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SYSTEM

IPET-IV9 Product Specification & Operation Guide

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Content

IV9 Integrated Power System Product Specification

1. Introduction

The IV series is an integrated power system specifically developed for fixed-wing and Vertical Take-Off and Landing (VTOL) unmanned aerial vehicles. Its design features focus on high operational life, efficient heat dissipation, high reliability, extended endurance, and low noise.

2. Notes

- Proprietary System & Motor Matching: This power system series is a proprietary design and requires strict parameter matching with the corresponding motors. The firmware is unique; each program is specifically tailored for a single motor and propeller combination. It is not compatible with multiple configurations. Please contact the manufacturer if you require a different combination.
- Ground Testing Safety: DO NOT install the propeller during ground testing to prevent potential hazards and personal injury.
- Connection Integrity: Ensure all components are connected carefully and securely. Poor connections may lead to loss of flight control, equipment damage, or other unforeseen circumstances.
- Soldering Instructions: If you need to solder any input or output connectors to the Electronic Speed Controller (ESC), please use a sufficiently powerful soldering station to guarantee a reliable and robust connection.
- Motor Rotation Direction: If a change in the motor's rotational direction is required, it must be configured using the dedicated upper-computer software (Ground Control Station software).

IV9(7224)-Recommended for VTOL and fixed-wing UAVs with a takeoff weight of 28-32kg

1. Parameters

System Parameters	**Model**	IV9(7224) KV160
	Configuration	IV9(7224) Motor+14S FOC IV150A ESC
	Recommended Battery	12-14S(LiPo)
	Max Thrust (kg)	18
	Recommended Take off Weight(kg)	28-35
	Total Weight with Wires(g)	1300±2%
	Protection Rating	IPX5
	Operating Temperature(℃)	-30～60
	Wire Length (mm)	1800±5
	Wire Specifications	Power Wire: Silicon wire-Red/Black-10AWG-1800mm Signal Wire: Shield wire-Black-OD4.2-5C-1200mm Connector:-JP-3P*2-Black/White/Green/Yellow/Gray
Motor	**KV（RPM/V）**	160
ESC Parameters	**Throttle Range(μs)**	1040-1940（Fixed）
	Protocol	DroneCAN、 UAVCAN
	Control Method	PWM/CAN
	Max Voltage(V)	60
	Max Continuous Current (A)	80（Open environment, ≤60℃）
	Peak Current (A)	150（Open environment, ≤60℃）
Propellers	**Model**	24*12
	Length(mm)	609.6

System Parameters	**Model**	IV9(7224) KV190
	Configuration	IV9(7224) Motor+14S FOC IV150A ESC
	Recommended Battery	12S(LiPo)
	Max Thrust (kg)	18
	Recommended Take off Weight(kg)	28-35
	Total Weight with Wires(g)	1300±2%
	Protection Rating	IPX5
	Operating Temperature(℃)	-30～60
	Wire Length (mm)	1800±5
	Wire Specifications	**Power Wire:** Silicon wire-Red/Black-10AWG-1800mm **Signal Wire:** Shield wire-Black-OD4.2-5C-1200mm **Connector:** -JP-3P*2-Black/White/Green/Yellow/Gray
Motor	**KV（RPM/V）**	190
ESC Parameters	**Throttle Range(μs)**	1040-1940（Fixed）
	Protocol	DroneCAN、 UAVCAN
	Control Method	PWM/CAN
	Max Voltage(V)	60
	Max Continuous Current (A)	80（Open environment, ≤60℃）
	Peak Current (A)	150（Open environment, ≤60℃）
Propellers	**Model**	22*10
	Length(mm)	558.8

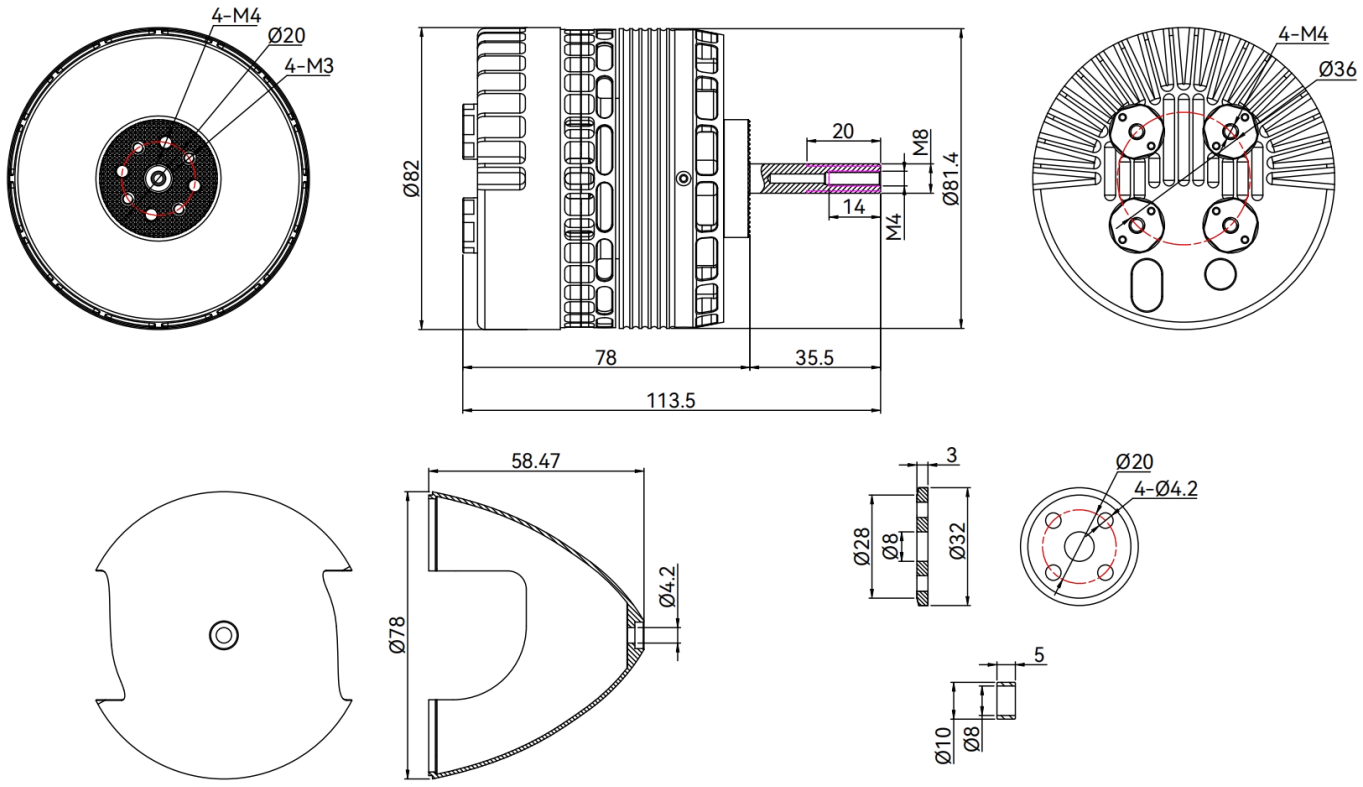
2. Test Data

IV9(7224) KV160+14S FOC IV150A+22*10					Ambient Temp：		25℃
Voltage (V)	Throttle (%)	Current (A)	Thrust (g)	Torque (N·m)	RPM	Power(W)	Overall Efficiency (g/W)
48	30%	3.16	1579	0.55	2007	152	10.38
	35%	4.77	2197	0.75	2359	229	9.58
	40%	6.87	2934	0.97	2710	331	8.87
	45%	9.59	3778	1.24	3061	462	8.19
	50%	12.99	4717	1.52	3410	625	7.55
	55%	17.22	5790	1.87	3758	828	6.99
	60%	22.27	6960	2.21	4105	1071	6.50
	65%	28.39	8224	2.59	4451	1364	6.03
	70%	35.24	9620	3.07	4795	1694	5.68
	75%	44.34	11114	3.54	5148	2130	5.22
	80%	54.82	12787	4.10	5502	2632	4.86
	85%	68.17	14683	4.69	5872	3272	4.49
	90%	86.99	17035	5.43	6298	4170	4.09
	95%	98.84	18362	5.86	6510	4738	3.88
	100%	98.82	18341	5.86	6509	4736	3.87

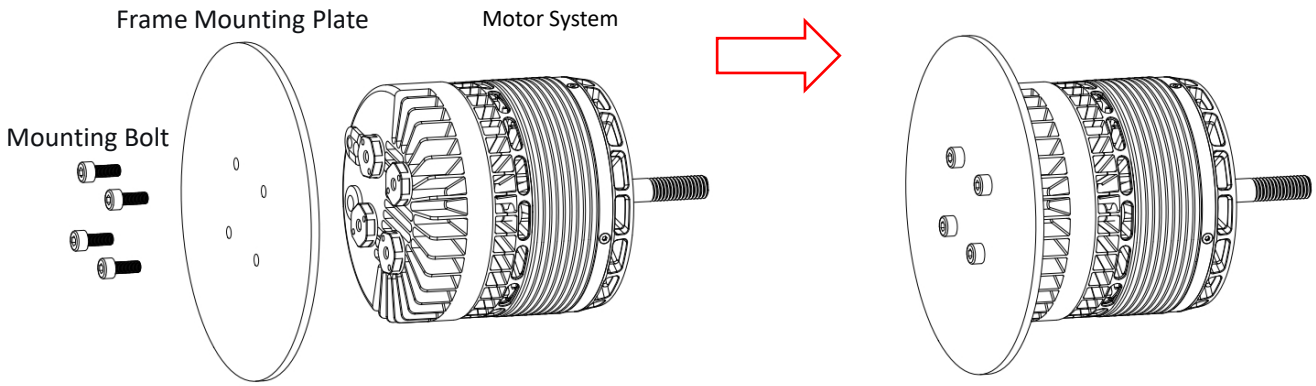
IV9(7224) KV190+14S FOC IV150A+20*10					Ambient Temp：		25℃
Voltage (V)	Throttle (%)	Current (A)	Thrust (g)	Torque (N·m)	RPM	Power(W)	Overall Efficiency (g/W)
48	30%	3.85	1498	0.47	2521	185	8.11
	35%	5.50	2060	0.62	2925	264	7.82
	40%	7.65	2721	0.81	3337	367	7.42
	45%	10.46	3499	1.03	3765	501	6.98
	50%	14.07	4441	1.27	4196	675	6.58
	55%	18.39	5437	1.56	4627	881	6.17
	60%	23.88	6594	1.88	5054	1144	5.76
	65%	30.28	7796	2.21	5481	1451	5.37
	70%	37.89	9151	2.56	5907	1815	5.04
	75%	47.24	10678	3.01	6338	2263	4.72
	80%	58.51	12321	3.47	6769	2801	4.40
	85%	72.21	14094	3.96	7210	3456	4.08
	90%	88.66	16547	4.57	7696	4239	3.90
	95%	122.18	17393	5.63	8217	5832	2.98
	100%	121.67	17379	5.61	8203	5808	2.99

Note: The above data are measured by a professional laboratory test bench for reference in selection.

3. Appearance and mounting structure（mm）



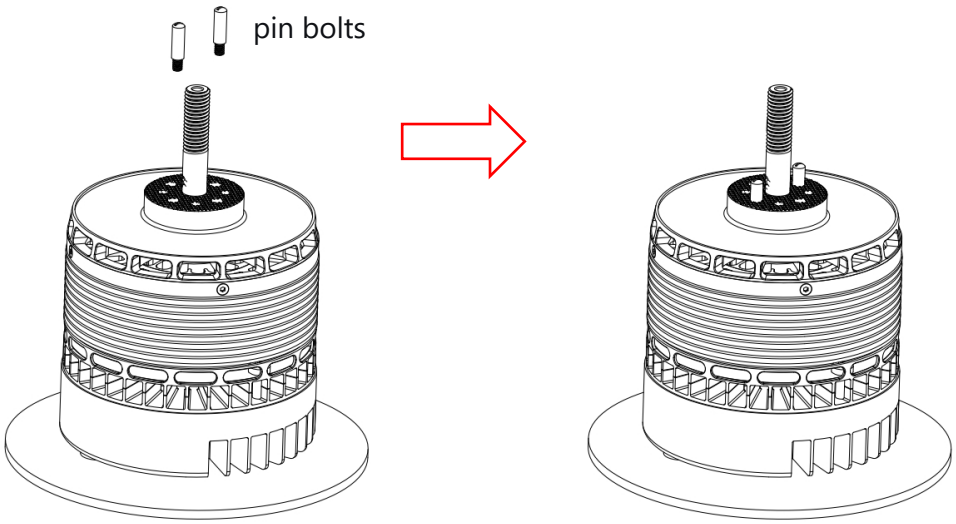
4. Power System Installation Instructions



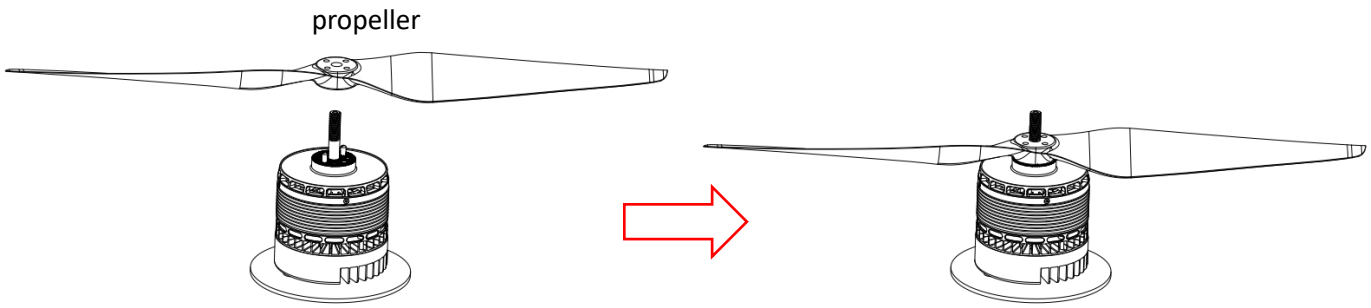
Install the motor onto the frame mounting plate using the mounting bolts.

5. Propeller Installation Instructions

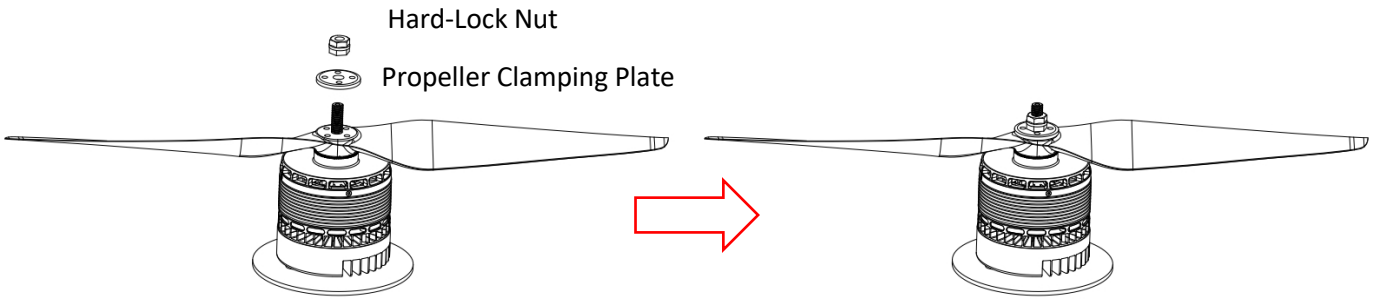
5-1: Hard-Lock Nut Locking Method



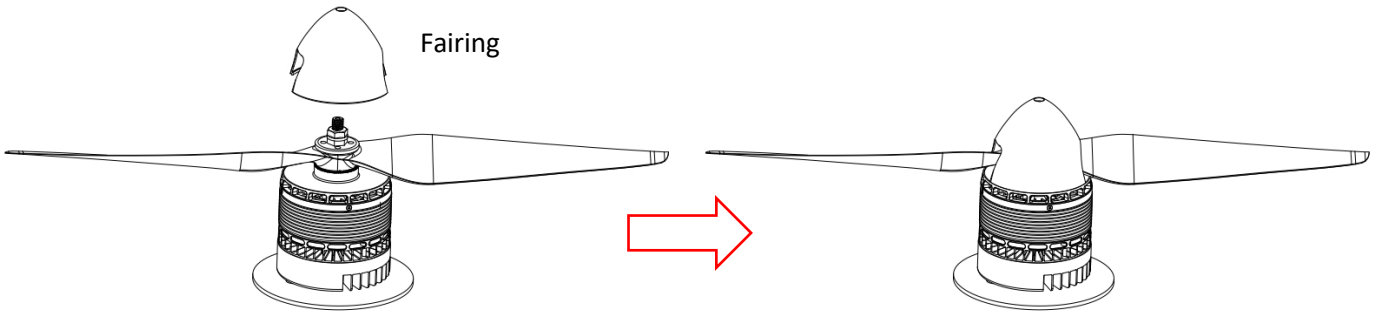
Step 1: Install the two pin bolts into the threaded holes on the blade mounting surface.



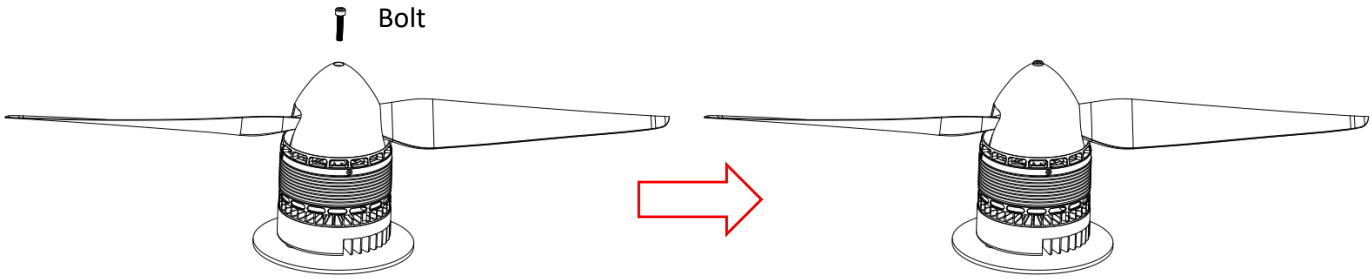
Step 2: Slide the propeller over the steel shaft, ensuring the pin bolts fit into the corresponding holes on the propeller.



Step 3: Place the propeller clamping plate and tighten the Hard-Lock nuts.

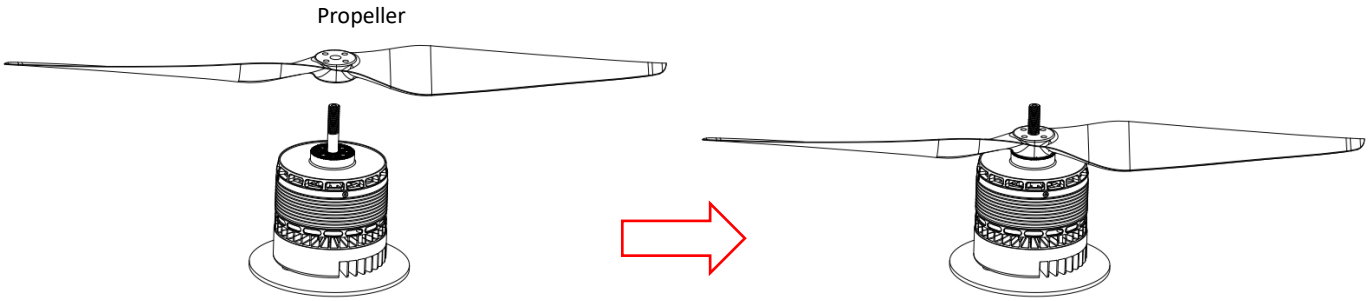


Step 4: Position the fairing in place.

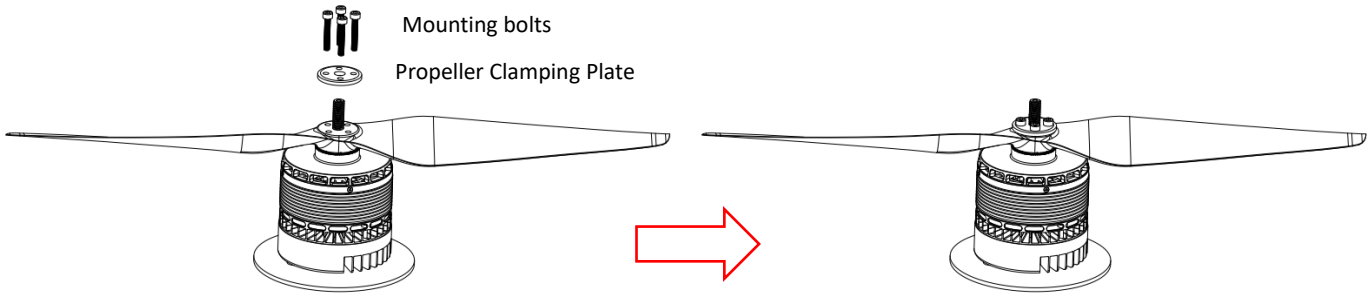


Step 5: Insert the bolts through the fairing and tighten them into the mounting holes on the steel shaft to secure.

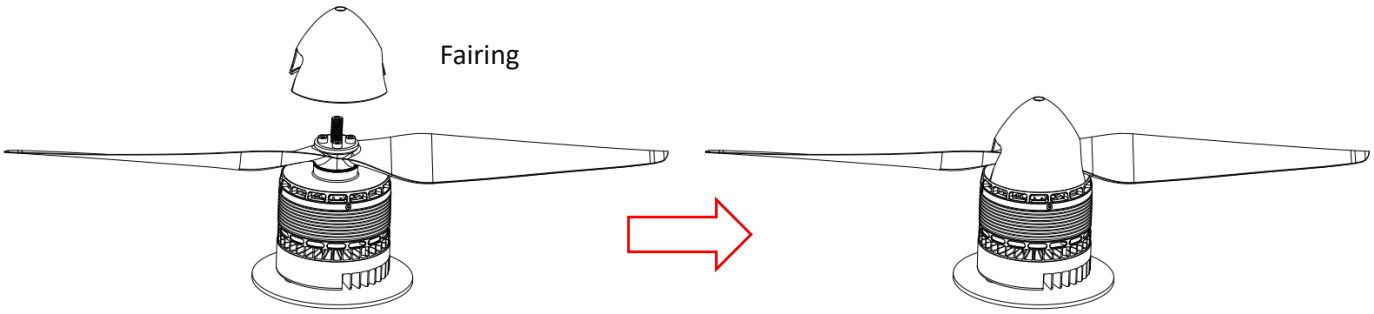
5-2: Bolt Locking Method



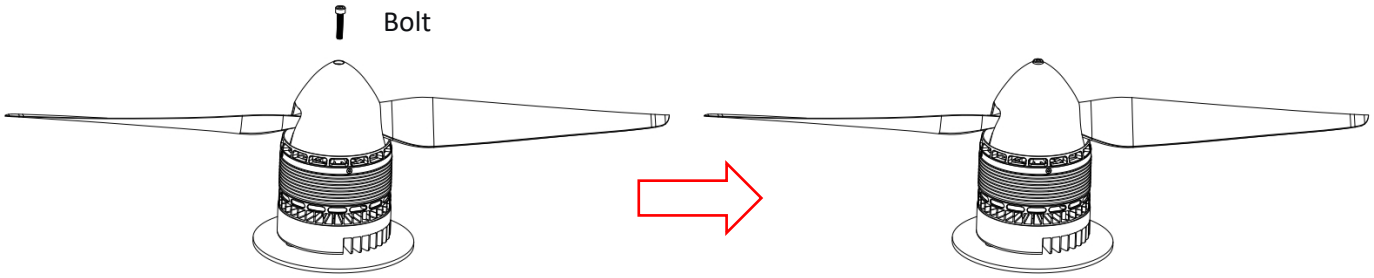
Step 1: Slide the propeller blade over the steel shaft.



Step 2: Place the propeller clamping plate and tighten the mounting bolts respectively.



Step 3: Position the fairing in place.

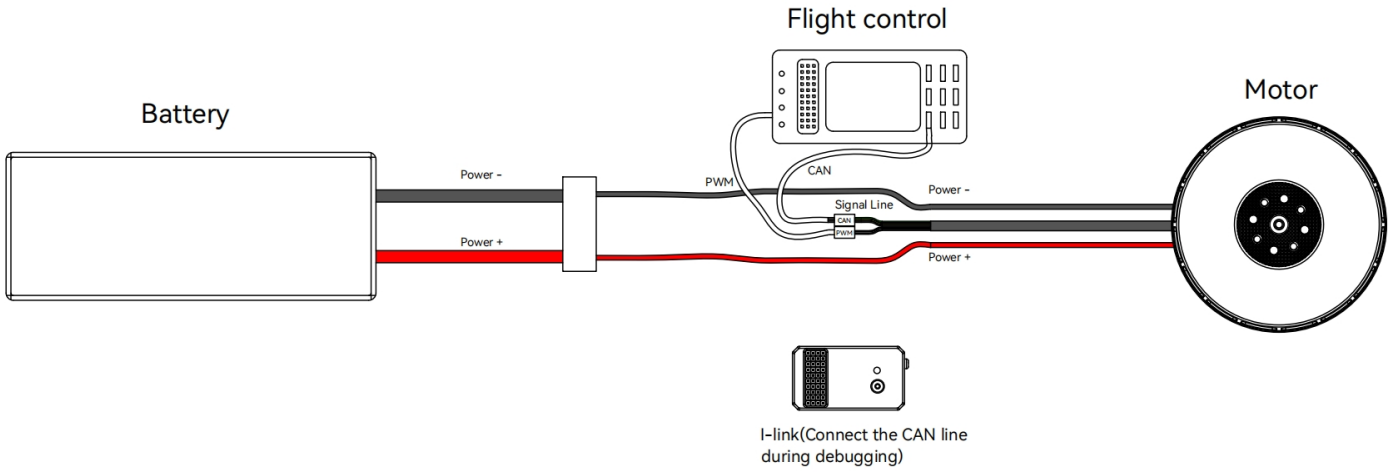


Step 4: Insert the bolts through the fairing and tighten them into the mounting holes on the steel shaft to secure.

6. User Guide

6-1: Notes

- Do not exceed the ESC's recommended operating voltage range, otherwise, it may cause irreversible damage to the ESC.
- The throttle for this ESC is fixed and does not require calibration. The throttle range is 1040-1940μs.
- The FOC ESC has a braking effect and generates back EMF. Please ensure you use a power supply capable of absorbing back EMF during ESC testing or flight to avoid damaging the ESC and power supply.
- The ESC supports both PWM and CAN throttle modes. One mode is set as the primary mode, and the other serves as a backup. Upon startup, the throttle signal must be connected to the ESC via the primary mode to ensure normal operation. The backup throttle only becomes effective if the primary throttle signal is lost during operation. The default factory setting is PWM throttle priority mode. To change it to CAN throttle priority mode, please contact the manufacturer or configure it via the PC software.



6-2: Wiring Method

1) The 2P-JR connector serves as the PWM throttle input. The white wire is the throttle signal wire, and the black wire is the ground wire.
2) The 3P-JR connector serves as the CAN throttle input. The green wire is CANL, the yellow wire is CANH, and the gray wire is the ground wire.
3) The red wire is power positive, and the black wire is power negative.

7. Startup Process

1) Turn on the remote control and move the throttle stick to the lowest point.
2) Connect the system to the battery. The motor will emit a beep, indicating the system is ready and the self-check is complete, and it is ready for takeoff.

8. Protection Functions

Startup Protection:

When powered on normally, the ESC first initiates a self-check. If the self-check succeeds, it will beep normally and is ready to run. If the self-check fails, the ESC cannot start.

Stall Protection:

When the ESC detects a motor stall, it will completely cut off output after 5 seconds and report a fault. If the stall fault is cleared, returning the throttle to zero and then outputting again can restart the motor.

Current Protection:

When an instantaneous current anomaly exceeds 280 A, the ESC will attempt to restart three times. If the ESC is still in an overcurrent state on the fourth attempt, it will completely shut down output. Restoring power will return it to normal.

Temperature Warning:

When the MOS or capacitor temperature exceeds 110 °C, a temperature alarm will be sent via the CAN communication interface. After the throttle is returned to zero, the navigation light will flash yellow three times, with a 1-second interval between flashes. After 2 seconds, the flash cycle repeats. The motor will also emit a long “Beep… Beep… Beep…” (with a 2-second interval between each beep). If the temperature exceeds 130 °C, the ESC may burn out. Upon receiving the warning, please land immediately or reduce throttle output.

Throttle Signal Loss Protection:

When the ESC detects throttle loss and a backup throttle is available, it will immediately respond to the backup throttle output.

When the ESC detects throttle loss without a backup throttle, it will continue outputting based on the last received throttle for 2 seconds. If the throttle signal is received within 2 seconds, it will resume normal response. If no signal is received within 2 seconds, the output is cut off. Power must be cycled to restore operation.

9. Common Faults and Alert Tones Description

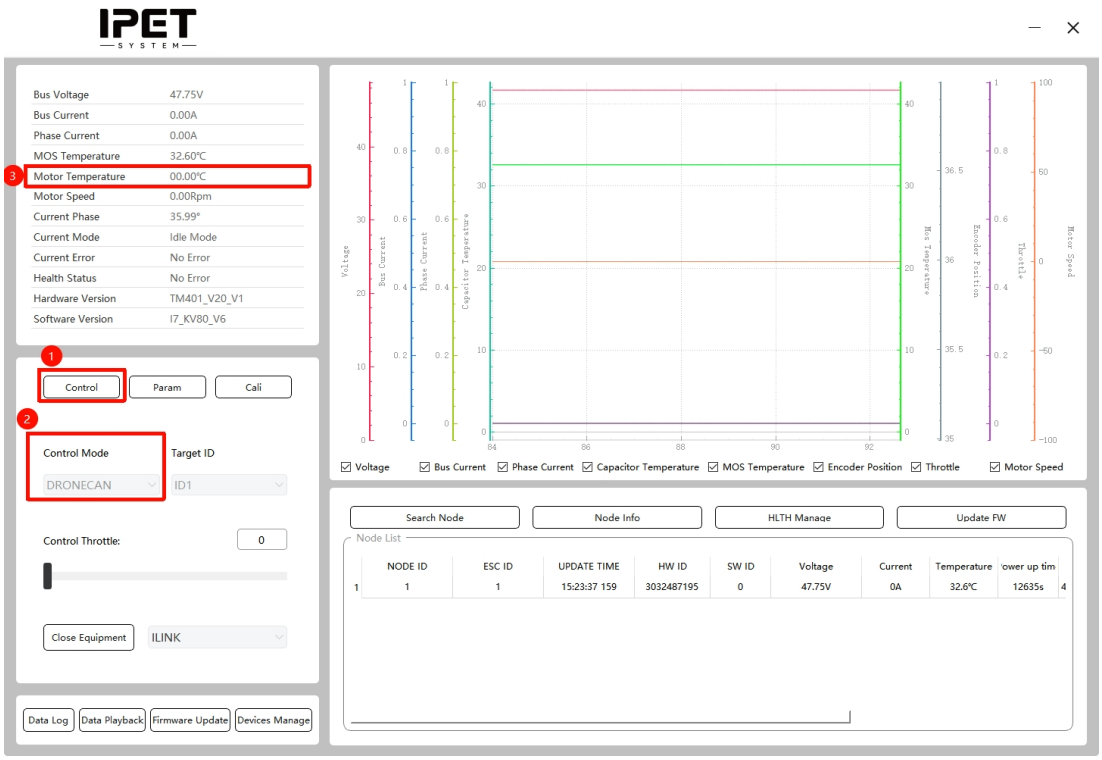
Fault Phenomenon	Alarm	Possible Cause	Solution
Motor fails to start after power-up	Rapid single-tone "beep beep beep..."	Throttle not at zero position	Move the throttle stick to the lowest position.
Motor fails to start after power-up	"beep, beep, beep_" (1-second intervals)	The receiver's throttle channel is not outputting a throttle signal	1. Check if the radio and receiver are paired correctly. 2. Check if the throttle channel wiring is connected properly. 3. Verify the ESC communication priority (factory default is PWM).
The power supply voltage is above 63V.	"beep, beep, beep_" (1-second intervals)	Input battery voltage is too high.	Replace with a suitable, fully charged battery with voltage below 63V.
ESC LED indicator flashing	"beep, beep, beep_" (2-second intervals)	Secondary fault detected after landing.	Identify issues through electrical health management

10. Motor Temperature Viewing

Notes:

- Disconnect the propeller during setup to avoid hazards.
- On the same drone, different ESCs must have unique IDs; otherwise, those with the same ID will be recognized as a single ESC when using CAN functions.
- By default, the ESC factory settings are: ID = 1, throttle channel = 1, and baud rate = 1 MHz.
- This feature requires the purchase of I-link.

10-1: Operation



1)Click “Control”;

2) Under Motor “Control Mode”, select “DRONECAN” mode;

3) The motor temperature in the ESC status will then be displayed in real time in the upper right corner.

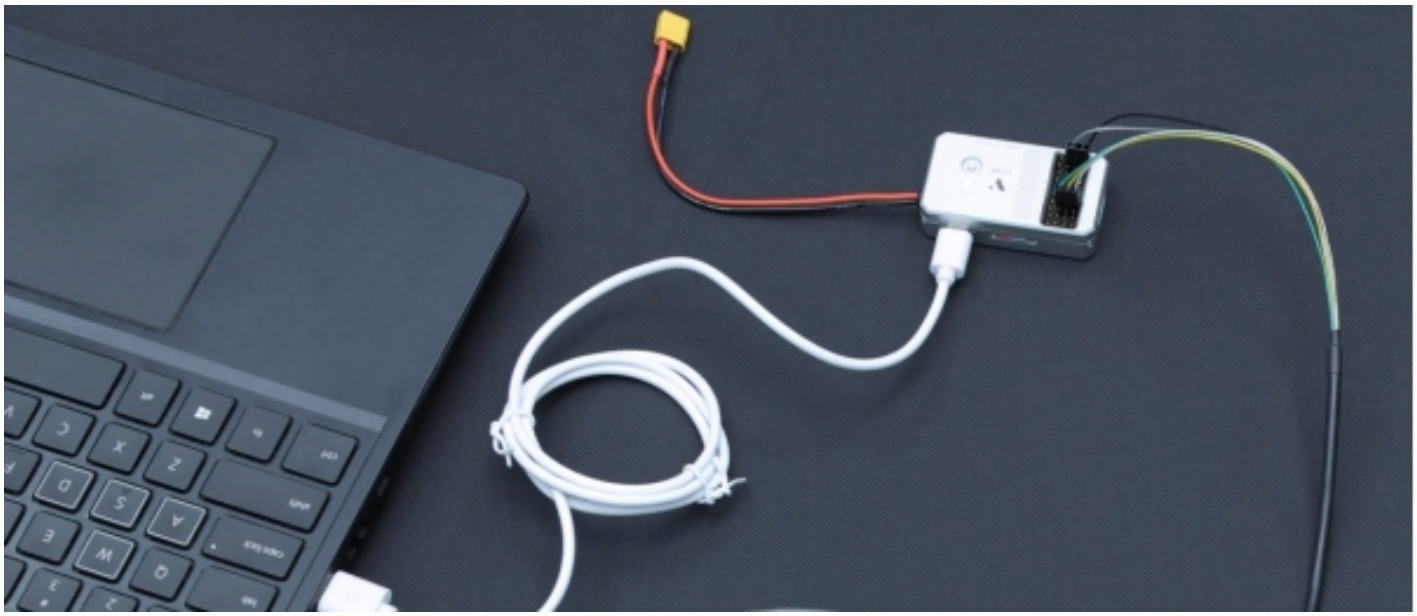
11. Setting the ID via the PC software

Notes:

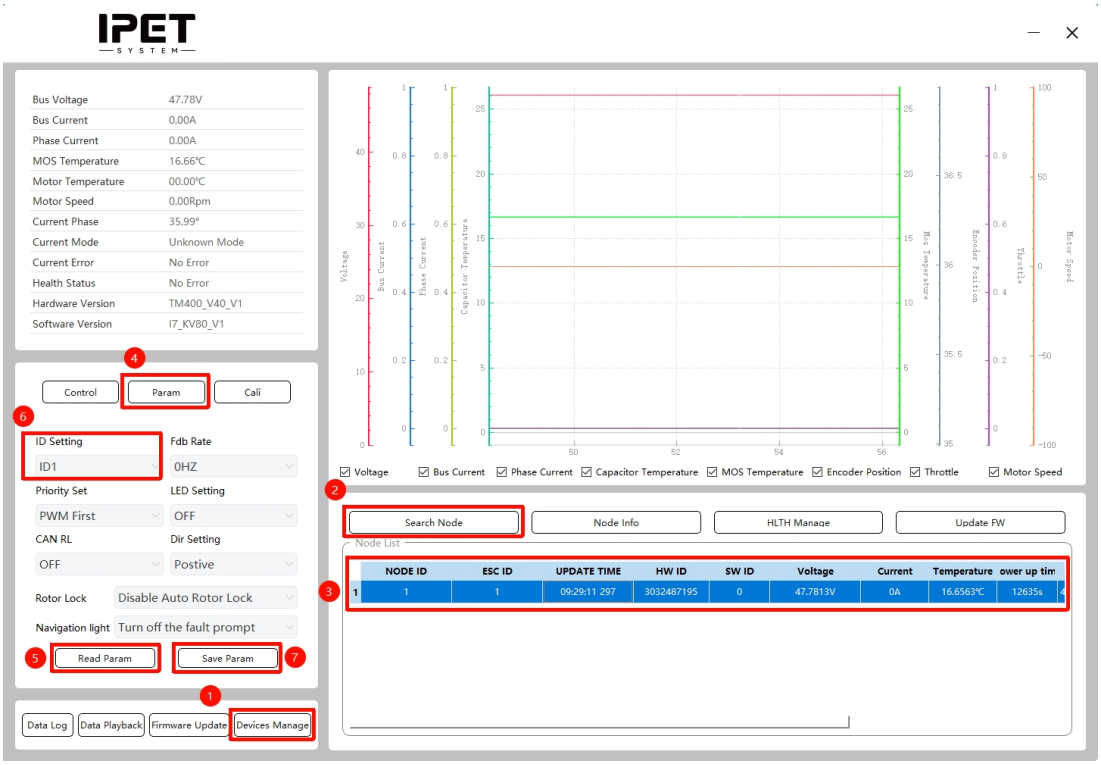
- Disconnect the propeller during setup to avoid hazards.
- On the same drone, different ESCs must have unique IDs; otherwise, those with the same ID will be recognized as a single ESC when using CAN functions.
- By default, the ESC factory settings are: ID = 1, throttle channel = 1, and baud rate = 1 MHz.
- This feature requires the purchase of I-link.

11-1: Connection (This procedure applies to the setup of all subsequent functions.)

- ESC---->I-Link; “Green Yellow Gray”----> “CAN LOW CAN HIGH -”
- Connect the I-Link to the computer via USB.



11-2: Operation



1) Click "Device Management" (If a node already exists, skip steps 1-3).
2) Click "Search Node".
3) The node information will be displayed.
4) Click the "Parameters" button. If the read is successful, the following prompt will appear.
5) Click "Read Parameters". If the read is successful, the following prompt will appear.

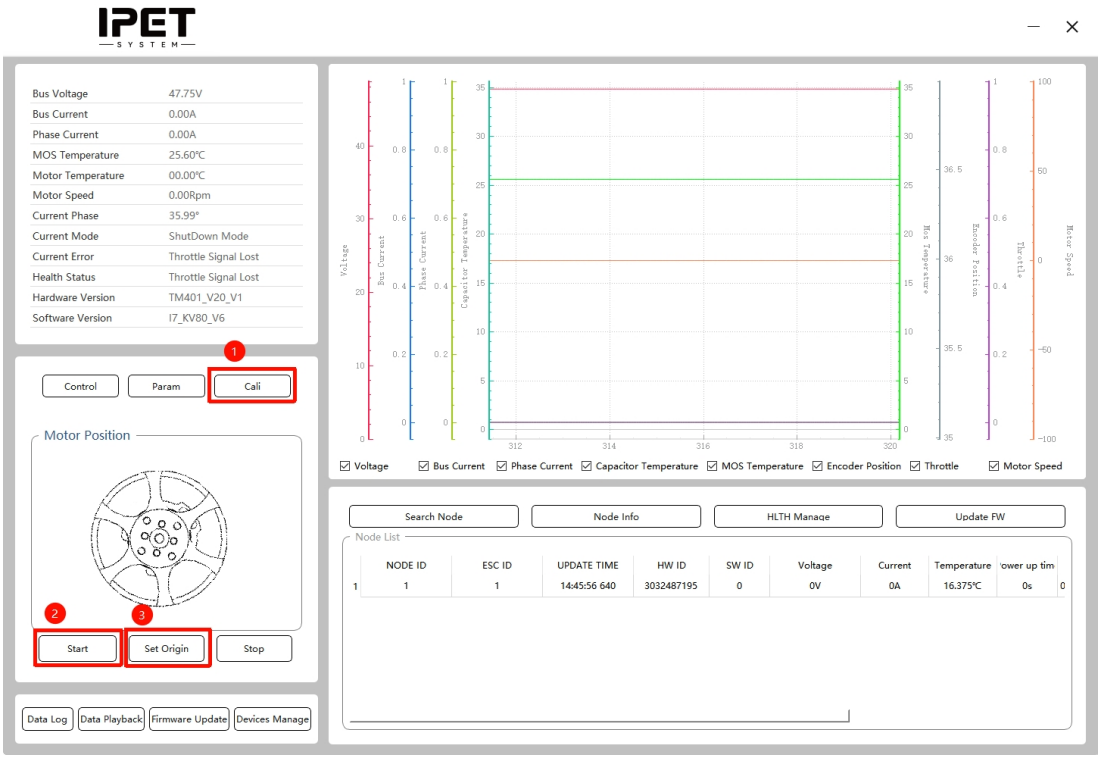
6) Click "ID Settings" and select the ID you want to change.
7) Click "Save Settings." If the save is successful, the following prompt will appear:

12. Motor Encoder Calibration Settings

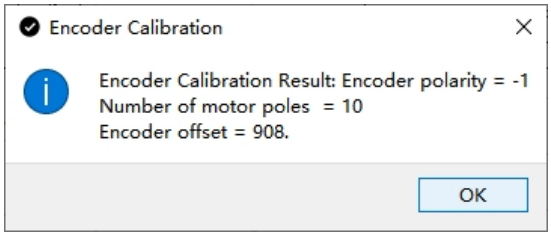
Notes:

- Disconnect the propeller during setup to avoid hazards.
- On the same drone, different ESCs must have unique IDs; otherwise, those with the same ID will be recognized as a single ESC when using CAN functions.
- By default, the ESC factory settings are: ID = 1, throttle channel = 1, and baud rate = 1 MHz.
- This feature requires the purchase of I-link.

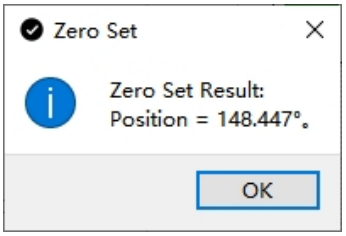
12-1: Operation



1) Click “Calibration”;
2) Click “Start Calibration”. The motor will slowly rotate several times. Upon successful calibration, the following prompt will appear;



3) Click “Set Origin” to set the motor’s origin position. When successful, the following prompt will appear.

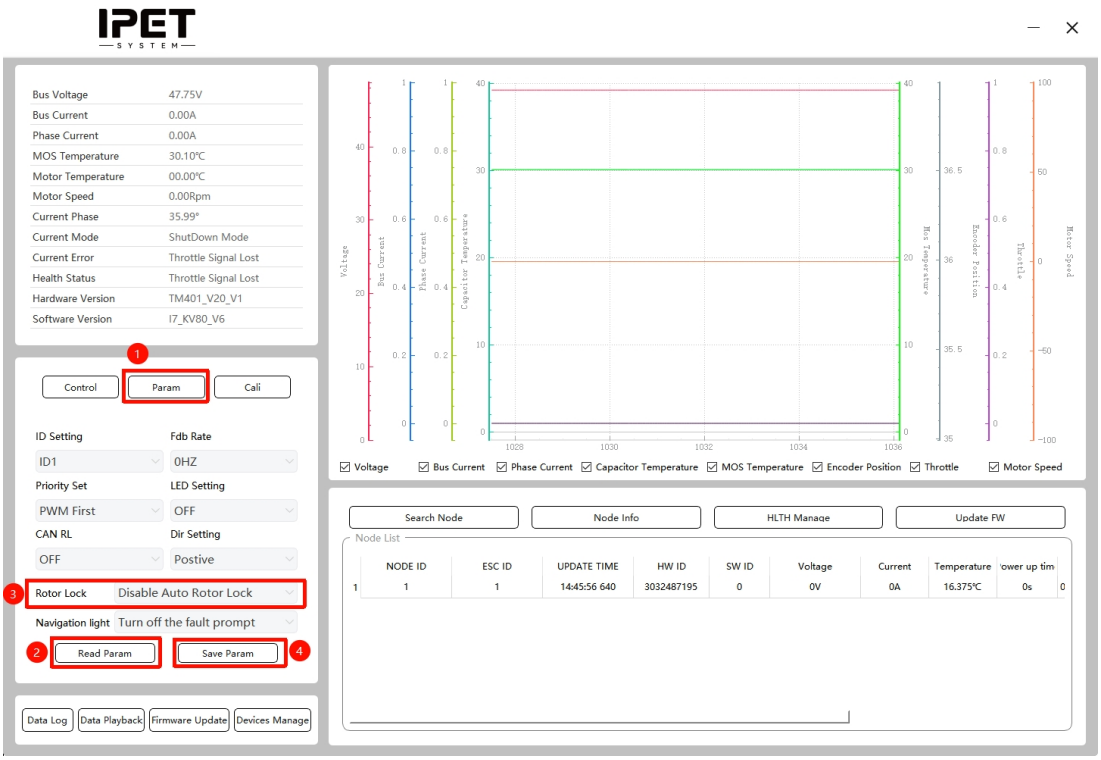


13. Propeller Lock

Notes:

- Disconnect the propeller during setup to avoid hazards.
- On the same drone, different ESCs must have unique IDs; otherwise, those with the same ID will be recognized as a single ESC when using CAN functions.
- By default, the ESC factory settings are: ID = 1, throttle channel = 1, and baud rate = 1 MHz.
- This feature requires the purchase of I-link.

12-2: Operation



1) Click “Parameters”;

2) Click “Read Parameters”. Upon successful reading, the following prompt will appear;

3) Click “Propeller Brake Settings” and select “Disable Auto Propeller Brake” or “Enable Auto Propeller

Brake”.

Note:

Disable Auto Propeller Brake: The motor will not automatically enter propeller brake mode. However, the motor can be controlled by sending arbitrary position commands via CAN, and the motor’s fixed position will be the commanded position.

Enable Auto Propeller Brake: When the PWM pulse width is below 1080 μs, the motor is in idle mode; between 1080 μs and 1120 μs, propeller brake mode is active, and the motor will automatically enter propeller brake mode with the motor’s fixed position set to the configured origin position. Above 1120 μs, normal PWM speed regulation is active.

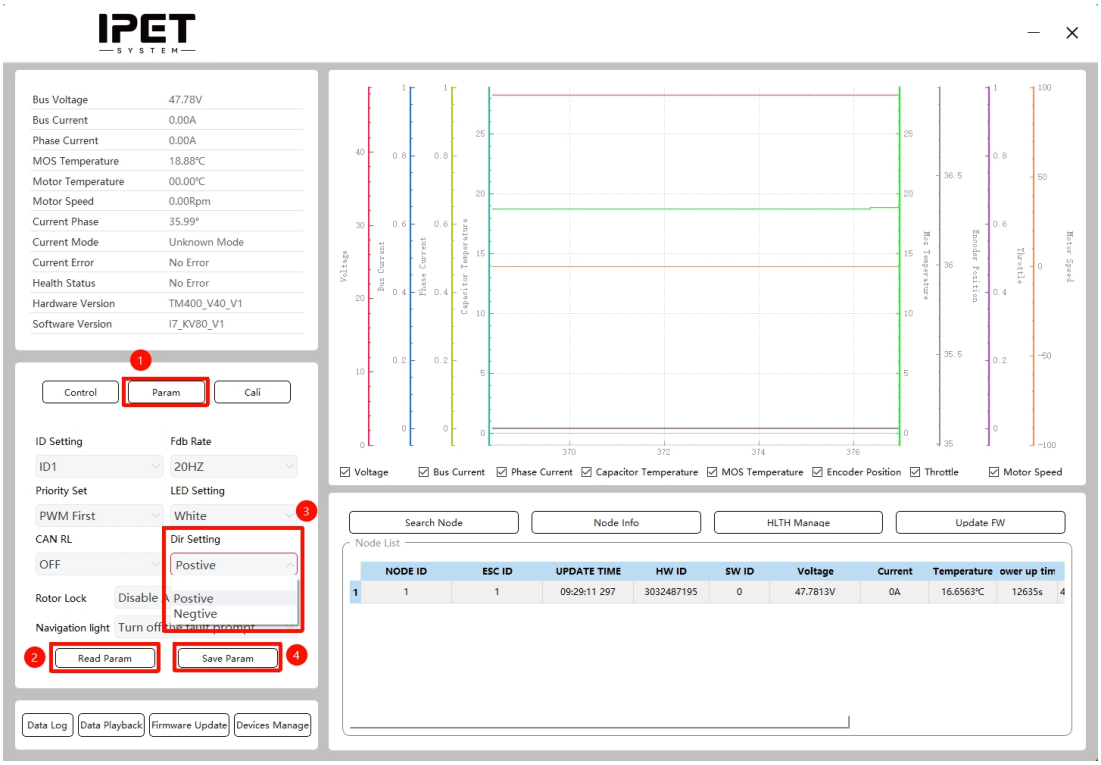
4) Click “Save Settings”. Upon successful saving, the following prompt will appear.

14. Rotation direction setting

Notes:

- Disconnect the propeller during setup to avoid hazards.
- On the same drone, different ESCs must have unique IDs; otherwise, those with the same ID will be recognized as a single ESC when using CAN functions.
- By default, the ESC factory settings are: ID = 1, throttle channel = 1, and baud rate = 1 MHz.
- This feature requires the purchase of I-link.

14-1: Operation



1) Click on "Parameter Settings".
2) Click "Read Parameters". If the read is successful, the following prompt will appear:

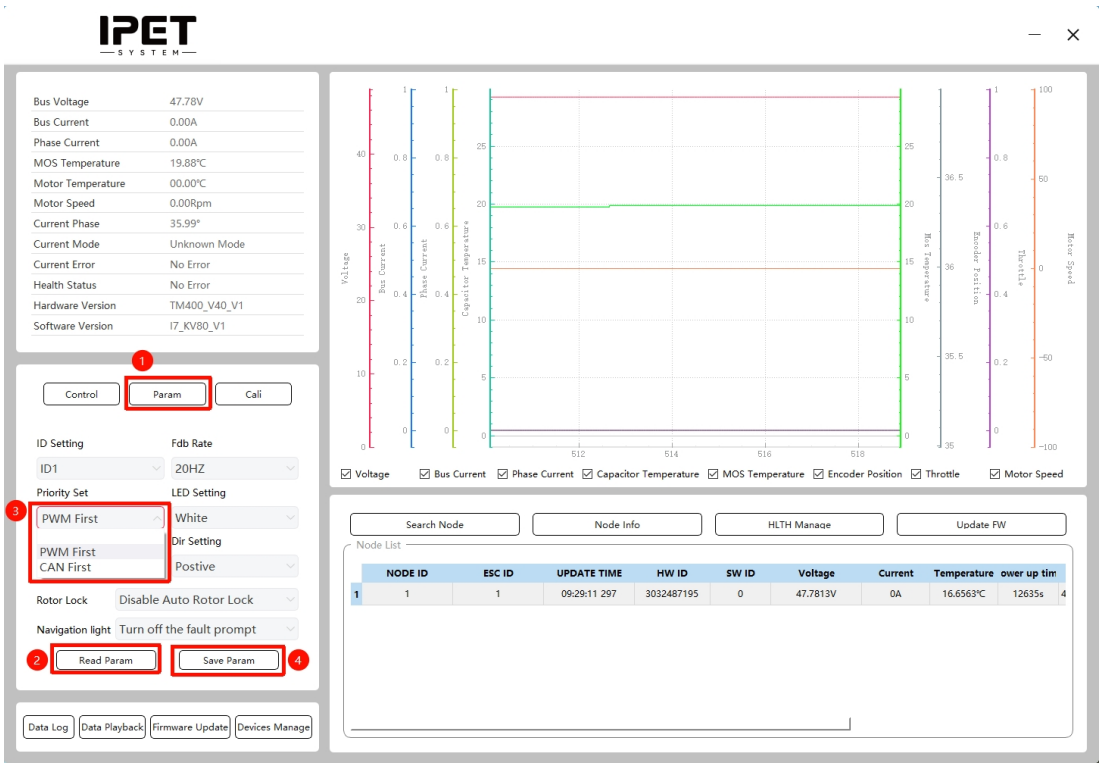
3) Click on "Rotation Direction Setting" and select the desired rotation direction for modification.
4) Click "Save Settings". If the save is successful, the following prompt will appear:

15. Throttle Priority Setting

Notes:

- Disconnect the propeller during setup to avoid hazards.
- On the same drone, different ESCs must have unique IDs; otherwise, those with the same ID will be recognized as a single ESC when using CAN functions.
- By default, the ESC factory settings are: ID = 1, throttle channel = 1, and baud rate = 1 MHz.
- This feature requires the purchase of I-link.

15-1: Operation



1) Click on "Parameter Settings".
2) Click "Read Parameters". If the read is successful, the following prompt will appear:

3) Click "Throttle Priority Settings" and select the throttle priority you wish to change.
4) Click "Save Settings". If the save is successful, the following prompt will appear:

16. Firmware Update

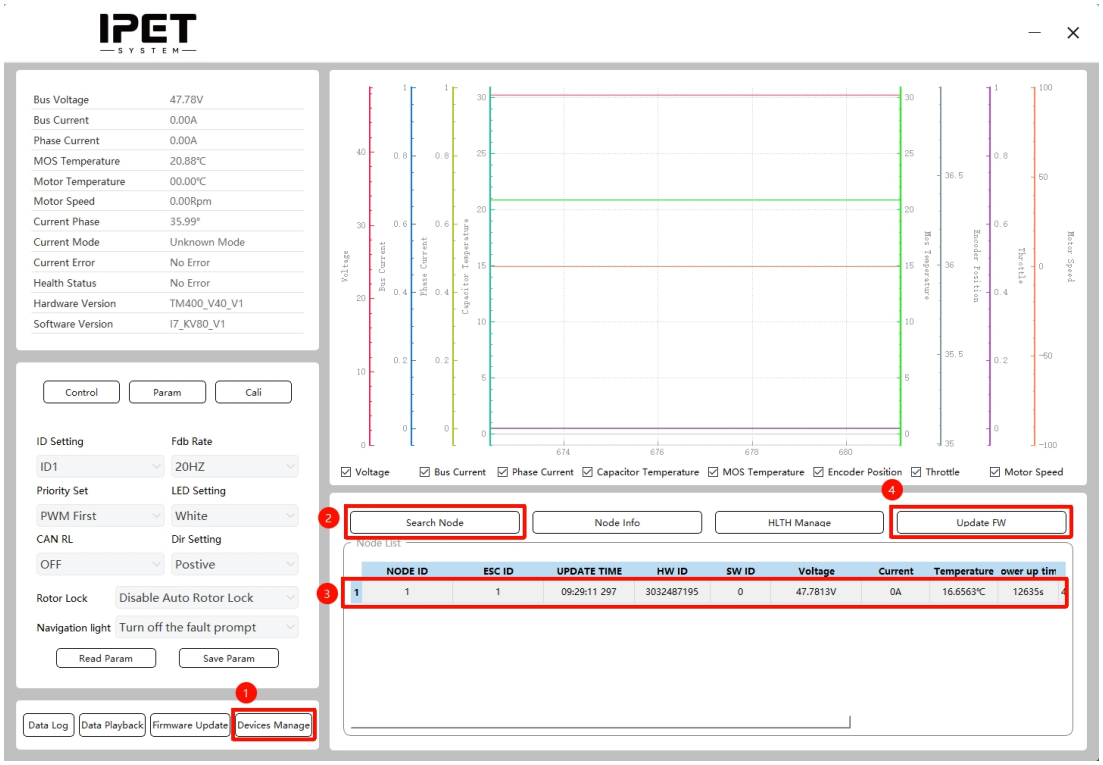
The firmware upgrade function requires the use of I-Link, a USB cable, and the PC software package. Multiple ESCs can be upgraded simultaneously.

Note: The PC software package can be obtained from the point of purchase, or from the IPET official website, sales, or after-sales support.

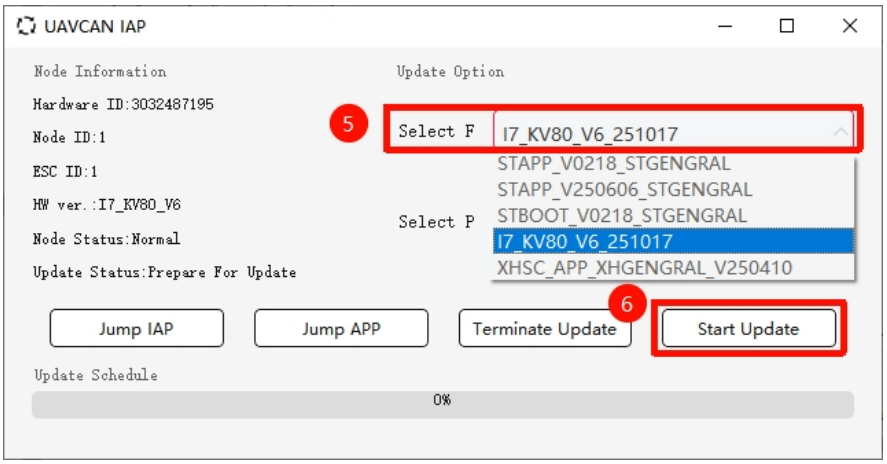
Notes:

- Disconnect the propeller during setup to avoid hazards.
- On the same drone, different ESCs must have unique IDs; otherwise, those with the same ID will be recognized as a single ESC when using CAN functions.
- By default, the ESC factory settings are: ID = 1, throttle channel = 1, and baud rate = 1 MHz.
- This feature requires the purchase of I-link.

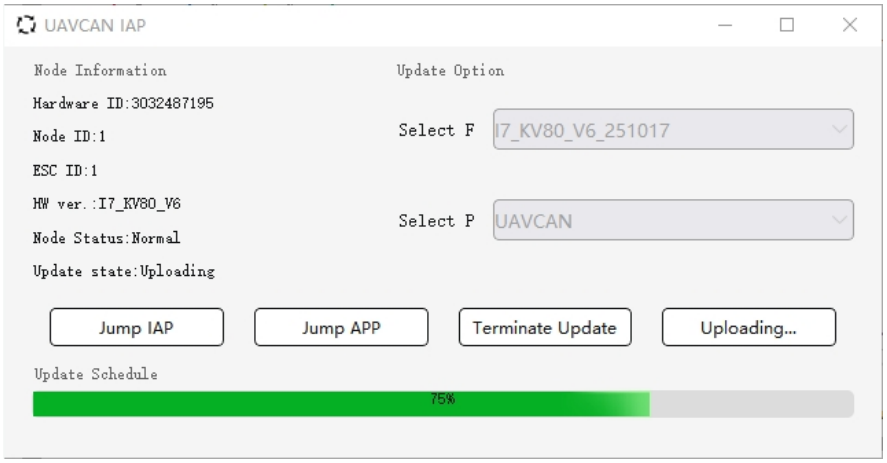
16-1: Operation



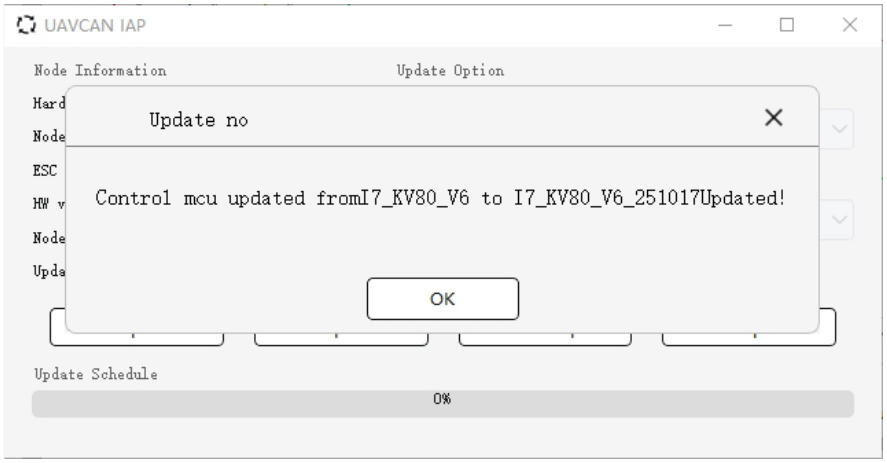
1) Click "Device Management".
2) Click "Search Nodes".
3) Select ESC.
4) Click "Upgrade Node Firmware"



5) Select the corresponding firmware
6) Click "Start Upgrade".
7) Power on the ESC.



8) Wait for the progress bar to complete.



9) When the prompt appears, the update has been completed;

10) Click “OK”, then power cycle the ESC and check whether the version has been updated correctly.

17. Frequently Asked Questions

1) This series of propulsion systems is unique and requires strict matching of motor parameters. The firmware is exclusive, meaning one firmware version is only suitable for one specific motor + propeller combination. It cannot be compatible with multiple combinations simultaneously. Contact the manufacturer if usage is needed.

2) It is not recommended to change the propeller for the propulsion system combo. Improper combinations may trigger ESC protection, rendering it unusable.

3) Do not install propellers during ground tests to avoid unnecessary danger.

4) To change the motor's rotation direction, you can configure it via the PC software.

5) Do not exceed the ESC's recommended operating voltage range, otherwise, it may cause irreversible damage to the ESC.

6) The throttle for this ESC is fixed and does not require calibration. The throttle range is 1040–1940 μs.

7) The FOC ESC has a braking effect and generates back EMF. Please ensure you use a power supply capable of absorbing back EMF during ESC testing or flight to avoid damaging the ESC and power supply.

8) The ESC supports both PWM and CAN throttle modes. One mode is set as the primary mode, and the other serves as a backup. Upon startup, the throttle signal must be connected to the ESC via the primary mode to ensure normal operation.

9) The backup throttle only becomes effective if the primary throttle signal is lost during operation. The default factory setting is PWM throttle priority mode. To change it to CAN throttle priority mode, please contact the manufacturer or configure it via the PC software.