SIYI

# D6
# ENTERPRISE PROPULSION SYSTEM
## USER MANUAL


**SIYI Technology (Shenzhen) Co., Ltd.**

**siyi.biz/en**

Thank you for purchasing SIYI's product.

D6 enterprise propulsion system is the first integrated brushless propulsion system developed by SIYI Technology. It is mainly suitable for enterprise flying platform with 30mm arm diameter and single-axis take-off weight of 2KG to 2.5KG. D6 enterprise propulsion system adopts nano-coating technology, waterproof level up to IPX5 and can operate stably in an environment of -30℃ to 50℃. It is equipped with self-developed electric speed controllers using FOC algorithm control to improve the throttle response speed while making the system more efficient, the operation lower noise, and the throttle more linear. D6 propulsion system also has power-on low voltage, high voltage, op amp abnormality, MOS short circuit, and phase loss protection functions. During operation, it has stall protection, throttle loss, and temperature abnormality prompt functions. It uses CAN protocol to communicate with DroneCAN / UAVCAN / ArduPilot / PX4 open-source ecosystem and stores operation data and fault data.

To ensure you a good experience of the product, please read this manual carefully. If you encounter any issue using the product, please consult the manual or check the online pages of this product on SIYI official website (https://siyi.biz/en). You can also write an email to SIYI official A/S center (support@siyi.biz).

Contact Us: **SIYI Official Website** *(https://siyi.biz/en)*

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|---|---|
| SIYI User Group - Facebook | |
| Facebook | |
| LinkedIn | |
| YouTube | |

## Manual Version Update Record

| Version | Date | Updates |
|---|---|---|
| **1.0** | 2024.9 | Initial version. |
| 1. 1 | 2025.2 | 1. Add content to section 2.3.2.<br>2. Update section 7 on after-sales and warranty. |

## CONTENTS

# READ TIPS

## Icons

Please pay more attention to content indicated with the following marks:

**DANGER** Dangerous manipulation probably leads to human injuries.

**WARNING** Warnings on manipulation possibly leads to human injuries.

**CAUTION** Cautions on what manipulation may lead to property loss.

**Prohibited** **Mandatory** **Mark**

## Safety

D6 enterprise propulsion system is designed for professional application in specific scenes, users who approach to the equipment should have the basic knowledge of how to operate

it. Irregular or irresponsible manipulations to the device may cause damage, property loss, or human injuries, and SIYI Technology is not obliged to any of the damage, loss, or injury. It is prohibited to use SIYI products for military purpose. Users under 14 years' old should follow an experienced trainer's guide. Disassembling or modification to the system is prohibited without permission from its manufacturer, SIYI Technology.

## Storage / Carrying / Recycling

When your SIYI product is left unused, or you are bringing it outdoors, or the product life has expired, please do read the below precautions.

### ⚠ DANGER

Always place your SIYI products at places where babies or kids do not reach.

SIYI products should be placed in places which are too hot (above 60℃) or too cold (under -20℃).

### ⚠ CAUTION

SIYI products should not be placed in places under direct sunshine or too dusty or too wet.

Carrying or transporting SIYI products should avoid vibration or shatter by which components may break.

# CHAPTER 1 INTRODUCTION

## 1.1 Product Features

### A Fully Self-Developed & Highly Integrated Propulsion System

Integrated design, stable and reliable, lightweight and compact, efficient and collaborative, easy for solution provider and maintenance.

### Electronic Speed Controller

The electronic speed controller (ESC) is field-oriented control (FOC) and is developed by SIYI, which provides precise control and efficient response. The fault protection function has been tested by massive experiments and is safe, reliable and highly stable. It supports data storage and real-time monitoring of system operation status, which is convenient for locating and analyzing problems. It also adopts nano-coating technology and provides IPX5 protection level.

### Motor

The motor is SIYI strictly selected by craftmanship and materials, which comes with full CNC structure, imported bearings, imported permanent magnets, and high temperature resistant enameled wire. Strong thrust and good heat dissipation.

**Propellers**

Equipped with pure carbon fiber blades, lightweight material, high strength and durability, high rigidity and no deformation, corrosion resistance, stable performance, high precision and smooth operation.

**Strong Thrust, Extraordinary Efficiency**

**Straight & Foldable Propellers Equally Matched**

D6 enterprise propulsion system is compatible with both straight propellers and foldable propellers, considering both thrust performance and flight efficiency.

**PWM & CAN**

**Dual Throttle Redundancy**

The dual throttle design allows flexible selection of control response and control logic, real-time adjustment of fast response, and improved data transmission stability and system anti-interference capabilities. The PWM throttle and CAN

throttle are dual-redundant, and the throttle attitude remains unchanged when the throttle is disabled during operation, greatly improving the system's fault tolerance and safety.

**Fault Storage**

**Real-Time Analytics**

The propulsion system is equipped with a variety of sensors to detect and store core parameters such as system voltage, current, temperature, and rotating speed in real time. It supports reading data through the CAN bus, providing pilots and engineers with reliable and rich fault analysis basis, and improving diagnosis and maintenance efficiency.

**Complete ESC Protection Function**

Whether in the power-on self-test stage or the operation stage, a rich set of preset detection mechanisms can be used to take protective measures for abnormal system operation conditions or potential problems to avoid equipment damage and ensure personnel safety.

**Outstanding Design**

**Top-Notch Craftsmanship**

Excellent design concepts combined with stringent process requirements provide multiple guarantees for user delivery.

**Heat Dissipation Performance**

The motor is fully CNC-processed and equipped with a centrifugal fan to ensure that the internal temperature of the ESC is lower than 45 °C and the internal temperature of the motor is lower than 40°C in the hover throttle thermal balance state.

**Protection Performance**

Key components and materials are selected to high standards, and the overall protection level can reach IPX5.

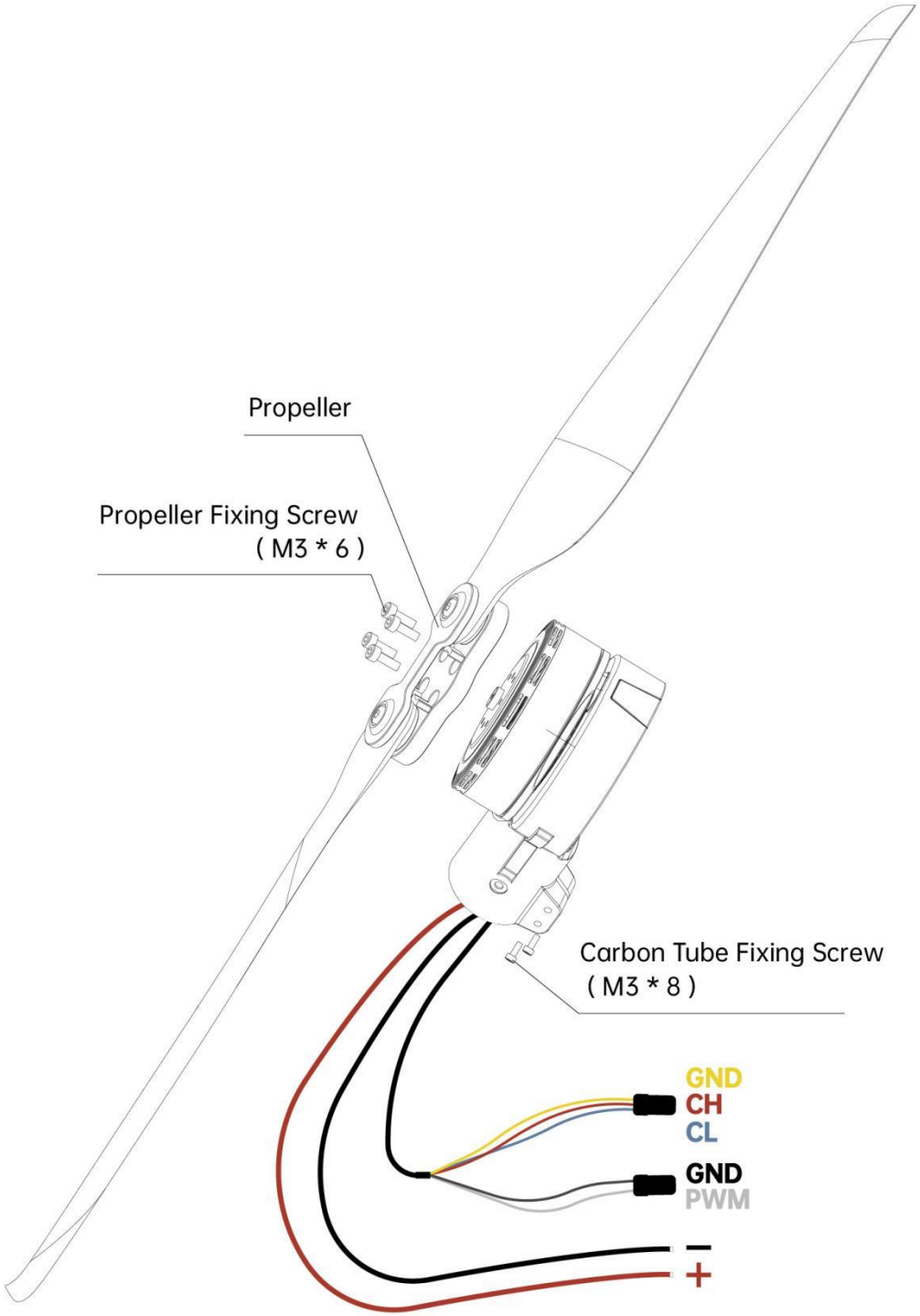
**Motor Life**

The normal operating life of the bearings can exceed 1000 hours.

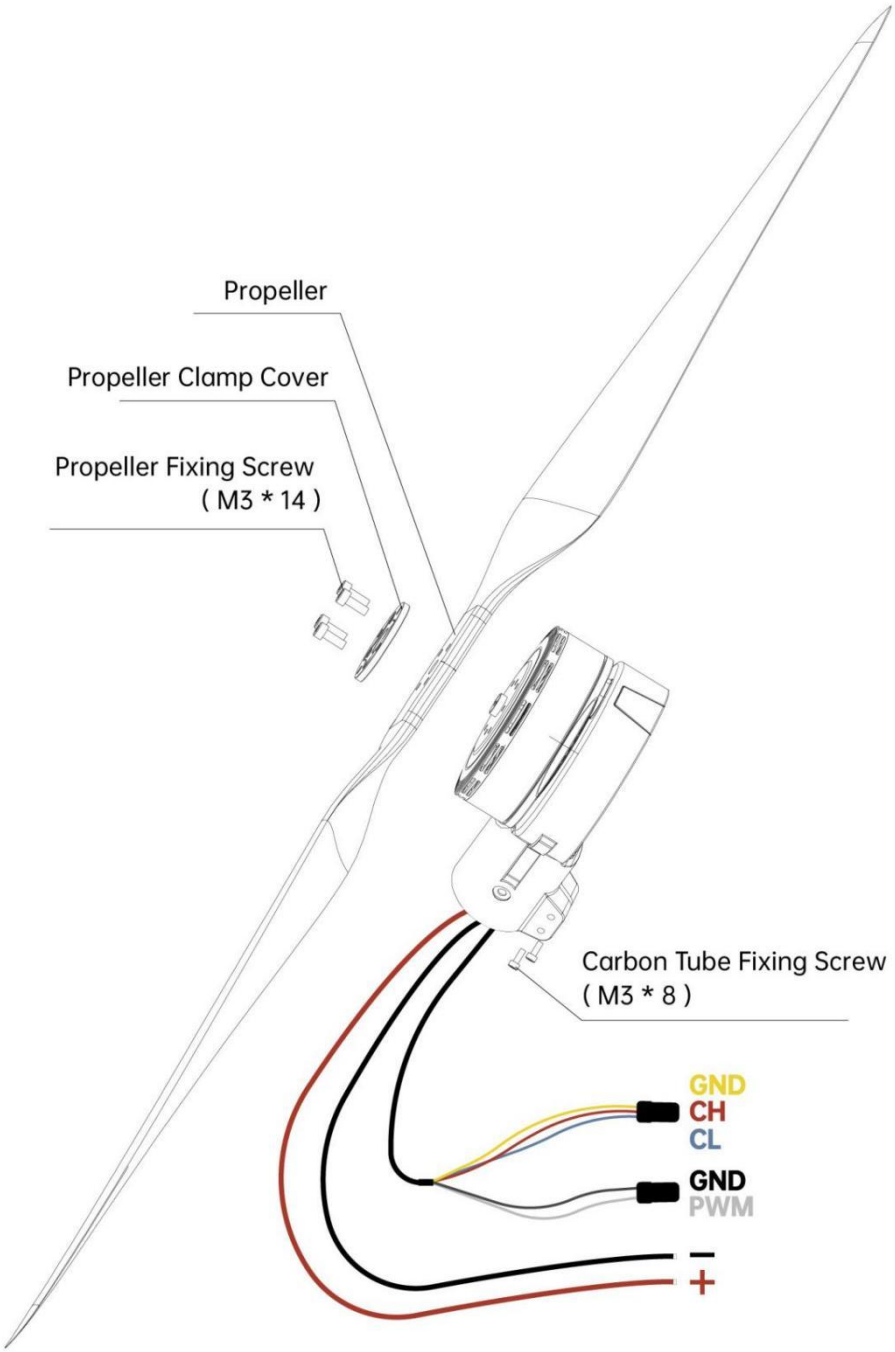
**Both Open-Source & Commercial Ecosystem Compatible**

SIYI Technology has been adhering to its fine traditions in the field of intelligent robots for many years, while adapting inclusive open-source systems and trustworthy commercial systems, injecting strong vitality into enabling the construction of a sustainable industry ecosystem!

## 1.2 Product Overview




**Propeller (Foldable)**




**Propeller (Straight)**

## 1.3 Technical Specification

### Overall

| | |
|---|---|
| **Max Thrust** | 6.5 kg / rotor |
| **Recommended Take-off Weight** | 2 to 2.5 kg /rotor |
| **Recommended Battery** | 12 ~ 14S LiPo |
| **Cable Length** | Power Cable: 710 mm<br>Signal Cable: 780 mm |
| **Protection Class** | IPX5 |
| **Compatible Arm Tube Diameter** | 30 mm |
| **Product Weight** | 429 g |

### ESC

| | |
|---|---|
| **Model** | 55 A FOC |
| **PWM Voltage Input** | 3.3 / 5 V |
| **PWM Pulse Width** | 1100 ~ 1940 μs |
| **PWM Working Frequency** | 50 ~ 500 Hz |
| **Max Voltage** | 60 V |
| **Continuous Current** | 23 A |
| **Max Current** | 55 A |
| **Communication Protocol** | CAN |
| **Firmware Upgrade** | Supported |
| **Digital Throttle** | CAN Throttle |

## Motor

| | |
|---|---|
| **KV** | 130 KV |
| **Motor Size** | Φ67.7 * 23.1 mm |
| **Poles & Magnets** | 24N28P |
| **Product Weight** | 240 g |

## Propeller (Straight)

| | |
|---|---|
| **Diameter x Pitch** | 22 x 7.8 Inch |
| **Product Weight** | 35.7 g |

## Propeller (Foldable)

| | |
|---|---|
| **Diameter x Pitch** | 22 x 9 Inch |
| **Product Weight** | 61.2 g |

# 1.4 Performance Specifications

## D6 Foldable Propeller Performance

| D6 Foldable Propeller Performance | | | | | | | |
|---|---|---|---|---|---|---|---|
| Working Voltage | Propellers | Throttle (%) | Thrust (G) | Current (A) | RPM | Power Input (W) | Efficiency (G/W) |
| 48V | 22*9" Foldable | 30 | 1109 | 1.85 | 2120 | 88.7 | 12.5 |
| | | 33 | 1316 | 2.29 | 2297 | 110.0 | 12.0 |
| | | 36 | 1513 | 2.80 | 2468 | 134.2 | 11.3 |
| | | 39 | 1697 | 3.26 | 2633 | 156.5 | 10.8 |
| | | 42 | 1931 | 3.96 | 2799 | 190.0 | 10.2 |
| | | 45 | 2201 | 4.64 | 2962 | 222.8 | 9.9 |
| | | 48 | 2374 | 5.30 | 3112 | 254.1 | 9.3 |
| | | 51 | 2626 | 5.98 | 3260 | 286.9 | 9.2 |
| | | 54 | 2885 | 6.87 | 3401 | 330.2 | 8.7 |
| | | 57 | 3136 | 7.78 | 3540 | 373.7 | 8.4 |
| | | 60 | 3339 | 8.51 | 3677 | 408.6 | 8.2 |
| | | 63 | 3562 | 9.47 | 3809 | 454.4 | 7.8 |
| | | 66 | 3869 | 10.53 | 3933 | 505.3 | 7.7 |
| | | 69 | 4028 | 11.53 | 4055 | 553.1 | 7.3 |
| | | 72 | 4308 | 12.52 | 4166 | 600.5 | 7.2 |
| | | 75 | 4527 | 13.79 | 4279 | 662.4 | 6.8 |
| | | 78 | 4844 | 14.85 | 4386 | 713.4 | 6.8 |
| | | 81 | 5019 | 15.87 | 4490 | 762.0 | 6.6 |
| | | 84 | 5210 | 16.91 | 4586 | 811.7 | 6.4 |
| | | 87 | 5445 | 18.13 | 4682 | 870.0 | 6.3 |
| | | 90 | 5501 | 18.76 | 4771 | 900.1 | 6.1 |
| | | 95 | 6230 | 22.44 | 4882 | 1077.8 | 5.8 |
| | | 100 | 6510 | 25.02 | 5066 | 1200.3 | 5.4 |

# D6 Straight Propeller Performance

| D6 Straight Propeller Performance | | | | | | | |
|---|---|---|---|---|---|---|---|
| Working Voltage | Propellers | Throttle (%) | Thrust (G) | Current (A) | RPM | Power Input (W) | Efficiency (G/W) |
| 48V | 22*7.8 Straight | 30 | 1101 | 1.75 | 2114 | 84.2 | 13.1 |
| | | 33 | 1257 | 2.12 | 2299 | 102.0 | 12.3 |
| | | 36 | 1440 | 2.65 | 2469 | 127.0 | 11.3 |
| | | 39 | 1659 | 3.20 | 2634 | 153.6 | 10.8 |
| | | 42 | 1910 | 3.80 | 2803 | 182.3 | 10.5 |
| | | 45 | 2088 | 4.39 | 2960 | 210.8 | 9.9 |
| | | 48 | 2364 | 5.16 | 3108 | 247.4 | 9.6 |
| | | 51 | 2570 | 5.83 | 3257 | 279.6 | 9.2 |
| | | 54 | 2818 | 6.66 | 3401 | 319.8 | 8.8 |
| | | 57 | 3047 | 7.54 | 3541 | 362.3 | 8.4 |
| | | 60 | 3307 | 8.36 | 3675 | 401.4 | 8.2 |
| | | 63 | 3688 | 9.76 | 3810 | 468.3 | 7.9 |
| | | 66 | 3871 | 10.45 | 3932 | 501.4 | 7.7 |
| | | 69 | 4056 | 11.41 | 4047 | 547.5 | 7.4 |
| | | 72 | 4133 | 12.00 | 4172 | 575.5 | 7.2 |
| | | 75 | 4581 | 13.65 | 4284 | 654.6 | 7.0 |
| | | 78 | 4688 | 14.36 | 4389 | 688.1 | 6.8 |
| | | 81 | 4970 | 15.76 | 4491 | 756.8 | 6.6 |
| | | 84 | 5294 | 17.10 | 4579 | 820.8 | 6.5 |
| | | 87 | 5401 | 17.95 | 4676 | 861.5 | 6.3 |
| | | 90 | 5544 | 18.80 | 4770 | 901.9 | 6.1 |
| | | 95 | 5992 | 21.22 | 4911 | 1019.2 | 5.9 |
| | | 100 | 6566 | 25.60 | 5040 | 1227.9 | 5.3 |

## 1.5 Packing List

### Motor Assembly (Excluding Propellers)

1 x D6 Industrial Propulsion System Assembly (CW or CCW)

### Straight Propeller

1 x D6 2278 Straight Propeller (CW or CCW)

1 x Propeller Spacer

4 x Hex Socket Head Cap Screw HM3*14

### Foldable Propeller

1 x D6 Foldable Propeller (CW or CCW)

4 x Hex Socket Button Head Screw M3*6

## 1.6 Protection Function, Indicator Definition, & Buzzer Definition

SIYI propulsion system uses both indicators and buzzers to define different working states.

| Status | Errors | Buzzer | Indicator | Suggested Actions |
|---|---|---|---|---|
| Self-Check Status | Overvoltage, Undervoltage | No Beep | Yellow Blinks<br>Overvoltage: One short<br>Undervoltage: Two short | Check the power supply voltage and reduce it appropriately |
| | Operational Amplifier Abnormality | No Beep | Yellow Blinks<br>Two long & three short | Contact technical support |
| | MOS Short Circuit | No Beep | Yellow Blinks<br>Two long & two short | Contact technical support |
| | Motor Phase Loss | No Beep | Yellow Blinks<br>Two long & one short | Check if the motor rotation is stuck |
| | Throttle Signal Loss | One Short Beep | Yellow Blinks<br>One long | Check if the throttle wires are damaged and whether the connected equipment is outputting the |

| | | | | |
|---|---|---|---|---|
| | | | | corresponding signal |
| | Throttle Not Zero | Rapid Short Beeps | Yellow Blinks<br>One long & one short | Check the throttle range on the flight controller and the remote controller |
| In Operation | Throttle Signal Loss | One Short Beep | Yellow Blinks<br>One long | Loose wires, damaged wires, or no signal output from the connected device |
| | Throttle Stall | No Beep | Yellow Blinks<br>One long & four short | Check if the motor rotation is stuck |
| | MOS Overheat | No Beep | Yellow Blinks<br>One long & two short | Is payload weight within recommended range? |
| | Capacitor Overheat | No Beep | Yellow Blinks<br>One long & three short | Is payload weight within recommended range? |
| | Full Throttle (100%) | No Beep | Solid yellow until normal throttle (less than 100%) then returns to normal color | Beyond recommended thrust range, returns to normal color in normal throttle |
| ESC Firmware Upgr | No Firmware | No Beep | Solid White | Upgrade firmware through SIYI software |
| | Firmware | No | Solid White | Ensure the |

| | | | | |
|---|---|---|---|---|
| ade | Upgrade Failed | Beep | | propulsion system is working properly, and the wires are connected correctly, then try re-flashing the firmware |
| | Firmware Upgrading | No Beep | White Blinks | Firmware upgrade in progress, returns to normal color after successful upgrade |

## Mark

Red, green, and blue are normal indicator colors. Users can define the colors or turn off indicator blinking.

Even if indicator blinking is turned off, the yellow color will still blink in case of a malfunction or abnormal condition.

# CHAPTER 2 PREPARE FOR ASSEMBLY

**Watch Tutorial Video**

**SIYI D6 Enterprise Propulsion System User Tutorial Vol.1 - ASSEMBLY**

https://www.youtube.com/watch?v=Cdg3LkeN-eI&list=PLnwDdKcxuIbc5StgCD-xdx9GRcsUEuvWD&index=2

**SIYI D6 Enterprise Propulsion System User Tutorial Vol.2 - ADJUST & CHECK PARAMETER**

https://www.youtube.com/watch?v=gYLqLQA97nQ&list=PLnwDdKcxuIbc5StgCD-xdx9GRcsUEuvWD&index=3

**SIYI D6 Enterprise Propulsion System User Tutorial Vol.3 - FLIGHT TEST**

https://www.youtube.com/watch?v=2bfIGtdI_l8&list=PLnwDdKcxuIbc5StgCD-xdx9GRcsUEuvWD&index=4

**SIYI D6 Enterprise Propulsion System User Tutorial Vol.4 - TROUBLE SHOOTING**

https://www.youtube.com/watch?v=QXPyzqQuO8c&list=PLnwDd

KcxuIbc5StgCD-xdx9GRcsUEuvWD&index=5

**SIYI D6 Enterprise Propulsion System User Tutorial Vo.5 - FIRMWARE UPGRADE**

https://www.youtube.com/watch?v=SHv5EgqwnTE&list=PLnwDd

KcxuIbc5StgCD-xdx9GRcsUEuvWD&index=6

## 2.1 Solder the Power Connector

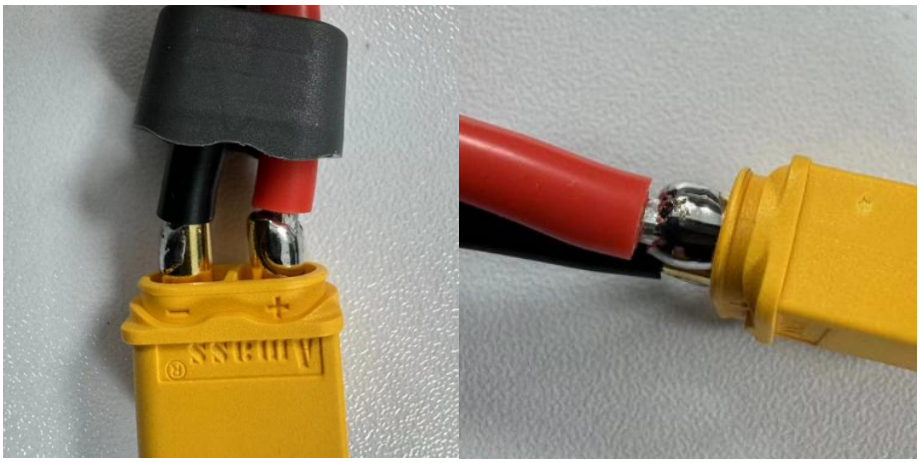
Soldering the power connector is a necessary step to ensure that the propulsion system works properly.

**Tools Required:**

- Soldering Iron
- Soldering Tin (enough)
- Connectors (Amass XT60 or higher grade is recommended)

**Steps**

1. Identify the positive (red) and negative (black) power wires of the propulsion system.
2. Use the soldering iron to solder the positive wire to the positive pole of the connector and the negative wire to the negative pole of the connector.



## Mark

Please ensure that the power wires are fully and securely soldered to the connector, with the solder joints being well-filled to avoid cold or weak soldering. This is crucial for maximizing flight safety.

## 2.2 Configuration

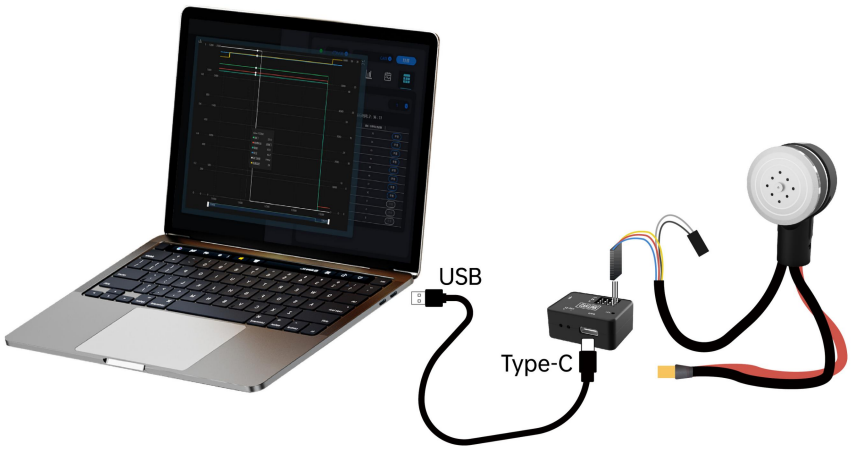
The SIYI software allows users to customize the propulsion system's indicator colors, throttle ID, and CAN throttle settings.

### Tools Required

- SIYI Software for Windows
- SIYI CAN Link Module

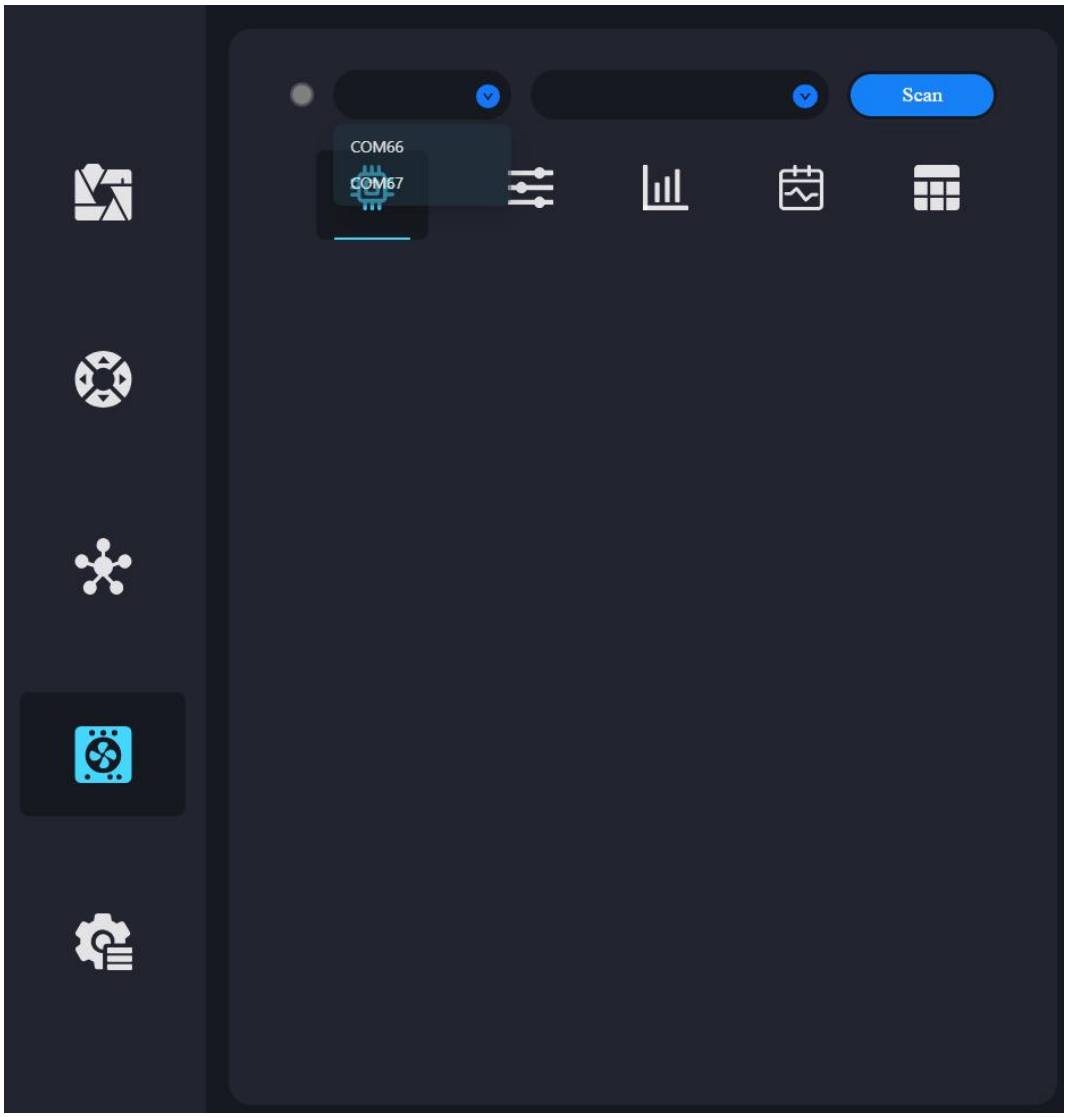
- Windows Device

**Steps**

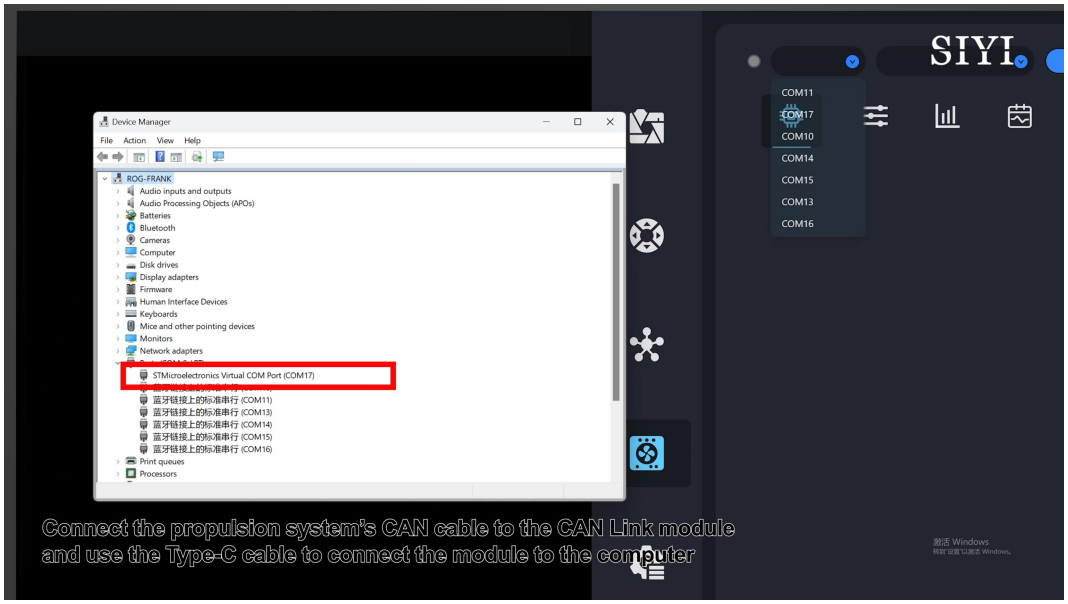


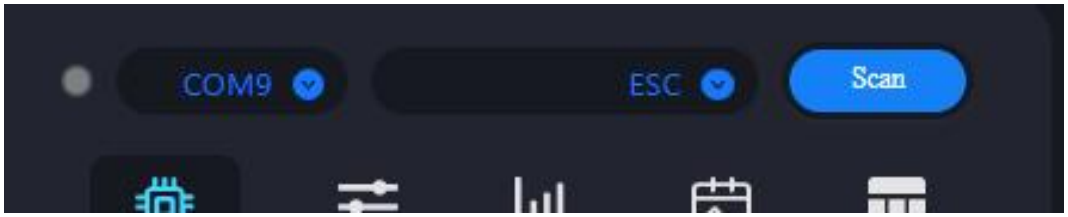

Connect the flight controller that is connected to
the CAN Hub module bus to the computer using a Type-C cable

1. Please refer to the diagram above to connect the propulsion system, the CAN Link module, and the Windows device.
2. Run the SIYI software and go to the ESC settings menu.

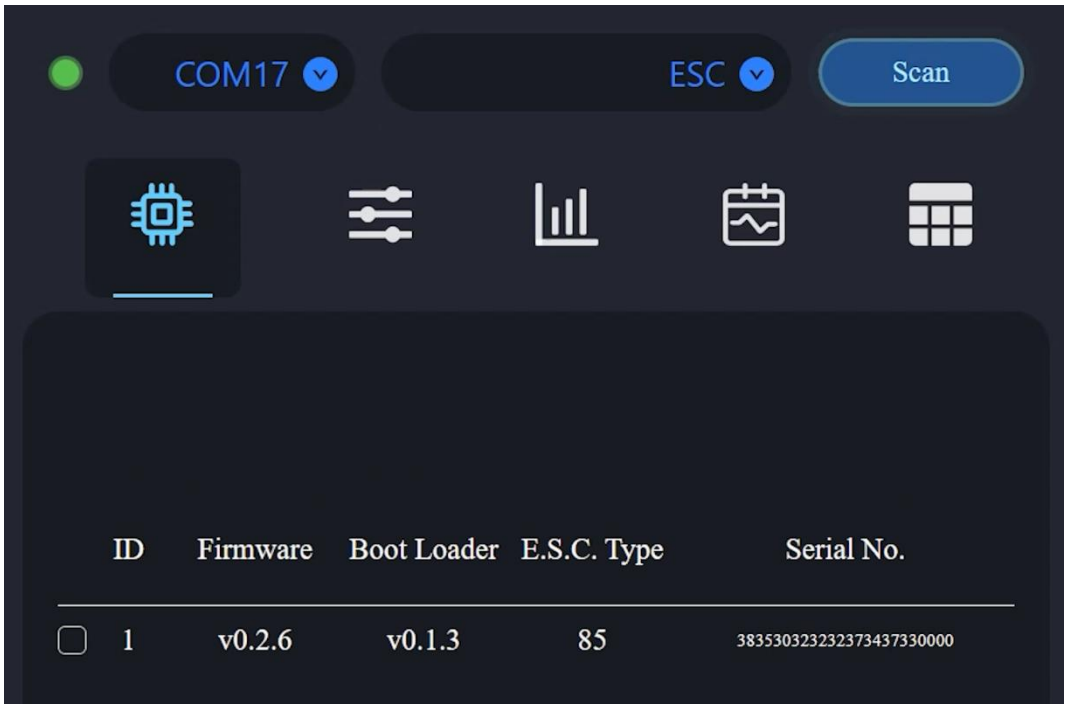



3. Select the corresponding COM port and device type (ESC), then click "Scan."



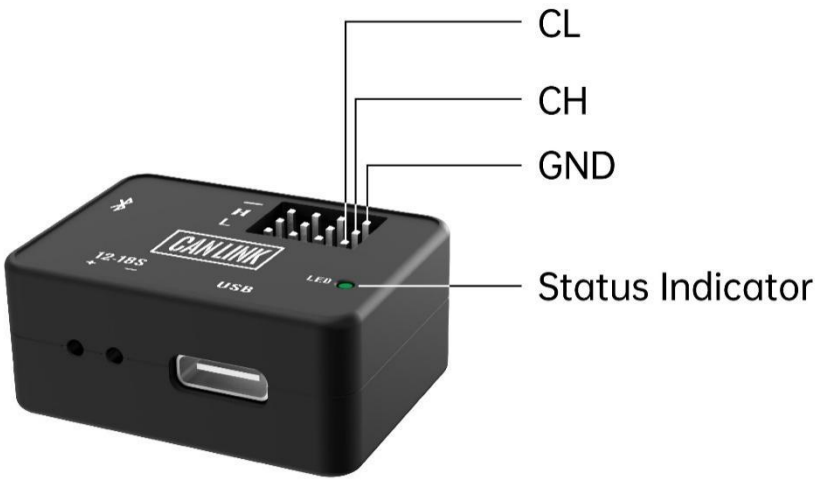




4. If the propulsion system is recognized successfully, connection is established.



**Mark**

Before configuration, make sure the propulsion system is functioning properly and pay special attention to the CAN interface pin definitions to avoid incorrect connections.

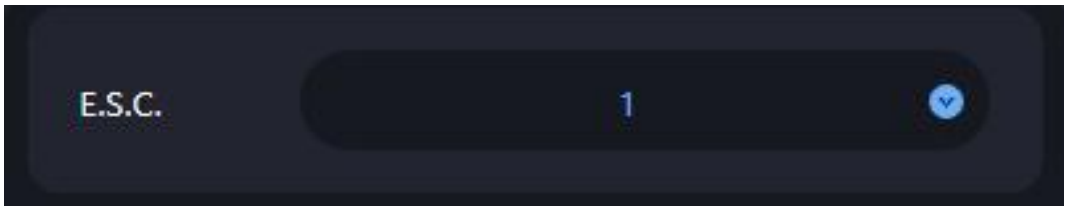



### 2.2.1 Indicator Colors

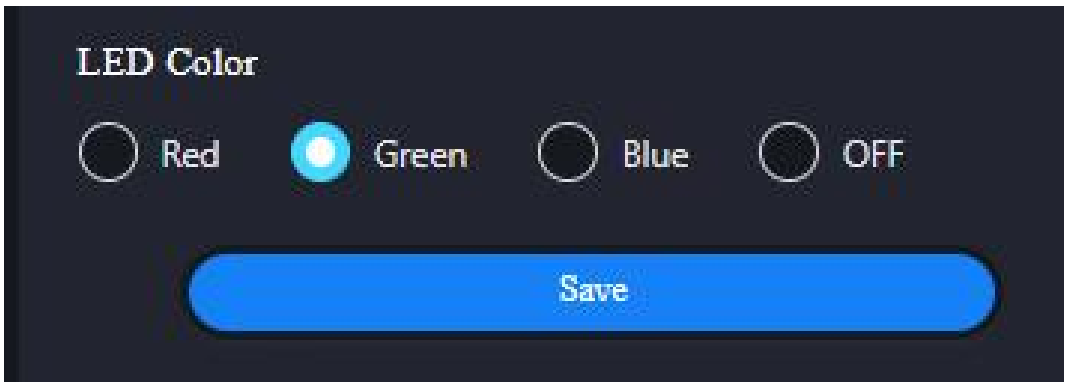
The indicator colors of the propulsion system are an important reference during LOS (Line of Sight) flight.

**Steps**

1. Select the target ESC ID.




2. Set the indicator color for the selected ESC and save the settings.



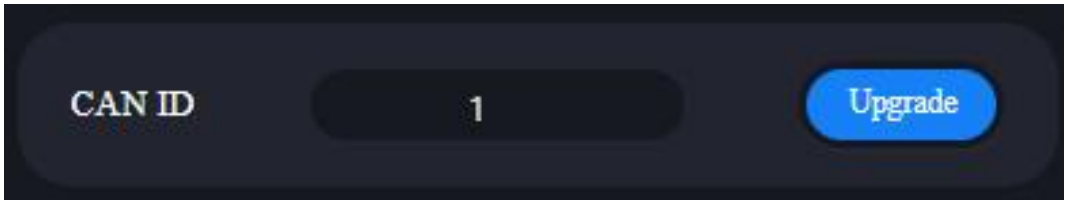

3. If the propulsion system's indicator color changes accordingly, settings are successful.


**Mark**

Before configuring the ESC, please disconnect other serial port devices to avoid issues in recognizing the propulsion system.

### 2.2.2 CAN ID

When using CAN throttle, it is necessary to set a CAN ID for the propulsion system.

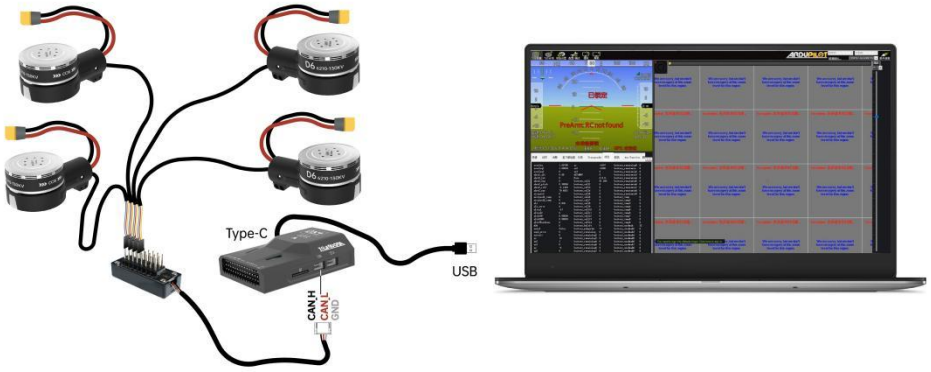



**Mark**

CAN ID has been automatically assigned during production. So, it is not mandatory to configure the CAN ID every time.

## 2.3 CAN Throttle

CAN throttle is digital throttle which helps the propulsion system function more precise and smoother.




Connect the flight controller that is connected to the CAN Hub module bus to the computer using a Type-C cable

### Mark

D6 propulsion system is PWM throttle priority in default and will only use CAN throttle if PWM throttle is not available. If you require CAN throttle priority, please always contact SIYI support.

If you do not use CAN throttle, then it's not necessary to configure CAN throttle.

### 2.3.1 Setting CAN Throttle through SIYI Software

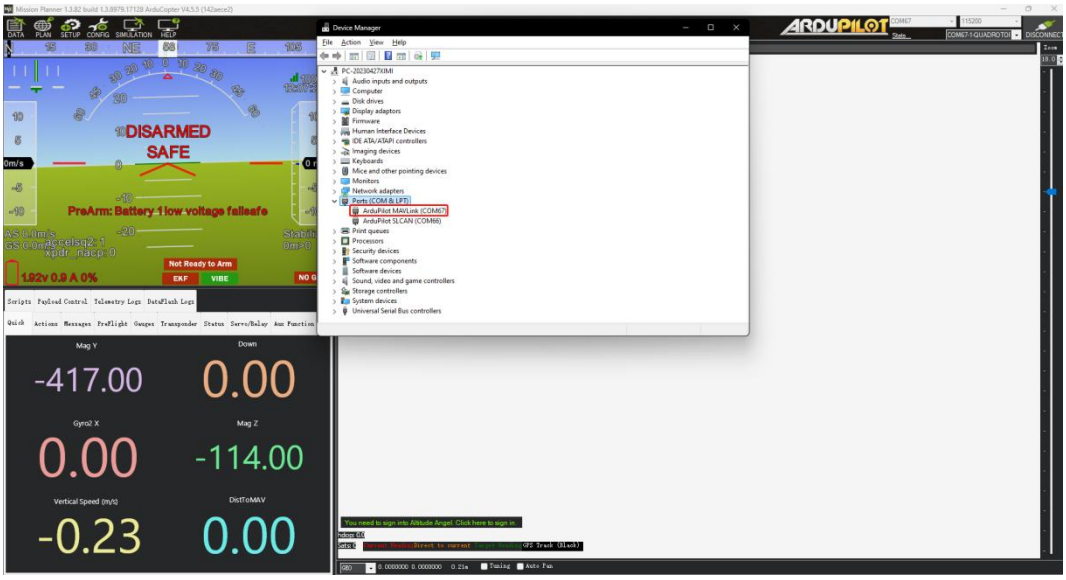
Please refer to chapter 2.2 of this user manual to connect devices and run the SIYI software. Then go to "ESC Settings", select the target ESC and set its throttle ID, then save the settings.

### 2.3.2 Setting CAN Throttle through Mission Planner (ArduPilot)

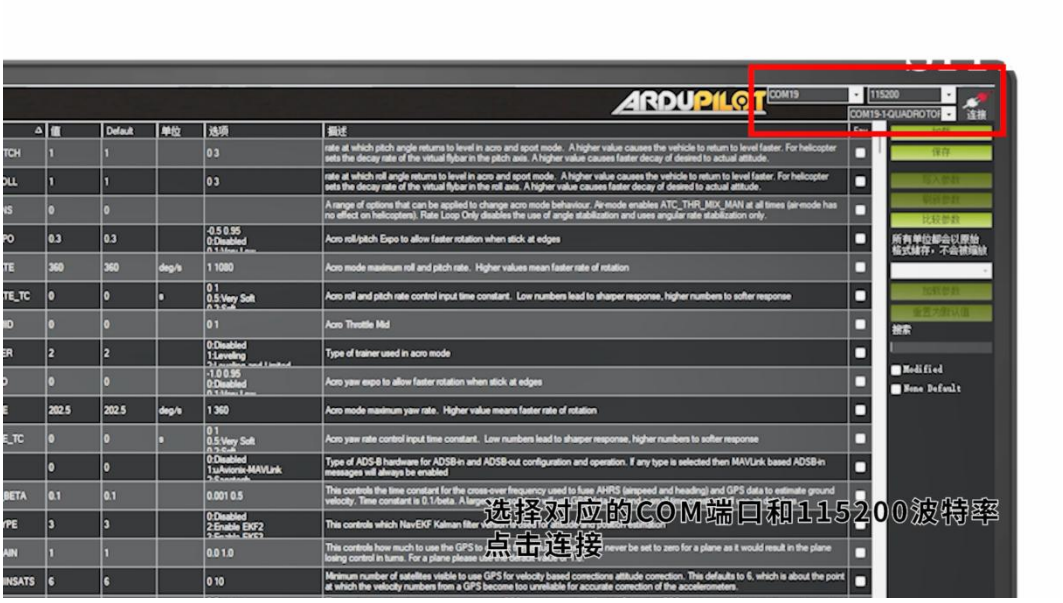
ArduPilot flight controllers support setting D6 propulsion system through the DroneCAN protocol.

**Steps**

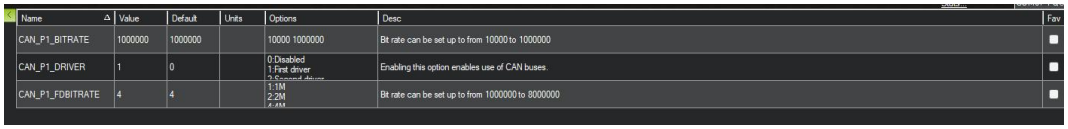
1. Run Mission Planner and locate the corresponding port in PC Device Manager.



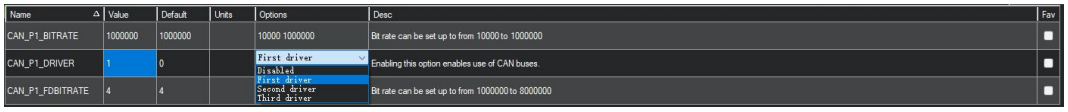
2. Select the corresponding COM port and set the baud rate to 115200.




3. Locate the CAN_P1_DRIVER by searching.



4. Set the value of CAN_P1_DRIVER to 1.



5. Set the value of CAN_D1_PROTOCOL to 1 and configure the CAN interface protocol to DroneCAN.

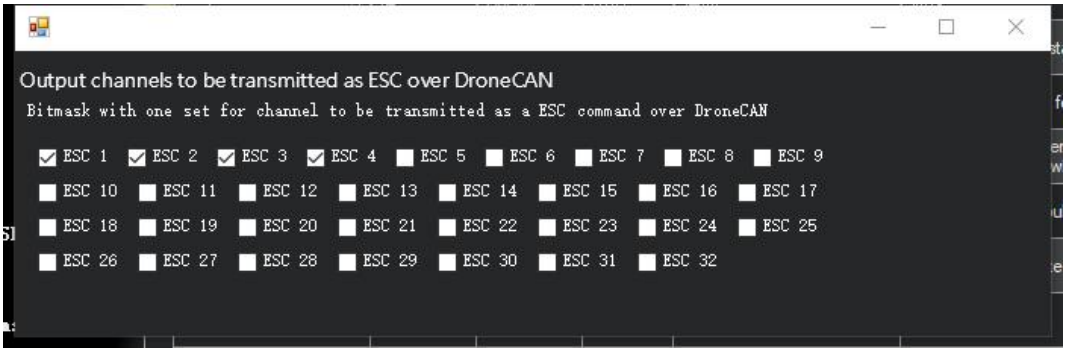
6. After successful setup, restart the flight controller. You should see additional parameters: CAN_P1_BITRATE and CAN_D1_UC_ESC_BM.

| Name | Value | Default | Units | Options | Desc |
|---|---|---|---|---|---|
| CAN_D1_PROTOCOL | 1 | 1 | | DroneCAN | Enabling this option starts selected protocol that will use this virtual driver |
| CAN_D1_PROTOCOL2 | 0 | 0 | | 0:Disabled<br>7:USD1 | Secondary protocol with 11 bit CAN addressing |
| CAN_D1_UC_ESC_BM | 0 | 0 | | | Bitmask with one set for channel to be transmitted as a ESC command over DroneCAN |
| CAN_D1_UC_ESC_OF | 0 | 0 | | 0 18 | Offset for ESC numbering in DroneCAN ESC RawCommand messages. This allows for more efficient packing of ESC command messages. If your ESCs are on servo functions 5 to 8 and you set this parameter to 4 then the ESC RawCommand will be sent with the first 4 slots filled. This can be used for more efficient usage of CAN bandwidth |
| CAN_D1_UC_ESC_RV | 0 | 0 | | | Bitmask with one set for each output channel that uses a reversible ESC over DroneCAN. Reversible ESCs use both positive and negative values in RawCommands, with positive commanding the forward direction and negative commanding the reverse direction. |
| CAN_D1_UC_NODE | 10 | 10 | | 1 125 | DroneCAN node ID used by the driver itself on this network |
| CAN_D1_UC_NTF_RT | 20 | 20 | Hz | 1 200 | Maximum transmit rate for Notify State Message |
| CAN_D1_UC_OPTION | 0 | 0 | | | Option flags |
| CAN_D1_UC_POOL | 16384 | 16384 | | 1024 16384 | Amount of memory in bytes to allocate for the DroneCAN memory pool. More memory is needed for higher CAN bus loads |
| CAN_D1_UC_RLY_RT | 0 | 0 | Hz | 0 200 | Maximum transmit rate for relay outputs, note that this rate is per message each message does 1 relay, so if with more relays will take longer to update at the same rate, a extra message will be sent when a relay changes state |
| CAN_D1_UC_SER_EN | 0 | 0 | | 0:Disabled<br>1:Enabled | Enable DroneCAN virtual serial ports |
| CAN_D1_UC_SRV_BM | 0 | 0 | | | Bitmask with one set for channel to be transmitted as a servo command over DroneCAN |
| CAN_D1_UC_SRV_RT | 50 | 50 | Hz | 1 200 | Maximum transmit rate for servo outputs |
| CAN_LOGLEVEL | 0 | 0 | | 0 4<br>0:Log None | Loglevel for recording initialisation and debug information from CAN Interface |
| CAN_P1_BITRATE | 1000000 | 1000000 | | 10000 1000000 | Bit rate can be set up to from 10000 to 1000000 |
| CAN_P1_DRIVER | 1 | 0 | | 0:Disabled<br>1:First driver | Enabling this option enables use of CAN buses. |
| CAN_P1_FDBITRATE | 4 | 4 | | 1:1M<br>2:2M | Bit rate can be set up to from 1000000 to 8000000 |

7. Configure CAN_P1_BITRATE to 1000000。

| Name | Value | Default | Units | Options | Desc | Fav |
|---|---|---|---|---|---|---|
| CAN_P1_BITRATE | 1000000 | 1000000 | | 10000 1000000 | Bit rate can be set up to from 10000 to 1000000 | |

8. Select the CAN_D1_UC_ESC_BM options according to the number and IDs of the ESCs. The below picture shows the situation using 4 ESCs of which the IDs are assigned as 1, 2, 3, and 4.

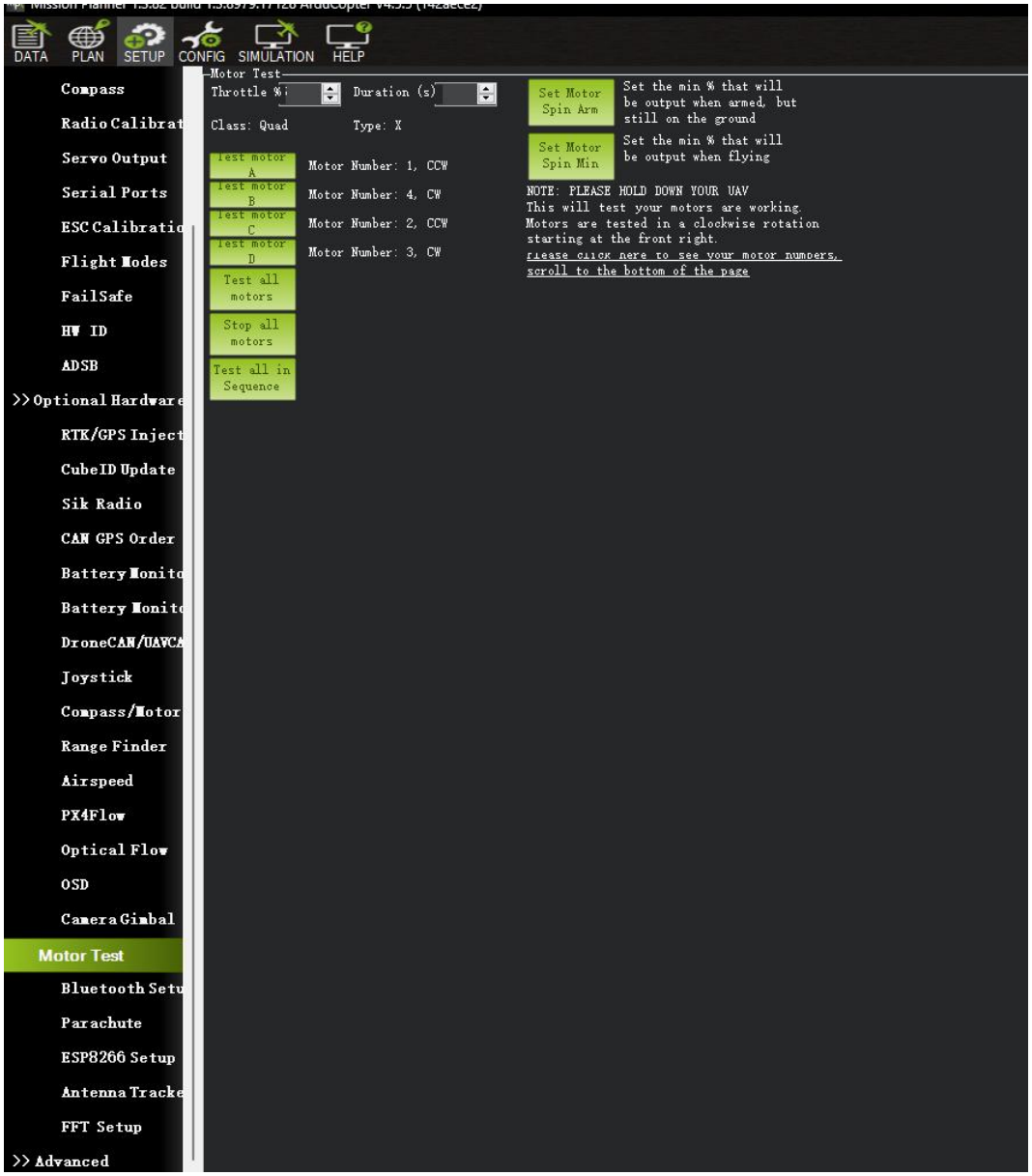



9. Set MOT_PWM_MAX to 1940 and MOT_PWM_MIN to 1100.

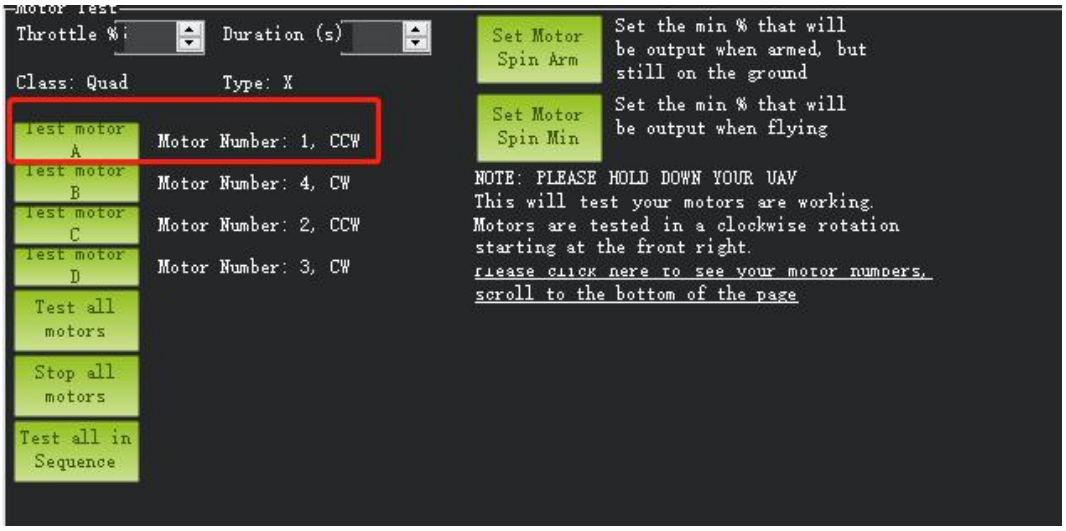
| Name | Value | Default | Units | Options |
|---|---|---|---|---|
| MOT_PWM_MAX | 1950 | 2000 | PWM | 0 2000 |
| MOT_PWM_MIN | 1050 | 1000 | PWM | 0 2000 |

## ESC Testing

1. In " Motor Testing " page, you can set the throttle and the duration of the throttle action. After configuring these settings, select the motor you need to test according to its number.



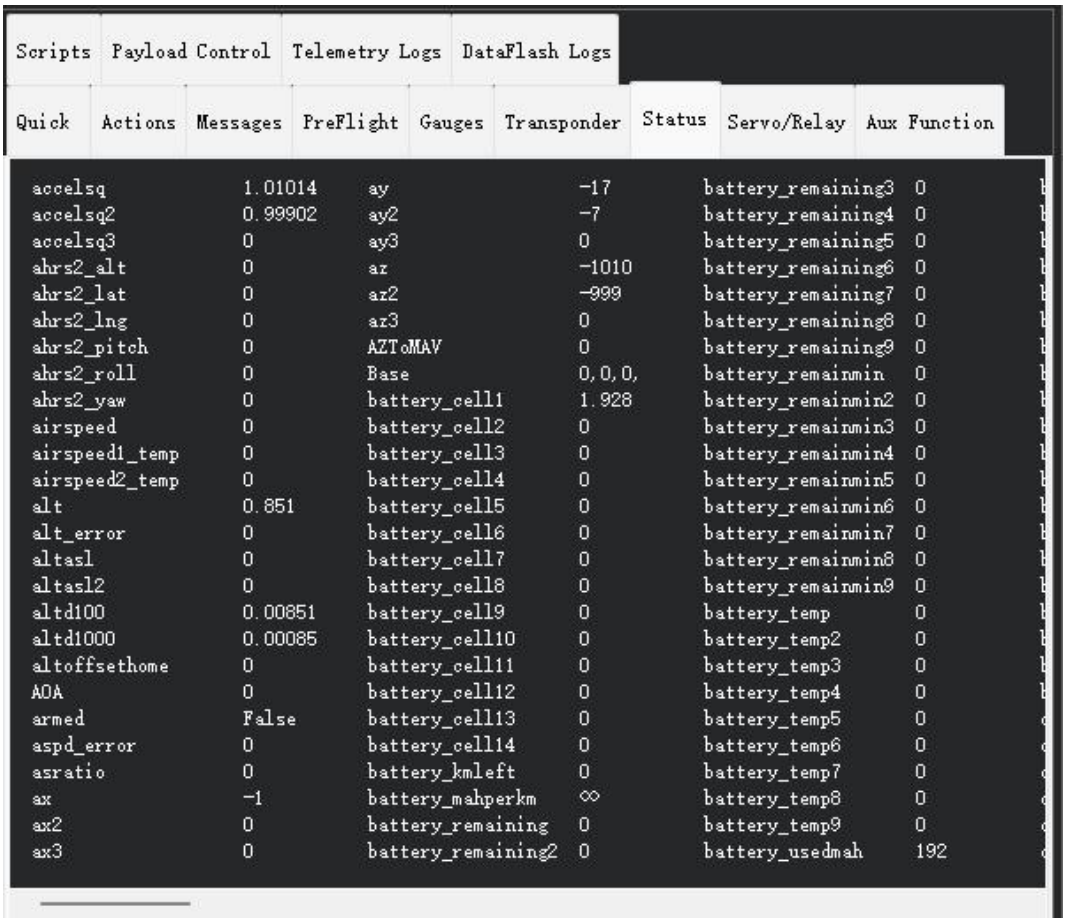

2. For example, to motor 1, click "Test motor A."




3. In the status bar, under the current throttle action, you can see ESC 1's

- Voltage ( esc1_volt )
- Current ( esc1_curr )
- RPM ( esc1_rpm )
- Temperature ( esc1_temp )

  data, etc.



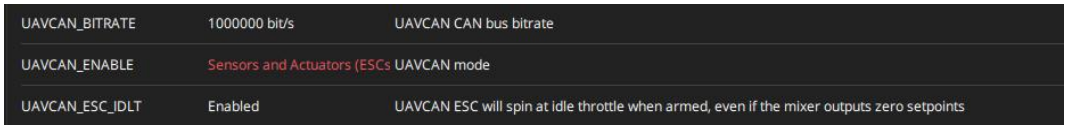

### 2.3.3 Setting CAN Throttle through QGroundControl (PX4)

PX4 flight controllers support configuring D6 propulsion system through the UAVCAN protocol.

**Parameter Configuration**

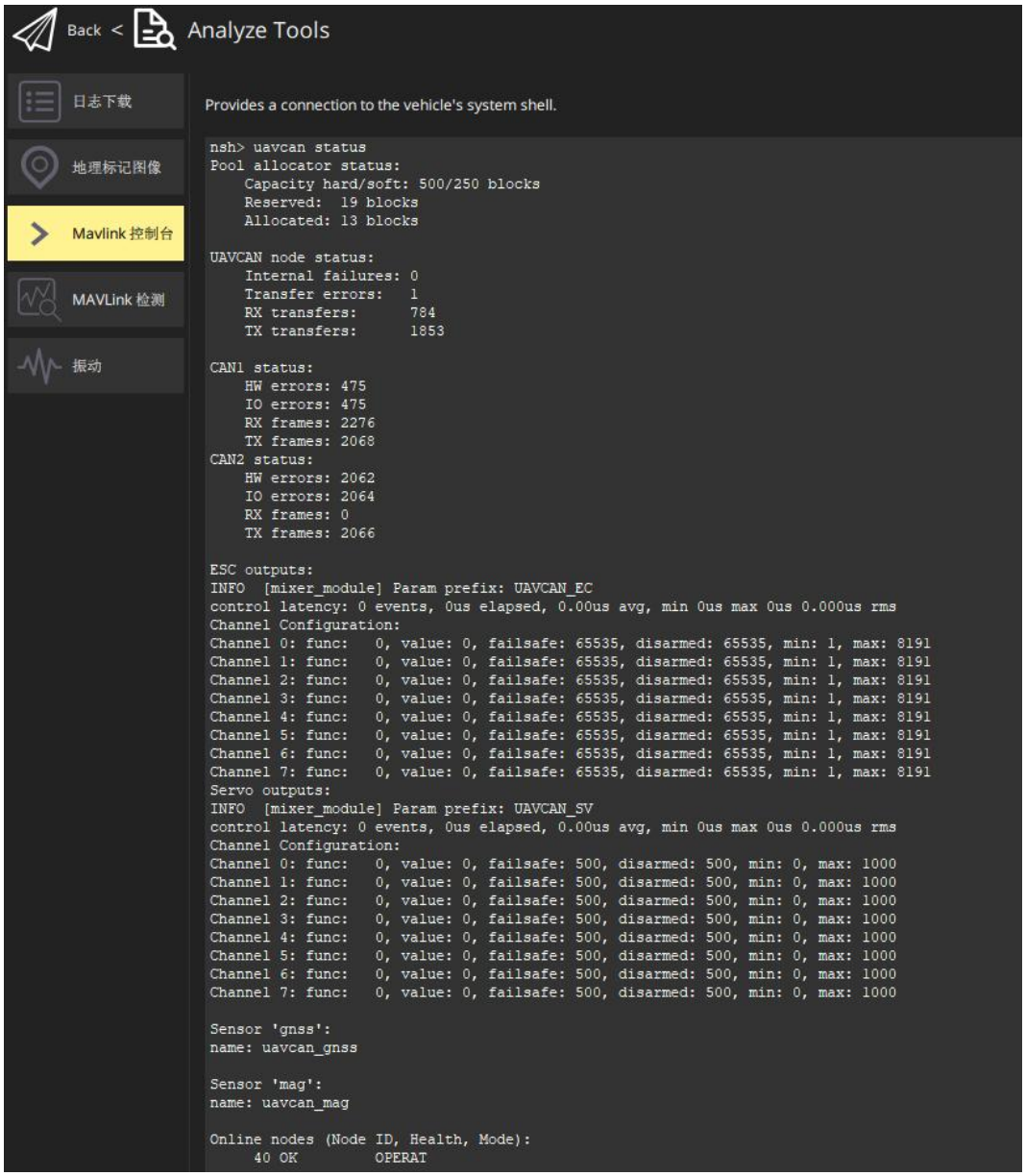
Set UAVCAN_BITRATE to1000000.

Set UAVCAN_ENABLE to Sensors and Actuators (ESCs) Automatic Config.




Set SYS_CTRL_ALLOC to "Enabled" to enable CAN dynamic ID allocation. PX4 dynamic CAN ID allocation requires an SD card. Without SD card, PX4 does not dynamically allocate CAN node IDs for CAN devices.

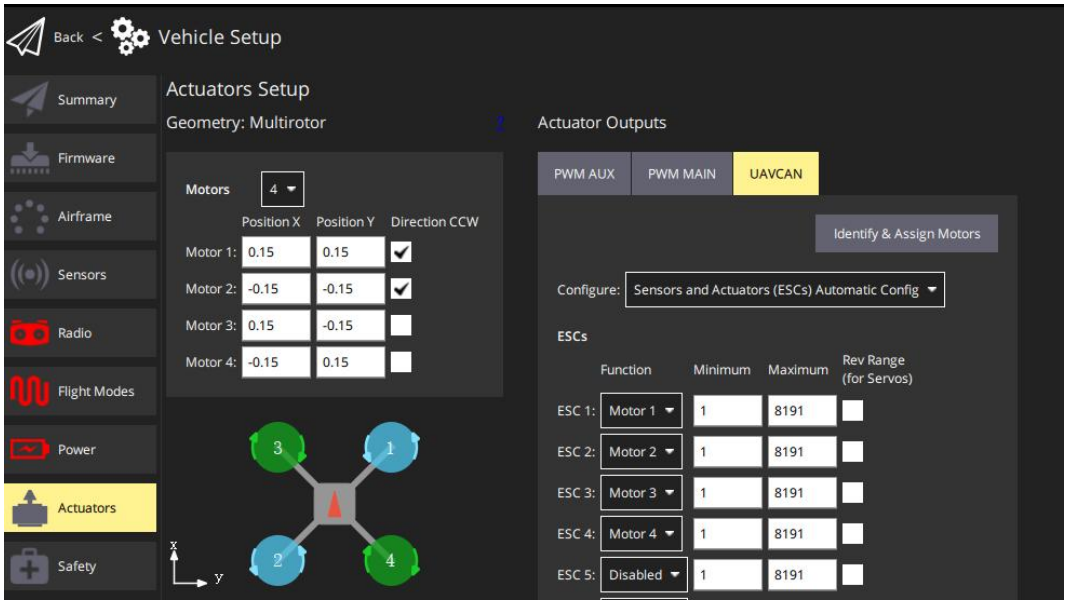

After configuring the above parameters, restart the PX4 flight controller. In Mavlink console, enter "uavcan status" to view the CAN port status information and the devices connected to the CAN port.



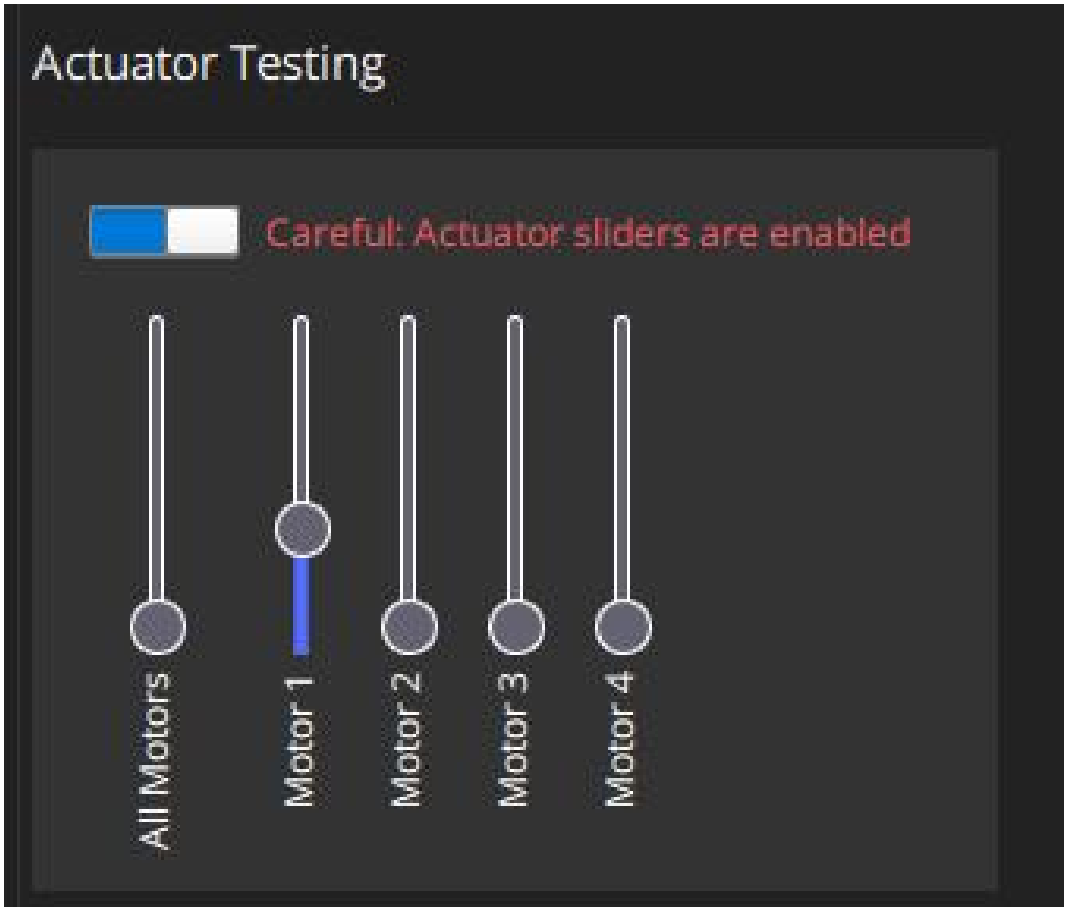

## ESC Testing

In "Actuators Outputs", set the correspondence between the ESCs and motors, and configure the maximum and minimum throttle values.

In "Geometry: Multirotor", set the rotation orientation of the motors and their configuration relative to the center point.

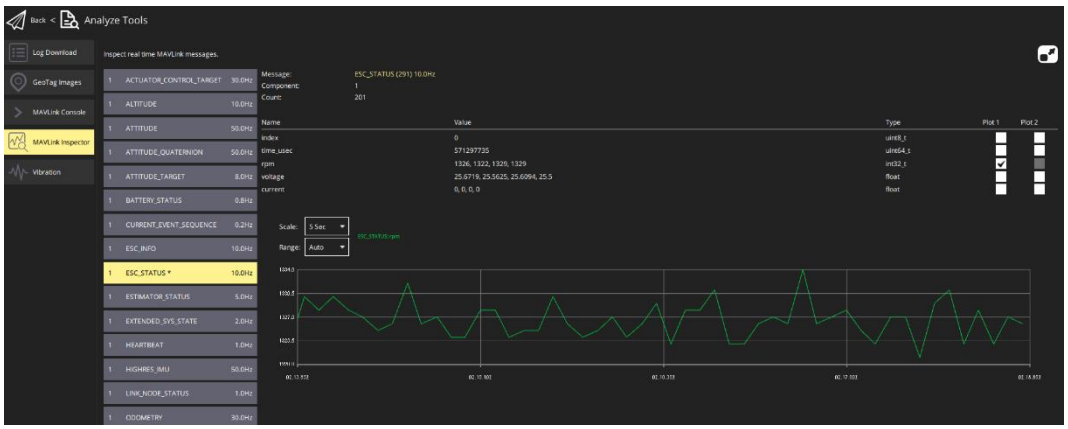



Open the switch in "Actuator Testing" and adjust the throttle size of the motor to be tested by sliding the throttle slider.




Check Mavlink messages. The ESC_STATUS message includes

information such as the ESC's RPM, voltage, and current. Select the option to plot the data to view the variation of these parameters over time.



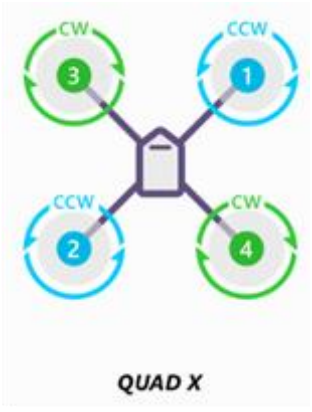
# CHAPTER 3 START ASSEMBLY

## 3.1 Motor Assembly

### 3.1.1 Match Throttle ID & Motor Orientation

Most flight controllers on market have predefined throttle IDs and motor orientation for specific drone models. When assembling the propulsion system, please carefully refer to the flight controller's user manual to correctly match each throttle ID with the corresponding motor orientation.

For example, when using N7 flight controller (ArduPilot firmware) with D6 enterprise propulsion system:




**Quadcopter**


**Hexacopter**


**Octocopter**

Select the corresponding motor based on its orientation (CW or CCW).

**Mark**

If your SIYI propulsion system is to be used with a close-source commercial flight controller, please carefully check the flight controller user manual regarding throttle ID and motor orientation to avoid improper use and potential safety risks. If necessary, please always consult the manufacturer's technical support.

### 3.1.2 Adjusting Arm Diameter (if necessary)

D6 propulsion system is 30mm arm diameter in default.


If your arm diameter is less than 30 mm, you will need a reducing component between the arm tube and the D6 motor tube to make sure that the propulsion system can be assembled properly.


## Steps

Install the Reducing Component


## Mark

When installing the reducing component, it is recommended to use rivets to secure the arm to ensure the overall structural stability and safety.

### 3.1.3 Assemble and Pre-tightening the Motor to the Arm

After matching the throttle ID and motor orientation, let ' s assemble the motor onto the arm. During this step, the motor only needs to be pre-tightened, allowing a little space for post adjustments during calibration process.

**Steps**

1. Pass the propulsion system wires through the arm tube.


2. Assemble the motor onto the arm.


3. Pass the propulsion system's wires through the arm tube.

## 3.2 Balance the Motor

Next, use a level to balance the motor assembly's X-axis and Y-axis.


## 3.3 Lock the Arm

After assembling and balancing the motor, let's lock the motor to the arm tube to ensure a secure installation.

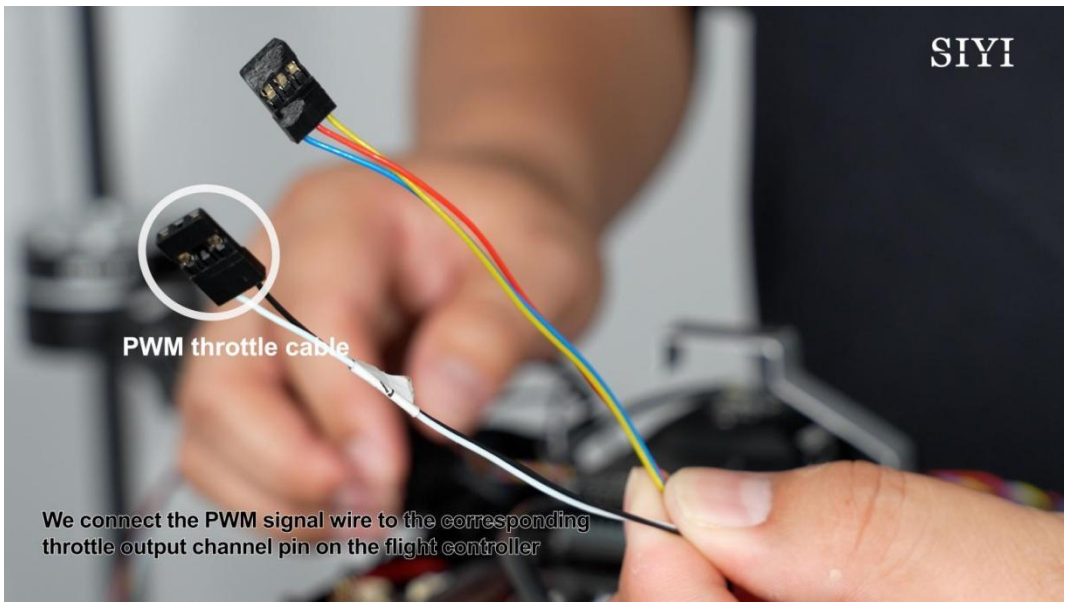

**Mark**

D6 propulsion system comes with rivet holes. It ' s up to customers whether rivets are required based on the actual situation to ensure overall structural stability and safety.

## 3.4 Wiring and Routing

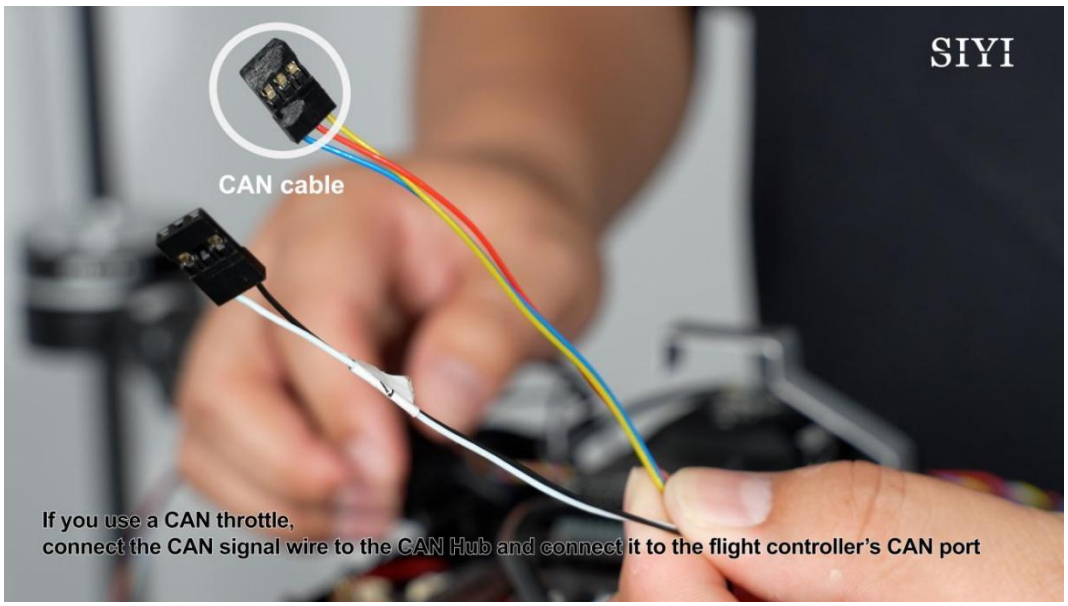
Now, let ' s connect all propulsion system wires to their designated positions and arrange them appropriately.

### 3.4.1 PWM Throttle Wire

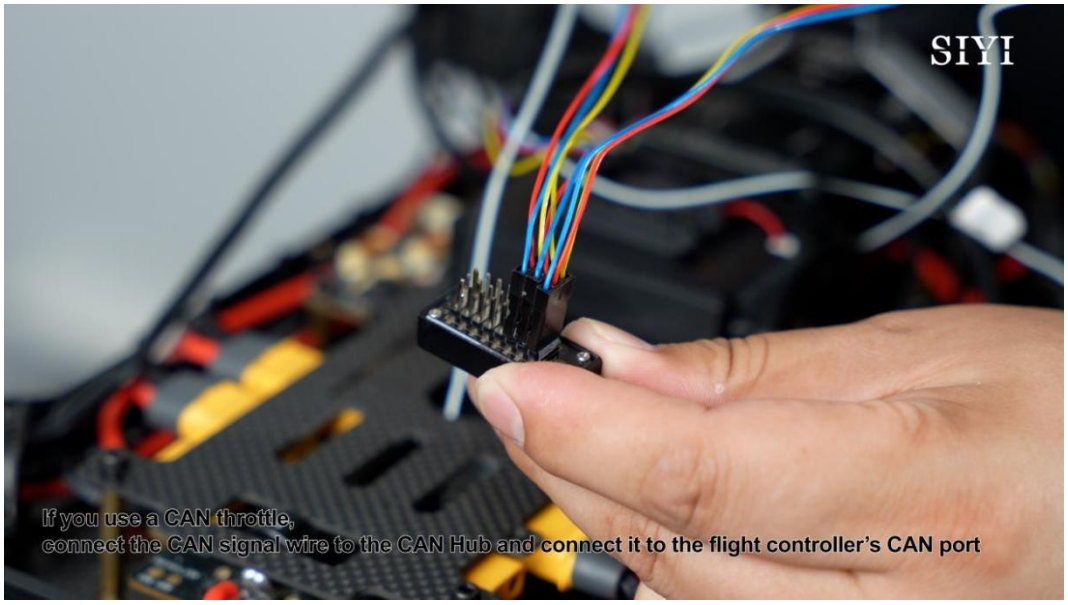


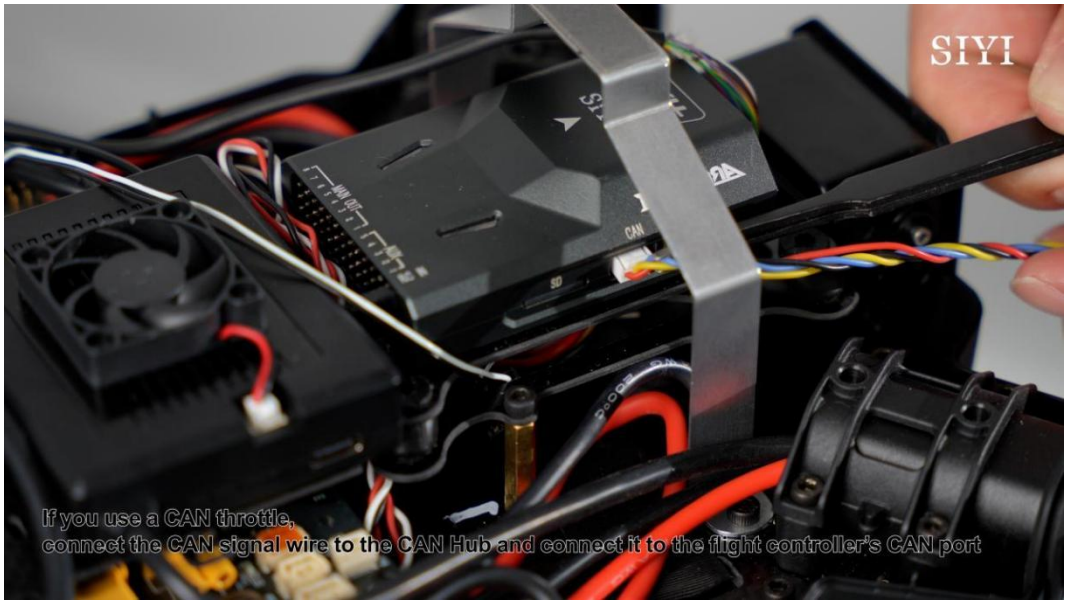

Connect PWM signal wires to the corresponding pins of throttle output channel on the flight controller.

### 3.4.2 CAN Signal Wire (if necessary)




If using CAN throttle, connect the CAN signal wires to the CAN Hub module and integrate it into the flight controller's CAN port through the bus.



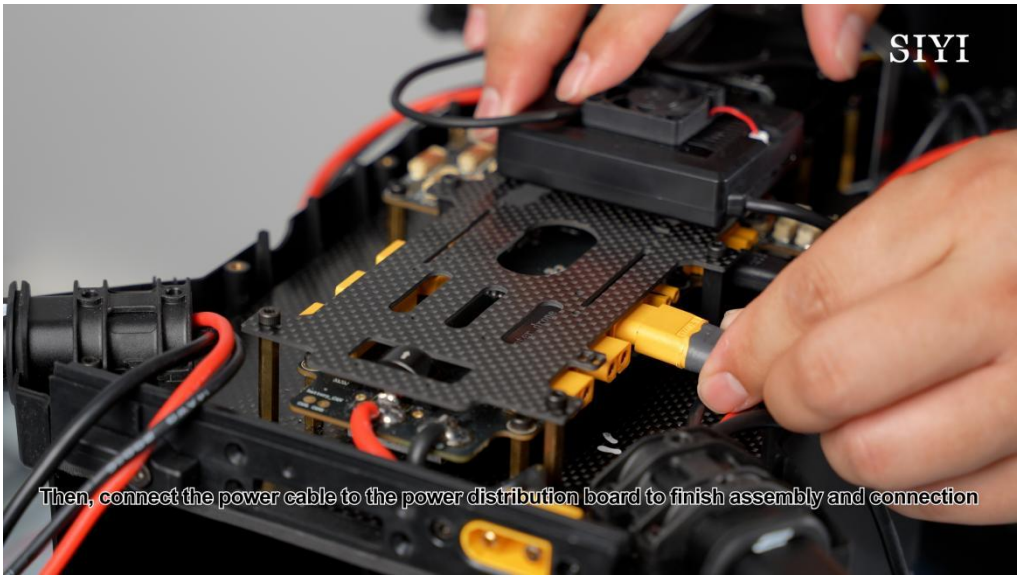


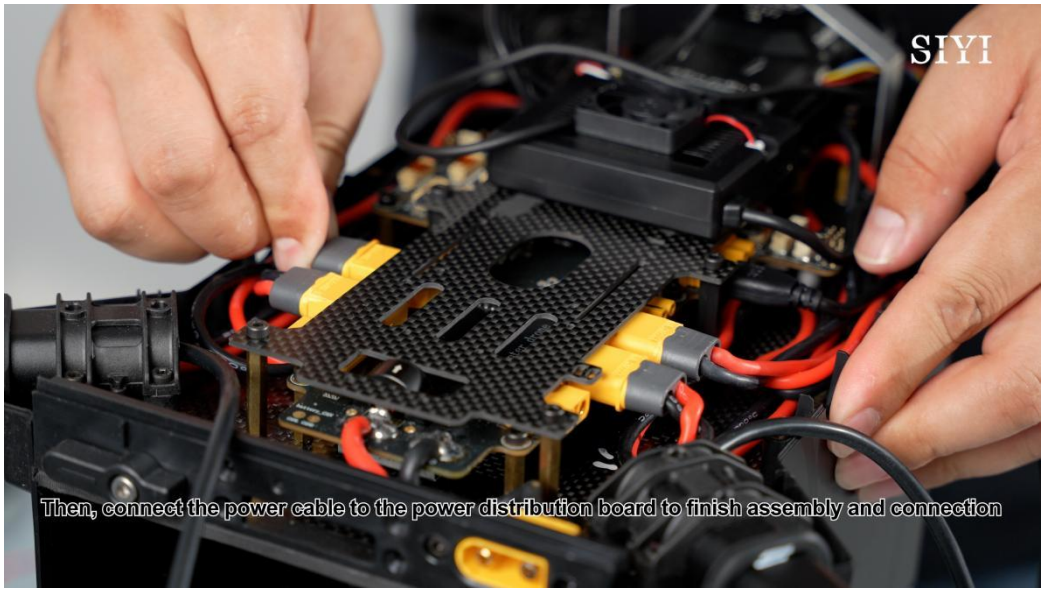

**Mark**

If CAN throttle is not used, no additional configuration is required.

### 3.4.3 Power Supply Wire

Connect the power wire to power supply on the power distribution board.



## 3.5 Debug and Check

Before debugging, please strictly follow the below steps in order:

1. Ensure that the propulsion system wires are correctly connected to avoid safety risks from incorrect or missing connections.
2. Confirm that no propellers are installed to prevent safety risks during debugging.
3. Power on the system and verify that the communication between the ground station and the flight control system is functioning correctly.

### 3.5.1 Throttle Channels

Use the GCS to send signals to flight controller to individually verify if each throttle ID works consistently with the default settings of the flight controller.


### 3.5.2 Motor Orientation

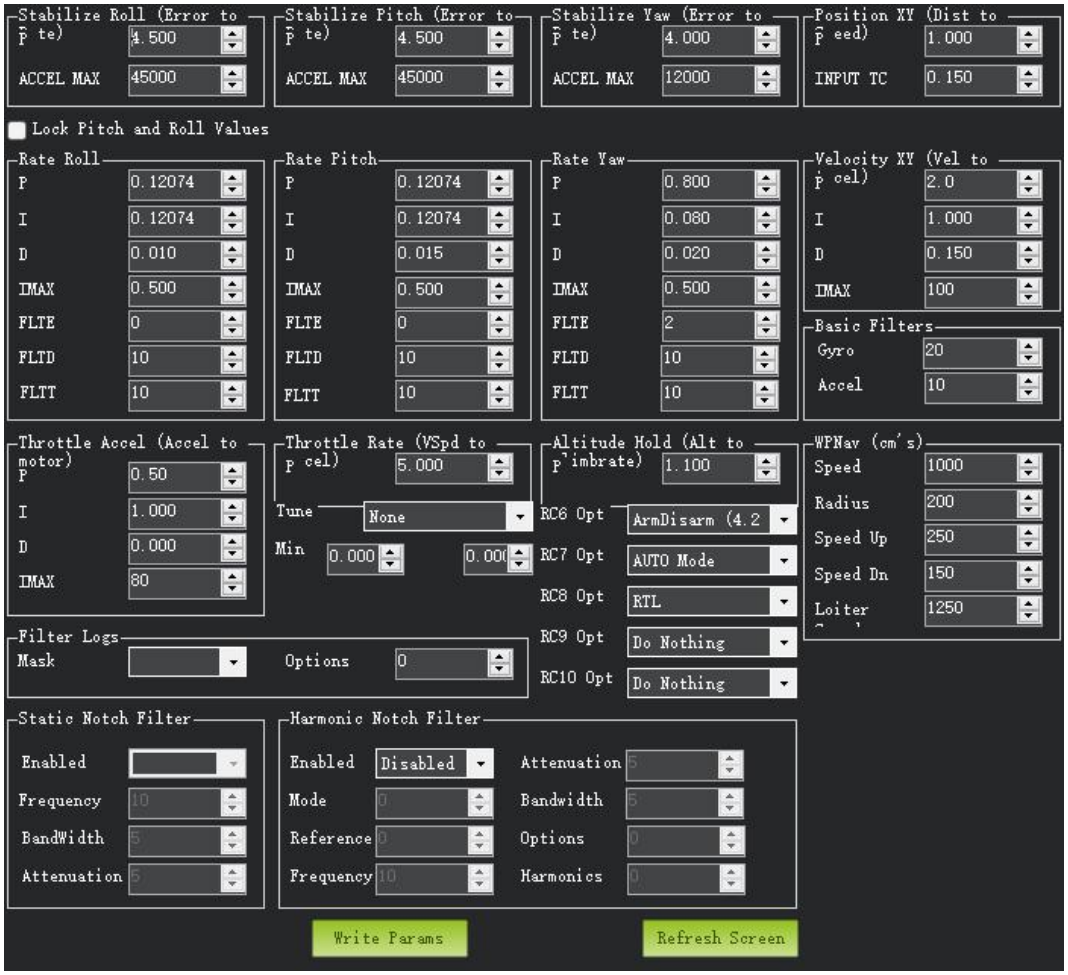
Activate each motor individually through the GCS to verify if each motor of the propulsion system matches the default settings of flight controller.

### 3.5.3 Flight Controller Parameters

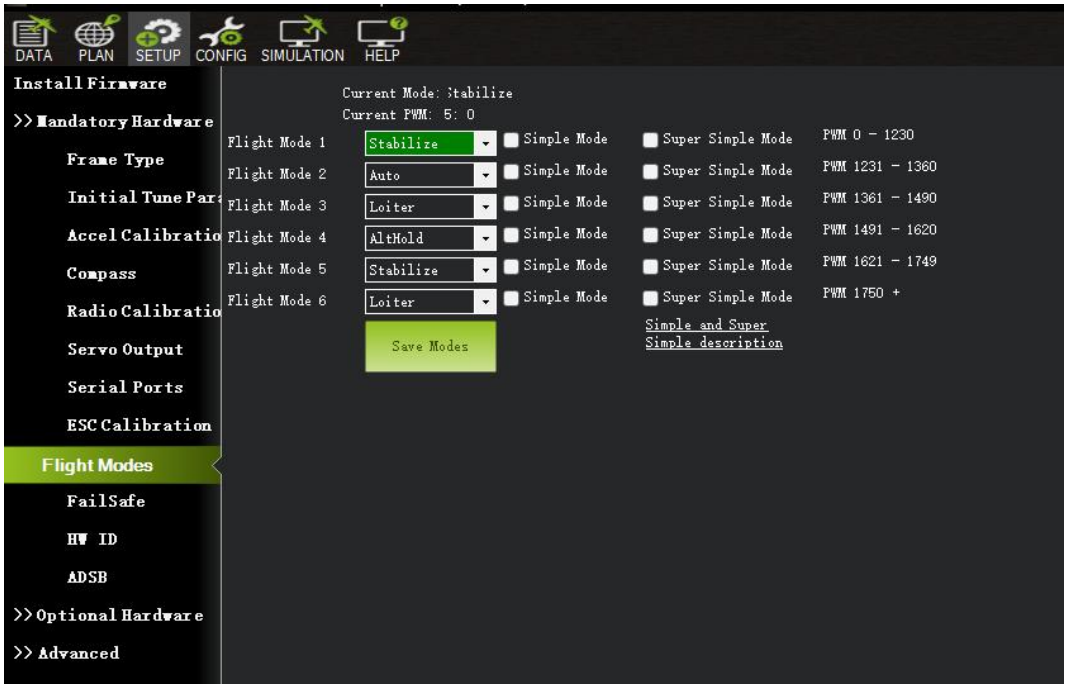
Checking flight controller parameters is crucial for ensuring drone flight safety, enhancing flight stability and precision, performing troubleshooting, and evaluating and optimizing performance. Therefore, it is essential to regularly check and adjust these parameters both before and during drone operations to ensure smooth flight and successful mission completion.

**Recommended Key Parameters to Monitor**

PID (Proportional, Integral, Derivative Control Parameters)

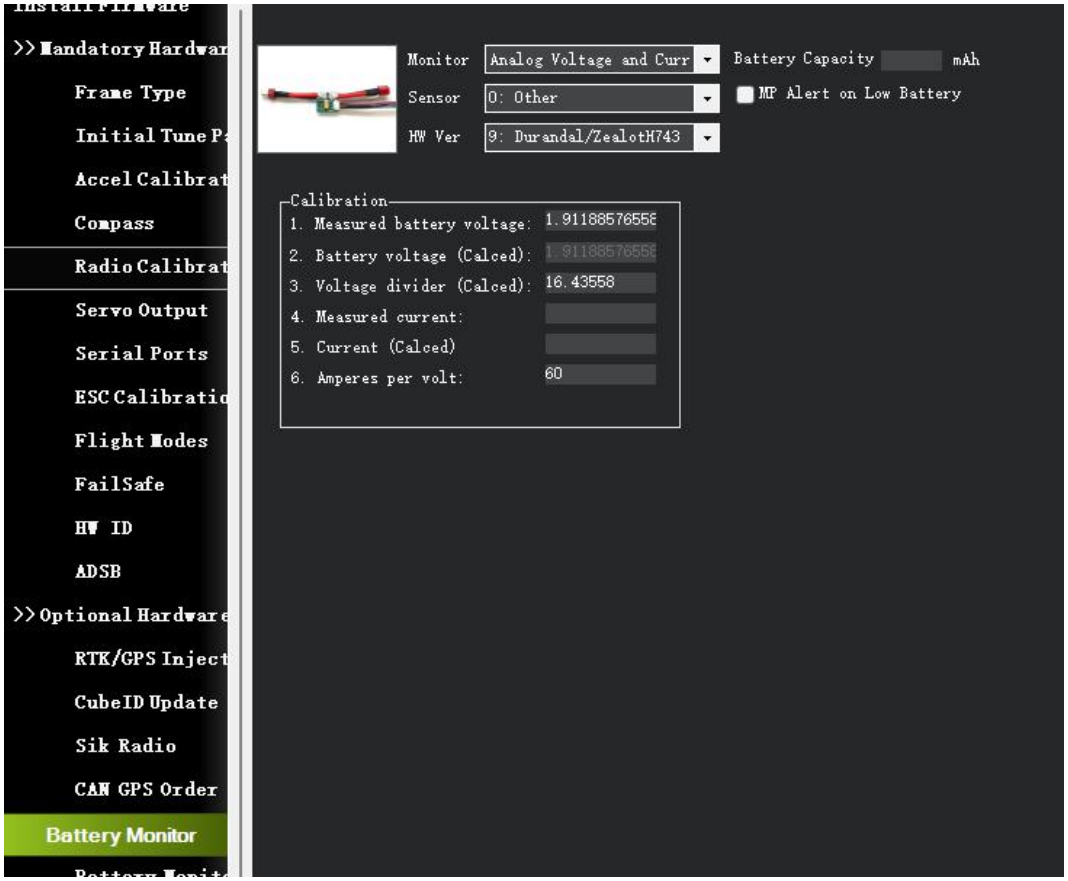



## Flight Mode Configuration



## Gyroscope and Accelerometer Calibration Status


## Voltage and Current Monitoring Settings




**Mark**

Based on actual drone flight performance and suggestions from GCS, PID parameters should be adjusted as needed. To verify the effects of these adjustments, it is recommended to conduct a few flight tests and carefully observe the drone's stability and response speed. On this basis, fine-tune the parameters step by step until the drone achieves optimal flight performance.

## 3.6 Installing Propellers

Installing propellers is the final step before conducting flight tests. Before installing propellers, please ensure that all previous steps have been completed correctly to avoid test accidents that could result in personal injury or property loss.

### 3.6.1 Matching Motor Orientation

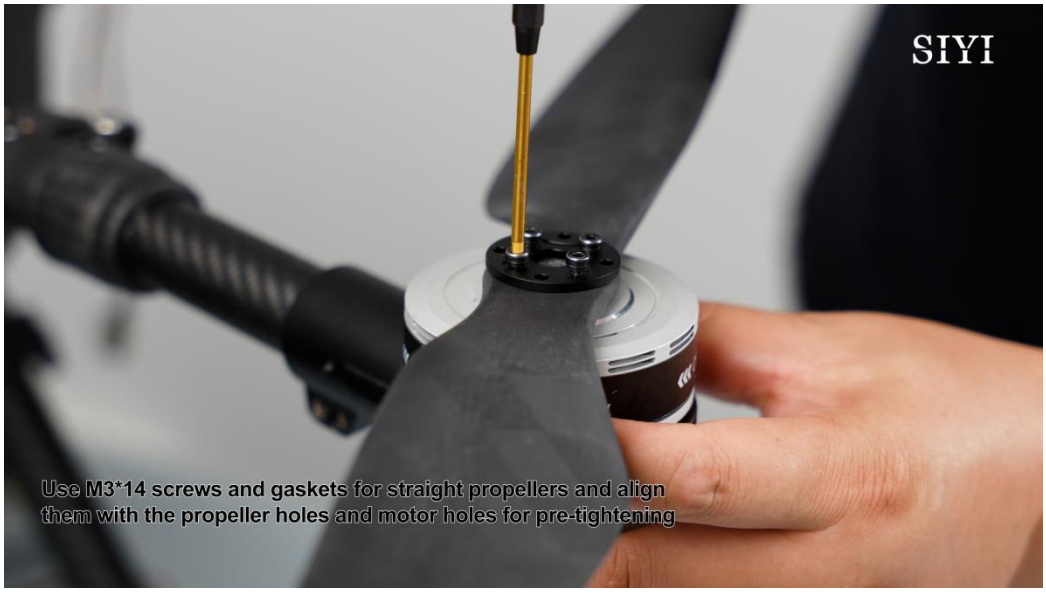
Propeller rotation orientation (CW and CCW) should correspond precisely with the motor rotation orientation (CW and CCW).


CW


CCW

### 3.6.2 Installation and Tightening

Use M3*14 screws for straight propellers and align the propeller washers to the propeller holes and the motor holes. Only pre-tightening the screws in this step.



Use M3*6 screws for foldable propellers and align the propeller holes with the motor holes. Only pre-tightening the screws in this step.


**Mark**

Do not mix straight and foldable propellers on the same multirotor drone.

# CHAPTER 4 FLIGHT TEST

Before arming the drone to take off or during flight, it is necessary to conduct a series of basic checking on the drone to ensure flight safety, improve test efficiency and success rate.

**Mark**

This chapter only introduces the test guidance related to the propulsion system. Regarding flight test guidance for other components, please refer to the user manual of the corresponding component.

## 4.1 Pre-flight Checking

A pre-flight inspection should be conducted every time before powering on.

### 4.1.1 Check the Propellers

Confirm that the propellers are installed correctly, firmly fastened, and without damage.


If foldable propellers are used, it's time to unfold the propellers to avoid unnecessary vibrations during takeoff.


### 4.1.2 Check the Power Assembly

Confirm that the motor is firmly installed, and the wiring is correct.


And manually rotate the motor to check if there is any blockage or jamming.

## 4.2 Start Flight Test

### 4.2.1 Ground Test

Place the drone on a flat and open ground and power on the drone. Then arm the drone and slowly increase throttle, and carefully observe drone feedback to ensure that all motors and propellers are working properly.


### 4.2.2 Low-Altitude Hovering Test

The low-altitude hovering test is to check the stability and control response of the drone.


Hover the drone at height of one to two meters, observe its hovering stability, and test pan control (forward and backward, left and right) and spin control (yaw) in all orientation in a small scale to ensure that the drone can stably perform these actions.

### 4.2.3 Basic Flight Movement Test

Increase the flight altitude and perform simple forward, backward, left-right pan and spin movement. Observe drone response feedback and stability to confirm the response ability and stability of the propulsion system.


## 4.3 Post-flight Inspection

After each flight, it is recommended to conduct necessary inspections on the drone to detect flight abnormalities and potential safety hazards in a timely manner.

### 4.3.1 Check Propellers and Motors

Check if the propellers are loose or damaged, and check if the motors are loose, blocked, or overheated.

### 4.3.2 Record and Analyze Flight Log

Analyzing flight log is helpful for trouble shooting and improving flight quality to propose countermeasures in a timely manner and improve flight test efficiency.

It is suggested to pay more attention to the flight test data below:

- Flight Time
- Power Consumption
- Flight Mode
- Abnormal Phenomena

# CHAPTER 5 TROUBLESHOOTING

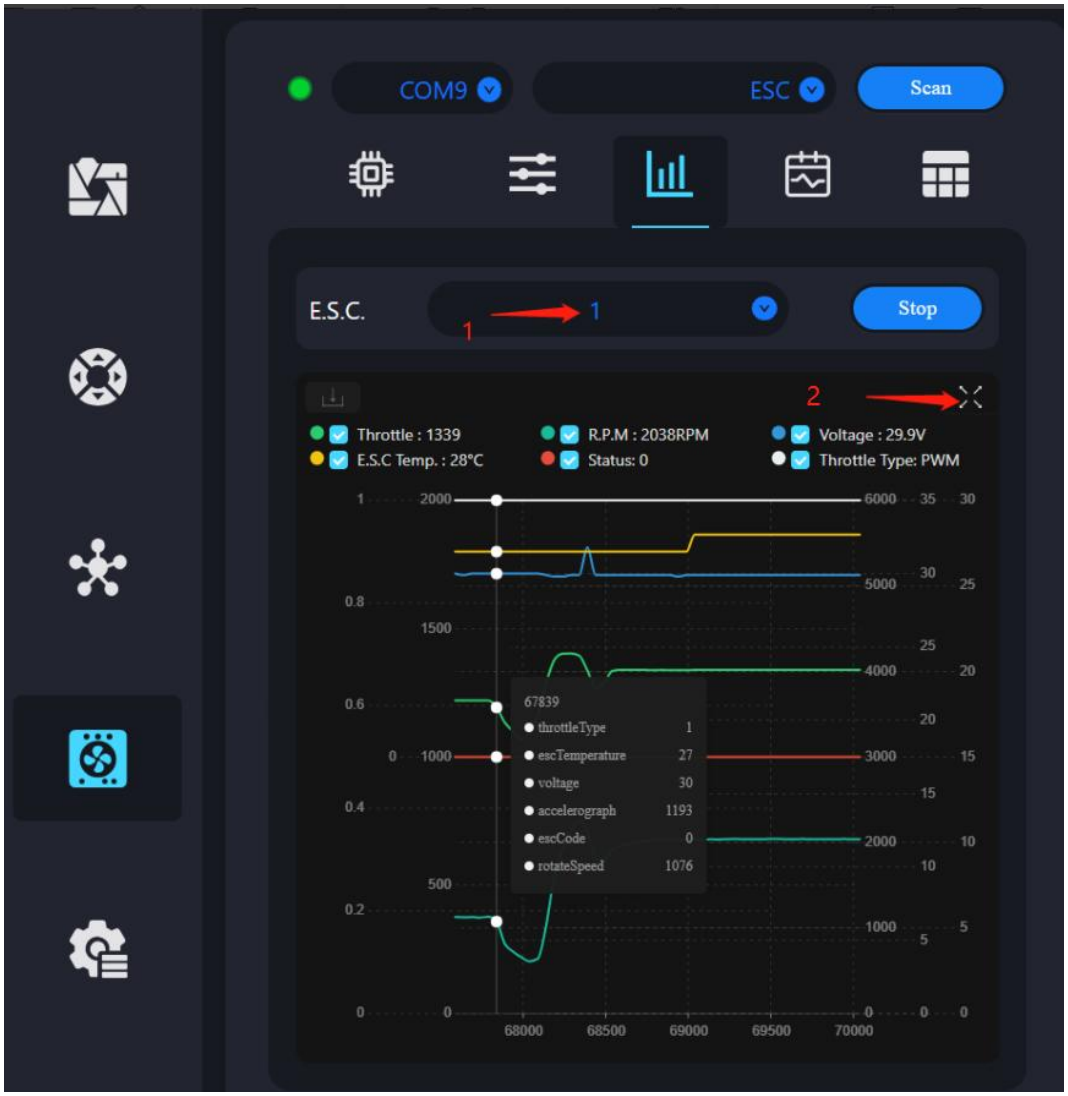
SIYI software supports real-time view of propulsion system working status information such as vibration, temperature, current, and voltage which are very helpful for quick troubleshooting, improving maintenance efficiency, and ensuring operation safety.

**Mark**

Propellers should be removed before troubleshooting to avoid risks to personal safety.

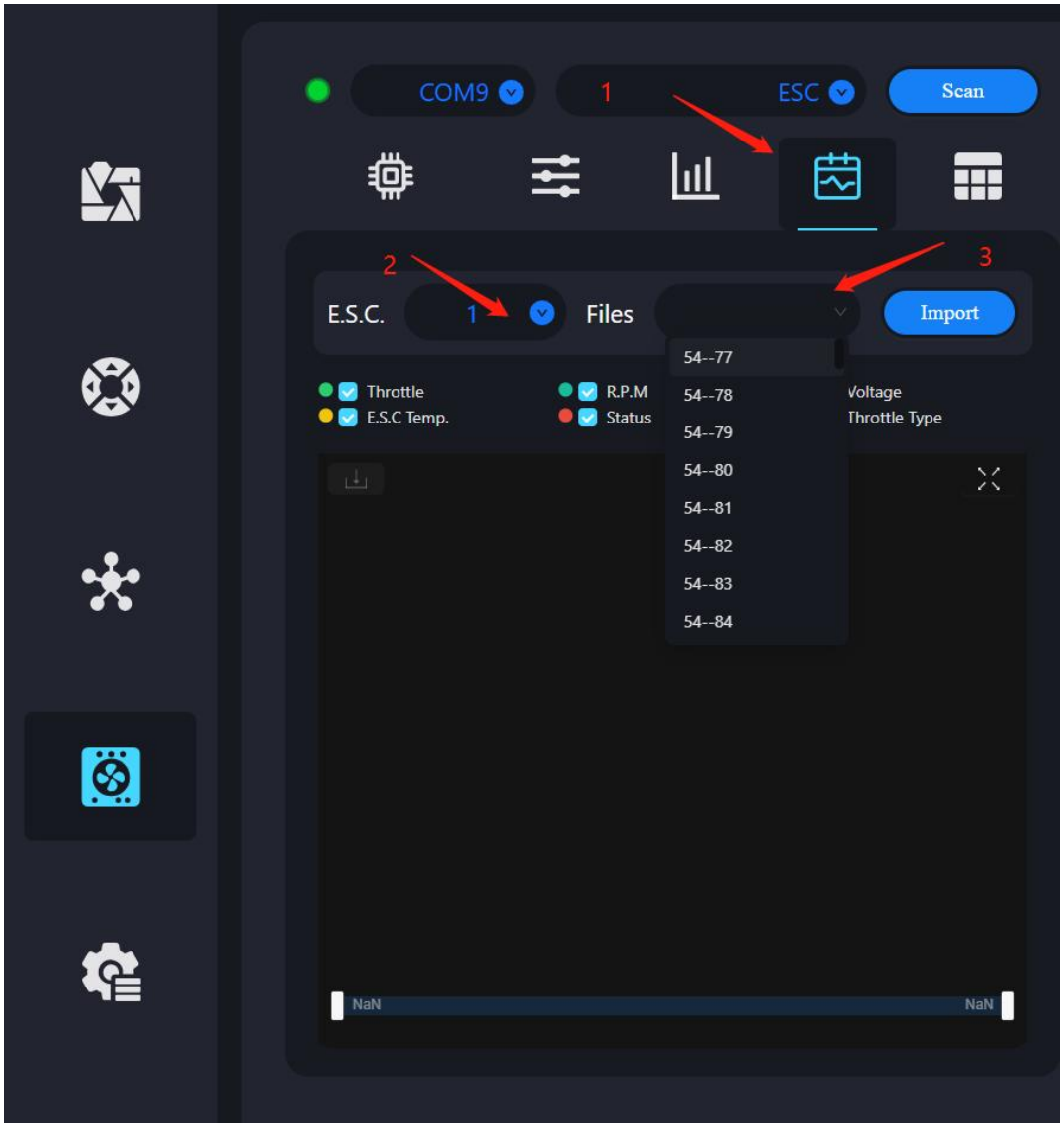
Confirm flight log to avoid incorrect data analysis and inability to accurately analyze the cause of the problem.

## 5.1 Real-time Operating Data

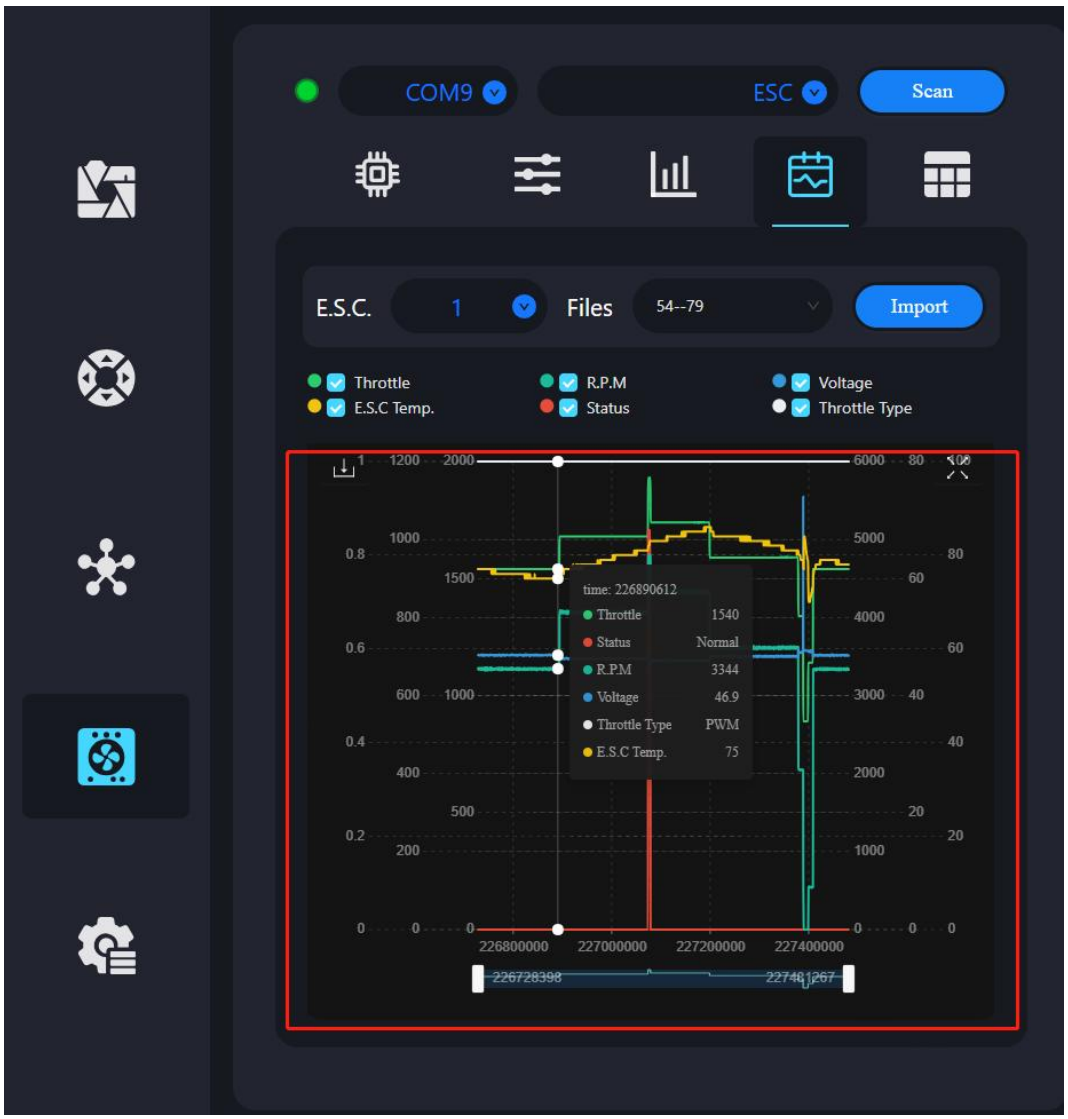


After selecting the corresponding ESC ID, the system will display a series of parameters, including throttle status, RPM, voltage, ESC temperature, ESC status, and throttle type. In addition, the corresponding waveform diagrams will be displayed in real time for monitoring and analysis.

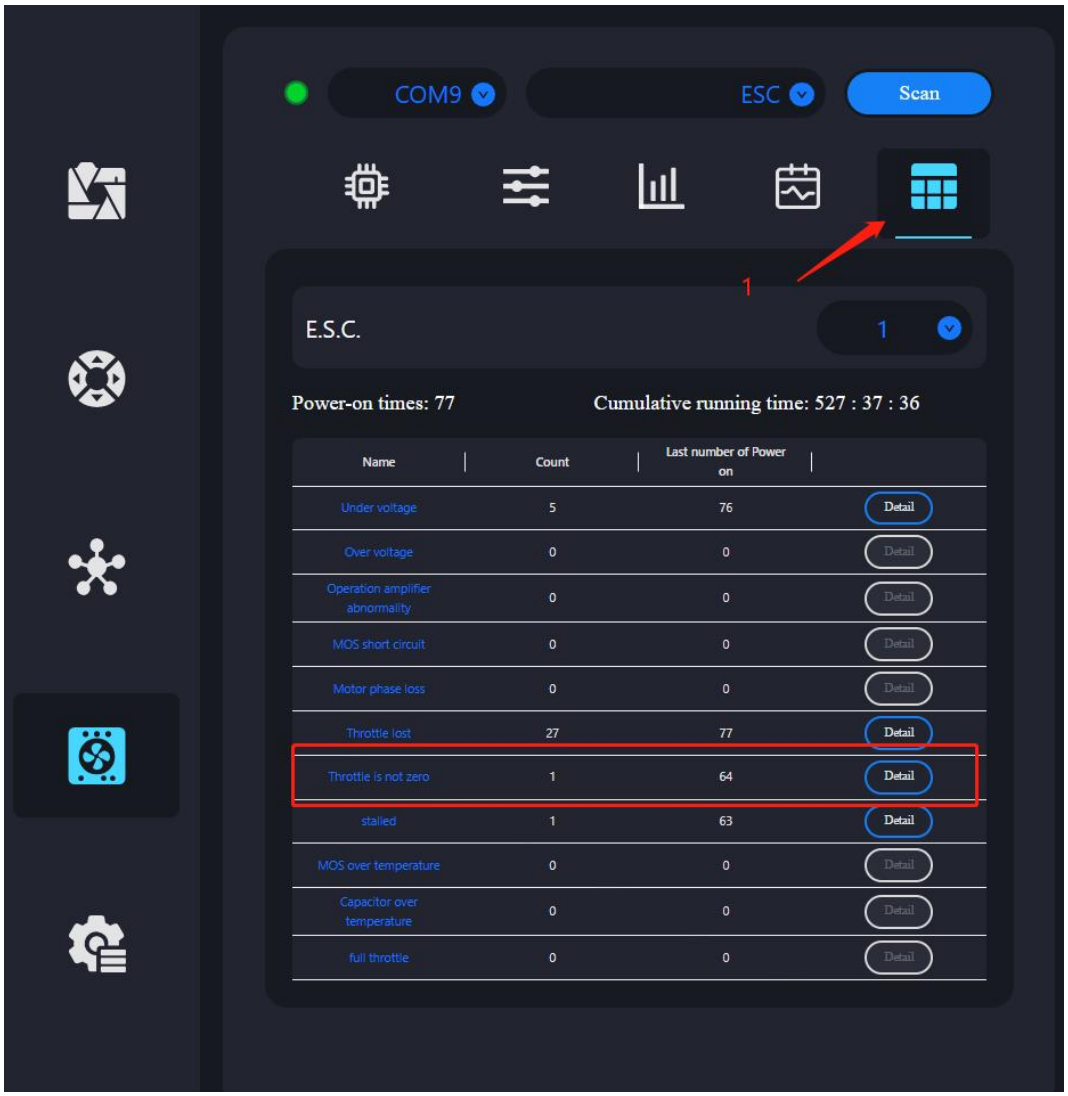
## 5.2 Historical Operating Data



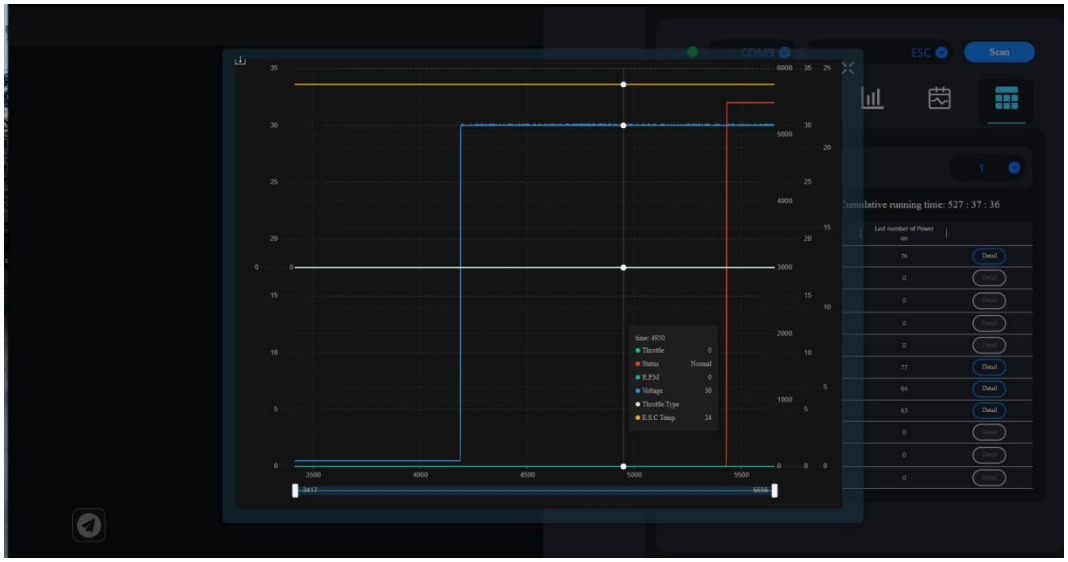
Users can consult relevant information through the ESC ID. The front part represents the corresponding number of power-on times, and the rear part represents the file serial number. According to this naming rule, users can read the data content of the corresponding file.



## 5.3 Fault Storage Function




Users need to select the corresponding ESC ID for viewing according to actual needs. When the user clicks the details option, the system will display the abnormal occurrence time of the file and specific abnormal point information.


COM9
ESC
Scan
Cumulative running time: 527 : 37 : 36
Last number of Power on
Detail
time: 4950
Throttle 0
Status Normal
R.P.M. 0
Voltage 30
Throttle Type
E.S.C Temp. 24
3500
4000
4500
5000
5500
3417
5656

# CHAPTER 6 FIRMWARE UPGRADE

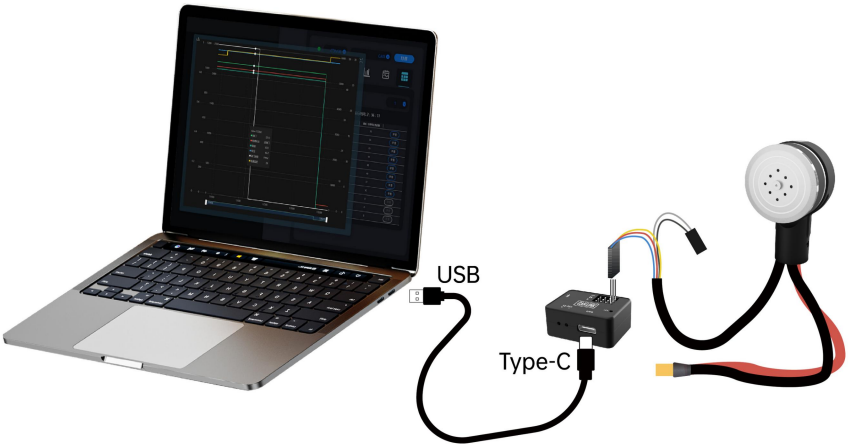
## 6.1 Upgrade through SIYI Software

SIYI software supports users to upgrade the ESC firmware of the propulsion system.

**Tool Preparation**

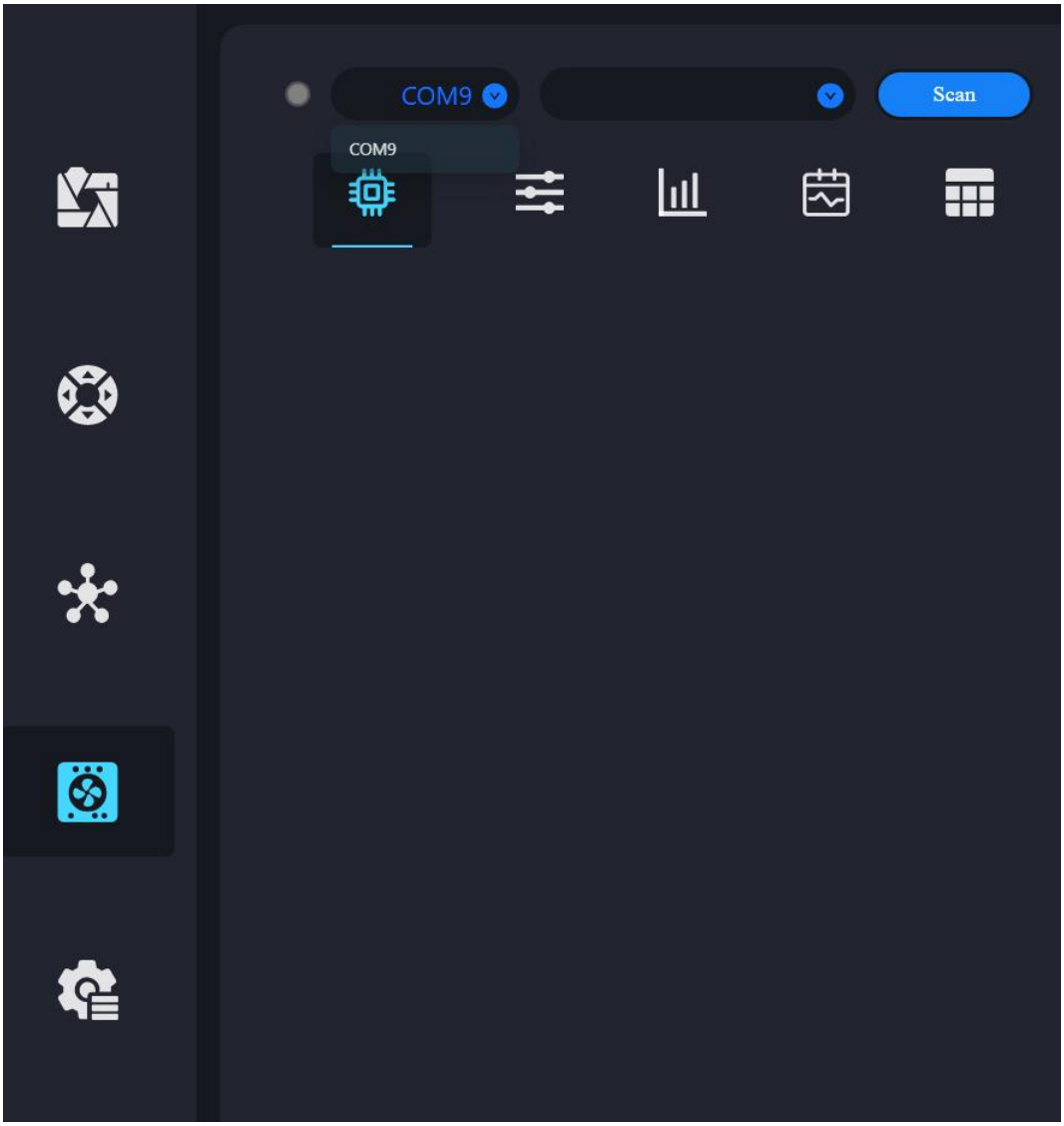
- SIYI Software
- SIYI CAN Link Module
- Windows device

**Steps**

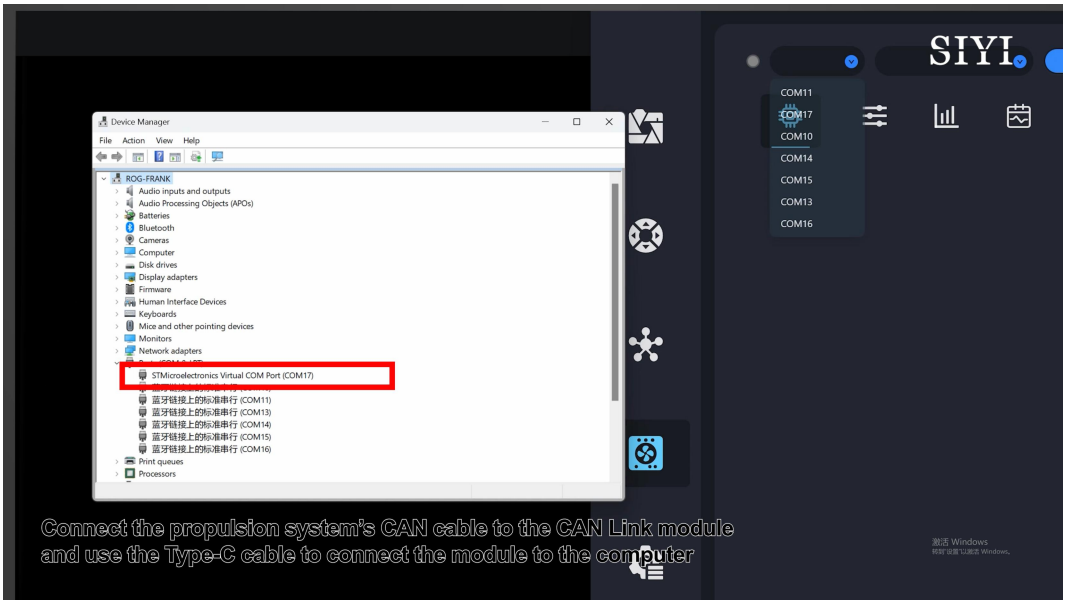



Connect the flight controller that is connected to
the CAN Hub module bus to the computer using a Type-C cable

1. Please refer to the above picture to connect the propulsion system, the SIYI CAN Link module, and the Windows device.
2. Run SIYI software and go to “ESC Settings”.

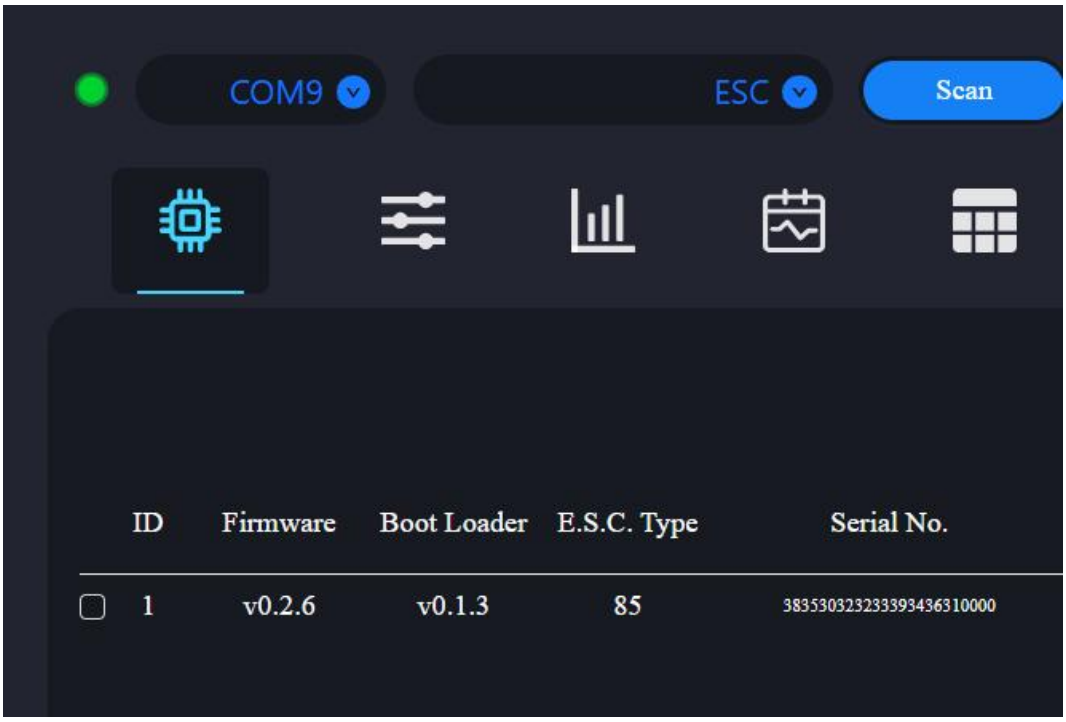



3. Select the corresponding COM port and device type (ESC), and then click "Scan".

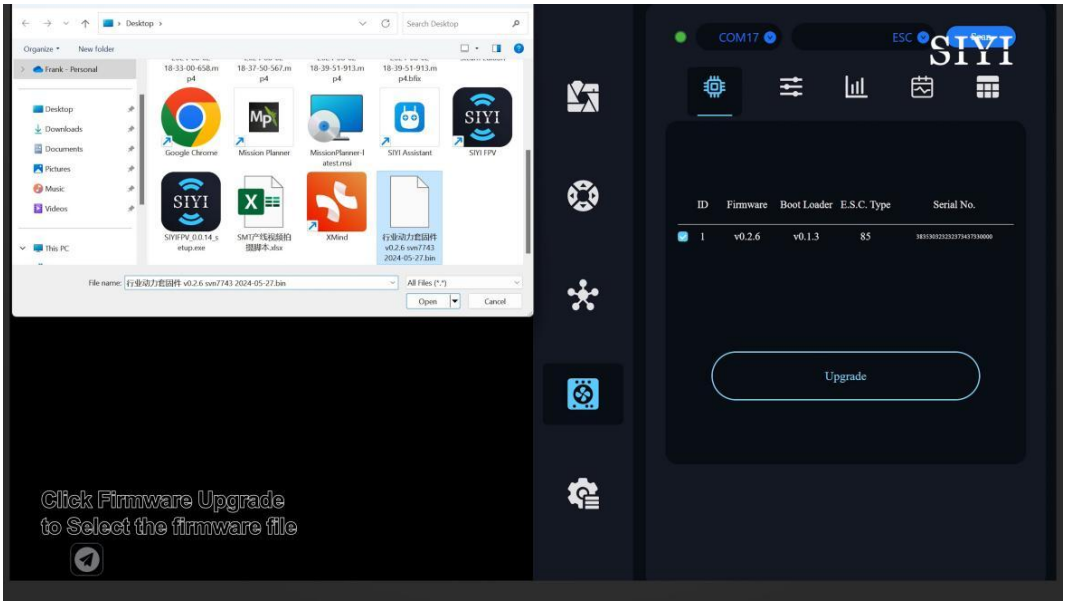




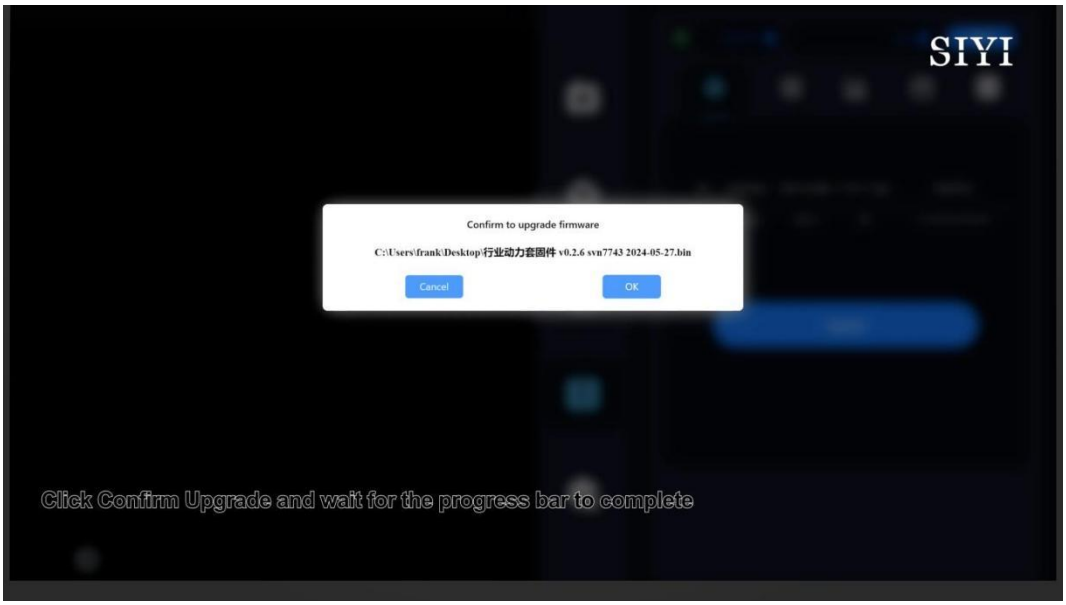
4. If the propulsion system is recognized normally, the connection is successful.

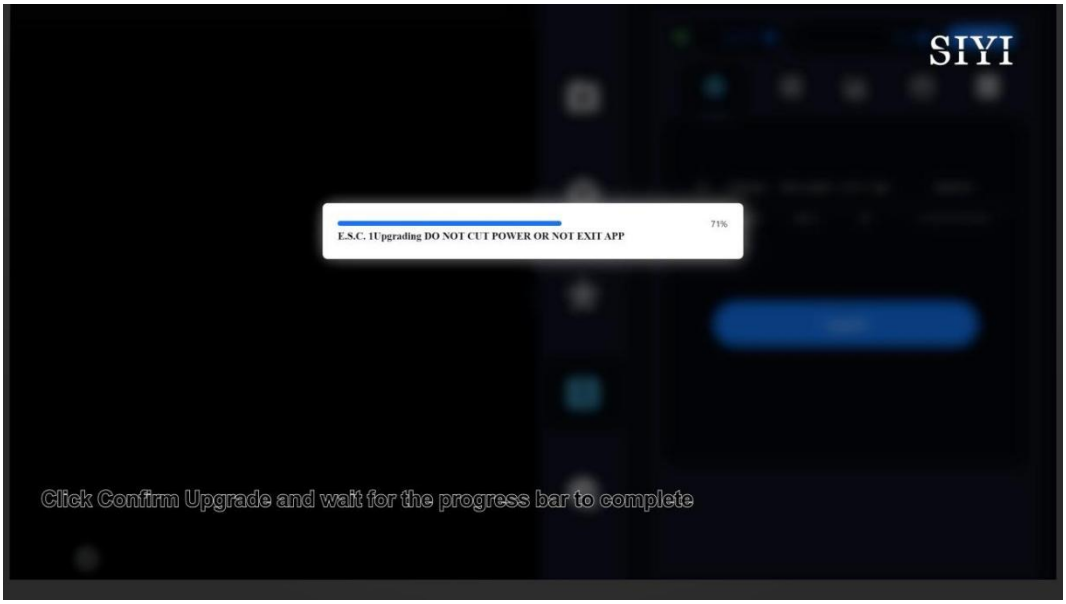


5. Click "Upgrade" and select the firmware file.

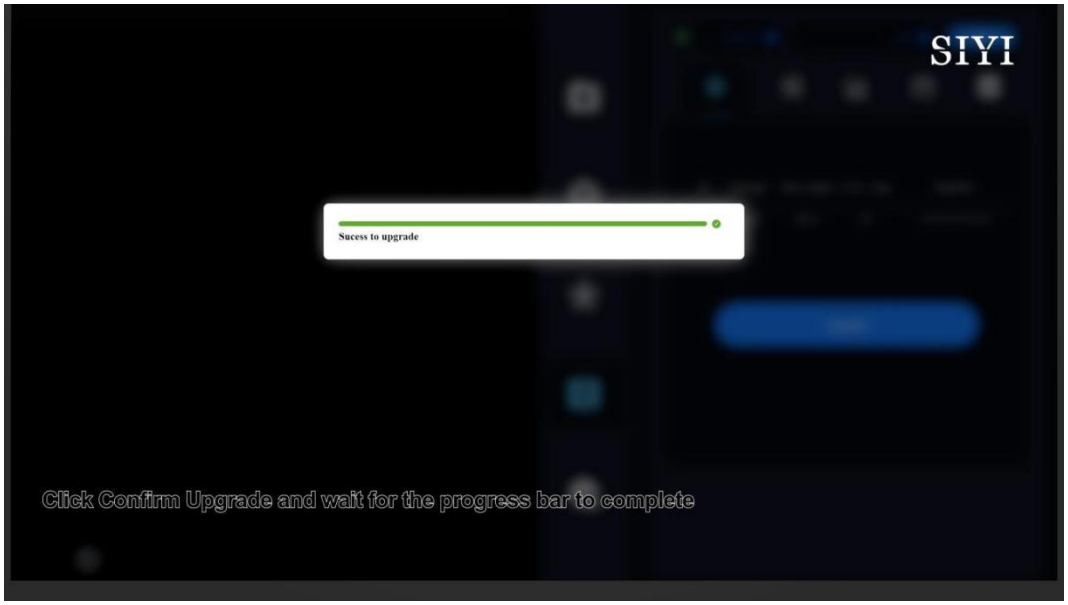



6. Then click " OK " and wait for the update progress bar is completed.






7. Upgrade is successful.




## Mark

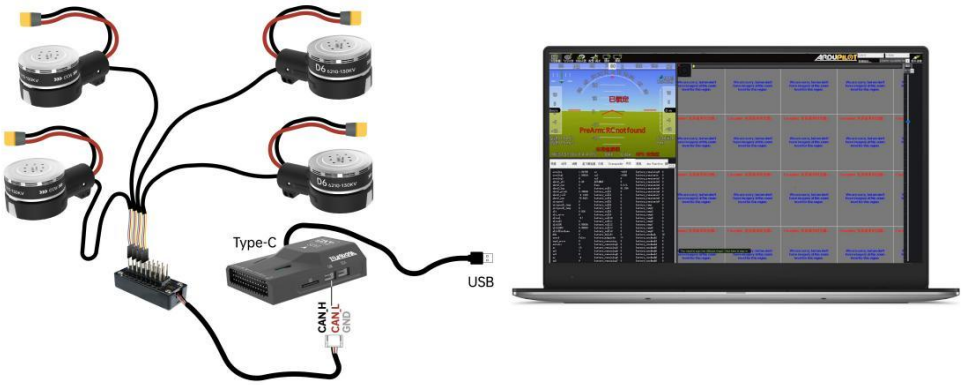
Before firmware upgrade, please make sure that the propulsion system is working properly. And pay special attention to the pin definition of the CAN Link Module to avoid reverse insertion.

Upgrade status will be presented through indicator color

changes. After upgrade, there will be a beep sound and the indicator will return to its original color simultaneously.

## 6.2 Upgrade in DroneCAN Protocol through Mission Planner (ArduPilot)

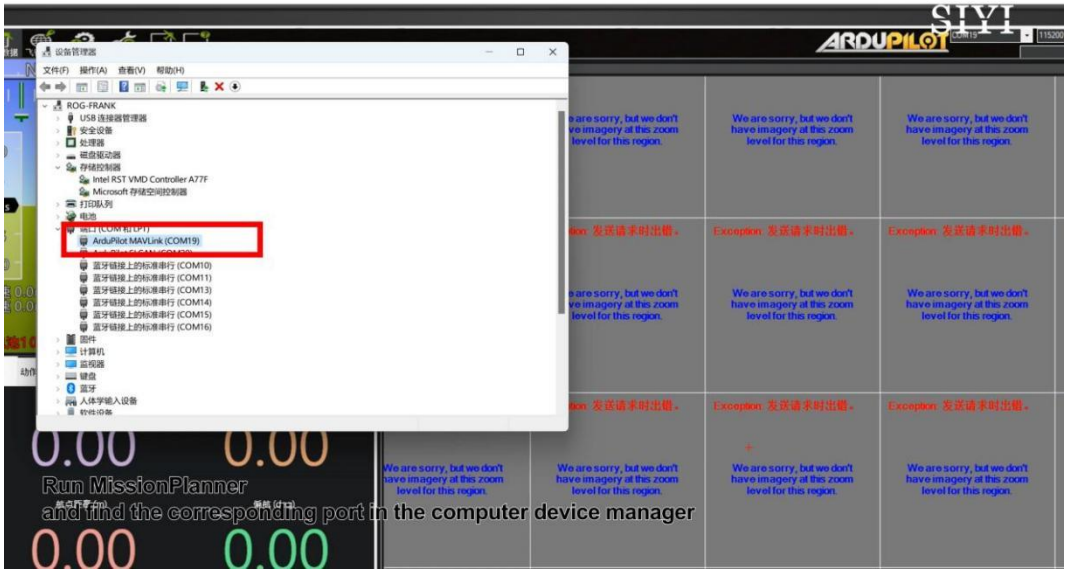
ArduPilot flight controller supports upgrading SIYI propulsion system firmware through DroneCAN protocol.



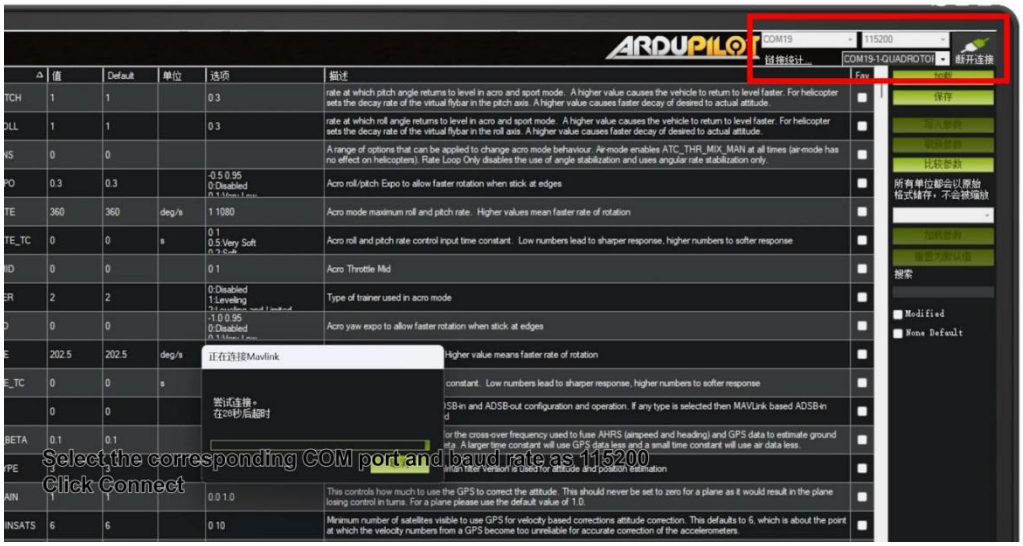

Connect the flight controller that is connected to the CAN Hub module bus to the computer using a Type-C cable

### Steps

Run Mission Planner and find the corresponding port in the PC device manager.

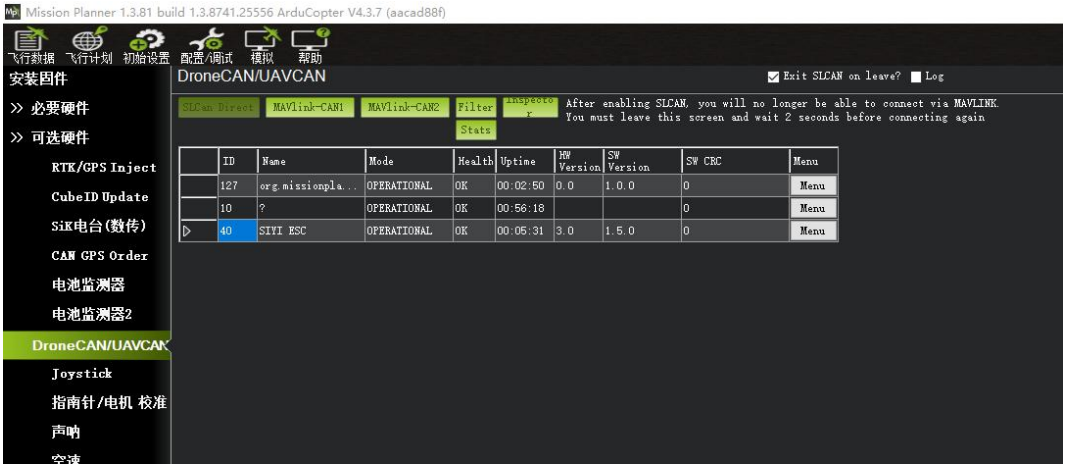



Select the corresponding COM port and 115200 baud rate.

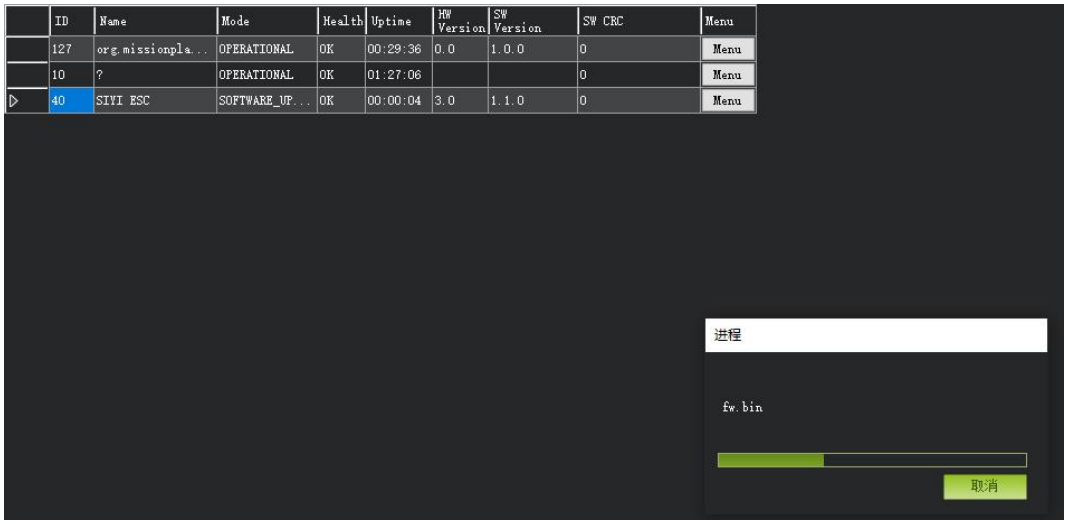



In DroneCAN / UAVCAN column, click MAVlink-CAN1 to refresh the CAN device.

The option "SIYI ESC" belongs to SIYI propulsion system ESC.




Find the “Update” option. Select the ESC firmware for upgrade. During the upgrade process, “Mode” is "SOFTWARE_UPDATE" and a progress bar is displayed.



# CHAPTER 7 AFTER-SALE SERVICE

Please visit the SIYI Technology support page at Service and Support - SIYI Technology | Empowering and Building an Intelligent Robot Ecology for the latest after-sales and warranty information.