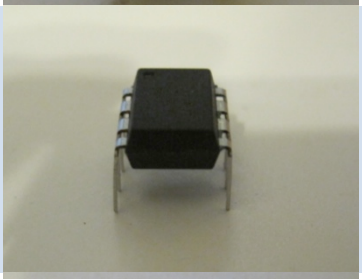
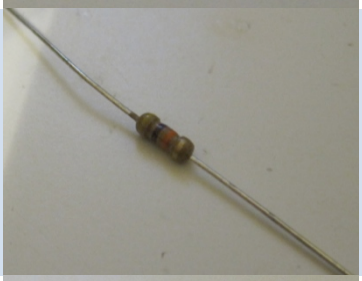
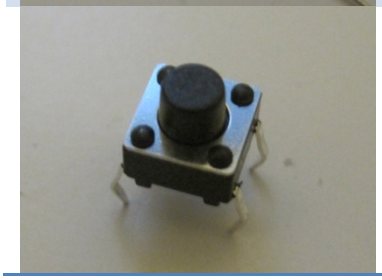
Christmas Tree PCB Assembly Instructions

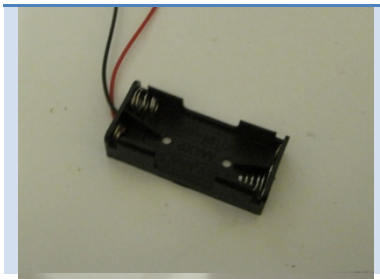
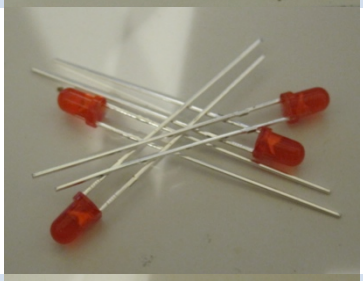
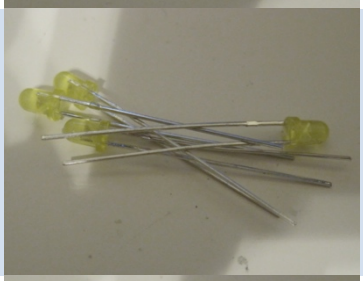
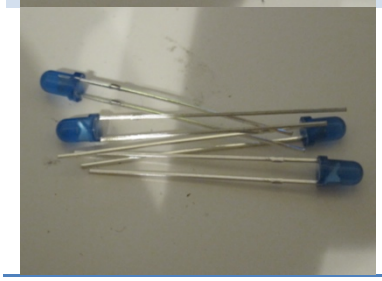
Thanks for purchasing the Surreality Labs Christmas Tree PCB! These instructions will guide you through assembling and testing the Christmas Tree. Let's get started!

Stuff you need

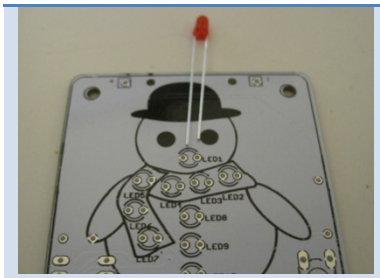
	Soldering iron
	Solder
	Wire clippers
	Wire strippers
	Multimeter
	2 AAA batteries

Parts in the kit

	Circuit board
	IC socket
	ATTiny25 microcontroller
	100nF capacitor (marked 104)
	47K resistor (Yellow Violet Orange Gold)
	Button

	Battery holder
	8 red LEDs
	8 white LEDs
	8 green LEDs
	8 yellow LEDs
	8 blue LEDs

Instructions

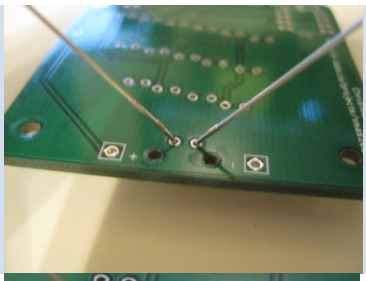


We'll start by inserting the LEDs. LEDs are polarized –they need to go into the board in a certain orientation. Looking at the LED, they have two leads – a long one and a short one. They have a positive side – the anode, which has the longer of the two leads, and the negative cathode side, which has the short lead.

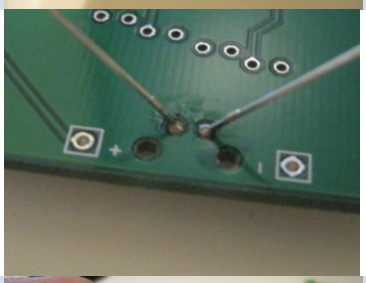
Looking at the board with the Christmas tree facing upwards and the two large holes away from you, all of the LEDs are inserted into the holes with the **cathodes towards the right.**

Plan out how you want the LEDs to go. We suggest having a yellow LED for the star at the top, and then whatever pattern you like for the lights on the tree. You're free to do whatever you want, though! Keep in mind that the green LEDs are much dimmer than the blue and white, so they don't go well together.

Insert your first LED. Remember: short lead towards the right of the board.



Holding the LED close to the board, flip the board over and bend out the two leads. This prevents the LED from falling through when you solder it.

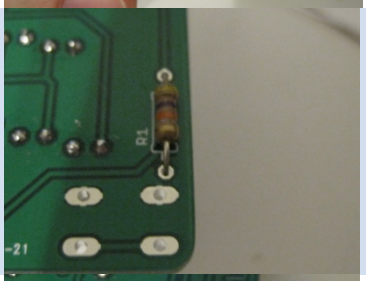


Solder the leads of the LED in place. Clip the leads.

Your LED should be firmly attached! If it's on a slight angle, heat up both leads with the iron and straighten the LED by pressing from the other side. Work quickly, though – the LED will get hot.

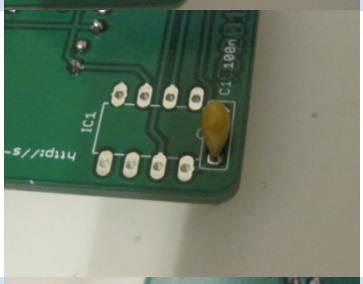
Repeat the process for the next LED.

Repeat the process for the rest of the LEDs.



Flip the board over to the non-artwork side and insert the 47K resistor in the spot for R1. Bend the leads outwards so you can solder it. Solder it in, and clip the leads.

For the resistor, it doesn't matter which pin goes in which hole.



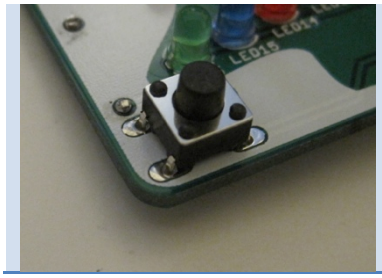
Insert the 100nF capacitor in the spot for C1. Bend out the leads, solder it in and clip the leads.

For the capacitor, it doesn't matter which pin goes in which hole.

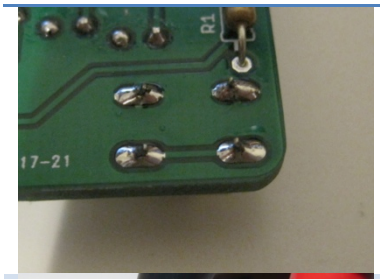
Insert the 8-pin IC socket in the spot for IC1. Note that one end of the socket has a little notch in it, as does the outline on the board. This is to indicate which pin is pin #1. Make sure to line those up when you insert the socket.

Holding the socket in place, flip the board over, and bend out two pins on opposite sides. This helps keep the socket in place as you solder it. Make sure to hold the socket flush against the board when you bend the pins, so that it goes on straight.

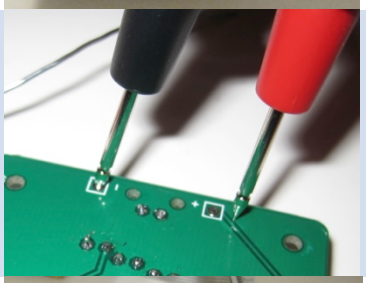
Solder the pins in, and then clip off the excess leads. Don't clip too much – you don't want to be clipping off the solder join, just the pointy ends of the leads.



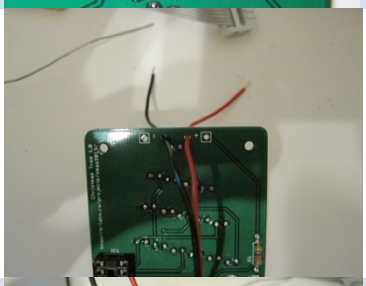
Press the button in place on the artwork side of the board, where S1 is indicated. It should hold itself in place.



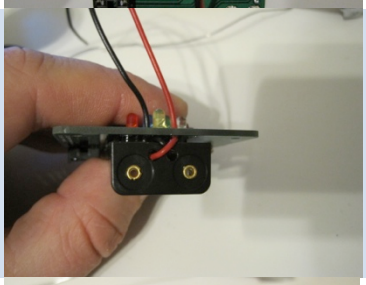
Solder the leads of the button in place, and clip off the excess. Again, don't clip off your solder joint, just the pointy ends of the leads.



Put your multimeter into continuity check mode and make sure that the pads marked + and – aren't shorted together. If they are, look over the board for any soldering faults, and correct them.



Thread the red wire through the hole next to the pad marked +, and the black wire through the hole next to the pad marked -. The pads have shiny contacts for soldering – the holes for the wire don't, and are larger.

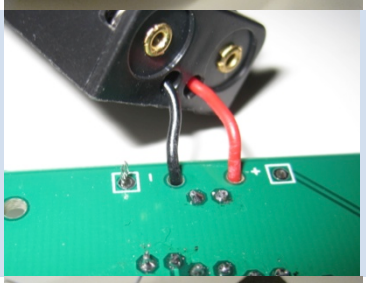


Bring the battery holder right up against the back of the board, and pull through the wire, leaving a small amount of slack.

Clip the wires off about an inch / 25mm above the board.

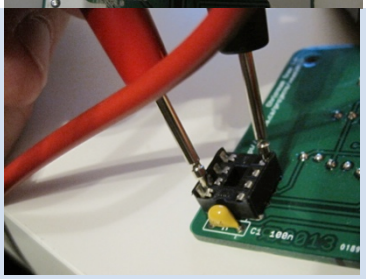
Strip a small amount of insulation from the wire – enough to go through the board and solder it, probably about a quarter of an inch / 5mm.

Fold the battery holder back out. Put the wire for the negative battery lead through the hole marked -.



Solder the negative battery lead in place, and clip the excess.

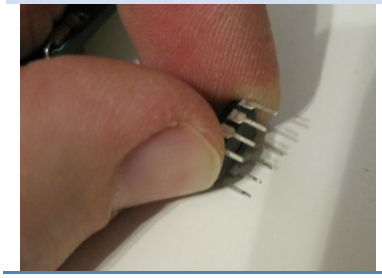
Repeat for the positive lead.



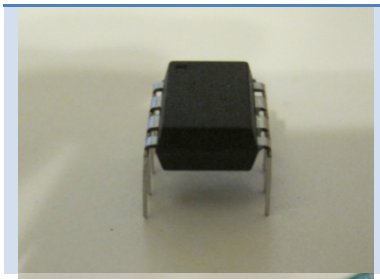
Put the 2 AAA batteries in, and measure the voltage across the IC socket, using your multimeter.

Note which pins you should be using – they're number 8 for the positive lead, and number 4 for the negative. If you have the socket facing up and the notch away from you, the positive is the one furthest away from you on the right, and the negative is the one closest to you on the left.

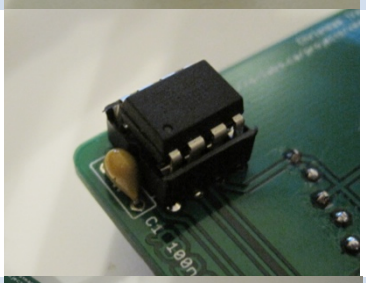
You should read about 3.2V with a fresh set of AAA batteries. If you're reading less than about 2.8V, get new batteries – not rechargeable, sorry. If you're reading more than about 3.6V, you have magical batteries that you can't use for this project – get some standard Alkaline ones.



You need to bend the leads on the ATTiny25 IC to make them parallel, so that they fit in the socket nicely. Grab the two sides of the chip as shown, and press each side of the chip – VERY GENTLY – against a flat table.

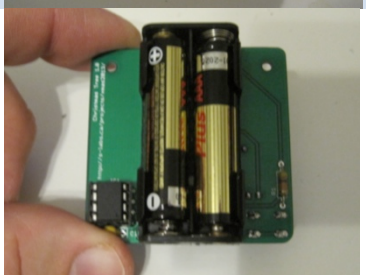


This is what the chip should look like when you're done – the two rows of leads are parallel, rather than bent more outwards.



Insert the chip into the socket. It's very important to have it go in the right way – there's a small divot on the chip that indicates pin #1. This goes towards the end of the socket with the notch.

Apply the two-sided adhesive to the battery holder if it's not already there. Peel off the backing, and stick the battery holder to the board, lining it up with the board edges.



You're done! Insert your batteries and cycle through the patterns with the button.

You may find that when you first insert the batteries, the board doesn't come on. Some battery holders are very tight, and prevent the positive (bumpy) terminal of the battery from making good contact with the contact in the battery holder. Check for a gap, and push on the battery to move it so that it has good contact.