# Solder Time Desk Clock

spikenzielabs.com

This guide will show you how to solder and assemble the SpikenzieLabs Solder Time Desk Clock Kit.

For the best outcome, follow each step in order. This is a relatively easy kit to build, however there are certain steps that need to precede other steps. Read through the entire guide, and check your parts. Questions or problems, let us know at support@spikenzielabs.com

These are to call attention to certain elements of the build that require additional care & attention.

!
Caution
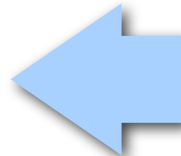
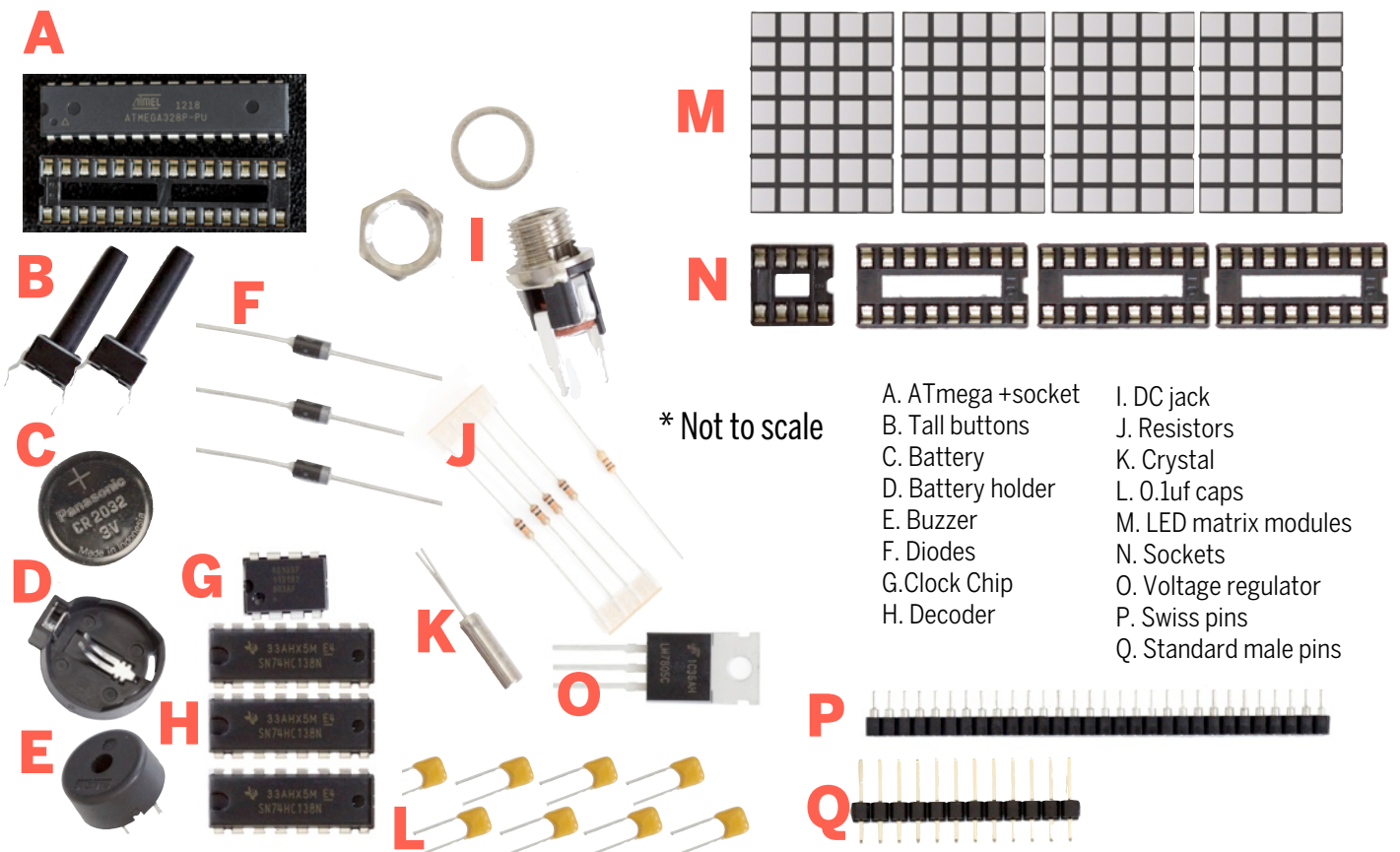Look here...

Info

## Unpack the electronics parts.

A

M

B

F

I

N

C

D

G

J

K

O

* Not to scale

A. ATmega +socket
B. Tall buttons
C. Battery
D. Battery holder
E. Buzzer
F. Diodes
G. Clock Chip
H. Decoder

I. DC jack
J. Resistors
K. Crystal
L. 0.1uf caps
M. LED matrix modules
N. Sockets
O. Voltage regulator
P. Swiss pins
Q. Standard male pins

H

E

L

P

Q

There are 8 mounting holes on the PCB. With this version of the clock, we will only be using the inner 4. The outer 2 are designed to snap off.

Using pliers, grasp the edge, and rock it back and forth, allowing the PCB to flex only along the cut line.

Repeat until the small piece breaks off, and then do the same with the other side.
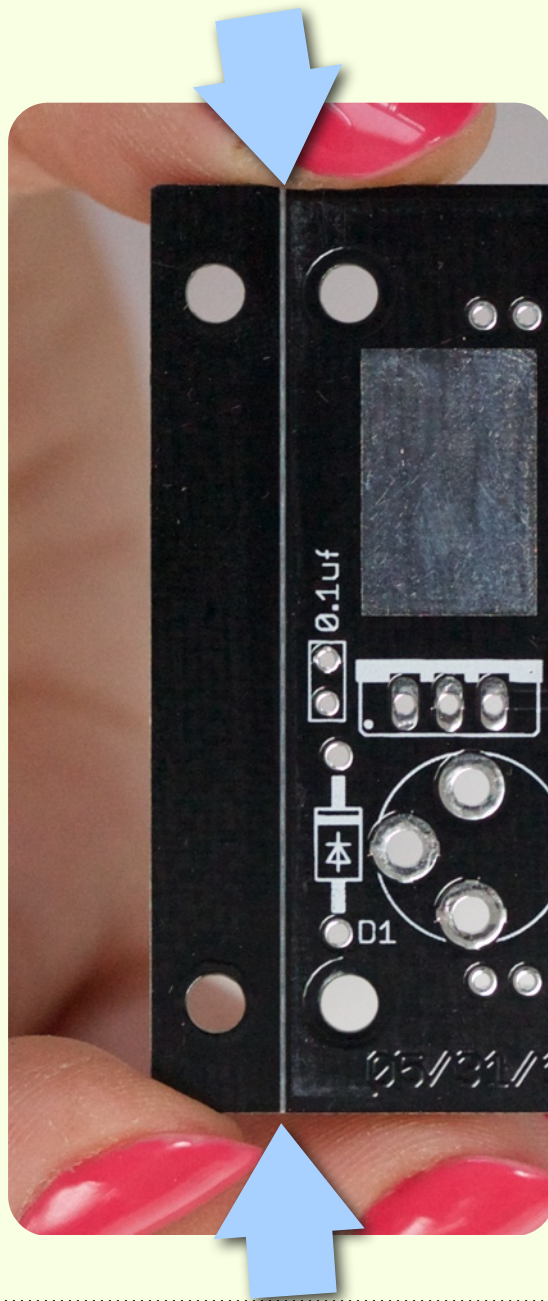
Preparing the resistors

Take resistors, and snip them from the tape. Bend the legs as close as you can to the body of the resistor for all of them, as in the picture (right).

Note the color bands. You have four resistors that are 10k, (brown - black - orange) and one 100 ohm (brown - black - brown).

They all get the same bend, but it is important to solder them in the correct locations on the PCB.

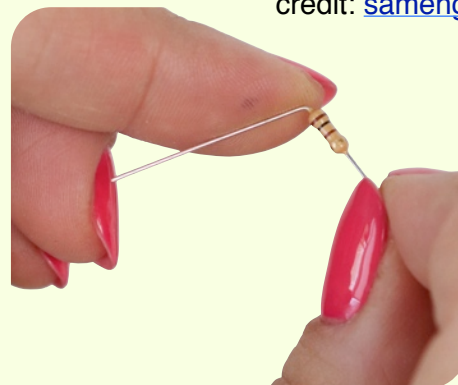The value for the required resistor is printed on the PCB to reduce mistakes.

One : 100 ohm

Four : 10K ohm

credit: samengstrom.com

Preparing a 100 ohm resistor

## Placing and soldering the resistors

Start with the single 100 ohm resistor. It gets placed in either orientation (no polarity). If you have bent the legs properly, the resistor will slide all the way down, and the resistor body will touch the PCB.

Secure the resistor in place with some low tack painter's tape, or flare the legs out to hold it in place. Double check to make sure it hasn't shifted, before soldering in place.
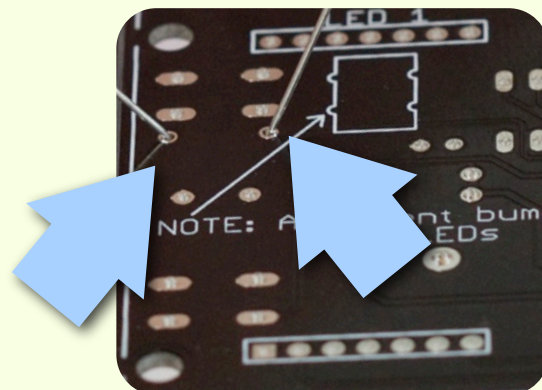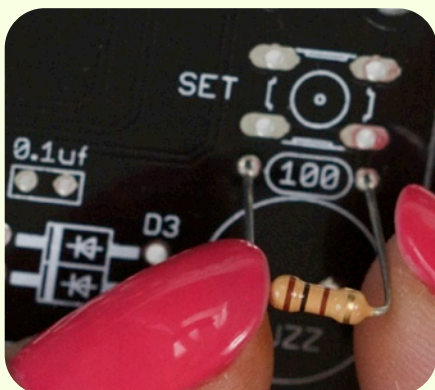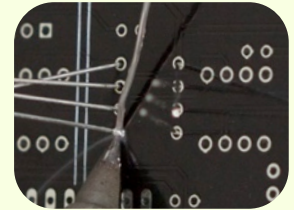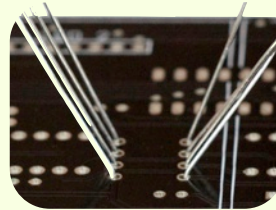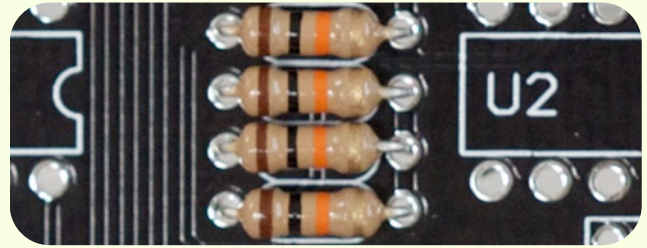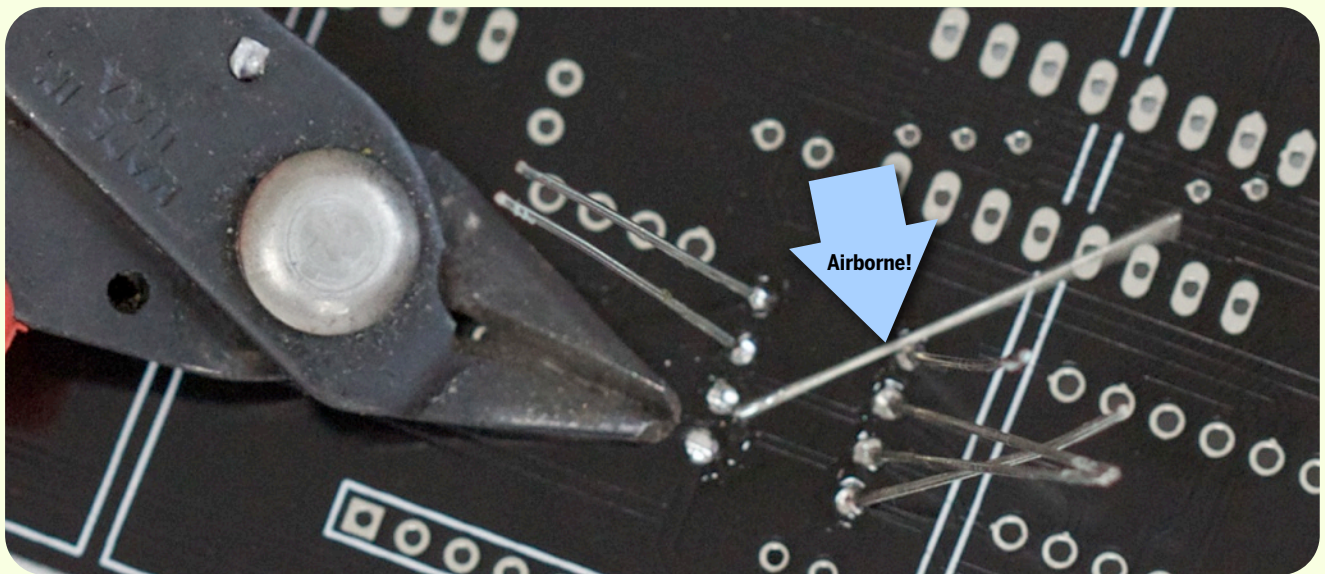
Solder the legs.
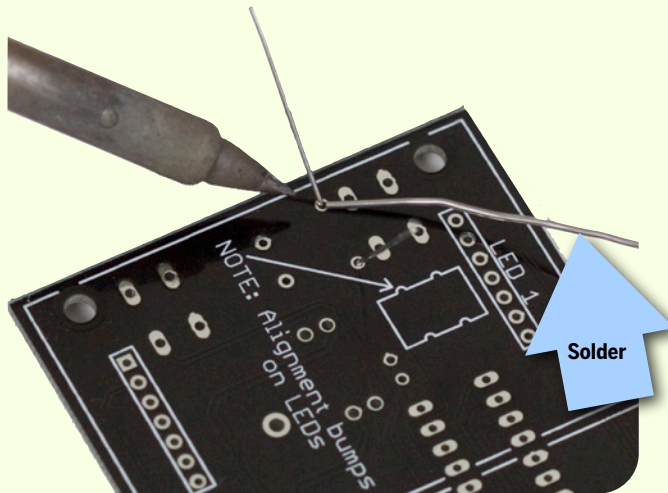
Repeat for for the 4x 10k ohm resistors

NOTE: Alignment bumps on LEDs

LED 1

U2

Solder

⚠ Snipping legs of components is about to start. If you haven't put on a pair of **safety glasses** yet, now is the time. When snipped, the bits get airborne, and somewhat unpredictable. **Working with someone? They need a pair too!**

Airborne!

Carefully snip the excess legs. Use caution to not scratch the surface of the PCB.

Don't pry or pull up on the leg with the snips. **It is better to snip twice than to scratch the PCB.**

⚠
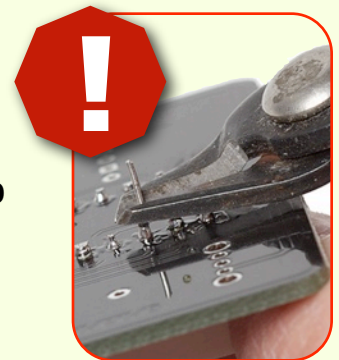
Preparing and placing the capacitors

There are eight 0.1uf capacitors included in your pack.

Remove them from the paper backing by snipping them free. (see below)

The capacitors get placed in the white boxes marked 0.1 uf on the PCB. Slip the capacitors in place, flare the legs, or tape them down in preparation for soldering. This type of capacitor does not have polarity, you can insert them either way.
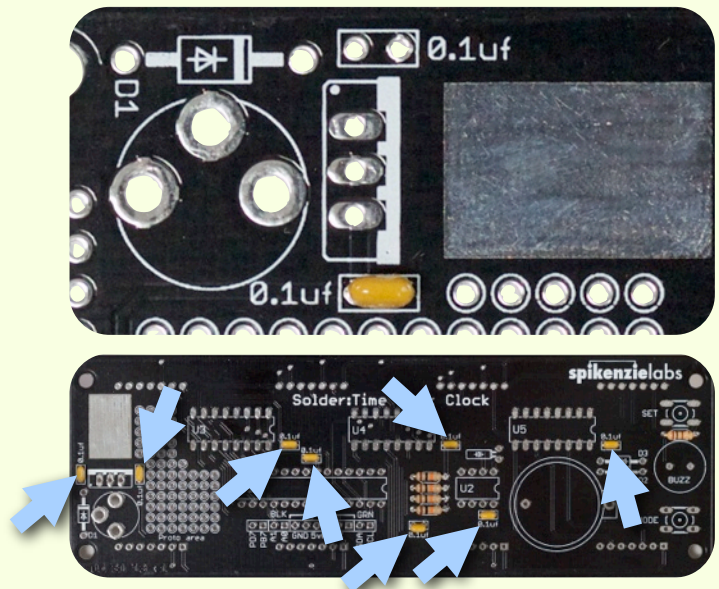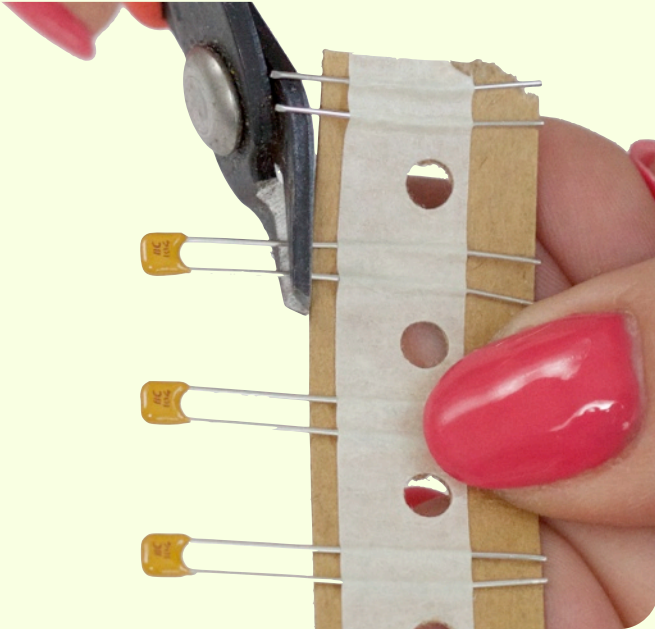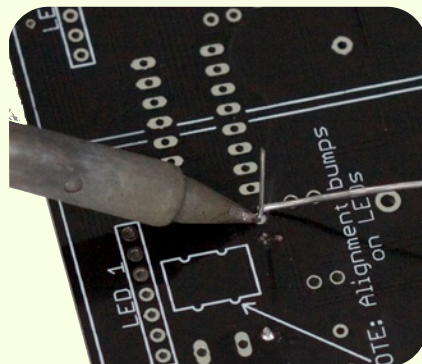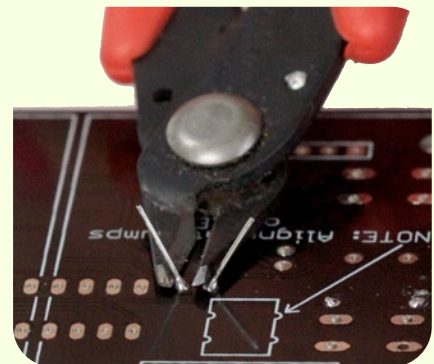
Placements of the 0.1uf capacitors

! Did you remove your safety glasses? Put them back on for this step.
It is recommended to keep them on throughout.
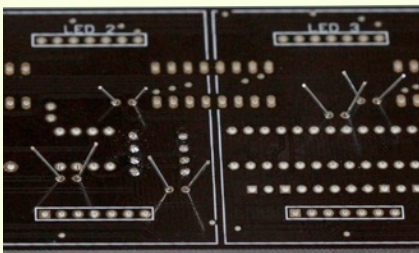
Flare out the legs

Solder in place

Snip the excess

Preparing and placing the diodes
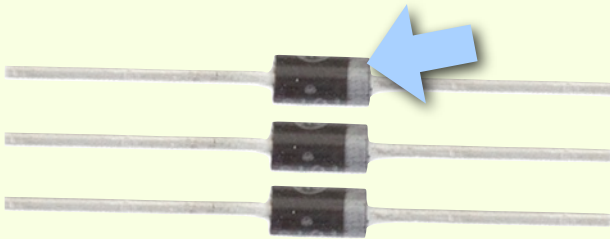
The Solder Time Desk Clock uses 3 of these diodes. Take a moment to notice that they have a grey stripe one one end. **These have polarity**, and can only be installed in one way.
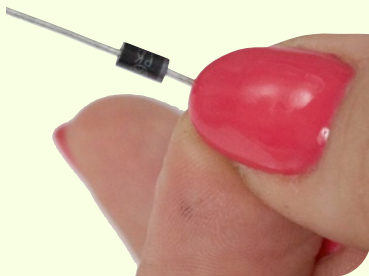
Grasp the diode a little bit away from the body, and bend the legs similar to the way you prepared the resistors.

These diodes get their legs bent a little bit away from the body.
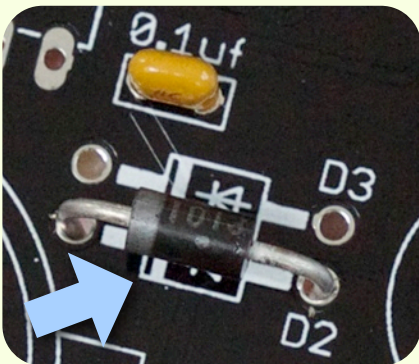
Note the white stripe on the PCB.

Match the stripe with the grey stripe on the diode

Flare the legs, solder then snip the excess.

Once you have soldered and snipped these diodes into locations D1, D2, and D3, continue to the next step.

The IC Sockets

The Solder Time Desk Clock has 5 sockets. Each of them has a notch on one end. When you are soldering these in place, be sure to match the notch with the white printing on the PCB.

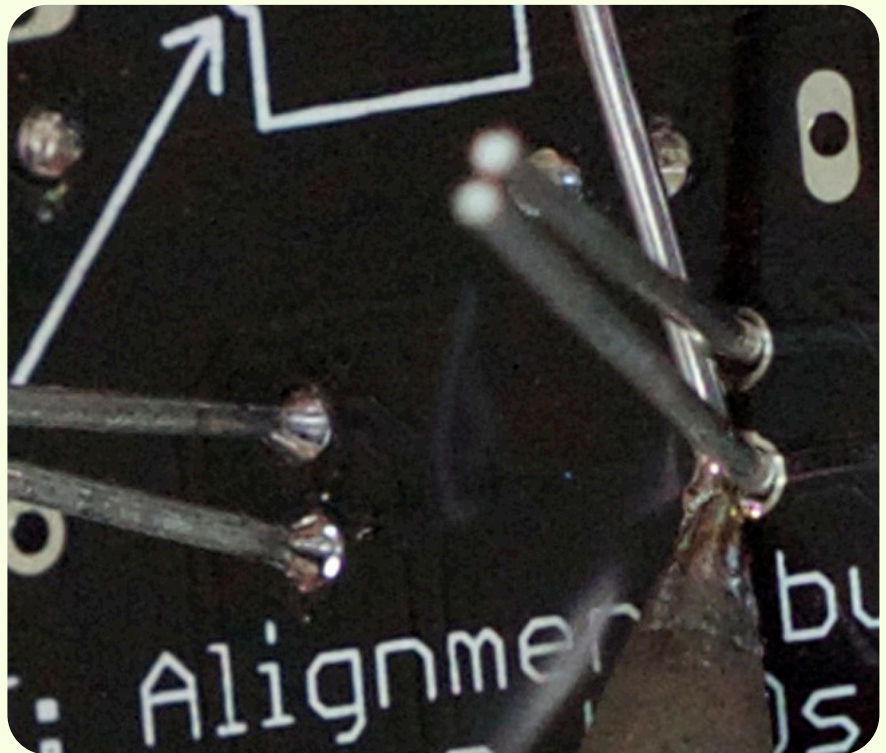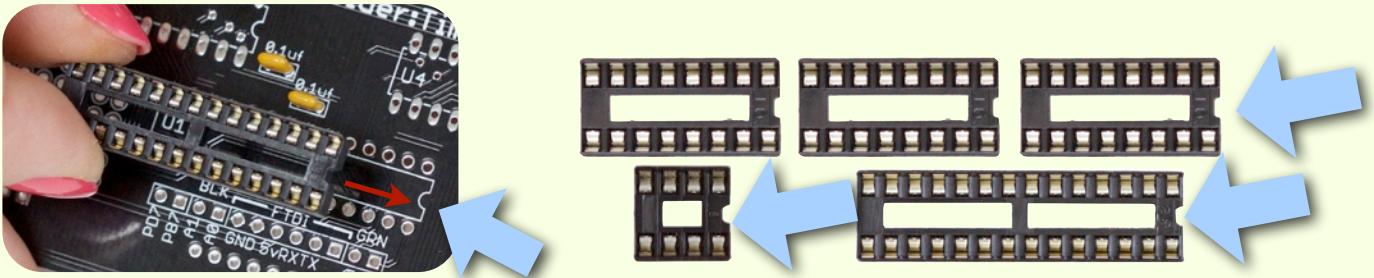Hold each socket in place with tape, or carefully with your finger while soldering. Solder the first pin on one row, and then the last pin on the other row. Double check to make sure all of the legs are poking through, and the socket is laying as flat as possible on the PCB. If it's uneven, reheat the first and last legs while pressing the socket into place.

Once you're happy with how it looks, continue soldering the remaining legs. Trim, and move on to the next socket. **Be sure to solder all of the legs.**
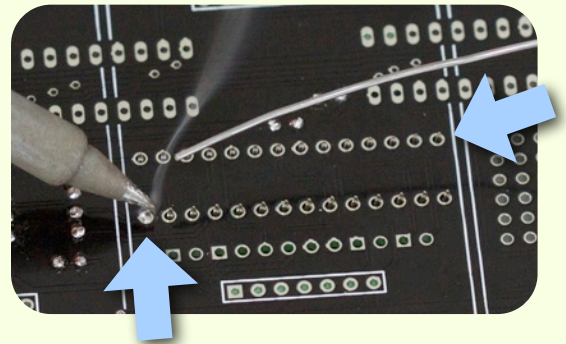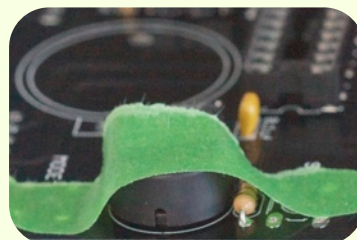
Placing and soldering the buzzer

Every great clock needs an alarm function. The Solder Time Desk Clock has a little piezo buzzer that gets soldered to the PCB. It is not polarity sensitive, so you can install it in either orientation.

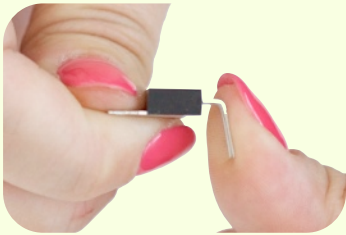**This is the buzzer.**   **Buzzer held in place with tape.**   **Solder and trim the excess.**

Placing and soldering voltage regulator

The voltage regulator needs to have its legs bent at a 90 degree angle. The best way is as in the photo below:

Place it onto the PCB, the three legs through the holes, and the metal back plate touching the exposed metal pad on the PCB. Tape in place.
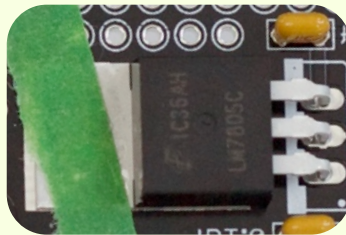
Solder the three legs, and trim the excess legs.
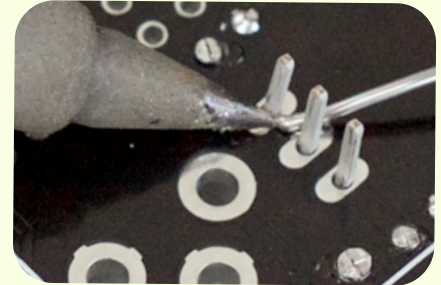
You do not solder the metal base of the regulator.

Battery holder placement and soldering

The Solder Time Desk Clock uses a standard CR2032 cell as a backup for the time.Match the outline of the battery holder placement on your PCB, secure and solder in place.
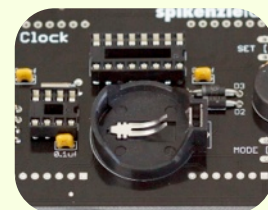
Soldering the FTDI / Hacking pin header

The 12 pin header that is included in the kit gets installed next.
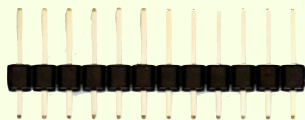
Place the shorter legs against the component side of the PCB, and then solder from the LED side. Hold the pins in with a piece of tape, or carefully with your finger on one of the pins that you're not soldering.
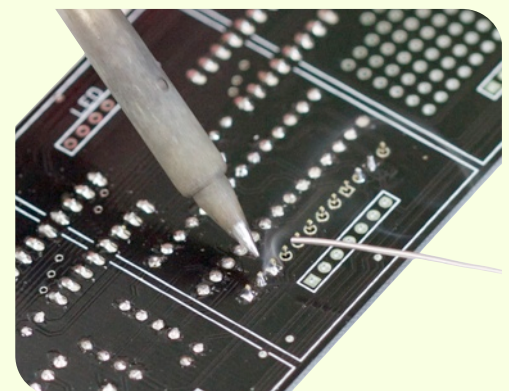
The Swiss pins: Placement and Soldering

! **The Swiss pins get soldered to the LED matrix side of the PCB. Make sure your soldering matches these photos exactly.**

This kit uses Swiss pins to hold and connect the LED matrix displays to the PCB. Snip the pins into 7 pin strips. You will need eight strips in all.

Locations where you are going to **SOLDER** the Swiss pins:
The Swiss pins will be inserted through on the other side. The arrows show where you will be soldering. **Be sure not to insert the Swiss pins on the wrong side!!**

Apply Solder Where indicated by blue arrows

! **The Swiss pins get soldered to the LED matrix side of the PCB. Make sure your soldering matches these photos exactly.**

Swiss pin inserted properly:
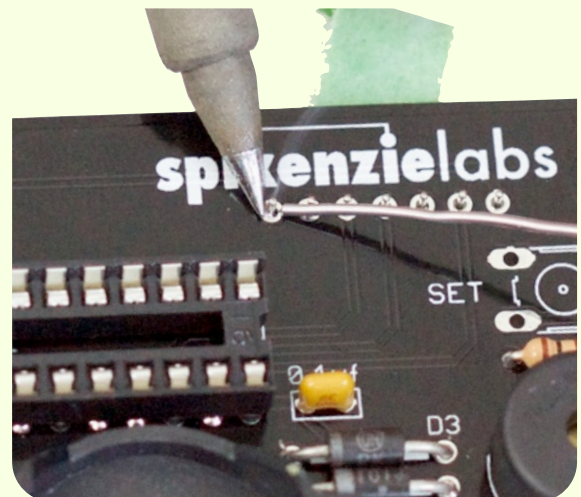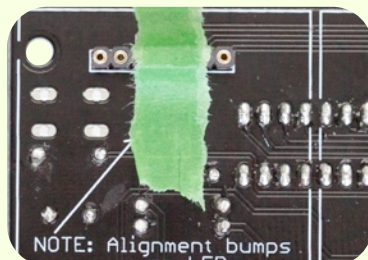
Buttons placement and soldering

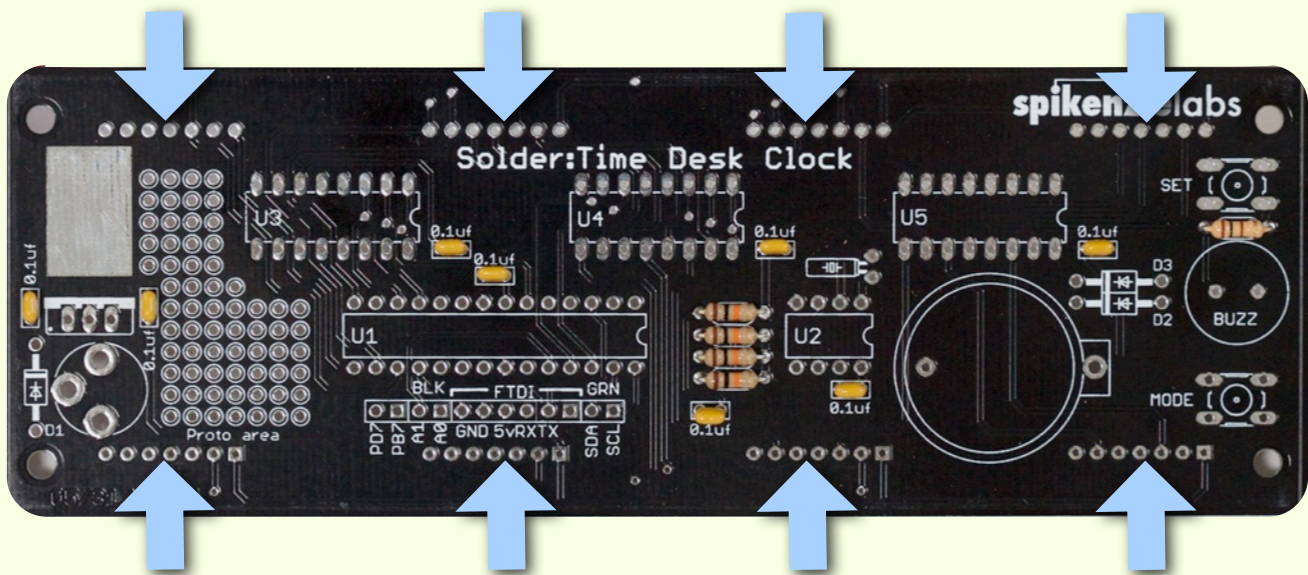There are two tall momentary buttons in your kit. Place them in their mounting positions beside the text '**mode**' and '**set**' on the PCB.
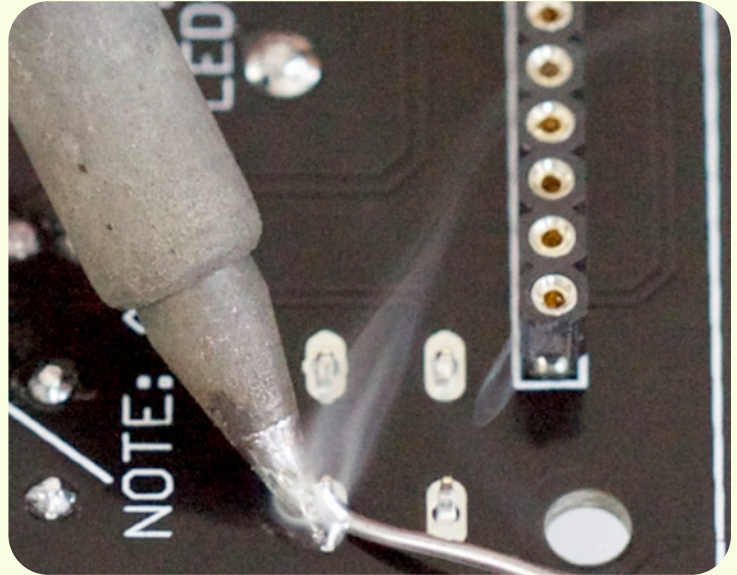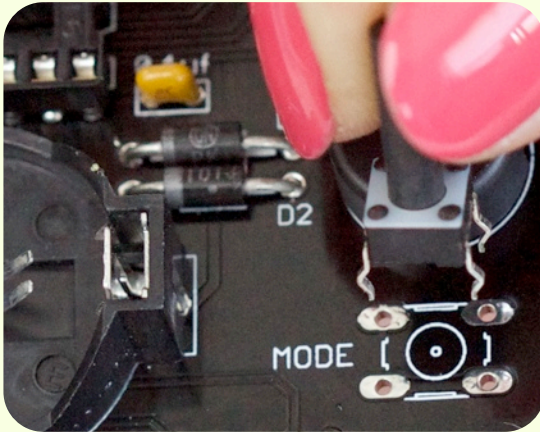
Solder the 4 legs. Repeat for the other button

Placing and soldering the DC jack

Place the DC barrel jack as in the photos below left. Hold it in place with a piece of tape, and solder one of the three legs.

Make sure it is perfectly flat against the PCB, it will bottom-out on the thicker part of the legs, leaving a small gap. Adjust it to be perfectly level, and then solder the other 2 pins.
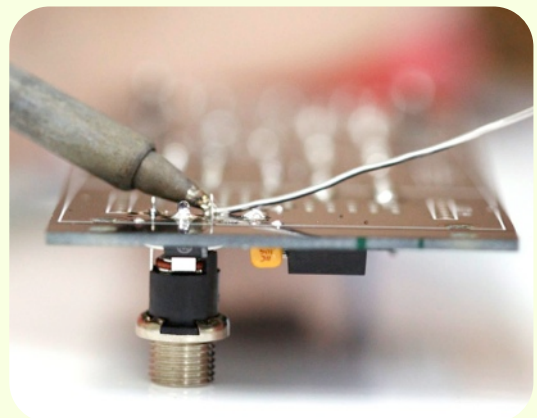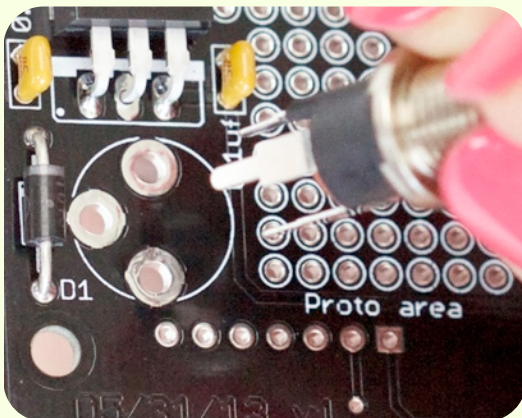
Preparing the Chips.

There are five chips that make the Solder Time Desk Clock work. One 8 pin RTC (Real time clock). Three 16 pin 75HC138 decoders and one 28 pin (ATmega microcontroller). Before we install the chips, we need to slightly bend the legs perpendicular to the body of the chip. The easiest way is like this:

Do this to each of the five chips

Hold on the ends, press evenly against a flat surface
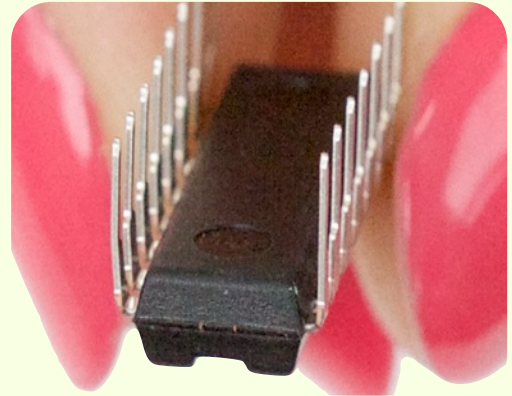
Perfectly perpendicular. Legs are square to the body.

Place and solder the crystal

The crystal is a small thin metal barrel, the legs are very thin. Place the crystal legs through the holes as in the photo below middle. Hold it in place with a thin piece of tape, and solder.

The crystal
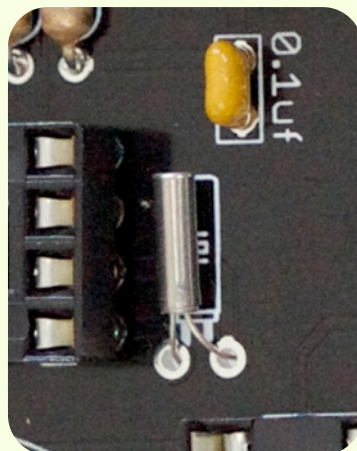
Spread the legs, and insert one of the crystal legs into each hole
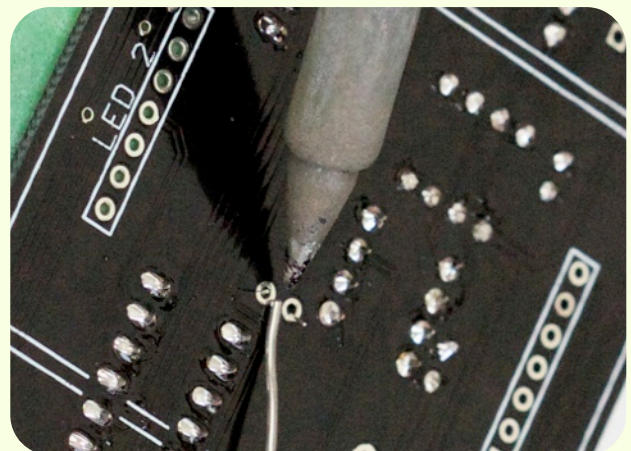
Fill the hole with solder. The legs on these are thinner. Make sure there is good contact.

Chip insertion

With the chips now having their legs ready for installation, we are ready to mount them into the sockets on the PCB. Start with the 8 pin RTC chip. Look at the notch that is on one end of the chip, and line it up with the notch that is on the socket, and the PCB. The **notch** is there to ensure that the chip doesn't get installed in the wrong orientation.

Place the chip over the socket, and check to make sure that none of the legs are bent too far towards the middle of the chip, and also that they are not aimed over the side of the socket. Ideally they will be aiming directly into the slots of the socket.

Gently push evenly down until the chip stops, and look around the chip once again. If any of the legs have buckled under, or missed the holes in the socket, remove the ship, straighten the legs, and try again.

If the legs have been properly straightened in the previous step, this should go very smooth.
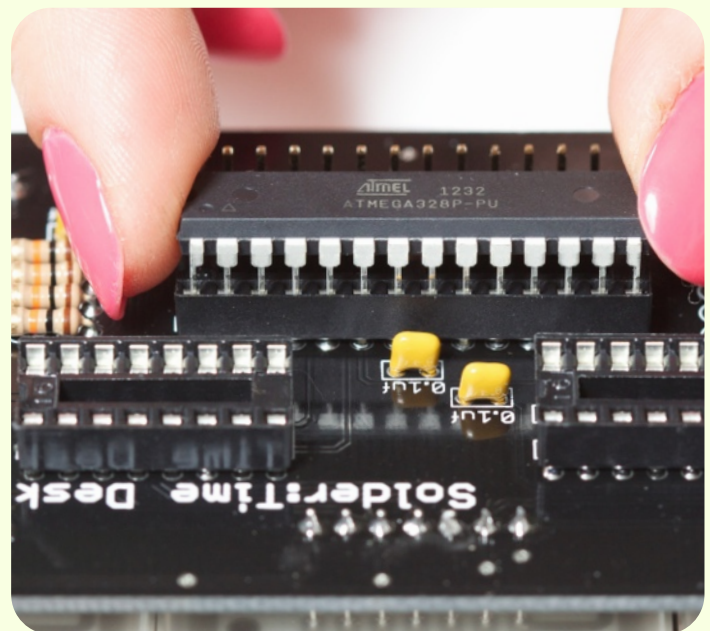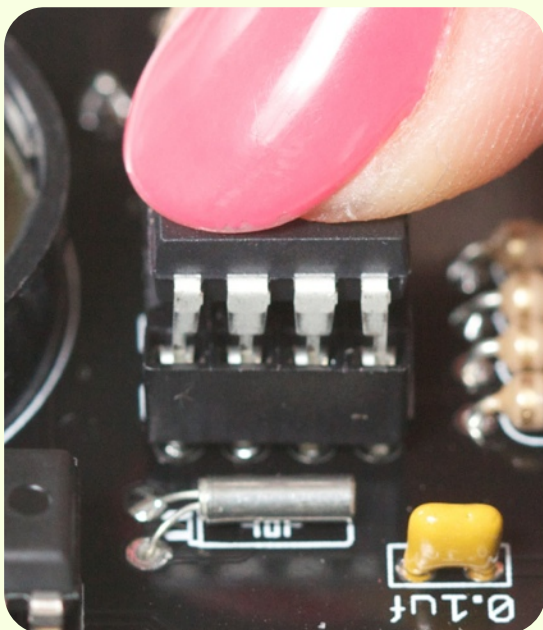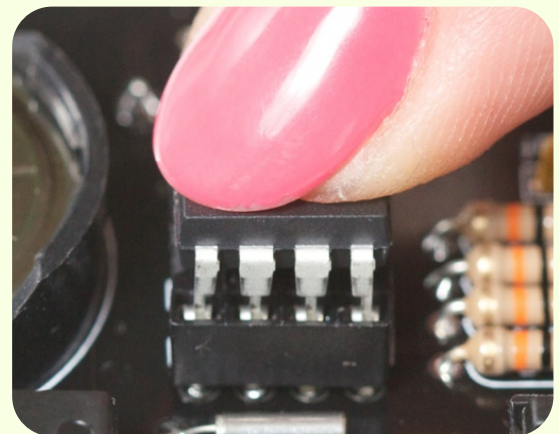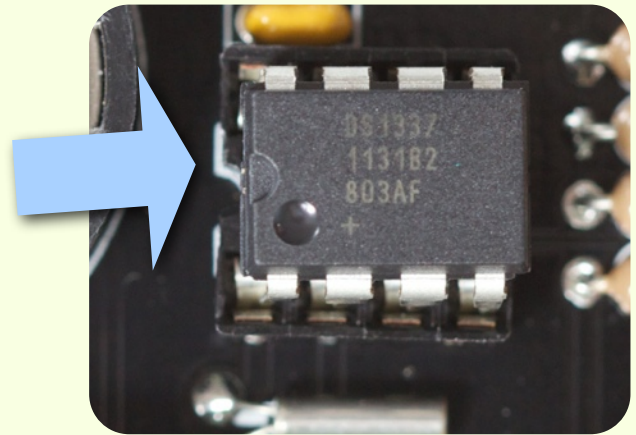
Display mounting

Before mounting the assembly into the housing, we are going to mount the LED display modules, and test. The ATmega ships pre-programmed, so all we need to do is install the LEDs and test power up.

The LCD modules need to be installed in the proper orientation. Much like the chips, there are notches along the side to denote which side is which.
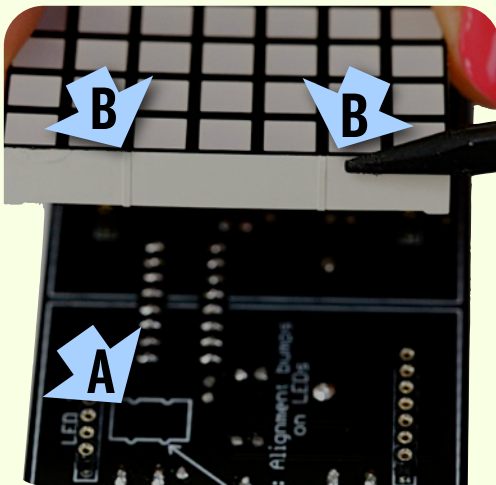
Hold the display along the short sides, pins down as in the photo (left). One side has 2 bumps, and the other side 2 recesses.

Match the bumps and recesses (arrows 'B') to the direction printed on the PCB. (arrow A)

Making sure that all of the pins under the LCD module are slipping inside the Swiss pins, press evenly until the display module stops. You should have a gap that looks like the photo below.

The displays will only work if they are installed correctly.
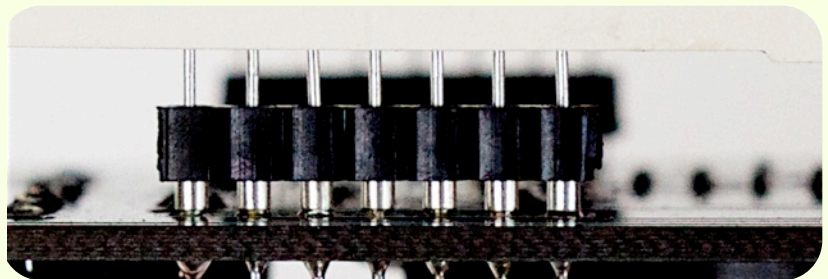
Continue placing the other 3 LED modules by matching their protrusions and recesses one after the other.

You may need to adjust the pins by hand so that they mate with the Swiss pins.

The swiss pins hold the matrix modules in tight. Take your time inserting the modules, you don't want to bend the legs.

Backup battery installation.

Remove the CR2032 battery from the little bag, and insert it into the battery holder. Make sure you are installing it with the writing up. As in the photo (right):
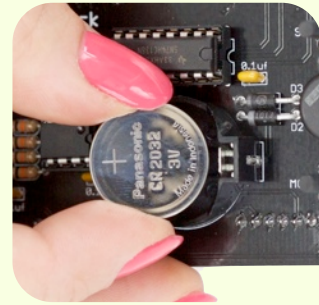
Test Power-up

Connect a 9~12v DC power source to the DC barrel jack. You should see the LED display light up. Press mode and set, and go through the menus. Set the time, and unplug the power.
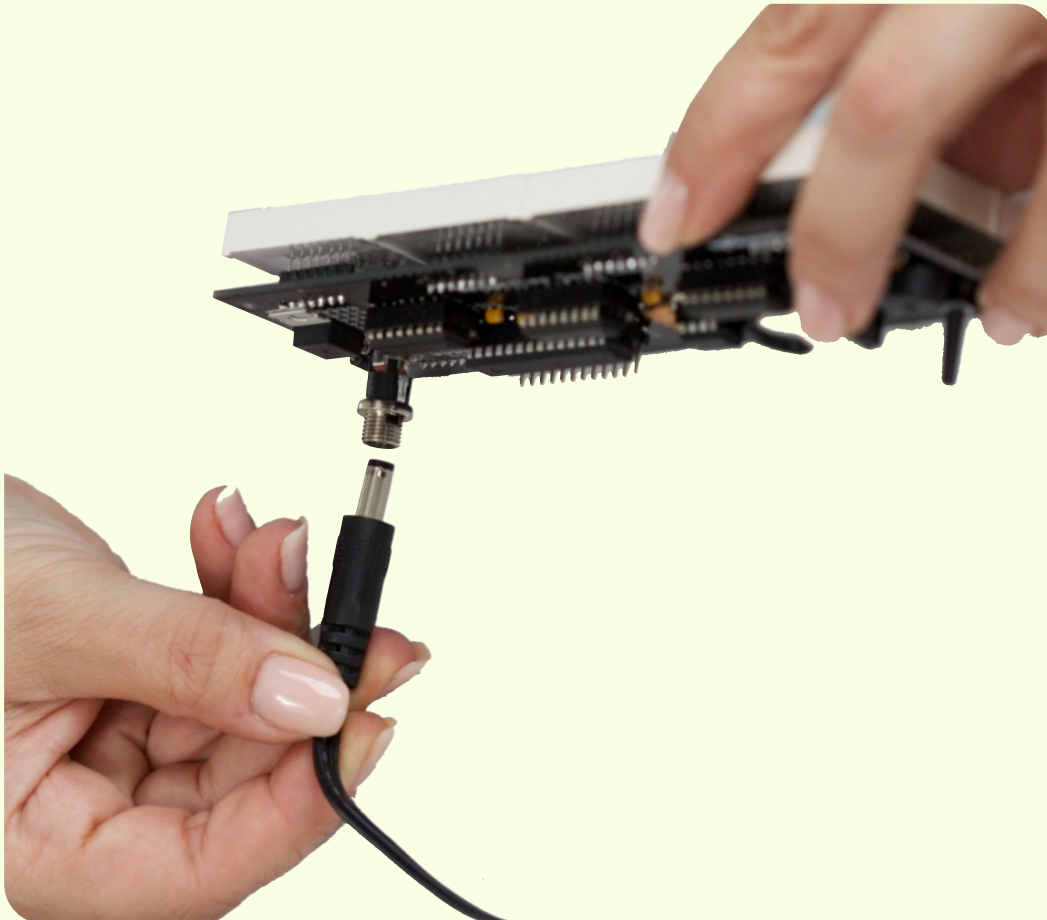
These are the laser cut acrylic parts. Some parts will have a shiny off-white double-sided tape cover. **Leave those tape covers in place until this guide says to remove them.**
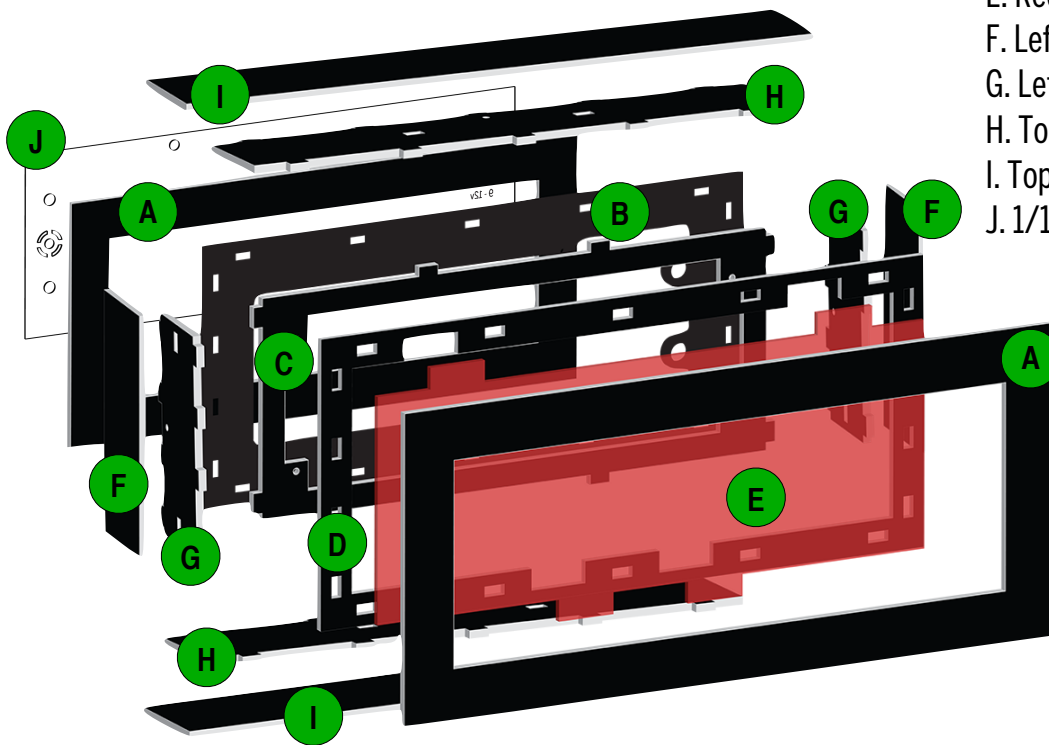
A. Front & rear cosmetic bezel
B. Rear structural panel
C. PCB layer panel
D. Front structural panel
E. Red translucent filter
F. Left & Right cosmetic bezel
G. Left & Right structural panel
H. Top & Bottom structural panel
I. Top & Bottom cosmetic bezel
J. 1/16" clear rear cover

4 x 1/4" metal screws
1 x 1/4" black screw

Parts that have double sided tape on one side, are going to have their other side visible when the clock is complete. Take care to not scratch the visible parts during this part of the build.
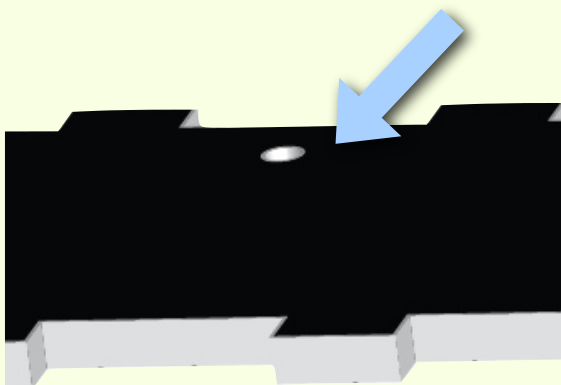
NB: The 'Visible when finished parts' do not have tabs or holes in them, and they have double sided acrylic tape pre applied.

The internal top & bottom parts have an indicator circle cut into them. These circles show the 'back side' of the clock. You will see these on the 2 internal sides, as well as the the top and bottom parts.

De-burr the plastic tabs

Unwrap the plastic from the protective bubble-wrap. There are 5 acrylic parts that have plastic tabs. To aid in the plastic assembly, you will need to lightly sand the edges of the plastic tabs. When acrylic is laser cut, the flat sides end up with a slight amount of burr. If you run the tip of your finger out towards an edge, you can sometimes feel a slight ridge. These ridges need to be removed from the tabs, or you may experience difficulty fitting the tabs into the slots.

Without removing the plastic protective film, carefully run these tabs against some sandpaper, or an abrasive sanding sponge. It is better to sand these pieces lightly and multiple times, rather than pressing hard for only a few swipes. When you can run your finger along the tabs and you don't feel any burrs, continue with the rest of the pieces until you're finished. Another way to determining if you've sanded enough is when the blue protective sheeting has been worn off the tab, that's a good time to stop.

The only parts that need to have the tabs sanded are, (C) PCB Layer, (H & G) Structural top and bottom, left and right.
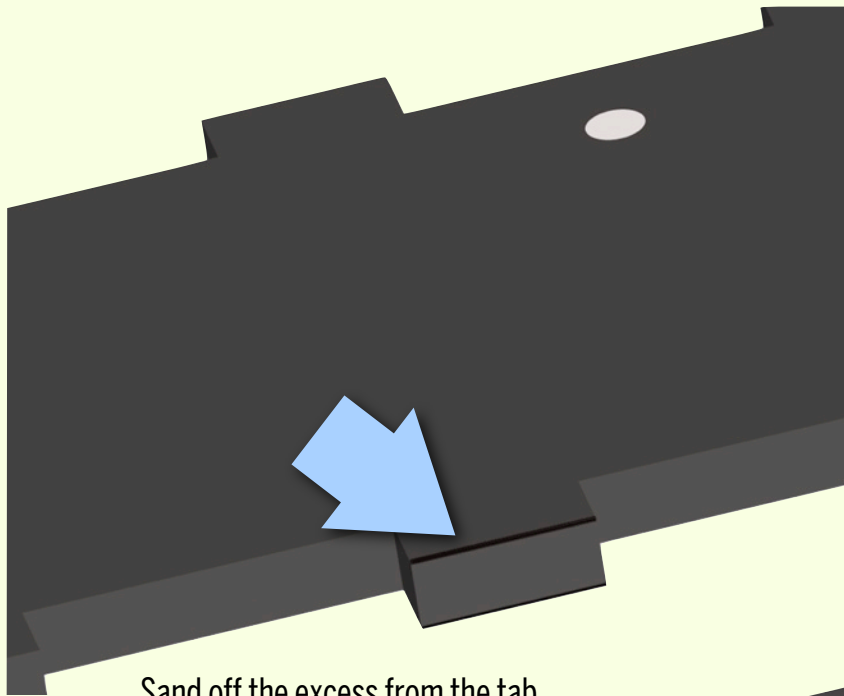
Sand off the excess from the tab.
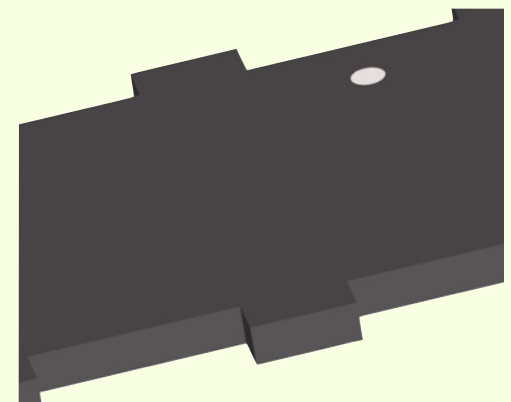
Make it smooth like above.

Peeling the protective film

Start by peeling the protective sheeting (seen in blue below) from these acrylic parts only.
None of these parts will have visible faces once the build is complete. You still need to be careful not to accidentally crack the thin pieces. The structural front (D) in particular.

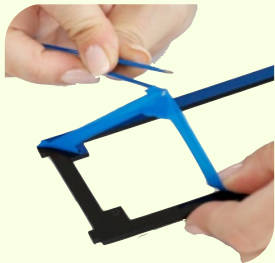**PCB Layer (C)** **Structural top and bottom (H)** **Structural front (D)** **Structural sides left and right (G)** **Structural back panel (B)**
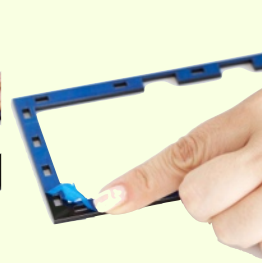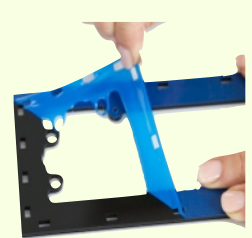
Check all of the holes. (In structural pieces) If there are small rectangular bits stuck, free them now. These are remnants that didn't fall out while these pieces were in the laser cutter.

Structural housing parts

Take the PCB layer and place the top and bottom structural pieces with the indicator circles both on the same side.

The circles on the structural pieces indicate rear of the housing. The side structural pieces as well as the top and bottom pieces all need to have the circles on the same side. See photo (right)
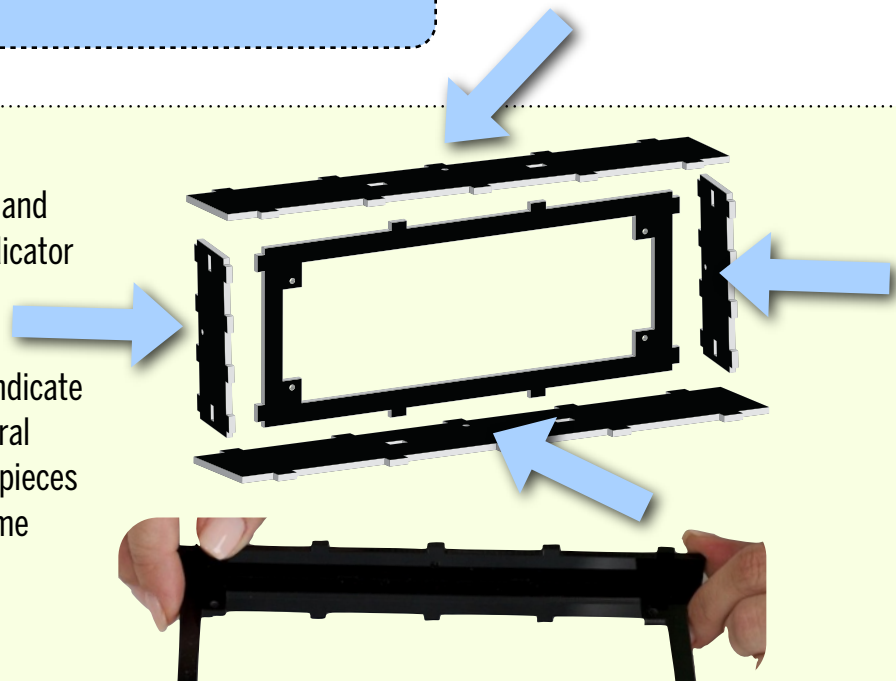
! If you feel a lot of resistance trying to get the tabs into the holes on a particular piece, flip it over lengthwise, and try inserting the tabs from the opposite side. All the while making sure that the indicator dots are all on the same side of the PCB layer. Parts still not fitting? Sand the tabs just a little more.

Assembling the structural housing
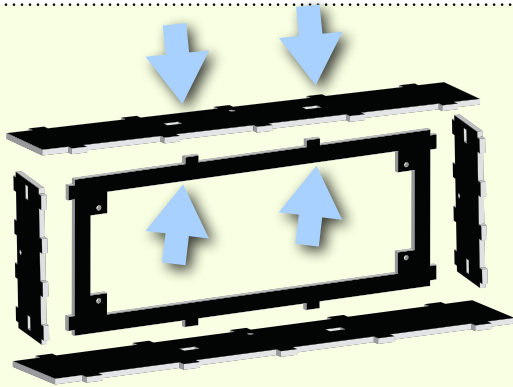
Once all the tabs are inside the holes, using only your fingers, pinch from the hole to the bottom of the tab, until each panel is as flush as possible with the PCB layer.

You don't want there to be any big gaps, especially along the length of the PCB layer. A hairline gap is acceptable. This housing has been designed to self-adjust in the steps that will follow.

You can pinch directly above and below a tab & hole to make it fit.

Prepare the PCB to be mounting inside the housing

To mount the populated & tested PCB, you will need to remove the first LED module. Leaving the other three in place. Gently wiggle it out, trying as much as you can to not bend the pins on the modules.

The less the legs bend on the way out, the easier it will be to re-insert in the next steps.

PCB mounting

Place the structural housing with the indicator up. The PCB assembly gets installed from the rear side.

Angle the PCB so that the PCB layer of acrylic comesbetween the bottom of the fourth LED module and the PCB. Then, place the side with the missing first LED down. The acrylic layer needs to be in contact with the PCB.
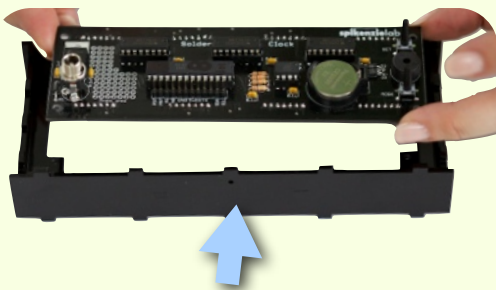
Indicator for the rear side

Putting back the LED matrix modules

Flip the assembly over in your hand, so the LED modules are aiming up towards you, and support the PCB from the backside. With the PCB loose, you can carefully re-insert the first LED module. It goes in the same orientation as before. Mind the notches on the long sides.

You may find it easier to skip down 2 steps, and screw the PCB in place for this step, depending on your preference.
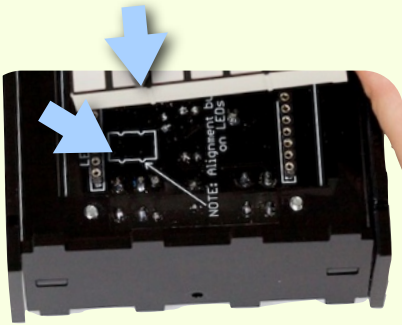
Test one last time...

Once the led modules are in place, and are flush, power up the PCB once again, to double check that the modules are all installed correctly. If a pin missed its connection, or a module is re-inserted wrong, it is easier to catch the mistake now, rather than later in the build.

Screwing the PCB to the structural housing
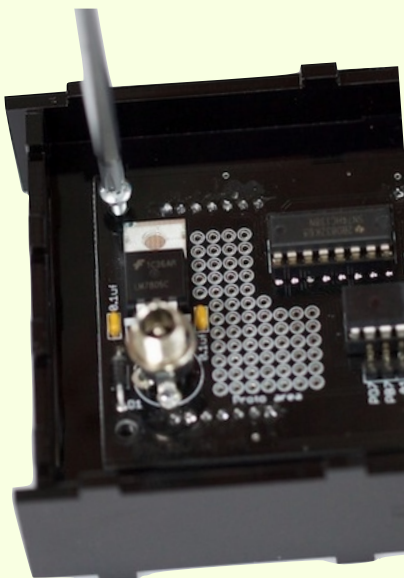
There are 4 x 1/4" (4-40) metal screws in your kit.

You are now going to screw the PCB in place. The machine screws go through the holes in the PCB, and set into tapped holes in the plastic 'PCB' layer.

Do not over-tighten!
Finger tight is enough to hold the PCB in place. If you over tighten, you will crack the PCB layer.

Repeat in each of the other 3 corners.

Front bezel & display filter

There are 3 pieces that make up the front face.

The structural front, the red filter and the front bezel.
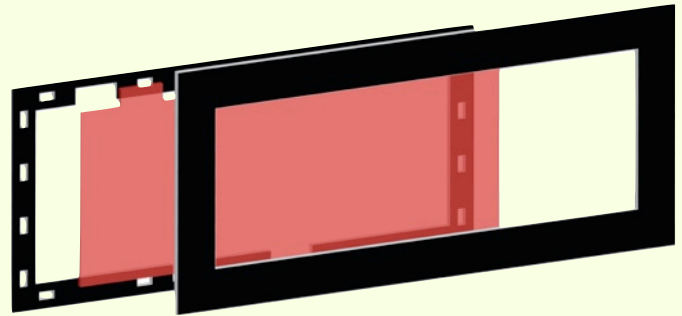
Front bezel bonding to front structural frame

Remove the slippery white double-sided tape covering from one of the bezels
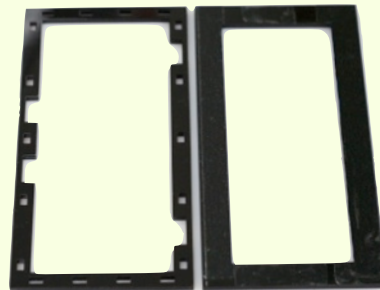
Peel both sides of the structural front piece (D) and lay it beside the bezel. (Leave the blue protective film on the other side of the bezel to protect it from dust and scratches during assembly.)

Position the structural layer (either side) perfectly square and flush on top of the double sided tape side of the bezel. Take your time, it has to be perfect.
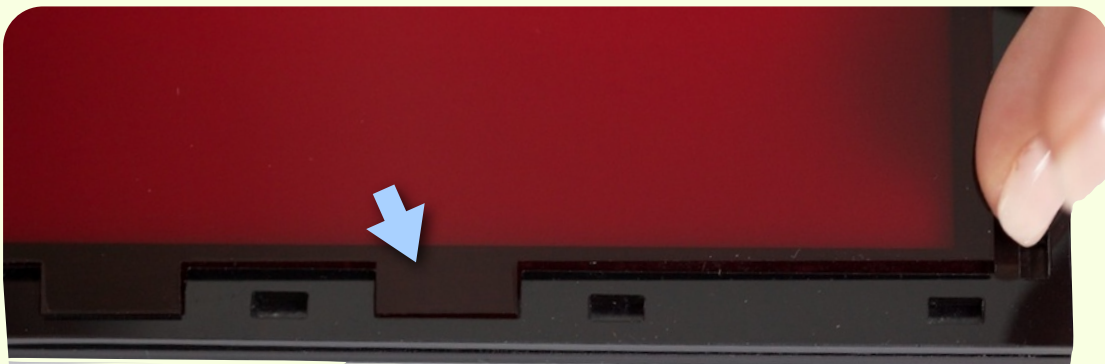
Peel the paper from both sides of the red filter, and place it 'into' the slots cut out to accept it on the structural front piece. Press firmly over the notched parts of the red filter, as well as around 1/8" tabs along the edge. The double sided tape will be holding the structural front, and red filter to the bezel.

Using a lint-free, clean cloth, wipe any dust from the inside of the red filter. Any dust trapped inside may be visible. If you need to use a liquid cleaner, we recommend spraying a very slight a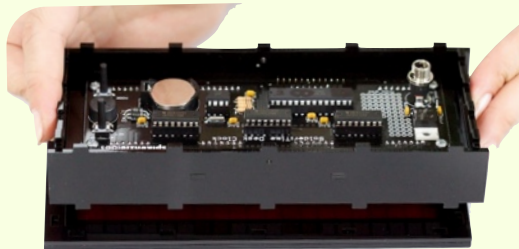mount of Windex™ on the cloth, and going over it a few times until it is perfectly clean. While you're at it, give the LED modules a very light dusting as well.

Carefully line up all of the structural tops and sides, so that their tabs are positioned over the holes. **Don't push it together yet.**

Now, place the rear structural panel over the button tops, and line up the tabs so that they are over the holes. **Make sure the tapped hole is towards the top, beside the SpikenzieLabs logo printed on the PCB.**
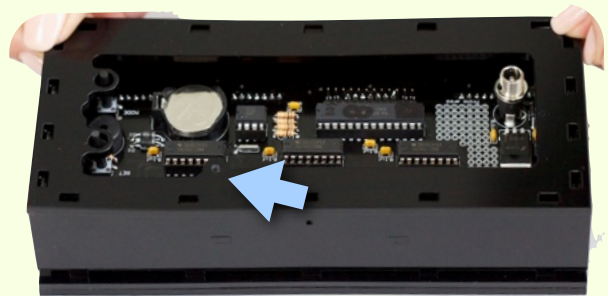
If everything looks like it is lining up, gently apply pressure in a circular manner. You don't want one part of the housing too tight before the rest. If you have one end that is seated before another, you can gently pry it loose with a flat blade screwdriver. Do it slowly, and carefully.

Going around the outside, gently ease it together as evenly as possible. Only apply pressure along the tab holes. Pressure on an edge / corner may crack the plastic.

Continue to gradually seal the housing until it can't get any tighter. Squeeze if necessary as in the photos (right).

You may hear a 'creaking' sound. That is the tabs locking into the holes. Continue until the tops and sides are inserted as far as they can go. If you get the feeling that the pieces are not going to fit, go over the tabs on both sides with a little more sandpaper.

Final structural assembly & compression

Here is a close up photo of the front side still having a tiny bit more to go. The rear side is fully tight. Continue working it until both the front and back are as tight as possible. Also check the left and right sides.

You may be tempted to switch to a hammering technique, or use a pneumatic impact wrench. Although these would work wonderfully, it is not advised.

! **Don't lay the clock down on it's rear side, the buttons and DC barrel jack protrude further than the rear face, and you will cause damage to those parts if you try.**

Applying the rear bezel

Once all of the compressing is complete, it is time to mount the rear panel bezel. Peel the white double sided tape covering off, and mount it to the rear panel so that it is flush with all four sides.

A technique we've used is to put your fingers along the left or right sides of the clock, and touch the end of the bezel down. Adjust it, and as you're gently laying it flat, run your fingers around the top and bottom, gently pushing so that the edges are flush. Once it is set in place there is no 'give' so do this step slowly, and carefully.

If this piece is installed slightly shifted, the last remaining piece (clear rear cover 1/16") will not fit properly.
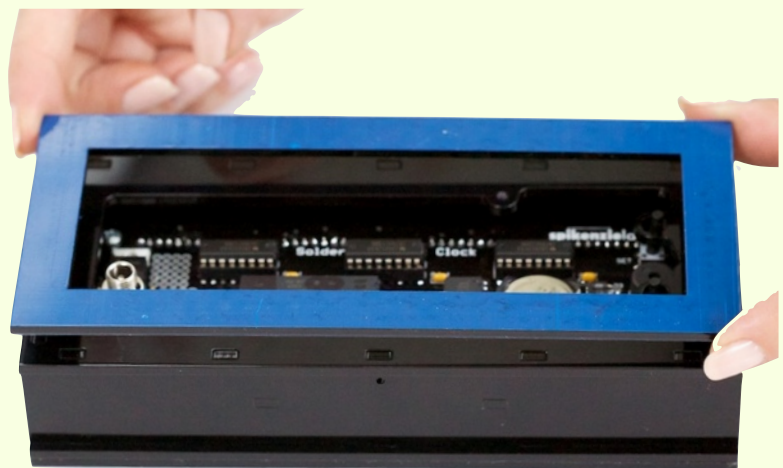
Peel the blue film, and white masking tape from the last remaining piece.

When the masking tape is coming free, there will be some remnants on the etched text. Remove it, and polish with some Windex™ if need be.

Lay the clear rear cover over the button posts, and then over the DC barrel jack. It will be resting on a ledge. Test press the buttons to make sure they both can be pressed, and move freely.
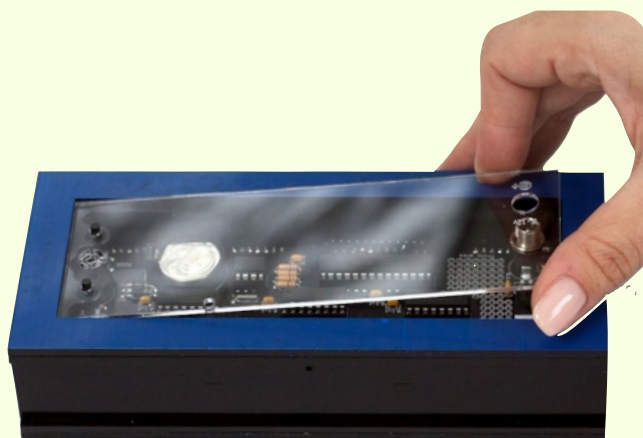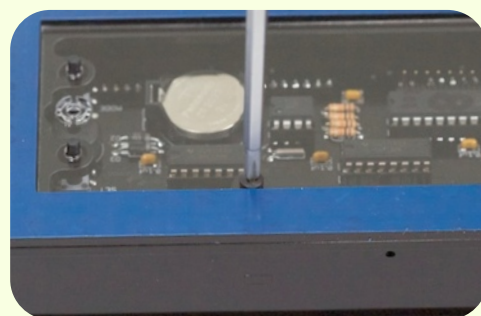

Place the DC barrel jack washer over the DC barrel jack.

Finger tighten the DC barrel jack nut. Tighten as much as you can without using tools.

Take the remaining black screw, and finger tighten it through the hole into the rear structural layer.

Side bezels installation

Test fit the side bezels in place by fitting an edge within the space. There should be the most minimal amount of clearance. If you can wiggle it any more than about 1/32" of an inch, go back and compress the housing some more.

Once satisfied, remove the white backing, revealing the double-sided acrylic tape from the left and right bezels, and drop them in place. They will stick and hold in place. You can leave the blue protective film in place until you are finished the entire build, and then remove all of the blue film at once.
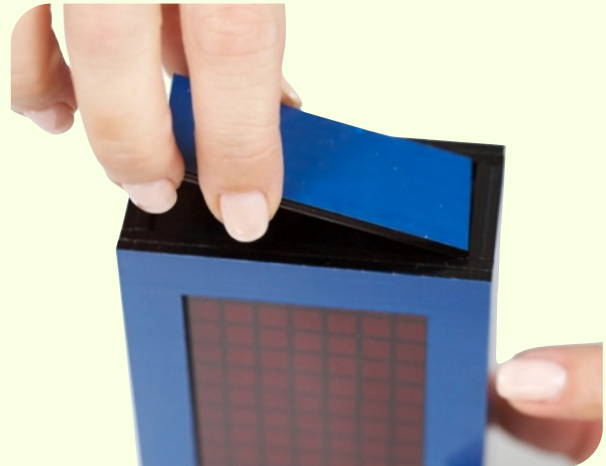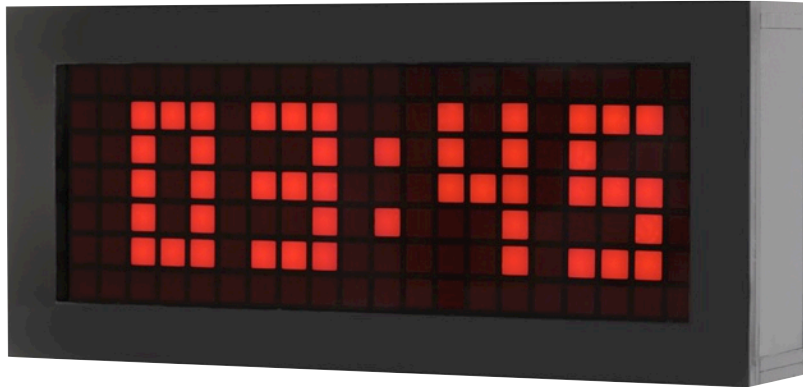

In the same fashion, test fit, then peel the top and bottom bezels. When you're satisfied, remove the backing and stick them in place. You want to make sure they are as centered as possible.

Very last step: Peel the blue protective covering. Start at one corner, and pull it away. Don't use a sharp object to get it started. A fingernail works best.

If you've run into a problem during the build, and you need some assistance, support@spikenzielabs.com is the place to get help.

For comments, other than support related inquiries, please email feedback@spikenzielabs.com, we would love to hear from you.

Follow us on twitter : @spikenzielabs

Thank you

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[Adafruit](#):
  [1530](#)