

D6

ENTERPRISE

PROPULSION SYSTEM

USER MANUAL



V1.0

September 2024

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°C to 50°C. 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).

SIYI User Group - Facebook



SIYI Official Website (<https://siyi.biz/en>)

SIYI Official Store (<https://shop.siyi.biz>)

SIYI YouTube Channel (<https://www.youtube.com/c/SIYITech>)

SIYI Facebook Page (<https://www.facebook.com/siyitechnology>)

User Manual Update Log

Version	Date	Updates
1.0	2024.9	Initial version.


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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°C) or too cold (under -20°C).

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.

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 craftsmanship 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.

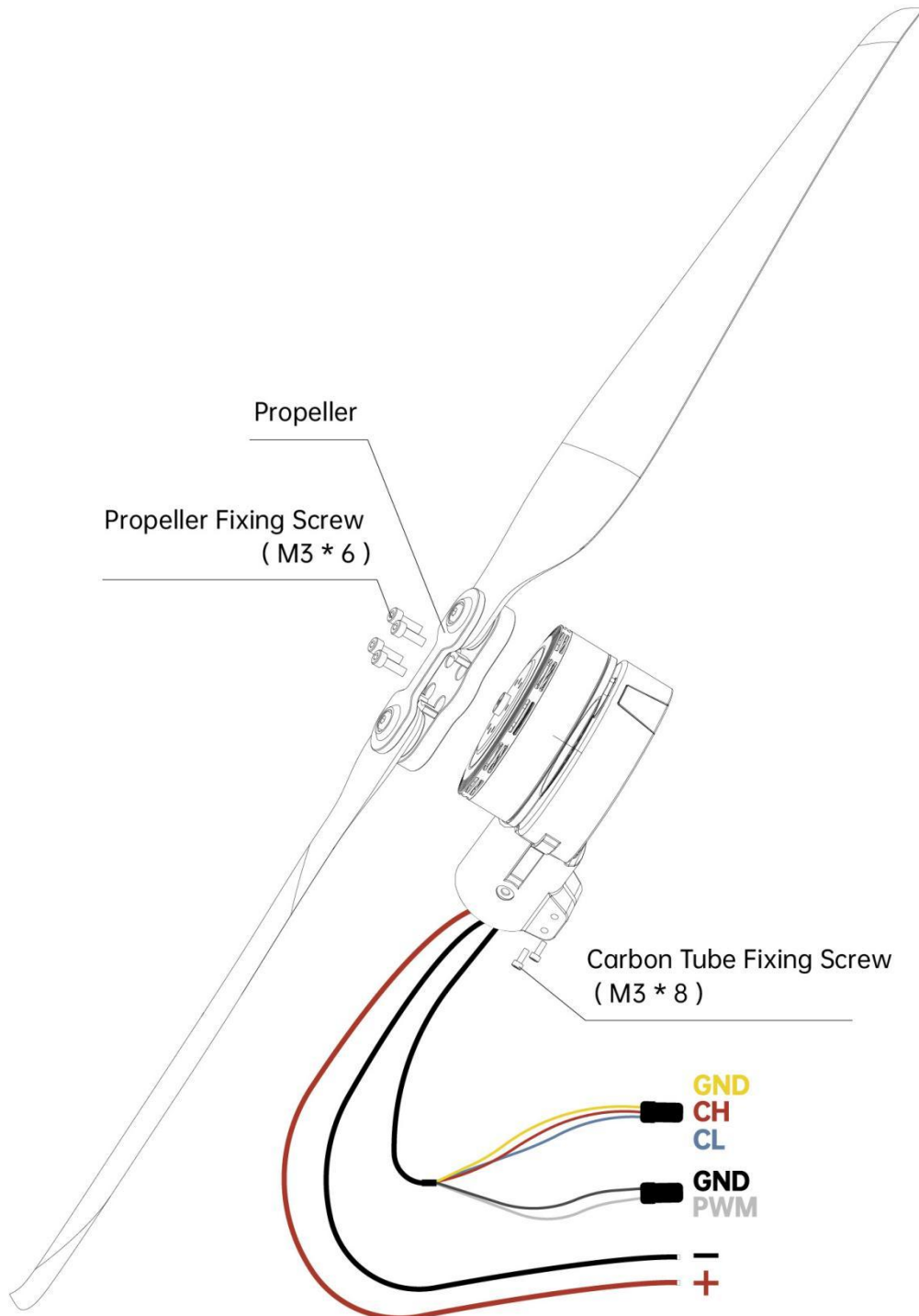
Motor Life

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

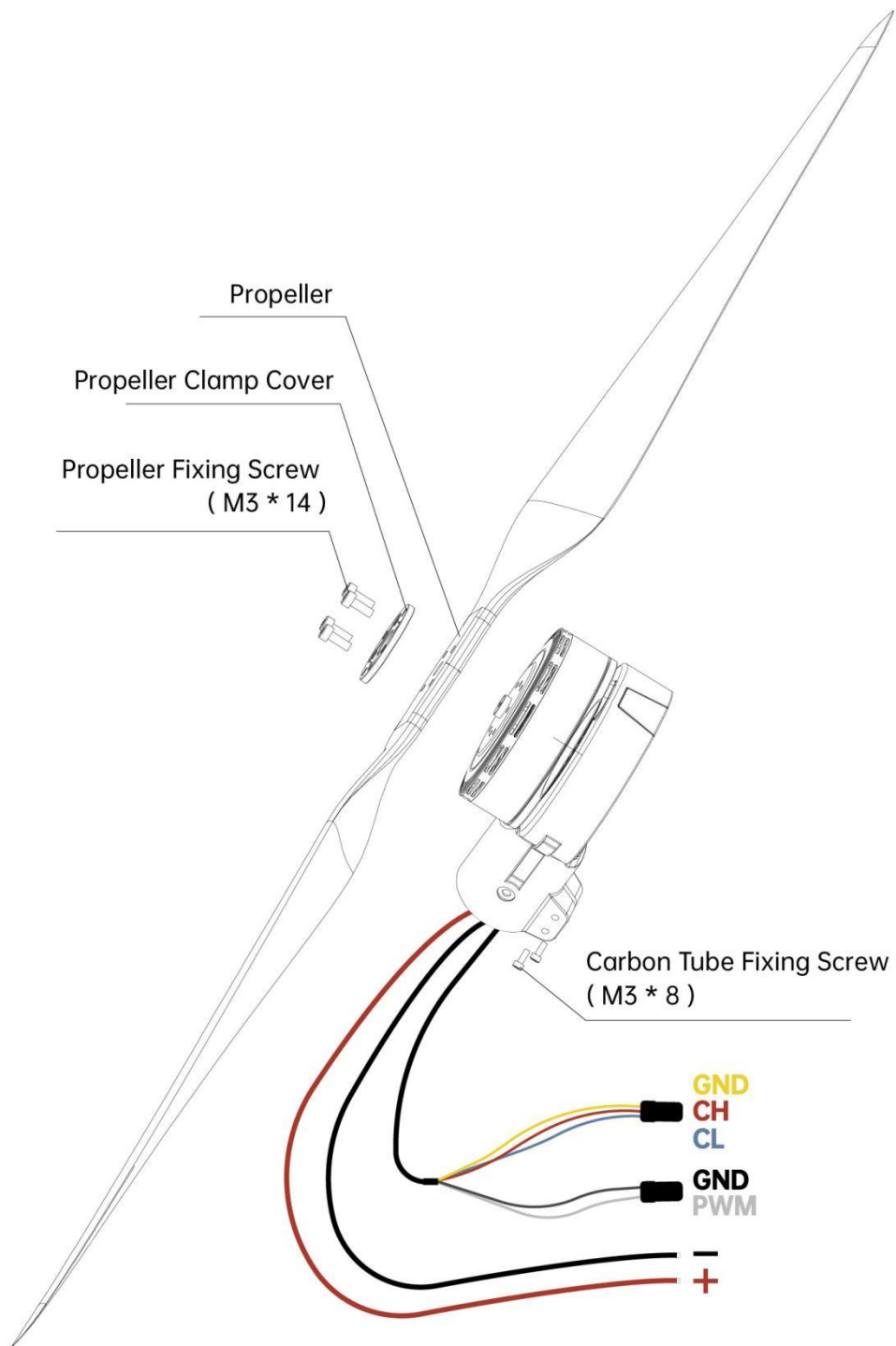
Both Open-Source & Commercial Ecosystem Compatible

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 / axis
Recommended Take-off Weight	2 to 2.5 kg / axis
Recommended Battery	12 ~ 14S LiPo
Cable Length	Power Cable: 710 mm 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 μ s
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 Overvoltage: One short Undervoltage: Two short	Check the power supply voltage and reduce it appropriately
	Operational Amplifier Abnormality	No Beep	Yellow Blinks Two long & three short	Contact technical support
	MOS Short Circuit	No Beep	Yellow Blinks Two long & two short	Contact technical support
	Motor Phase Loss	No Beep	Yellow Blinks Two long & one short	Check if the motor rotation is stuck
	Throttle Signal Loss	One Short Beep	Yellow Blinks 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 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 One long	Loose wires, damaged wires, or no signal output from the connected device
	Throttle Stall	No Beep	Yellow Blinks One long & four short	Check if the motor rotation is stuck
	MOS Overheat	No Beep	Yellow Blinks One long & two short	Is payload weight within recommended range?
	Capacitor Overheat	No Beep	Yellow Blinks 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 Upgrade	No Firmware	No Beep	Solid White	Upgrade firmware through SIYI software
	Firmware Upgrade Failed	No Beep	Solid White	Ensure the 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.

2 PREPARE FOR ASSEMBLY

Watch Tutorial Video

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

<https://www.youtube.com/watch?v=Cdg3LkeN-el&list=PLnwDdKcxulbc5StgCD-xdx9GRcsUEuvWD&index=2>

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

<https://www.youtube.com/watch?v=gYLqLQA97nQ&list=PLnwDdKcxulbc5StgCD-xdx9GRcsUEuvWD&index=3>

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

https://www.youtube.com/watch?v=2bflGtdl_l8&list=PLnwDdKcxulbc5StgCD-xdx9GRcsUEuvWD&index=4

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

<https://www.youtube.com/watch?v=QXPyzqQuO8c&list=PLnwDdKcxulbc5StgCD-xdx9GRcsUEuvWD&index=5>

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

UPGRADE

<https://www.youtube.com/watch?v=SHv5EgqwnTE&list=PLnwDdKcxulbc5StgCD-xdx9GRcsUEuvWD&index=6>

2.1 Solder the Power Connector

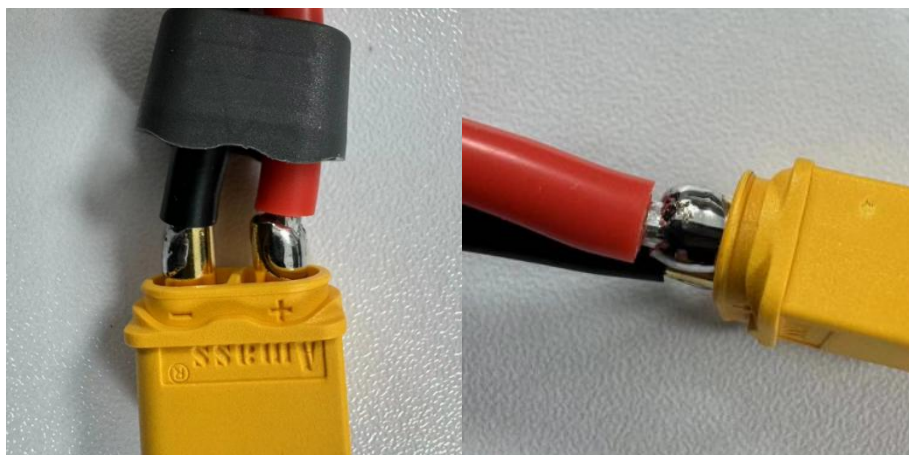
Soldering the power connector is a necessary step to ensure that the propulsion system works properly.

Tools Required:

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

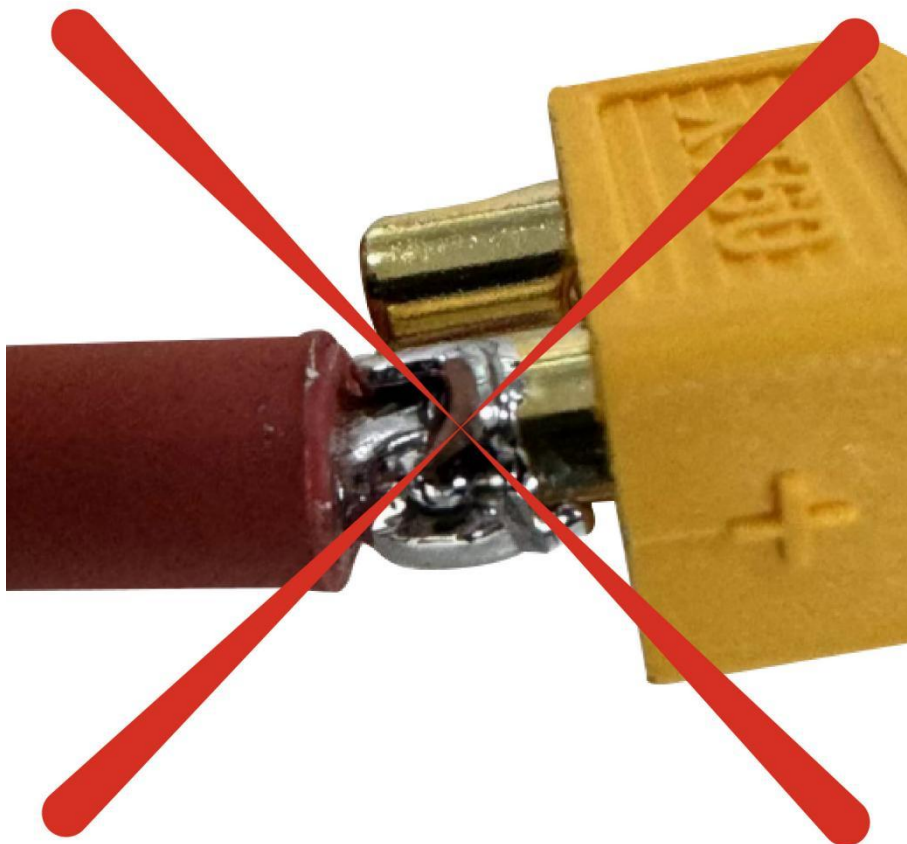
Steps

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.



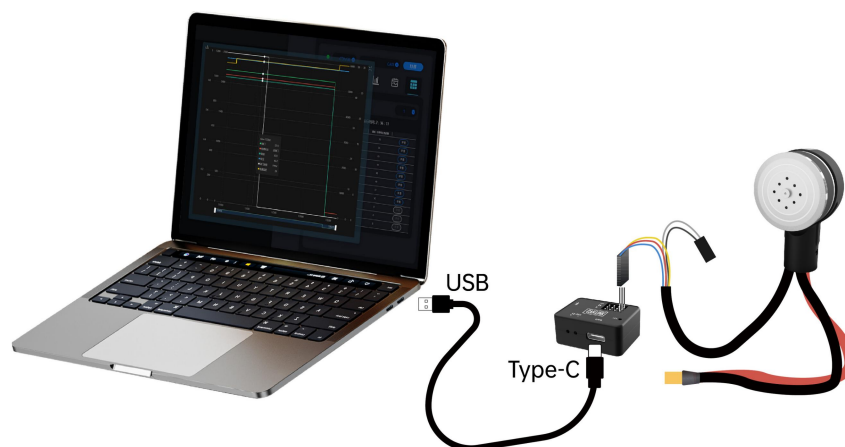
2.2 Configuration

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

Tools Required

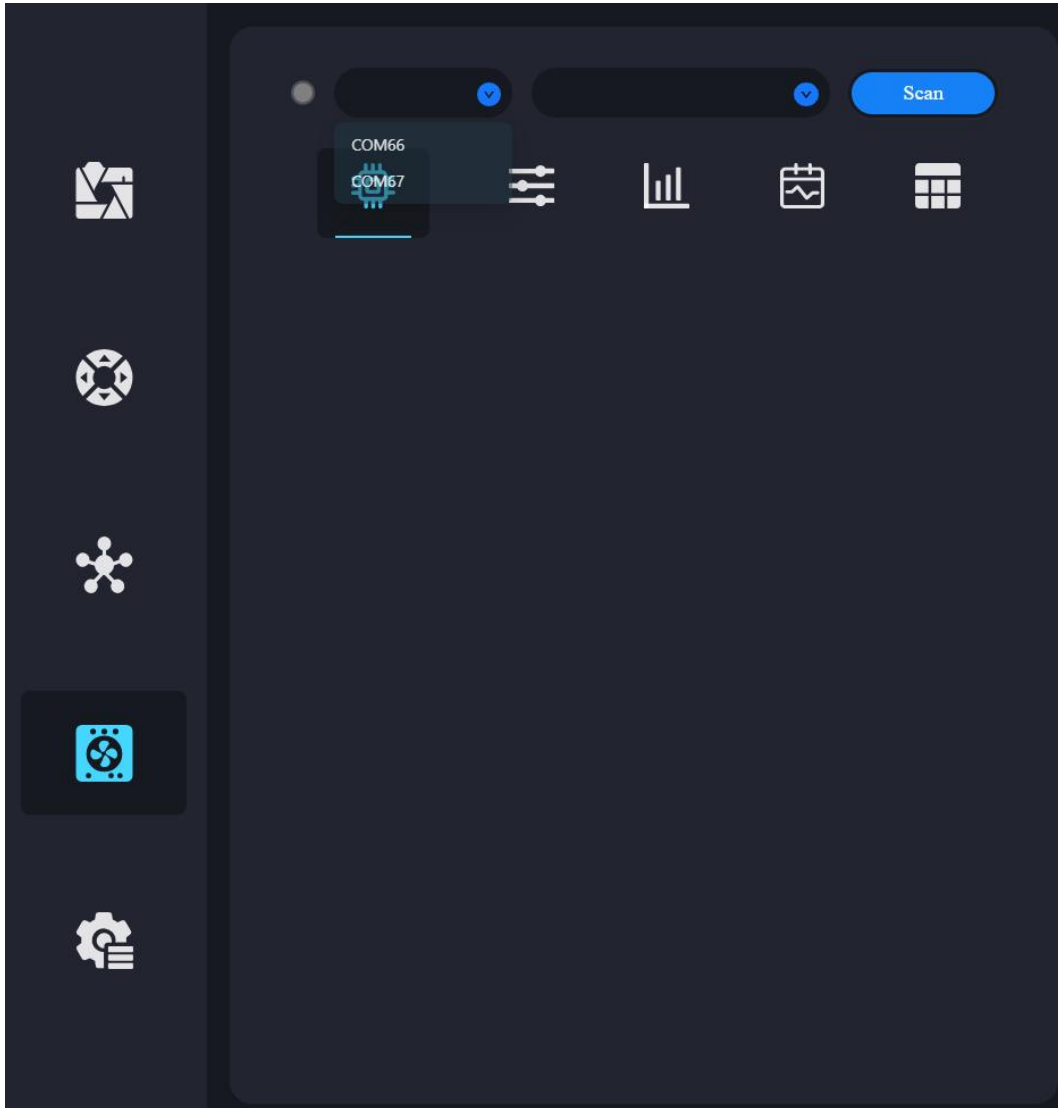
- SIYI Software for Windows
- SIYI CAN Link Module
- Windows Device

Steps

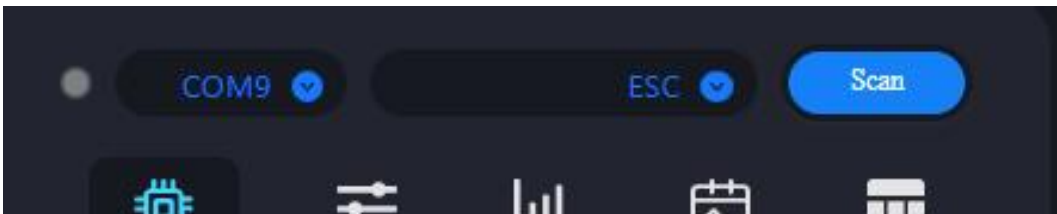
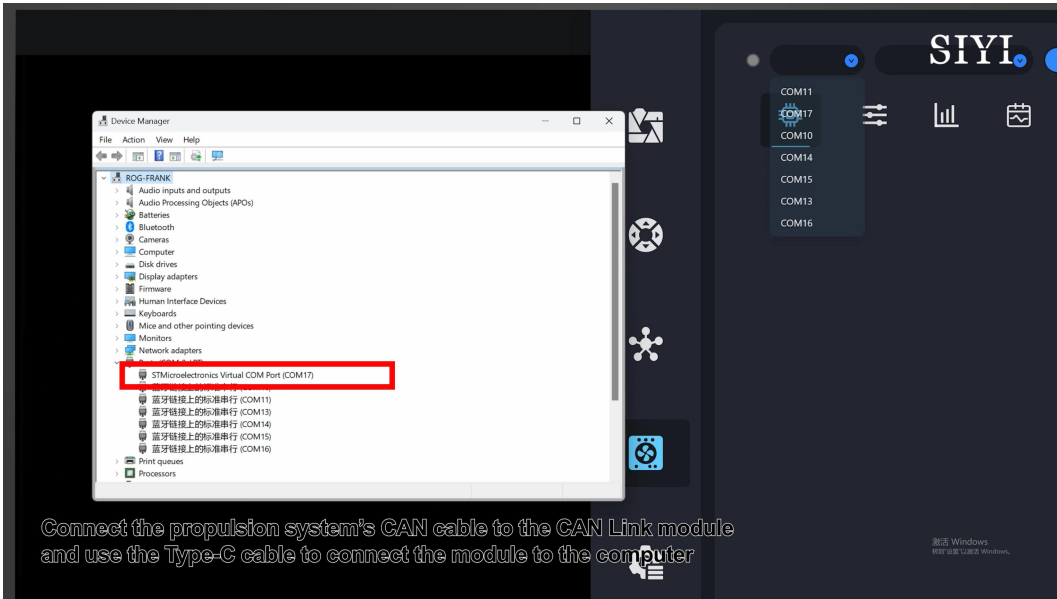


Connect the flight controller that is connected to the CAN Hub module bus to the computer using a Type-C cable

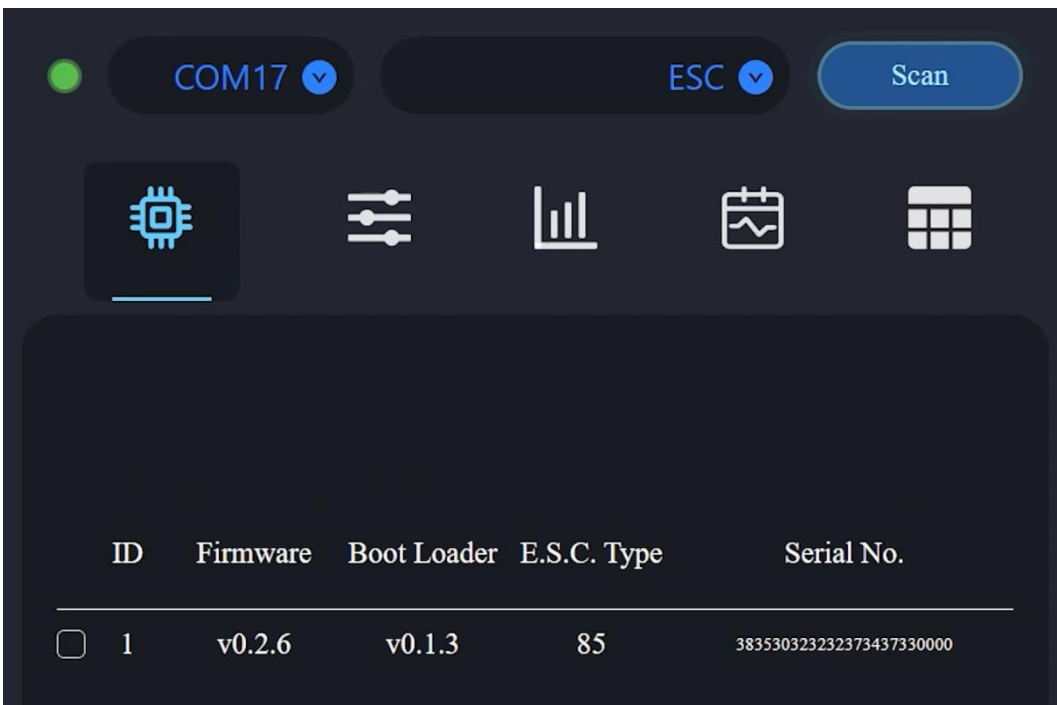
1. Please refer to the diagram above to connect the propulsion system, the CAN Link module, and the Windows device.
2. Run the SIYI software and go to the ESC settings menu.



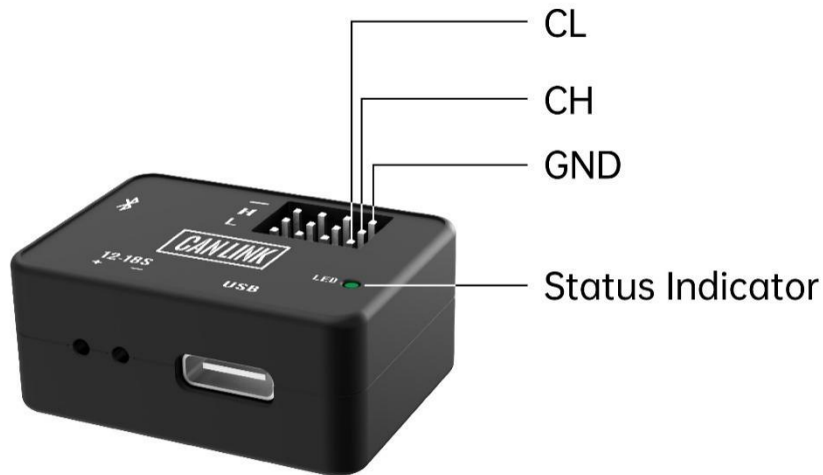
3. Select the corresponding COM port and device type (ESC), then click "Scan."



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



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

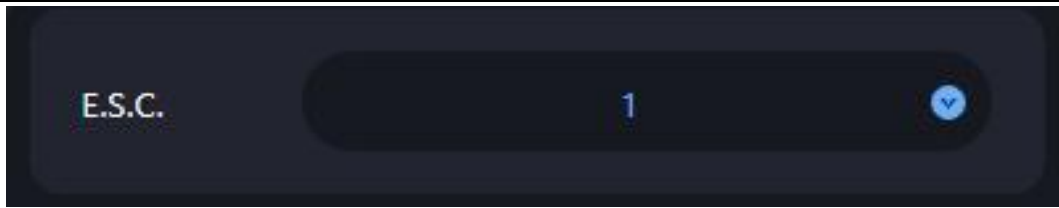


2.2.1 Indicator Colors

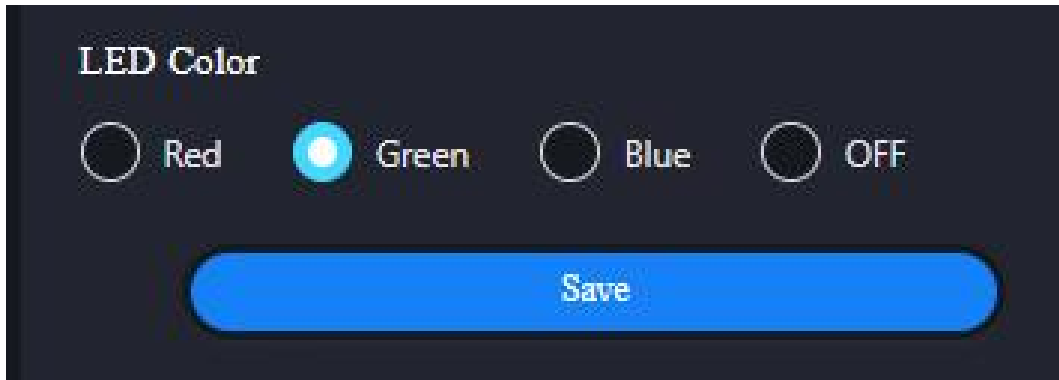
The indicator colors of the propulsion system are an important reference during LOS (Line of Sight) flight.

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.

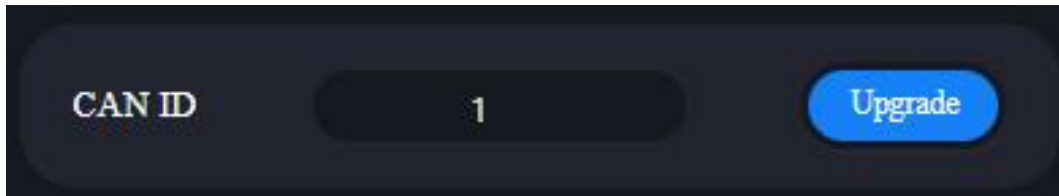


Mark

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.

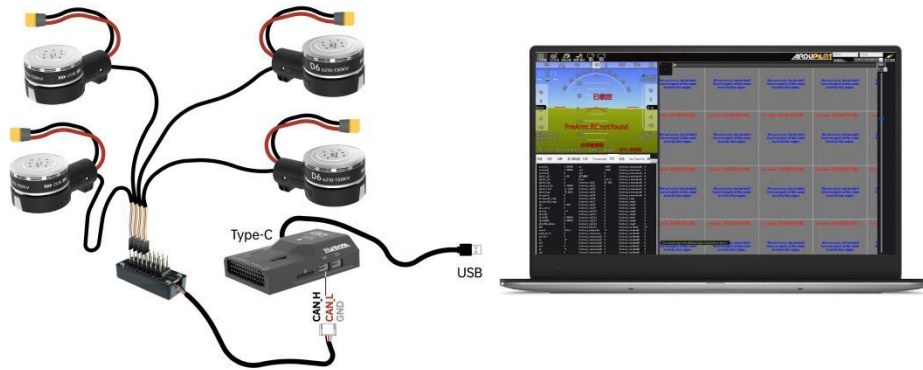


Mark

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

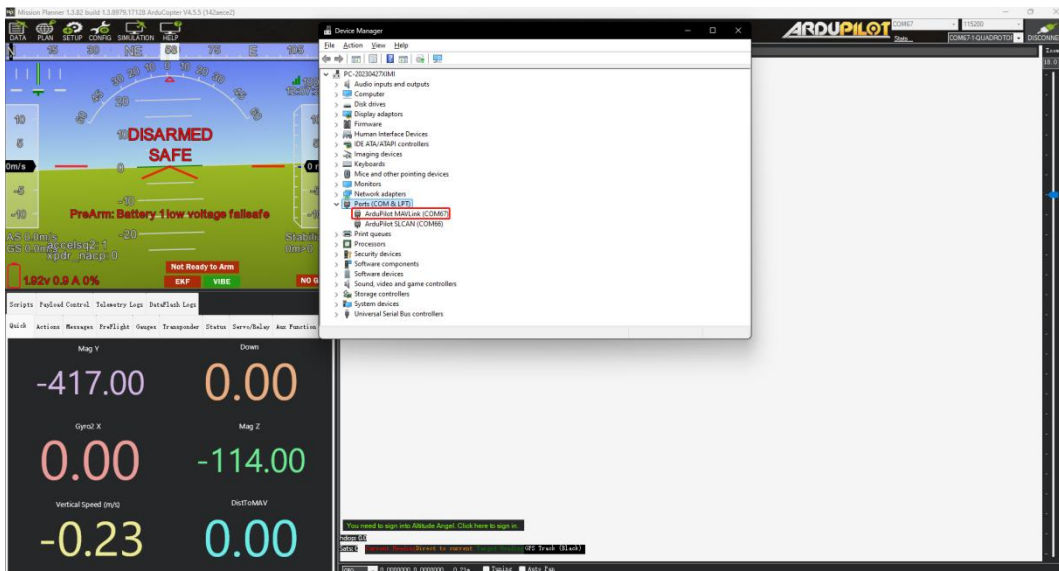
ID, then save the settings.

2.3.2 Setting CAN Throttle through Mission Planner (ArduPilot)

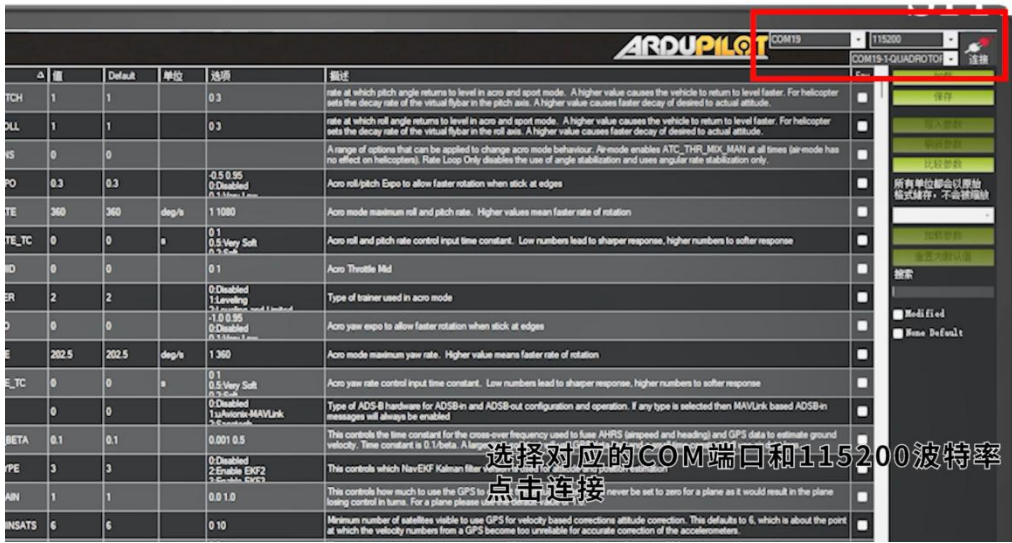
ArduPilot flight controllers support setting D6 propulsion system through the DroneCAN protocol.

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.

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	
CAN_P1_DRIVER	1	0		0 Disabled 1 First driver	Enabling this option enables use of CAN buses.	
CAN_P1_FDBITRATE	4	4		1:1M 2:2M	Bit rate can be set up to from 1000000 to 8000000	

4. Set the value of CAN_P1_DRIVER to 1.

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	
CAN_P1_DRIVER	1	0		First driver Disabled First driver Second driver Third driver	Enabling this option enables use of CAN buses.	
CAN_P1_FDBITRATE	4	4		1:1M 2:2M	Bit rate can be set up to from 1000000 to 8000000	

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

Name	Value	Default	Units	Options	Desc	Fav
CAN_D1_PROTOCOL	1	1		DroneCAN Disabled DroneCAN	Enabling this option starts selected protocol that will use this virtual driver	
CAN_D1_PROTOCOL2	0	0		DroneCAN ESP_WIFI USB Scripting Scripting2 DRONECAN Hardware	Secondary protocol with 11 bit CAN addressing	

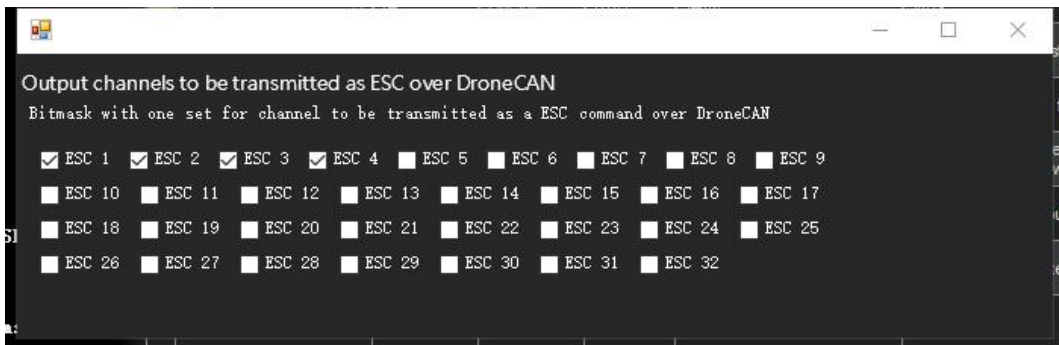
6. After successful setup, restart the flight controller. You should see additional parameters: CAN_P1_BITRATE and CAN_D1_UC_ESC_BM.

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 1 USD1 2 ESC-over-CAN	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 bits 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, an extra message will be sent when a relay changes state
CAN_D1_UC_SER_EN	0	0		0 Disabled 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 0 Log None 1 Info 2 Error	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 1 Fast driver 2 Standard driver	Enabling this option enables use of CAN buses
CAN_P1_FDBITRATE	4	4		1 1M 2 2M 4 4M	Bit rate can be set up to from 1000000 to 8000000

7. Configure CAN_P1_BITRATE to 1000000.

Name	Value	Default	Units	Options	Desc
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.

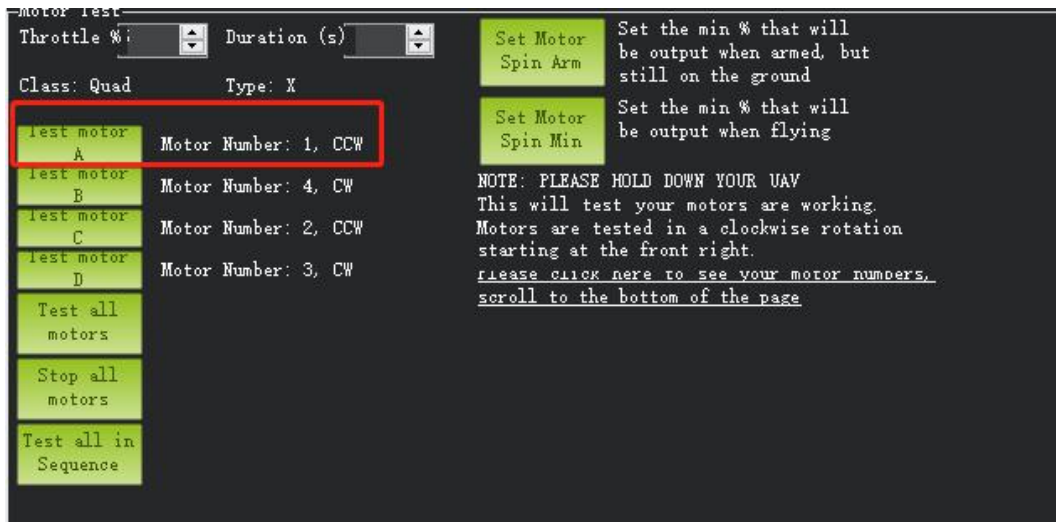


ESC Testing

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.

Scripts		Payload Control		Telemetry Logs		DataFlash Logs			
Quick	Actions	Messages	PreFlight	Gauges	Transponder	Status	Servo/Relay	Aux Function	
accelsq		1.01014	ay		-17		battery_remaining3	0	b
accelsq2		0.99902	ay2		-7		battery_remaining4	0	b
accelsq3		0	ay3		0		battery_remaining5	0	b
ahrs2_alt		0	az		-1010		battery_remaining6	0	b
ahrs2_lat		0	az2		-999		battery_remaining7	0	b
ahrs2_lng		0	az3		0		battery_remaining8	0	b
ahrs2_pitch		0	AZtoMAV		0		battery_remaining9	0	b
ahrs2_roll		0	Base		0,0,0,		battery_remainin	0	b
ahrs2_yaw		0	battery_cell1		1.928		battery_remainin2	0	b
airspeed		0	battery_cell2		0		battery_remainin3	0	b
airspeed1_temp		0	battery_cell3		0		battery_remainin4	0	b
airspeed2_temp		0	battery_cell4		0		battery_remainin5	0	b
alt		0.851	battery_cell5		0		battery_remainin6	0	b
alt_error		0	battery_cell6		0		battery_remainin7	0	b
altasl		0	battery_cell7		0		battery_remainin8	0	b
altasl2		0	battery_cell8		0		battery_remainin9	0	b
altdi00		0.00851	battery_cell9		0		battery_temp	0	b
altdi000		0.00085	battery_cell10		0		battery_temp2	0	b
altoffsethome		0	battery_cell11		0		battery_temp3	0	b
AOA		0	battery_cell12		0		battery_temp4	0	b
armed		False	battery_cell13		0		battery_temp5	0	b
aspd_error		0	battery_cell14		0		battery_temp6	0	b
asratio		0	battery_kmlleft		0		battery_temp7	0	b
ax		-1	battery_mahperkm		∞		battery_temp8	0	b
ax2		0	battery_remaining		0		battery_temp9	0	b
ax3		0	battery_remaining2		0		battery_usedmah	192	b

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 to 1000000.

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

UAVCAN_BITRATE	1000000 bit/s	UAVCAN CAN bus bitrate
UAVCAN_ENABLE	Sensors and Actuators (ESCs) UAVCAN mode	
UAVCAN_ESC_IDLT	Enabled	UAVCAN ESC will spin at idle throttle when armed, even if the mixer outputs zero setpoints

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.

SYS_CTRL_ALLOC Enabled Enable Dynamic Control Allocation

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.

```

Back < Analyze Tools
日志下载 Provides a connection to the vehicle's system shell.
地理标记图像
Mavlink 控制台
MAVLink 检测
振动

nsh> uavcan status
Pool allocator status:
Capacity hard/soft: 500/250 blocks
Reserved: 19 blocks
Allocated: 13 blocks

UAVCAN node status:
Internal failures: 0
Transfer errors: 1
RX transfers: 784
TX transfers: 1853

CAN1 status:
HW errors: 475
IO errors: 475
RX frames: 2276
TX frames: 2068

CAN2 status:
HW errors: 2062
IO errors: 2064
RX frames: 0
TX frames: 2066

ESC outputs:
INFO [mixer_module] Param prefix: UAVCAN_EC
control latency: 0 events, 0us elapsed, 0.00us avg, min 0us max 0us 0.000us rms
Channel Configuration:
Channel 0: func: 0, value: 0, failsafe: 65535, disarmed: 65535, min: 1, max: 8191
Channel 1: func: 0, value: 0, failsafe: 65535, disarmed: 65535, min: 1, max: 8191
Channel 2: func: 0, value: 0, failsafe: 65535, disarmed: 65535, min: 1, max: 8191
Channel 3: func: 0, value: 0, failsafe: 65535, disarmed: 65535, min: 1, max: 8191
Channel 4: func: 0, value: 0, failsafe: 65535, disarmed: 65535, min: 1, max: 8191
Channel 5: func: 0, value: 0, failsafe: 65535, disarmed: 65535, min: 1, max: 8191
Channel 6: func: 0, value: 0, failsafe: 65535, disarmed: 65535, min: 1, max: 8191
Channel 7: func: 0, value: 0, failsafe: 65535, disarmed: 65535, min: 1, max: 8191
Servo outputs:
INFO [mixer_module] Param prefix: UAVCAN_SV
control latency: 0 events, 0us elapsed, 0.00us avg, min 0us max 0us 0.000us rms
Channel Configuration:
Channel 0: func: 0, value: 0, failsafe: 500, disarmed: 500, min: 0, max: 1000
Channel 1: func: 0, value: 0, failsafe: 500, disarmed: 500, min: 0, max: 1000
Channel 2: func: 0, value: 0, failsafe: 500, disarmed: 500, min: 0, max: 1000
Channel 3: func: 0, value: 0, failsafe: 500, disarmed: 500, min: 0, max: 1000
Channel 4: func: 0, value: 0, failsafe: 500, disarmed: 500, min: 0, max: 1000
Channel 5: func: 0, value: 0, failsafe: 500, disarmed: 500, min: 0, max: 1000
Channel 6: func: 0, value: 0, failsafe: 500, disarmed: 500, min: 0, max: 1000
Channel 7: func: 0, value: 0, failsafe: 500, disarmed: 500, min: 0, max: 1000

Sensor 'gnss':
name: uavcan_gnss

Sensor 'mag':
name: uavcan_mag

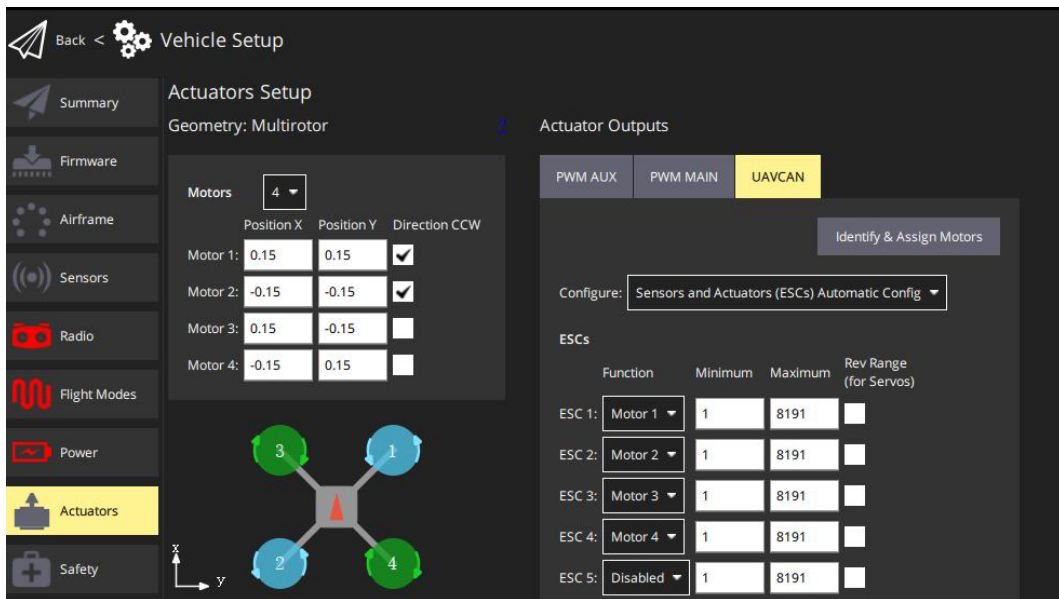
Online nodes (Node ID, Health, Mode):
40 OK OPERAT

```

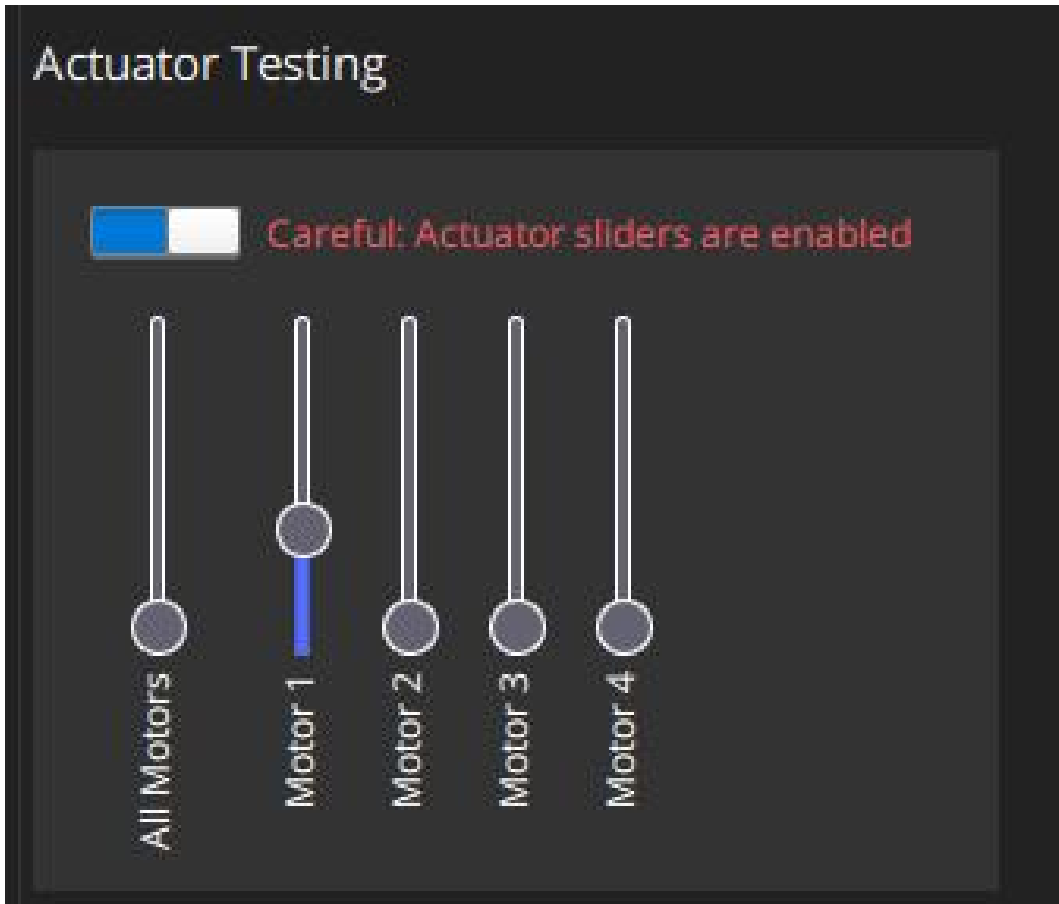
ESC Testing

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

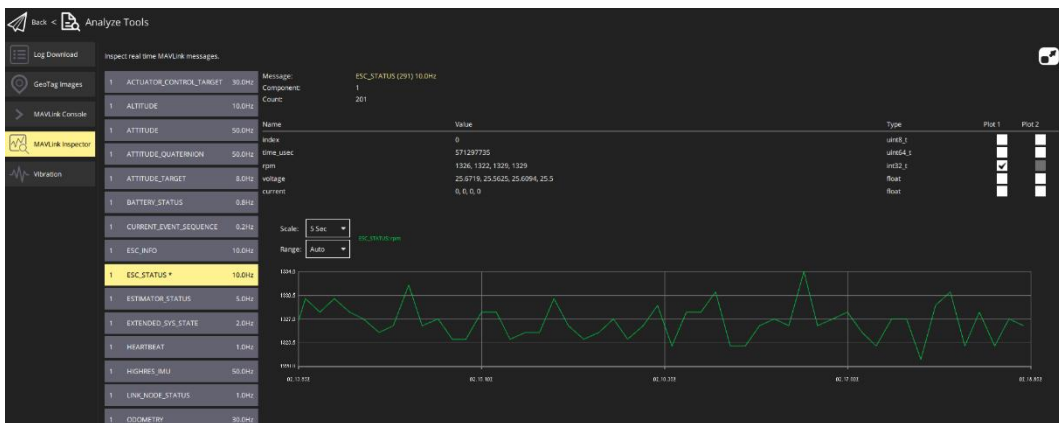
In “Geometry: Multirotor”, set the rotation orientation of the motors and their configuration relative to the center point.



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.



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.

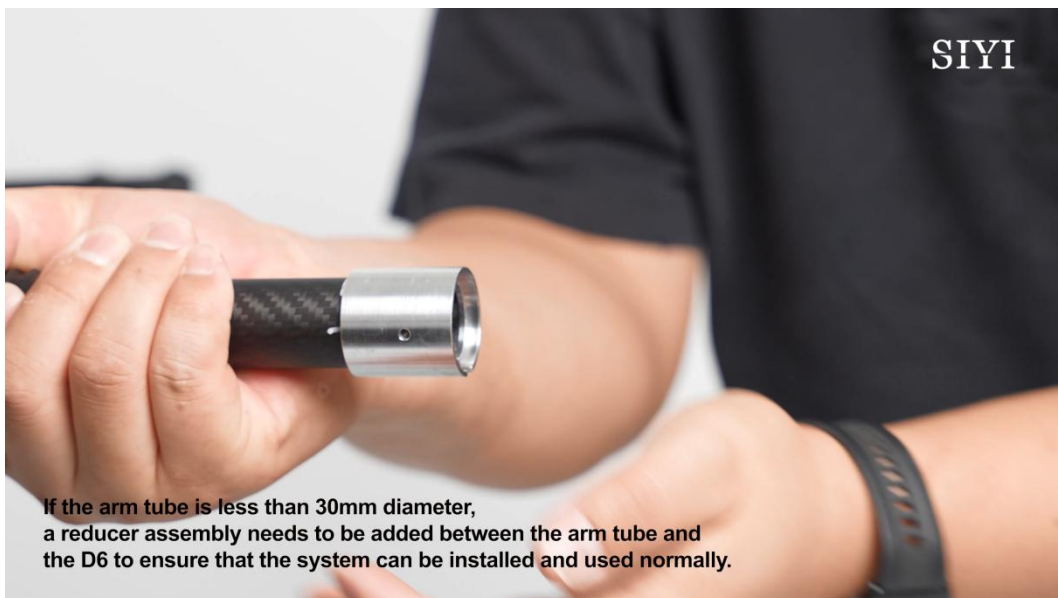


If your arm diameter is less than 30 mm, you will need a reducing component between the arm tube and the D6 motor tube to make sure that the propulsion system can be assembled properly.



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.

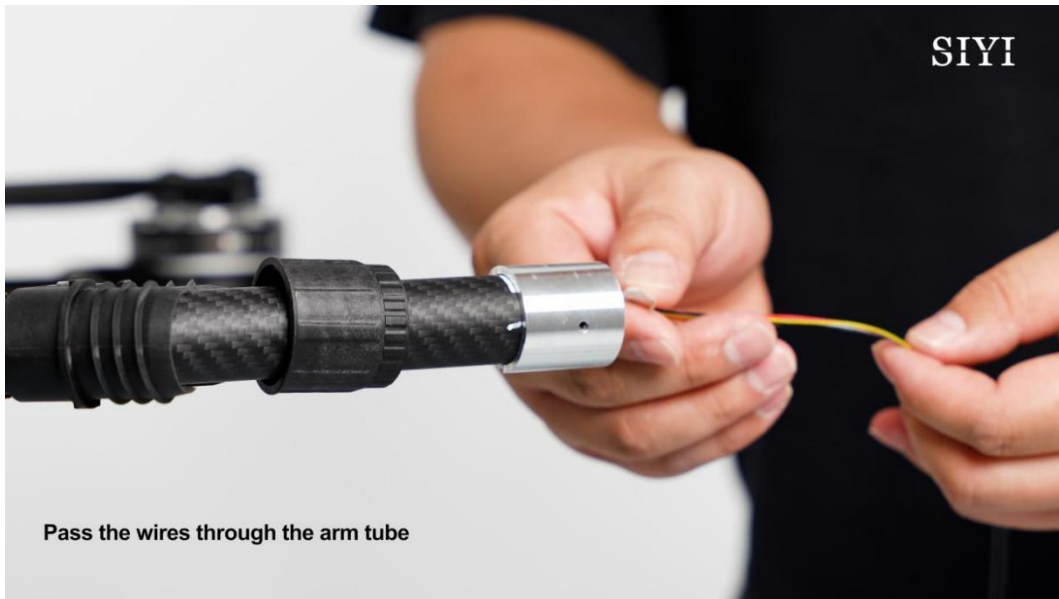


3.1.3 Assemble and Pre-tightening the Motor to the Arm

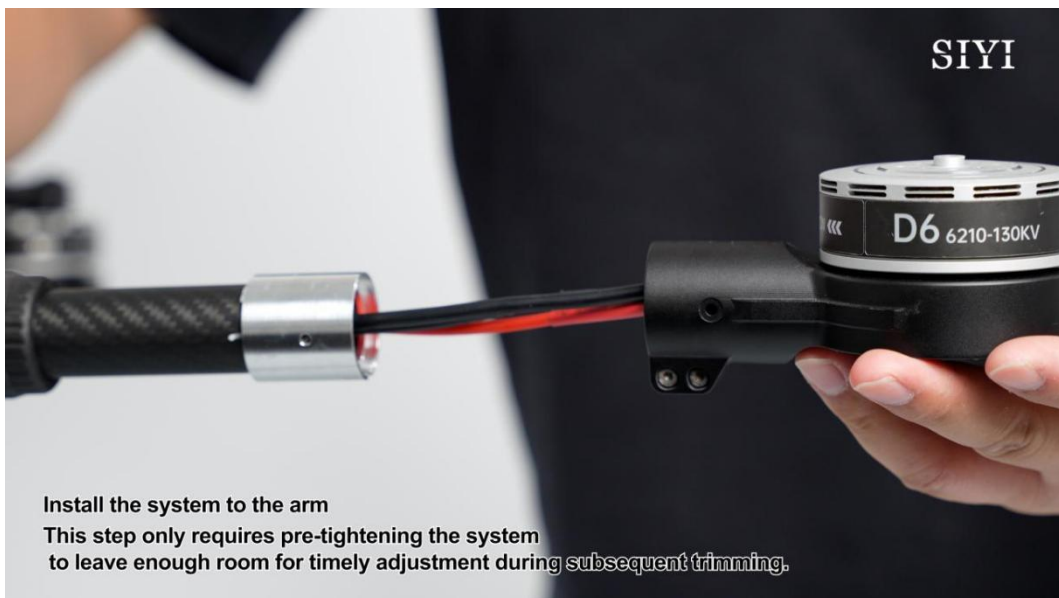
After matching the throttle ID and motor orientation, let's assemble the motor onto the arm. During this step, the motor only needs to be pre-tightened, allowing a little space for post adjustments during calibration process.

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.



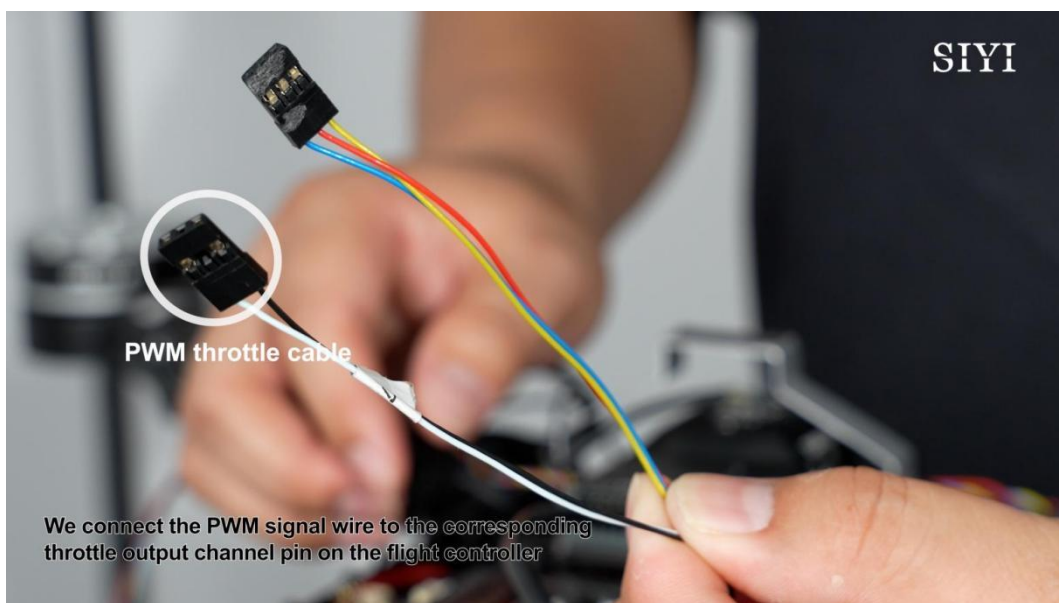
Mark

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.

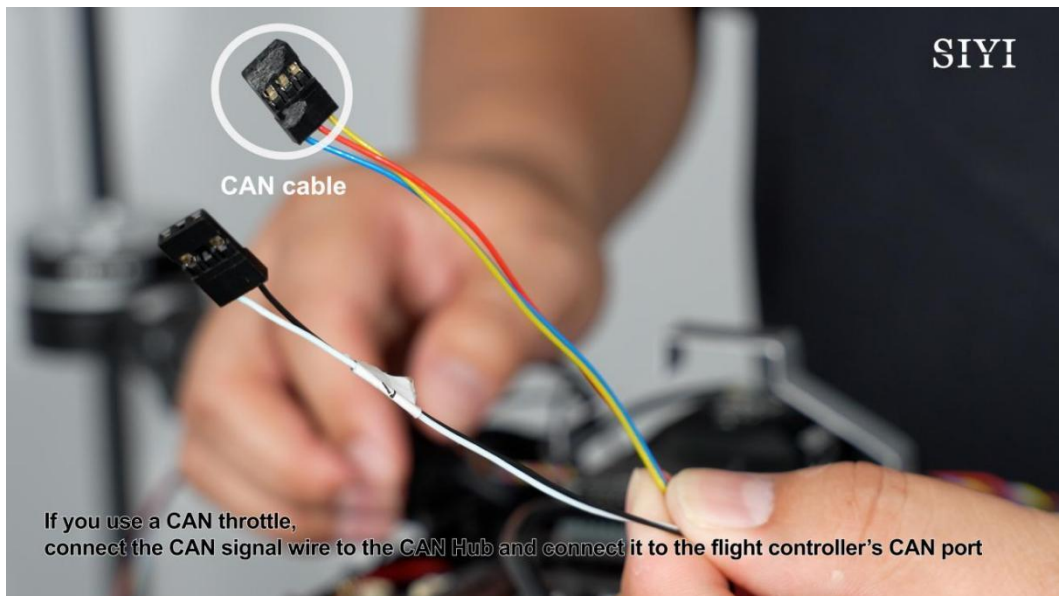
3.4.1 PWM Throttle Wire



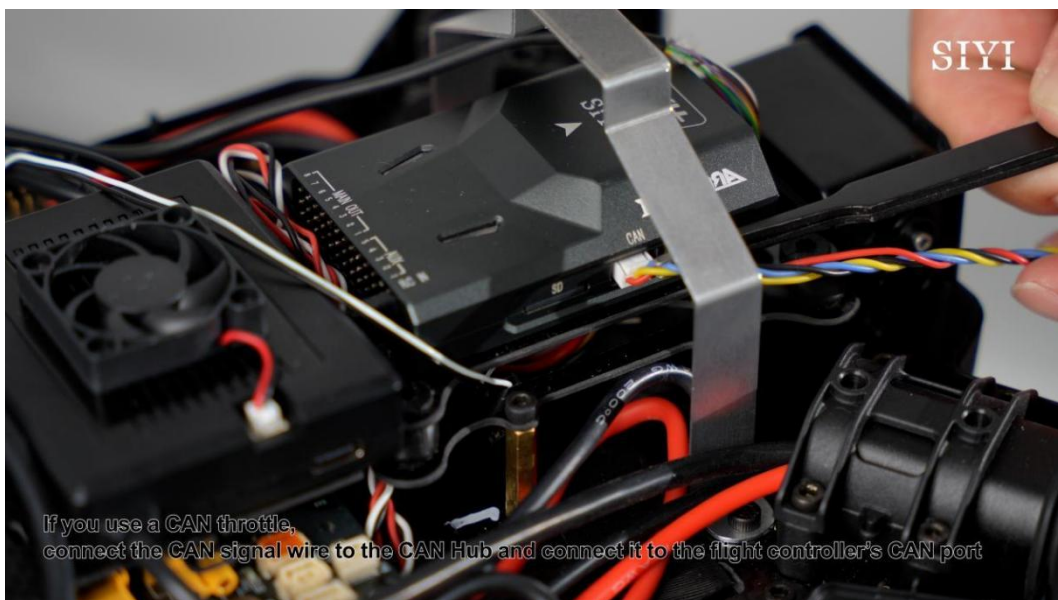
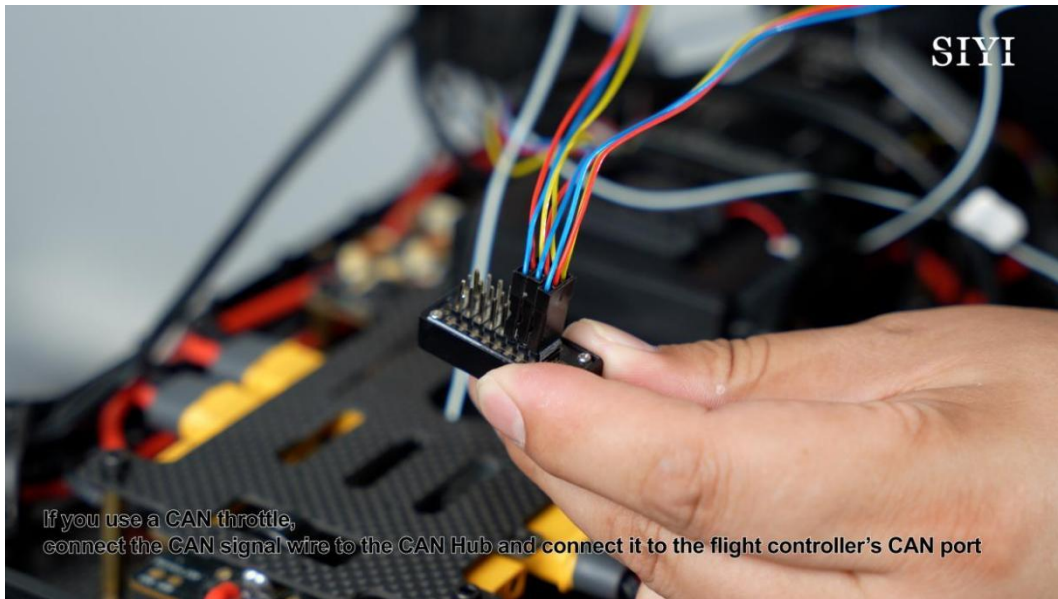
Connect PWM signal wires to the corresponding pins of throttle output channel on the flight controller.



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.

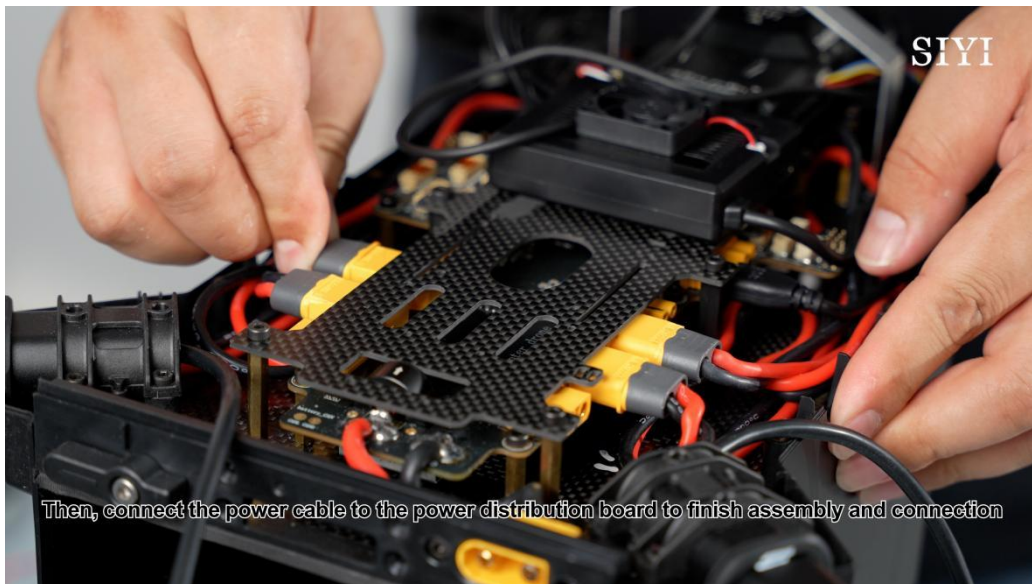
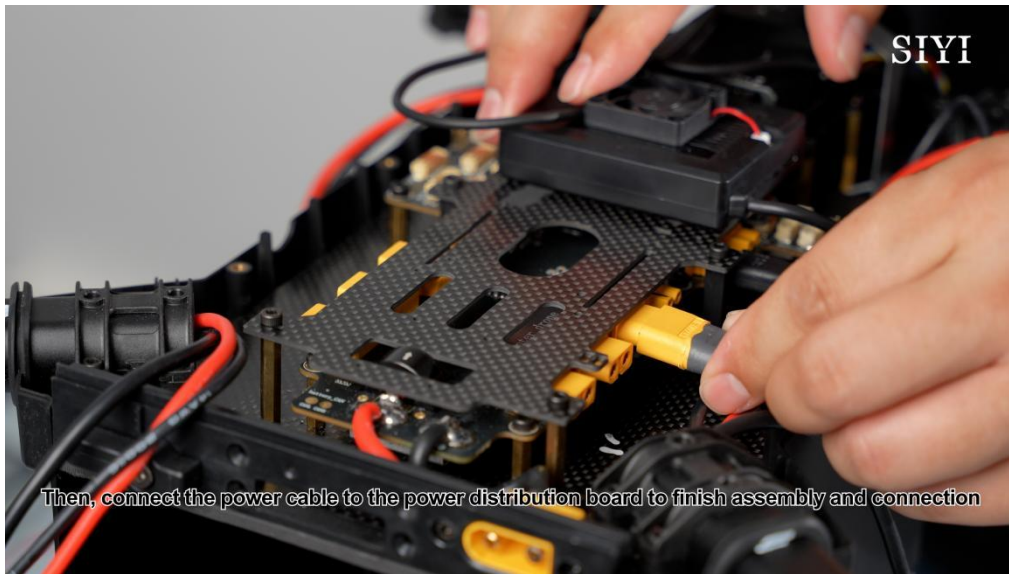


Mark

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

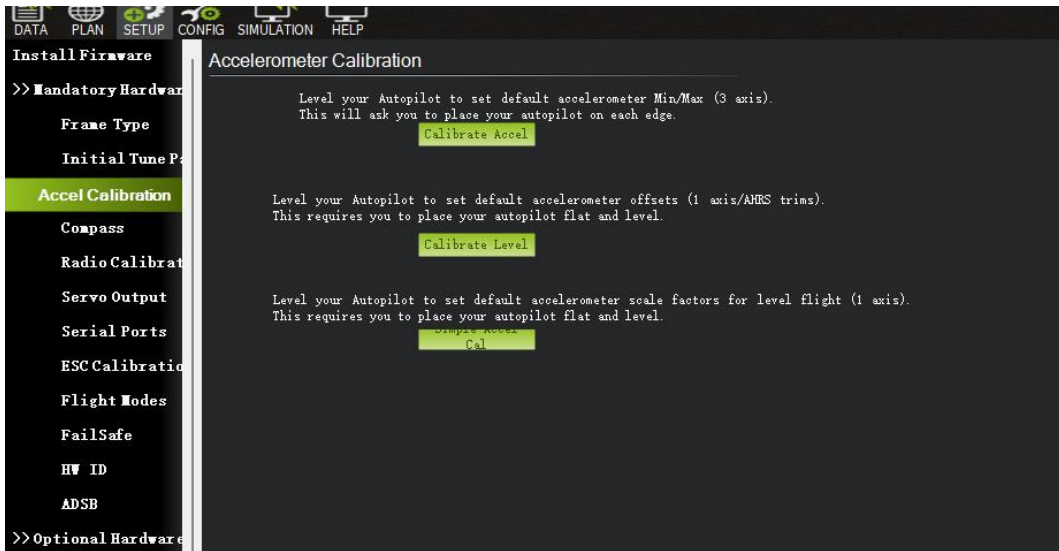
PID (Proportional, Integral, Derivative Control Parameters)

Stabilize Roll (Error to p te) 4.500 ACCEL MAX 45000	Stabilize Pitch (Error to p te) 4.500 ACCEL MAX 45000	Stabilize Yaw (Error to p te) 4.000 ACCEL MAX 12000	Position XY (Dist to p eed) 1.000 INPUT TC 0.150
<input type="checkbox"/> Lock Pitch and Roll Values			
Rate Roll P 0.12074 I 0.12074 D 0.010 DMAX 0.500 FLTE 0 FLTD 10 FLTT 10	Rate Pitch P 0.12074 I 0.12074 D 0.015 DMAX 0.500 FLTE 0 FLTD 10 FLTT 10	Rate Yaw P 0.800 I 0.080 D 0.020 DMAX 0.500 FLTE 2 FLTD 10 FLTT 10	Velocity XY (Vel to p cel) 2.0 I 1.000 D 0.150 DMAX 100 Basic Filters Gyro 20 Accel 10
Throttle Accel (Accel to motor) P 0.50 I 1.000 D 0.000 DMAX 80	Throttle Rate (VSpd to p cel) 5.000 Tune None Min 0.000 0.000	Altitude Hold (Alt to p imbrate) 1.100 RC6 Opt ArmDisarm (4.2) RC7 Opt AUTO Mode RC8 Opt RTL RC9 Opt Do Nothing RC10 Opt Do Nothing	WPNav (cm's) Speed 1000 Radius 200 Speed Up 250 Speed Dn 150 Loiter 1250
Filter Logs Mask Options 0	Static Notch Filter Enabled Frequency 10 BandWidth 5 Attenuation 5		Harmonic Notch Filter Enabled Disabled Mode Reference 0 Frequency 10 Attenuation 5 Bandwidth 5 Options 0 Harmonics 0
<input type="button" value="Write Params"/>		<input type="button" value="Refresh Screen"/>	

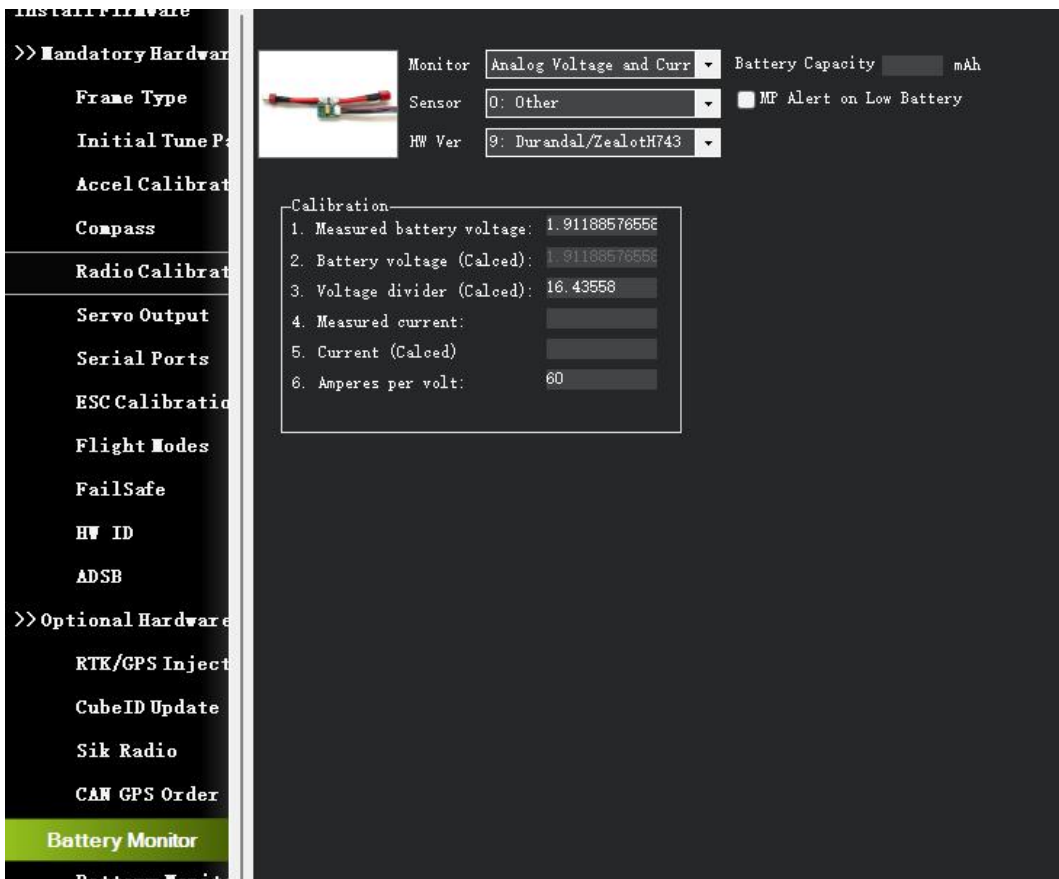
Flight Mode Configuration

DATA PLAN SETUP CONFIG SIMULATION HELP	Install Firmware >> Mandatory Hardware Frame Type Initial Tune Par Accel Calibration Compass Radio Calibration Servo Output Serial Ports ESC Calibration Flight Modes FailSafe HW ID ADSB >> Optional Hardware >> Advanced	Current Mode: Stabilize Current PWM: 5: 0 Flight Mode 1 Stabilize <input type="checkbox"/> Simple Mode <input type="checkbox"/> Super Simple Mode Flight Mode 2 Auto <input type="checkbox"/> Simple Mode <input type="checkbox"/> Super Simple Mode Flight Mode 3 Loiter <input type="checkbox"/> Simple Mode <input type="checkbox"/> Super Simple Mode Flight Mode 4 AltHold <input type="checkbox"/> Simple Mode <input type="checkbox"/> Super Simple Mode Flight Mode 5 Stabilize <input type="checkbox"/> Simple Mode <input type="checkbox"/> Super Simple Mode Flight Mode 6 Loiter <input type="checkbox"/> Simple Mode <input type="checkbox"/> Super Simple Mode PWM 0 - 1230 PWM 1231 - 1360 PWM 1361 - 1490 PWM 1491 - 1620 PWM 1621 - 1749 PWM 1750 + <input type="button" value="Save Modes"/>
--	--	---

Gyroscope and Accelerometer Calibration Status



Voltage and Current Monitoring Settings



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).



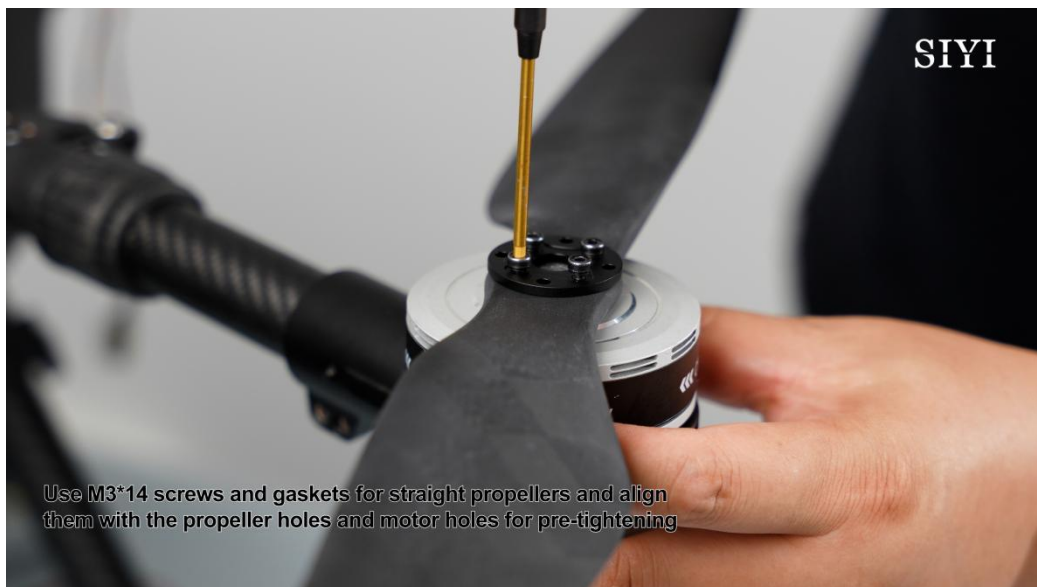
CW



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.

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

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.

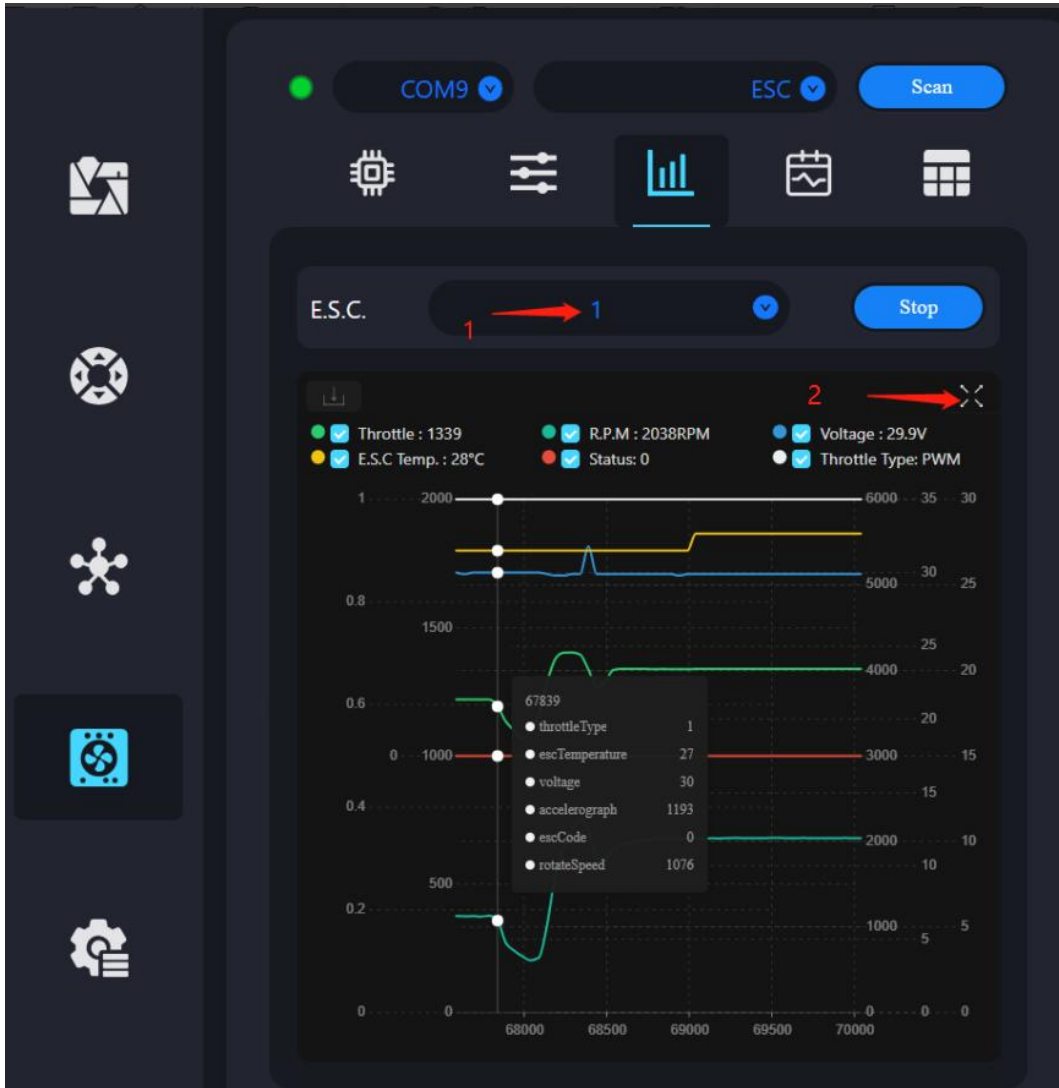


Mark

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

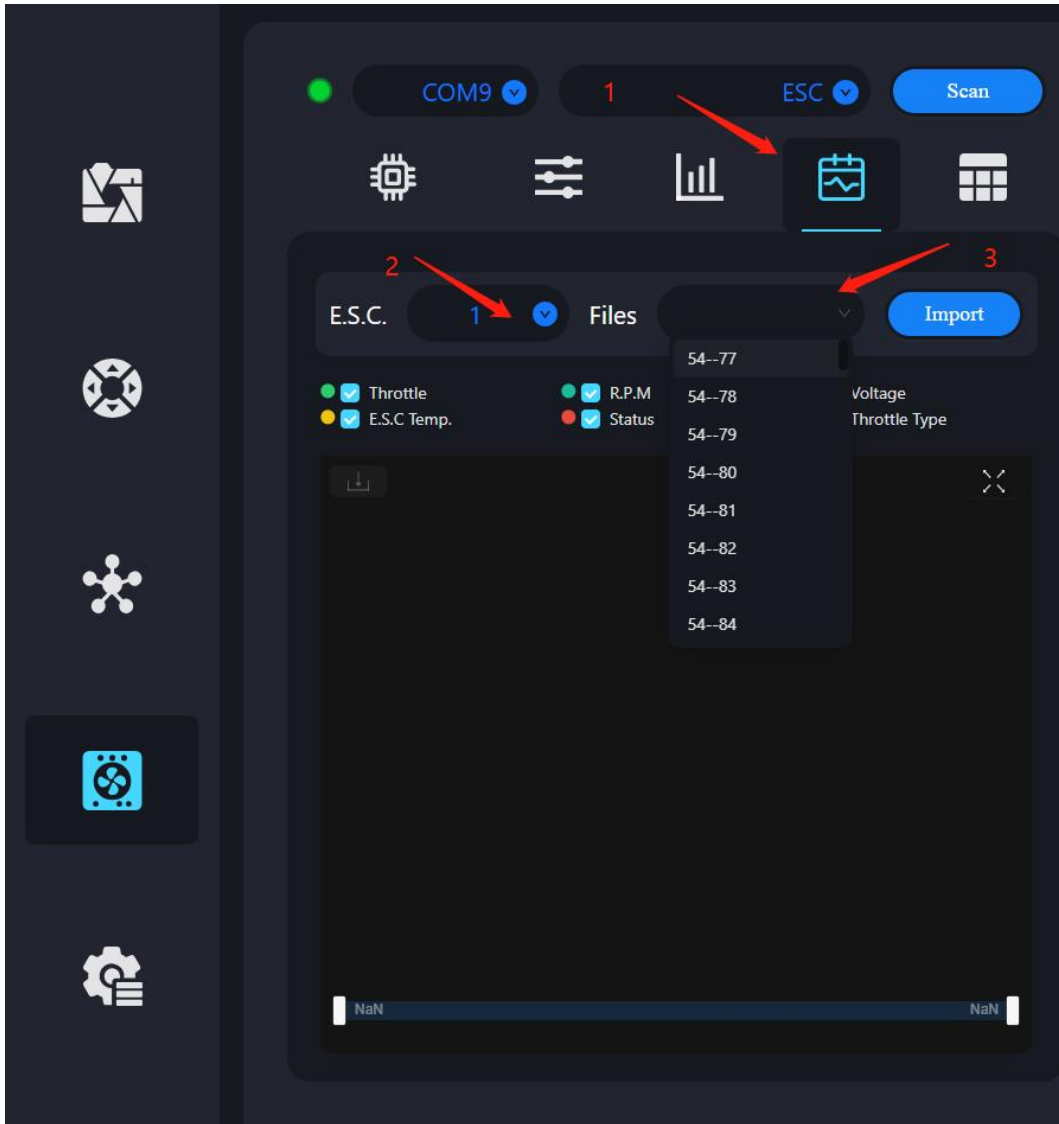
Confirm flight log to avoid incorrect data analysis and inability to accurately analyze the cause of the problem.

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.

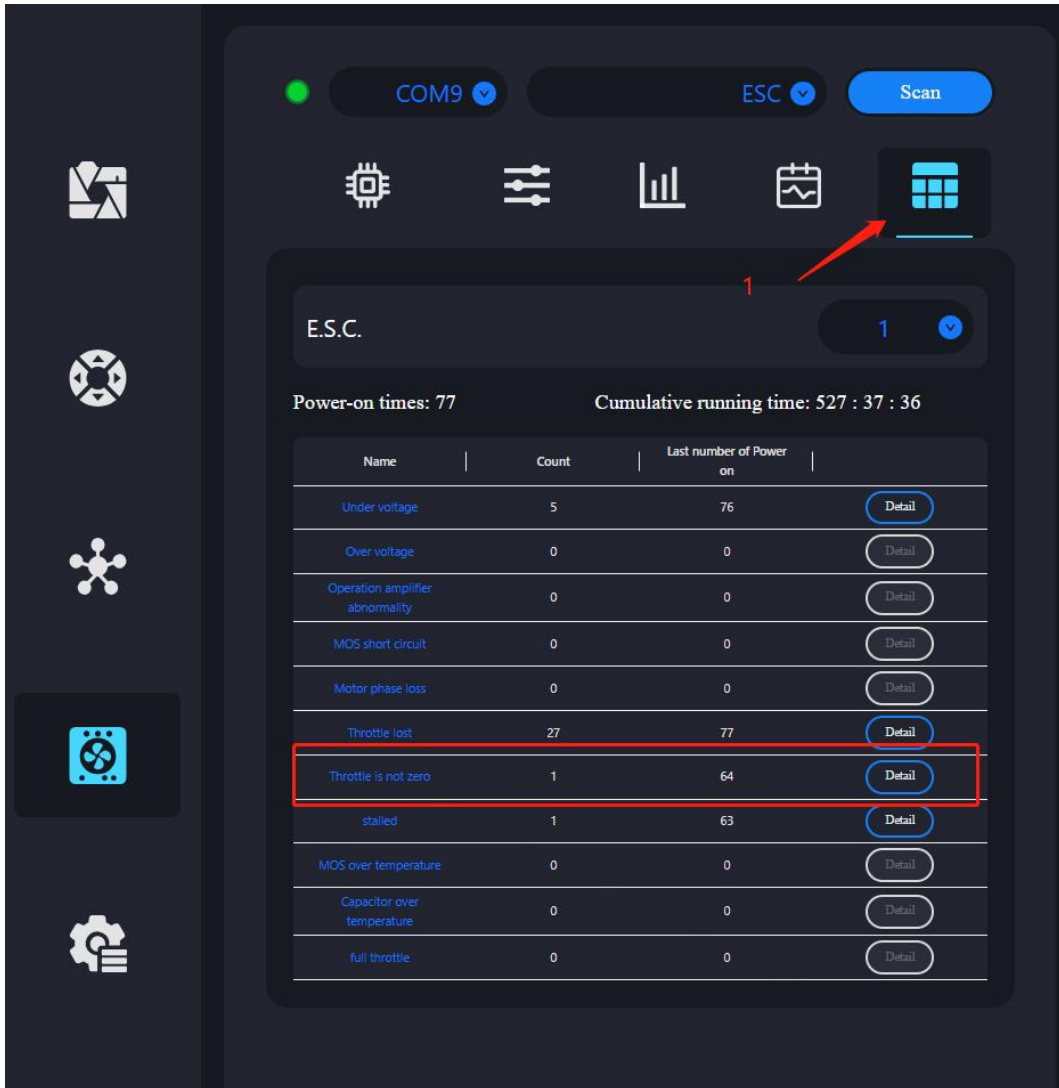
5.2 Historical Operating Data



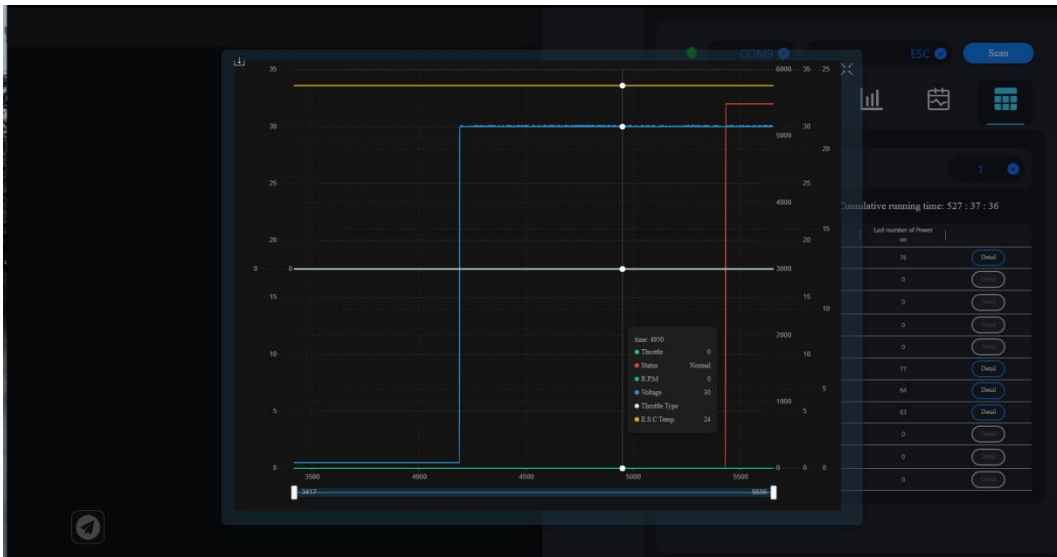
Users can consult relevant information through the ESC ID. The front part represents the corresponding number of power-on times, and the rear part represents the file serial number. According to this naming rule, users can read the data content of the corresponding file.



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.



6 FIRMWARE UPGRADE

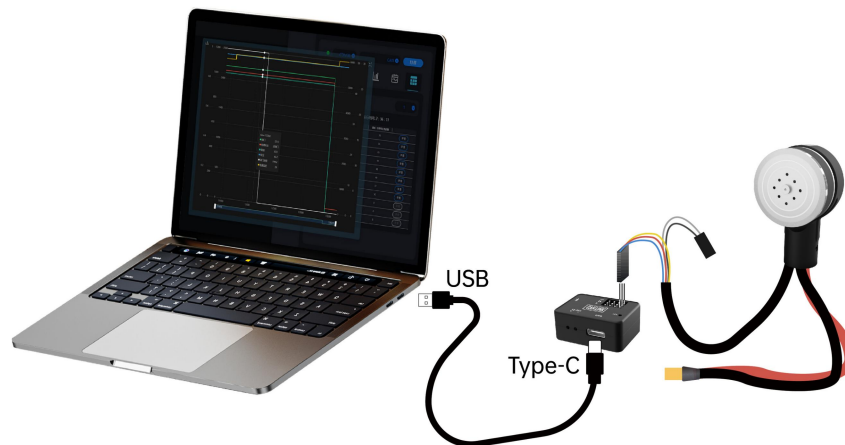
6.1 Upgrade through SIYI Software

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

Tool Preparation

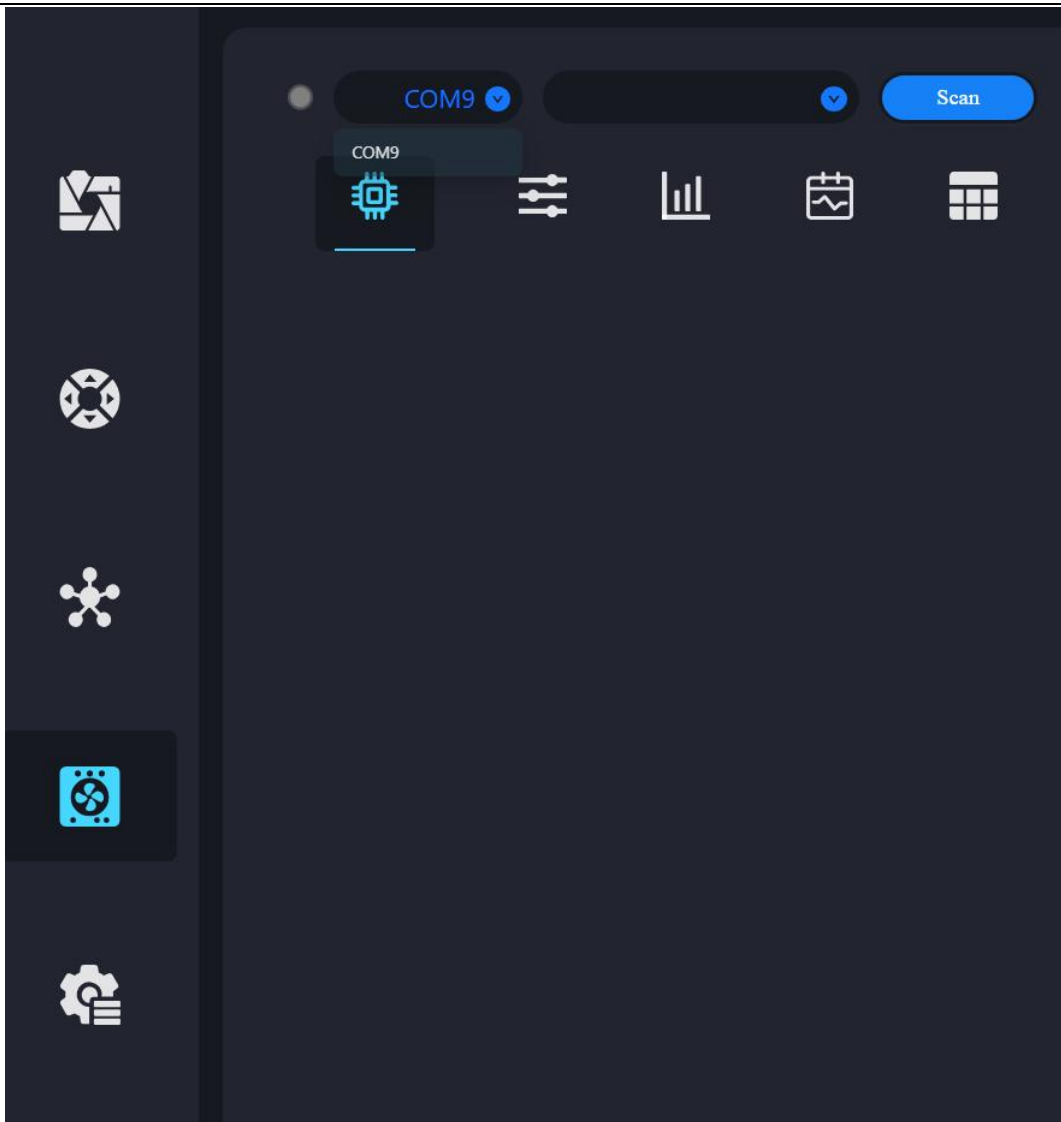
- SIYI Software
- SIYI CAN Link Module
- Windows device

Steps

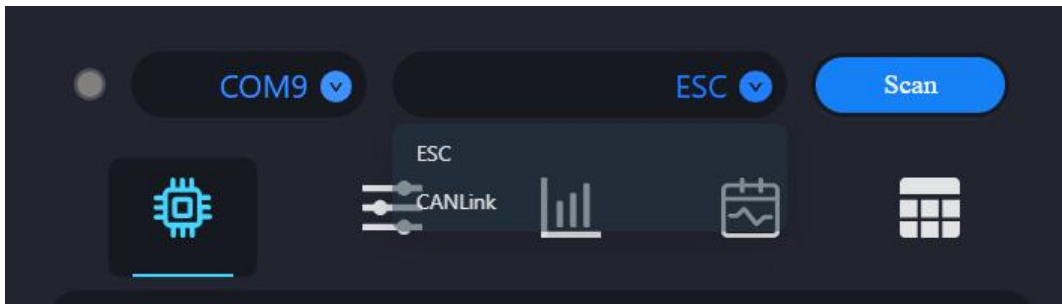
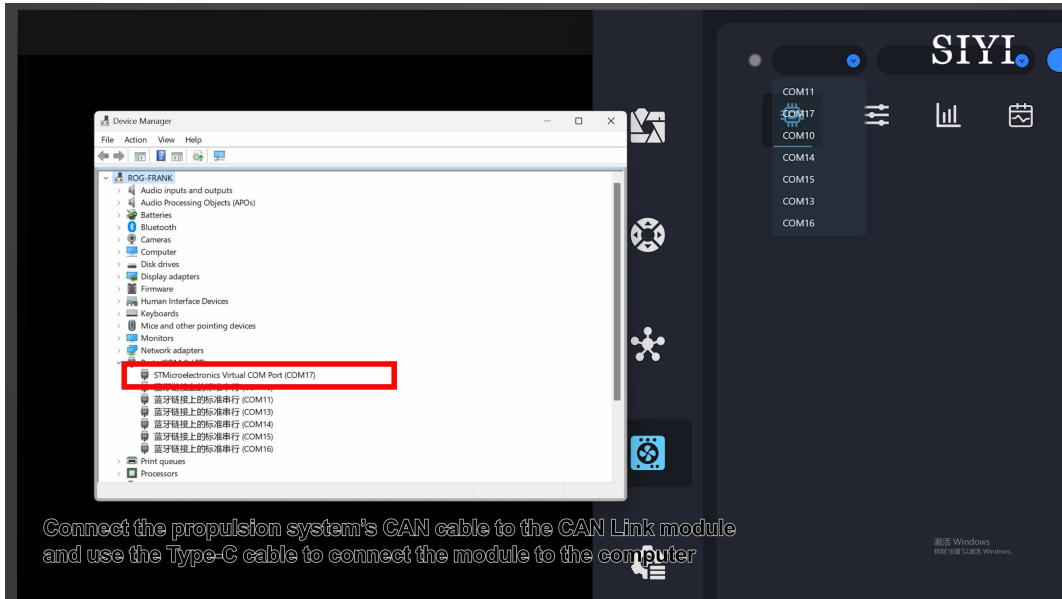


Connect the flight controller that is connected to the CAN Hub module bus to the computer using a Type-C cable

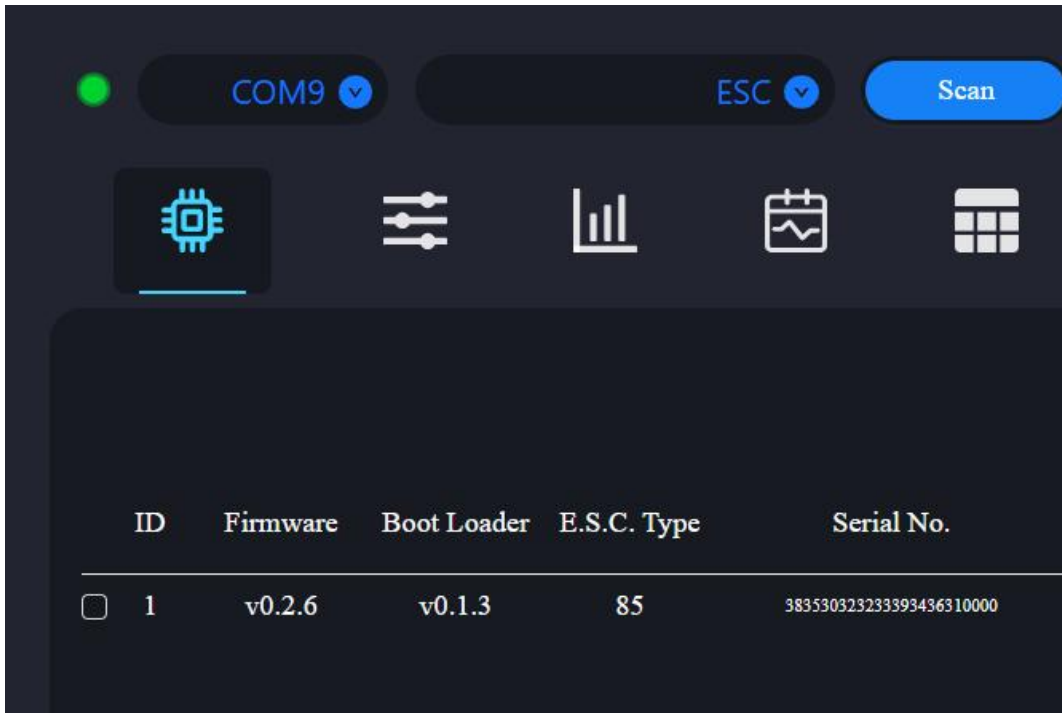
1. Please refer to the above picture to connect the propulsion system, the SIYI CAN Link module, and the Windows device.
2. Run SIYI software and go to “ESC Settings”.



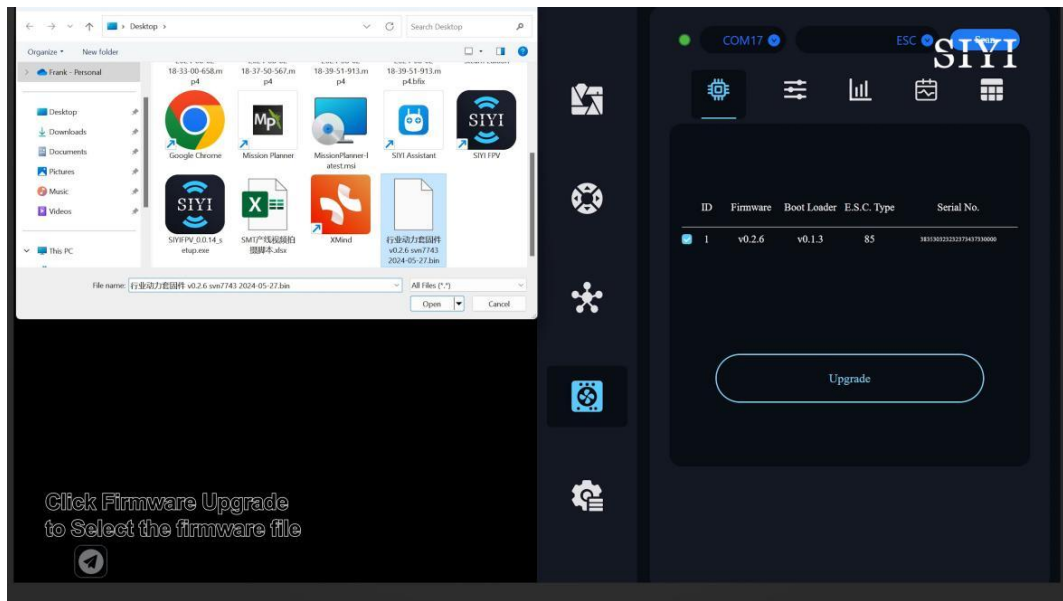
3. Select the corresponding COM port and device type (ESC), and then click "Scan".



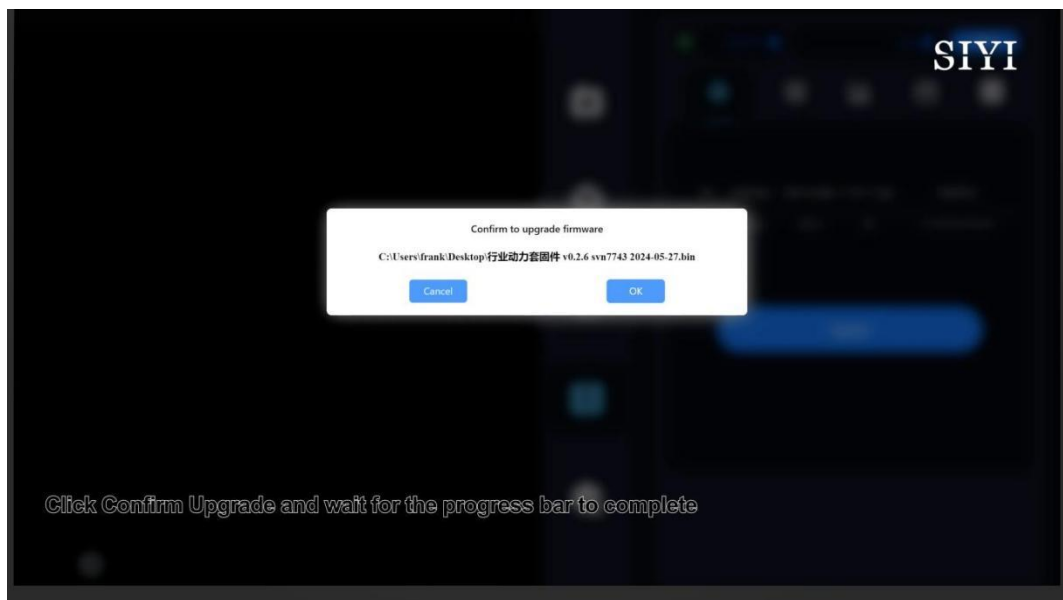
4. If the propulsion system is recognized normally, the connection is successful.

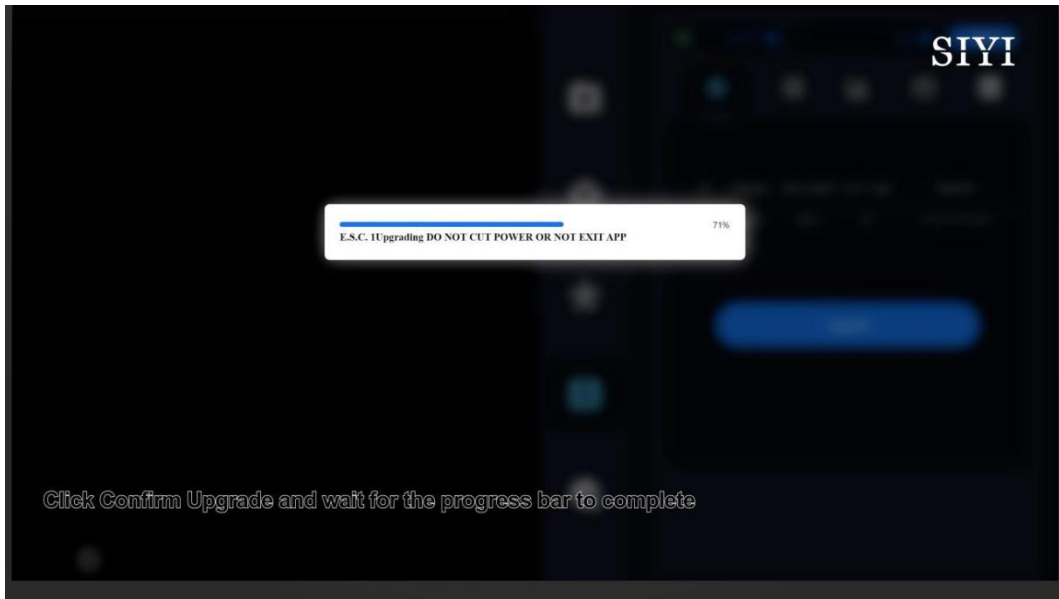


5. Click “Upgrade” and select the firmware file.

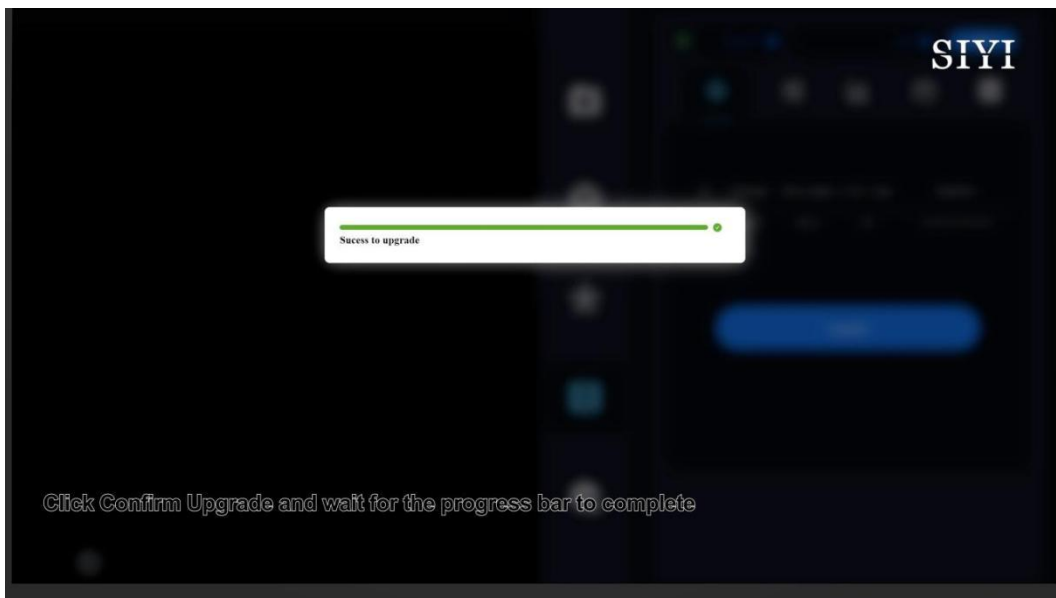


6. Then click “OK” and wait for the update progress bar is completed.





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.

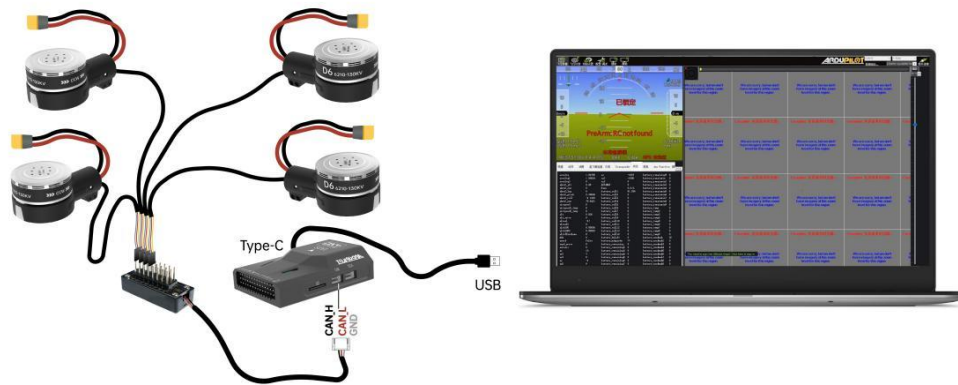
Upgrade status will be presented through indicator color changes. After upgrade, there will

be a beep sound and the indicator will return to its original color simultaneously.



6.2 Upgrade in DroneCAN Protocol through Mission Planner (ArduPilot)

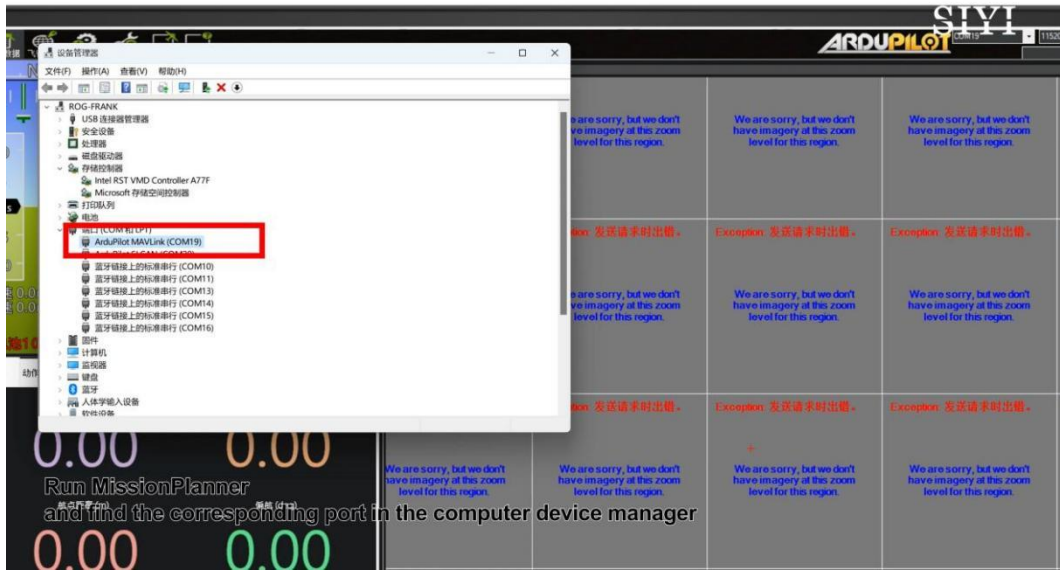
ArduPilot flight controller supports upgrading SIYI propulsion system firmware through DroneCAN protocol.



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

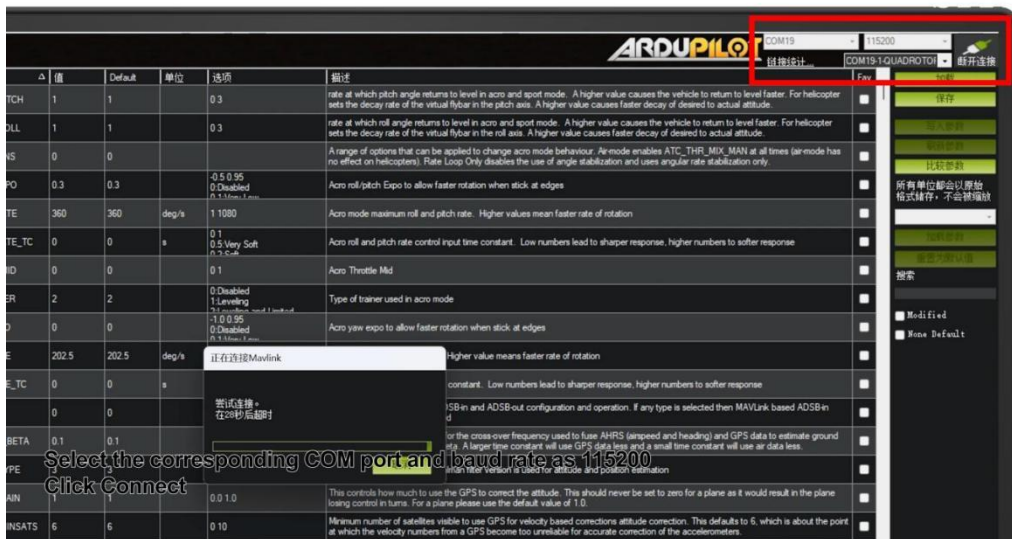
Steps

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



Run MissionPlanner and find the corresponding port in the computer device manager

Select the corresponding COM port and 115200 baud rate.



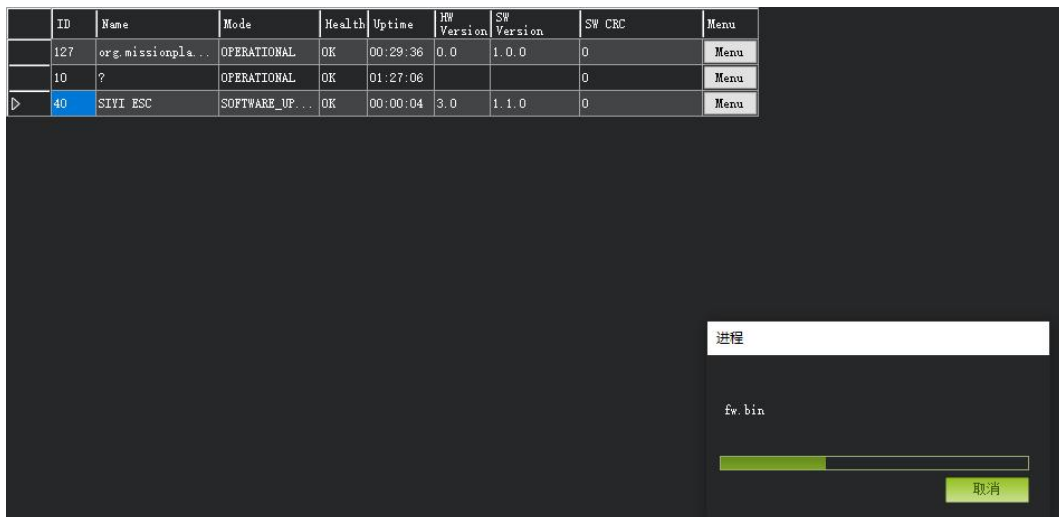
Select the corresponding COM port and baud rate as 115200
Click Connect

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.



7 AFTER-SALE SERVICE

If there were any questions or problems using SIYI Technology's product, you can always try to send an email to SIYI Official A/S Center (support@siyi.biz) or consult your sales representative or dealer for answers or solutions.

7.1 Repair Service

If your purchased SIYI products cannot work properly, please contact SIYI Official A/S Center for consulting.

Usually there are two situations for acquiring repair service.

- Product Defect
- Product Damage

SIYI products under the two situations can be sent back to SIYI for repairing. Defect products with valid warranty can be repaired for free. Defect products without valid warranty or damaged products should be charged of repair fees after repairing. Please refer to SIYI's Official A/S Quotation for detail.

7.2 Warranty

SIYI Technology guarantees that, subject to the following conditions, Return & Refund Service, Replacement Service, and Warranty Repair Service can be requested. Please contact SIYI directly (support@siyi.biz or your sales representative) or authorized SIYI dealer for more detail.

7.2.1 7-Day Return & Refund

You can request Return & Refund Service:

Within seven (7) days of receiving a product if the product has no manufacturing defect, has not been activated and is still in new or like-new condition.

Within seven (7) days of receiving a product if the product has a manufacturing defect.

Return & Refund Service will not be provided where:

It is requested beyond seven (7) calendar days of receiving a product.

A product sent to SIYI for Return & Refund Service does not include all original accessories, attachments or packaging, or any item is not in new or like-new condition, i.e., with cracks, dents, or scratches.

A legal proof of purchase, receipt or invoice is not provided or is reasonably believed to have been forged or tampered with.

Any fault or damage of the product is caused by unauthorized use or modification of the product, including exposure to moisture, entry of foreign bodies (water, oil, sand, etc.) or improper installation or operation.

Product labels, serial numbers, waterproof marks, etc. show signs of tampering or alteration.

Damage is caused to the product by uncontrollable external factors, including fire, floods, high winds, or lightning strikes.

A product is not delivered to SIYI within seven (7) calendar days after Return & Refund Service confirmation is sent from SIYI.

Other circumstances stated in this policy.

7.2.2 15-Day Replacement

You can request Replacement Service:

Within fifteen (15) calendar days of receiving the product if the product has sustained a substantial damage in transit, provided always that the damage proof issued by the carrier can be provided to SIYI.

Within fifteen (15) calendar days of receiving the product if the product does not match the original description of the product in one or more significant respects.

Within fifteen (15) calendar days of receiving the product if the product suffers performance failure.

Replacement Service will not be provided where:

Service is requested more than fifteen (15) calendars days after receiving a product.

Legal proof-of-purchase, receipts, or invoices are not provided, or are reasonably believed to have been forged or tampered with.

A product sent to SIYI for replacement does not include all original accessories, attachments, and packaging, or contains items damaged by user error.

A product is found to have no defects after all appropriate tests are conducted by SIYI.

Any fault or damage of the product is caused by unauthorized use or modification of the product, including exposure to moisture, entry of foreign bodies (water, oil, sand, etc.) or improper installation or operation.

Damage is caused by uncontrollable external factors, including fires, floods, high winds, or lightning strikes.

Received product has not been sent back to SIYI seven (7) calendar days after replacement confirmation from SIYI.

Proof of damage during transit issued by the carrier cannot be provided.

Other circumstances stated in this policy.

7.2.3 1-Year Warranty Repair

You can request warranty repair service:

If a product does not function as warranted during the warranty period, you may obtain after-sales service by contacting SIYI's service center. You will need to provide a valid proof-of-purchase, receipt, or order number for the warranty service.

Charges may apply for services not covered by this Limited Warranty. Please contact SIYI for information specific to your location.

Please note that the warranty service is only available in the respective SIYI service regions where you purchased your SIYI product.

Warranty Repair service will not be provided where:

Crashes or fire damage caused by non-manufacturing factors, including but not limited to pilot errors.

Damage caused by unauthorized modification, disassembly, or shell opening not in accordance with official instructions or manuals.

Damage caused by improper installation, in correct use, or operation not in accordance with official instructions or manuals.

Damage caused by non-authorized service provider.

Damage caused by unauthorized modification of circuits and mismatch or misuse of the battery and charger.

Damage caused by operation in bad weather (i.e., strong winds, rain, sand/dust storms, etc.)

Damage caused by operating the product in an environment with electromagnetic interference (i.e., in mining areas or close to radio transmission towers, high-voltage wires, substations, etc.)

Damage caused by operating the product in an environment suffering from interference from other wireless devices (i.e., transmitter, video-downlink, Wi-Fi signals, etc.)

Damage caused by reliability or compatibility issues when using unauthorized third-party parts.

Damage caused by operating the unit with a low-charged or defective battery.

Products or parts with an altered identification label or from which the identification label has been removed.

SIYI Technology

Business Inquiry: info@siyi.biz

Phone: +86 400 838 2918

A/S Center: support@siyi.biz