

LipSync

ASSEMBLY MANUAL

Version 1.41

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PART 0a

OBTAINING COMPONENTS AND FILES

Components should be ordered at least 2 weeks in advance to allow for sufficient shipping time. See Part 0b for the full list of components and its purchase links.

Download all the necessary files and directories to assemble a LipSync:
<https://github.com/makersmakingchange/LipSync/archive/master.zip>

LipSync-master\Hardware\Housing_design: Contains all 3D printing files in STL format and its respective print settings

LipSync-master\Hardware\PCB_design: Contains schematic and layout for the LipSync printed circuit boards

LipSync-master\Software\LipSync_Firmware: Contains microcontroller code

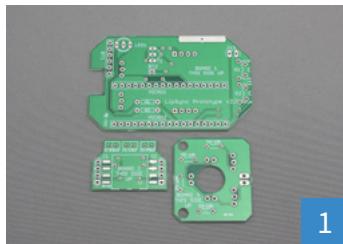
LipSync-master\LipSync_BOM.csv: Contains LipSync Components in CSV format

PART 0b

COMPONENT CHECKLIST

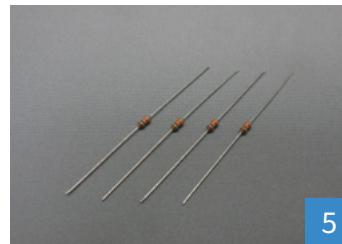
- 1** (1) LipSync Circuit Board Package (3 boards)
- 2** (1) Arduino Micro **OR**
(1) Genuino Micro
- 3** (2) Right Angle Push Buttons
- 4** (2) 300 Ohm 1/4W T/H Resistors
- 5** (4) 10k Ohm Mini 1/4W T/H Resistors
- 6** (1) NXP Semiconductors Pressure Sensor
- 7** (1) 0.01uF Ceramic T/H Radial Capacitor
- 8** (1) 1.0uF Ceramic T/H Radial Capacitor
- 9** (1) 470pF Ceramic T/H Capacitor

<input type="checkbox"/> 10	(2) 17-Position Straight Female T/H Headers	<input type="checkbox"/> 22	(1) Joystick Rocker	<input type="checkbox"/> 34	(1) Luer Lock Nut
<input type="checkbox"/> 11	(2) 3-Position Right Angle Male Headers	<input type="checkbox"/> 23	(1) Joystick Baseplate	<input type="checkbox"/> 35	(4) Bumpers
<input type="checkbox"/> 12	(2) 3-Position Straight Female Header	<input type="checkbox"/> 24	(1) Rear Housing	<input type="checkbox"/> 36	(4) Nuts M3
<input type="checkbox"/> 13	(2) 4-Position Straight Female T/H Headers	<input type="checkbox"/> 25	(2) Buttons	<input type="checkbox"/> 37	(1) Tubing 3/32" ID x 45mm
<input type="checkbox"/> 14	(1) Break Away Male Headers	<input type="checkbox"/> 26	(1) Mouthpiece	<input type="checkbox"/> 38	(1) Light Pipe
<input type="checkbox"/> 15	(1) 5mm Bi-Color T/H LED	<input type="checkbox"/> 27	(1) Filter	<input type="checkbox"/> 39	(1) Threaded Insert 5/8"-27
<input type="checkbox"/> 16	(1) Shunt Connector	<input type="checkbox"/> 28	(1) Luer Lock Fitting	<input type="checkbox"/> 40	(1) Threaded Adapter 5/8"-27
<input type="checkbox"/> 17	(1) 2N3906 PNP-Type T/H Transistor	<input type="checkbox"/> 29	(4) Force Resistive Sensor	<input type="checkbox"/> 41	(1) USB Cable
<input type="checkbox"/> 18	(1) 6-Position Straight Female T/H Header	<input type="checkbox"/> 30	(4) Screws Phillips Head M3	<input type="checkbox"/> 42	(1) USB Adapter
<input type="checkbox"/> 19	OPTIONAL (1) 1-Position Straight Female T/H Header	<input type="checkbox"/> 31	(6) Compression Springs	<input type="checkbox"/> 43	(1) Cable Tie
<input type="checkbox"/> 20	(1) Front Housing	<input type="checkbox"/> 32	(2) Standoffs M3 10mm	<input type="checkbox"/> 44	(10) Velcro Strap 0.5" x 6"
<input type="checkbox"/> 21	(1) Joystick Front Plate	<input type="checkbox"/> 33	(2) Standoffs M3 15mm	<input type="checkbox"/> 45	OPTIONAL (1) Magic Arm 11" and Clamp



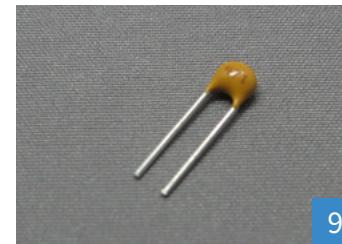
LipSync Circuit Board Pack:
(1) Main Interface Board
(1) Pressure Sensor Board
(1) Joystick Board
[LipSync Page](#)

1



(4) 10k Ohm Mini Axis
Through Hole Resistors
[Digikey.ca](#)
[Digikey.com](#)
*or from any electronics shop

5



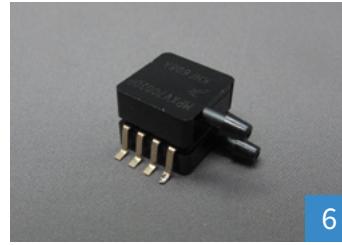
(1) 470pF Ceramic Through
Hole Radial Capacitor
[capacitor label: 471]
[Digikey.ca](#)
[Digikey.com](#)
*or from any electronics shop

9



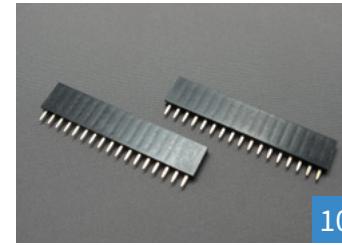
(1) Arduino Micro/ Genuino
Micro microcontroller
[Arduino](#) [Digikey](#) [Robotshop](#)
[Adafruit](#) [Pololu](#)
COMPATIBILITY NOTE: The
"Arduino Micro" or "Genuino
Micro" **MUST** be used.

2



(1) NXP Pressure Sensor
[component label:
MPXV7002DP]
[Digikey.ca](#)
[Digikey.com](#)

6



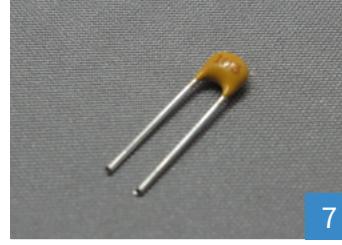
(2) 17-Position Straight
Female Through Hole
Headers
[Digikey.ca](#)
[Digikey.com](#)
*or from any electronics shop

10



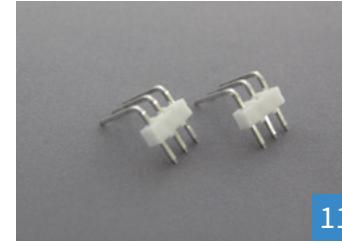
(2) Right Angle Push Buttons
[Digikey.ca](#)
[Digikey.com](#)

3



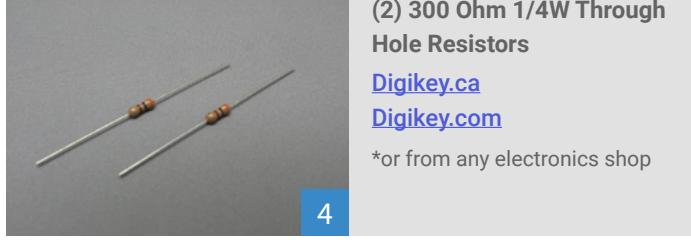
(1) 0.01uF Ceramic Capacitor
[capacitor label: 103]
[Digikey.ca](#)
[Digikey.com](#)
*or from any electronics shop

7



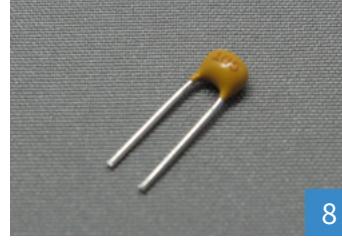
(2) 3-Position Right Angle
Male Header
[Digikey.ca](#)
[Digikey.com](#)
*or from any electronics shop

11



(2) 300 Ohm 1/4W Through
Hole Resistors
[Digikey.ca](#)
[Digikey.com](#)
*or from any electronics shop

4



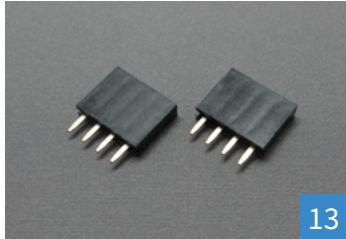
(1) 1.0uF Ceramic Capacitor
[capacitor label: 105]
[Digikey.ca](#)
[Digikey.com](#)
*or from any electronics shop

8



(2) 3-Position Straight
Female Header
[Digikey.ca](#)
[Digikey.com](#)
***ONLY from the above source**

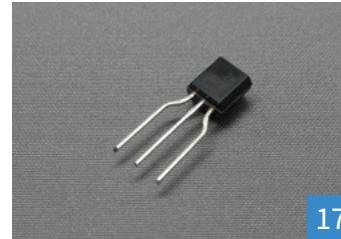
12



(2) 4-Position Straight Female Header
[Digikey.ca](#)
[Digikey.com](#)

*or from any electronics shop

13



(1) 2N3906 PNP-Type T/H Transistor
[Digikey.ca](#)
[Digikey.com](#)

*or from any electronics shop

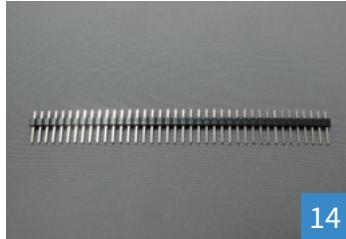
17



(1) Joystick Base Plate
[LipSync Page](#)

NOTE: 3D printed files and print settings can be found in "LipSync_STL.zip"

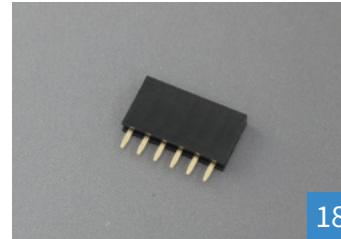
21



(1) Break Away Male Headers
[Digikey.ca](#)
[Digikey.com](#)

*or from any electronics shop

14



(1) 6-Position Straight Female T/H Headers
[Digikey.ca](#)
[Digikey.com](#)

*or from any electronics shop

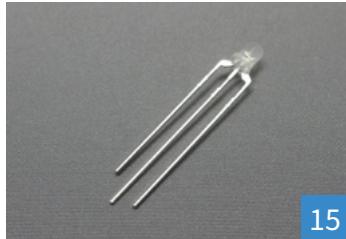
18



(1) Joystick Rocker
[LipSync Page](#)

NOTE: 3D printed files and print settings can be found in "LipSync_STL.zip"

22



(1) 5mm Bi-Color T/H LED
[Digikey.ca](#)
[Digikey.com](#)

*or from any electronics shop

15



(OPTIONAL) (1) 1-Position Straight Female T/H Header
[Digikey.ca](#)
[Digikey.com](#)

*or from any electronics shop

19



(1) Joystick Top Plate
[LipSync Page](#)

NOTE: 3D printed files and print settings can be found in "LipSync_STL.zip"

23



(1) Shunt Connector
[Digikey.ca](#)
[Digikey.com](#)

*or from any electronics shop

16



(1) Front Housing
[LipSync Page](#)

NOTE: 3D printed files and print settings can be found in "LipSync_STL.zip"

20



(1) Rear Housing
[LipSync Page](#)

NOTE: 3D printed files and print settings can be found in "LipSync_STL.zip"

24



(2) Buttons
[LipSync Page](#)

25

NOTE: 3D printed files and print settings can be found in "LipSync_STL.zip"



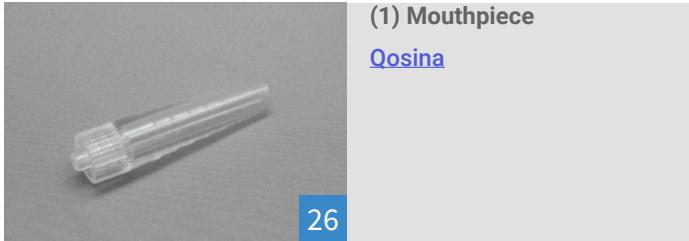
(4) Force Resistive Sensor
[Digikey.ca](#)
[Digikey.com](#)

29



(2) Standoffs M3 15mm
[Digikey.ca](#)
[Digikey.com](#)

33



(1) Mouthpiece
[Qosina](#)

26



(4) Screws Phillips Head M3
[Digikey.ca](#)
[Digikey.com](#)

30



(1) Luer Lock Nut
[Cole-Parmer](#)

34



(1) Filter
[Qosina](#)

27



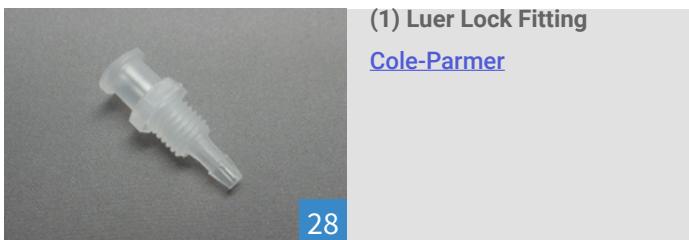
(6) Compression Springs
[Lee Spring](#)

31



(4) Bumpers
[Digikey.ca](#)
[Digikey.com](#)

35



(1) Luer Lock Fitting
[Cole-Parmer](#)

28



(2) Standoffs M3 10mm
[Digikey.ca](#)
[Digikey.com](#)

32



(4) Nuts M3
[Digikey.ca](#)
[Digikey.com](#)

36



(1) Tubing 3/32" ID x 45mm
[US Plastic](#)

37



(1) USB Cable
[Amazon.com](#)

41



(OPTIONAL) (1) Magic Arm
11" and Clamp
[Amazon.com](#)

45



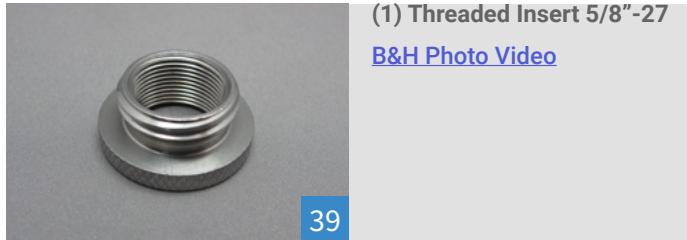
(1) Light pipe
[Mouser](#)

38



(1) USB Adapter
[Amazon.com](#)

42



(1) Threaded Insert 5/8"-27
[B&H Photo Video](#)

39



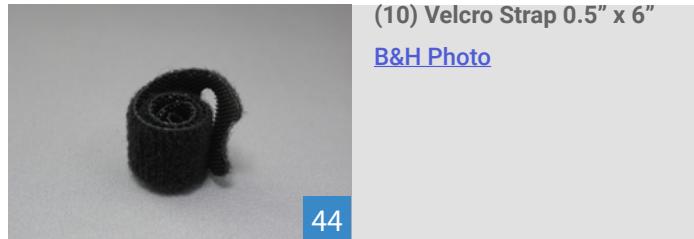
(1) Cable Tie
[Digikey.ca](#)
[Digikey.com](#)

43



(1) Threaded Adapter 5/8"-27
[Amazon.com](#)

40



(10) Velcro Strap 0.5" x 6"
[B&H Photo](#)

44

PART 0c

EQUIPMENT CHECKLIST

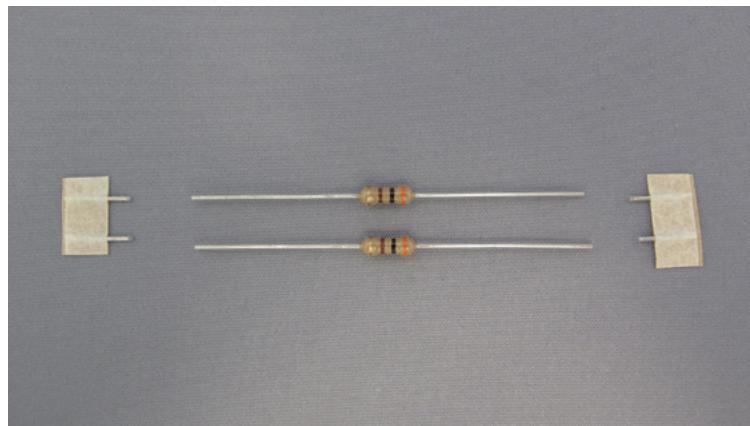
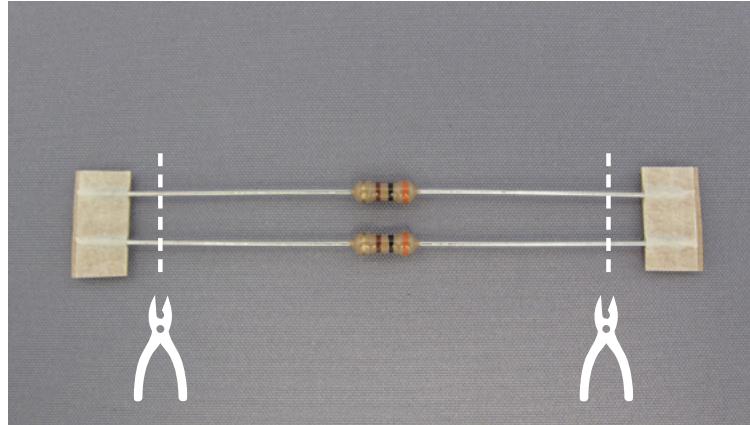
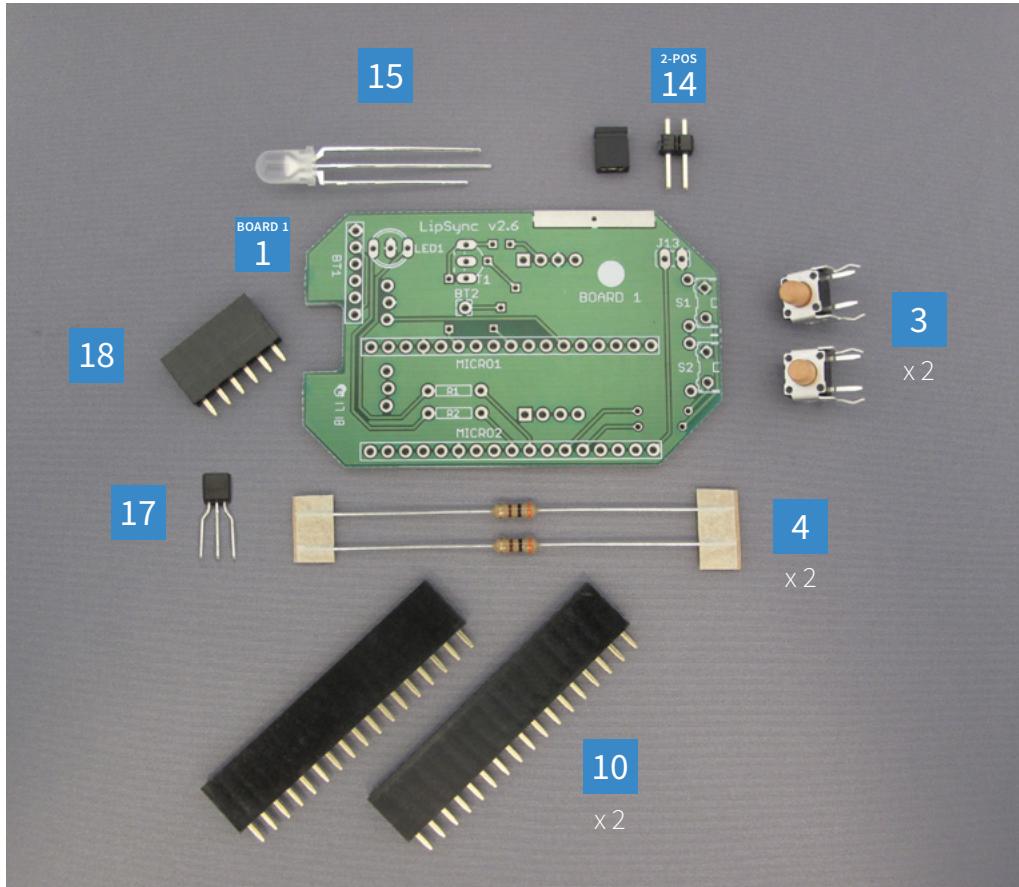
- Small Spool of 60Pb/40Tn Solder Wire
- Desolder Pump (or "solder sucker")
- Temperature Adjustable Soldering Iron (350°C)
- (1) Adjustable Tabletop Vise (if possible, PANAVISE Junior Vise with Base)
- Needle Nose Pliers
- Safety Glasses
- Fine File or Sandpaper
- Small Fan (if possible, fume extractor)
- Baby Powder
- Hobby Knife
- Super Glue
- Flush Cutters
- Medium Strength Threadlocker
- ABS or High Strength PLA Filament 100g



= Solder the part outlined

CAUTION: Safety glasses should be worn at all times during the assembly.

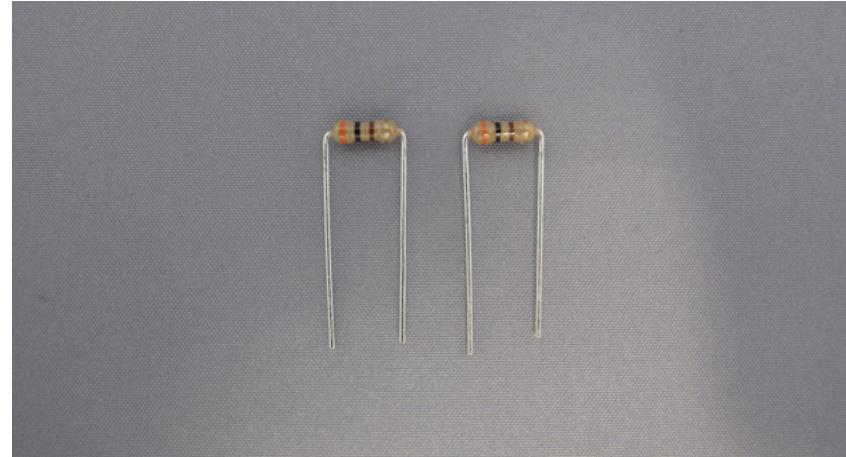
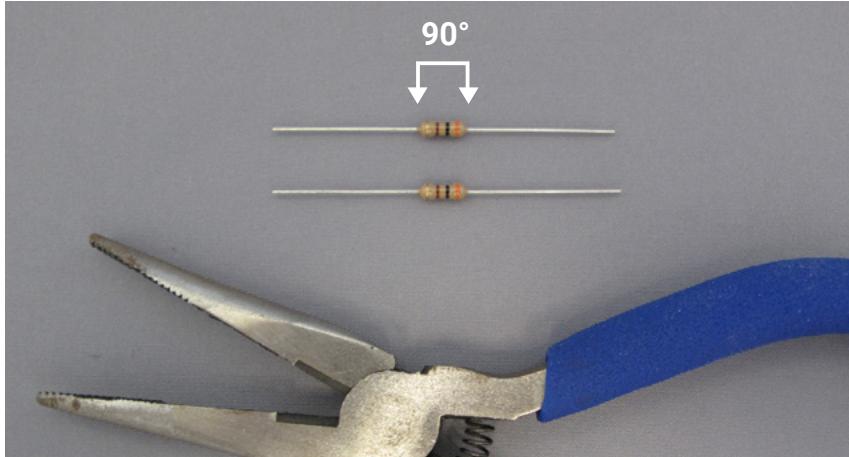
PART 1



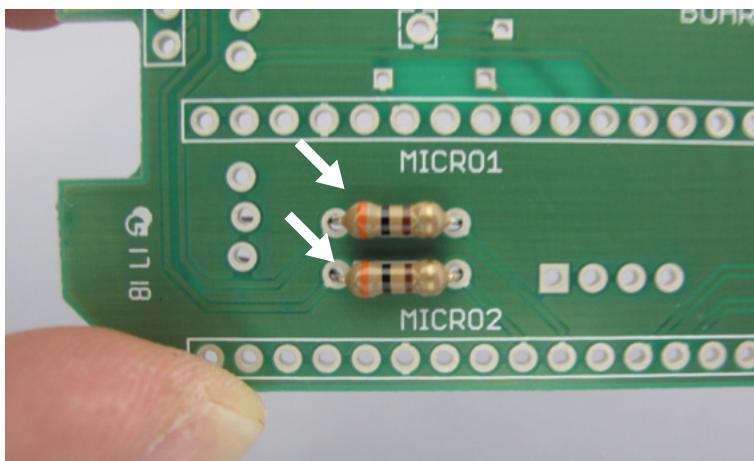
4
x 2

01.

02.



03.



BOARD 1

1

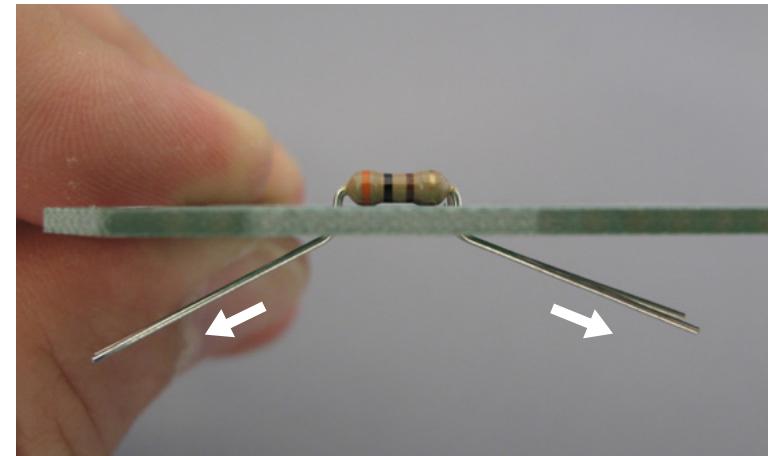
HOLE

R1

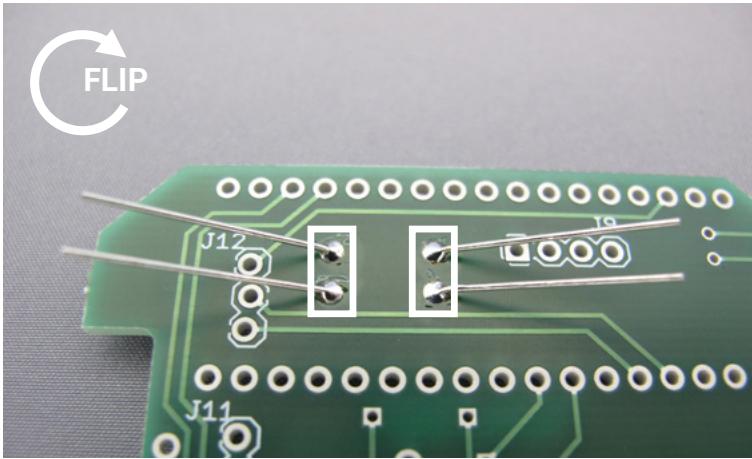
HOLE

R2

04.

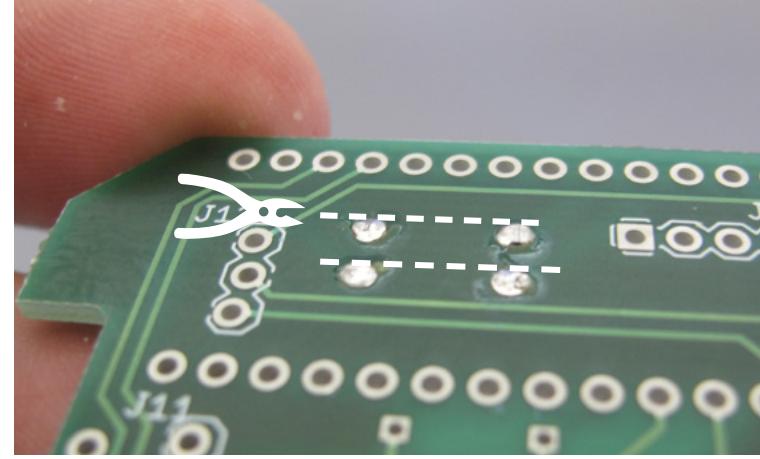


05.

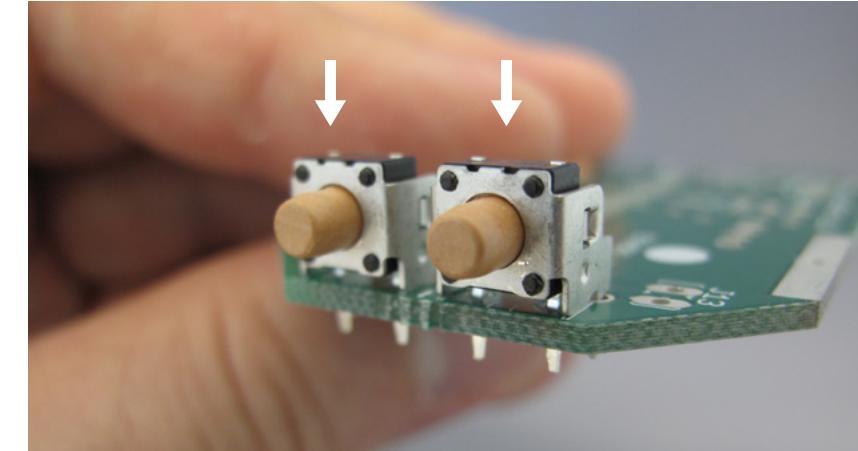
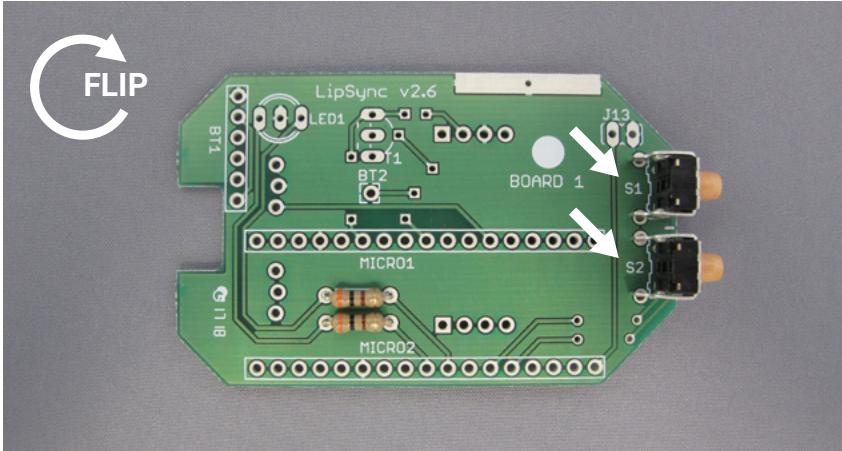


x 4

06



07.



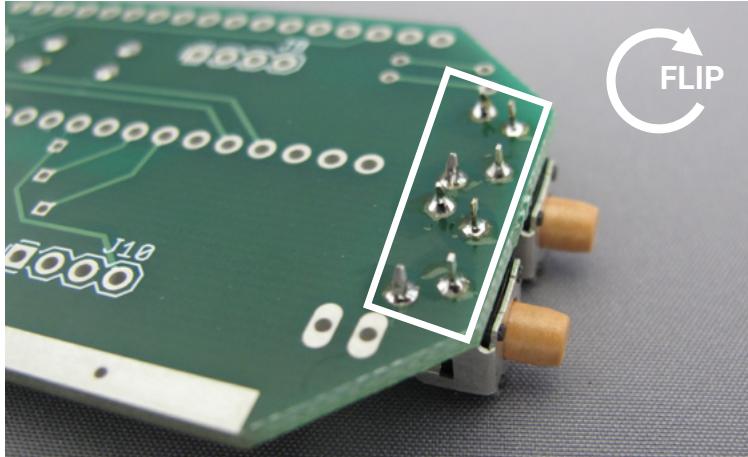
3

x 2

HOLE
S1

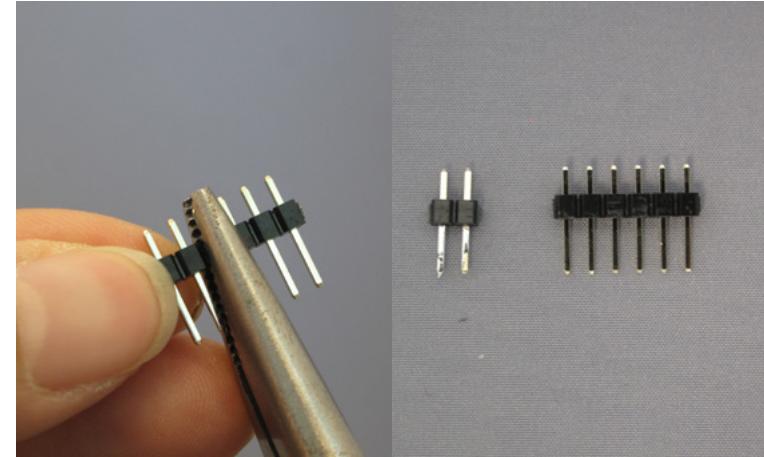
HOLE
S2

08.

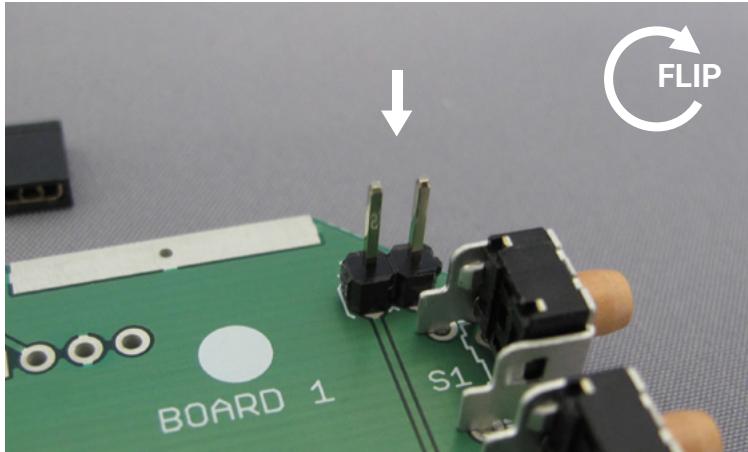


x 8

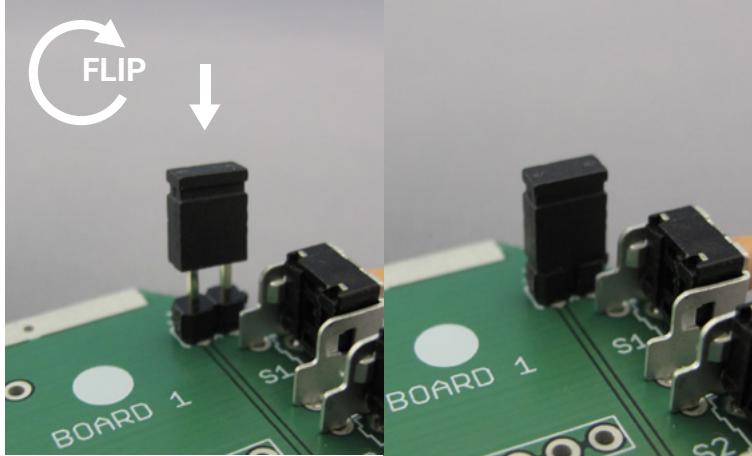
09.



10.

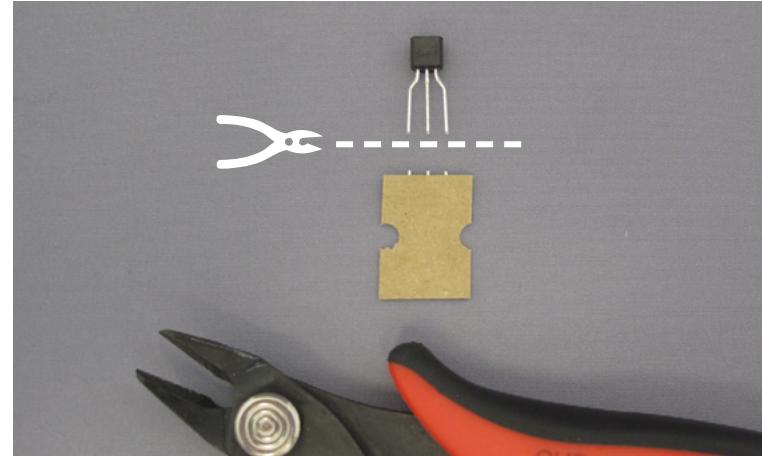


12.



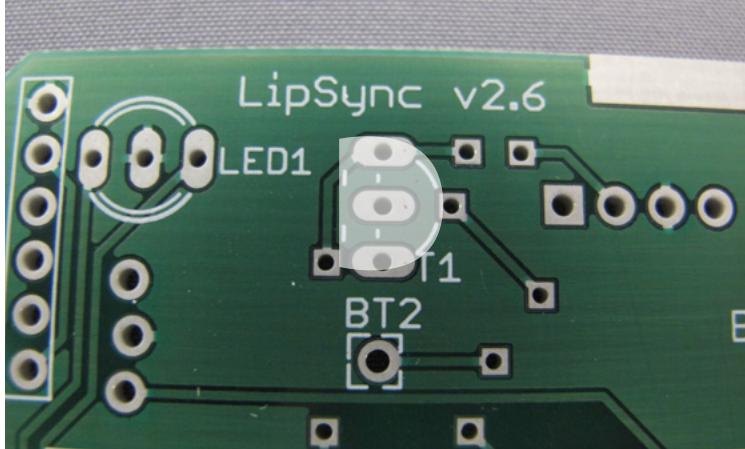
16

13.



17

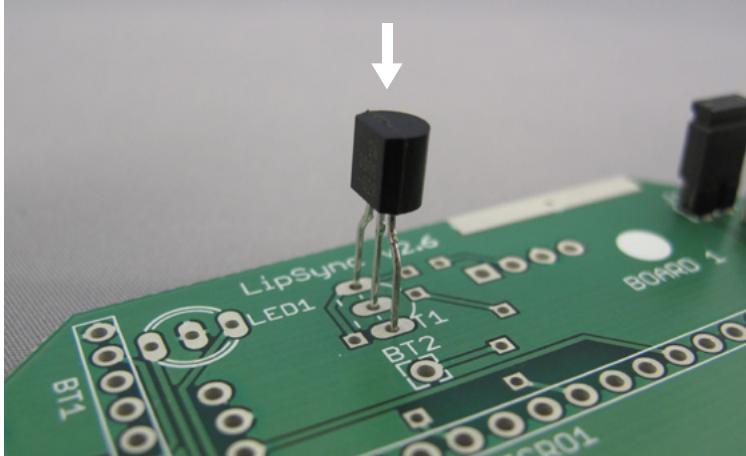
14.



HOLE
T1

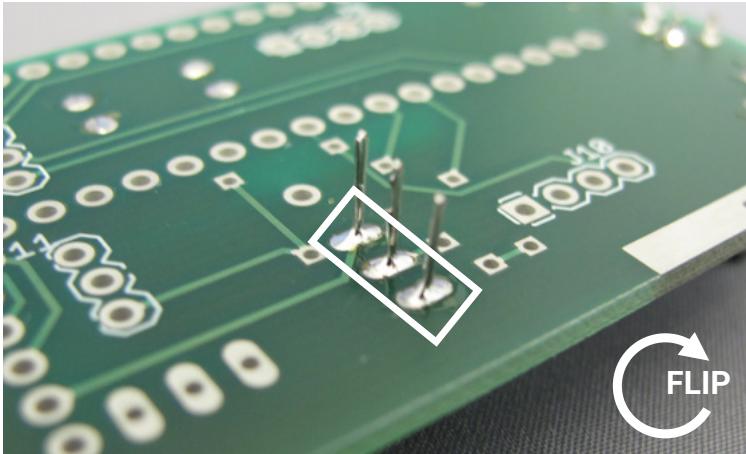
NOTE: The silkscreen outline for hole T1 on Board 1 matches the orientation of which the transistor is inserted.

15.



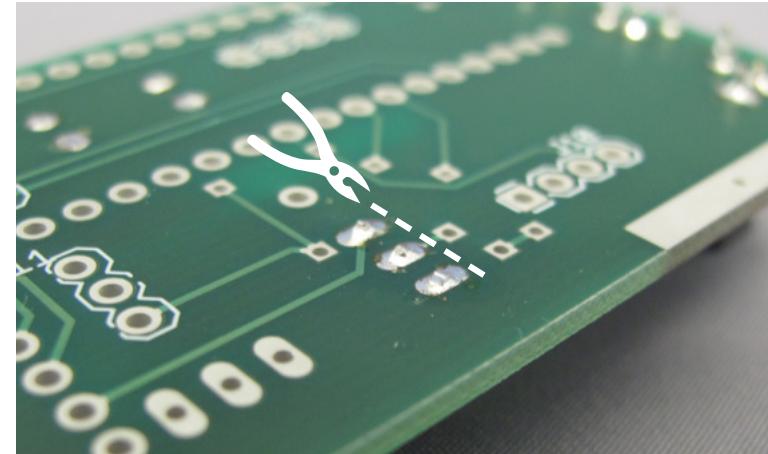
NOTE: After inserting the transistor, there will be a gap between the transistor and Board 1

16.

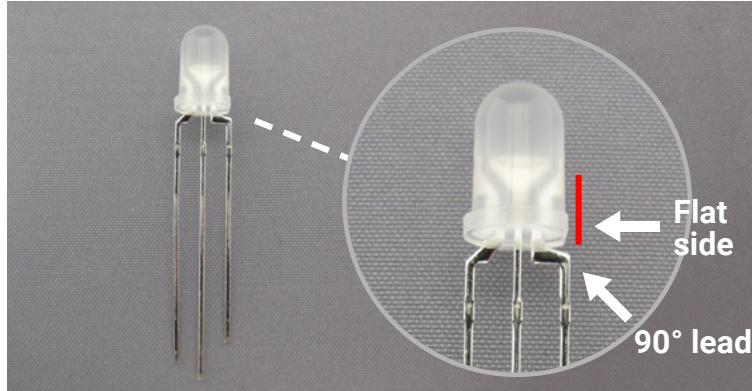


x 3

17.



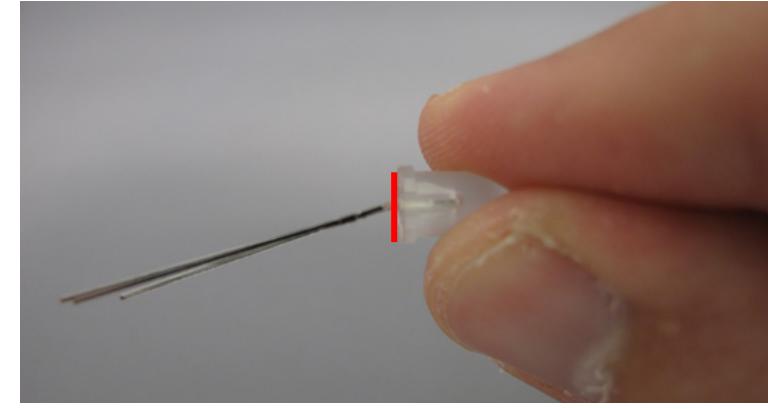
18.



IMPORTANT: The flat side of the LED head and the 90° lead should be on the **RIGHT** when installed.

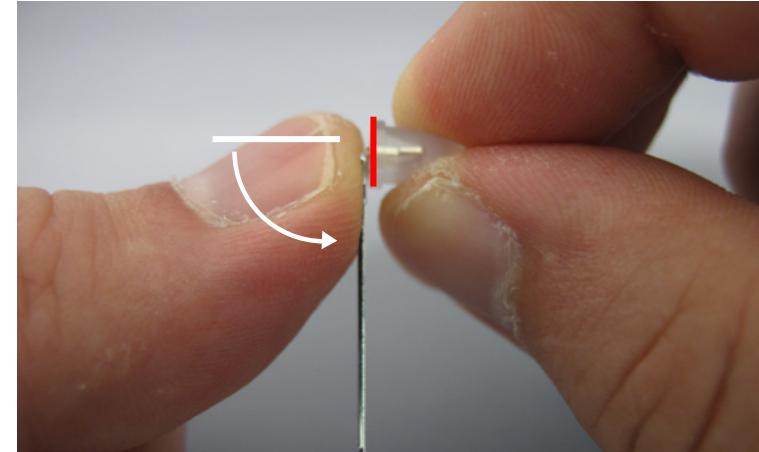
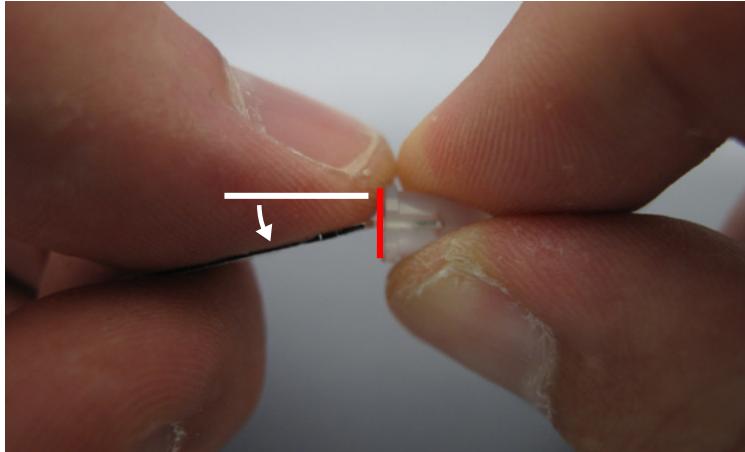
15

19.



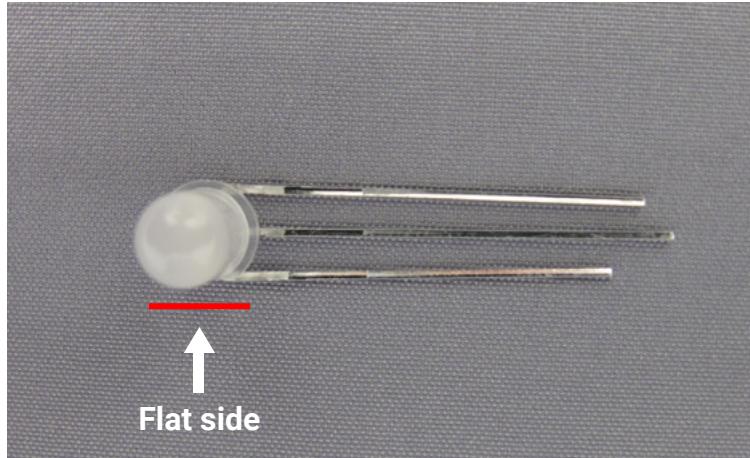
IMPORTANT: Hold the LED so that the flat side and the 90° lead is facing **TOWARDS** you.

20.



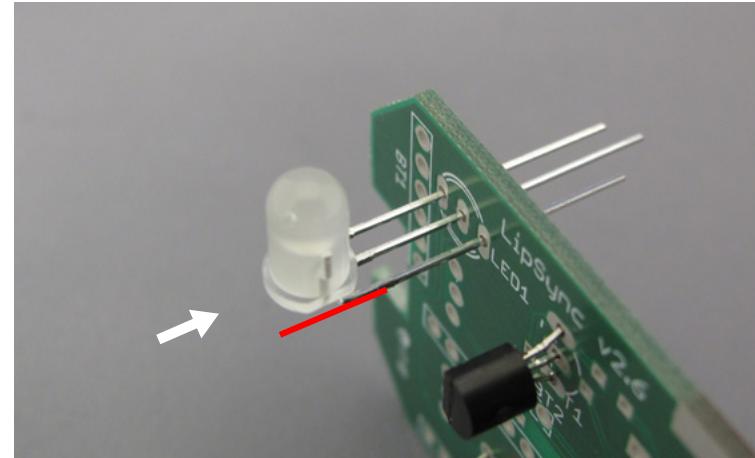
NOTE: Using a finger, bend the leads by 90° right at the LED base.

21.

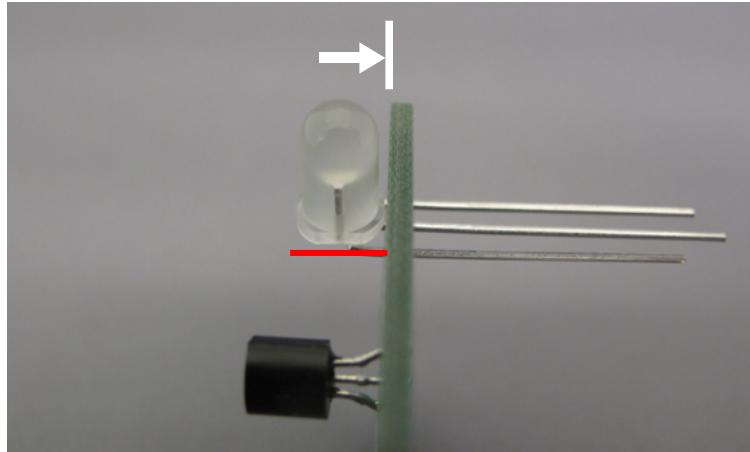


HOLE
LED1

22.

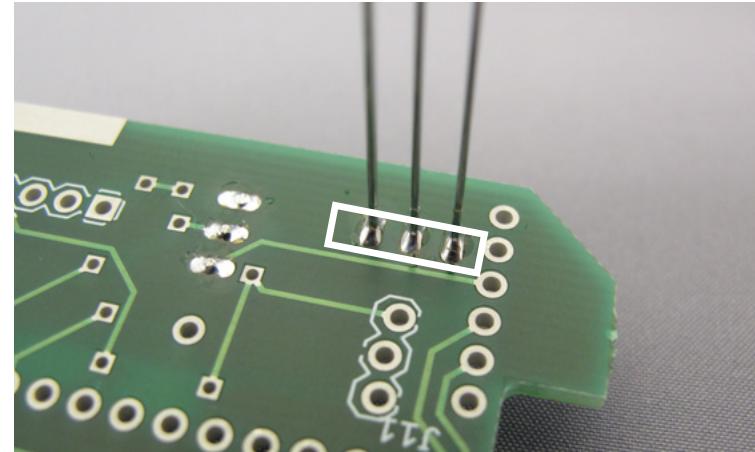


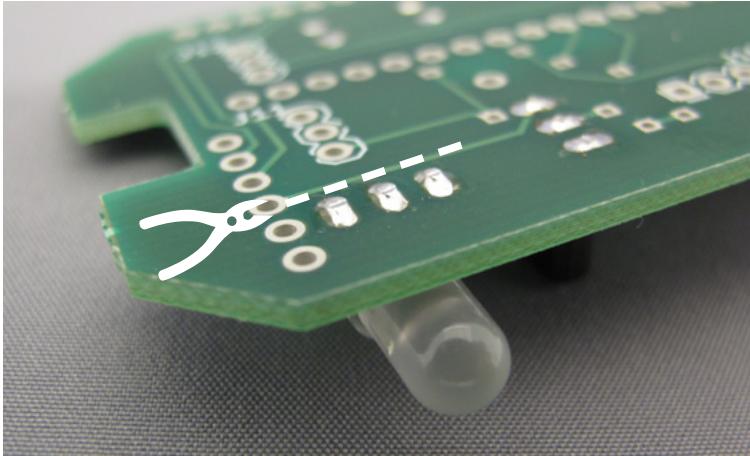
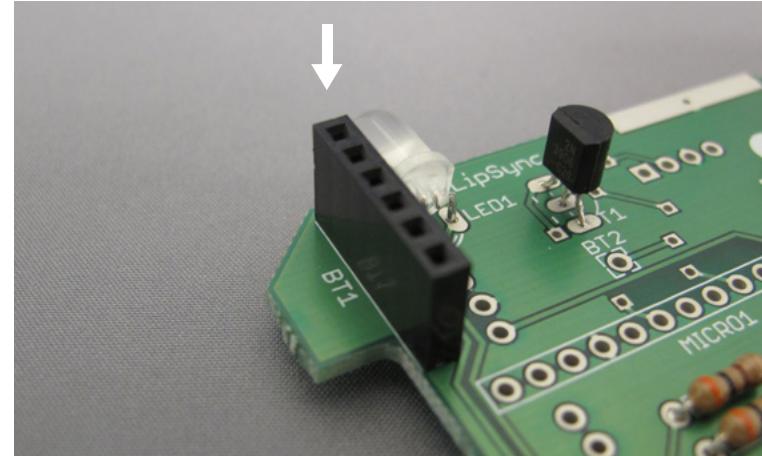
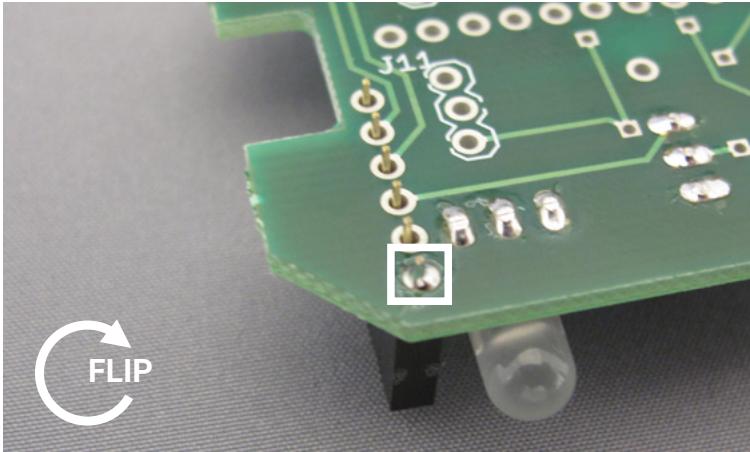
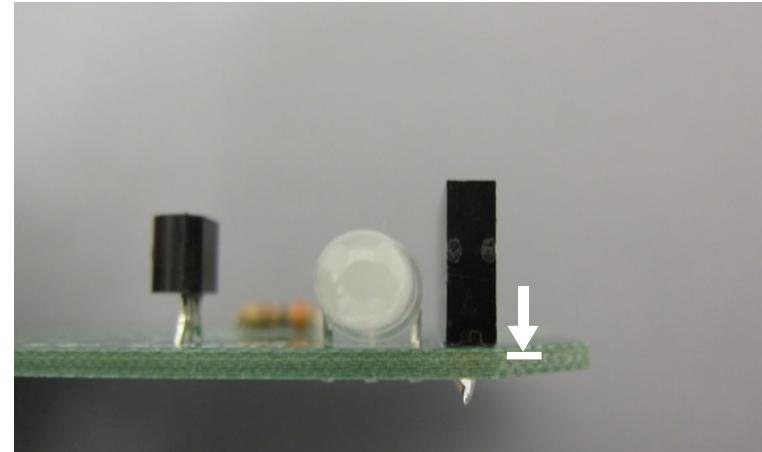
23.



x 3

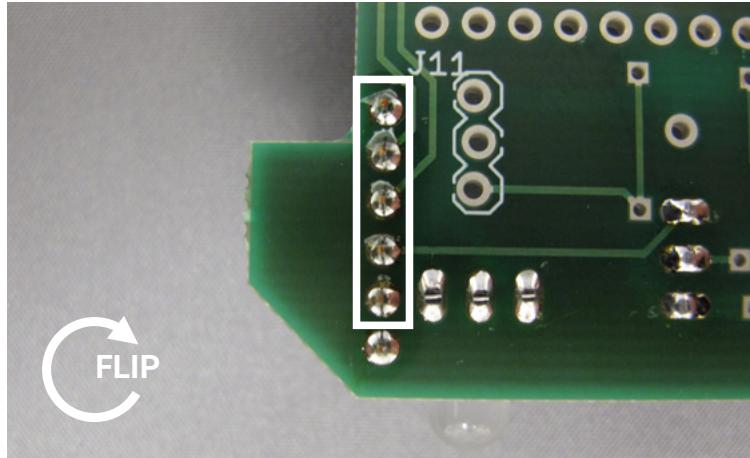
24.



25.**26.****27.****28.**

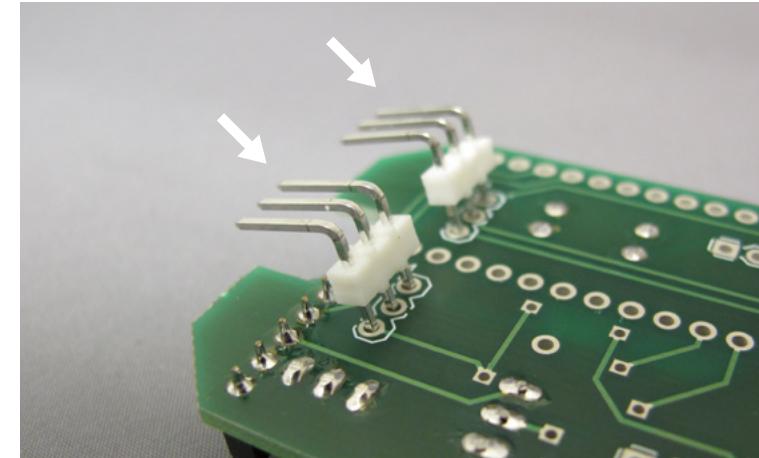
NOTE: Check that component is flush to the board

29.



x 5

30.



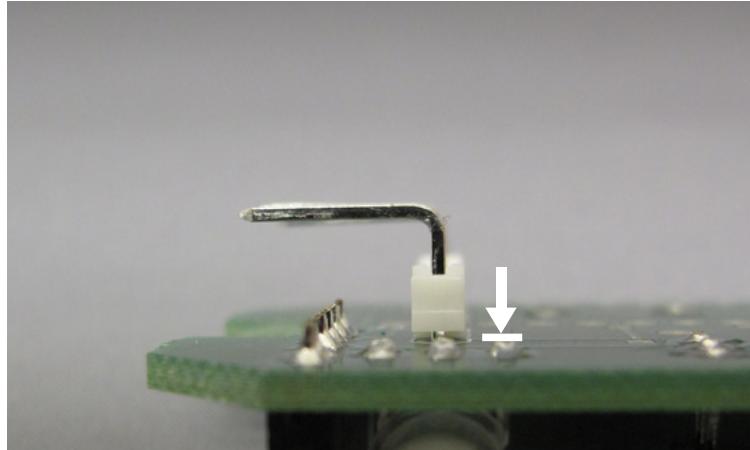
11

x 2

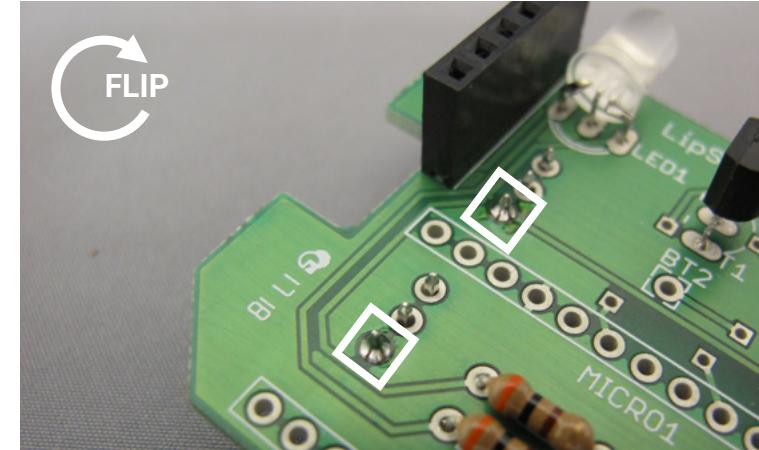
SECTION
J11

SECTION
J12

31.



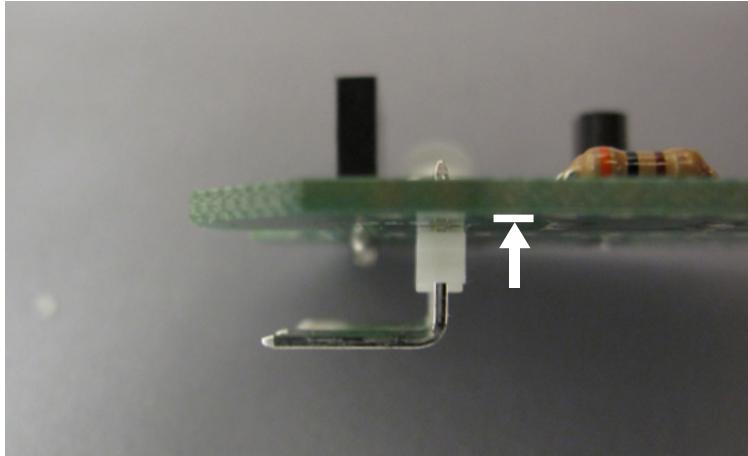
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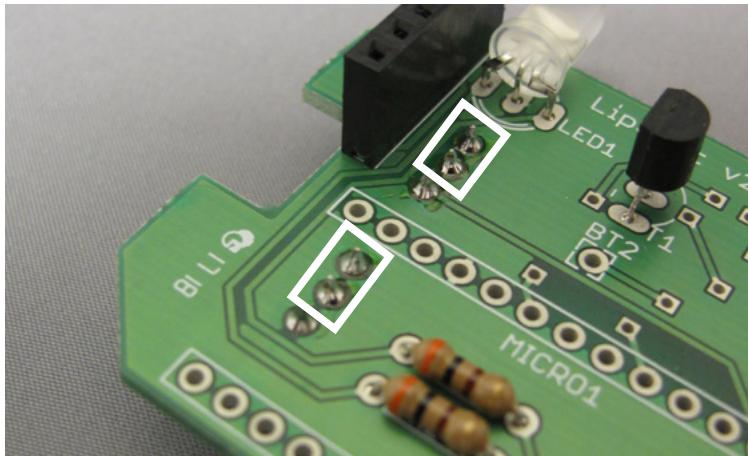
x 2

PART 2

33.

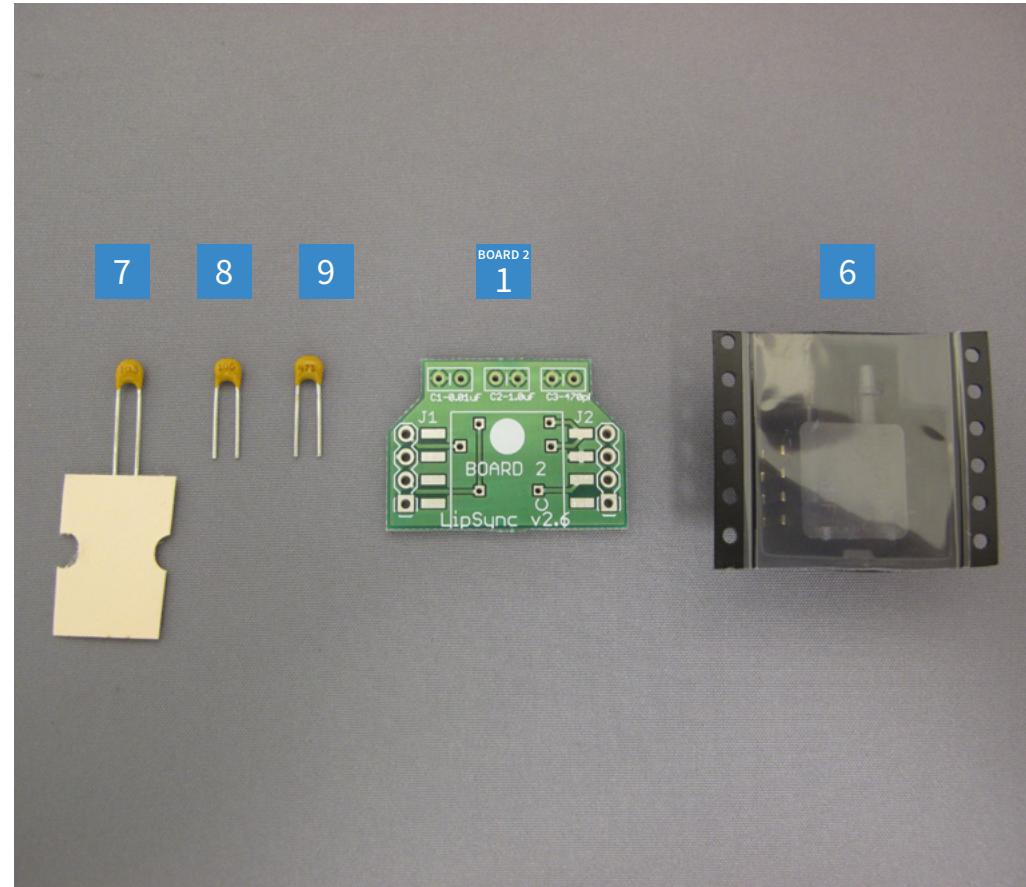


NOTE: Check that component is flush to the board

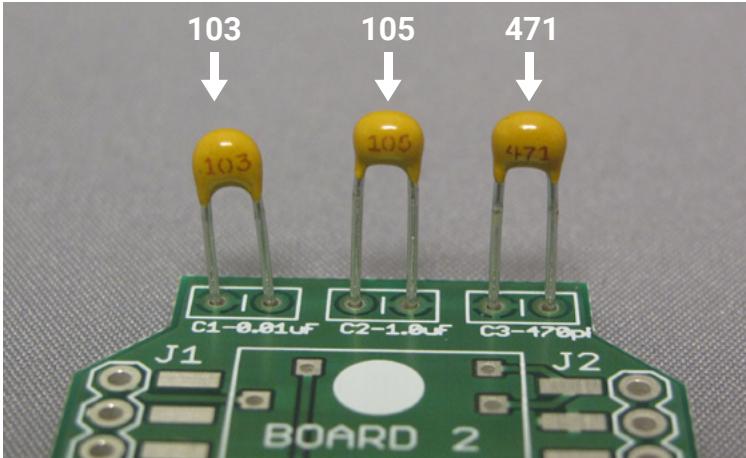


x 4

34.



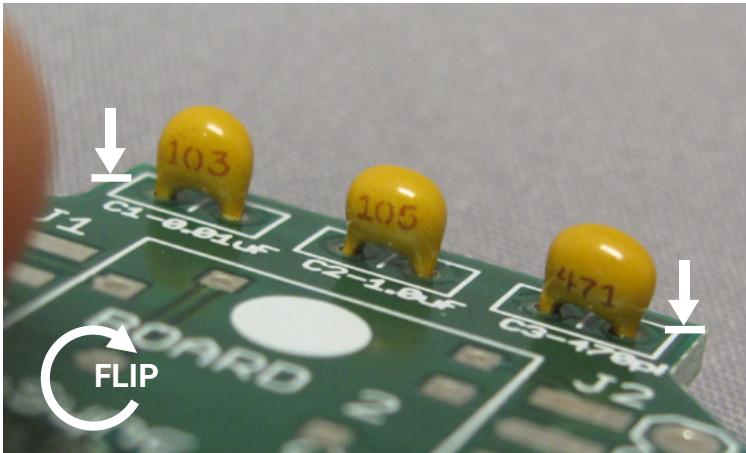
01.



NOTE: The capacitors **MUST** be inserted in the order shown.



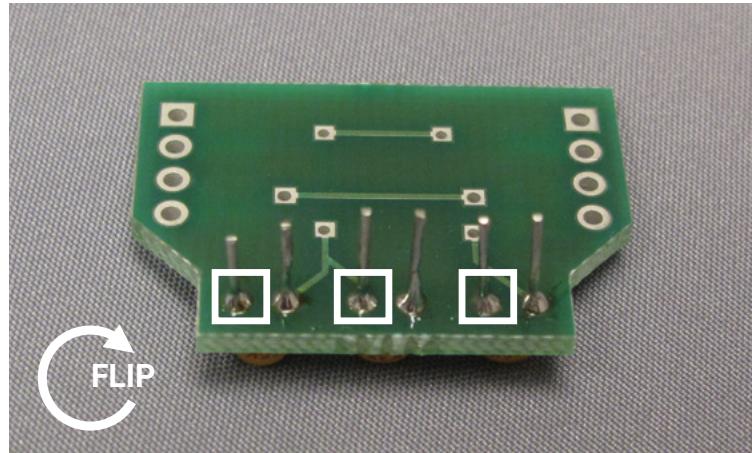
03.



NOTE: Check that components are flush to the board

20

04.

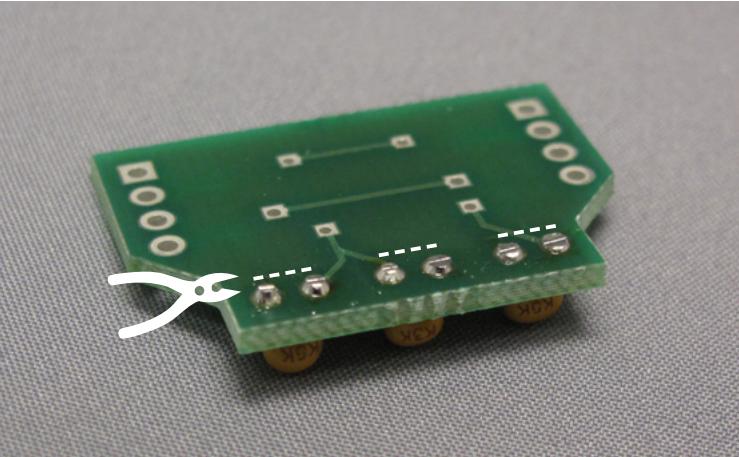


x 3

6

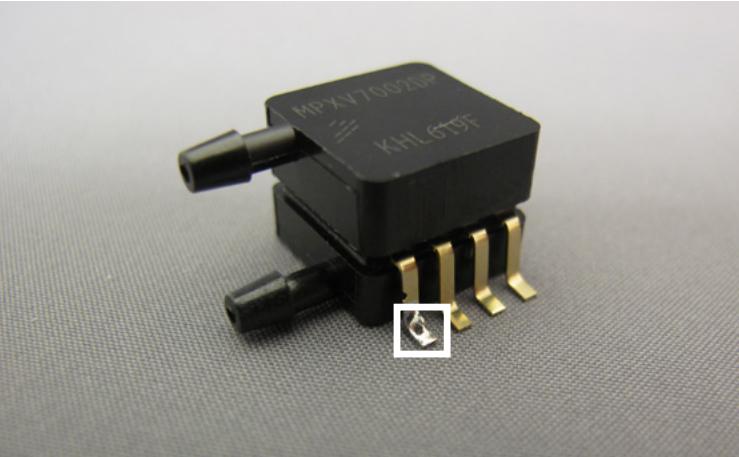


x 1

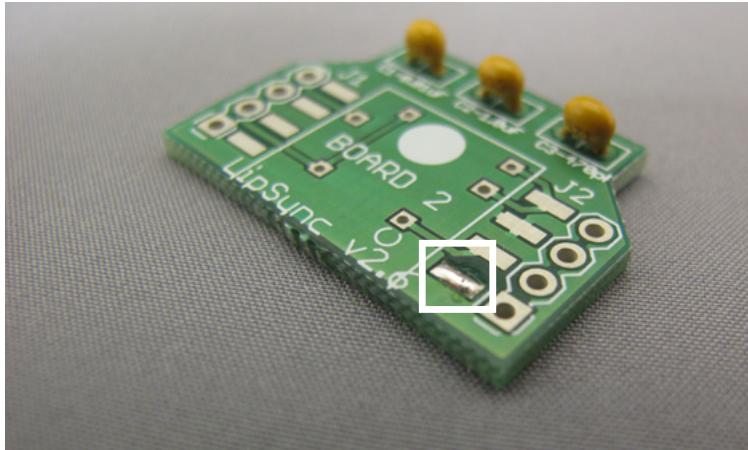


05.

06.

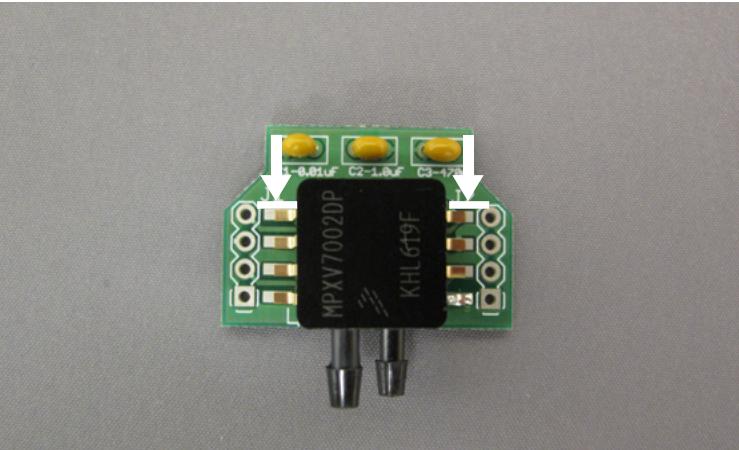


x 1

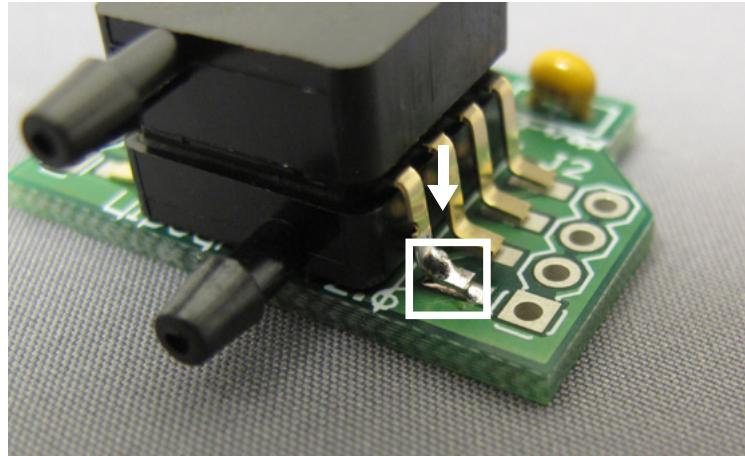
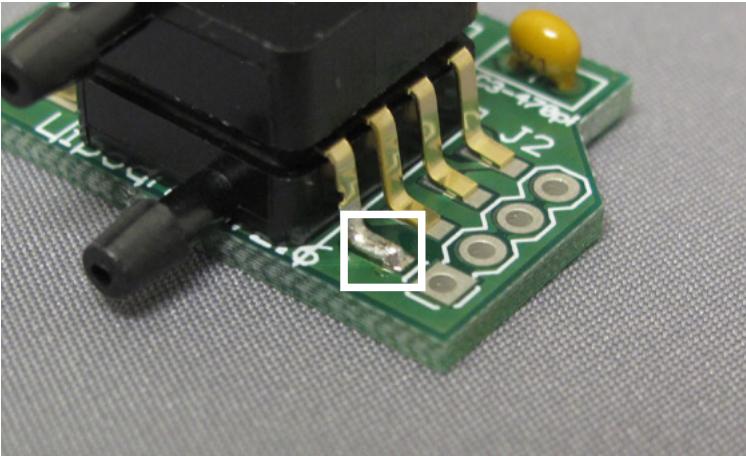


07.

08.



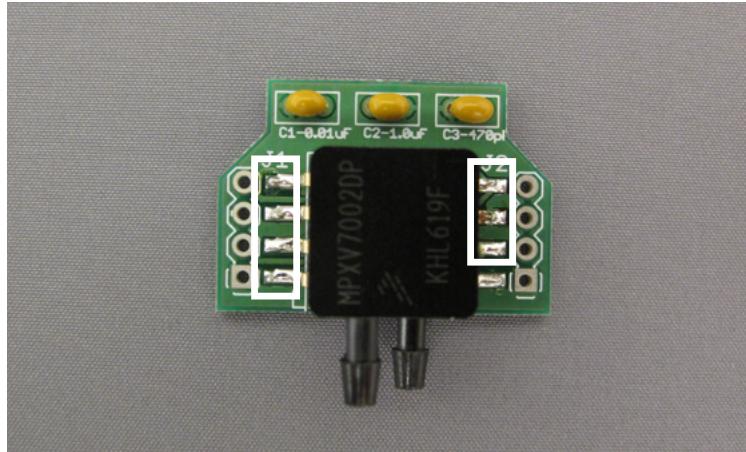
09.



NOTE: Place the solder tip on the lead to reflow the solder on the two components. The pressure sensor should "drop" onto Board 2.

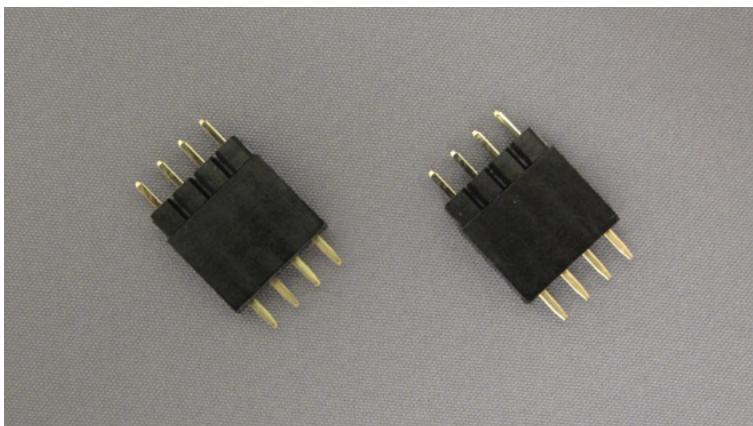
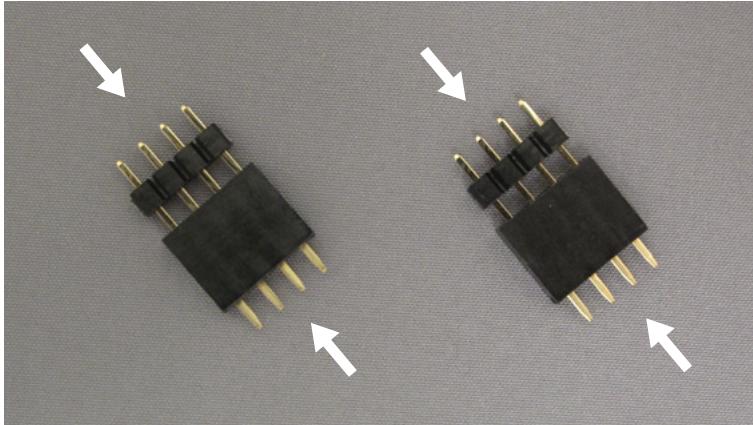
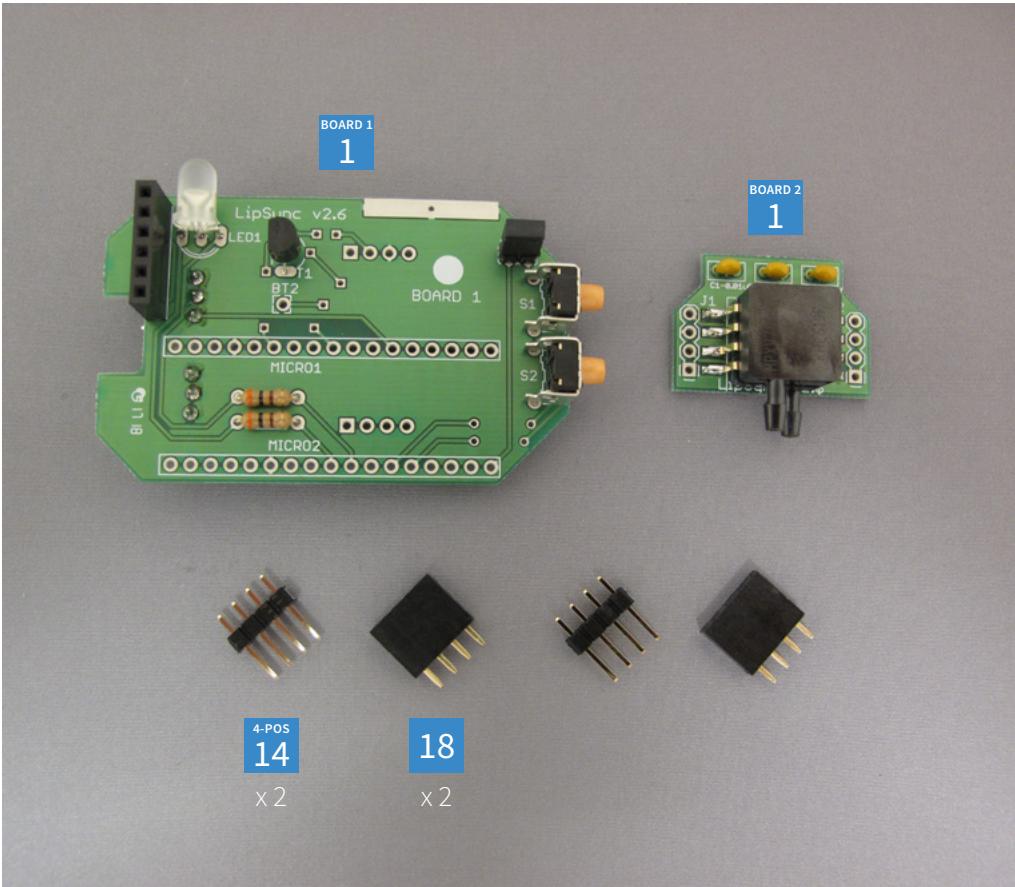
x 1

10.



x 7

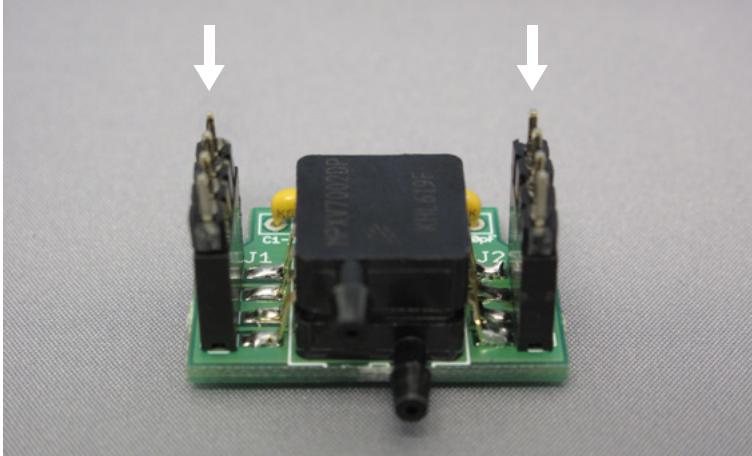
PART 3



01.

4-POS
14
x 2
18
x 2

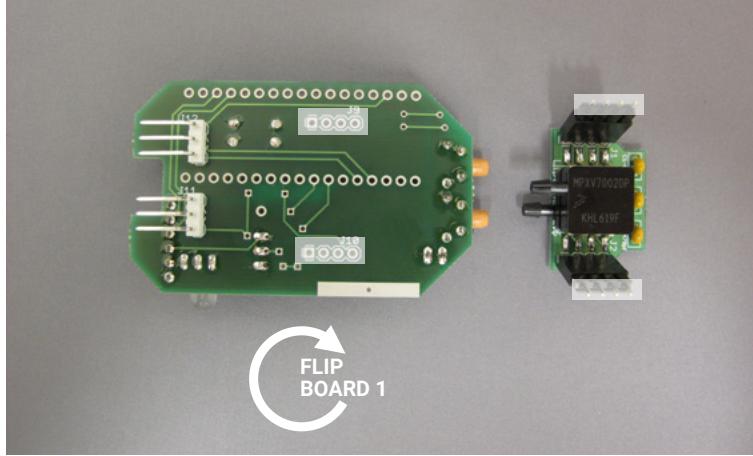
02.



BOARD 2
1

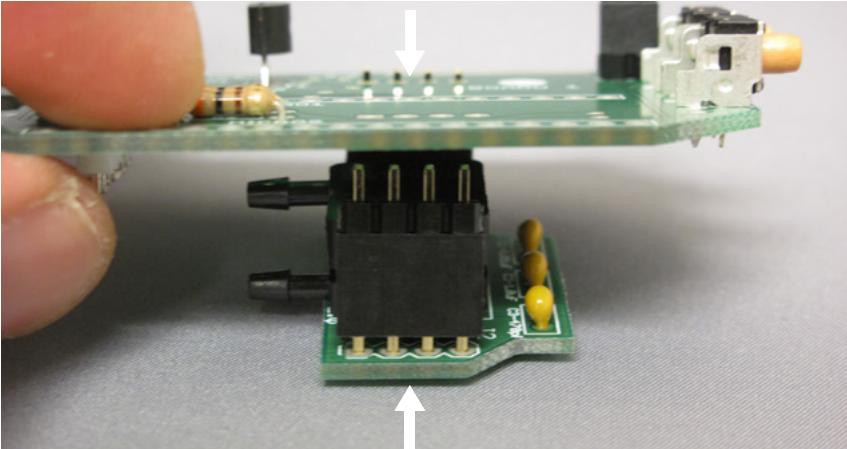
NOTE: The 4-position female headers are inserted

03.

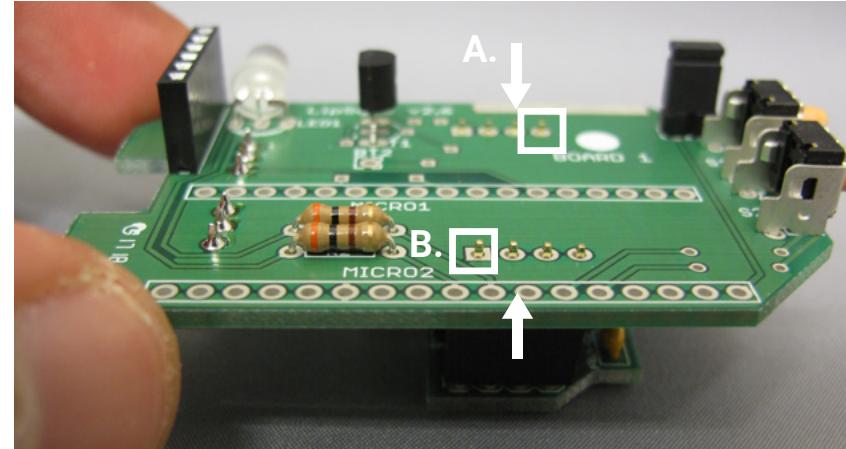


BOARD 1
1

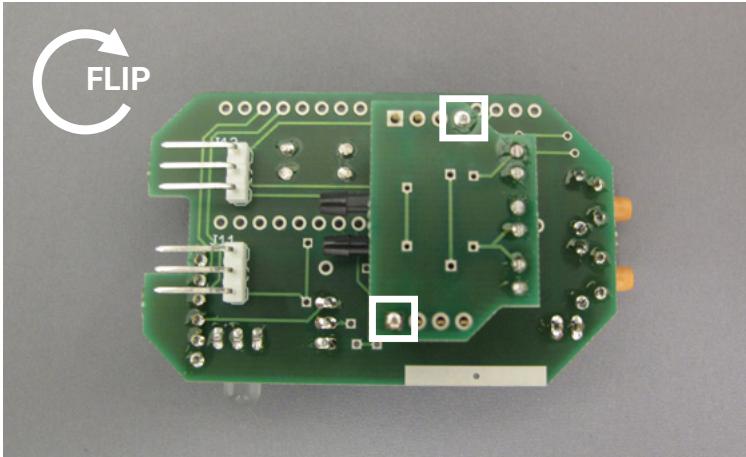
04.



x 2

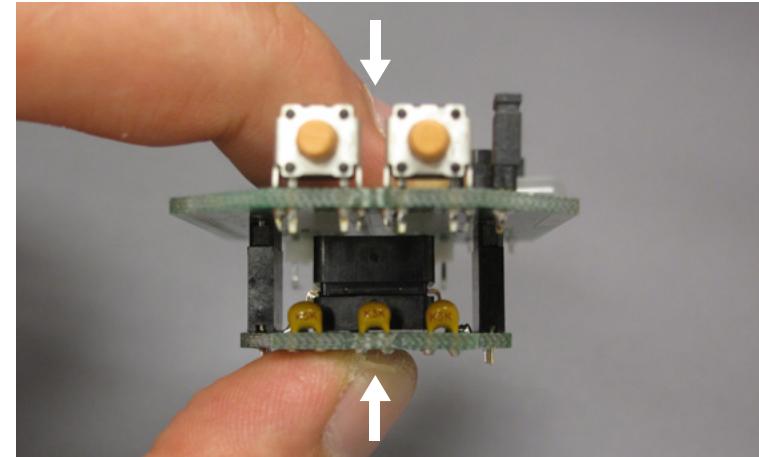


05.



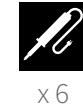
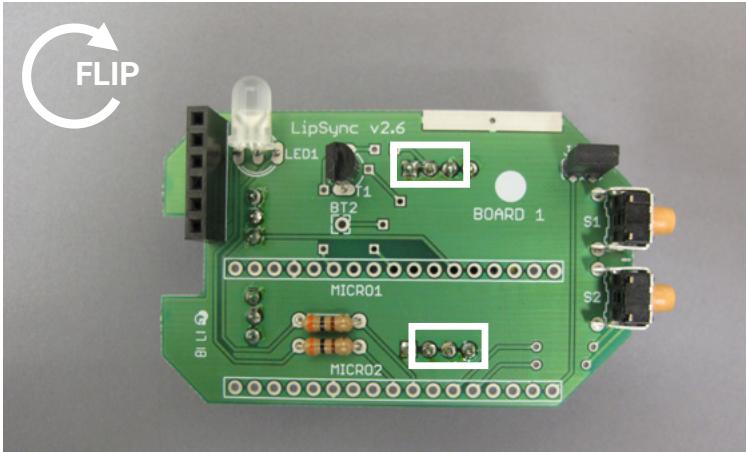
x 2

06.



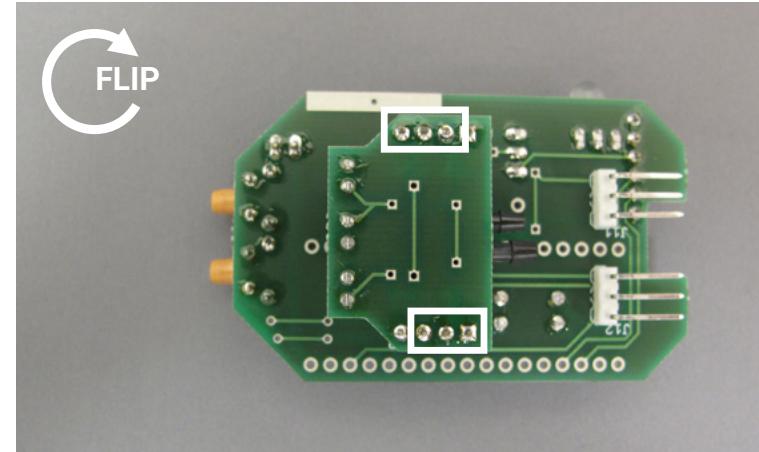
NOTE: Check that components are flush to the board

07.



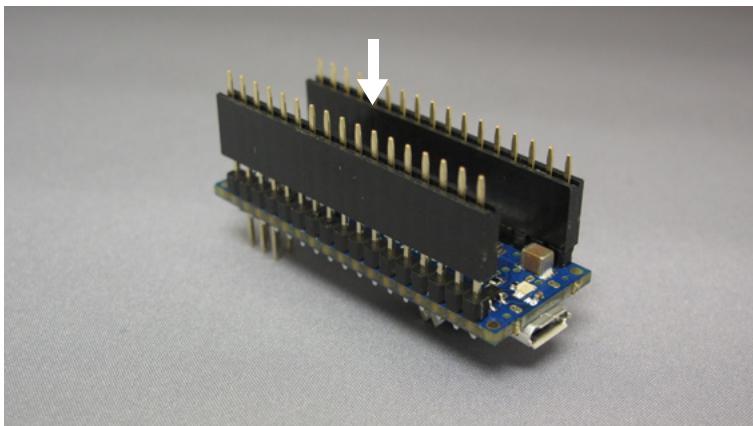
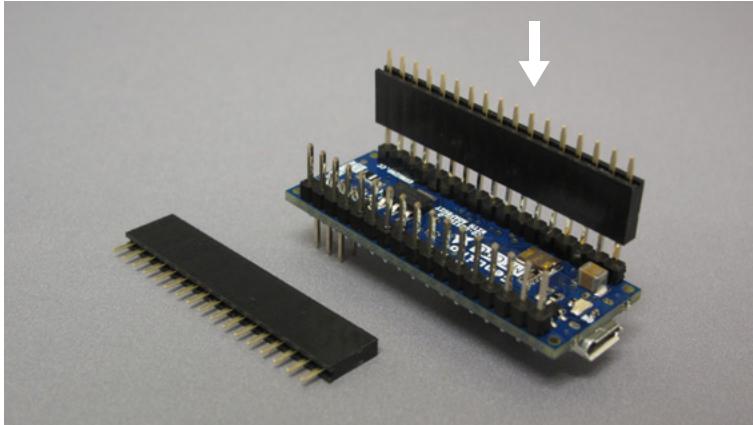
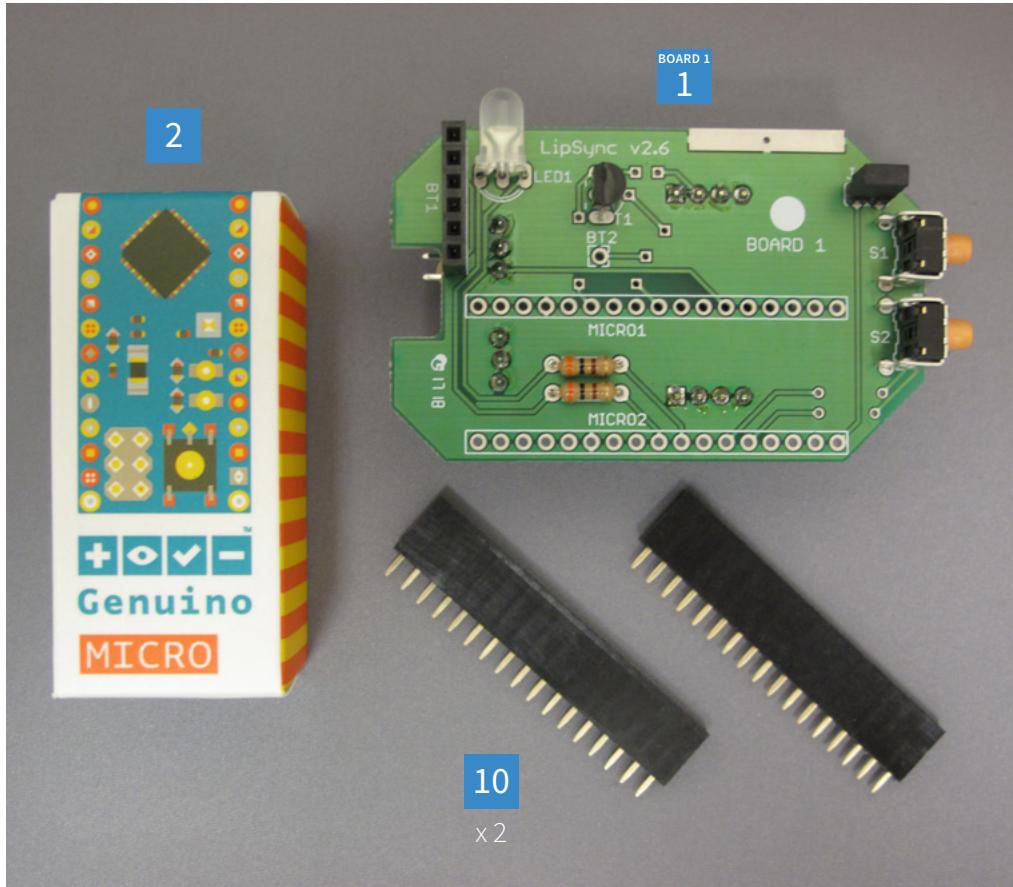
x 6

08.



x 6

PART 4

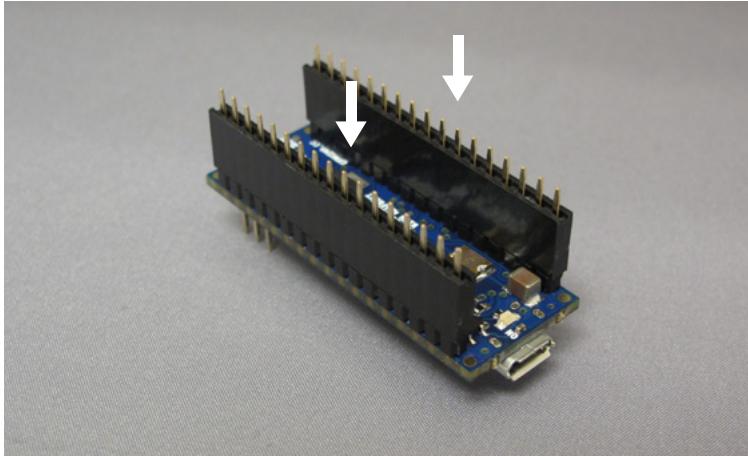
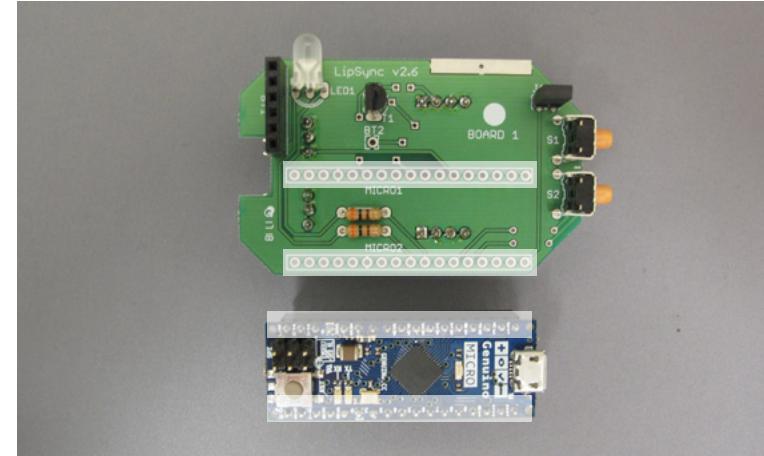
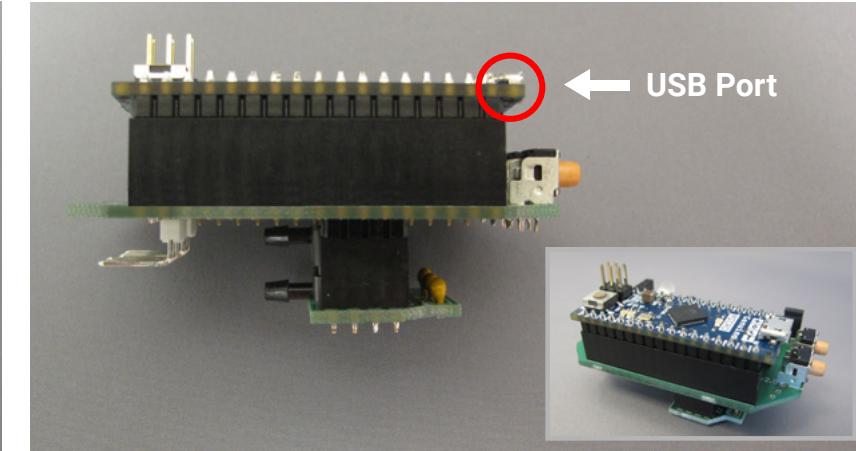
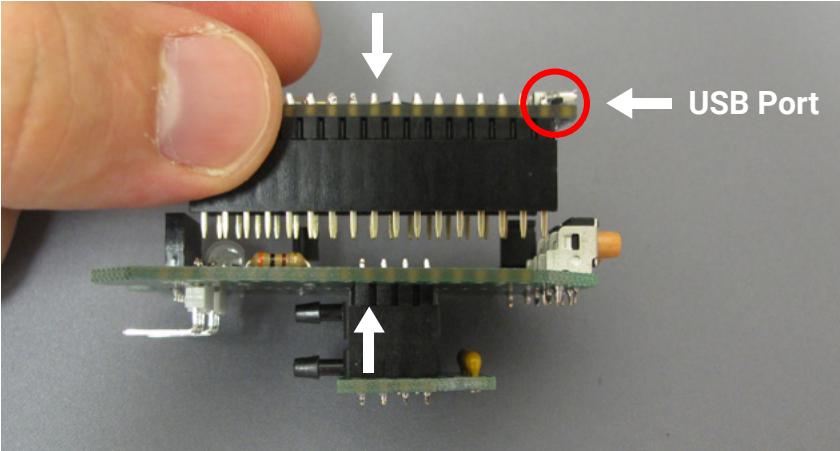


01.

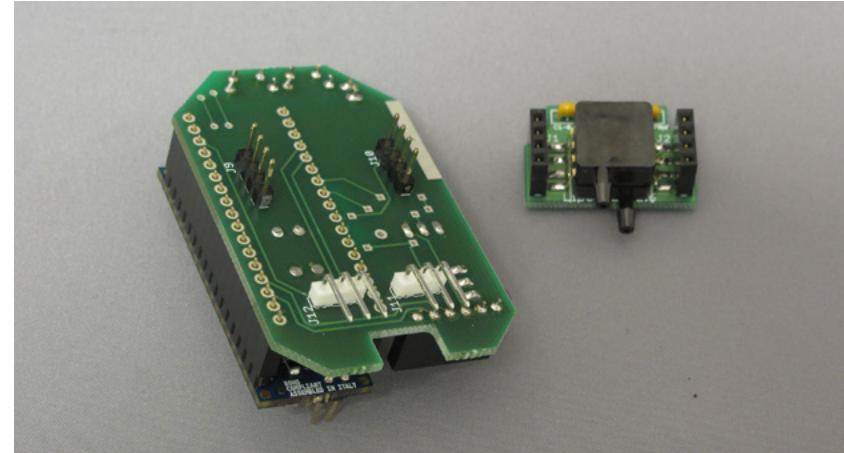
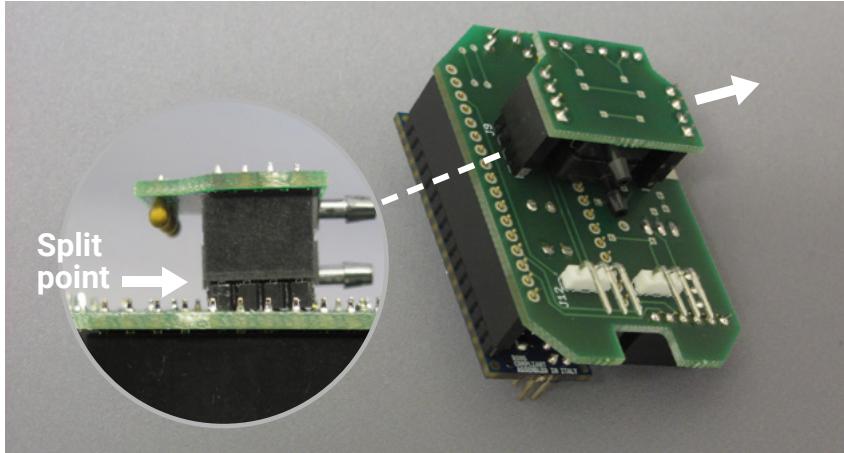
2

10

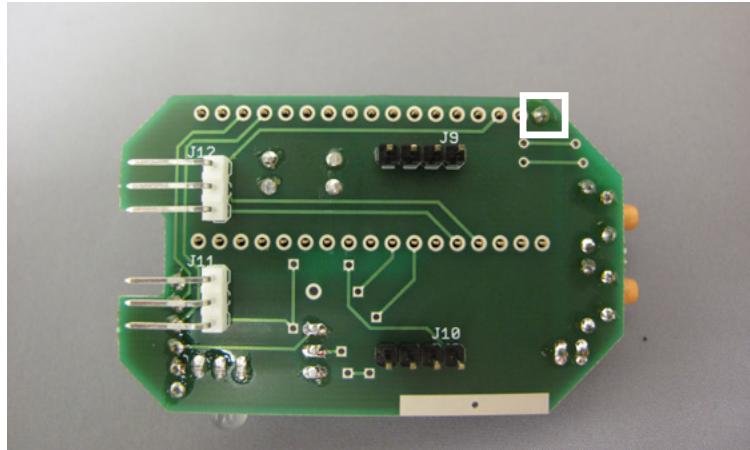
x 2

02.**03.****04.**

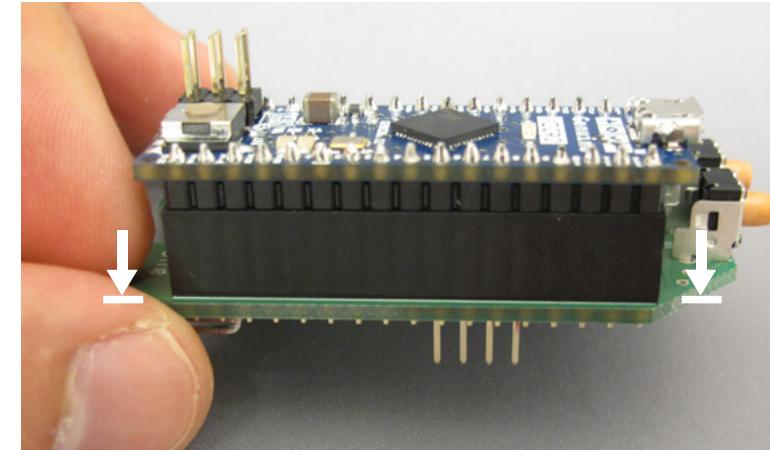
05.



06.

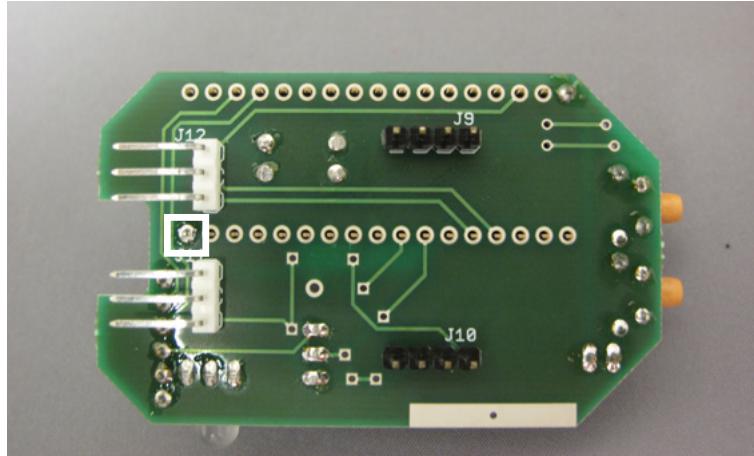


07.



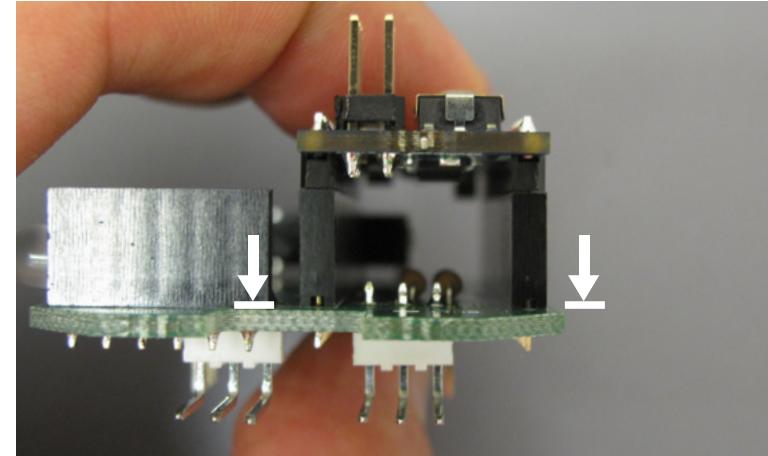
NOTE: Check that components are flush to the board

08.



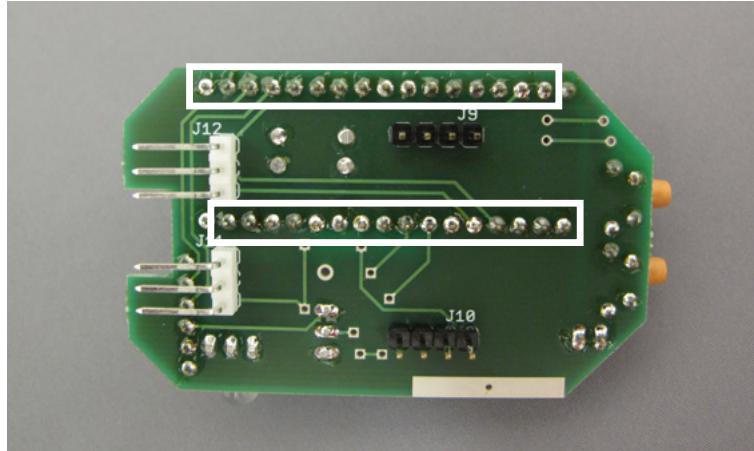
x 1

09.



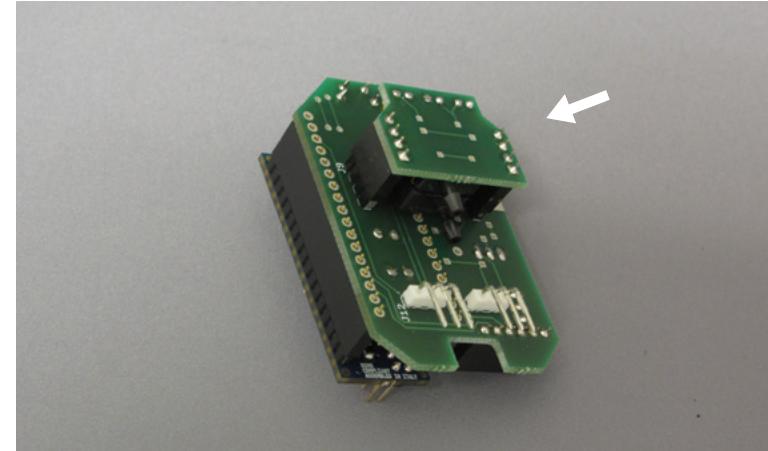
NOTE: Check that components are flush to the board

10.

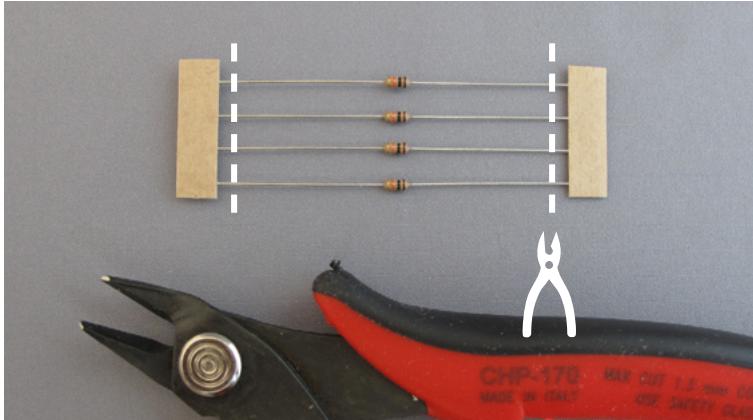
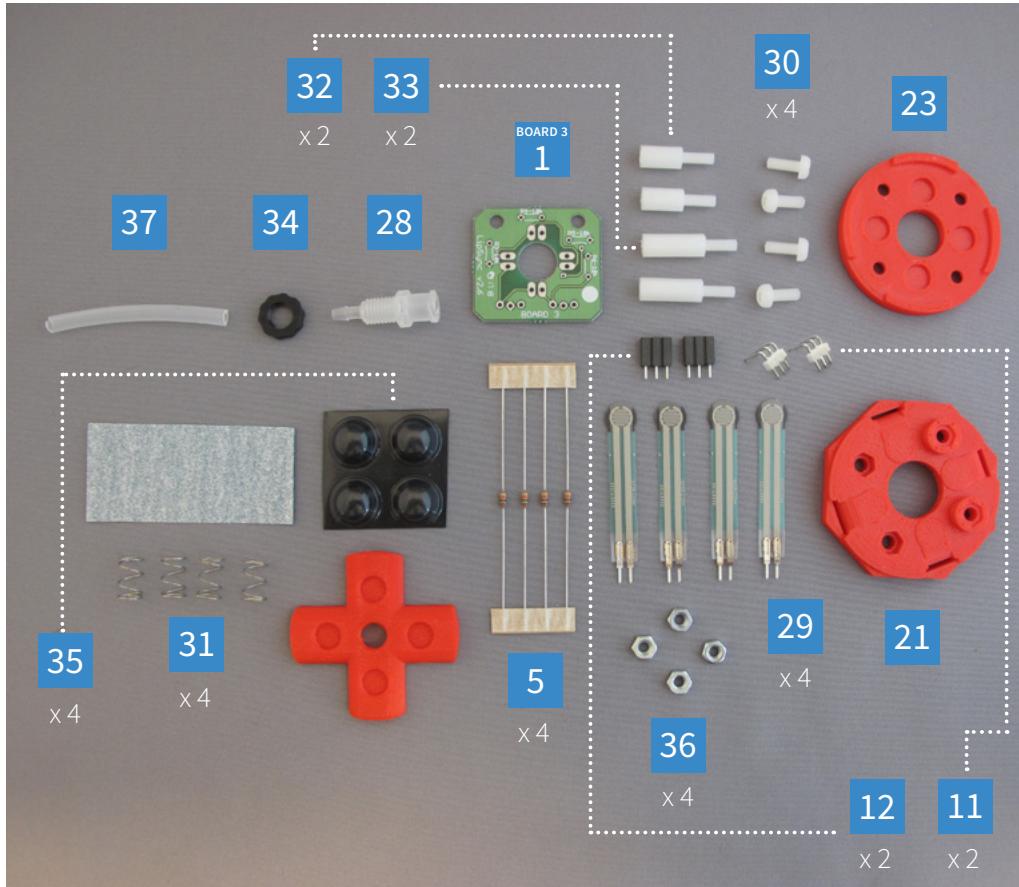


x 32

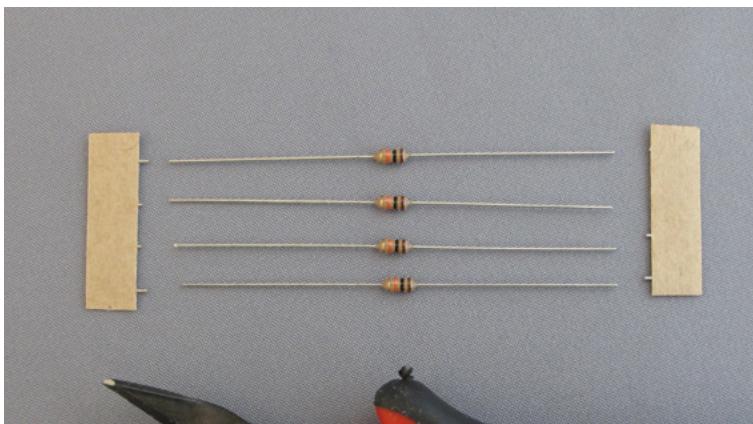
11.



PART 5

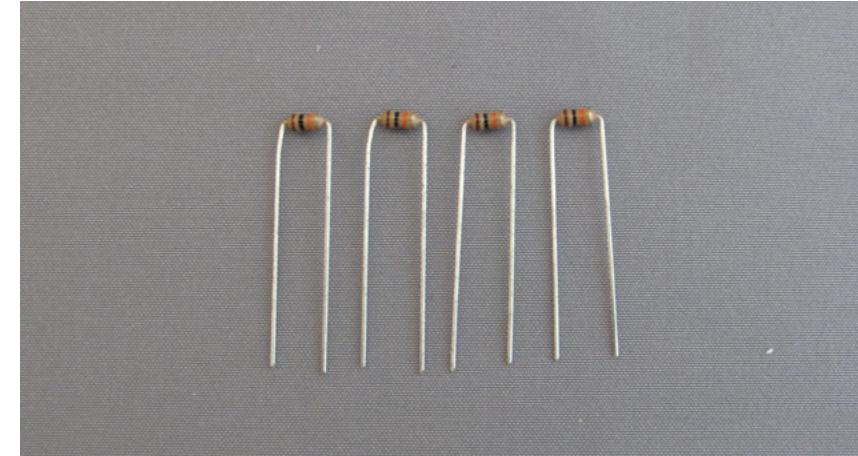
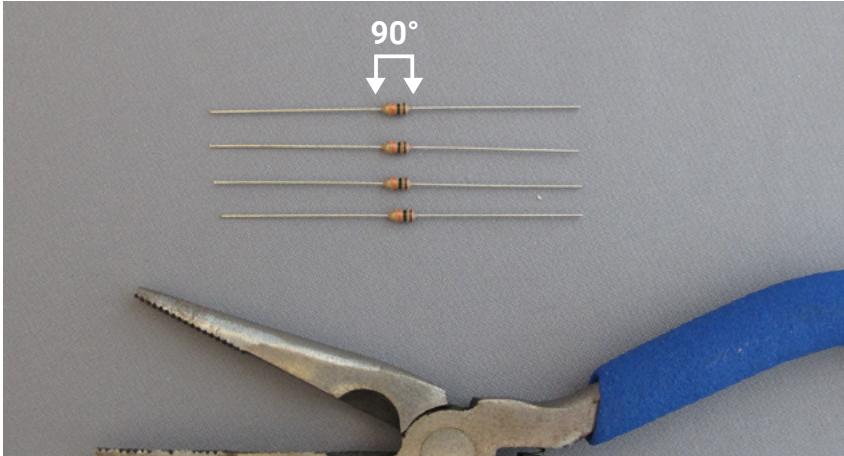


5
x 4

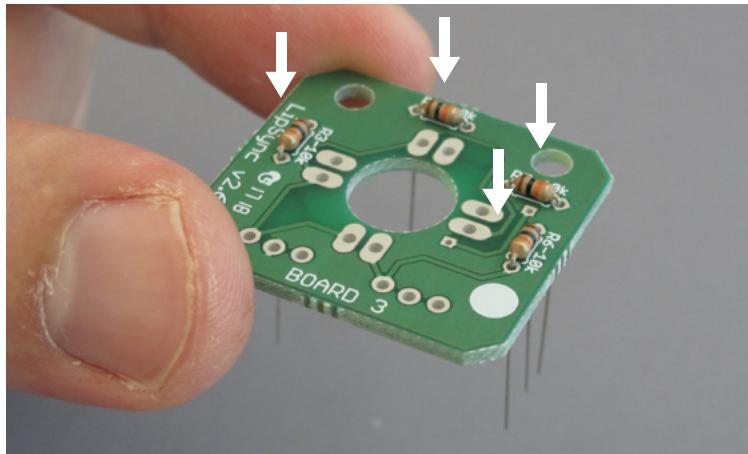


01.

02.



03.



BOARD 3

1
x 4

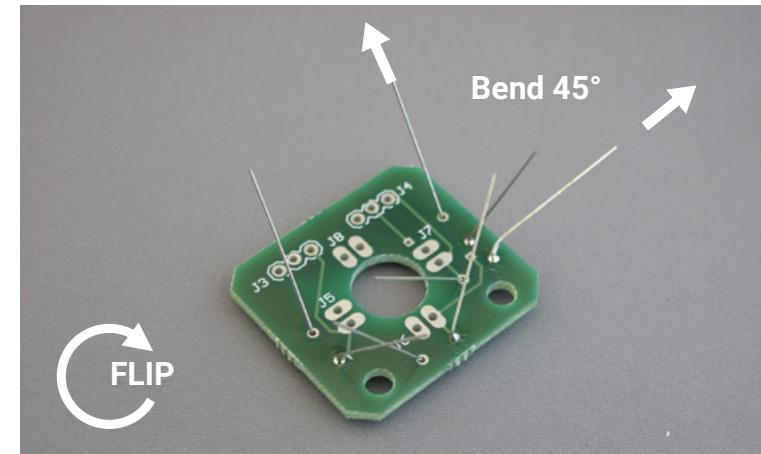
HOLE
R3

HOLE
R4

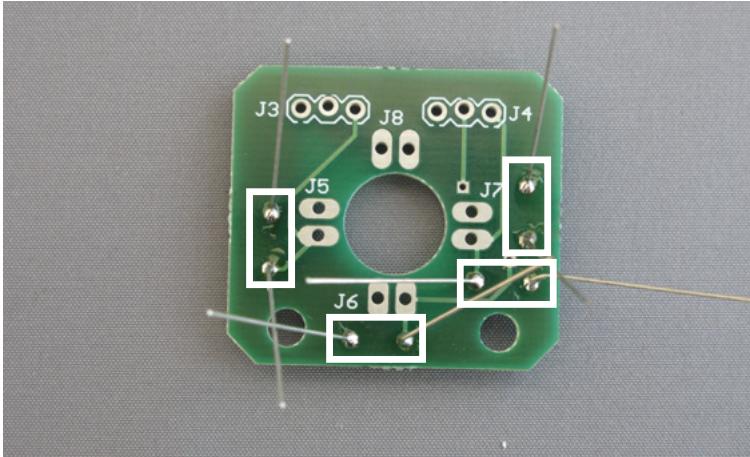
HOLE
R5

HOLE
R6

04.

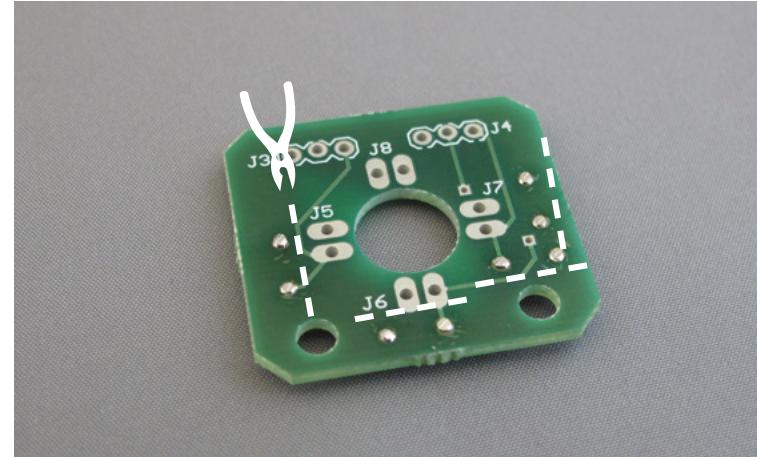


05.



x 8

06.



07.



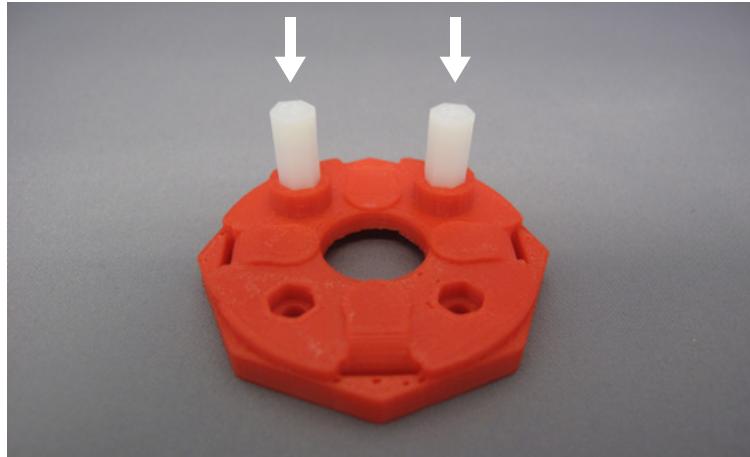
21

22

23



08.



NOTE: Insert the 10mm standoffs

32

x 2

10.



33

09.

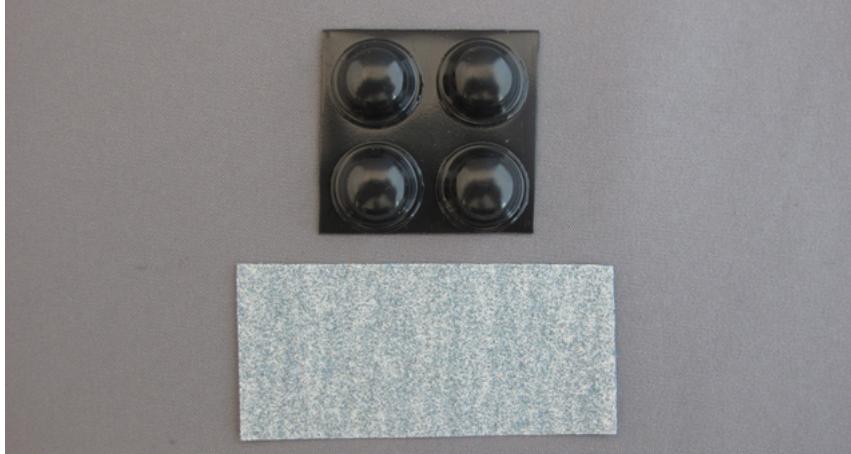


36

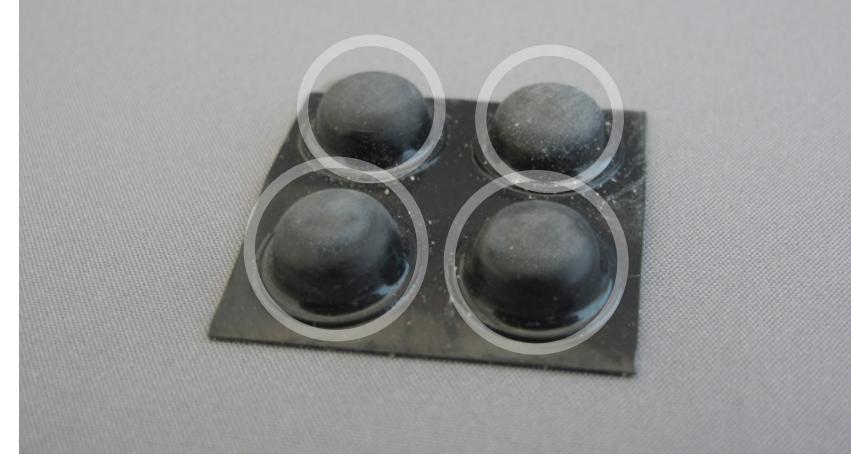
x 2

WAIT
5
min

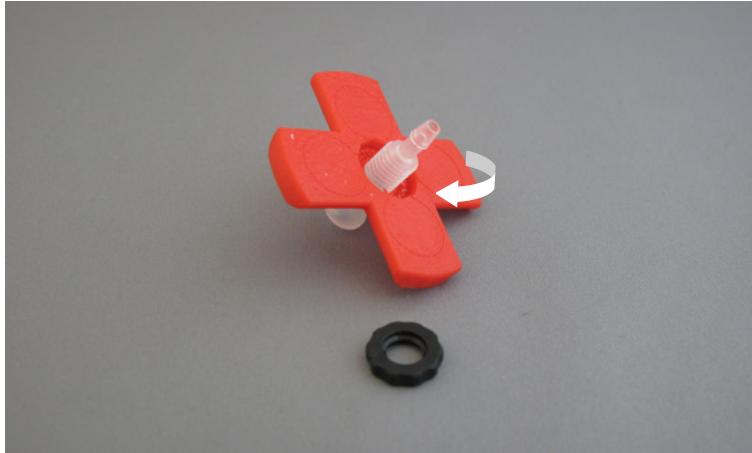
11.



35
x4

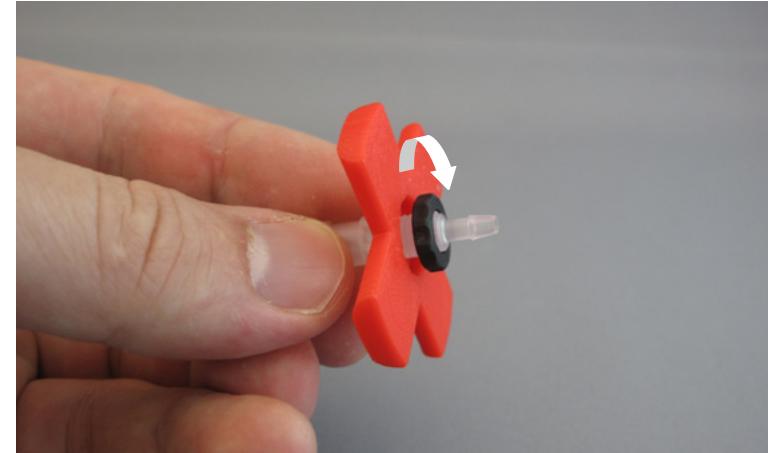


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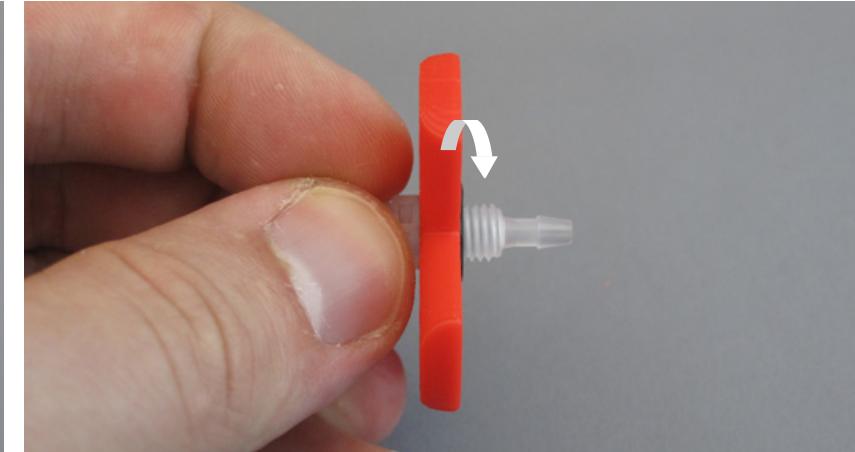
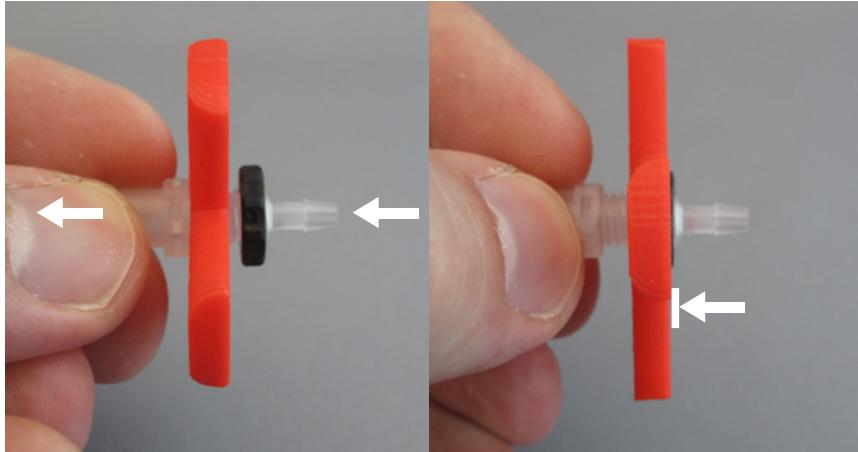


22
28
34

13.



14.

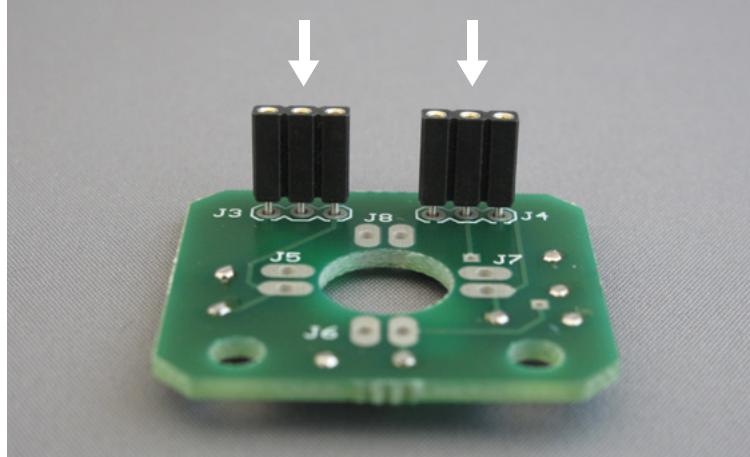


NOTE: The luer lock nut should sit flush to the rocker. Once flushed, twist the luer lock fitting the rest of the way.

15.



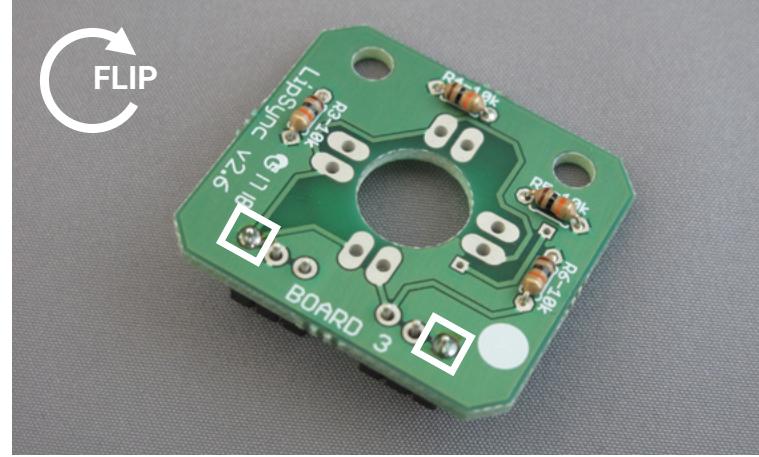
16.



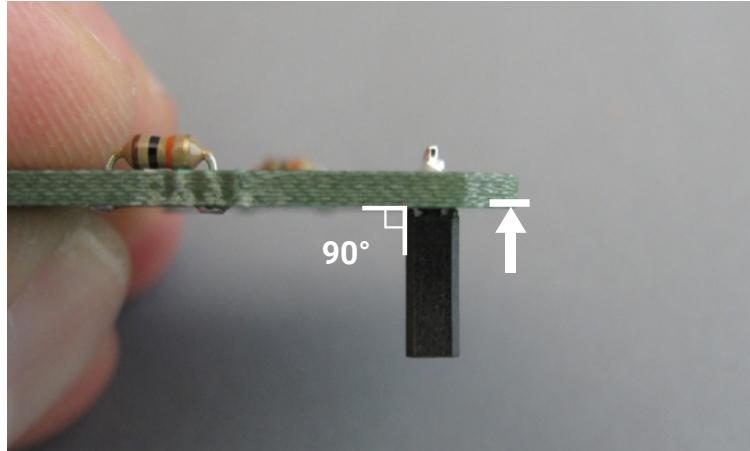
12
x 2

x 2

17.



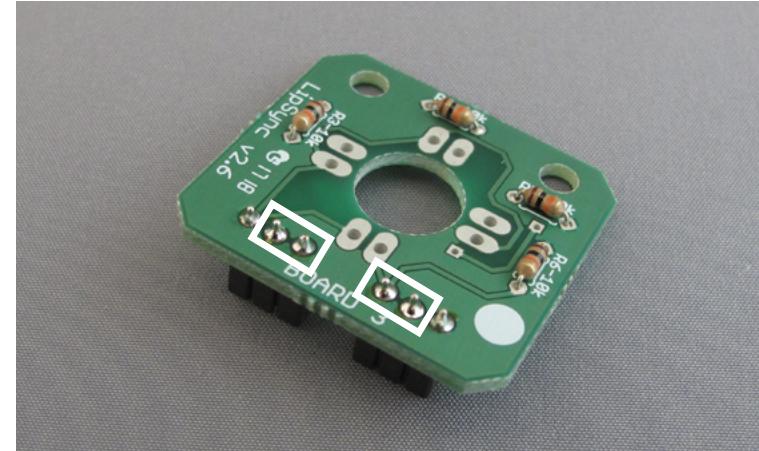
18.



NOTE: Check that components are flush to the board

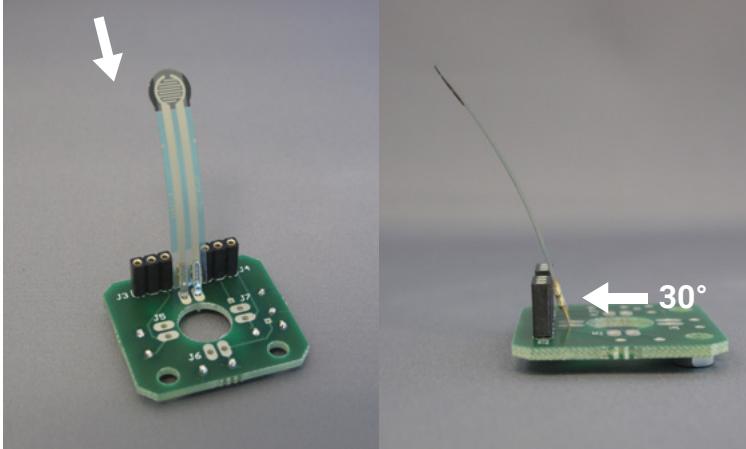
36

19.



x 4

20.

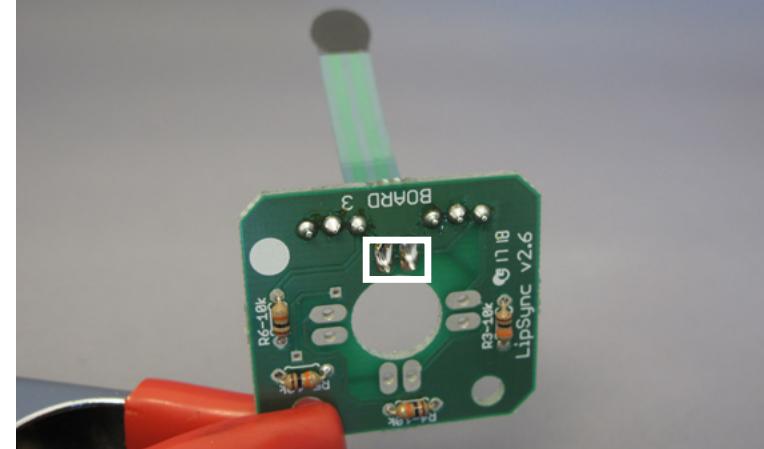


NOTE: Insert FSR at a 30° angle away from the centre of the board

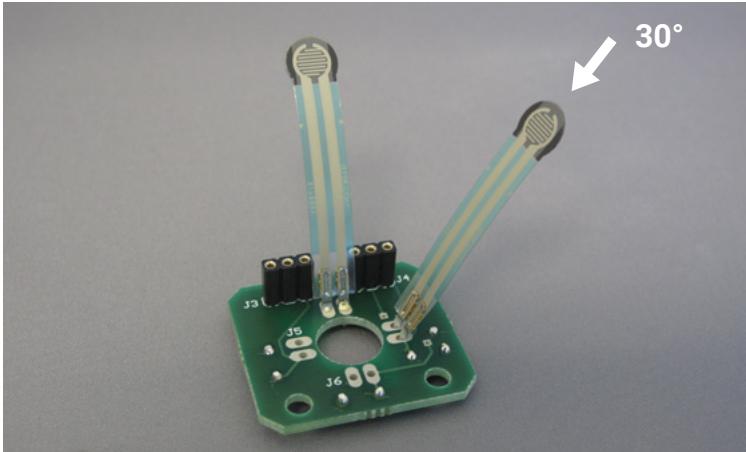
29

x 2

21.



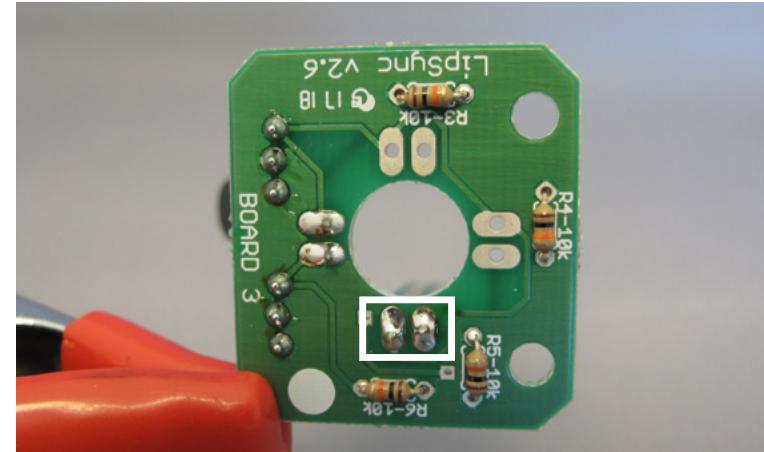
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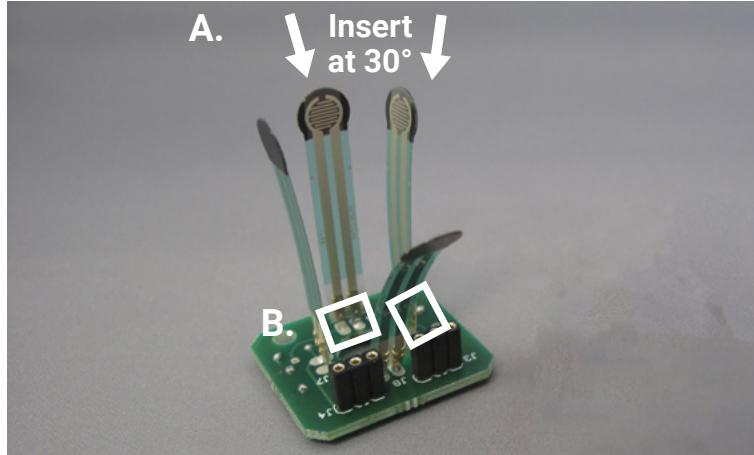
29

x 2

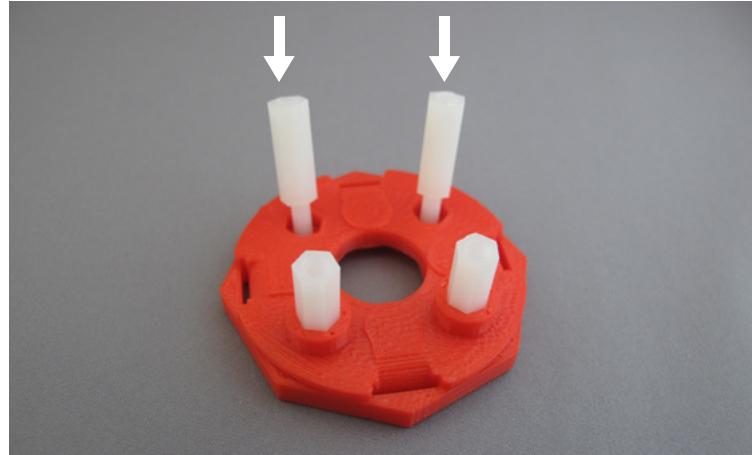
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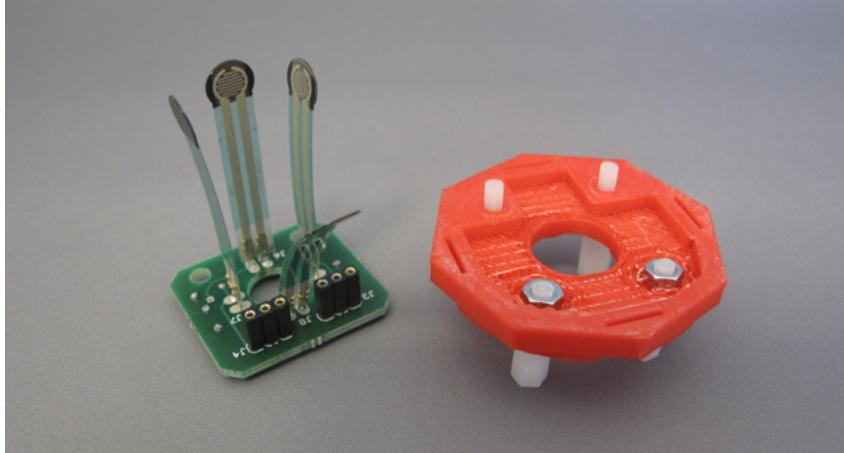
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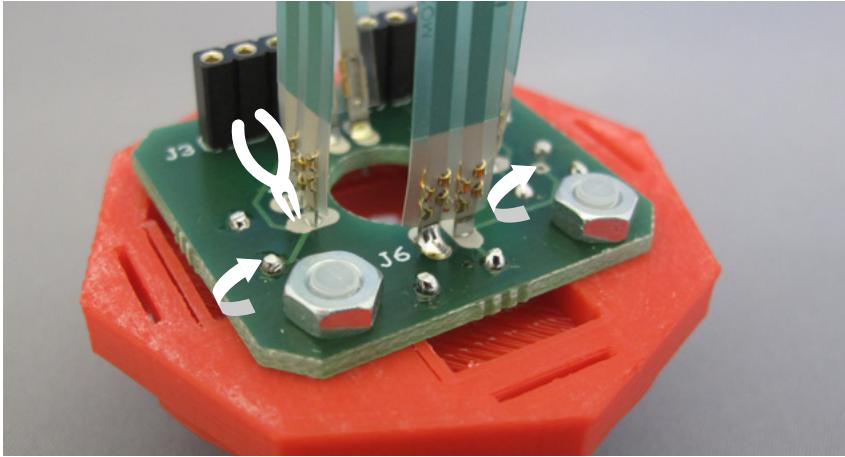
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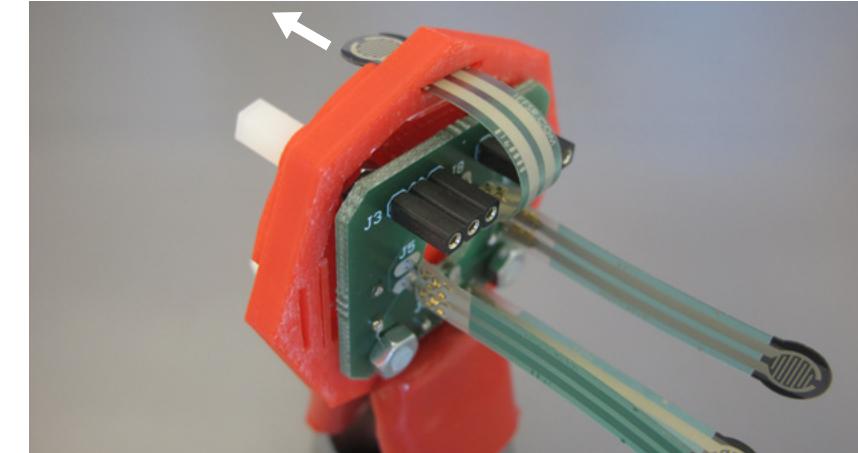
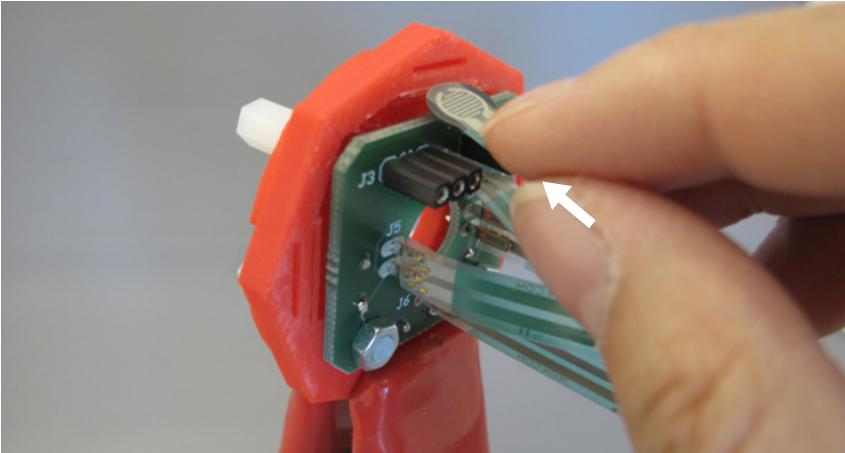
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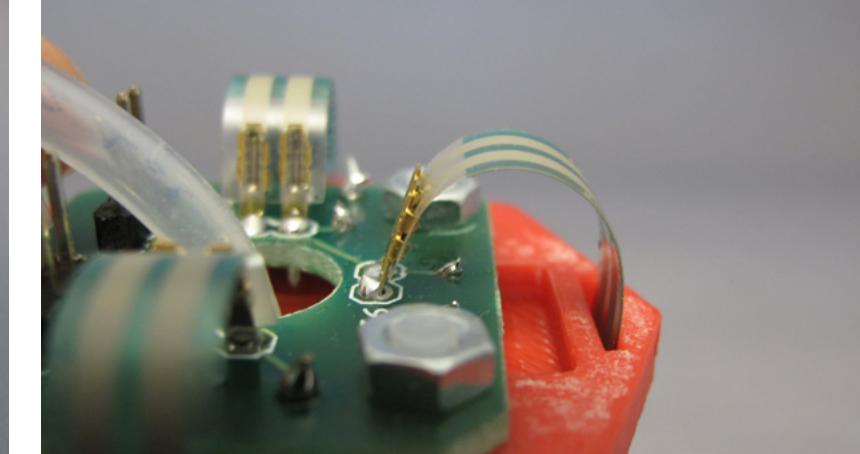
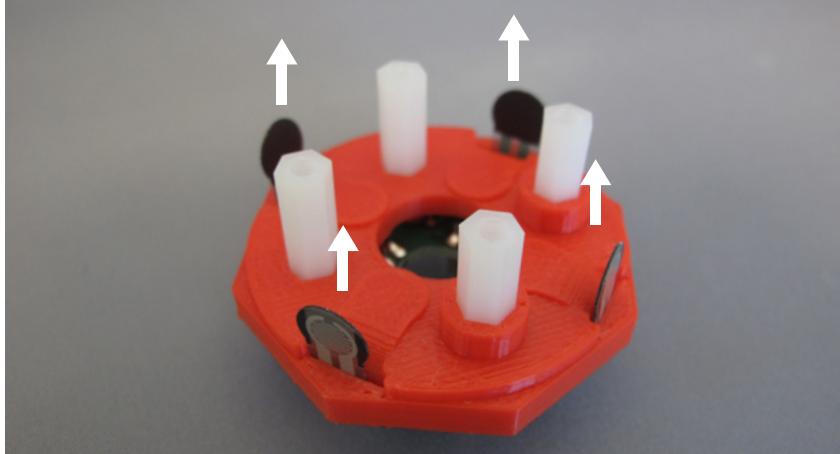
27.



28.

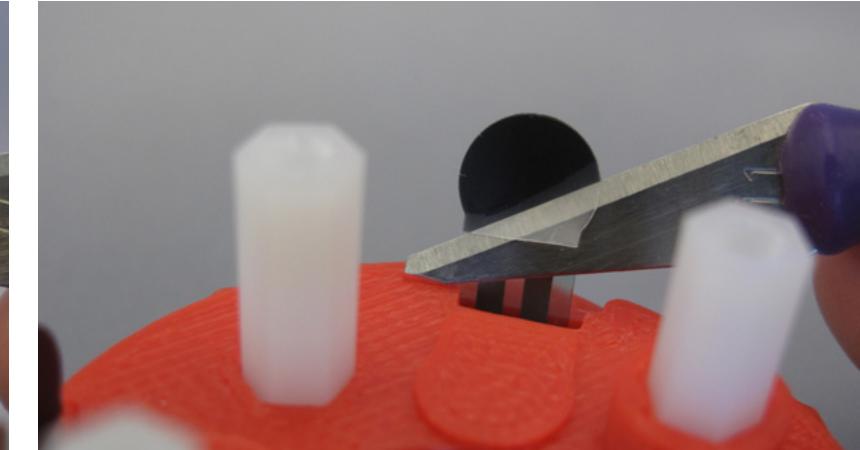
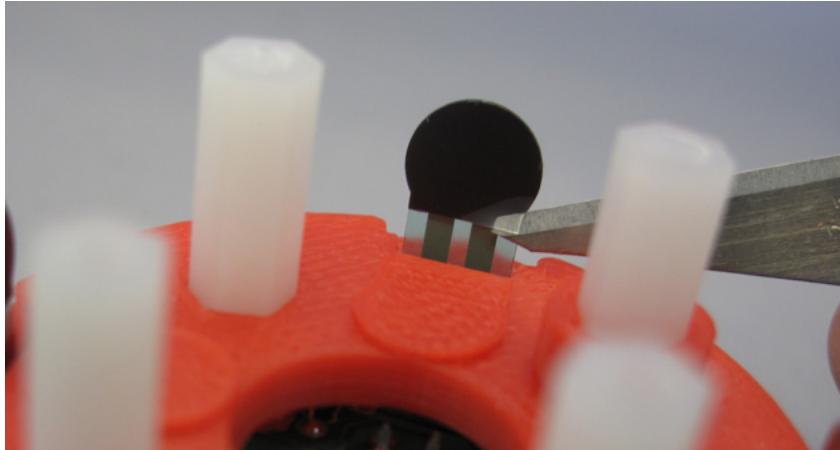


29.



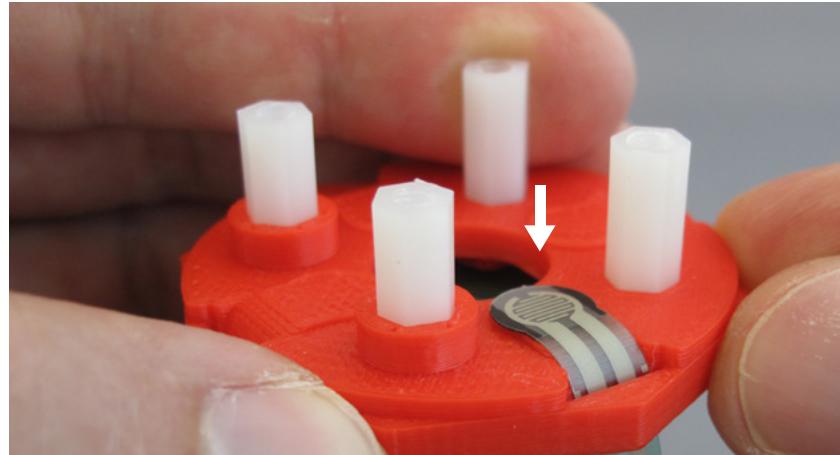
NOTE: On the back of each FSR is a clear adhesive lining. Carefully remove with a hobby knife.

30.

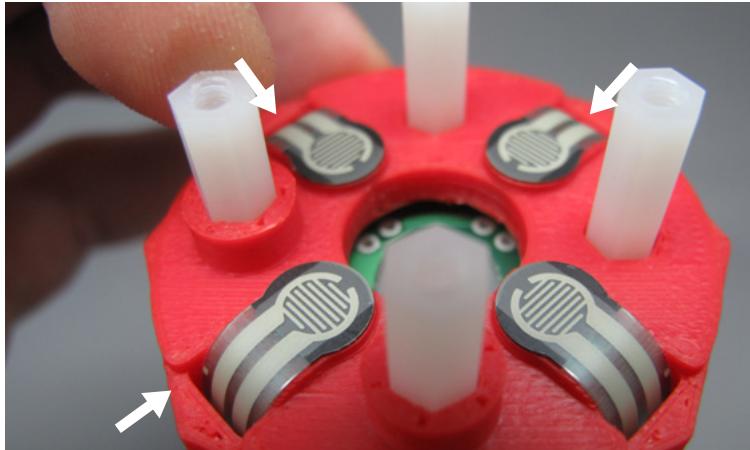


NOTE: On the back of each FSR is a clear adhesive lining. Carefully remove with a hobby knife.

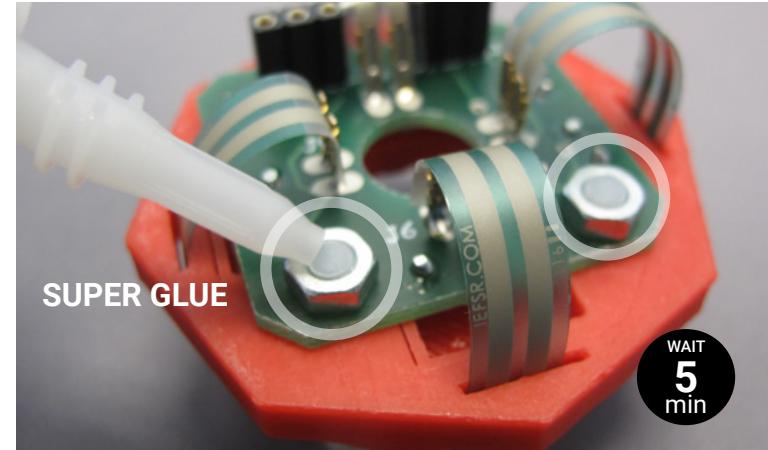
31.



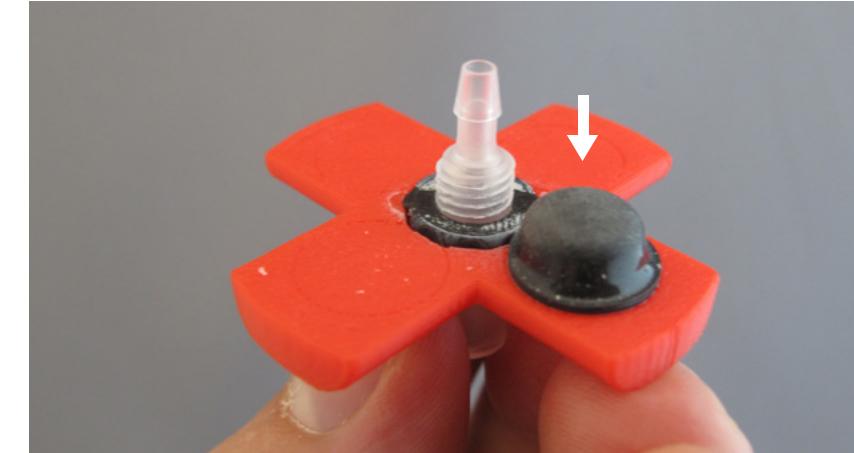
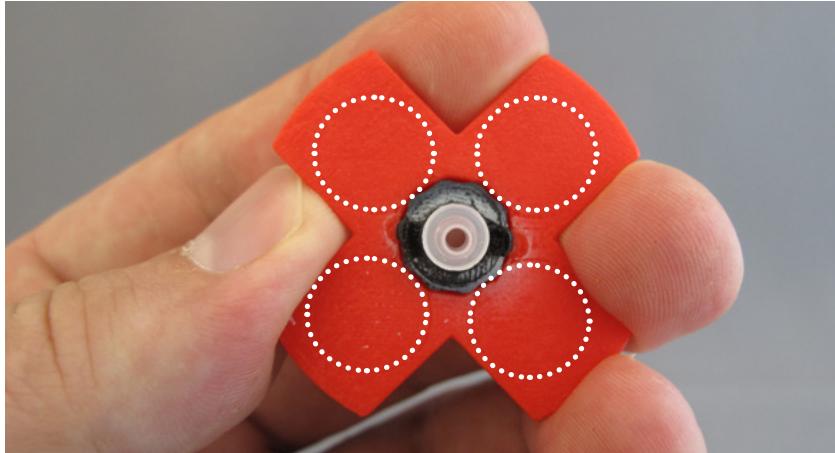
32.



33.

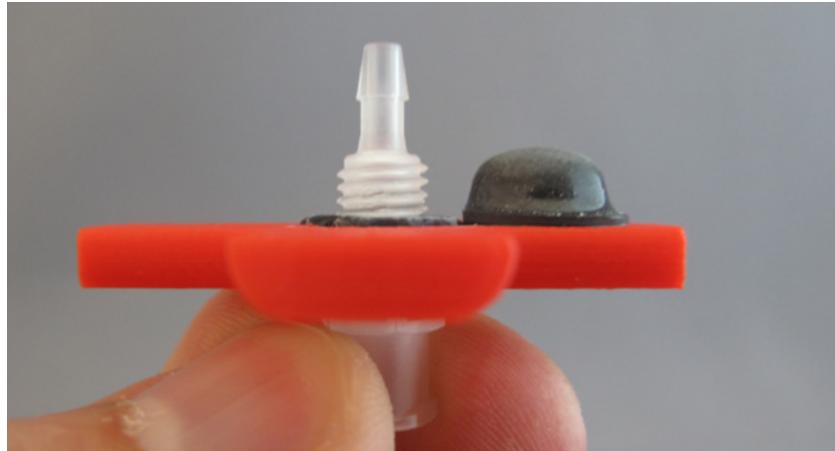


34.



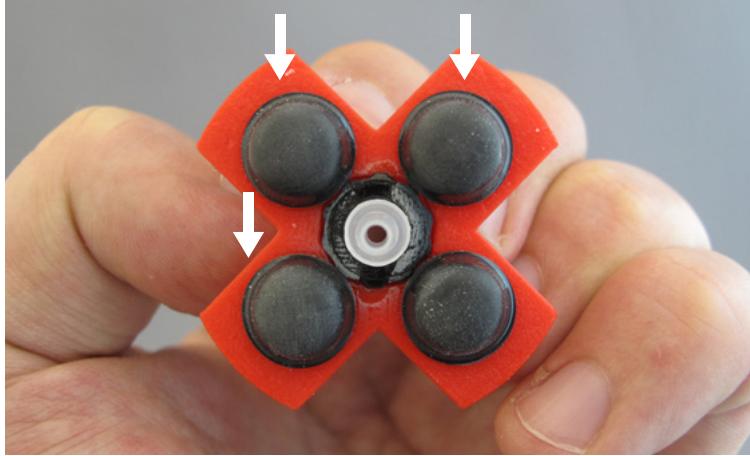
NOTE: On the flat side of the rocker are 4 circles. Place one bumper inside each circle.

35.

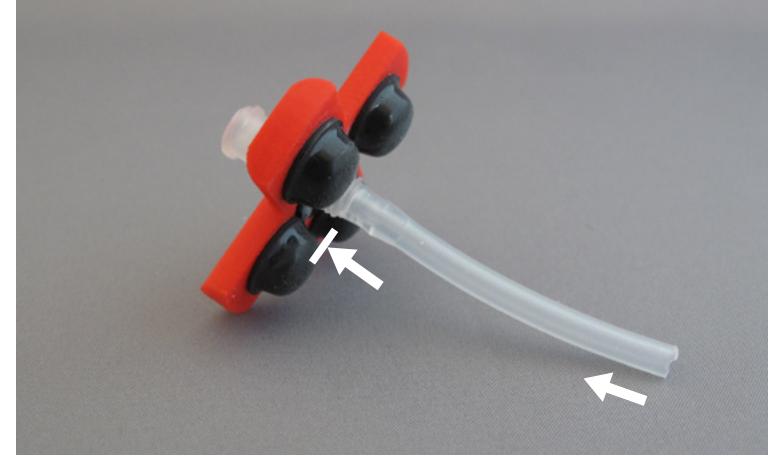


NOTE: Ensure the bumpers are oriented with the high point of each bumper pointed towards the centre. Stick them on the four circular outlines on the Joystick Rocker.

36.

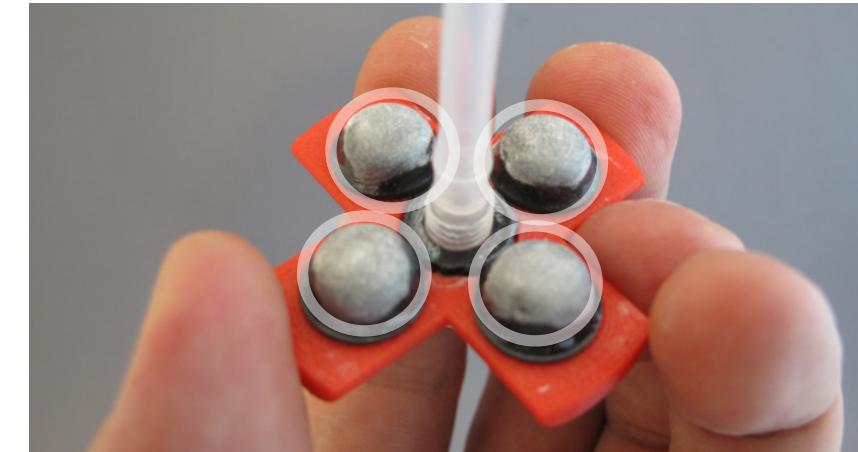


37.



NOTE: Apply
baby powder
with your finger

38.

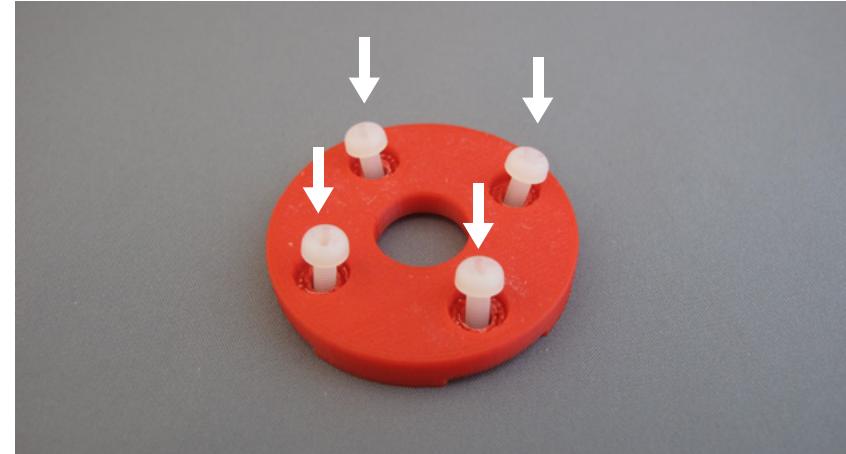
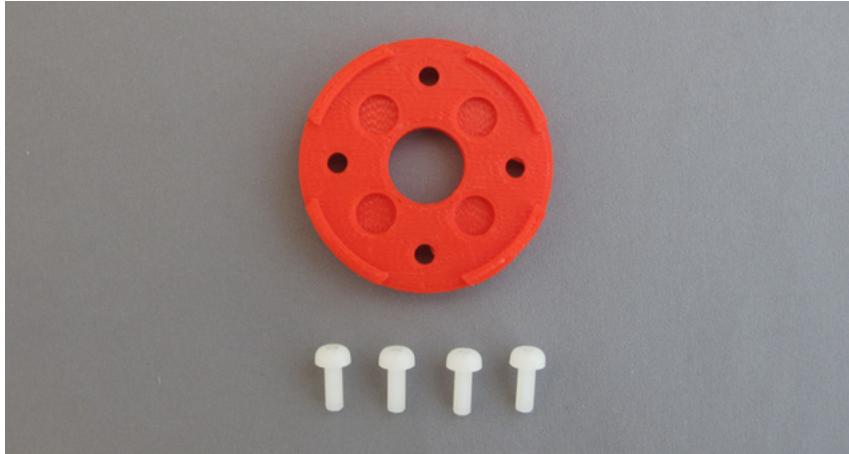


23

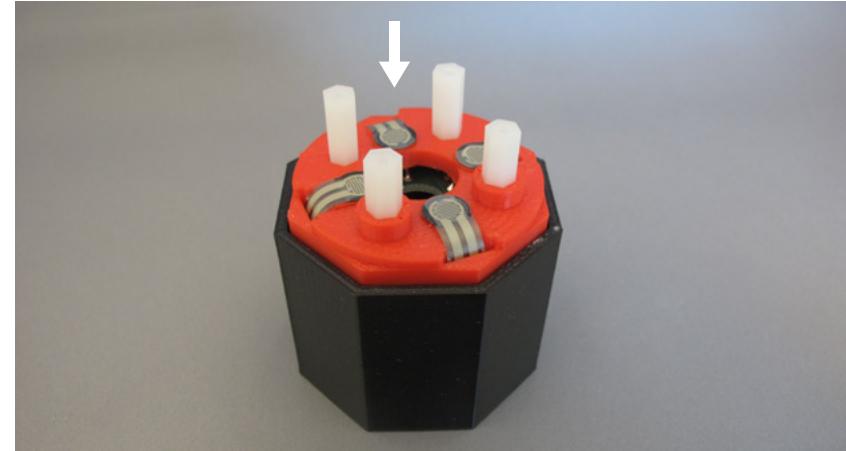
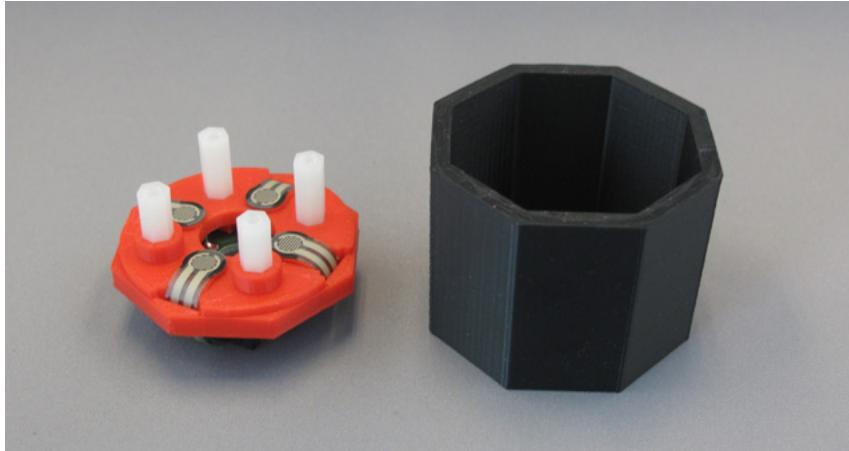
30

x 4

39.

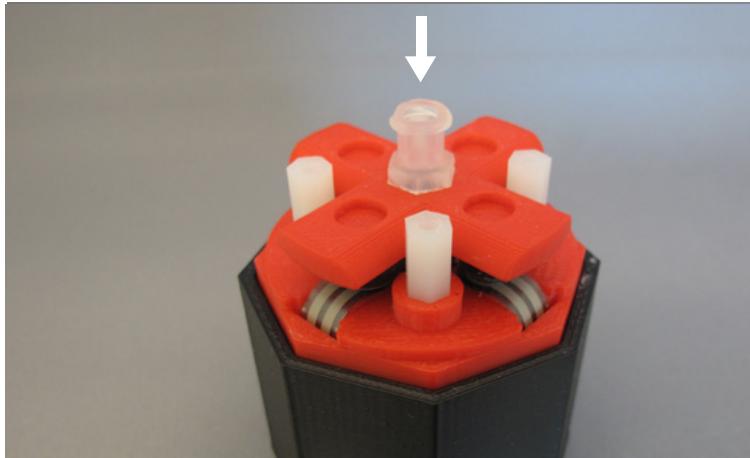


40.

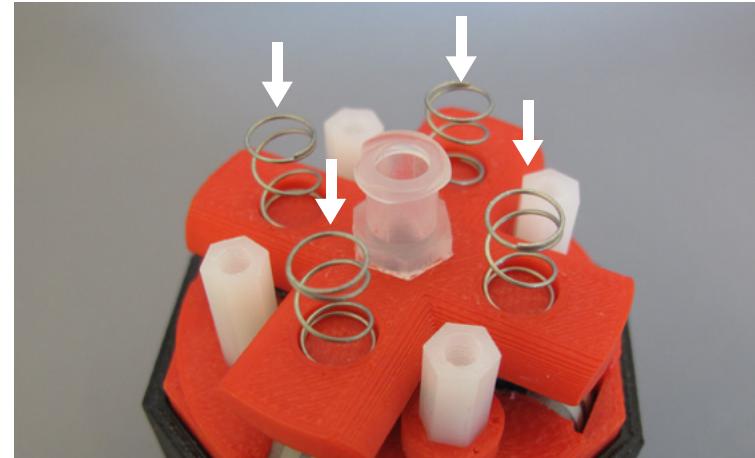


Use the joystick stand holder to assist with assembly for Steps 34-37

41.

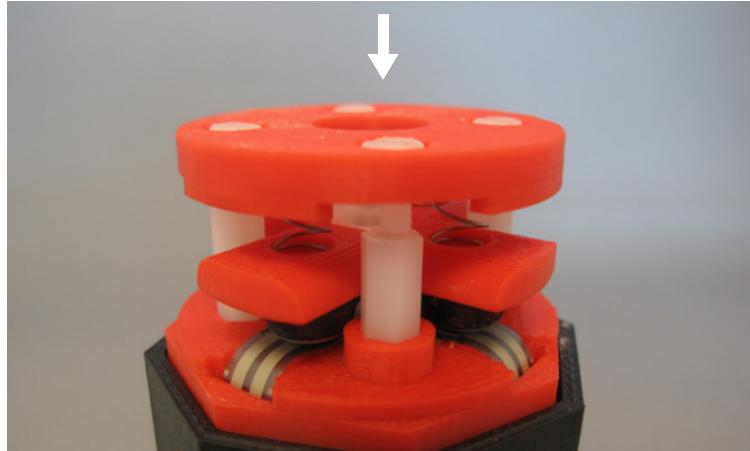


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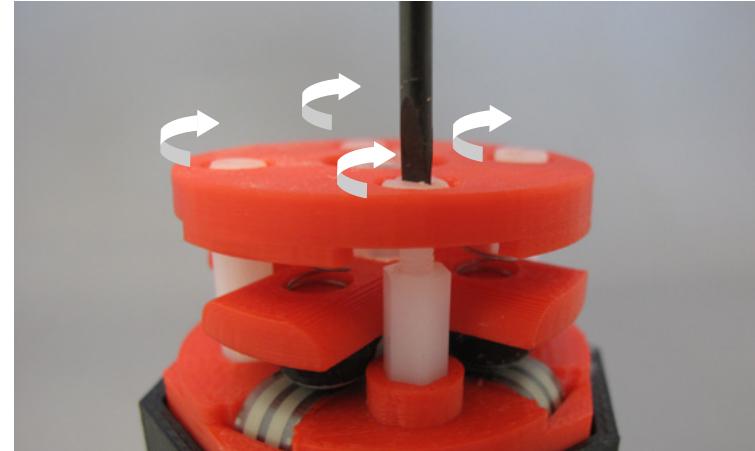


31
x 4

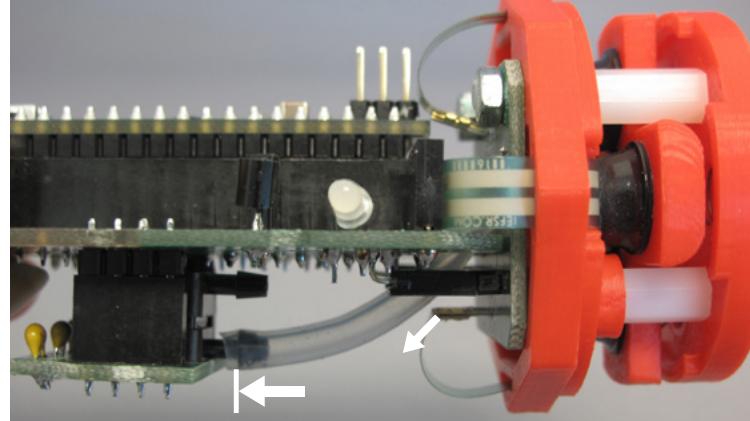
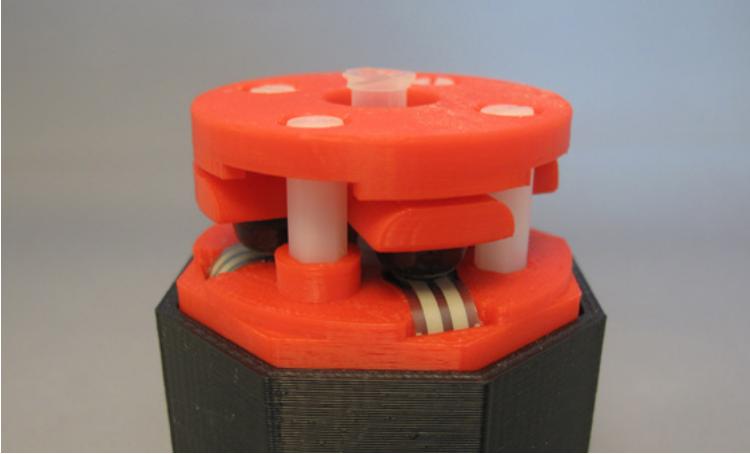
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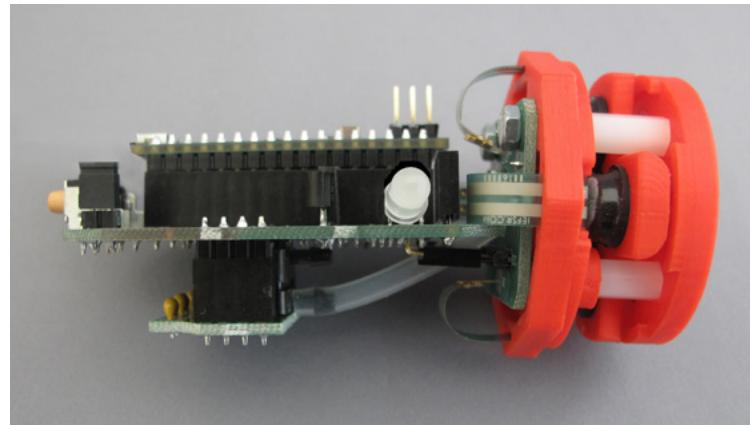
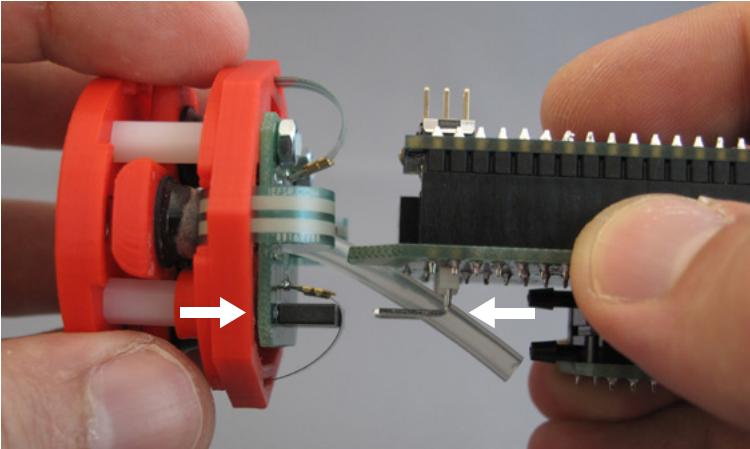
44.



45.



46.

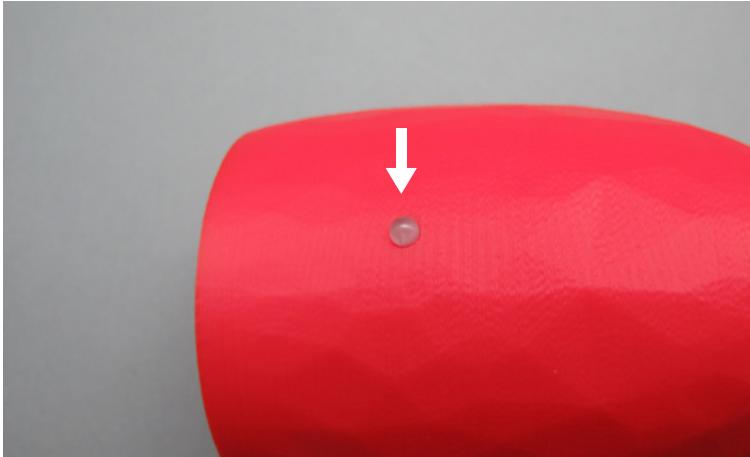


47.

PART 6



01.



24

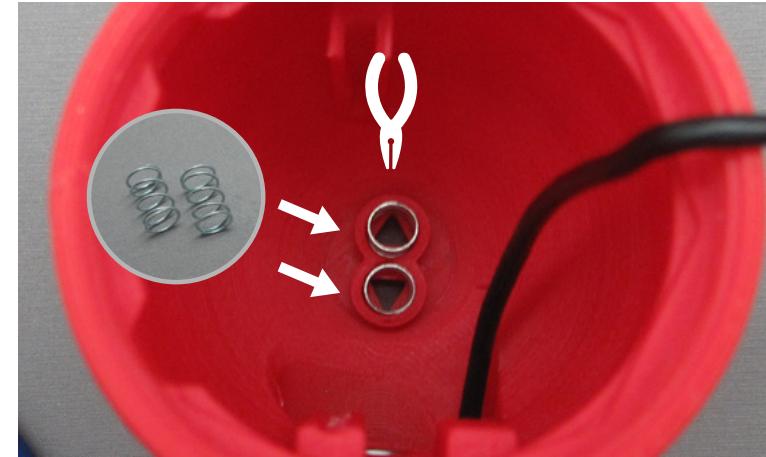
38

02.



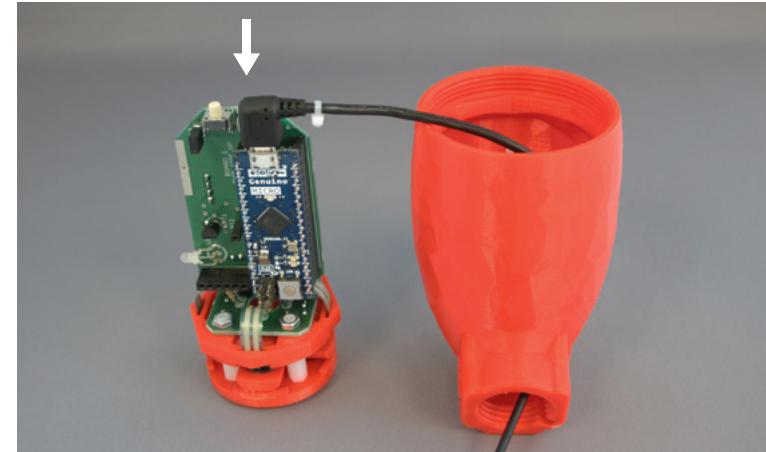
41

43

03.**04.****05.**

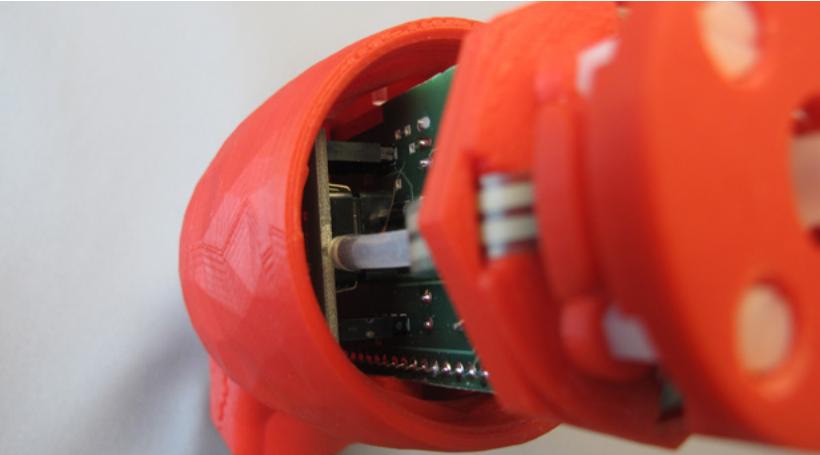
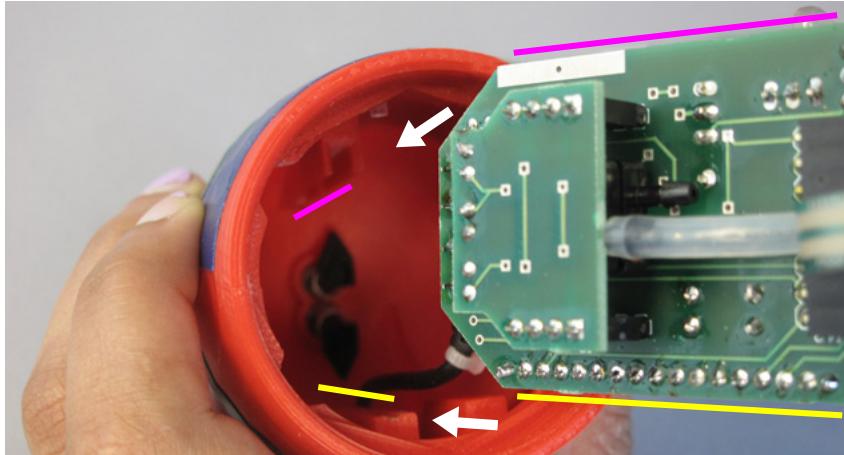
25

x 2

06.

CAUTION: If need be, unplug the cable gently while holding onto the port.

07.



NOTE: Slide the assembly along the internal tracks in the rear chamber housing.

08.



09.



CAUTION: Twist on hand tight

10.



CAUTION: Twist on hand tight

27

11.



CAUTION: Twist on hand tight

26

12.



39

13.



42

PART 7

(OPTIONAL) MOUNTING THE LIPSYNC



01.

02.



THREADLOCKER

03.



04.



40

05.



THREADLOCKER

06.



07.



08.



PART 8

SETTING UP THE DEVICE

It is essential that the following steps are completed in the listed order to ensure that your device is properly set up before first using

- A. Upload the microcontroller code.
- B. Calibrate the joystick.
- C. Read through the Startup Guide for complete information on using the LipSync:
<https://hackaday.io/project/13424/files>

NOTE: In the startup guide is information about device compatibility, mounting, sip-and-puff functions, and speed control among others.

A - UPLOADING THE MICROCONTROLLER CODE

1. Download and install the latest version of Arduino IDE:
<https://wwwarduino.cc/en/main/software>
2. Download and save the latest LipSync microcontroller code:
https://raw.githubusercontent.com/makersmakingchange/LipSync/master/Software/LipSync_Firmware/LipSync_Firmware.ino

Right-click on the hyperlink of microcontroller code, select "Save Target As" (Internet explorer) or "Save Link As" (Chrome or Firefox) and save the microcontroller code (LipSync_Firmware) to the computer directory or folder of your choice.
3. Open the Arduino IDE and click on **Tools** → **Board** → **Arduino/Genuino Micro**
4. Connect to the PC using the LipSync USB cable.
5. Click on **Tools** → **Port**
6. Click the right arrow at the top left of the Arduino IDE to upload the microcontroller code to the LipSync device.
7. Once upload is complete, a message saying "Upload Successful" will show at the bottom left of the Arduino IDE.

B - JOYSTICK CALIBRATION

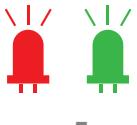
Calibrate your LipSync joystick before first using your device.

IMPORTANT: Allow the LipSync to initialize for 3 seconds before moving the mouthpiece each time after it's plugged into a device.



1

Press both speed adjustment buttons on the back of the LipSync for a few seconds until LED comes on



x 5

2

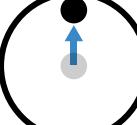
LED slowly blinks red & green 5 times



3 sec.
pause

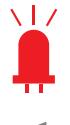


x 6



3

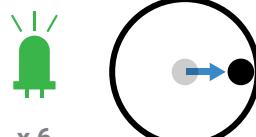
While LED blinks green 6 times, move the mouthpiece to the 12 o'clock position (up direction)



x 1

4

LED blinks red 1 time when position is measured



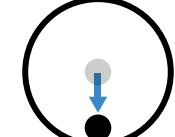
x 6



x 1

5

While LED blinks green 6 times, move the mouthpiece to the 3 o'clock position (right direction) time when position is measured



x 6

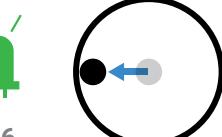
7

While LED blinks green 6 times, move the mouthpiece to the 6 o'clock position (down direction) time when position is measured



x 1

8



x 6

9

While LED blinks green 6 times, move the mouthpiece to the 9 o'clock position (left direction) time when position is measured



x 1



x 6

11

LED rapidly blinks red and green 6 times when calibration is complete