project together. Be careful, the needle has a sharp point!

HERE IS A LIST OF TOOLS AND SUPPLIES THAT COMPLEMENT YOUR SET. WE ALSO ENCOURAGE YOU TO COMBINE THIS SET WITH OTHER TEKNIKIO SETS + PARTS.

1X 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.

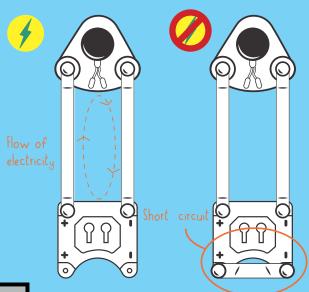| OPTIONAL TOOLS	OPTIONAL MATERIALS
Multimeter Scissors Glue/ Hot glue	Cotton stuffing Non-conductive thread

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.**

Flow of electricity

Short circuit

If you were to connect the circuit line in the diagram to the right, the current will flow through the shorter (orange) path and skip the path that connects to the LED.

This will result in a short circuit—a short circuit is basically equivalent to connecting from the positive end of the power source to the negative, without putting anything in between.

This will drain or "burn out" your battery very quickly. You should always make sure there are no short circuits in your design.

BASIC CIRCUITS

OUTPUT
The output, or part that is powered in a circuit. The LEDs and buzzer are loads in your kit.
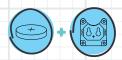
RESISTANCE
Restricts the rate at which electrons flow through the circuit. Materials have different resistances.

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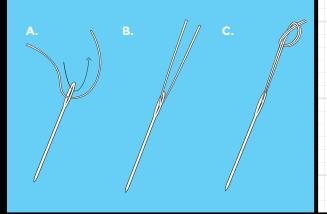The flow of electrons across the circuit, carried by conductive materials.

POWER SOURCE
Provides power to the circuit. Yours is the coincell battery.

SWITCH
Closes and opens a break in the circuit.

HOW TO THREAD A NEEDLE

A. Cut about an arm's length of thread. Stick one end of your thread through the eye of the needle

B. Pull your thread until it is folded in half on the needle

C. Take the two ends of the thread and tie a knot
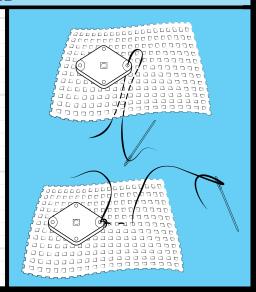
HOW TO SEW A CIRCUITBOARD

Take your Felt, your threaded (conductive thread) needle, and a Sewable LEDboard.

First, place the LEDboard where you want to attach it to the cloth.

Then, take your threaded needle and starting from the back, push your needle through the cloth and the positive or negative pad of the LED.
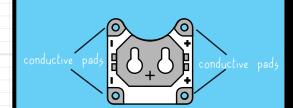
Loop the thread through the hole and cloth multiple times so the LED is secured tightly.

After looping a few times, push the needle down through the fabric next to the LED. Push the needle up through the fabric about 1/4 inch away and repeat up and down.

CONDUCTIVE PADS

Conductive pads are the silver or gold ends of the circuitboards that have holes in the middle. This is what you sew around when connecting a board to another part of the circuit or materials. You can also use aligator clips by clipping them to connect parts of a circuit together by clipping to the conductive pads.
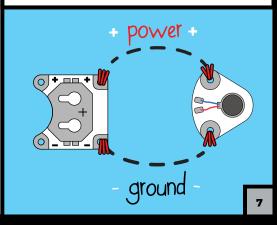

conductive pads   conductive pads

HOW TO SEW A CIRCUIT

THERE ARE 2 SEPARATE PIECES OF THREAD IN THIS CIRCUIT

Sew between the pad of the battery and the pad of the motionboard. The motionboard doesn't have a negative or positive pad. So, it doesn't matter which pad you sew to. It should it should vibrate.
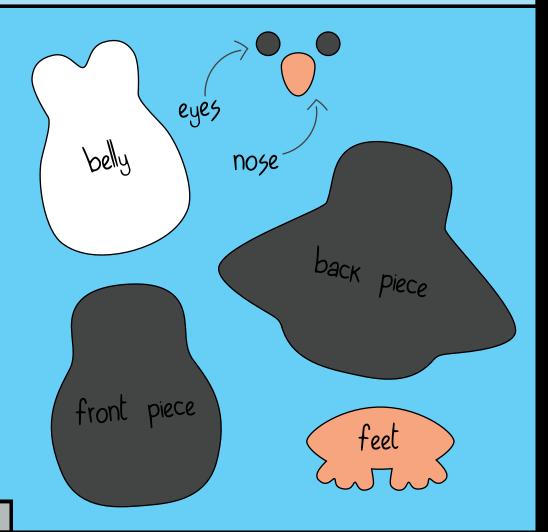
The red stitches indicate where the thread ends. Once you get to a red stitch or a hole on the board, tie a knot, cut the thread, and start with a new piece. When you are sewing around a conductive pad, make sure to loop around it a couple of times to make sure it is secure.
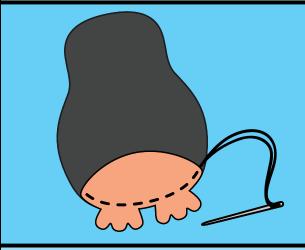

+ power +

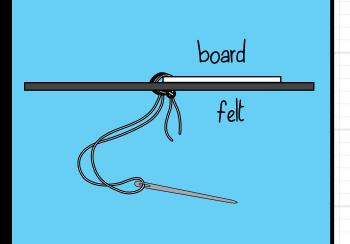- ground -

belly

eyes

nose

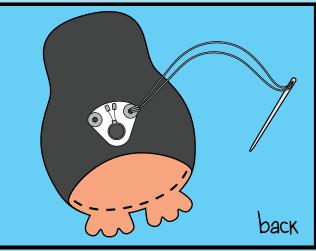back piece

front piece

feet

STEP 1: SEWING THE FEET

Attach the feet of the penguin to the front piece of the body. Align the pieces so only the feet stick out. Use a running stitch to sew only along the side of the bottom piece that has feet.

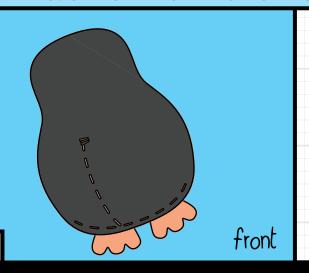## HOW TO SEW THE CIRCUITBOARDS

board

felt

Now thread your needle with conductive thread. To attach electronics to the felt you will use a method we refer to as "looping" Hold the board in place while you sew through the felt and the hole on the silver pad. Loop around the board and the felt 3 - 4 times.
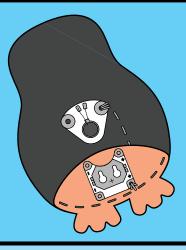
STEP 2: SEWING THE MOTIONBOARD

back

Place your motionboard on the back of the front piece of the penguin's body. The back is the same side your feet are sewn to. Sew on the right pad on the motionboard to the fabric.

STEP 3: STITCH FROM MOTIONBOARD

front

Use a running stitch to sew from the motionboard to the bottom edge of the front of the penguin body. Make sure you are only sewing through the body piece of the penguin and not the feet piece. Don't knot your stitch yet.

STEP 4: CONNECTING THE POSITIVE

back

Hold your batteryboard in place while you loop around the positive hole marked with "+". Sew through both the body and feet piece only to loop around the hole. Finish with a knot and trim the excess thread.

STEP 5: ATTACHING THE BELLY & FACE

front

Next, flip your penguin over and lay out the belly, eyes, and beak on the body of the penguin. Using non-conductive thread, sew around the edge of the belly with a running stitch to anchor the pieces in place. Secure with a knot and trim the excess thread. Do the same for the eyes and beak or you can use glue instead.

STEP 6: ATTACHING THE CONDUCTIVE TAPE

front

Place one piece of conductive tape down on the right side of the penguin's belly to create a conductive pad. This is where the wing will fold down to make a switch.
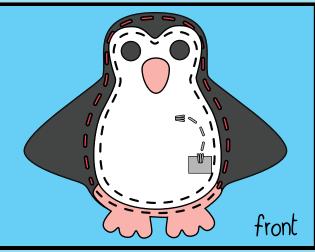
STEP 7: CONNECTING THE MOTIONBOARD

back

Using conductive thread loop around the open hole on the motionboard 3-4 times. Then use a running stitch to sew to the conductive pad on the front of the penguin. Loop around the conductive pade 3-4 times. Tie a knot and trim the excess thread.
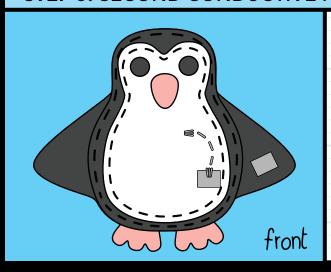
STEP 8: ATTACHING THE BACK

front

Using non-conductive thread, sew the back body piece of the penguin to the front body piece. You will only sew around the edge of the front piece. Do not sew the back of the bottom piece yet. Leave the bottom open because you still need to stuff the penguin!
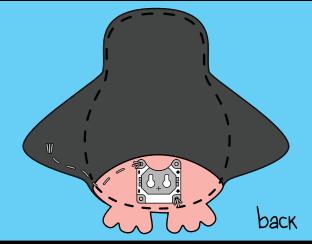
*Only sew the stitches shown in red in the picture!
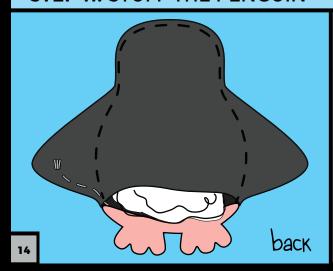
STEP 9: SECOND CONDUCTIVE PAD

front

Fold the right wing of your penguin in to touch the belly. Mark the spot where the wing meets the first conductive pad. Place your remaining piece of conductive tape in this spot to make your second conductive pad.

STEP 10: CONNECTING THE NEGATIVE

back

Sew a running stitch from the second conductive pad down the wing to the negative (marked with "-") pads of the batteryboard. Loop around the negative pad 3-4 times. Make a knot and trim the excess thread.
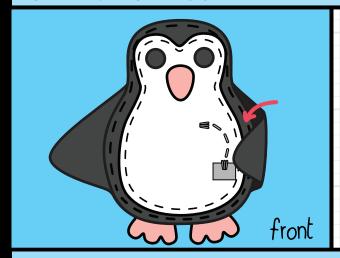
STEP 11: STUFF THE PENGUIN

back

Fill the bottom opening of the penguin with stuffing until it feels fluffy, but not too stuffed!

Using non-conductive thread, sew the bottom of the back of the penguin's body to the back of the feet. Secure with a knot and trim the excess thread.
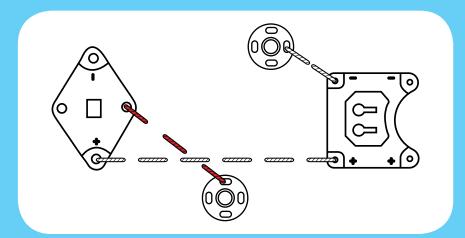
STEP 11: TEST IT OUT

front

Insert a battery into the battery-board with the "+" side facing up. Fold the wing over so the two conductive pads are touching. Your penguin should shiver!

If it is not shivering, make sure all of your stitches are secure and that there is no excess thread creating a short circuit (connecting positive to negative).

Create a hat, a scarf, or a house for your penguin!

Explore more ideas at www.teknikio.com

There are 2 common problems that can break the circuit. The first is that the positive and negative paths are crossing. Make sure none of your paths look like the image above.

Then make sure none of the thread coming off the knots on the back of your circuit are touching.

The second common problem is a bad connection. This can happen anywhere your thread is connecting to a board or snap. Make sure all of these connections are tight and that the thread is making good contact with the silver surface on the boards and/or with the snaps.