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The Useless Machine™ DIY Soldering Edition

Instruction Guide

v0004

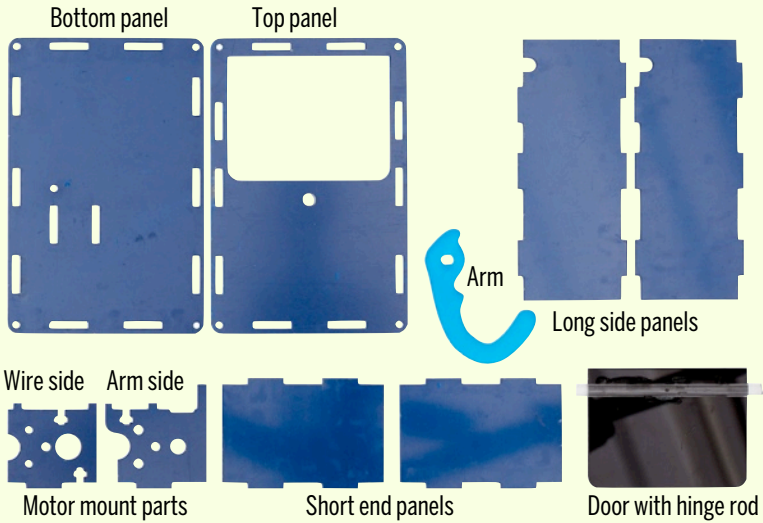
For the best outcome, follow each step in order.
We recommend reading this guide entirely before you get started.



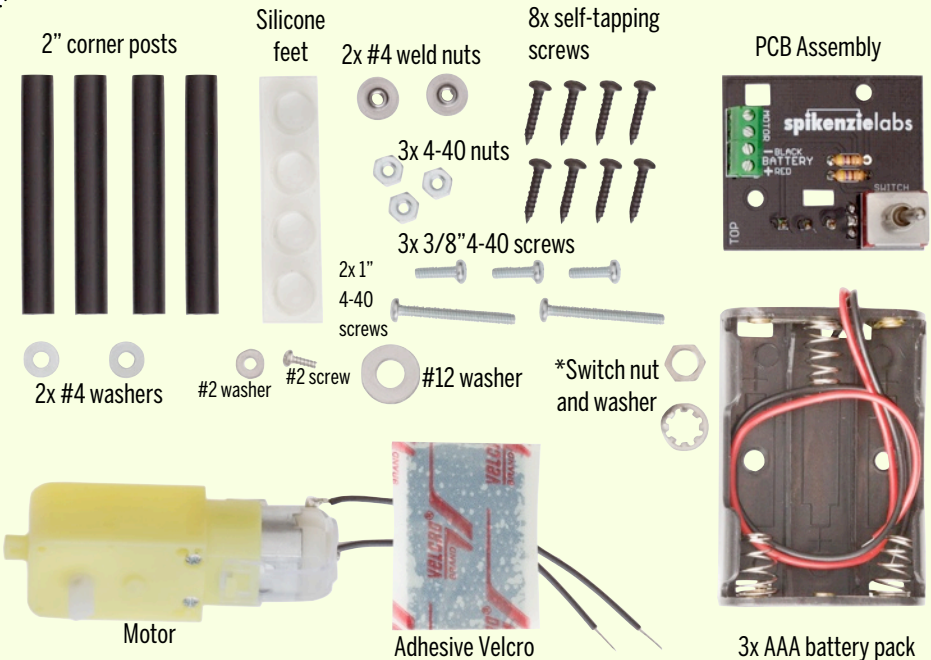
Tools required:

Soldering iron, solder, flush cutters
One phillips screwdriver, and one flat screwdriver.

Laser cut acrylic parts



Electronics and hardware



* The nut and lock washer may have shipped on the switch rather than in the hardware bag. If this is the case, remove all the washers and nuts from the switch. Discard the extra nut and flanged washer.

Assembling the PCB

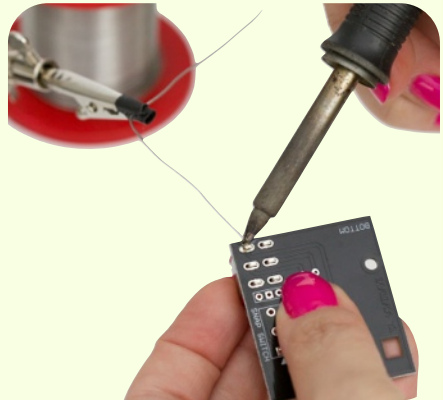
Switch Installation:

Make sure that the switch is being installed on the top side of PCB. There is no orientation to the switch. Refer to these photos.



Switch Soldering:

The switch needs to be standing **perfectly vertical on the PCB**. We use a 'Helping Hands' tool to hold the solder. This way, your fingers hold the switch, and the other hand is free to solder. Solder one tab, and see if the switch is 90° to the PCB.



Resistor Preparation:

There are 2 resistors in the kit. One 100 Ohm (brown black brown), gets installed into [R1]. The 220 Ohm (red-red-brown) gets installed in [R2].

Bend the legs like in the photos here, with the leg as close as possible to the body of the resistor.



Resistor placement and soldering:

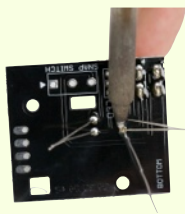


1- Place the resistors in place as the photo above.

2- Flare the legs to hold the resistors in place



3- Solder the 4 legs on the bottom side of the PCB.



4- While wearing safety glasses,

Trim the excess.



Screw terminal placement and soldering:



1- Slide the 2 screw terminals together joining them into one single 4 pin strip.

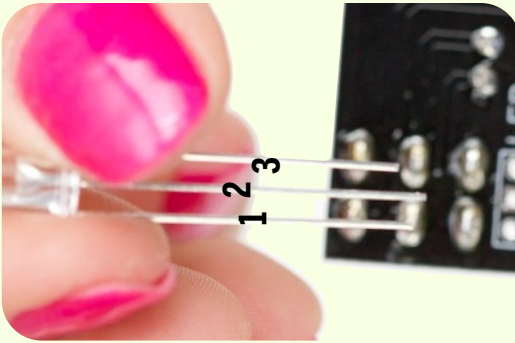
2- The holes in the screw terminals need to be aiming away from the switch.



3- Solder all 4 pins.



Aligning and soldering the LED:



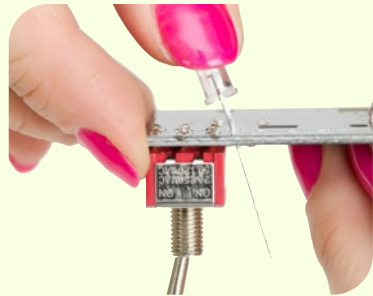
1- Notice the different lengths of the legs on the LED. Leg #2 is the longest. #1 is the second longest, and #3 is the shortest.

The LED gets installed with leg #1 closest to the edge of the PCB.

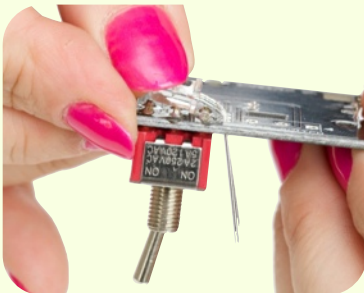
Important to note:
The LED gets installed on the bottom side of the PCB.



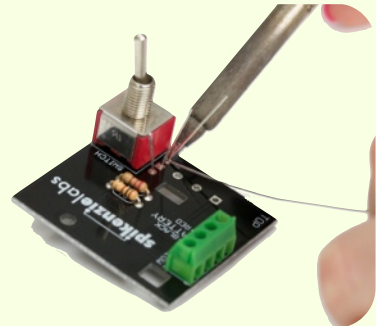
2- Slide the 3 LED legs down through the holes in the PCB.



3- Leaving about .25" of leg bend the LED so that it can bend like the photo in step #4.

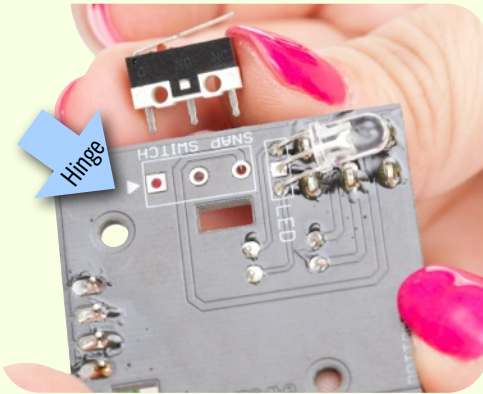


4- Bend the led like in this photo, and hold it in place.



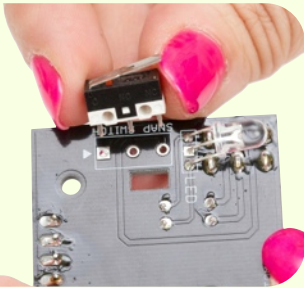
5- Solder the three legs of the LED, and snip the excess.

Placing and installing the snap switch:

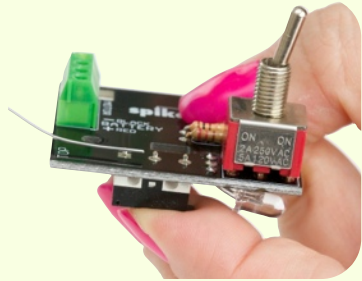


1- The snap switch gets installed on the bottom side of the PCB.

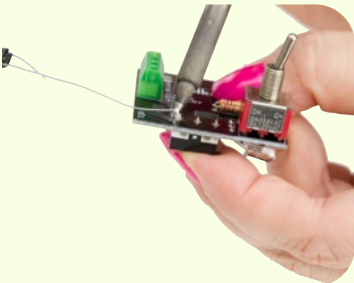
The hinge side of the snap switch goes on the indicated side on the PCB.



2- Line up the 3 pins with the three holes on the PCB.



3- Press firmly on the snap switch, making sure it is flush with the surface of the PCB.



4- Solder one pin, and check to make sure the snap switch is flush with the PCB.



5- Solder the other two pins.

Peel the protective film

All of the acrylic parts have a cling film that protects the pieces during manufacturing and transport. The film or tape may be blue, brown, white or clear. Start at a corner, and remove the film from both sides of each piece. Place the peeled parts aside on a clean surface.

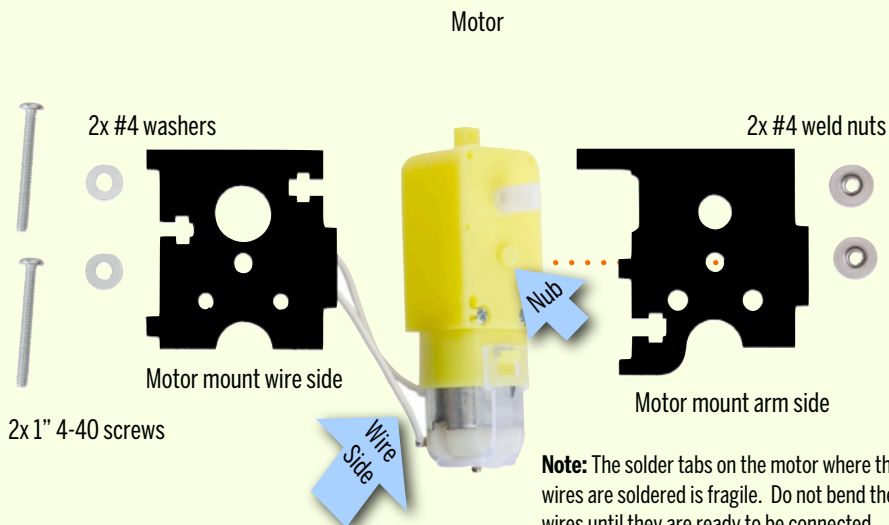


Etched parts are covered by a special masking paper. Sometimes the glue from the tape is difficult to remove. If there is stubborn glue residue left from the masking tape, the best way to clean it is using some WD-40, which will remove the glue.

Follow this with some Windex, and the part will be clean. Never use an alcohol based cleaner.

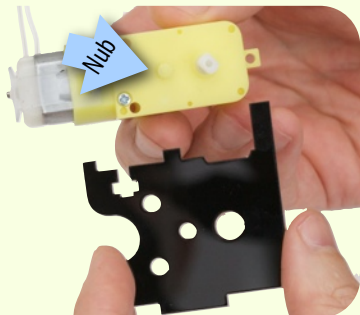
Ready the motor, motor mount, and fasteners

Line up the 2 long screws, 2 small washers, 2 motor mount acrylic pieces, and weld nuts as you see below.

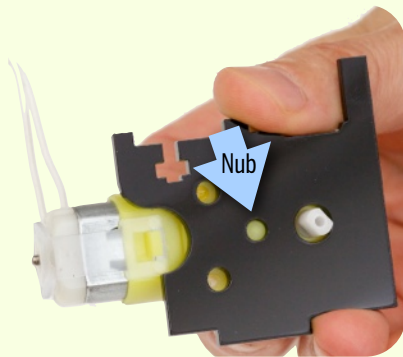


Attaching the motor to the mount

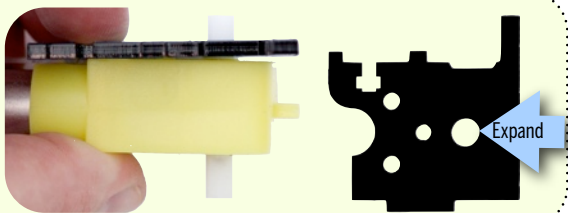
Hold the motor with the wires on the left and away from you. The 'nub' facing you.



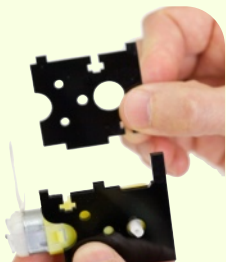
Place the arm side motor mount acrylic piece over the motor, making sure that the 'nub' fits in the hole in the mount.



If the arm side motor mount is not fitting flush against the motor: Use a hobby knife to expand the hole in the motor mount.



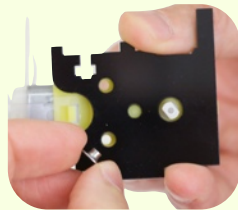
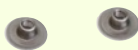
If the mount is not flush, the motor may be squeezed, interfering with the gears inside. This causes the motor to possibly not flip the switch.



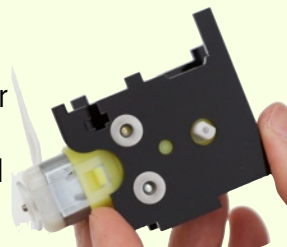
Hold the other motor mount as above. Place against the wire side of the motor

Place the weld nuts into the holes on the arm side of motor mount.

The weld nuts

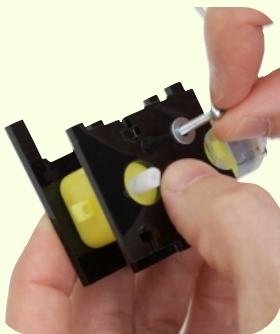


Hold the weld nuts in place with tape or your fingers. In the next step we will be screwing them in place.





Place a washer on each of the long screws



While holding the weld nuts in place, slide both screws through the washers, motor mount, motor and screw into the weld nut. For the moment, leave the screws loose enough so that the motor mount plastic can wiggle a little.



With the screws a little loose, press down against a flat surface, so that the both bottoms of the motor mount are flat.



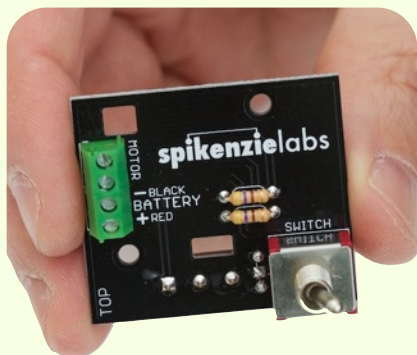
Keeping the bottoms of the motor mount flat against the surface, tighten both screws.



**Do not over-tighten,
you may crush the motor.**

Attaching the PCB assembly

Remove the PCB assembly from the bag.



Place the PCB assembly over the motor assembly.

Note how the acrylic tabs fit through the holes in the PCB.



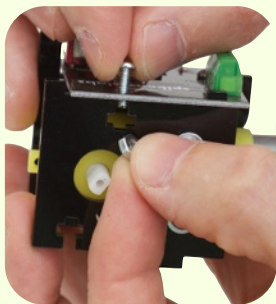
You will be using these nuts and screws to hold secure the PCB to the motor mount.

3/8" 4-40 screws

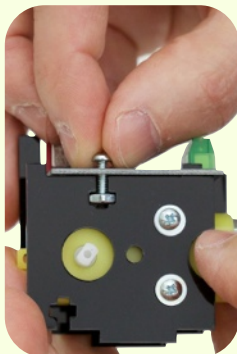


4-40 nuts

Slide the nut into the slotted area in the mount, and start sliding the screw through the hole in the PCB.



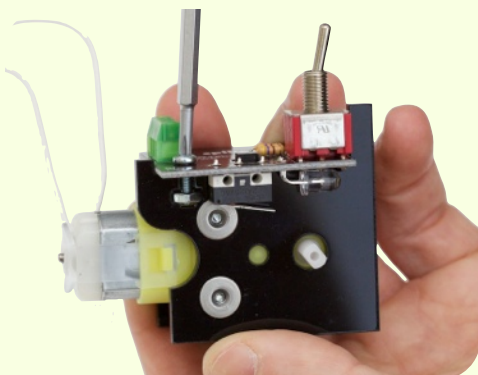
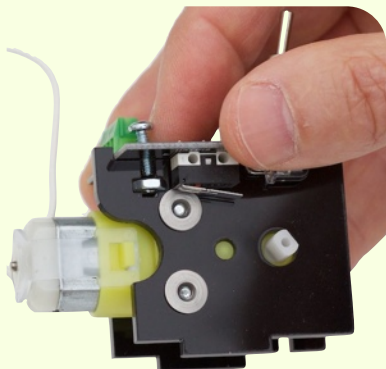
Using your fingers, tighten the screw. Make sure the nut does not slide out.



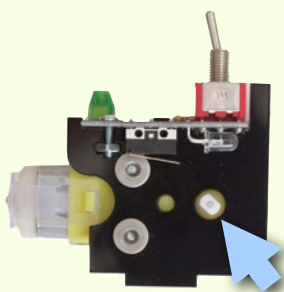
Finish tightening the screw using a screwdriver.



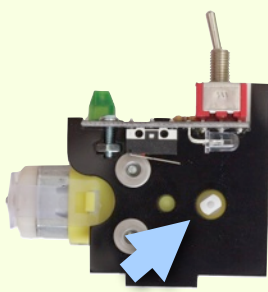
In the same way, slide in the other nut, on the other side, and attach the other screw.



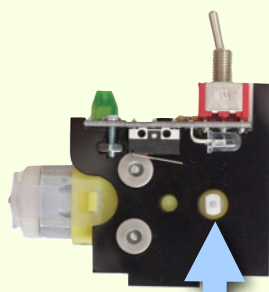
In order to attach the arm, the motor spindle should be in the 12 o'clock position (or close to it). Check yours.



Bad



Bad



Good

12 o'clock position

If your motor happens to be in the correct 12 o'clock position, skip to: **Attaching the arm**

Adjusting the motor shaft position



Skip this step if your motor shaft is already in a 12 o'clock position - from the previous step

Do not try to twist the motor spindle by hand, or using the arm. We will show you how to use the battery pack to rotate the motor.



Load 3x AAA batteries into the battery holder.



Touch the red and black wires to the wires connected to the motor. Pull one of the wires away and check the position of the motor shaft. Repeat until you have the motor shaft at a 12 o'clock position. Really close is good too. Once done, remove the batteries from the holder and set it aside.

Attaching the arm

Locate these parts:



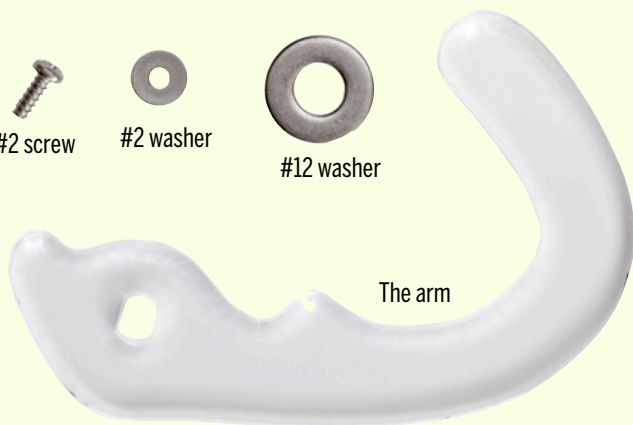
#2 screw



#2 washer



#12 washer

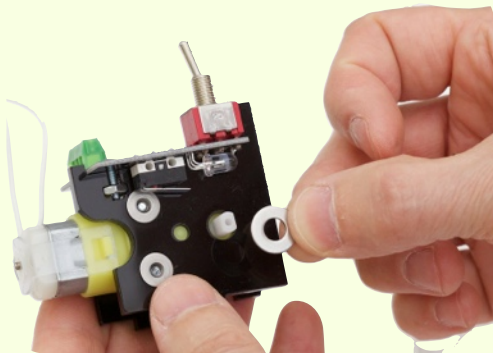


The arm

Place the large washer over the motor spindle.

Note: The washer and arm get attached to the LED / Switch side.

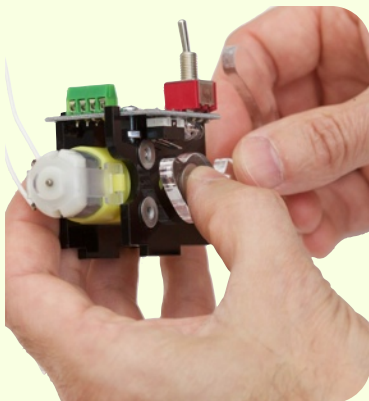
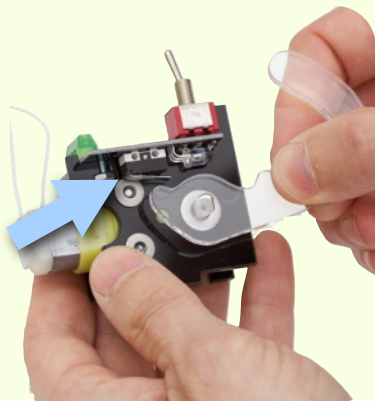
The large washer in place.



Align the arm piece so that the laser cut hole will fit the motor spindle. Press the arm over the spindle until the top of the spindle and the arm plastic are flush. The arm does not get pushed all the way down to the washer.



Make sure not to bend the lever on the snap switch with the arm as you are attaching the arm to the motor spindle.

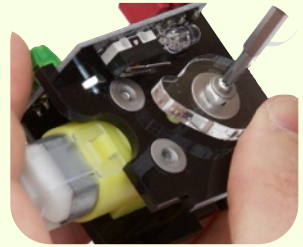


**Do not try to move the arm with your hand.
You will break the gears in the motor**

Put the #2 washer on the #2 screw.



Using a screwdriver, screw in the screw and washer to secure the arm.



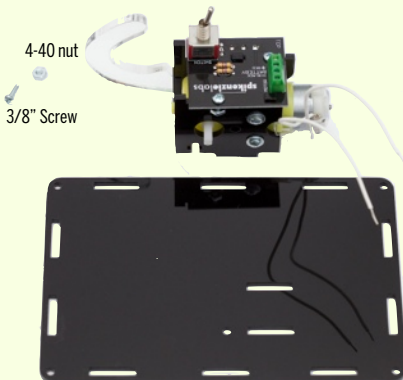
Installing completed motor assembly

Next, we will be attaching the bottom panel

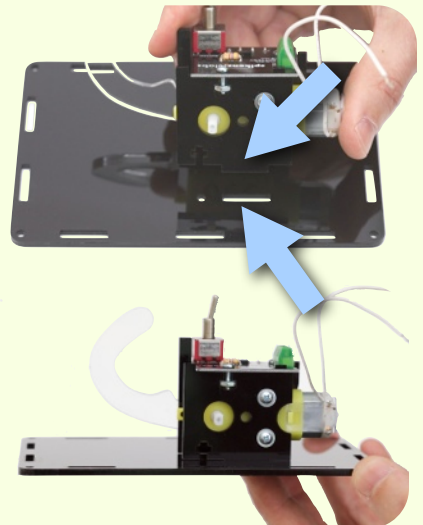


Set up the bottom panel, and the motor assembly in this orientation in front of you.

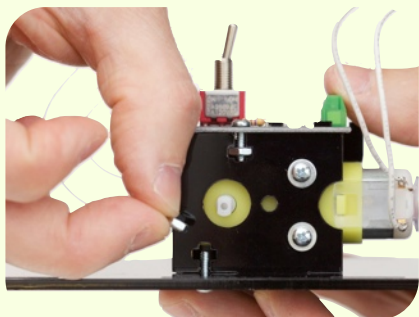
Note the hole, and the 2 slots. The bottom cover is otherwise symmetrical.



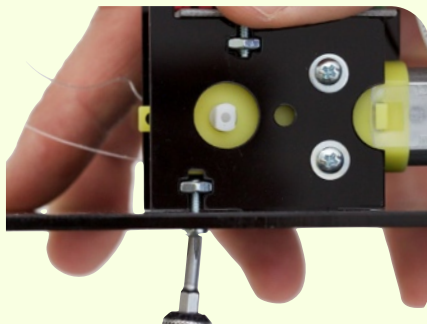
Line up the 2 slots, and place the motor assembly in place.



Slide the screw up through the bottom cover, and side the nut in so it rests in the slot.



Tighten with a screwdriver, do not over tighten.



Silicone feet application

There are 4 silicone feet that shipped in your kit. Place one in each corner, about 3/4" in from each corner. Once in place, press down firmly.

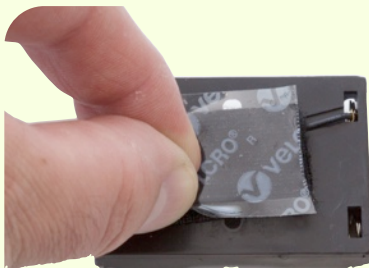


Velcro and the battery holder preparation

Peel one side of the Velcro backing

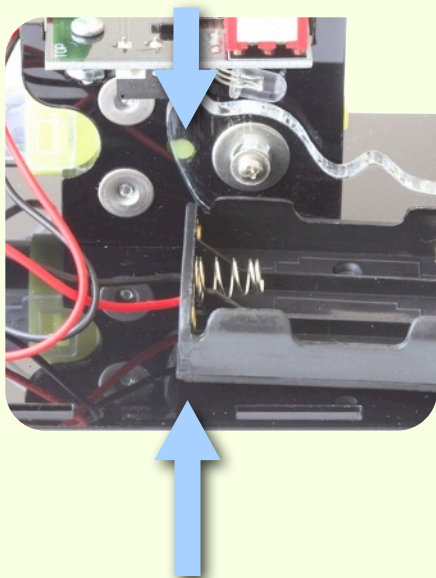


Place the sticky side down on the bottom of the battery holder. Press firmly so the sticky side bonds.

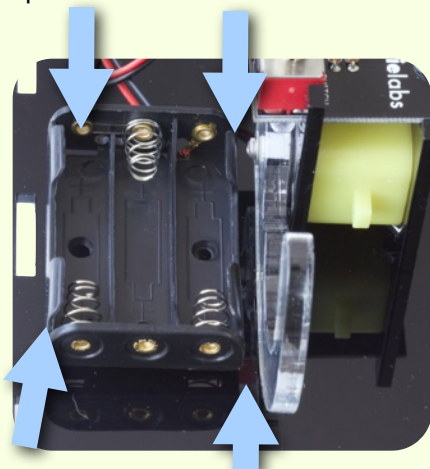


Battery holder installation

The placement for the battery holder is indicated in these photos. Left side of the battery holder is inline with the 'nub' on the motor.



The right side has an equal distance between the arm and the slots along the left side of the bottom panel. Installed in this way, the battery holder is accessible, and will not interfere with the arm operation.



Peel the other side of the velcro backing, and attach the battery holder to the bottom panel.

Attaching the wires

To attach the wires, you will need a small flat blade screwdriver. Start by sliding the black wire from the battery pack in to the screw terminal marked **-BLACK** on the PCB.



The red wire from the battery pack goes to the **+RED** screw terminal. Screw both in place.



Note: Make sure to tighten the screw terminals onto the bare wire, and not the colored plastic casing. You may have to loosen the screw terminal in order to get the wire in.

The bottom wire coming off the motor goes beside the black wire. Handle these wires carefully, the terminals on the motor are not very robust. Slide in and screw down the wire.



The top wire from the motor connects to the last screw terminal. Slide it in place, and screw it down.



Motor and wiring testing flowchart

Flip switch - away from arm



Install batteries



Arm should move down
(If not already in
the down position)



Flip switch - towards arm



Works well?

→ No

Yes



Continue to next step

Troubleshooting

No movement at all:

- Check batteries.
- Verify black goes to (-) and red to (+) on the PCB assembly.
- Make sure bare wire is making contact in each of the screw terminals, and not the plastic covering.

Arm does not fully toggle the switch:

- Loosen the two motor mount screws slightly (2x 1" 4-40 screws)
- Check motor mount for flush fit against motor. See Attaching the motor step.

Arm moves the wrong way:

- Switch the position of the two wires from the motor going to the screw terminals on the PCB assembly.

After troubleshooting, test again.

Door doesn't close all the way:

- Slightly shave the edges of the door using a sharp hobby knife. Dulling the edge of the acrylic should fix this.

Inspecting the corner posts

Inspect the 4 corner posts.
Remove any burrs on the ends
of the plastic rods left from the
manufacturing process.



Corner post pre screwing

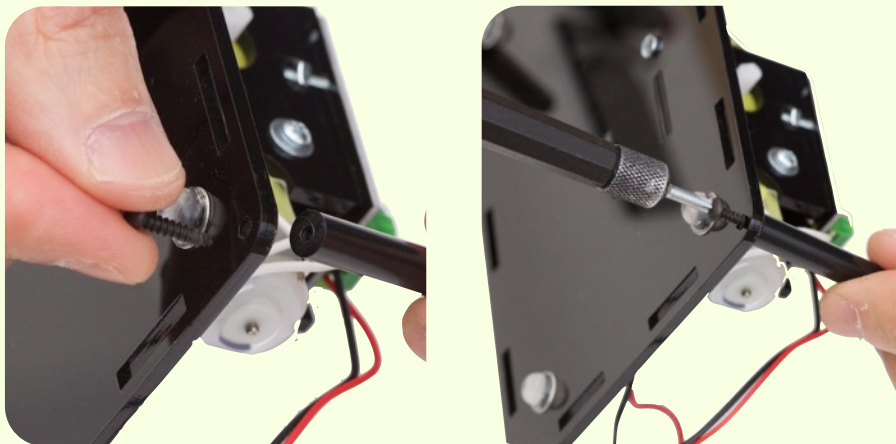
Included in your kit, there are 8 self-tapping screws, and 4 posts. To make the final assembly easier, we recommend screwing and unscrewing each of the screws to the hollow posts. Doing this cuts a path inside the post, and makes the final assembly easier. Do this for all 8 holes in the posts. You won't be able to grip these posts as well during the final build. Remember to remove the screws before continuing.



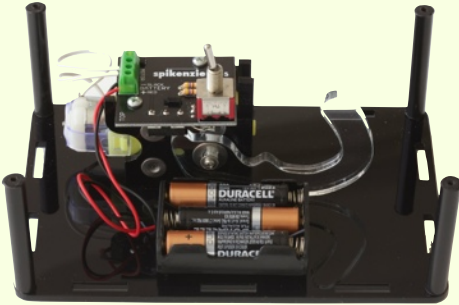
Hint: Hard time gripping the rod? Wrap an elastic band around it for a better grip.

Corner post mounting

Screw posts to all 4 corners of the bottom panel. Send the screw in from the bottom, and hold the post firmly. Don't lift the assembly by the post. You may crack the corner. You should also not over-tighten these. The screws can crack the bottom panel if you over-tighten. See the photos below:



Continue in the same manner for the other 3 posts.
When complete, you should have something that looks like this:



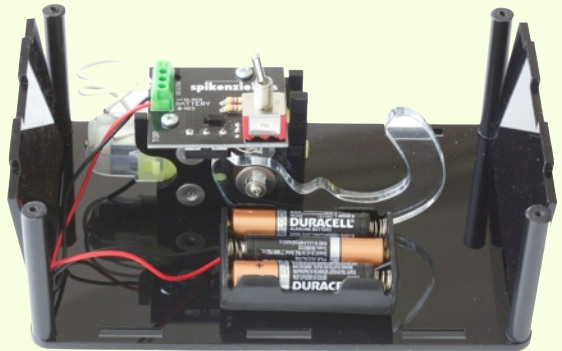
Note: Take some time to carefully bend the wires away from the mechanism (Arm, and bottom of the PCB).

Bunch the battery wires behind the batteries. The extra wire length makes it easy to change the batteries.

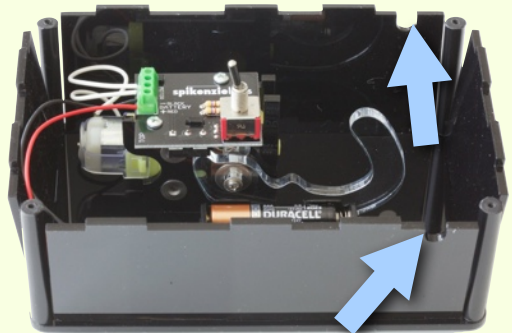
Sides, door and top panel installation

Place the short end panels in place.

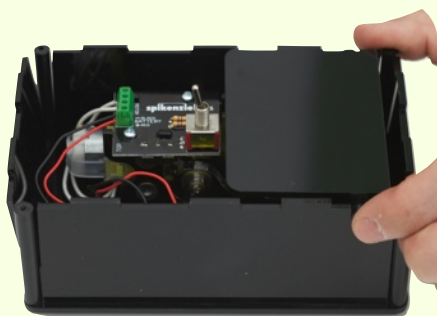
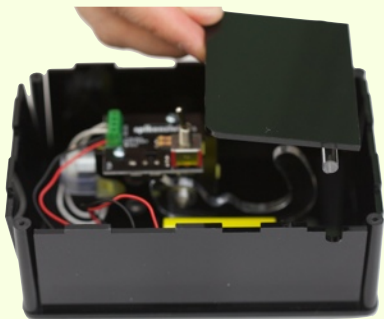
The end panel marked “Useless Machine” should be installed in the side closest to the arm with the text facing the outside of the box



The long side panels need to be installed with the hinge curves on the arm side.



Place the acrylic rod that is glued to the bottom of the door into the hinge curves on the long sides.



Place the top cover over the toggle switch, and fit it carefully over the door. If everything collapses when you're going about this, just put the parts back in place.



Move each of the side panels so that the tabs from all 4 sides are held within the slots on the top panel.

It can be helpful to pop open the door and press gently on a side piece that is tilted towards the inside of the box.

Note: No force is needed. It may take a few minutes of jiggling to get all the pieces to fall into place.



Once the top panel is set, take the washer, and place it over the toggle button. (Curved side up)



Screw the nut down, finger tight only. Do not use any tools for this.



The remaining 4 black screws get sent through the holes in the corners of the top cover. Make sure that the screw and the round corner pieces are lining up as you go. Once again, do not over-tighten.



Only screw the top screws in until they touch the top piece of acrylic. If the corner posts are not flush, the top will flex. It is ideal to have the top piece laying flat.



 Bad

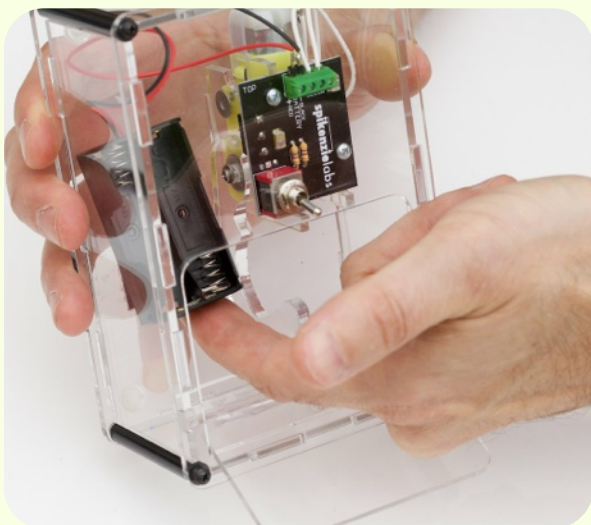


 Good

Battery Replacement

Changing the batteries is really easy.

Pop the door open, and reach in with one finger to free the battery case from the velcro.



Here we are showing a clear box for clarity.

With the battery holder out, you can change the batteries easily.

Replace the battery holder onto the velcro, and get back to the uselessness.

Make sure to keep the battery holder and wires clear of the arm.



Care and maintenance

Cleaning:

- No alcohol based cleaners.
- Windex and lint free cloth work best.

Other:

- Check for screws that have become loose.

Battery:

- Remove batteries for extended periods of storage.
- There is no 'off' switch, when the door is closed, the Useless Machine is 'off'

Handling:

- Do not drop it.

Tweet your build photos!

@spikenzielabs #uselessmachine

Help!

If you need some assistance, a part, or have a question? We are here for you.

E-mail us :

support@spikenzielabs.com

**Check out our other kits, available online,
or at finer electronics distributors.**



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