



UFACTORY UARM

User Manual



SHENZHEN UFACTORY CO. LTD.

V1.1.23

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1. Safety Precautions

This chapter describes the safety precautions that should be taken when using this product. Please read this manual carefully before using it. User should strictly follow this operating manual.

1.1. Precautions

1. When working with the robotic arm, do not put your hand between the connecting rods;
2. Please use the official standard power adapter ;
3. Please make sure that there is enough space on the desktop to avoid hitting obstacles during the operation of the robotic arm ;

1.2. General Safety

- If an error occurs, please contact support@ufactory.cc in time.
- If the product is scrapped, please comply with relevant laws to properly dispose of industrial waste and protect the environment.
- The robotic arm comes with small spare parts; please keep them away from children to prevent accidental swallowing.
- Parental guidance is required if the operation is conducted by children. Please shut down uArm properly in time when the operation is completed.
- Do not put your hand into the range of motion to prevent accidents.
- It is strictly forbidden to change or remove and modify the nameplate, instructions, icons, and markings of the robotic arm and related equipment.

-
- Be careful during handling and installation. Pay attention to the instructions on the box and place the robot according to the direction of the arrow. Otherwise, the machine may be damaged.
 - Before operating the robotic arm, please refer to the user manual attached to the box.

1.3. Emergency Stop

Press the power button to stop the drive, all actions and the running program in uArm Studio will be stopped.

Should not press the power button during normal operation. If the power button is pressed during the action, the trajectory of the robot will then be changed and become different with the initial setting, which may trigger an unexpected situation such as a collision.

2. Quick Start

This chapter briefly describes how to control uArm through uArm Studio so that users can quickly understand and start using uArm .

2.1. uArmWiring

Step 1 Connect the power cord

Step 2 Turn on the power switch

Step 3 Connect uArm via USB cable and your computer

2.2. Install uArm Studio

Users can control the robotic arm by uArm Studio, and to realize teaching reproduction, 3D printing and other operations. This chapter takes the teaching reproduction as an example.

2.2.1. System Requirements

Operating systems supported by uArm Studio software are as follows:

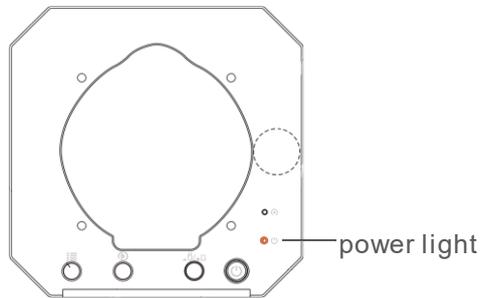
- Windows 10
- Ubuntu 16.04
- Mac OSX 10.10 or above

2.2.2. Download and Install the uArm Studio Software

Before using uArm , please download the uArm Studio software and install according to the instructions.

Download link: <https://www.ufactory.cc/pages/download-uarm>

2.3. Power On/Off



After pressing the power button, the power indicator lights up, indicating that the robotic arm is turned on.

After pressing the power button, the power indicator is off, indicating that the robotic arm is off.

3. Product Description

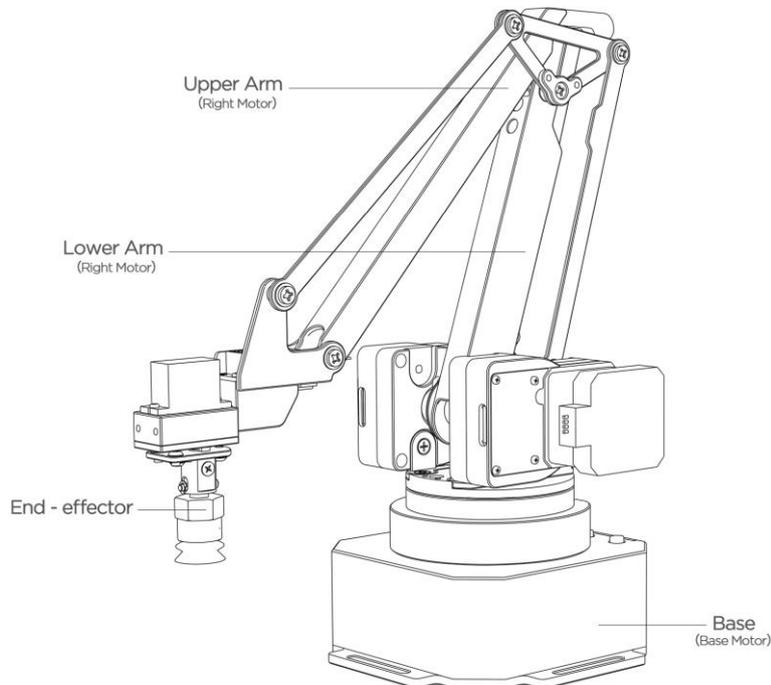
3.1. Overview

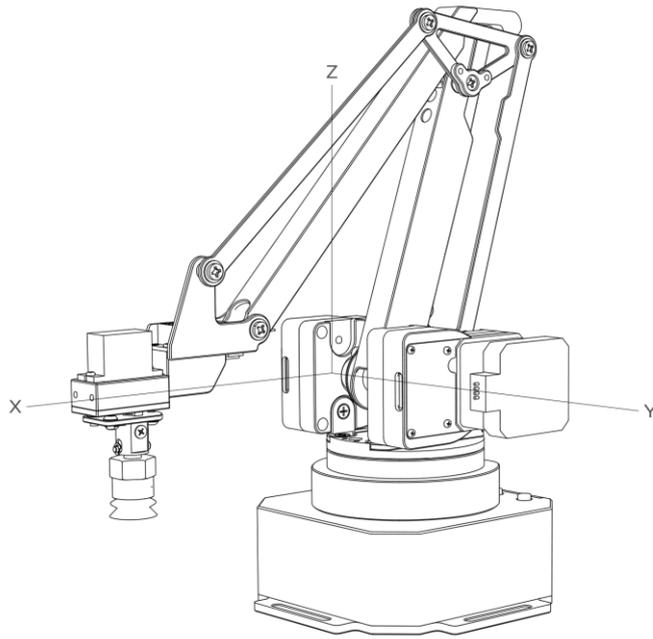
uArm is the world's first open-source desktop robotic arm, it features open source hardware and software, you can expand and develop uArm functions according to your own needs. The uArm Swift Pro with uArm vision module to perform image recognition and it is ideal for AI robotics research.

3.2. uArm

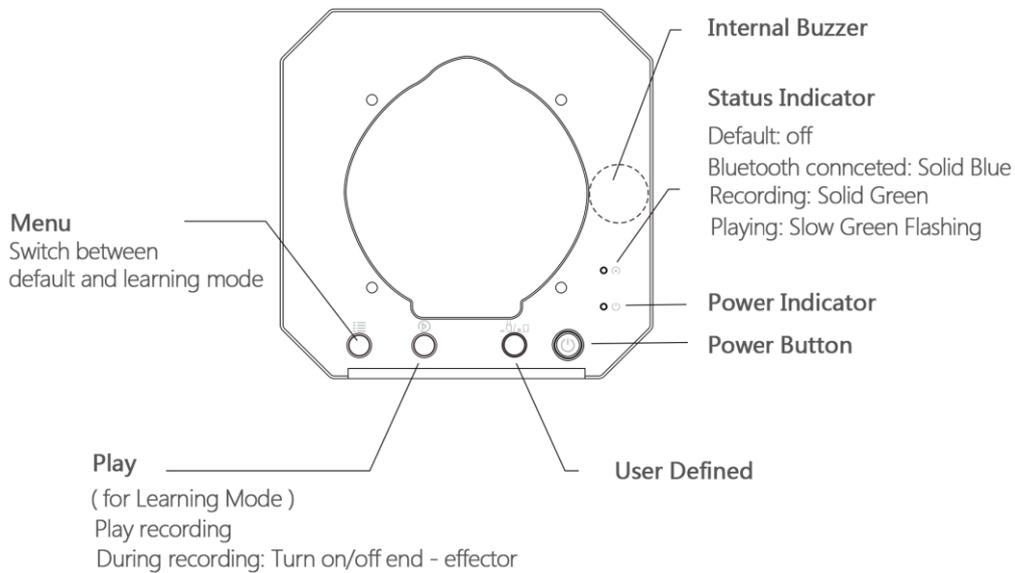
3.2.1. External Structure

The appearance of the uArm is as shown in the figure.

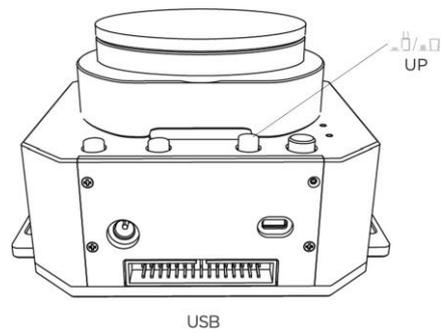
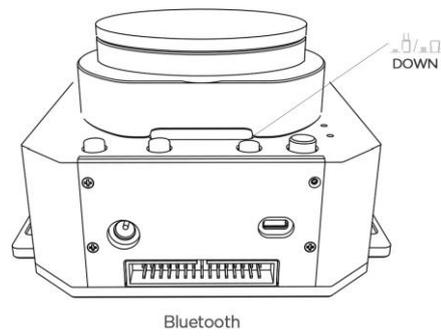




3.2.2. Base & Indicator

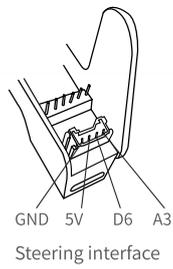
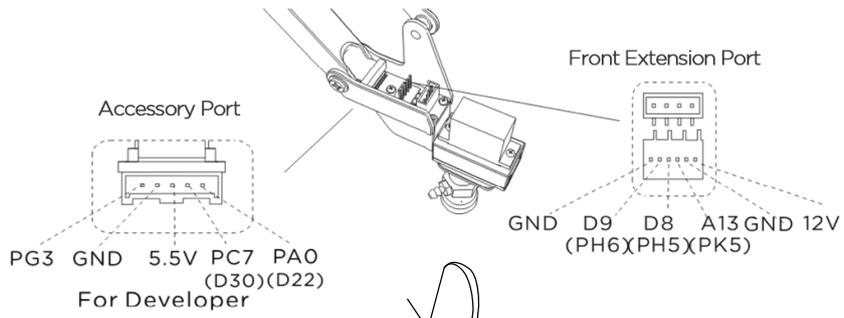
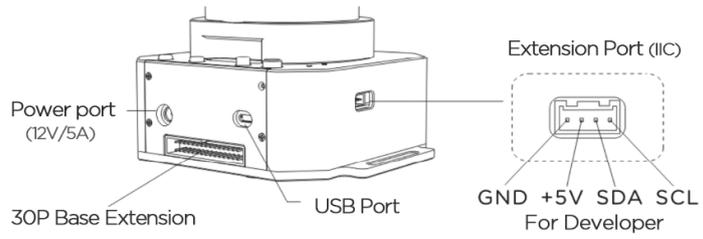


By default, the custom function button is used for Bluetooth mode /USB mode switching. Before using the USB mode, make sure the custom function buttons are in the up state as shown.



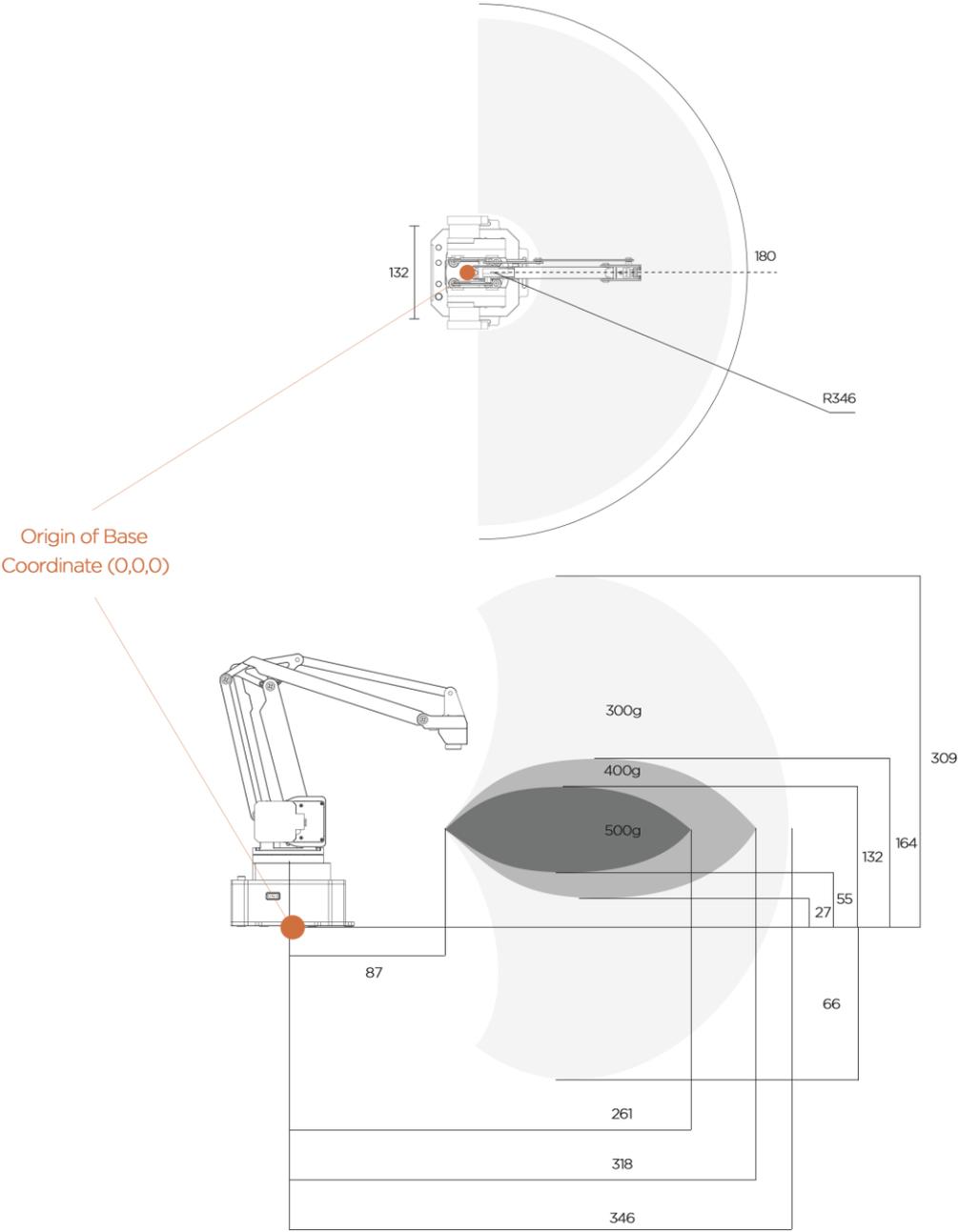
3.3. Extension Port

The uArm interface is located on the back of the base and the arm. The diagram of the base extension is shown in the figure.



3.4. Workspace

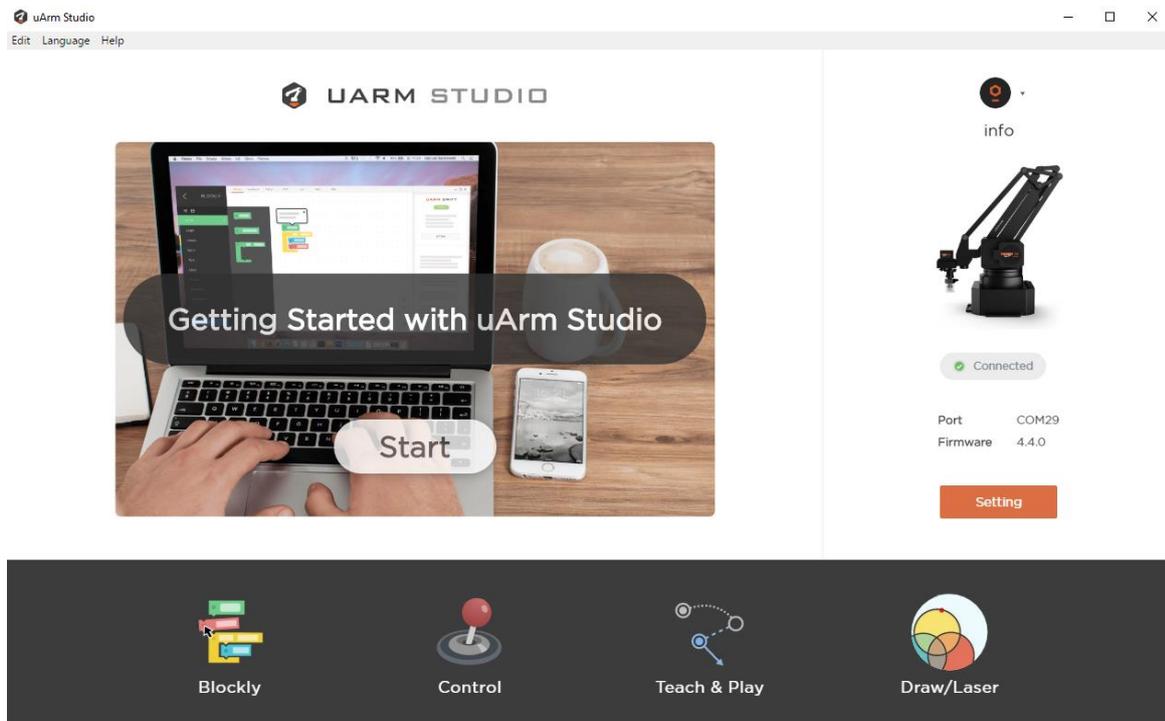
uArm 's workspace is shown in the figure.



4. Operating Guide

4.1. uArm Studio Software Instructions

The uArm robotic arm has teach-play, drawing, engraving and 3D printing functions, which can be implemented by uArm Studio software. The functions supported by uArm Studio are shown in the figure, and the detailed functions are as shown in the table.



Module	Function
Blockly	The robotic arm is controlled in a visual programming manner, and the user can program by means of drag-n-drop.

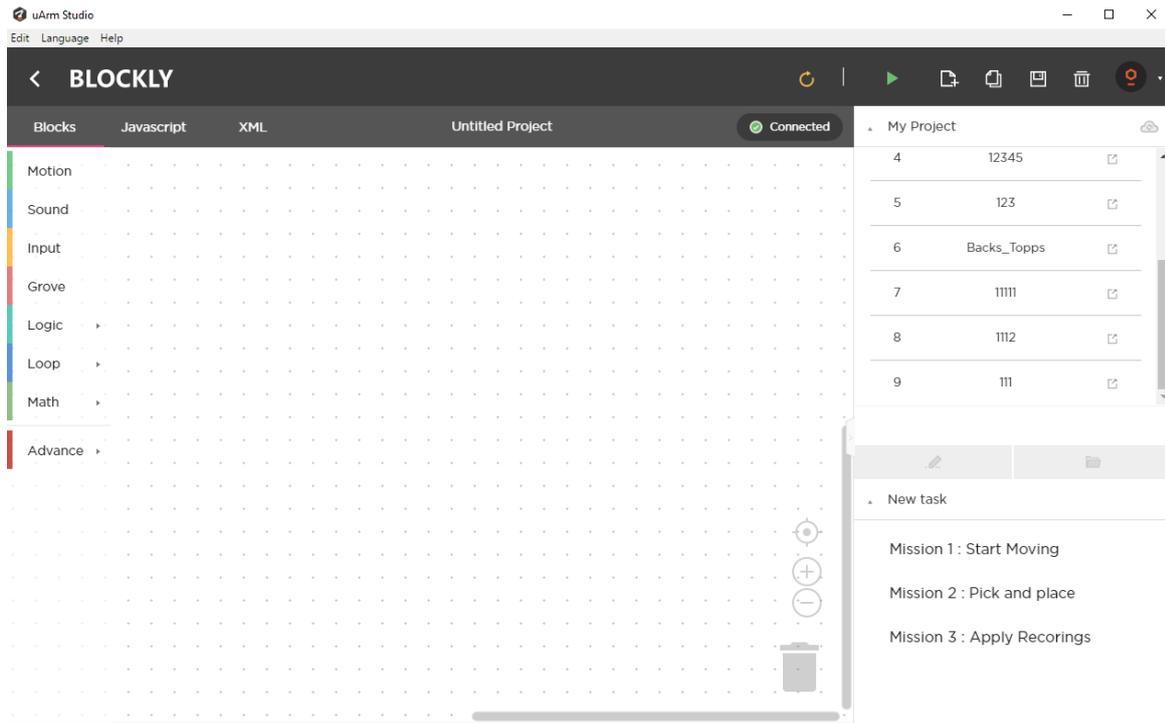
Teach&Play	Once the teaching mode has recorded a series of actions that taught to the robotic arm, the robotic arm automatically repeats the recorded actions.
3D Printing	3D printing with robotic arm.
Drawing &Engraving	Use the robotic arm to complete the drawing and engraving operations.

4.2. Blockly: Visual Programming Tutorial

uArm Studio Blockly is a visual programming interface designed specifically for uArm.

4.2.1. Quick Start

There are three tasks for newbie to help you quickly understand Blockly.



▲ New task

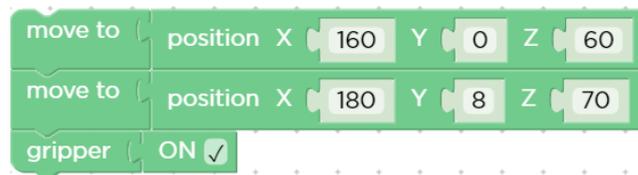
Mission 1 : Start Moving

Mission 2 : Pick and place

Mission 3 : Apply Recorings

4.2.2. Blockly Function Description

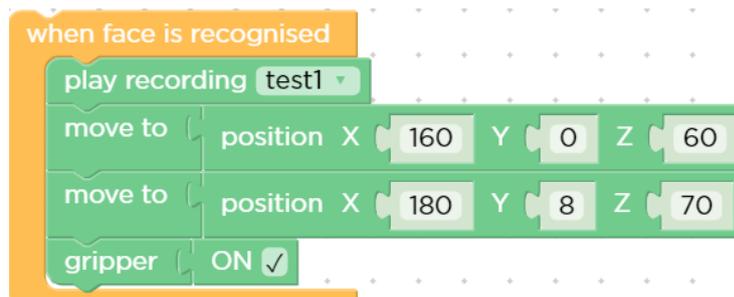
1) Control the basic motion of uArm



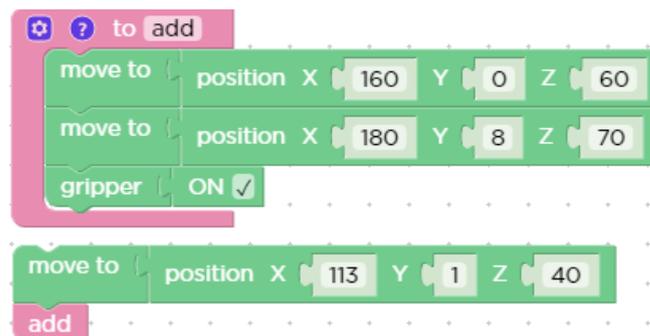
2) Events (How to trigger a command)



3) Apply the action you recorded



4) Advanced programming (functions, variables, etc.)



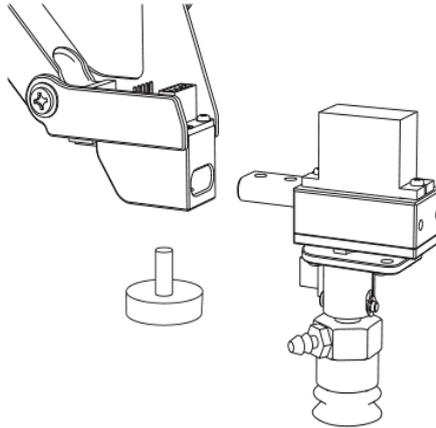
4.3. Teach&Play Tutorial

Holding the uArm to record the action , then playing the recorded action.

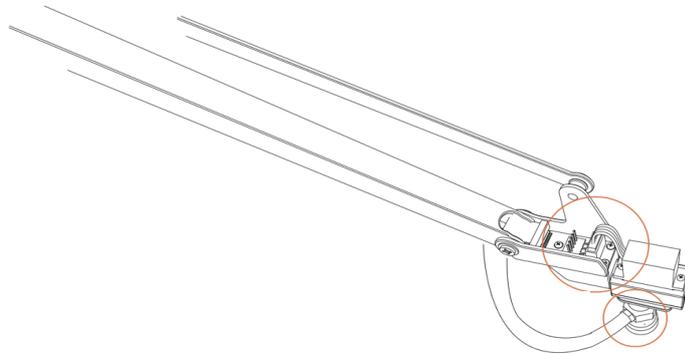
4.3.1. Suction Cup Installation Tutorial

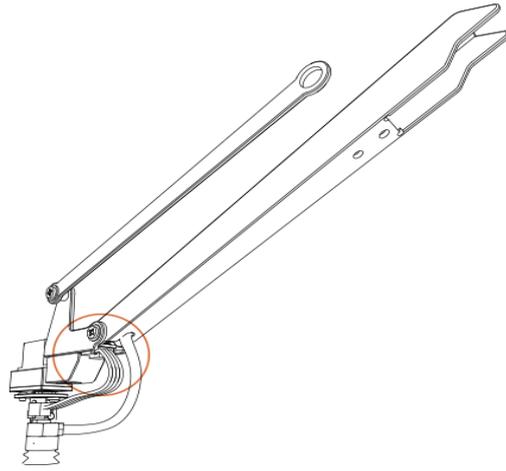
Step 1 : Install the suction cup on the fourth axis of the arm and tighten the hand screw.

Note : If you need to remove the suction cup, please loosen the hand screw.

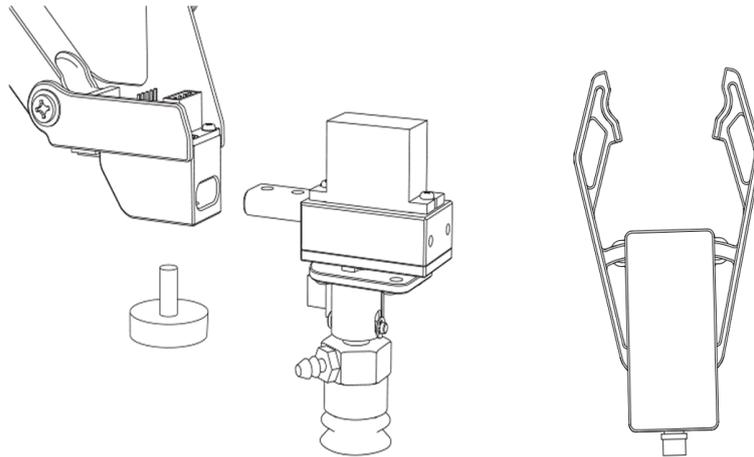


Step 2: Connect the wires of the fourth axis, the suction tube and the limit switch.

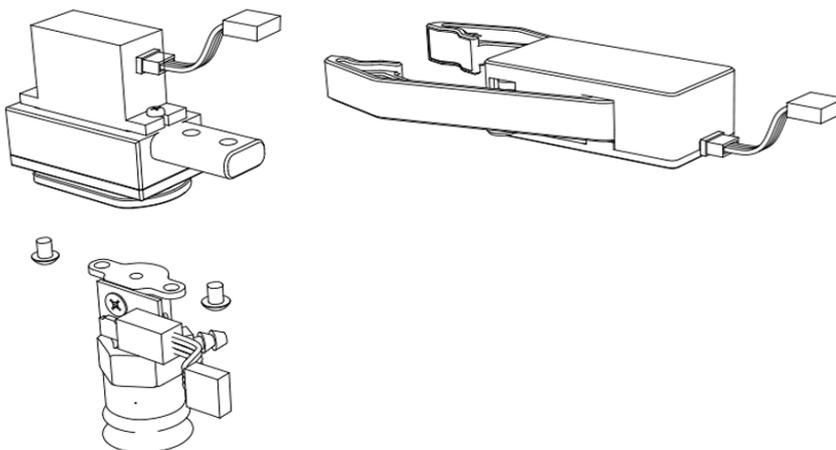




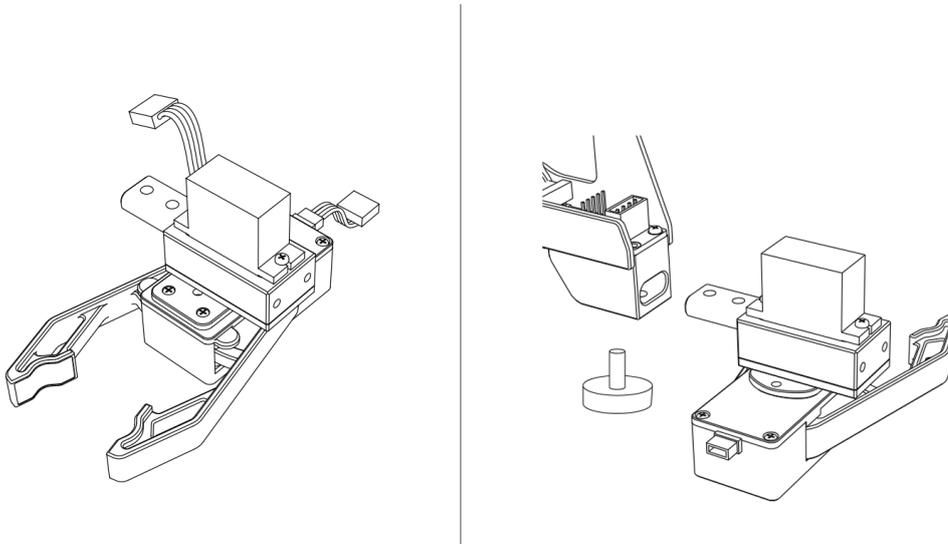
4.3.2. Gripper Installation Tutorial



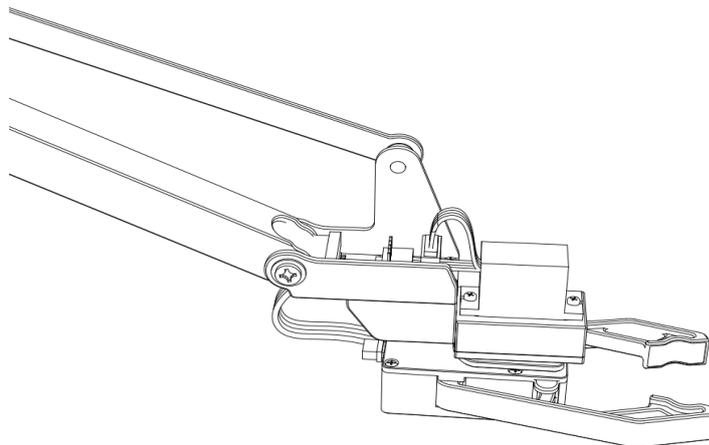
Step 1 : Use a hex wrench to remove the suction cup.



Step 2: Install the gripper and lock the fixing screws.



Step 3: Install the fourth axis motor and gripper.



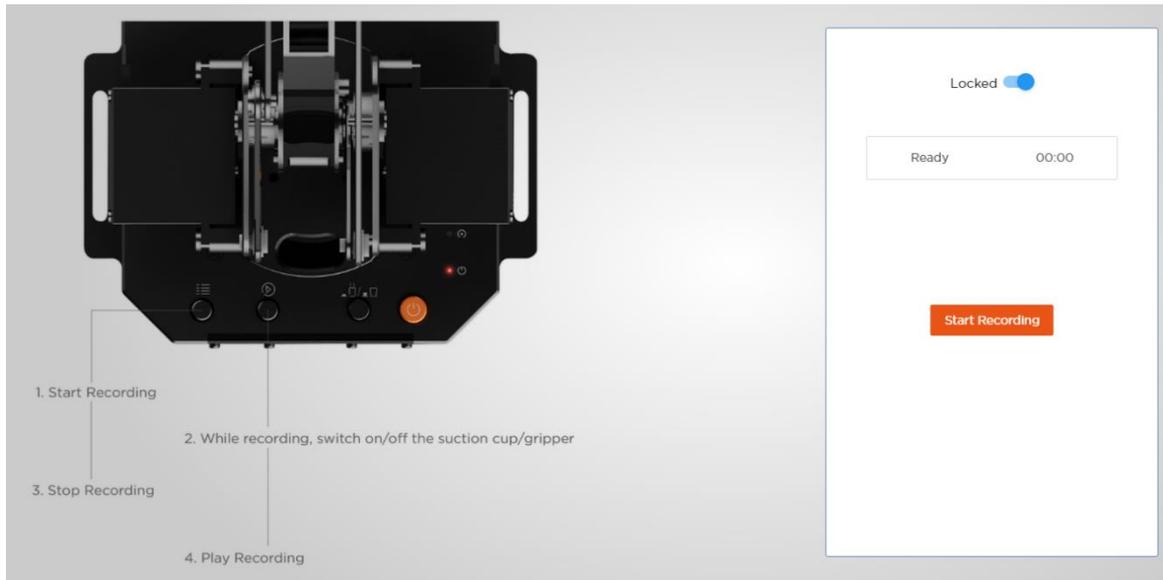
4.3.3. Teach&Play

Holding the uArm to record the action , then playing the recorded action.

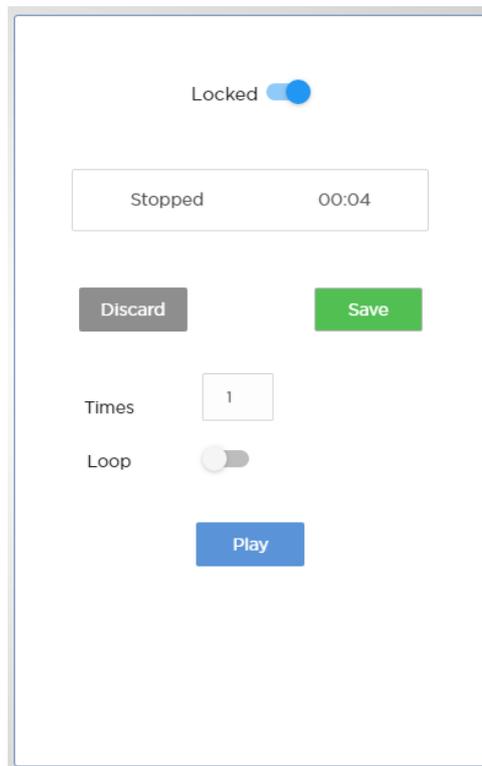
4.3.3.1. Operation Tutorial

1) Record Action

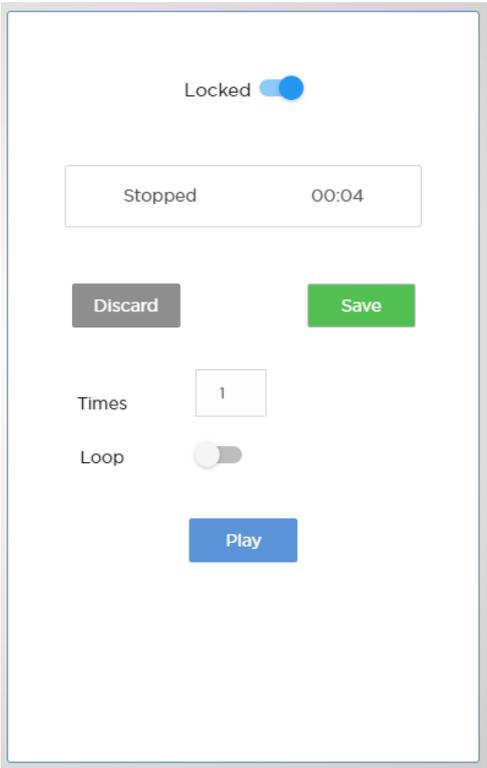
Click 'Start Recording' on uArm Studio or press the Menu button on the uArm base to start recording.



2) Save

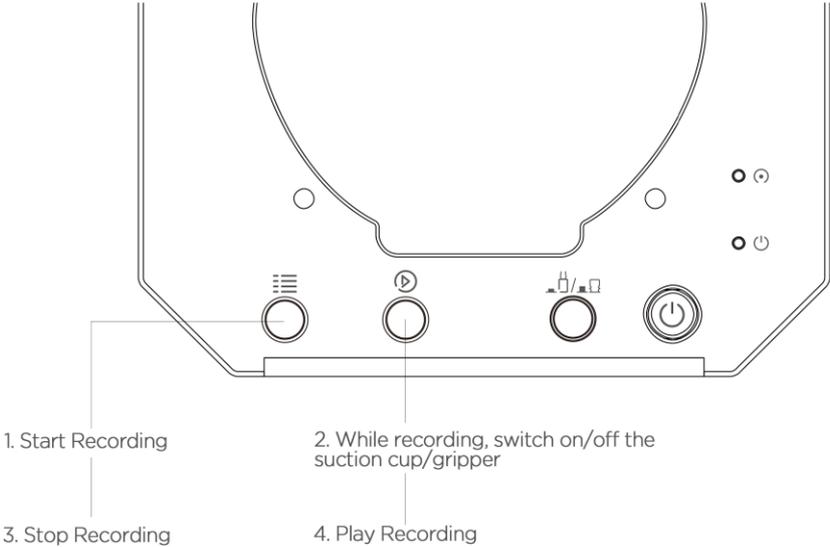


3) Set the times of playback



4.3.3.2. Offline Teaching Operation Tutorial

Teaching with buttons on the robotic arm when offline.



Recording :

1. Turn on the teaching mode: press the menu button, the status indicator will turn green .
2. Hold the uarm and guide it, press the play button to turn on the suction cup/gripper, and then press the play button again to turn off the suction cup/gripper. (If custom button is pressed, and the uArm is in gripping/suction cup mode, press the custom button again, otherwise the Bluetooth function will automatically start in this mode.)
3. Complete the recording process, press the menu button once, the status indicator will go off.

Play :

1. Press the play button for single play; long press the play button for 2 seconds for playing in loop.
2. During playback, the status indicator flashes slowly .
3. During playback, press the play button to stop playback .

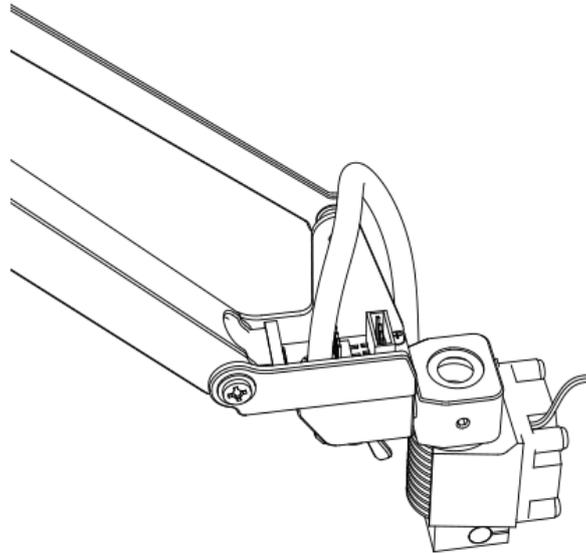
4.3.3.3. Difference between Teach&Play and Offline Teaching

1. Teach&Play has no time limit.
2. You can save and export your recorded actions, and you can also import actions recorded by others.
3. You can use your recorded action in Blockly.

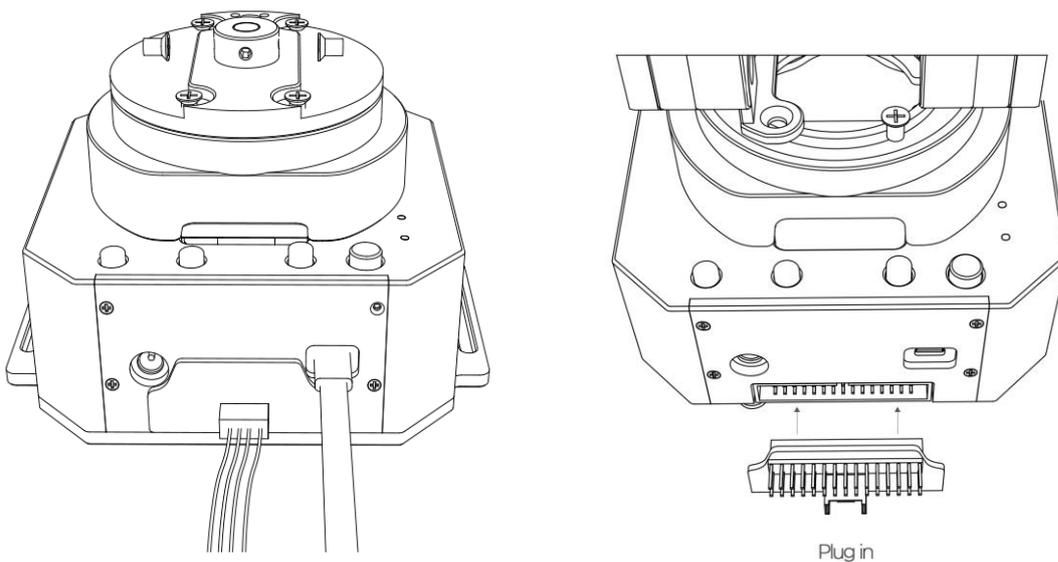
4.4. 3D Printing Tutorial

4.4.1. 3D Printing Nozzle Installation Tutorial

Step 1: Install the 3D print nozzle, tighten the fixing screws.

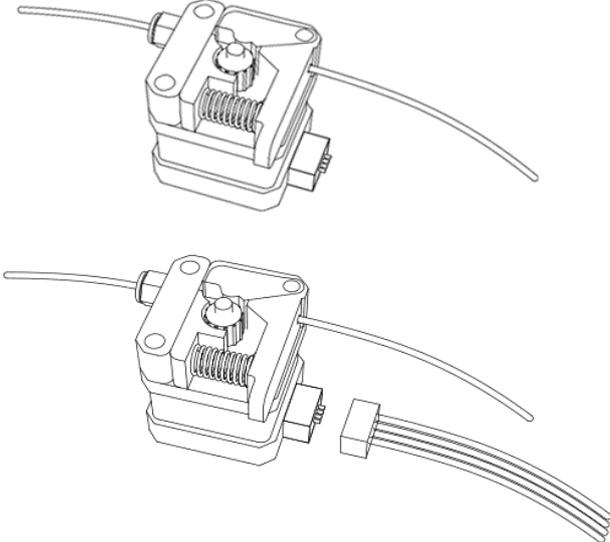


Step 2 : Install the 3D printing feeding system.



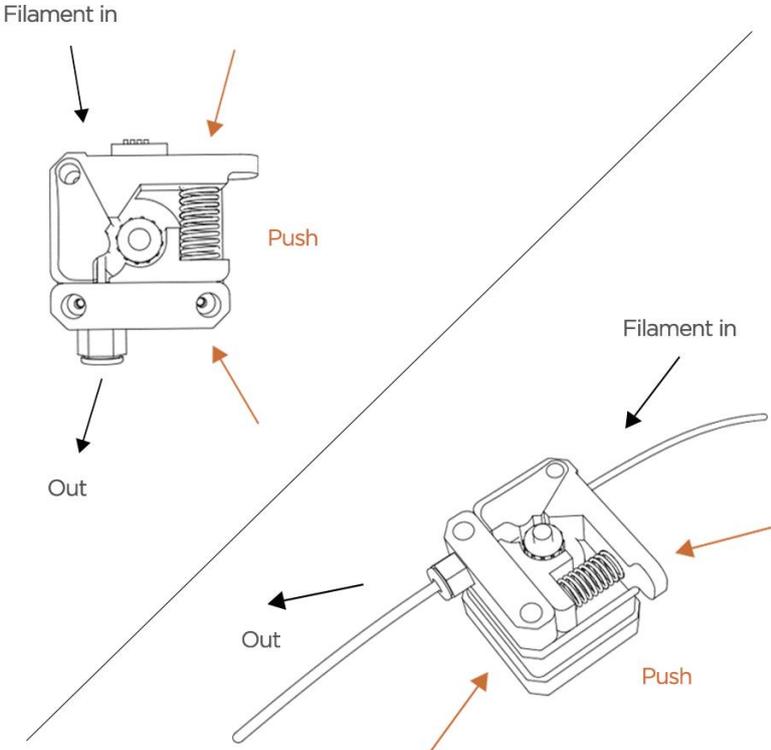
Note : Please make sure the connection is correct, otherwise the computer will not recognize the robotic arm.

Connect the motor and expansion board with a color 4pin cable

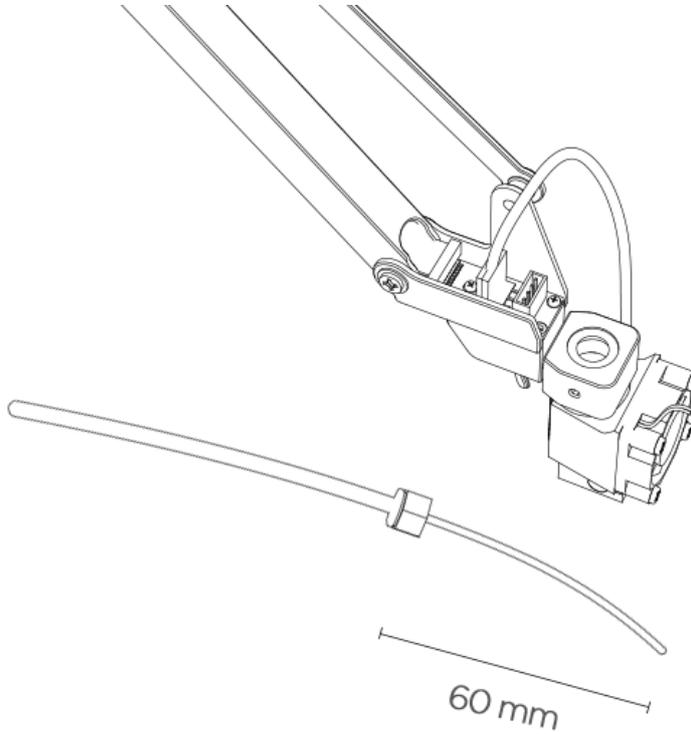


(Importing PLA printing materials into the feeding system)

Step 3 : Install PTFE catheter, install printing material and feeding tube.

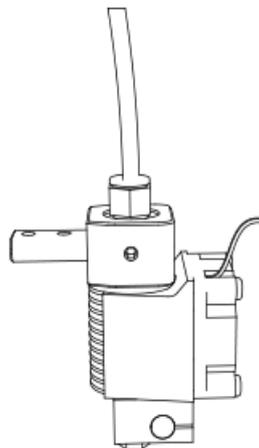


Step 4 : Allow the 3D printed material 60 cm above the catheter.

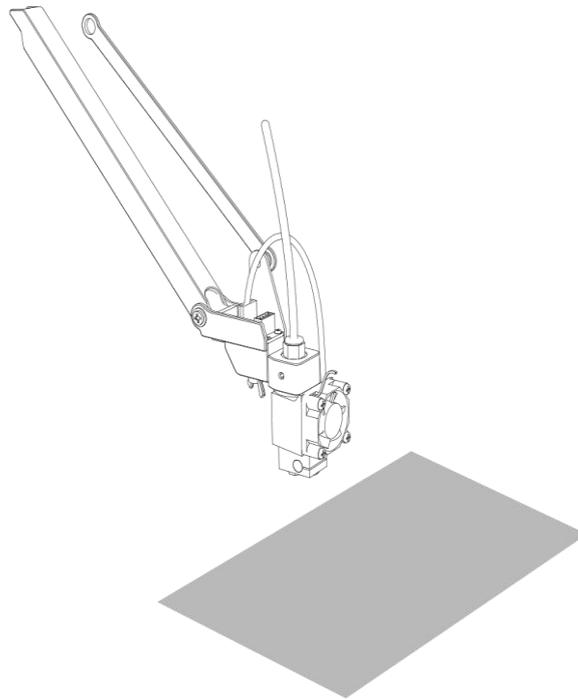


Note : If the printer is unable to discharge, it may be due to the deformation of the end of the printed material.

Step 5 : 3D print nozzle mounting catheter.



Step 6 : Paste the tape on the desk.



If there is an error in the horizontal state of the arm, please refer to 4.4.3 for the calibration.

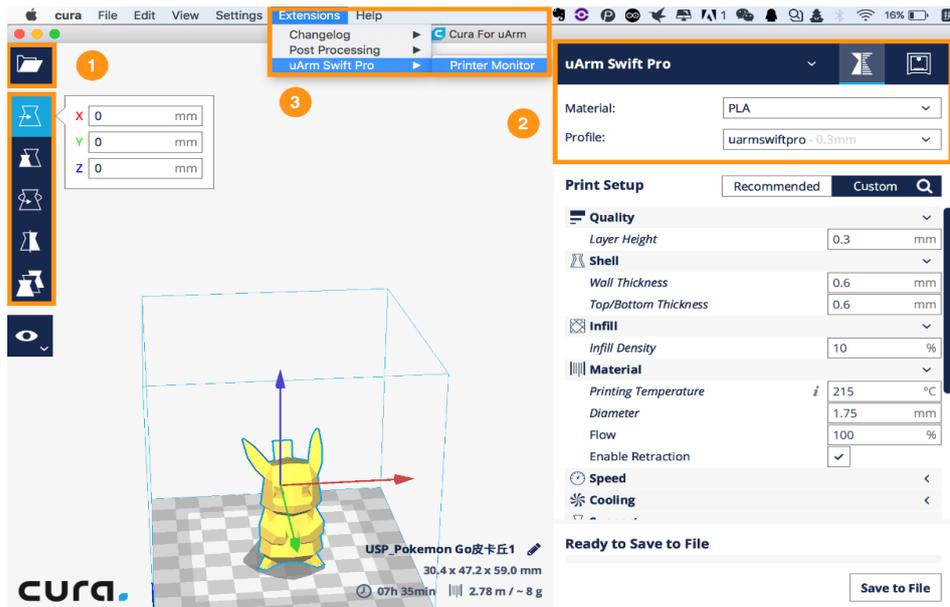
4.4.2. Cura For uArm Software Tutorial

1. Download and install CuraForuArm :

<https://www.ufactory.cc/pages/download-uarm>

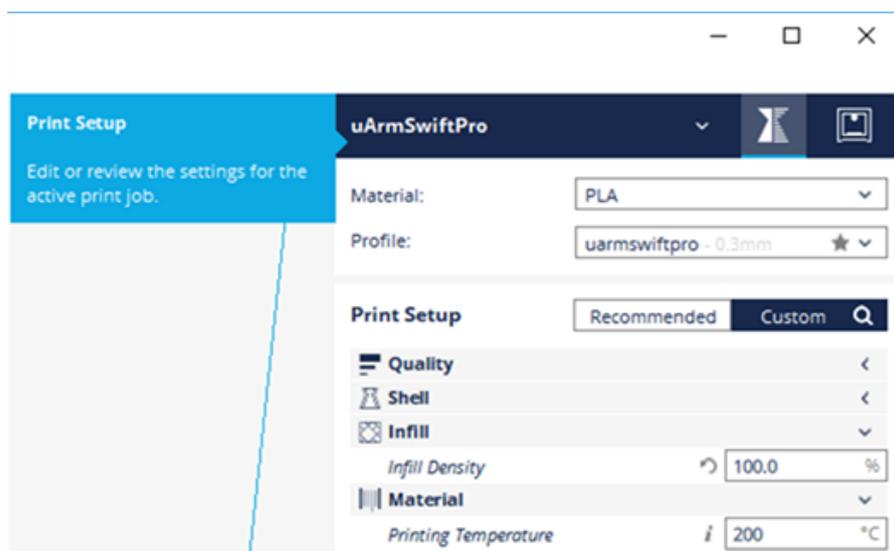
2. Enter uArm 3D printing, CuraForuArm will automatically start, if it doesn't start, click 'Open Cura' .

Cura for uArm Interface



3. Import a .stl file and adjust the size/position of the model.

4. Select "uArm Swift Pro" printer and the corresponding files. It is suggested to use the default settings. To set the 3D printing parameters, select the "Print Setup" option. If the "Print Monitor" option is selected, the printer will not be found on the interface.

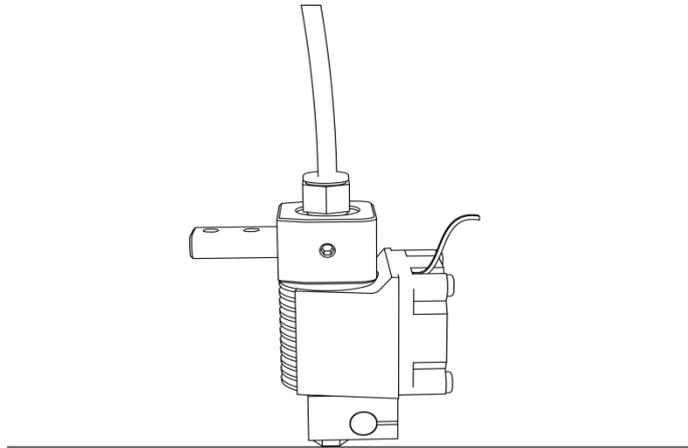


5. Open Printer Monitor

Adjust the zero point before printing. When you adjust the printhead to just touch

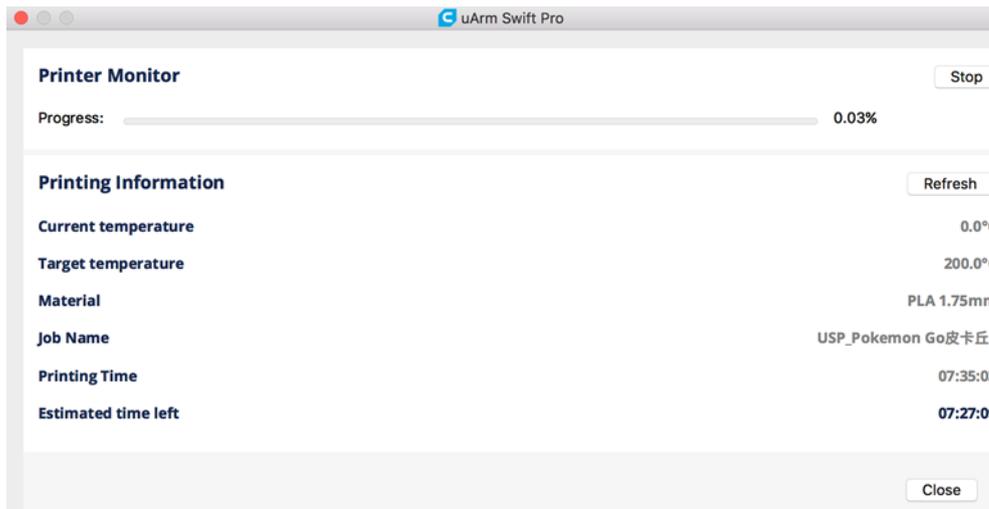
the desktop, click " Save Zero " .

(The zero point of each uarm is different, please adjust the zero point according to the above steps before printing)



6. Start printing

The 3D print nozzle will be preheated to 200 °C . The robotic arm will wait for the print nozzle to heat up. Please do not touch the metal part of the print nozzle to avoid burns.



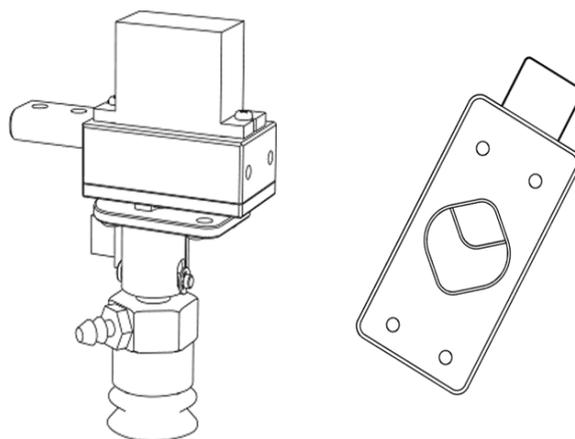
4.4.3. Calibration Tutorial

Calibration tutorial:

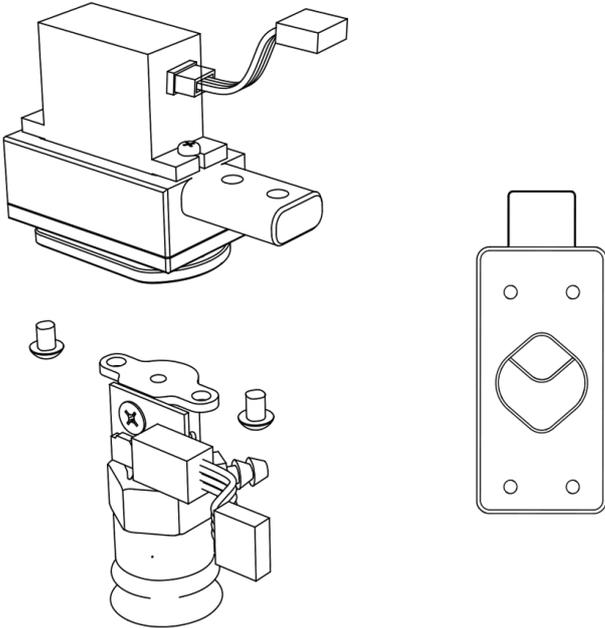
[uArm-Swift-Pro-Calibration.pdf](#)

4.5. Drawing / Engraving Tutorial

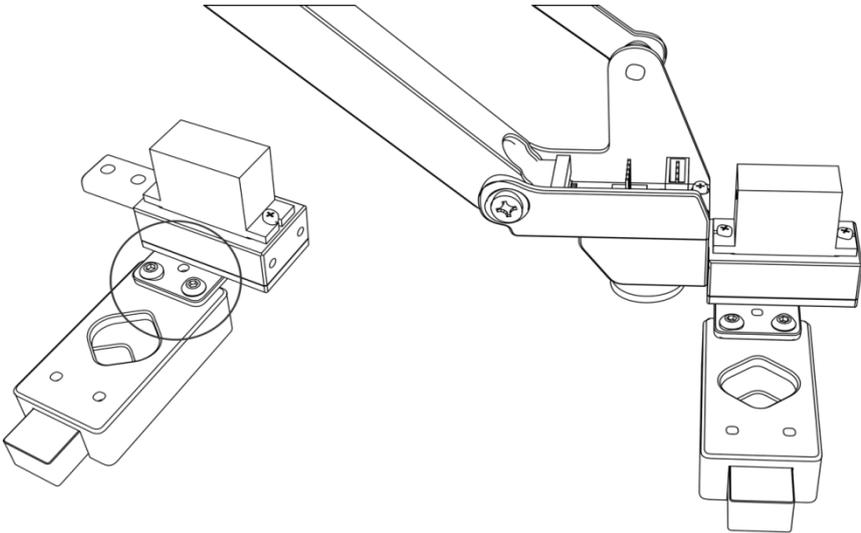
4.5.1. Universal Pen Holder Installation Tutorial



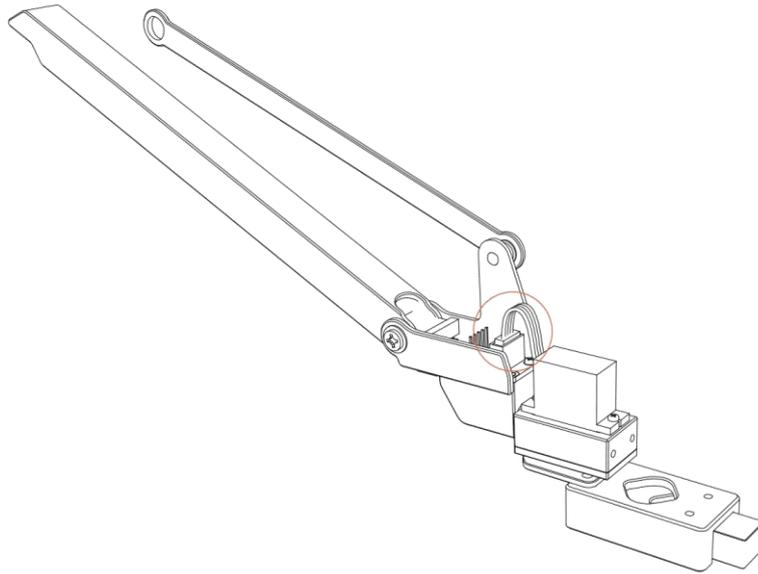
Step 1 : Remove the suction cup with a hexagonal L -wrench



Step 2 : Install the universal clip and tighten the screws

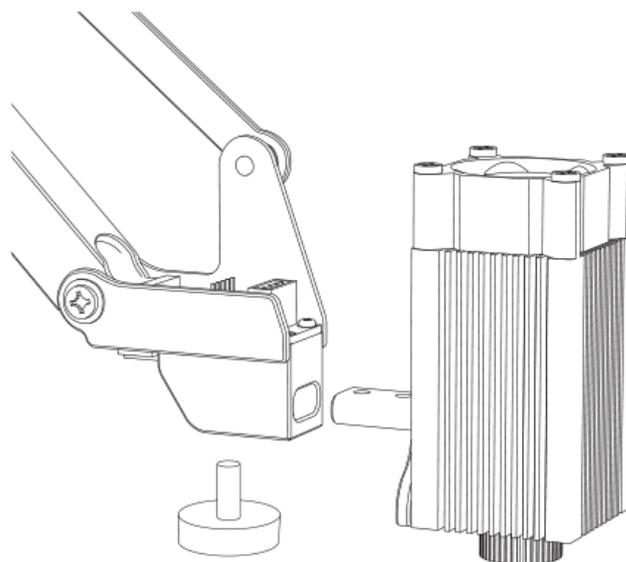


Step 3 : Connect the fourth axis motor

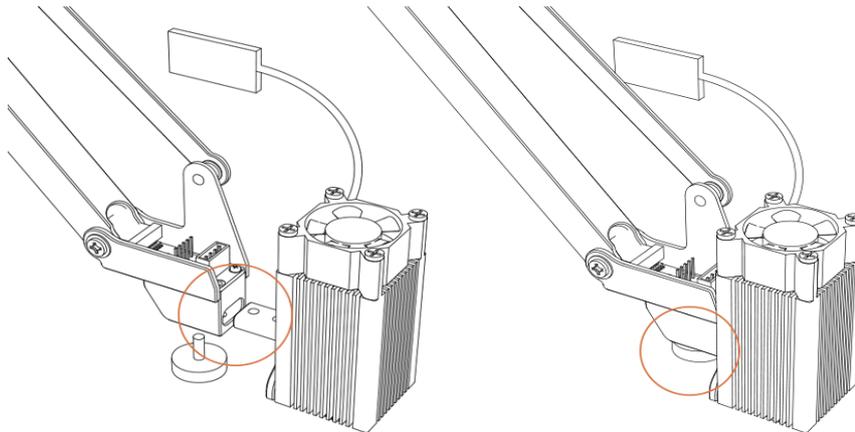


4.5.2. Laser Kit Installation Tutorial

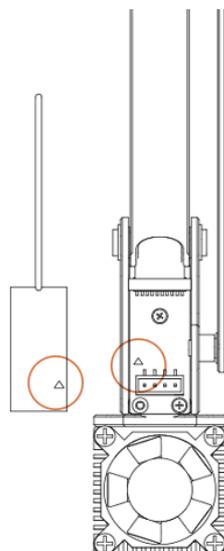
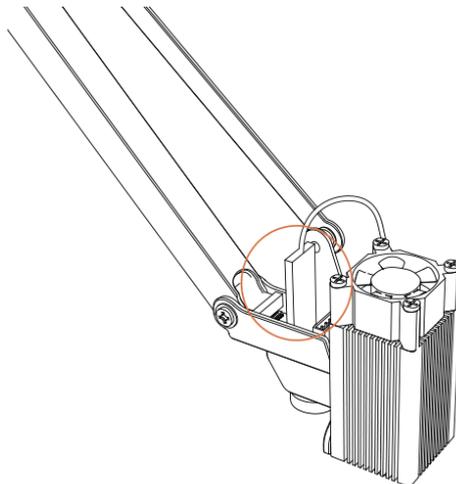
Material (laser nozzle, hand screw)



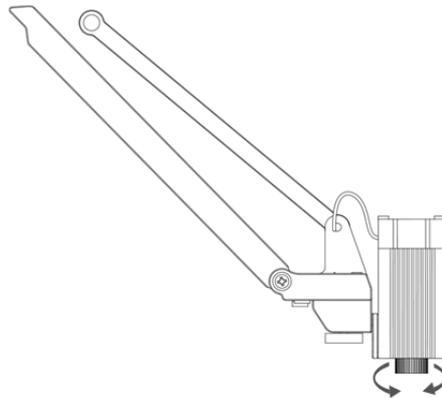
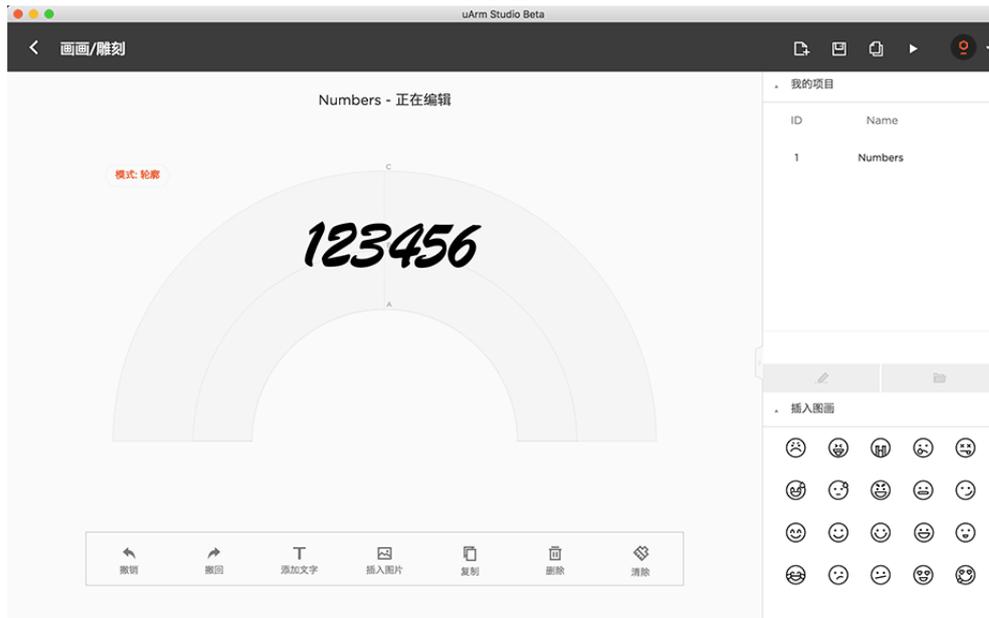
Step 1 : Fix the laser nozzle and tighten the hand screw.



Step 2: Insert the laser control board into the end of the uarm. (please pay attention to the interface direction)

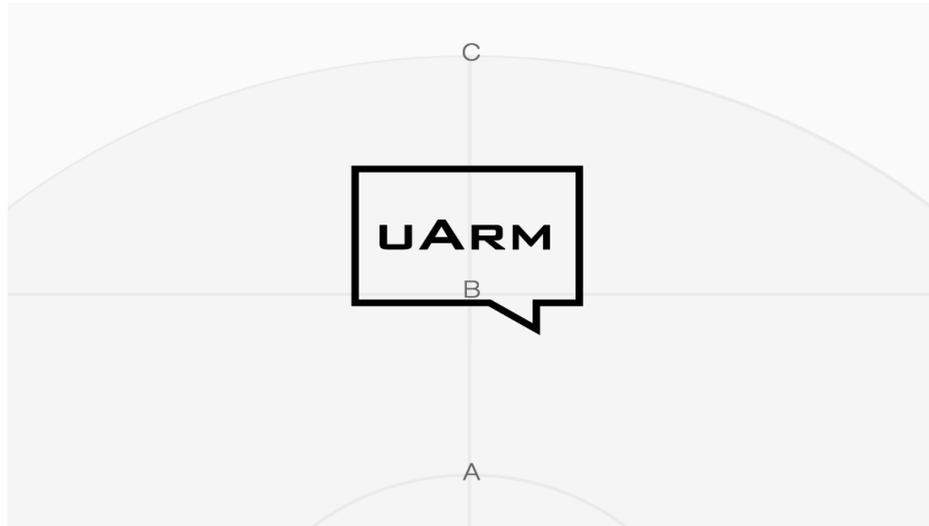


Note : If you cannot perform laser engraving, please open the uArm Studio software, turn on the “ drawing / engraving ” function, and rotate the laser nozzle to adjust the focus. During the engraving process, please do not touch the laser nozzle or place your hand in the laser irradiation area.



4.5.3. Import Patterns & Parameters Setting

Step 1: Design a pattern, insert text / shape.



(contour or grayscale mode)

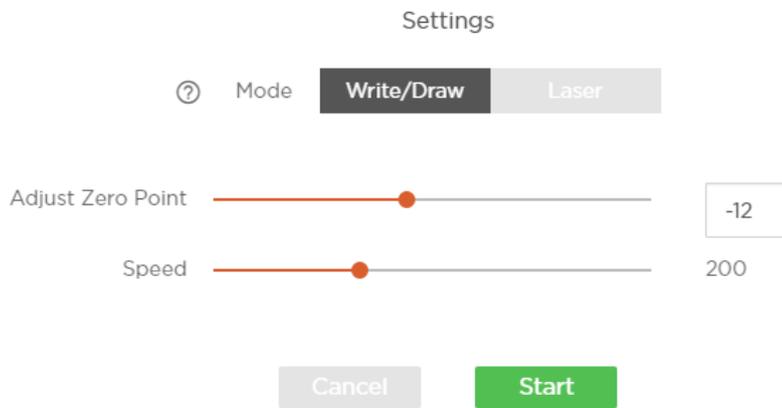
Step 2: Click the " Run " button to start running.

Step 3: Start drawing / engraving.

4.5.4. Adjust the Zero Point

Before using the " paint / engraving " function, please adjust the zero point to

ensure that the pen / laser nozzle just touches the table. Engraving speed can be set before laser engraving.



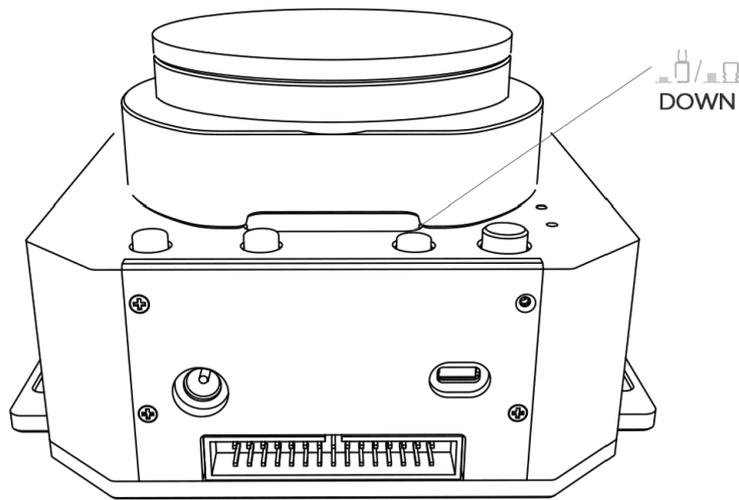
4.6. Bluetooth Tutorial

4.6.1. Bluetooth Pairing Steps for IOS

Step 1: Open uArm software and Bluetooth on your phone, click to connection.

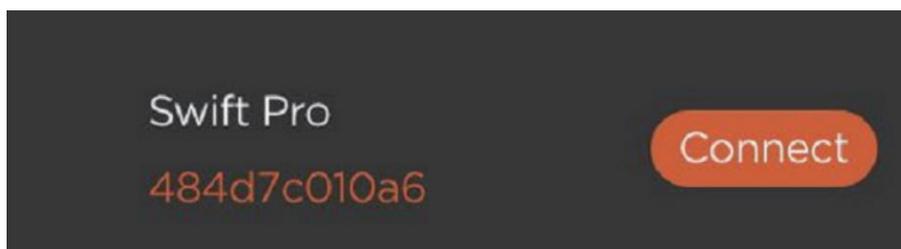
Step 2: Turn on the uArm power supply.

Step 3: Press the Bluetooth button.



Bluetooth

Step 4: As shown in the figure , the name of uArm will be displayed in the software , click to connect.



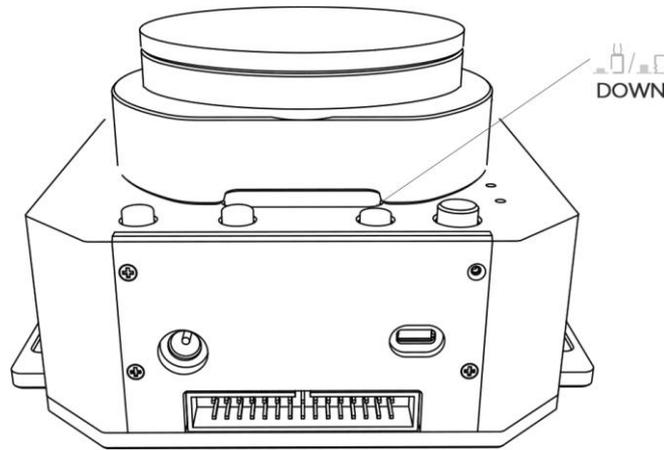
If the indicator status is steady blue, the Bluetooth mode is connected.

4.6.2. Bluetooth Pairing Process for Android

Step 1: Open uArm Play App and turn on the Bluetooth of your phone,click to connect.

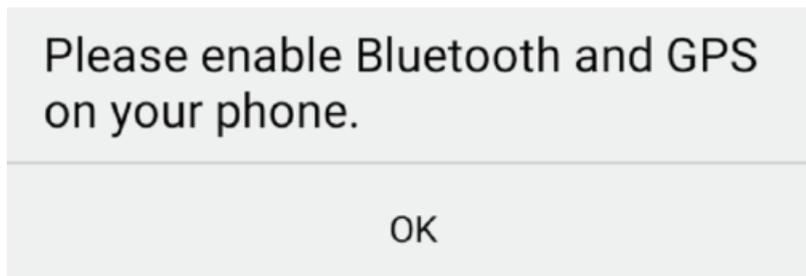
Step 2: Power on the uArm robot.

Step 3: Press the Bluetooth button on the base of the uarm robot.



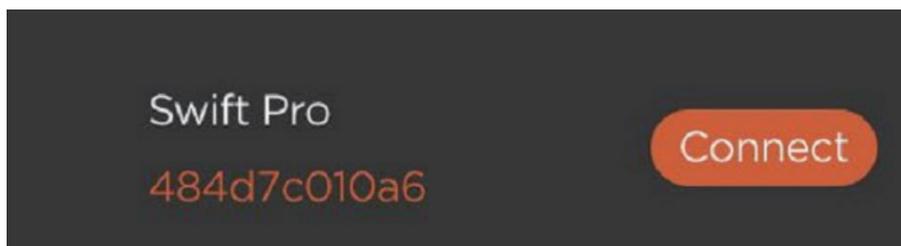
Bluetooth

Step 4: After clicking the connection, the following interface will pop up (if no, you can skip to step 5)



Note: You need authorize the uArm Play APP to access the position and Bluetooth of your phone in Settings-Authorization Management-uArm Play.

Step 5: As shown in the figure , the name of uArm will be displayed in the software , click to connect. If the indicator status is solid blue, the Bluetooth mode is activated.

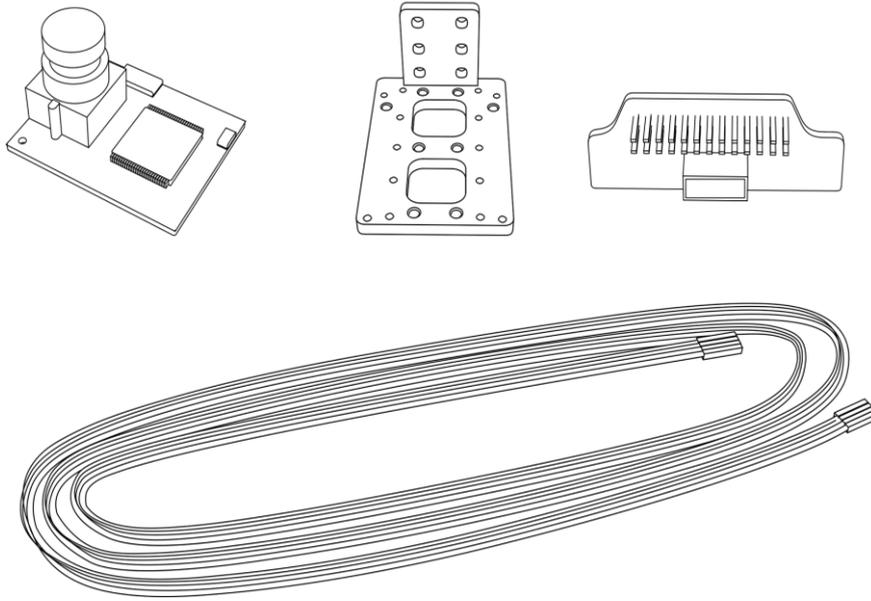


4.6.3. Precautions

Bluetooth connection only supports firmware 3.2.0.

5. OpenMV Module

OpenMV Module (firmware version should be at least 3.1.9)

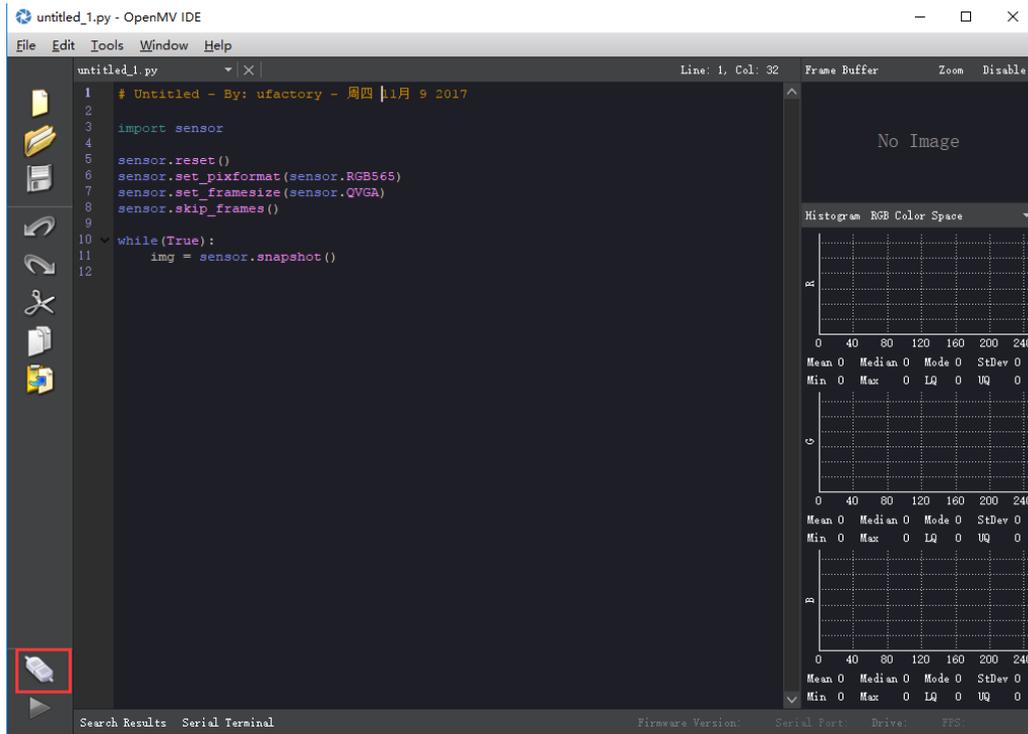


Step1: Download the latest OpenMV IDE

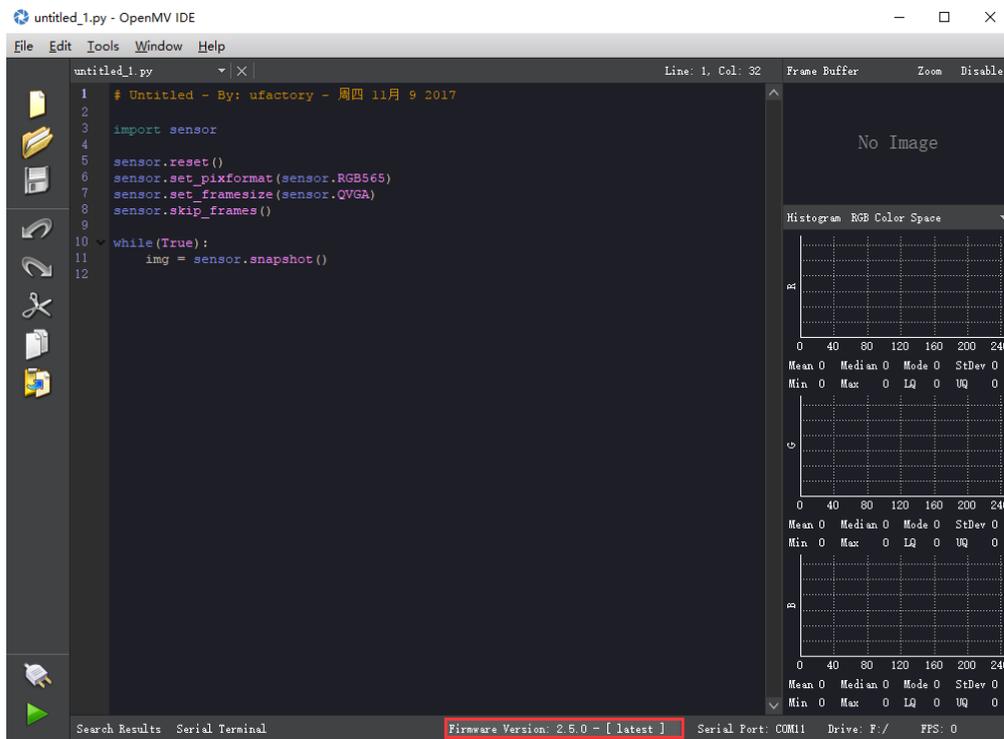
Download the latest OpenMV IDE: <https://openmv.io/pages/download>

After installing OpenMV IDE , connect OpenMV to computer with USB cable , click the

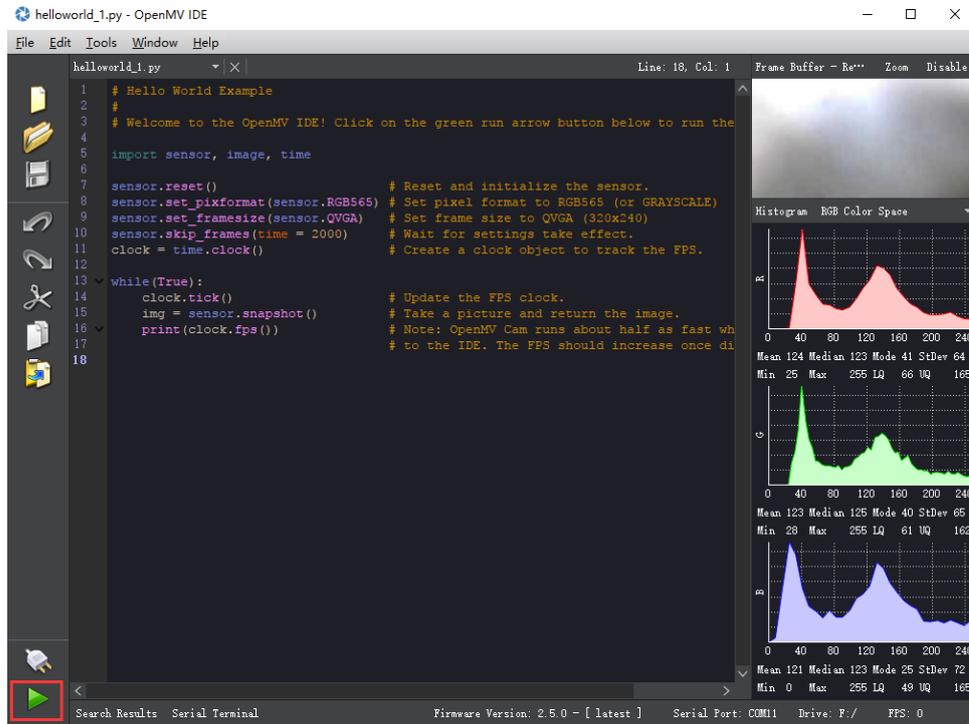
“Connect ” button in the lower left corner of the software interface .



Step 2 : Upgrade OpenMV firmware via OpenMV IDE .



Step 3: Run helloworld.py to adjust the camera focal length through the image of the software interface

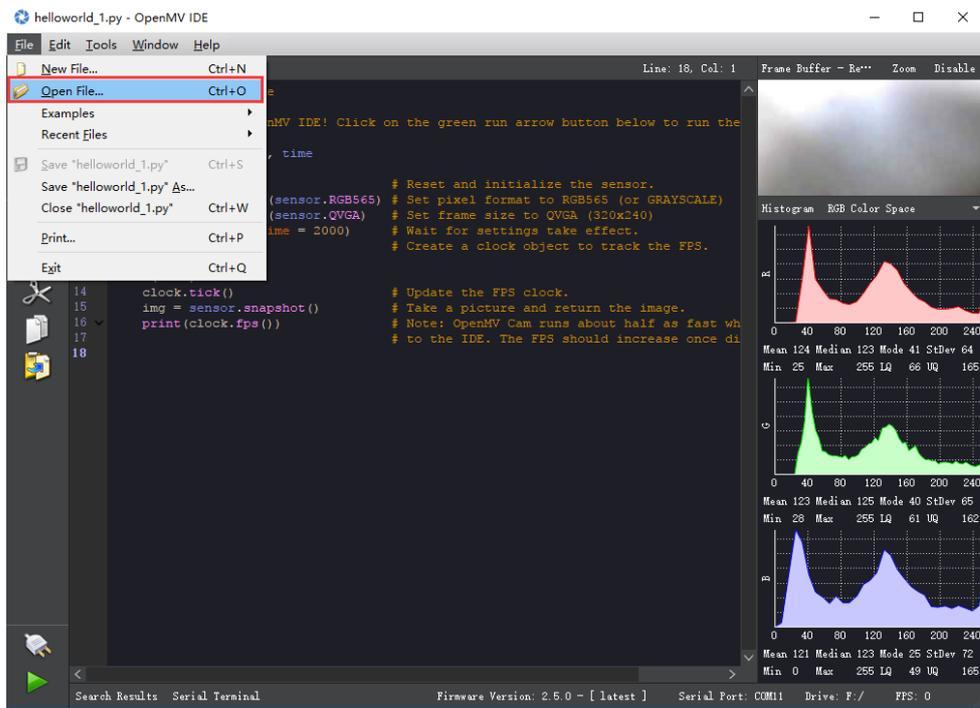


Note : When the IDE captures the image, rotate the lens to adjust the focus (you can clearly see objects outside 20cm), tighten the screws after the focus is complete.

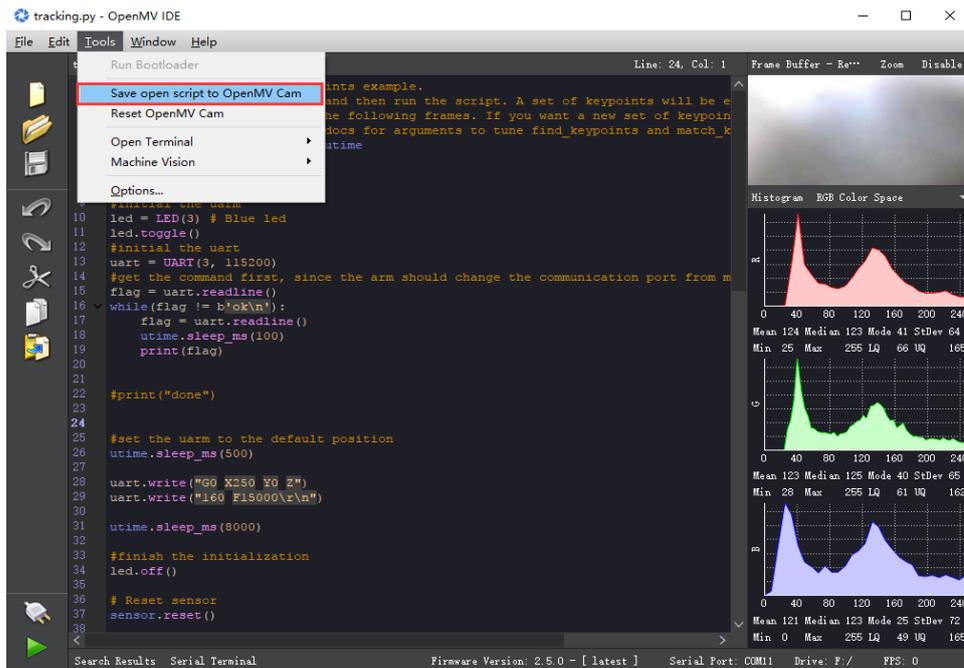
Step 4: Download tracking.py, save to OpenMV.

Download link: <https://github.com/uArm-Developer/OpenMV-Examples>

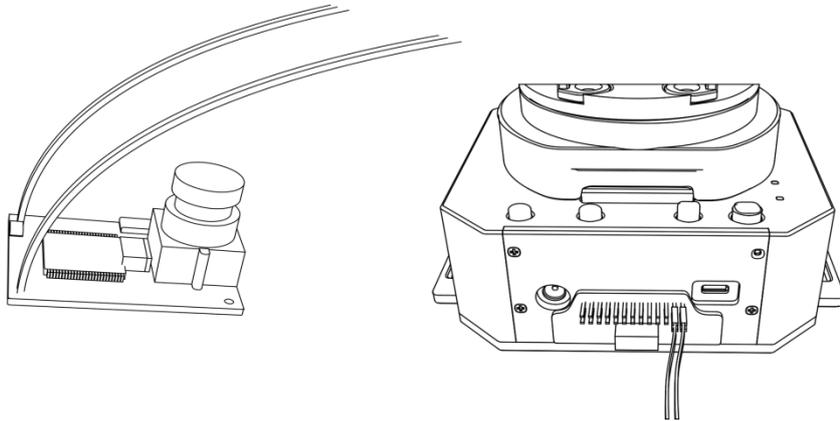
Click "File" - "Open File" to import tracking.py



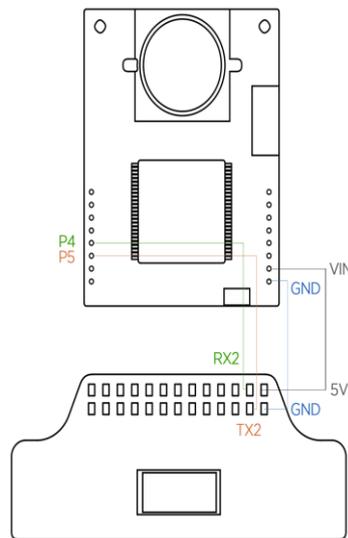
Click "tool" - "Save open script to OpenMV Cam" , after the code is successfully saved, restart OpenMV by plugging in the USB cable . If the code is successfully stored ,after the OpenMV module is connected to USB , the status of OpenMV is light blue.



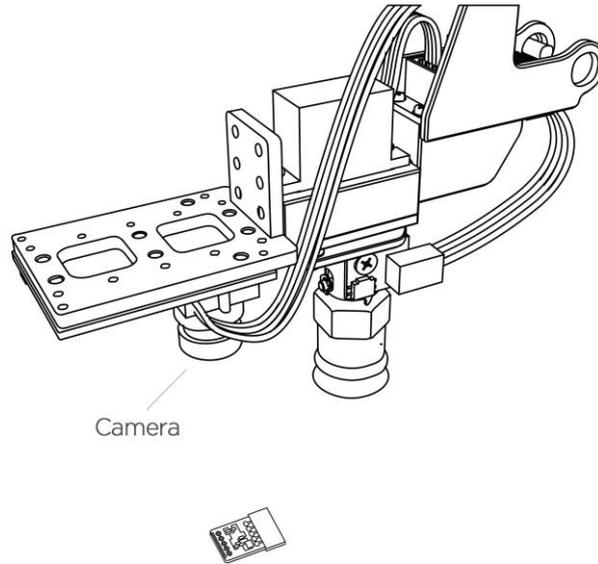
Step 5 : Unplug OpenMV USB cable, connected by wires to the robotic arm OpenMV.



Note : Make sure the installation is correct or your computer may not recognize your uArm .

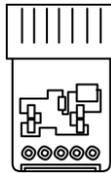


Step 6 : OpenMV secured to the robotic arm end-effector.

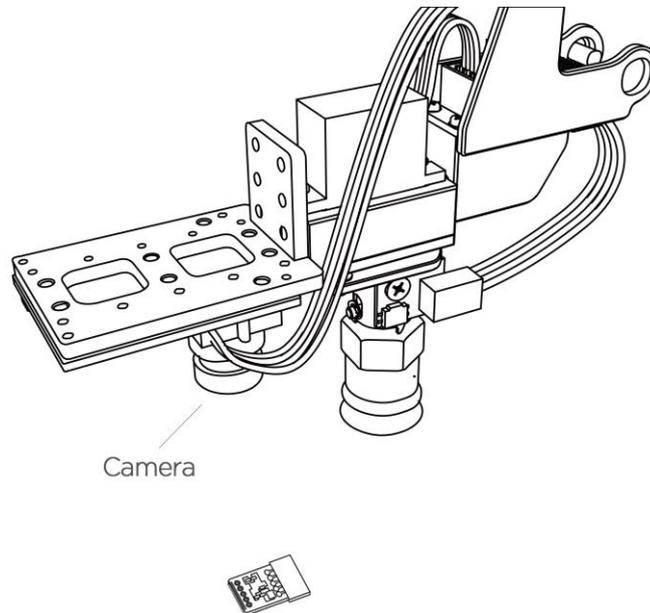


Note : Please pay attention to the installation direction of OpenMV . If the direction is wrong, The uarm may move in the opposite direction. Please ensure OpenMV has already been disconnected from the computer, otherwise Open MV IDE will continue to control Open MV

Step 7 : Make sure the desktop is clean and non-reflective. Place an easy-to-recognize object on the table, such as a small PCB with resistors.



Step 8 : Place the robotic arm about 25 cm above the target object to let the Open MV recognize the object.

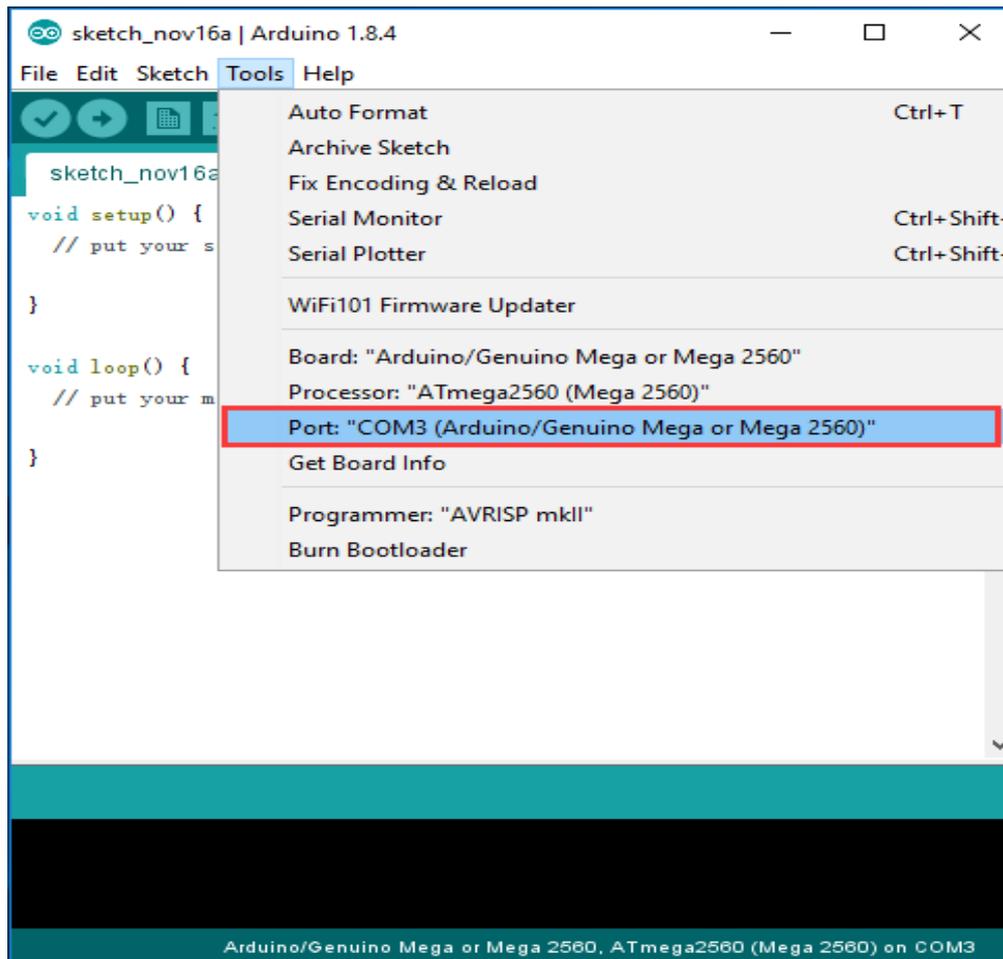


Step 9 : Power on the uarm and connect it to the computer, then turn on the power switch of the uarm.

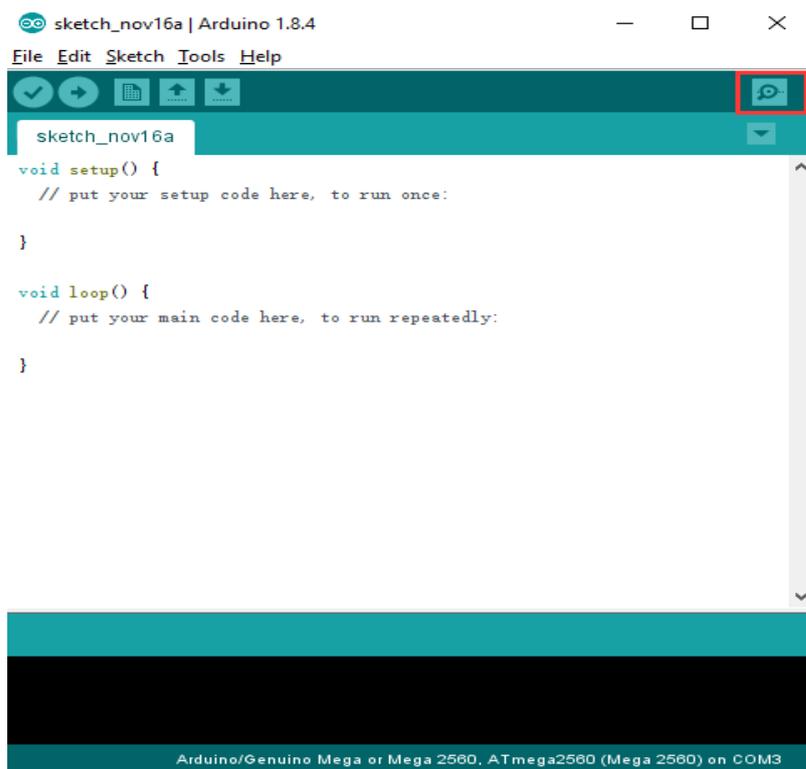
Launch the Arduino IDE (Download link:

<https://www.arduino.cc/en/Main/Software>)

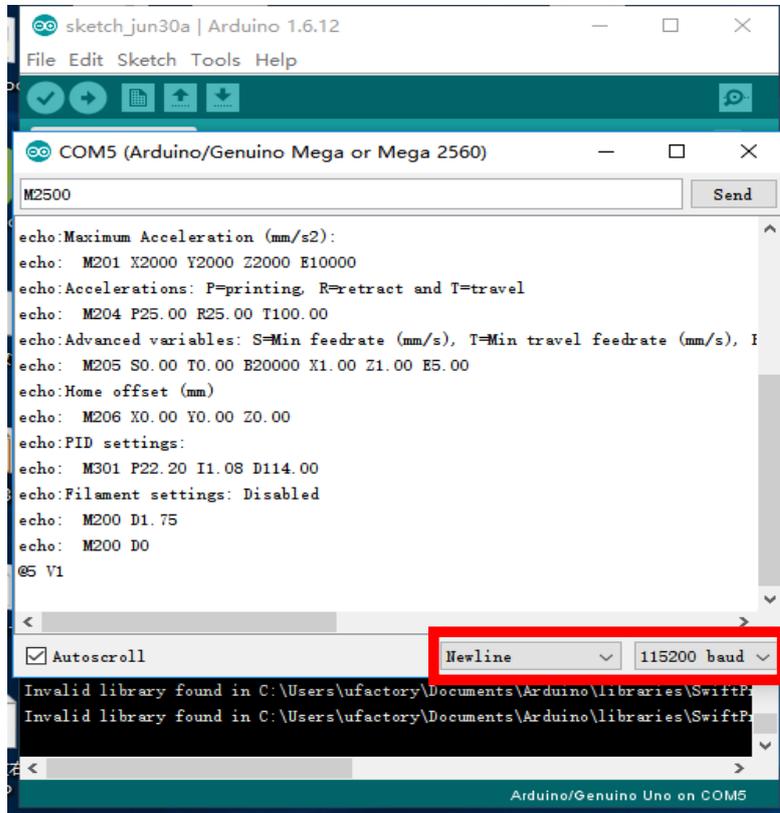
Select the correct COM port : COM (Arduino/ Genuino Mega or Mega 2560)



Step 10 : Click to open the serial monitor.



Step 11 : Change settings (Line feed & 115200 baud rate) , send M2500 command, the UART main communication port of the robotic arm will be switch from USB to OpenMV.



Step 12 : Move the object slowly and the arm will follow the target object .

6. Appendix

1. uArm Community

UFACTORY Official Forum: <http://forum.ufactory.cc/>

uArm Facebook : <https://bit.ly/2PUOQfE>

uArm Technical Support: support@ufactory.cc

Product Video: <https://bit.ly/30caY9M>

2. uArm Firmware Guidance Manual

Download: [Guidance Manual](#)

3. Releases History

Version	Releases Description
1.0.7	Added content to 3D printing operation guide and make
1.0.8	Added details to OpenMV content. Released Content about Laser Nozzle focal Length. Released Precautions for Base Expansion. Released precautions for Custom Button.
1.0.9	Modified the Content of Laser Nozzle Focal Length. Adjustment/Gripper Installation.
1.0.10	Released OpenMV instructions. Released Offline Teaching Content.
1.0.11	Modified the content about OpenMV Instructions.

1.0.12	Released Guidelines on 3D Printing catheter Installation.
1.0.13	Released robotic arm working range diagram.
1.0.14	Released 3D printing operation precautions.
1.0.15	Modified the content about Gcode in the Developer' s
1.0.16	Modified visual kit content.
1.0.17	Updated calibration card link.
1.1.23	Updated the official link.