

japonés → inglés ▾

⋮ ⌂



Let's summarize the assembly points of Mini Pupper

♡ 6



ThousanDIY (Masawo Yamazaki)

February 26, 2022 09:10



Mini Pupper is a quadruped walking robot from MangDang Technology of China, which raised 57 million yen (HK \$ 3,900,000) on Kickstarter .

Mini Pupper: Open-Source, ROS Robot Dog Kit

Mini Pupper will make robotics easier for schools, homeschool

www.kickstarter.com

Currently (February 2022) ,a campaign is underway at Makuake in

Japan.

[www.makuake.com](https://www.makuake.com/project/mangdangtech/mini-pupper/)

Both beginners and professionals can enjoy it! Robot dog "Mini Pupper" that you can make your...

Mang Dang Technology 🎨 product

- ¥26,341,000 • 466 people
- ⏳ 1 day left

8780%

This is a video of what was actually completed. It's more fun to move than I expected.

tomorrow56@最近は分解の人(モ3済) 
@tomorrow56

Replying to @tomorrow56

よし！リモコンで動いた！これは楽しい！
[#100日後に動き出すMiniPupper](#)
93日前倒ししたww

[Watch on Twitter](#)

11:35 AM · Feb 12, 2022 from Sapporo City Chuo Ward, Hokkaidō 

 36  Reply  Copy link

[Read 2 replies](#)

今回は評価機を提供していただけましたので、組立て苦労したポイントをまとめてみます。

組立の実況中継をツイッター

組立にあたっては、まとまった時間を取りなかつたので、毎朝1-2時間と時間を作つて組立状況をツイッターで実況しました。

tomorrow56@最近は分解の人(モ3済)
@tomorrow56

#minipupper 日本代理店からの評価機が届きました。これから開封～

3:41 AM · Feb 6, 2022

(i)

[Read the full conversation on Twitter](#)

132 [Reply](#) [Copy link](#)

[Read 1 reply](#)

組み立てにあたっては、公開されている手順書でわかりにくい部分や現物と

異なる部分がありましたので、実際の組み立て手順に従ってまとめていきます。

組立て前の準備

組立手順書の入手

本体には組立手順書は同梱されていません。

手順書は以下で公開されていますので、これを見ながら順番に組み立てていきます。手順書は英語と日本語が併記されています。

Assembly — Mini Pupper 1.0.0-alpha document ation

mangdang-minipupperdocs.readthedocs-hosted.com

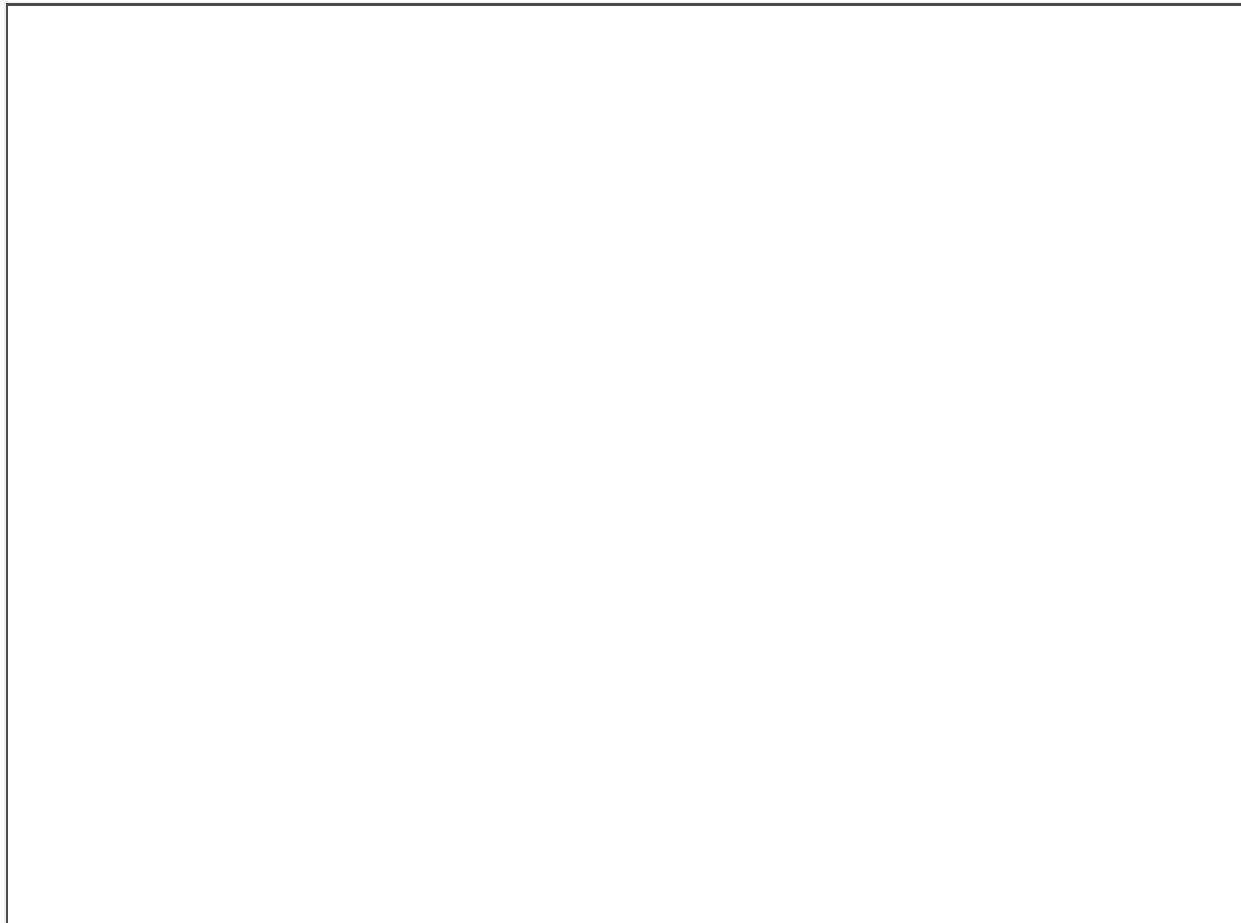
また、各種ドキュメントや設計データはオープンソースとしてMangDang社のGitHubで公開されています。

GitHub - mangdangroboticsclub/QuadrupedRobot at MiniPupper

Open-Source,ROS Robot Dog Kit. Contribute to mangdangrobotics
[github.com](https://github.com/mangdangroboticsclub/QuadrupedRobot)

開封の儀

外箱を開けると、各部品は個包装されていて、スポンジのクッションで固定されています。予想よりきちんとっています。



開封の儀

本体パーツは白い箱に収められています。箱の中は余裕があります。
中国製のキットはギチギチに詰め込まれているものを見かけることが多く、
これはきちんとしているという印象です。





本体の格納箱には余裕がある

赤い箱にはRaspberry Pi 4(以降、ラズパイ)とコントローラボード(カスタム回路基板)が入っています。現在、調達が非常に困難なので、苦労が想像されます。



Raspberry Pi 4とコントロール基板

付属のリモコンはPS4互換です。Binbok製のこちらの色違いのようです。





付属リモコン

ちなみにリモコンのボタンの表示がPS4純正品と異なっています。組立手順書ではPS4のボタン名で記載されていますので、以下を参考にボタン配置を確認しておきます。

各部の名称とボタン配置 | サイバーガジェット

www.cybergadget.co.jp

Charging the battery pack and remote control

Charge the battery pack and remote control before you start assembling.

In particular, the **attached remote control does not enter pairing mode during charging**, so it is recommended to charge it before assembling.



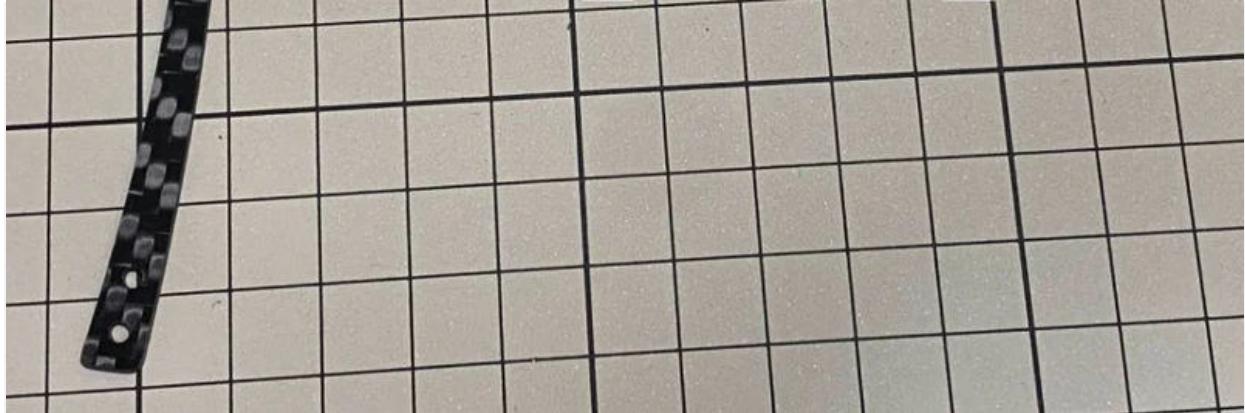
Charge the remote control first

Leg assembly

Assembly of leg parts

First of all, I will assemble the legs. Check the required parts based on the photos in the procedure manual.





Step manual parts

Most of the leg parts are in a cohesive bag. However, please note that **the parts ① and ⑥ are in the servo bag**.

Since the part of ④ is a combination of three parts, adjust the length so that the position of the spherical bearing matches the hole position of ⑤ as shown in the picture below.



Adjust the length of ④ to match the hole position of ⑤

First, fix ① and ② with **M2x5mm** bolts. Use the included M2 hex wrench to tighten the bolts. However, the attached wrench is quite loose with respect to the bolt holes, so it is recommended to prepare a proper hex wrench separately.



Fix ① and ② with bolts

Attach the part (3) to this using **M2x8mm** bolts and M2 lock nuts. Tighten the lock nut using the included spanner.



Tighten the nut with the included spanner



With the parts of ③ attached

Next, fix the servo horn ⑥ to the leg part ⑤ with **M2x5mm** bolts. Be careful not to mistake the mounting direction of ⑥ and the direction of the bolt.



Fix ⑤ and ⑥ with bolts

Attach ⑦ to this part using two sets of **M2x12mm bolts, M2 lock nuts, and ball bearings.**

Since a set of ball bearings is divided into three parts, the part with the ball in the middle is sandwiched with the grooved side of the upper and lower parts facing inward.



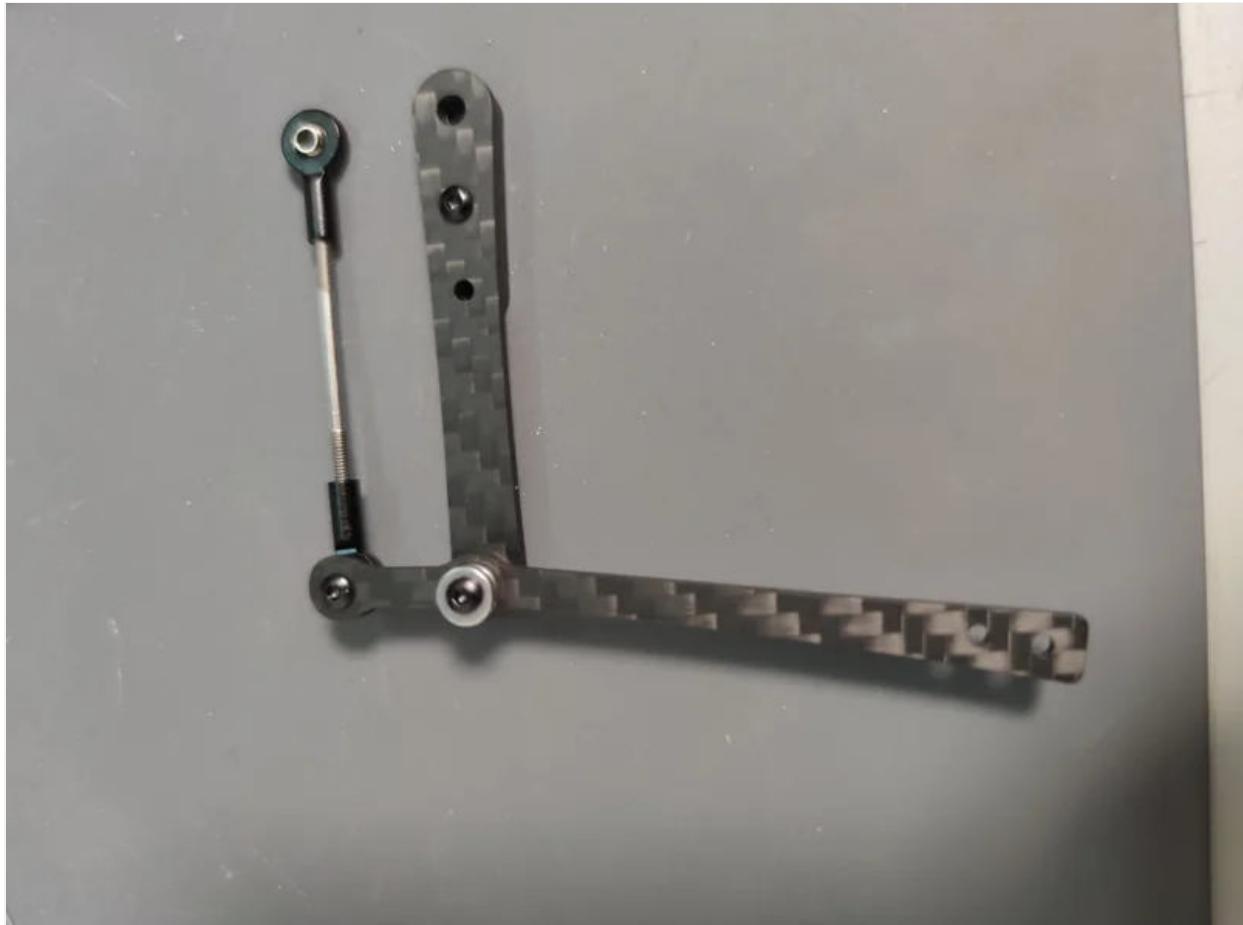
⑦ is installed

Bolts, ball bearings, lock nuts and other parts are passed through the bolts in order and fixed with the lock nuts, referring to the pictures below.



Installation order of bearings and parts

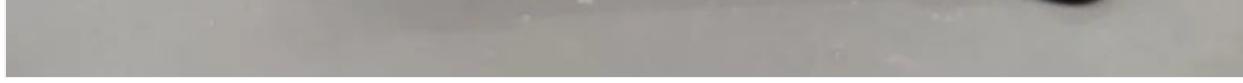
Fix the spherical bearing part of ④ to this using **M2x8mm** bolts and M2 lock nuts.



Attach the bearing part of ④ with bolts

Please refer to the picture below for the mounting orientation.





Mounting orientation

Attach the parts ① to ③ that were first assembled to this part with **M2x8mm** bolts and M2 lock nuts to form a link structure.



Assembled link structure legs

Assemble 4 left and right. Since the combination of the front and back of the parts is different on the left and right, assemble each by referring to the following pictures.

After assembling , **fix the lock nut part with Loctite** so that it will not come loose . Since there is no Loctite this time, I will substitute it with correction fluid.



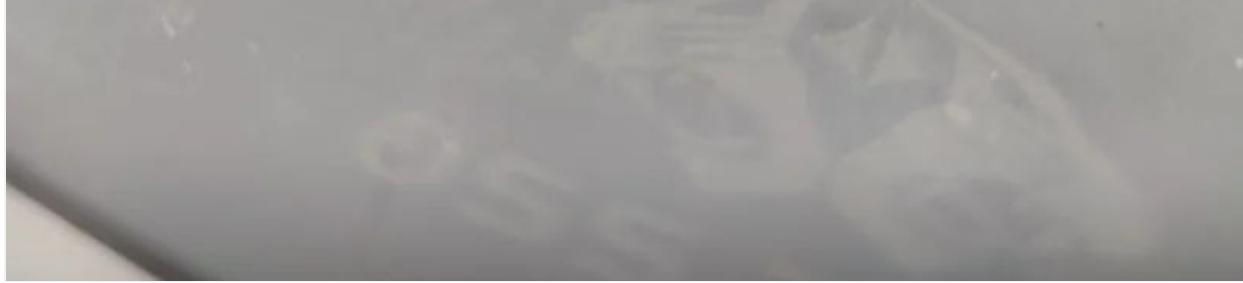


4 legs

Attach it to the servo horn of ⑥ and the hole in the middle of ③ using **M2x14mm** bolts and two sets of ball bearings.

Since the servo horn will be fixed to the servo later, leave it as it is without fixing it with the nut.





Installation order of bearings and parts



With bolts attached

Assembling the buttocks parts

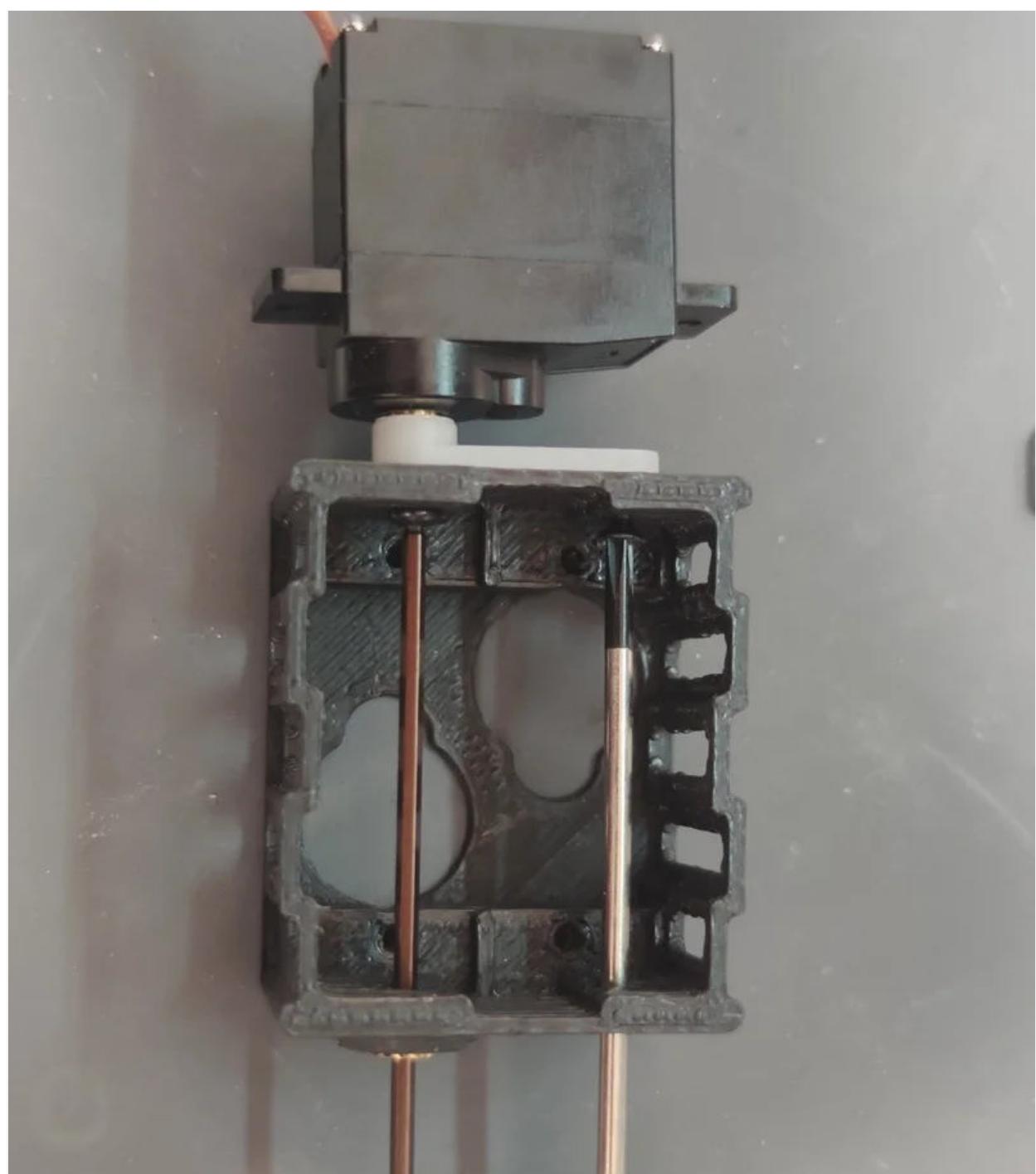
Next, attach the servo to the buttocks parts. **Servos have lead lengths of 9 cm and 15 cm .**

As for the buttocks, the orientation of all parts is different in the front, back, left and right, so be careful when assembling.

First , insert the servo horn into **the 9 cm servo** and fix it to the outside of the 3D printed buttock parts. The servo is near the center by default, **so be careful not to rotate it when inserting the servo horn . Use M2x6mm tapping screws**

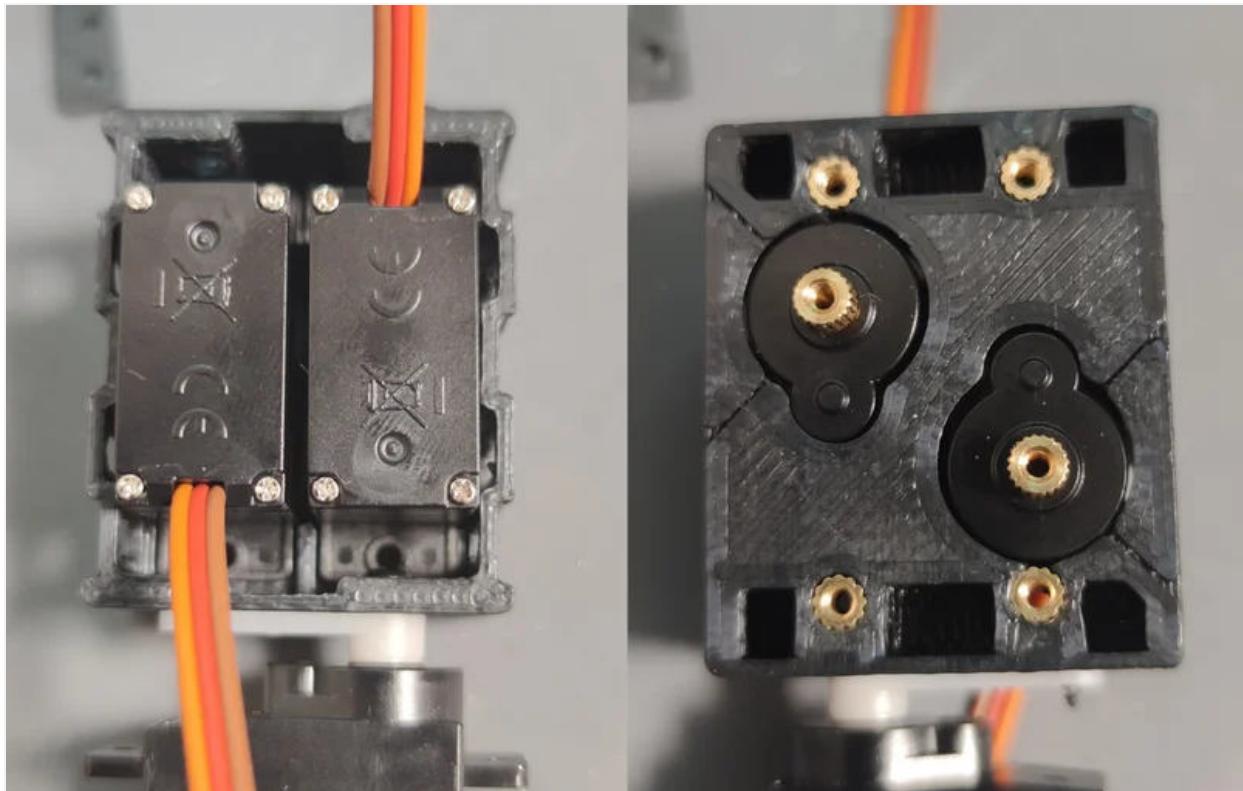
for the tip of the servo horn, and **M2x6mm** bolts for fixing to the servo shaft .

As shown in the picture below, insert a long cross screwdriver and a 2mm hex wrench through the holes in the buttocks and tighten.





Insert two **15cm servos** into this and fix them with four **M2x6mm** bolts from the back side of the servo.



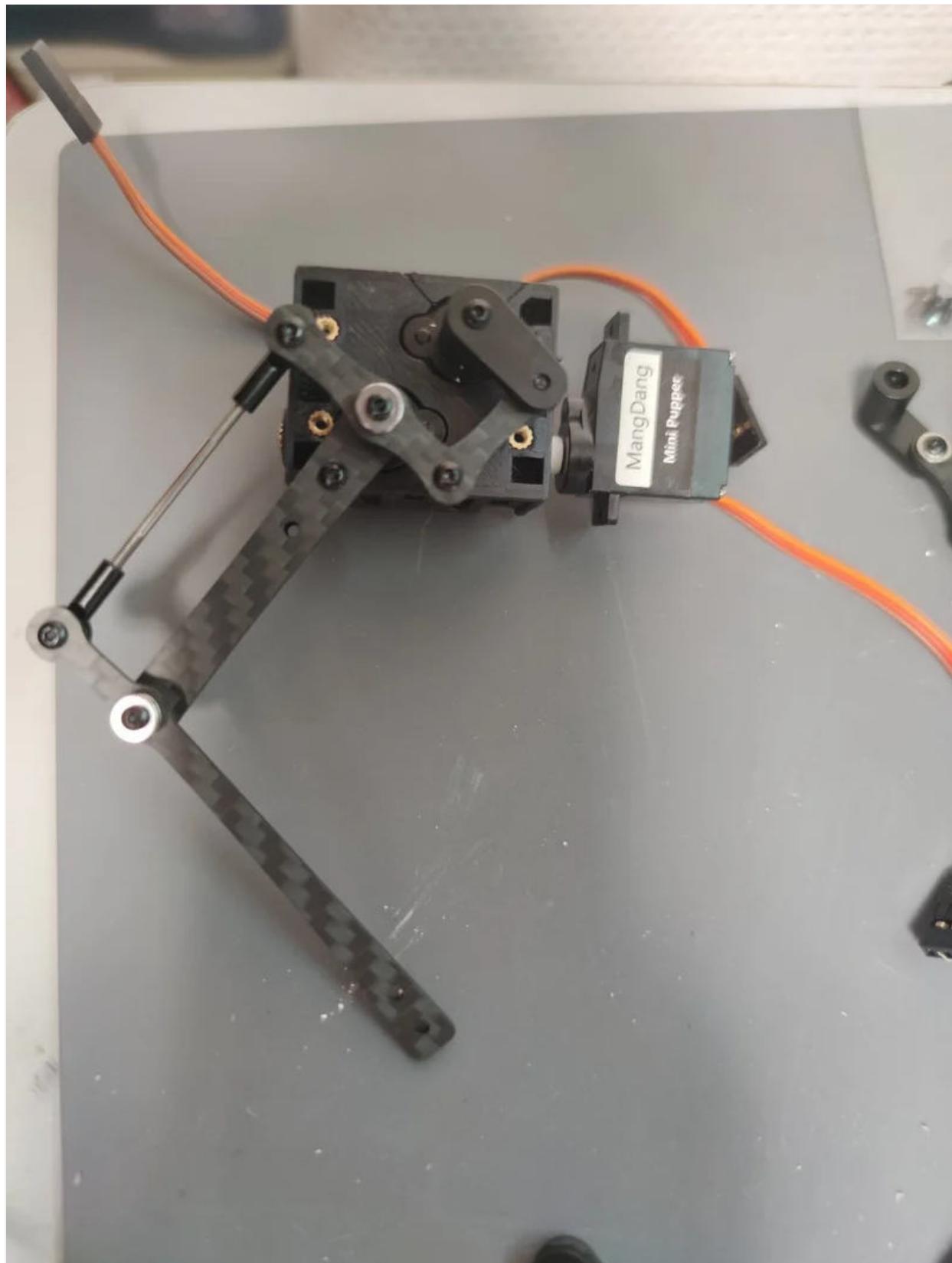
Fit and fix two case nun servos

Attach the legs to the buttocks parts

Attach the legs to this buttock part using **M2x12mm** bolts. Bolts that were not tightened when assembling the legs are also tightened to the servo here. **At this time, apply Loctite to the holes in the servo shaft so that the servo screws do not come loose .**

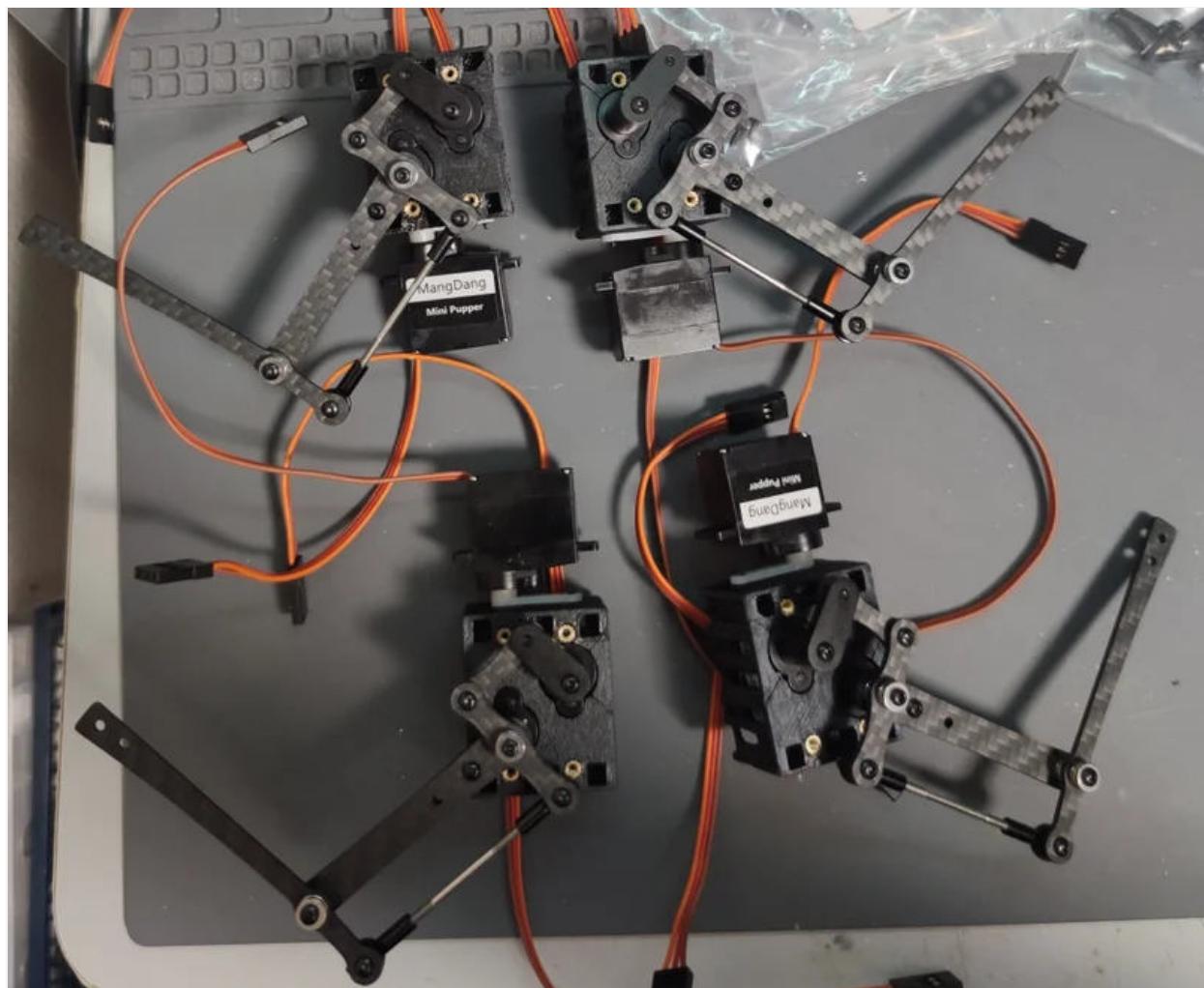
Attach the legs and buttocks so that the legs are tilted approximately 45 degrees as shown in the photo below.

The combination of legs and buttocks is different in the front, back, left and right, so be careful not to make a mistake.



Attach the legs to the buttocks parts

Assemble 4 pieces in front, back, left and right, paying attention to the combination, referring to the picture below.



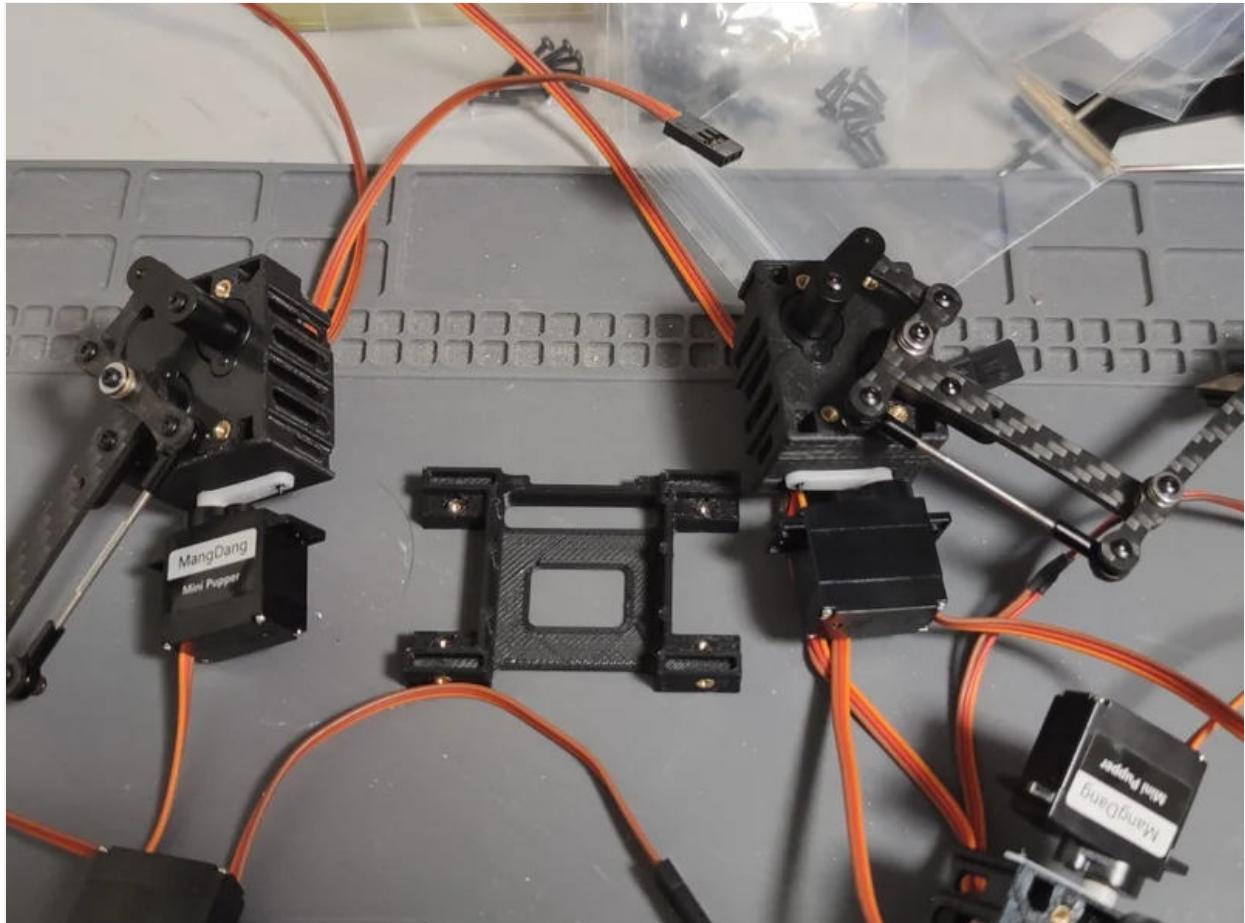
Note that the combination is different for front, back, left and right.

Attaching the legs to the center parts

After assembling the legs, attach them to the center parts.

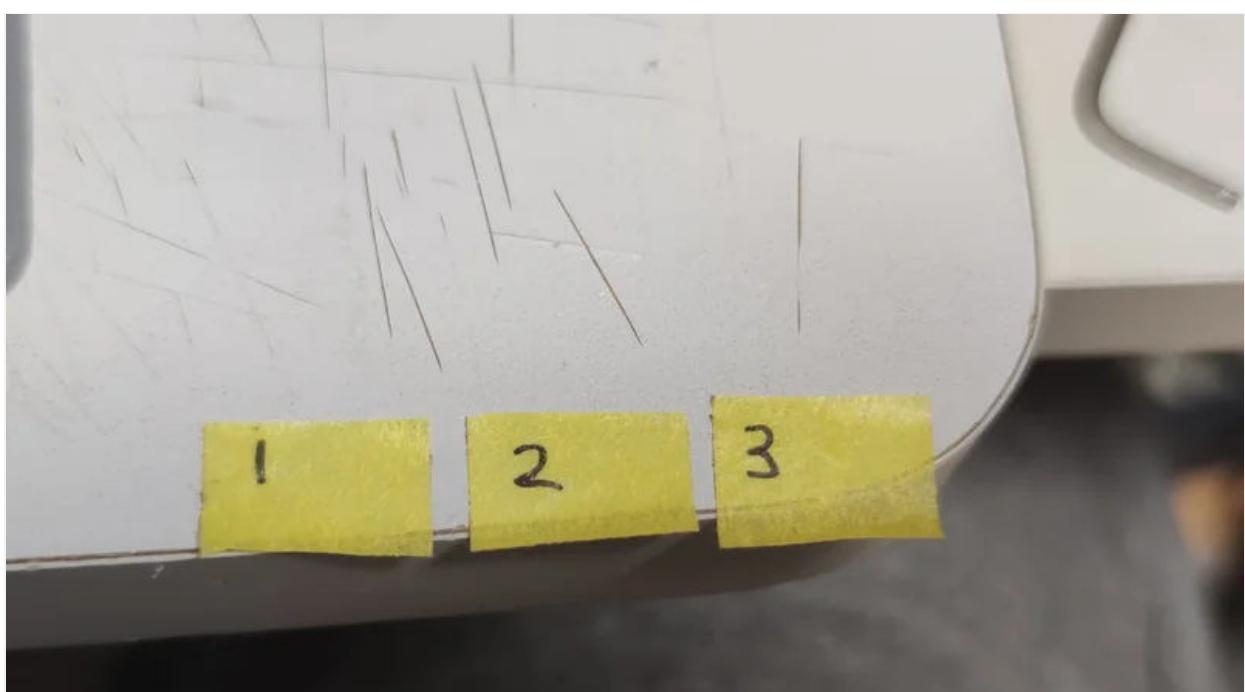
Installation of front left and right legs

First, attach the legs to the front parts. Be careful not to make a mistake in the type of leg to be attached.



Attach the front legs to the front parts

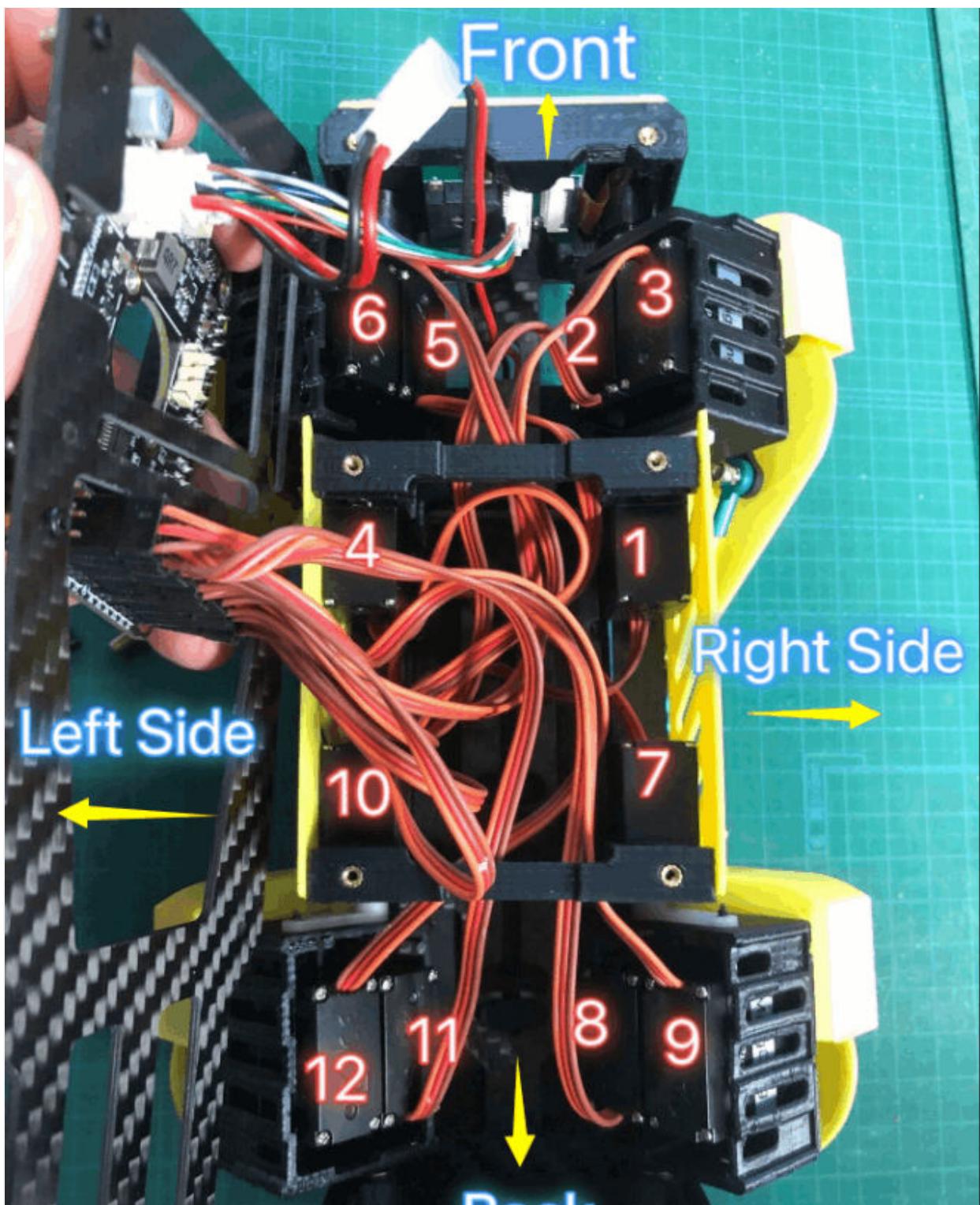
Prepare a masking tape with a number written in advance to distinguish the servo connectors.





Have a masking tape with the servo number on it.

Refer to the photo (below) in the assembly procedure for the servo number.



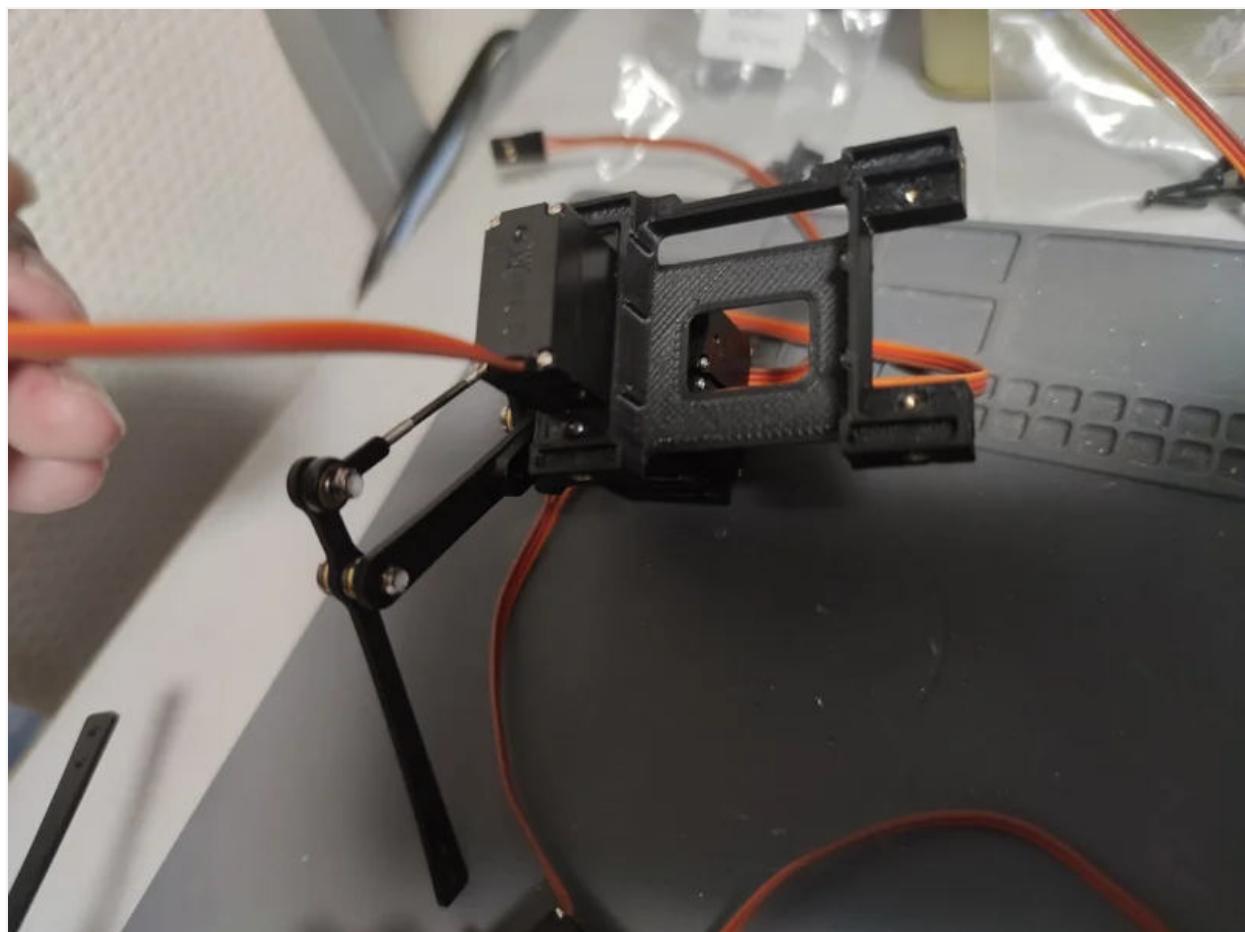


Servo number (from assembly procedure)

Now, let's attach it from the front left leg.

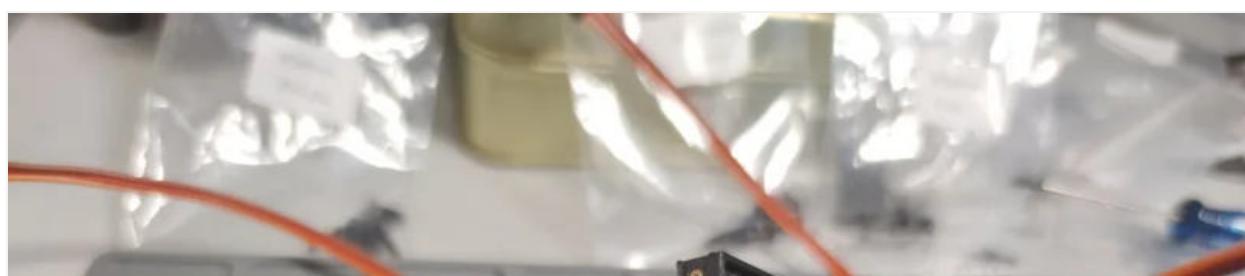
Insert the servo into the left part of the front part as shown in the figure below.

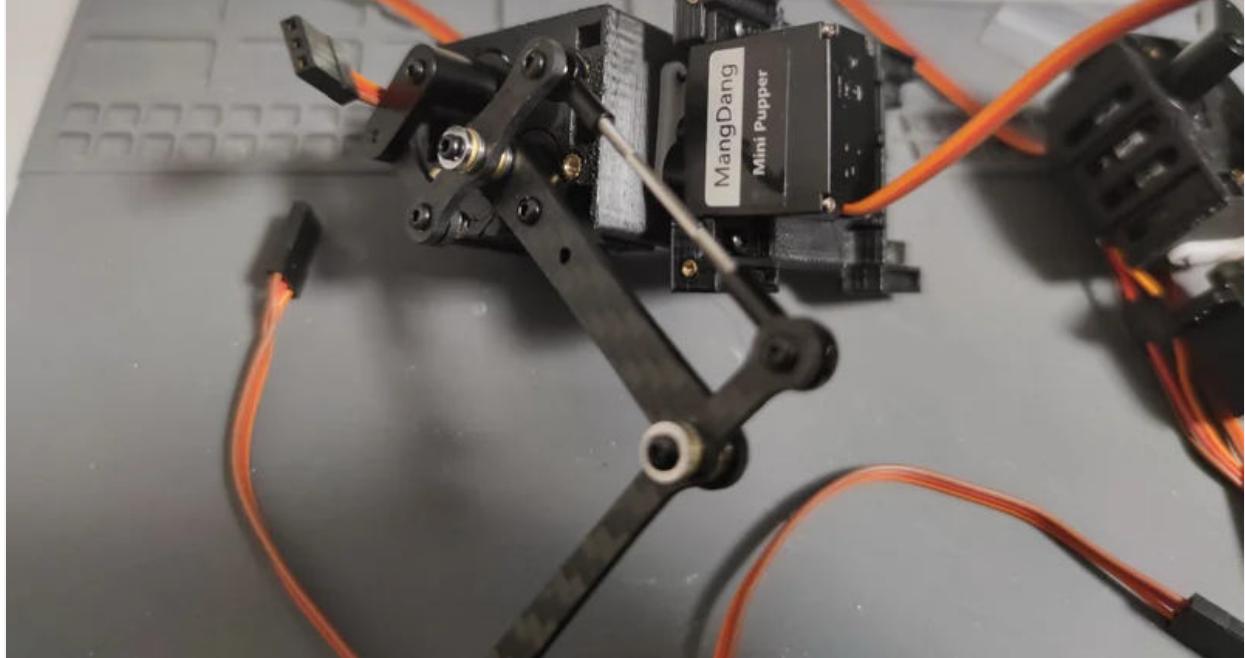
Be careful not to mistake the front and back of the front parts.



Fit the servo into the front part

Use two M2x8mm bolts to secure the fitted servo from the rear.

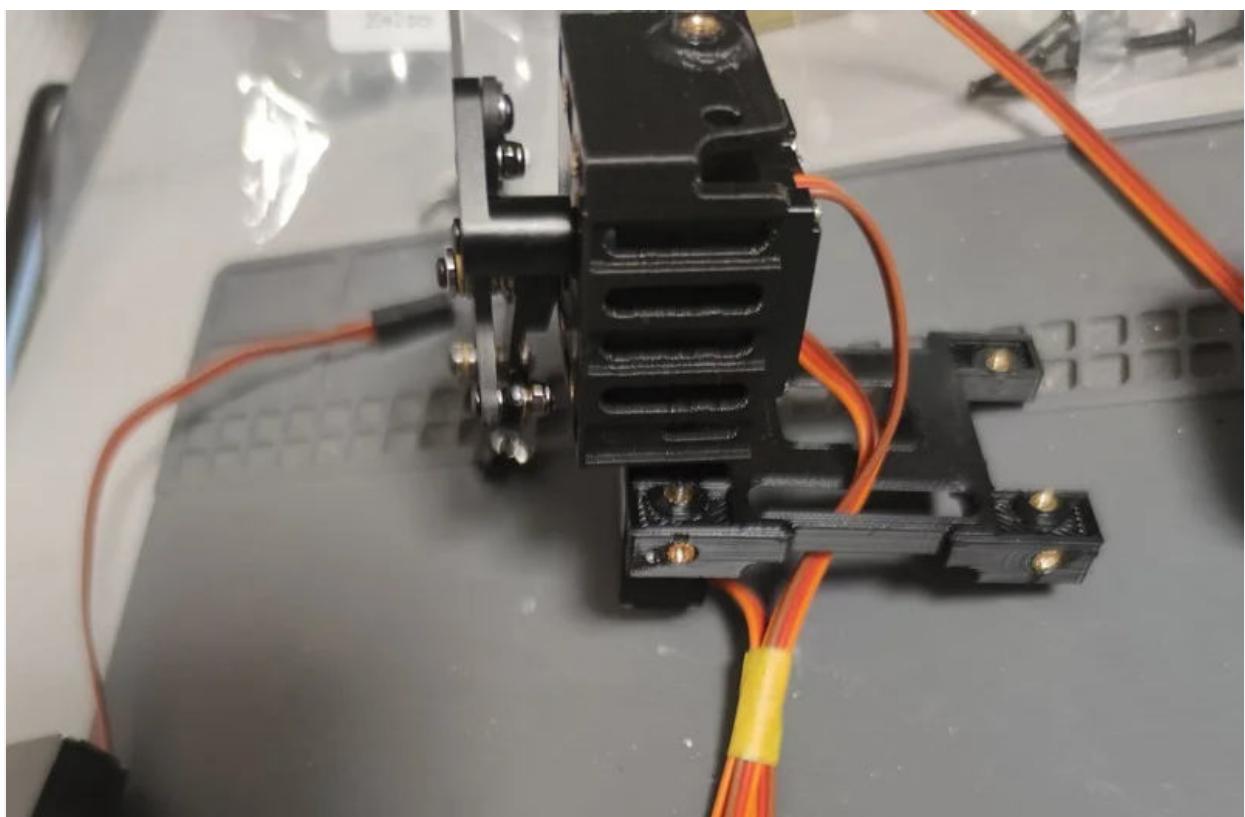




Fixed with screws from the back of the servo

After fixing the servo, pass the long lead of the servo on the front side through the rectangular hole of the molded product.

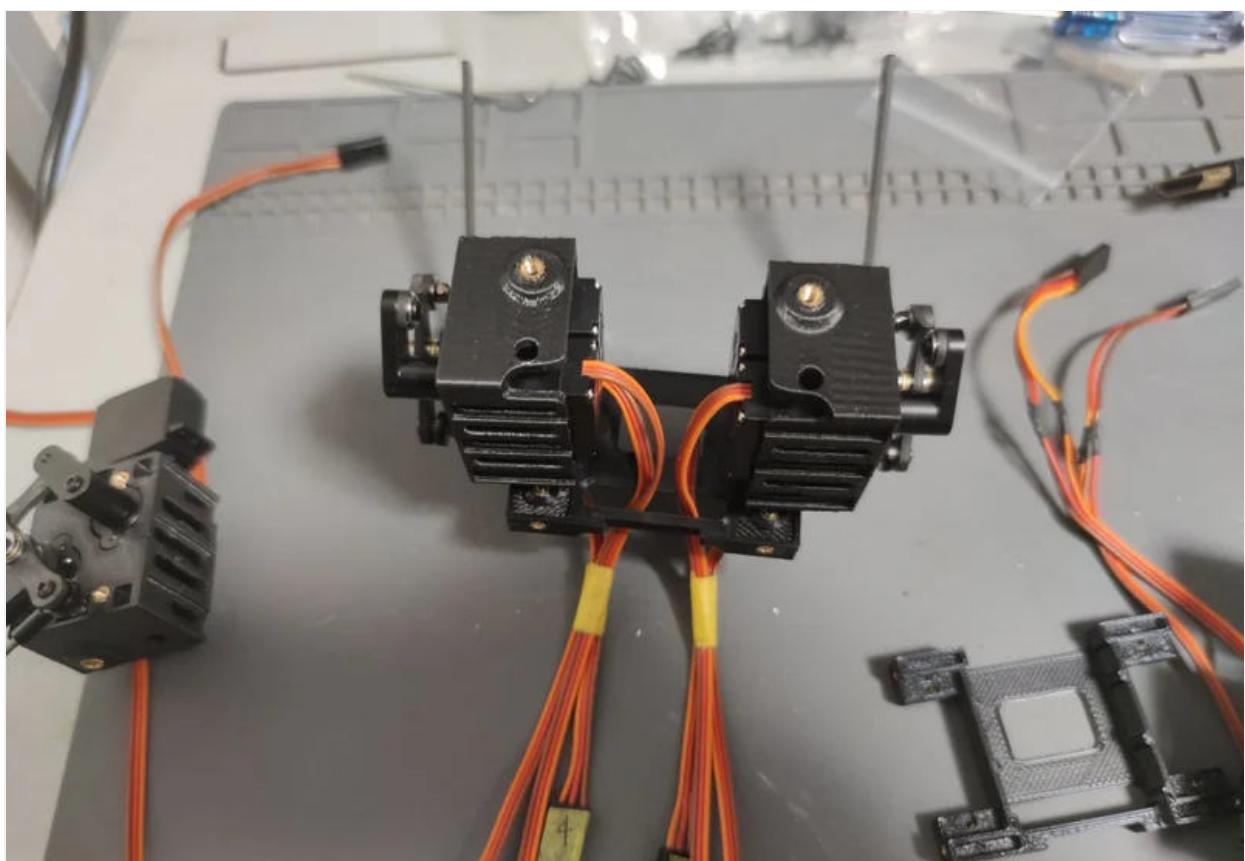
Paste the numbered masking on the connector of each servo, and bundle the three leads with masking tape. The servo numbers are 4 to 6 because the one installed above is on the front left.





Bundle the servo leads with masking tape

Similarly, attach the front right leg to the front part and bundle the servo leads with masking tape.





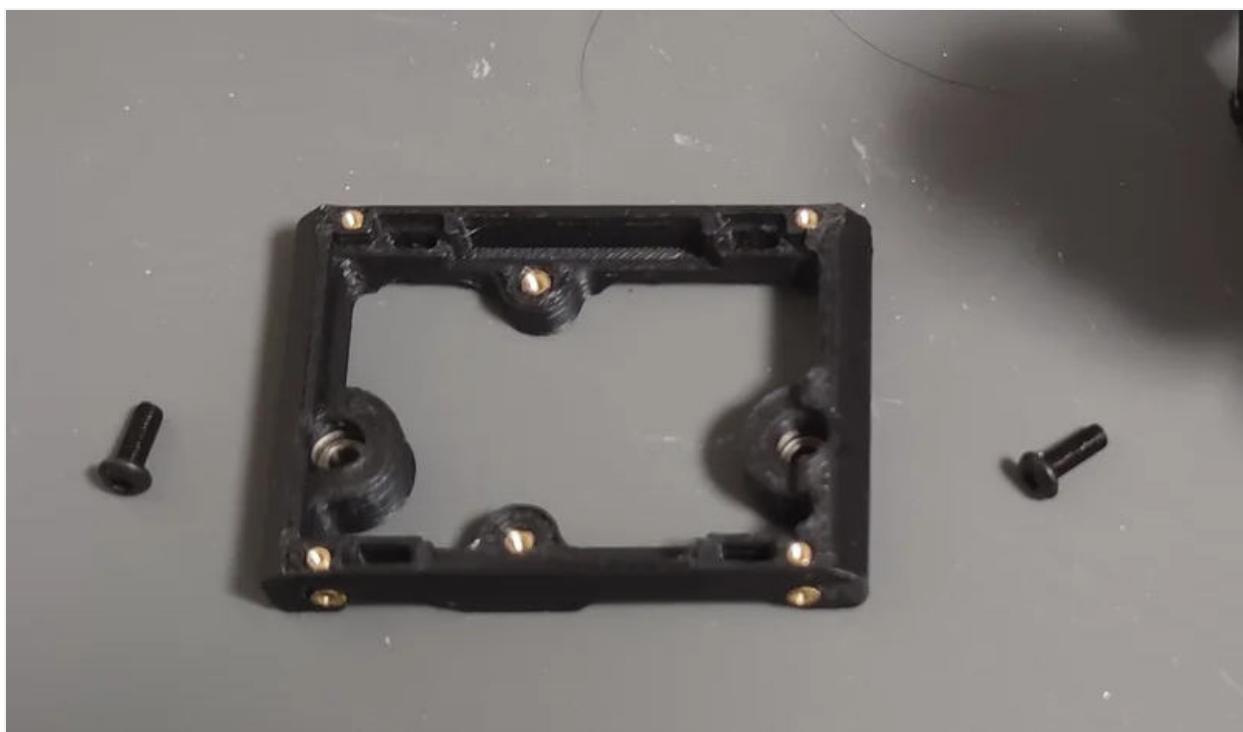
With both front legs attached to the front parts

Installation of front parts

Attach the front part with the LCD panel to the assembled front leg parts.

The assembly procedure manual says "Install with M3x8mm flat head screws", but this time the aircraft came with "**M3x8mm bolts**", so I will use this.

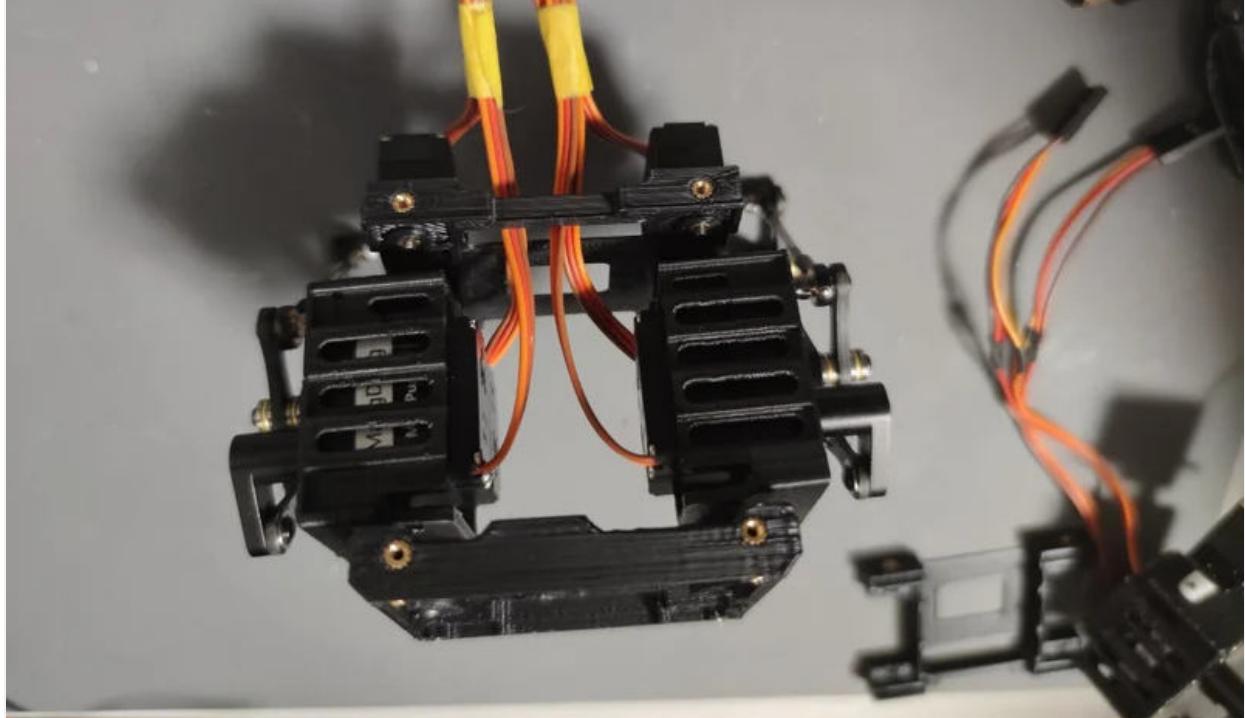
A hex wrench for M3 is not included and must be prepared separately.



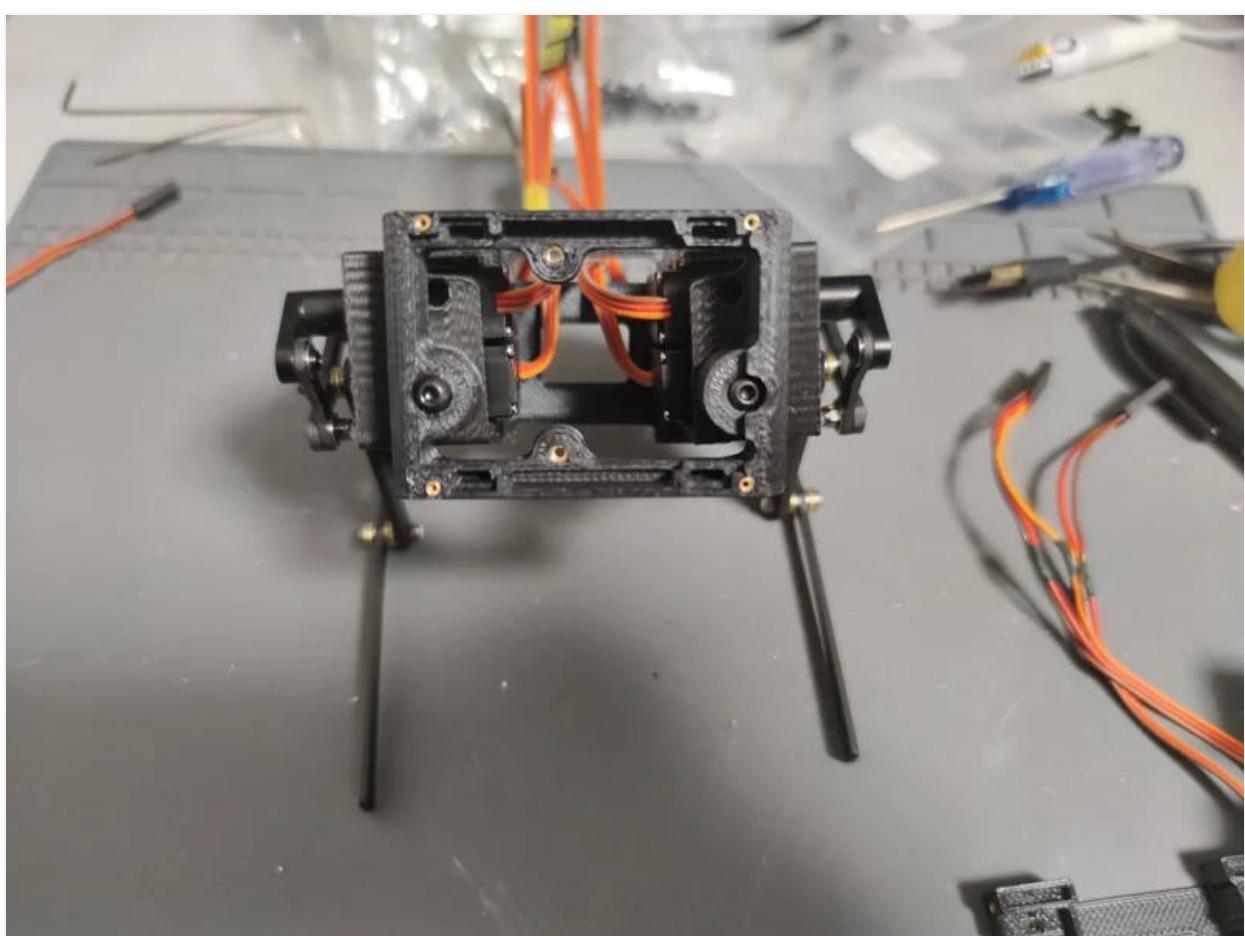
Front parts are fixed with pan screws

Fix the front part to the front side of the front leg part. Be careful not to confuse the front and back of the front part with the top and bottom.





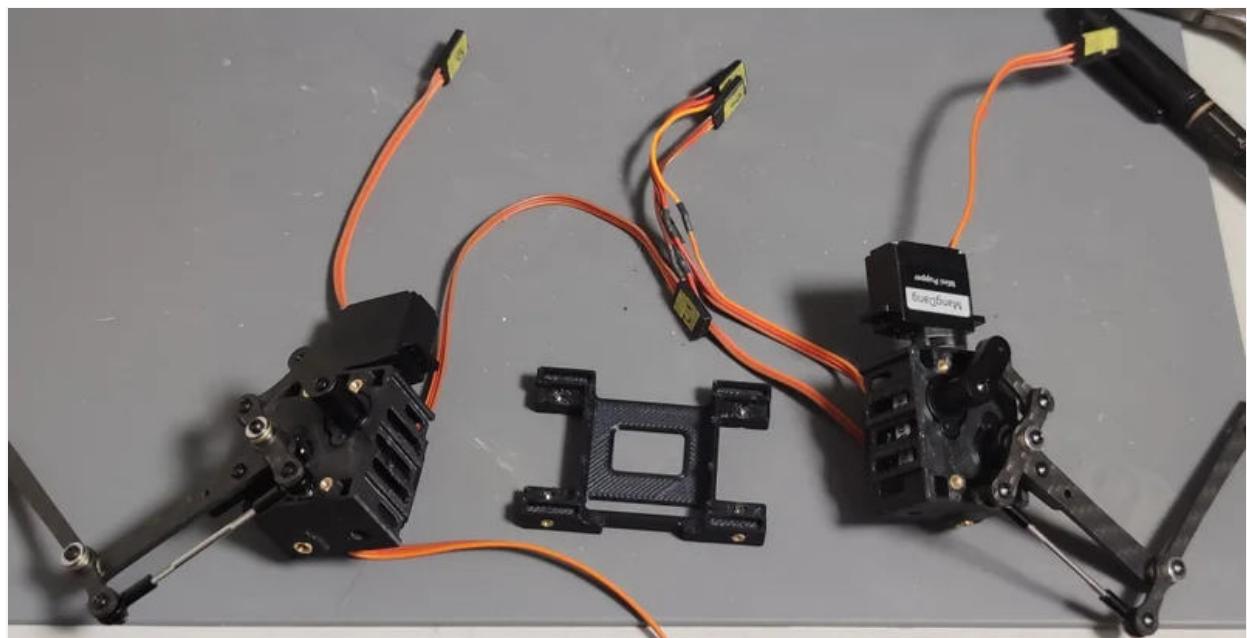
Install front parts



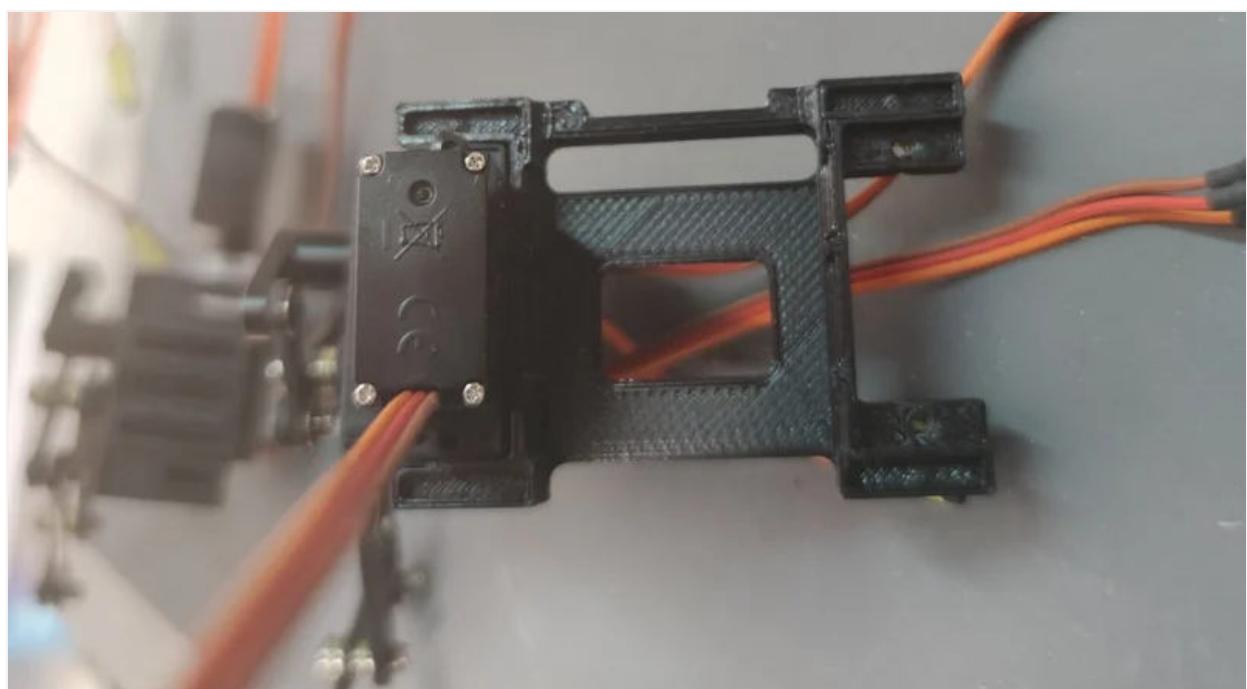
Be careful not to mistake the front and back of the front parts and fix them with bolts.

Mounting the left and right rear legs

Similarly for the rear, attach the rear left and right legs to the rear parts. At this time, be careful not to mistake the front and back of the rear parts for the legs to be attached.



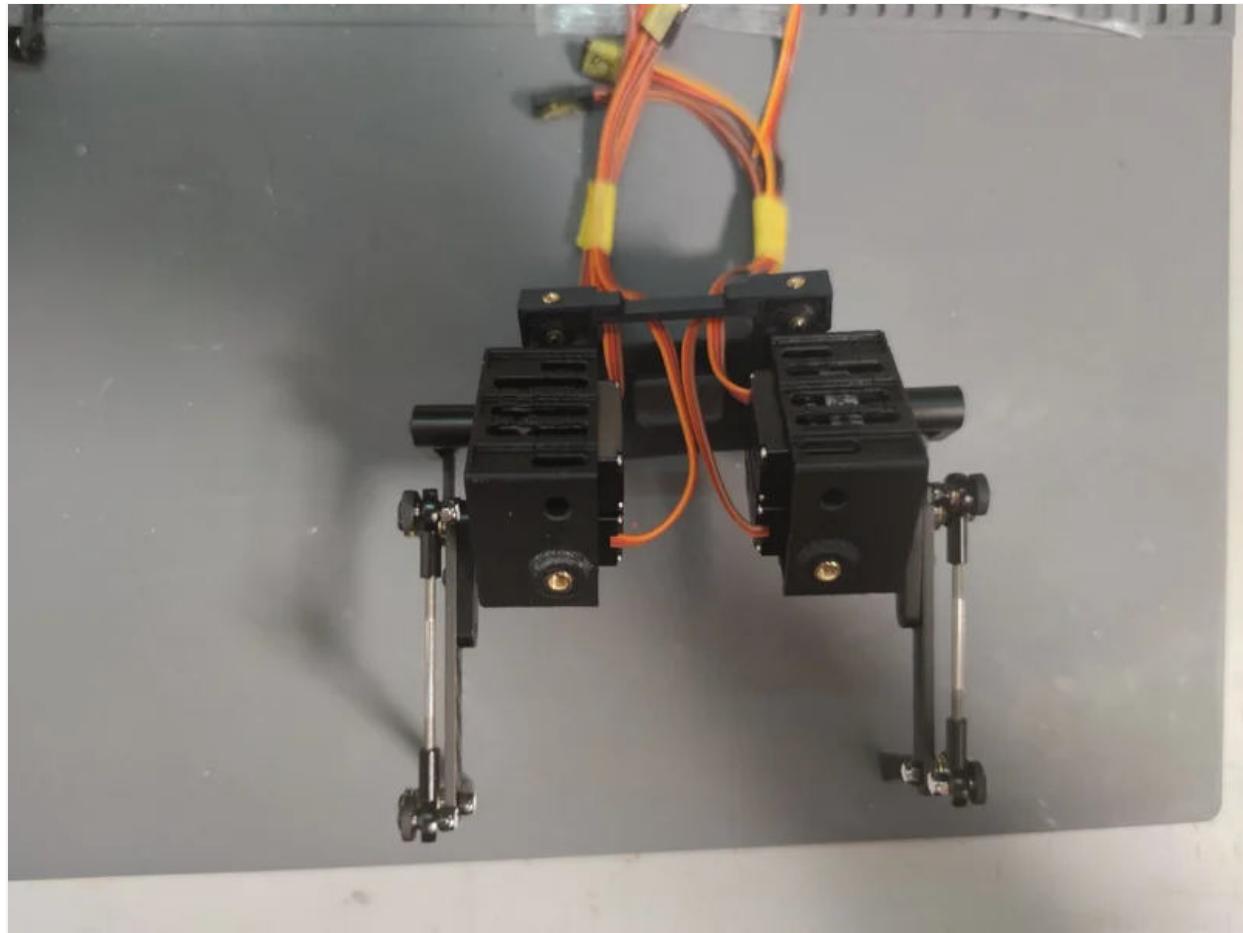
Attach the legs to the rear parts



Attaching the legs to the rear parts

After attaching the left and right rear legs to the rear parts, bundle the servo

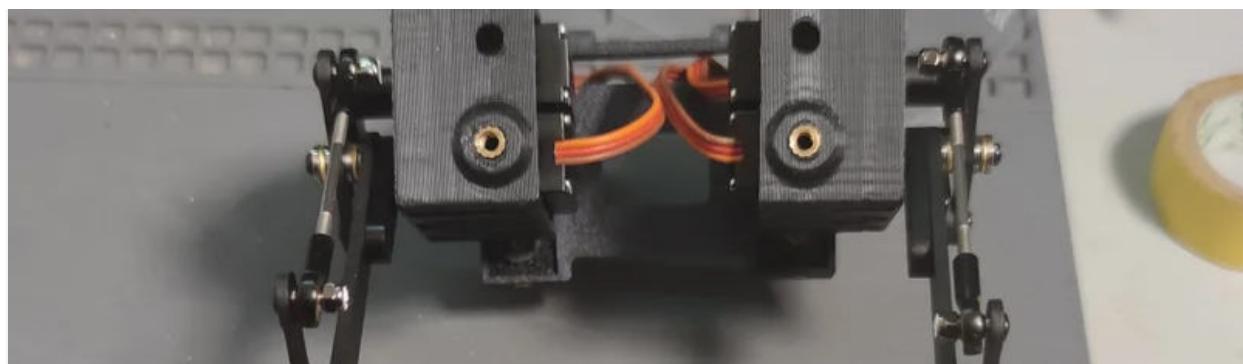
leads with masking tape through the holes in the rear parts as with the front legs.

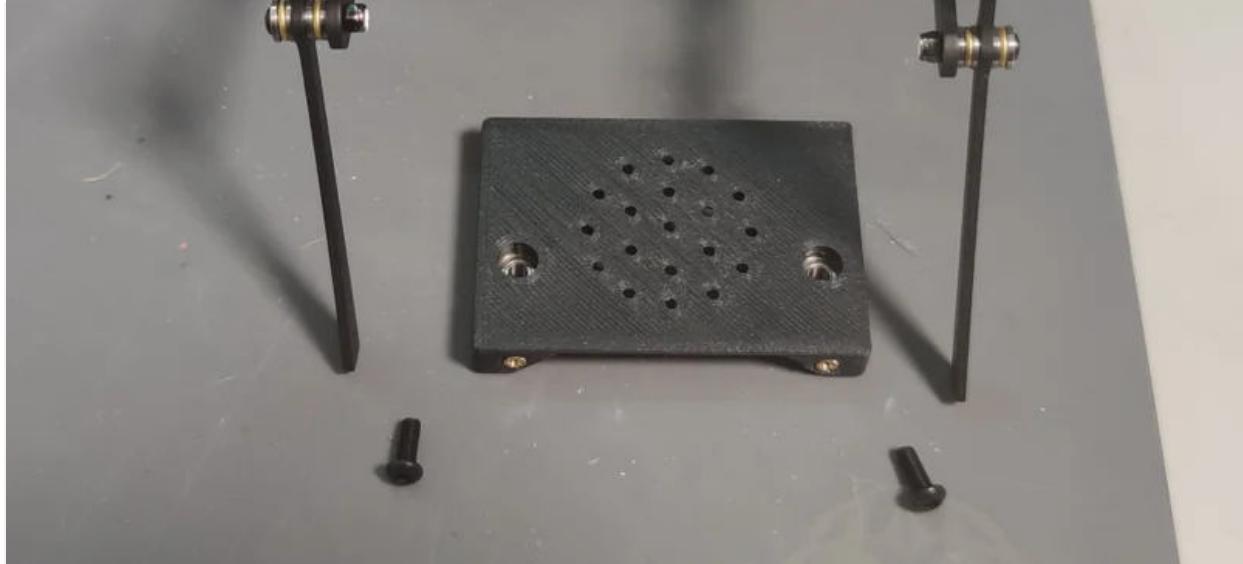


With both hind legs attached to the rear parts

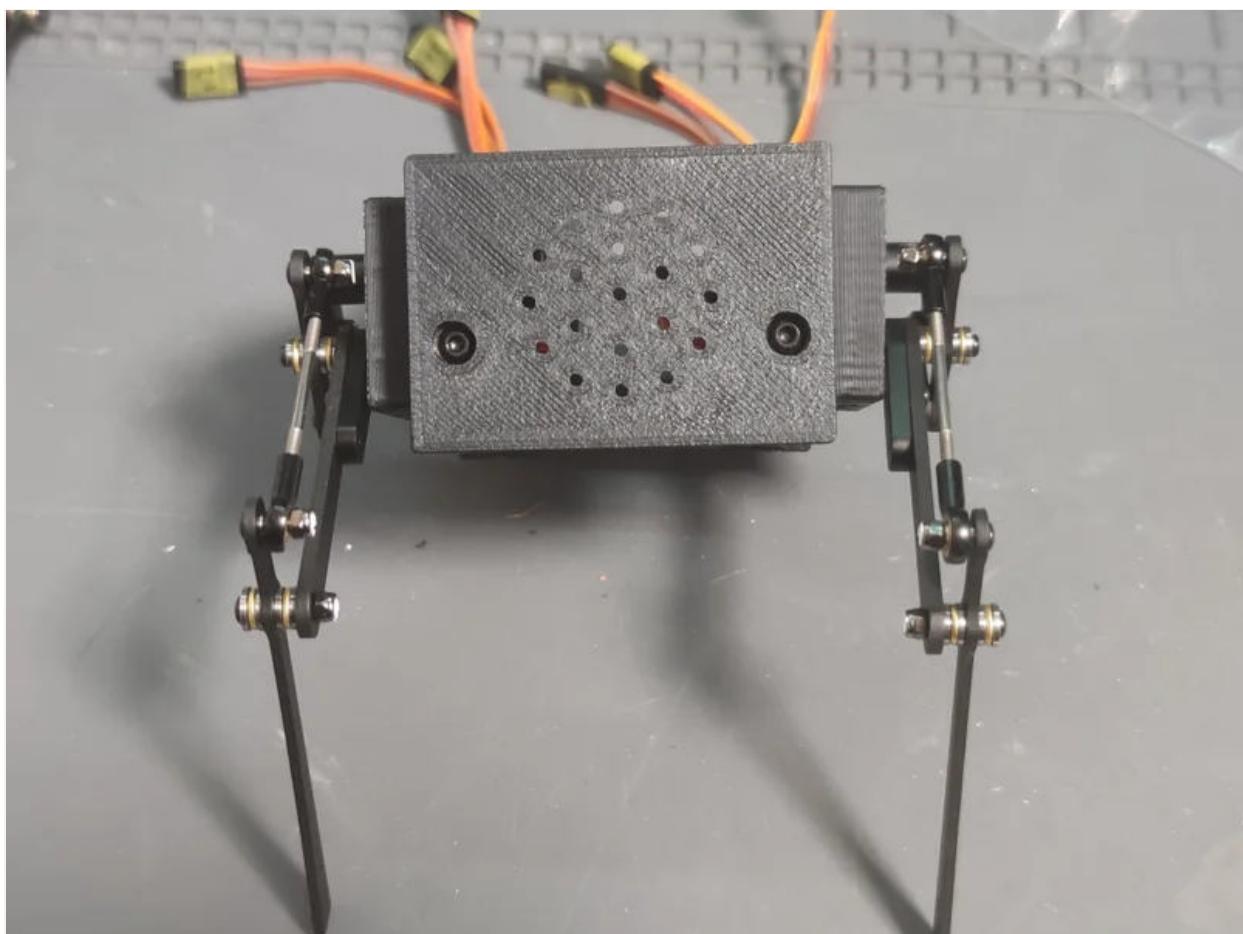
Installation of rear parts

Use " M3x8mm bolts" on the rear side of the assembled rear leg parts to fix the rear parts. As with the front parts, be careful not to confuse the front and back of the rear parts with the top and bottom.





Fix the rear part with a pan screw

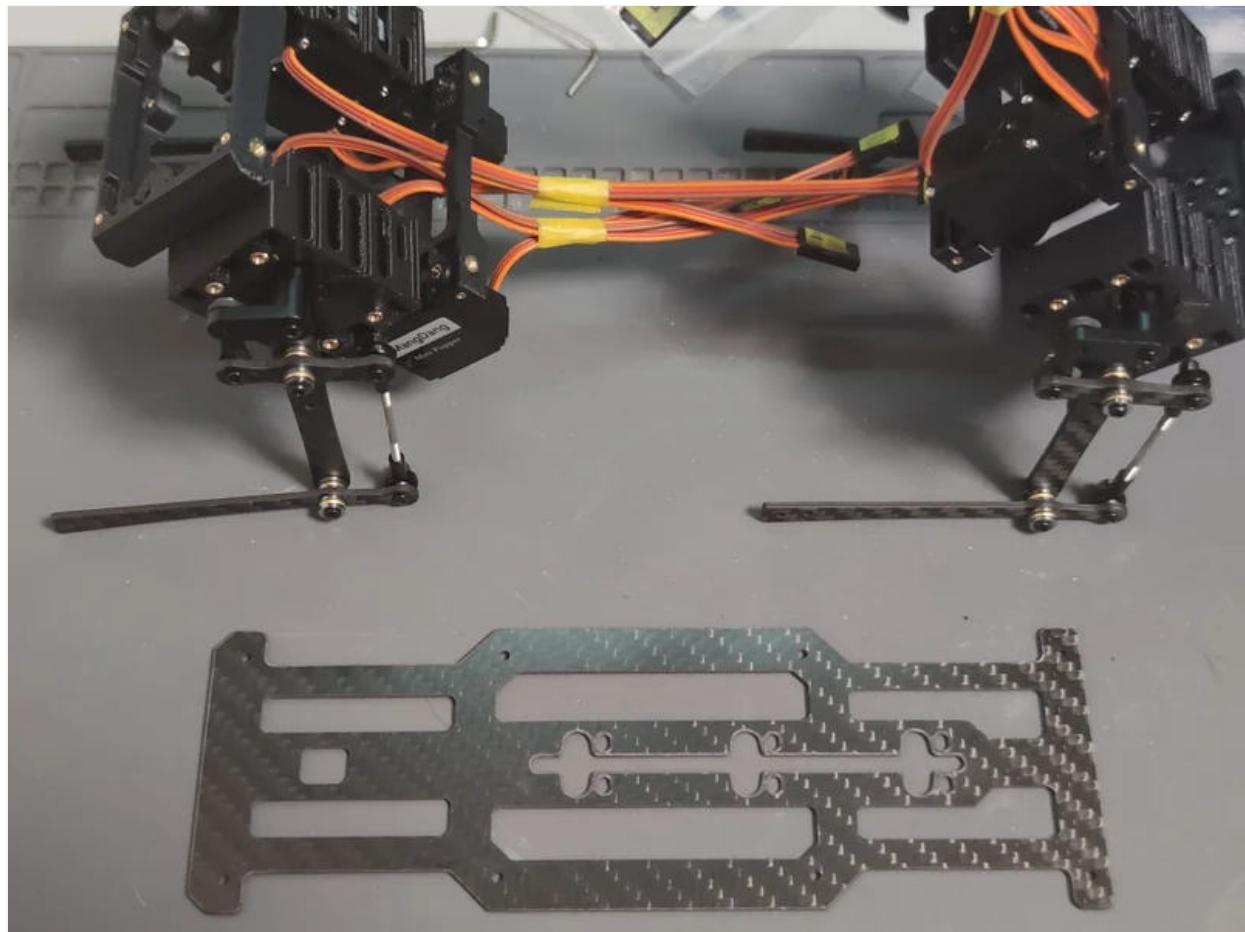


Be careful not to mistake the front and back of the rear parts and fix them with bolts.

Attaching leg parts to the bottom plate

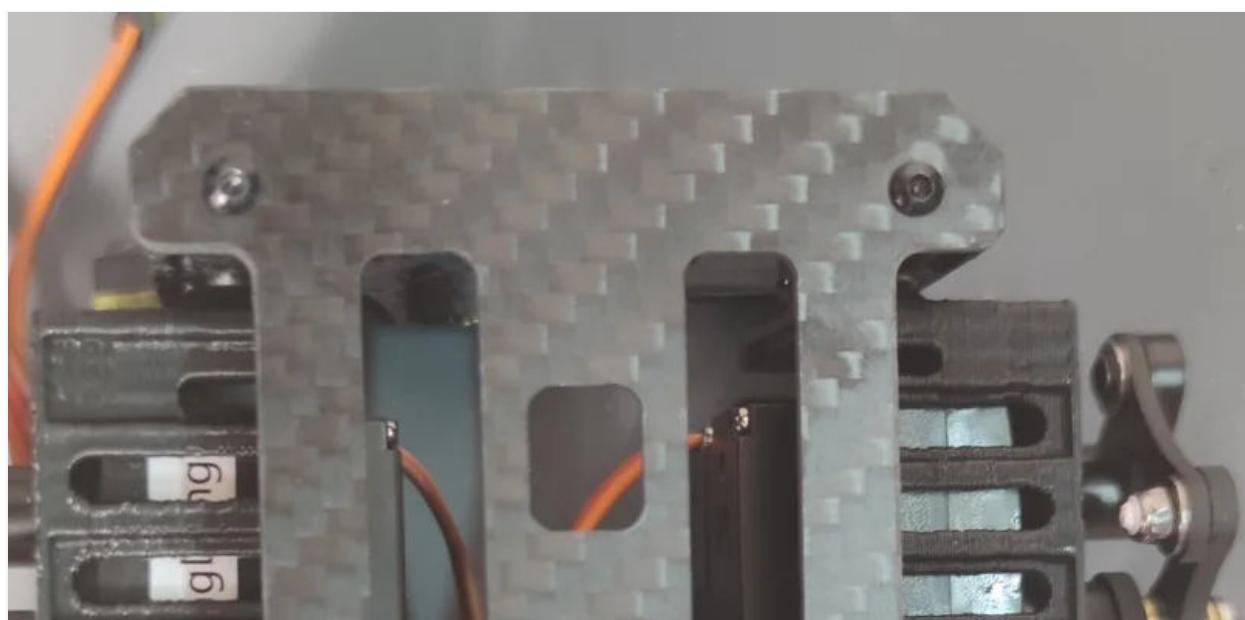
Attach the assembled front and rear legs to the bottom plate. The battery pack will be fitted to the bottom plate at the end, so attach the legs to the

surface where the circumference of the hole is slanted.



Attach the legs to the bottom plate

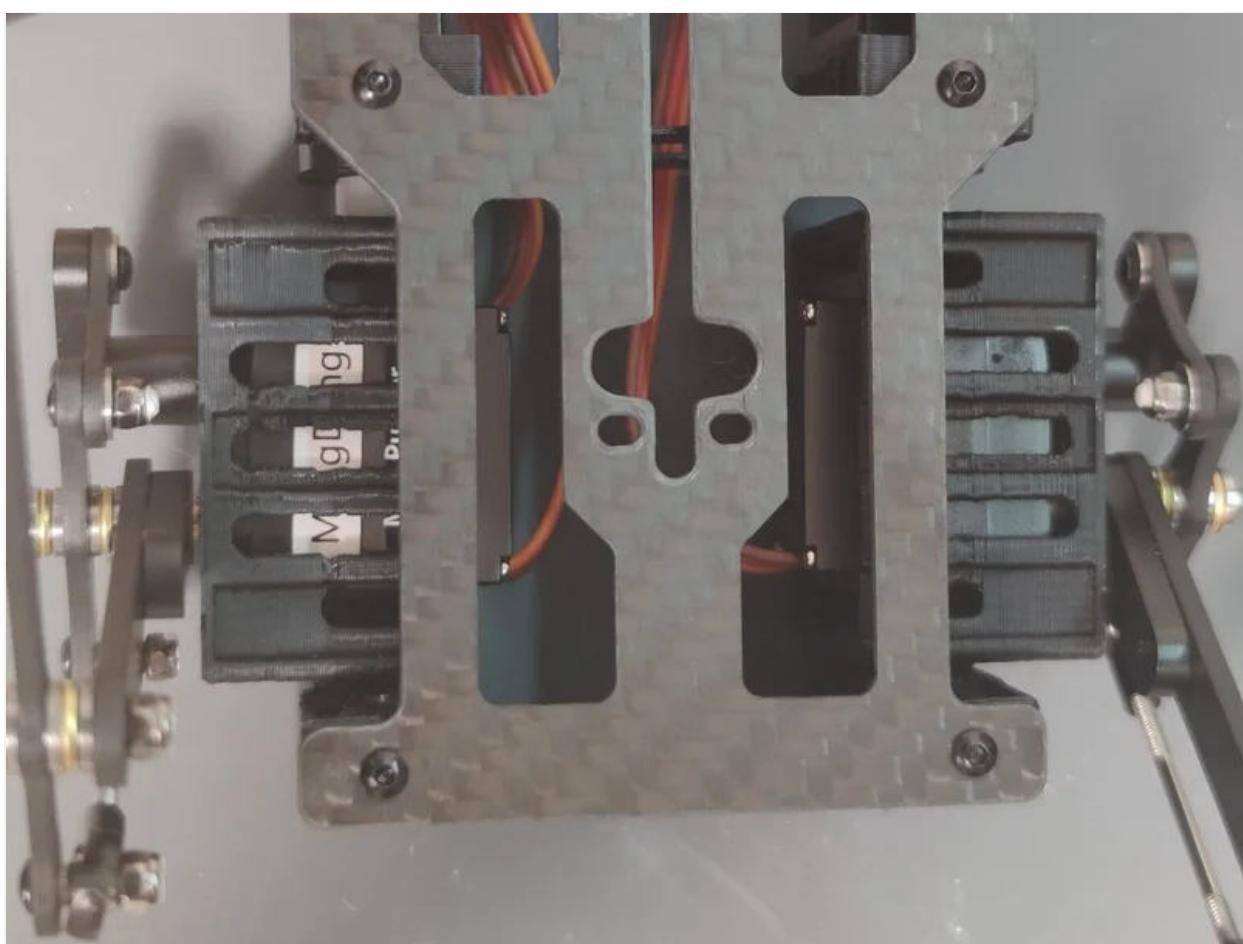
First, fix the front leg to the bottom plate using four **M2x5mm bolts**. Be careful not to confuse the front and back of the bottom plate.





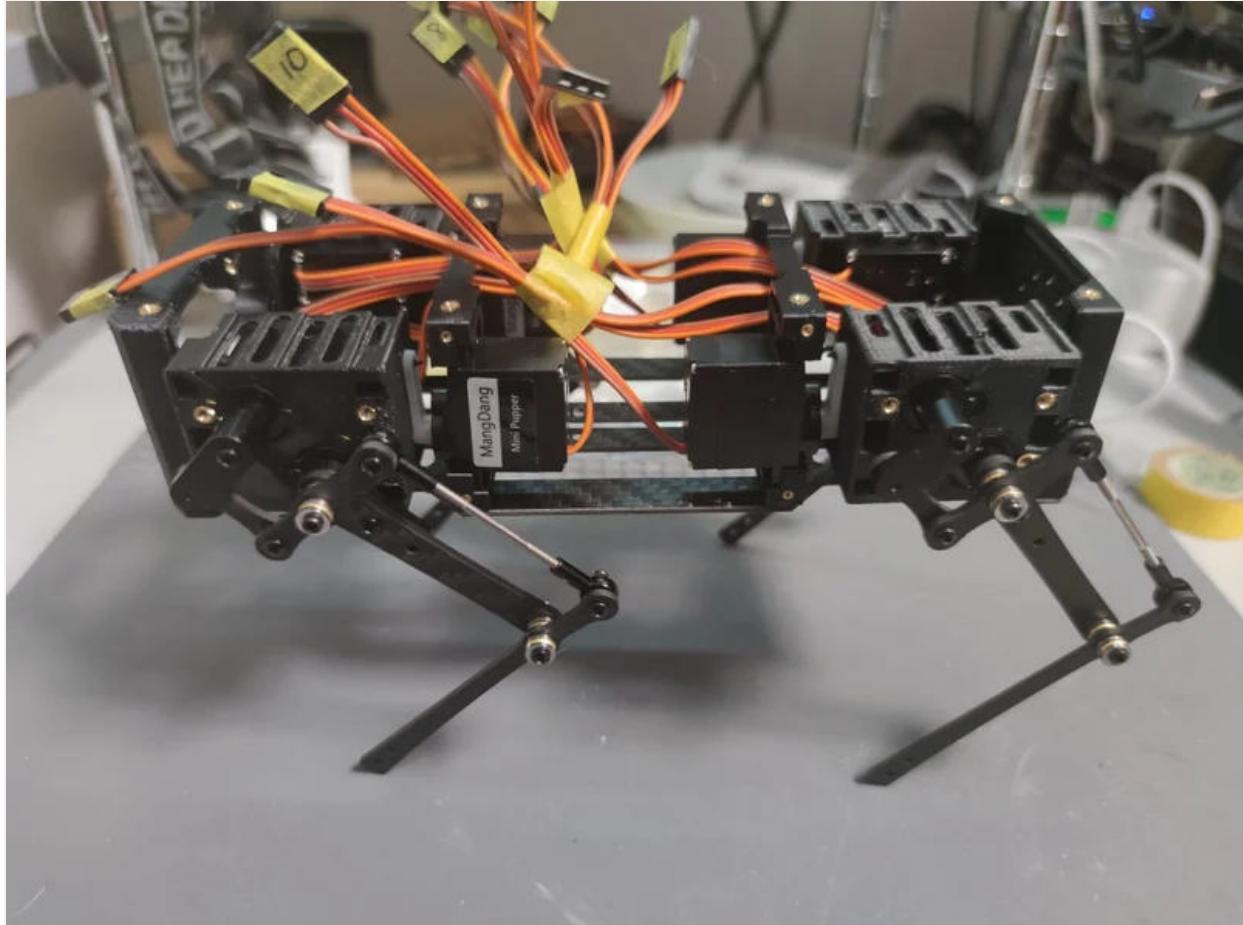
Fix the front legs to the bottom plate

Similarly, fix the rear leg to the bottom plate.



Fix the hind legs to the bottom plate

By fixing the legs to the bottom plate, Muni Pupper started up.

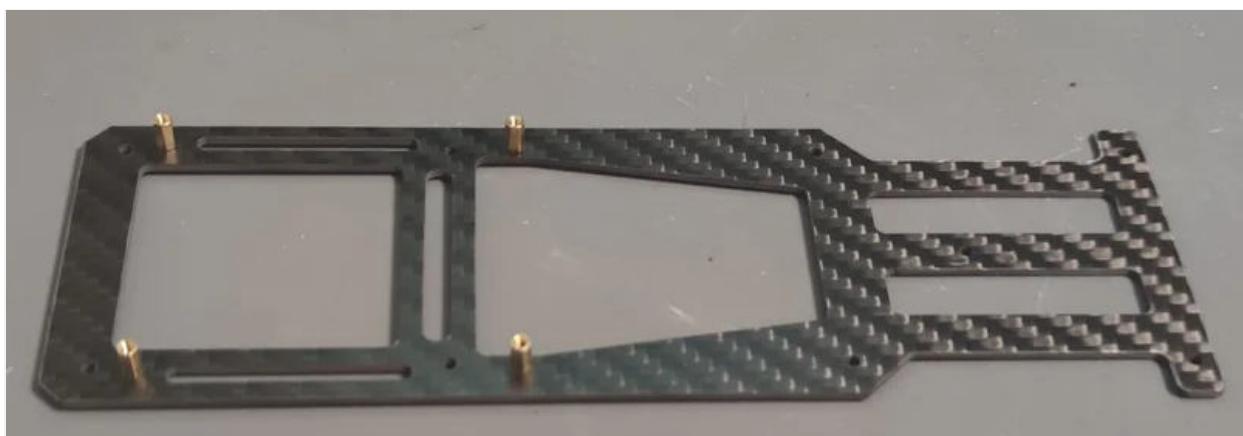


Mini Pupper stood up!

Installation of top plate

Next, install the top plate. **First, use four M2x5mm bolts and four short stanchions**

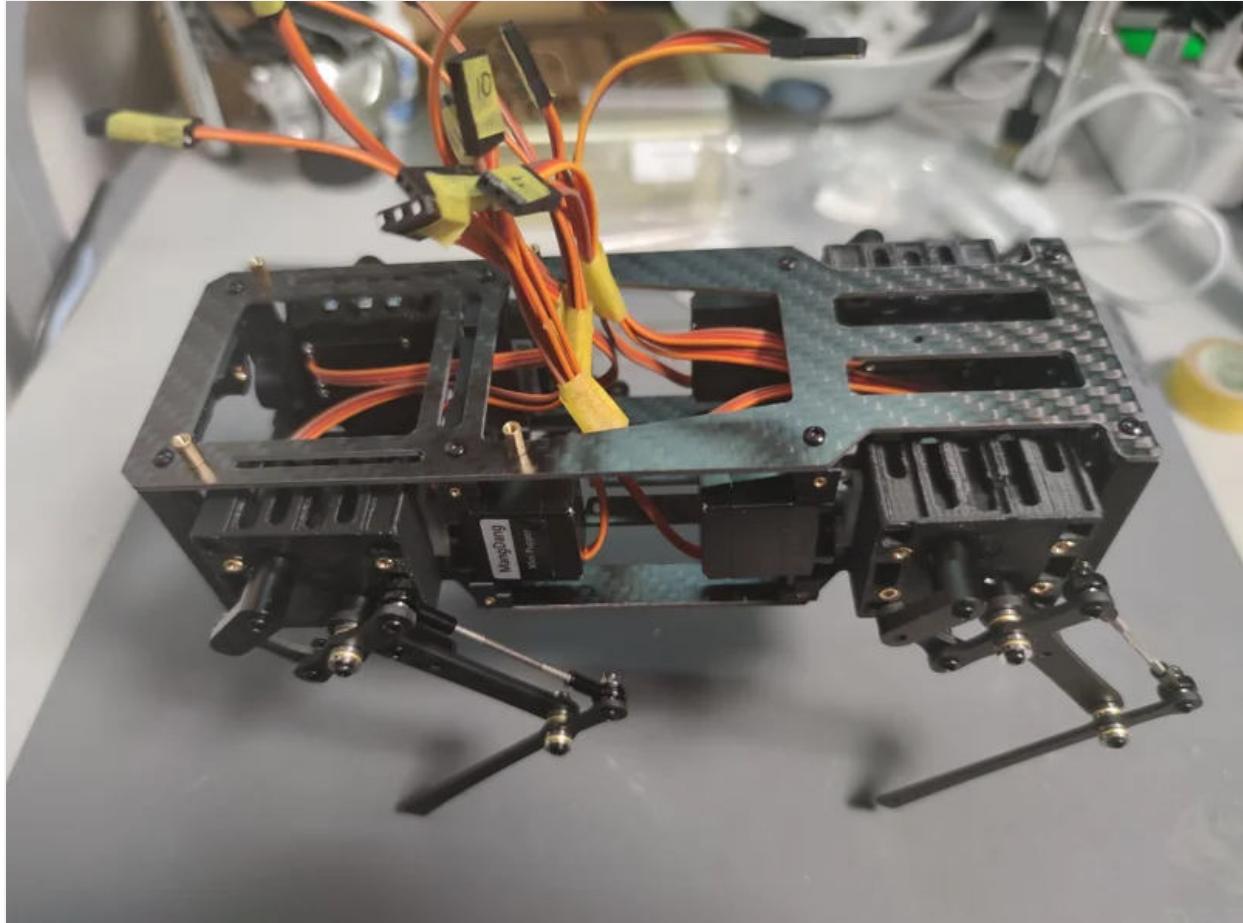
on the top plate to erect the stanchions for mounting the control board (custom circuit board and Raspberry Pi).





Stand up a support on the top plate

Attach the top plate to the body using eight **M2x5mm bolts**.



Main body with top plate attached

LCD panel installation

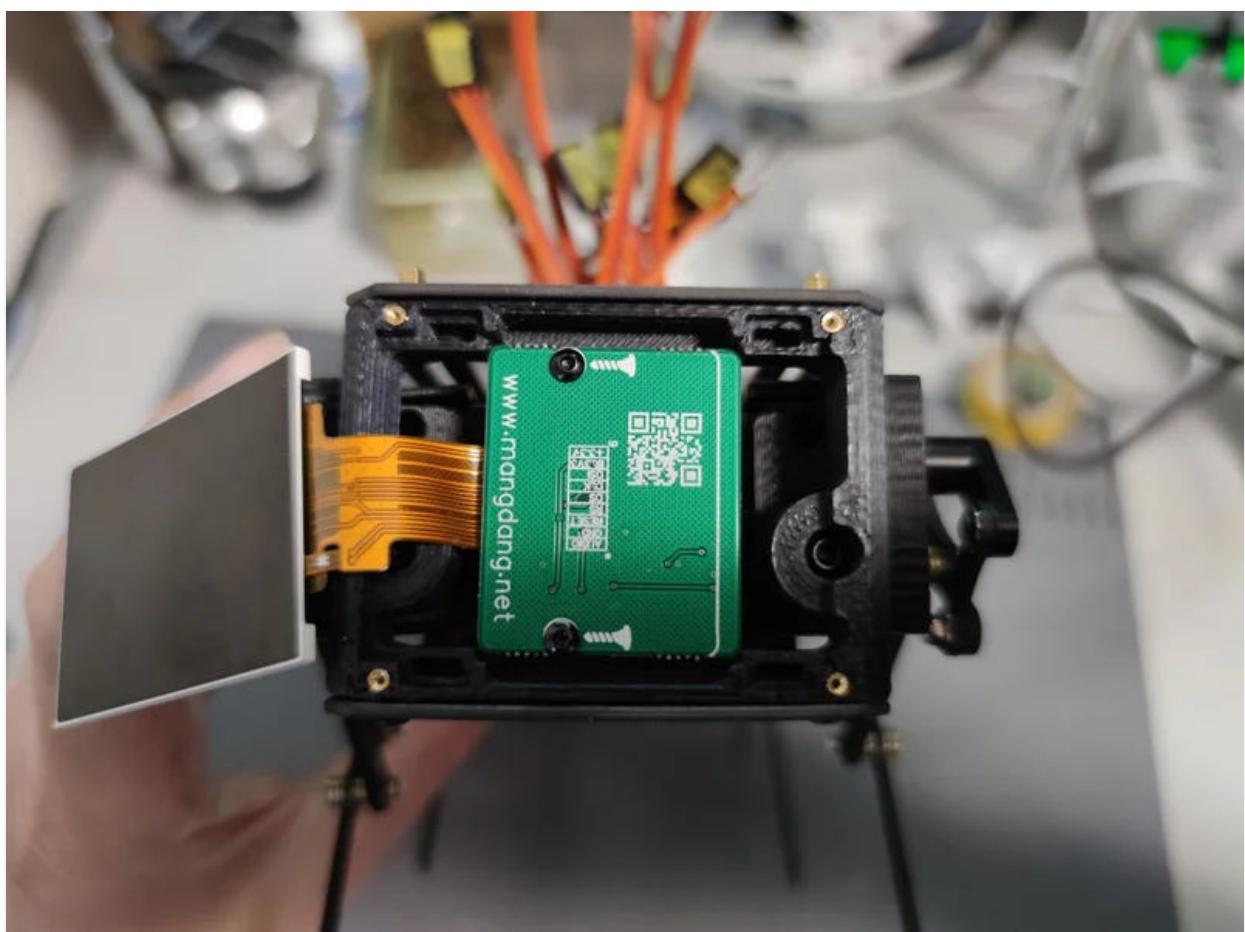
Next, attach the LCD panel that displays facial expressions on the front of the main unit. Remove the protective sheet of the LCD panel in advance.





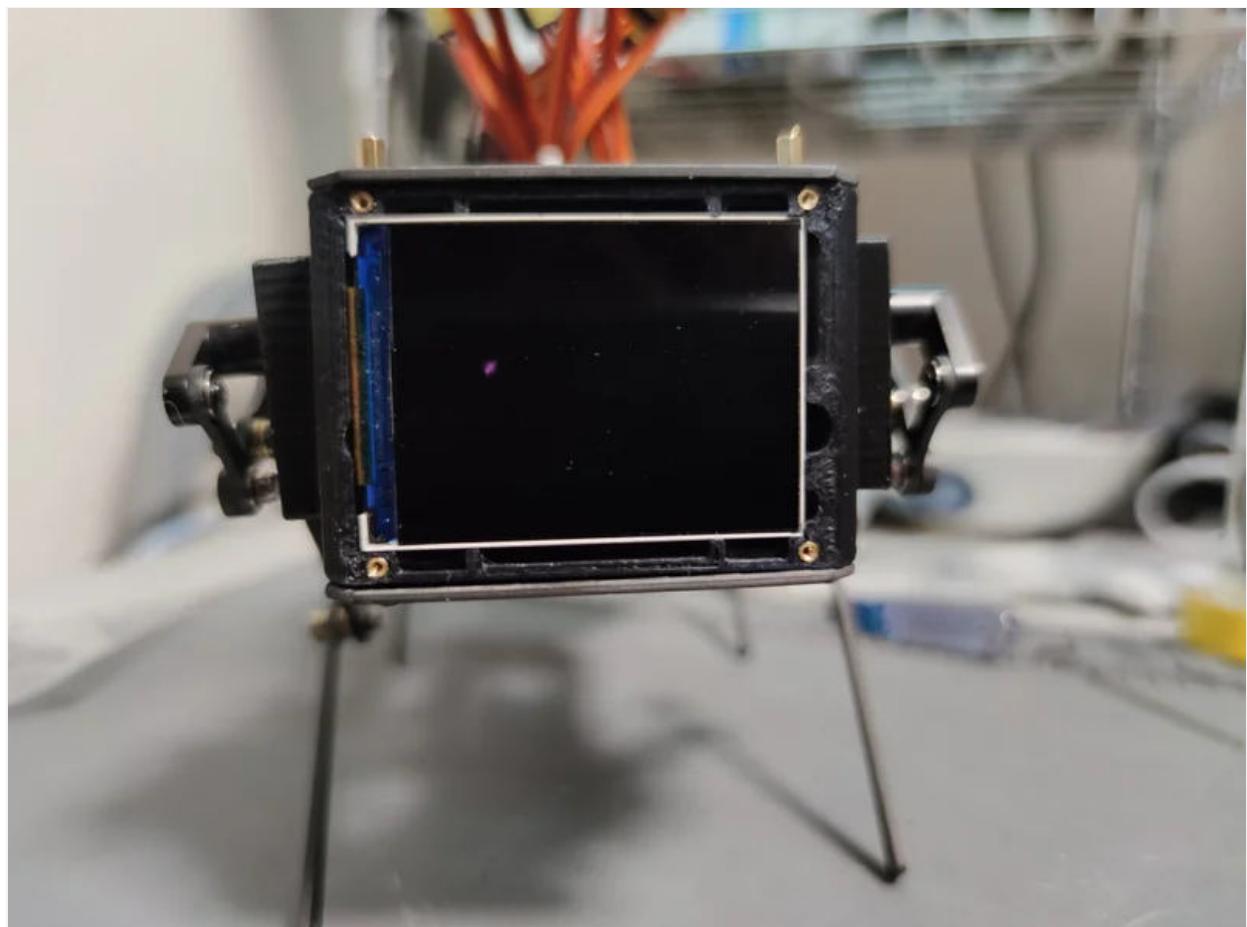
Attached LCD panel and control board

Pay attention to the front and back of the control board, and attach it to the front part using two **M2x5mm** bolts.



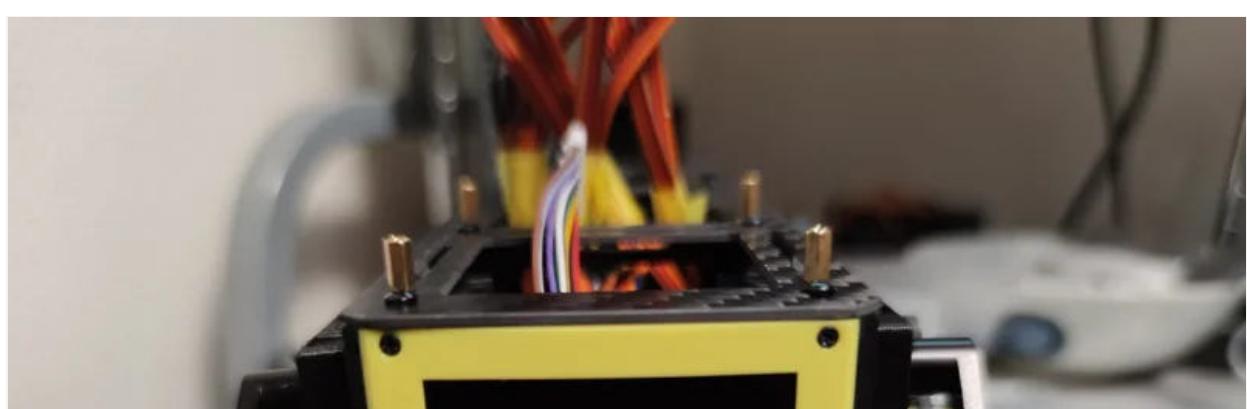
Fix the control board to the front part

Fold the flexible cable that connects the LCD panel to the control board lightly at the edge of the panel, and place the LCD panel in front of the board so that the flex can be pushed into the front part.



Push in the flex and place the LCD panel

Cover the LCD panel with a yellow cover and secure it with four **M1.4x3mm flat head screws**.

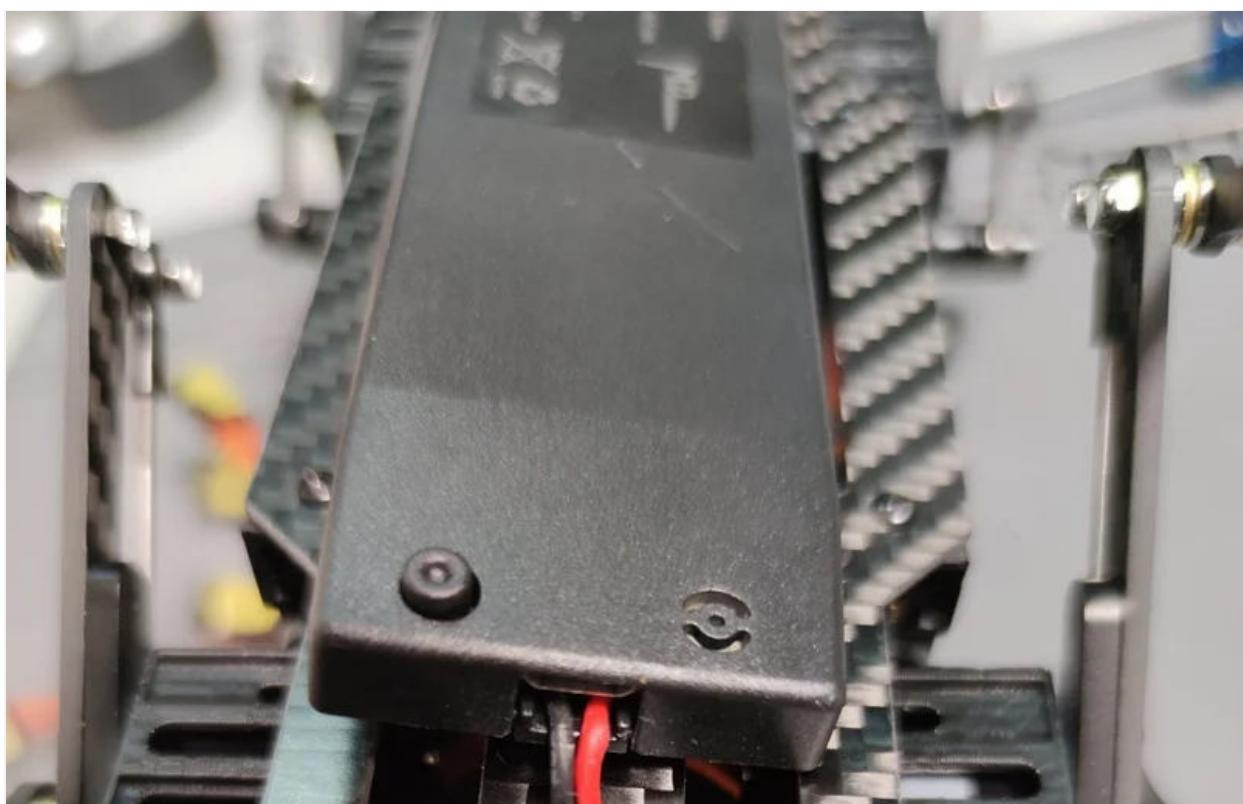


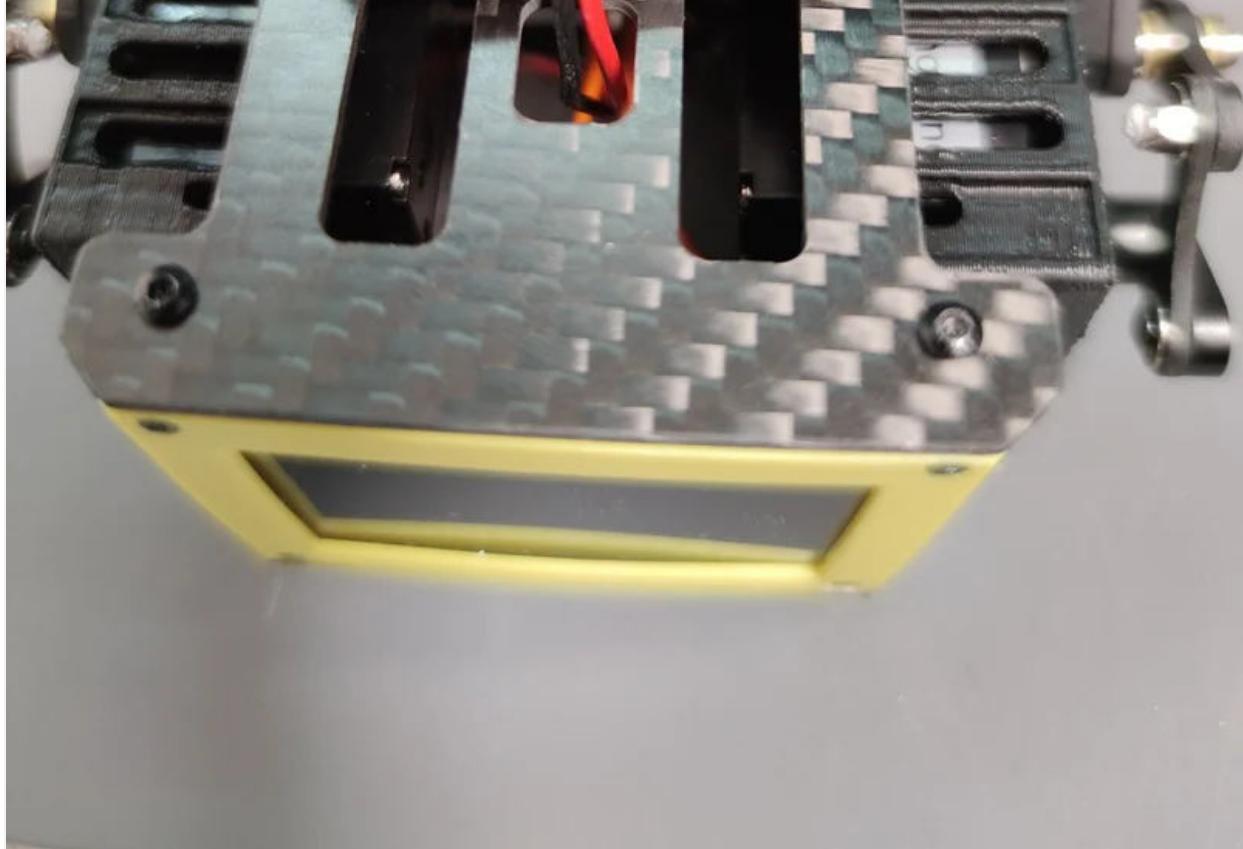


Cover with a yellow panel and fix with screws

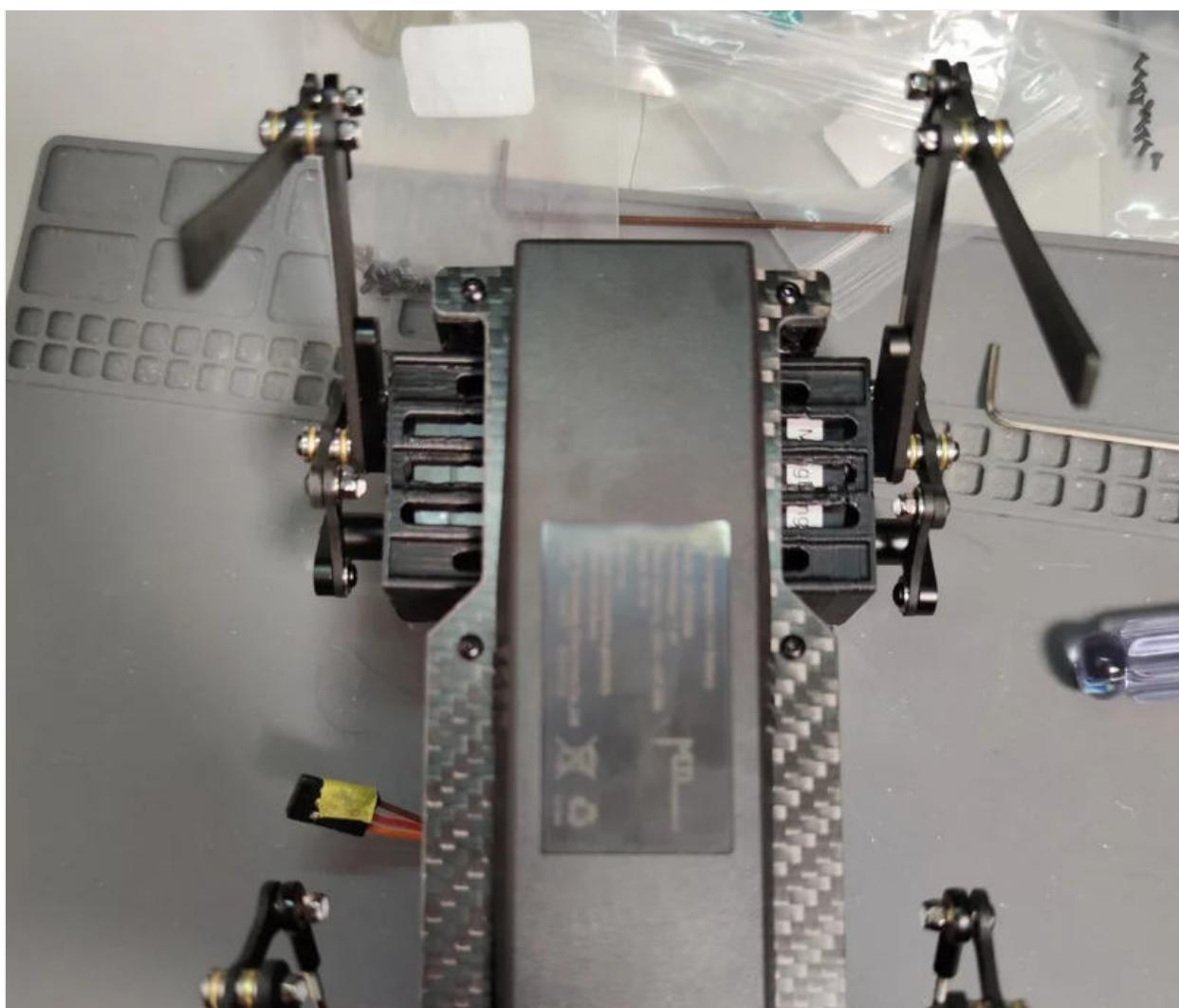
Battery pack installation

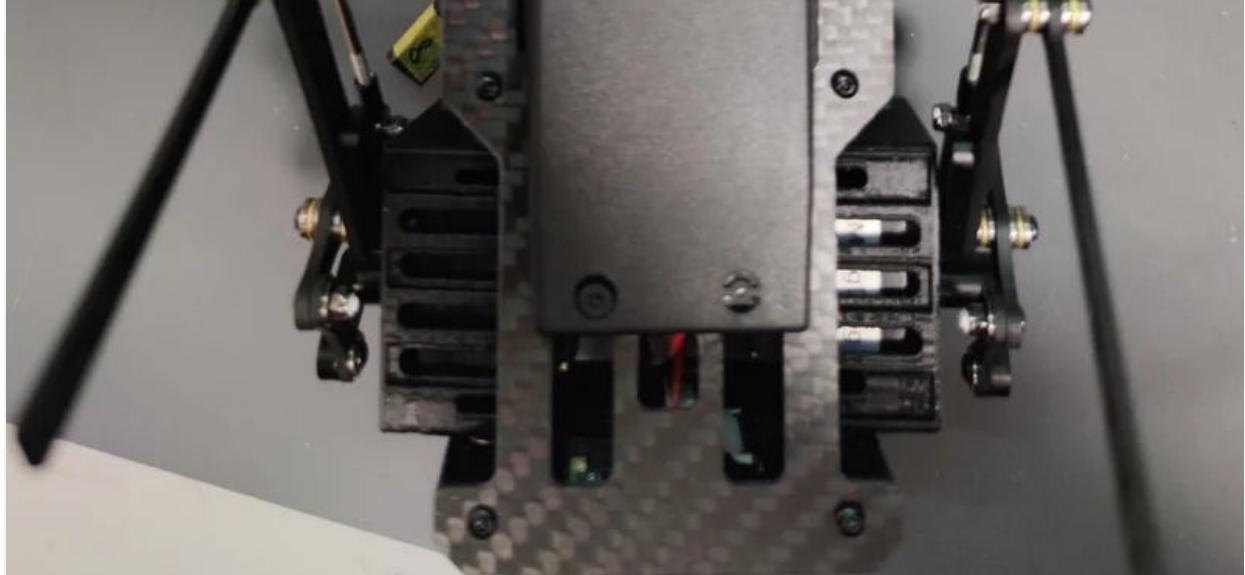
Insert the battery pack into the bottom of the main unit. First, pass the lead wire of the battery pack through the hole on the front side, align the claw with the hole on the bottom, and slide it back to fix it. Since the installation is firm, it will work well if you work after raising the claws on the battery pack side a little.





First pass the battery lead wire through the hole on the front side.

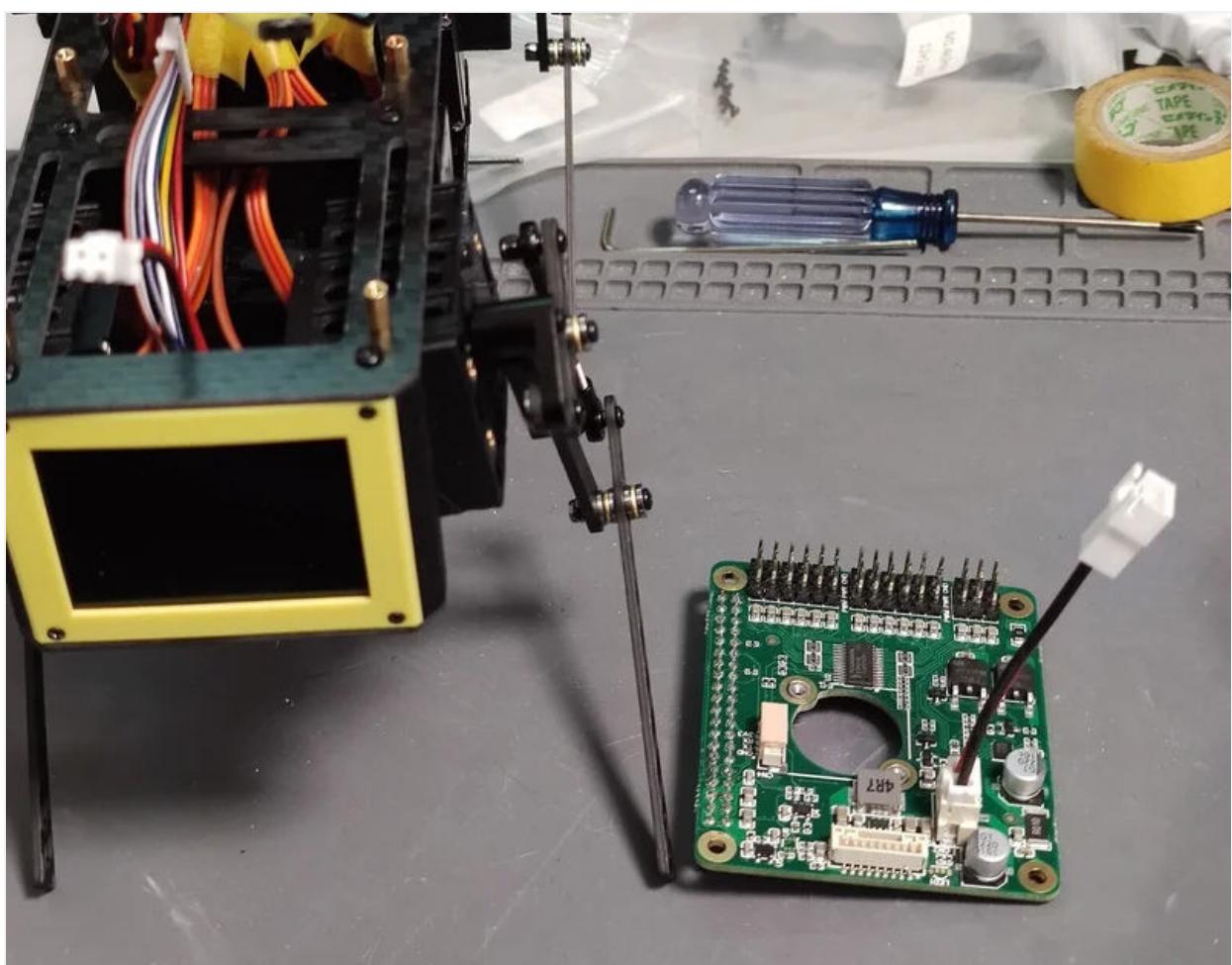




Attach the battery pack to the bottom

Installation of control board

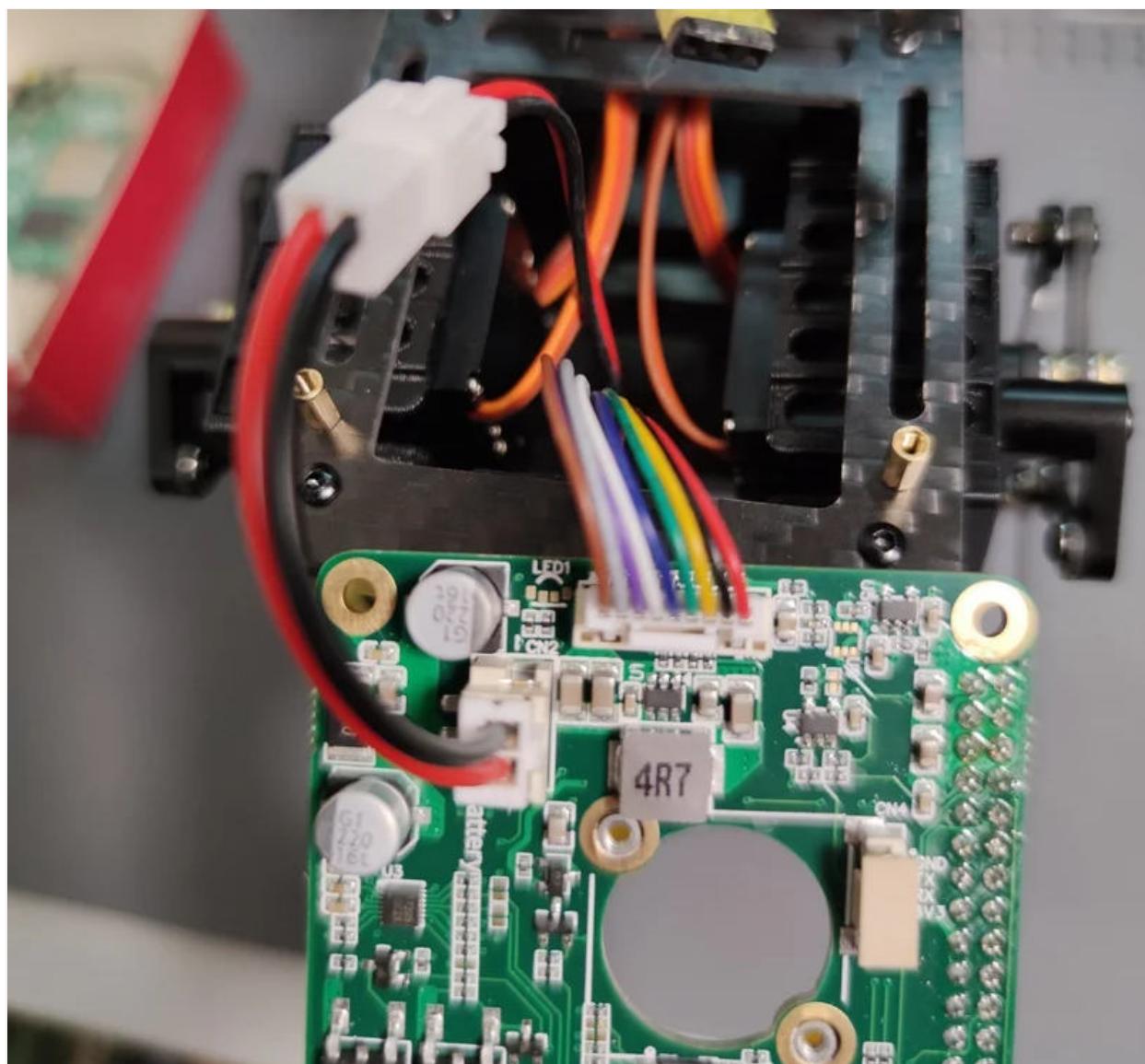
Next, attach the custom circuit board to the main body.



Attach a custom circuit board to the main body

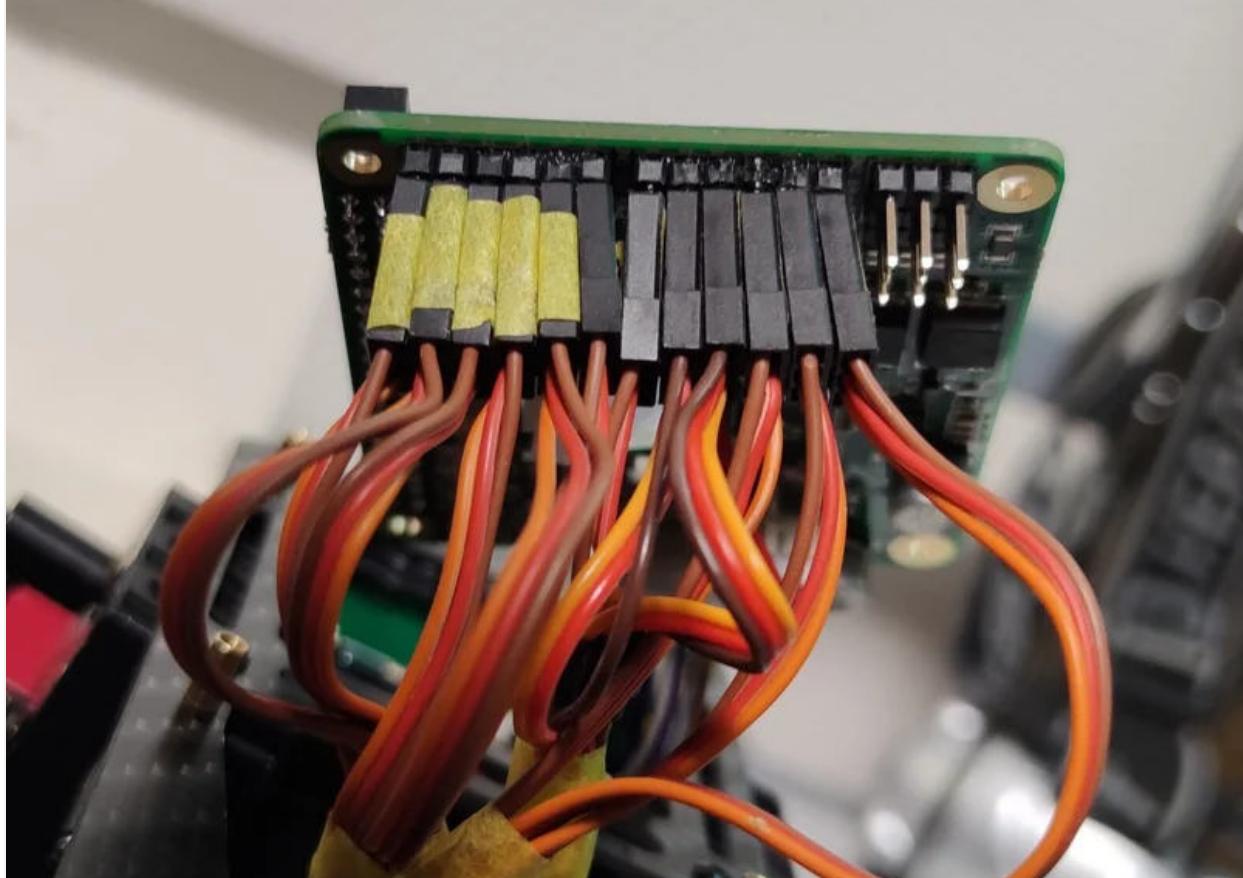
Connecting leads to a custom circuit board

First, connect the LCD panel control board and the battery lead wire to the connector of the custom circuit board.



Connect the LCD board and battery leads to the custom circuit board

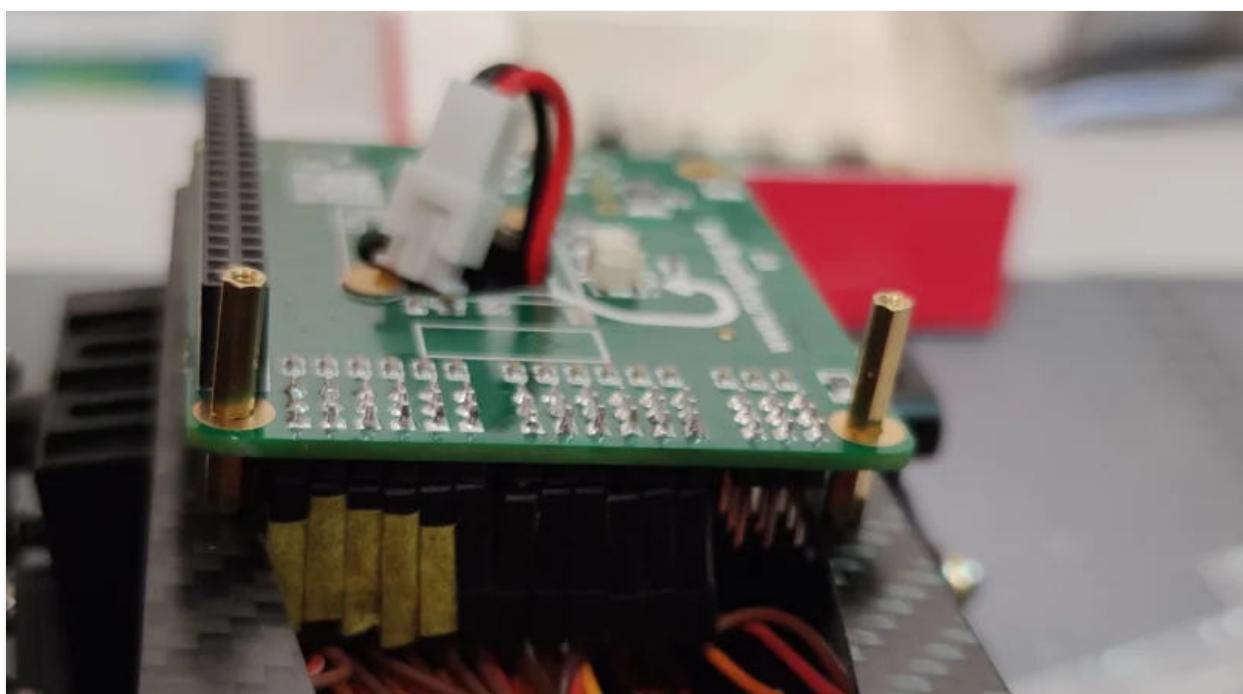
Insert 12 servo connectors in order from J1 **with the edge side of the board as GND**. The upper part of the housing is a little thicker, so it will be slanted and difficult to insert, but you can connect without worrying about it.



Connect the servo connector to the custom circuit board

Mounting a custom circuit board on the top plate

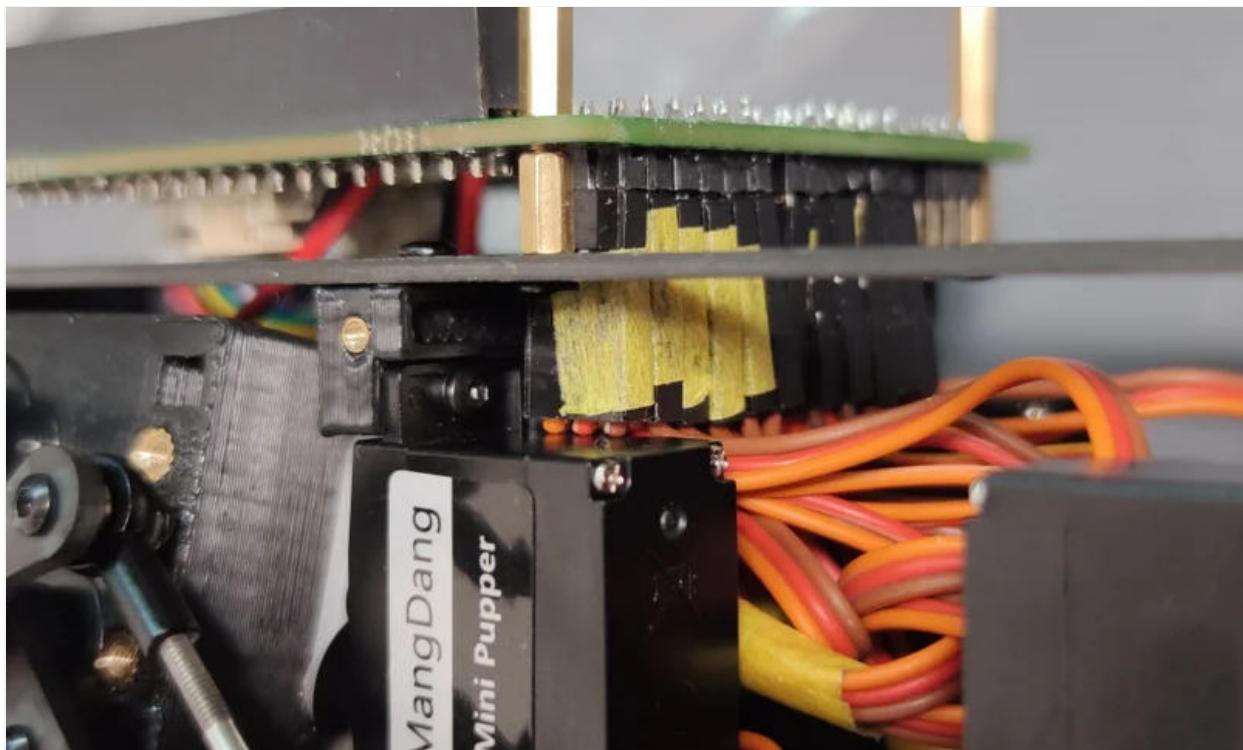
Push the servo lead into the hole in the plate at the top of the body and hold it down to secure the custom circuit board with the **stanchions** .





Attach the custom circuit board to the top plate

The connector in the foreground is close to the **servo**, so bend the lead wire inward first and push it in with a little force.



Lead wire processing of the servo part

Installation of cooling fan

Remove the protective tape from the screw holes and use two **M2x8mm** bolts to attach the cooling fan with screws.

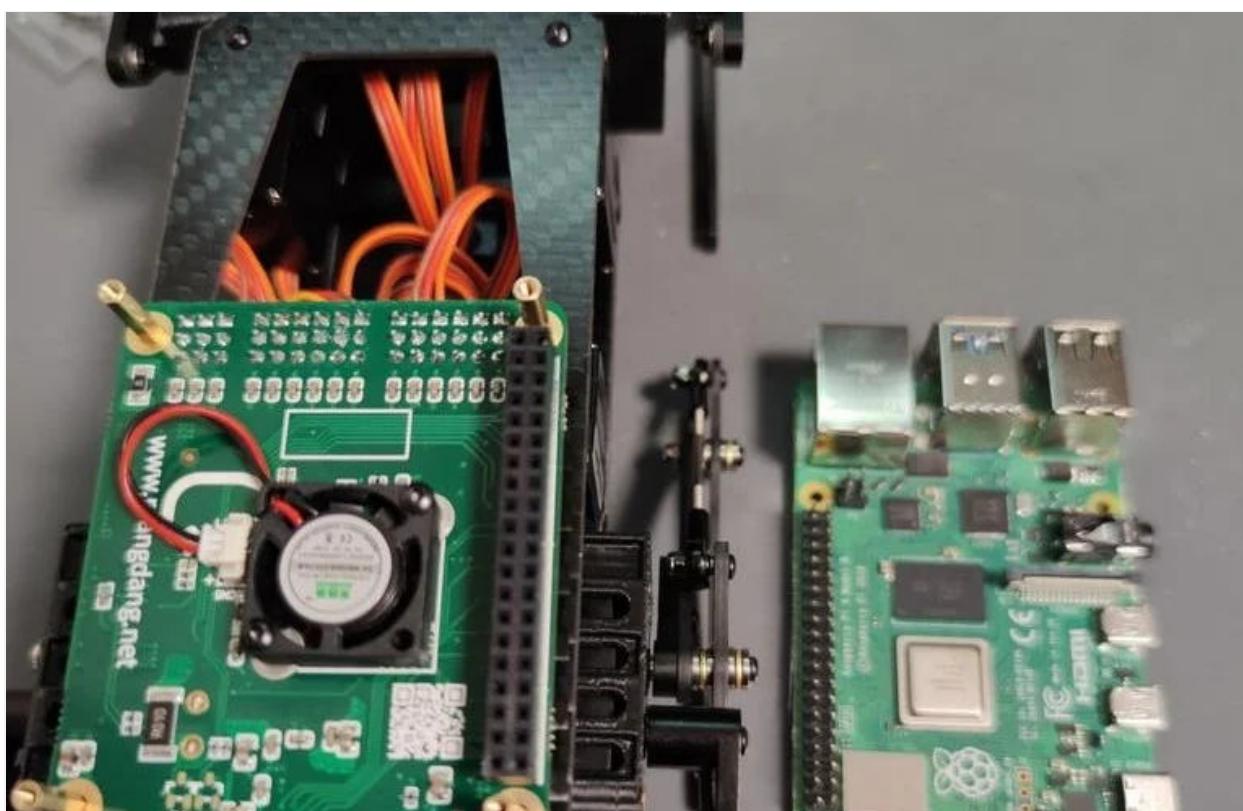




Installation of cooling fan

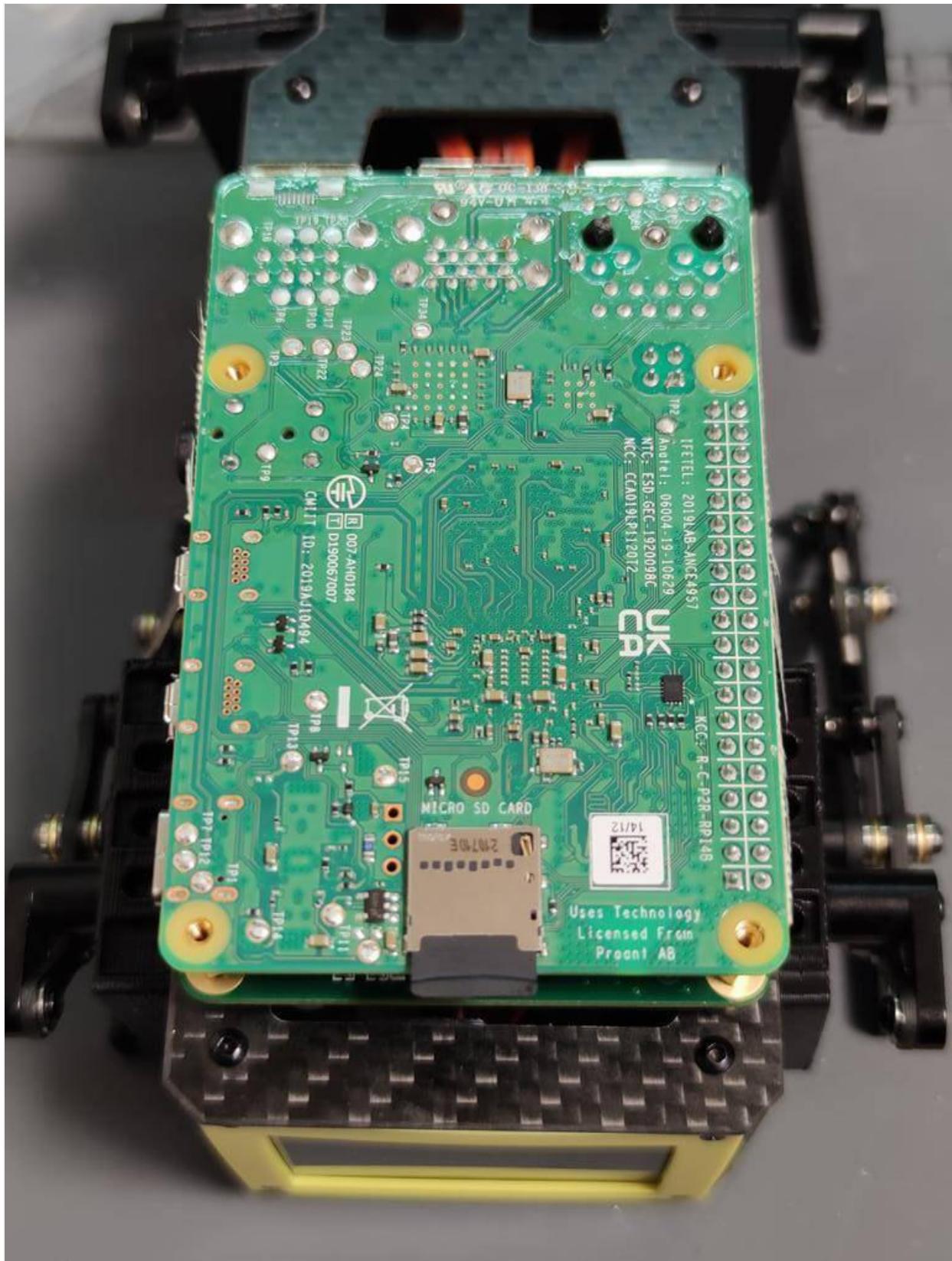
Installation of Raspberry Pi 4

Insert the Raspberry Pi's 40-pin header into the 40-pin connector on the custom circuit board and attach it.





Custom circuit board and Raspberry Pi

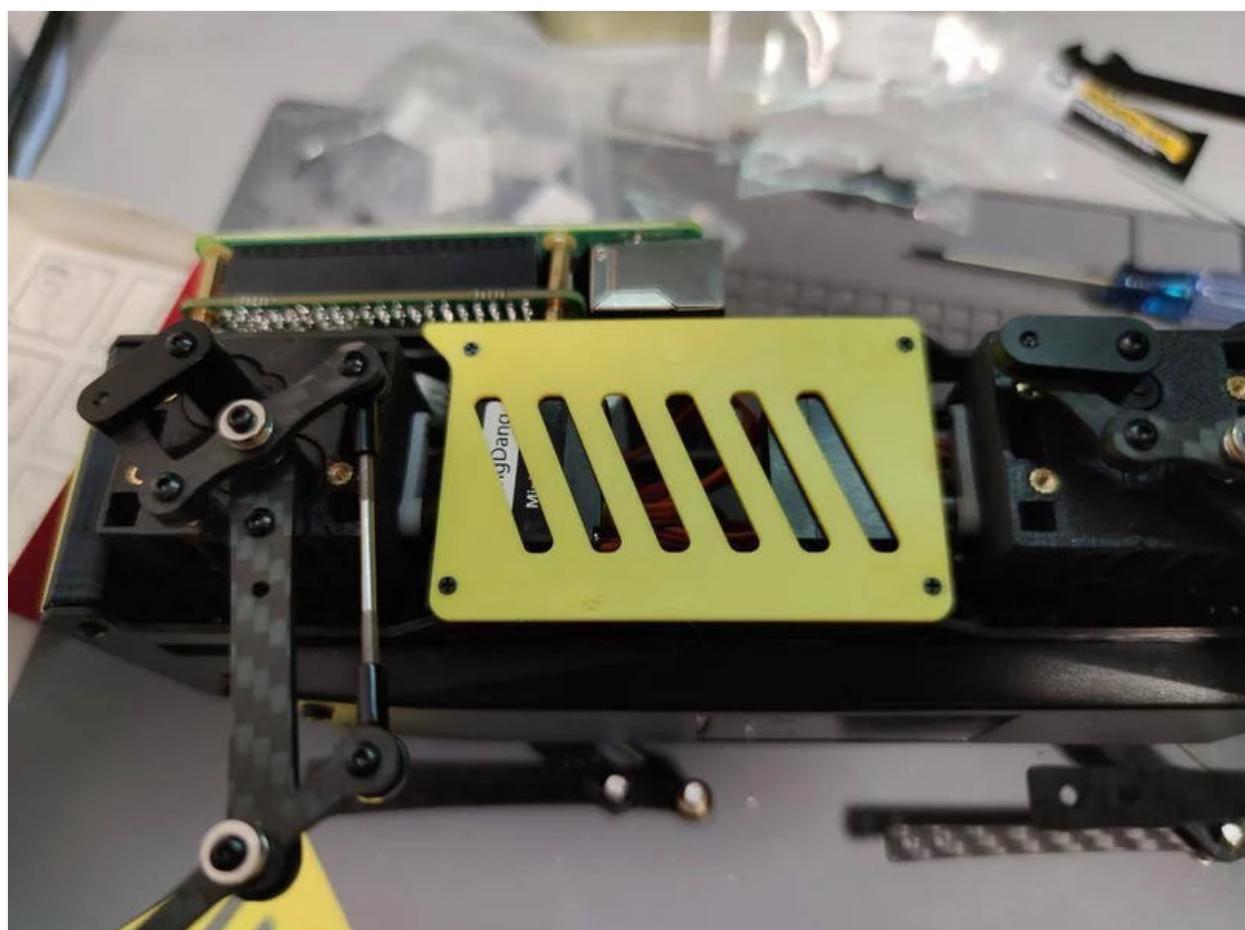


With Raspberry Pi attached

Exterior installation

Side panel installation

Install the left and right side panels using eight **M1.4x3mm countersunk screws**.

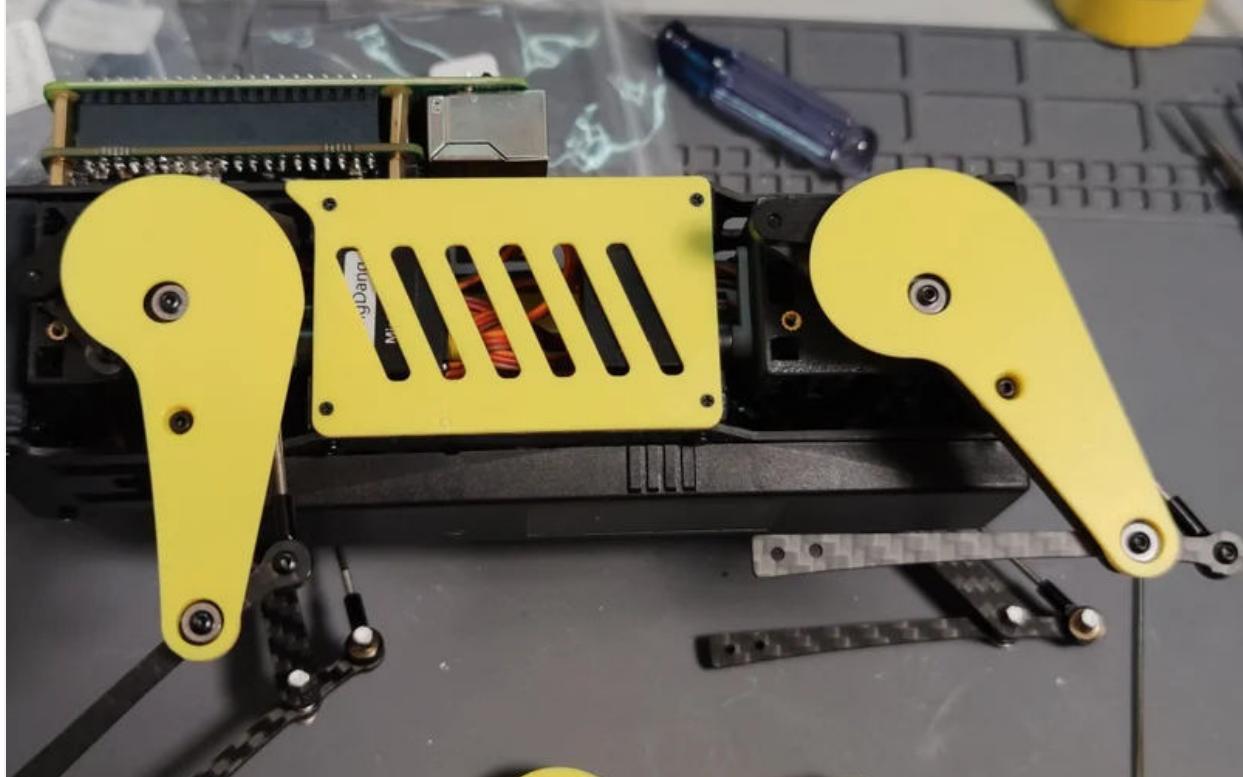


Side panel installation

Attaching the leg cover

Attach the leg cover using one **M2x10mm bolt for each leg**.

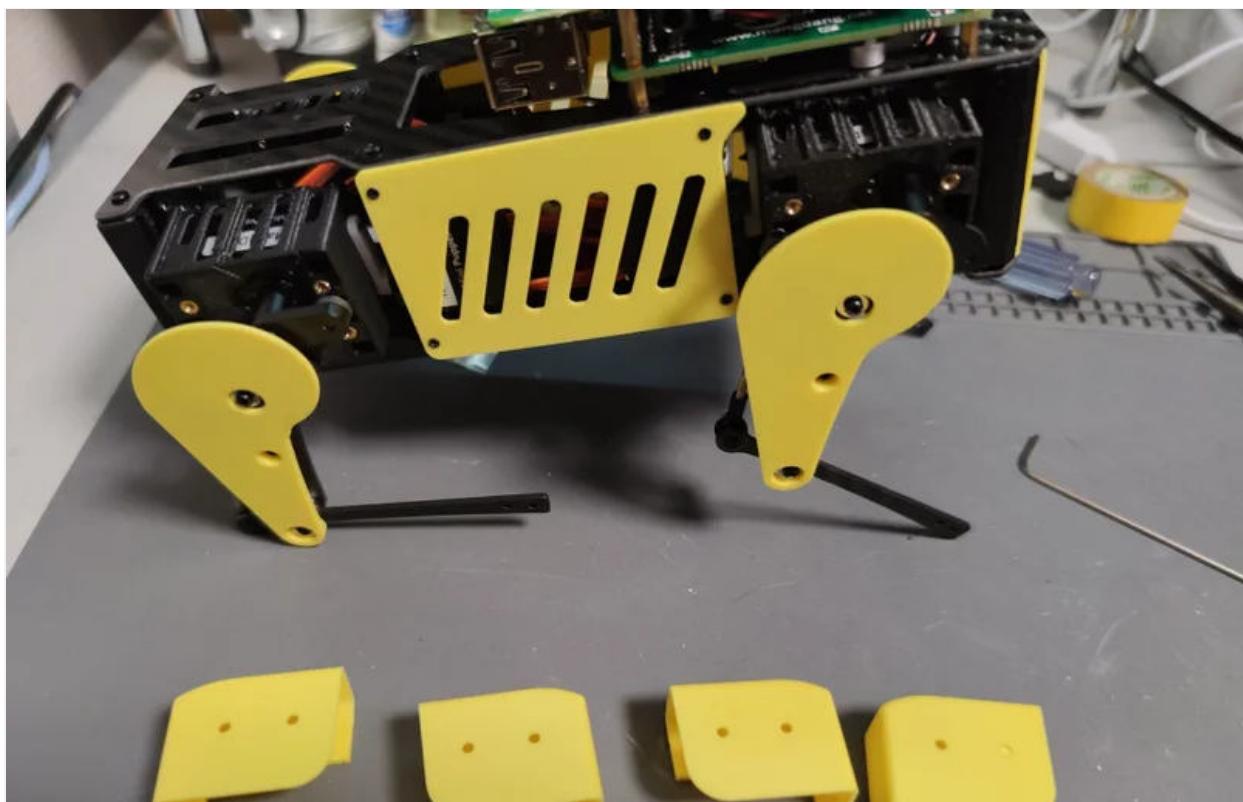




Attaching the leg cover

Attaching the shoulder cover

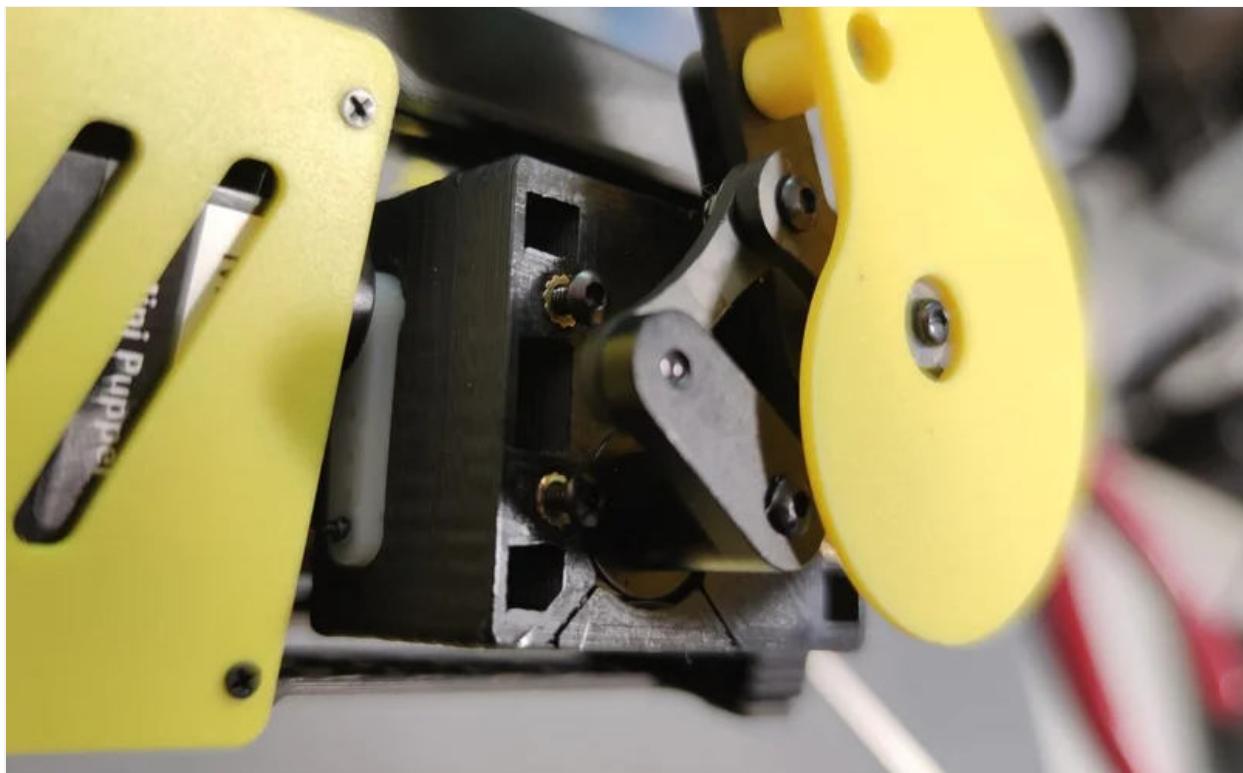
Attach the shoulder cover to the base of the leg. **Use two M2x4mm bolts on each leg.**





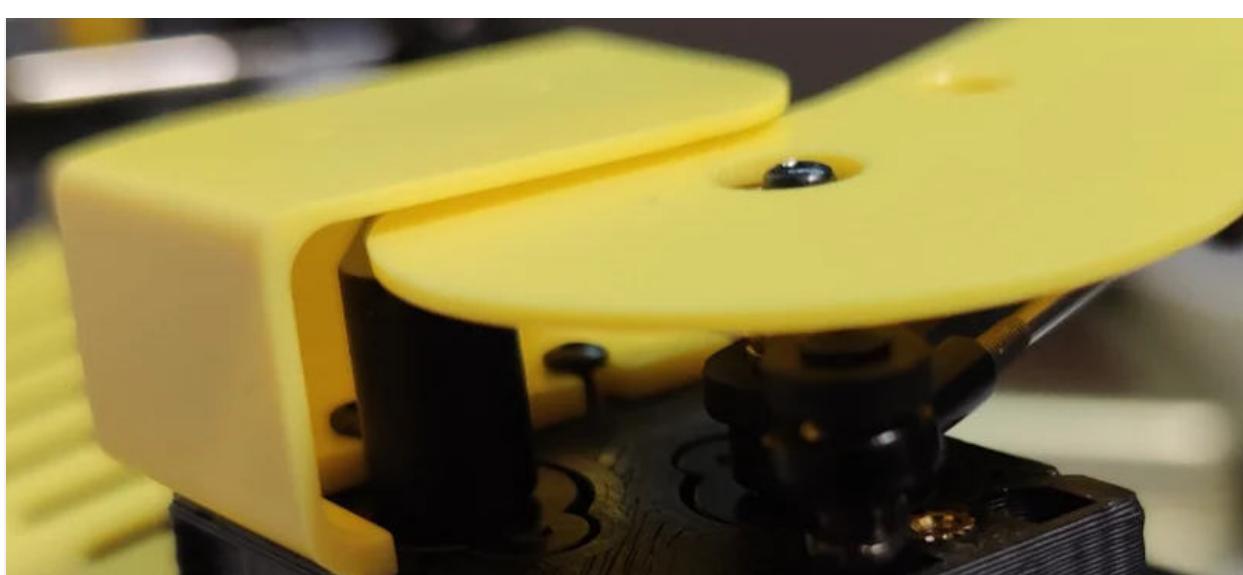
Shoulder cover

First, temporarily fix the two bolts to the buttocks parts.



Temporarily fix the bolt

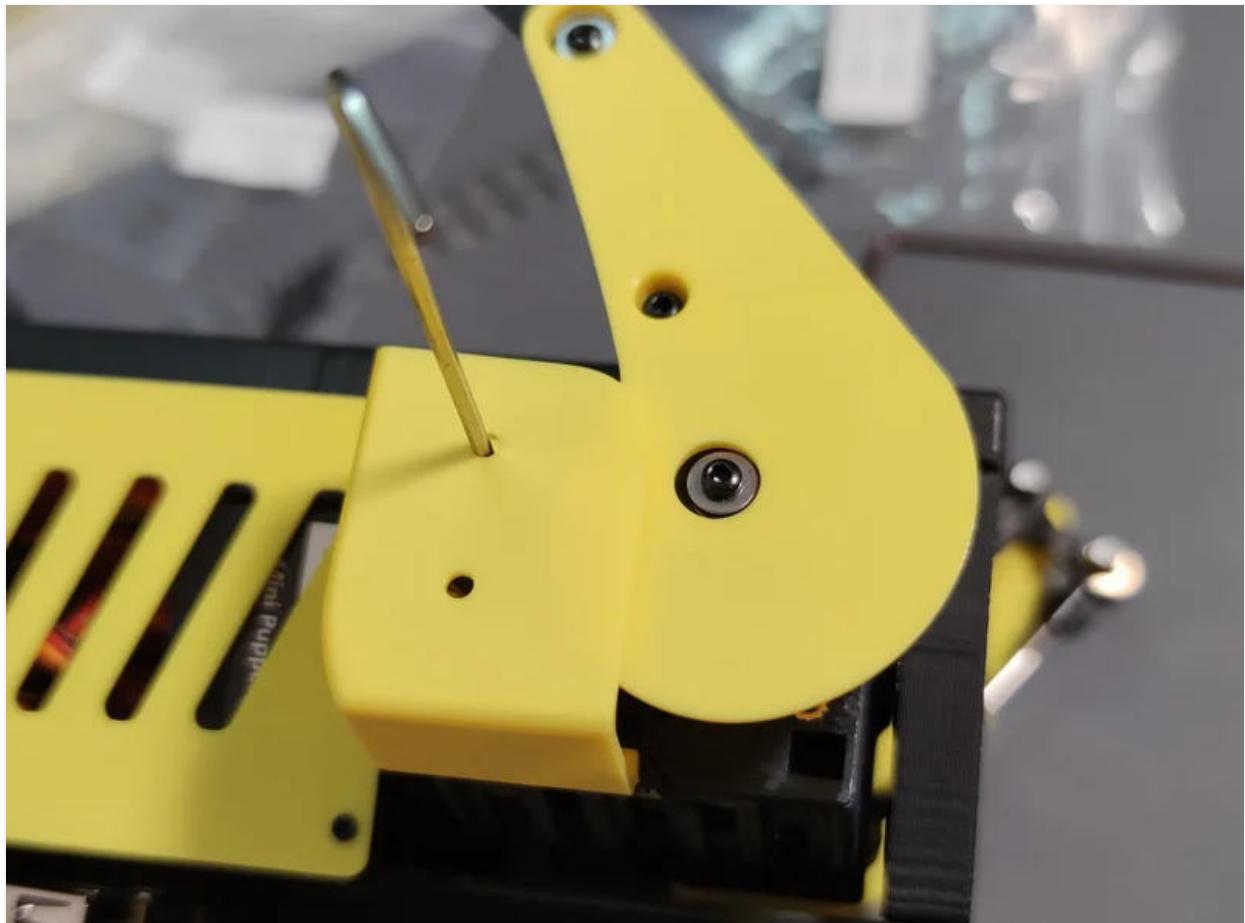
Hook the shoulder cover on the temporarily fixed screw.





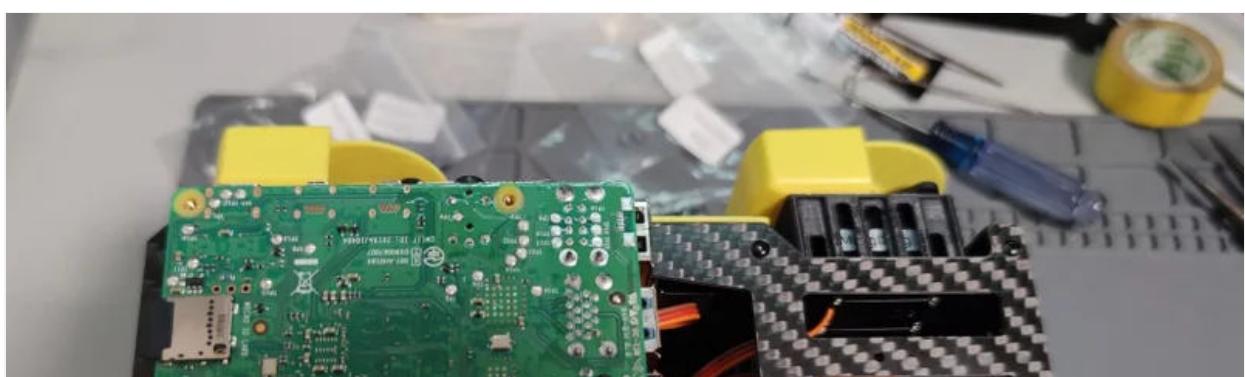
Hook the shoulder cover on the screw

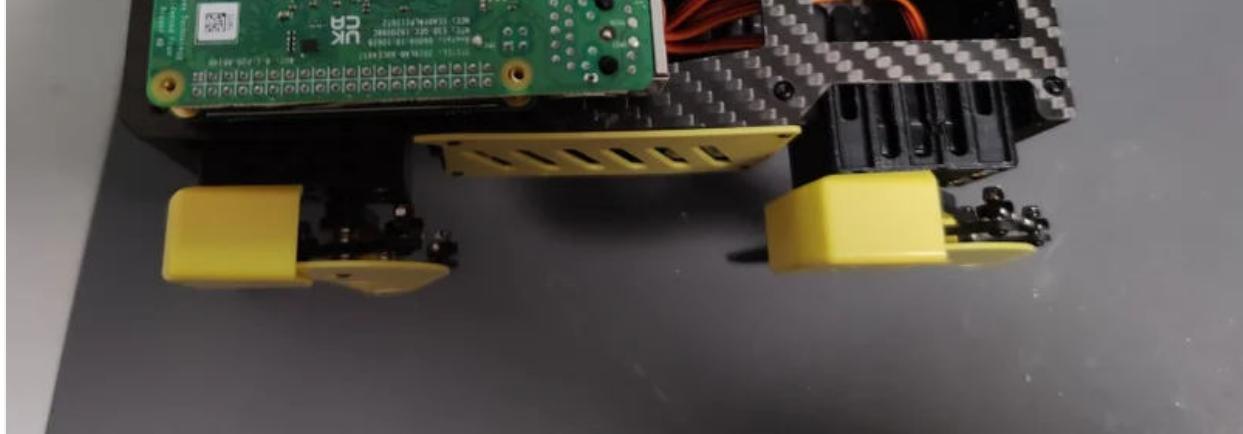
Pass the wrench through the hole in the shoulder cover and tighten two bolts to complete the installation.



Tighten the bolt through the hole

The picture below shows all legs with shoulder covers.

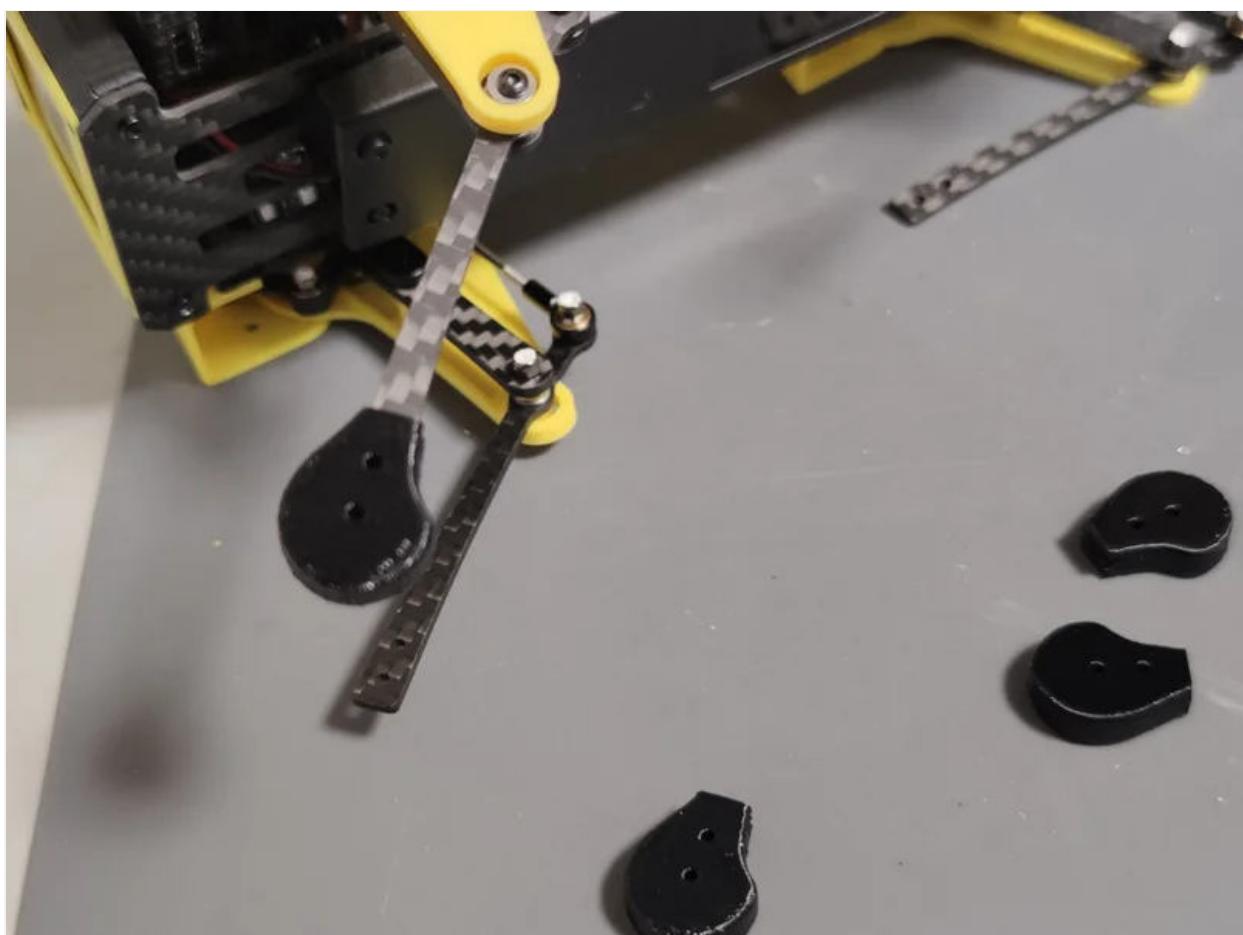




With the shoulder cover attached

Put shoes on your legs

Attach the black shoe parts by fitting them into the tips of the four legs.



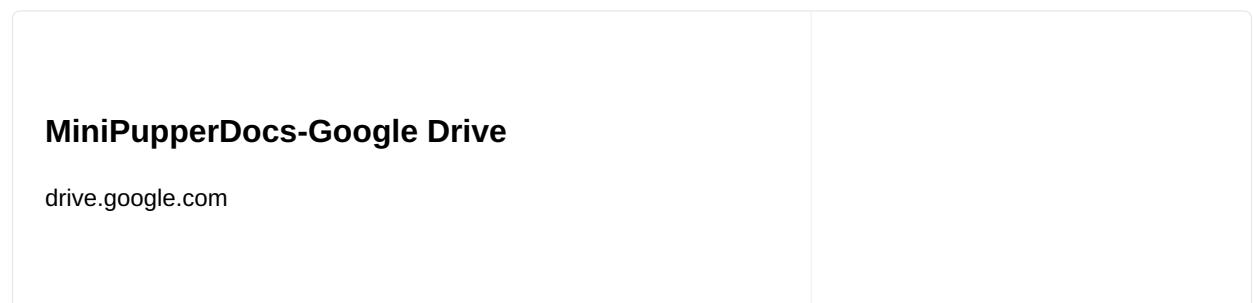
Put shoes on your legs

Software writing

The top cover will cover the Raspberry Pi, so write the software to the microSD card and attach it to the Raspberry Pi before installing it.

Download SD image

Download the SD image according to the version of the custom circuit board from the following site.



Since the custom circuit board that came with this time is V2 , the image file will be

20220109_v1.7.0_MiniPupper_V2_PS4_Ubuntu_21.10.0_Baseline.img.zip

After the download is complete, unzip and save the image file (* .img) in a suitable location.

Writing an image to an SD card

Insert the microSD card into the SD card reader of your PC and write the image. I used balena Etcher

for writing . The image file has a large file size of 15GB, and it takes time to write. It is recommended to write in advance in parallel with the assembly work.

縮サイズ	パスワード保...	サイズ	圧縮
4,201,269 KB 無		15,558,144 KB	73%

The size of the image file after decompression

The download link disappeared from the balena Etcher link in the assembly instructions . The official website has been moved to here, so download and use the one that suits your PC environment from here.

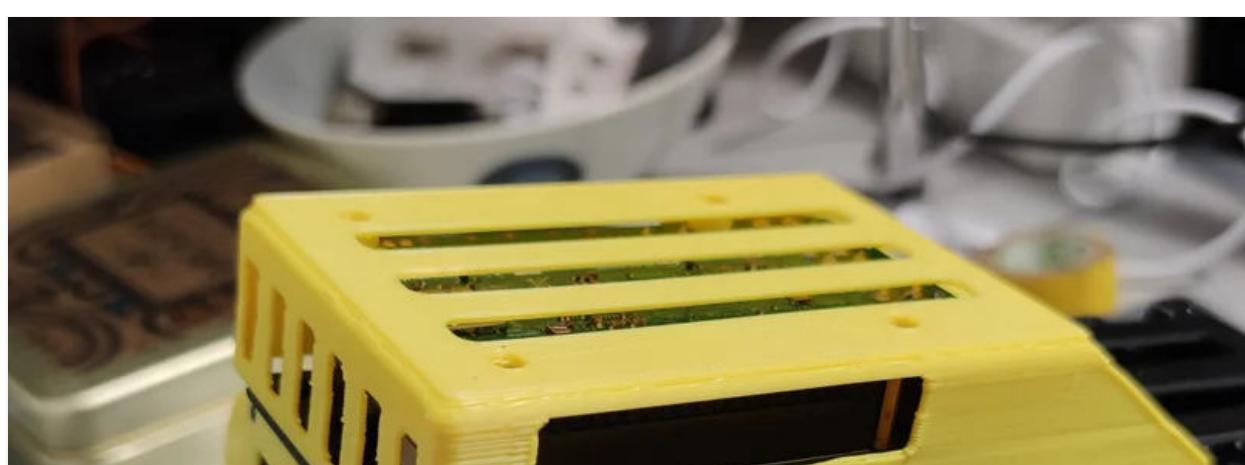
balenaEtcher --Flash OS images to SD cards & USB drives

A cross-platform tool to flash OS images onto SD cards and US
www.balena.io

After writing the image, insert the microSD into the Raspberry Pi.

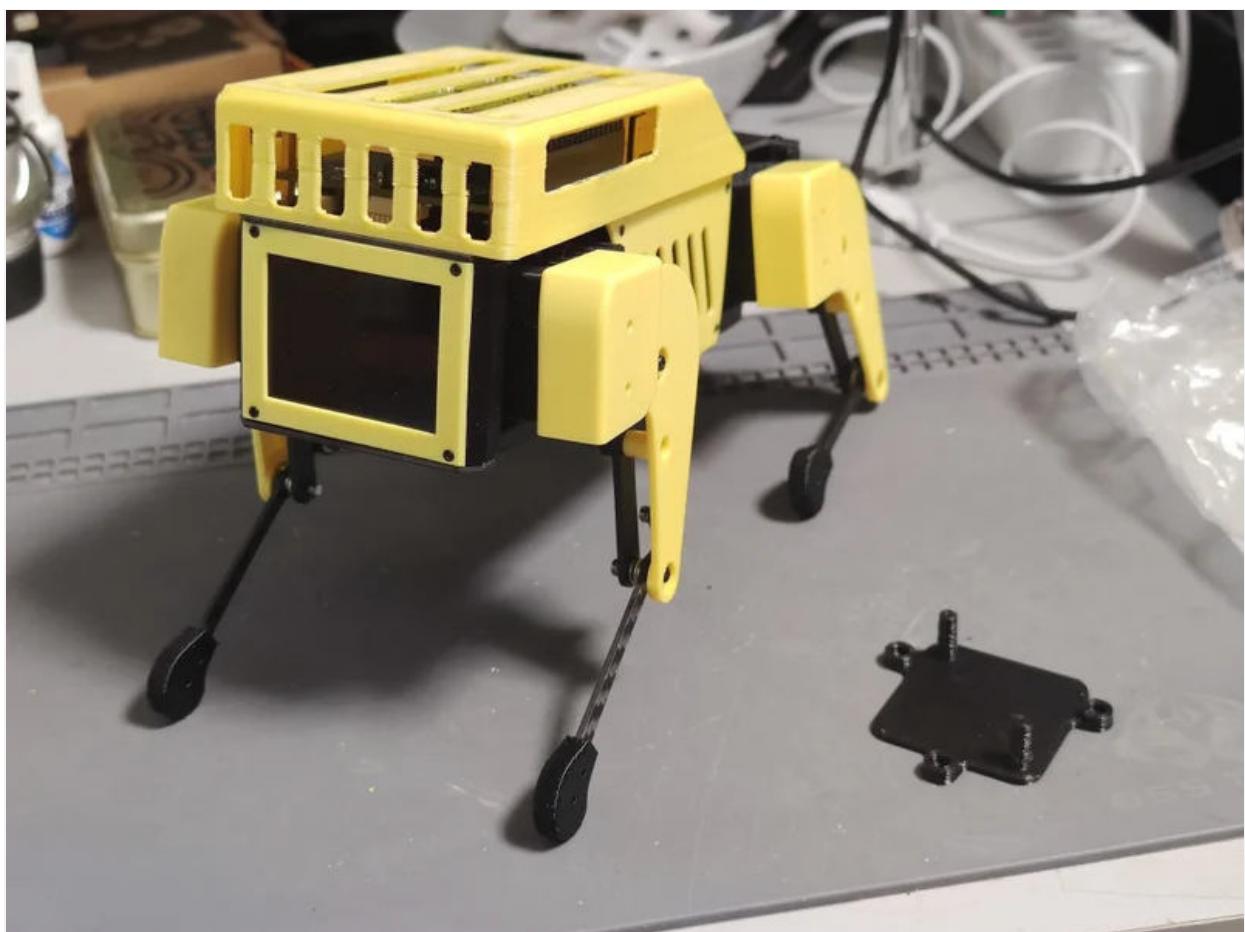
Installation of top cover

After inserting the microSD into the Raspberry Pi, attach the top cover. **Use four M2x10mm bolts for mounting** . If the mounting holes are small, widen the holes in advance.





Install the top cover



Assembly completed!

Software initialization

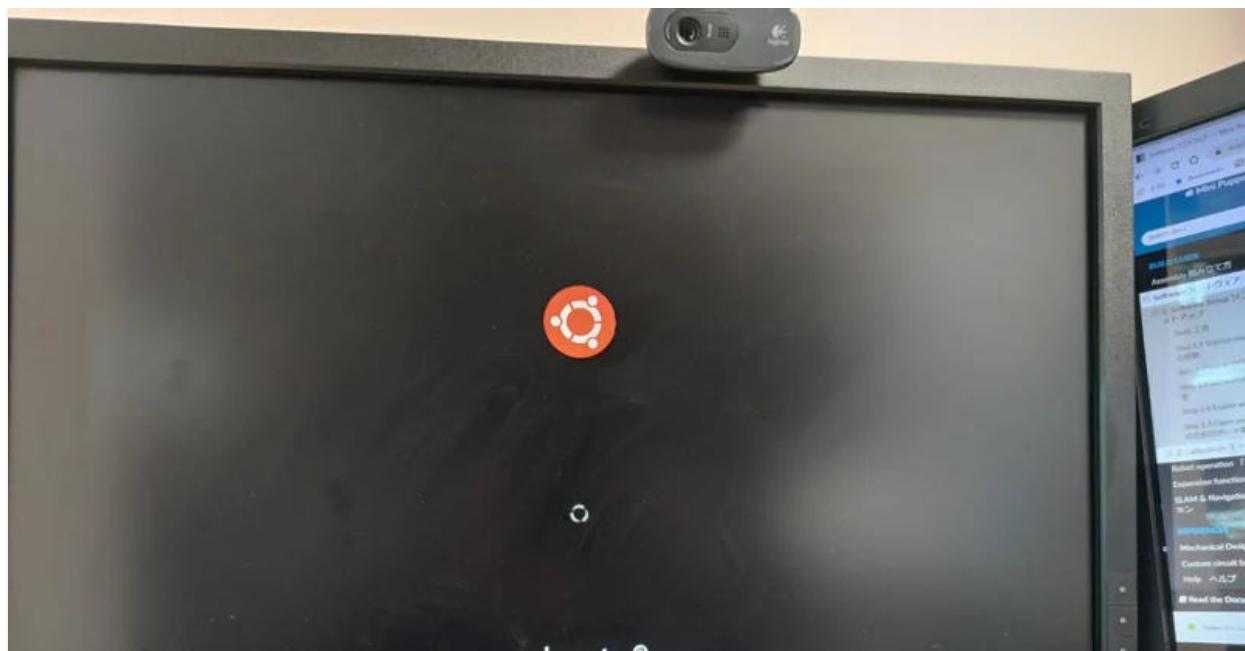
The initial software settings are made by connecting a keyboard, mouse and monitor to the Raspberry Pi.

Please note that the connector of Raspberry Pi 4 is **microHDMI** . You can buy the conversion adapter at Daiso.



You can buy the microHDMI conversion adapter at Daiso

Press and hold the button on the bottom of the battery pack for 3 seconds to launch Ububtu.





Ubuntu startup screen

After waiting for a while, the desktop will be displayed. When the login screen is displayed, log in with the following information.

Initial user name: ubuntu

Initial password: mangdang

Please change the user name and password if necessary.



Launched desktop screen

When Ubuntu starts, you will see your face on the LCD panel of the Mini

Pupper.

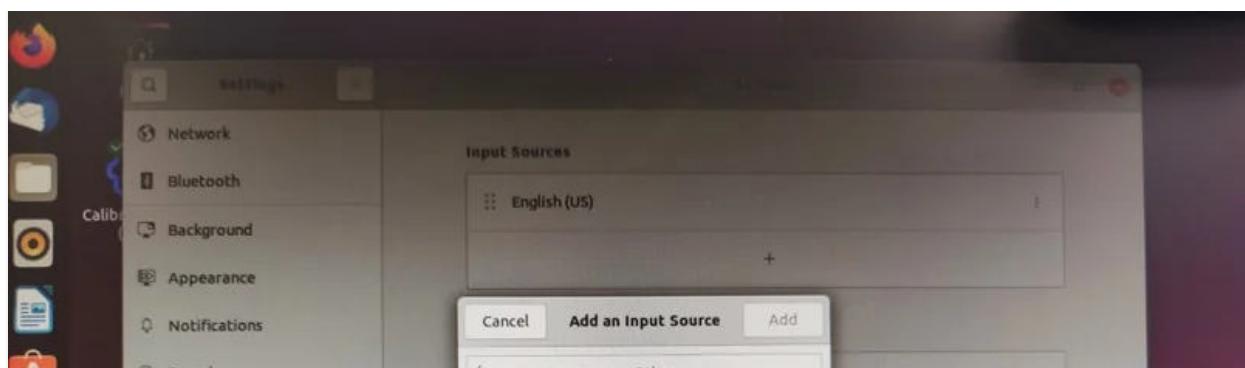


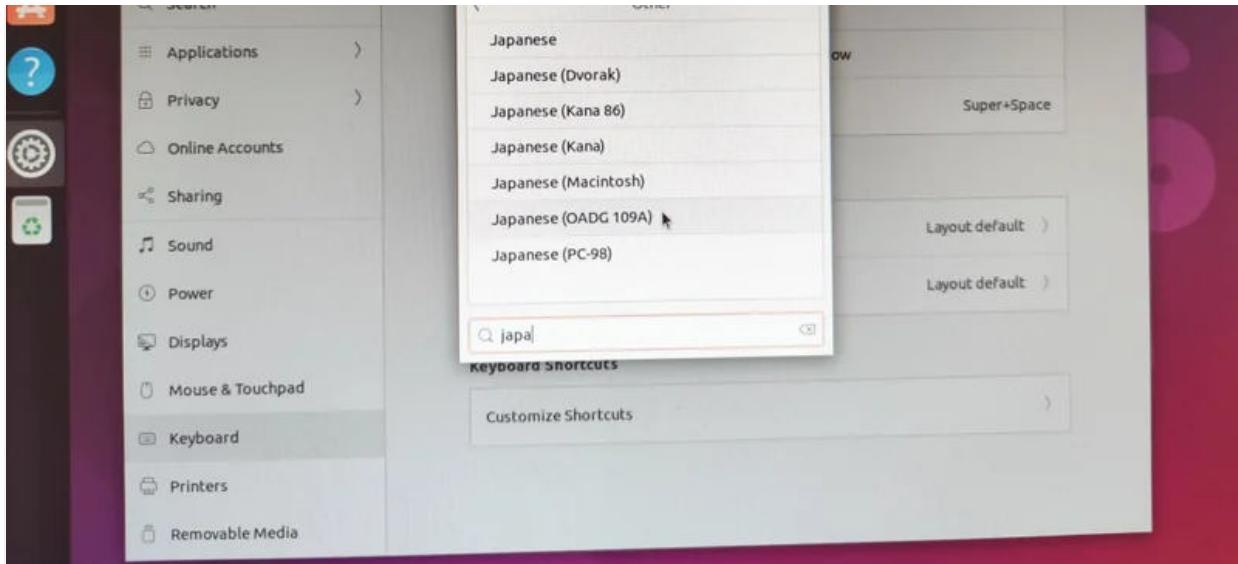
The face of Mini Pupper is displayed!

Select the keyboard settings to use

Press the menu button at the bottom left of the Ubuntu screen and type settings to launch the settings.

Select the keyboard you are using (this time the Japanese keyboard) from the Keyboard settings.

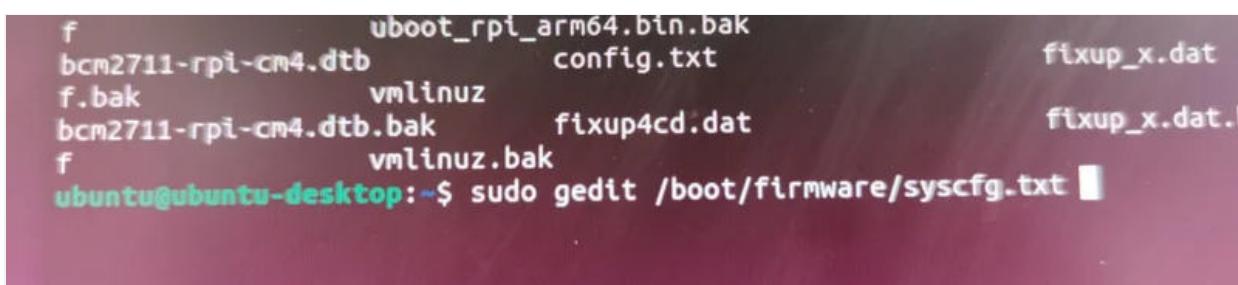




Select Japanese keyboard

Enable Wi-Fi

Open syscfg.txt, comment out the disable-wifi part, and reboot.



Open syscfg.txt in an editor

```
1 # This file is intended to contain system-made con
2 # configuration changes should be placed in "userc
3 # README file for a description of the various con
4 # partition.
5
6 dtparam=i2c1
7 dtoverlay=i2c3,pins_4_5
8 dtoverlay=i2c4,pins_6_7
9 dtoverlay=spi0-1cs
10 dtoverlay=i2c-pwm-pca9685a
11 #dtoverlay=disable-wifi
12 dtoverlay= gpio-fan
13 dtparam=audio=on
```

```
14 dtoverlay=audremap,pins_18_19  
27: 15 dtoverlay=act-led,activelow=on  
16 dtparam=pwr_led_trigger=none  
27: 17 dtparam=pwr_led_activelow=off
```

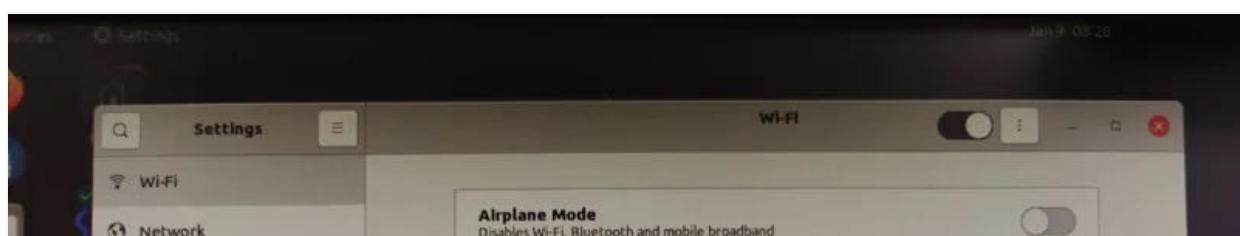
Comment out the "disable-wifi" line

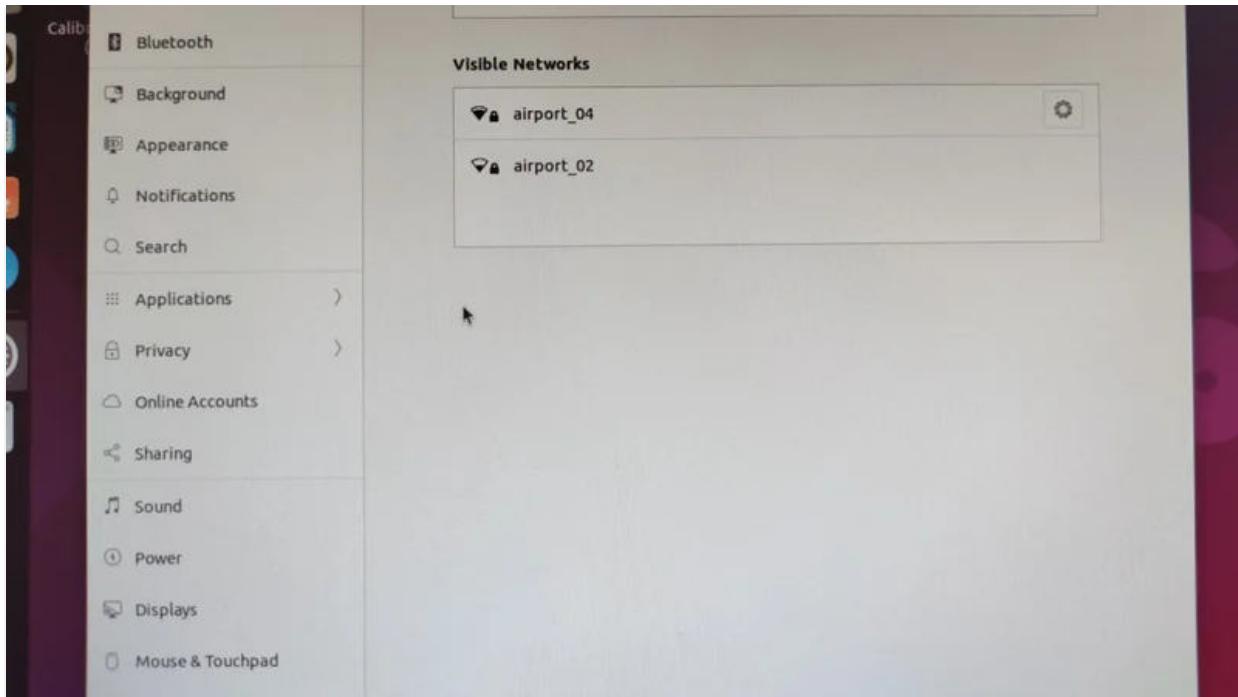


Restart with "Restart" from the pull-down menu on the upper right of Ubuntu

After rebooting, press the menu button at the bottom left and type settings to launch the settings.

Set the AP information (SSID, password) of the connection destination Wi-Fi from the Wi-Fi settings and connect.





Set AP connection information

Once you have a Wi-Fi connection, use the Ubuntu terminal to connect via SSH from your PS.

```
ip a
```

And make a note of the IP address assigned to the Raspberry Pi's Wi-Fi adapter (wlan0).

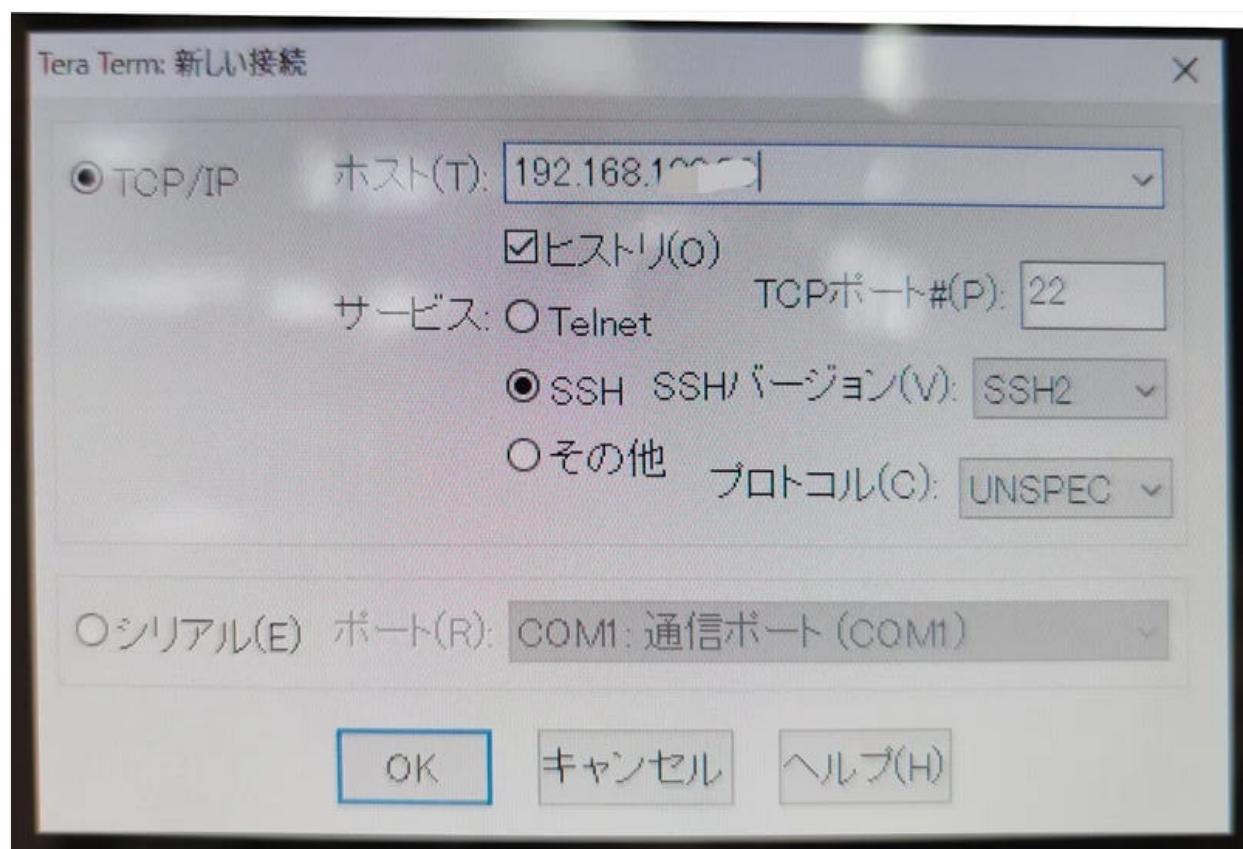
At this time, it is a good idea to set the router to allocate a fixed IP to the Raspberry Pi.

```
3: wlan0: <BROADCAST,MULTICAST,UP  
      link/ether e4:5f:01:7f:ea:7f brd 192.168.1.255  
        inet 192.168.1.10/24 brd 192.168.1.255  
          valid_lft 259170sec preferred_lft forever  
        inet6 2409:13:9520:1110:d12f:  
          brd fe80::2409:13ff:fe95:2110  
          valid_lft 259170sec preferred_lft forever
```

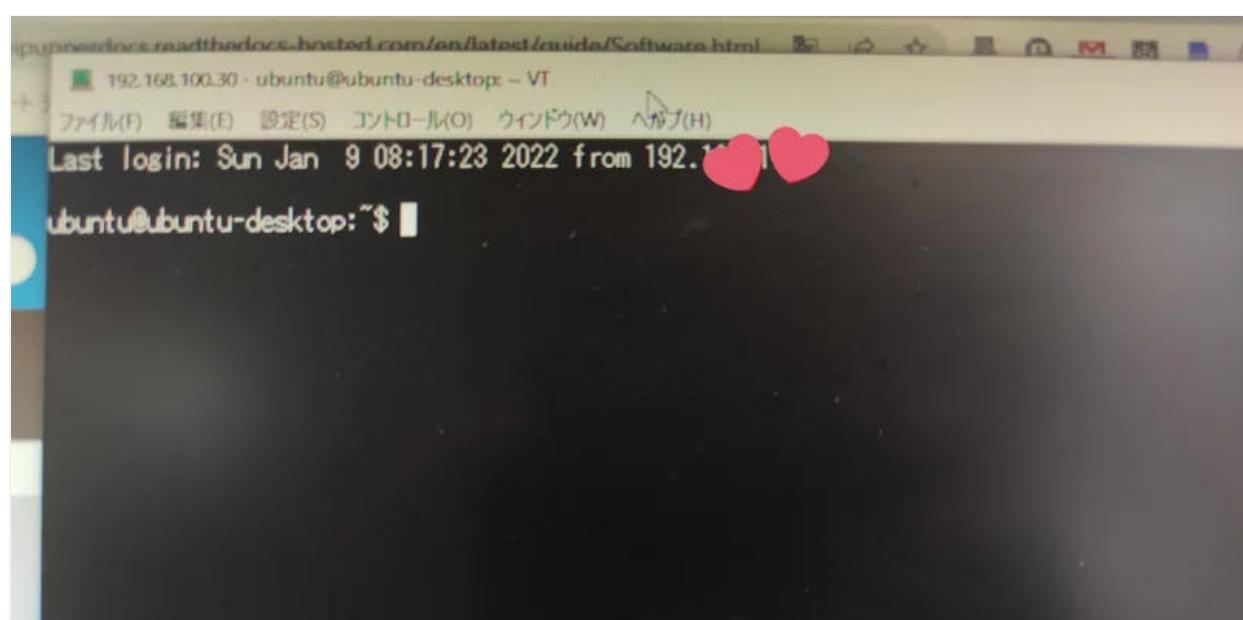
Check the IP address of Raspberry Pi

SSH connection check

Go to your PC and make sure you can connect to the Mini Pupper via SSH from the terminal software (Tera Term is used in this example).



Select TCP / IP connection in Tera Term





Screen of Tera Term connected by SSH

Precautions before turning off the power

Mini Pupper runs on Ubuntu, so if **you suddenly turn off the power by pressing and holding the power button on the battery pack, your SD card may be destroyed.**

Before turning off the power, it is necessary to perform shutdown processing on Ubuntu, so type the following command from a PC via SSH connection.

```
sudo shutdown -h now
```

After waiting for about 30 seconds, the shutdown will be completed, so press and hold the power button on the battery pack to turn off the power.

Alternatively, you can shut down Ubuntu by pressing and holding the △ button on the remote control .

Calibration of the main body

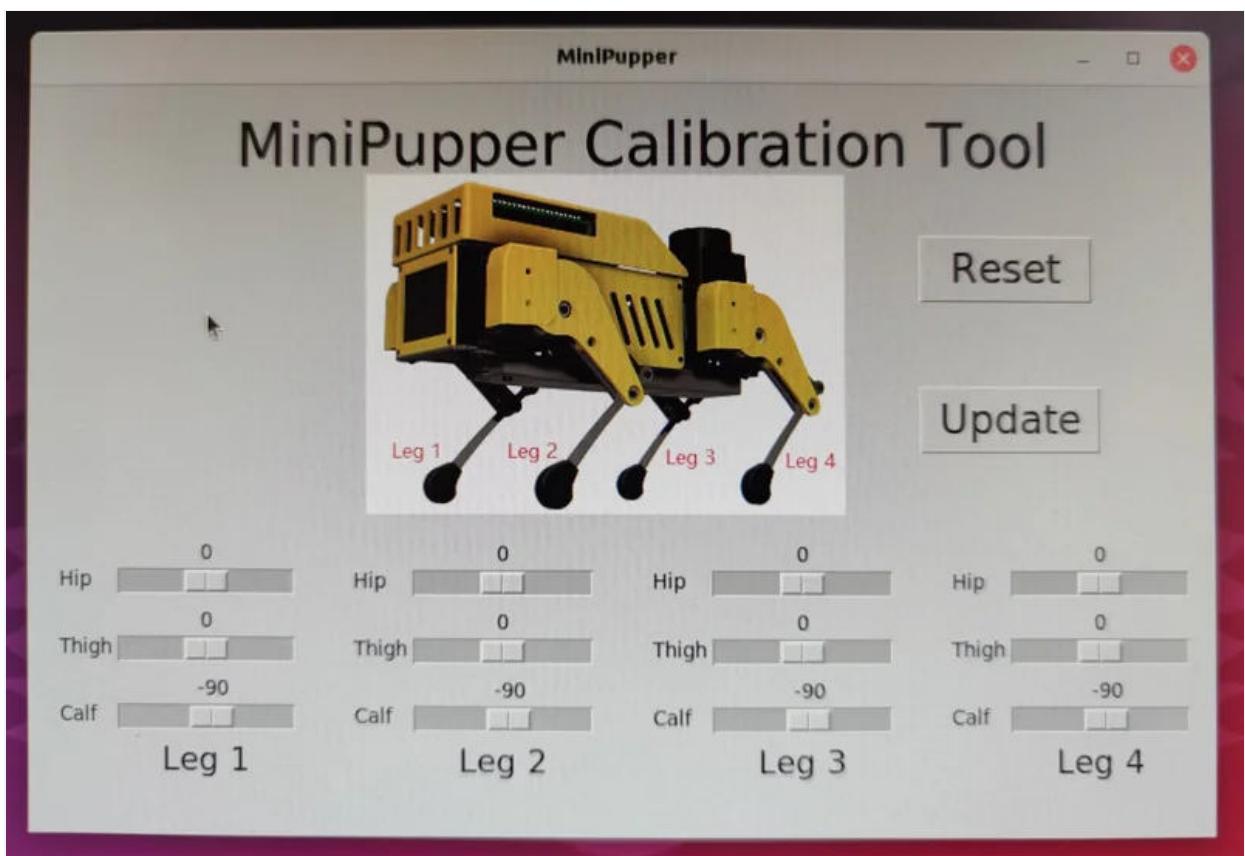
The calibration tool of the main unit is an Ubuntu app.





Calibration tool icon

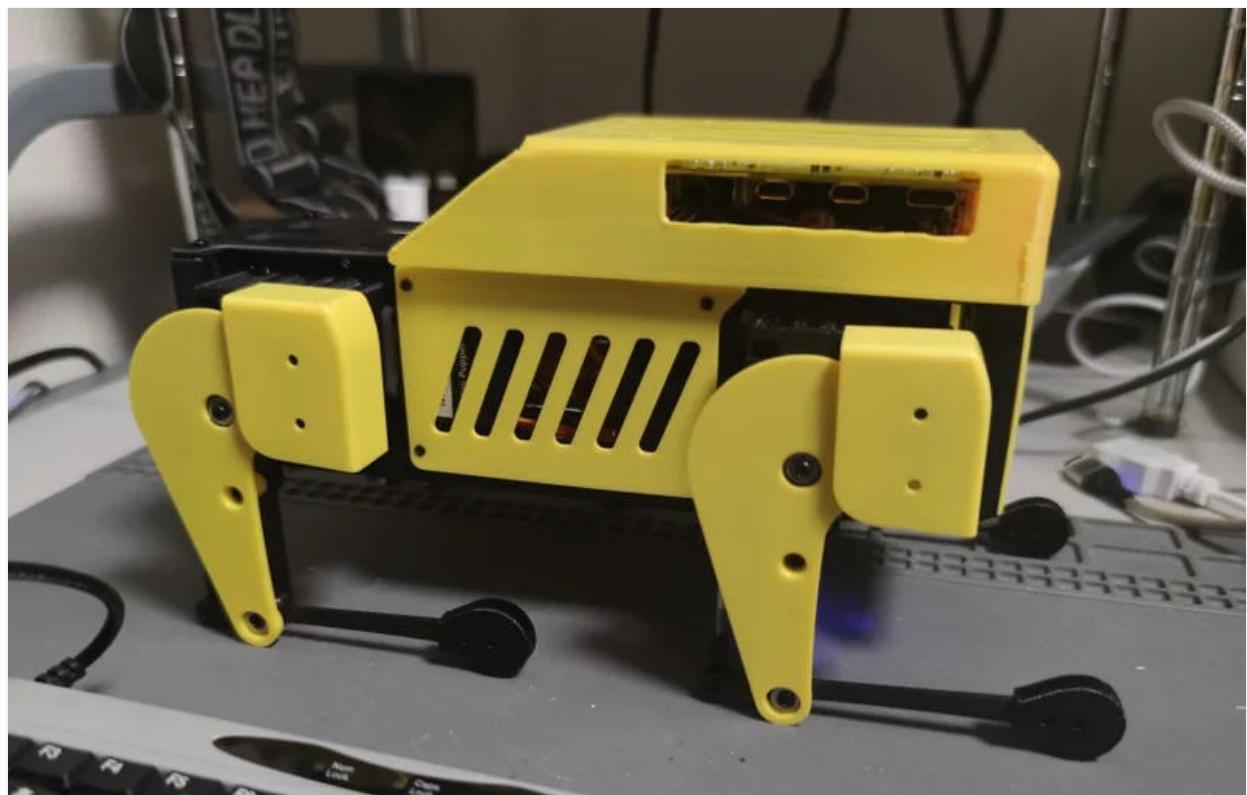
Double-click the icon to launch the calibration tool.



Calibration tool

In the latest firmware, use the slide bar of the calibration tool to set the **four legs to 90 degrees as shown in the picture below**.

After completing the settings, click the [Update] button to save the settings and exit the tool.



Calibrated state

When the calibration is complete, shut down the Mini Pupper and remove the mouse, keyboard, and monitor.

When you restart the Mini Pipper, it will start in a prone state as shown in the picture below.





With Mini Pupper running

Press and hold the "SHARE button" and "PS button" on the attached remote controller at the same time for 3 seconds or longer to enter pairing mode. In pairing mode, the remote control light will blink twice.

When the remote control is connected to the main unit, the light of the remote control turns green.

If you press the L1 button on the remote control in this state, the Mini Pupper will turn yellow and start up.





Stand up when pairing is completed

Since the pairing was completed, I immediately tried moving the Mini Pupper with the remote control. This is not a fast forward, but an actual movement is amazing! (vocabulary)

tomorrow56@最近は分解の人(モ3済)
@tomorrow56

Replying to @tomorrow56

よし！リモコンで動いた！これは楽しい！
[#100日後に動き出すMiniPupper](#)
93日前倒ししたww

[Watch on Twitter](#)

11:35 AM · Feb 12, 2022 from Sapporo City Chuo Ward, Hokkaidō ⓘ

Heart 36 Reply Copy link

[Read 2 replies](#)

tomorrow56@最近は分解の人(モ3済)



@tomorrow56

Replying to @tomorrow56

狭いけど床に移動してR1ボタンでのトロットモードで操作。予想以上に前後左右に機敏に動くし、コントローラのジョイスティック操作が簡単でいい感じ。

#100日後に動き出すMiniPupper

[Watch on Twitter](#)

11:45 AM · Feb 12, 2022 from Sapporo City Chuo Ward, Hokkaidō



8 Reply Copy link

[Read 1 reply](#)

The operation method with the remote control is described in "Robot operation" of the official document.

Robot operation — Mini Pupper 1.0.0-alpha documentation

mangdang-minipupperdocs.readthedocs-hosted.com

summary

Lastly, I would like to mention the precautions for assembly that I learned through this assembly.

Items other than accessories required for assembly

- Loctite (substitute for correction fluid)
- Toothpick (Apply Loctite to screw holes)
- Hex wrench for M3 (It is a cross in the official procedure manual, but the attached screw is a hex bolt)
- Masking tape and thin permanent marker (McKee)

Good things to have

- A little good hex wrench for M2 (attached is loosely engaged)

Precautions when assembling

- Anyway, the combination of leg parts (slightly different in front, back, left and right)
- Use the lead length of the servo properly
(If the servo is screwed, the molded product is fragile, so it is difficult to

remove it)

- Front and back of the bottom plate (I made a mistake)

Reference material for expansion

The official document of Mini Pupper has a procedure manual for expansion, so it seems that you can continue to play with it.

Extended functions (animation display on LCD screen, etc.)

Expansion functions — Mini Pupper 1.0.0-alpha documentation

[mangdang-minipupperdocs.readthedocs-hosted.com](https://mangdang-minipupperdocs.readthedocs-hosted.com/en/latest/expansion.html)

SLAM & Navigation

SLAM & Navigation — Mini Pupper 1.0.0-alpha documentation

[mangdang-minipupperdocs.readthedocs-hosted.com](https://mangdang-minipupperdocs.readthedocs-hosted.com/en/latest/slam.html)

Mang Dang's GitHub

mangdangroboticsclub --Overview

Mini Pupper: Open-Source, ROS Robot Dog Kit. Mangdangrobotics
[github.com](https://github.com/mangdangroboticsclub)

Finally, I will post a link to crowdfunding again, so if you are interested, please try Pledge.

Kickstarter

Mini Pupper: Open-Source, ROS Robot Dog Kit

Mini Pupper will make robotics easier for schools, homeschool
www.kickstarter.com

Makuake

www.makuake.com

Both beginners and professionals can enjoy it! Robot dog "Mini Pupper" that you can make your...

Mang Dang Technology  product

• ¥26,341,000 • 466 people

8780%



Have a nice Mini Pupper life!