Tips

Welcome to read Taurus-2 on-line document. This manual will assist you with the installation and post-installation checking of Taurus-2.

Blue text, suggestions and content you may need to know

Orange text, please pay close attention

Red text, must be strictly enforced

Version

Version：V1.0

Update note:

1. Create a document

System overview

Functions

The Taurus-2 Series GNC(Micro Guidance Navigantion Control System) , as an upgraded version of Taurus, provides a new generation of navigation flight control system with high integration, high reliability and high cost performance for industrial-grade drones. It supports VTOL quad plane, fixed wing, multi-rotor and other types of aircraft.

TAURUS-2 adopted a four redundancy IMU design and has designed a new data arbitration mechanism to seamlessly switch IMU data sources. Attitude measurement accuracy can reach 0.05 °;The standard configuration can realize the automatic switch of dual-redundancy compass, which can be expanded to 3-degree compass, dual-degree satellite receiver and dual-degree airspeed meter; Industrial-grade MCU with a frequency up to 1020 DMIPS to ensure efficient operation. MEMS sensor comes with a -20 ° C ~ 75 ° C temperature compensation and metal shell to ensure excellent reliability. TAURUS-2 uses a decoupled extended Kalman filter, improved L1 guidance rate, and ADRC controller as core algorithm, which has extremely high precision.

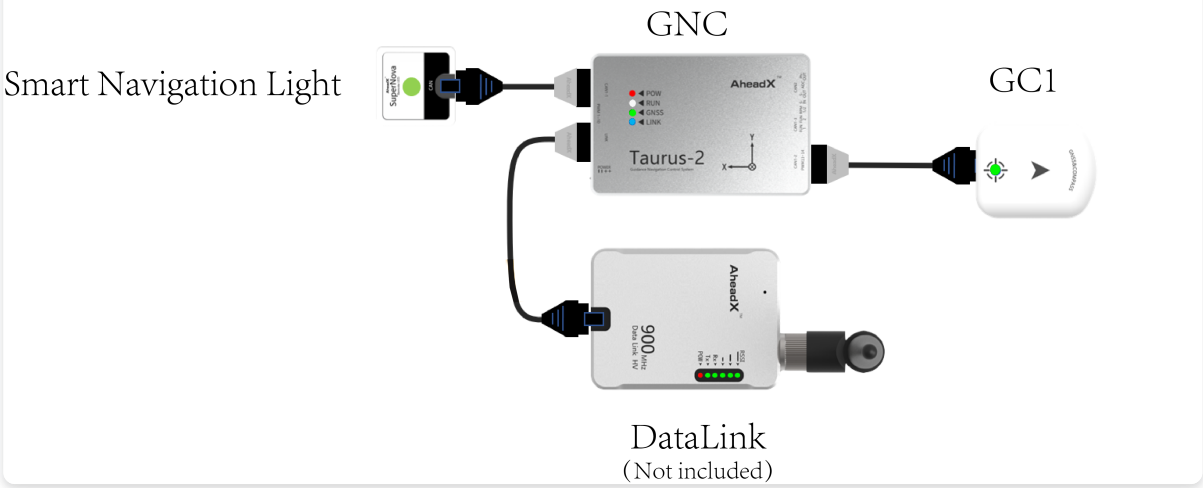
Compared with the first generation products, Taurus 2 has a more compact size and richer expansion interfaces to adapt to more application scenarios; Taurus 2 can adapt to a variety of bodies without installing external shock absorption, because of its excellent internal shock absorption structure design. The use of Taurus 2 is simpler, with a new avionics system: smart aviator lights, high-precision external airspeedmeter, GC1 (GPS & magnetic compass).

Features and applications

- Small size, modular connection, it's very easy to use;
- The internal constant temperature design makes the operation stable and reliable, the working temperature is -20 ~ 75 ℃;
- Industrial-grade MCU with a frequency up to 1020 DMIPS to ensure efficient operation
- Built-in latest sensor fusion technology, attitude measurement accuracy can reach 0.05 deg;
- TAURUS-2 adopted a four redundancy IMU design and has designed a new data arbitration mechanism to seamlessly switch IMU data sources;
- Sophisticated internal damping structure effectively reduces the impact of vibration on the inertial measurement unit;
- Two temperature-compensated AM1 high-precision airspeed meter modules can be connected to Taurus-2, which improves reliability through redundancy technology;
- Built-in dual redundancy magnetic compass;
- Taurus-2 can realize dual-redundant satellite receiver and three-redundancy orientation by connecting DG3 positioning and orientation system,
- Support high-precision 200Hz position, attitude, speed, airspeed and other motion information output; Support redundant switching command and it can be used as GPS / INS combined navigation system;

- 8 KV static protection (the highest level of national standard 3);
- Rich interface, PWM * 15, CAN * 4, serial port * 4;
- Support 3 CH voltage monitoring, rigorous low voltage protection strategy;
- It supports VTOL quad plane, fixed wing, multi-rotor, tilt-wing drones, unmanned vehicles, unmanned surface and other types of aircraft.
- It can realize one station control multi-machine with Space V3 Pro ground control software,
- Support cloud management, such as flight data cloud monitoring, remote control, no-fly zone query, differential base station sharing, Qianxun network & CORS base station data access and other functions;
- It supports application scenarios such as block surveying, strip surveying, pipeline inspection, training, pod reconnaissance, etc .;
- Powerful remote assistance service. Whenever and wherever you need technical support, you can request AheadX's official remote technical support via the Internet
- 10 mission route, max 1000 waypoints per route, automatic route switch
- Simulation training. TAURUS-2 can work with AheadX's semi-physical simulator for pilot’s daily simulation training
- On-line upgrade. User can quickly get the latest firmware and ground station software on the Internet.

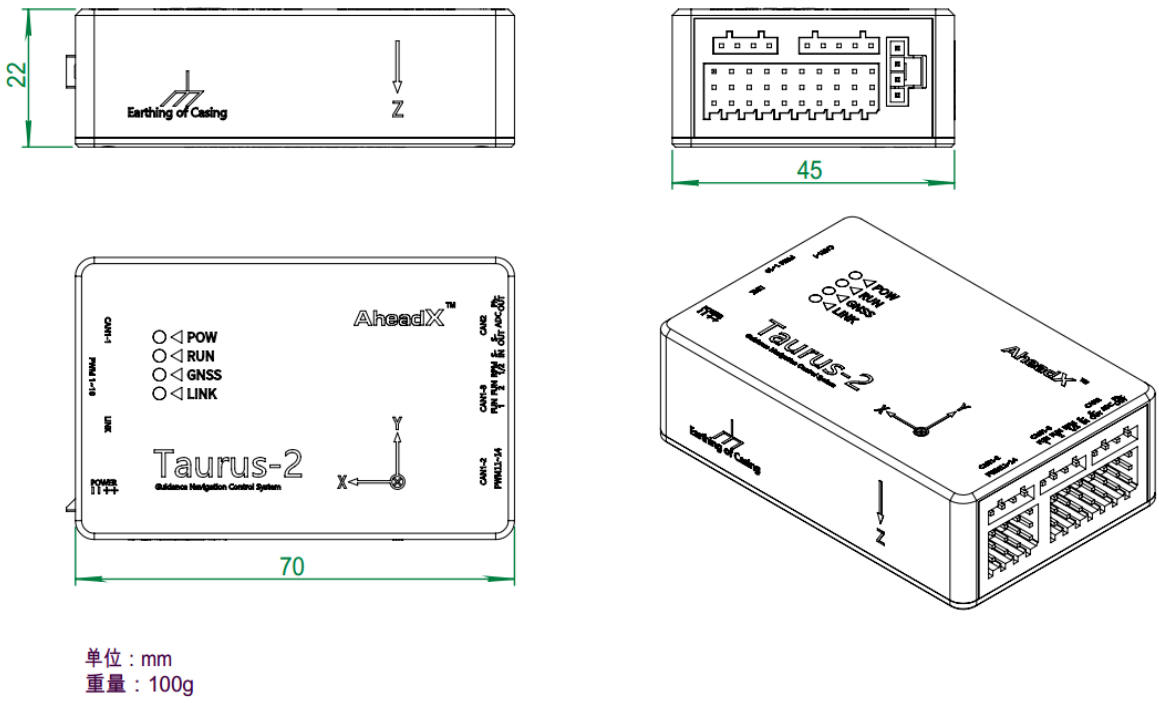
Components



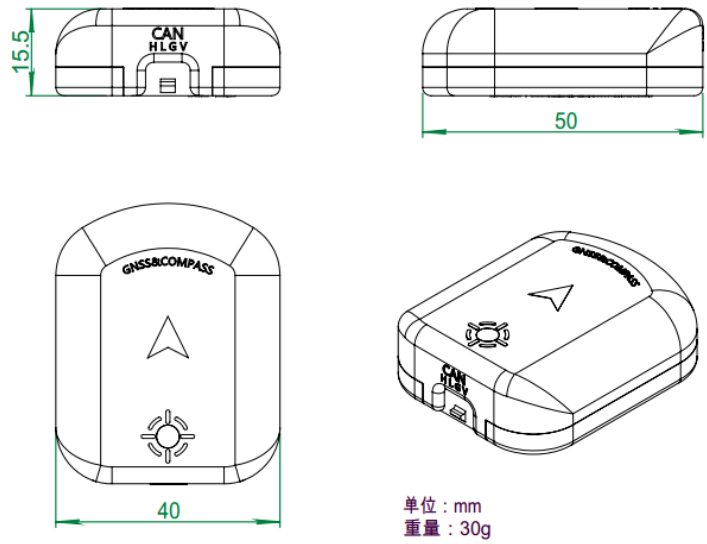
Technical Parameters

Size and weight

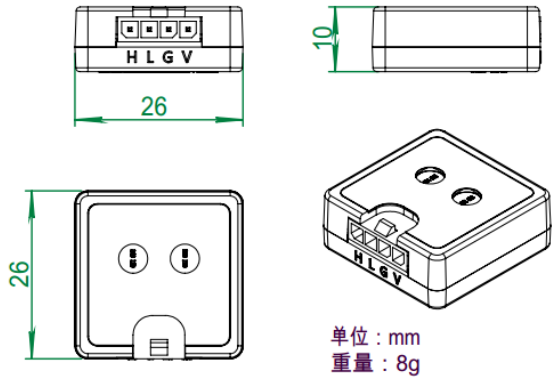
Taurus GNC



Satellite compass module



Smart navigation light



Taurus-2 technical parameters

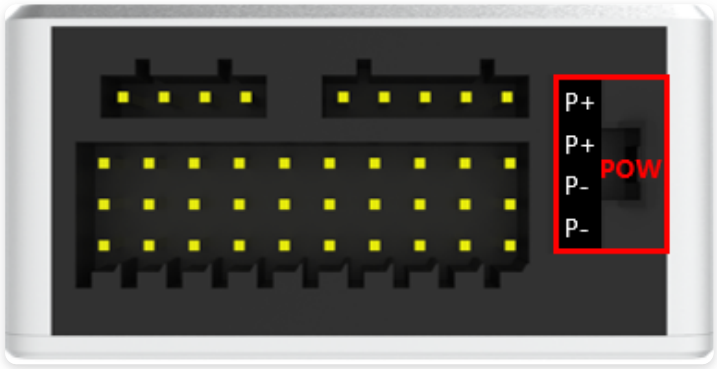
Item	Max	Std	Min	Unit	Remarks
GNC weight		100		g	
GC1 Weight		32		g	
INL Weight		8		g	
AM1 Weight		20		g	
Size		75 * 45 * 22		mm	
V-IN	53	25	7	V	
Power		1.5		W	
Work temperature	85	25	-20	℃	
Attitude accuracy		0.05		°	Dynamic，after GNSS
Angular velocity measurement range	1000		-1000	°/s	
Acceleration measurement range	8		-8	g	
positioning accuracy		1		m	CEP
Speed measurement accuracy		0.02		m/s	
Height measurement range	10000		-400	m	

Airspeed measurement range	140		0	m/s	
Speed measurement range	500		0	m/s	
PWM channel		15		CH	
SBUS-in channel		1		CH	For backup remote control data link
SBUS-out channel		1		CH	
Servo update frequency	400		50	Hz	
RC telemetry communication interface		1		CH	
Voltage monitoring channel		3		CH	
Voltage monitoring range	58		0	V	
RPM monitoring channel		2		CH	
RPM monitoring range	65535		0	RPM	

CAN interface		4		CH	Used for smart battery, airspeedmeter and blinker
EX communication interface		3		CH	forwarding data to user's equipment,connecting gimbal, DG3 and other equipment

Interface Definiton

POW interface

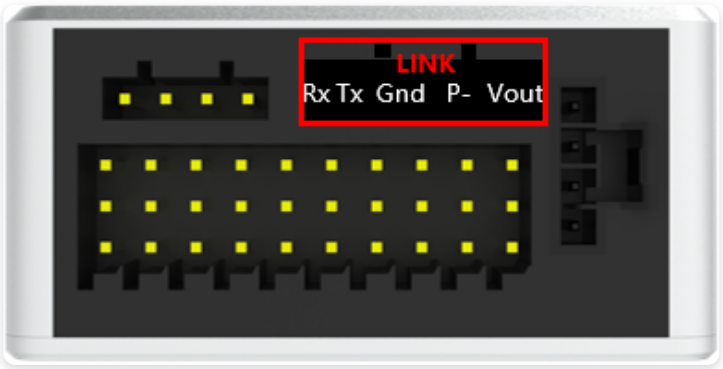


Power supply voltage is 7-53V.

P +: the positive pole of the power supply for flight control, and the voltage monitoring 1 channel collects this pin.

P-: Power supply ground.

Link interface



RS232 communication interface, can be directly connected to the AheadX DL900 digital transmission airborne terminal.

Vout: power supply output (voltage is the same as that of flight control power supply P +).

P-: Power supply ground.

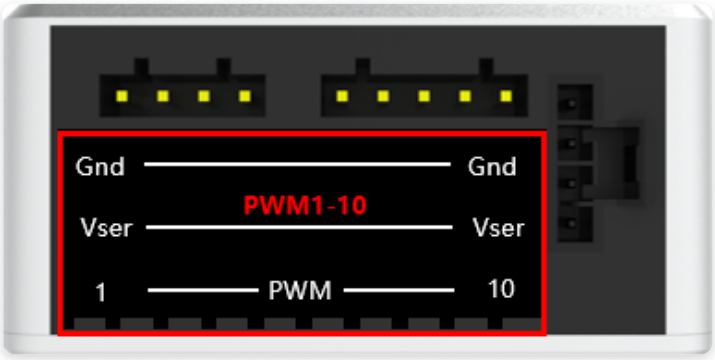
Gnd: Radio communication location.

Tx: flight control telemetry data transmission.

Rx: External data reception.

PWM interface

PWM1-10



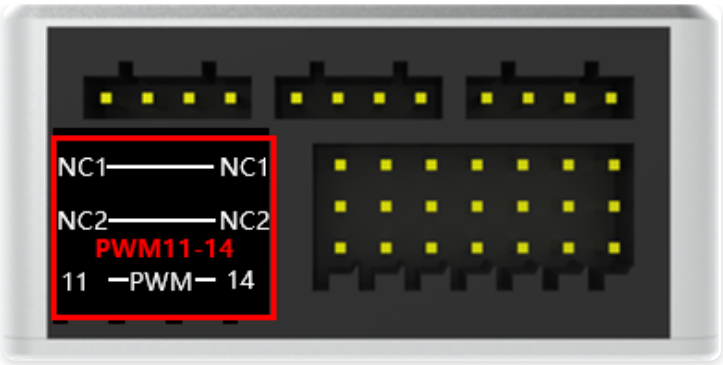
PWM1~10： PWM Signal output.

Vser： Servo external power supply, voltage monitoring 2 channels to collect this pin.

Gnd： PWM signal gnd.

PWM1-10 interface Gnd is connected, Vser is connected

PWM11-14

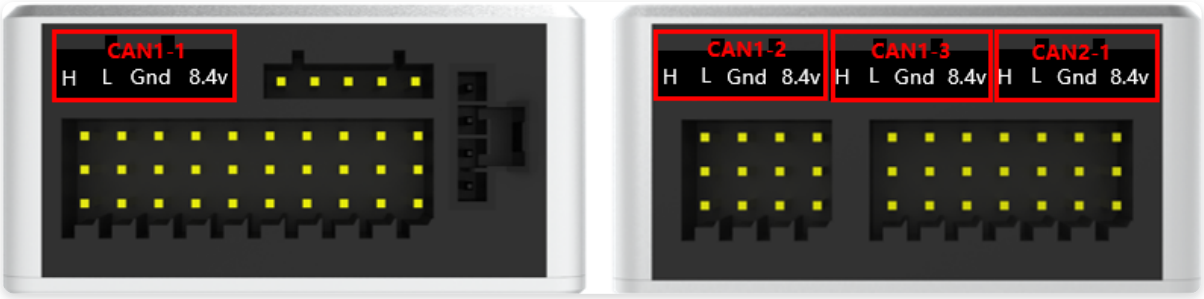


PWM11 ~ 14: PWM signal output.

NC1: floating, NC1 communicates with each other.

NC2: floating, NC2 communicates.

CAN interface



CAN_H: CAN signal H.

CAN_L: CAN signal L.

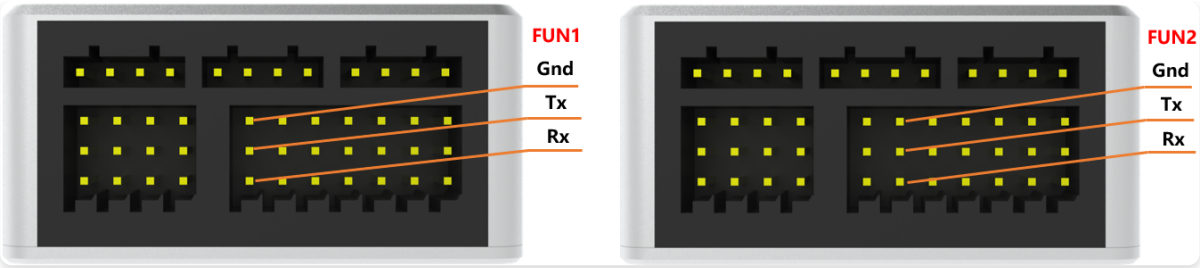
Gnd: CAN signal ground.

8.4V: 8.4V power output.

CAN1-1, CAN1-2, CAN1-3 can only be used to connect aerial light modules and satellite compass modules; CAN2 can only be used to connect AheadX custom CAN devices.

The maximum output power of 8.4V single CAN port is 5W, and the total output power of all CAN ports is less than 10W

FUN1/2 interface



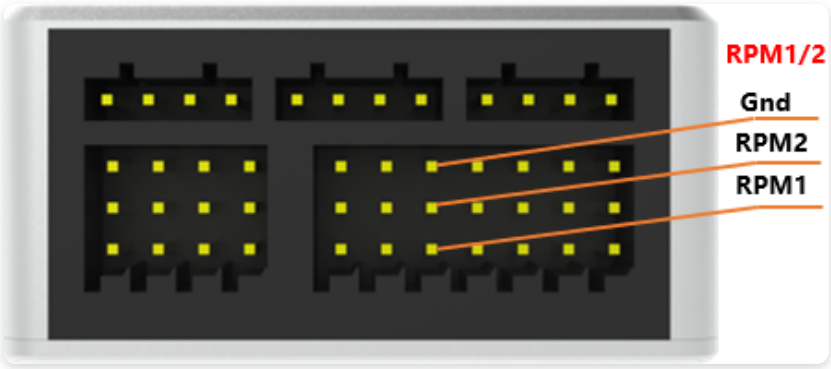
The Rs232 extended serial port can be connected to the AheadX DG3 differential positioning and directional system airborne end, Sirius engine or other devices that conform to the AheadX serial communication protocol.

Rx: External data reception.

Tx: flight control data transmission.

Gnd: Serial communication port.

RPM1/2 interface



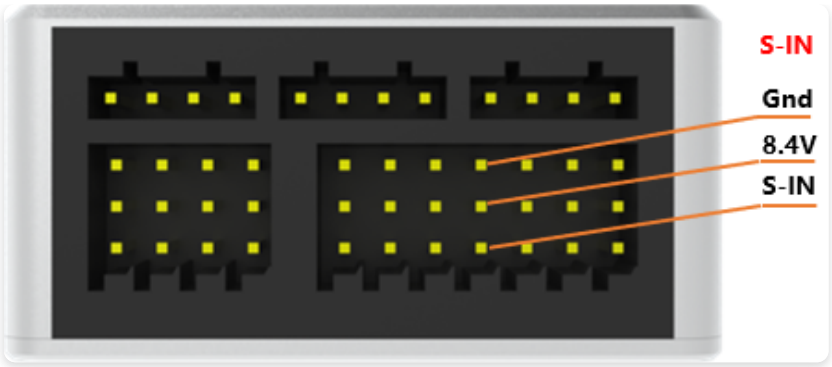
Speed measurement interface, support 2-way speed measurement.

RPM1: speed measurement signal 1.

RPM2: speed measurement signal 2.

Gnd: Signal ground.

S-IN interface



SBUS input interface, connected to the auxiliary joystick receiver.

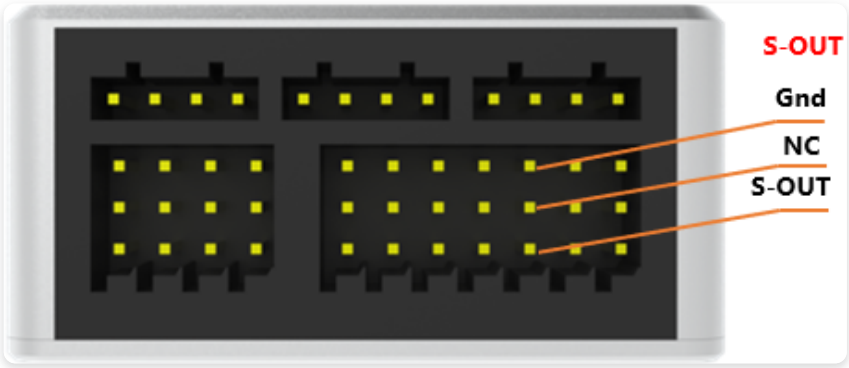
S-IN: SBUS input signal.

8.4V: 8.4V power output.

Gnd: Signal ground.

Before connecting, please make sure that the receiver can use 8.4V power supply

S-OUT interface



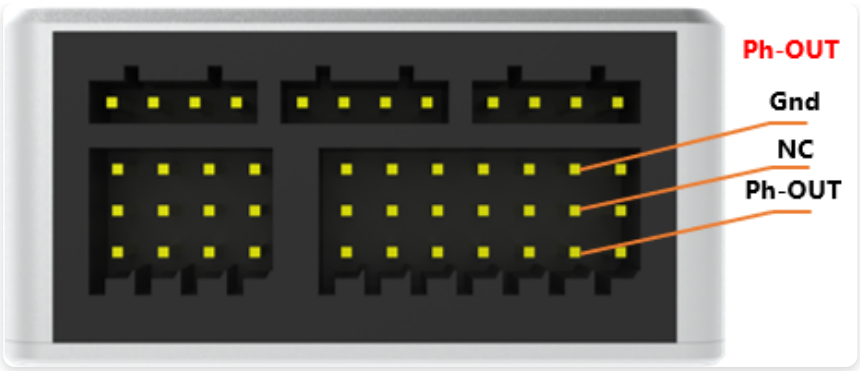
SBUS output interface, can be connected to SBUS flight or mission steering gear.

S-OUT: SBUS output signal.

NC: floating.

Gnd: Signal ground.

PH-OUT interface



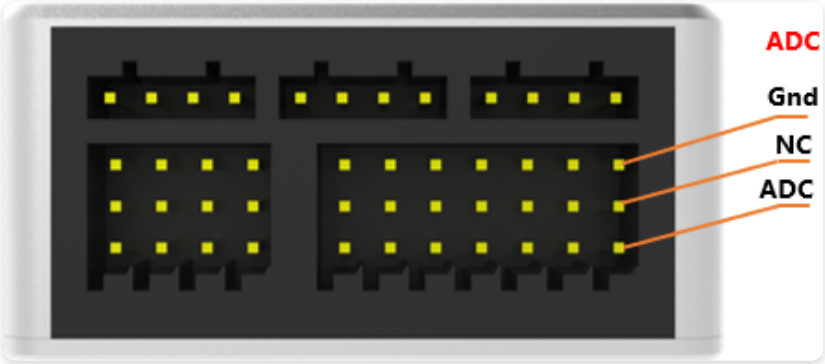
Camera trigger interface, default high level trigger.

Ph-OUT: Photo trigger pin.

NC: floating.

Gnd: Signal signal ground.

ADC interface



Flight control voltage 3 acquisition interface.

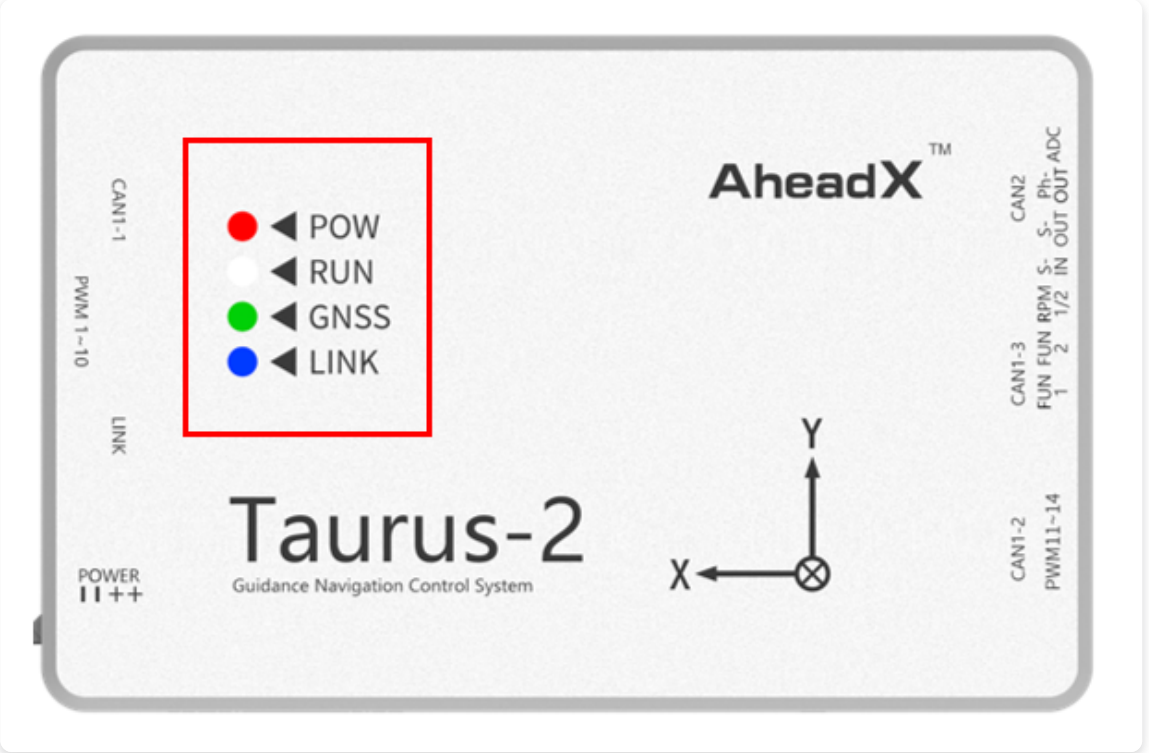
ADC: Voltage monitoring 3-channel acquisition of this pin, monitoring range 0 ~ 58V.

NC: floating.

Gnd: voltage collection ground.

Please make sure the interface is connected correctly and then power on. Incorrect interface connection will cause damage to the device

Indicator Lights



Taurus-2 GNC		
indicator light	**description**	**status**
● ——	POW is always on	Power supply is normal
● - - - - -	RUN light flashes quickly	Operating normally
● – – –	GNSS light flashes slowly	Locating
● ——	GNSS light is always on	Locates
● - - - - -	LINK flashes quickly	Receive data
● —— ● – – – ● – – –	POW on、RUN off、GNSS、LINK flash slowly	Firmware upgrade mode


AheadX
SuperNova
Remote LED
CAN

Smart Navigation Light		
indicator light	**description**	**status**
	Yellow light flashes slowly	No positioned
	Green light flashes slowly	Positioned and the flight control mode is in standby, multi-rotor attitude remote control mode, fixed wing rudder surface & attitude remote control mode
	blue flashes slowly	Positioned and the flighe control mode is in Rotor speed / attitude position remote control mode, autonomous flight
	Red and yellow lights flash alternately	Magnetic reference overrun, magnetic compass disturbed
	Yellow lights flash quicklly	The joystick is missing and not connected to the ground station
	Red lights	Attitude is greater than 15 ° and the flight control mode is in standby
	Red lights flash quickly	Voltage 1, voltage 3 is lower than the set first, second and third level protection voltage;Voltage 2 is lower than the set secondary protection voltage

	Yellow and blue lights flash alternately	FC temperature is too low

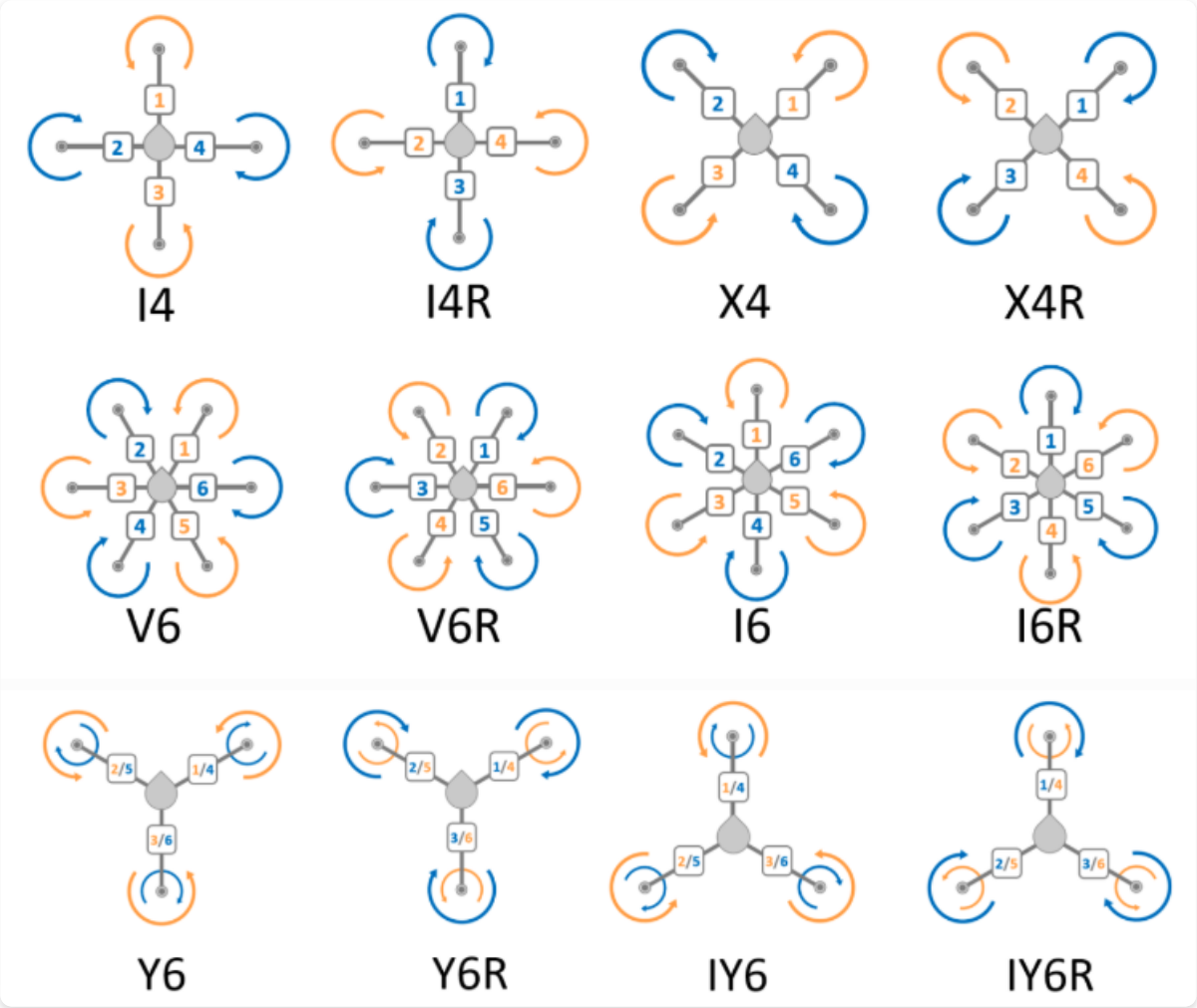
Installation

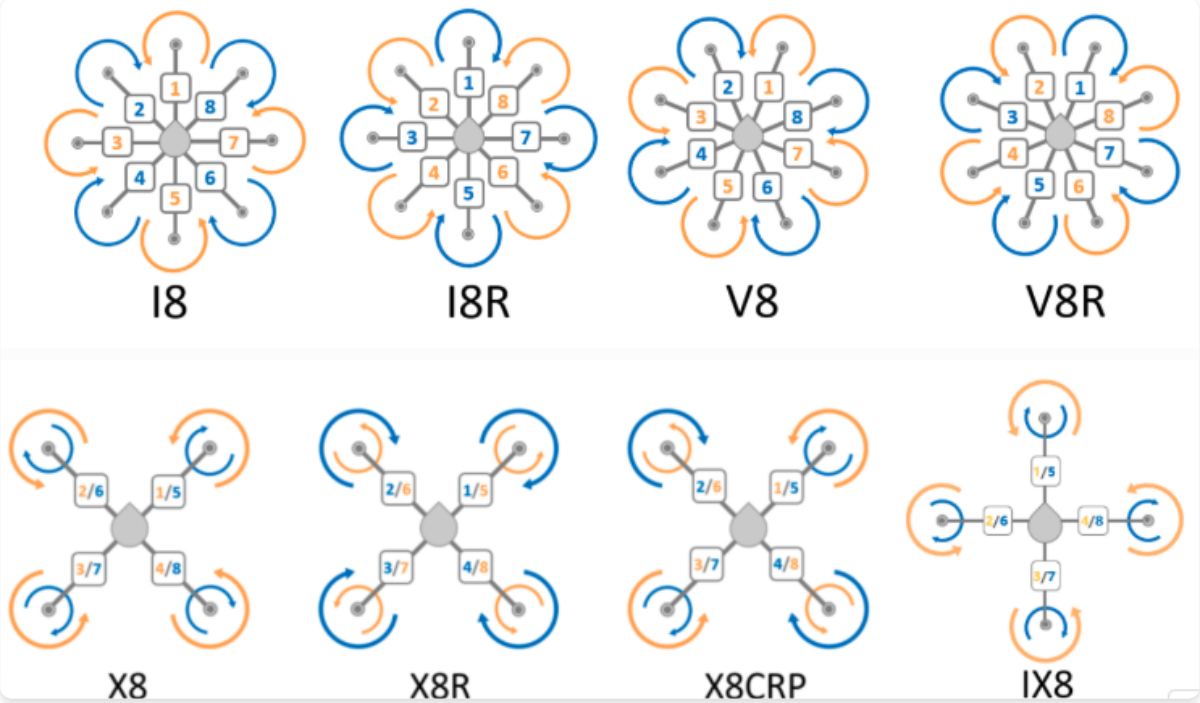
Pre-installation

You need to prepare the following equipment:

A Multi-rotors

Prepare multi-rotor drones that meet the following layout:





Datalink and Receiver

Datalink

A radio equipment with RS232 interface, 115200 baud, it is recommended to buy and use AheadX DL900 radio products.

Auxiliary joystick and receiver

Joystick requirements

1. Please select a remote control device that supports SBUS output and no less than 10 channels. The receiver needs to support SBUS or SBUS2 (for example: FUTABA T8FG / T14SG).
2. It contains at least two customizable three-segment switches, two customizable two-segment switches, and two customizable side sliding levers.
3. Please adjust the receiver operating mode to normal mode, do not use high-speed mode. The receiver in normal mode will send the SBUS signal at a frequency of 70Hz, which fully meets the auxiliary control needs of all drones. The receiver in high-speed mode will send SBUS signals at a high frequency of 140Hz, which may cause instability. For the switching method between normal mode and high-speed mode, please refer to the manual of the receiver used.

Joystick device connection

Taurus 2 supports 2 auxiliary rocker connection methods:

1. The receiver is directly connected to the flight control S-IN interface. At this time, the control distance of the joystick is affected by itself, and it is generally suitable for the use scenario of close-range remote control within the line of sight.
2. The receiver connects to AheadX Space ground station software through SBUS to USB module. At this time, the joystick control distance is determined by the communication distance of the wireless data transmission link used.

Before connecting the auxiliary joystick, it needs to be configured before it can be used.

Siyi Technology DK32 / DK32S connection

Connect the SBUS interface of the receiver to the SBUS interface of the flight control (it is forbidden to connect the red power supply line to the 8.4V output pin of the flight control, only the signal line and the ground wire are required);
Connect one end of the dual serial port conversion module to the receiver UART interface, and the other end to the flight control LINK interface;
Use a microUSB cable to connect the MicroUSB end to the DK32 / DK32S and the USB end to the computer;
Power on the device, open the Space ground station software, and connect the serial port corresponding to the USB.

SA: down: rotor attitude remote control; up: rotor attitude position remote control;

S2: Press: enable the heading remote control (in the route mode, the direction of the drone can be controlled by the direction stick);

S3: Press: open the umbrella; loosen the umbrella.

Futaba configuration example:

Take Futaba 14SG as an example, click to view configuration method

Other remote control connection standards:

If you use other brands of auxiliary joysticks, the SBUS travel requirements are as follows:

Channel 1 (rolling), channel 4 (direction): left limit 364; median 1024; right limit 1684;

Channel 2 (front and rear), channel 3 (throttle): lower limit 364; median 1024; upper limit 1684;

Channel 5: Not used;

Channel 6: Not used;

Channel 7 (remote control mode switching): position 1 (attitude position remote control) 511; position 2 (empty) 1024; position 3 (attitude remote control) 1541;

Channel 8: Not used;

Channel 9 (course heading remote control): position 1 (heading remote control enabled) 511; position 2 (turning heading remote control off) 1541;

Channel 10 (open umbrella, not open by default): position 1 (open umbrella) 511; position 2 (close umbrella) 1541.

C Battery

The power supply range of Taurus 2 is 7 ~ 53V, which can be powered by 2S ~ 12S lithium polymer batteries.

D Related software download and installation

Download the latest AheadX Space ground station software, assistant software AheadX Master, firmware upgrade tool.

click to download the latest version

Follow the installation prompts to install, it is recommended to install the software in a non-system disk.

Start Installation

Install Taurus-2 GNC

Connection requirements

Because the flight control is connected to other avionics equipment, it will involve cable welding or plug connection. In order to ensure reliability, you need to pay attention to the following points:

1. Extend the welding connection and use silver-plated cables that can withstand high temperatures and pull as much as possible. In any airborne environment, avoid breaking the inner core of the cable, damaging the outer skin, and excessive welding resistance.
2. The connecting plug should use a plug with a self-locking structure, and be fastened and glued at key parts to improve the reliability of the connection.

Electromagnetic Compatibility

The flight control installation location is as far away as possible from the following equipment:

1. Keep away from high-power electrical equipment such as motors, ESCs, and gimbals;
2. Keep away from high-current power supply lines, distribution boards and other components that are prone to electromagnetic interference;
3. Keep away from radio transceiver equipment with high power radiation capability;
4. Keep away from the engine to avoid the double strong interference of magnetic compass and vibration;
5. Keep away from devices with magnetic screws, large metal structures, etc. that may cause constant deflection interference to the magnetic compass.

Installation recommendations:

1. Power supply wires, magnetic screws, etc. must not appear within 10 cm around the flight control; motors, gimbals, and other magnetic motion devices must not appear within 15 cm; stay away from the engine by 30 cm or more;
2. The bracket can be used to raise the GC1 away from the source of interference, so that even if the interference problem of the built-

in magnetic compass of the flight control cannot be effectively solved, the system can still operate normally.

If the servo is shaking or the positioning quality is poor, check and shield the following equipment:

1. High-power radio transmission equipment with poor shielding effect, power supply wires, magnetic equipment, etc .;
2. If the PWM control signal is interfered by the electromagnetic field, the abnormal power and other abnormal conditions may occur in the high-power radio transmitting equipment and its transmitting antenna with poor shielding effect, which may cause hidden control problems
3. The airborne electromagnetic environment is relatively harsh, you can consider adding magnetic rings, shielding nets and other anti-interference equipment.

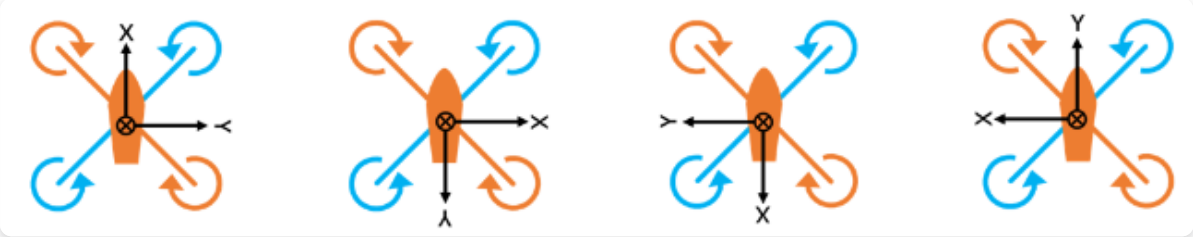
Structural interference

If you need to install a shock-absorbing structure, the vibration of the body may cause the flight controller to follow the shaking. During the movement of the shock-absorbing structure, do not make collisions or other contacts to avoid unpredictable movement interference.

In the motion interference of sudden impact, flight control cannot determine whether it is caused by flight motion or structural interference. The resulting flight failure is a human cause.

Installation

The Taurus 2 flight controller should be installed as horizontally as possible to ensure that the internal shock-absorbing structure works at its best. Support the following 4 installation angles:



During installation, the silk screen coordinates of the flight control surface shall be consistent with the illustrated coordinates.

Pay attention to the following content:

1. Mount the flight controller pointing to the front (X arrow to the front, Y arrow to the right). In this way, user doesn't need to adjust the installing angle.
2. User must know the installing angle and input it in the software if user doesn't mount FC pointing to the front. It may cause bad performance or accident if real installing angle is not matched with the input value in the software.
3. User should follow Euler angles and right-hand principles (thumb points to the front of X axis, the direction four fingers bending is "+") to adjust the installing angle. Reference coordinate is the aircraft coordinate, and rotation coordinate is flight controller coordinate. It means user should rotate the flight controller according the coordinate marked on the flight controller.
4. There is a strict order to rotate the flight controller. (Please read the "Parameter adjustment manual—Installation and Adjustment" to learn how to do the parameter configuration). First rotate YAW axis (rotate around "Z" axis, the parameter can be only 0~360 degree). Second rotate Pitch axis (rotate around "Y" axis, the parameter should be -90~+90 degree). Finally, rotate Roll axis (rotate around "X" axis, the parameter should be 180~+180 degree)

The subsequent parameter setting chapter will describe how to configure the installation parameters.

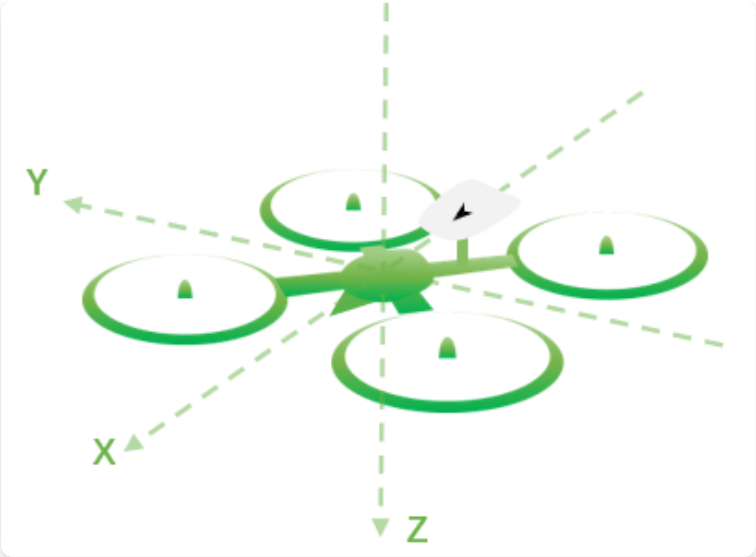
Install Satellite Compass Module

The GC1 integrates and electronic compass and satellite receiver, and supports GPS / GLONASS (or BEIDO). When installing the device, try to stay away from the following devices:

1. Keep away from high-power electrical equipment such as motors, ESC, and gimbals;
2. Keep away from high-current power supply lines, distribution boards and other components that are prone to electromagnetic interference;
3. Keep away from radio transceiver equipment with high power radiation capability;
4. Keep away from the engine to avoid the double strong interference of magnetic compass and vibration;
5. Keep away from equipment with magnetic screws and large metal structures that may cause constant deflection interference to the magnetic compass;

Pay more attention during installation

1. It is recommended that the GC1 be supported by a support rod and not installed in the cabin or other enclosed spaces.
2. The surface of the GC1 should not be covered with metal materials such as copper foil, or with absorbing materials such as carbon fiber, otherwise the signal quality will be greatly affected. The aircraft will not be able to accurately orientate.
3. The plane of the arrow on the surface of the satellite compass module should be parallel to the XY plane of the aircraft coordinate system, and the direction of the arrow should be consistent with the direction of the nose, otherwise it will cause anomaly in the heading measurement, which will affect flight safety.



The subsequent parameter setting chapter will describe how to configure the installation parameters.

Install smart navigation light module

The navigation light module can be used as status light and navigation light.

Multi-rotor drones are used as status lights by default, and are generally installed at the tail of the drone, which can be installed firmly for easy observation.

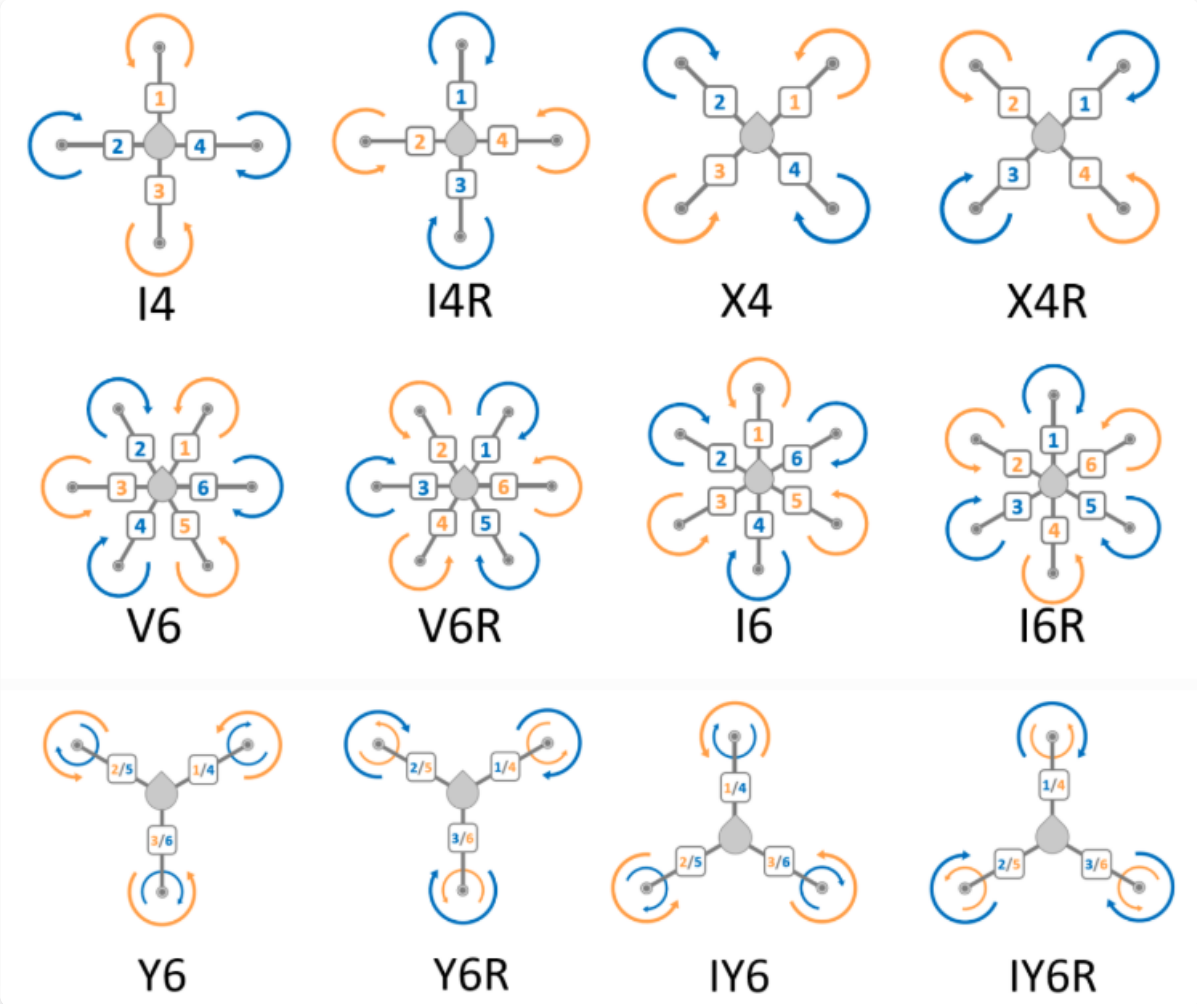
Install datalink module

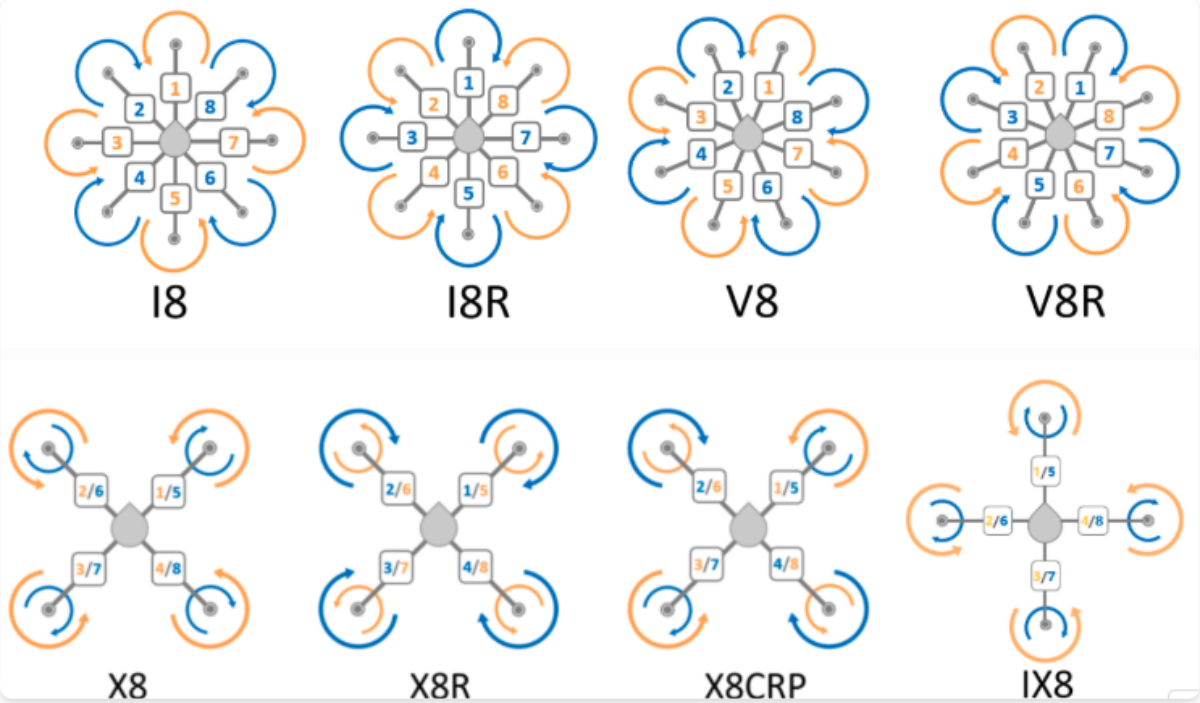
1. Datalink antenna(feeder) should be well connected to “DATA LINK”SMA connector. The antenna should be exposed to the drone body. Trying to make sure the antenna is not blocked by materials with electromagnetic shielding properties such as metal and carbon fiber.
2. The datalink module is a radio device, which may cause electromagnetic interference to other airborne equipment. When installing, keep the antenna far away from the equipment or circuit susceptible to electromagnetic interference such as the flight control host, satellite compass module, steering gear, and ESC signal line.

3. The antenna should be mounted straight up or down to get a longer horizontal transmission distance.
4. Connect the airborne Radio to the flight control via a 5PIN radio cable, and the ground Radio to a PC via USB. After the flight control is powered on, the Rx indicator on the ground radio will start to flash. Open AheadX Space, select the serial port connection and open. Click the blue button to synchronize the flight control parameters. After the synchronization is complete, click the orange button to enter the ground station.

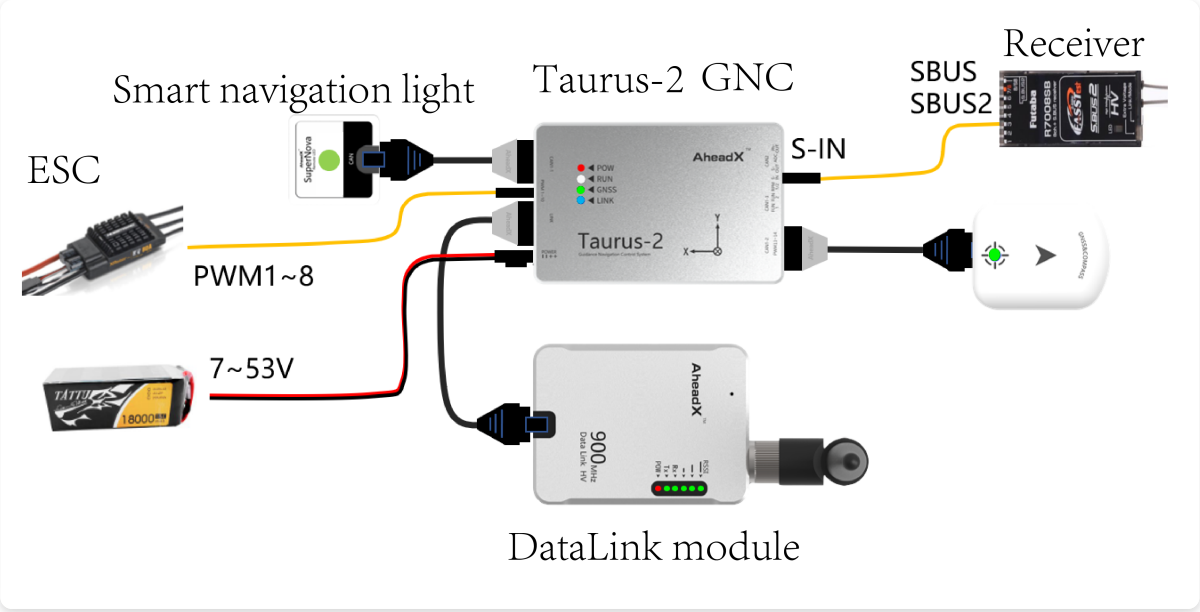
Multi-rotor ESC Connection

The digital serial number in the figure below represents the Taurus 2PWM serial number. Connect the rotor signal cable to the Taurus 2PWM1-8 channel as shown below.





System connection



When the receiver is directly connected to the S-IN interface of the flight controller, the control distance of the joystick is affected by itself, and it is generally suitable for the use scenario of close-range remote control within the line of sight. It is recommended that the receiver access the AheadX Space ground station software through the SBUS to USB module. At this time, the control distance of the joystick is determined by the communication module used. Ideally, the effective control distance of the joystick can be increased to more than 10KM after using DL900.

The ground terminal of DL900 digital radio can be connected in the following ways:

1. Use stable and reliable microUSB data cable to connect PC and radio;
2. Use USB to RS232 to connect radio 5PIN interface, and use external power supply to improve power supply stability.

Redundancy configuration scheme

Default hardware tolerance:

1. 4 degree IMU
2. Double redundant magnetic compass
3. Dual redundant air pressure and altitude measurement

Redundancy expansion: After accessing the AheadX DG3 differential positioning and orientation system, the following hardware redundancy can be expanded.

1. Dual redundancy satellite receiver
2. 3 degree heading measurement

Parameters setting

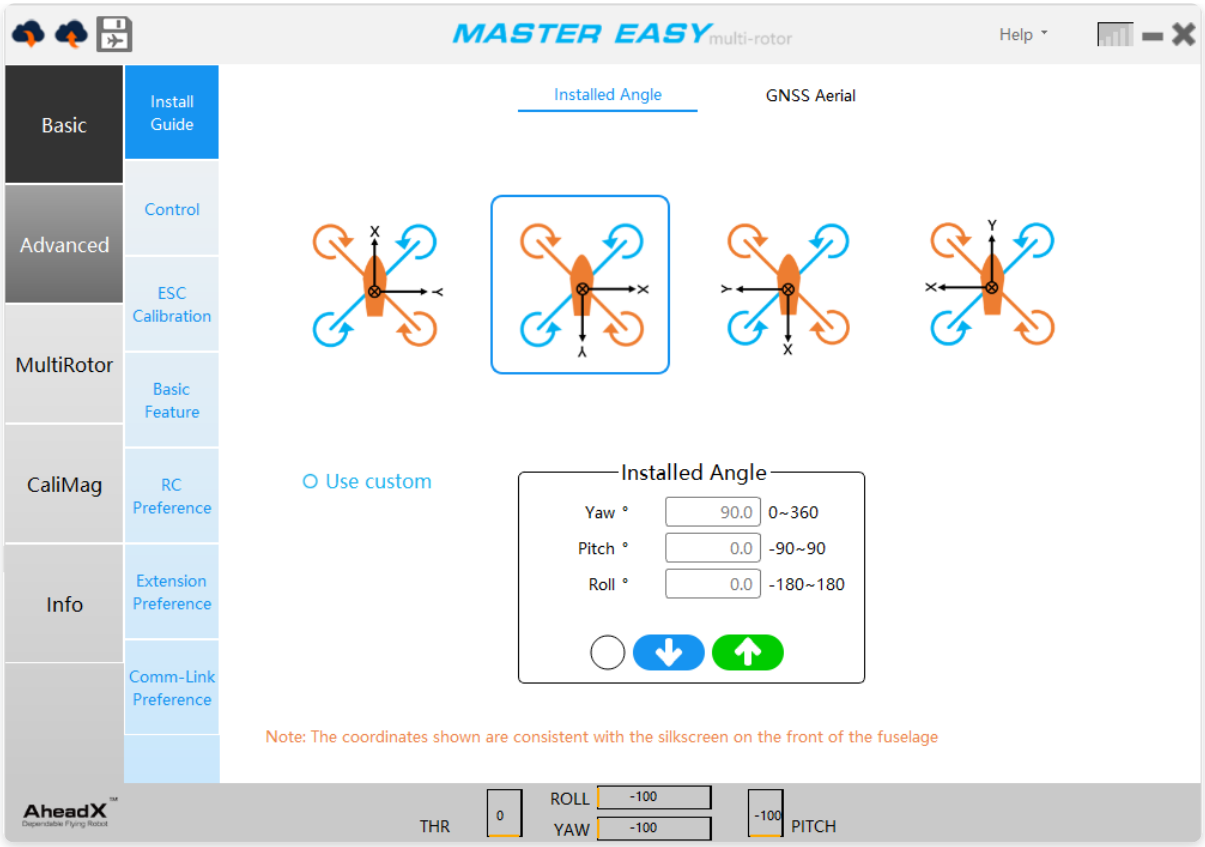
AheadX Master Connection

After the installation is complete, power on all devices except the power system, open the AheadX Space ground station software, select the serial port corresponding to the ground station, click the ON button, after the connection is successful, click the progress bar to complete, click to start the ground station.

Open the Master Easy Assistant, the software will automatically identify the device version and authorize it, wait for the prompt in the lower left corner to indicate that it has been automatically authorized, and click the Enter button.

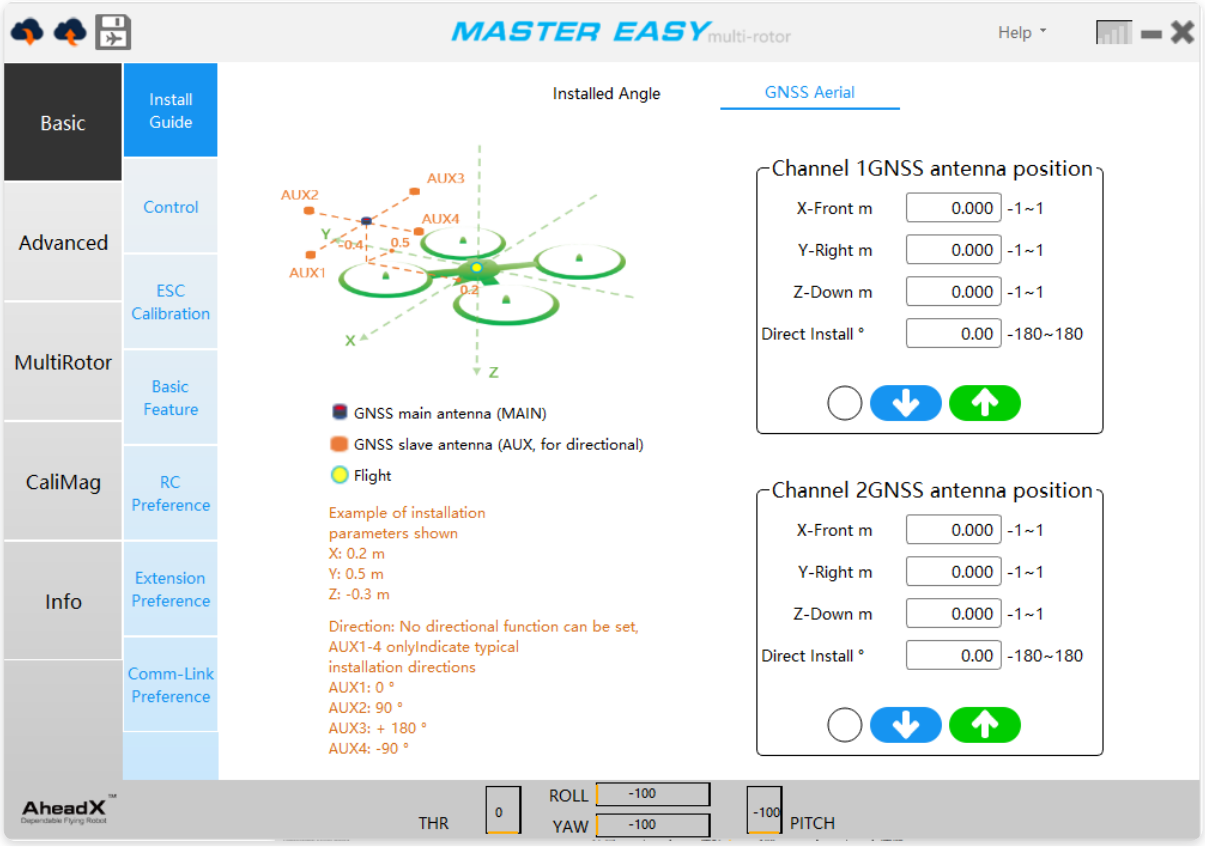
GNC installation angle adjustment

The coordinates in the picture below are consistent with the screen printing on the front of the flight control. Select the same option as the actual installation method and click the button.



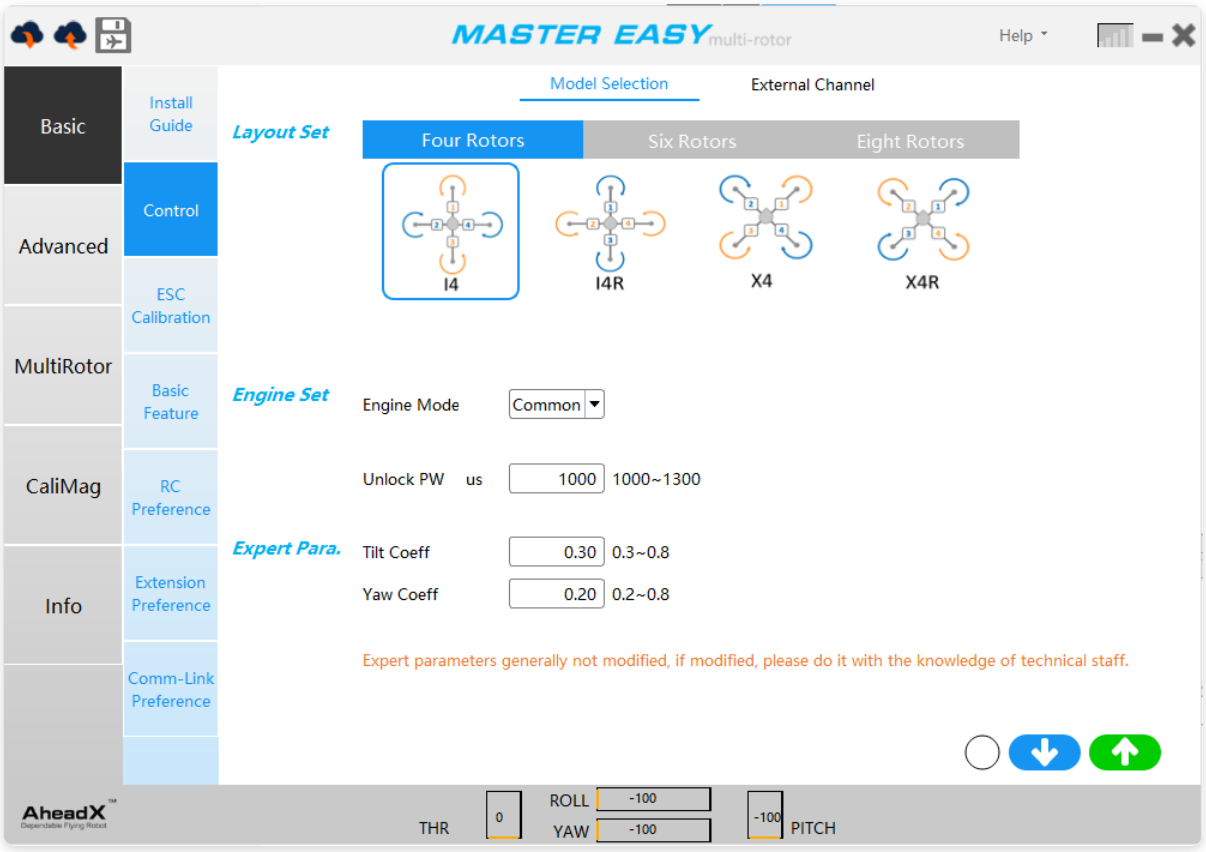
Satellite compass module installation position adjustment

Write the XYZ calibration data to the channel 1GNSS antenna position as shown in the example below (the satellite compass is the GNSS main antenna), click the button.*



Control distribution

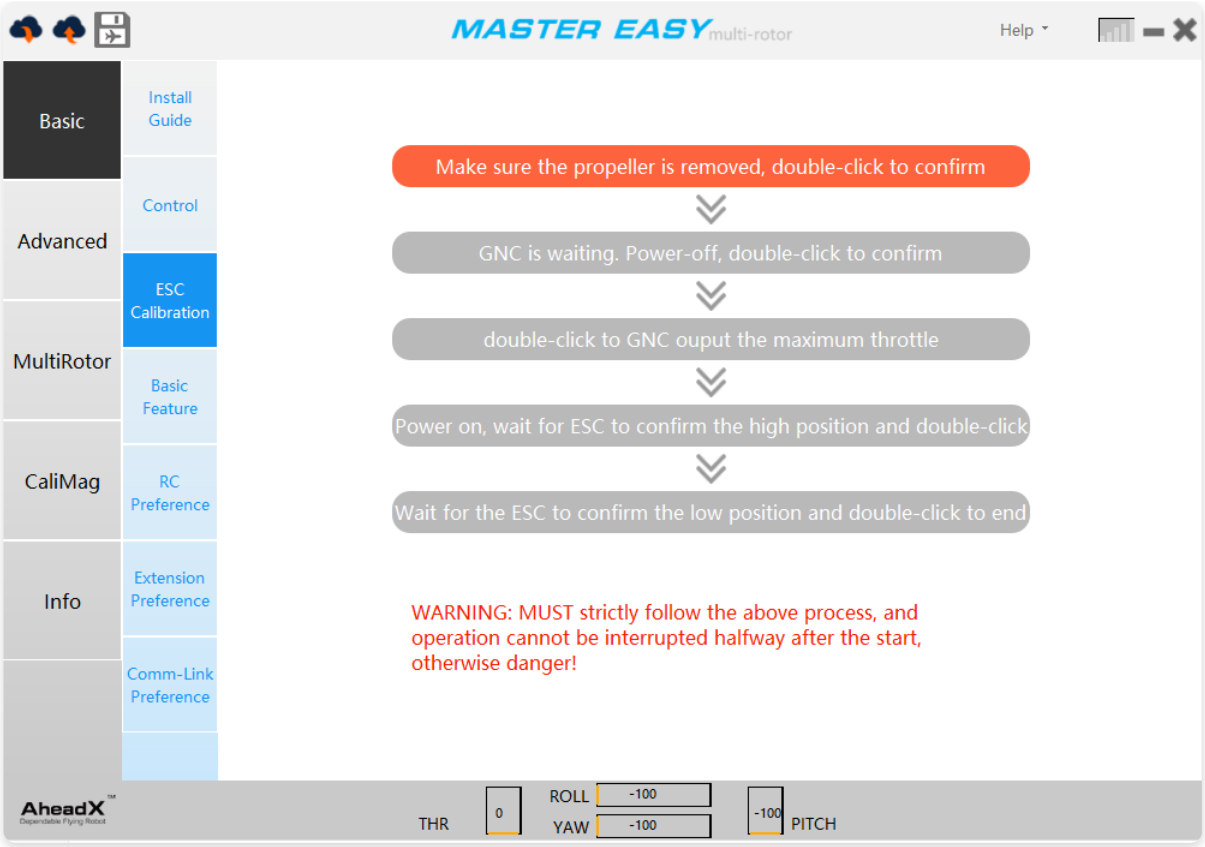
Choose the same layout as the actual drone, and use the default for other parameters. Click the button to upload the parameters and click the button in the upper left corner.



Pre-flight Prepare

ESC calibration

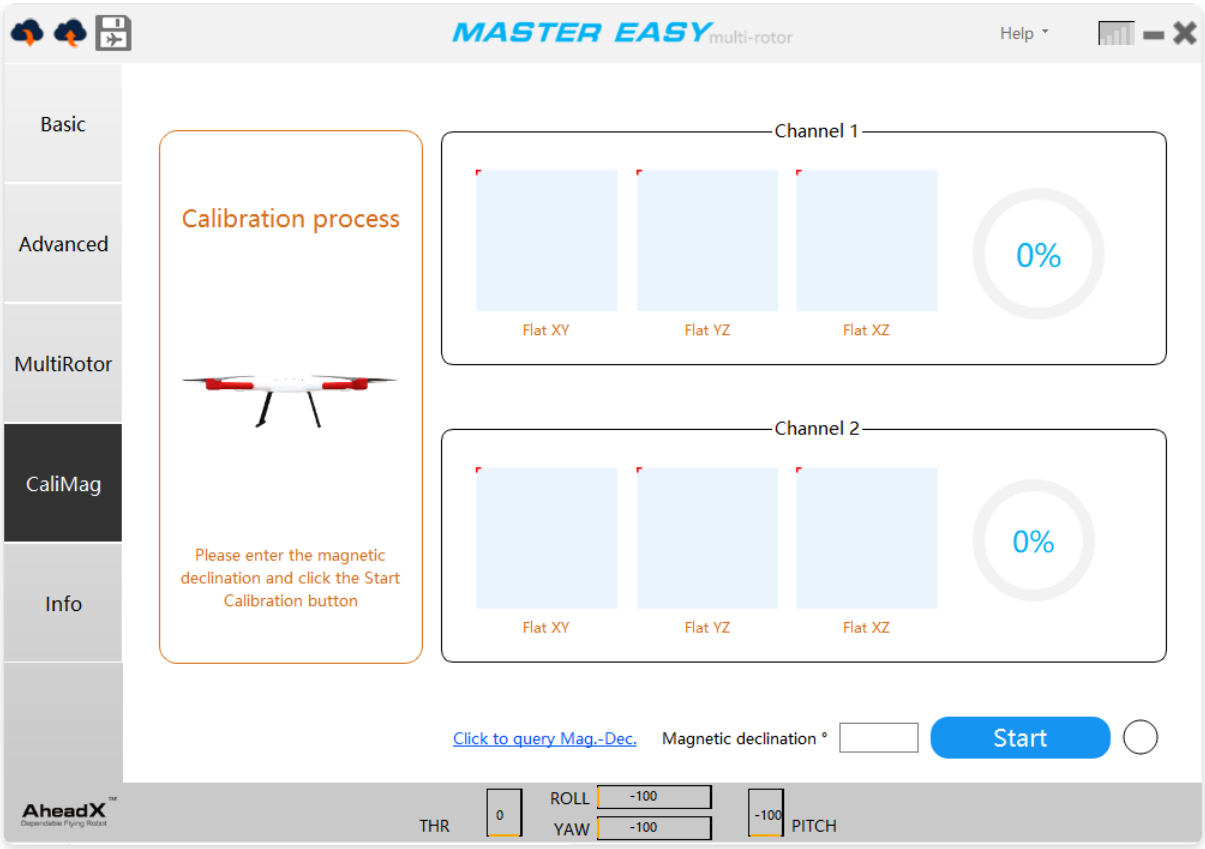
Separately power on the flight controller, open the Master Easy assistant software, and operate as shown in the figure.



Magetometer Calibration

Use Master Easy to perform advanced calibration of the flight control magnetic compass. Please perform this operation when the machine is installed for the first time or the magnetic compass has an abnormal state that cannot be accurately checked.

Please strictly follow the software calibration process prompts to complete the operation.



When Taurus 2 performs advanced magnetic compass calibration, it will simultaneously calibrate the internal magnetic compass and satellite compass module of the flight control. After completing the advanced calibration, a pre-takeoff check-magnetic compass status check is required.

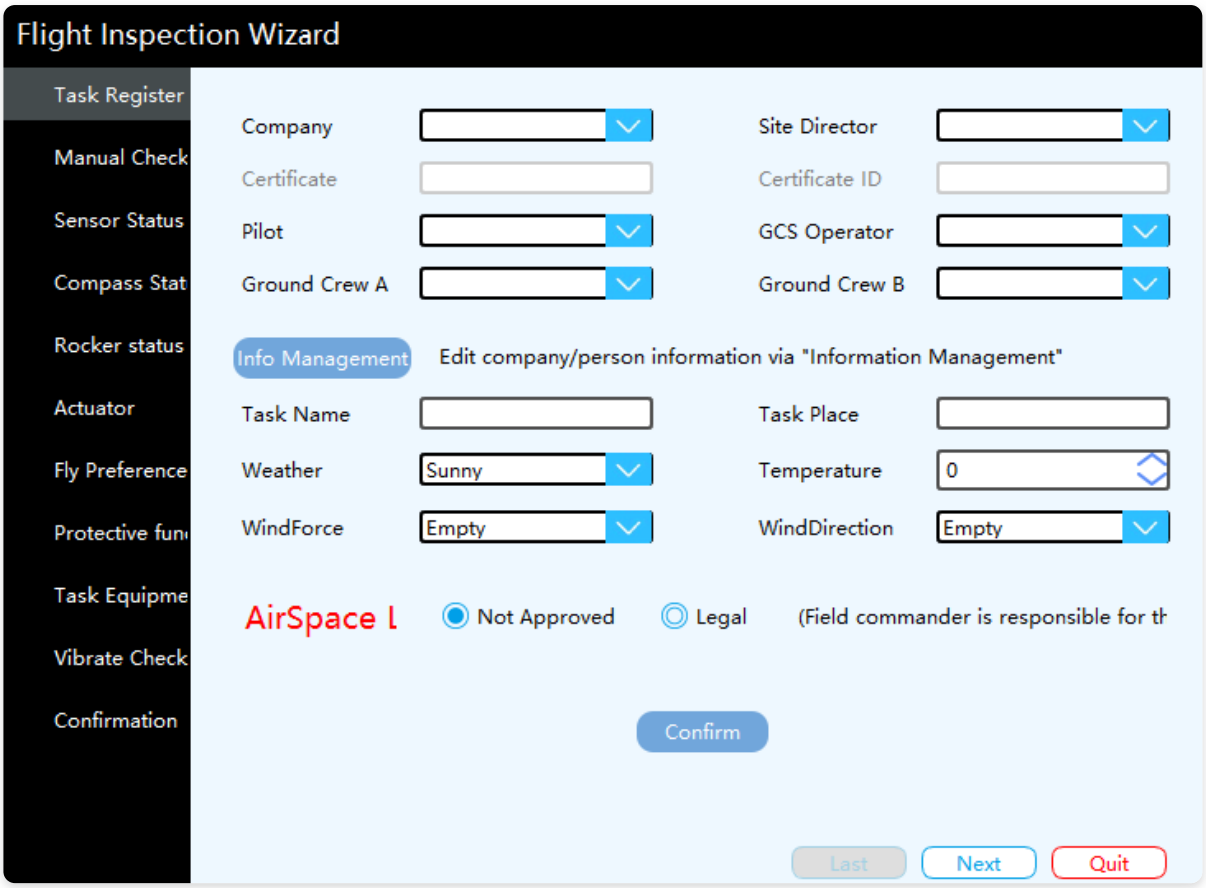
Pre-flight Check

After starting the AheadX Space ground station software and successfully connecting to Taurus 2, click the icon on the left side of the main interface to start the pre-takeoff software and hardware check.

The inspection items marked with * mark are decided according to the task situation, and other inspection items must be completed before takeoff.

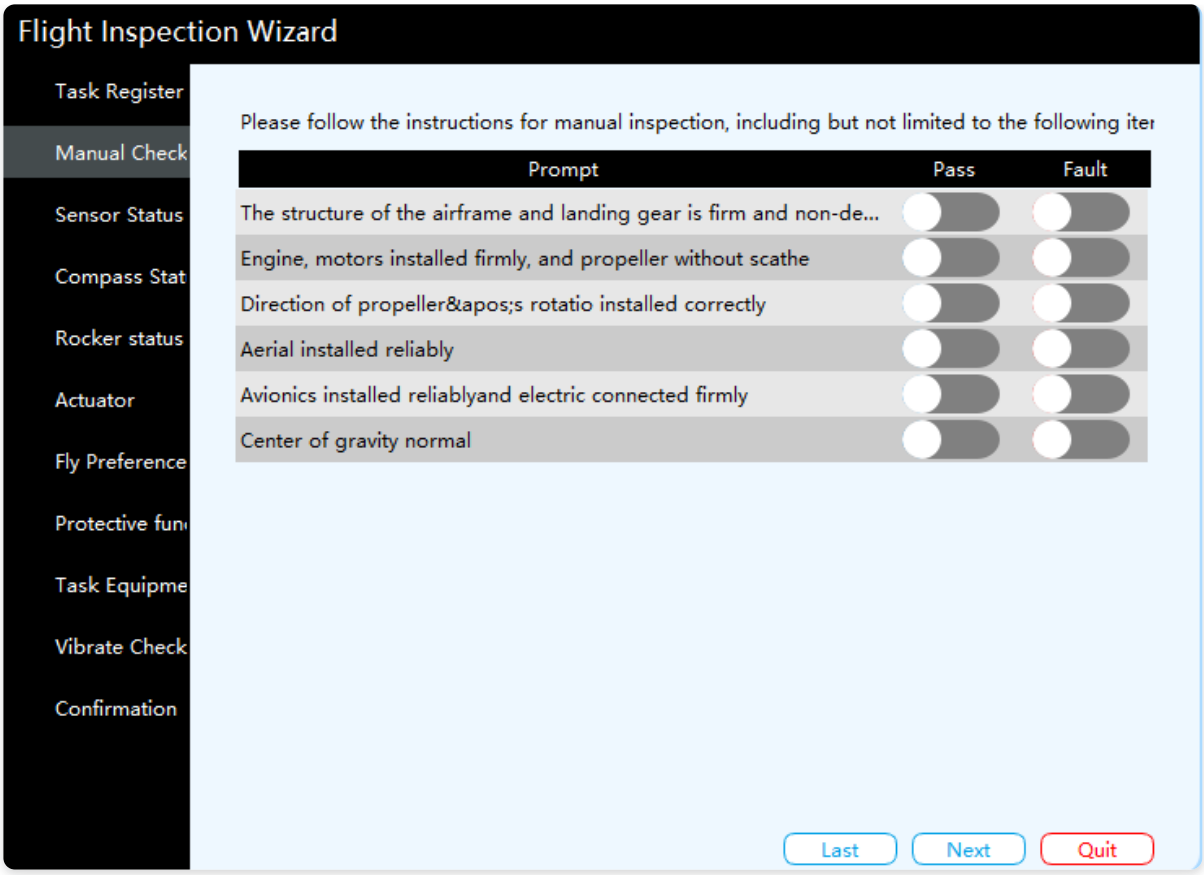
Task registration *

This page is used to register personnel and task information. Click "Information Management" to register the team members' information, which will take effect after being saved. After selecting the division of tasks, it can be set as the default value, and the team information will be loaded automatically next time.

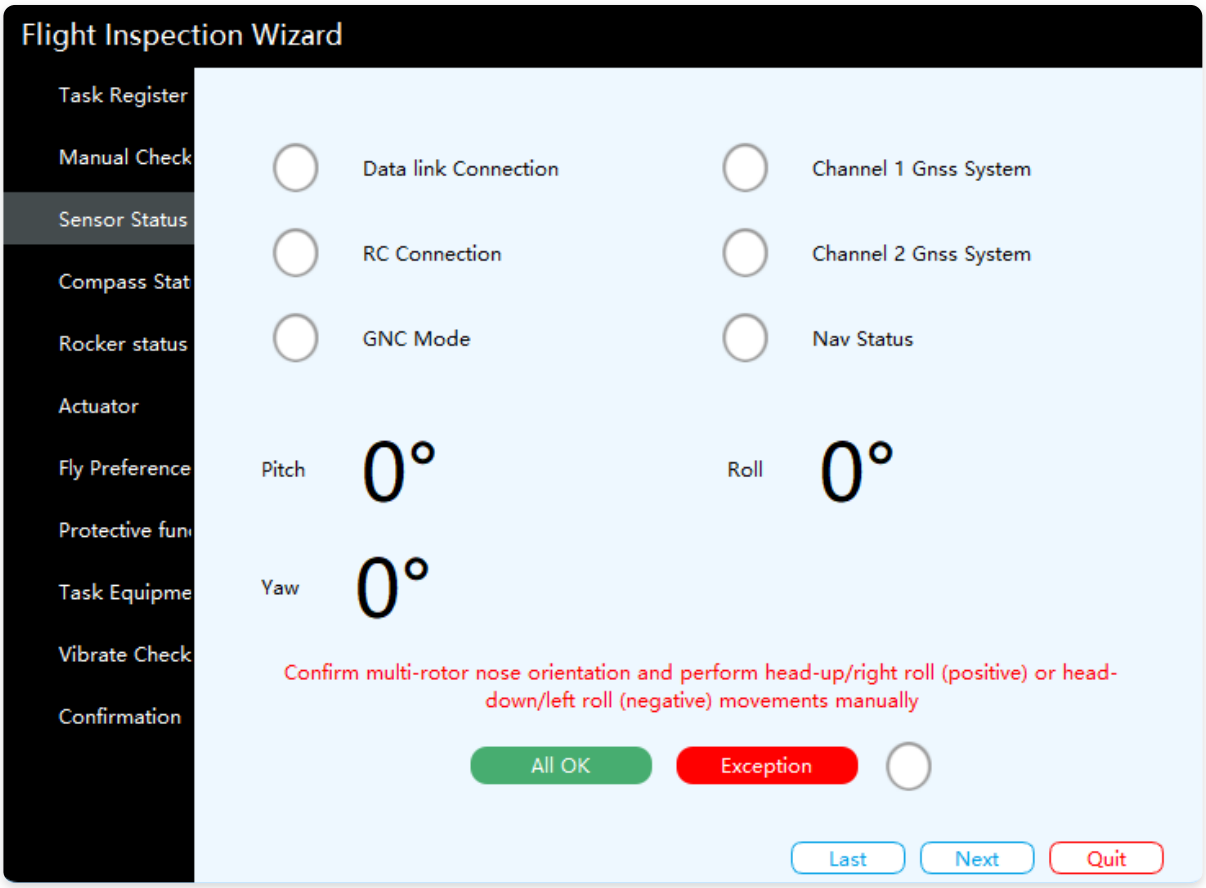


Manual inspection

This step requires the ground crew to cooperate in a detailed inspection.

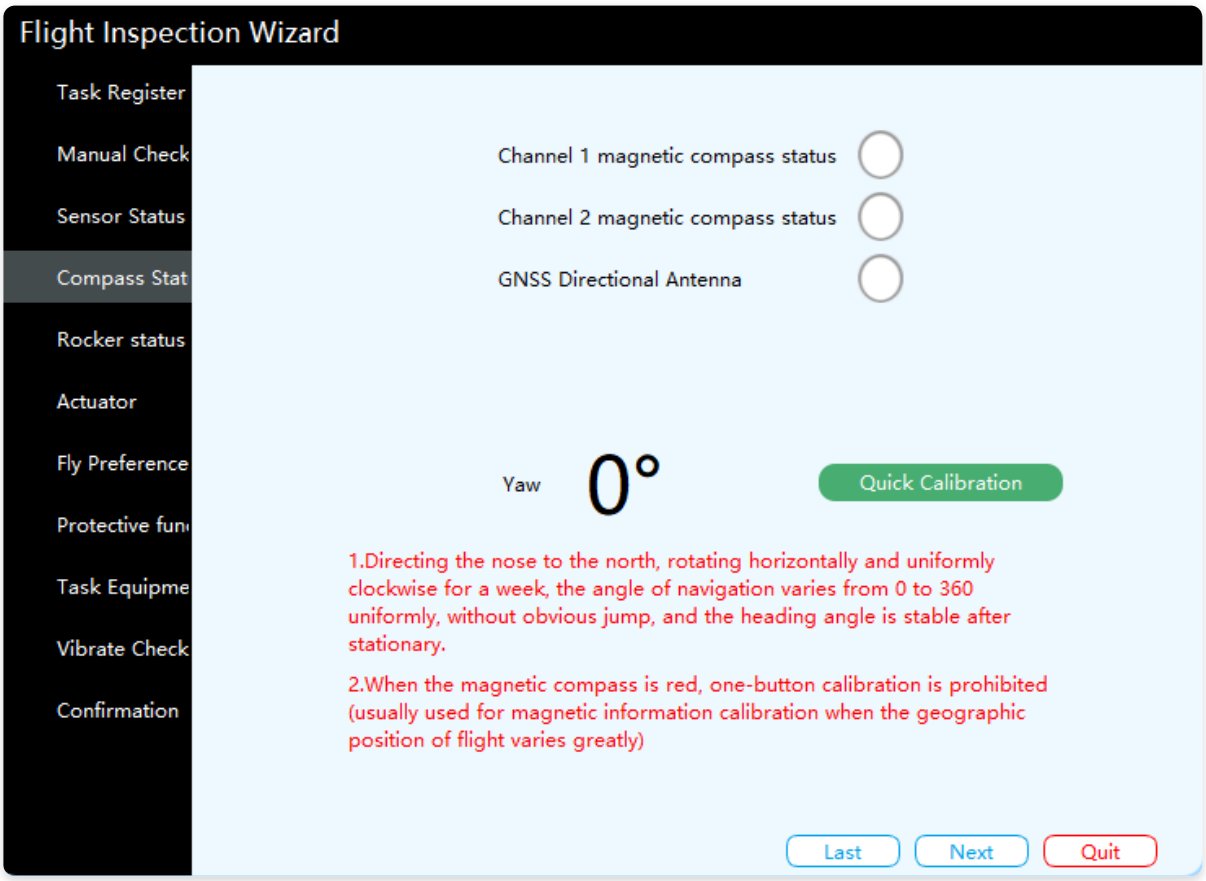


Sensor status



This page will automatically detect the current flight control status. If a red warning sign appears, troubleshoot related issues in a timely manner. The contents still need to be manually checked: Attitude angle check: Raise the aircraft to make the aircraft produce pitch / roll changes, observe the corresponding value changes, and raise the head / right roll to be positive values. If the actual changes are inconsistent with the values, please check whether the flight control installation angle is The configuration is correct;

Compass status



Entering this check interface will automatically refresh the magnetic compass information. If a yellow magnetic reference out of limit prompt appears, you can perform "one-key calibration". If the magnetic compass reports red, please check the interference source first. If there is no interference, please perform the advanced calibration operation of the magnetic compass.

Taurus 2 defaults to a dual-redundant magnetic compass, and you need to check both channel 1 and channel 2 magnetic compasses.

1. Magnetic compass selection

The heading angle displays the data of the magnetic compass currently in use. Under the HUD, find the information shown in the figure below, right-click the location and select the magnetic compass.

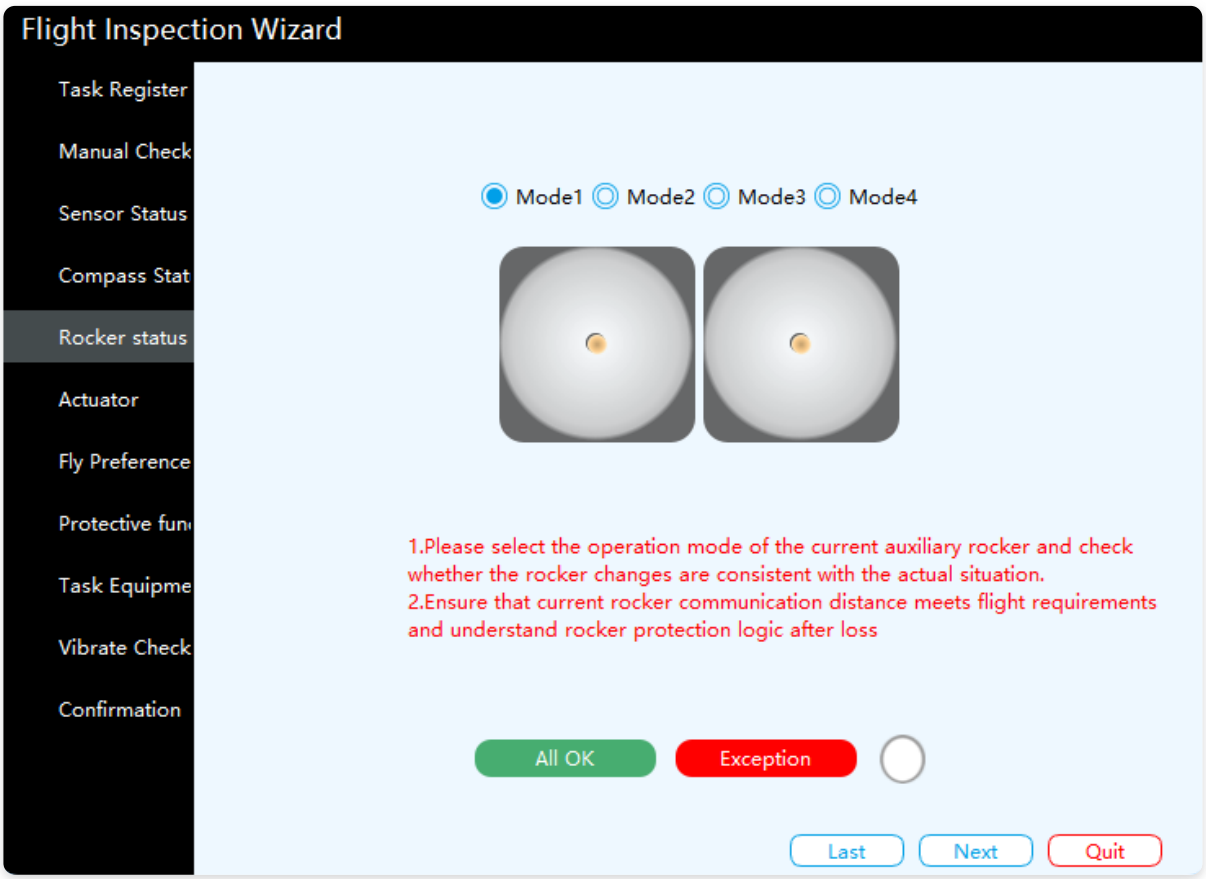
2. Heading check

When the aircraft is stationary, confirm that the current heading angle value is stable and consistent with the actual heading (0 ° corresponds to true north, 90 ° corresponds to true east, 180 ° corresponds to true south, and 270 ° corresponds to true west). In general, the heading difference Should be kept within 10 °;
Rotate the aircraft at a constant speed of 90 ° and observe whether the heading angle value changes at a constant speed of 90 ° and whether the direction of change is consistent with the actual situation. Rotate at a constant speed of 90 ° again and check until the aircraft rotates to its original position.
Complete the above checks for channel 1 and channel 2 magnetic compasses respectively.

3. Tolerance setting

Right-click the position in the figure below and select dual redundancy mode.

Rocker status

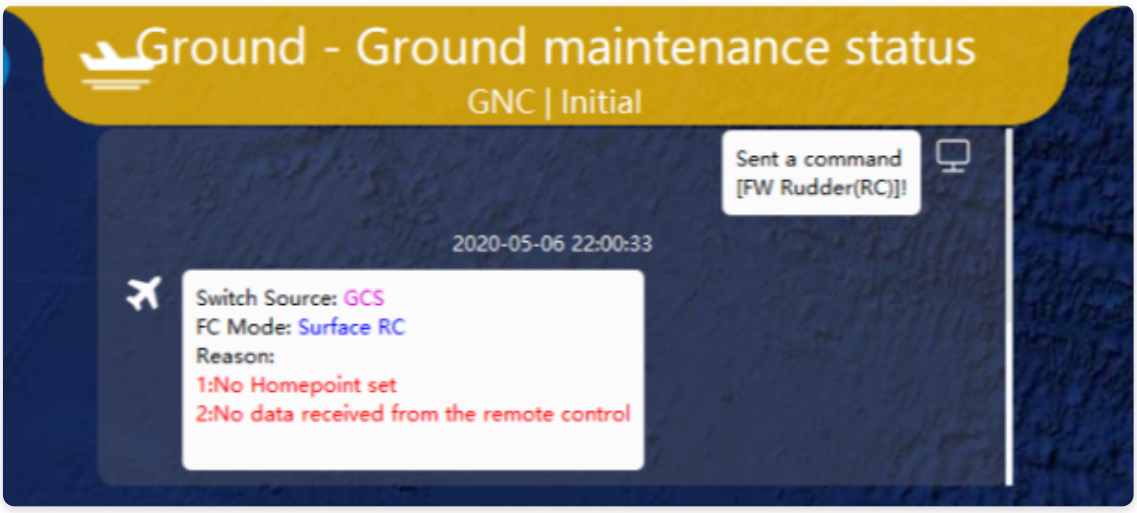


1. Rod check

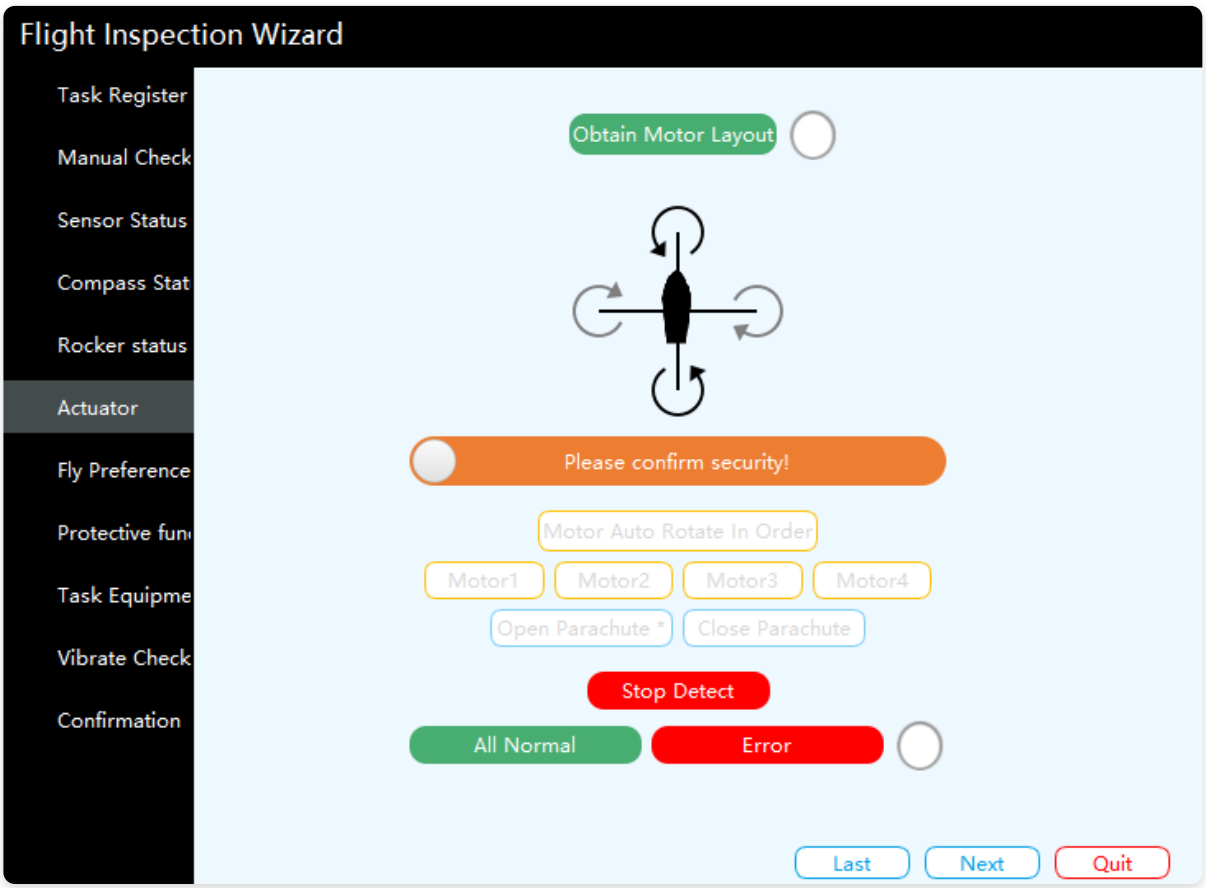
After selecting the display mode corresponding to the remote control, observe whether the actual stroke of the joystick is consistent with the display.

2. Mode switching check

Toggle the mode switch and observe whether the status of the remote control mode pops up as expected in the figure below.

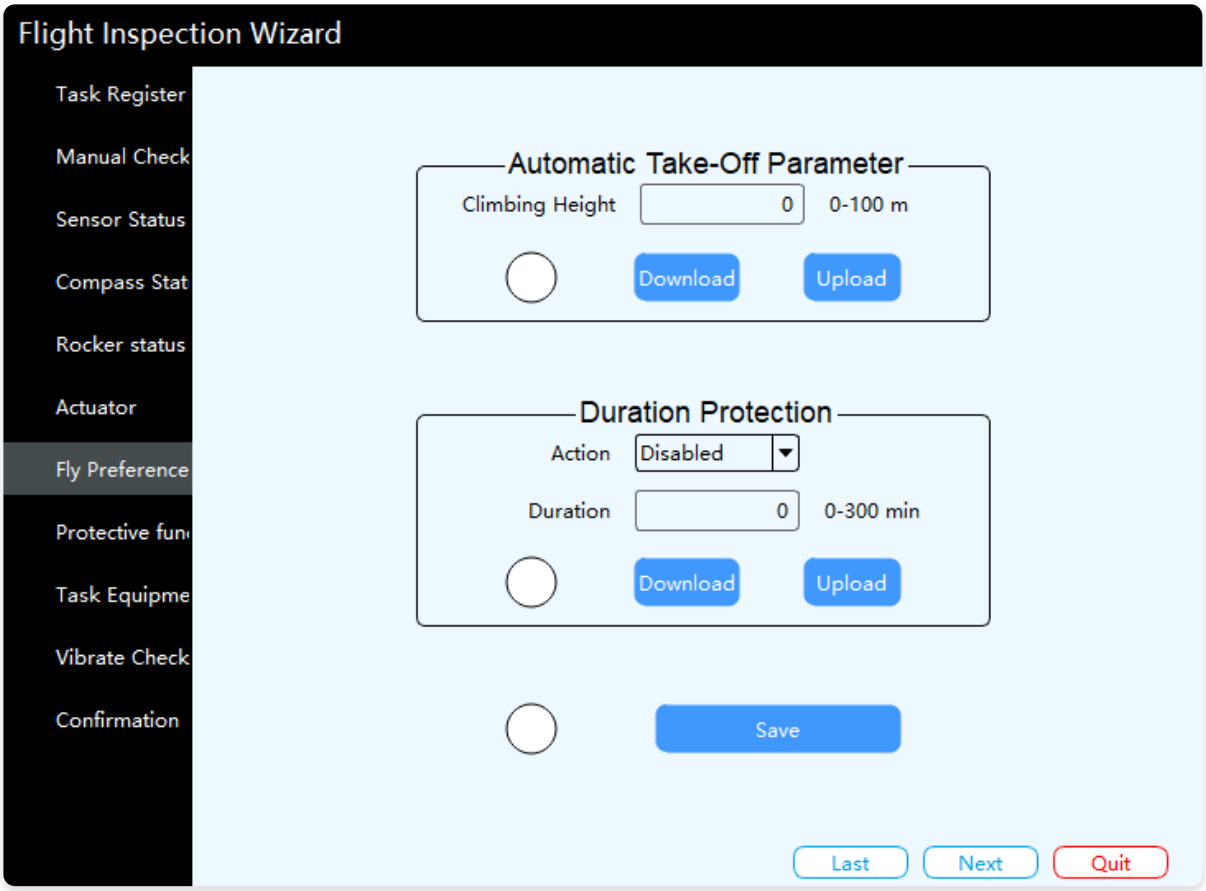


Actor Check



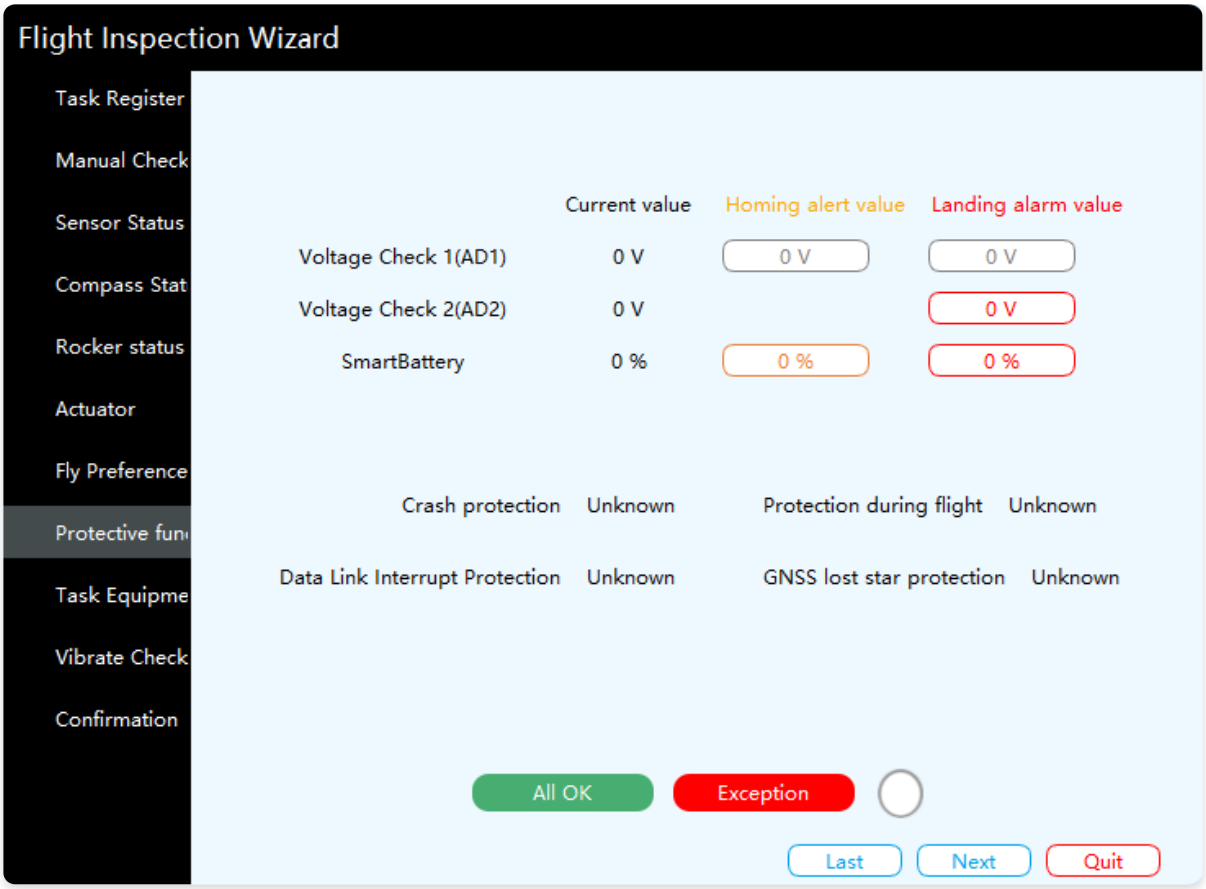
Click the Get Model button, and the current flight layout diagram will be displayed. After confirming the safety of personnel and equipment, drag the slide bar button to the right to start the inspection of the actuator of the motor and umbrella cabin (if included).

Flight preference



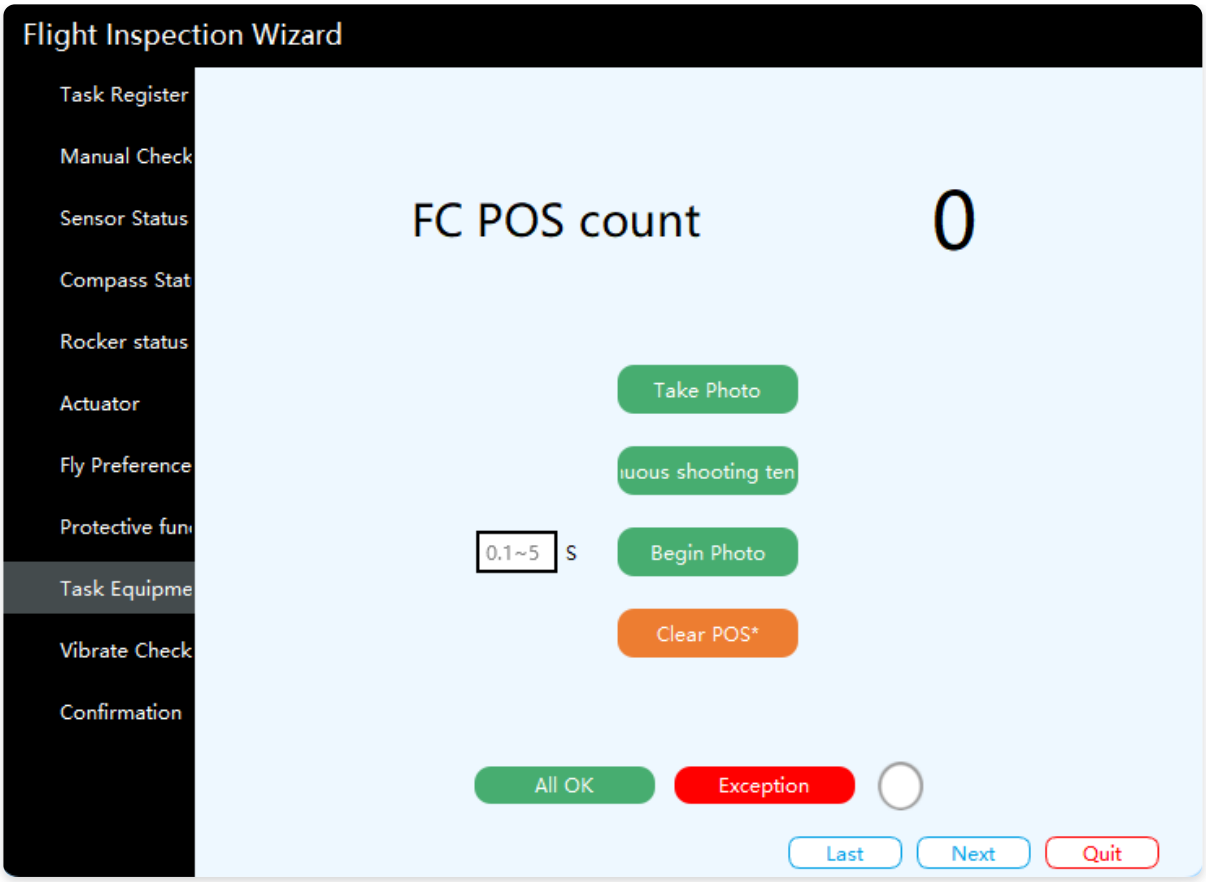
After entering the check page, the parameters will be downloaded automatically. The parameter upload is not saved, only this flight control start takes effect, and it will remain effective after saving.

Protective function



Opening this interface will automatically refresh the current flight control protection parameters. After checking the correctness, click all normal buttons to pass this check. If the protection parameters are set incorrectly, please enter the Master Assistant software for configuration.

Task equipment*



Perform manual photographing to check whether the actual number of camera photographs is consistent with the flight control record value. It is recommended to clear the last POS record data before each operation.

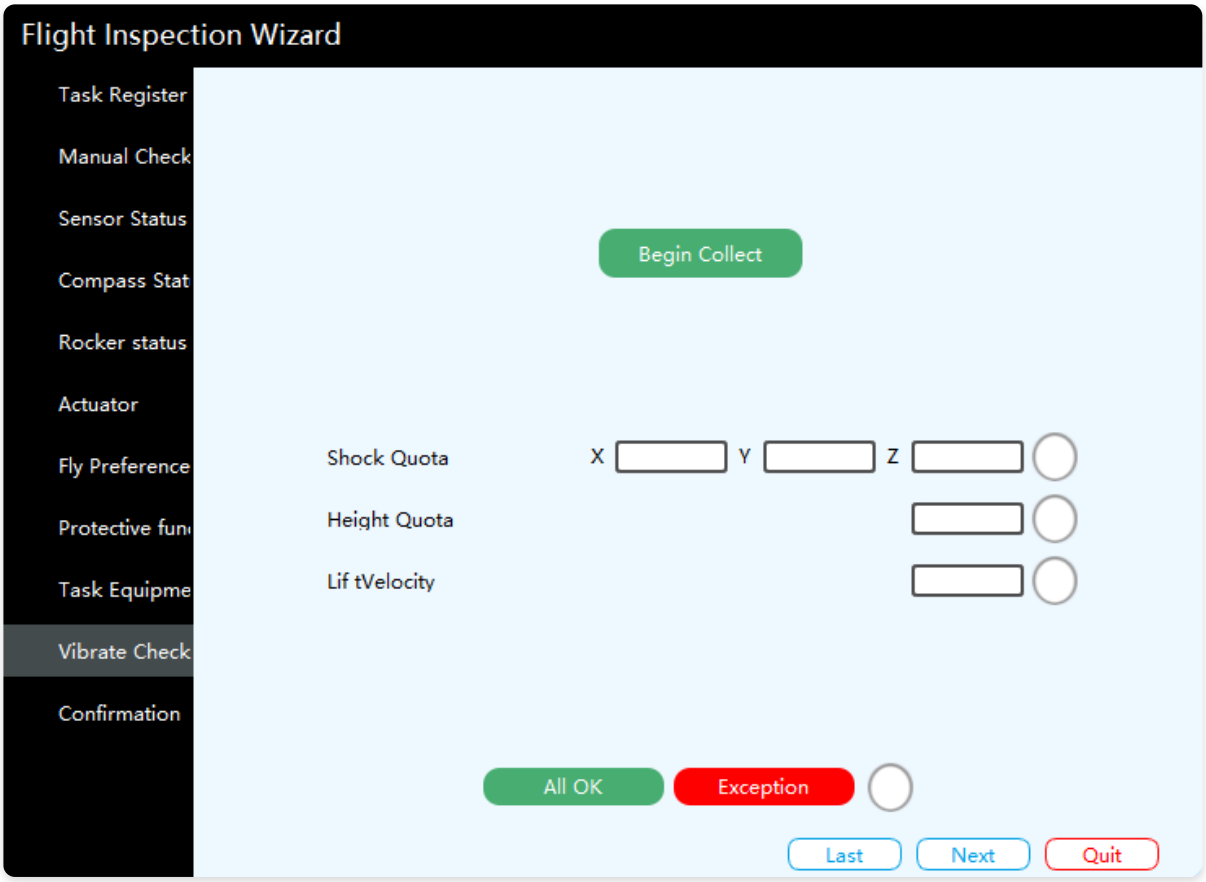
Take a photo once: only take a photo action once;

Ten times of photo taking: Automatically execute ten consecutive photo taking actions with 500ms interval between photos;

Start isochronous photo taking: Take continuous photo taking action according to the set photo taking interval, click again to stop;

Clear POS data: Click four times in succession to clear POS data;

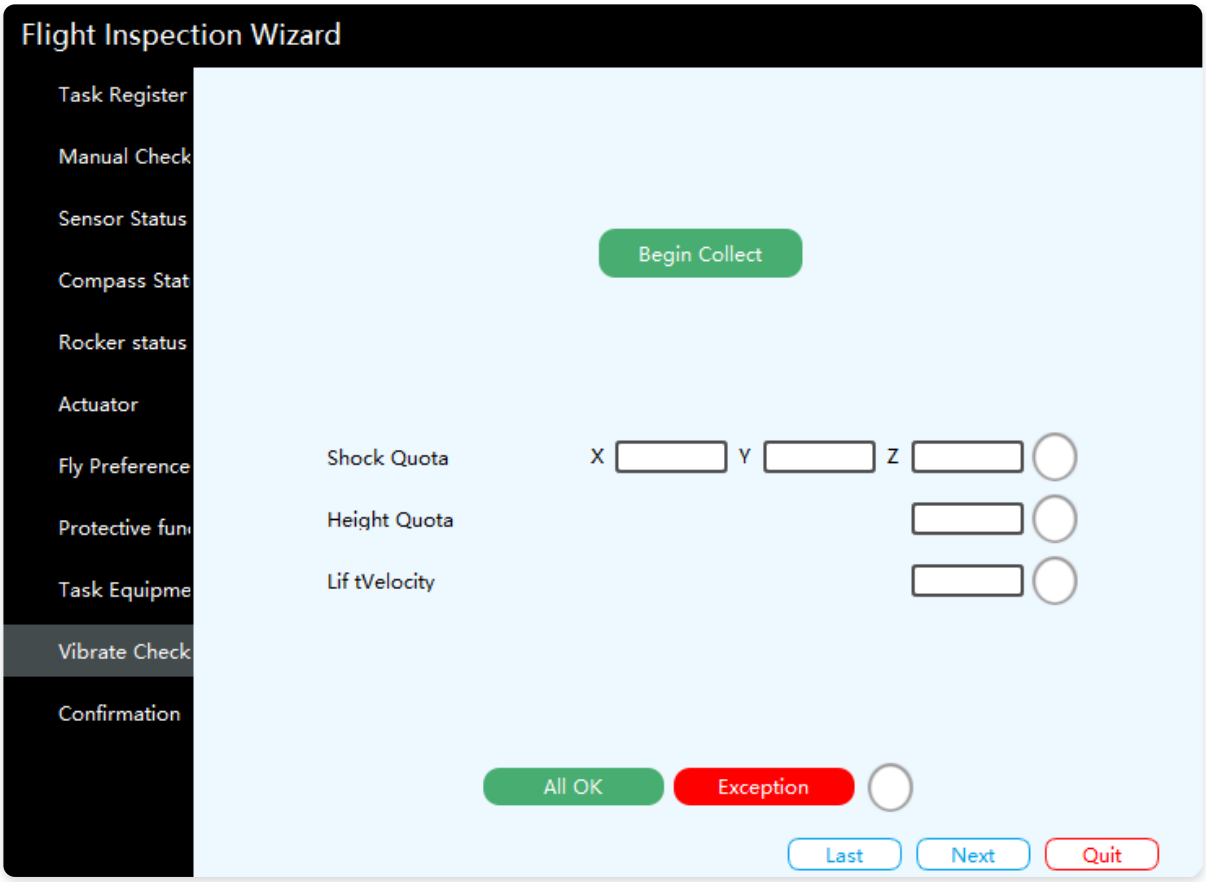
Vibrate check*



It is used by oil-powered drones to detect engine vibration on the ground. After clicking the Start Collection button, data collection will be performed automatically, and click the End Collection button to end the collection and verify the data.

Confirmation*

After the inspection is completed, click the Finish button to pop up a confirmation dialog box. After confirmation, a takeoff check report will be generated. The location of the report is: root station software root directory / Report / TakeOffCheck.



Flight

Flight mode introduction

Standby mode

In this mode, the UAV power system will be shut down. This mode is used for ground debugging and maintenance.

Ready to take off

In this mode, the UAV power system will enter a pre-rotation state, ready to take off manually or automatically at any time.

Attitude remote control

In this mode, the pitch roll joystick directly controls the attitude of the aircraft; the throttle stick controls the ascent and descent speed, setting the height at the neutral position; the yaw stick controls the steering speed.

Attitude and position remote control

In this mode, the joystick control is basically the same as the attitude remote control. The difference is that when the 1-4 channel control joysticks are in the neutral position, the drone will hover at the current altitude and position.

Take off automatically

The drone will climb to the preset altitude and hover to wait.

Return home

The drone will fly to the set home point and hover to wait. The home point defaults to the take-off point.

Route

The drone will automatically follow the preset path and perform waypoint / segment tasks.

Automatic landing

If the flight altitude is lower than the regular homing protection altitude (default 35m, which can be configured in the Assistant Software-Advanced Configuration-Landing Parameters page), and the distance between the drone and the takeoff point is greater than 10m, the drone will climb to that altitude and fly Land at the take-off point, otherwise keep the current altitude and land at the take-off point.

Home landing

The drone will fly to the take-off point and land at the current altitude.

Land in place

The drone will land at its current location.

Remote control flight

After completing all pre-flight inspections, observe the status of the indicator lights of the flight light module. When it turns green slowly, it means you can take off.

Remote takeoff

The inner eight or outer eight of the joystick are unlocked, and the drone enters the pre-rotation state. At this time, the throttle stick is pushed to the middle position. .

If an abnormality occurs during take-off, the inner eight or outer eight of the rocker can be used for emergency locking, and the power of the drone will be turned off.

Mode switch

When the drone is in attitude mode, dial the 7-channel three-segment switch of the remote control to the maximum. If it is in the maximum position, dial back to the middle position and then dial up. The module will turn blue and flash slowly. When the 1-4 channel rockers are in the neutral position, the drone will hover at the current altitude and position.

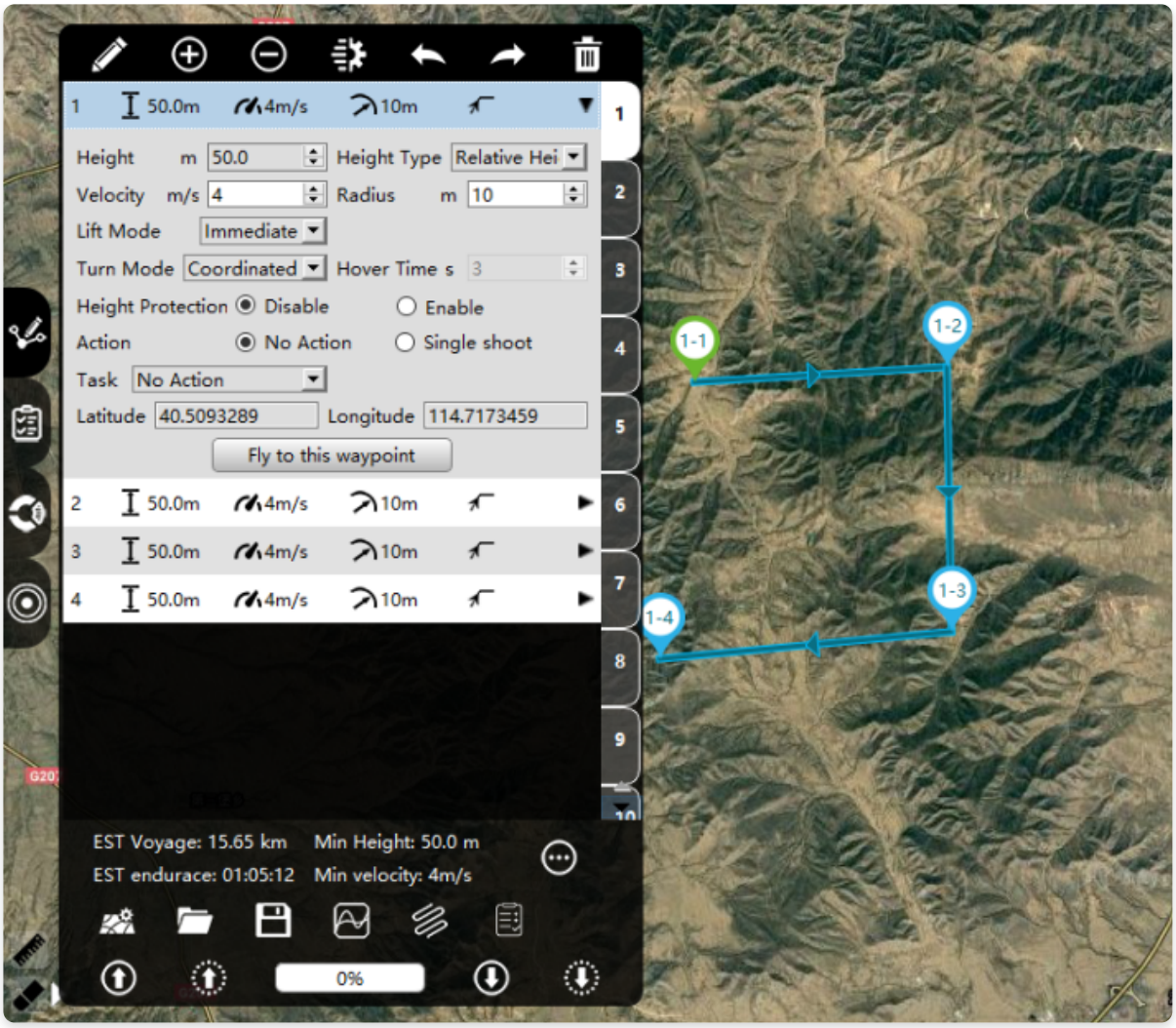
Lost control protection

After the joystick is lost, if the flying altitude is lower than the regular homing protection altitude (default 35m, which can be configured in the assistant software-advanced configuration-landing parameters page) and the distance between the drone and the takeoff point is greater than 10m, the drone will climb After reaching this altitude, fly to the take-off point to land, otherwise keep the current altitude to fly

Automatic Flight

When the remote control flight test is completed, it can cooperate with AheadX Space ground station software to realize fully automatic flight.

Click on the left side of the main interface  to pop up the route editing panel. After clicking, a cross cursor will appear. Move the cursor to the map and click to start planning the route  . After planning, the mouse will exit the editing state a little. At this time, the waypoint attributes can be modified in the route editing panel. After the modification is completed, click the button  to upload the route to the flight control.



The waypoint parameters are defined as follows:

Lifting mode:

1. Immediate Elevation: The aircraft will adjust to the target altitude according to the maximum ascent and descent rate in the set parameters.
2. Ramp up and down: The aircraft will fly along the previous waypoint or current position and connect with the waypoint space straight line and adjust the altitude. The parameters are adjusted in height to avoid exceeding the aircraft performance.

Turning mode:

1. Coordinated turning: The UAV will turn by rolling and yaw control, which is close to the fixed-wing turning method.
2. Turning to the point: The UAV only turns through the yaw control. After reaching the target point and maintaining the hover time, it starts to adjust the course alignment and fly to the next target

point.
Height difference protection: This parameter does not take effect.

Waypoint Action: After choosing to take a photo once, the drone will take a photo after reaching the waypoint.

Segment mission: You can choose to take pictures at the same time / equidistant or turn off. The drone will perform the corresponding action after reaching the waypoint until the next segment mission is triggered.

Take off automatically

Check the panel again before take-off to confirm the take-off climb height.

Double-click the automatic take-off button, the drone will enter the pre-rotation state, and will automatically take off after 3 seconds; after take-off, the drone will automatically climb vertically to the preset height, and then enter the hovering waiting stage, and maintain the current position and altitude, such as If there is no switching mode or connection command, the aircraft will keep hovering and waiting.

At this point, all the automatic takeoff process is completed.

Execution route

After taking off, click the route button, select the waypoint number, loop laps and end mode, double-click the immediate execution button, the drone will fly to the waypoint and follow the preset route.

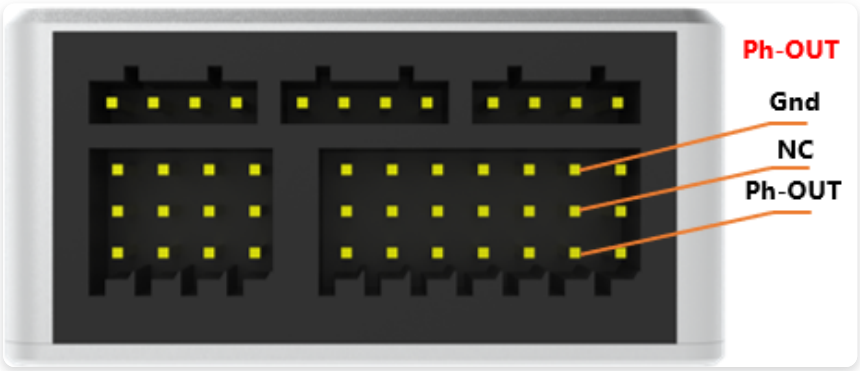
Automatic landing

Double-click the automatic landing button, the drone will fly to the take-off point and land. If the flight altitude is lower than the homing altitude, the drone will climb to that height and fly to the take-off point.

Industry applications

Aerial mapping

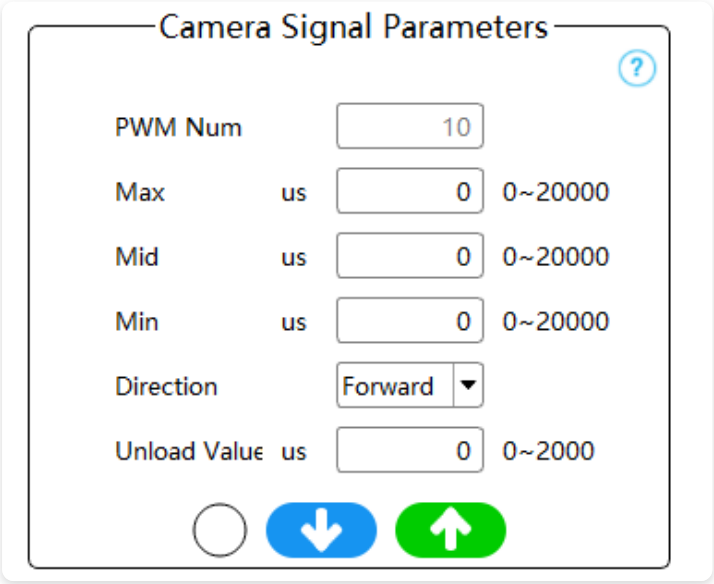
Camera connection and inspection



Connect the camera signal line to the Ph-OUT pin. The default is rising edge trigger.

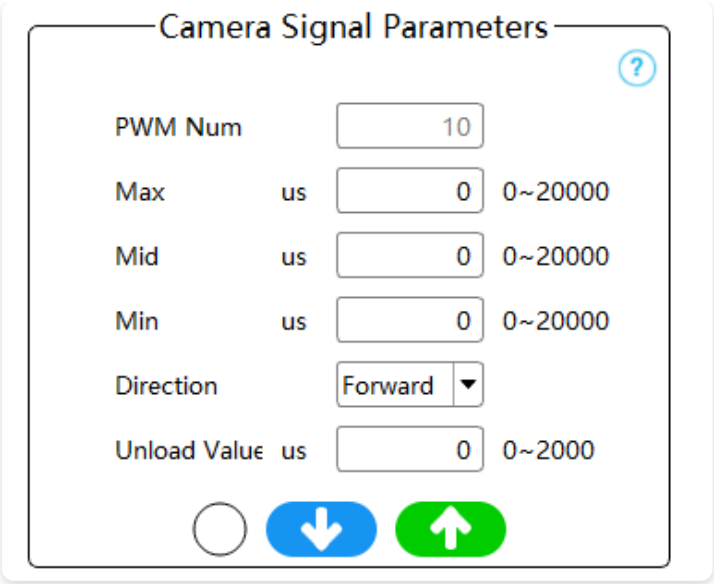
Trigger mode adjustment:

Trigger on falling edge: Connect Master Easy Assistant software, open the basic configuration-control distribution interface as shown below:



Set the direction to reverse, upload and save the parameters.

Trigger on specific pulse width:



Fill the default pulse width into the minimum value;

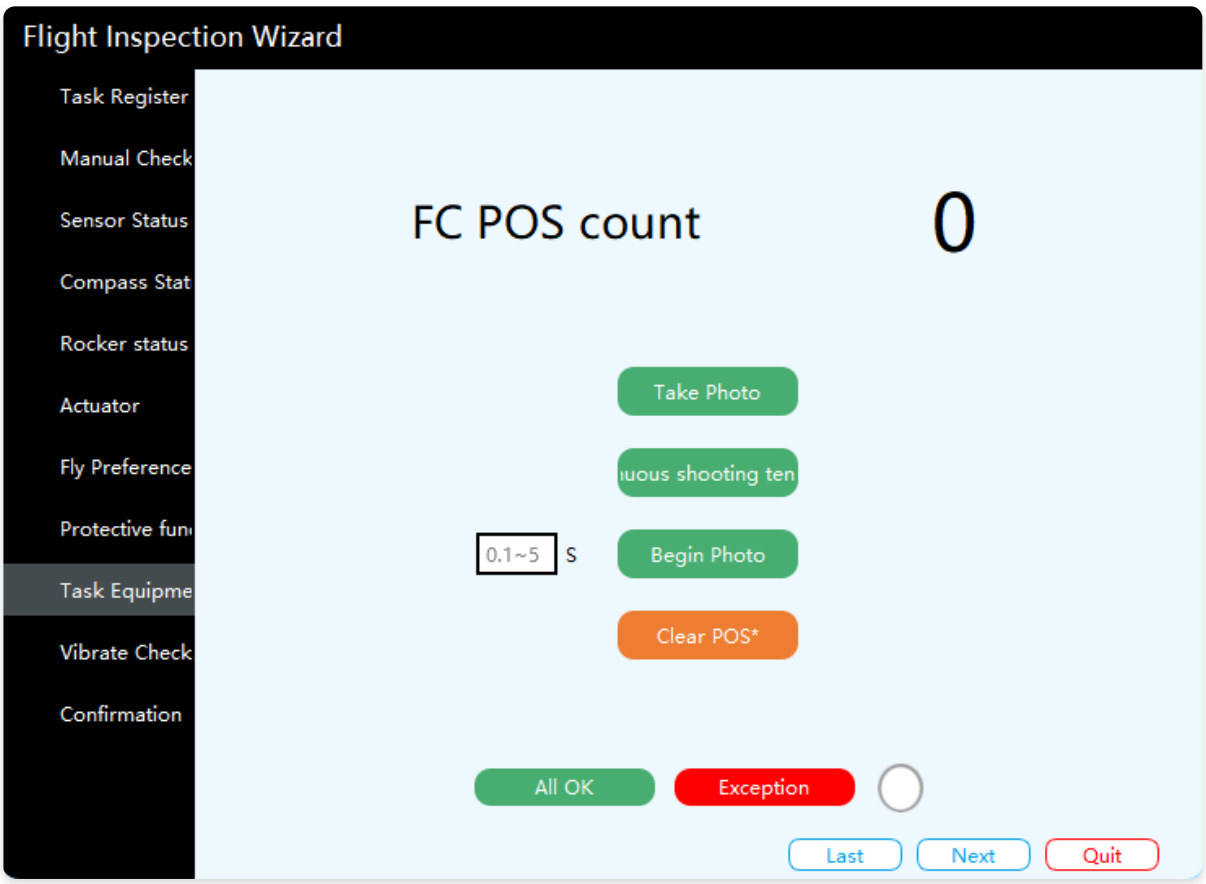
Fill in the maximum pulse width of the photo;

The direction selection is normal;

Upload and save the parameters.

Camera inspection:

Connect to Space and open the check panel before takeoff as shown below:



Perform manual photographing to check whether the actual number of camera photographs is consistent with the flight control record value. It is recommended to clear the last POS record data before each operation.

Take a photo once: only take a photo action once;

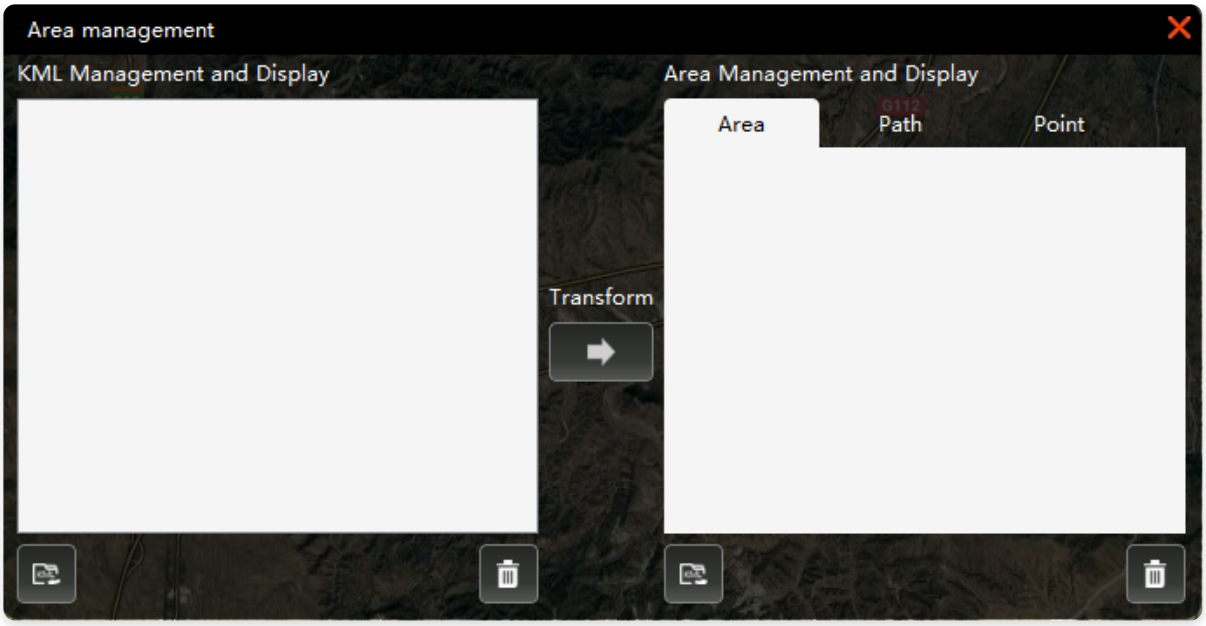
Ten times of photo taking: Automatically execute ten consecutive photo taking actions with 500ms interval between photos;

Start isochronous photo taking: Take continuous photo taking action according to the set photo taking interval, click again to stop;

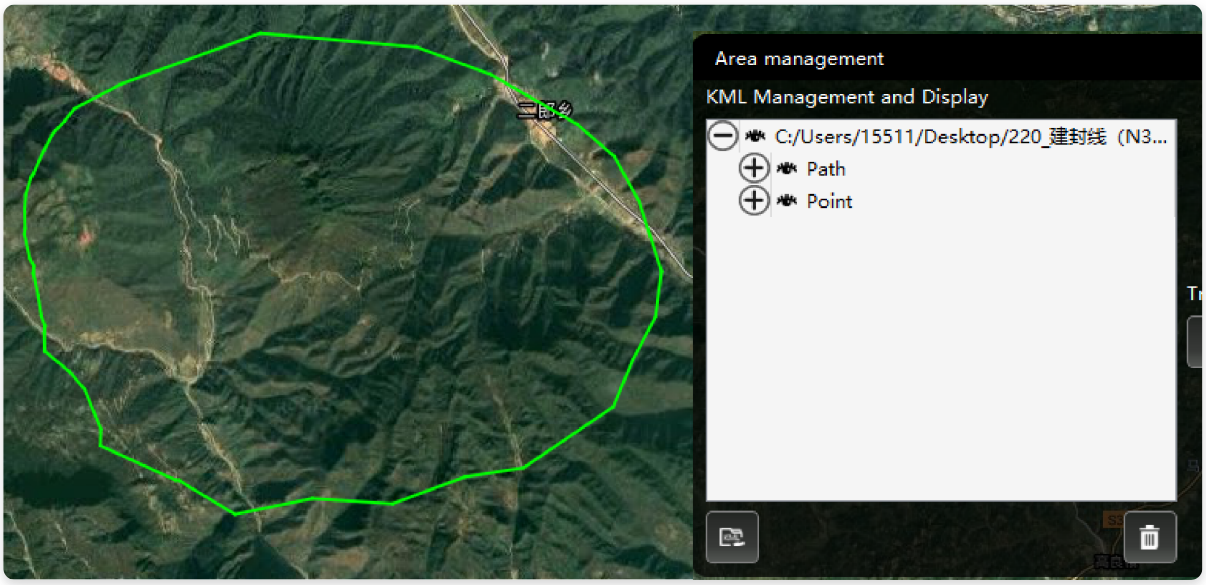
Clear POS data: Click four times in succession to clear POS data.

KML & KMZ file import

Click the left side of the main interface to pop up the route editing panel. Click the icon in the lower left corner of the panel to call out the area management interface.

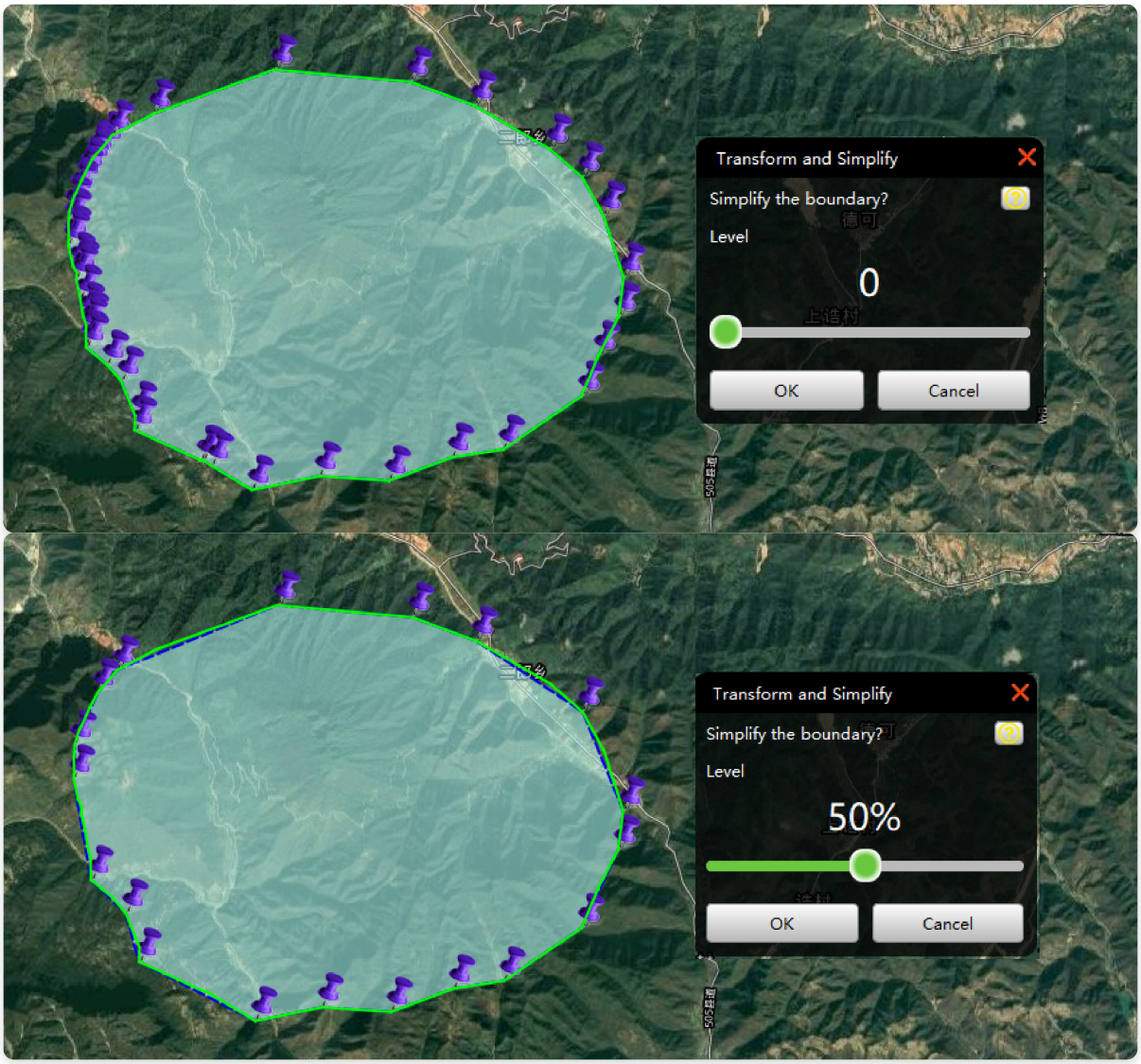


Click the button  to import the KML & KMZ area file, after importing, open the KML lowest file to select the area, as shown below:



Click the button  to call out the conversion interface to convert and simplify the file in order to generate the scanning route.

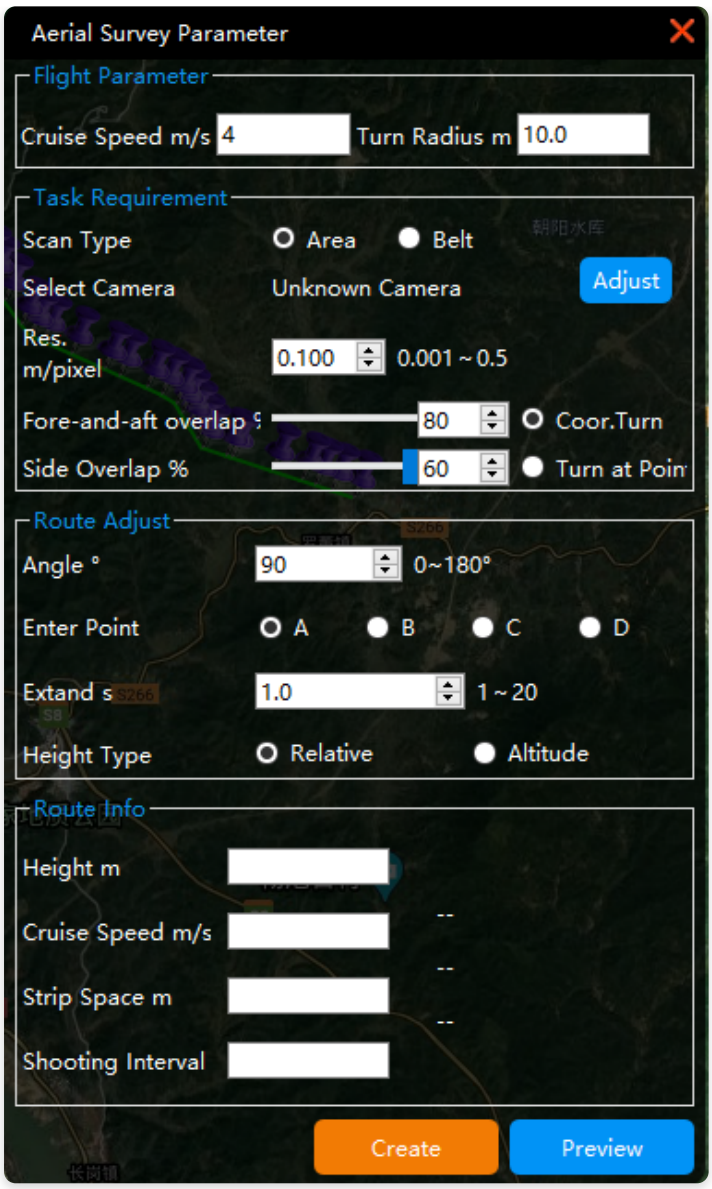
For documents with more points, it can be simplified appropriately, as shown below:



After the simplification is completed, click the confirm button to close the interface.

Generate scan route

After selecting the area on the map, click the icon below the route editing panel to call up the aerial survey parameter panel, as shown below:



Flight parameters:

Enter the flight speed and turning radius of the drone during the operation, according to the following standards:

Cruising speed: 4 Turning radius: 10

Cruising speed: 6 Turning radius: 20

Cruising speed: 8 Turning radius: 30

Cruising speed: 10 Turning radius: 40

Mission requirements:

Measuring area type: select the corresponding type.

Camera selection: Select the camera used and the corresponding camera installation method. If it is not included in the list, you can add it manually.

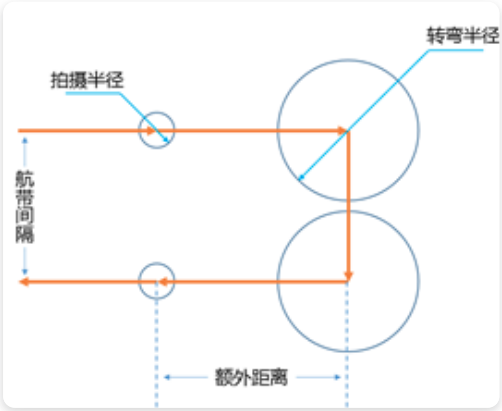
Please fill in the resolution, heading / side overlap ratio according to the actual mission requirements.

Route adjustment:

Scanning angle: modify the UAV scanning route angle, which can be previewed in real time after modification.

Entry location: Confirm the entry location based on the ABCD point displayed in the map area.

Turn extension time: the product of this time and the flight speed is the extra distance added to the turn



Altitude type: You can choose to fly by relative or altitude.

Route information:

You can view or manually modify the current scanning route information.

After the parameter modification is completed, the scan route will be generated after clicking the Generate button.

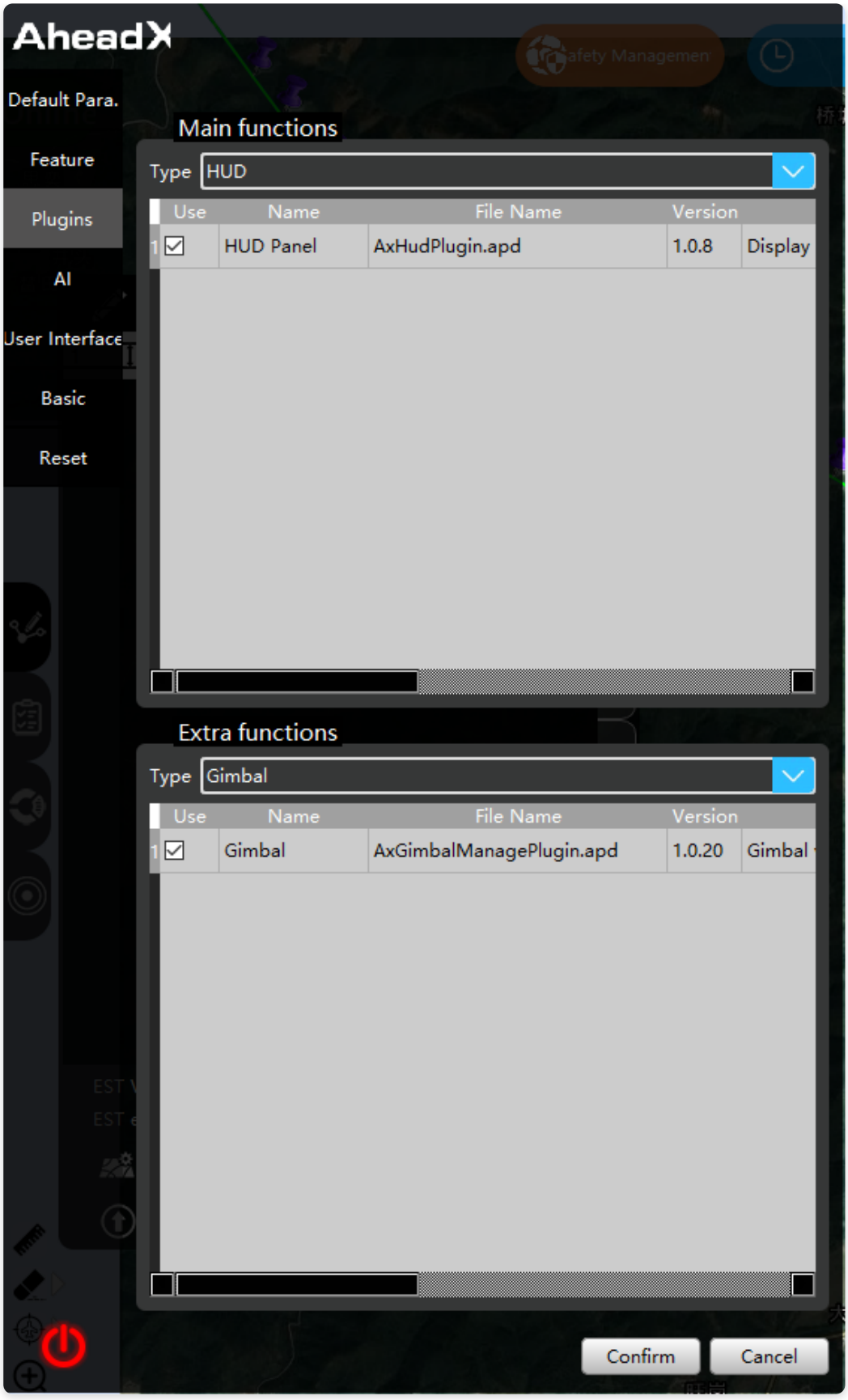
Reconnaissance monitoring

Ready

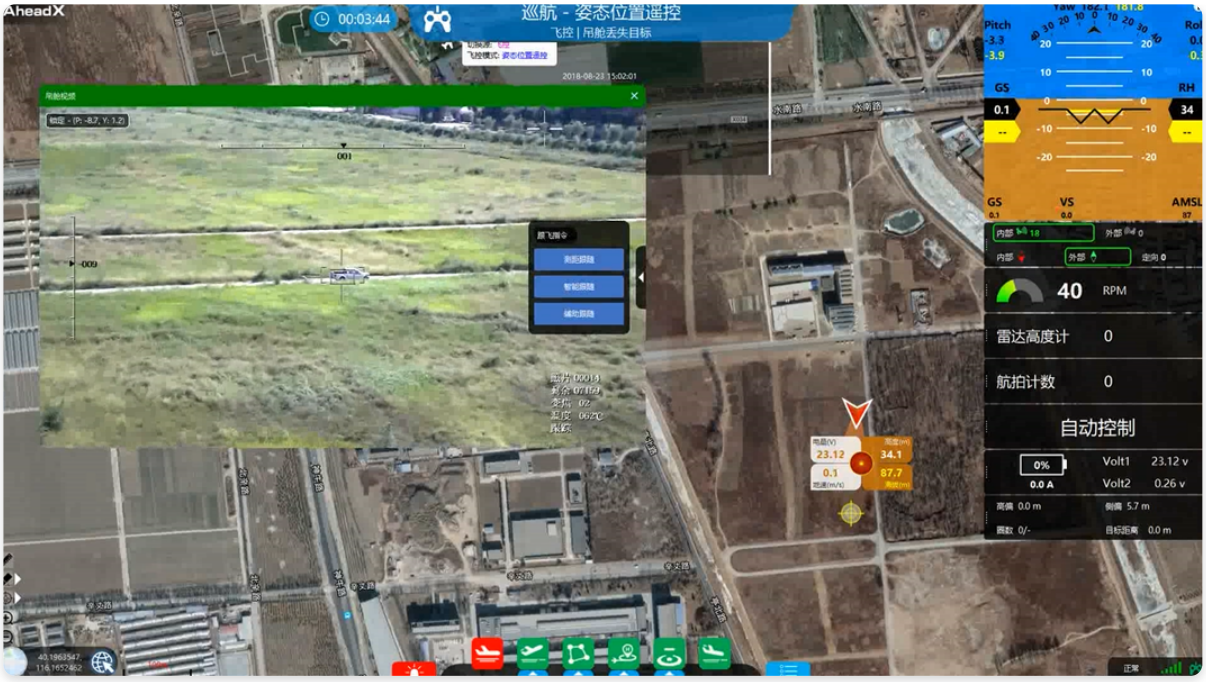
Please ensure that the pod follow-up function has been tested and can be used normally.

Basic process

Open the AheadX Space ground station software, as shown below, check the pod video and restart the ground station.



After restarting the AheadX Space ground station software, right-click the map area to open the pod video plugin



Click the right button of the pod video to call out the pod tracking menu. The multi-rotor pod follows three basic commands.

Auxiliary following: The multi-rotor head will always face the target point, at this time, you can use the remote control pitch control to approach or move away from the target, roll around to track, and adjust the height of the throttle.

Intelligent following: At this time, the flight controller will estimate the distance to the target point, the UAV will keep the distance to track, and the joystick control is the same as the auxiliary following.

Range following: The only difference between this mode and smart follow is that the distance measured by the pod laser (required by the pod) is used for tracking.

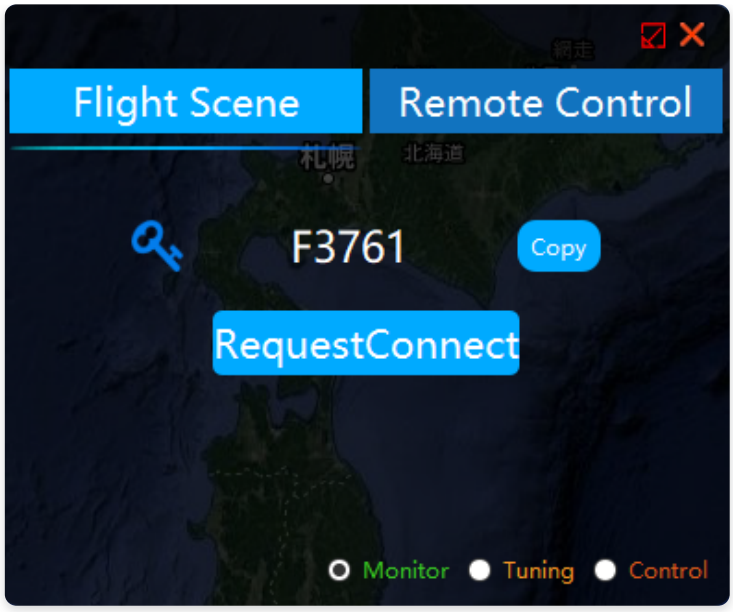
After selecting the pod video window, press tab to call out the pod operation prompt. After the pod locks the target, double-click to execute the above instructions to complete the corresponding tracking action.

Remote control

User must register and log in to the AheadX Galaxy cloud management system to use the Remote control function for remote monitoring and control. The first time you start the ground station, the user registration interface will pop up, enter the account password to log in, if you have not registered or forgot your password, click the bottom link.

After successful login, the login interface will be minimized to the upper left corner

Right-click the map area to open the remote control panel.



Flight scene

On-site personnel send the secret key to the remote personnel, and click the request connection button to wait for the remote personnel to access

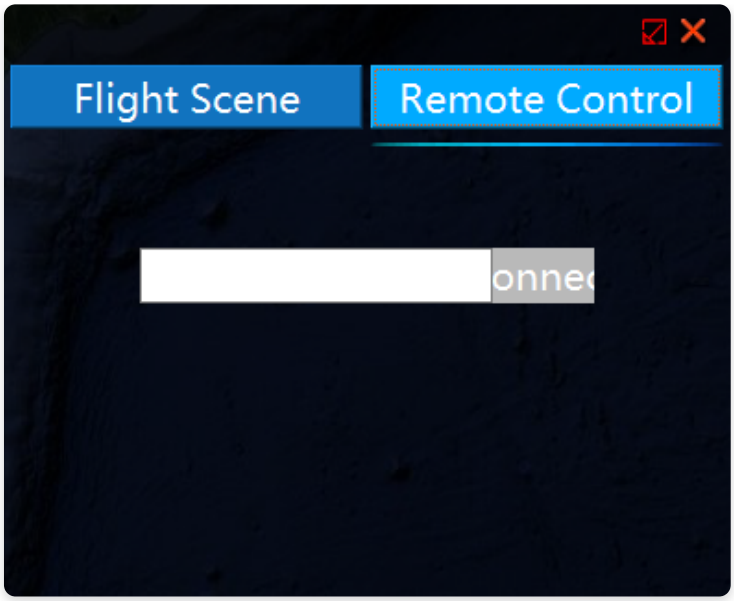
 : Click this button to refresh the key

Monitoring: The default state is the monitoring state. At this time, the remote can only view the drone data, and cannot modify parameters or control the flight.

Tuning: The far end can view the drone data and adjust the parameters, but cannot control the flight.

Control: At this time, the far end has all the rights (the flight site can still use the auxiliary joystick for emergency intervention).

Remote control



The remote personnel enter the secret key provided by the field personnel, click the connect button and wait for the other party to access

Mini interface

After the connection is successful, click to display the mini interface, as shown below:

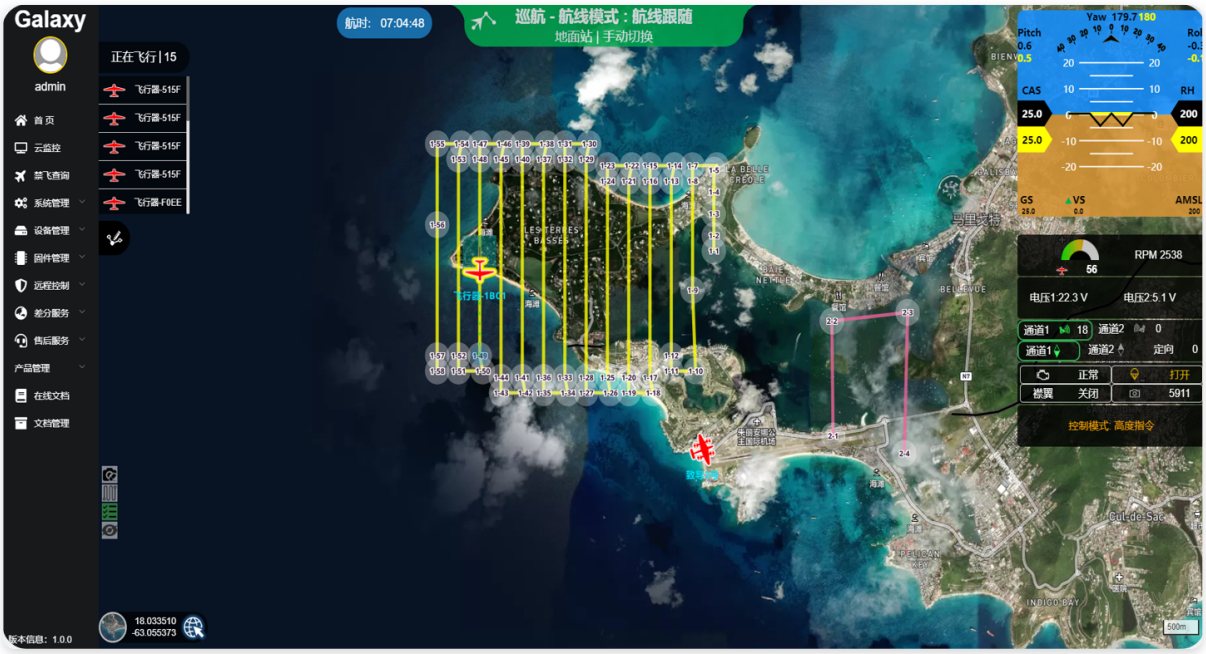
Not connected or abnormal network

Remote monitoring

Remote control terminal status display

Flight scene status display

AheadX Galaxy System



The AheadX Galaxy cloud system can realize the functions of cloud surveillance, remote control, differential base station sharing, network RTK, no-fly query, and after-sales query.

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