

Mechanical Blooming Flower

Assembly Guide

Created by Thomas Lamb – WMG Intern

Components



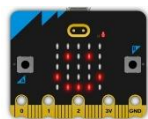
[Stepper Motor & Driver](#)



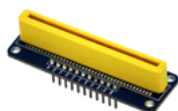
[Force Sensitive Resistor](#)



[Kitronik LED Ring](#)



[BBC Micro:bit v2](#)



[Micro:bit Expansion Board](#)



[USB Cable Splitter](#)



[Jumper Wires](#)



[M2 12mm Screw + M2 Nuts](#)

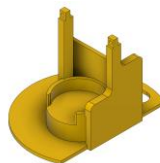


[USB Cable](#)

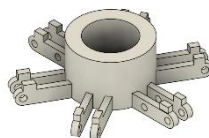
Printed Components



Outer Casing



Shelf



Stationary Fixing



Lid



Lead Screw



Mobile Fixing



Petal x6



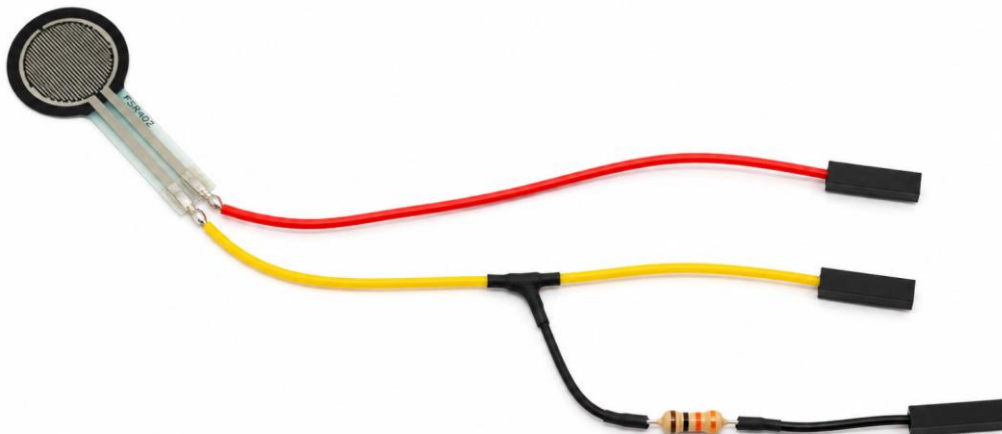
Linkage x12

Step 1:

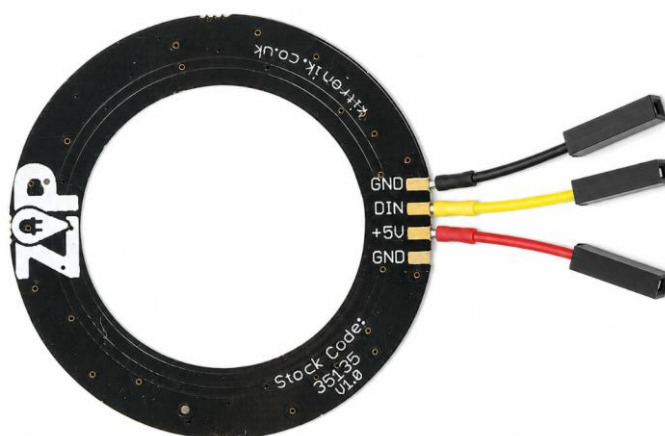
Cut a spare USB cable in half, and splice one end of the cable to two female jumper wires.

**Step 2:**

Create your force sensitive resistor (FSR) circuit by splicing together female jumper wires and a 10 k Ω resistor.

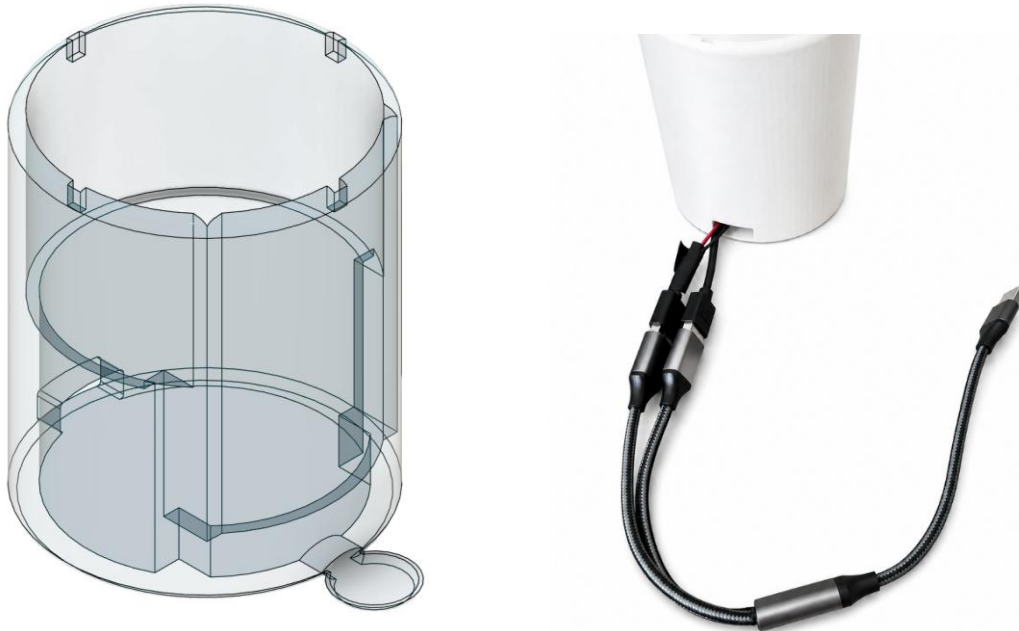
**Step 3:**

Solder short female jumper wires onto the LED ring as shown.



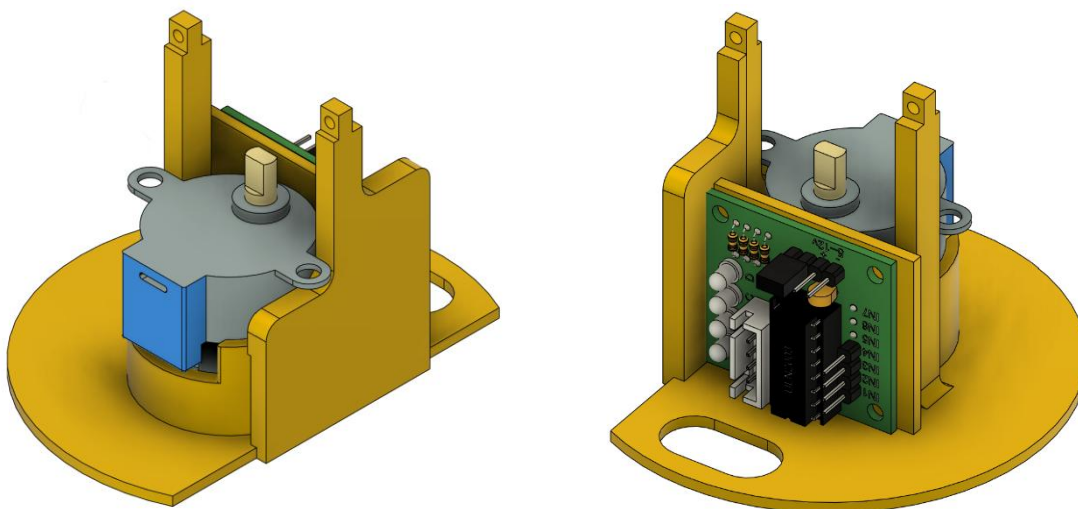
Step 4:

Print the outer casing. Use tree supports for the FSR and USB slots at the bottom of the design. Connect the USB cable splitter to the previously spliced USB cable (step 1) and the micro:bit data cable. Thread the USB cables through the slot as shown.



Step 5:

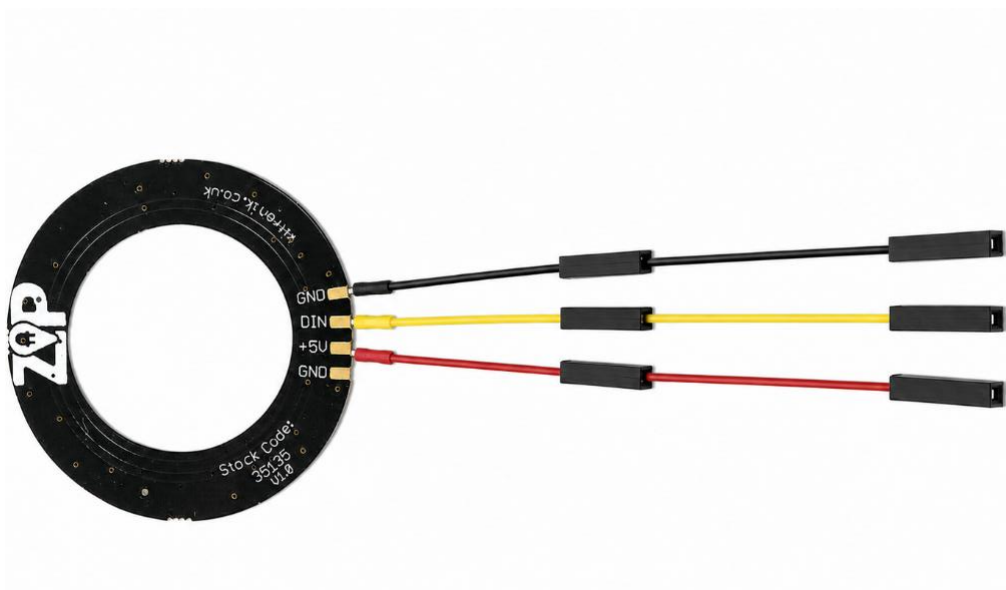
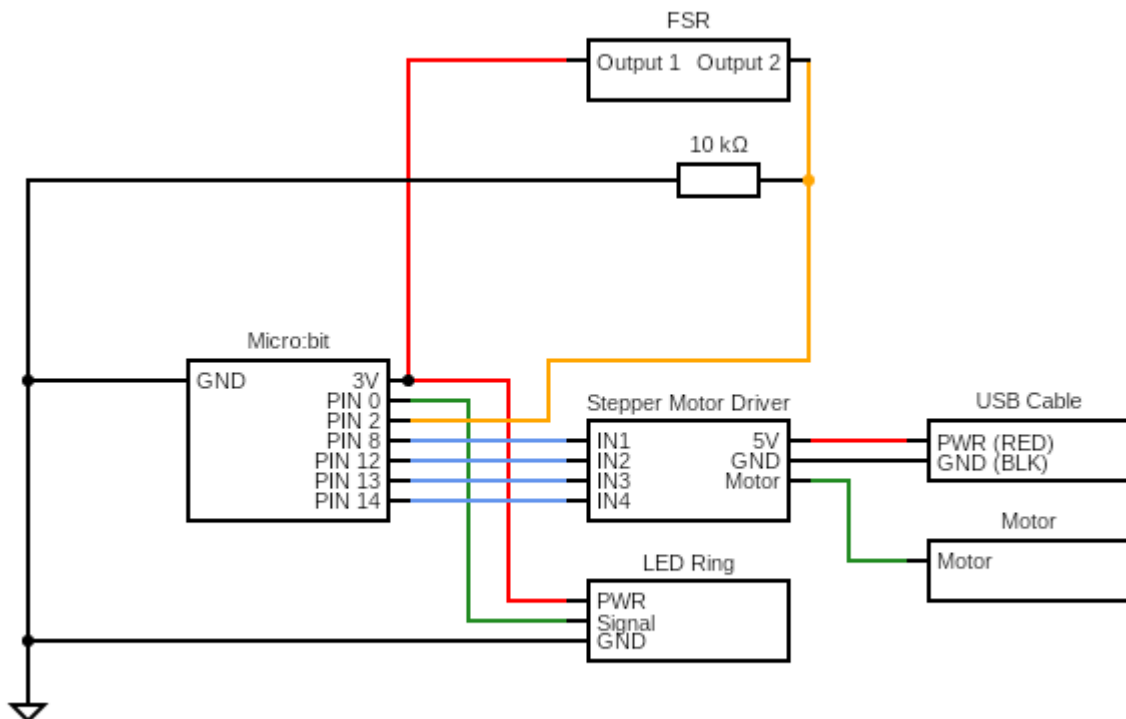
Print the shelf. Insert the stepper motor and stepper motor driver. It is recommended to hot glue these into position to keep them stable.



Step 6:

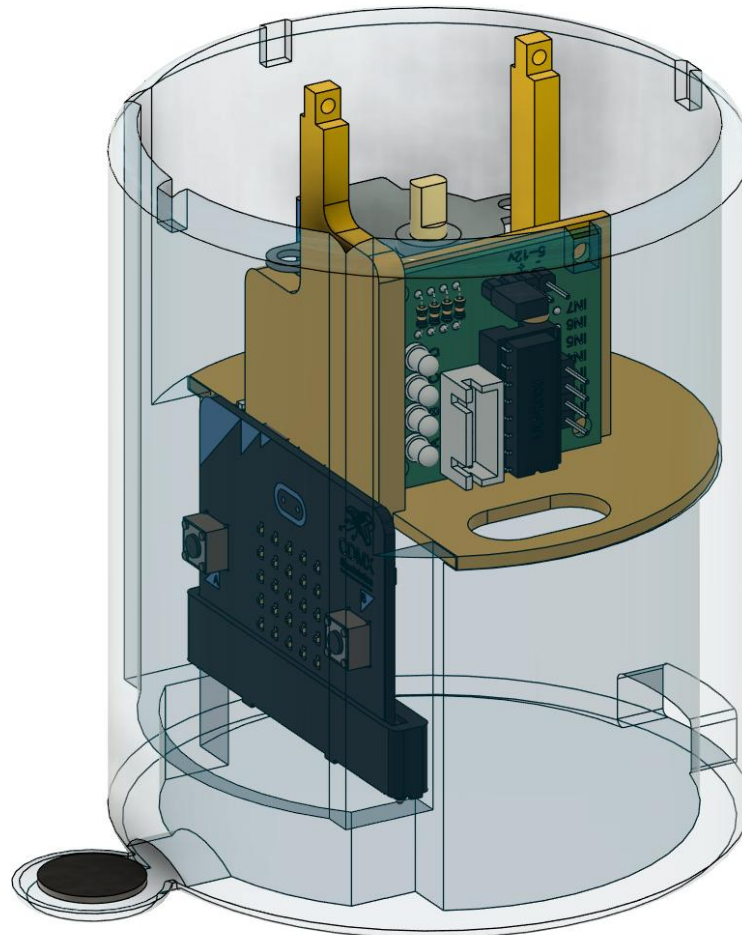
Insert the micro:bit into its expansion breakout board and connect its USB data cable. Wire all of the electrical components together using the following circuit diagram. You may have to splice PWR and GND wires together depending on the quantity of available headers on your expansion board.

I would recommend using extra male-to-female jumpers between the micro:bit and LED ring so the ring can be removed and is easily accessible without de-soldering. This is important to position the LED ring at the end of the instructions. Detach the LED ring for now, ensuring the 3 male-to female jumpers extending from the micro:bit are kept accessible.



Step 7:

Insert the FSR, micro:bit and shelf (with stepper motor and driver attached) into the outer casing as shown. A hole in the shelf is available for neat cable management. The shelf should slot into the outer casing. Hot glue or blue tac this down to prevent it coming out of place.



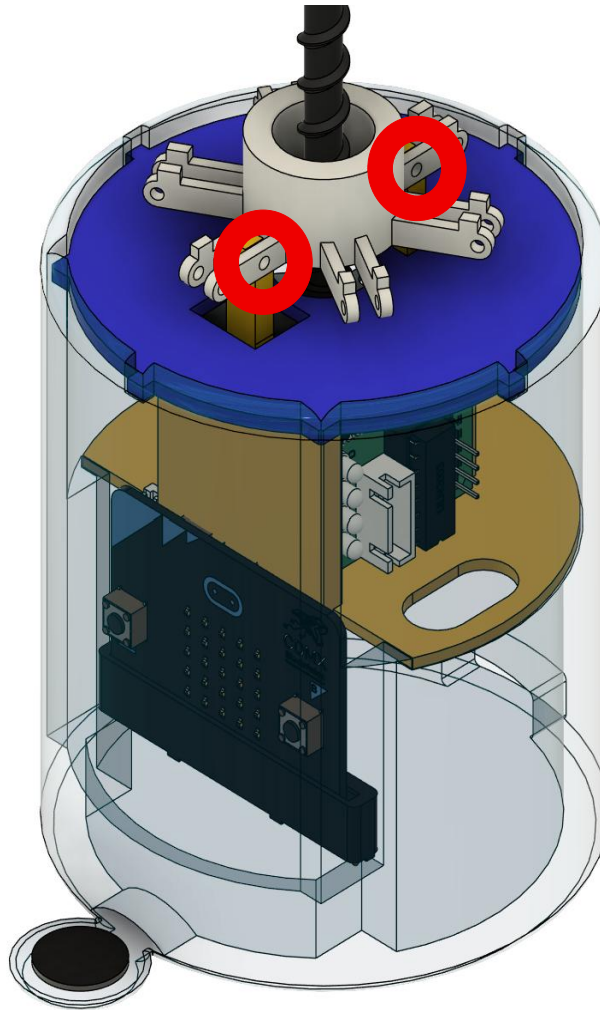
Step 8:

Print the lead screw, lid, and stationary fixing. The lead screw requires support. Remove the support and attach the lead screw to the stepper motor shaft. **Note:** carefully gluing the stepper's horn to the internal slot of the lead screw will extend the lifespan of the flower, but increases the risk of initially damaging the stepper motor if done improperly.

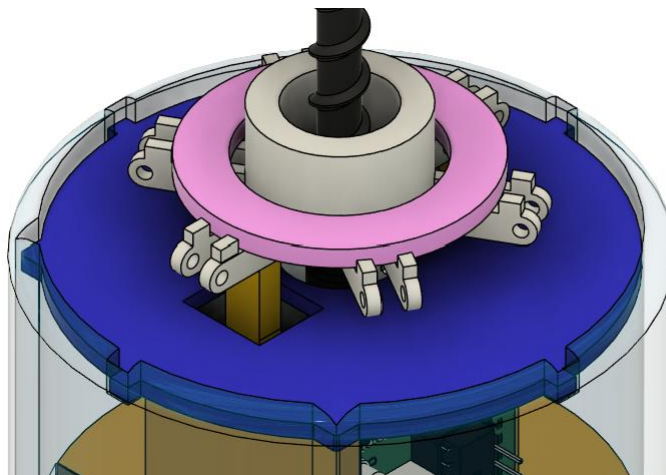


Step 9:

Insert the newly printed components into the design as shown. Screw down the holes in red.

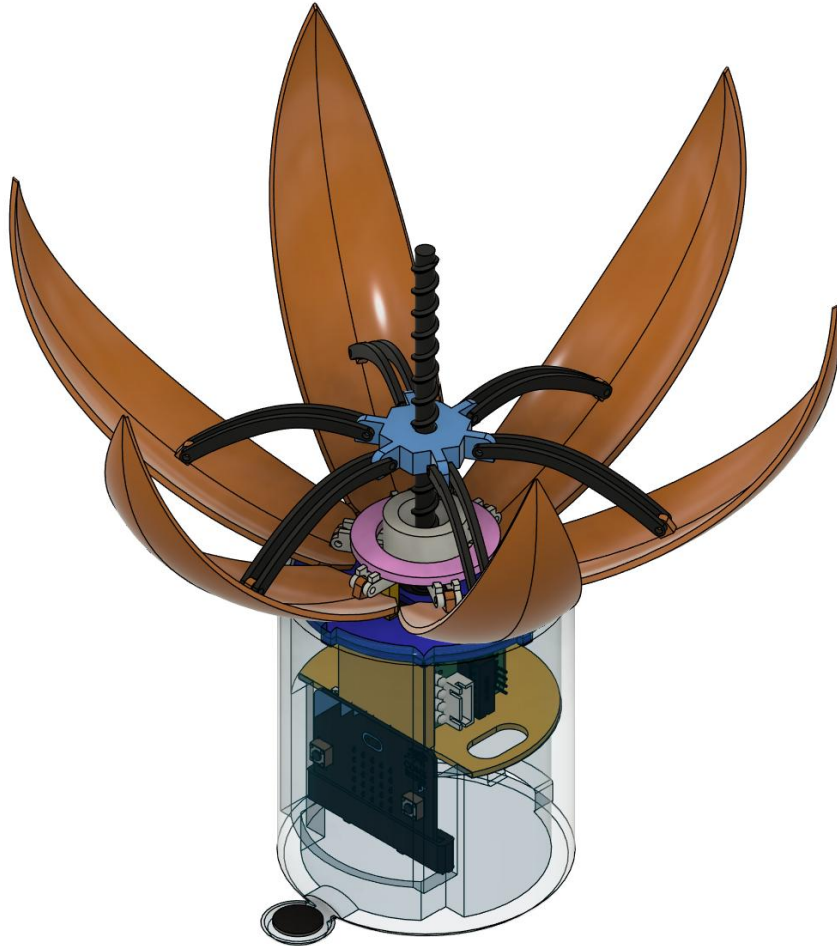
**Step 10:**

Rewire the LED ring by pulling the cables through the most sensible rectangular hole in the lid and connecting them to the female headers. Place the LED ring on the stationary fixing.

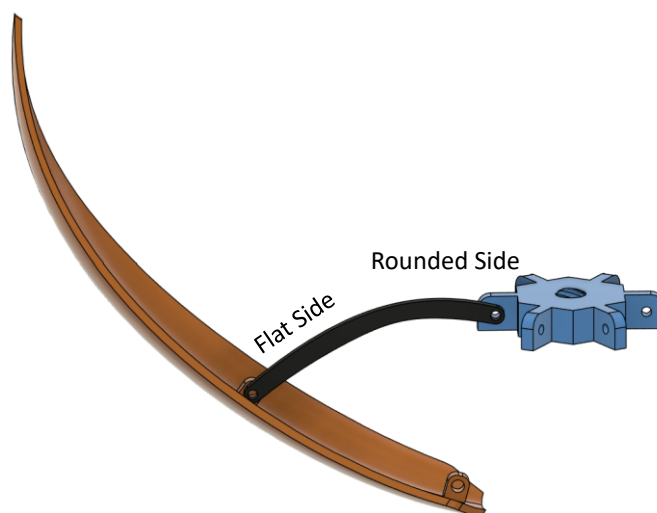


Step 11:

Print six individual petals using tree supports. Reducing the print speed during the final minutes of the print ensures enough time for each layer to cool before a new one is applied. Print twelve individual linkages and finally the mobile fixing. Each petal should be connected to the mobile linkage by two linkages.



Pay close attention to the orientation of the linkages. Secure all connection points with a screw and a nut.



Step 12:

Upload the 'Trial' code to the micro:bit to test the FSR, LED ring and stepper motor are all behaving. Use this code to move the petals into a closed position. Upload the 'Final' code to complete your mechanical flower project.

A light touch of the FSR will activate RED on the LEDs, medium touch will activate ORANGE, and a hard touch will activate the GREEN LEDs and the mechanism to come to life. The flower will begin to open, pause once opened with GOLD LEDs, and close with purple LEDs. BLUE LEDs indicate standby mode.

