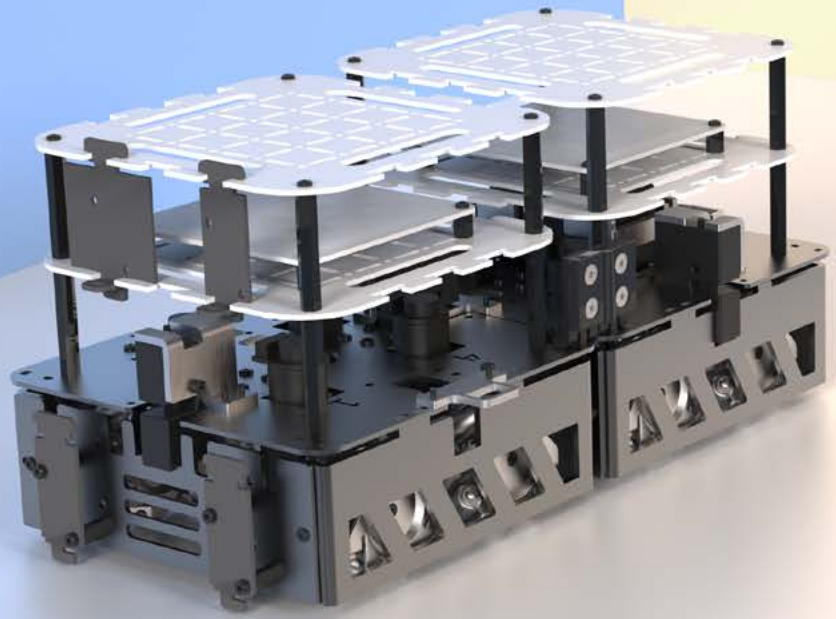
wefaa robotics



smorphi 2

transforming learning with
transformer robots

assembly & info

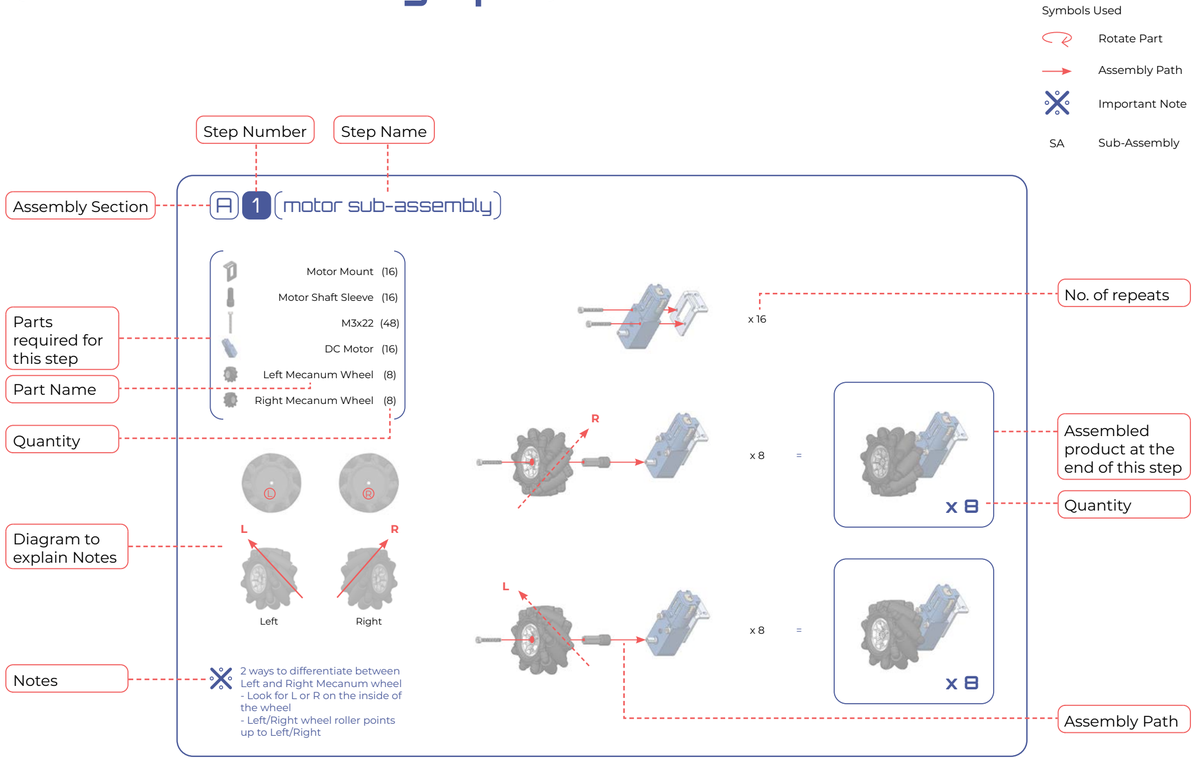
contents

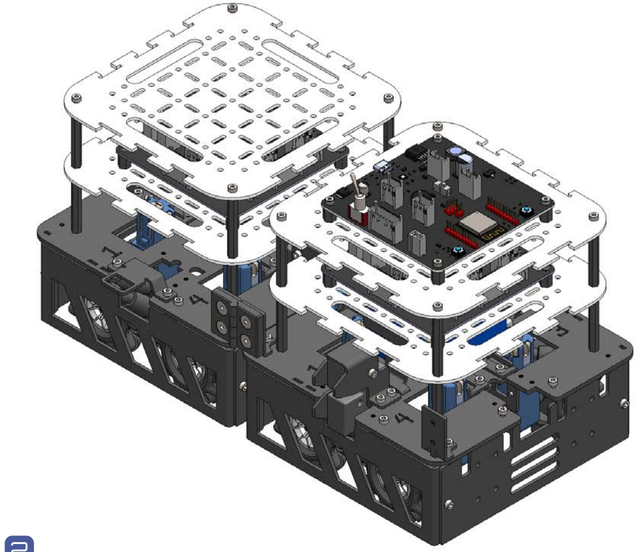
part list

All colors of parts are represented accurately here.
In the assembly steps, colors of some parts will be changed for diagram clarity.

- 4 x Acrylic Base Plate 
- 2 x Aluminium Base Plate 
- 4 x Base Skirt Panel A 
- 4 x Base Skirt Panel B 
- 4 x Mecanum Wheel (Right) 
- 4 x Mecanum Wheel (Left) 
- 8 x Mecanum Motor 
- 8 x Motor Shaft Sleeve
- 8 x Motor Mount 
- 2 x Solenoid 
- 2 x Solenoid Latch Mount 
- 2 x Solenoid Latch Guide 
- 2 x Solenoid Catch 
- 2 x Hinge Mount 
- 1 x Hinge Mechanism 
- 1 x Battery 
- 2 x Battery bracket 
- 1 x Masterboard (ESP32) 
- 2 x Slaveboard 
- 1 x Sound Sensor 
- 1 x Temperature Sensor 
- 4 x IR Sensor 
- 6 x Sensor Lock
- 12 x Hex F-F M3 Nylon 10mm 
- 16 x Hex M-F M3 Nylon 45mm 
- 100 x Cap Screw M3x5 
- 30 x Cap Screw M3x25 
- 5 x Countersunk Screw M4x8
- 2 x Wing Screw M3x5
- 1 x USB Cable 
- 6 x 4-pin Connector 
- 2 x 8-pin Connector 
- 1 x Battery Charger 
- 1 x Ceramic Screwdriver CD-25 
- 1 x HEX Key 1.5mm 

basic assembly tips



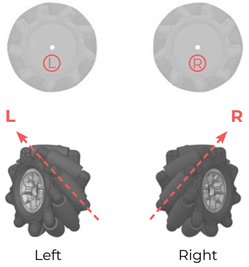


smorphi 2

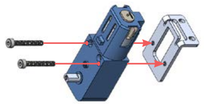
assembly start

A 1 motor sub-assembly

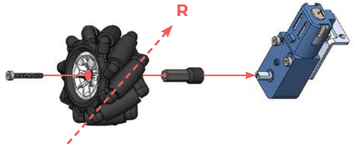
Motor Mount	(8)	
Motor Shaft Sleeve	(8)	
M3x22	(24)	
DC Motor	(8)	
Left Mecanum Wheel	(4)	
Right Mecanum Wheel	(4)	



2 ways to differentiate between Left and Right Mecanum wheel
- Look for L or R on the inside of the wheel
- Left/Right wheel roller points up to Left/Right

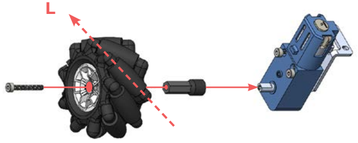


x 8



x 4 =

x 4

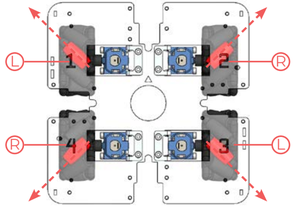


x 4 =

x 4

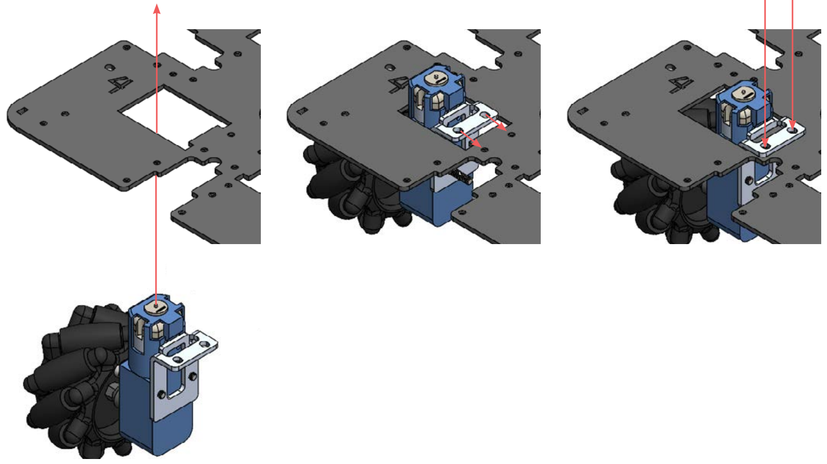
A2 base module sub-assembly

	Al Base Plate	(2)
	Hex M-F M3 45mm	(8)
	M3x5	(16)
	Left Wheel SA from A.1	(4)
	Right Wheel SA from A.1	(4)

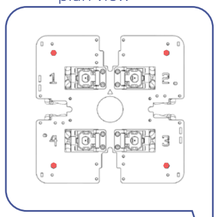


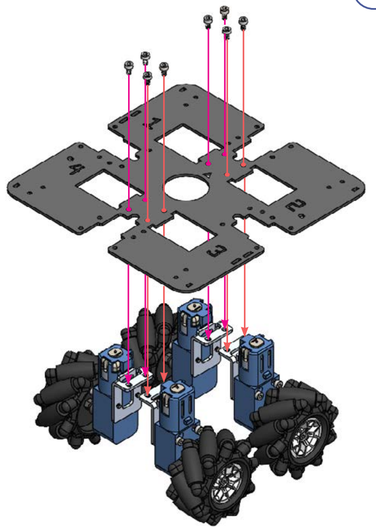
Make sure that the numbers are facing the right way up as shown in the plan view above.

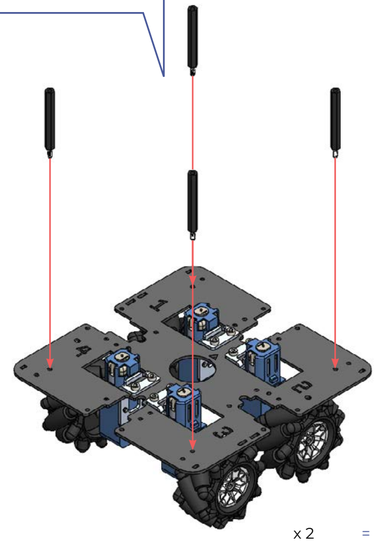
Before attaching each wheel, check that the wheel is of the correct orientation for each numbered slot.



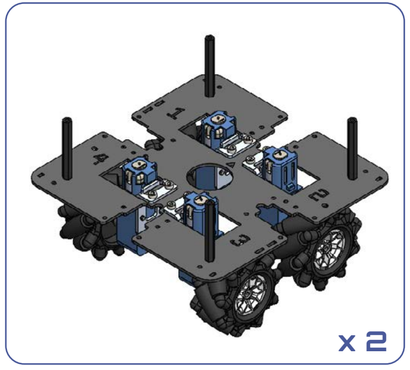
plan view



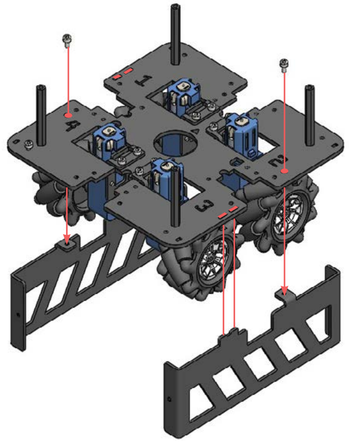




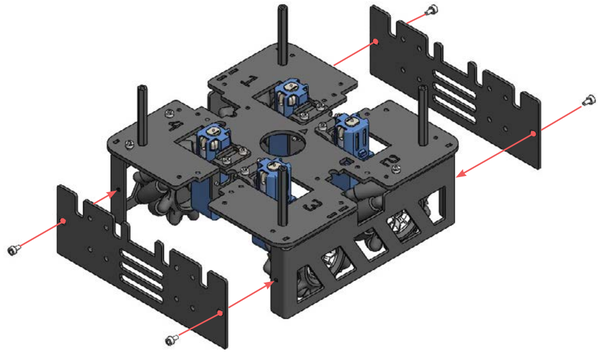
x 2 =

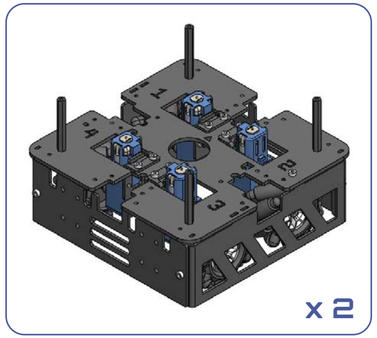


- Base Skirt Panel A (4)
- Base Skirt Panel B (4)
- M3 x 5 (12)



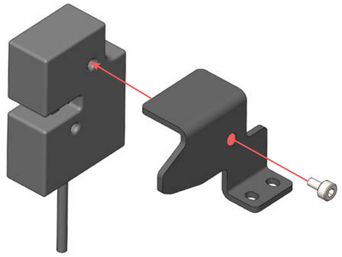
x 2 =

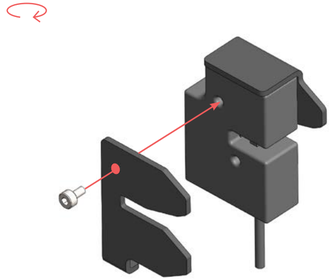


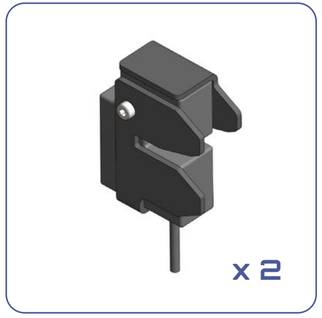


A3 solenoid latch sub-assembly

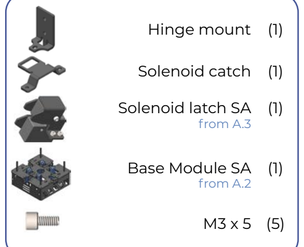
- Solenoid latch (2)
- Solenoid latch mount (2)
- Solenoid latch guide (2)
- M3 x 5 (4)



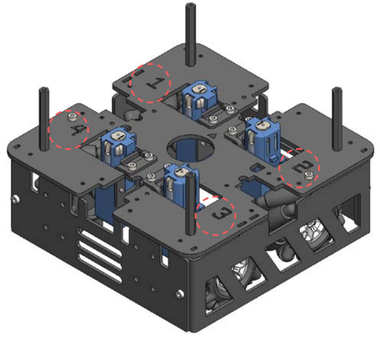


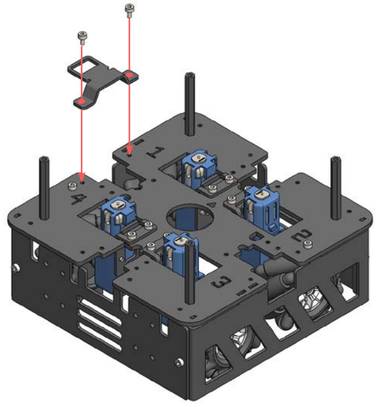


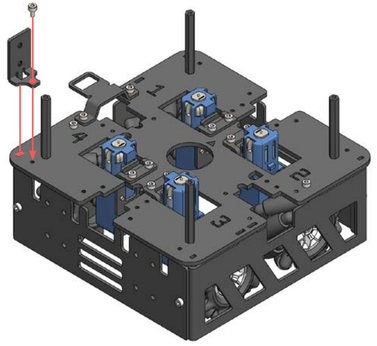
A4 module 1 mechanical sub-assembly



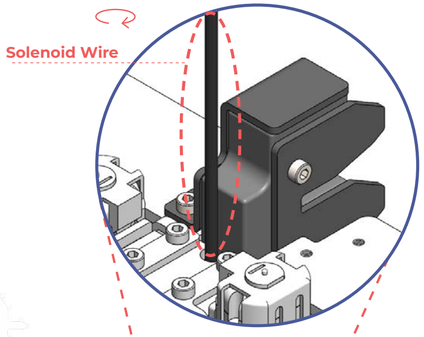
- Hinge mount (1)
- Solenoid catch (1)
- Solenoid latch SA (1) from A.3
- Base Module SA (1) from A.2
- M3 x 5 (5)

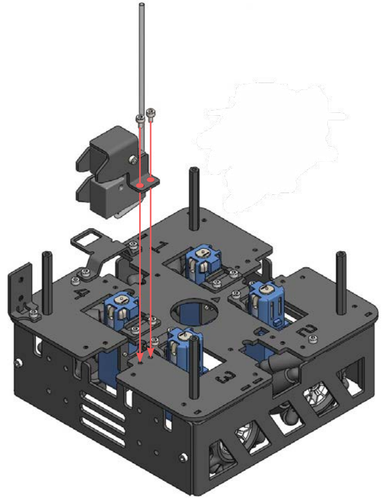


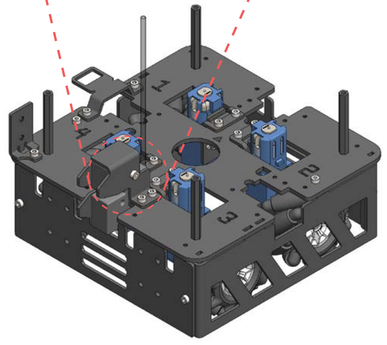


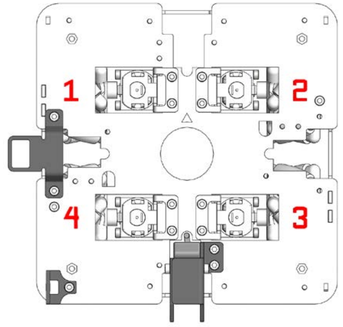


Pay attention to the numbers and their positions in relation to the parts being attached.





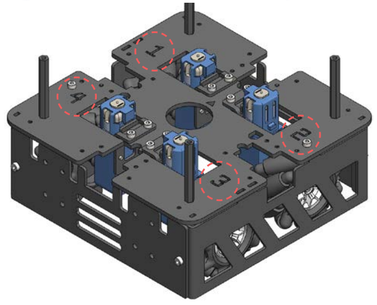


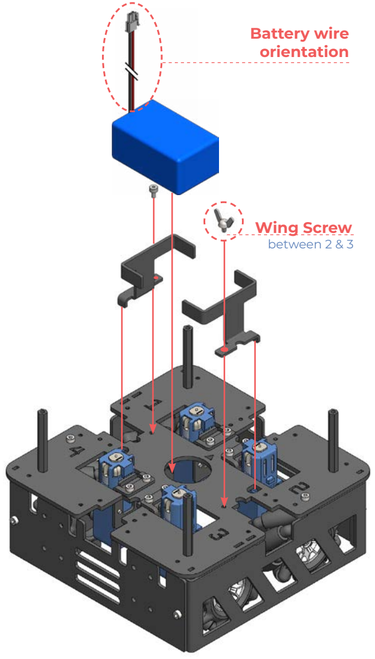


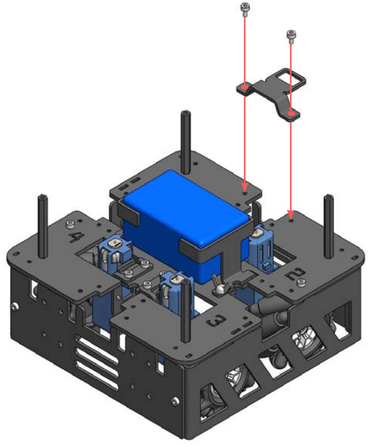
Check that the parts have been attached in the right location, in relation to the numbers.

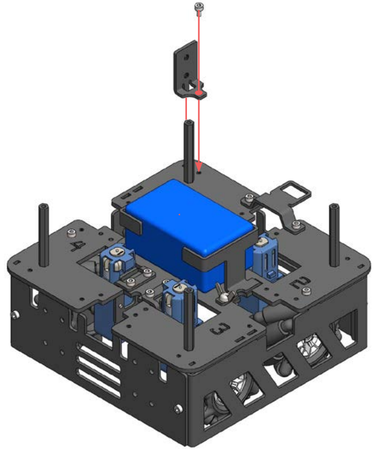
A.5 module 2 mechanical sub-assembly

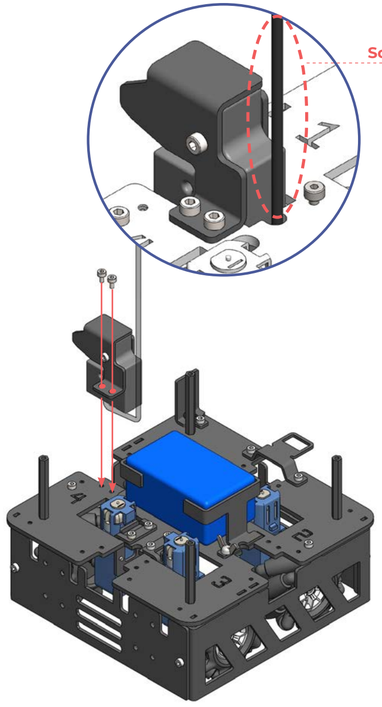
- Hinge mount (1)
- Solenoid catch (1)
- Solenoid latch SA (1) from A.3
- Battery bracket (2)
- Li-ion Battery (1)
- Base Module SA (1) from A.2
- M3 x 5 (6)
- Wing Screw M3 x 5 (1)

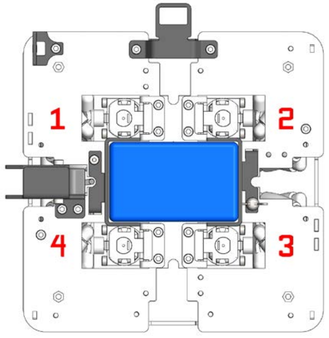










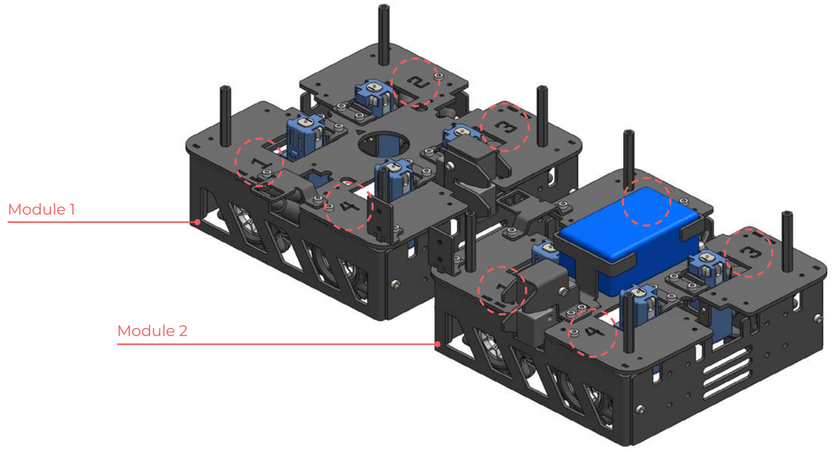


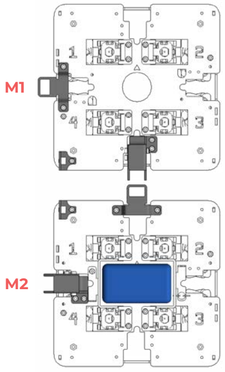
Pay attention to the numbers and their positions in relation to the parts being attached.

Check that the parts have been attached in the right location.

A 6 full mechanical assembly

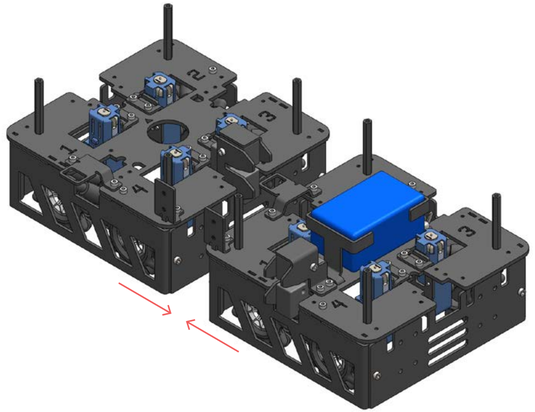
Module 1 (1)
from A.4
Module 2 (1)
from A.5
Hinge mechanism (1)
M4 x 8 (4)



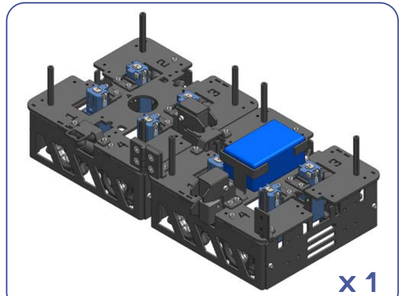


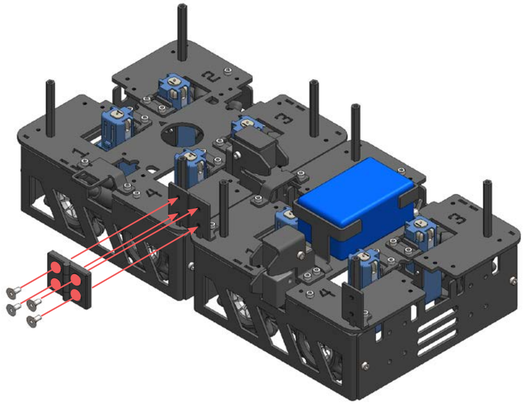
plan view

Pay attention to the numbers and their orientation when attaching the modules together.



Check all the positions of solenoids, solenoid catches, hinge mounts before proceeding to section B.

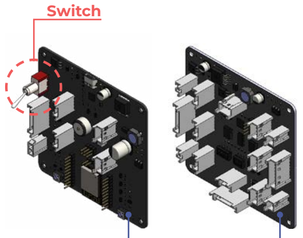


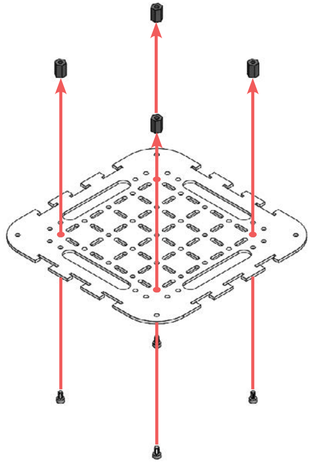


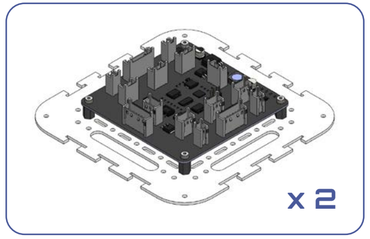
A mechanical assembly completed

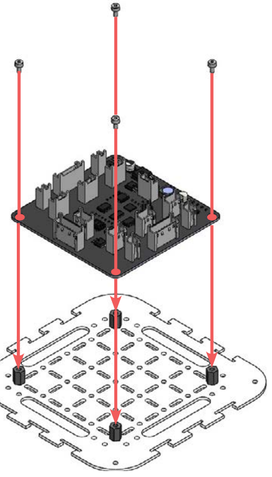
B 1 e-tray sub-assembly

	Acrylic base plate	(2)
	Slaveboard	(2)
	Hex F-F M3 10mm	(8)
	M3 x 5	(16)







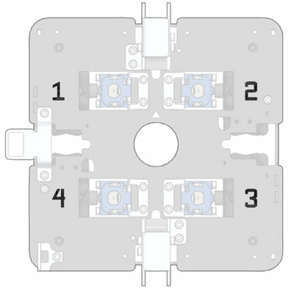


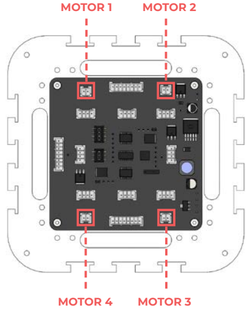
Make sure that you are attaching the slaveboards and not the masterboard.

How to differentiate between masterboard and slaveboards:
- Masterboard has a special switch

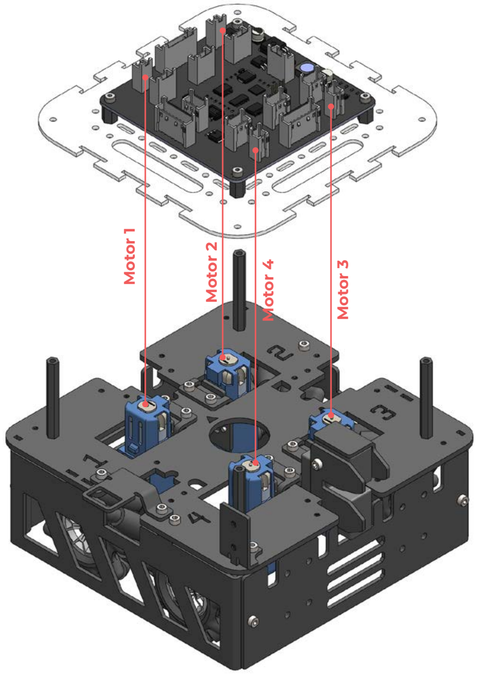
B 2 e-tray onto mechanical assembly

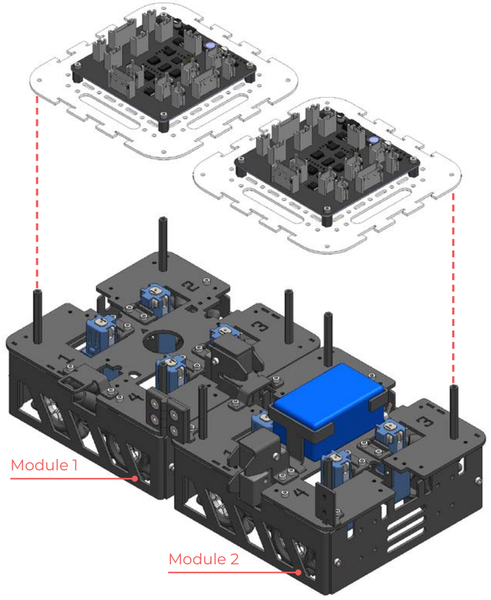
	e-tray SA from B.1	(2)
	full mechanical SA from A.6	(1)
	Hex M-F M3 45mm	(8)

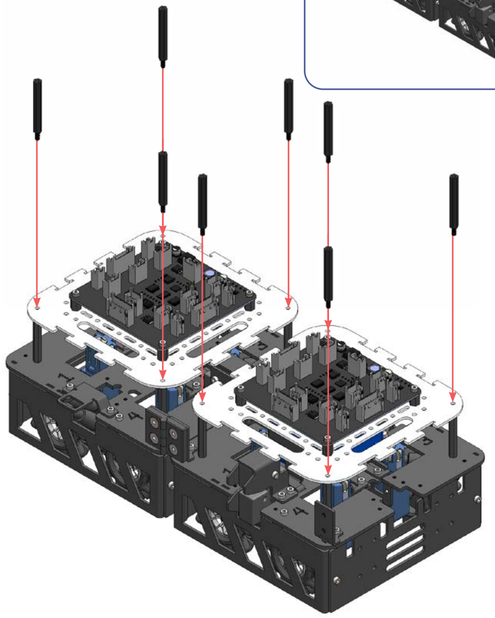


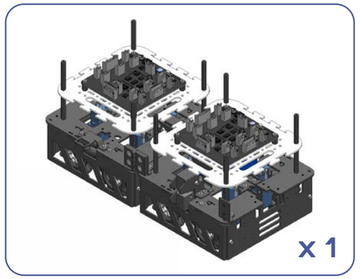


Orientate e-tray SA and base module as shown on the right.
Motor 1 connector on e-tray should be on top of Motor 1 of base module.
Same goes for Motor 2, 3 and 4.





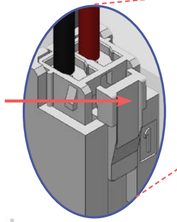




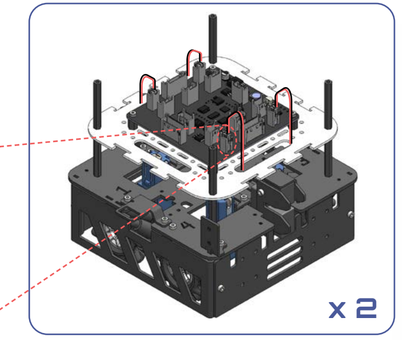
8.3 all module motor cable connection

motor cables (8)
attached to motor

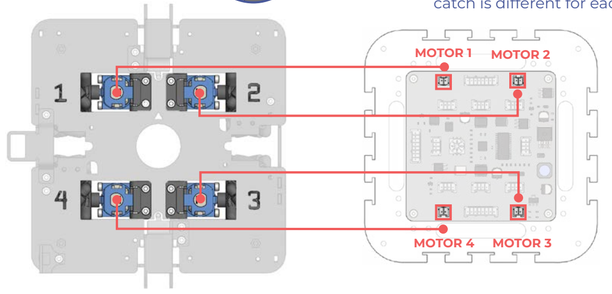
module SA (2)
attached to full assembly



To unplug cable:
Press and pull out
the connector

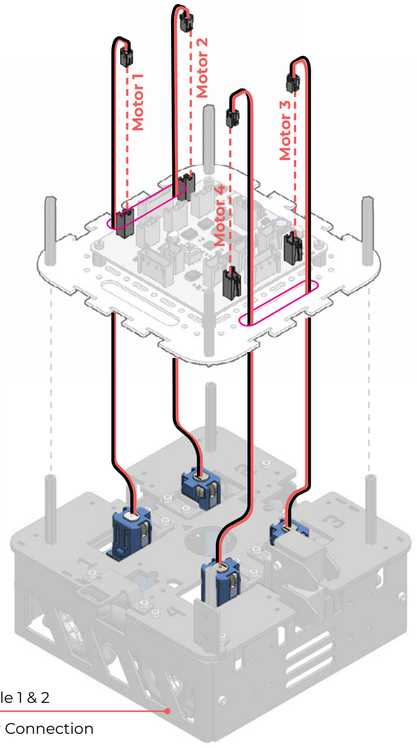


Note: Position of solenoid latch and solenoid catch is different for each module



Make sure that Motor 1 is connected to Motor 1 connector on Slaveboard; the same goes for Motor 2, 3 and 4.

Motor cable connection is the same for both modules



Module 1 & 2

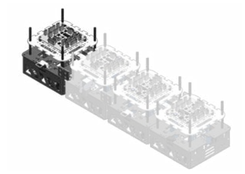
Motor Connection

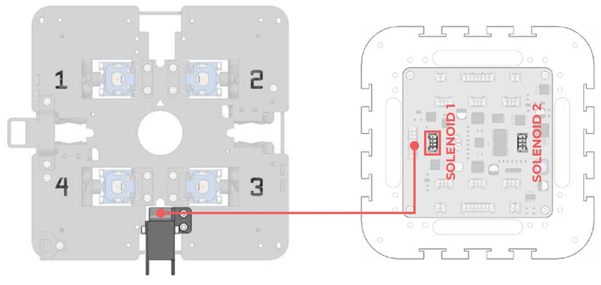
Opening to pass wire through

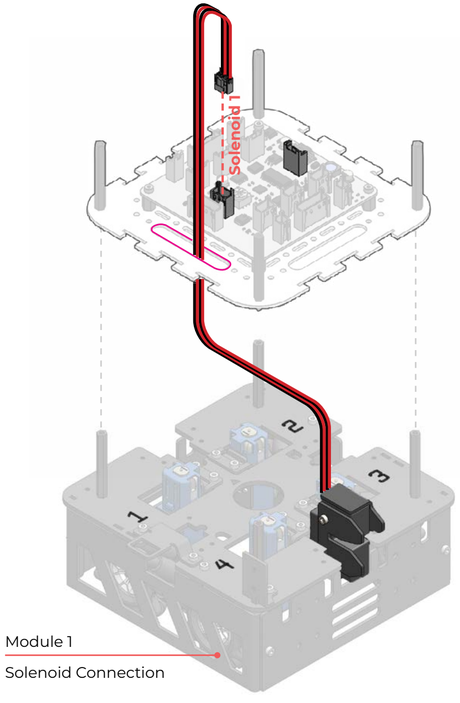
B4 module 1 solenoid cable connection

solenoid cables (1)
attached to solenoids

module 1 SA (1)
attached to full assembly







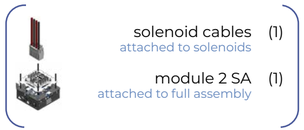
Module 1

Solenoid Connection

Make sure to connect the solenoid to the labelled solenoid connector exactly as in the diagram below.

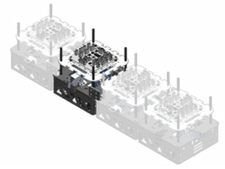
Opening to pass wire through

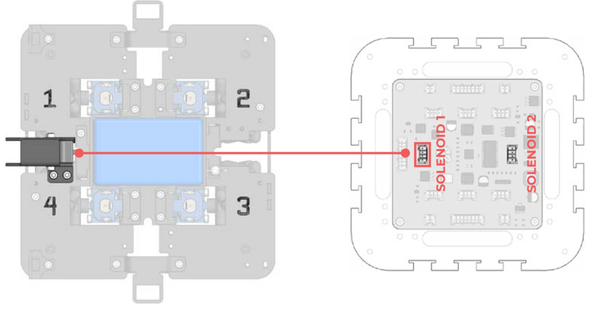
B5 module 2 solenoid cable connection

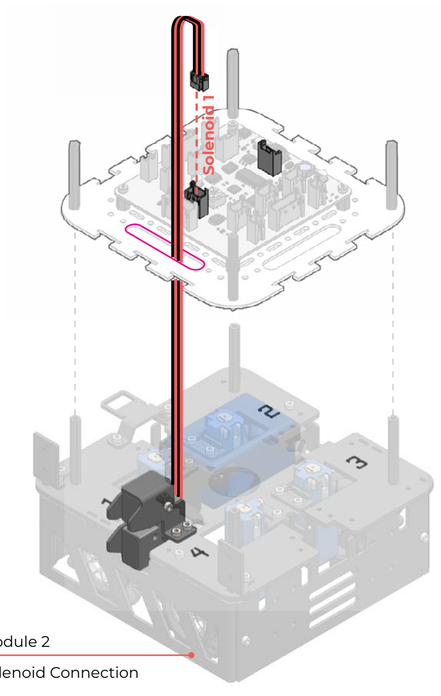


solenoid cables (1)
attached to solenoids

module 2 SA (1)
attached to full assembly







Module 2

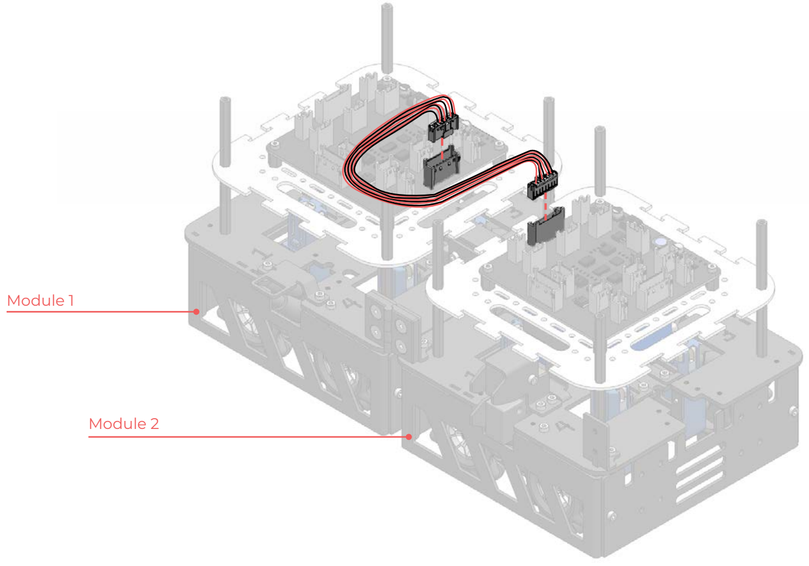
Solenoid Connection

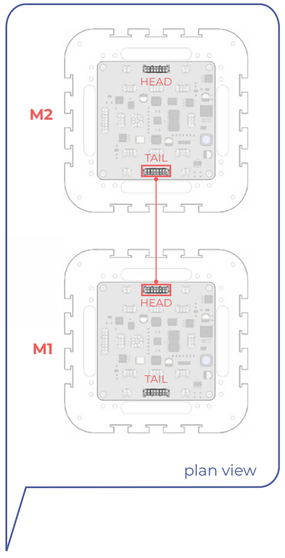
Make sure to connect the solenoid to the labelled solenoid connector exactly as in the diagram below.

Opening to pass wire through

B6 inter-module cable connection

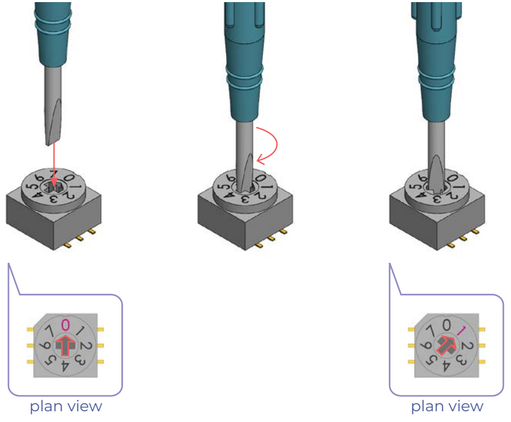
- 8-pin connectors (1)
- full assembly (1) from B.5



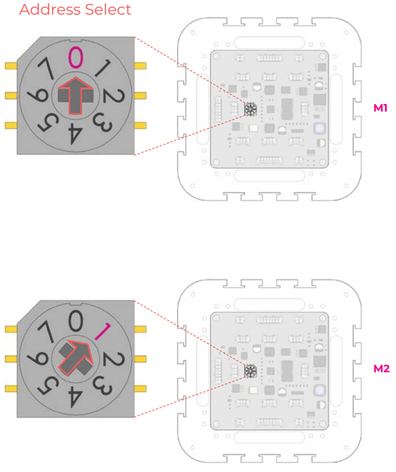


B7 address selection

- full assembly (1) from B.6
- ceramic screwdriver (1)

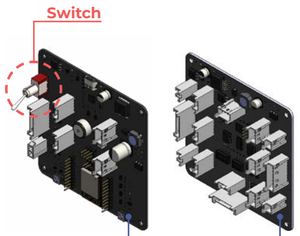


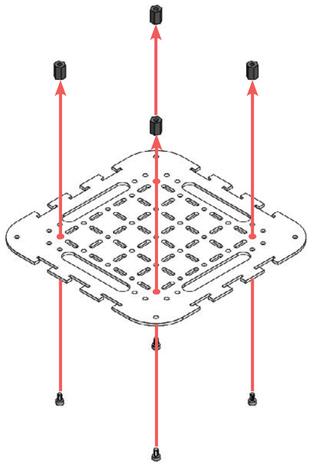
Use the ceramic screwdriver to adjust the rotary switch and select the address for all 2 modules.
Module 1: Address 0, Module 2: Address 1

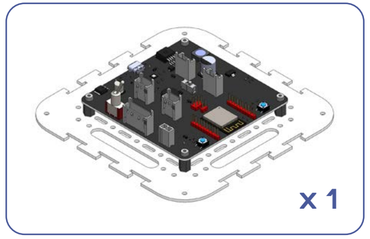


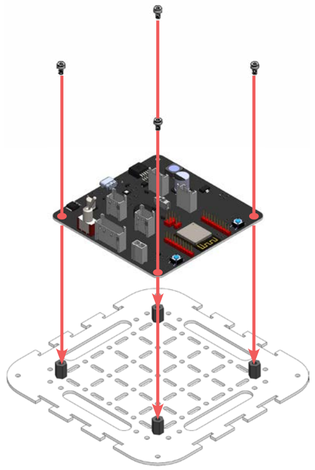
B8 masterboard e-tray sub-assembly

- Acrylic base plate (1)
- Masterboard (ESP32) (1)
- Hex F-F M3 10mm (4)
- M3 x 5 (8)







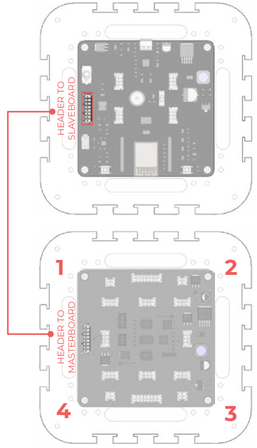


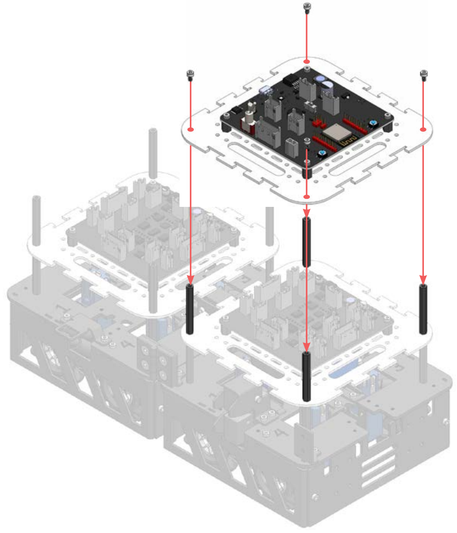
Make sure that you are attaching the masterboard and not the slaveboards.

How to differentiate between masterboard and slaveboards:
- Masterboard has a special switch

B9 masterboard e-tray onto main assembly

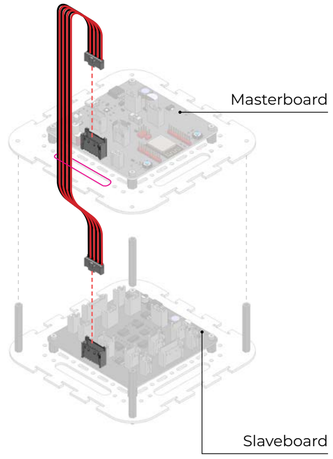
- masterboard e-tray SA (1) from B.8
- full mechanical SA (1) from B.6
- 8-pin connector (1)
- M3 x 5 (4)





Align the header to slaveboard connector on the masterboard to face the side connecting Motor 1 and 4

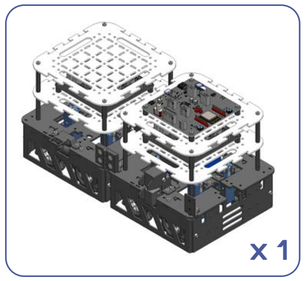
"DO NOT PLUG-IN / UNPLUG THE CONNECTOR CABLES WHILE THE POWER SUPPLY IS ACTIVELY PROVIDED (EITHER THROUGH BATTERY/ USB)"

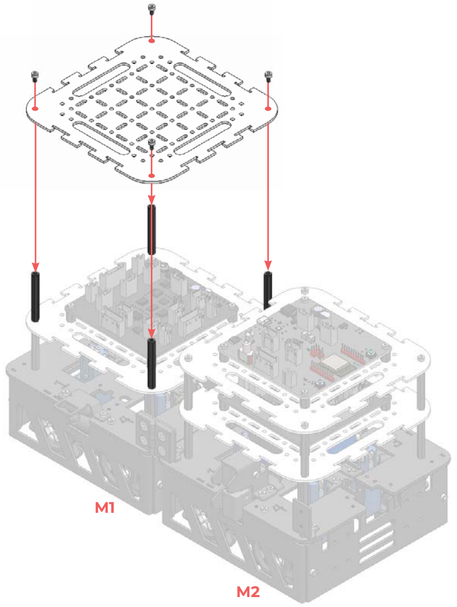


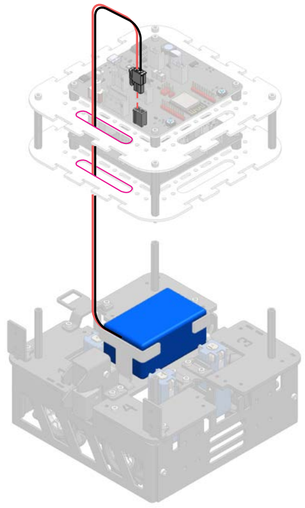
Opening to pass wire through

B 10 attach acrylic covers & connect battery to masterboard

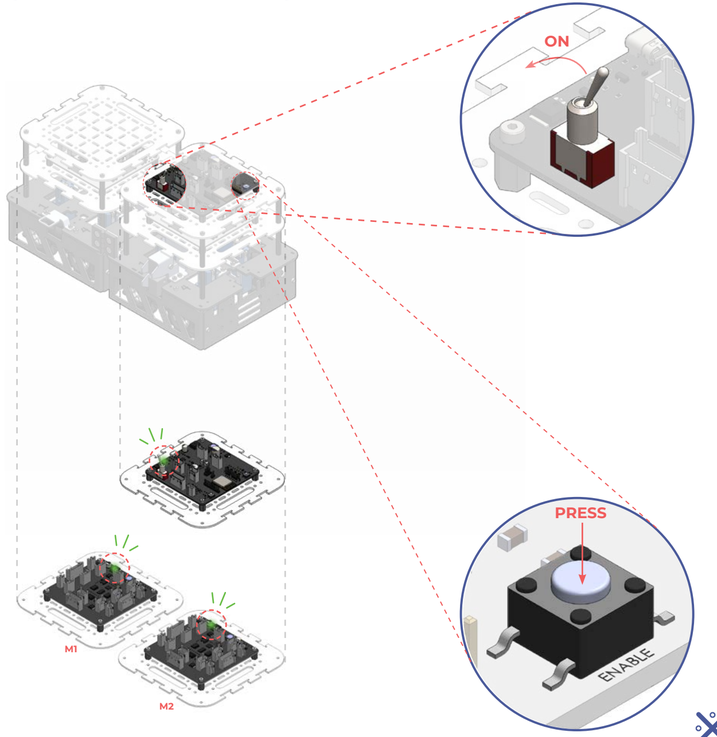
- Acrylic base plate (1)
- full mechanical SA (1)
- M3 x 5 (4)







B 11 check connection

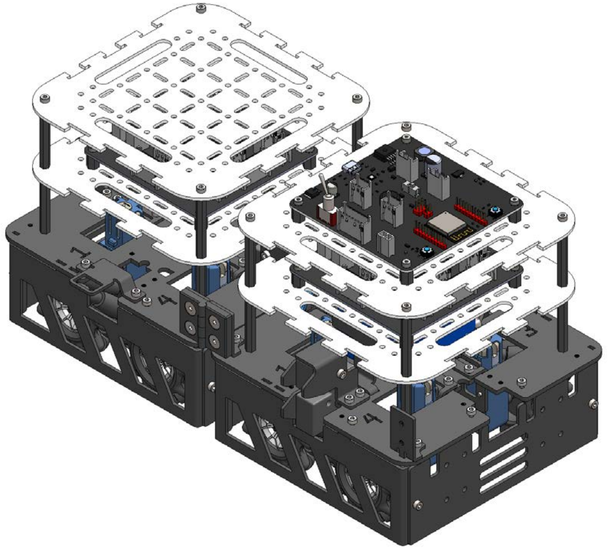


After checking that the lights are turned on, press on the enable button to activate the robot

8 electronic assembly completed

smorphi is ready!

next step: connect with app



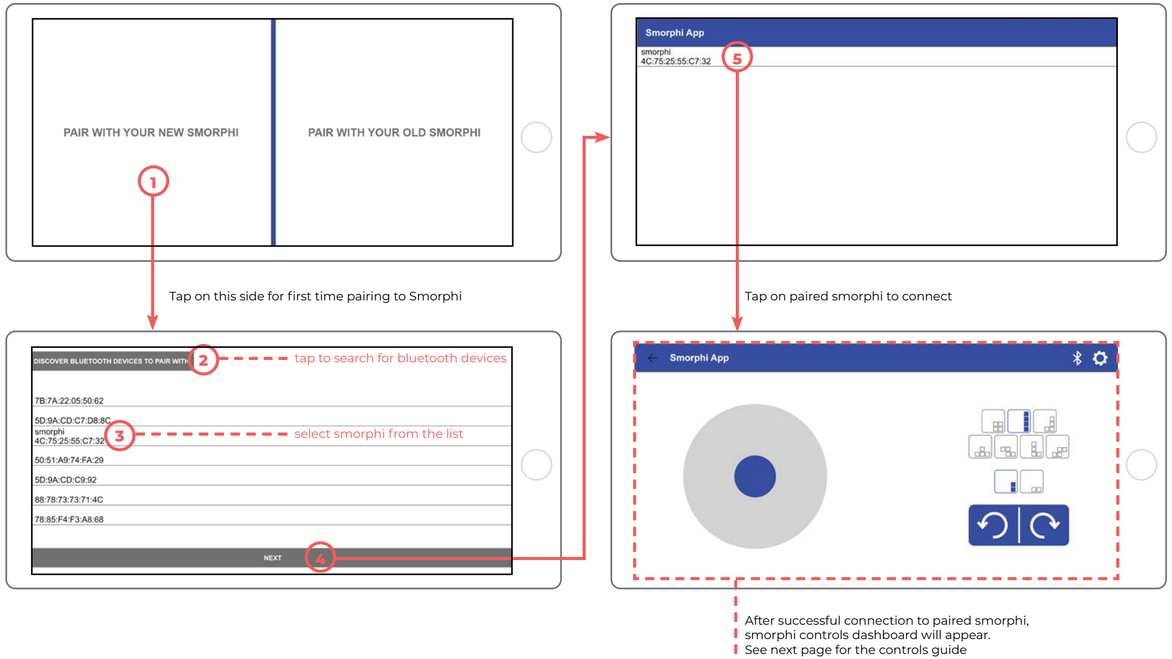
app

1. App Download.

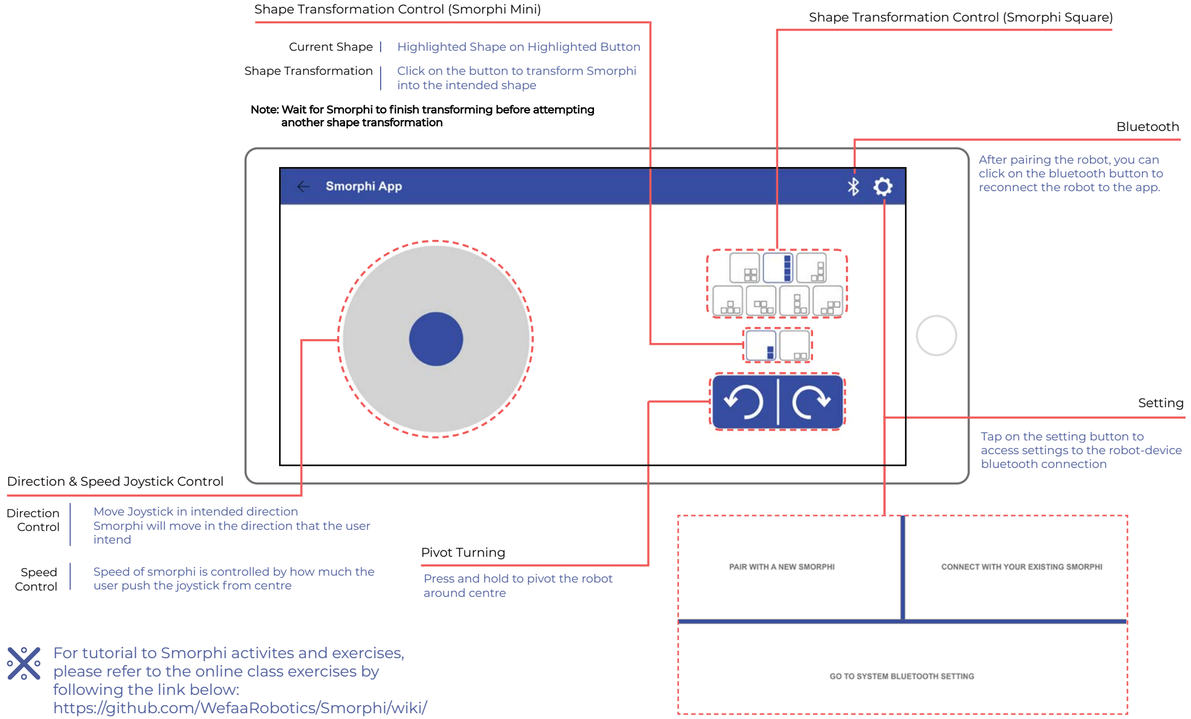
Not all devices are compatible now.
See the table below to check if your device is compatible with the Smorphi app.

Smorphi App Information	
Available Platforms	Android
Download from	Google Play
App Icon & Name	smorphi
System Requirements OS Requirements	Android 6+ Bluetooth 4.0+

2. Bluetooth Connection. Turn on Smorphi and the Bluetooth of your smart device. Tap on Smorphi app icon to launch application.



3. Smorphi controls dashboard guide.



For tutorial to Smorphi activites and exercises, please refer to the online class exercises by following the link below:
https://github.com/WefaaRobotics/Smorphi/wiki/

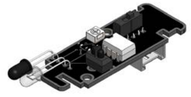
sensors

sound sensor (x2)

Sound sensor measures volume of sound. Onboard potentiometer* can be used to tune the range of sensing.
Possible applications: sound-triggered shape transformation or sound-triggered locomotion.

temperature sensor (x1)

Temperature sensor measures surrounding temperature, with a range of -55°C to 125°C.



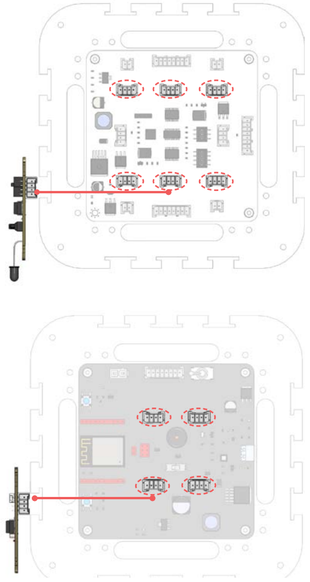
IR sensor (x4)

IR sensors comes with 2 different modes, toggled by the switch onboard the sensor itself. One IR is front-facing and can be used to detect obstacles ahead. The other IR faces the ground and can be used for path tracking.

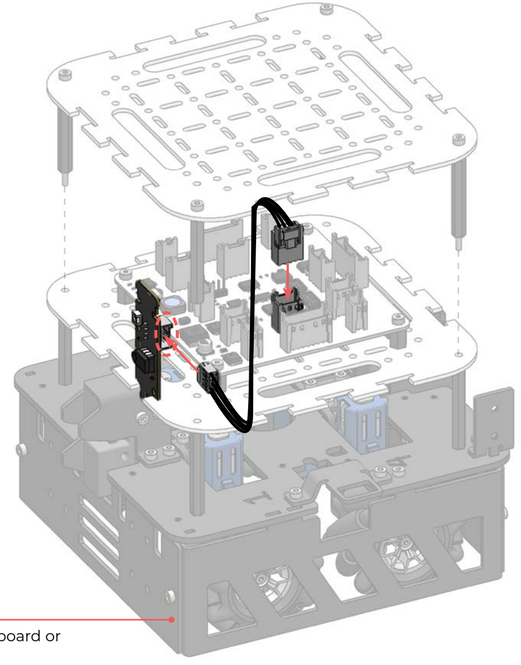
For sensor related activities and implementation, please refer to the online class exercises by following the link below:
https://github.com/WefaaRobotics/Smorphi/wiki/Robot-Exercises

Tutorial on how to operate the potentiometer can be found by following the link below:
https://github.com/WefaaRobotics/Smorphi/wiki/Exercise-6

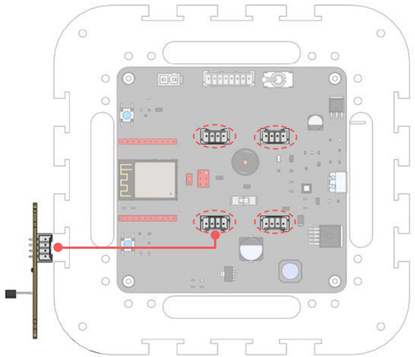
sound/IR sensor wiring

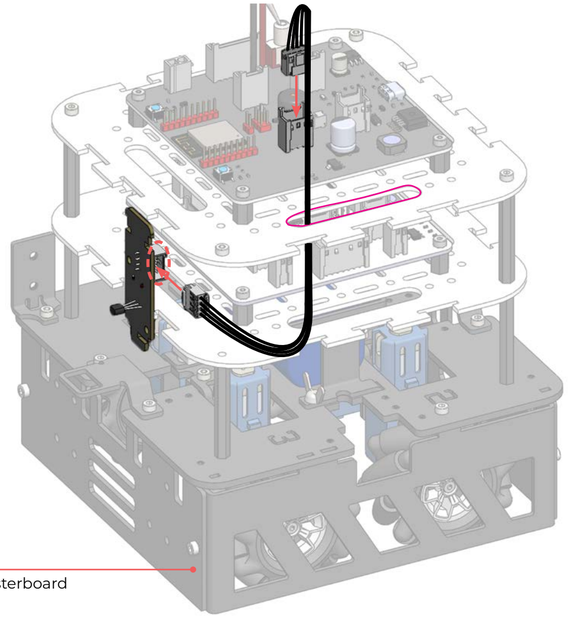


Sound/IR sensor can be connected to any of the 6 sensor ports on the slaveboard (top) or any of the 4 sensor ports on the masterboard (bottom).



(temperature sensor wiring)

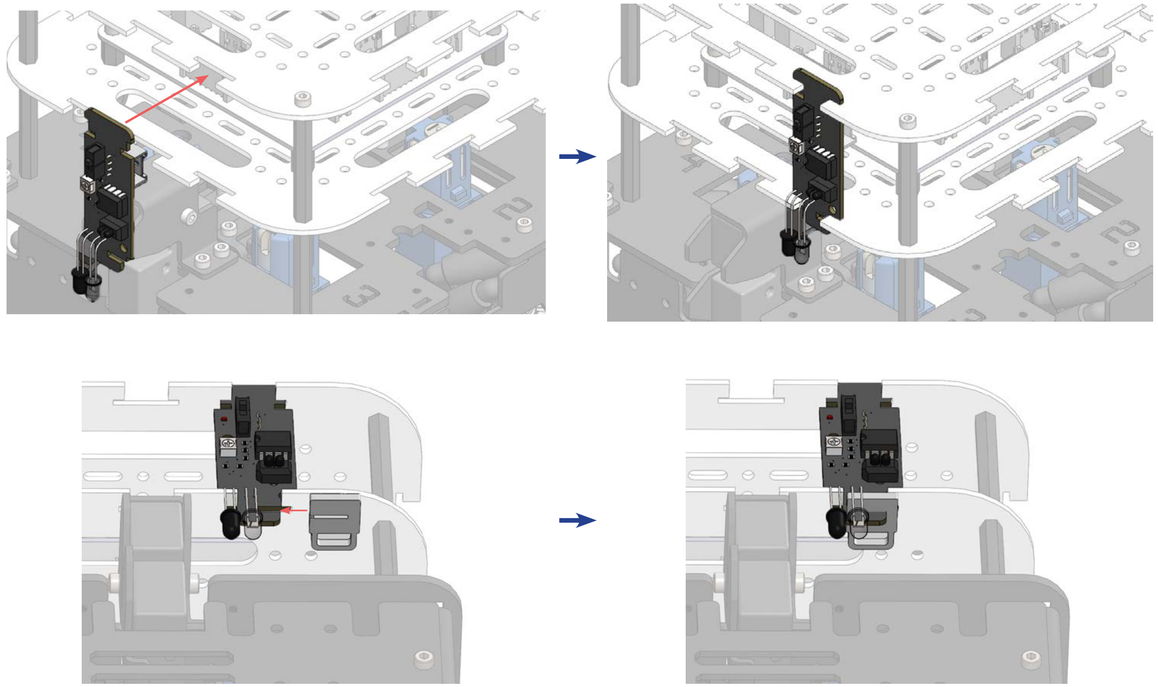




Temperature sensors can only be connected to any of the 4 sensor ports on the masterboard.

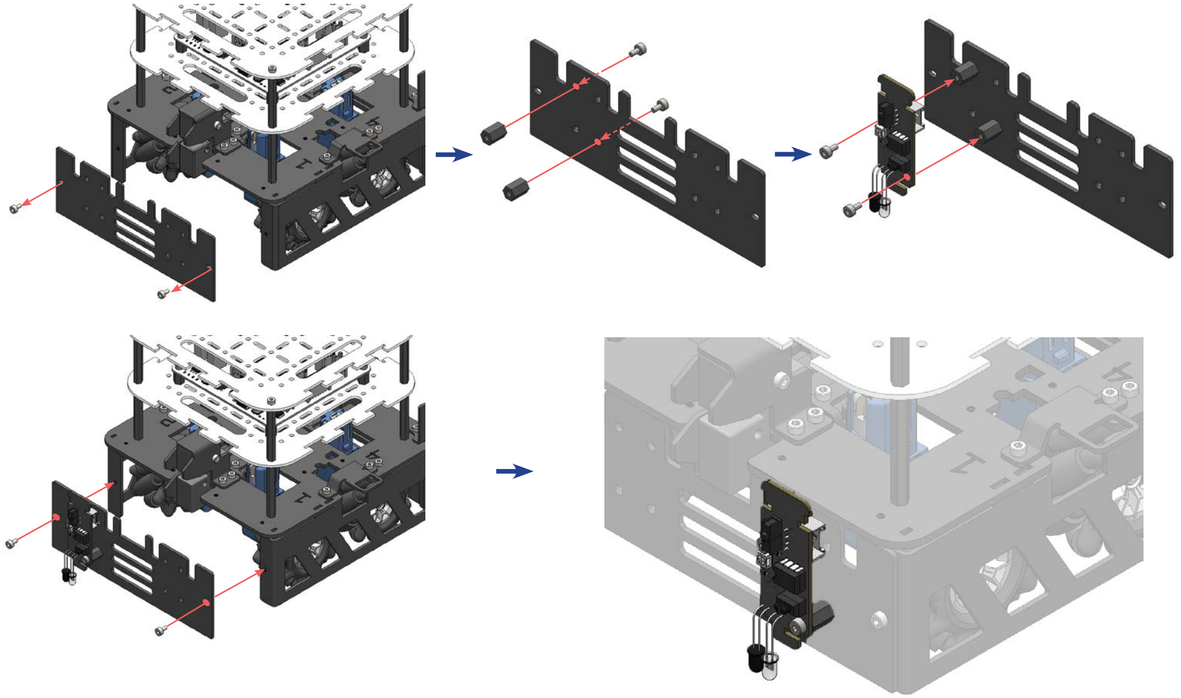
Opening to pass wire through

(sensor position 1)



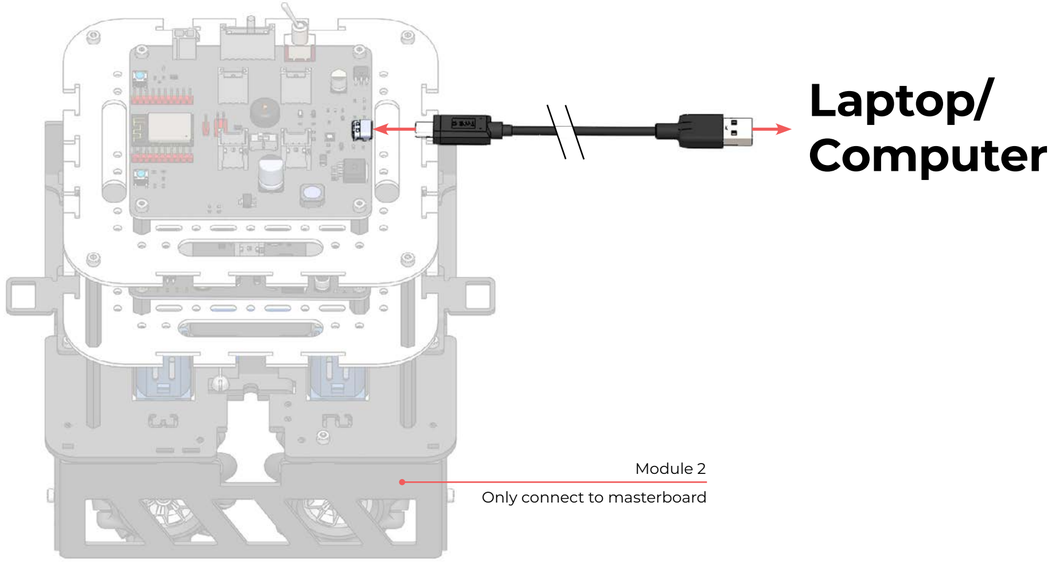
Sensors can be secured to the robot using the sensor lock provided

sensor position 2



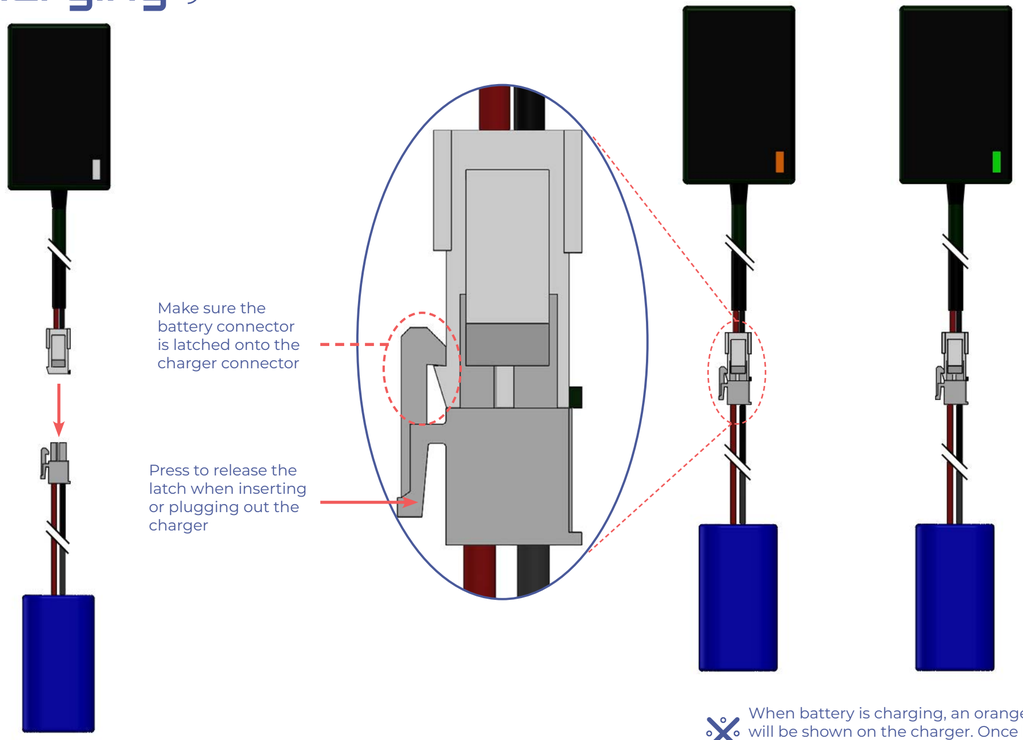
Sensors can also be attached at the skirt panel of the robot

connect to laptop



Plug in the USB-C cable as shown above to connect the masterboard to the computer.
It allows us to upload our code from our computer onto the masterboard.

charging



When battery is charging, an orange light will be shown on the charger. Once battery is fully charged, a green light will be shown

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