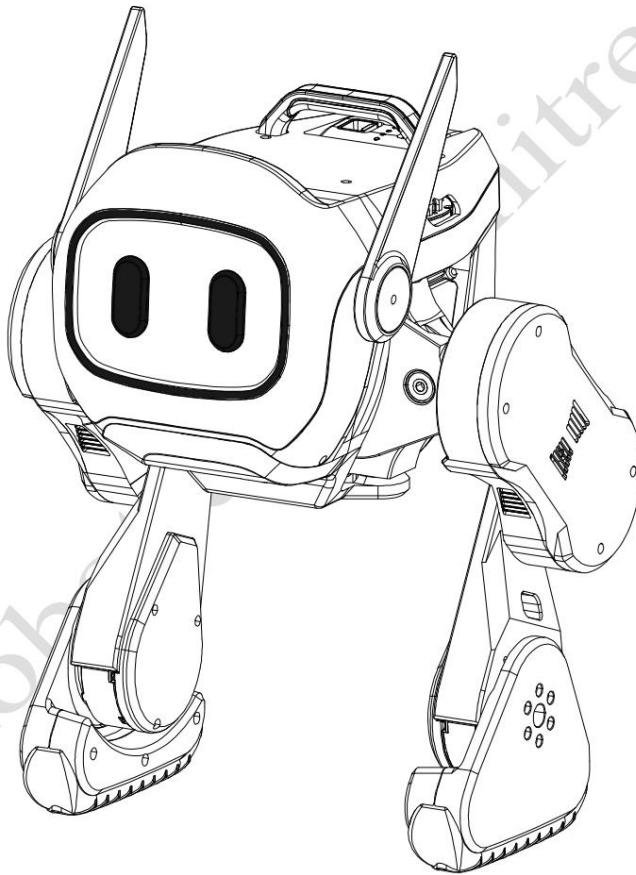


# Yushu Qmini Bipedal Robot

Main assembly instructions V1.0



## Unitree

This product is a civilian robot product. Please do not modify or use the robot in a dangerous manner.

Please visit the official website of Yushu Technology to learn more about product-related terms and policies. Please comply with the laws and regulations of each region.

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# 1 机器人零部件制作

## 1.1 Main body parts

The robot's main structural parts are all made of FDM 3D printing materials, aiming to provide a low-cost and quickly verifiable robot hardware solution.

The appearance and color of parts can refer to the open source model, or you can DIY it yourself.

Table 1.1.1 Recommended printing parameters for fuselage main parts

Component	Material	Number of wall layers	Number of top shell layers	Number of bottom shell layers	Sparse fill density	Sparse fill pattern
Top frame	PLA	4	4	4	20	honeycomb
Main frame	PLA	5	5	5	20	honeycomb
Front fan mounting parts	PLA	5	5	5	20	honeycomb
Battery compartment	PLA	3	3	3	15	Grid/Cellular
Battery bottom support	PLA	3	3	3	15	Grid/Cellular
Leg yaw axis limit block	PLA	5	5	5	20	honeycomb
Top yaw axis motor mount	PLA	4	4	4	20	honeycomb
Top gyro mount	PLA	3	3	3	15	Grid/Cellular
Raspberry Pi Mount	PLA	3	3	3	15	Grid/Cellular



⚠ Note: All prints have tree support turned on by default, and the outer skirt is turned on.

The following are the structural parts of the main body of the machine that need to be implanted with hot melt nuts after printing. When implanting hot melt nuts on the printed parts, please be sure to

It must be ensured that the implantation direction is perpendicular to the implantation plane and the end face of the nut is flush with the top surface.

Reference: [\[Teach you how to embed nuts in 3D printed parts in one minute\]](#)

Main frame on top of the fuselage:

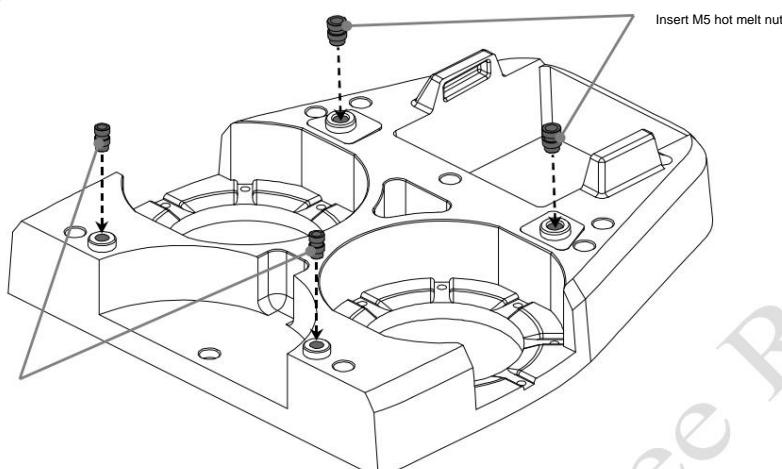


Figure 1.1.1 Oblique view of the main frame on the top of the fuselage

Main frame of the body:

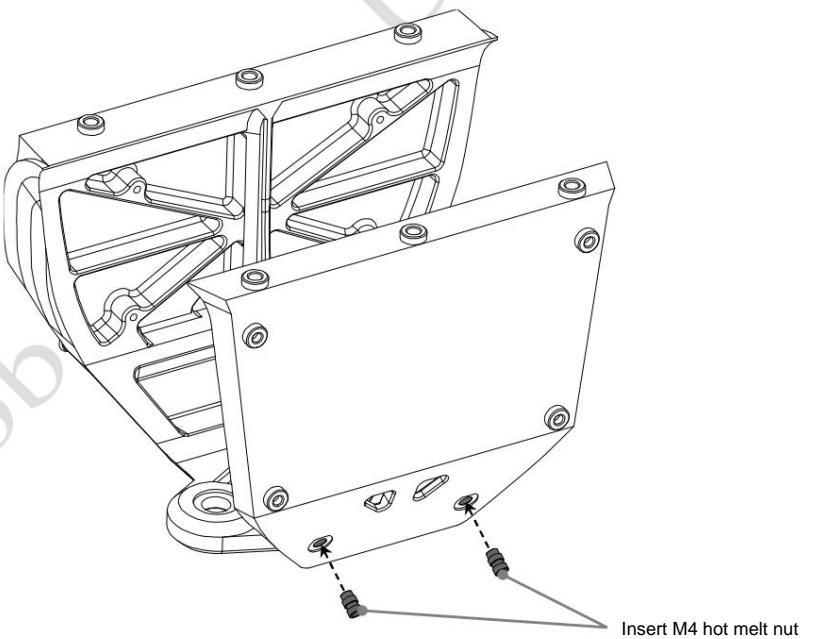
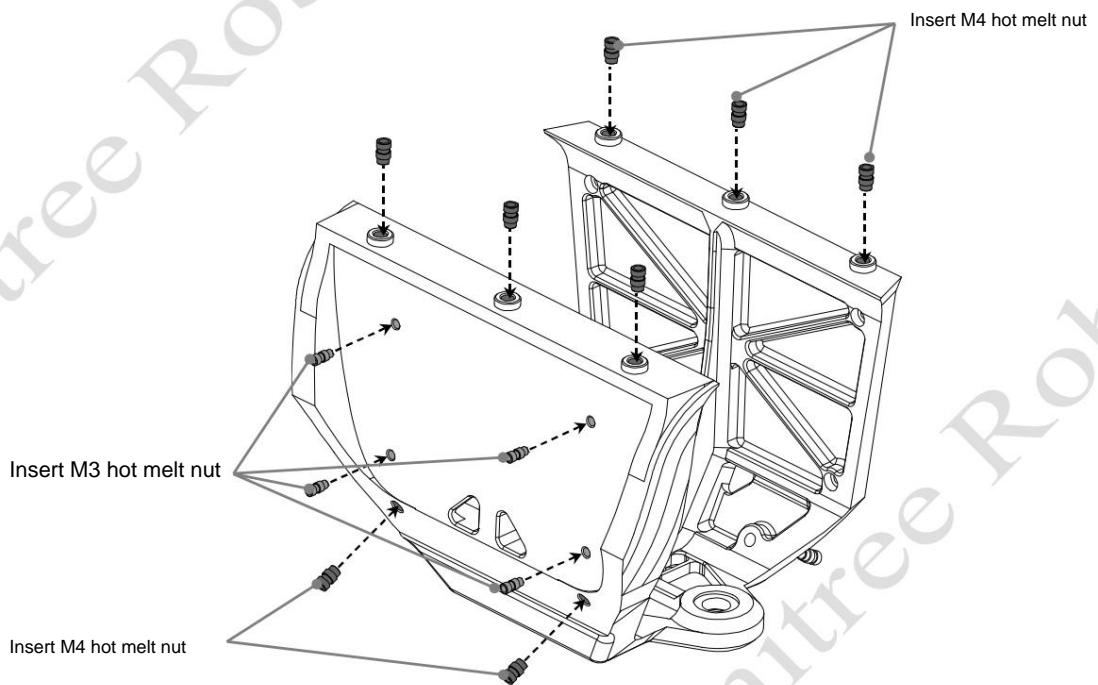


Figure 1.1.2 Oblique view of the main frame of the aircraft

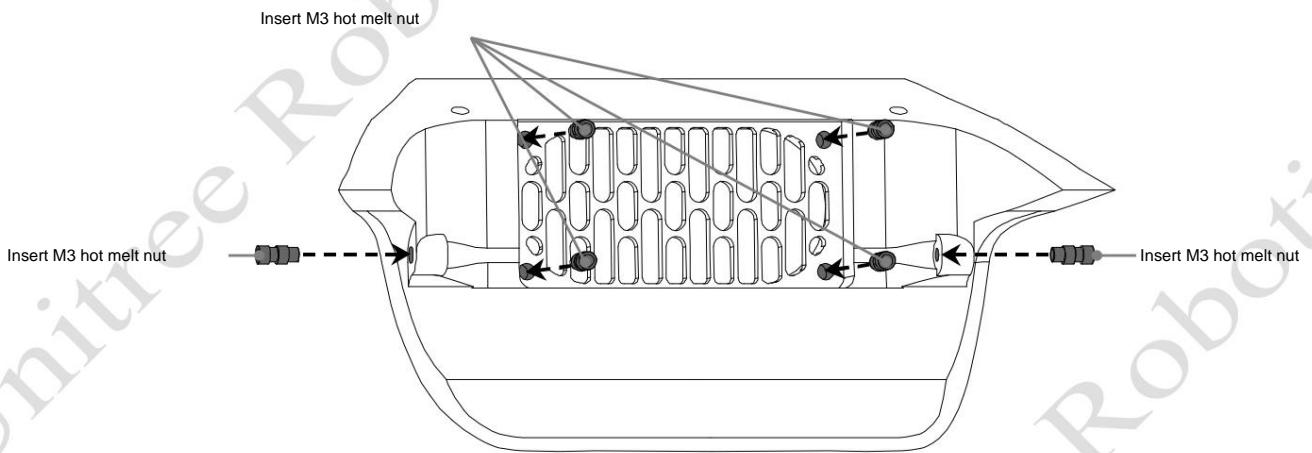
**Front fan mounting parts:**

Figure 1.1.3 Oblique view of the fan mounting at the front end of the machine

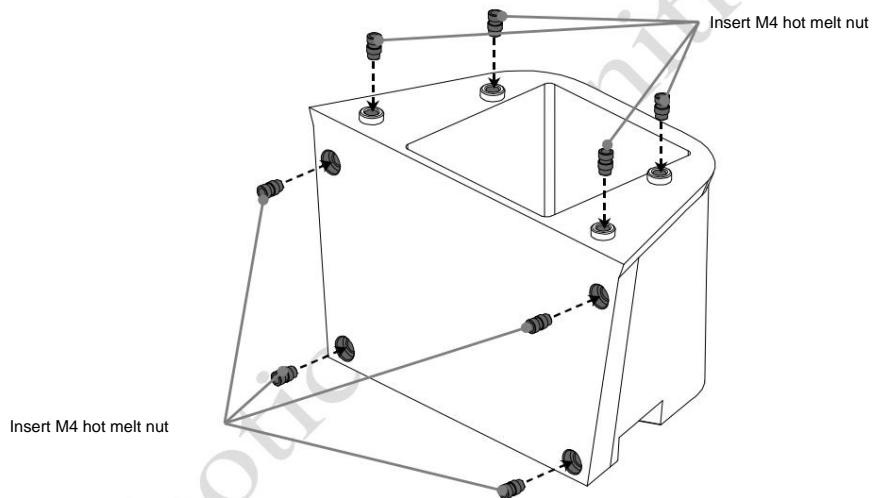
**Battery compartment:**

Figure 1.1.4 Battery compartment oblique view

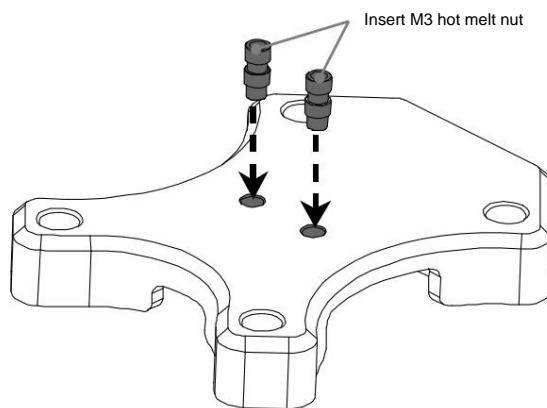
**Top Gyro Mount:**

Figure 1.1.5 Oblique view of the top gyroscope mount

## 1.2 Leg parts

The leg parts are divided into hip joint motor mounting seat, hip joint motor clamp, side swing drive gear, side swing connector, thigh body, thigh side cover,

The calf body, the ankle motor cover, the outside of the foot, the inside of the foot and the sole. The left and right legs are in a mirror image relationship.

Table 1.2 Recommended printing parameters for leg parts

Component	Material	Number of wall layers	Number of top shell layers	Number of bottom shell layers	Sparse fill density	Sparse fill pattern
Hip Motor Mount	PLA	5	5	5	20	honeycomb
Hip joint motor clamp	PLA	5	5	5	20	honeycomb
Side swing drive gear	PLA	5	5	5	20	honeycomb
Side swing connector PLA-CF/PETG-CF	PLA-CF/PETG-CF	3	3	3	20	honeycomb
Thigh body	PLA	6	6	6	20	honeycomb
Thigh side cover	PLA	2	3	3	15	Grid/Cellular
Calf body	ABS/ PLA-CF/PETG-CF	6	6	6	20	honeycomb
Ankle motor side cover	PLA	2	3	3	15	Grid/Cellular
Outer side of foot	PLA	4	4	4	20	honeycomb
Inside of foot	PLA	4	4	4	20	honeycomb
Sole	TPU	3	3	3	15	honeycomb



ŷ Note: All prints have tree support turned on by default, and the outer skirt is turned on.

ŷ When printing the TPU robot foot, pay special attention to selecting "Generate only in the print panel" in the support option.

The following are the structural parts of the leg parts that need to be implanted with hot melt nuts:

Front fan mounting parts:

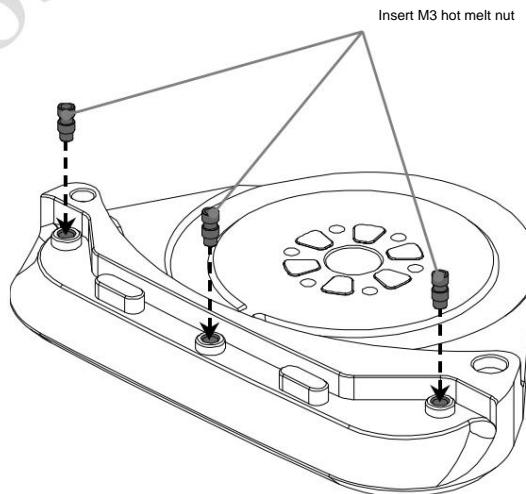


Figure 1.2.1 Angle view of the fan mounting at the front of the machine

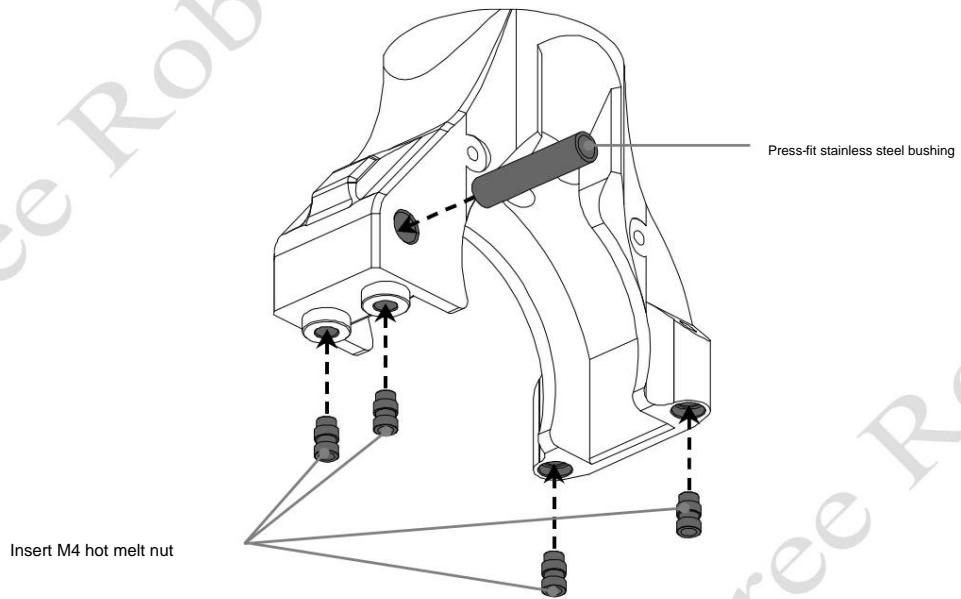
**Hip Motor Mount:**

Figure 1.2.2 Oblique view of hip joint motor mounting base

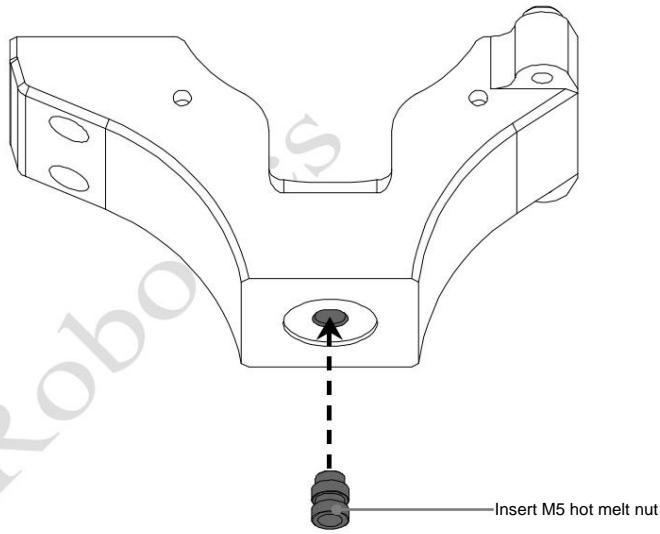
**Hip joint motor clamp:**

Figure 1.2.3 Oblique view of hip joint motor clamp

### 1.3 Exterior decoration and other structural parts

The exterior decorative parts include robot top cover, robot front face, left antenna, right antenna and handle.

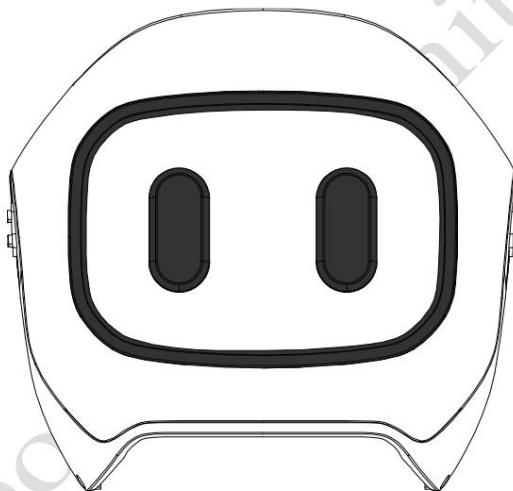
Table 1.3 Recommended printing parameters for exterior decoration parts

Component		Material	Number of wall layers	Number of top shell layers	Number of bottom shell layers	Sparse fill density	Sparse fill pattern
Robot cover	PLA	3	3	3	3	15	Grid
Robot face	PLA	3	3	3	3	15	Grid
Antenna decoration	PLA	3	3	3	3	15	Grid
Handle	PLA	6	6	6	6	20	honeycomb



Note: All prints have tree support turned on by default, and the outer skirt is turned on.

Robot face: The black part of the face can be produced using multi-color printing, or it can be printed in monochrome and then colored later.



Heat-melt nuts are implanted from the outside on both sides of the face.

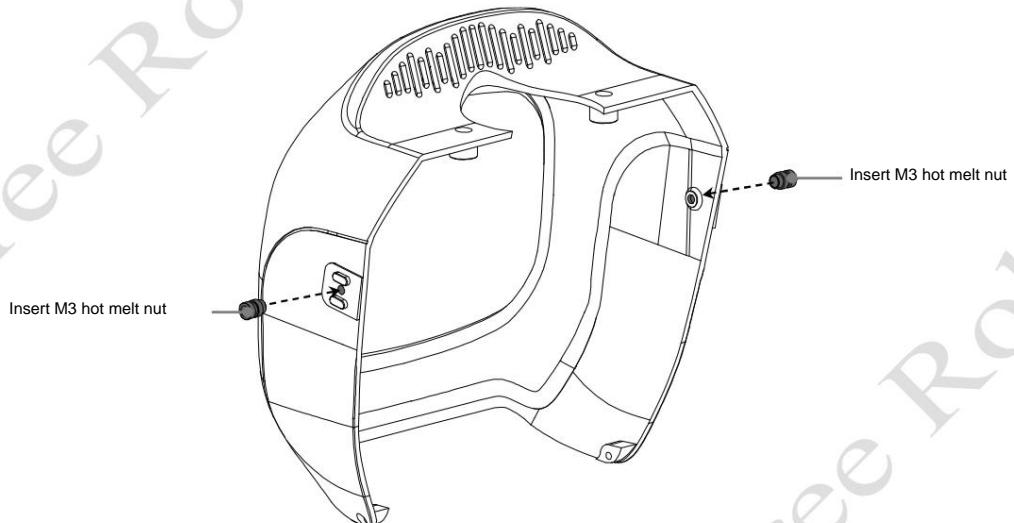


Figure 1.3.1 Front view & oblique view of the robot's face

## 2 机器人零部件组装

2.1 Motor system block diagram

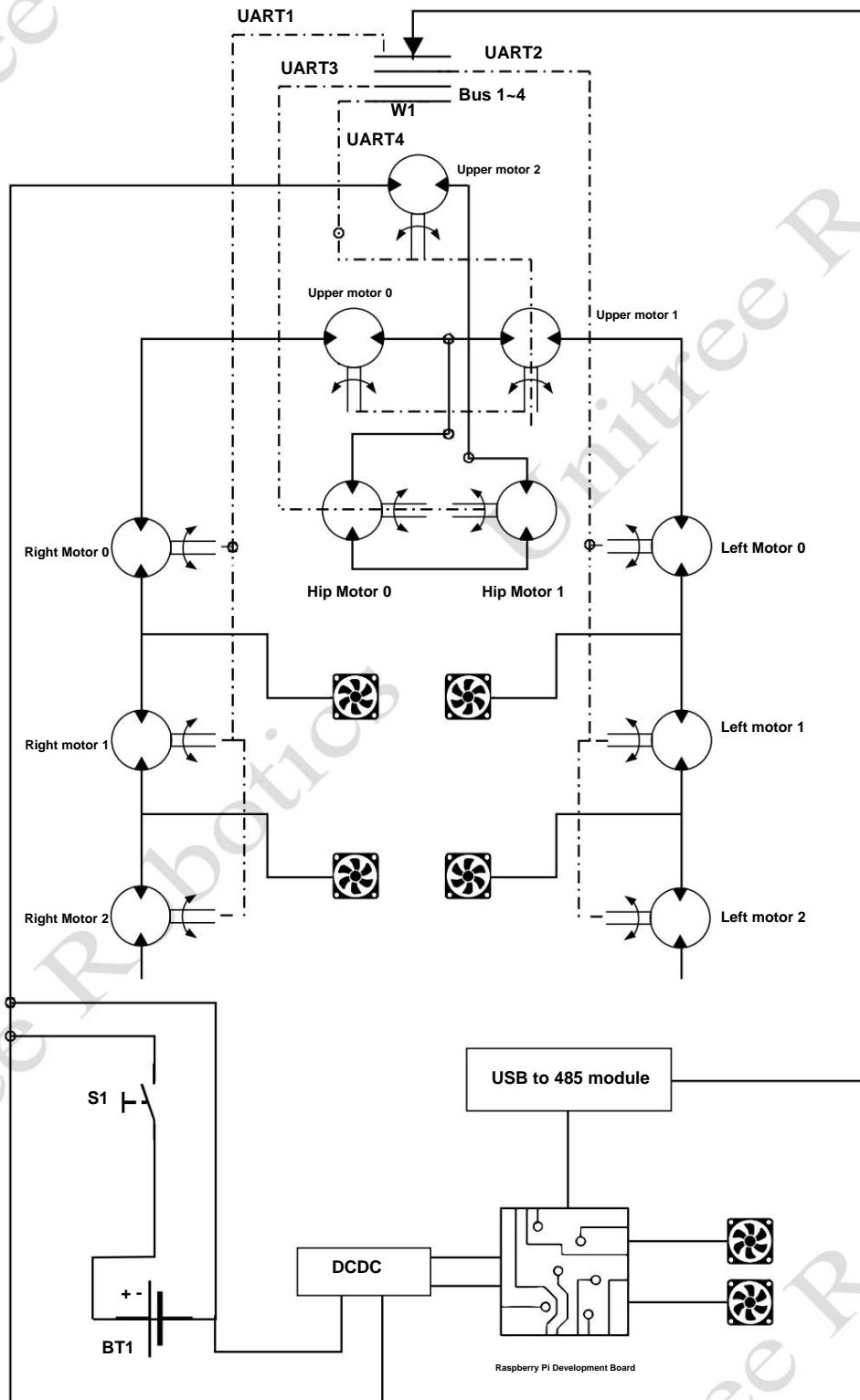


Figure 2.1.1 Motor system block diagram

## 2.2 Body assembly

### 2.2.1 Structural assembly

**Step 1:** Install the two M8010 motors into the corresponding grooves on the top main frame of the fuselage, as shown in the figure below.

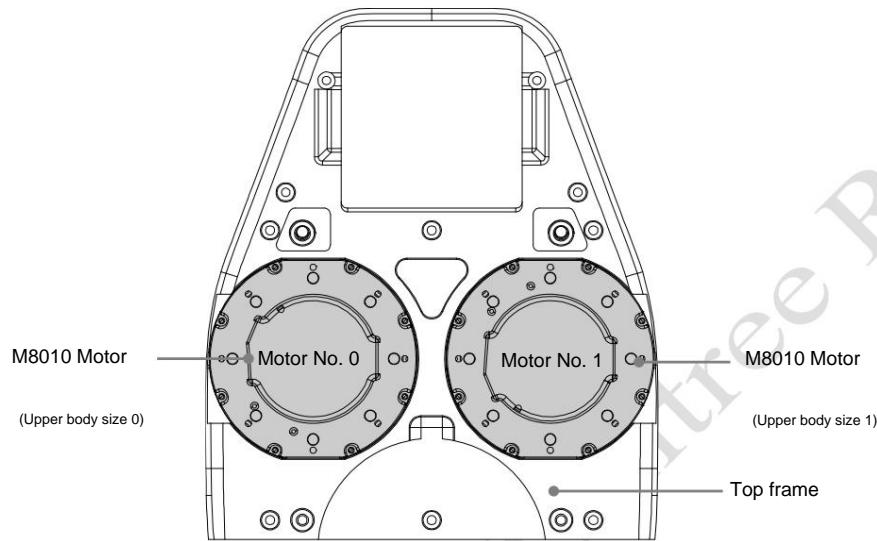


Figure 2.2.1 Motor installation diagram

**Step 2:** Turn the whole unit over, install the leg yaw axis limit block, and tighten the screws of corresponding specifications and length, as shown in the figure below.

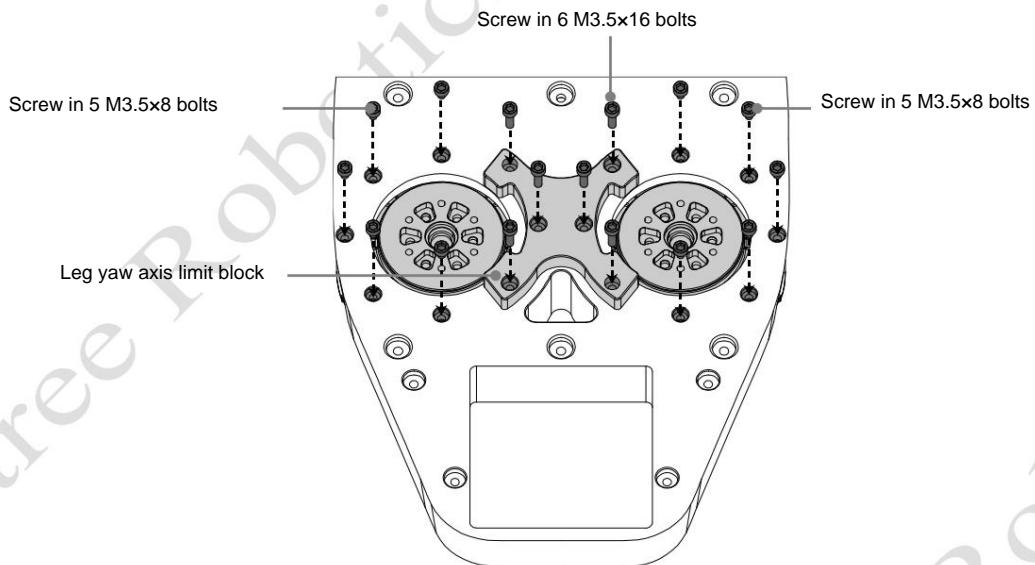


Figure 2.2.2 Installation diagram of yaw axis limit block

**Step 3:** Assemble the left and right hip joint motor mounts to the leg yaw axis motors, as shown below.

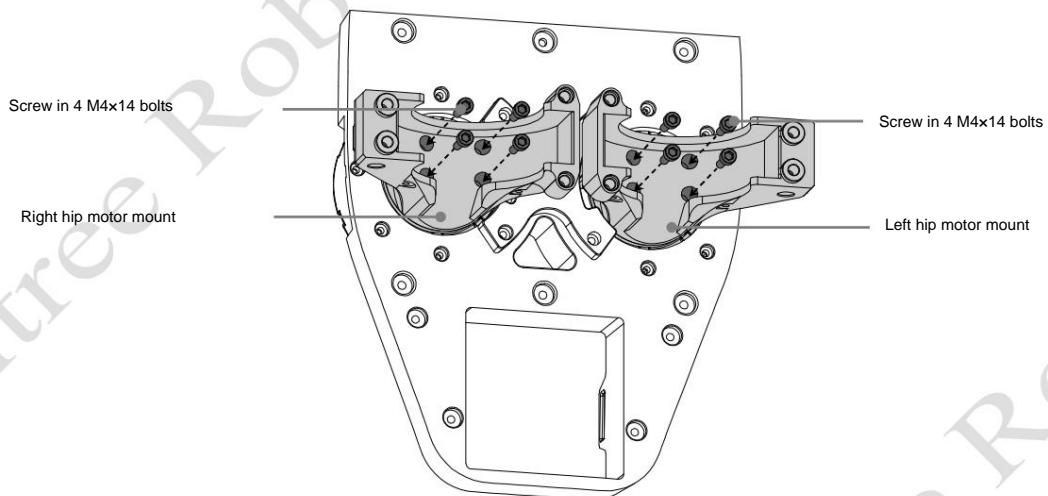


Figure 2.2.3 Installation diagram of left and right hip joint motor mounting bases

**Step 4:** Assemble the left and right hip joint motor clamps and install the left and right side swing drive gears. The parts of the left and right legs are mirror images of each other and cannot be confused.

Change.

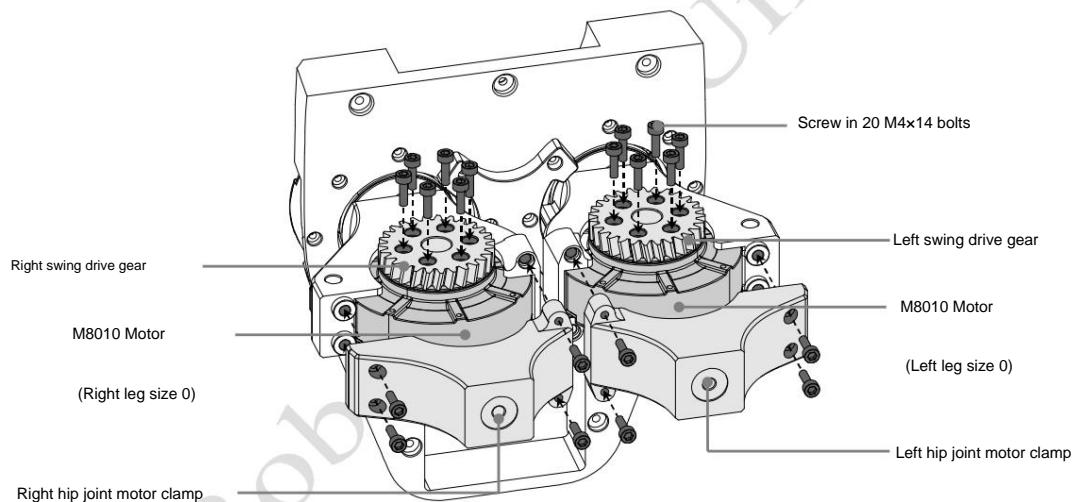


Figure 2.2.4 Left and right hip joint motor installation diagram

**Step 5:** Disassemble the charging base of the Go1 battery and remove the internal PCB.

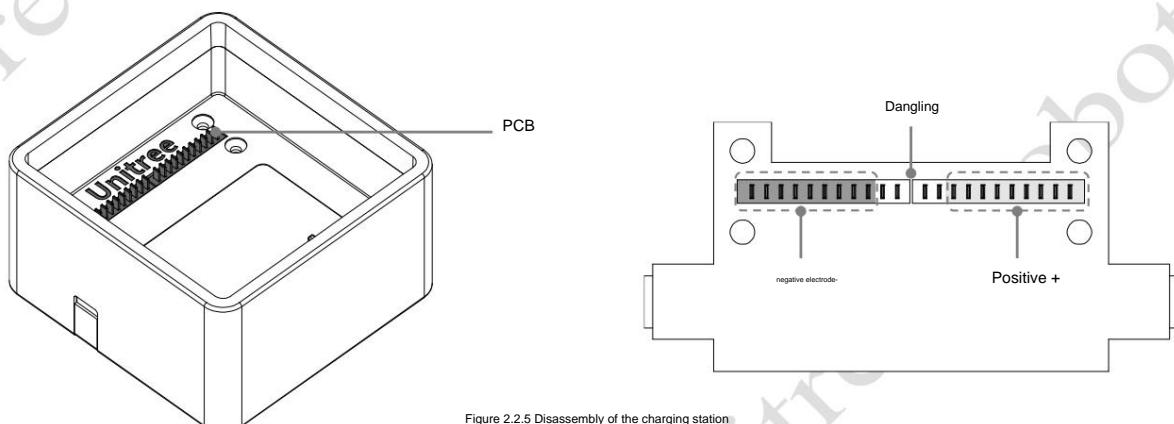


Figure 2.2.5 Disassembly of the charging station

**Step 6:** Install the removed battery contact holder on the bottom of the printed battery compartment and screw in the 4 countersunk screws of the original battery charging holder.

Top view of the battery contact assembly.

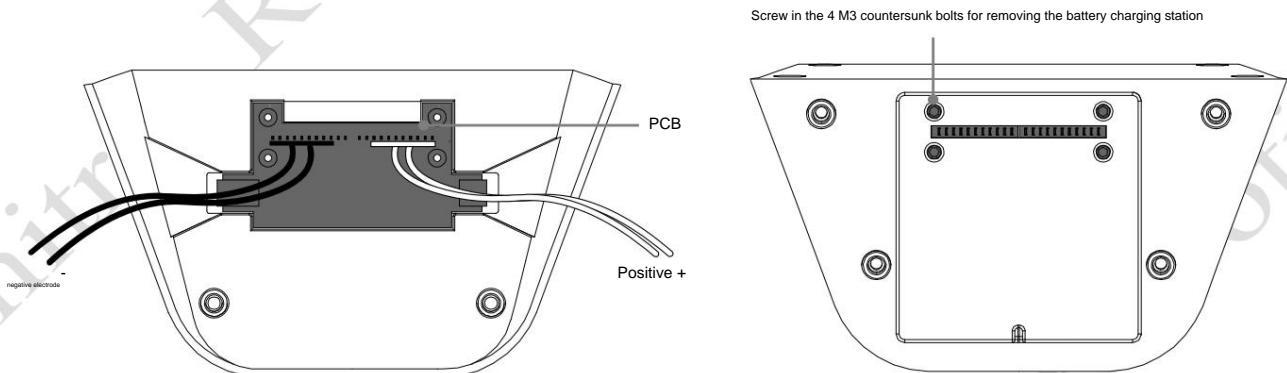


Figure 2.2.6 Battery compartment battery contact seat installation diagram

**Step 7:** Press the boat-shaped switch into the bottom support of the battery until it stops, then weld the switch contacts to the positive and negative contacts of the battery contact holder.

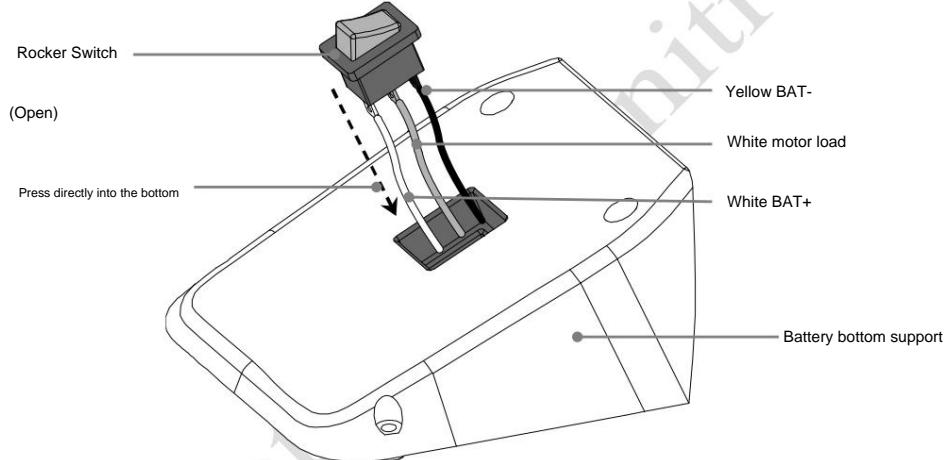


Figure 2.2.7 Installation diagram of rocker switch

**Step 8:** Install two 4010 axial-flow fans onto the fan mounting brackets at the front of the machine, as shown in the figure below.

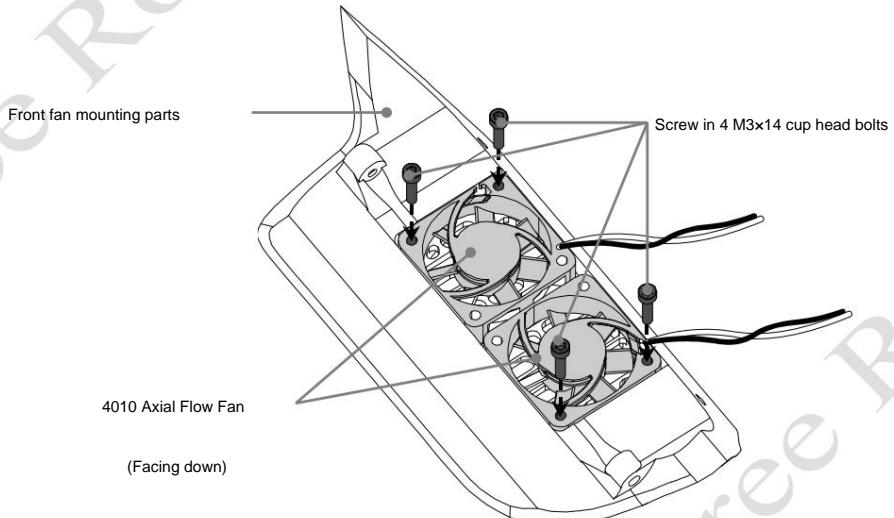


Figure 2.2.8 4010 axial flow fan installation diagram

Table 2.1.1 4010 axial flow fan specifications

model	size	Current and voltage	Speed	Wiring method
SF4010SM5-YSD	40*40*10mm	0.15A DC 5V	5100±10%RPM	Red positive and black negative, combined with motor XT30U(2+2)-F

**Step 9:** Install two bearings with an inner diameter of 6mm and an outer diameter of 22mm into the bearing holes of the main frame of the machine. You may need to use

Tap lightly with a rubber hammer and press it to the bottom to ensure that the outer ring of the bearing is tightly fitted with the main frame of the machine body.

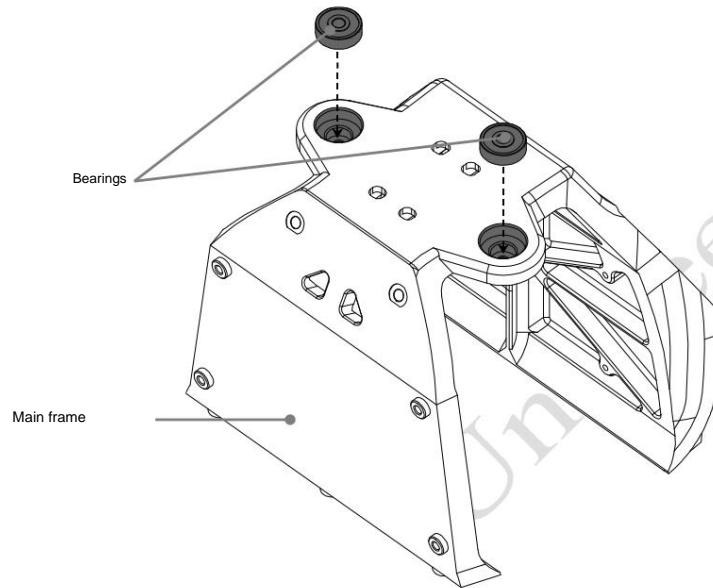


Figure 2.2.9 Main frame bearing installation diagram

**Step 10:** Align the main frame of the machine with the connection holes of the battery compartment, and screw in 4 M4X20 cup head bolts to tighten.

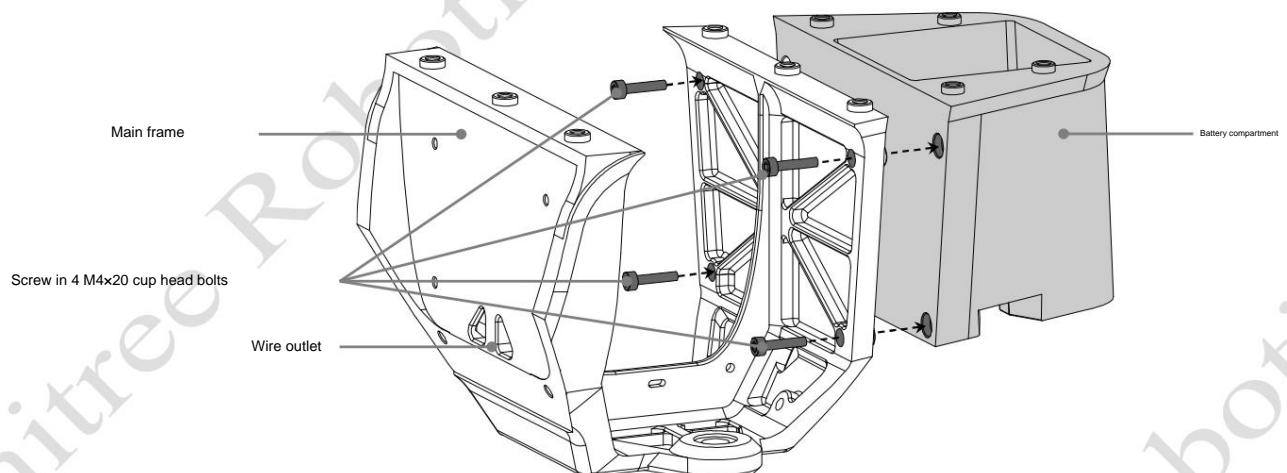


Figure 2.2.10 Installation diagram of the battery compartment of the main frame

**Step 11:** Connect the main frame of the machine and the battery compartment tightly.

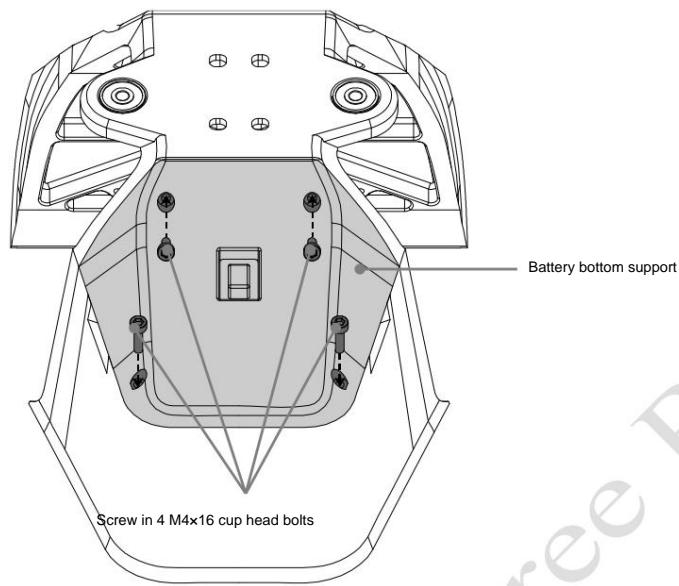


Figure 2.2.11 Installation diagram of battery bottom support

**Step 12:** Install the fan mounting bracket at the front end of the machine.

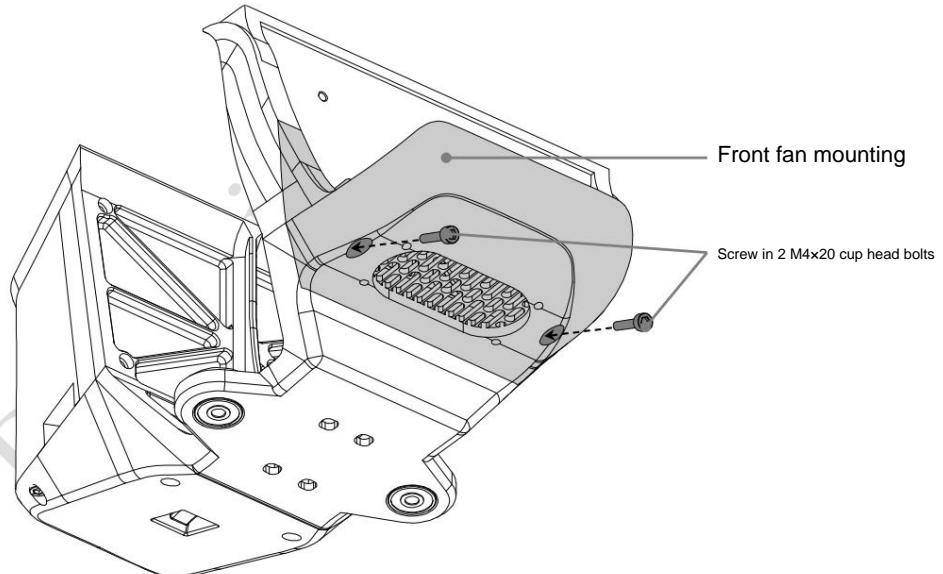


Figure 2.2.12 Installation diagram of the fan mounting parts at the front of the machine body

**Step 13:** Align the previously assembled top of the fuselage with the assembled main frame of the fuselage, and pass the left and right M4x

Insert the screws and screw them into the bottom of the left and right hip joint motor clamps. Screw the screws through the main frame at the top of the fuselage to complete the fastening assembly of the upper and lower main bodies of the fuselage.

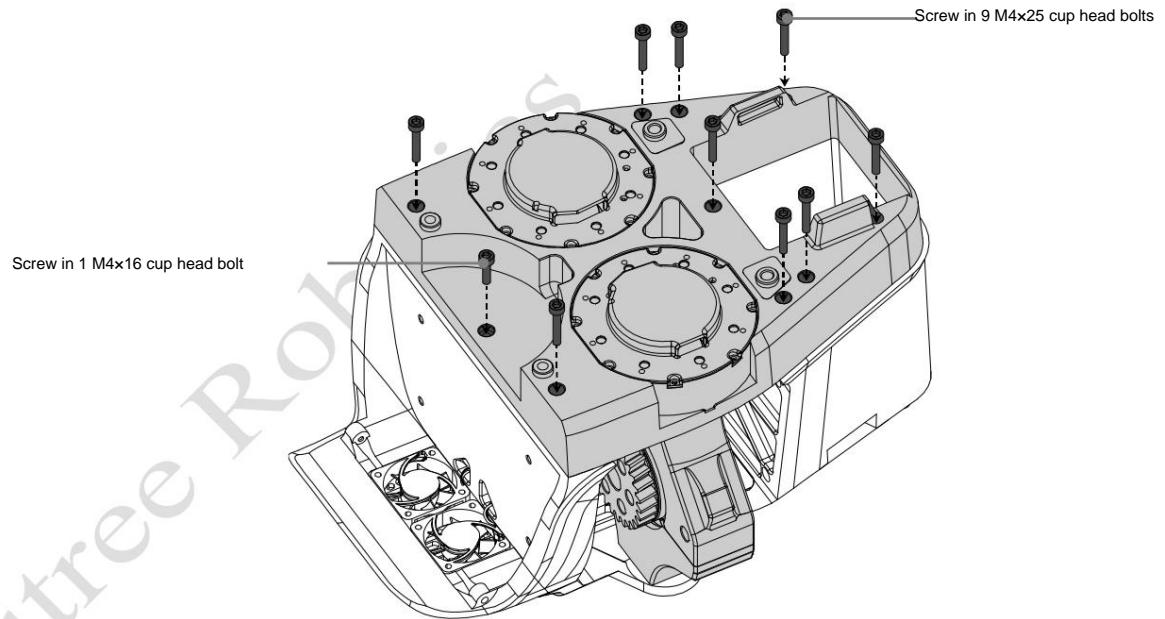
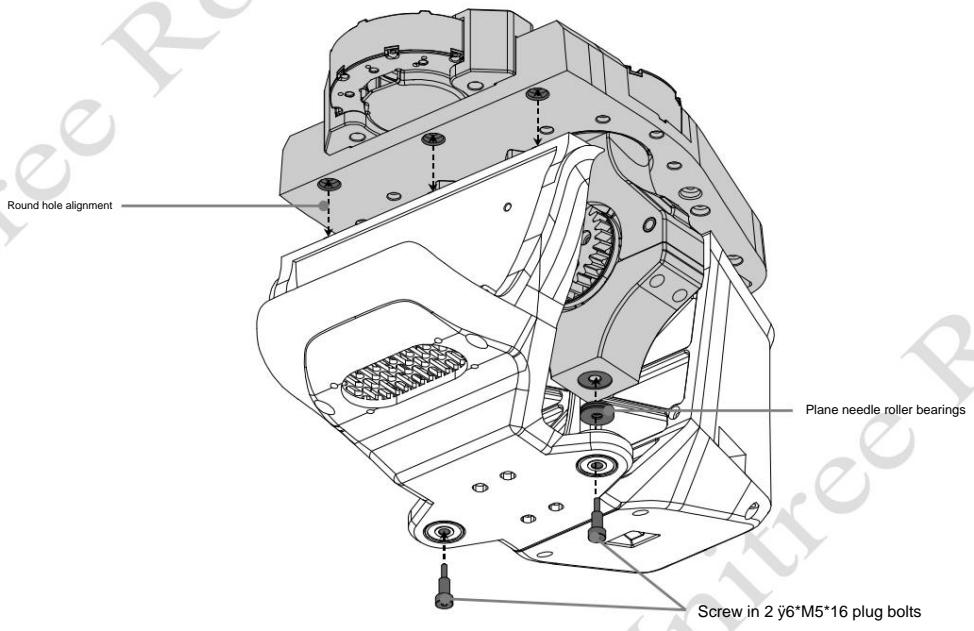


Figure 2.2.13 Installation diagram of the upper and lower parts of the fuselage

**Step 14:** Install the M8010 motor into the top yaw axis motor mount, and install the top yaw axis motor and top gyroscope to the main body.

On the body.

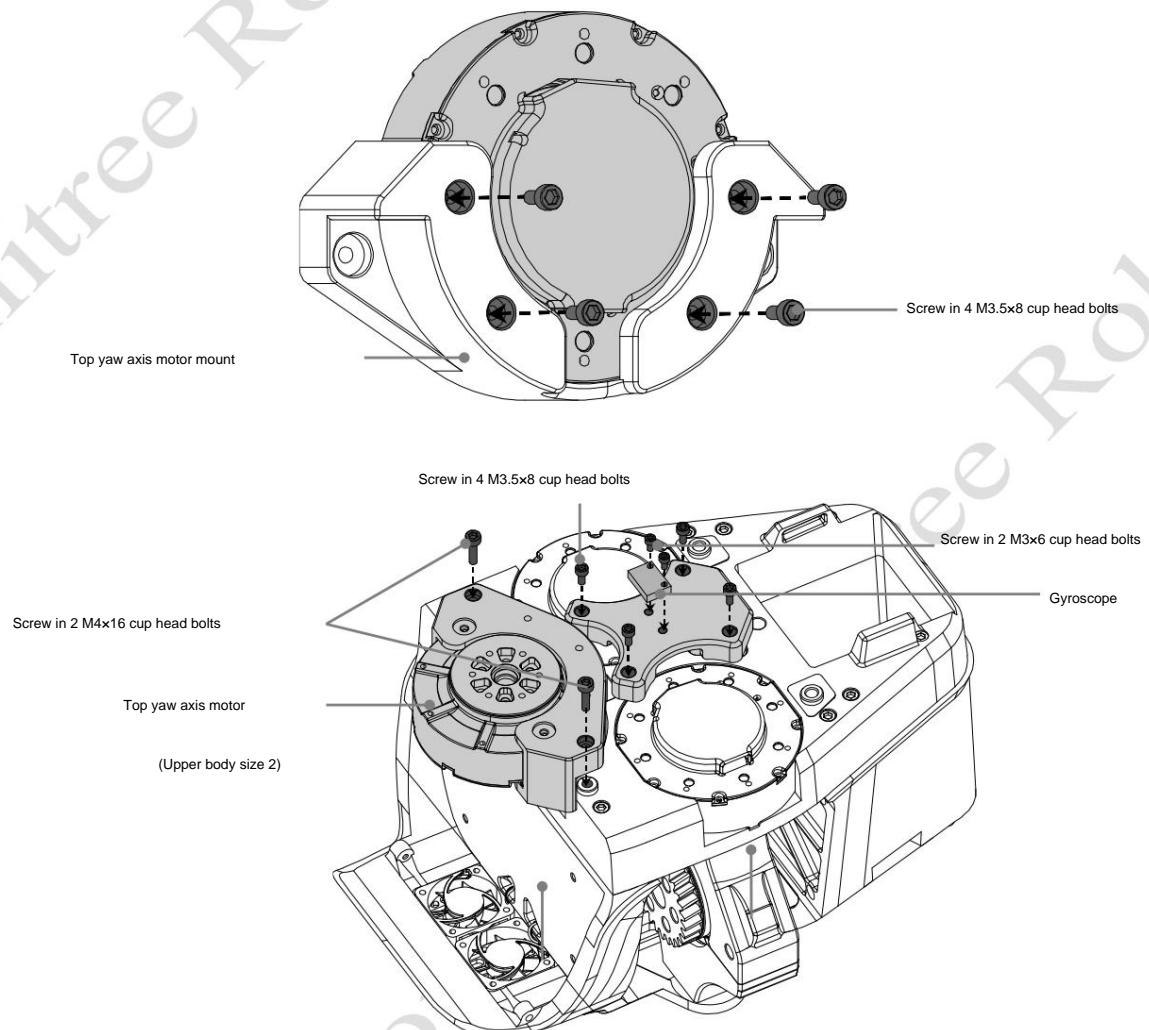


Figure 2.2.14 Top yaw axis motor and top gyroscope installation diagram

**Step 15:** Place the Raspberry Pi into the Raspberry Pi mount as shown.

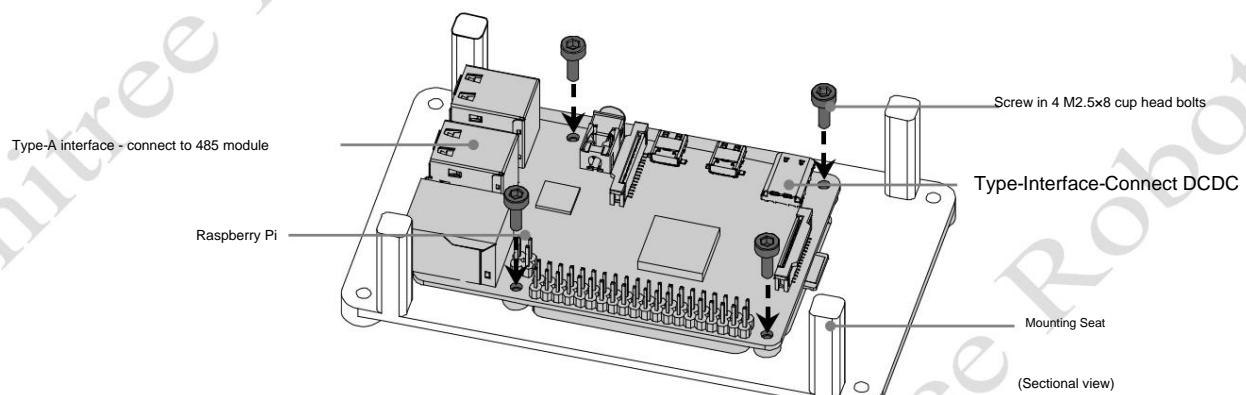


Figure 2.2.15 Raspberry Pi installation diagram

The meaning of the Raspberry Pi interface is shown in the figure below:

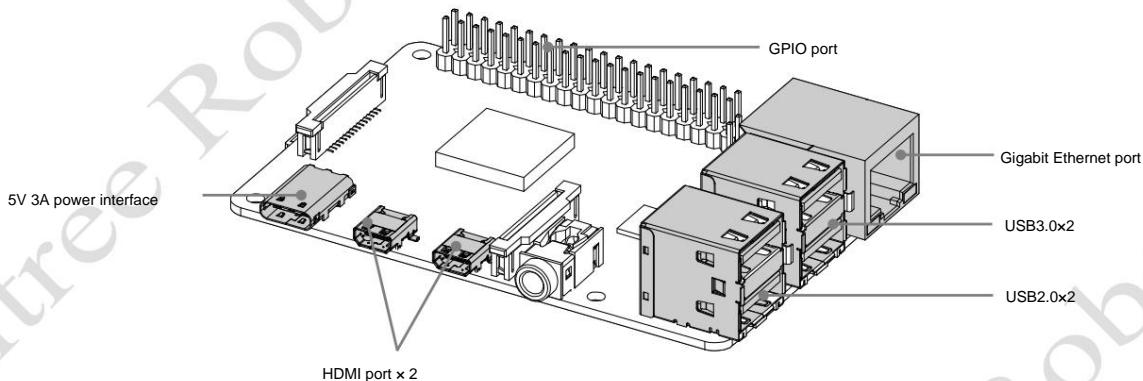


Figure 2.2.16 Raspberry Pi interface definition diagram

The GPIO expansion interface definition is shown in the following figure:

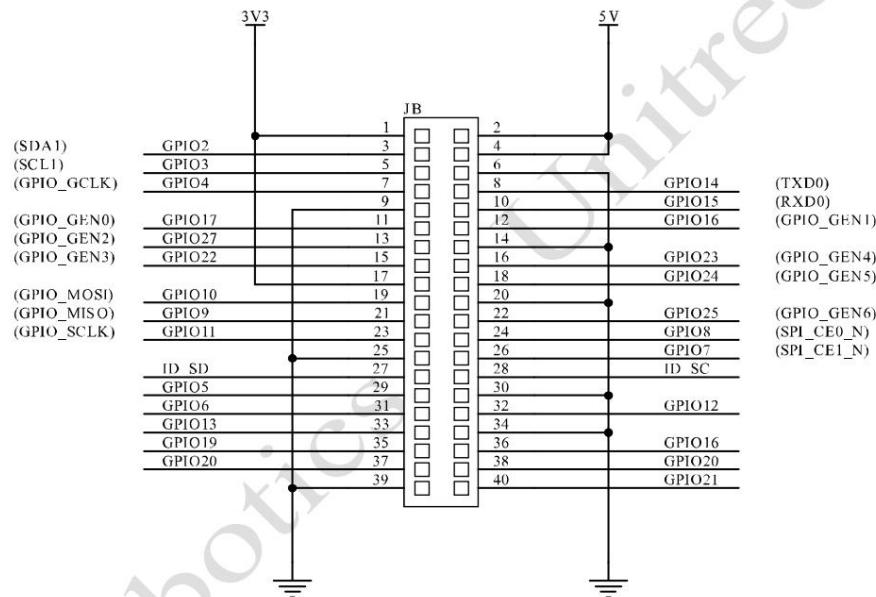


Figure 2.2.17 Raspberry Pi GPIO interface definition diagram

**Step 16: Install the USB-4X485 module and the power step-down module.** Before installing the power step-down module, solder the power cable.

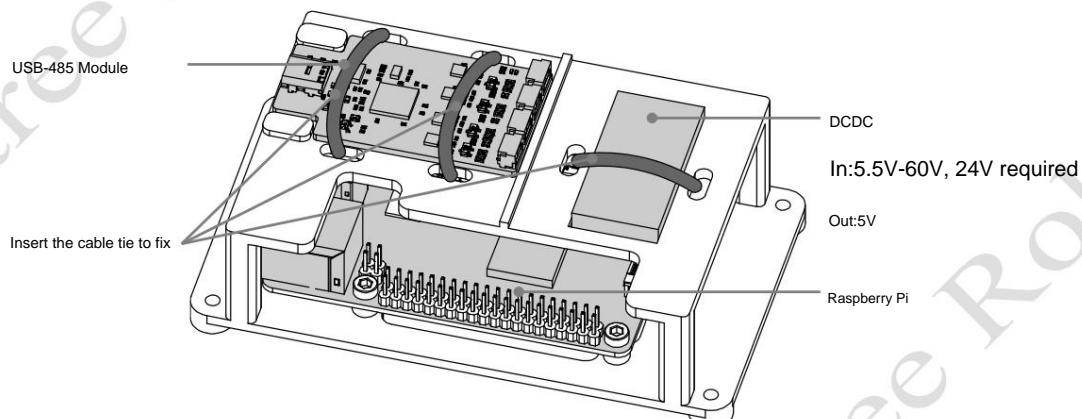


Figure 2.2.18 USB-4X485 module and power step-down module installation diagram

**Step 17:** Secure the hardware assembly to the main body of the device.

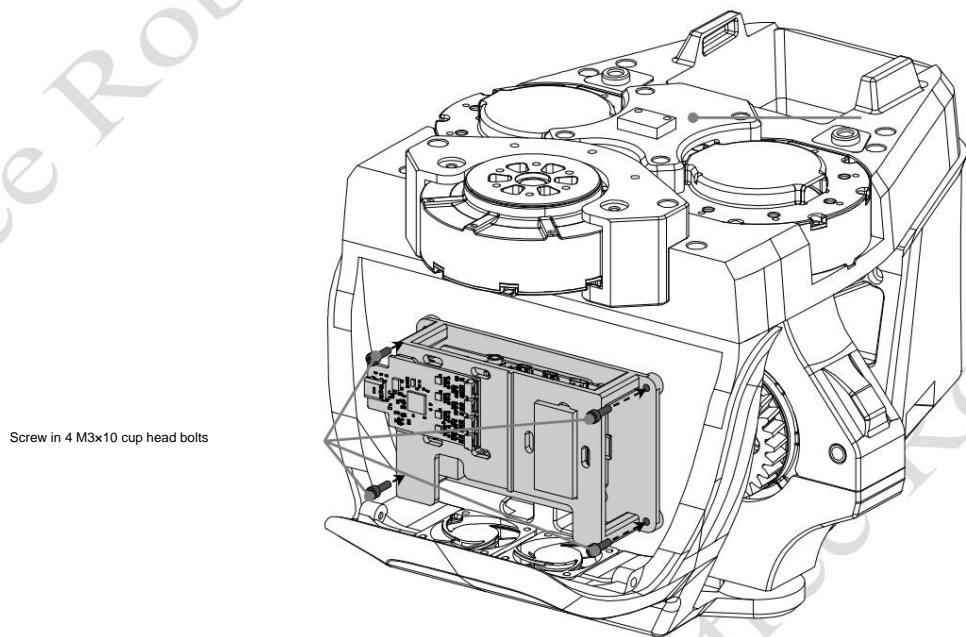
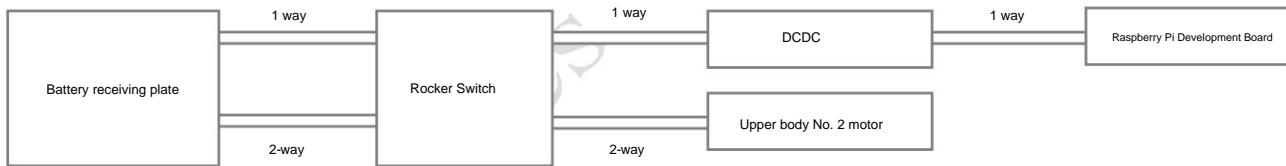


Figure 2.2.19 Hardware assembly installation diagram

### 2.2.2 Electrical connections

The main frame of the fuselage is reserved for reference:



The battery receiving board has two groups of positive and negative wires according to the schematic line sequence. Both groups are connected to the single-pole single-position boat-type switch contacts and pass through the main frame of the machine body.

One set is connected to the DCDC input, and the other set is connected to the upper body No. 2 (top yaw axis motor). The DCDC output is connected to the Raspberry Pi power input

Connect the USB port to power the development board.



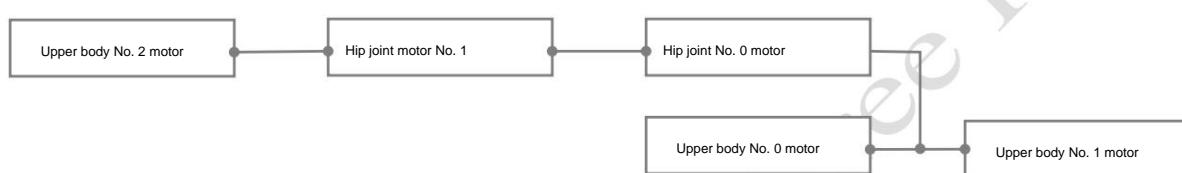
Attention! ÿ The line sequence of the system power supply and motor XT30 2+2-F is defined to avoid short circuit, open circuit, etc.

The fuselage body reserved line reference:

**Motor power line:** Upper body No. 2 (top yaw axis motor) as all motor power connection input, upper body No. 2 to hip joint No. 1 motor, hip

Joint No. 1 motor to hip joint No. 0 motor, hip joint No. 0 motor outlet wire welding connection into a T-shaped junction to upper body No. 0 motor, upper body No. 1 motor supply

electricity.



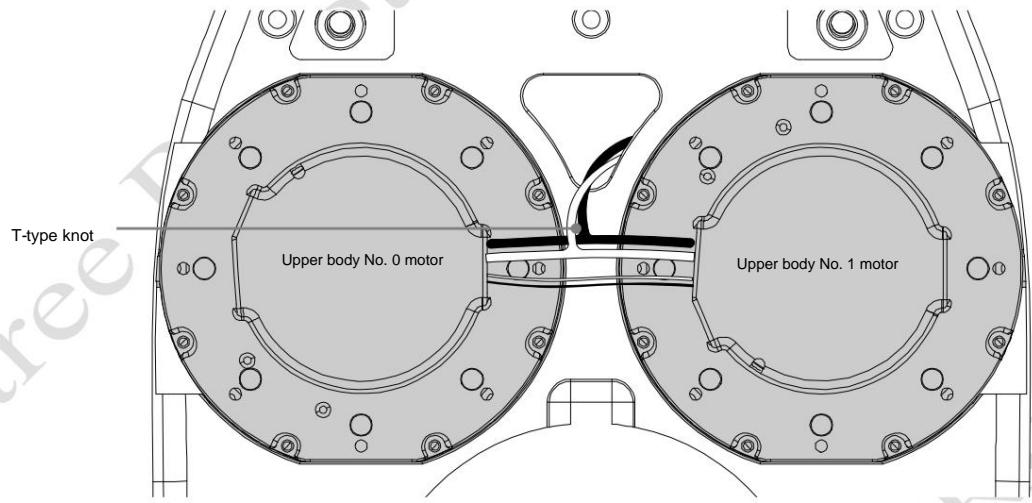
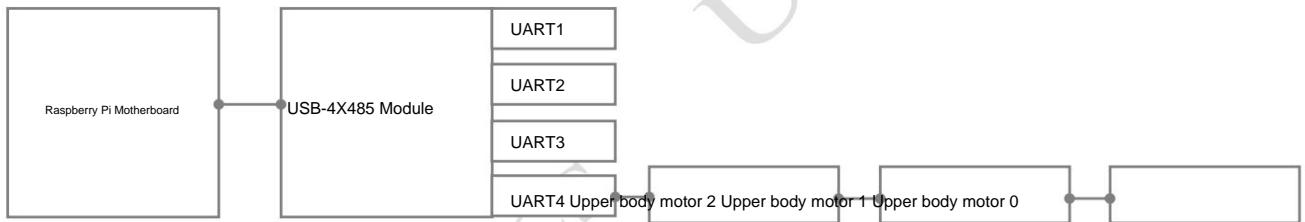


Figure 2.2.20 Schematic diagram of T-type connection

Motor communication line: From the USB3.0 interface of the Raspberry Pi motherboard to Type-A to Type-C, and then connected to the 485 adapter board.

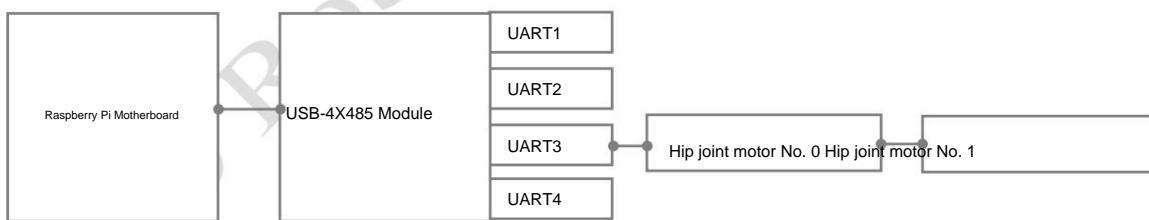
The **UART4** of the adapter board connects the 485A/B twisted pair to the upper body No. 2 motor; the upper body No. 2 motor connects to the upper body No. 1, and the upper body No. 1 motor connects to the upper body No. 0 motor.

machine, forming USB bus **UART4**.



The **UART3** of the adapter board connects the 485A/B twisted pair to the hip joint No. 0 motor, and the hip joint No. 0 motor to the hip joint No. 1 motor, forming a USB bus.

line **UART3**.



**Development board cooling fan power supply:** The development board GPIO2 (positive 5V) and 14 (GND) pins output 5V to power the outside.

**2.2.3 Overall installation effect of the fuselage**

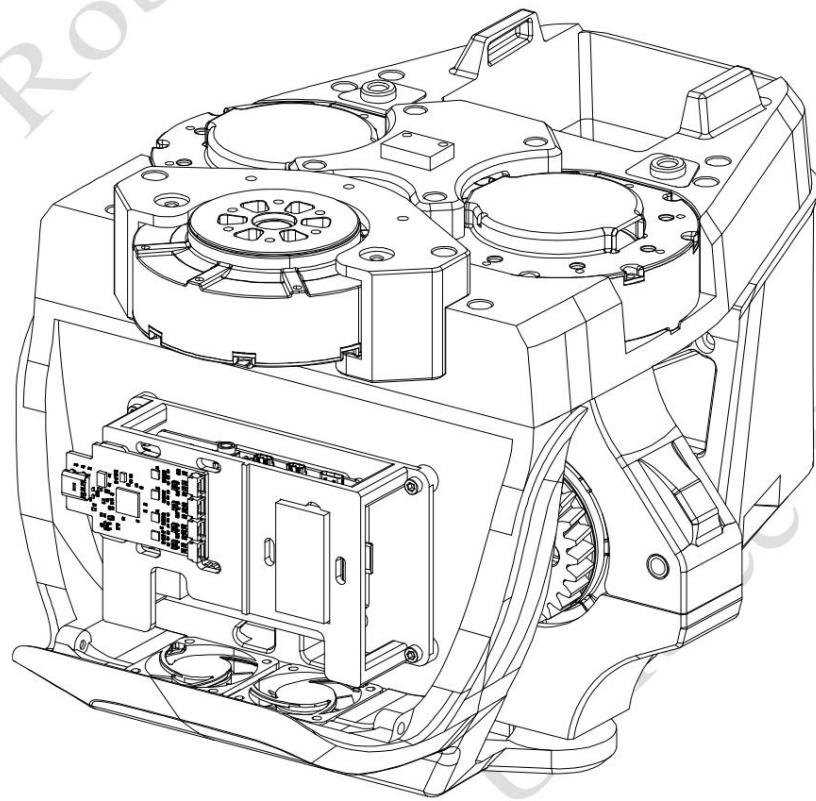


Figure 2.2.21 The effect of the whole fuselage after installation



Electrical connection is not shown in this figure. Please refer to the electrical connection section for cables.

## 2.3 Leg Assembly

### 2.3.1 Structural assembly

The left and right legs of the robot are mirror images of each other. The following only provides assembly instructions for the left leg. The right leg can be installed in a mirror image.

**Step 1:** Install two M8010 motors and two 3010 centrifugal fans into the left thigh body, and connect the fan and thigh motor circuits.

Pay attention to the direction of the fan inlet and outlet.

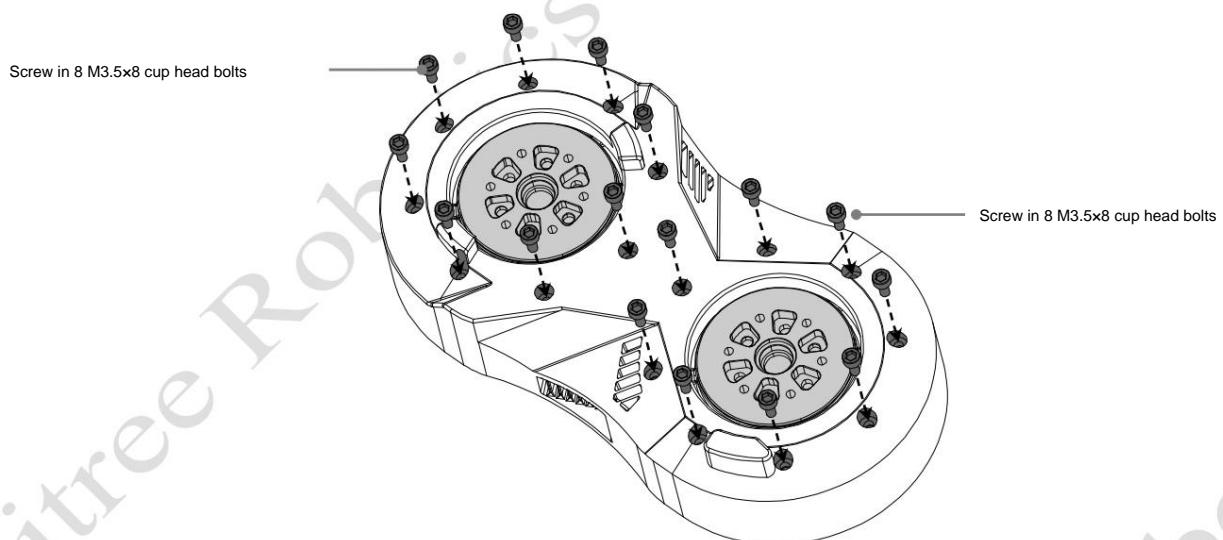
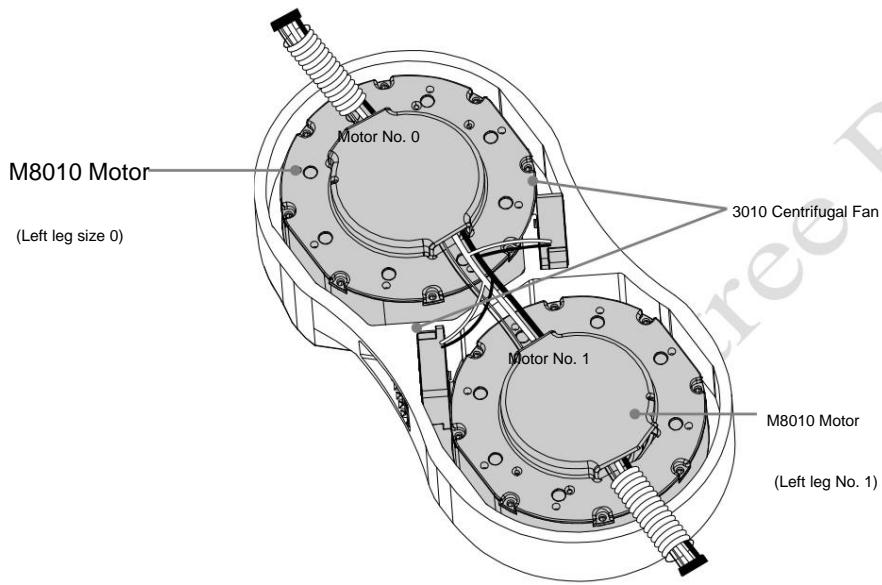


Figure 2.3.1 Left leg 8010 motor installation diagram

Table 2.3.1 3010 centrifugal fan specifications

model	size	Current and voltage	Speed	Wiring method
3010 Centrifugal fan 30*30*10mm		0.1A DC 24V	8000 RPM Red positive and black negative, combined with motor XT30U(2+2)-F	

**Step 2:** Connect the motor signal line as shown in the figure above, and cover the left thigh side cover. Before covering the side cover, make sure the corrugated tube protecting the line is

It fits in with the slot on the side cover without any misalignment.

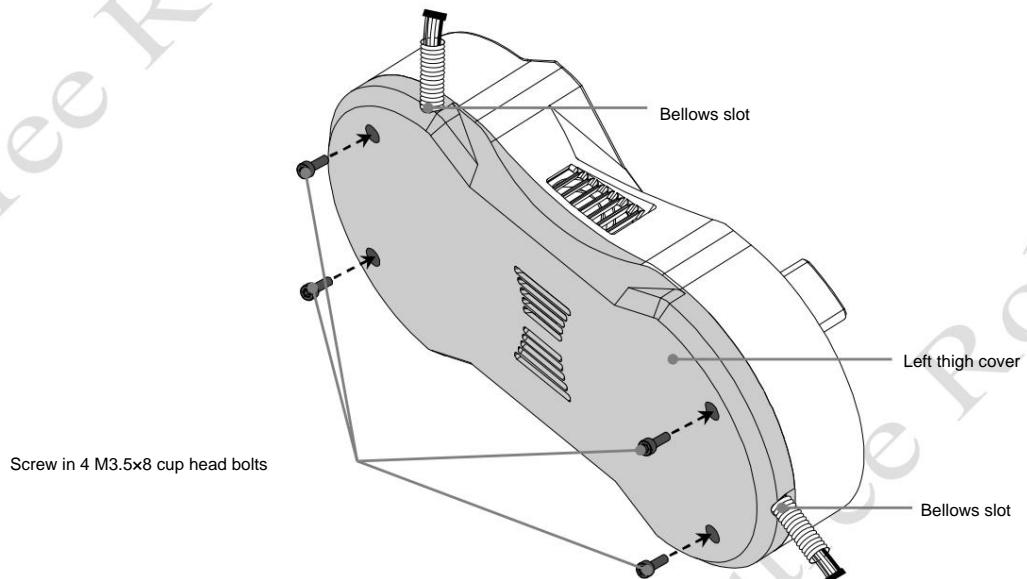


Figure 2.3.2 Installation diagram of left thigh cover

**Step 3:** Install an M8010 motor into the left calf body, as shown below.

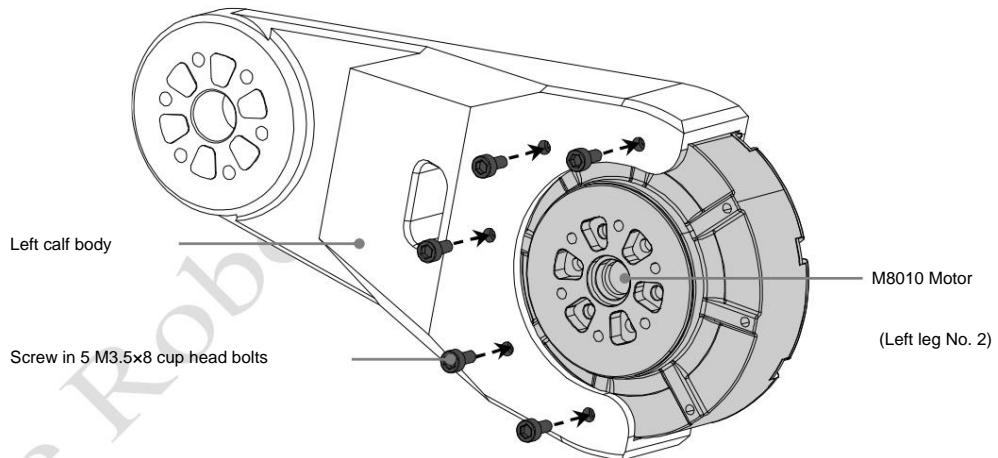


Figure 2.3.3 Left calf main motor installation diagram

**Step 4:** Install the left calf assembly and the left thigh assembly, and connect the left ankle motor power signal line. For details on the connection method, see Electrical Connection.

catch.

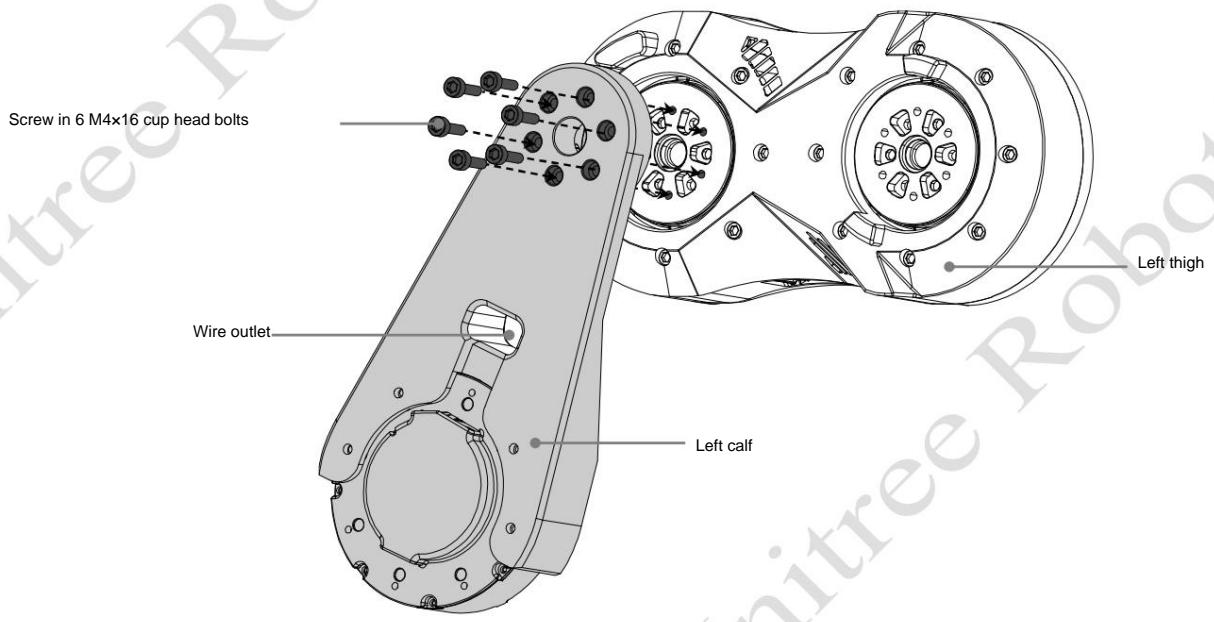


Figure 2.3.4 Installation diagram of left thigh and calf components

**Step 5:** Install the left ankle motor side cover, making sure that the bellows protecting the circuit fits into the slot of the side cover without misalignment.

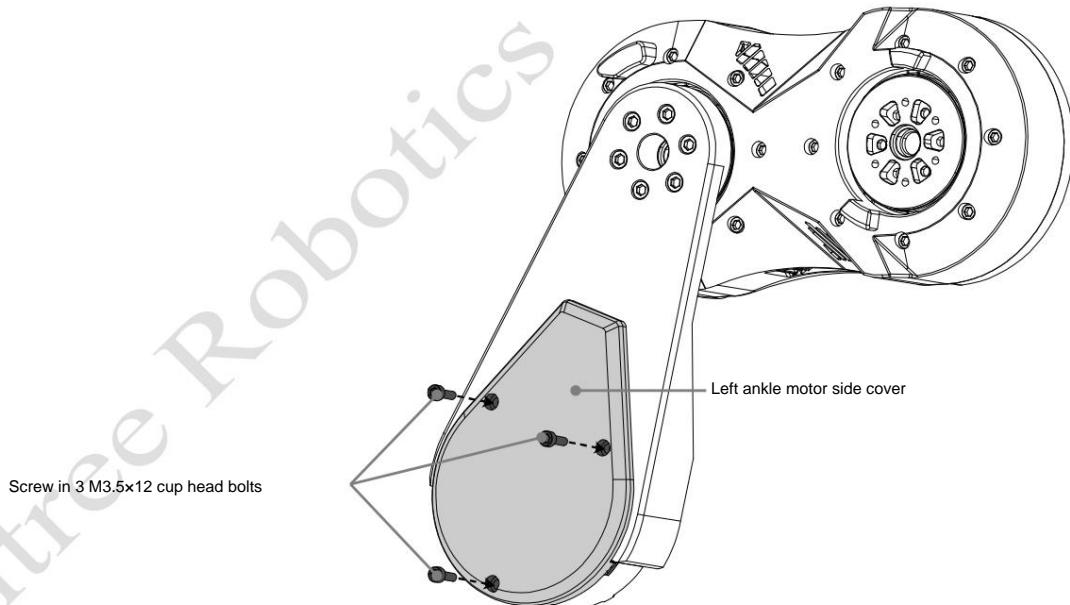


Figure 2.3.5 Installation diagram of the left ankle motor side cover

**Step 6:** Assemble the outside of the left foot, the sole of the foot, and the inside of the left foot.

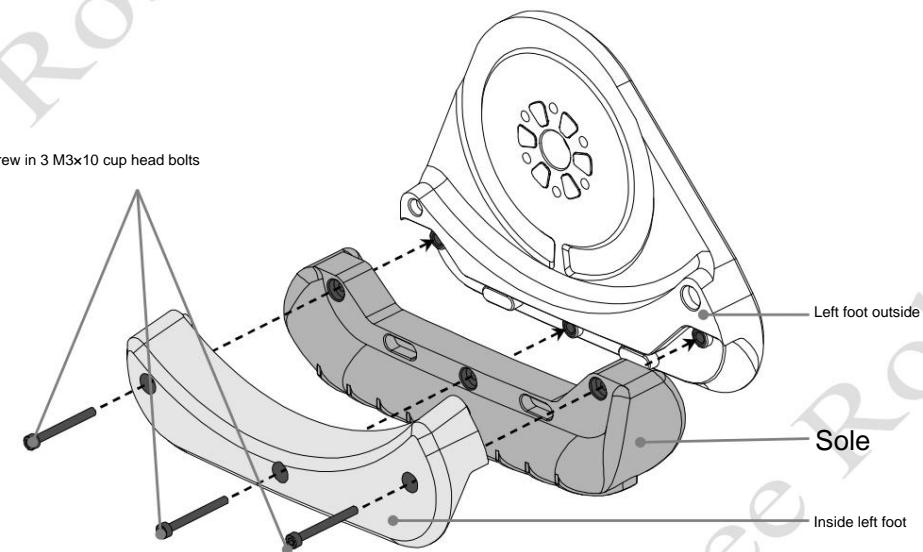


Figure 2.3.6 Left foot installation diagram

**Step 7:** Install the robot's left foot.

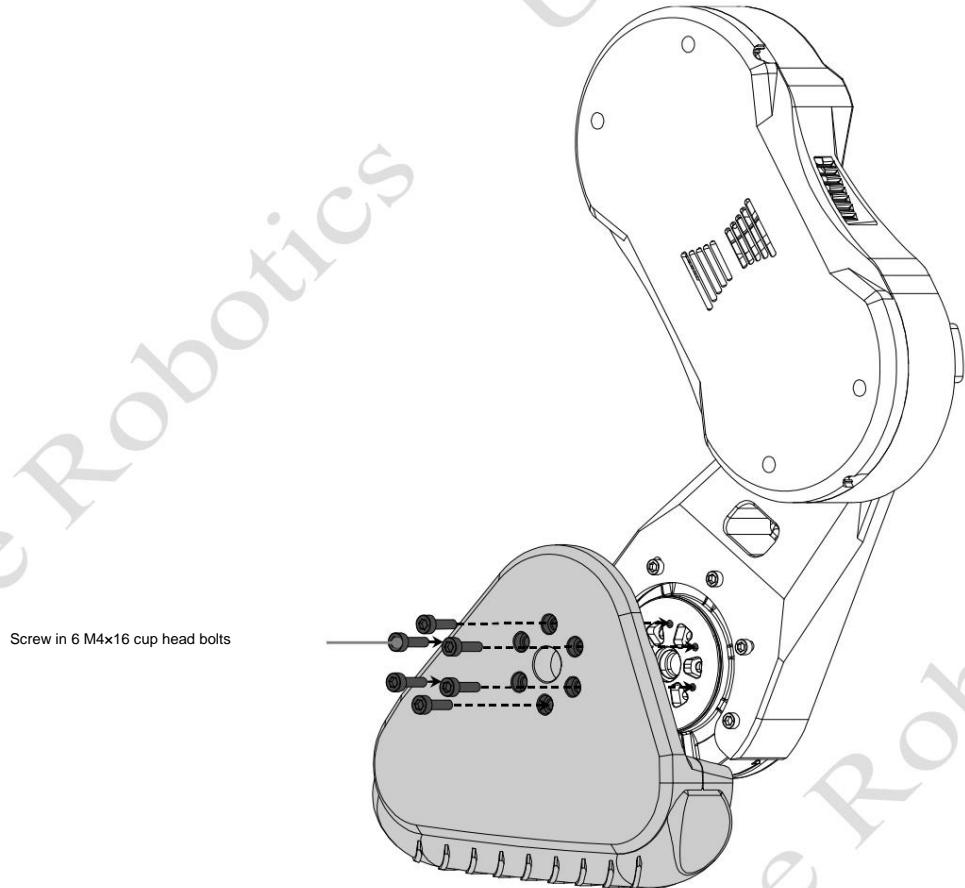


Figure 2.3.7 Left foot installation diagram

**Step 8:** Install the bearing with an inner diameter of 6mm, an outer diameter of 22mm and a thickness of 7mm into the bearing hole of the left side swing connector.

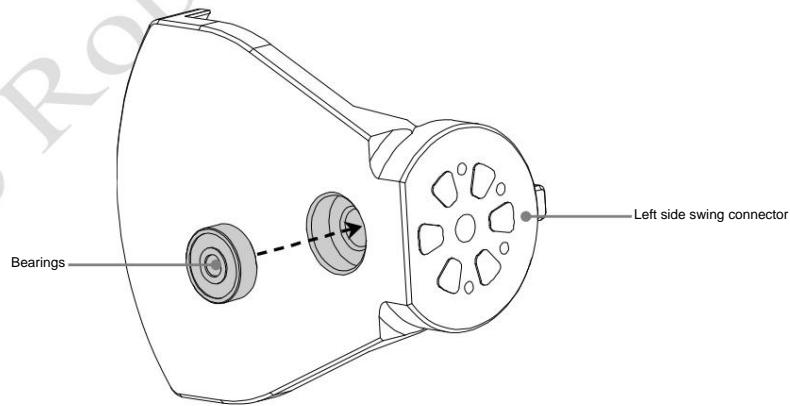


Figure 2.3.8 Bearing installation diagram of left side swing connector

**Step 9:** Install the left side swing connector and the left thigh motor

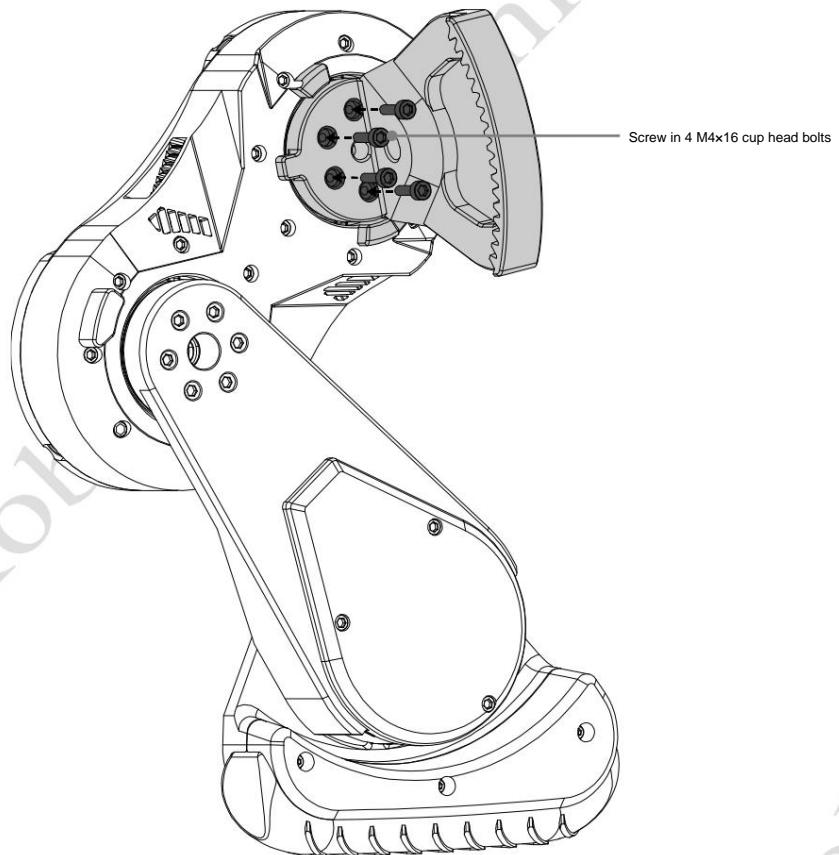


Figure 2.3.9 Installation diagram of the left side swing connector and the left thigh motor

**Step 10:** Install the left leg assembly on the main body of the fuselage, and install the right leg in a mirrored manner.

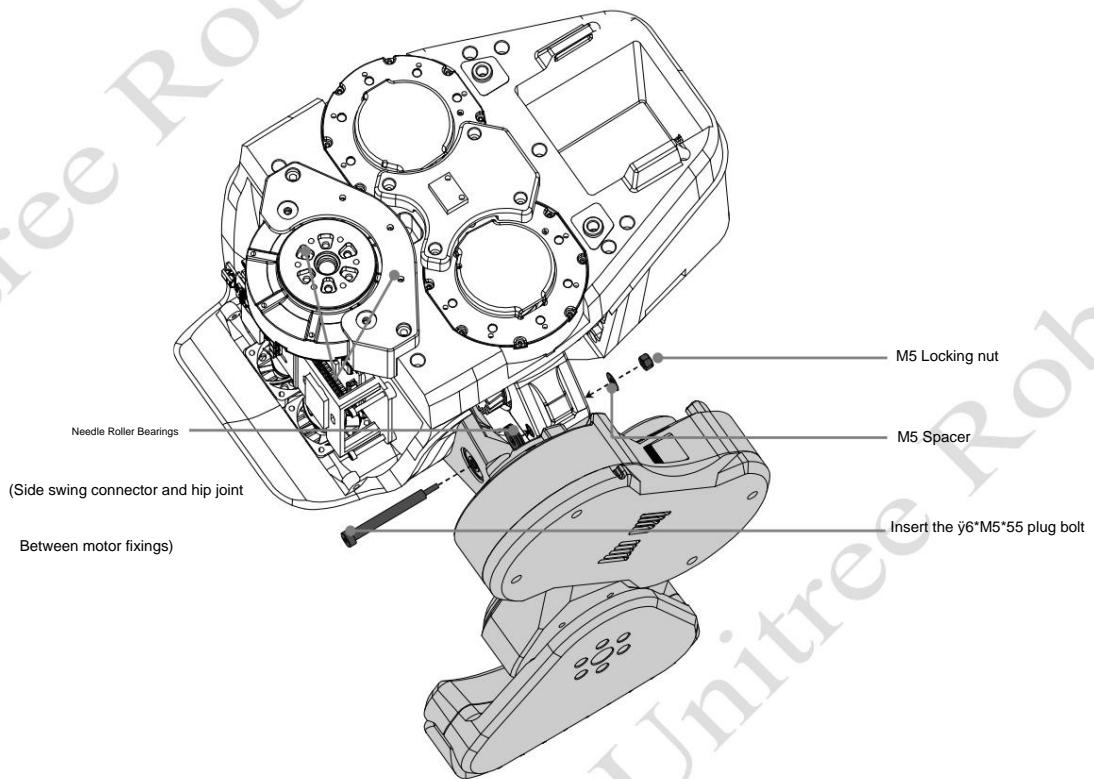


Figure 2.3.10 Installation diagram of left leg assembly

**Step 11:** Install the right leg in a mirrored manner.

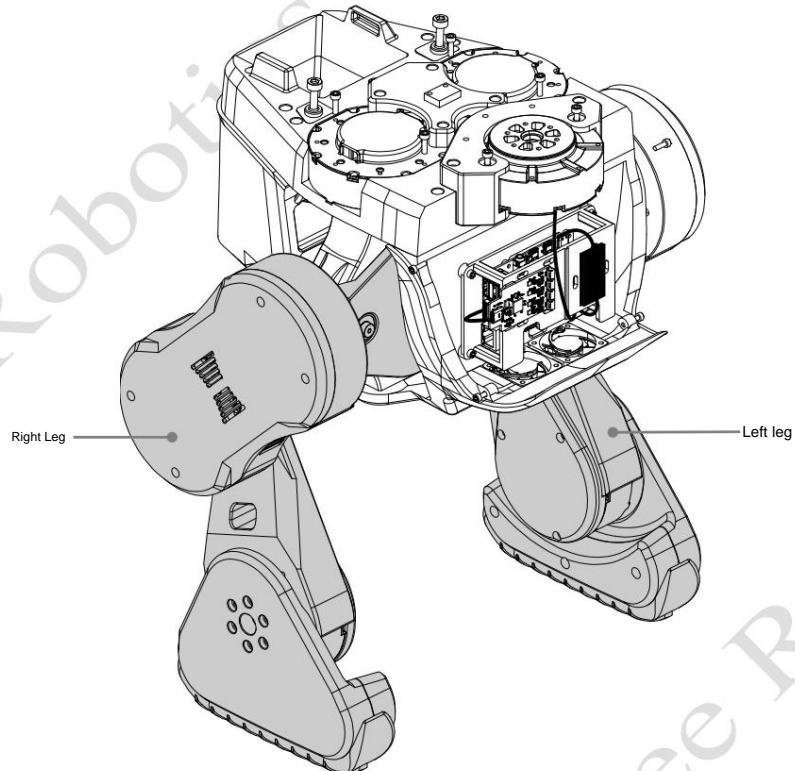


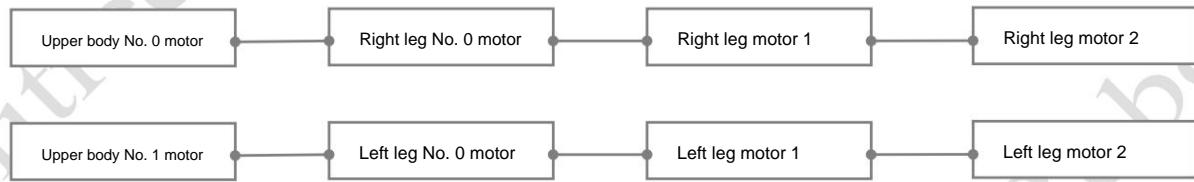
Figure 2.3.11 Right leg assembly installation diagram

### 2.3.2 Electrical connections

**Leg reserved crossing line reference:**

**Motor power line: upper body** No. 0 motor to right leg No. 0 motor, right leg No. 0 motor to right leg No. 1 motor, right leg No. 1 motor to right leg No. 2 motor

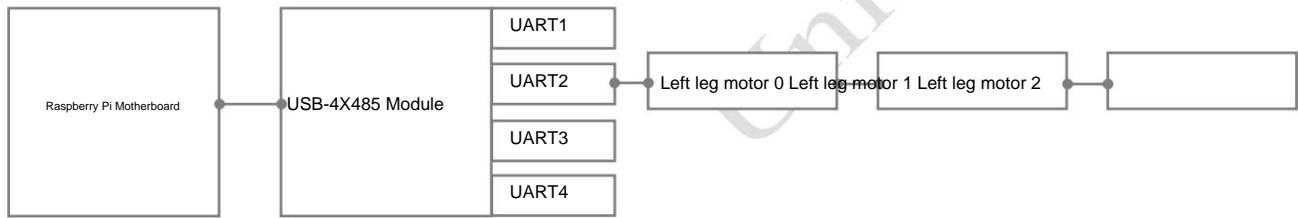
Motors. Upper body motor 1 to left leg motor 0, left leg motor 0 to left leg motor 1, left leg motor 1 to left leg motor 2.



**Communication line:** The USB3.0 interface of the Raspberry Pi motherboard is converted from Type-A to Type-C and connected to the 485 adapter board.

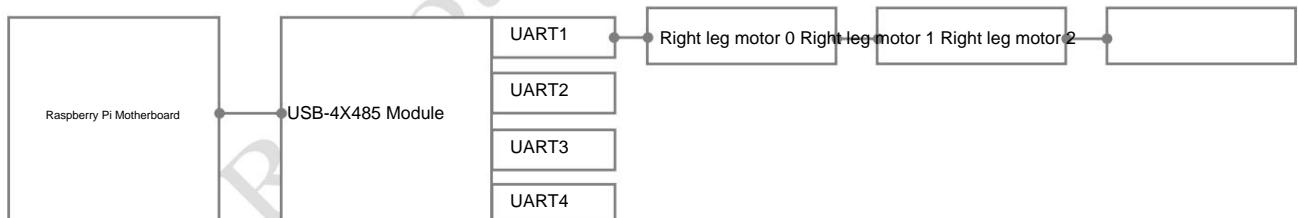
The **UART2** of the adapter board connects to the 485A/B twisted pair to the left leg 0, the left leg 0 motor to the left leg 1 motor, the left leg 1 motor to the left leg 2 motor

Motor, form USB bus UART2.



The **UART1** of the adapter board connects the 485A/B twisted pair to the right leg No. 0 motor, the right leg 0 to the right leg No. 1 motor, the right leg 1 to the right leg No. 2 motor,

Form USB bus UART1.



**Leg cooling fan power supply:** Incorporated into the leg motor XT30 2+2 power supply.

**2.3.3 Overall installation effect of the legs**

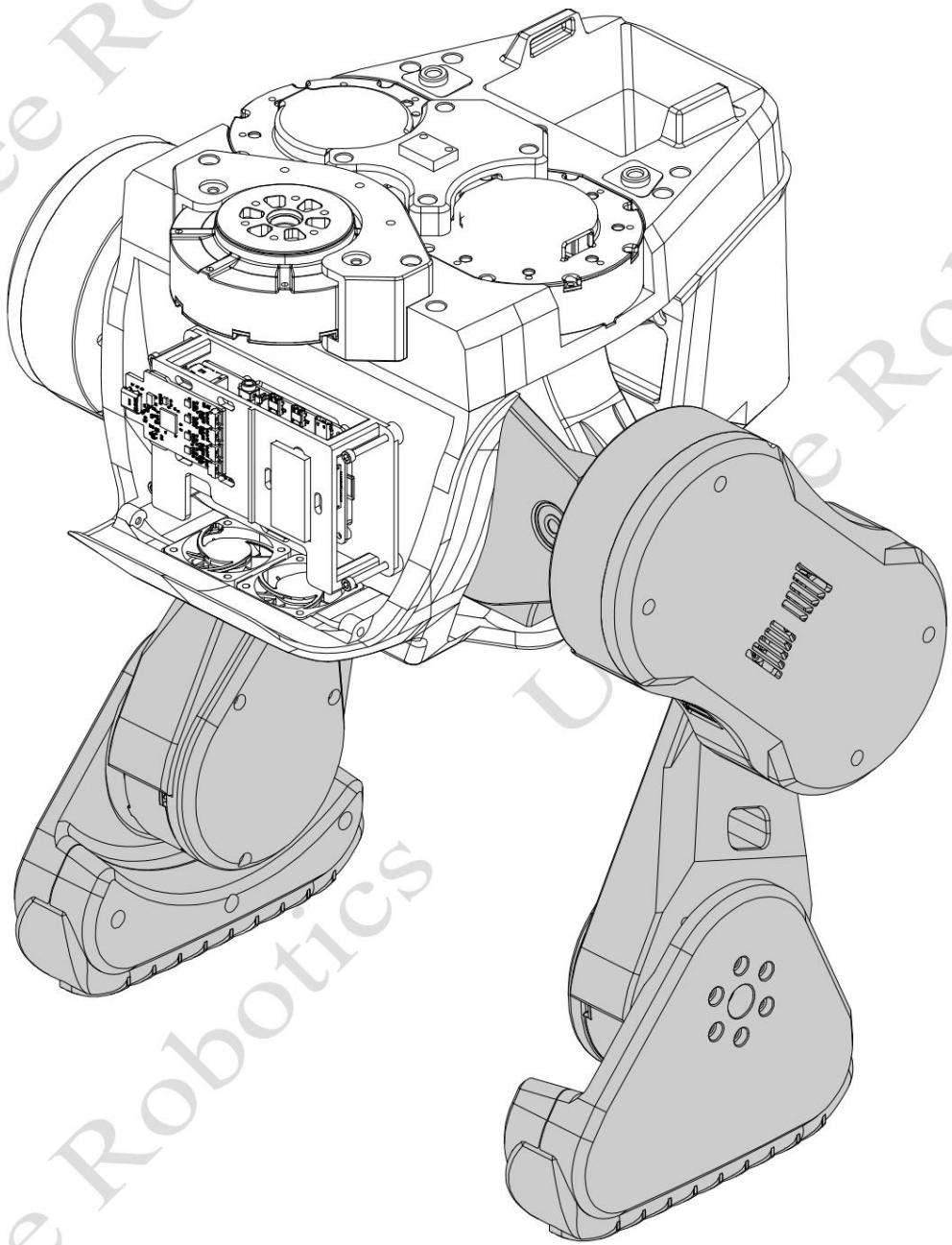


Figure 2.3.12 Effect after leg installation

## 2.4 Appearance parts assembly

**Step 1:** Install the left and right antenna decorations on both sides of the robot's face.

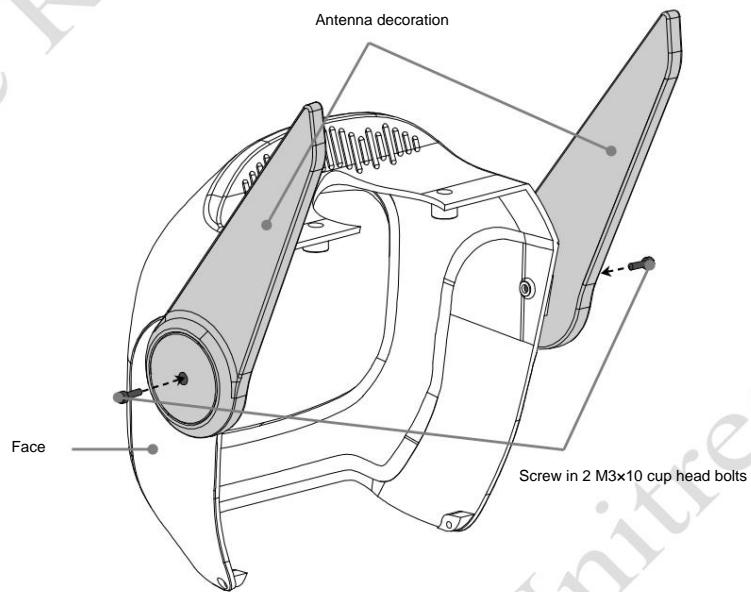


Figure 2.4.1 Installation diagram of facial antenna decoration line

**Step 2:** Install the robot face as shown below.

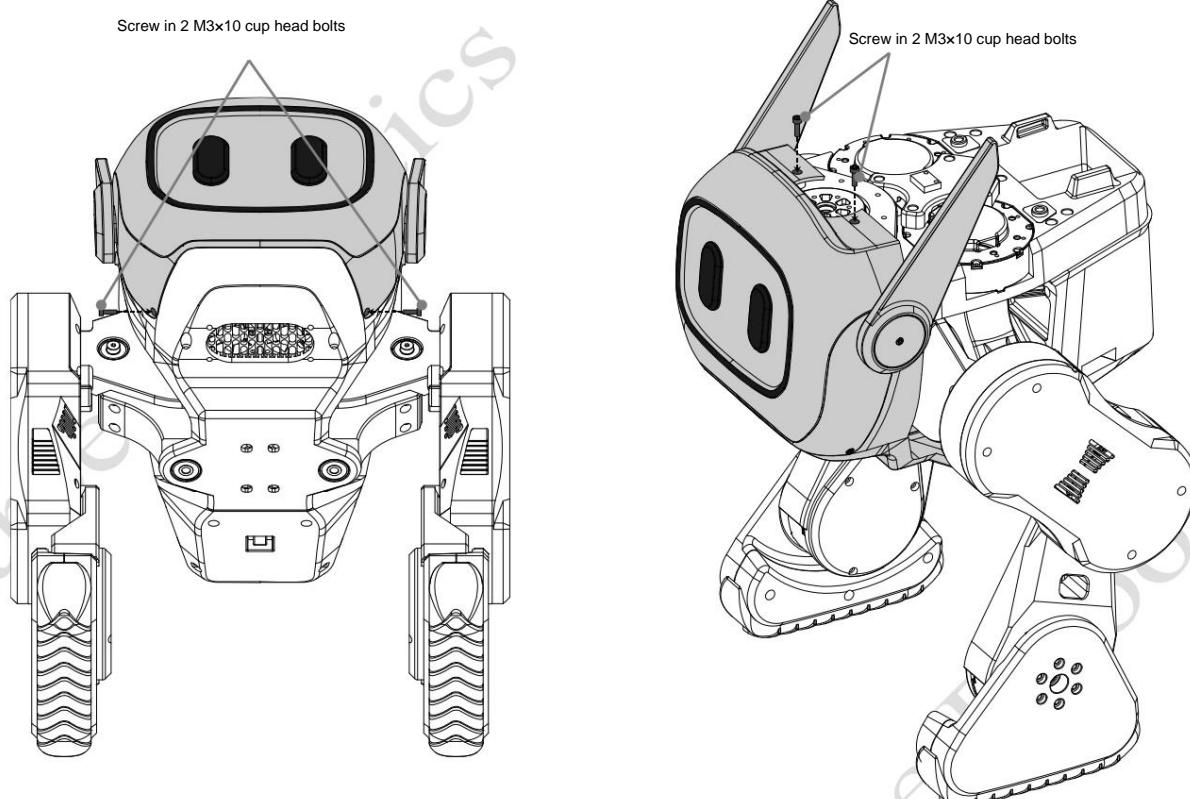


Figure 2.4.2 Robot face installation diagram

**Step 3:** Install the robot top cover as shown below.

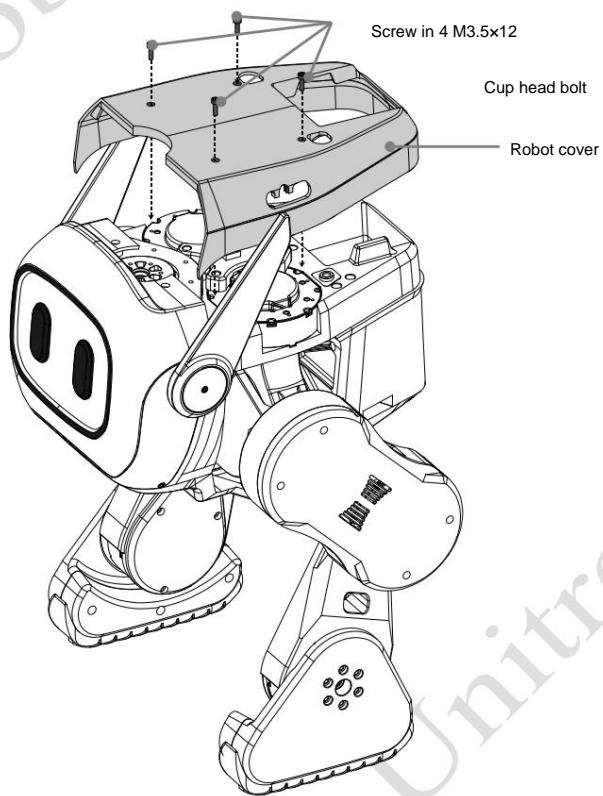


Figure 2.4.3 Robot top cover installation

**Step 4:** Install the top handle of the robot, as shown in the figure below.

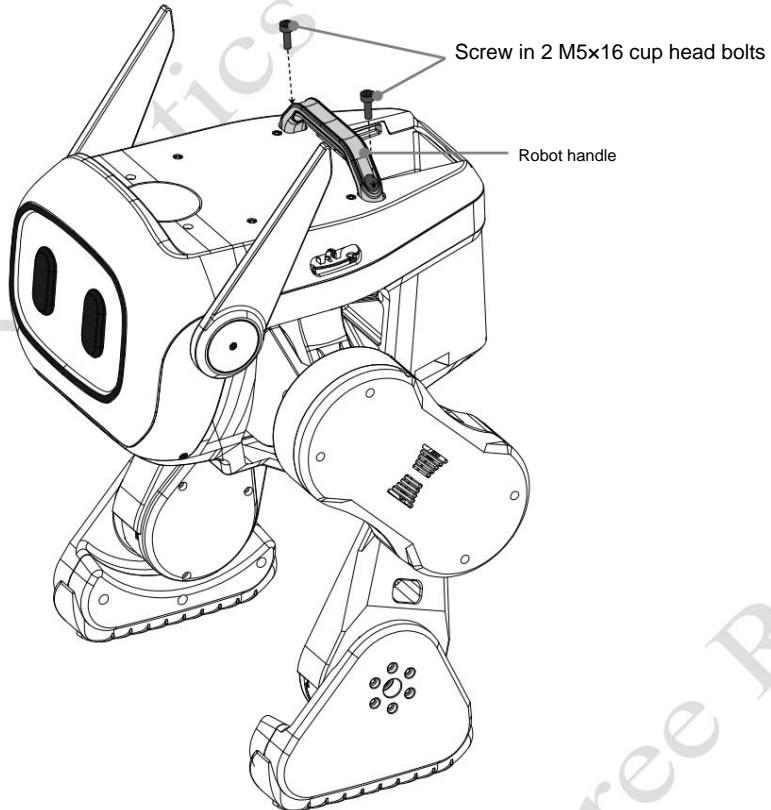


Figure 2.4.4 Installation diagram of the robot top handle

**Step 5:** Install the battery as shown below.

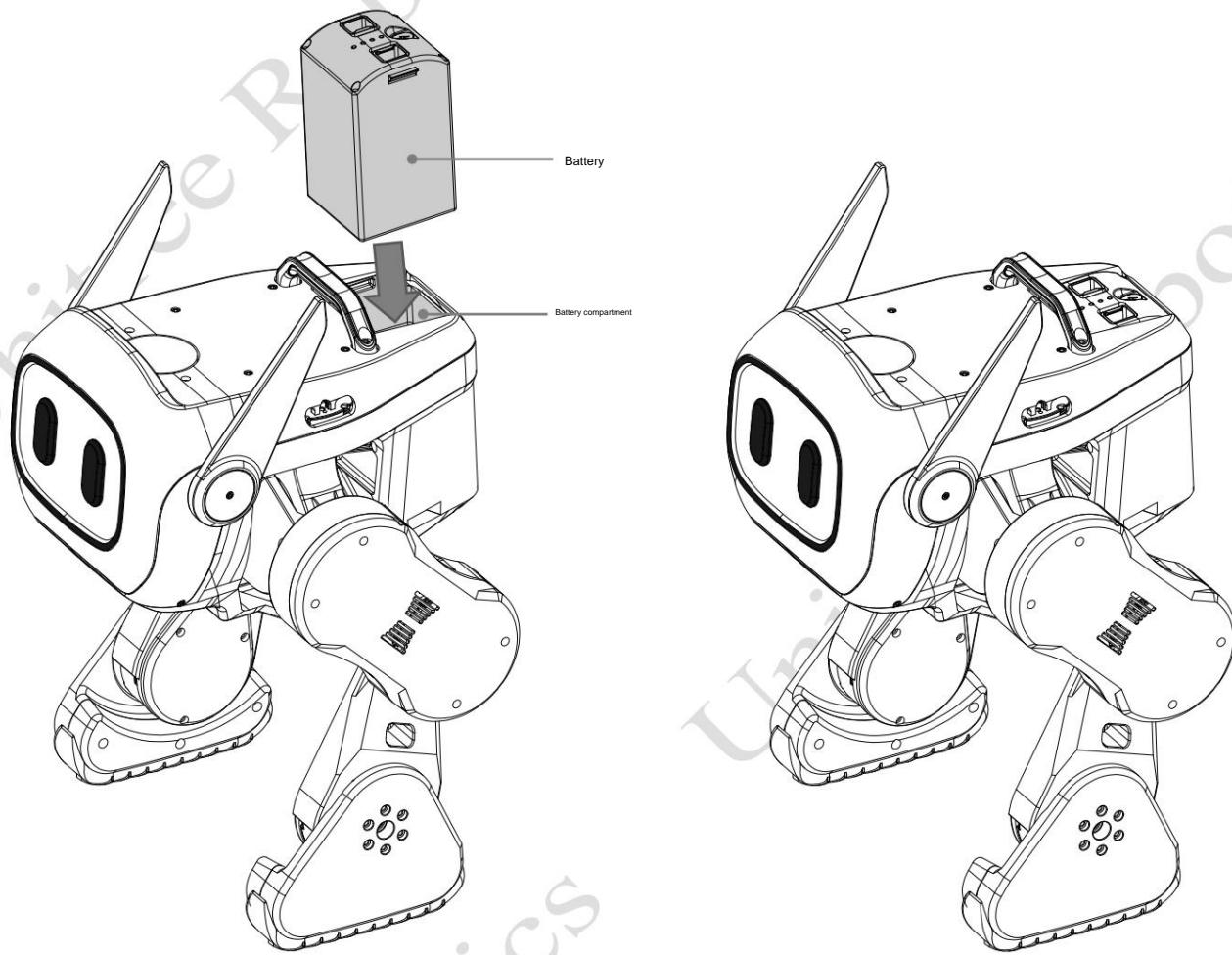


Figure 2.4.5 Battery installation diagram

### 3 总结

The open-source small bipedal robot is made of FDM 3D printing materials, aiming to provide low-cost and fast verification.

The robot hardware solution is verified. During the debugging process, especially in the case of external interference, the robot calf, side swing connector and other 3D printed structural parts,

It is easy to break, bend and other damages. It is recommended to use high-strength materials such as ABS/PLA-CF/PETG-CF for printing.

The end is currently printed with TPU filaments. For smooth tile floors, the foot may slip. We will also launch more

The foot end is non-slip and soft. For any deficiencies in this open source, please point them out to improve the open source solution together.

Developers can propose more novel and excellent designs and enrich the open source community environment.

## 4 附录

Table 4.1 Bill of Materials

Material Name	Specifications	Dosage	Remark
8010 Motor	/	11	Unitree Official Sales
4-channel 485 to USB module	/	1	Unitree Official Sales
Battery and adapter assembly	GO1 Battery and Adapter Assembly	1	Unitree Official Sales
Step-down switching power supply module	TPS5450, output 5V	1	<a href="#">Reference Links</a>
KCD1 Rocker Switch	Rocker switch/red with light/3 feet 2 levels	1	<a href="#">Reference Links</a>
3010 Fan	30*30*10mm turbine[24V]	4	Standards
4010 Fan	40*40*10MM DC5V-5100rpm	2	Standards
Accelerometer Gyroscope	GY-91 MPU9250+BMP280 10DOF	1	Standards
Raspberry Pi 4 Model B	Single motherboard 8GB	1	Standards
304 Stainless Steel Hollow Bushing	Φ6*8*35	2	Standards
Hot melt nut	M5*10*7	10	Standards
Hot melt nut	M4	1	Standards
Hot melt nut	M3	20	Standards
12.9 grade hexagon socket head screw	Diameter 6*M5*16	2	Standards
12.9 grade hexagon socket head screw	Diameter 6*M5*55	2	Standards
Hexagon socket screw 304 cup head full thread	M2.5*8	4	Standards
Hexagon socket screw 304 cup head full thread	M3*6	2	Standards
Hexagon socket screw 304 cup head full thread	M3*10	8	Standards
Hexagon socket screw 304 cup head full thread	M3*14	4	Standards
Hexagon socket screw 304 cup head full thread	M3*30	6	Standards
Hexagon socket screw 304 cup head full thread	M3.5*8	68	Standards
Hexagon socket screw 304 cup head full thread	M3.5*12	12	Standards
Hexagon socket screw 304 cup head full thread	M3.5*16	5	Standards
Hexagon socket screw 304 cup head full thread	M4*14	28	Standards
Hexagon socket screw 304 cup head full thread	M4*16	39	Standards
Hexagon socket screw 304 cup head full thread	M4*20	6	Standards
Hexagon socket screw 304 cup head full thread	M4*25	9	Standards
Hexagon socket screw 304 cup head full thread	M5*16	2	Standards
Locknuts, washers	M5	4	Standards
Plane needle roller bearings	Inner diameter 6mm, outer diameter 22mm, thickness 7mm	6	Standards
Cable Ties	/	3	Standards
Wire	16, 17AWG	1	Standards
Wire connector	XT30U(2+2)-F	1	Standards
Corrugated hose	The inner diameter is 50mm, the outer diameter is 57mm, and the socket depth is 14mm	1	Standards

## 5 修订历史

Table 5.1 Revision History

Version	date	Modifications
1.0	2025/5/17	Initial release

Unitree Technical Support

Unitree Support

<https://www.unitree.com>

The content is subject to update without further notice

You can get more documents on the Unitree official website

<https://www.unitree.com/download>

If you have any questions or suggestions about the manual, please contact us at the following

E-mail address: support@unitree.cc

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