

MIT App Inventor Codi Bot User Manual

90
mins



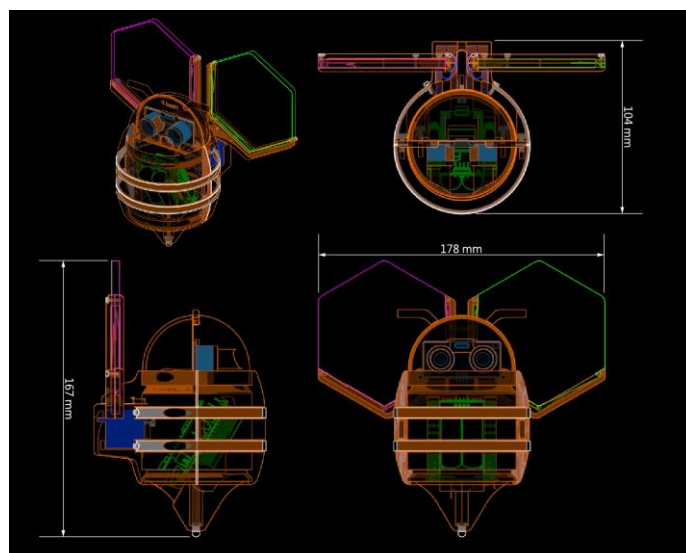
Introduction

MIT App Inventor Codi Bot is an educational kit demonstrating the Internet of Things (IoT). It has an adorable appearance. Children and adults alike can control it with App Inventor through Bluetooth communication. We have provided tutorials to show you how to interact with Codi Bot various functions, including:

- [Standalone demo](#)
- [LED](#)
- [Wing \(servo\)](#)
- [Sound](#)
- [Complete Codi Bot app](#)

Specification

- **Dimensions:** 178 x 104 x 167 (W, L, H in mm)
- **LinkIt 7697 power supply:** 5V adaptor or powrbank with USB connector. PC USB port.
- **Robot shield power supply:** 5V adaptor or powerbank with USB connector. PC USB port. All components function normally only when the shield is powered on (toggle the power switch to the left).

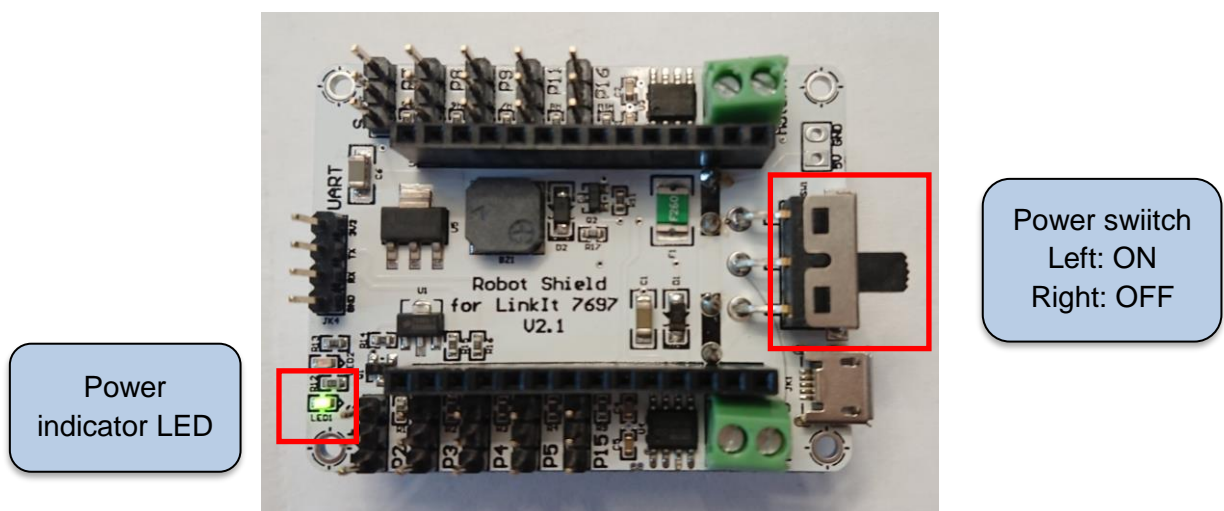


Hardware

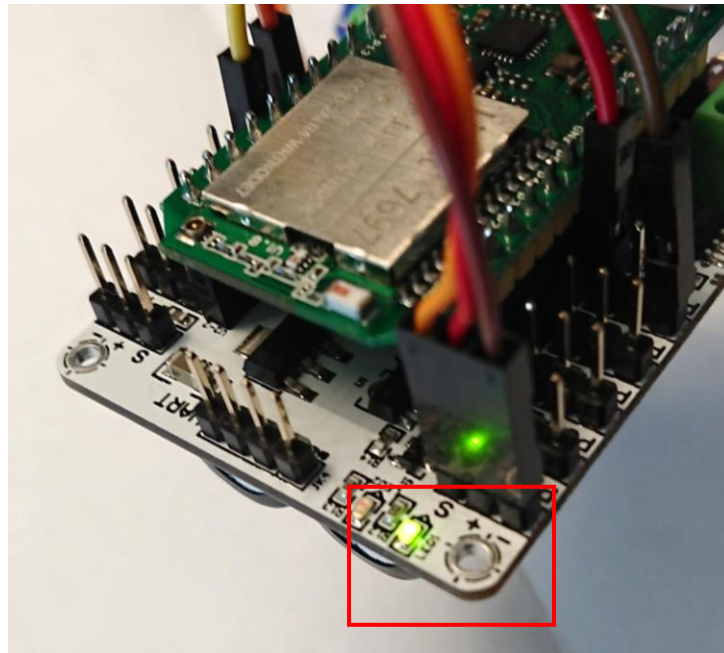
Parts list ([purchase link](#))

Each set includes the parts listed below:

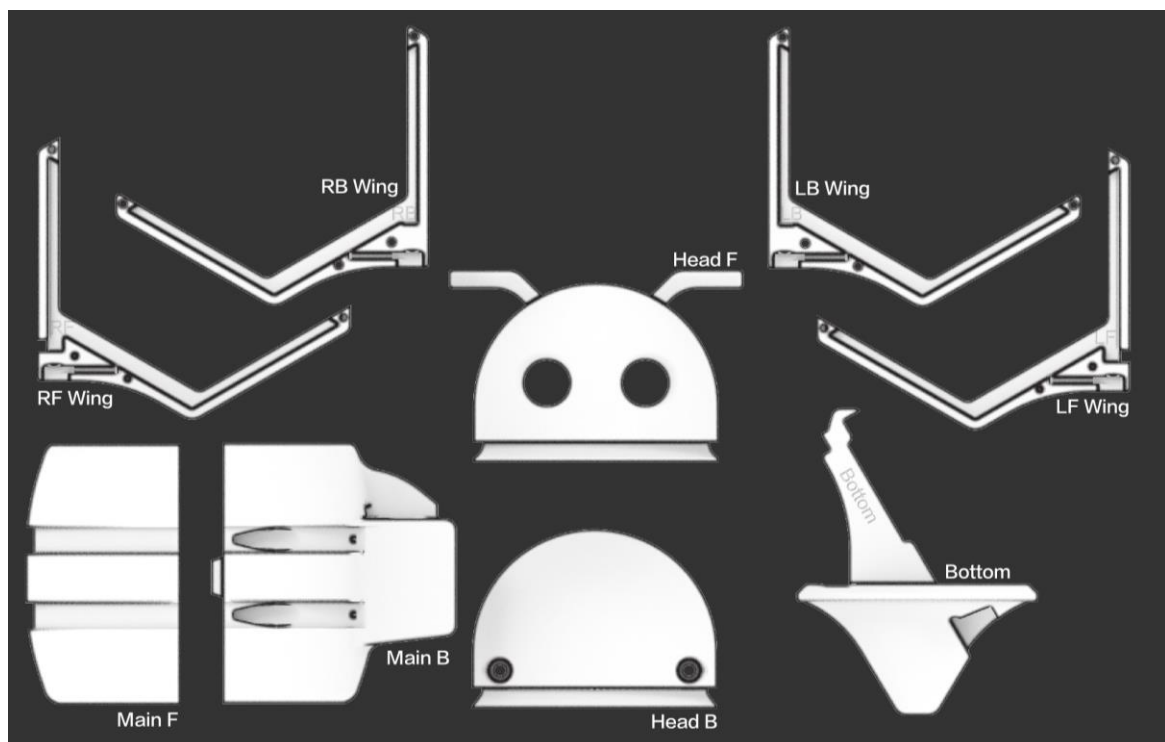
1. [LinkIt 7697 MCU board](#), 1
2. [RobotShield extension board](#), 1 (with an onboard buzzer)
3. RGB LED (common cathode), 1
4. LED stripe green (left wing), 1
5. LED stripe purple (right wing), 1
6. Ultrasonic sensor (HC-SR04), 1
7. Female-to-Female jump wires, 10
8. Mini servo (SG90), 2
9. Screw
 - a. M3x8, 7pcs
 - b. M2x12, 2pcs
 - c. M2x6, 12pcs
10. Acrylic (base, wings), 2 pieces.
11. Cow leather (stripes and body cushions), 4 pieces.
12. 3D printed parts (Main F, Main B, Head F, Head B, Bottom, Wing RF, Wing RB, Wing LF, Wing LB) - 9 pieces total.



Note: each 3-pin port of Robot Shield has labeled with **S** (signal), **+** (Positive) and **-** (Negative/GND). For each component's power supply, component's +/- terminals must connect to corresponding +/- pins on the Robot Shield, which is within the same port of the signal pin.

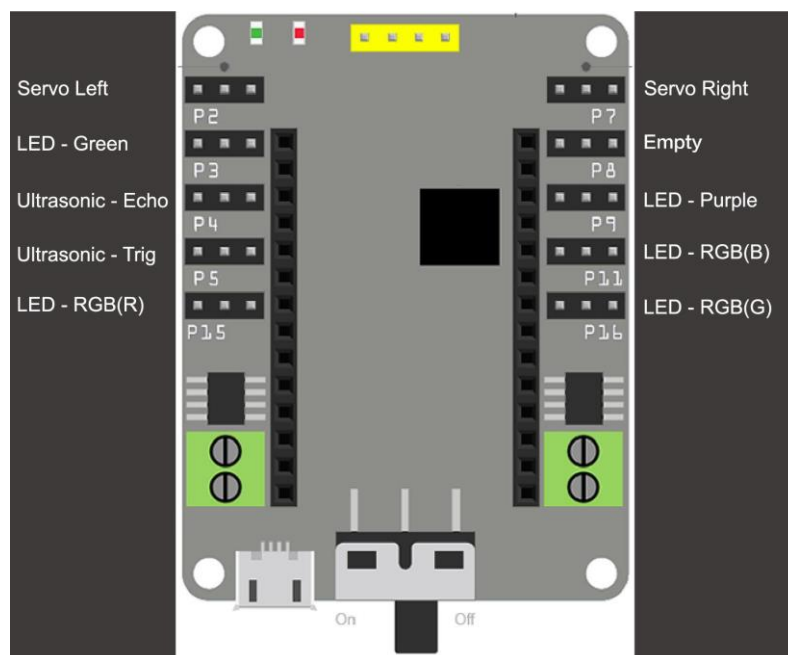
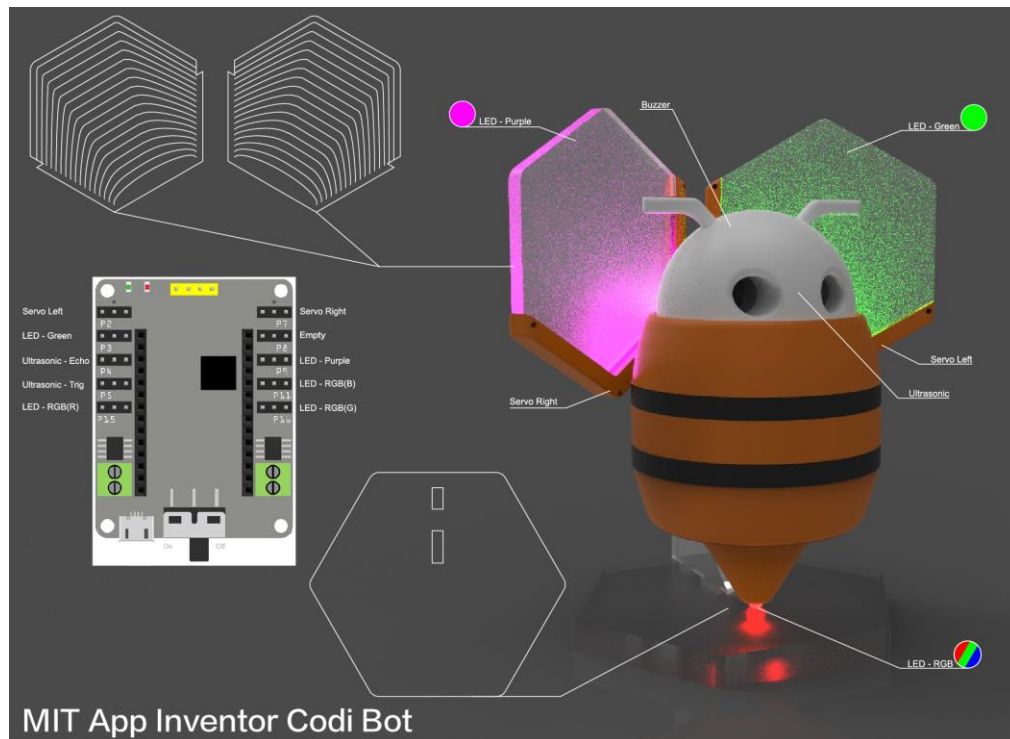


3D parts

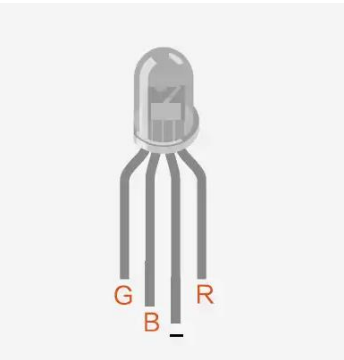
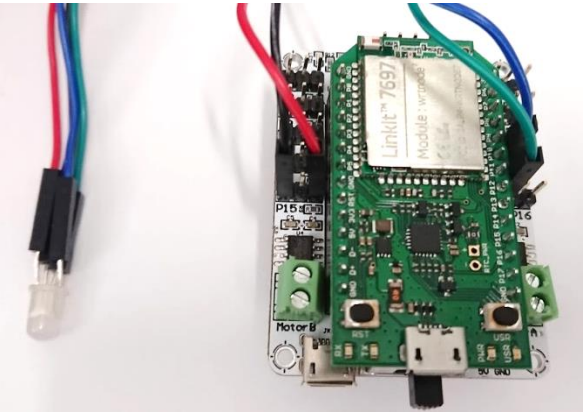


Pin mapping

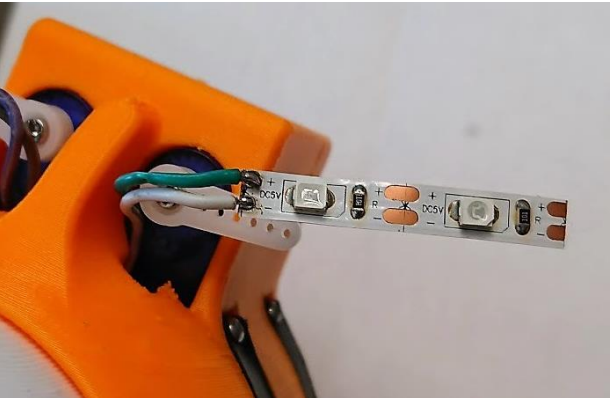
This section will guide you through connecting each component pin to the corresponding Robot Shield pin. Please ensure you have connected all of them correctly or your Codi bot may not function normally.




RGB LED (base)

RGB LED	Robot shield	 
R	P15	
G	P16	
B	P11	
GND (longest pin)	- of P11/P15/P16 port (any one)	


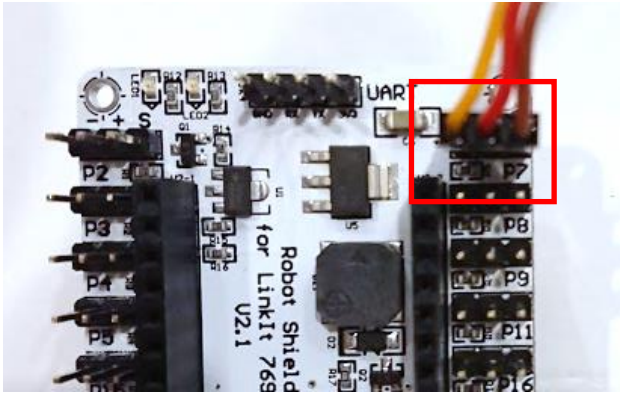
LED green (left wing)

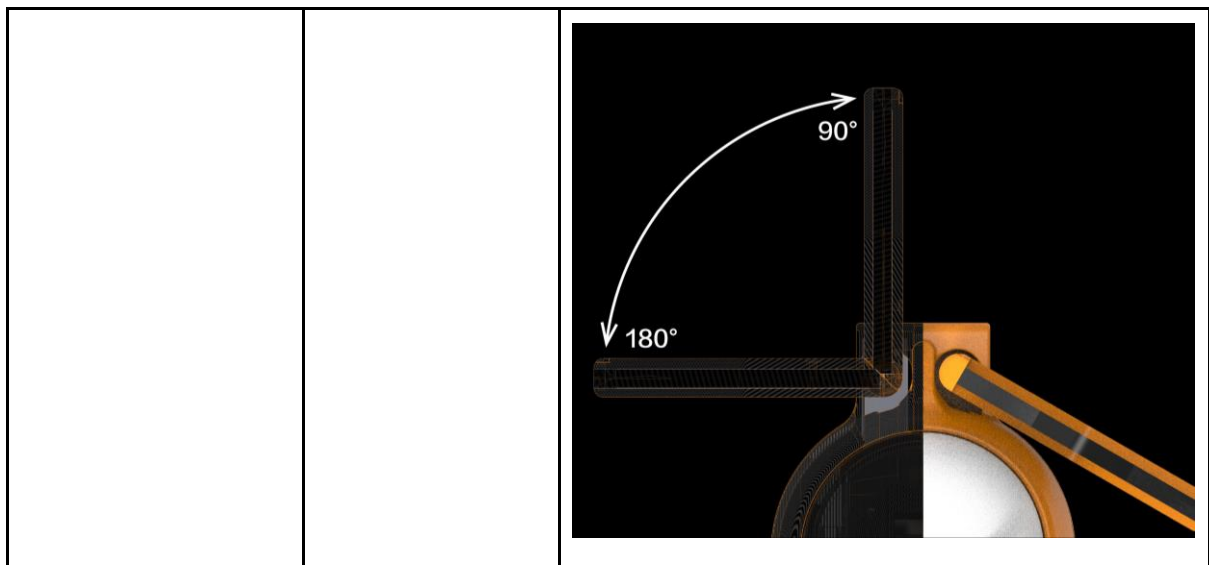
LED green (right wing)	Robot Shield	
+ (Green wire)	P3	
- (Black wire)	- of P3 port	

LED purple (right wing)

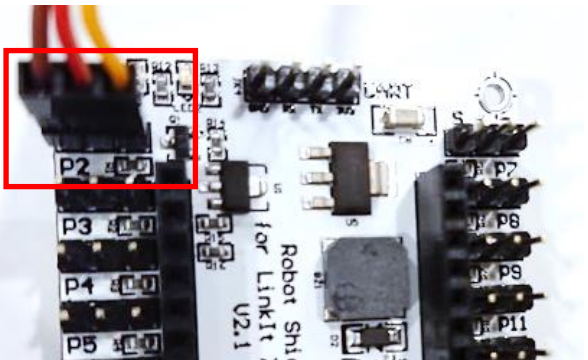
LED purple (left wing)	Robot Shield	
+ (Purple wire)	+ of P9 port	
- (Black wire)	P9	

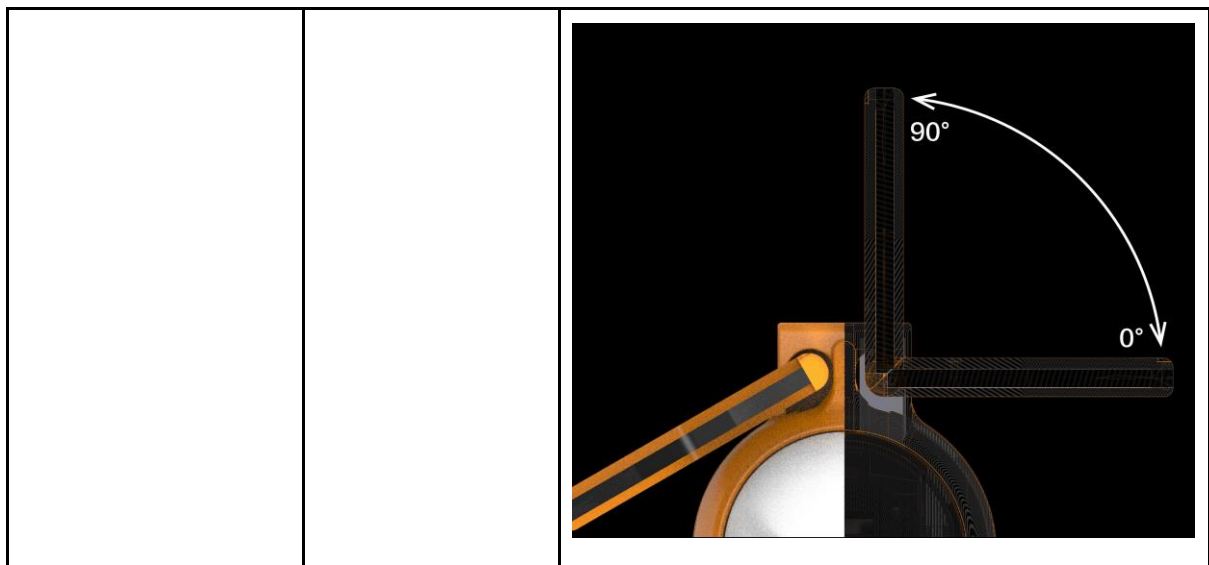
Right Servo

Right Servo	Robot Shield	<p>Forward: servo position 180 degree</p> <p>Backward: servo position 90 degree</p> <p>Servo pins: orange: signal / red: 5V / brown: GND</p> <p>Connect to RobotShield port 7</p>  
Signal (orange wire)	P7	
Power (red wire)	+ of P7 port	
GND (brown wire)	- of P7 port	



Left Wing Servo motor

Left Servo	Robot Shield	Forward: servo position 0 degree Backward: servo position 90 degree Connect to RobotShield port 7
Signal (orange wire)	P2	 <p>A close-up photograph of the Robot Shield P2 port. A red box highlights the signal pin (pin 2) where the orange wire is connected. The port is labeled P2, P3, P4, P5, P6, P7, P8, P9, P10, and P11. The text 'Robot Shield for LinkIt 7 U2.1' is visible on the board.</p>
Power (red wire)	+ of P2 port	
GND (brown wire)	- of P2 port	

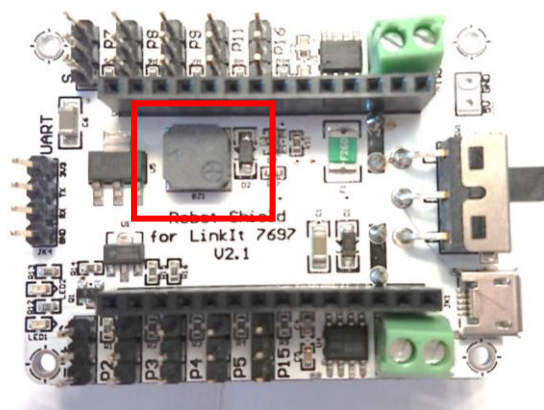


Ultrasonic sensor

Ultrasonic sensor	Robot Shield	
Echo	P4	
Trig	P5	
Vcc	+ of P4/P5 port	
GND	- of P4/P5 port	

Buzzer

Robot Shield has an onboard buzzer connected to its P14 pin, we can use to make sounds.



How to assemble

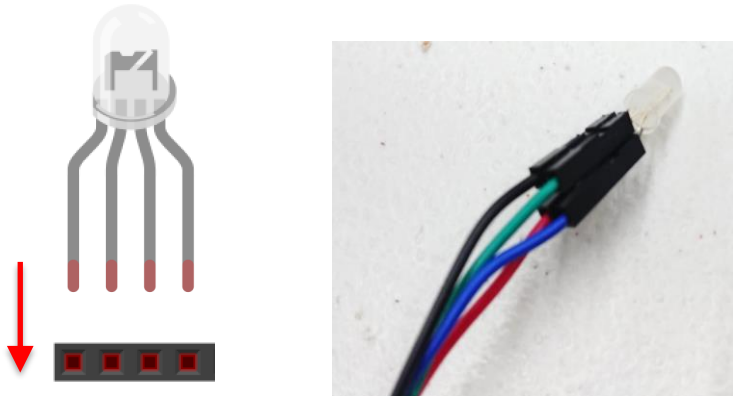
Please follow below Steps to assemble your Codi Bot. Note that the part name in Bold is the 3D-printed parts (**Head B**, **Bottom**, **RF Wing**, etc.)

Step 1:

Connect the RGB LED pins with wires

Parts:

- RGB LED, 1
- wire, 4
- 3DP-Bottom

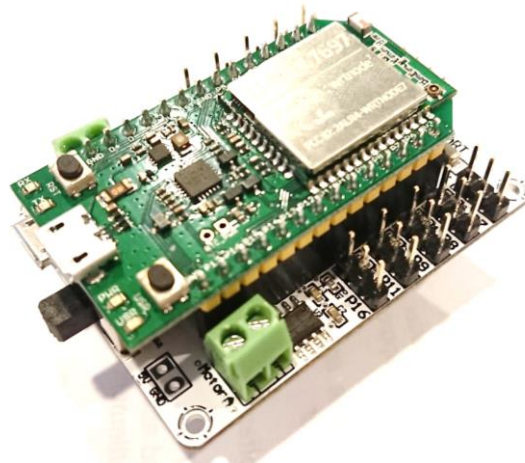


Step 2:

Assemble LinkIt 7697 with Robot Shield

Parts:

- LinkIt 7697 board, 1
- Robot Shield, 1

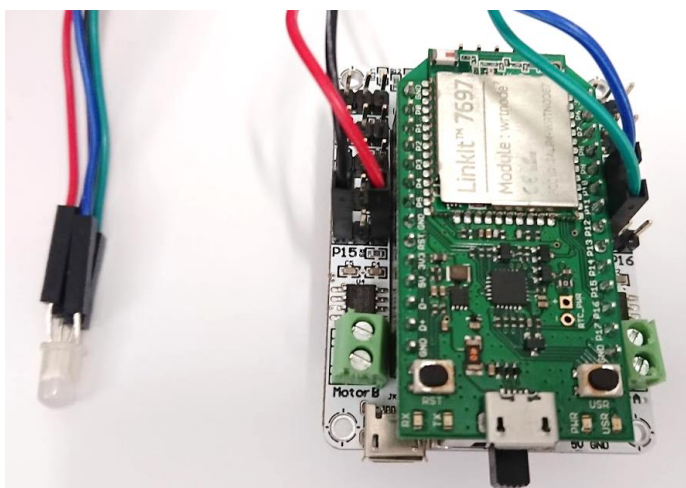


Step 3:

Connect RGB LED pins to corresponding pins of Robot Shield. (refer to [Pin Mapping](#) section).

Parts:

- Step 1
- Step 2



Step 4:

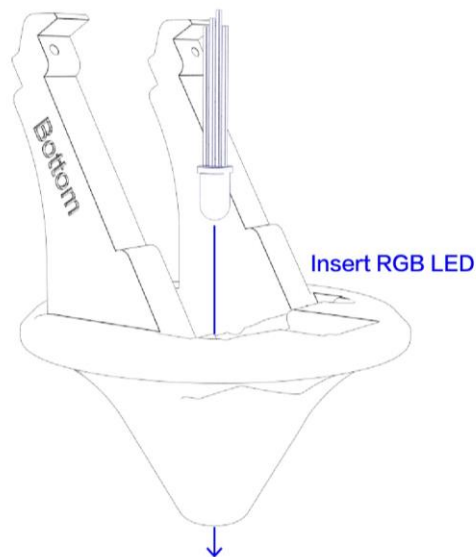
Secure RGB LED in the hole of **Bottom**.

Parts:

- Step3
- **Bottom**

Tips: Glue to secure

Tips: Cut LED pins shorter if necessary

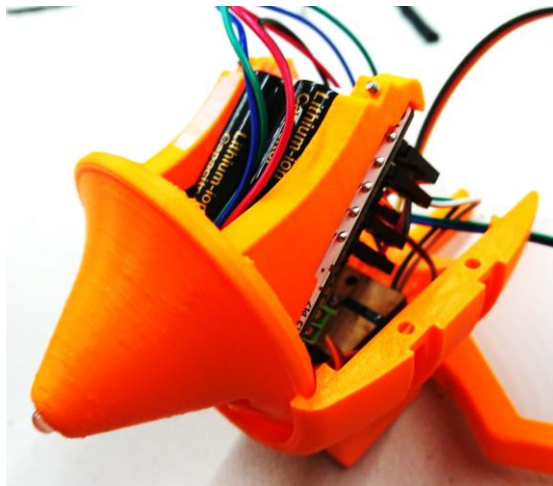
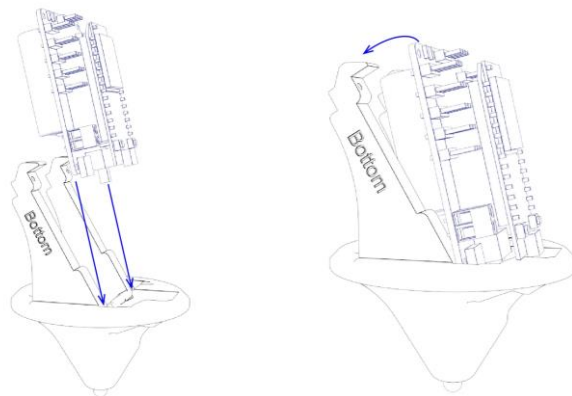
**Step 5:**

Secure the Link7697 and the Robot Shield on **Bottom**.

Parts:

- Parts from Step 1-4

Tips: Remove 3DP supporting structure.



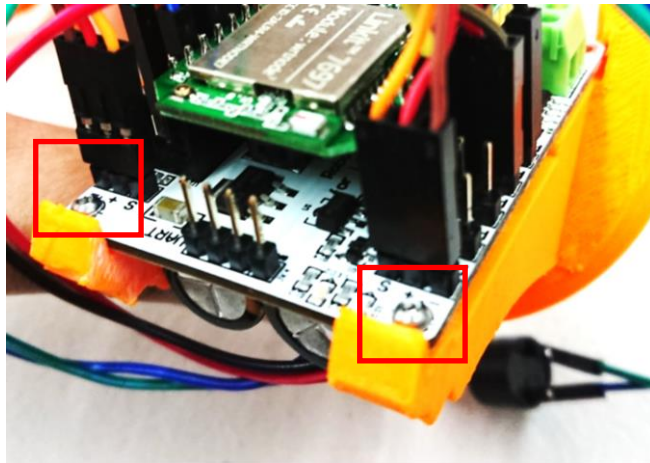
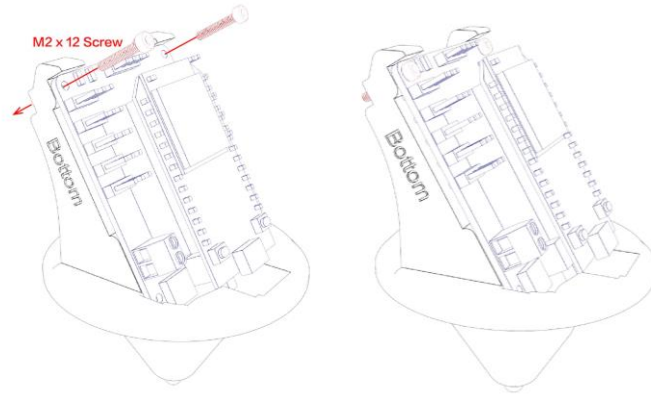
Step 6:

Secure with M2x12 screws.

Parts:

- M2x12 screw, 2

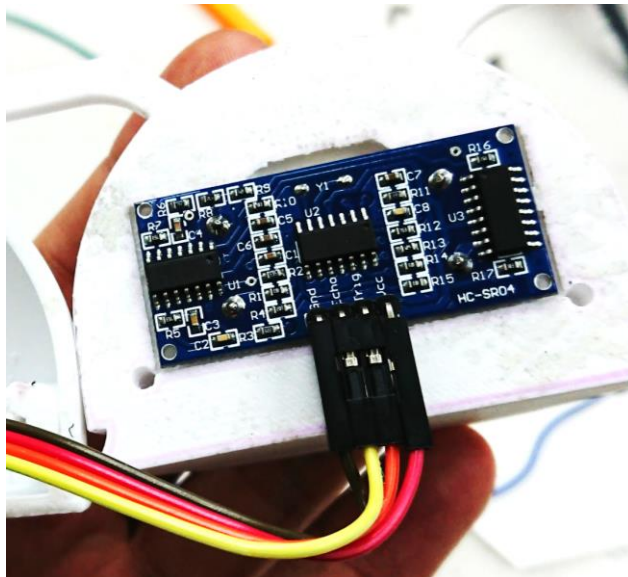
Tips: Please be careful while putting in the screws so you do not break your 3DP part

**Step 7:**

Connect the wires with the SR-04 pins and insert the ultrasonic sensor into **Head F**.

Parts:

- HC-SR04 ultrasonic sensor, 1
- **HeadF**, 1



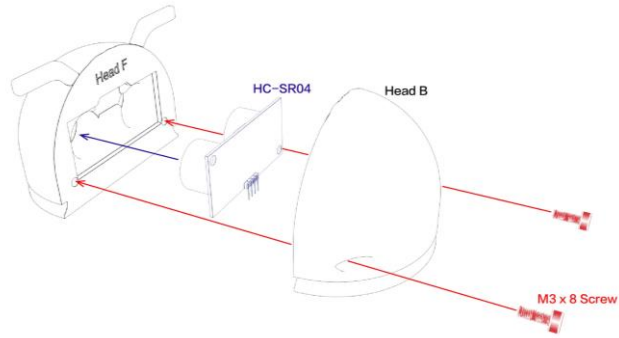
Step8:

Secure Step7 and **Head B** with M3x8 screws.

Parts:

- Step 7
- **Head B**
- M3x8 screw, 2

Tips: Remove 3DP supporting structure inside.

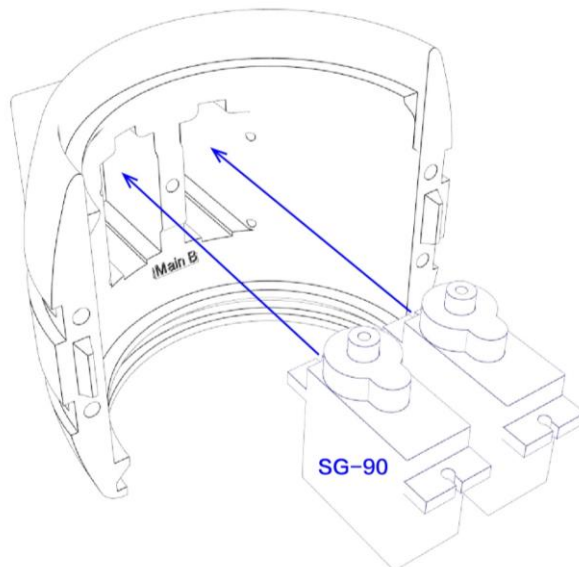
**Step 9:**

Insert 2 SG-90 servos into the holes of **Main B**. Make sure the servo wires are at the bottom of the servos.

Parts:

- SG-90 servo, 2
- **Main B**

Tips: Remove 3DP supporting.



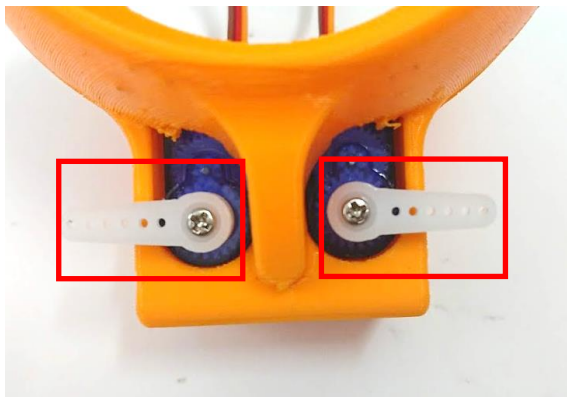
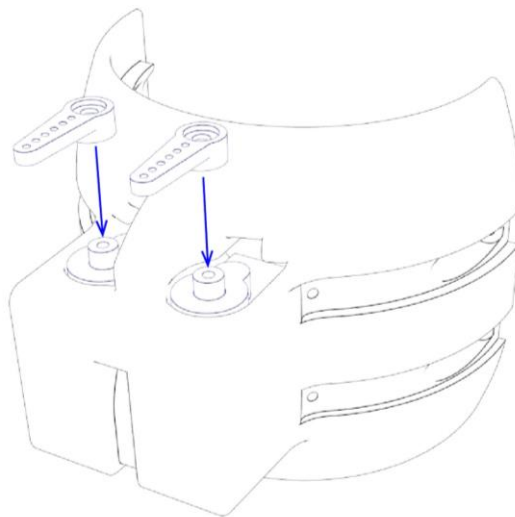


Step 10:

Rotate the left servo to the leftmost position. Rotate the right servo to the rightmost position. Then secure servo and servo horn with its screw.

Parts:

- Step 9
- Servo horn, 2
- Servo screw, 2

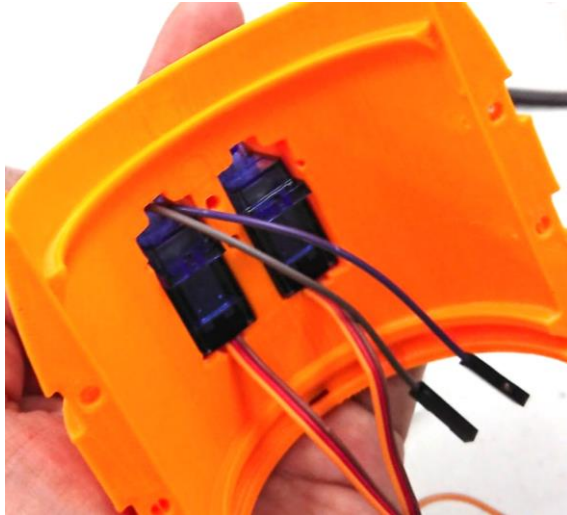


Step 11:

Pass the wires of two LED stripes through the corresponding holes we put in the servos in Step 10. Make sure the LED **green** stripe is in the **right** hole and LED **purple** stripe is in the **left** hole.

Parts:

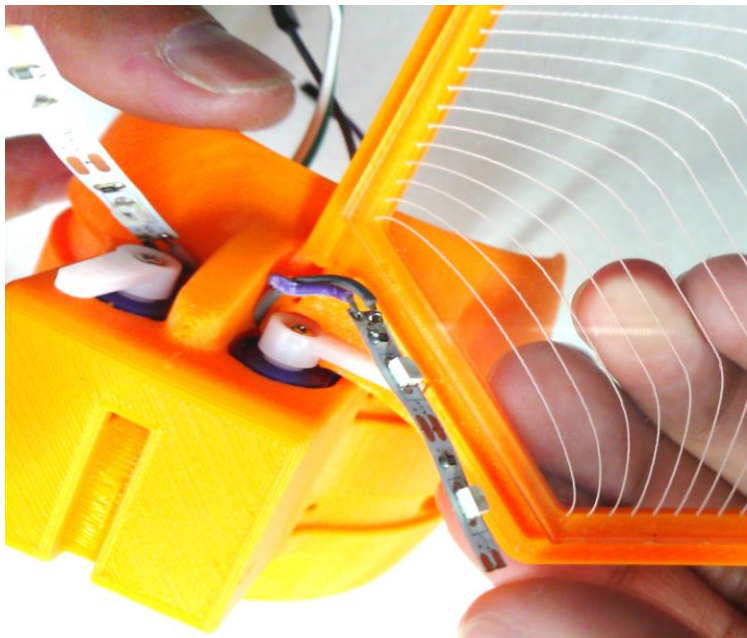
- Step10
- LED stripe **green**, 1
- LED stripe **purple**, 1

**Step 12:**

Put two LED stripes into grooves of **LF Wing** and **RF Wing**. Then assemble two acrylic wings pieces.

Parts:

- Step 11
- **LF Wing**
- **RF Wing**
- Acrylic wings, 2
- M2 x 6 screws, 8



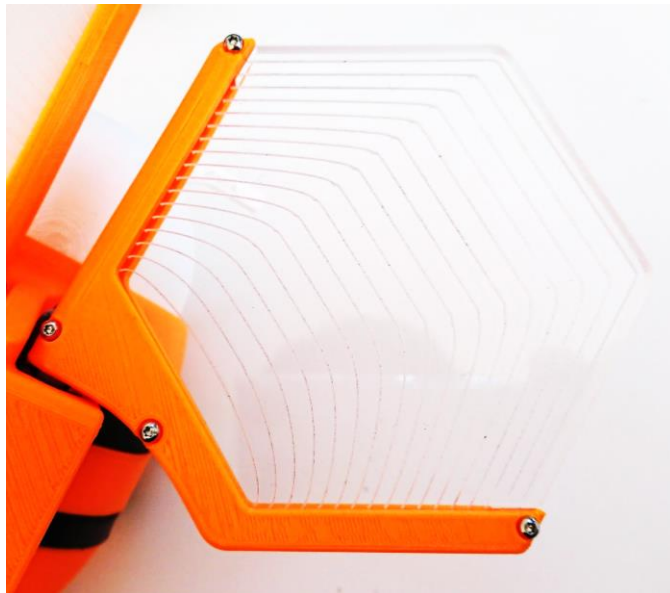
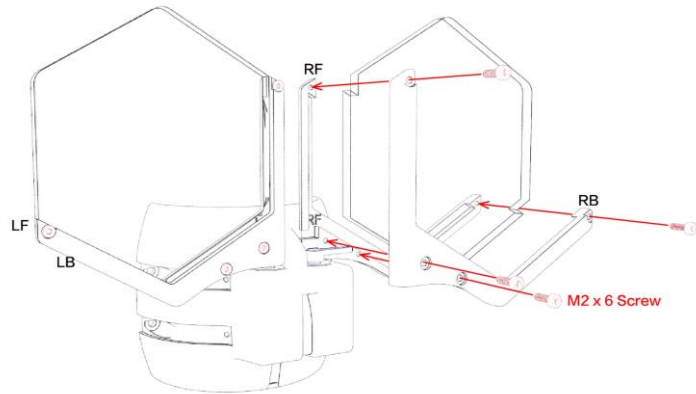
Step 13:

Secure the right wing (Step 12) and **RB Wing** with 4 M2 x 6 screws. Do the same thing for the left wing.

Parts:

- Step 12
- **LB Wing**
- **RB Wing**
- M2 x 6 screw, 8

Tips: Please be careful putting in the screws so you do not break the 3DP.



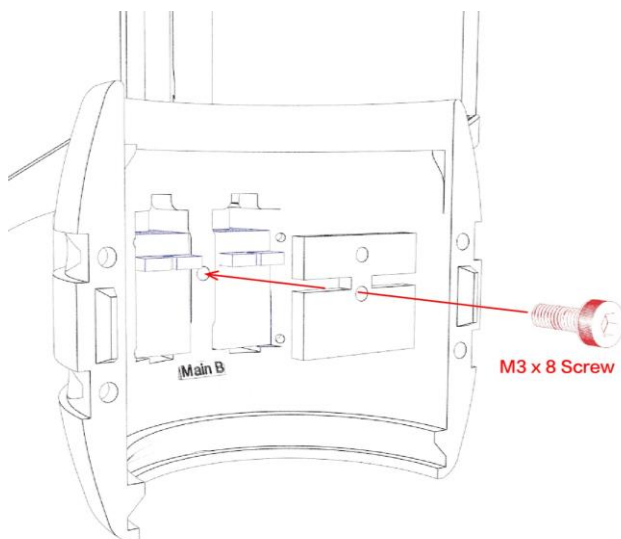
Step 14

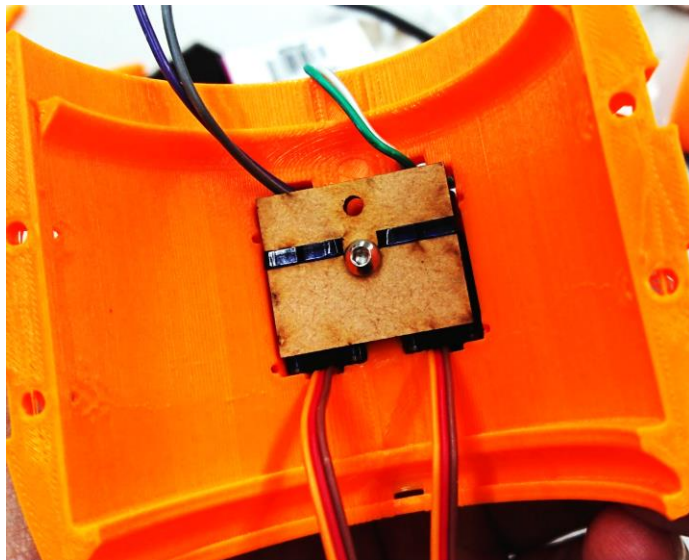
Secure the spacer on **Main B** with an M3x8 screw.

Parts:

- Step 13
- spacer, 1
- M3x8 screw, 1

Tips: Please be careful putting in the screws so you do not break the 3DP.





Step 15:

Connect all component wires to corresponding pins on Robot Shield.

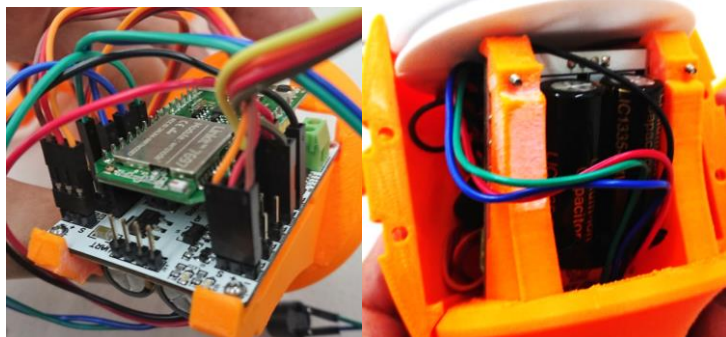
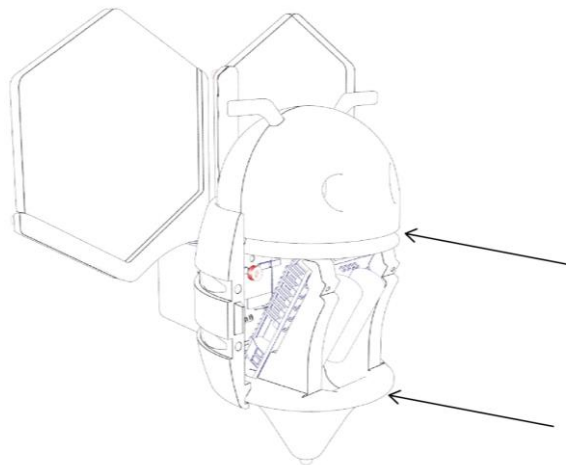
Then assemble **head** (Step 8), **core** (Step 6) and **body-back** (Step 14) together.

Parts:

- All above

Tips: Make sure all wires are connected correctly and neither squeezed nor interfered with mechanisms (servos).

Tips: You can now execute the [standalone sketch](#) to check that everything works correctly.



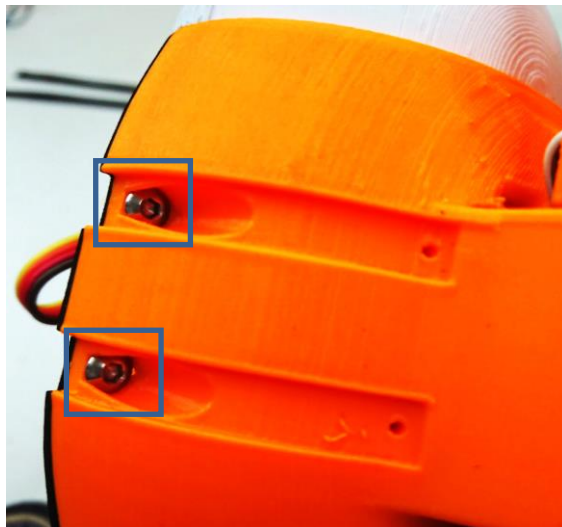
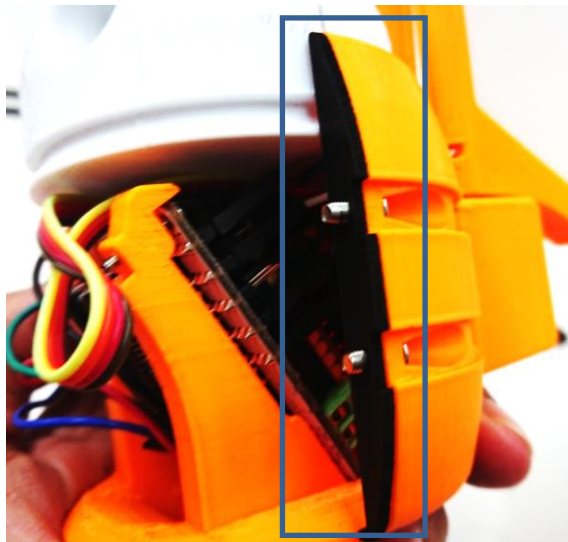
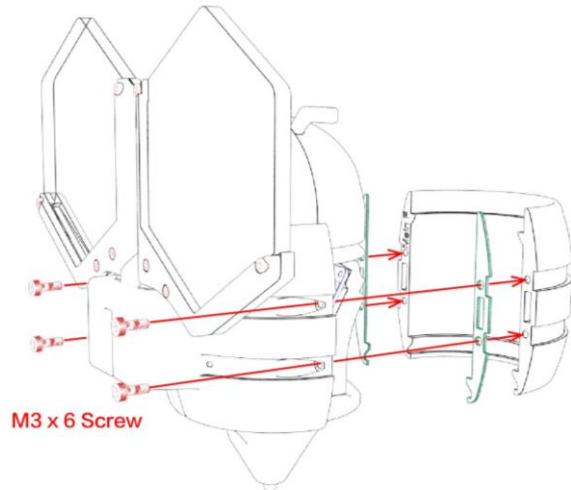
Step 16:

Secure **body-back**,
cushions and **Main F**
with four M3 x 6 screws.

parts:

- **Main F**
- cushions, 2

*Tips: Please be careful
putting in the screws so you
do not break the 3DP.*



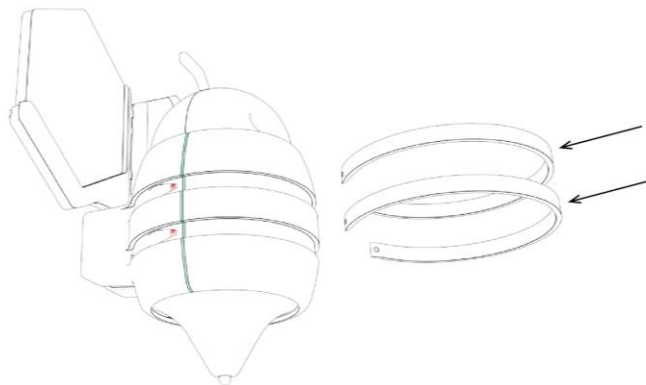


Step 17:

Assemble two stripes.

Parts:

- Step 16
- Stripes, 2



Step 18:

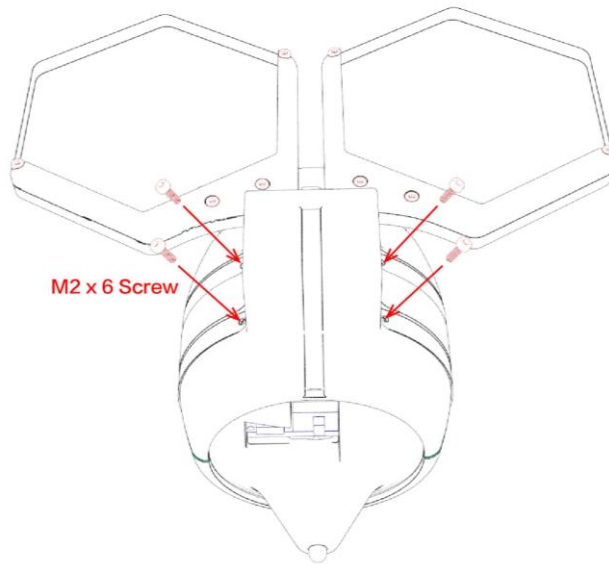
Secure stripes and Codi Bot with four M2 x 6 screws.

Parts:

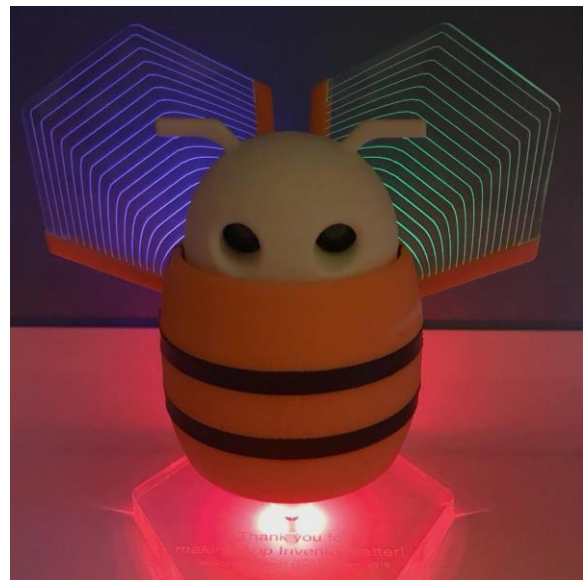
- Step 17
- M2 x 6 screw, 4

Tips: You may need to stretch leather a bit to screw.

Tips: Please be careful putting in the screws so you do not break the 3DP.



Congratulations, you have completed assembly of your CodiBot!



Software

Function list

1. **Standalone demo:** Use [the sketch](#) to check that the hardware functions correctly. Note that this demo has no interaction with App Inventor ([Video](#)).
 - a. LED (base, wings)
 - b. Servo (wings)
 - c. Sound
 - d. Ultrasonic sensor
2. **Codi Bot LEDs:** Controls LEDs by buttons and sliders ([Video](#)).
3. **Codi Bot Wings:** Controls wing flapping or move to certain position ([Video](#)).
4. **Codi Bot Sound:** Control Codi Bot to make different kinds of sound ([Video](#)).
5. **Codi Bot:** Combine all previous functions into one app ([Video](#)).

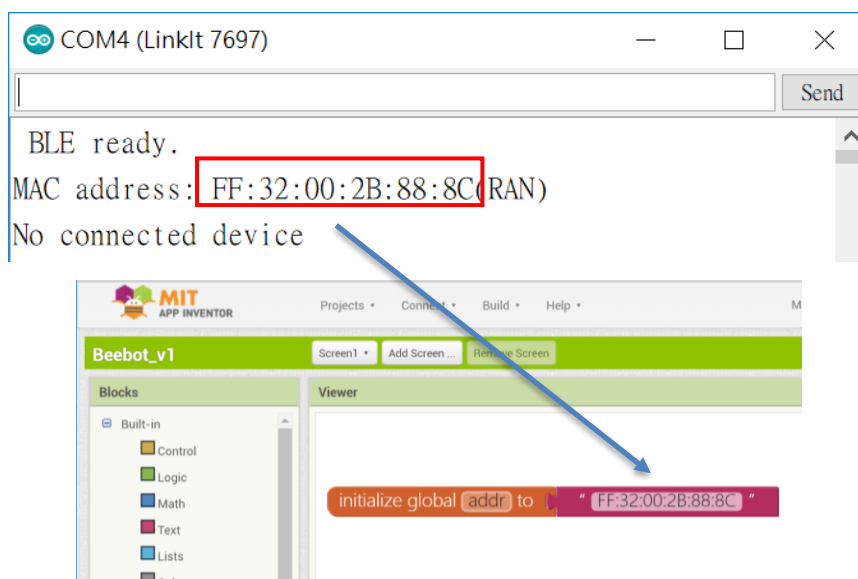
Arduino IDE setup

[Check this tutorial for Arduino IDE and MCU board driver setup](#)

After the environment is ready, connect the MCU board and your PC with a micro-USB cable. Open your Arduino IDE and load the sketch of each corresponding project (see below) and click the **Upload** button in Arduino IDE to upload to the LinkIt 7697 MCU board.



- **Project 1 - Standalone demo:** upload [this sketch](#) and the Codi Bot will flap wings and change LED color randomly. And Codi Bot LEDs of both wings will light up and it makes sounds when there is something in front of it.
- **Project 2. to 4:** upload [this sketch](#) and open Arduino IDE's serial monitor. You will see messages like below, the **FF:32:00:2B:88:8C** is the Bluetooth address of my LinkIt 7697 MCU board, which is different from yours. Therefore you have to either replace the **addr** variable of your AI2 project or use a ListPicker to select the correct address in the app. Otherwise your app cannot connect with the Codi Bot.



FAQ

1. Wings, LEDs are not functioning?
 - a. Check to make sure your Robot shield is switched on.
 - b. Robot Shield may run out of power, so connect it to your PC/laptop USB port by an USB cable.
 - c. Most problems come from wiring issues, please check that you've connected all the components correctly. (refer to [pin mapping section of this user manual](#)).
2. Cannot connect to the Codi Bot?
 - a. Check Arduino IDE setup section, make sure you've modified the **addr** variable (.aia) with the Bluetooth address of your LinkIt 7697.