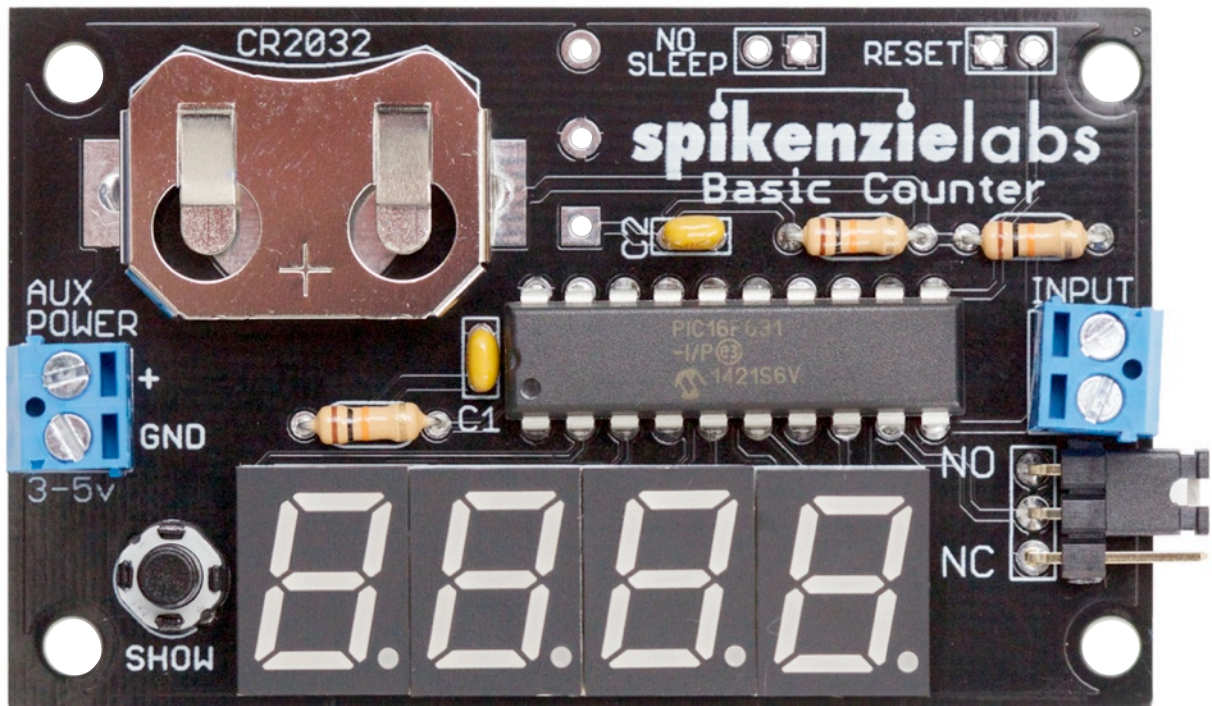# spikenzielabs.com

The Basic Counter™

Hobby Electronics Soldering Kit

Instruction Guide

For the best outcome, follow each step in order.
We recommend reading this guide entirely before you get started.

Tools required:
Soldering iron, solder, flush cutters, flat blade screwdriver, safety glasses, masking tape.

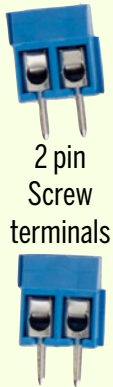## Electronics parts

3 pin header
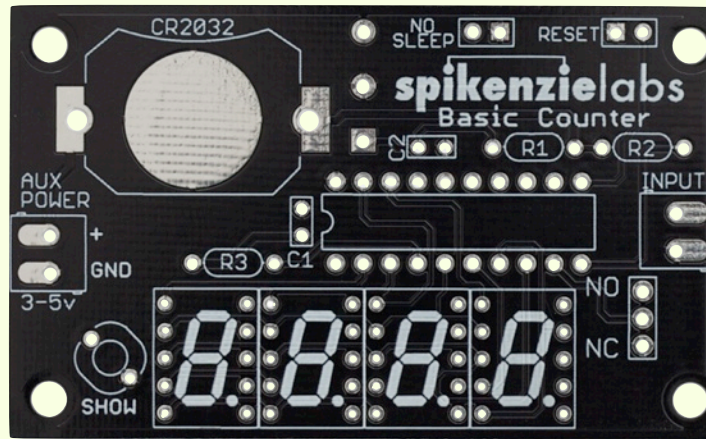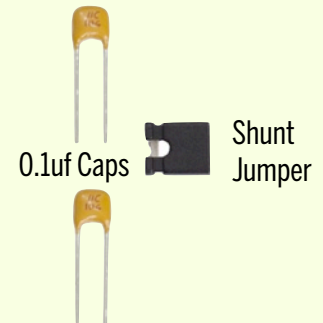
10k resistors

Button

CR2032 Battery

2 pin Screw terminals

PCB

0.1uf Caps

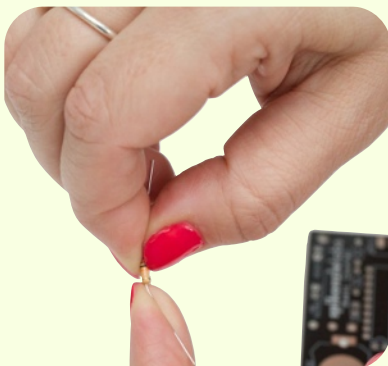Shunt Jumper

Battery clip

7 segment displays

IC Chip

Resistor preparation

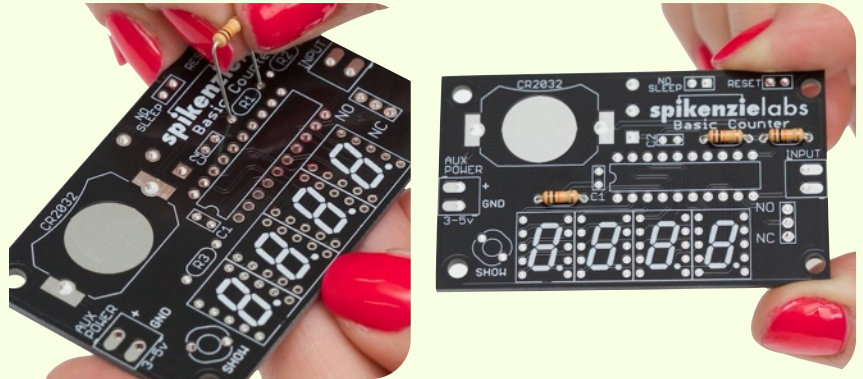Bend each of the resistors like in these photos:

You want to have the bend of the leg
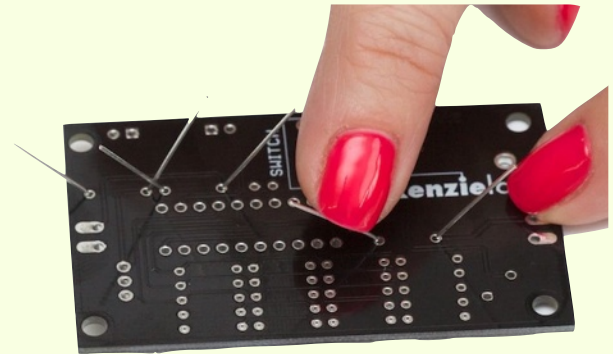as close as possible to the body of the resistor.

Resistor placing:

The Basic Counter takes 3 x 10k resistors. They get installed in the spots noted as R1, R2, and R3.

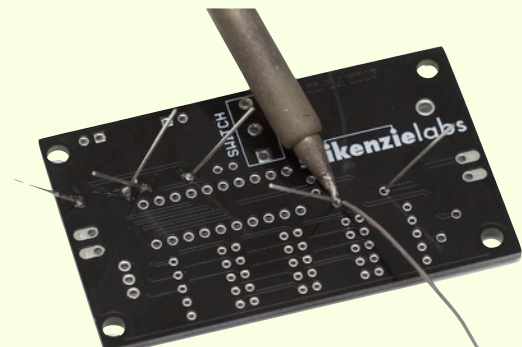Slide the resistors all the way down so that they are flush with the PCB.

Flare out the legs to keep them in place. Be sure that the body of the resistor is flush against the PCB.

Solder the resistors in place. Make sure you don't forget to solder any of the legs.
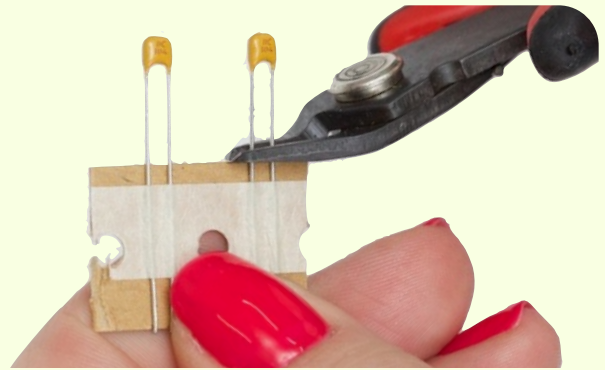
! Safety Glasses On!

Snip off the ends of the legs. Be sure not to scratch the surface of the PCB. Keep your safety glasses on!

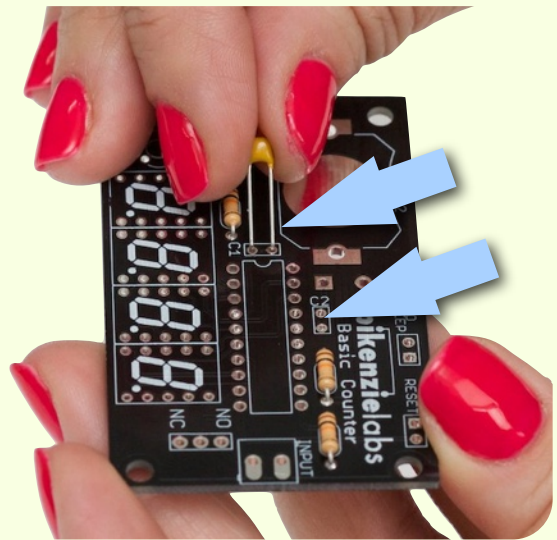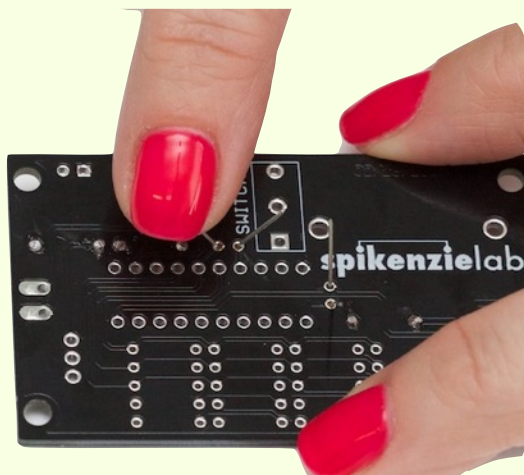Snip the capacitors from the paper tape.

Place the capacitors in the two locations as seen in these photos. Marked as 0.1uf on the PCB.

Flare the legs out as your did for the resistors,

Solder both capacitors in place. Snip the ends of the legs.
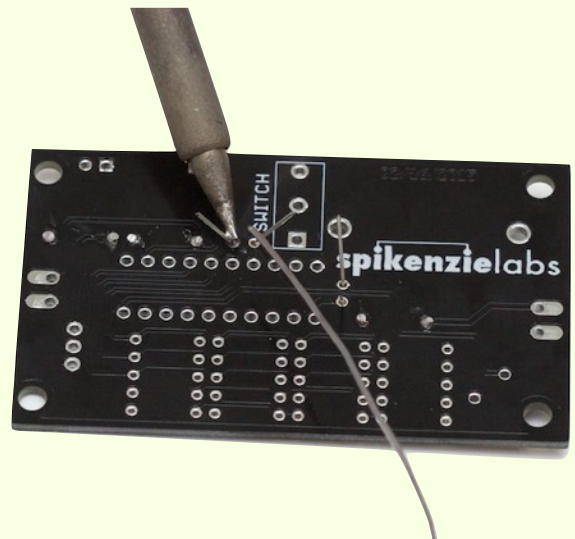
3 pin header

Place the 3 pin header over the area shown below:

You can hold the pin header in place with a piece of masking tape. This makes it easier to solder.

Solder the pin header in place.
You do not need to trim these.

Battery clip

Place the battery clip over the PCB.

You can hold the clip in place with a piece of masking tape if you like. Solder the 2 pins.
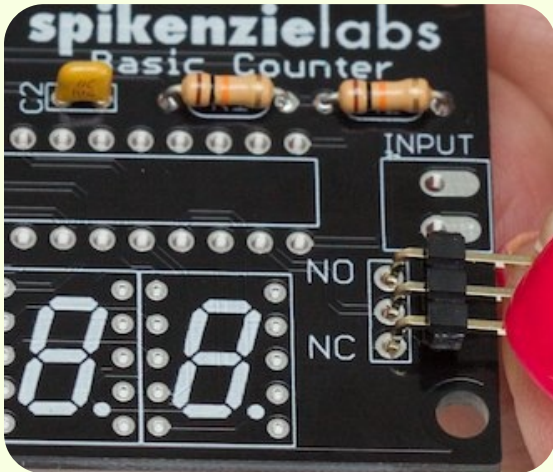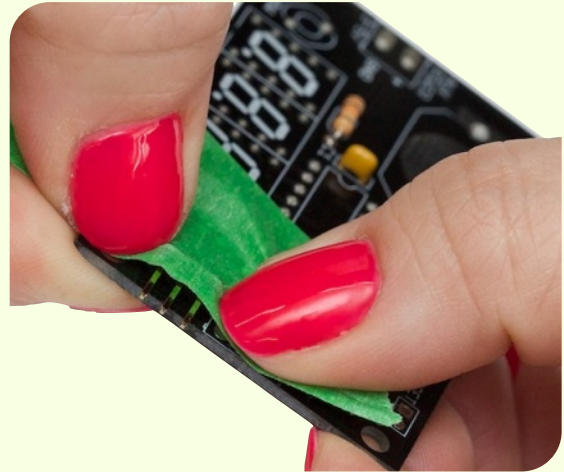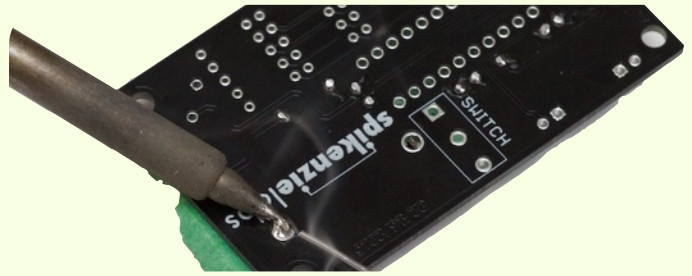
Screw terminals [optional]

If you would like your Basic Counter to be thinner, you do not need to solder these in place. The AUX power is only used if you have external power. You can also solder wires leading to your switch directly to the input.

The Basic Counter PCB takes a pair of these screw terminals.

Notice that the openings are aimed out towards the edge of the board.
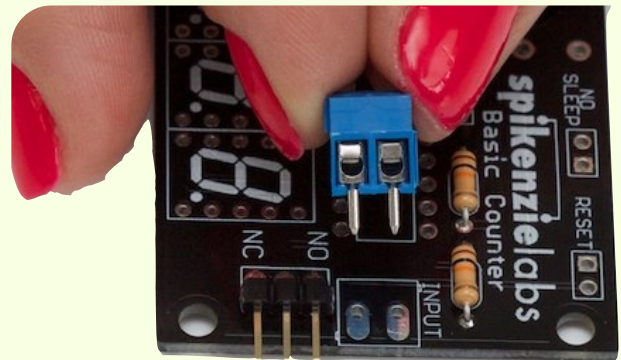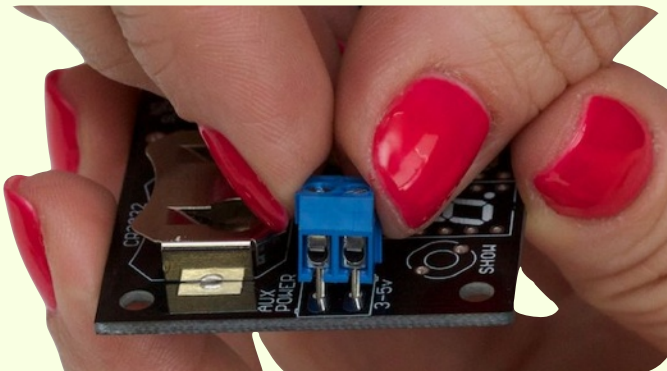
Solder both of the screw terminals in place. You can use a piece of masking tape to hold the terminals while soldering.
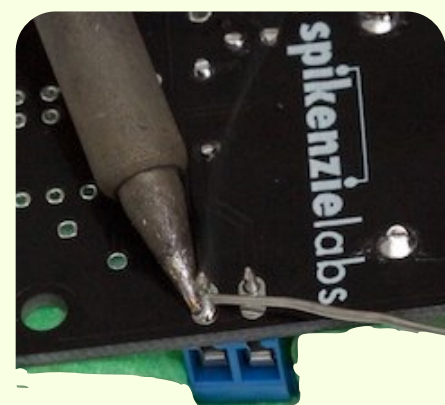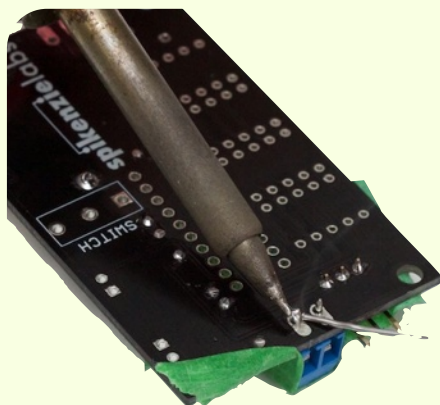
IC chip preparation

When manufactured, the legs are flared out slightly. To be mounted to the socket, the legs need to be closer to the body of the IC.

Remove the IC from the antistatic foam. Hold it firmly on either end, and press the legs down on a flat hard surface.

You can test fit it on the PCB if you think you have them straight enough.

!

Mind the notch!

The IC, and the PCB both have a notch indicating the correct orientation for the IC. Make sure they are lined up. If you insert the chip in the wrong orientation, it will not work.
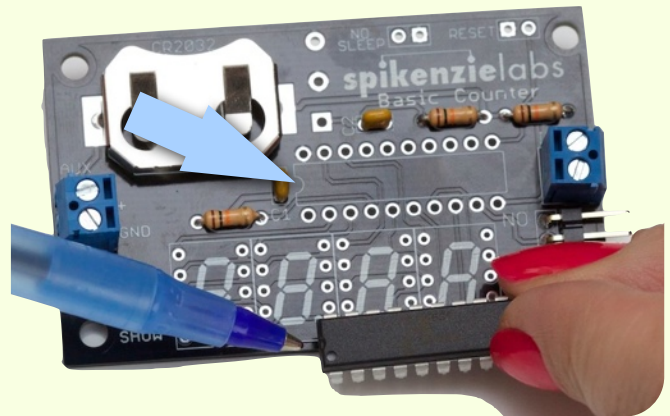
Proper placement for soldering the IC on the PCB.

Hold the IC in place with a piece of masking tape if you like.
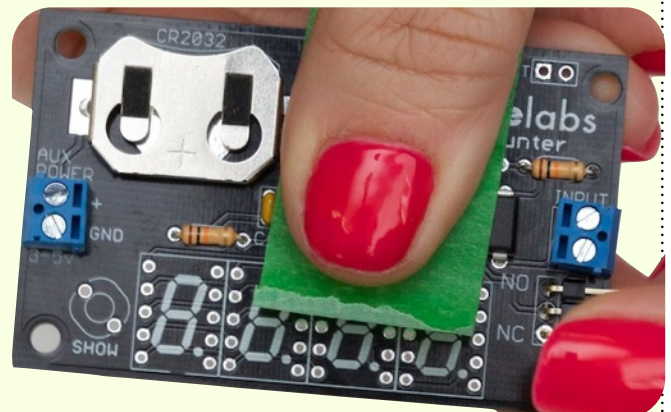
IC soldering

Solder the IC. Make sure not to forget any pins.
Be careful not to heat the IC pins for too long.
3 seconds maximum each.
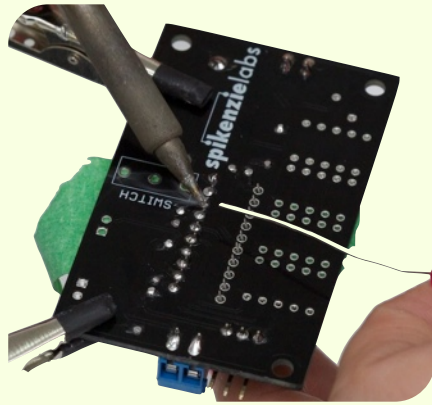
Trim the excess pins on the ends of the IC
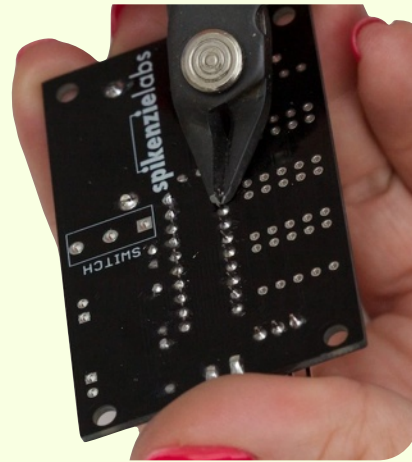
7 segment displays

Make sure that the legs are straight. The LED
modules will fit onto the PCB much easier if you
adjust them as needed.

Bend any leg that is not perfectly straight to be as
straight as possible.
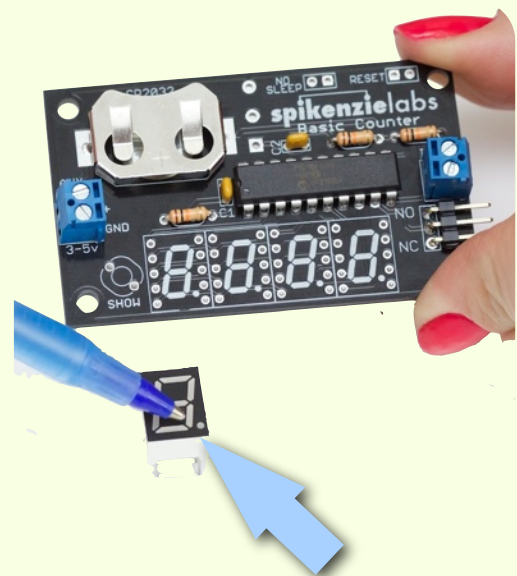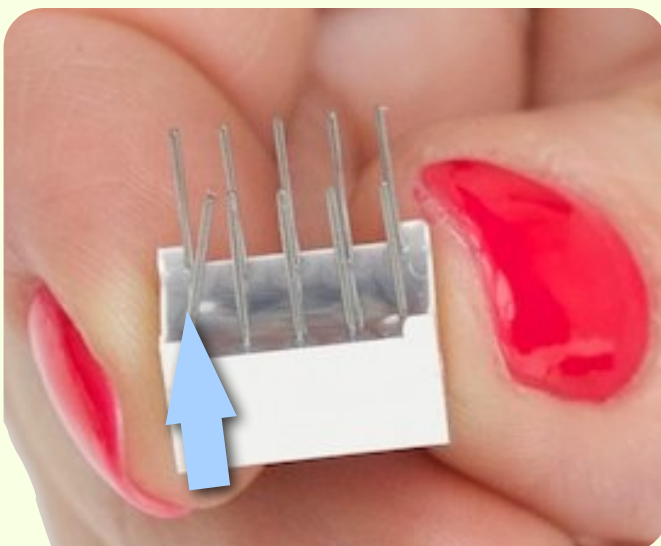
Notice the decimal point.
You will want to be sure to install them in
a matching orientation. Matching the
module to the printing on the PCB.

Place the LED modules one at a time. They will fit perfectly flat, against the PCB and be touching each other side by side. If you have trouble fitting a module in, re-examine / adjust the legs. A trick is to look underneath the LED as it is fitting in place to see which legs are not lining up.
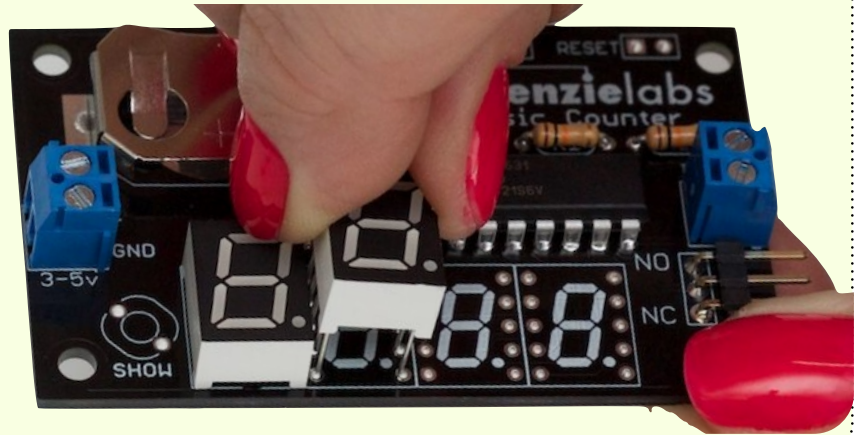
Once they are all in, your Basic Counter will look like this:

* For the best fit, place all four LED modules before you start soldering.

You can hold the LED modules in with a piece of tape.
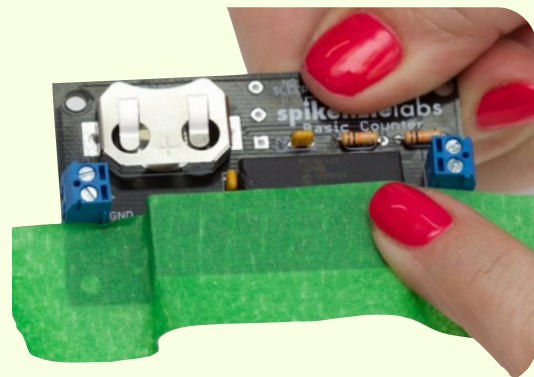
Solder all of the legs. Make sure you don't accidentally get a solder bridge across two pins.

Snip the extra length off of each leg. Be careful not to scratch the surface of the PCB.
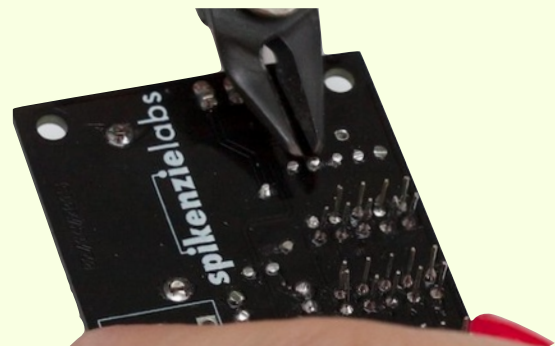
The Show button

Snip the button from the paper tape

Slide the button through the 2 holes to the left of the LED displays.

Flare out the legs to hold the button in place.

Solder the 2 legs, trim the excess.

All done.

How to use:

To use The Basic Counter you will need to connect a switch of your choosing to it.

The Basic Counter counts when a switch is either opened or closed. There are two contact points on The Basic Counter marked "INPUT". Wire a switch to either short the two pins together or break the short. This is where the NO (normally open) and NC (Normally closed) words come from. When a switch is N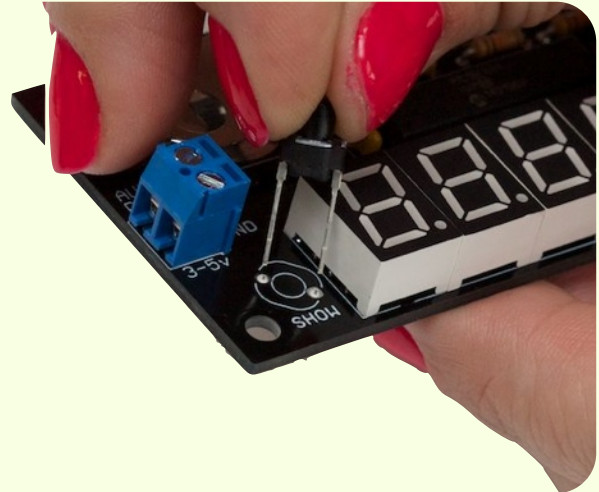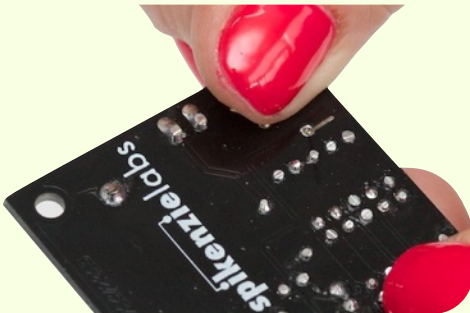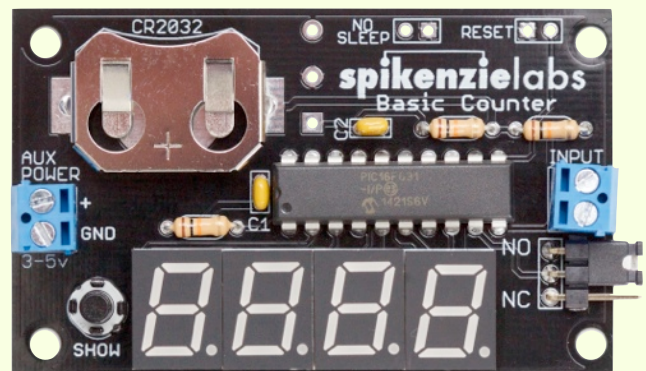O, you must short the two pins together to activate the switch. When a switch is NC, it is always shorting until the button is pressed.

If you are not sure which type of switch you have you can use the continuity tester on your voltmeter. If it buzzes until pressed it is NC and if it only buzzes when pressed it is NO.

Once you figure out which type of switch you have set the jumper on The Basic Counter to NO or NC in accordance.

NOTE: Do this BEFORE you connect the battery. When The Basic Counter first powers up, it check the jumper to know which type of switch is connected. If you change the type of switch (NO or NC) be sure to remove the battery / or AUX power before resetting the switch type jumper.

Now that your switch is wired up, you can connect the battery or AUX power but NOT both. If you are using AUX power The Basic Counter takes 3.3 to 5 volts.

Each time you press the switch your BC should count up one. After about 15 seconds, the BC will go to sleep. The display will turn off and internal functions of the microchip are reduced to save battery power. To wake the BC without incrementing the count, simply press the "SHOW" button to the left of the display and the current count will be displayed for about 15 seconds.

If you would like to keep the display on all the time, short a small piece of wire (or switch or jumper) between the two "NO SLEEP" pads. Note: This will use more power. Battery life will be reduced considerably. We recommend using the NO SLEEP option with AUX power.

To reset the counter to zero, you can either remove the power for a few seconds or connect a button to the two "RESET" pads.

Slide the shunt jumper onto the upper two pins for a normally open switch, or the lower two for a normally closed switch.
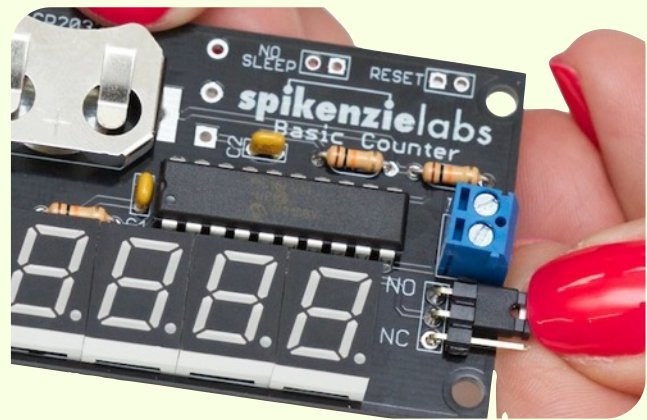
Power up

Slide the battery inside the battery clip, and you will see the display light up. Alternatively, you can power the Basic Counter with external power through the screw terminals on the left side of the PCB. Use any power source you like, so long as it is at least 3.3v and no more than 5v.

Troubleshooting

Q: The Basic Counter does not go to sleep:
When the switch to the BC is pressed, the BC waits for the switch to be released before it goes to sleep. So if your switch is triggered the display will stay on. This is common with a door switch when the door stays open. Another cause is when the wrong type of switch NC vs NO is selected or when no jumper is installed at all. Remember, when you change the switch type jumper The Basic Counter has to be power cycled.

Q: The Basic Counter only counts when the switch is released, not when pressed.
The wrong type of switch (NC vs NO) is selected or no jumper is installed at all.
Remember, when you change the NO to NC switch type jumper the BC has to be power cycled.

Q: The zero looks funny
When first powered on the "0" may look strange, after the BC starts to count the display refreshes clearly.