



LipSync

ASSEMBLY MANUAL

Version 1.21

CONTENTS

- 2 Part 0a - Obtaining Components
- 3 Part 0b - Component Checklist
- 4 Part 0c - Equipment Checklist
- 5 Part 1 - Assembling the Electrical Components
- 15 Part 6 - Assembling the Optional Bluetooth Component
- 21 Part 9 - Assembling the Mechanical Components
- 35 Part 12 - Setting Up the Device
- 37 Appendix A - Full Components List

PART 0a

OBTAINING COMPONENTS

Components should be ordered at least 2 weeks in advance to allow for sufficient shipping time. See Appendix A 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

(See Appendix A for a visual list)

- 1** (1) LipSync Circuit Board Package
- 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 Female Headers	<input type="checkbox"/>	23	(1) Joystick Baseplate	<input type="checkbox"/>	35	(4) Bumpers
<input type="checkbox"/>	12	(2) 4-Position Straight Female T/H Headers	<input type="checkbox"/>	24	(1) Rear Housing	<input type="checkbox"/>	36	(4) Nuts M3
<input type="checkbox"/>	13	(1) Break Away Male Headers	<input type="checkbox"/>	25	(2) Buttons	<input type="checkbox"/>	37	(1) Tubing 3/32" ID x 45mm
<input type="checkbox"/>	14	(1) Bi-Color T/H LED	<input type="checkbox"/>	26	(1) Mouthpiece	<input type="checkbox"/>	38	(1) Light Pipe
<input type="checkbox"/>	15	(1) Shunt Connector	<input type="checkbox"/>	27	(1) Filter	<input type="checkbox"/>	39	(1) Threaded Insert 5/8"-27
<input type="checkbox"/>	16	OPTIONAL (1) SparkFun Bluetooth Mate	<input type="checkbox"/>	28	(1) Luer Lock Fitting	<input type="checkbox"/>	40	(1) Threaded Adapter 5/8"-27
<input type="checkbox"/>	17	OPTIONAL (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	OPTIONAL (1) 1-Position Straight Female T/H Header	<input type="checkbox"/>	30	(4) Screws M3	<input type="checkbox"/>	42	(1) USB Adapter
<input type="checkbox"/>	19	OPTIONAL (1) 6-Position Straight Female T/H Header	<input type="checkbox"/>	31	(6) Compression Springs	<input type="checkbox"/>	43	(1) Magic Arm 11" and Clamp
<input type="checkbox"/>	20	(1) Front Housing	<input type="checkbox"/>	32	(2) Standoffs M3 15mm	<input type="checkbox"/>	44	(1) Cable Tie
<input type="checkbox"/>	21	(1) Joystick Front Plate	<input type="checkbox"/>	33	(2) Standoffs M3 10mm	<input type="checkbox"/>	45	(10) Velcro Strap 0.5" x 6"

PART 0c

EQUIPMENT CHECKLIST

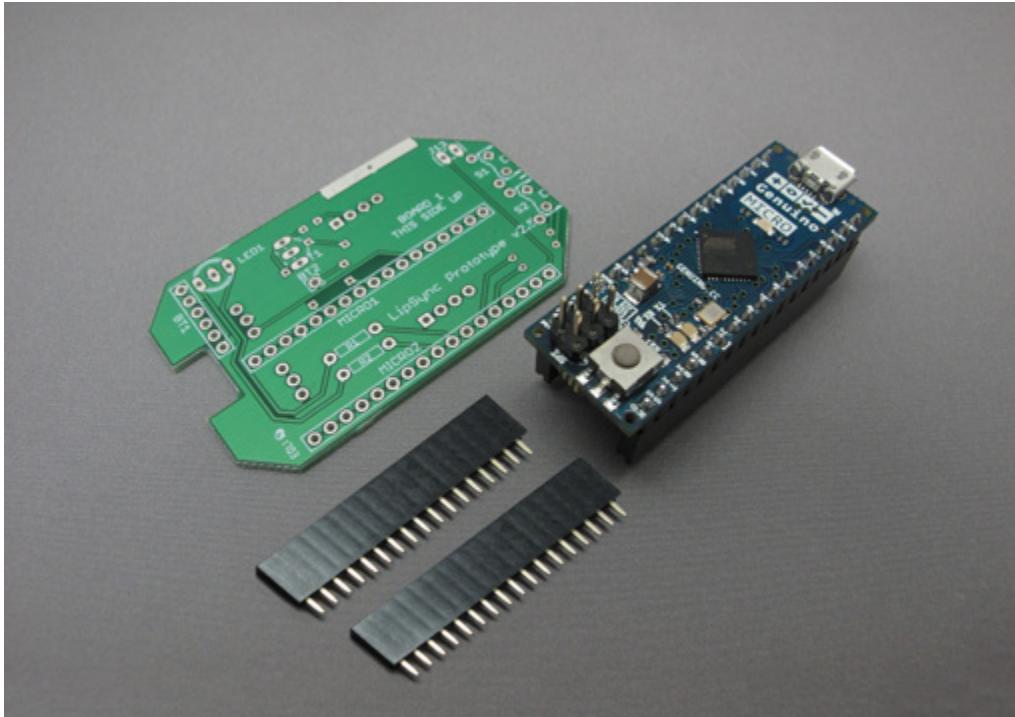
- Small Spool of 60Pb/40Tn Solder Wire
- Soldering Iron (if possible, with adjustable temperature)
- Pair of Needle Nose Pliers
- Fine File or Sandpaper
- Baby Powder
- Super Glue
- Medium Strength Threadlocker
- Desolder Pump (or "solder sucker")
- (1) Adjustable Tabletop Vise (if possible, PANAVISE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

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



= Solder the part outlined

PART 1

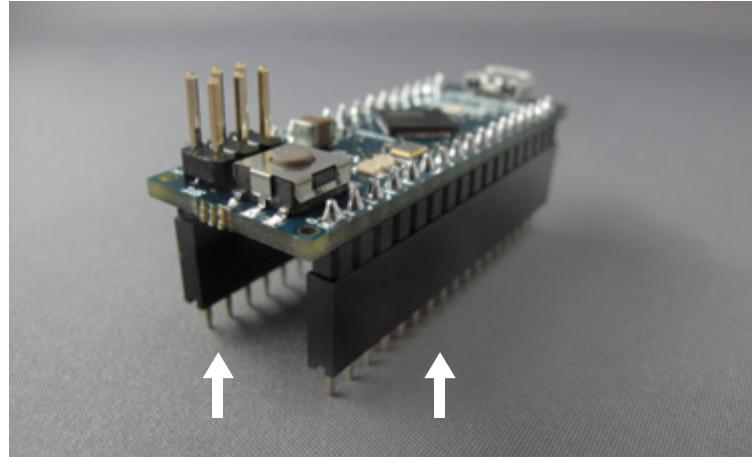


BOARD 1
1 | 2 | 10

x 2

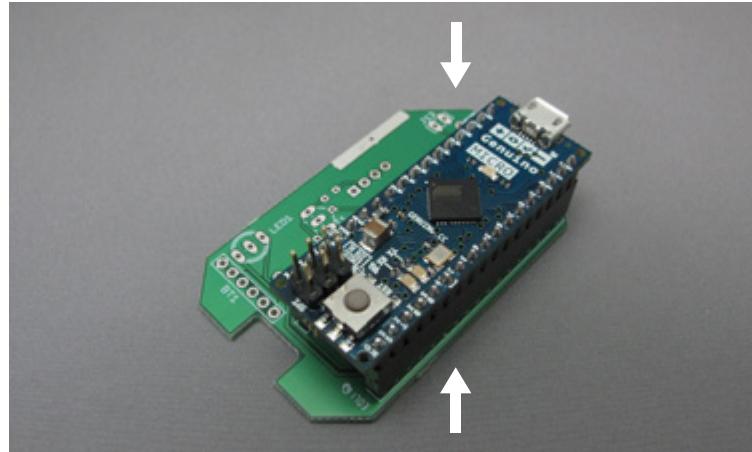
2
10
x 2

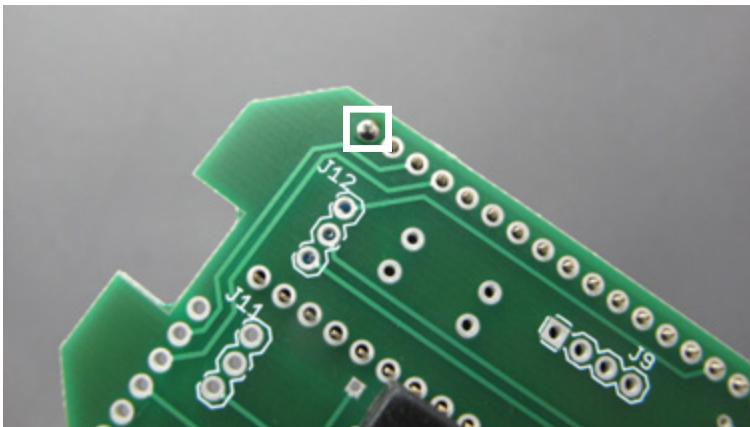
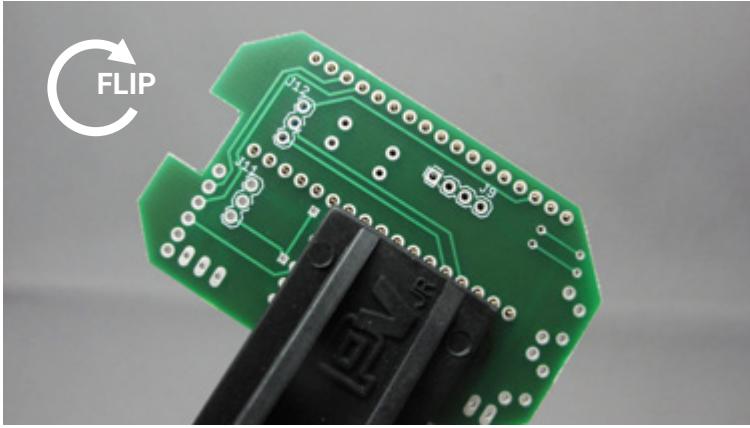
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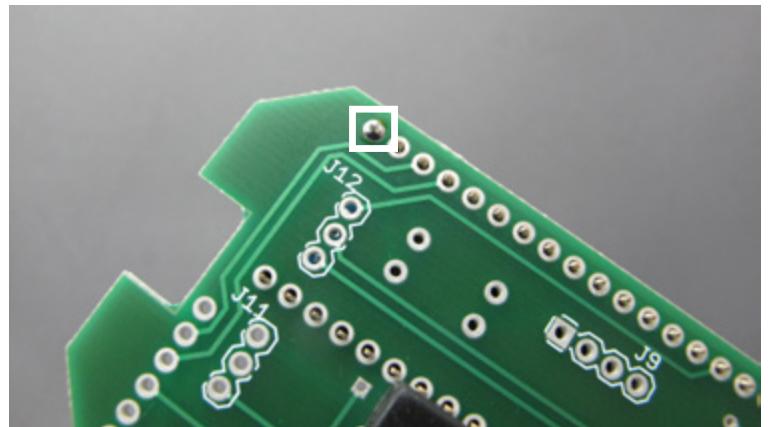
BOARD 1
1

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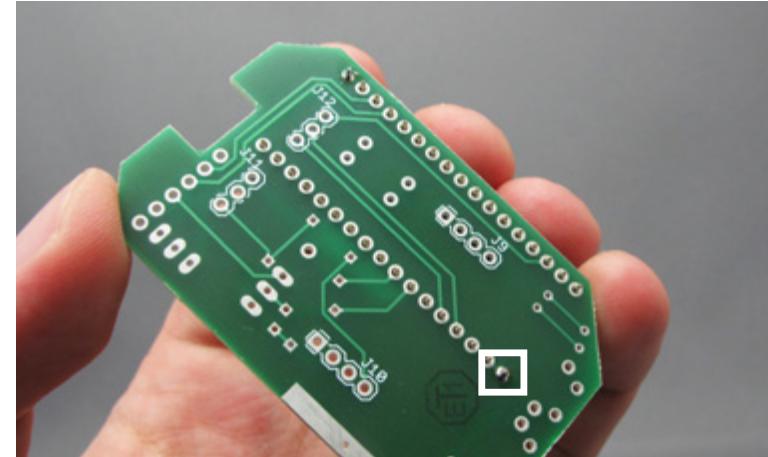


x 1



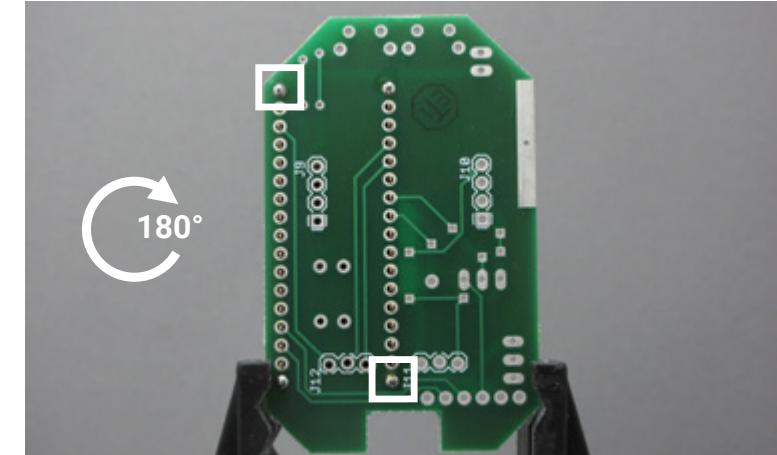
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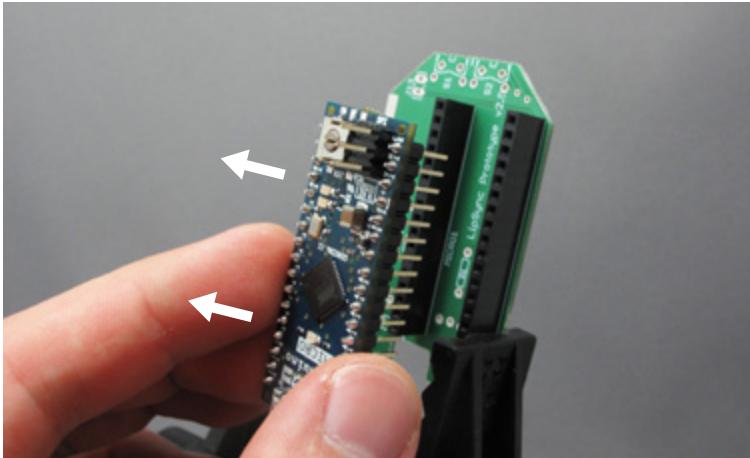


x 2

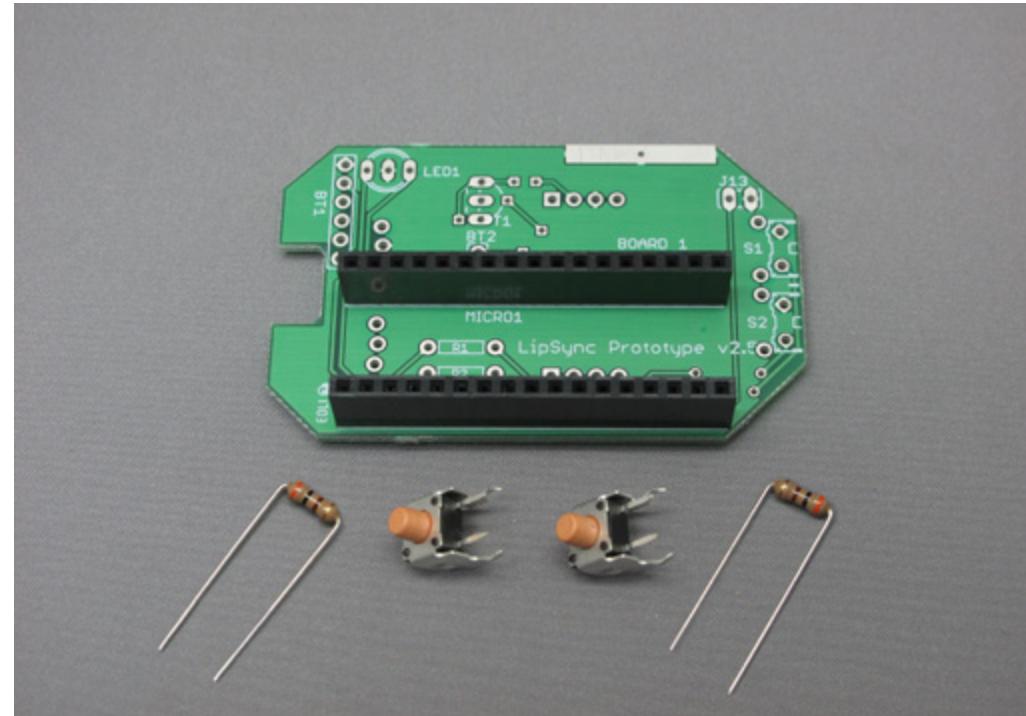
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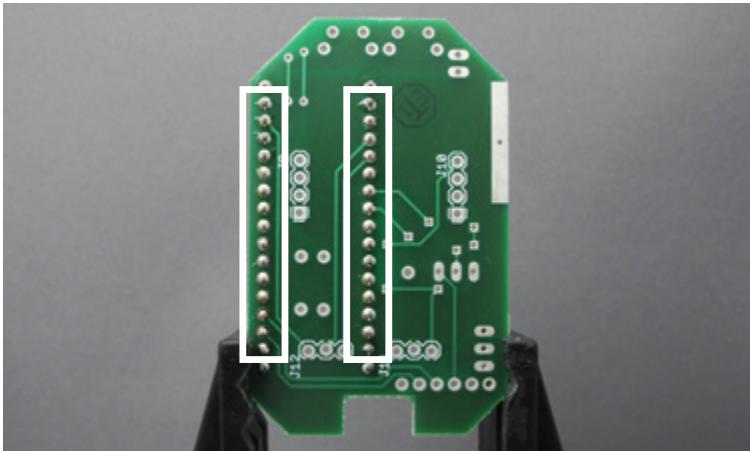
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PART 2

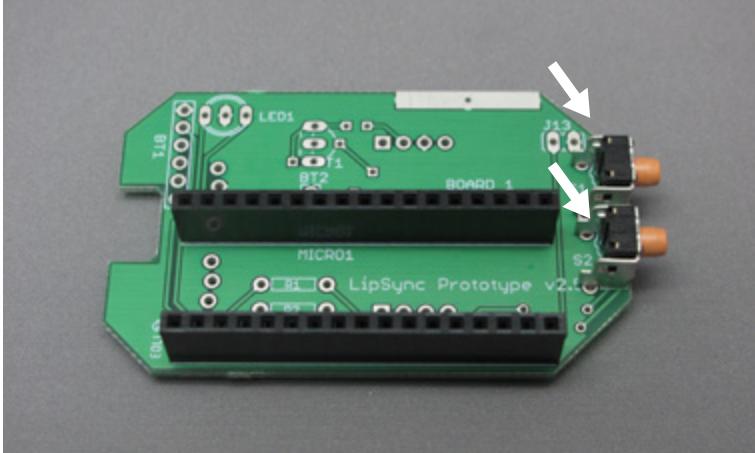
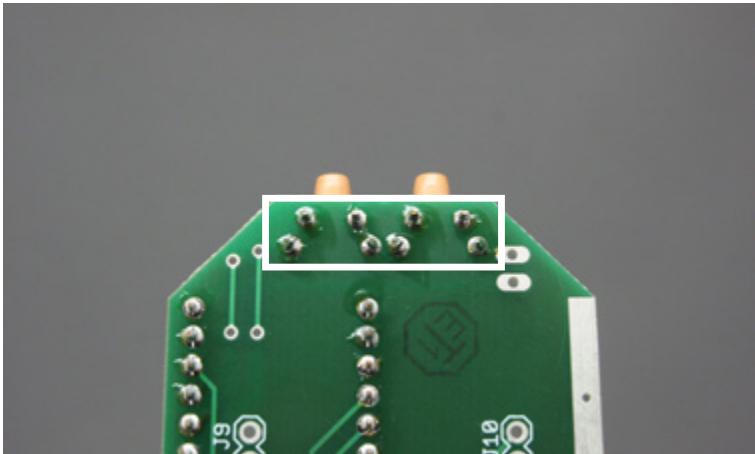


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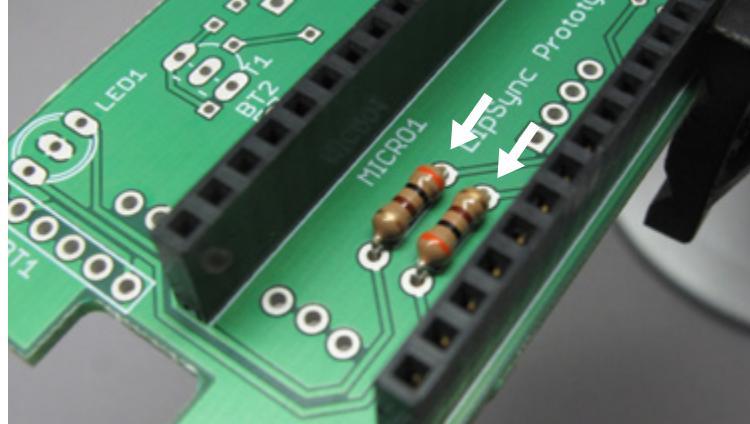


1	3	4
x 2	x 2	

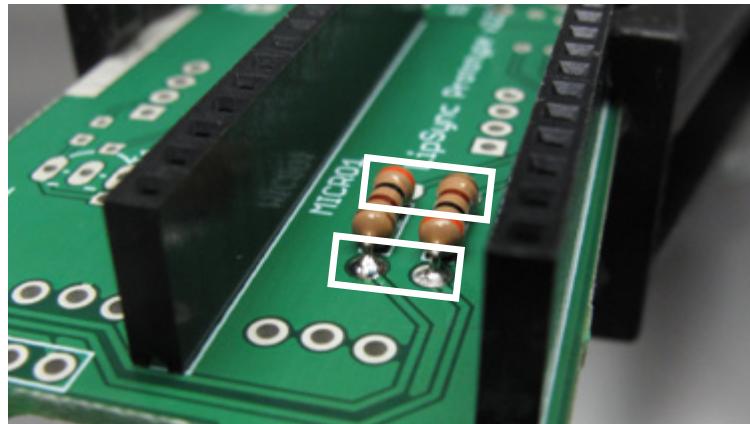
01.



BOARD 1
1
3
x 2
SECTION
S1
SECTION
S2



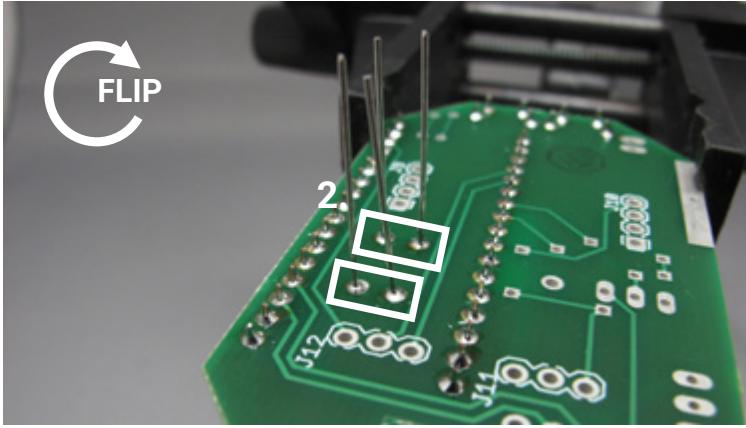
4
x 2
HOLE
R1
HOLE
R2



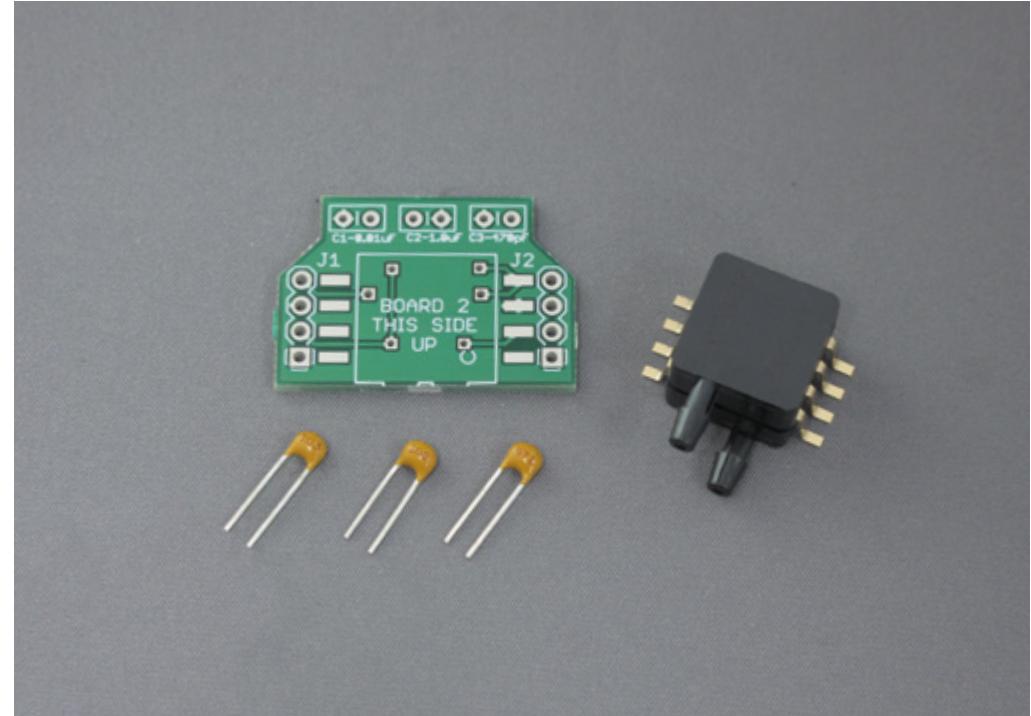
x 4

02.

03.



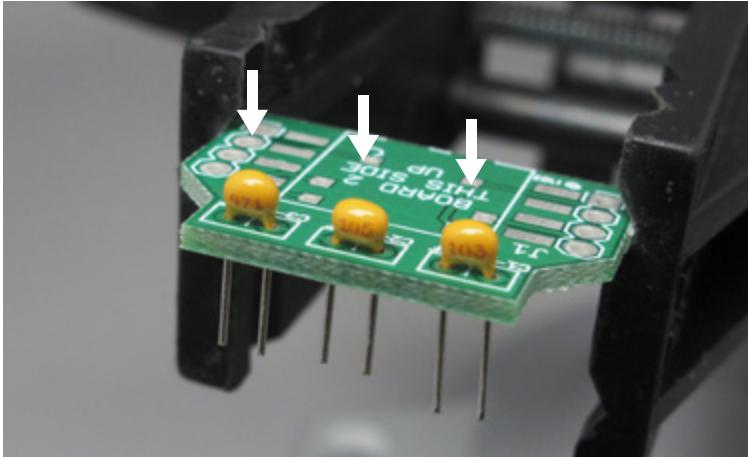
PART 3



BOARD 2
1 6 7 8 9

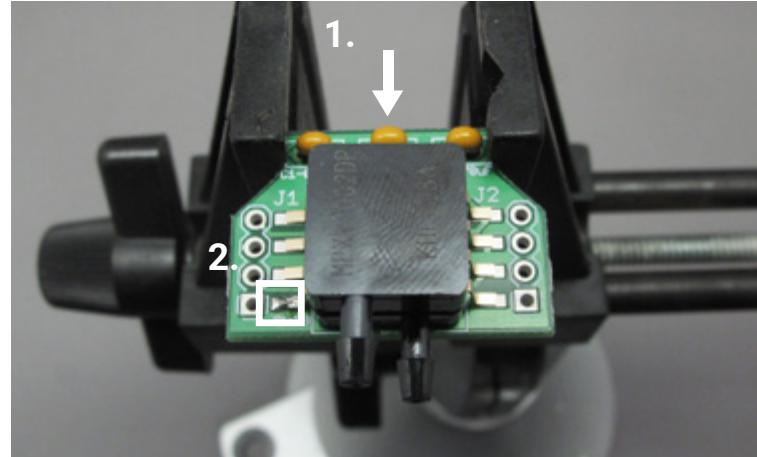
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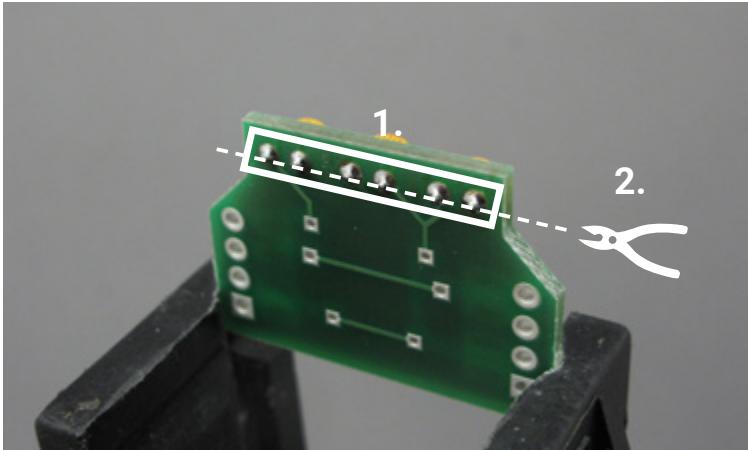
- | | |
|---|------------|
| 7 | HOLE
C1 |
| 8 | HOLE
C2 |
| 9 | HOLE
C3 |

03.



- BOARD 2
1
6
x 1

02.



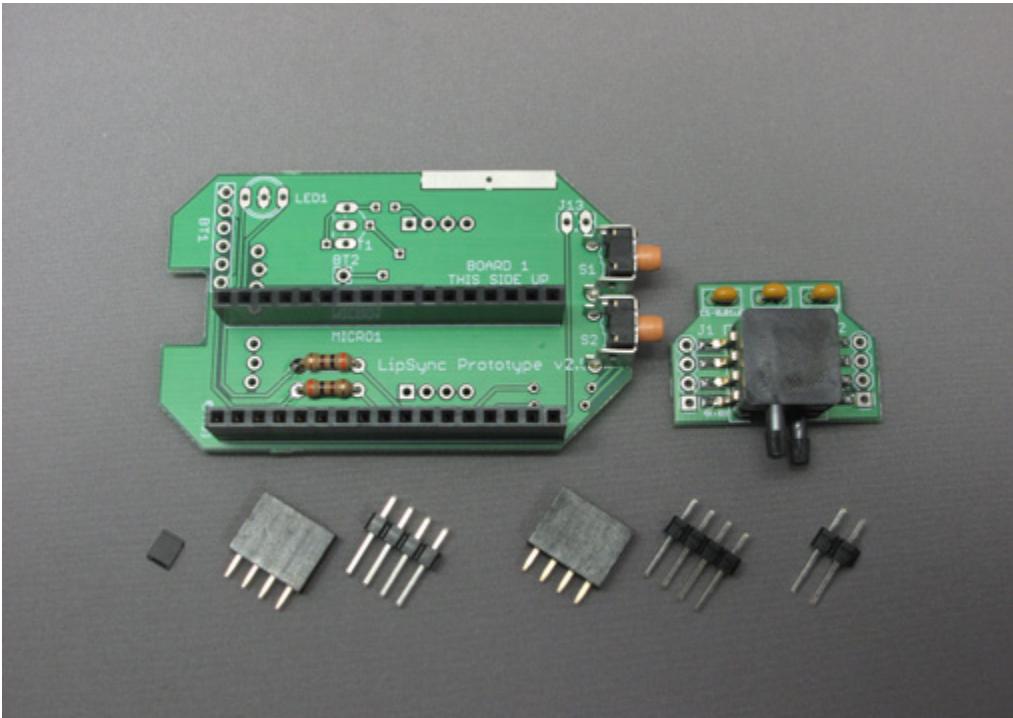
- x 6

04.



- x 7

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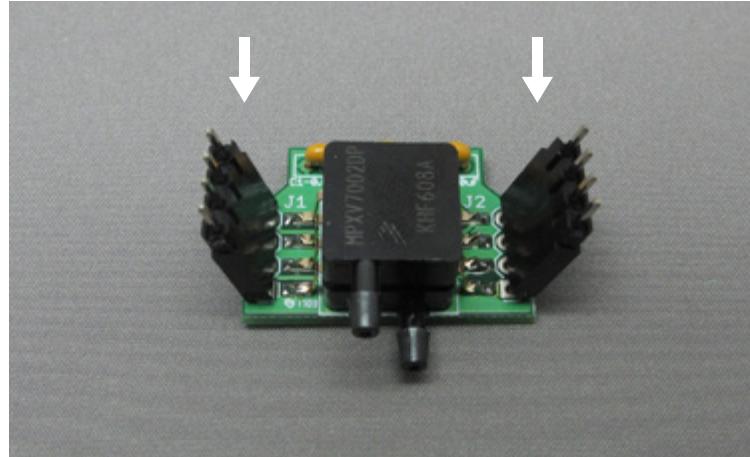


BOARD 1 BOARD 2 12 2-POS 4-POS 15

x 2

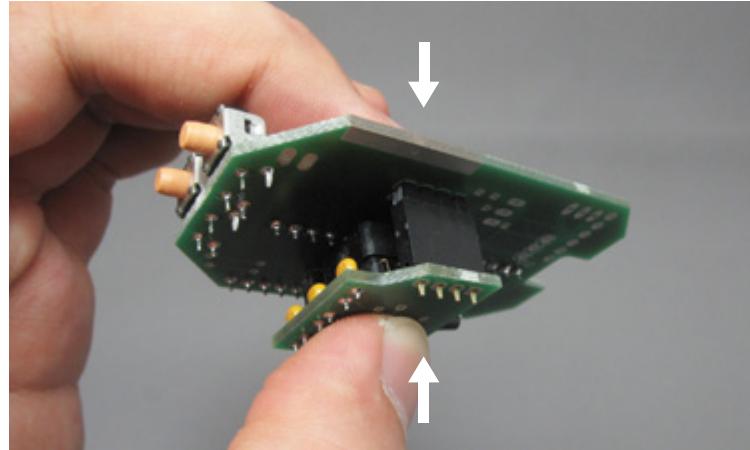
x 2

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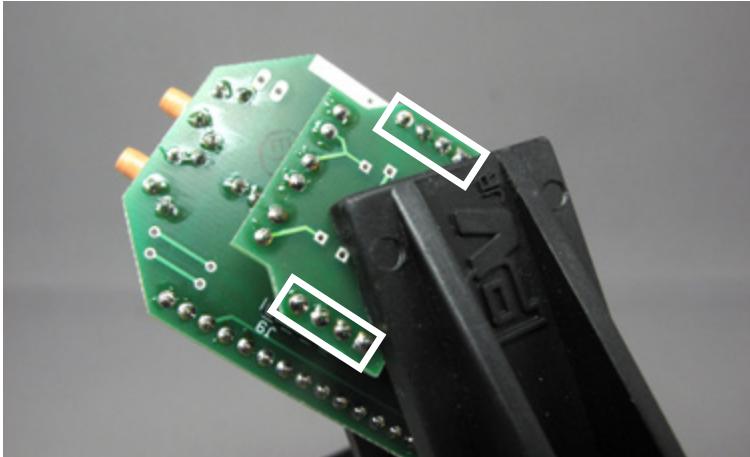
BOARD 2
1
12
x 2
4-POS
13
x 2
SECTION
J1
SECTION
J2

02.



BOARD 1
1

03.



x 8

2-POS

13

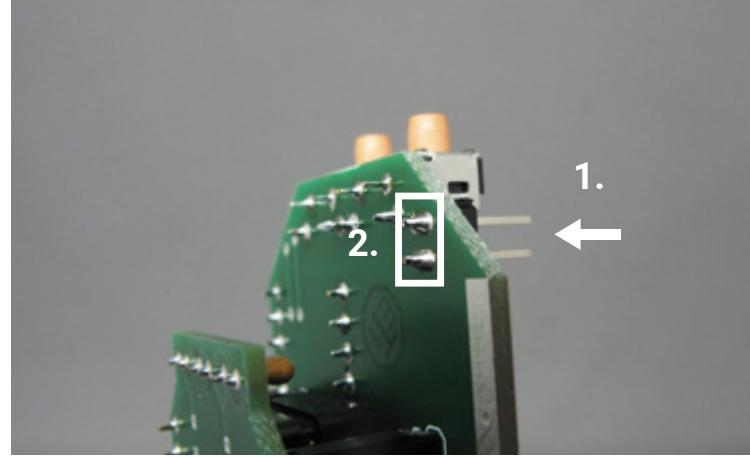
HOLE

J13

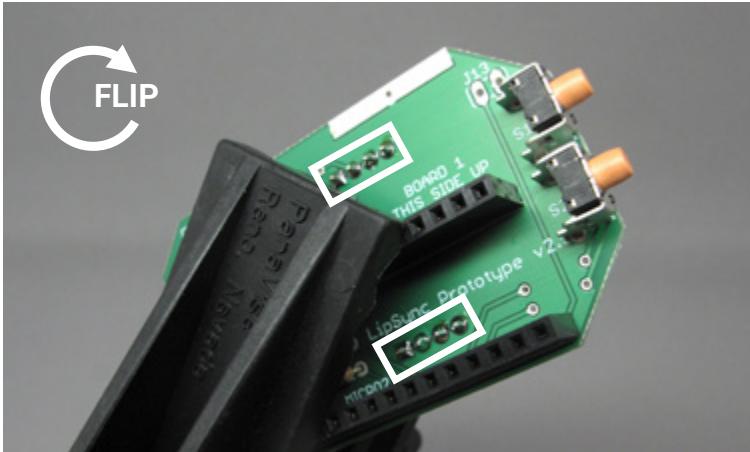


x 2

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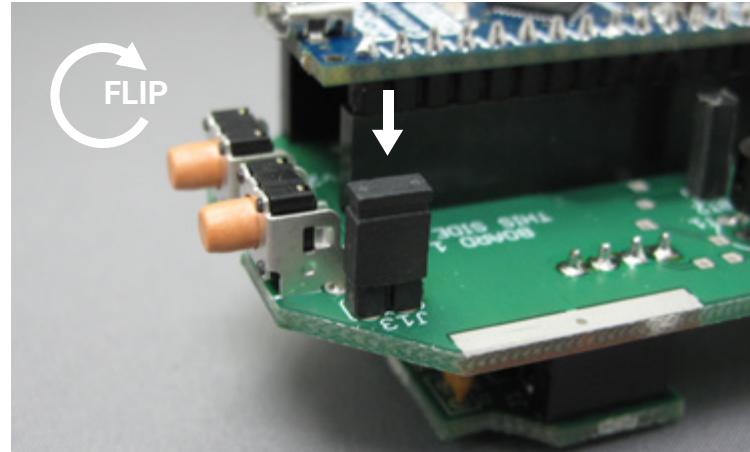
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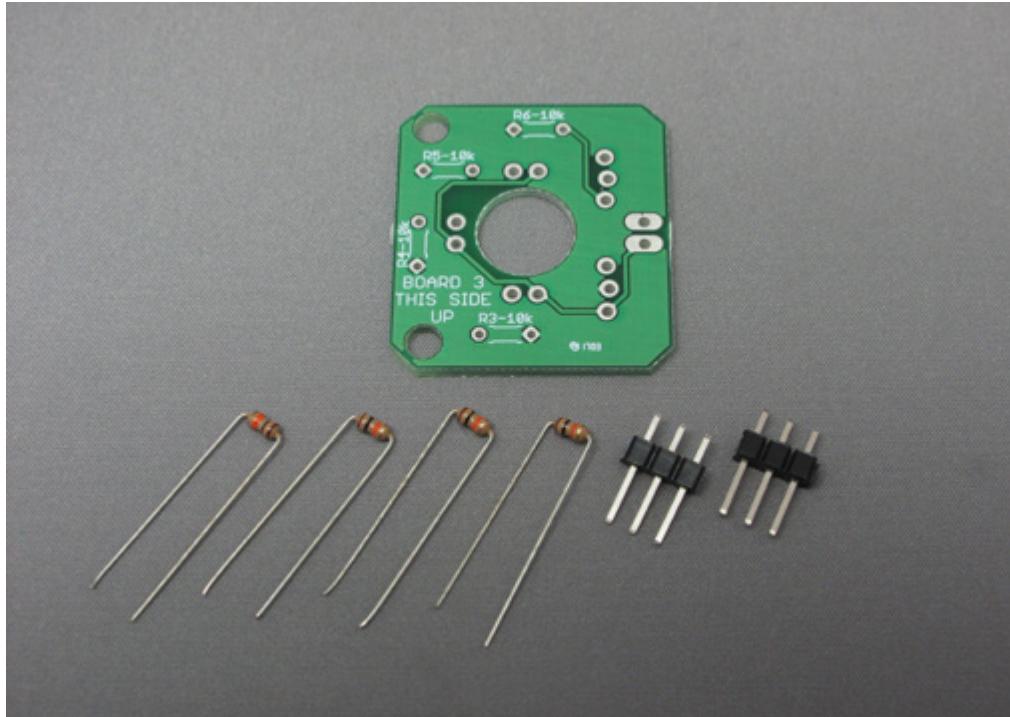
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15

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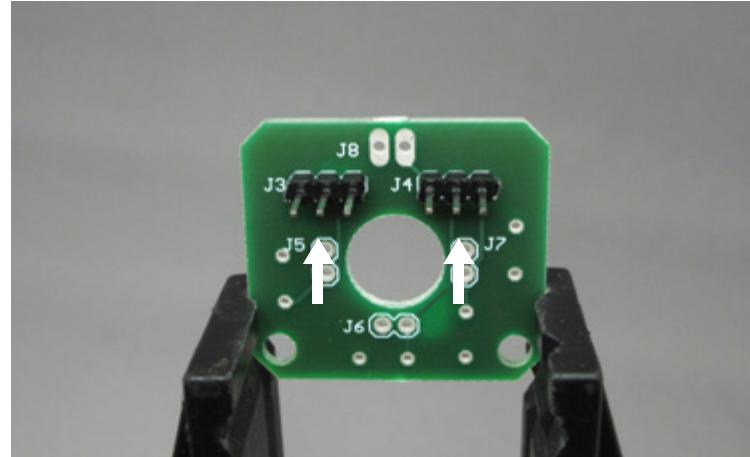


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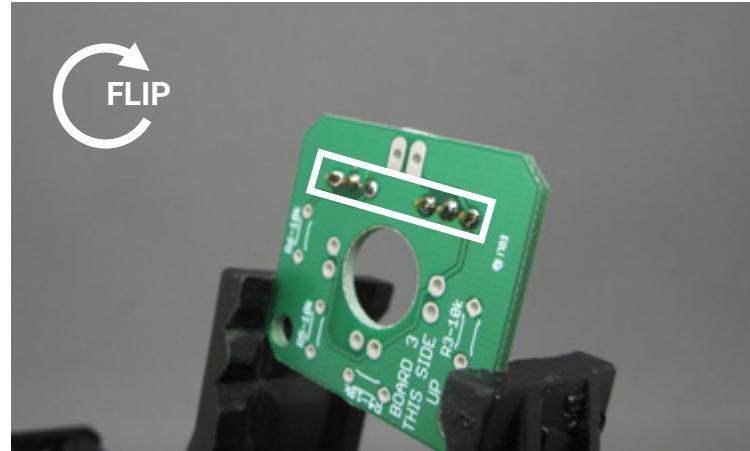


BOARD 3
1
3-POS
13
x 2
HOLE
J3
HOLE
J4

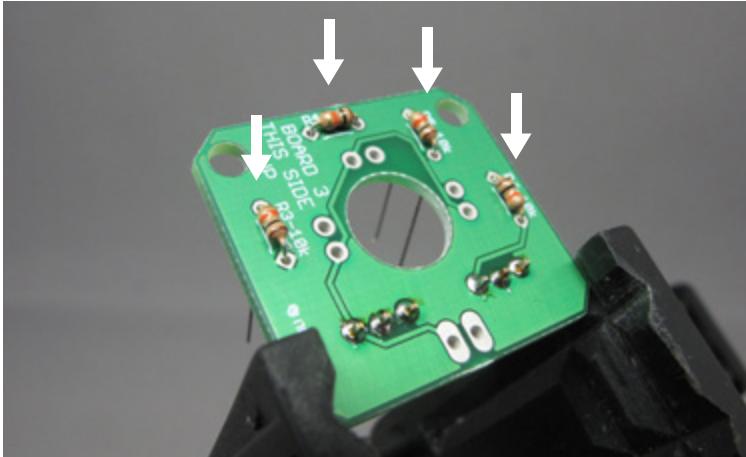
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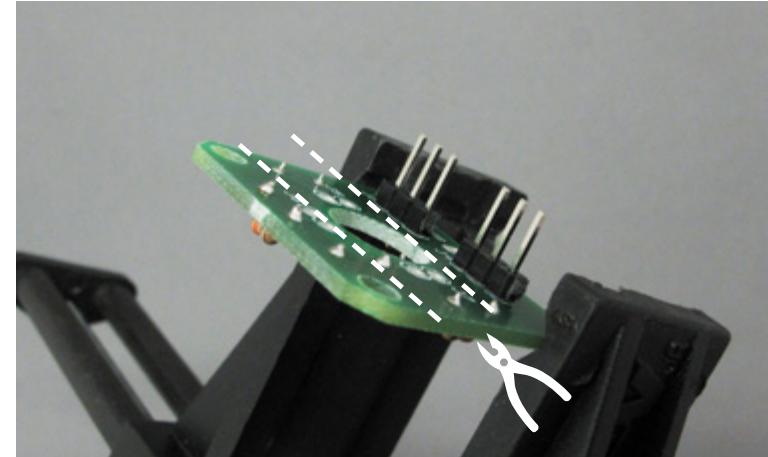


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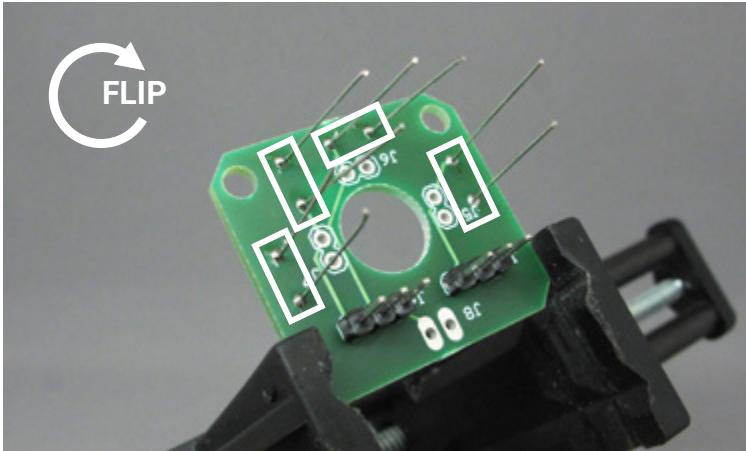


BOARD 3
1
5
x 4
HOLE
R3
HOLE
R4
HOLE
R5
HOLE
R6

05.

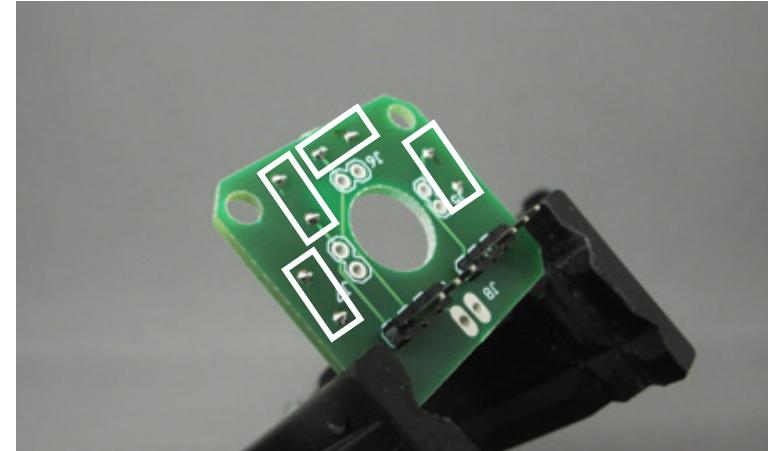


04.



FLIP
x 6

06.

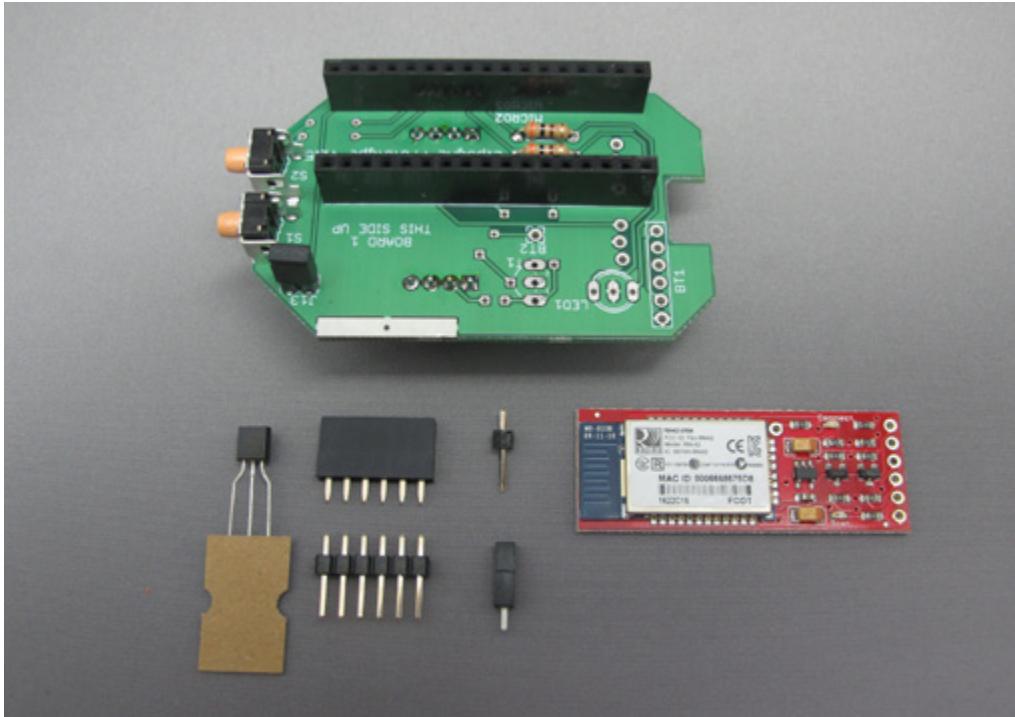


x 8

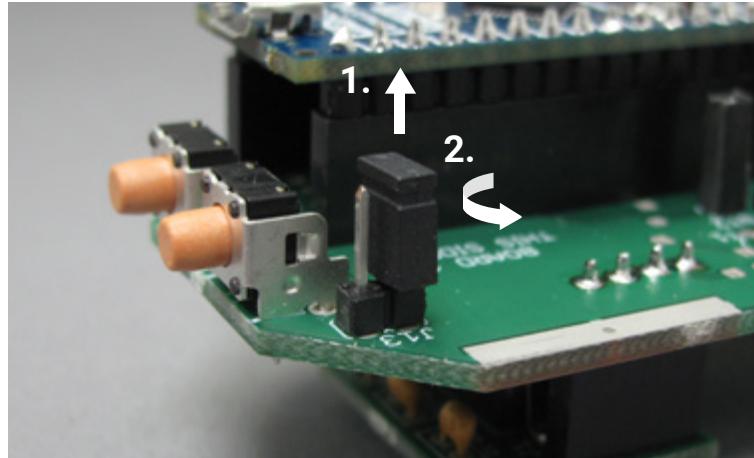
PART 6

(OPTIONAL) INSTALLING BLUETOOTH COMPONENT

Skip to Part 7 if not installing bluetooth



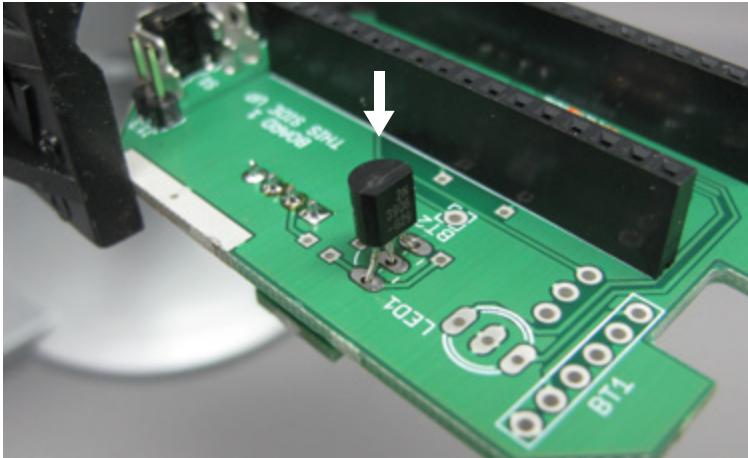
BOARD 1	1-POS	6-POS	16	17	18	19
1	13	13	16	17	18	19



If you are planning on using a Bluetooth LipSync, take off the shunt connector and place it sideways rather than completely taking it off. This is to prevent misplacement and allows for easy switching between Bluetooth to USB.

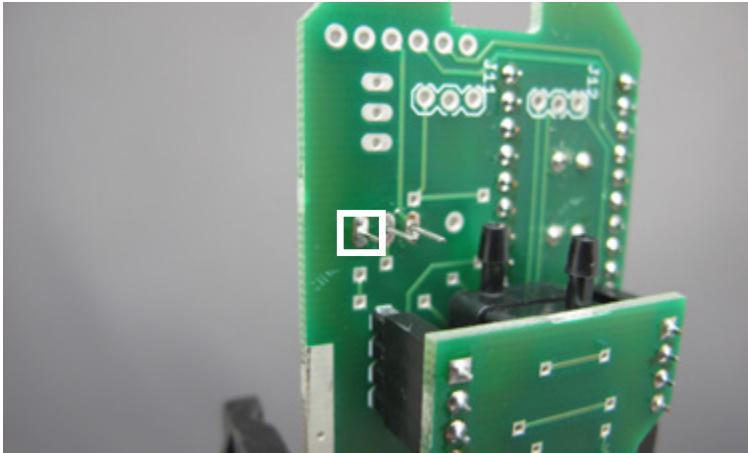
01.

02.



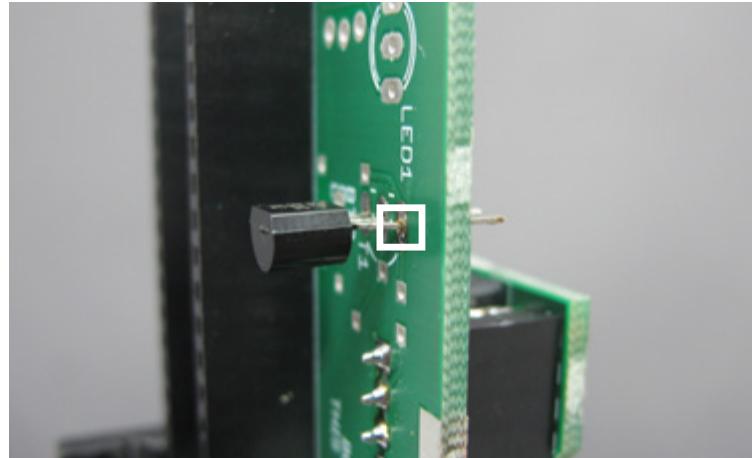
x 1

03.



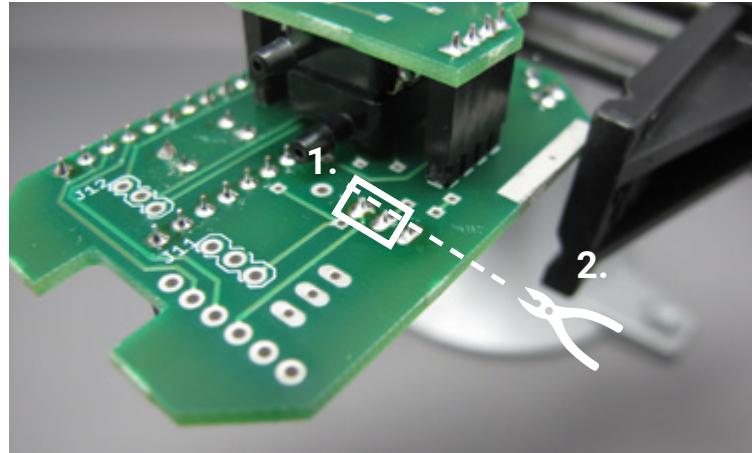
BOARD 1
1
17

04.



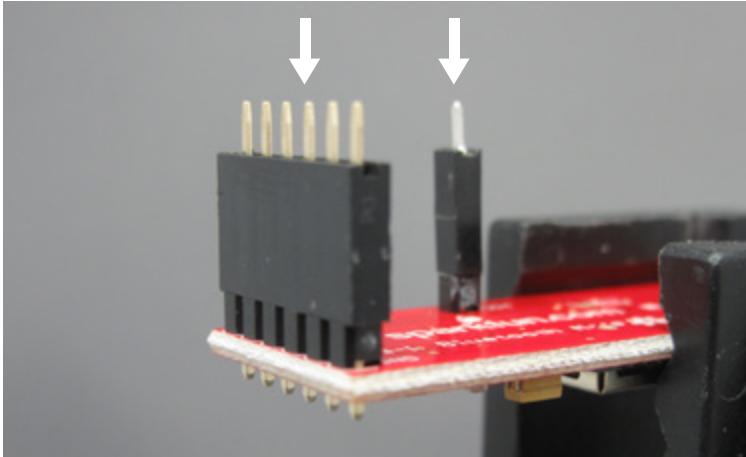
x 1

05.



x 2

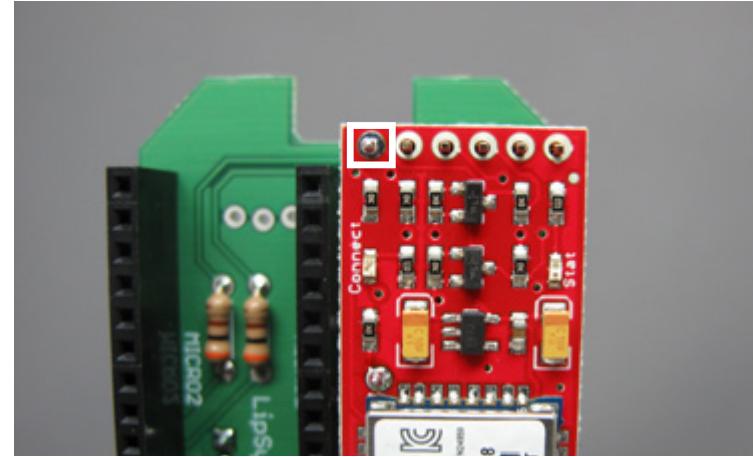
06.



1-POS
13
6-POS
13
16
18
19

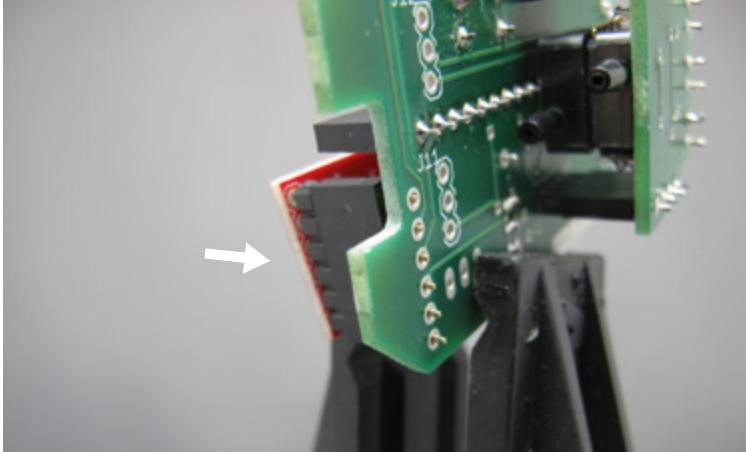
x 1

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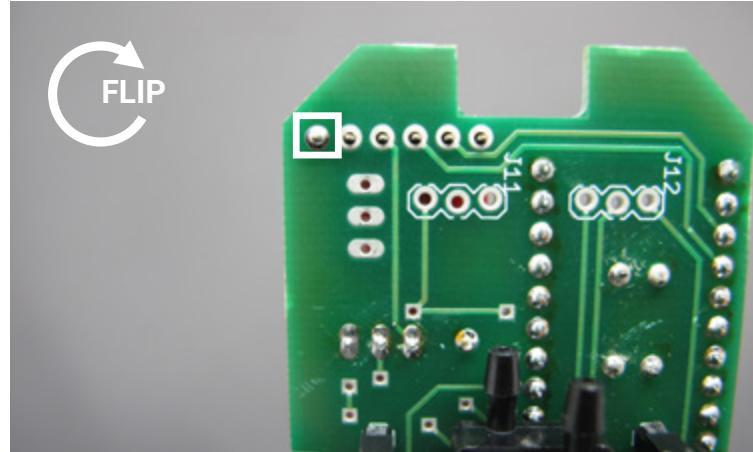
x 1

07.



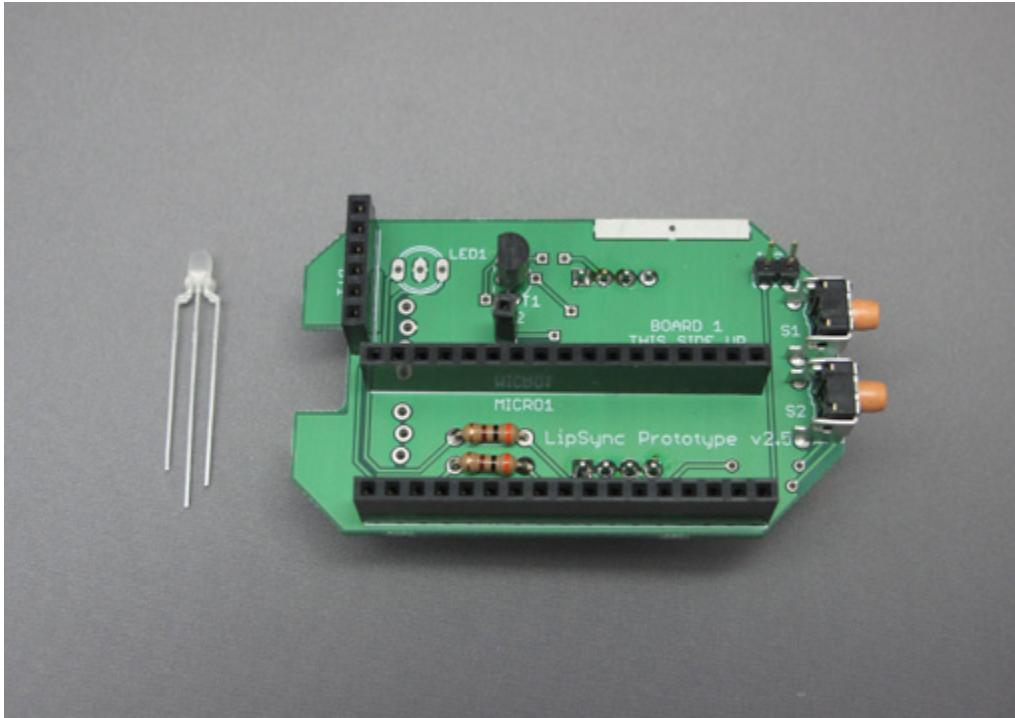
SECTION
BT1

09.



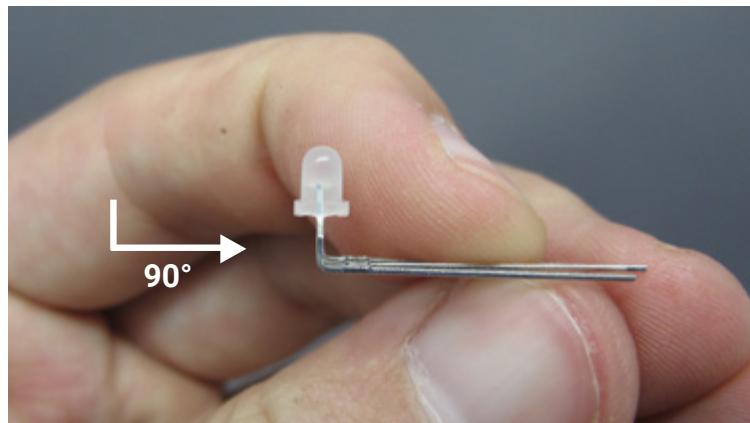
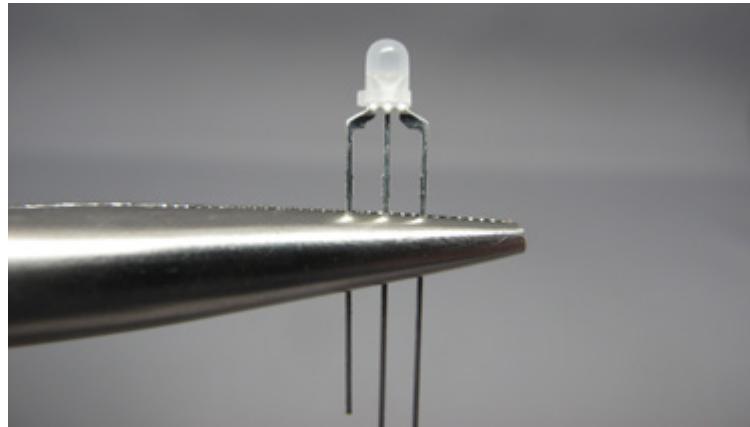
PART 7

14



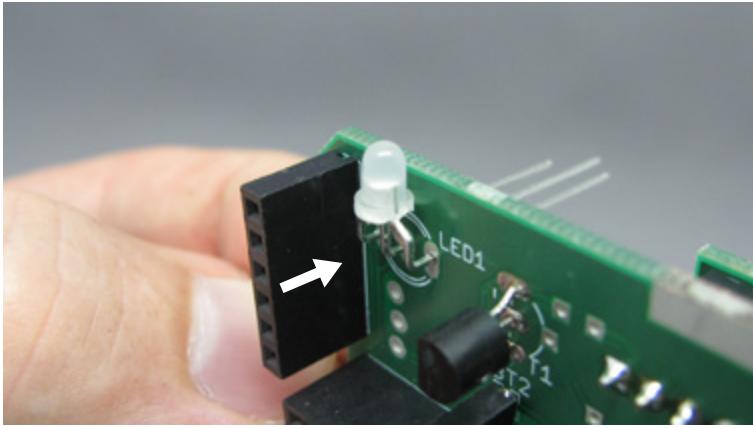
BOARD 1
1

14

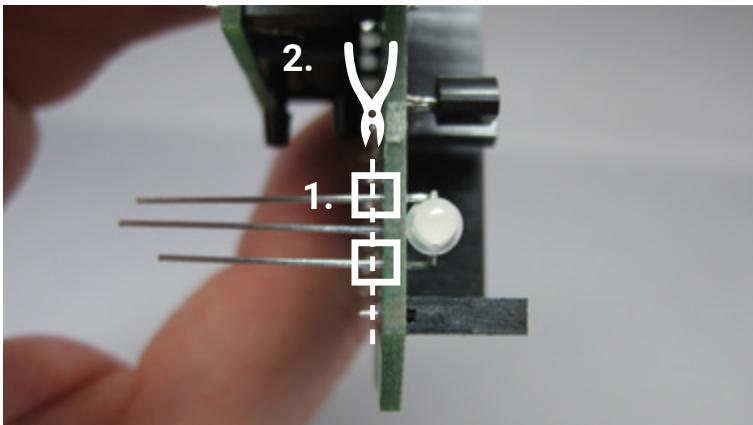


01.

CAUTION: Observe the LED leads. Make sure the longer side lead (red) is on the right and the short side lead (green) is on the left.

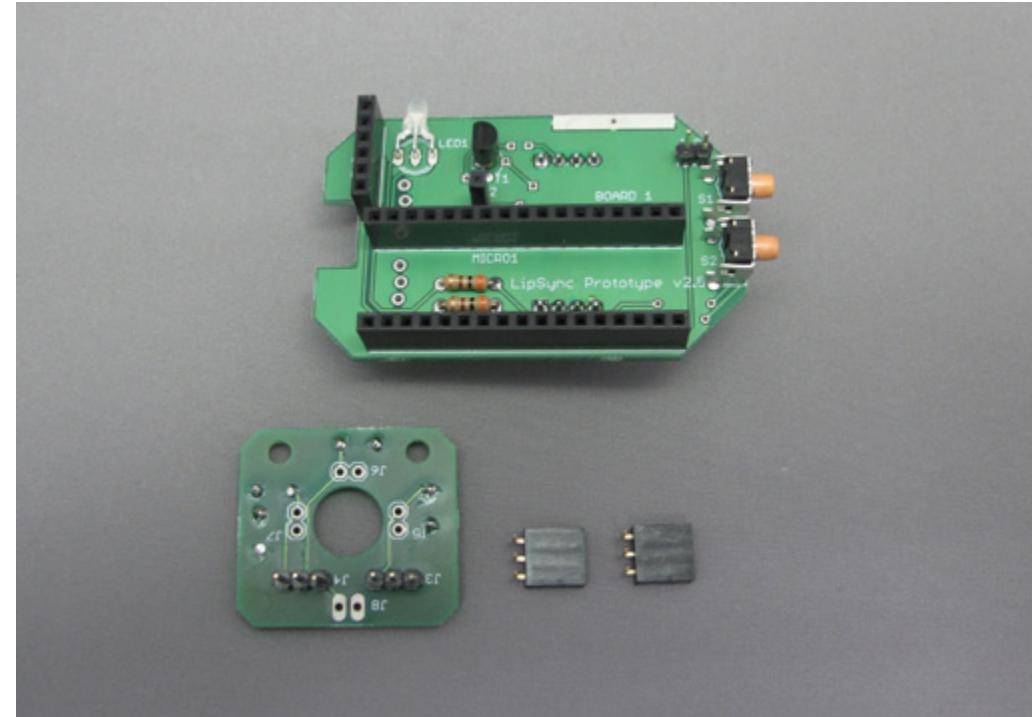


BOARD 1
1
HOLE
LED1



x 2

PART 8

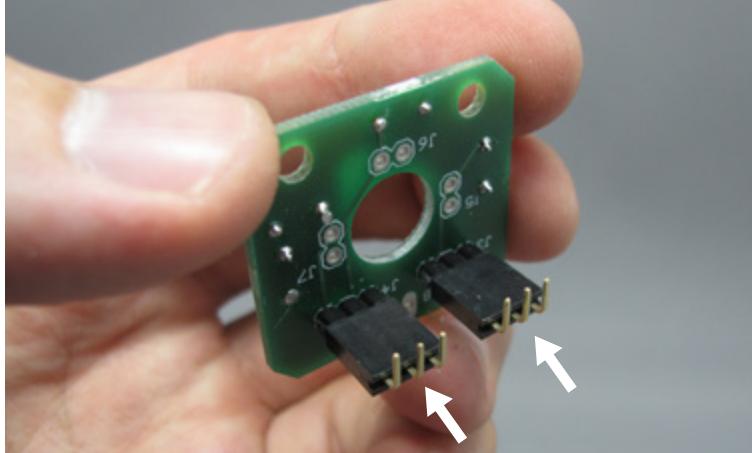


BOARD 1 BOARD 3
1 1 11

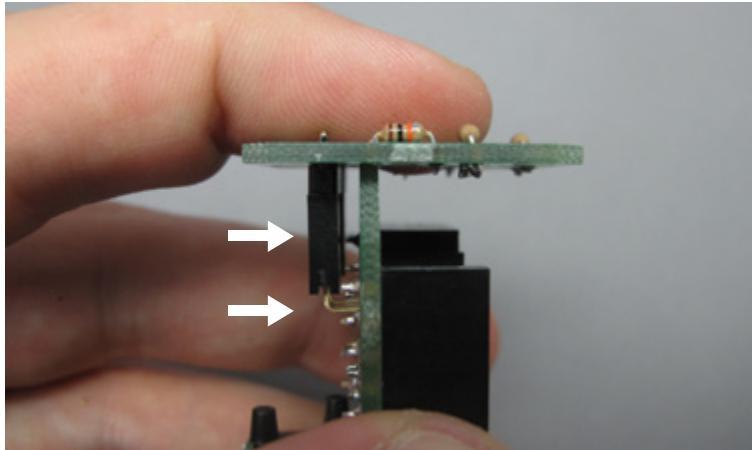
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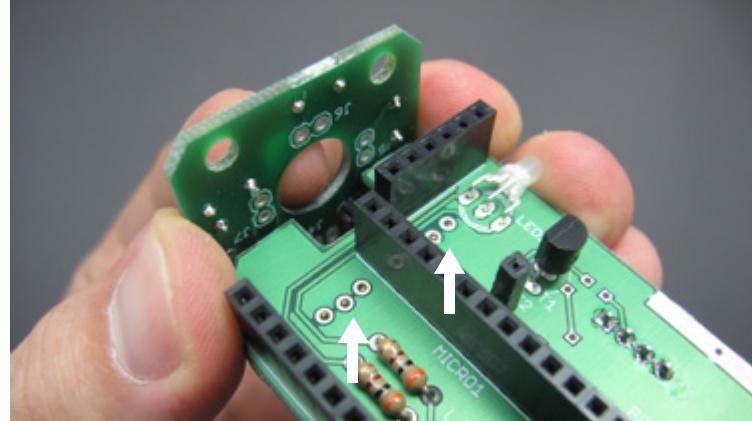
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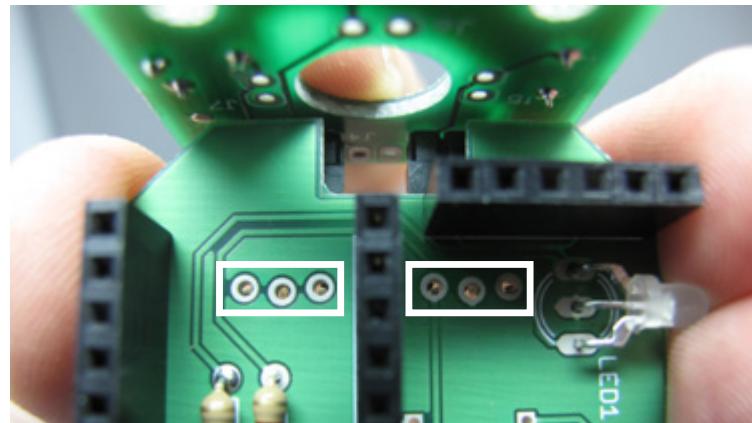
BOARD 3
1
11
x 2



BOARD 1
1
HOLE
J11
HOLE
J12

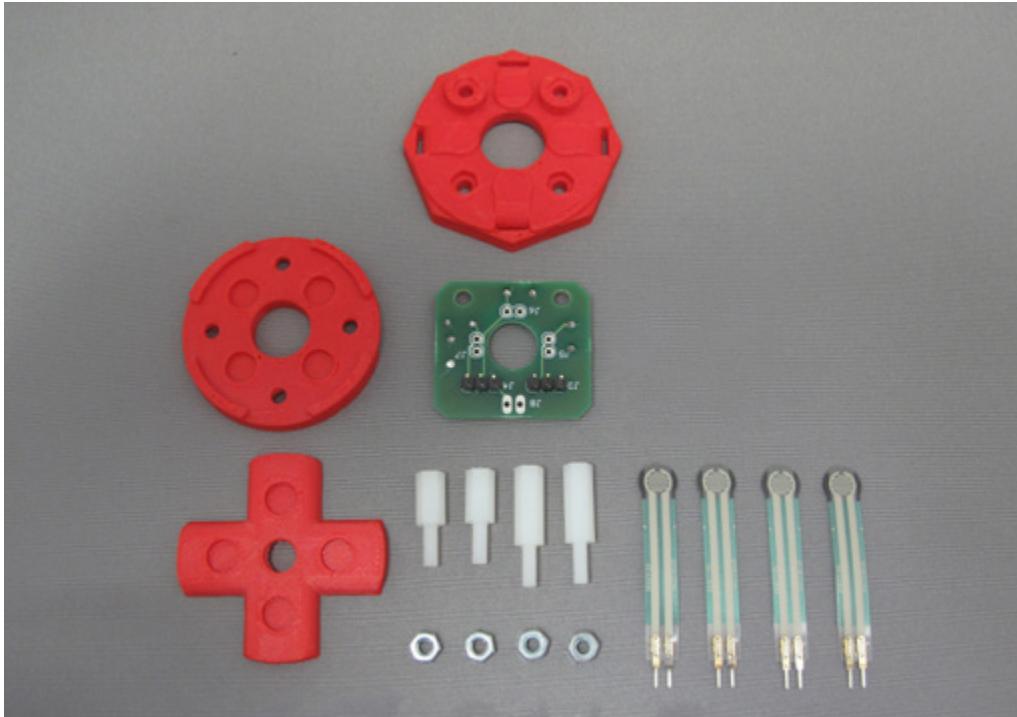


x 6

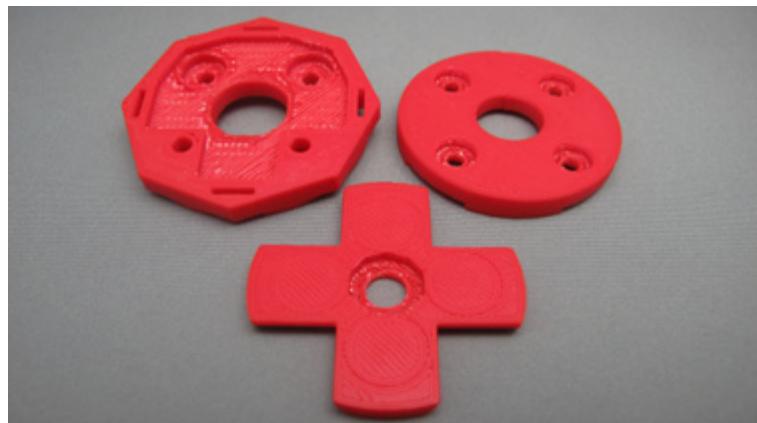


03.

PART 9



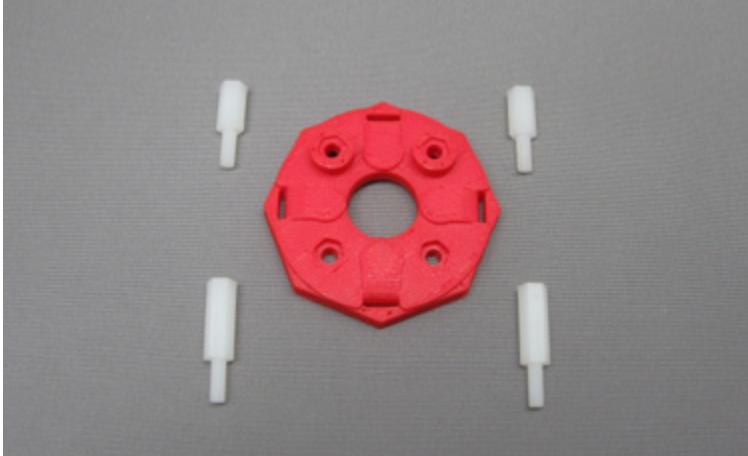
BOARD 3
1 21 22 23 29 32 33 36
x 4 x 2 x 2 x 4



01.

21
22
23

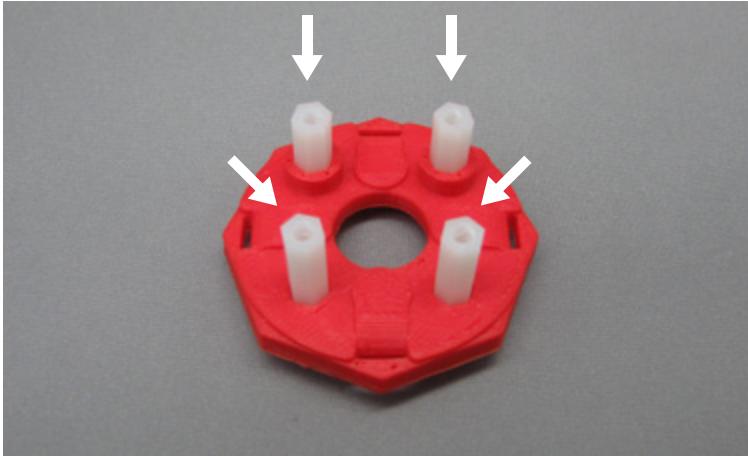
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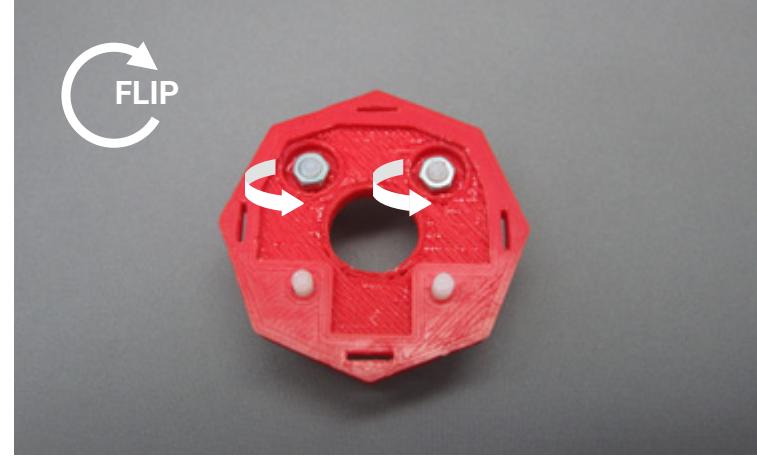
21
32
x 2
33
x 2

36
x 2

03.



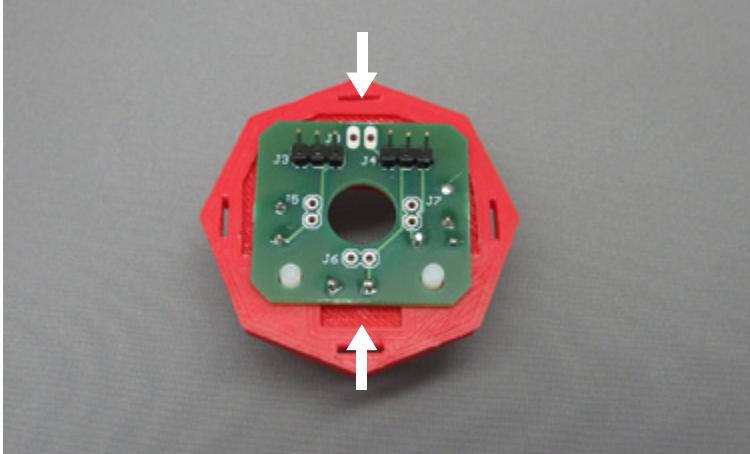
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05.



06.

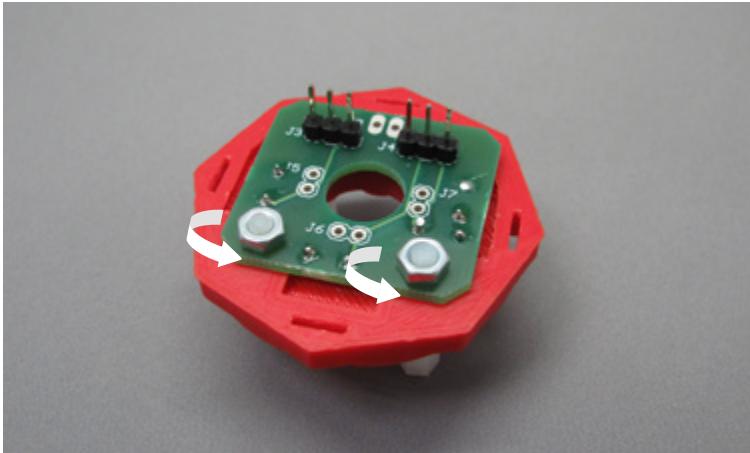


BOARD 3
1

08.

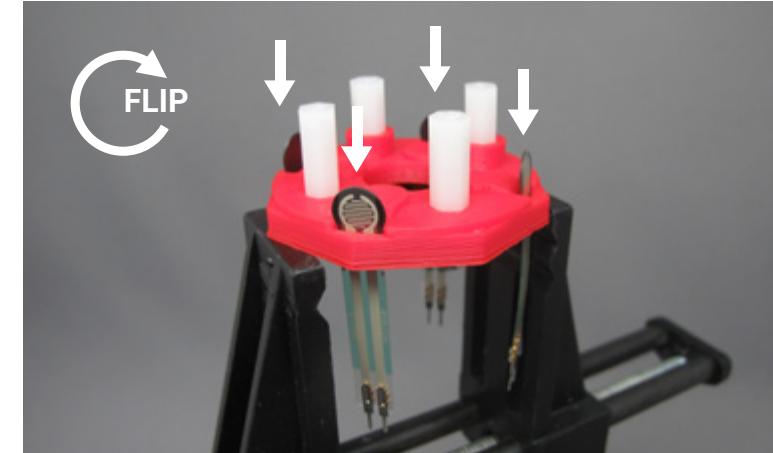


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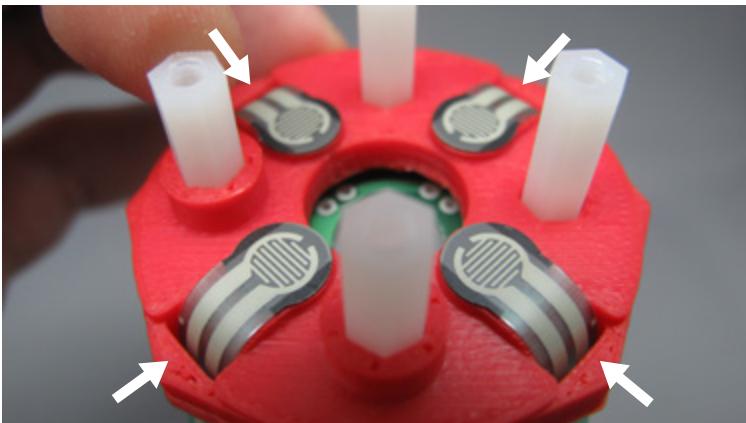
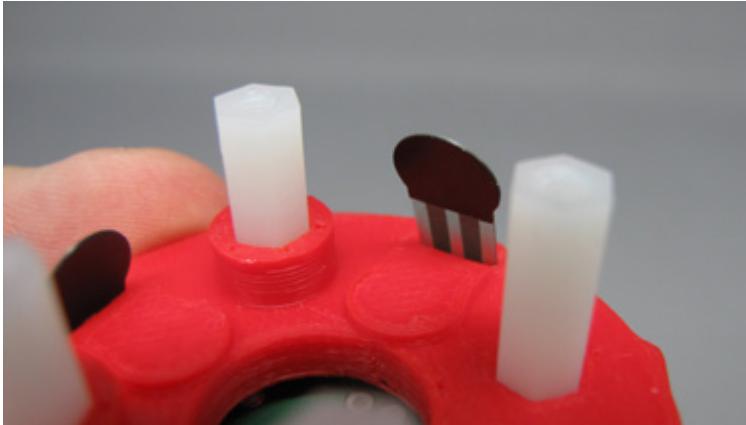


36
x 2

09.

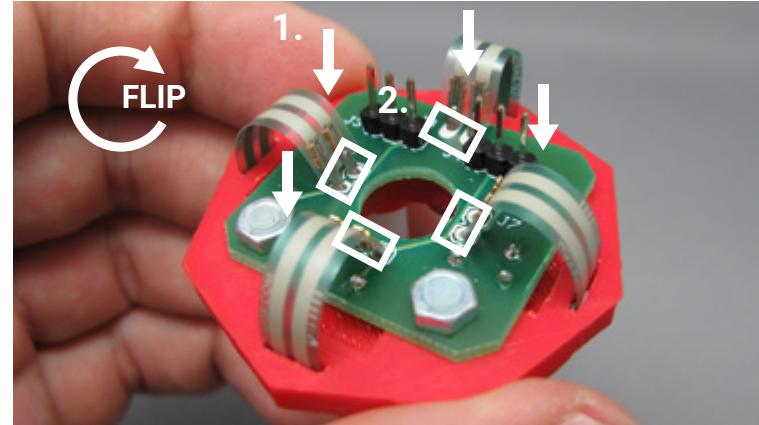


29
x 4



10.

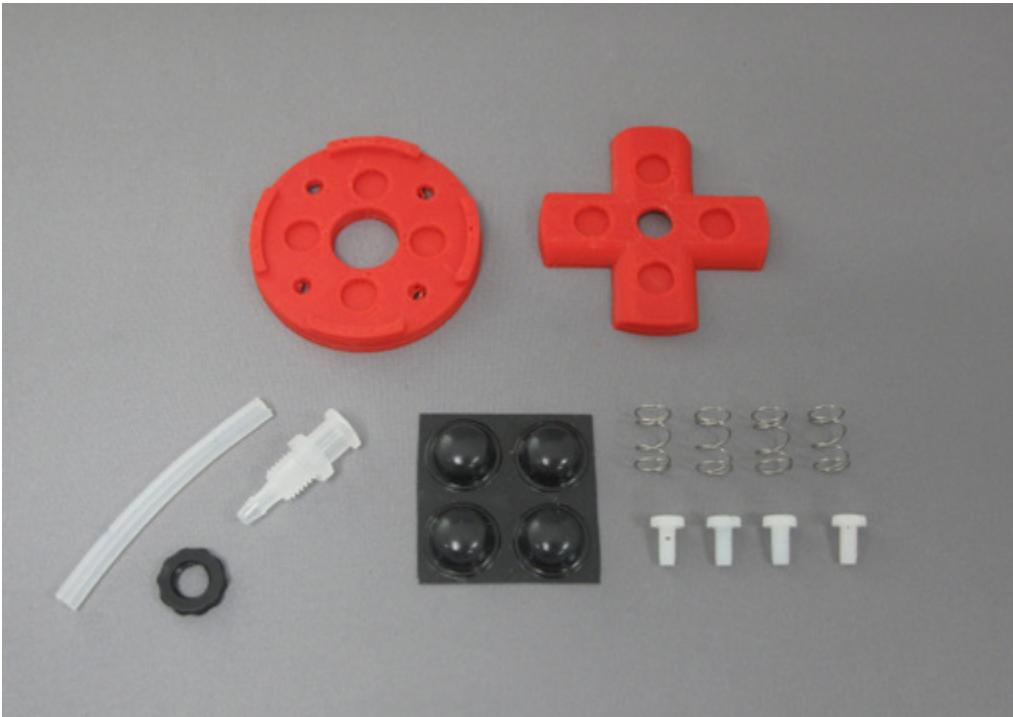
CAUTION: On the underside of the FSR is a clear adhesive lining. Carefully remove the lining with a utility knife and gently bend it to stick onto the front plate.



 x 8

11.

PART 10



22 | 23 | 28 | 30 | 31 | 34 | 35 | 37
x 4 x 4 x 4

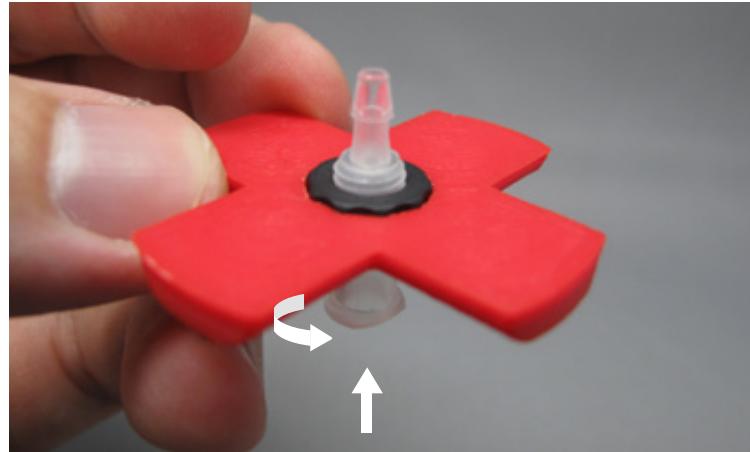
01.



22

34

02.



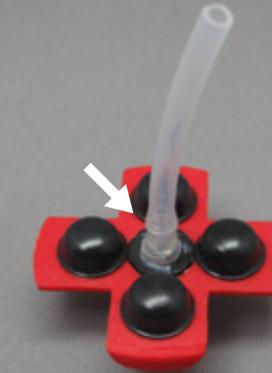
28

03.

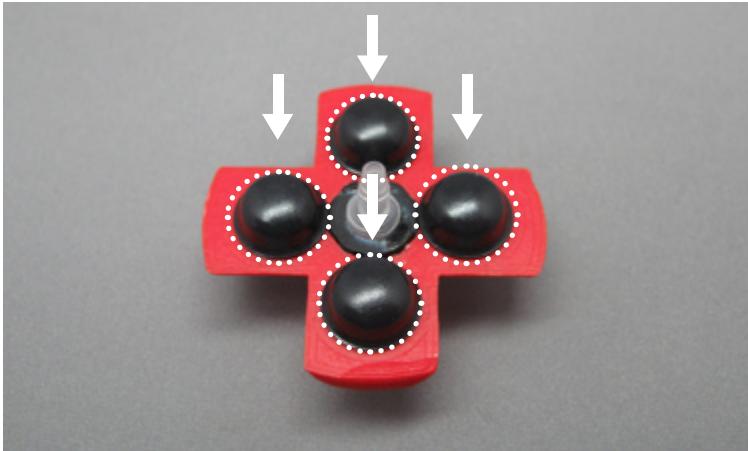


37

05.



04.



35

x 4

06.



07.

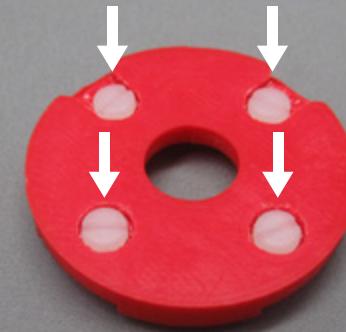


23

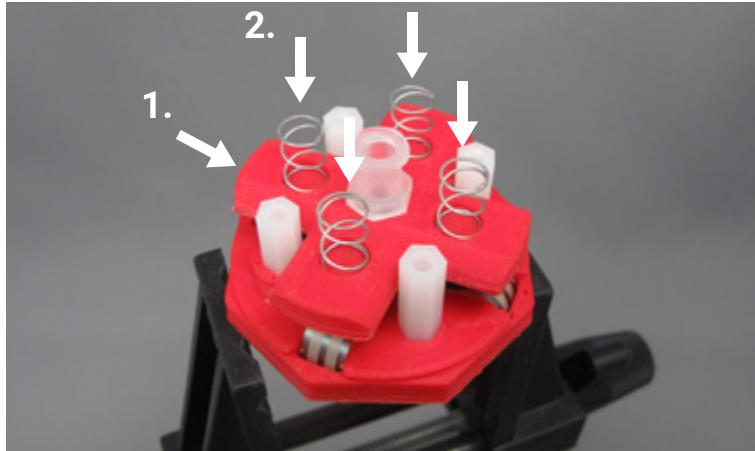
30

x 4

09.



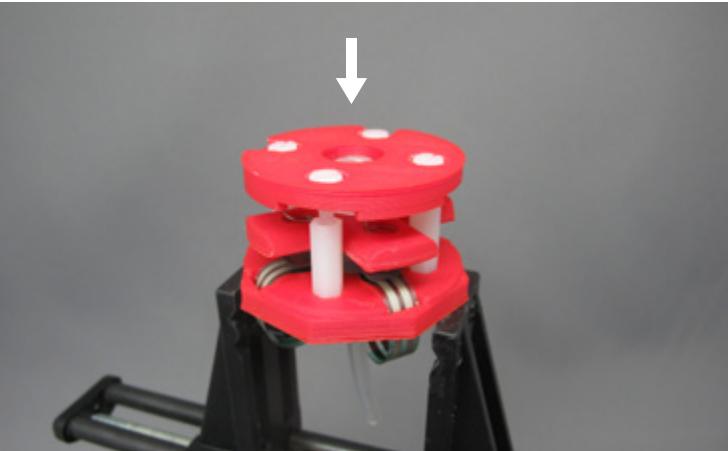
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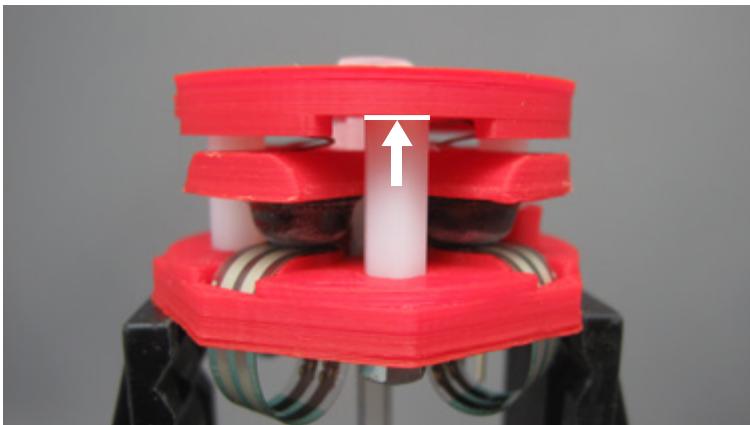
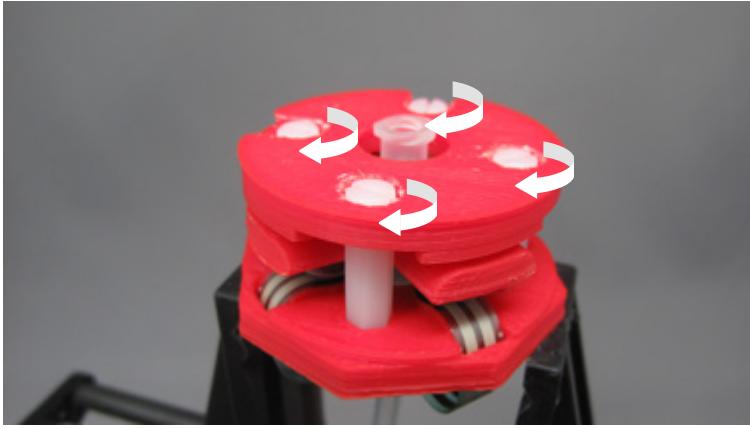


31

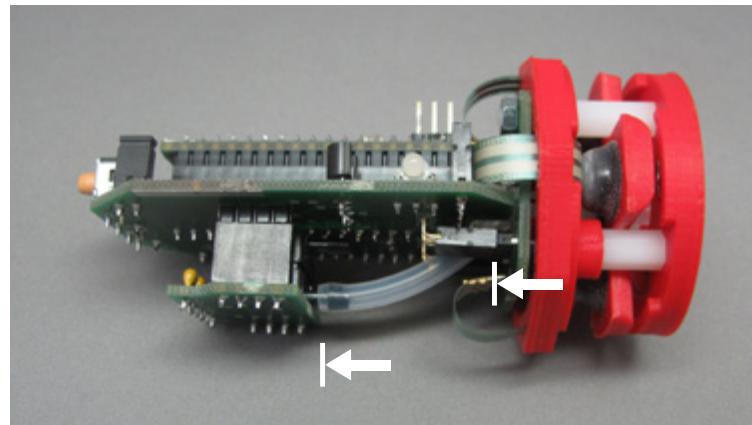
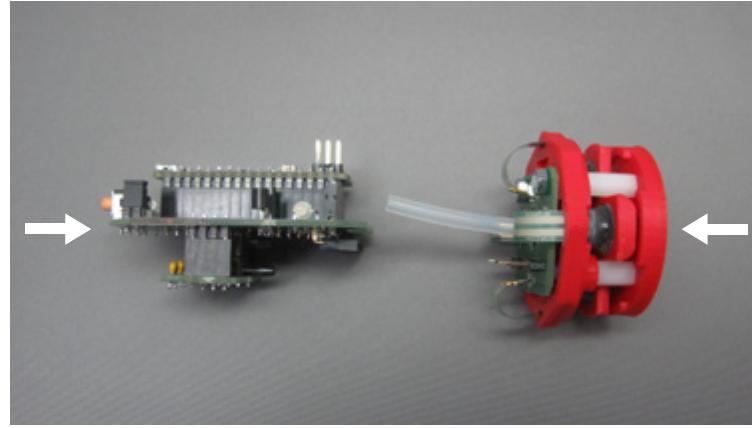
x 4

10.





11.



12.

CAUTION: First carefully connect the two 3-position male headers to the two 3-position right angle female headers, then fit the tubing over the pressure sensor

PART 11



20 | 24 | 25 | 26 | 27 | 31 | 38 | 39 | 40 | 41 | 42 | 43

x 2

x 2

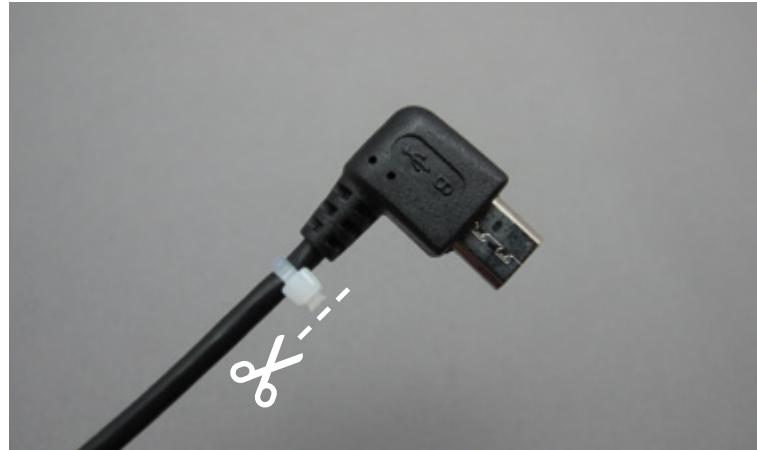
24

38

01.



02.



41

44

03.



05.

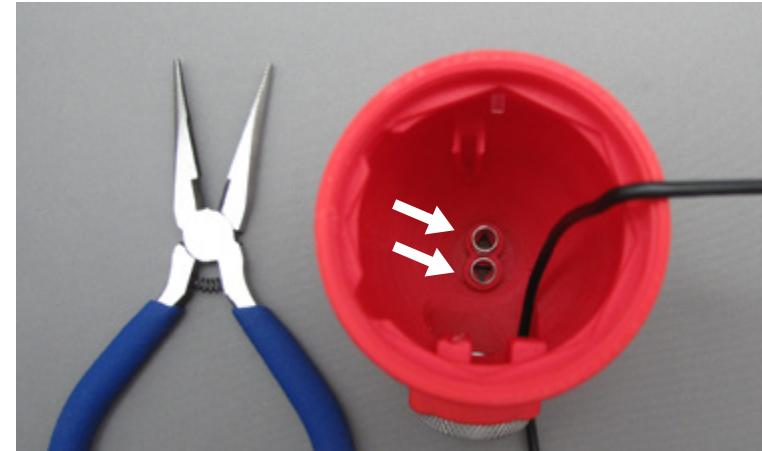


04.



39

06.



31

x 2

07.

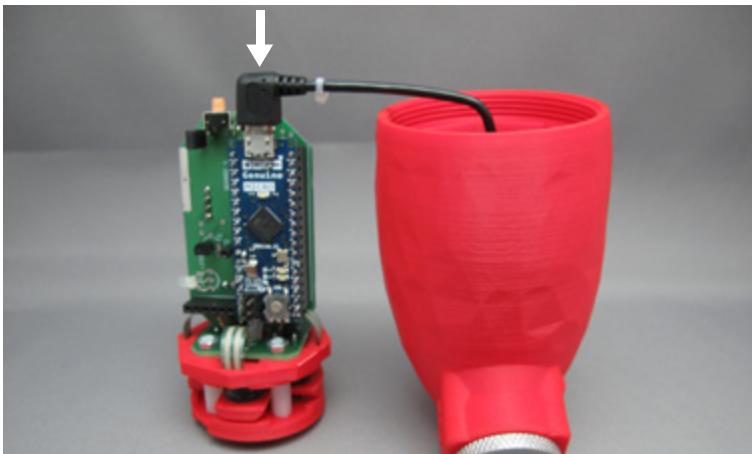


25

x 2



08.



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

09.



10.



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12.



26

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14.



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15.



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17.



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19.



20.



PART 12

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:

1. Upload the microcontroller code.
2. Calibrate the joystick.
3. Read through the Startup Guide for complete information on using the LipSync:
<https://hackaday.io/project/13424/files>

IMPORTANT: There are certain steps to take for the LipSync to operate properly, such as letting the device initialize for 5 seconds before moving the mouthpiece and others. These can be found in the guide.

UPLOADING THE MICROCONTROLLER CODE

1. Download and install the latest version of Arduino IDE:
<https://www.arduino.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.

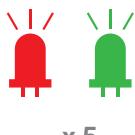
JOYSTICK CALIBRATION

Calibrate your LipSync joystick before first using your device.

This will help to measure the four axis of movement.



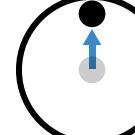
①



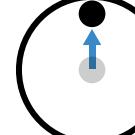
x 5



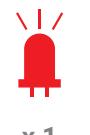
3 sec.
pause



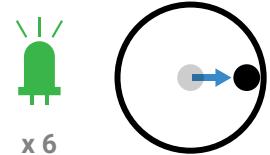
x 6



③



x 1



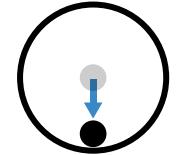
x 6



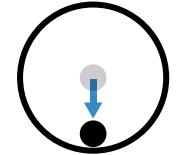
x 1

⑤

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



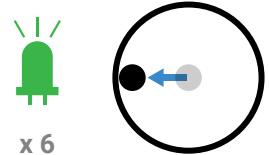
x 6



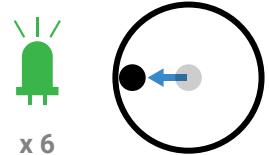
x 1

⑦

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



x 6



x 1

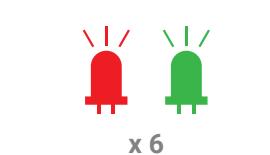
⑨

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



x 1

⑩



x 6

⑪

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

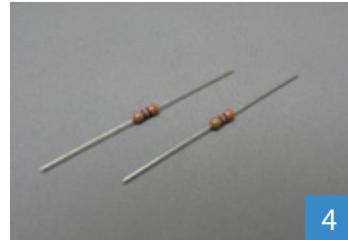
APPENDIX A

FULL COMPONENTS LIST



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

1



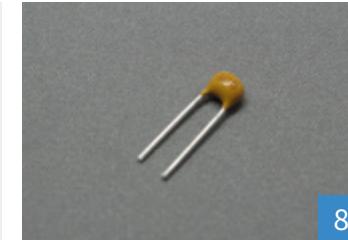
4

(2) 300 Ohm 1/4W Through Hole Resistors

[Digikey.ca](#)

[Digikey.com](#)

*or from any electronics shop



8

(1) 1.0uF Ceramic Capacitor
[capacitor label: 105]

[Digikey.ca](#)

[Digikey.com](#)

*or from any electronics shop



2

(1) Arduino Micro/ Genuino Micro microcontroller

[Arduino](#) [Digikey](#) [Robotshop](#)
[Adafruit](#) [Pololu](#)

COMPATIBILITY NOTE: The "Arduino Micro" or "Genuino Micro" **MUST** be used.

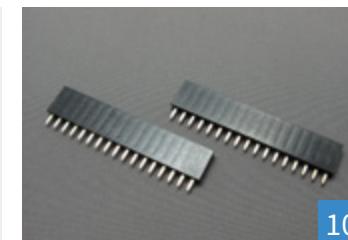


6

(1) NXP Pressure Sensor
[component label:
MPXV7002DP]

[Digikey.ca](#)

[Digikey.com](#)



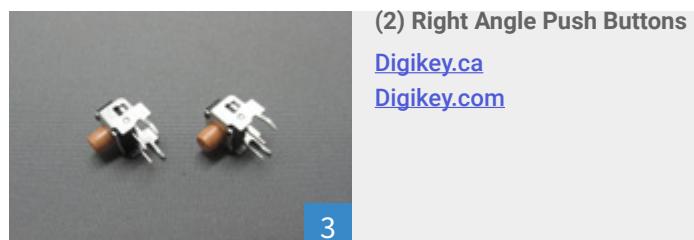
10

(2) 17-Position Straight Female Through Hole Headers

[Digikey.ca](#)

[Digikey.com](#)

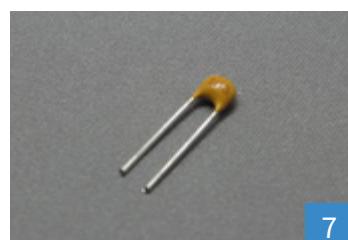
*or from any electronics shop



3

(2) Right Angle Push Buttons

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



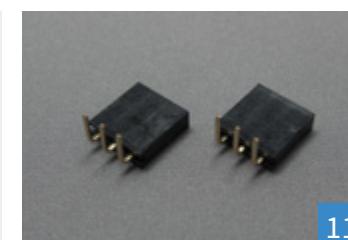
7

(1) 0.01uF Ceramic Capacitor
[capacitor label: 103]

[Digikey.ca](#)

[Digikey.com](#)

*or from any electronics shop



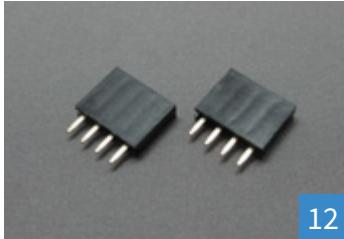
11

(2) 3-Position Right Angle Female Header

[Digikey.ca](#)

[Digikey.com](#)

*or from any electronics shop



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

*or from any electronics shop

12



(OPTIONAL) (1) "SparkFun Bluetooth Mate Silver" Bluetooth module
[Digikey.ca](#)
[Digikey.com](#)

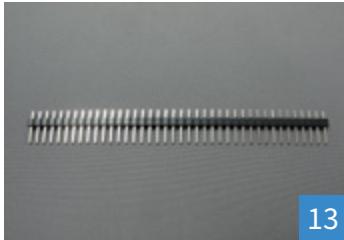
16



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

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

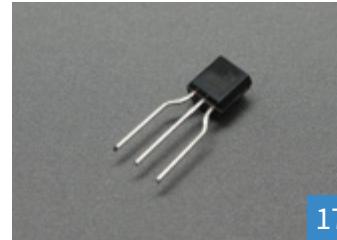
20



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

*or from any electronics shop

13



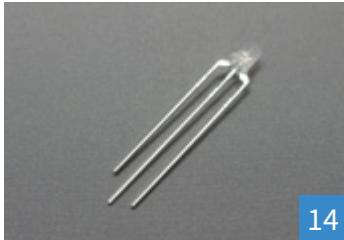
(OPTIONAL) (1) 2N3906 PNP-Type T/H Transistor
[Digikey.ca](#)
[Digikey.com](#)

17



(1) Joystick Front Plate
[LipSync Hackaday Page](#)

21



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

*or from any electronics shop

14



(OPTIONAL) (1-2) 1-Position Straight Female T/H Header
[Digikey.ca](#)
[Digikey.com](#)

18



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

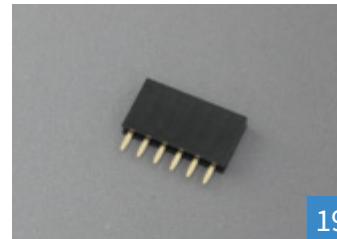
22



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

*or from any electronics shop

15



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

19



(1) Joystick Baseplate
[LipSync Hackaday Page](#)

23



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

24

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



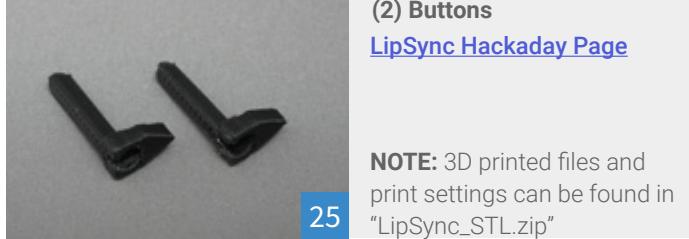
(1) Luer Lock Fitting
[Cole-Parmer](#)

28



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

32



(2) Buttons
[LipSync Hackaday Page](#)

25

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



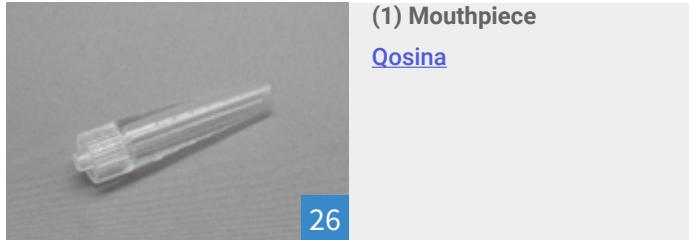
29

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



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

33



(1) Mouthpiece
[Qosina](#)

26



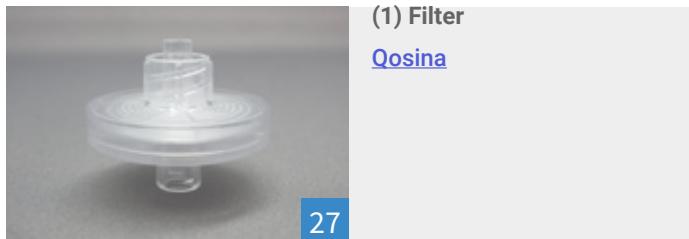
30

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



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

34



(1) Filter
[Qosina](#)

27



31

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



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

35



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

36



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

40



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

44



37

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



41

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



45

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



38

(1) Light pipe
[Mouser](#)



42

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



39

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



43

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