CUAV

LecentGroundControl

V1.0.0-beta9

User Manual

CUAV Tech Inc.,Ltd.

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CONTENTS

Note before use

LGC Ground Station Technology Explorer Edition is based on the secondary development of QGroundControl, and is intended for testing purposes only, and is not to be used as an accessory to the product or for commercial purposes. This note mainly describes the differentiated function descriptions, for generalized tutorials, please visit https://docs.qgroundcontrol.com/master/en/qgc-user-guide/.

The LGC Ground Station is primarily intended for end users or novices, with some necessary safety restrictions to improve flight safety. It does not necessarily conform to the usage habits of experienced users. Optimizations and new features are based on the ArduPilot firmware and may not necessarily be adapted to the PX4 firmware.

Feel free to share your experience and any problems you encountered via the following email. pm@cuav.net

Version differences

Key Features of LGC 1.0.0-beta1 (based on QGC version 4.4.3 main differences)

1. New features

a. Support network RTK (CORS/NTRIP).

b. Added on-board ADSB function for Ardupilot models

c. Support GCS flight mode lock configuration to restrict and hide flight modes with high risk factor.

d. Support one-key course altitude correction

e. Support MAVlink forwarding, support UAV forwarding to UAV, realize inter-aircraft communication.

f. Support RTMP video streaming, can stream the video to the live platform

g. Support viewing real-time flight data of multiple aircrafts at the same time.

h. Supports scanning remote ID messages around and displaying them.

2. Exploration test function

a. Support cluster formation flight, applicable to fixed-wing/vertical take-off and landing fixed-wing/multi-rotor models, optimize one-stop control logic for multiple aircraft.

3. Optimization Functions

a. Enrich and improve Chinese translation

b. Optimize the display of flight data, and show the Chinese instrument panel.
c. Optimize the mandatory checklist to guide newbies to pre-flight check.
d. Encrypt all parameter interfaces to prevent newbies or misuse from adjusting flight parameters.
e. Optimize MAVLINK pod gimbal control, support displaying two images at the same time.
f. Modify QGC video encoder from decodebin3 to decodebin to support some H264 RTSP video streams.
g. Optimize the display of battery information, add current, and set to display percentage/voltage.
h. Optimized flight view for vertical takeoff and landing fixed wing.
   - Add wind vane indicator and wind speed
   - Add real-time altitude and speed shortcut commands, hover radius command
   - Add airspeed zero and start point update.
i. Optimize the configuration portal and functions of Remote ID to meet China's policy requirements.
j. Optimize the reminder window after modifying parameters, and support one-key restart.

4. Fixes
   a. Repair the bug of route planning in QGC Chinese mode.

b. Fix the problem that some serial ports cannot be found in the connection configuration.

Key Features of LGC 1.0.0-beta4

1. **Upgrade and optimize remote ID scanner**
    a. Support Bluetooth scanning, support Bluetooth and WIFI to be turned on on demand.
    b. Optimize remote ID information display interface
    c. Support map display location
    d. Support drone proximity alert
2. **Add simulator function**
    a. Support software-in-the-loop simulation for Ardupilot firmware.
    b. Support vehicle types such as plane, multi-copter, rover, and sub.
    c. Support single creation or batch creation of simulations
3. **Add about LGC page**
    a. Add version upgrade reminders
    b. Migrate the disclaimer function to the "About LGC" page.
    c. Add shortcut entrance to related platforms
    d. Add feedback and evaluation portal
4. **Fixes**
    a. Fixed the problem that when disconnecting a drone in the case of multiple drones, the setting menu of the remaining drone is lost.

Key Features of LGC 1.0.0-beta7

1. Function optimization and upgrading

a. Optimize the interaction of airspeed check in fixed-wing pre-takeoff check.

b. Upgrade the password function in the parameter page to support users to set their own passwords, change passwords, close passwords and restart verification through the interface.

c. Optimize the connection of RTK devices, so that an RTK module can provide RTK service for UAVs and at the same time provide positioning data for ground stations to avoid port conflicts.

d. Uniformly add "restart" button to all configuration pages in UAV setting window.

2. New CUAV product module configuration interface

a. Reconstruct the power setting interface, which can quickly set the CUAV power module.

b. Reconfigure the air pressure calibration interface to quickly set up the CUAV air speed meter module.

c. Add GPS setting interface, which can quickly set up CUAV positioning module.

Key Features of LGC 1.0.0-beta8

1. **Enhanced configuration experience for multirotors, VTOLs, and fixed-wing**
    a. Expanded and refined subcategories for common multirotor models while removing uncommon variants. Replaced images with APM official model diagrams and added a link to APM official documentation;
    b. Added a frame configuration page for plane firmware. Supports switching between fixed-wing and VTOL modes, with basic VTOL configuration options;
    c. Optimized motor test interface. Added model diagrams, improved motor test interaction, enabled motor parameter configuration, and supported motor testing for both multirotors and VTOLs. Added APM official documentation access;
    d. Added a servo configuration interface;
    e. Reworked the drone tuning interface to support pre-flight parameter preparation and in-flight tuning for both multirotor and VTOL configurations;
    f. Added a parameter configuration interface for fixed-wing aircraft, enabling setup of fundamental flight parameters and flight stability-related settings;
    g. Added RTL configurations and multi-rotor auxiliary trigger settings to the VTOL safety configuration interface;

h. Optimize the RTL and Land configurations in the multirotor's safety interface.

i. Rearranged overall menu sequence based on drone configuration workflow;

2. Other Upgrades

a. Added "Mode 3" option to remote controller operation modes;

b. Added the new product PMU 2 Lite to the power module configuration function.

c. Based on the factory-preset power parameters of the X7+, 7-nano, X25, and V6x smart controllers and their corresponding power supply products, the system automatically matches the appropriate products in the power configuration interface.

d. For scenarios not using NEO series positioning modules, it also supports enabling/disabling LEDs, buzzers, and safety switches.

3. Fixes

a. Fixed APM parameter reset failure when no SD card is present

b. Fixed incorrect prompt message after APM controller accelerometer calibration

c. Fixed APM controller compass calibration failure in specific scenarios

d. Fixed a defect in the compass calibration priority settings for the APM controller.

e. Fixed an issue where the vehicle couldn't be switched when no SD card was present.

f. Enhanced error messages for upload failures during flight path uploads caused by packet loss or similar issues.

Key Features of LGC 1.0.0-beta9

1. Add No-Fly Zone Function

    a. Built-in no-fly zone data for domestic civil aviation airports and Beijing administrative districts;

    b. Supports no-fly zone identification during route upload, drone takeoff, and flight operations, providing alerts or triggering return-to-home commands to reduce the risk of unauthorized entry;

    c. Supports enabling/disabling the no-fly zone functionality and offers multiple levels of auxiliary function configurations;

    d. Supports global flight altitude limit configuration and alerts;

2. Add CAN Module Parameter Read/Write Function;

3. Drone Parameter Import Functionality, Compatible with MissionPlanner Parameter Files;

4. Fix for Missing Parameter Issue in Fixed-Wing Airframe Configuration Page;

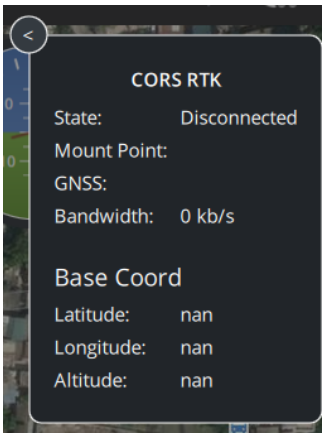
5. Fix for Missing Fault Protection Configuration in VTOL Aircraft Safety Configuration Page;

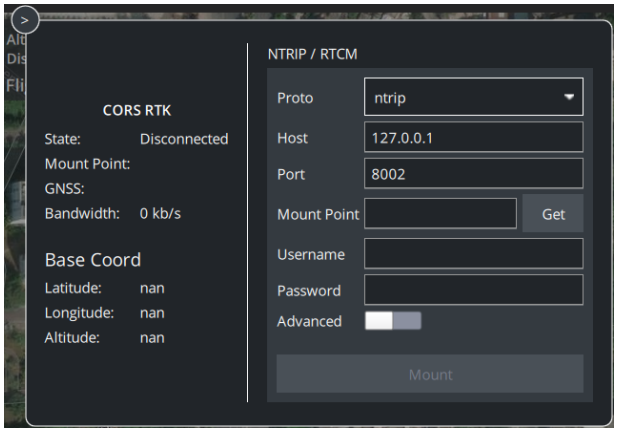
1. Network RTK (NTRIP)

⚠To use CORS/NTRIP service LGC needs to be connected to the internet service; you can use WIFI hotspot or cell phone USB to share the mobile network, make sure that the drone has been positioned and connected to the ground station before configuring (the ground station needs to send a GGA message to get the nearby CORS service).

LGC supports network RTK (CORS/NTRIP). Click the icon 

in the upper right corner of the main interface to check the RTK status, and click the icon  to display the NTRIP setting interface.



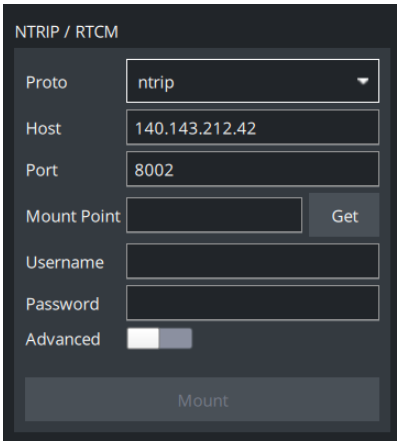


CORS/NTRIP Connection:

In the NTRIP setting interface, fill in the corresponding protocol, fill in the **address**, **port**, and check Connect to server to connect.

Port number: Geographic Coordinate System

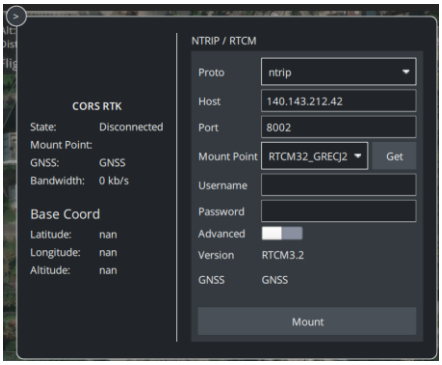
8001: CGC2000

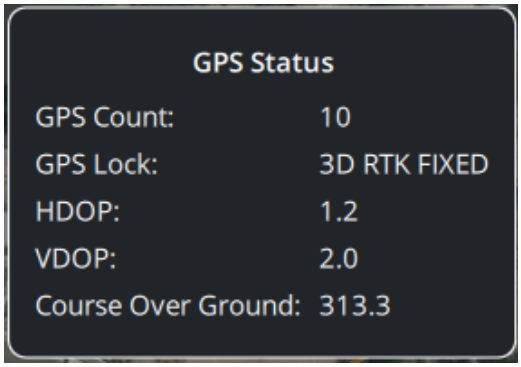


8002: WGS84 (coordinate system used by flight control)

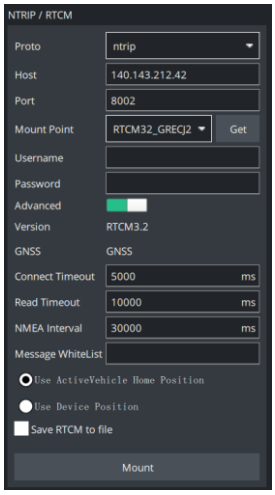
8003: ITRF2008

After completing the form, clicking **Get** will display a list of mount points for selection, as shown in the figure below. After selecting a mount point, enter the **username** and **password**, click **Mount**, and check that the GPS status has changed to “3D RTK FIX” to confirm that the setup is successful.





It is also possible to personalize the settings (e.g. connection timeout, read timeout, NMEA timeout, etc.); you can select "use the home point of the drone" or "the GPS location of the currently running ground station device" as the transmission location for NMEA (Note: the location is only acquired when the connection is clicked and does not change in real time). (Note: the position is only obtained when the connection is clicked, and will not follow the change in real time).



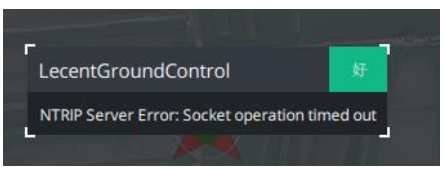
Ephemeris storage:

If you need to use PPK for mapping, you need to save RTCM data. You can check "Save RTMP to file" (the location is in the NTRIP folder of the application load/save path, the application load/save path can be seen in Application Settings->General ->Miscellaneous), and the name of the saved file is rtk_Year_Month_Day_Hour_Minute_Second. rtcm (UTC). rtcm (UTC= BST-8h) format.

Error description:

Check whether the account password is correct and valid, and whether you have permission to mount the corresponding mount point.

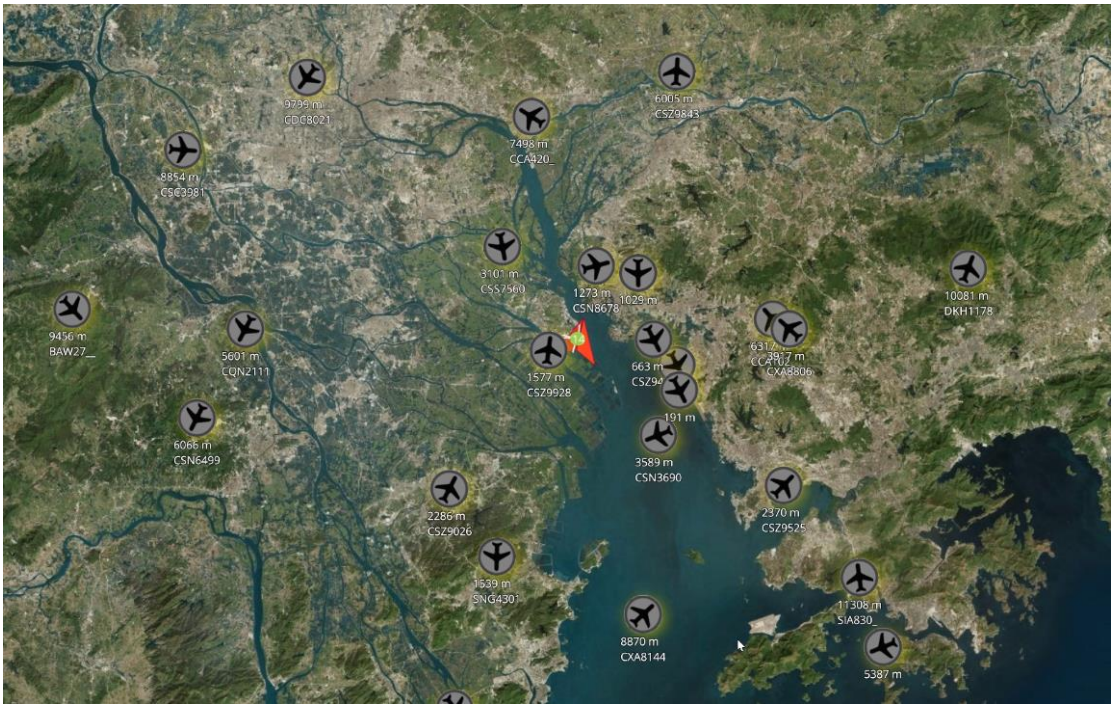
Check if the server address and port are correct and valid.



2. Optimize onboard ADSB support

> ⚠ADS-B (also known as Broadcast Automatic Correlation Surveillance) is an air traffic surveillance technology. It is a safety surveillance device that allows ground station operators to sense nearby manned aircraft and can keep the craft away from them automatically.

LGC has optimized support for the ArduPilot airborne ADSB device with a flight data refresh rate of 50Hz and a device refresh of 1 minute/time.



ArduPilot ADSB key parameters:

ADSB_TYPE=1 //ADSB device type

ADSB_LIST_MAX=50 //Maximum number of airplanes to be monitored by ADSB

ADSB_LIST_RADIUS=10000 //Radius of ADSB monitoring, only aircraft

within this radius will be displayed

SerialX_BAUD=115 //Communication baud rate between ADSB and flight control, X is serial number.

SerialX_Protocol=2 //Communication protocol between ADSB and flight control, X is serial number.

SrX_ADSB=5 //Ground station from which flight control serial port to get ADSB data and frequency, X is the serial port serial number.

3. LGC Flight Mode Lock

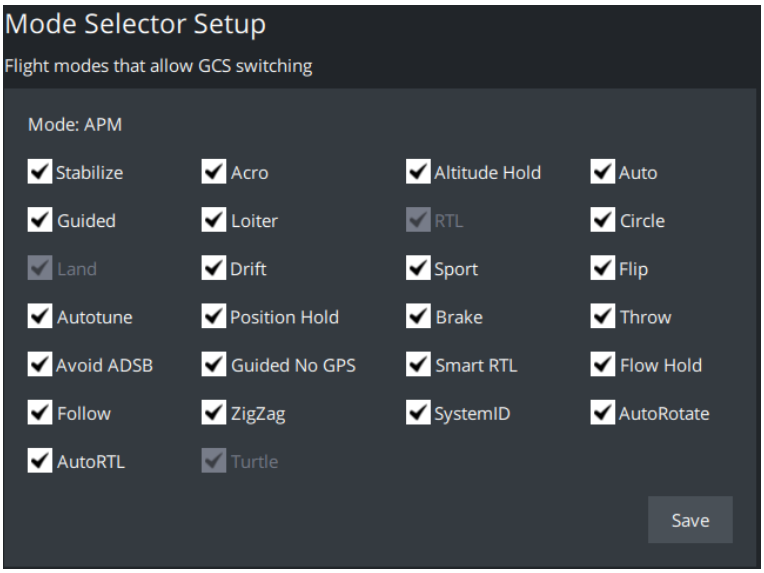
Simplified Flight Mode (aka GCS Mode Lock). It is a feature of the Ardupilot firmware that allows the user to specify (check) the flight mode to be used by the actual ground station. Flight modes that are not checked will not be displayed in the flight mode list and it is not possible to switch that flight mode via the ground station to prevent misuse/triggering that could result in the drone crashing. Also, fewer flight modes are displayed allowing the operator to switch modes more quickly.

The LGC categorizes flight mode storage into APM mode, which stores data into the ArduPilot flight controller (firmware version AP4.5.0 or above), and Local mode, which stores data into the computer's local storage. The storage mode is automatically recognized by the LGC system and cannot be changed.

⚠Some flight modes are restricted by the ArduPilot system and can't be

changed to show/hide; the storage mode is preset for VTOL and multi-rotor to show the flight model.

(1) Click the LGC icon on the upper left corner, select "Vehicle Setup", and then select "Mode Selector" in the left menu bar, the following interface will appear:



(2) Check the desired flight mode and click "Save" to complete the setting. When the storage mode is APM, the data will be written to the FLTMODE_GCSBLOCK parameter of the flight controller; Local mode will be saved locally.

⚠When you enable the mandatory checklist, it is recommended to check FBWA and Manual flight mode, which will be used in the operation.

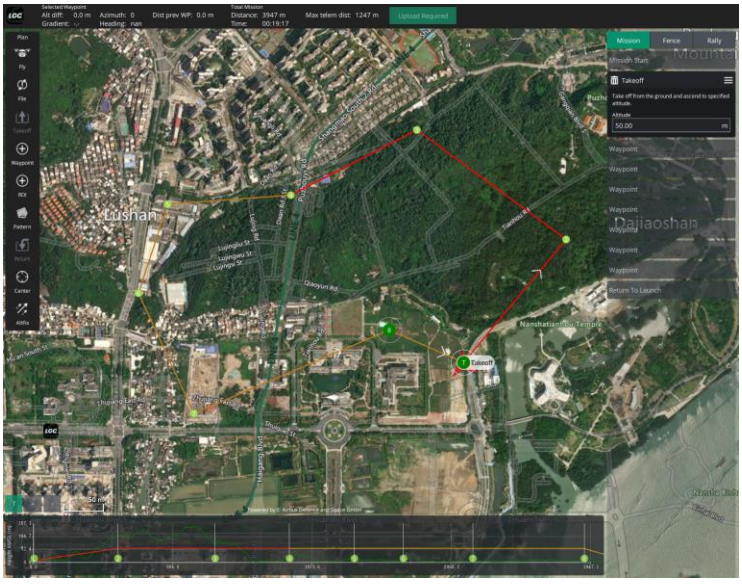
4. Altitude Correction

The Altitude Correction function is used to modify the route altitude with one click to reduce the possibility of collision caused by wrong route altitude

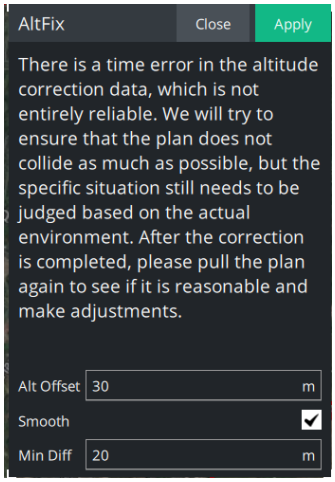
setting.

> ⚠This function is based on the altitude map data from the network, which may have some error with the actual, and cannot be 100% correct. It only serves as a pre-processing function to help detect and handle the fact that the altitude of some waypoints is lower than the acquired altitude data. Please do not put excessive trust in its processing results, which can be confirmed by checking the waypoints after correction.

(1) After entering the waypoint planning screen, after plotting the course, or pulling the aircraft's course.



(2) You can click the altitude correction button  in the sidebar to enter the correction interface (as shown below).

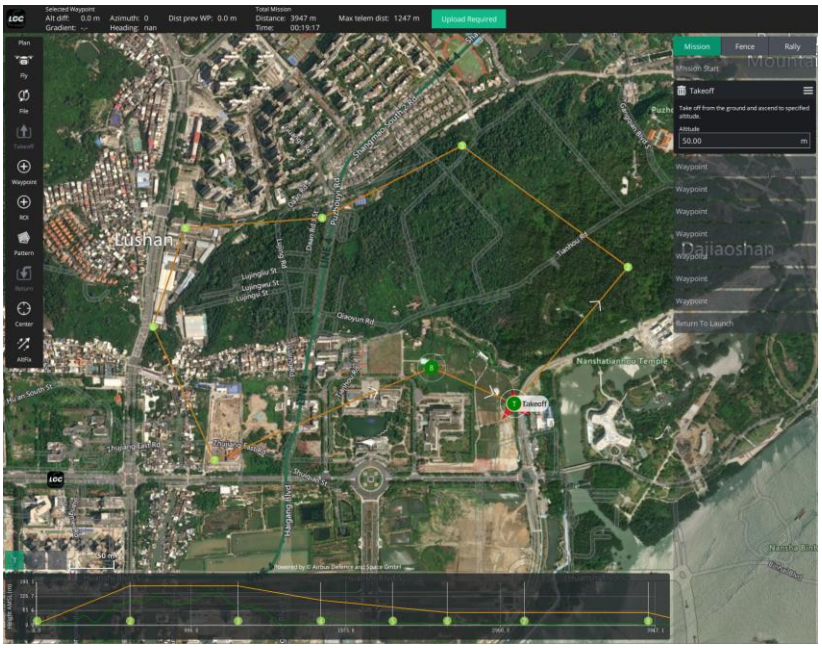


The Altitude Offset is the amount by which the known altitude data should be shifted upwards to prevent the altitudes from being too close together and causing problems;

The **Smooth Over** option smoothes the waypoints as continuously as possible after correction;

The Minimum Smoothing Difference is the value above which the difference in altitude between two waypoints will be involved in the calculation;

(3) As above (1) figure, you can see some waypoints are lower than the altitude data, enter the completion in the altitude correction window and click on the **Apply** button to complete the altitude correction, you can see the correction effect through the AMSL altitude chart below and view the waypoint altitude as shown below.

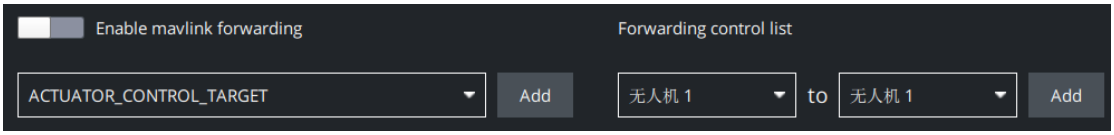


(4) Confirm the route is normal, then upload the route.

5. Mavlink Forwarding

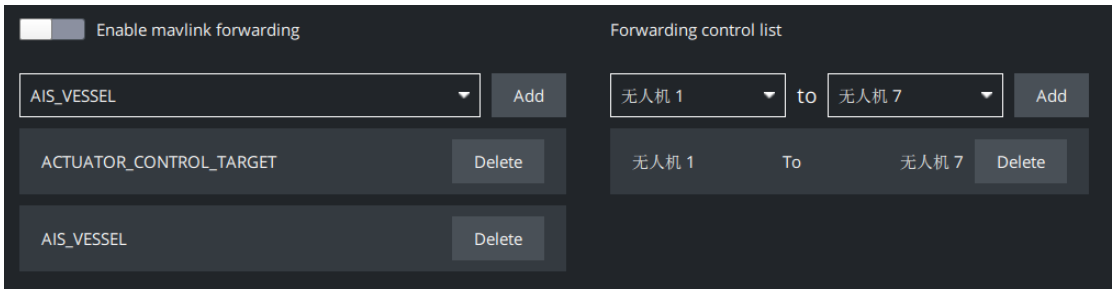
This function is used for mavlink data forwarding between drones, it supports selecting corresponding mavlink messages for forwarding, and it supports specifying drones to forward to certain drones, mainly used for testing data, assisting inter-drone communication, etc. This function is currently a test function, the message designation is only for testing. Currently, it is a test function and only supports global settings for message designation.

(1) Click  icon on the upper left corner, select **"Application Settings"->"Forwarding"**, you can see the interface as below



(2) On the left side, click the drop-down box to select the corresponding message, and click "Add" (you can add more than one forwarding message).

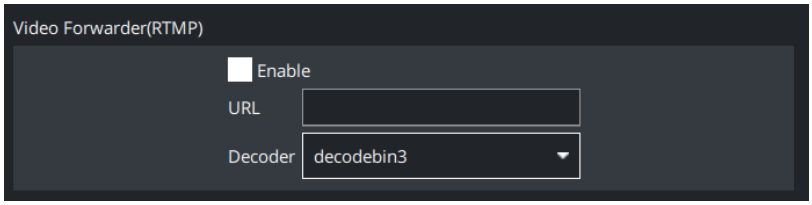
(3) On the right side, select the drone for forwarding, the left drop-down box is for **message sending**, and the right drop-down box is for **message receiving**, in which the All in the drop-down box represents all drones (Note: If the same drone is used for both sending and receiving, the message will not be sent to itself again), and the setting is completed, as shown in the following figure.



(4) Click the "Enable Mavlink Forwarding" slider to start forwarding.

6. RTMP Video Streaming

LGC supports to push the captured video stream to the target IP or live broadcasting platform, so as to share the video remotely. This function is suitable for remote dispatching or command and control centers. The forwarder selects the video decoder.



7. Remote ID Scanner

Remote ID is a technology used to identify and track drones, similar to a license plate for a car. Remote ID Module broadcasts key flight data such as identification information, real-time position/altitude/heading, etc. It can help air traffic control to monitor drones to prevent collision with manned aircraft, protect the security of sensitive areas, and so on.

Remote ID scanner function for LGC scans the information broadcasted by the remote ID devices over WIFI/Bluetooth signal and display it. For flyers, They can use the information display function to check if their drone's Remote ID

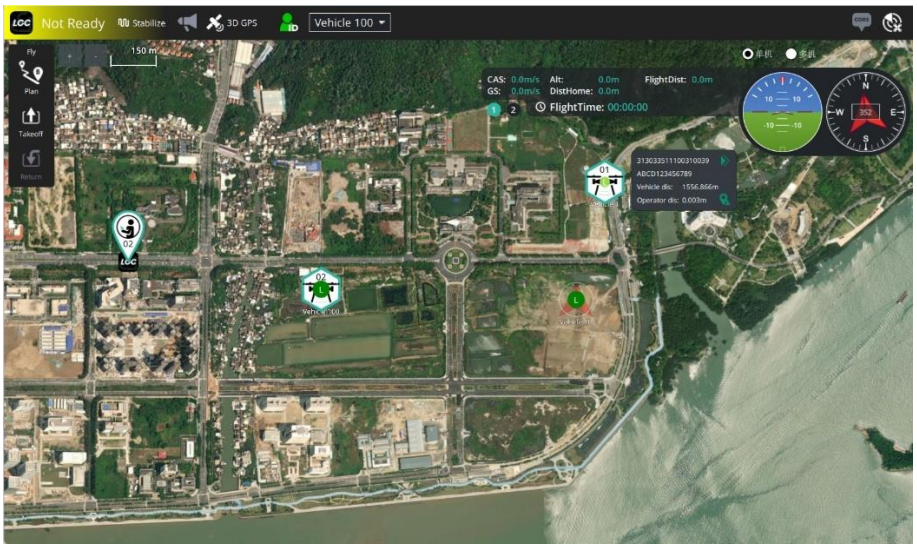
module is functioning properly and broadcasting information as required. The alert function can also assist in warning about nearby drones, helping to avoid collisions. For the general public or event organizers, it can be used to monitor specific areas for drone activity. If drones are detected, their real-time location can be viewed, and the operator can be quickly located.

> ⚠ This feature is only applicable in scenarios where drones have been equipped with Remote ID modules as required by regulations and are broadcasting identification information.

Viewing Methods

The scanned drones are available in map and list view:

① The map format is shown below, with the drone  and the operator  displayed in the flight view, and brief information about the drone appearing on the right when the mouse is introduced to the drone icon (clicking on it on mobile). Click on  to quickly locate the operator of the drone, for scenarios with a lot of drones, and click on  to see detailed information about the drone.



② The list can be accessed via the icon for a particular drone, or via the icon in the upper right corner of the flight view, as shown below.

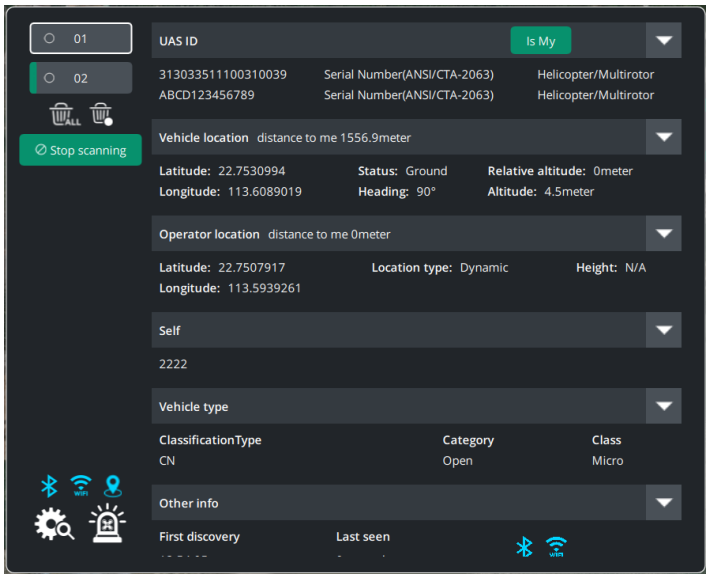
- The left side lists all the drones that have been found, and the system automatically arranges the serial numbers, clicking on one of the serial numbers, the right side will display the detailed information of that drone.

  The Bluetooth icon and WIFI icon in the lower right corner indicate whether the drone was discovered via Bluetooth or WIFI, the 2 icons will only be displayed if the drone was discovered via both routes, otherwise only the corresponding icon will be displayed.

- Clicking on Is My will mark the drone as my own, which will be reflected in the list as 02 to differentiate my drone from others'. Your own drones will no longer show the icon in the map.

- Click to clear all drones and rescan. Clicking on will only clear drones that have not been updated in the last 5 minutes (they may have

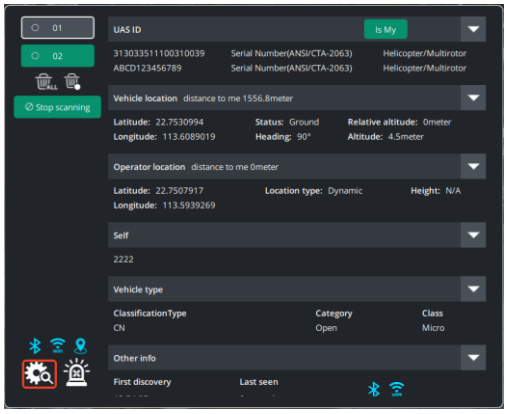
flown away, landed and shut down, or other possibilities).

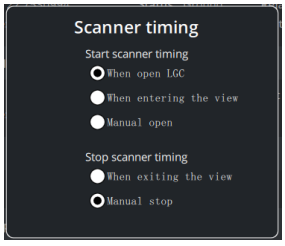


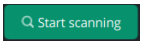
Search Timing

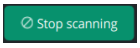
The default is to start scanning and searching automatically when the LGC ground station is turned on, and to stop scanning manually.

Click  in the upper right corner of the flight view to enter the list page, then click  in the lower left corner to set the search timing as desired.





- "Enter View" means when the above list screen is opened, "Exit View" means when the above list screen is closed.
- "Manual On" means clicking the  button, and "Manual Stop"

means clicking the 

button.

Bluetooth and WIFI Selection

- Bluetooth is on by default. Tap the icon at the bottom left corner of the list interface to enable or disable Bluetooth search, blue color means it is on.
- WIFI is on by default. Tap the icon at the bottom left corner of the list screen to enable or disable WIFI search, blue color means it is on.

Special Note:

1. If you are using an Android device and notice that the RID module's **Wi-Fi signal updates extremely infrequently** (e.g., once every 2 minutes), and wish to increase the update rate, please disable **the "Wi-Fi scan throttling" feature in the "Developer options"** of your Android system. (Disabling this will affect battery drain and network performance; please decide carefully. Recommended alternatives are: ① Switch to Bluetooth search mode on your Android device. ② Switch to a Windows device.)

2. If you have enabled Wi-Fi scanning (including location services) but **cannot detect any Wi-Fi signals**—only Bluetooth signals appear—please verify that the remote module has activated Wi-Fi broadcasting. Confirmation method: For CUAV's C-RID module, ensure the module parameter **WIFI_BCN_RATE** is set to at least **1.0**. For other brands, consult your manufacturer directly.

Map Display

Map display is enabled by default. Click icon at the bottom left corner of the list interface to enable or disable map display, blue color means it is enabled.

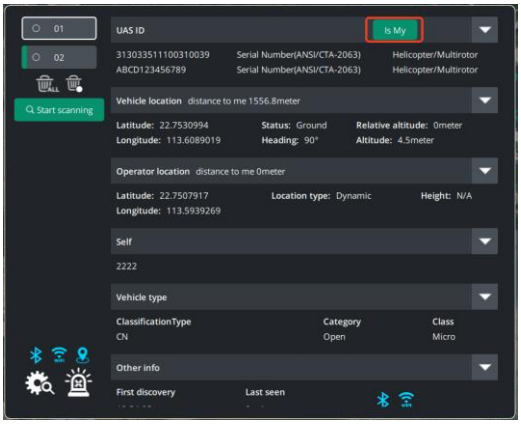
Proximity Alarm

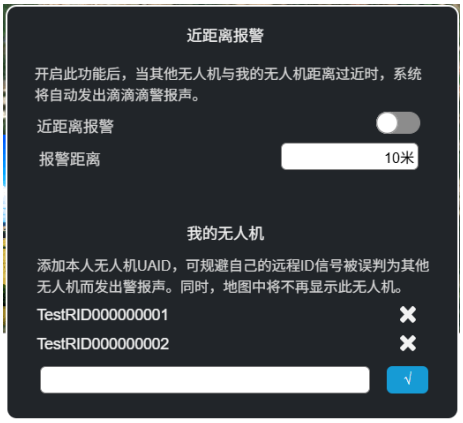
This function is used to remind "me" to be careful when my drone is too close to other drones, the system will automatically emit an alarm sound to avoid accidental collision.

This function is not enabled by default. Click the icon at the bottom left corner of the list interface, and then click the button in the pop-up window to enable or disable the function.

If the function is enabled, you need to configure the alert distance.

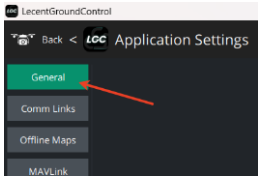
If the function is turned on, in order to avoid their drone's remote ID signal being mistaken for other drones and continuously sounding an alarm, users must mark their drone ID. Users can choose to fill in the ID directly in the window and click on the button, or click on the Is My button on the right side of the list.

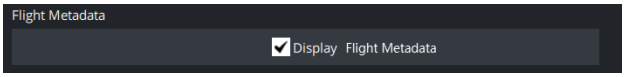




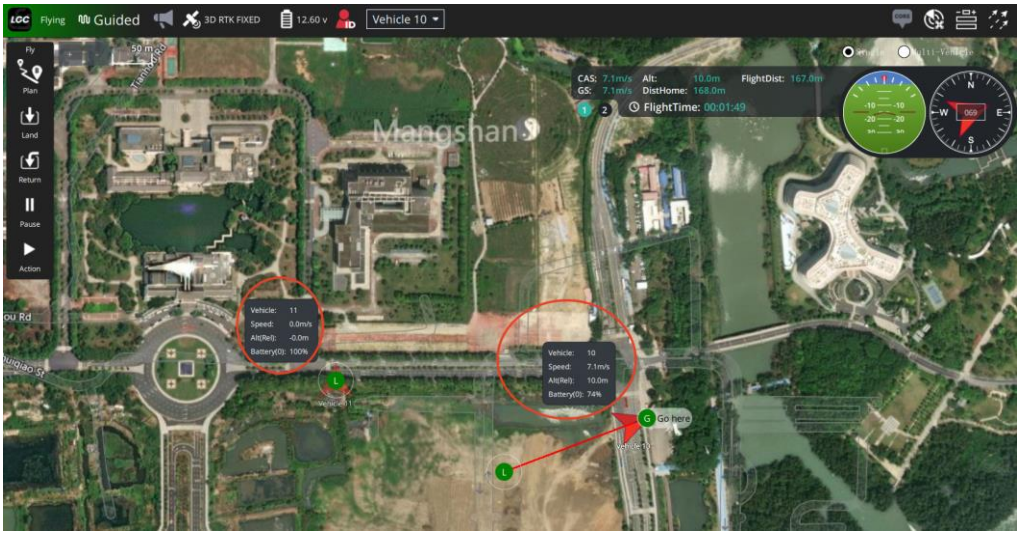
8. Real-time flight data of multiple drones

Click  icon on the upper left corner, select **"Application Settings"->"General"**, find the flight view data in the right interface, and check "Show flight data".





Then you can see the information of flight altitude, speed and power next to the airplane icon in the flight view. When the ground station connects and operates several UAVs at the same time, it can also pay attention to the data of each aircraft at the same time. As shown in the figure below.



9. Cluster Formation Function

⚠Cluster formation function is only applicable to vertical take-off and landing fixed-wing/multi-rotor/fixed-wing; this function is still in the process of improvement. The LGC will display the Cluster Formation control when multiple aircraft are accessed.

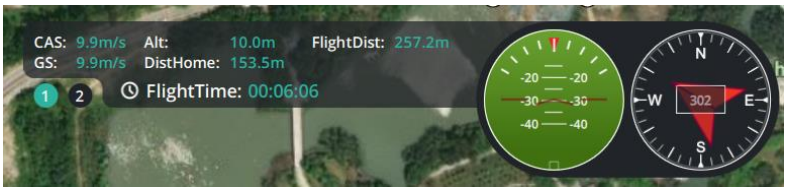
For detailed setting method, please read “基于 LBA3&LGC 地面站集群编队说明书 V1.3.pdf”

10. Language Description

LGC mainly improves and optimizes the Chinese language translation; some new functions are added and adjusted to take into account the Chinese and English languages, which are not yet compatible with other languages. When switching to other languages, the new interface and functions will be displayed in English.

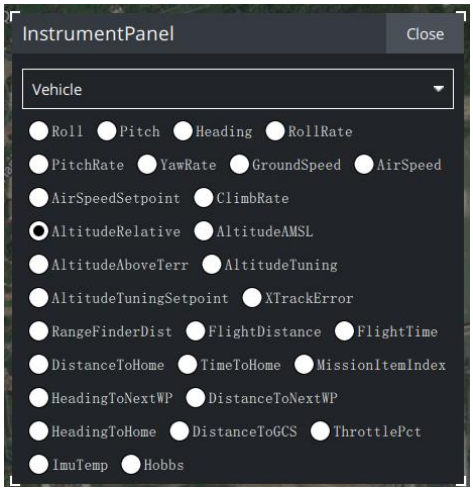
11. Flight Dashboard

Flight Dashboard is divided into two interfaces, ①Basic Dashboard Interface and ②Expanded Dashboard Interface.



You can click ①/② button to switch interface.

The data columns of the basic dashboard are fixed, no change is provided; in the extended dashboard, the throttle and flight are fixed, and the other four can be adjusted to other data. To modify, click the corresponding position, select the corresponding display value in the pop-up selection box, and finally click "Close".

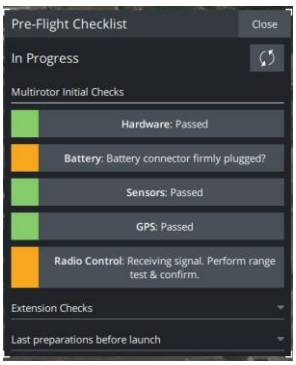


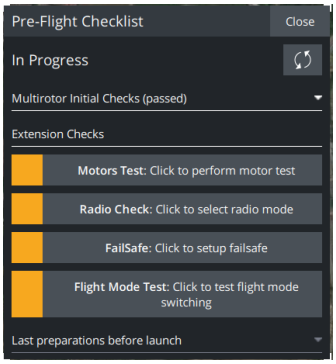
⚠LGC instrument panel does not support vertical instrument panel.

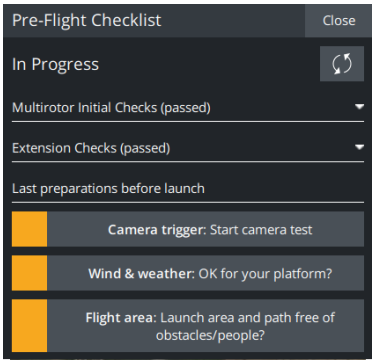
12. Mandatory checklist before takeoff

By default, LGC adopts the mandatory checklist to guide new pilots to complete the pre-takeoff setup and inspection according to the safety procedures. Click on the Mandatory Checklist icon on the left side of the flight interface.

The following picture takes multi-rotor as an example.







Initial Check:

- Hardware check: manually confirm that the propeller installation direction is normal.

- Battery: Manual check.

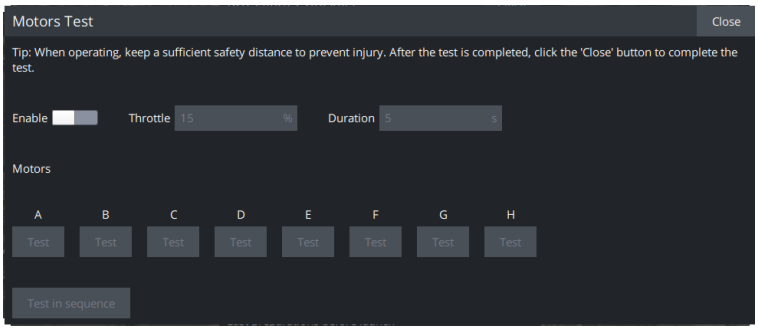
- Sensor: System self-check, no need to operate.

- GPS:System self-check, no need to operate.

- Remote control: Manual click to confirm.

Extended check:

- Motor check: manual motor steering and status test is required.



① Click to enter the motor test interface;

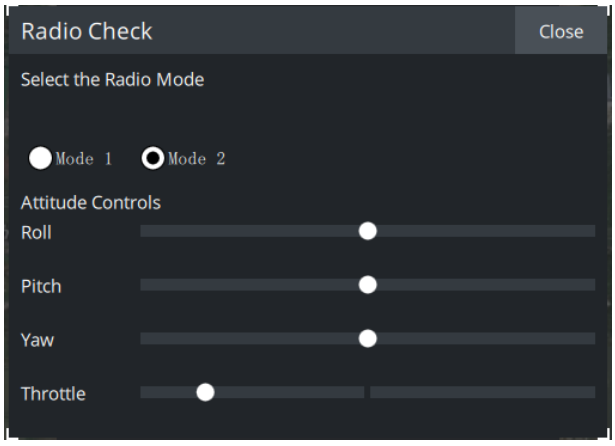
② Click "Test Confirmation" to confirm the start of test operation. Set the test throttle (10-15% recommended) and duration 0-2S;

③ Click the test button under the motor serial number, the corresponding motor will start to rotate;

④ Click "Close" after confirming the status of all motors.

⚠When operating, please fix the rotor arm and keep a safe distance to prevent accidents and injuries.

- Remote control confirmation: manually confirm whether the remote control mode and joystick control mapping are correct; the system is not involved in the check.



- Fault protection: Set battery low voltage protection, LGC ground station

communication loss protection, RC link fault protection (throttle fault protection) and geo-fencing according to actual needs.

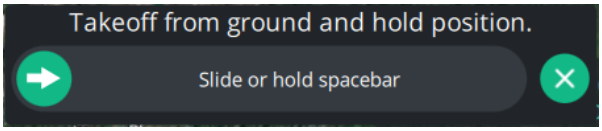
- Flight mode check: select to switch to unlock the flight mode before takeoff (unlocking is not possible in some flight modes).

Final check confirmation:

- Camera Trigger Test: Used to check the camera status when mapping application; if no camera, click "Close".

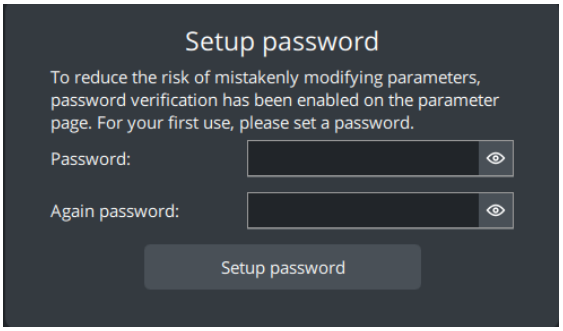
- Flight area: Manually check whether the airplane is placed in the obstacle-free area, waiting for the takeoff operation.

- After completing the pre-takeoff check, pull the slide bar to the right to confirm the takeoff and start the current mission.



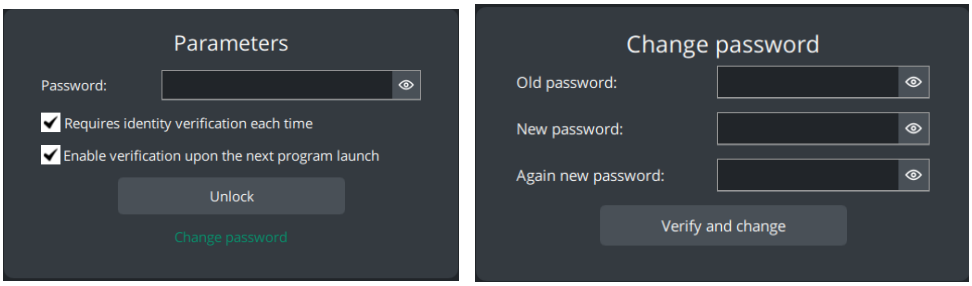
13. Encryption of all parameter list

When you enter the parameter page for the first time, you need to set a password by yourself.



After setting the password, every time you enter the parameter interface,

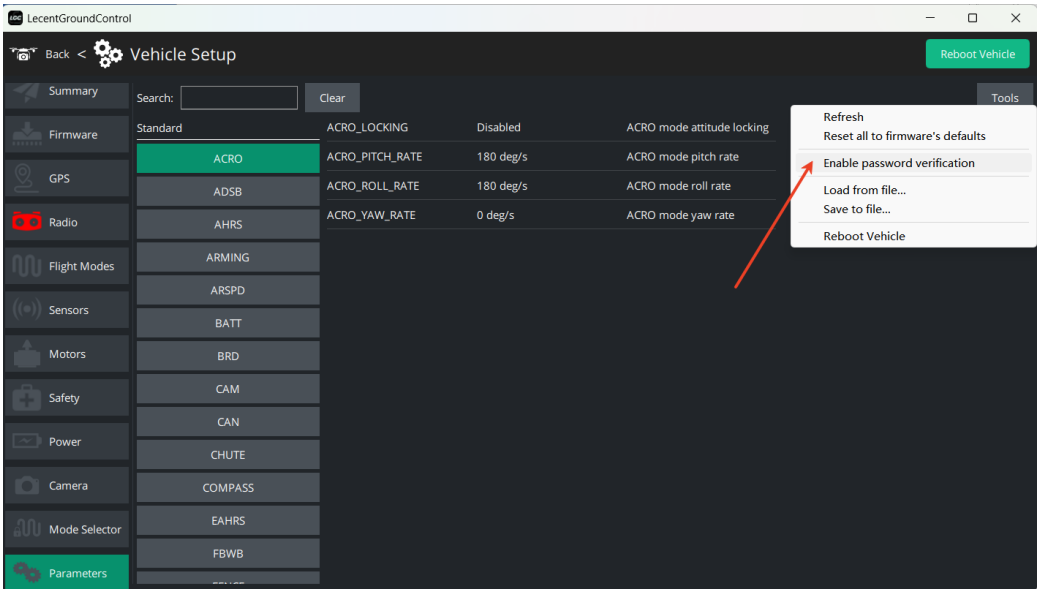
you have to verify the password before unlocking the interface. If necessary, you can click "Change Password" to reset the password.

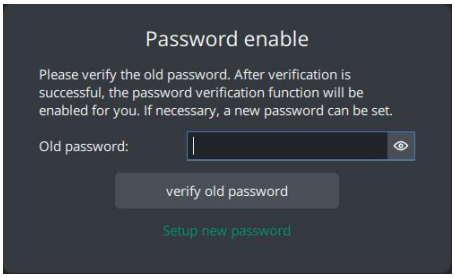


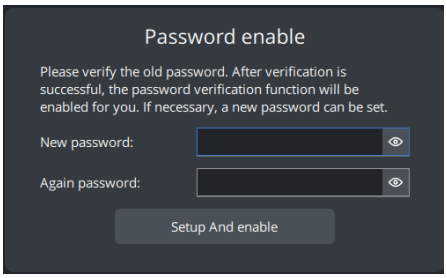
If you don't want to verify your password every time you open the interface (i.e., you only need to verify your password the first time you enter the parameter interface after you open the LGC, but not at other times), please uncheck the "Requires identity verification each time." checkbox.

If you don't want to use the password verification function, please uncheck "Enable verification upon the next program launch".

If you want to re-enable the password verification after canceling the password verification, you can click "Tools"> "Enable Password Verification" in the upper right corner, and then verify the original password, and then the password will be enabled after the verification is passed; if you have forgotten the original password, you can set a new password again. If the original password has been forgotten, you can set a new one.





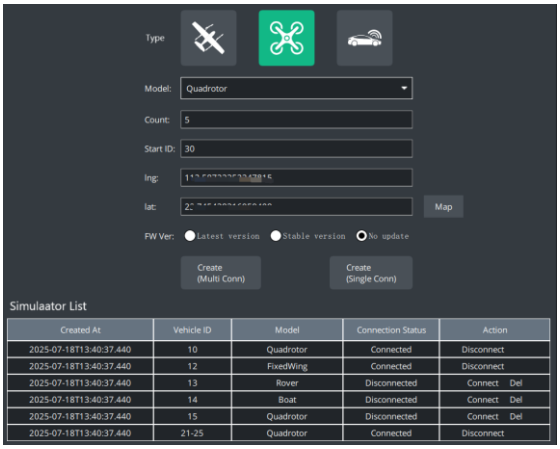


14. Simulator

LGC provides software-in-the-loop simulation of the Ardupilot firmware, which can be used for learning the basic functions of the GCS, simulation exercises for special flight requirements (e.g. formation flight), etc. The simulation function, without the support of hardware module, can complete the flight simulation only in the GCS, which is more convenient for users to learn, and also can reduce the cost and risk of flight test to a certain extent.

Click the  icon in the upper left corner, select "Application Settings"->"Simulator" to enter the Simulator creation interface. Select the **Type, model, longitude and latitude** (you can also select the location from the map),

firmware version type according to the requirements, and enter the **Count** and **Start ID**, then click the Generate button to generate the emulator and connect it automatically.



The default count of emulator is 1, only one simulator is generated at a time. If you need to generate more than one simulator at the same time, the generated simulators will be arranged in the vicinity of the specified location in accordance with specific rules, and at the same time, according to your actual need, you can choose to "Creat(Multi Conn)" or "Creat(Single Conn)".

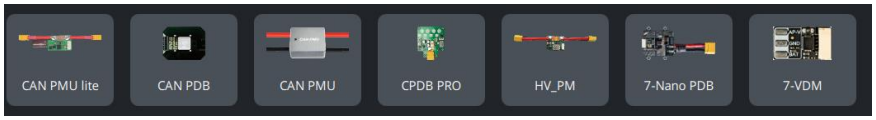
15. Power Setting

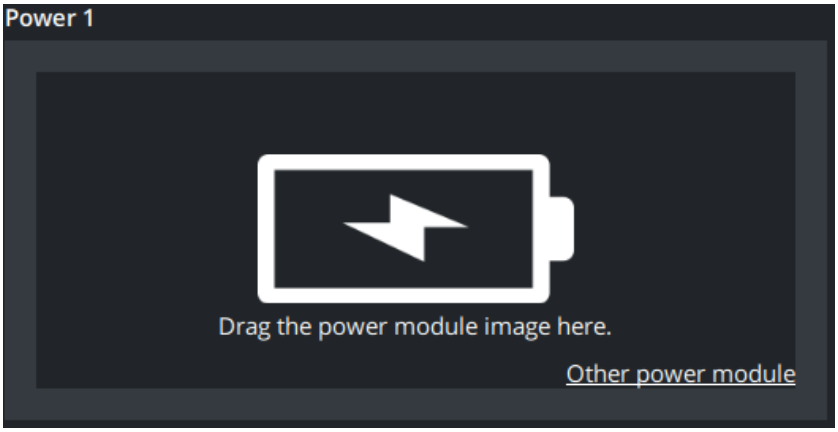
LGC Ground Station provides an easy power setting interface for CUAV product users, which can quickly set the power parameters of the controller based on the module picture. (For Ardupilot firmware only)

Initial Power Setup:

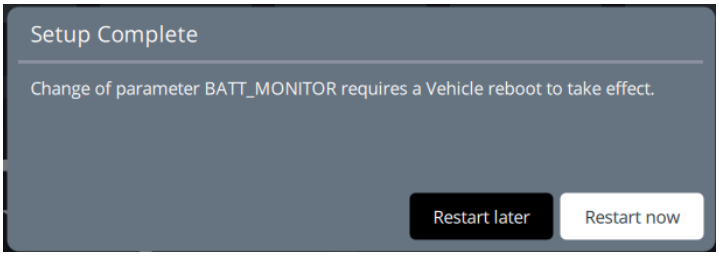
(1) Click icon on the upper left corner, select "Vehicle Setup" -> "Power" to enter the power setup interface;

(2) The interface shows CUAV power module products, drag the product you are using (picture) to the parameter area; (if you are not using a CUAV product, click "Other Power Module", and then configure the relevant fields by yourself)

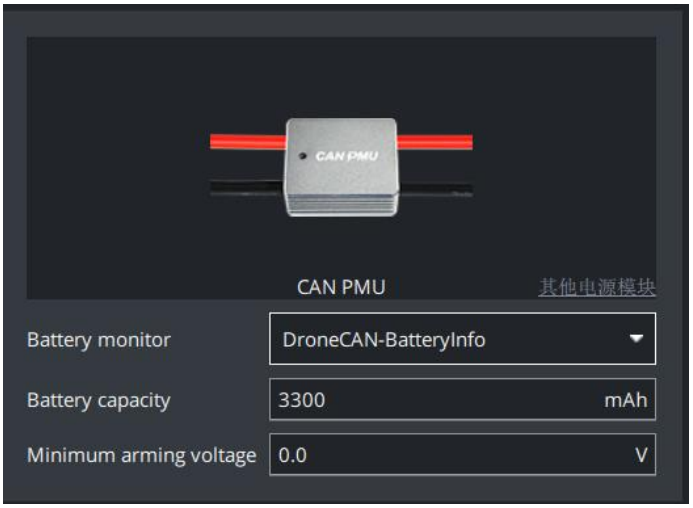




(3) LGC will automatically set the parameters for the drone, at this time may trigger a reboot reminder, if so, click "Reboot Now".



(4) After reboot, re-enter the power settings, the interface will show some customizable parameters, please set them according to the actual situation of the battery.



Modify power supply module:

Directly drag the new product module to the parameter area, the subsequent steps are the same as the initial configuration.

Cancel Power Configuration

Click "Reset" button or "Disable" button to clear the parameters.

16. Positioning Settings

The LGC ground station provides an easy positioning configuration interface for the CUAV product user community. Users can quickly set the “GPS” parameters of the controller via the module image . Also, based on different product combinations, LGC will flexibly guide users on how to connect. (Only for Ardupilot firmware)

Initial Configuration

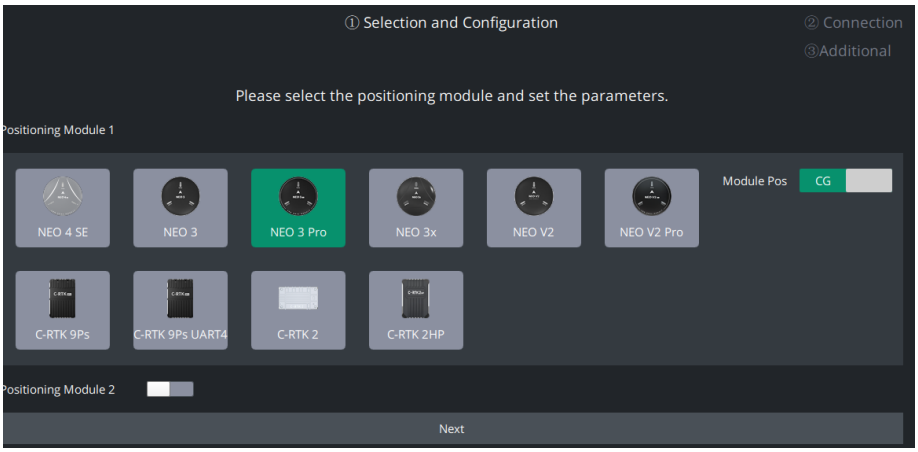
Based on different product combinations, the operation steps are slightly different. The following describes the operation steps according to the scenarios,

please select your matching scenario.

Use 1 module:

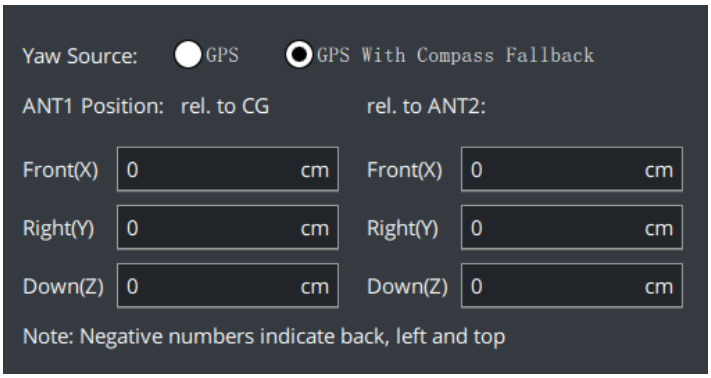
(1) Click icon in the upper left corner, select "Vehicle Setup" -> "Position", enter the Position Setup interface;

(2) The interface will show the picture of CUAV's positioning module, According to the product you actually use, click the product picture.

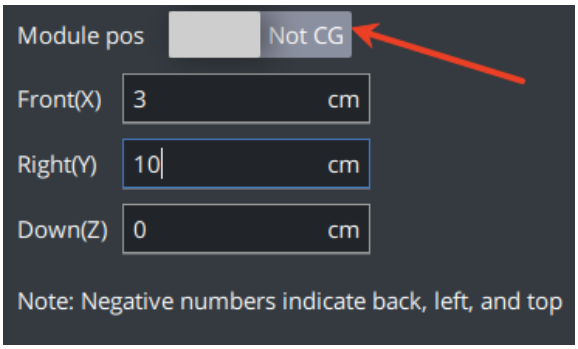


(3) Fill in the information on the right side.

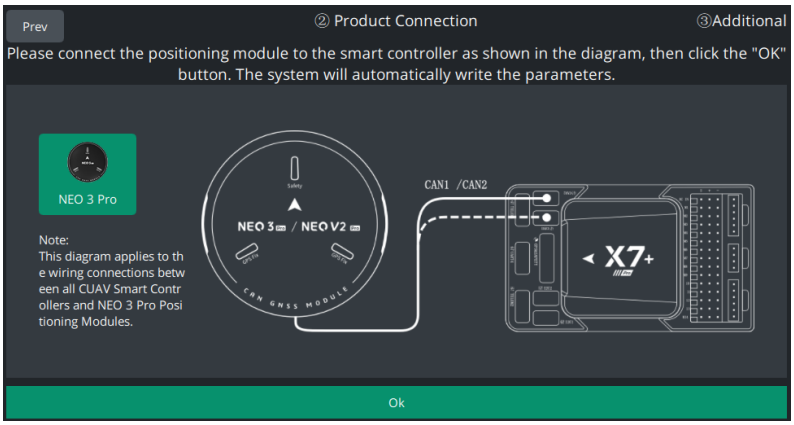
① If the module you selected is the C-RTK 2HP which supports dual antenna directionality, please select "Yaw Source" according to your actual situation. In addition, fill in the actual mounting position of the two antennas. The left side is the position of antenna 1 relative to the center of gravity, and the right side is the position of antenna 1 relative to antenna 2.



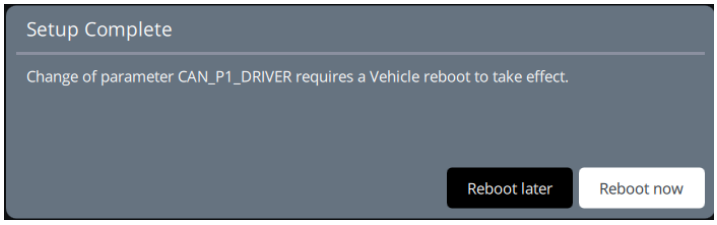
② If other products and the mounting position is not in the center of gravity, then toggle the CG switch to "Not CG" and fill in the position information.



(4) Click the "Next" button and connect the modules according to the wiring diagram in the interface.



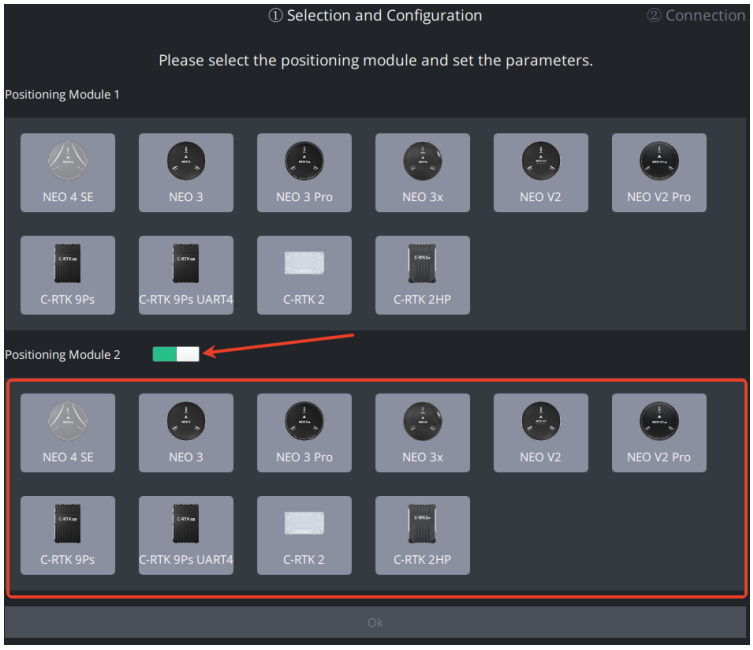
(5) Click "OK" button (this step is essential). Click "Reboot Now" if a reboot reminder pops up.



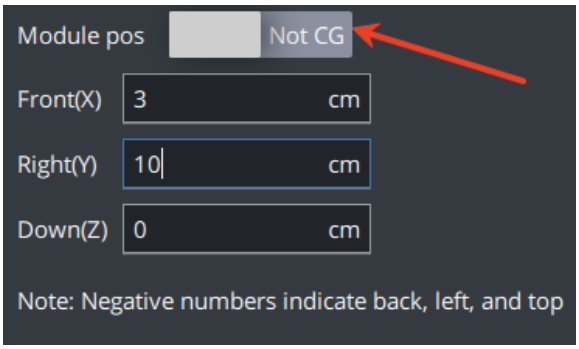
Using 2 C-RTK 9Ps modules:

(1) Click icon on the upper left corner, select "Vehicle Setup" -> "Position", enter the positioning setting interface;

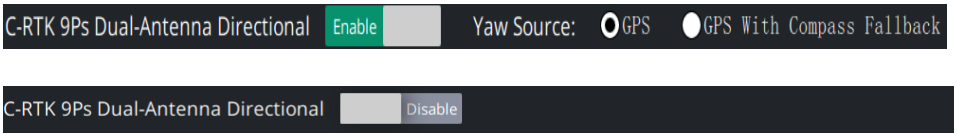
(2) Turn on the switch of "Positioning Module 2", the system will show the second configuration area.



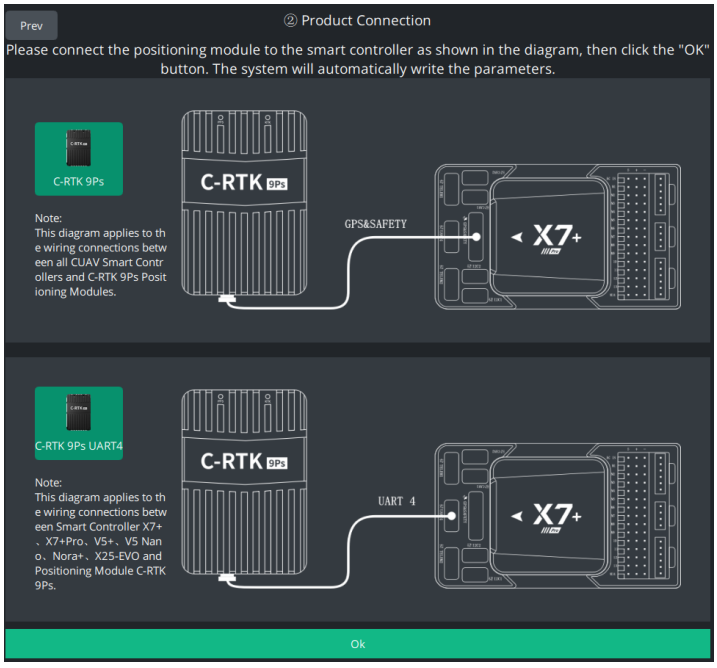
(3) Select "C-RTK 9Ps" for Positioning Module 1 and "C-RTK 9Ps UART4" for Positioning Module 2, and then fill in the antenna installation position on the right side.



(4) The combination of 2 C-RTK 9Ps can realize Dual-Antenna Direction, you can decide whether to enable it or not. If enable, please turn on the switch, and then select the “Yaw Source”. If you do not want to enable it, please turn it off.



(5) Click the "Next" button, then follow the wiring guide to connect the modules in order.

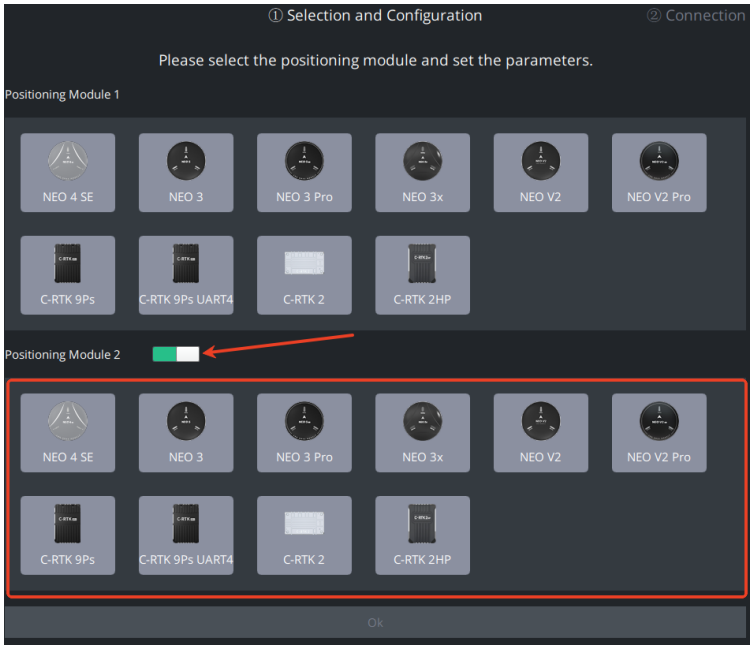


(6) Finally, click "OK" button. (This step is indispensable.)

Use 2 modules, or any other combination:

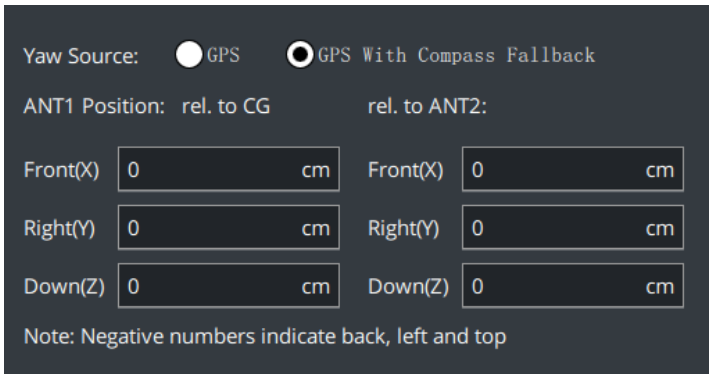
(1) Click icon on the upper left corner, select "Vehicle Setup" -> "Position", enter the positioning setting interface;

(2) Turn on the switch of "Positioning Module 2", the system will show the second configuration area.



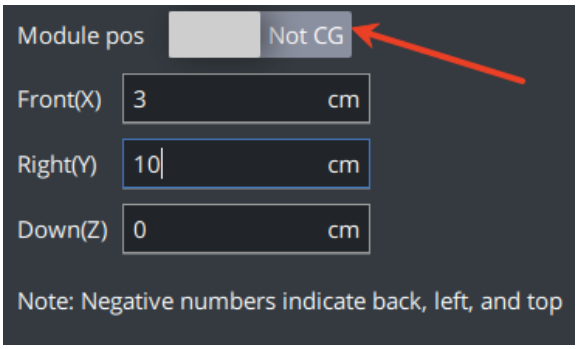
(3) According to the product you actually use, click the product picture in turn, and then fill in the antenna position on the right side.

① If the module you selected is the C-RTK 2HP which supports dual antenna directionality, please select "Yaw Source" according to your actual situation. In addition, fill in the actual mounting position of the two antennas. The left side is the position of antenna 1 relative to the center of gravity, and the right side is the position of antenna 1 relative to antenna 2.

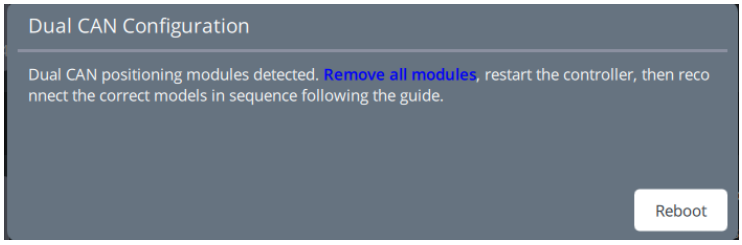


② If other products and the mounting position is not in the center of gravity, then toggle the 

switch to "Not CG" and fill in the position information.



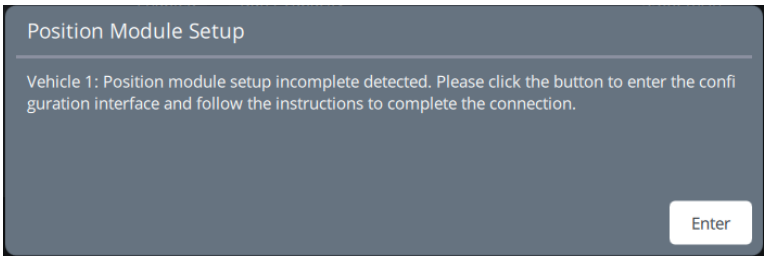
(4) Click on the "Next" button, then you may encounter the following reminders (scenario with 2 CAN types)



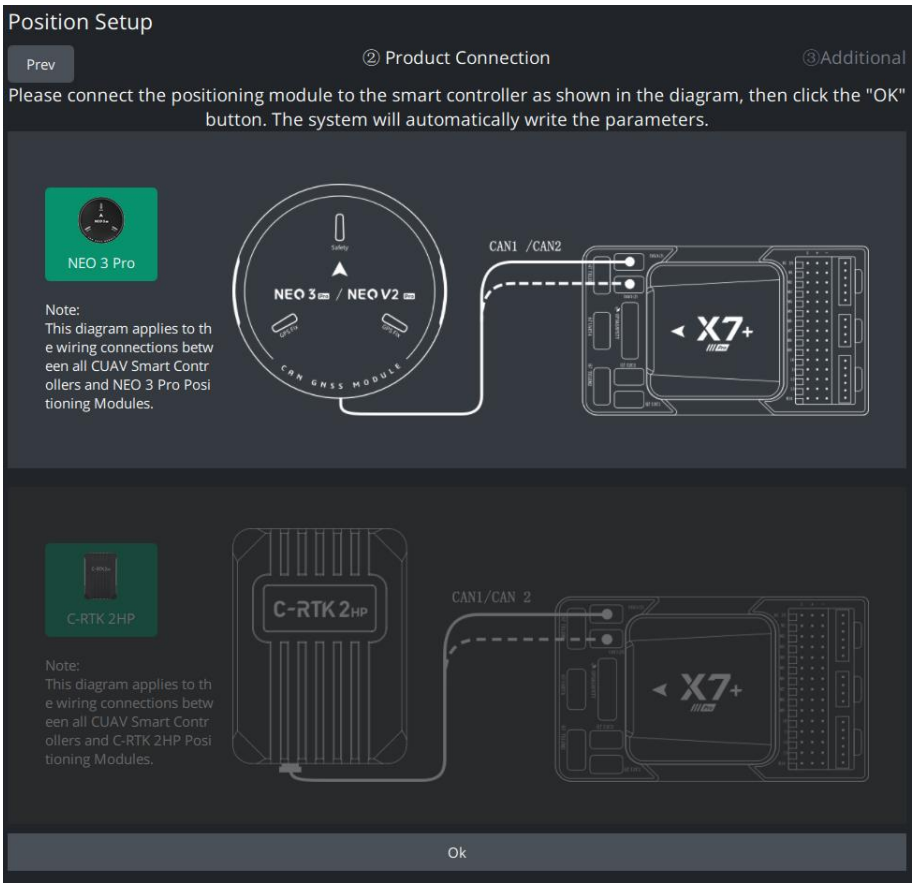
Please make sure that the positioning module is not connected to the intelligent controller, if it is connected, please unplug it immediately. Then, click the "Reboot" button. Then wait for the Intelligent Controller to reboot.

(5) After reboot (if it is not automatically connected to LGC after reboot, please connect it by yourself), LGC will pop up the following reminder, click "Enter"

button.



(6) Connect the modules according to the wiring guide. (Connect the first module, then wait for the second image to light up, and then connect the second module.)



(7) Finally, click the “OK” button. If the button is not highlighted, please wait a moment. (This step is essential.)

Modify Configuration

(1) Click the icon on the top left corner, select "Drone Settings" -> "Positioning" to enter the positioning settings interface;

(2) Click the "Modify" button on the top left corner of the configuration page.

(3)

①If you want to modify the installation location, directly modify it on the right side and click "Finish" button.

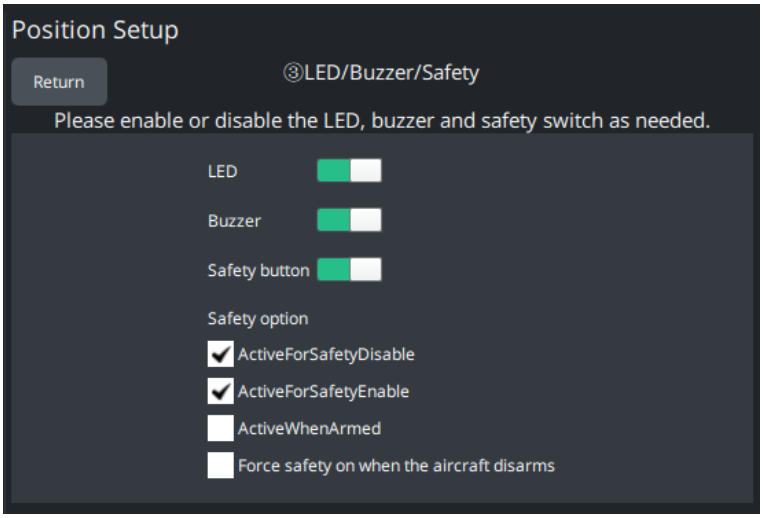
②If you are modifying the product, select the product again and follow the steps of the initial configuration.

Additional (LED, buzzer, safety button)

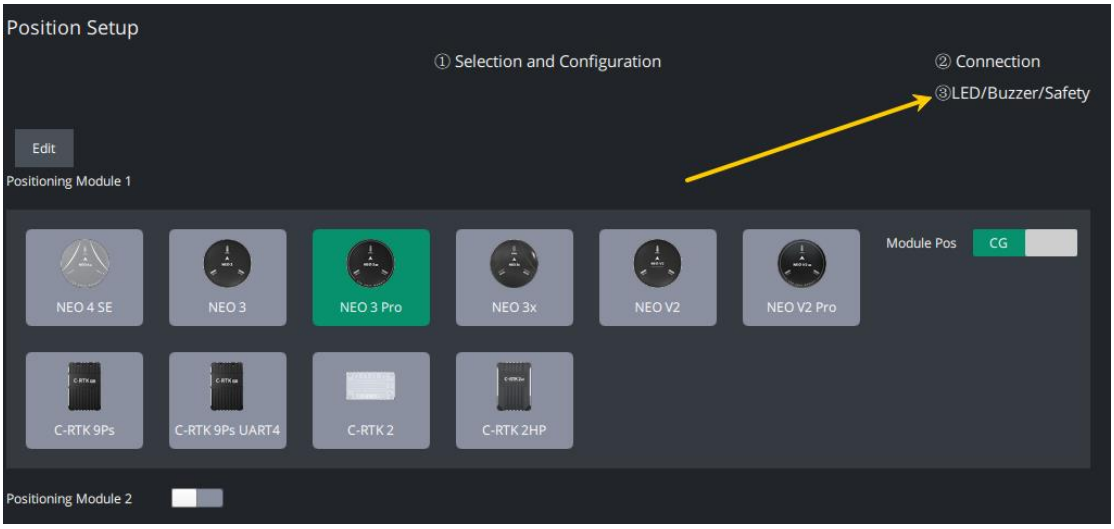
If the products you selected include the NEO series (products with

additional features such as LED/buzzer/safety switch), please enable/disable the LED lights, buzzer, safety switch, or adjust the behavior attributes of the safety switch according to actual needs.

Configure these settings after completing the positioning module configuration (after clicking the "OK" button), as shown in the figure below.



If you have already configured the positioning module information, you only need to modify these additional features this time. You can directly click "③ Additional" in the upper right corner to configure them.



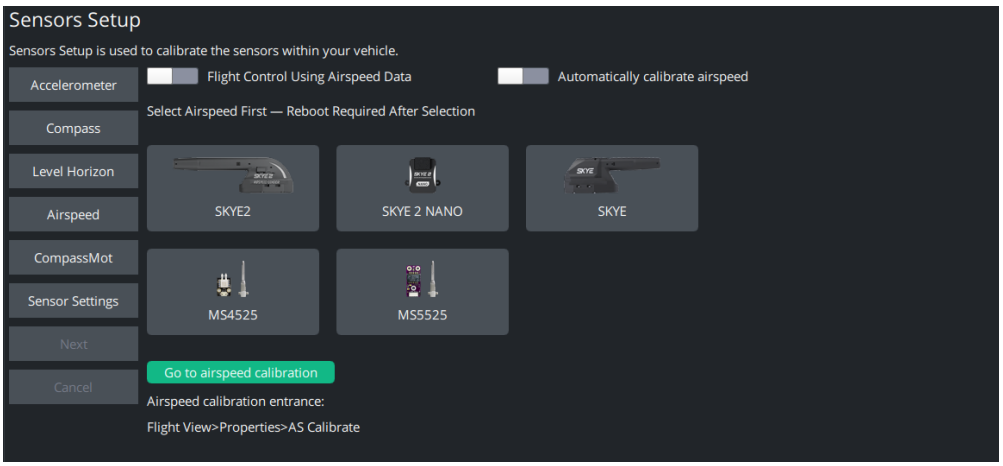
17. Airspeed setup

The LGC Ground Station provides the CUAV product user community with an easy airspeedometer setup interface to quickly set the controller's airspeed parameters based on the module picture. (For Ardupilot firmware only)

The operation steps are as follows:

(1) Click icon on the upper left corner, select "Vehicle Setup" -> "Sensors" -> "Airspeed" to enter the airspeed setting interface;

(2) The interface will show the picture of CUAV's airspeed module, according to the actual product you use, click the product picture.



(3) Configure "Flight control Using Airspeed Data" and "Automatically calibrate airspeed" according to the actual situation.

(4) Finally, restart the drone.

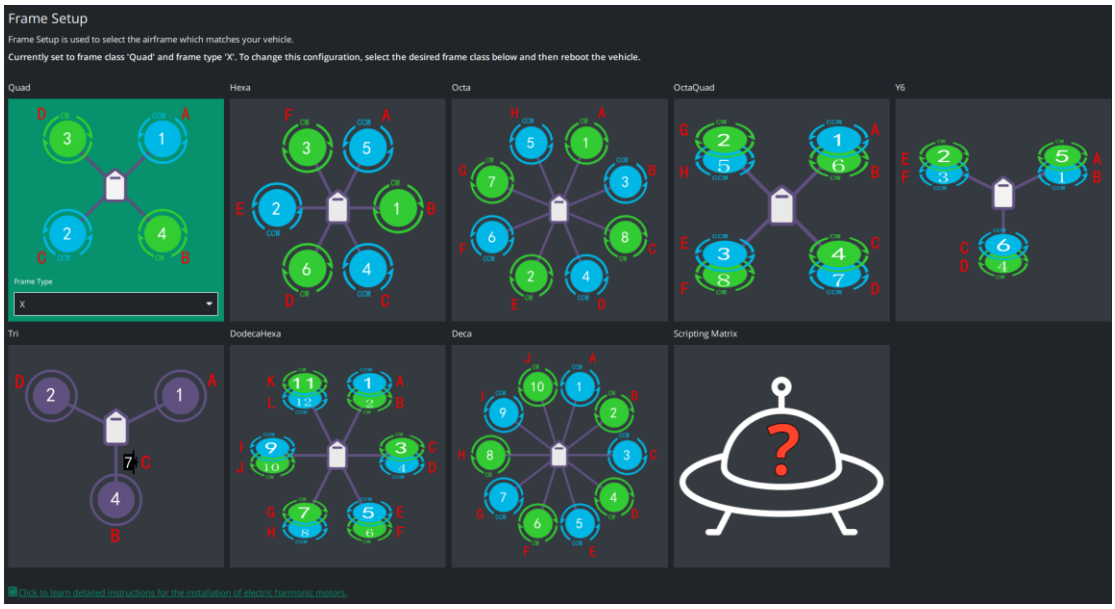
Other notes:

The airspeed calibration entrance has been moved to the flight view. You can quickly jump to the appropriate location by clicking the "Go to Airspeed

Calibration" button.

18. Multicopters Frame Settings

LGC now supports DodecaaHexa, Deca, and Hexadeca-Octa(script) configurations. It also adds frame types for quadcopters, hexacopters, Y6, and others, including BetaFlightX, DJIX, ClockwiseX, PlusReversed, and Y6A. LGC has removed some less common classes. View the details within LGC.

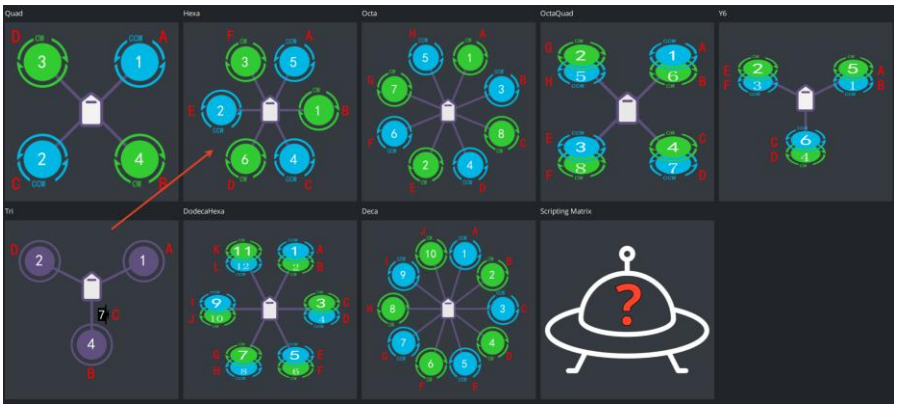


Following APM's official motor order diagrams, LGC has fully replaced the images on the frame page to help users better identify and configure their desired models.

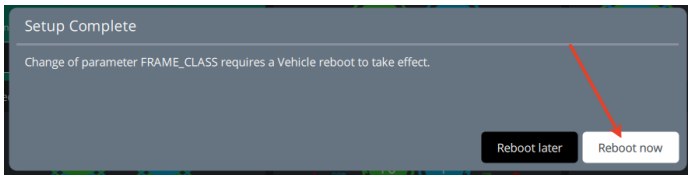
Steps:

(1) Access the page (LGC icon in top-left corner > Vehicle Setup > Frame)

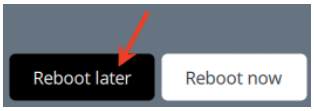
(2) Directly click the image of your desired frame class

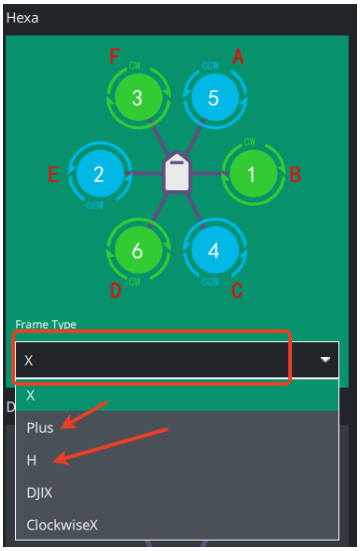


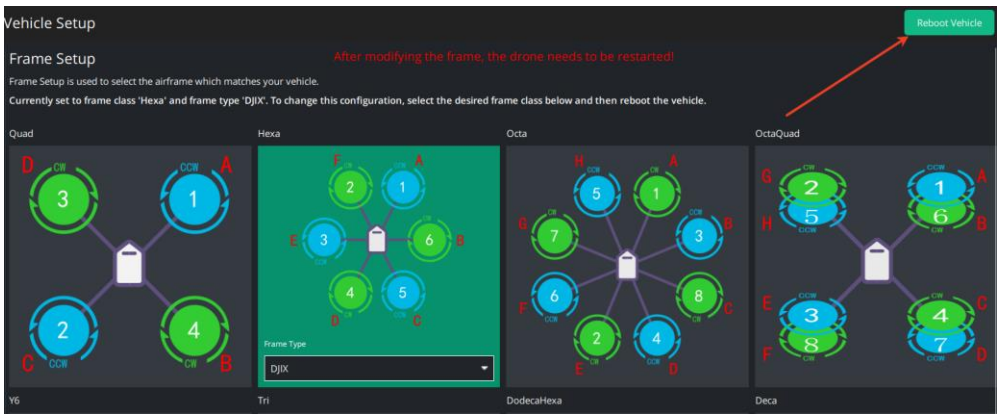
(3) ① If the motor order in the image perfectly matches your requirements, click "Reboot Now" in the prompt to complete the frame configuration.



② Otherwise, first click "Reboot later." Then, switch the frame type in the dropdown list below the image until it matches your requirement. Finally, click the "Reboot Vehicle" button in the top-right corner to complete setup.







Additionally, if you need to consult the APM official documentation for more information on specific frame, click the link below.

Click to learn detailed instructions for the installation of electric harmonic motors.

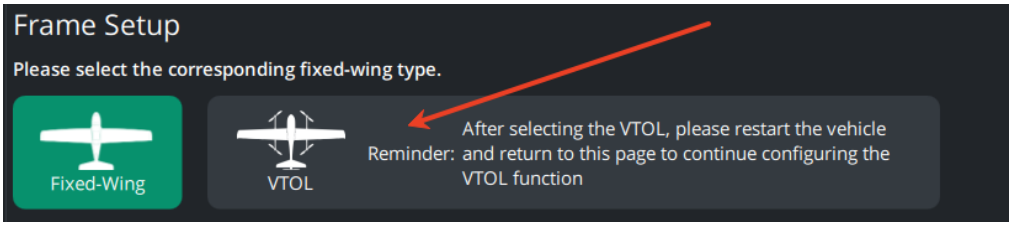
19. VTOL Frame Configuration

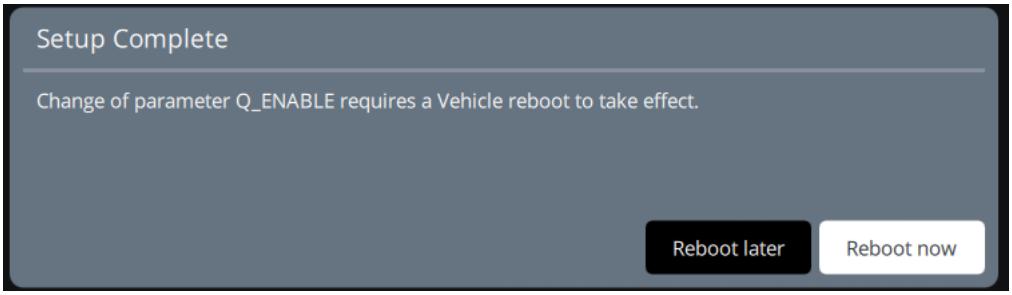
After installing the arduplane firmware, enable VTOL functionality and configure specific frame characteristics on this page for VTOL frame.

Steps:

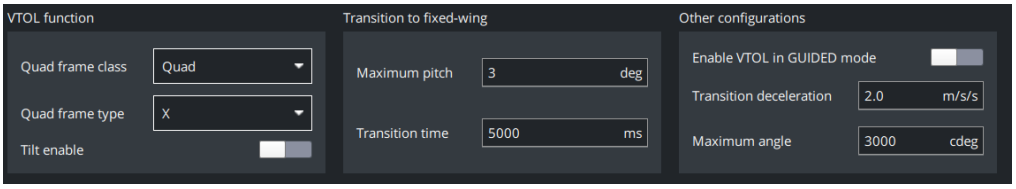
(1) Access the page (LGC icon in top-left corner > Vehicle Setup > Frame)

(2) Click "VTOL," then click "Reboot later" in the pop-up reboot prompt window

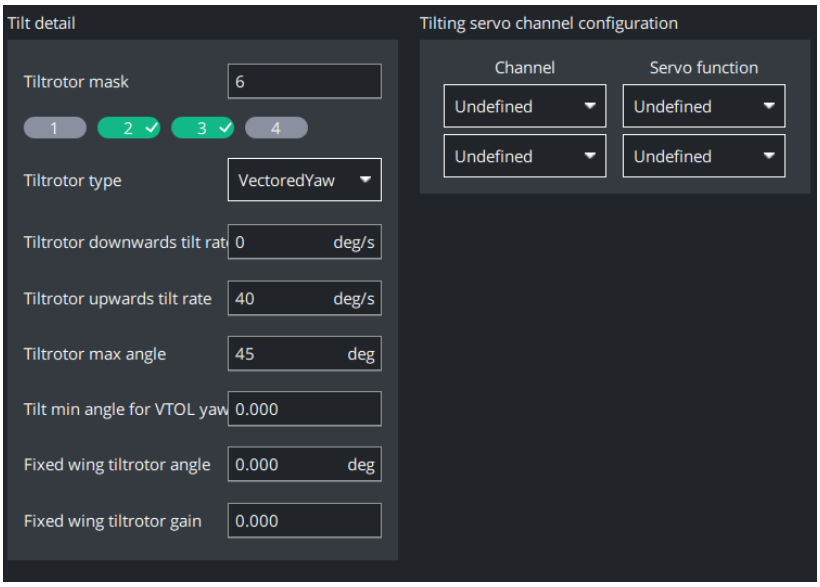




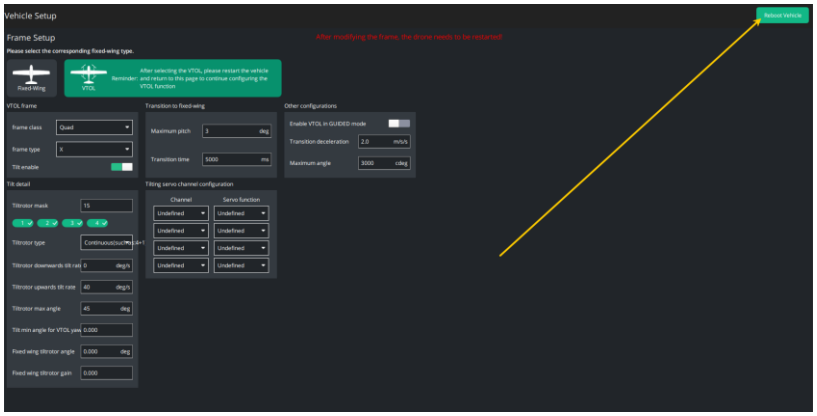
(3) Configure frame class and type, and other details based on actual conditions



(4) If enabling rotor tilt functionality, you need to configure the motor sequence numbers for tilt, servo channels for tilt control, and other tilt-related parameters.



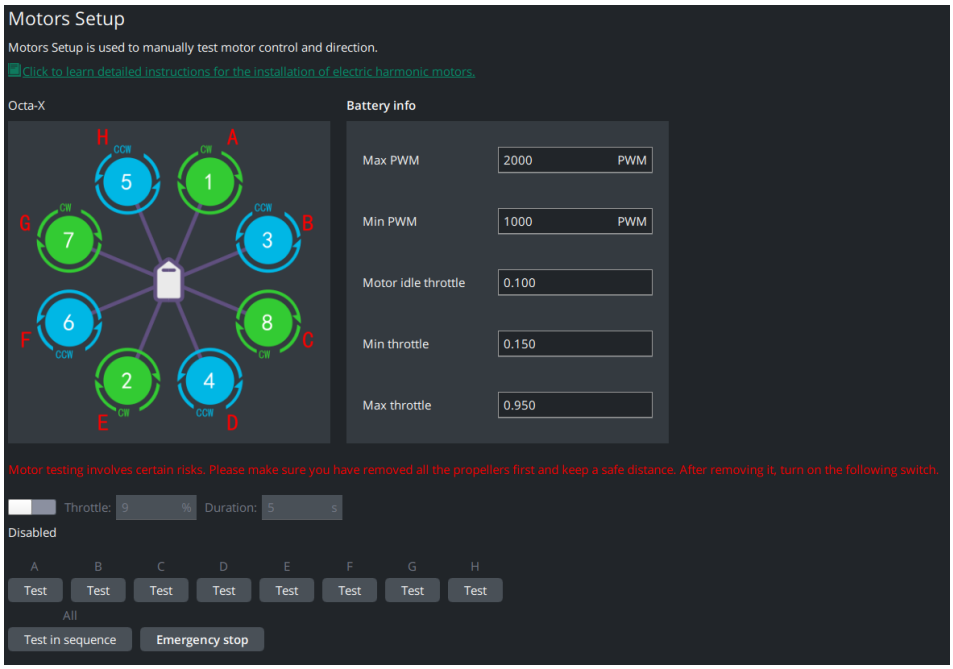
(5) After all configurations are completed, reboot the vehicle.



20. Multicopter/VTOL Motor Testing and Setup

LGC provides frame diagrams as reference for the multicopters motor testing process. Users should verify the motor rotation

direction and installation sequence against these diagrams during testing.



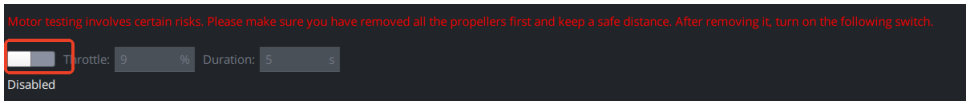
Operating Steps:

(1) Access the page (LGC icon in top-left corner > Vehicle Setup > Motors)

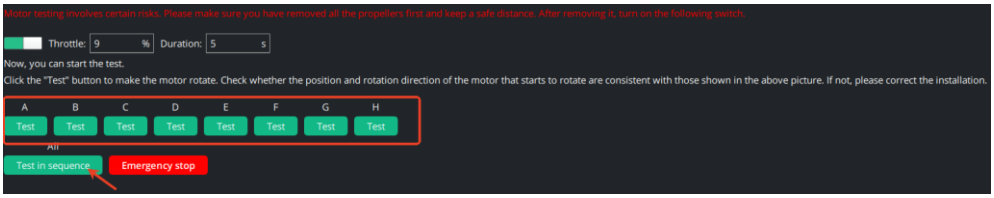
(2) Remove the propellers and maintain a safe distance. (Avoid injury)

(3) Press the safety switch (skip if already disabled)

(4) Activate the slider switch in the page.



(5) Click the “Test” button below each letter to observe if the corresponding motor spins and if the rotation direction is correct. If incorrect, adjust the wiring. (Alternatively, click the "Test in Sequentially" button for quick verification.)



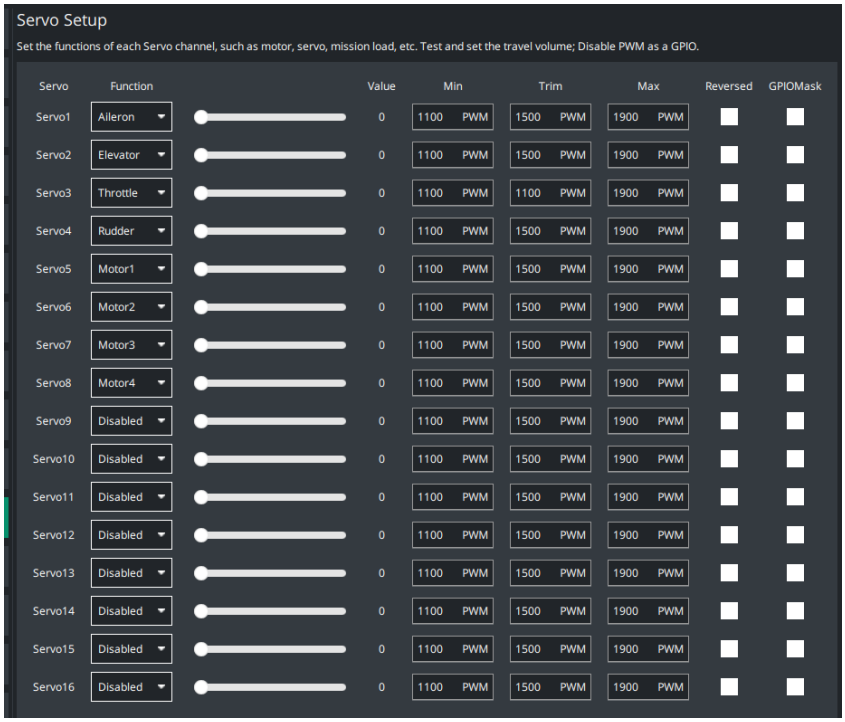
⚠ Important: If you realize you forgot to remove the propellers during motor testing, immediately press the " Emergency stop " button or turn off the propeller switch.

For multicopters, the "Emergency Stop" button immediately halts currently spinning motors and prevents the next motor from starting. For VTOLs, this button only prevents the next motor from starting during "Sequential Test" mode and cannot stop the current motor's rotation.

21. Servo Settings

You can inspect or configure the function of each servo channel, such as motors, rudders, or payloads. View channel output values and adjust travel limits. If a channel is not used for PWM output but for other functions, check the GPIO mask.

Access: Top-left LGC icon > Vehicle Setup > Servo

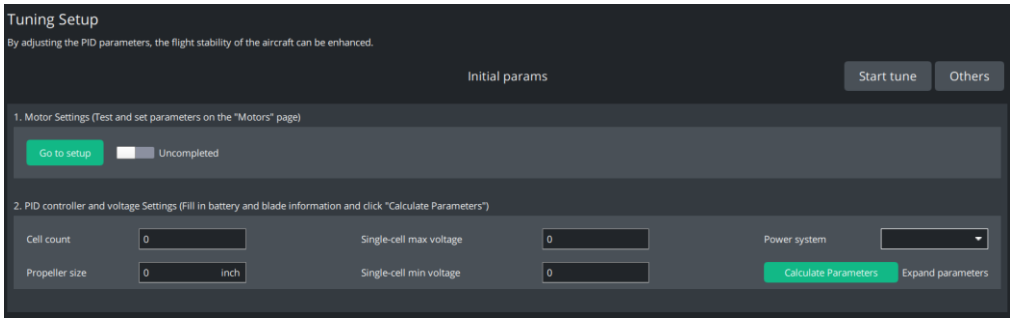


22. Multirotor/VTOL Parameter Tuning

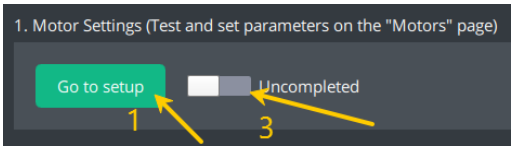
Procedure: Divided into 3 stages.

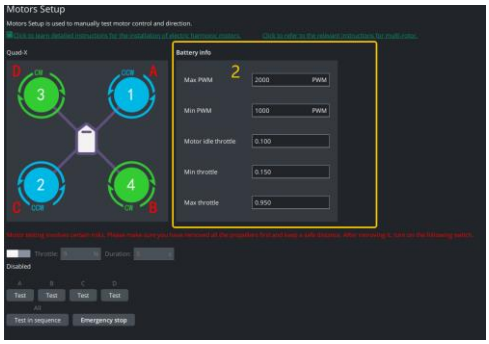
Preparation Before Tuning(Initial params)

(1) Access the page (LGC icon in top-left corner > Vehicle Setup > Parameters)

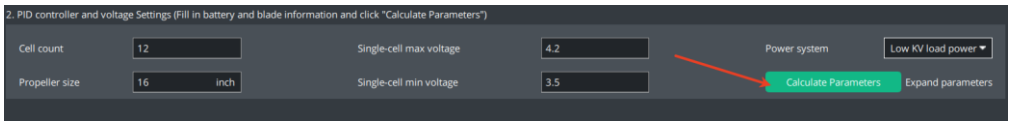


(2) Test motor parameters in the "Motor" interface and configure settings (click "Go to setup" button to jump to and access the "Motor" interface). After completion, toggle the switch on the right.

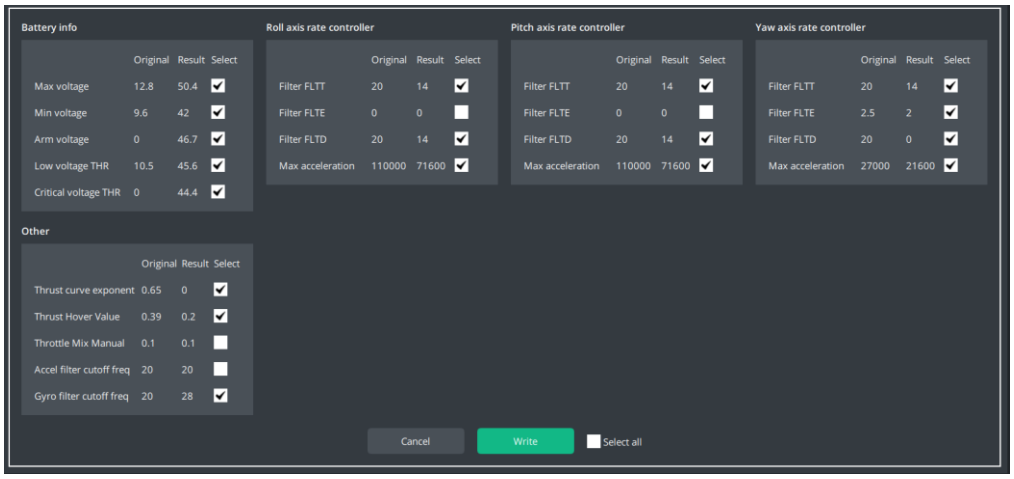




(3) Enter battery and propeller information, then click the "Calculate Parameters" button. The system will compute voltage-related parameters and basic PID controller values.

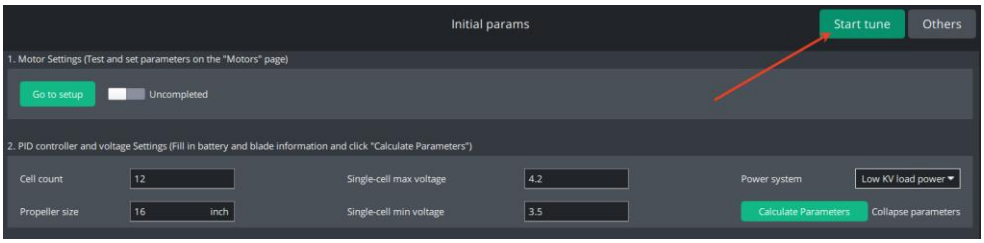


(4) Review the displayed parameters, select the ones to write as needed, then click the "Write Parameters" button.

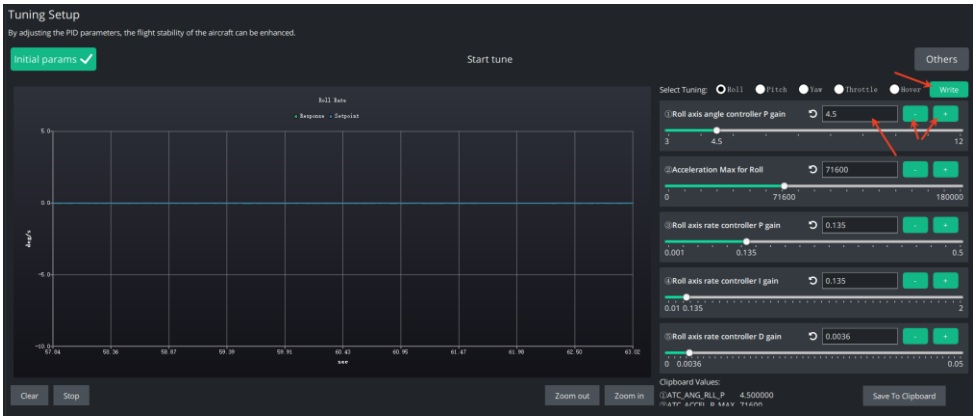


Begin parameter tuning

(1) Click the "Start tune" button to enter the interface.

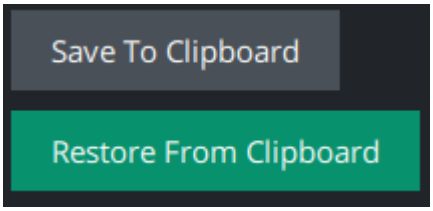


(2) Select the group requiring adjustment. Enter parameter values directly or use the "+" and "-" buttons for fine-tuning (long press for continuous adjustment). Then click the "Write" button in the upper-right corner. (Red segments indicate the magnitude of the current adjustment.)

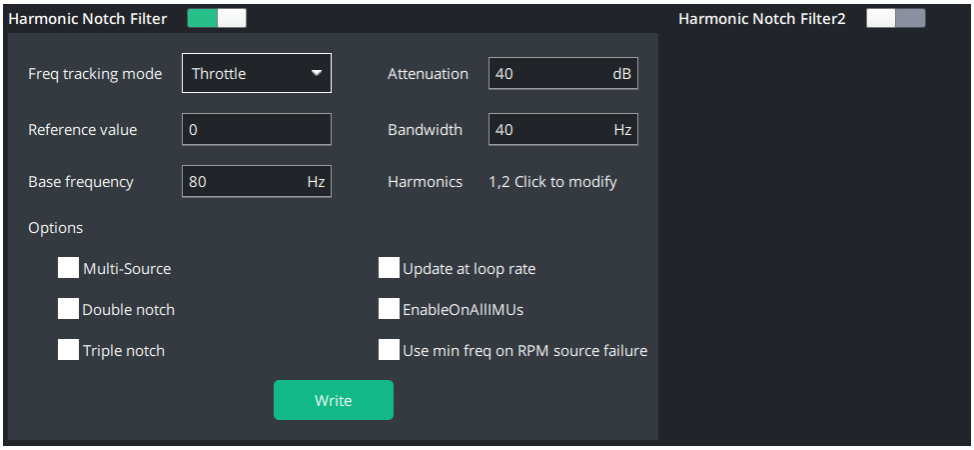


(3) Observe flight performance and continue adjusting parameters until

satisfied. (Without switching groups, click "Restore from Clipboard" to revert all parameters for the current group, or click the undo icon to restore specific parameter values.)



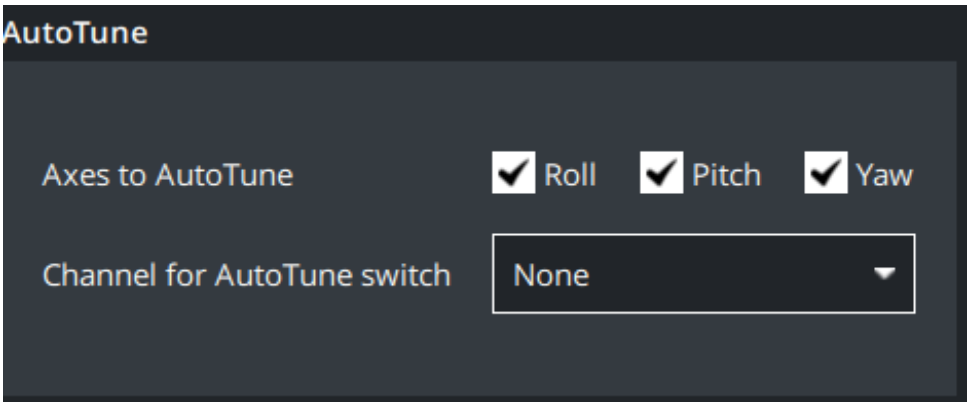
(4) Enable the Fillet Filter switch as needed, configure its parameters, and click the "Write" button.



✧ In addition to the PID parameter modification methods shown in steps (2) and (3) above, ArduPilot also provides other tune methods. LGC offers configurations for autoTune and Transmitter based tuning.

- **AutoTune**

Supports setting axes to AutoTune. Supports configuring AutoTune switch channels (VTOL does not support switch channel configuration; the alternative is to set the automatic tuning mode in the flight mode channel).



Additional Notes:

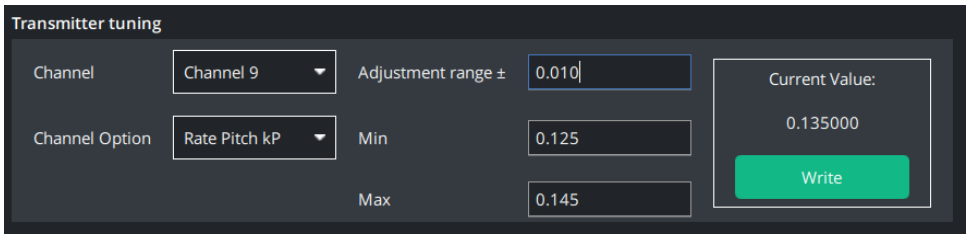
For multicopter, APM offers two methods to enable/disable auto-tune: one involves designating a channel in Flight Mode as AUTOTUNE mode; the other involves configuring a dedicated RC channel for auto-tune (as shown in this configuration).

For VTOL, APM currently only supports the first method described above.

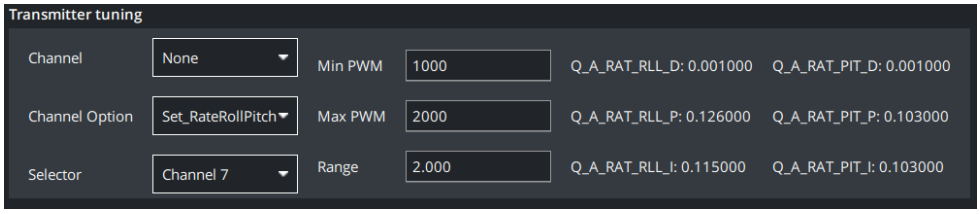
- **Transmitter Based Tuning：**

⚠ The operating procedures for transmitter based tuning are relatively complex (especially for VTOL models) and involve a high degree of risk; therefore, operation by beginners is generally not recommended.

For multicopter vehicles, you can assign tuning knob channels, select target parameters, and set the maximum and minimum values for tuning. You can configure the adjustment range; LGC automatically calculates and sets the maximum and minimum values based on the current parameter value and the adjustment range. After completing the tune, click the "**Write**" button on the right.

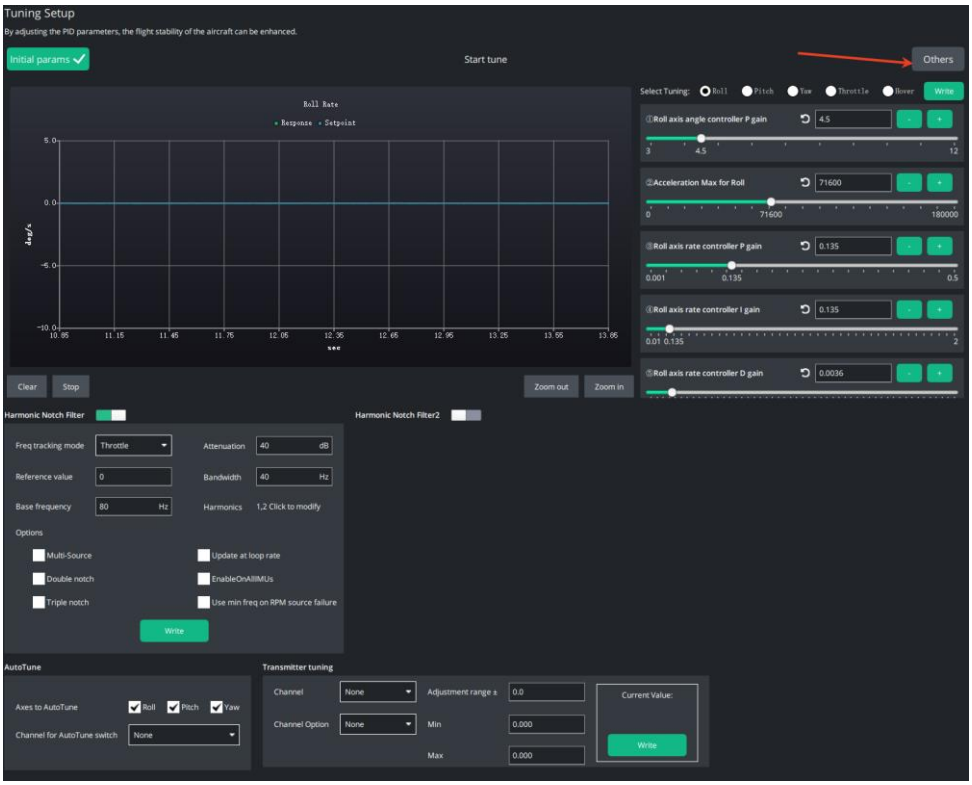


For VTOL, you can assign parameter tuning knob channels, select target parameters/parameter sets, specify parameter switching channels (also usable for triggering parameter writing and value centering), and set maximum/minimum PWM values and scaling ratios.

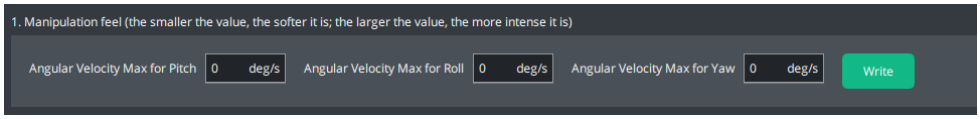


- **Other Flight Parameters**

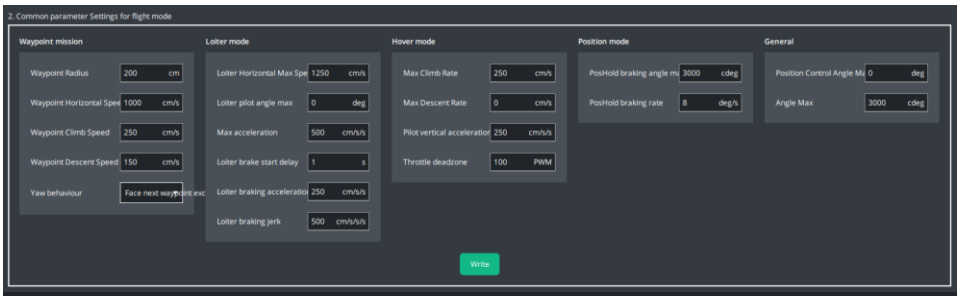
(1) Click the "Others" button to enter the interface



(2) Configure parameters related to control feel and click the "Write" button

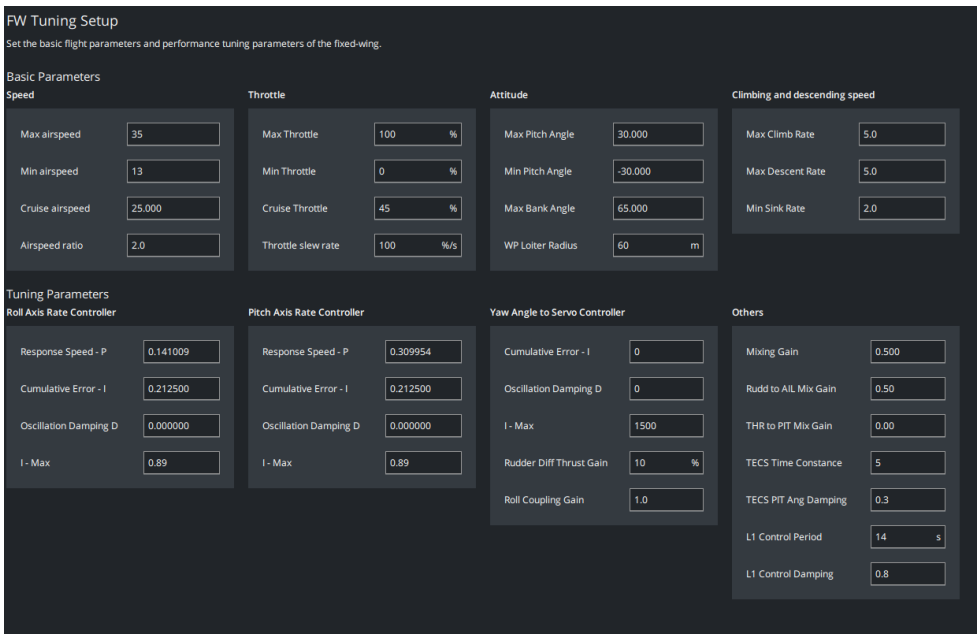


(3) Configure other commonly used parameters and click the "Write" button



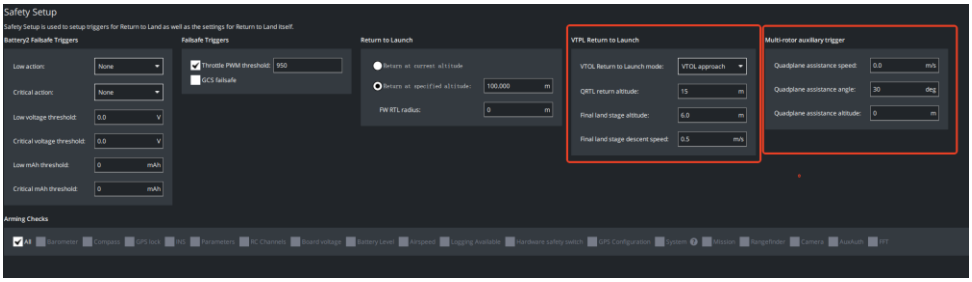
23. Fixed-Wing Parameter Tuning

Used to configure basic flight parameters and performance tuning settings for fixed-wing aircraft.

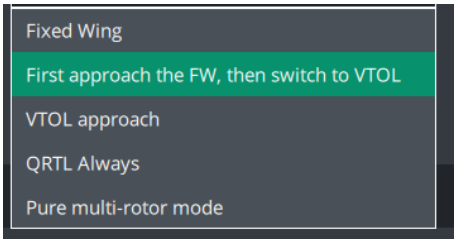


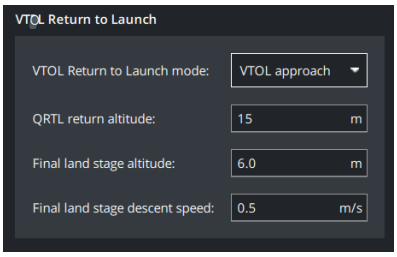
24. VTOL Safe Return and Rotor Auxiliary Trigger

Adds return to launch parameter configuration for VTOL models and rotor auxiliary trigger settings.



Select one of the RTL mode, and set the following parameters for the specific mode.



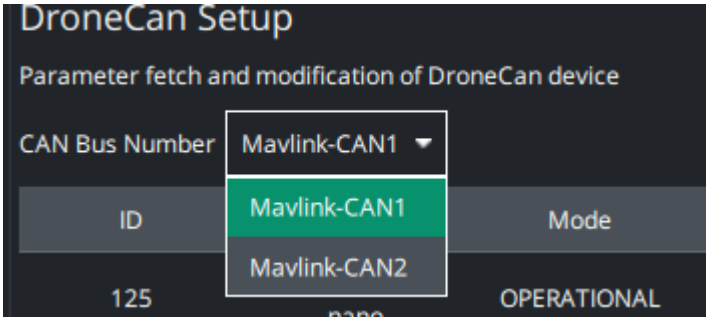


25. DroneCAN paramters

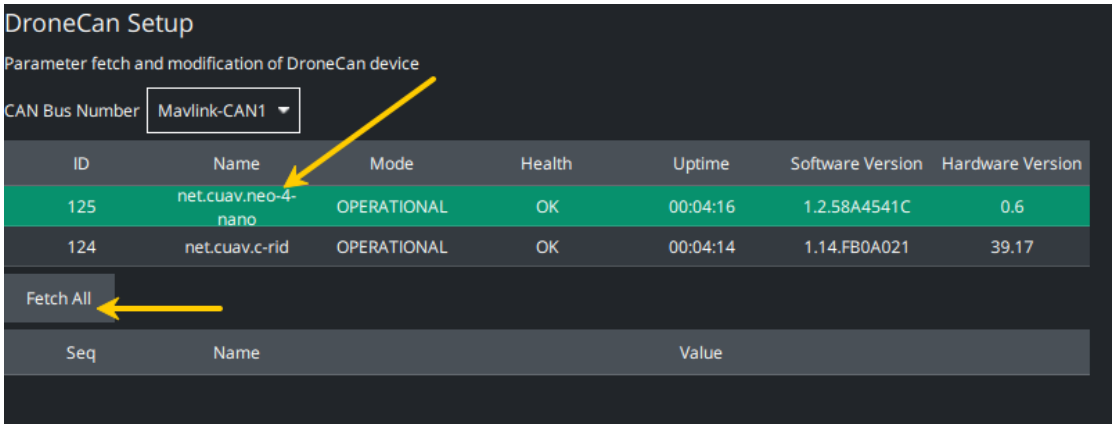
For the Ardupilot firmware, LGC has added DroneCan parameter read/write functionality.

(1) Access interface: LGC icon in the upper left corner> Vehicle Setup > DroneCan

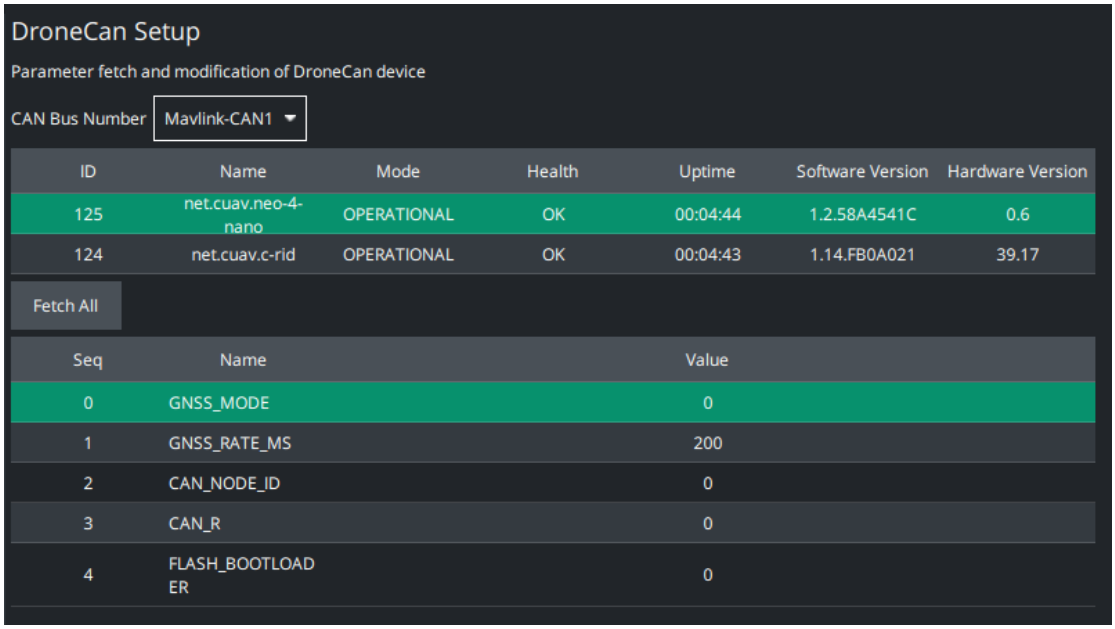
(2) Select CAN Bus Number

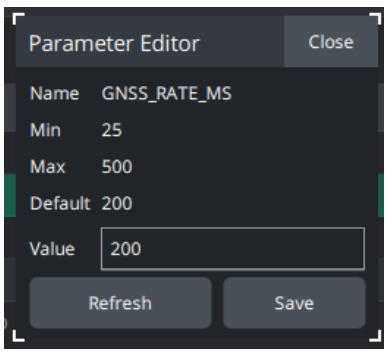


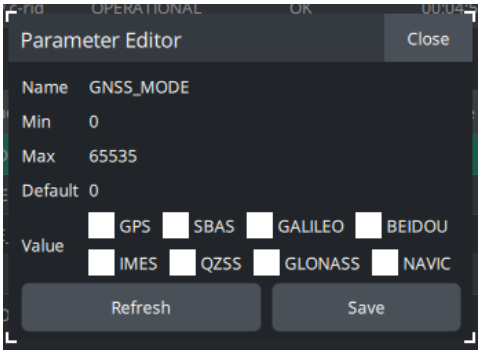
(3) Choose the required CAN device, then click the "Fetch All" button.



(4) Double-click the desired parameter, modify the parameter value in the window, and finally click "Save".







26. Flight Restriction Management

No-Fly zone

LGC has built-in no-fly zone data for all domestic civil aviation airports and Beijing's restricted areas, which can be specially marked on the map. For Ardupilot firmware, the system will perform no-fly zone verification when users upload flight plan or when the drone is armed for takeoff. If the operation violates no-fly conditions, a warning will be issued and the action will be cancelled. During flight, the drone's position is monitored in real time. If it enters a no-fly zone, the system will issue an alert and automatically initiate backtracking or return-to-home (This function is disabled by default and must be manually enabled by the user).

Function Configuration":

(1) Access Interface: LGC icon in the upper left corner > Application Settings > Limit > No-Fly Zones
(2) Users can choose whether to enable the no-fly zone function. If disabled, zones will not be displayed and no alerts or controls will be applied.
(3) To only view zones without system alerts or controls, check "No Control (Display Zones Only)".
(4) To receive warnings when the drone enters a no-fly zone without system intervention, check "Enter Warning" and leave all other options unchecked.
(5) To enable automated control measures, check the corresponding items.

"No Arming" means: The drone cannot be armed for takeoff if it is located inside a no-fly zone.

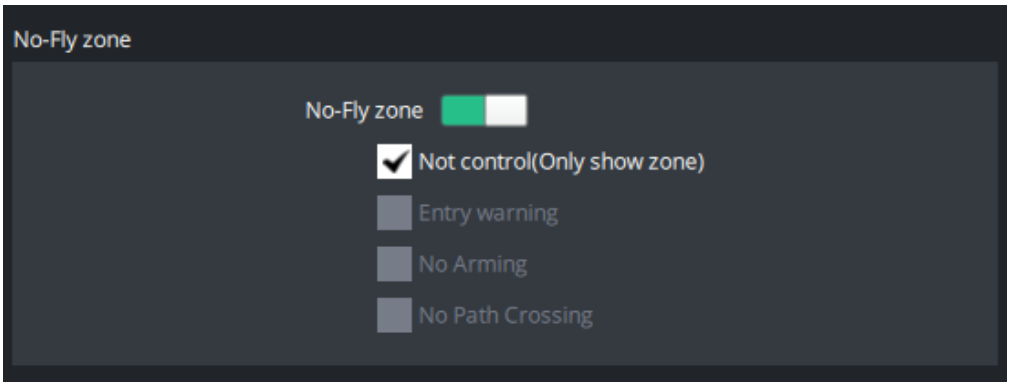
"No Path Crossing" means:

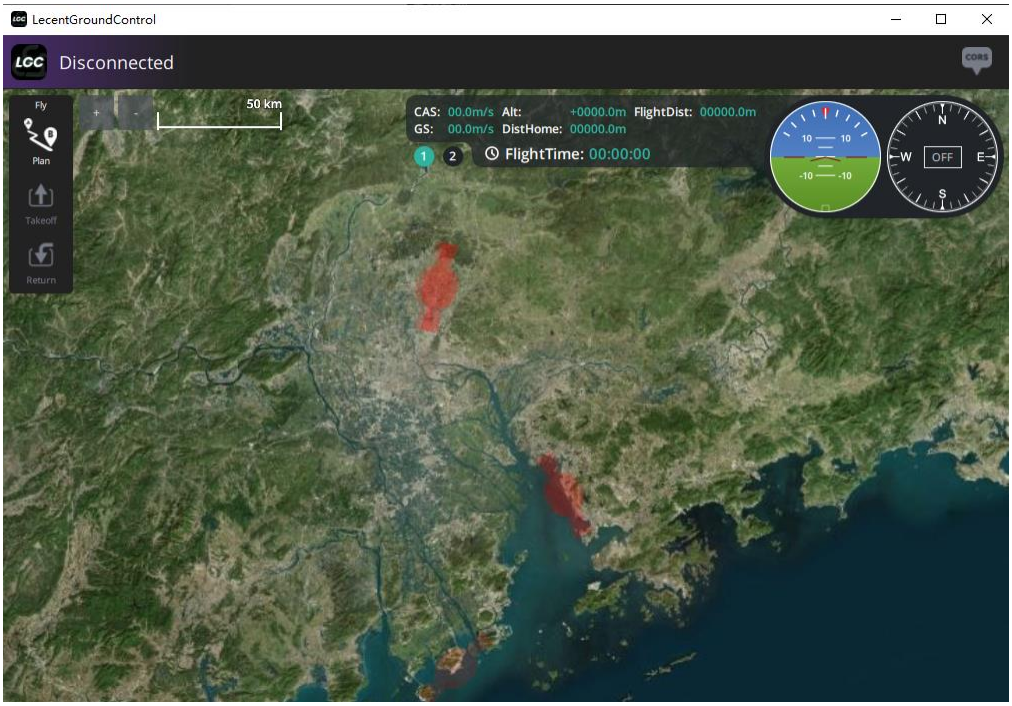
① Uploaded flight routes that would cross a no-fly zone will be rejected.

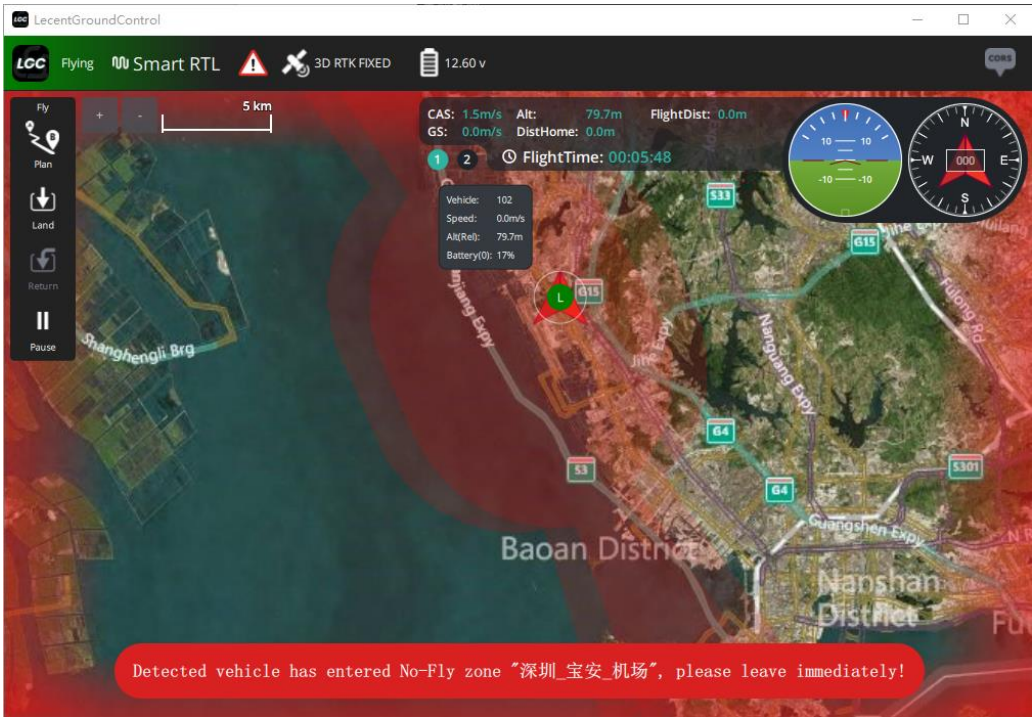
② Existing flight plans on the drone that cross a no-fly zone cannot be executed via the ground station in automatic mode.

③ The ground station cannot command the drone to fly into a no-fly zone via “Go to location” navigation.

④ During flight, if the ground station detects the drone entering a no-fly zone, it will automatically command the drone to backtrack along its entry path.







global flight altitude limit

According to relevant airspace management regulations, micro, light, and small drones must fly within a specified true altitude, while drones of other classes must operate within approved airspace (including restricted altitudes). LGC provides a global flight altitude limit control function. When users upload flight routes or during drone flight, altitude validation will be performed. If altitude limits are violated, warnings will be issued. (This function is disabled by default and must be manually enabled by the user.)

(1) Access Interface: LGC icon in the upper left corner > Application Settings > Application Settings > Limit > Global Limit Height

(2) **"Exceed Altitude Warning":** When the real-time flight altitude of the drone exceeds the limit, the ground station will issue a warning.

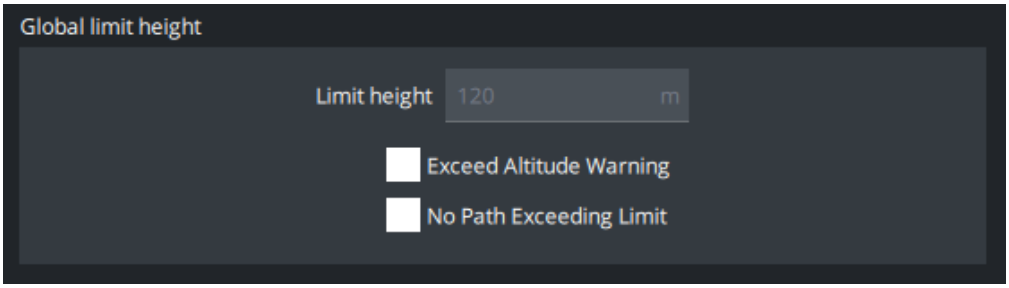
(3) **"No Path Exceeding Limit":**

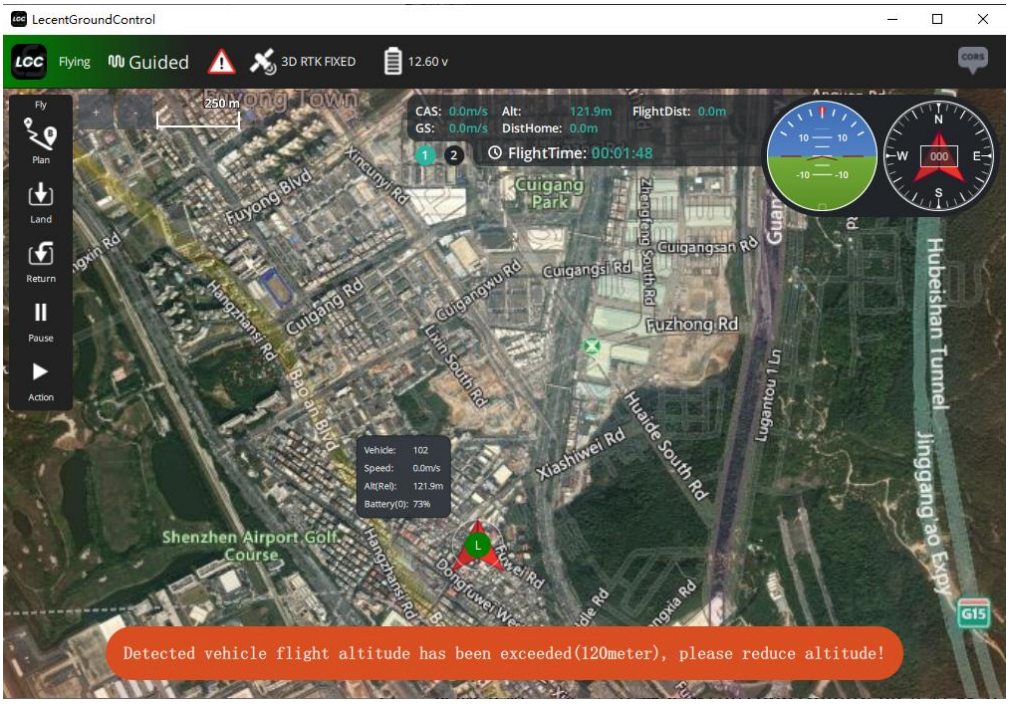
① Uploaded flight routes with waypoint altitudes exceeding the limit will be rejected.

② Existing flight plans on the drone cannot be executed via the ground station in automatic mode if any waypoint altitude exceeds the limit.

③ The ground station cannot command the drone to ascend beyond the restricted altitude.

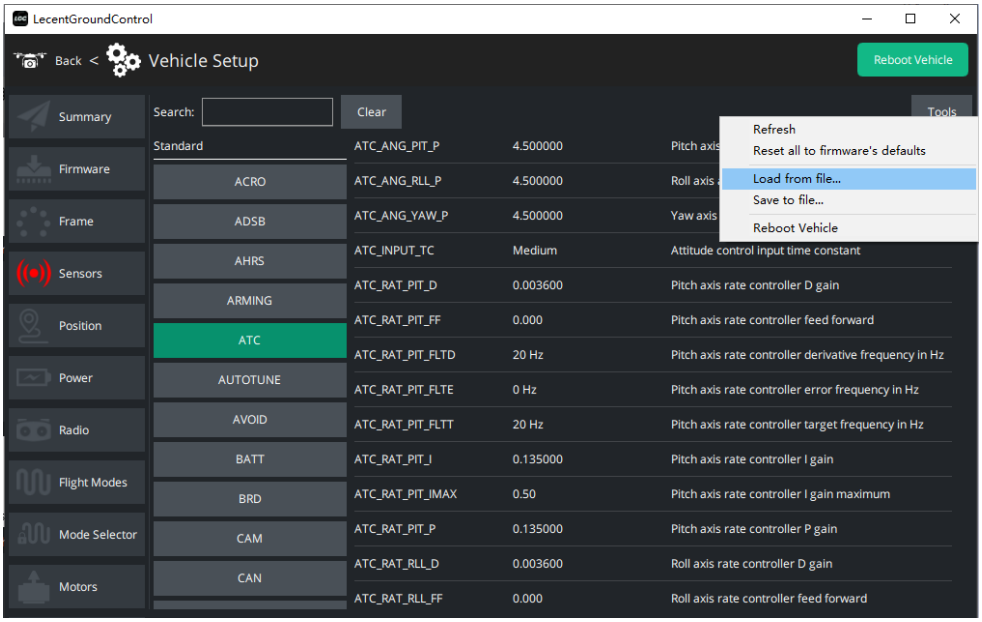
(4) Please check the required items as needed and configure the **“Limit height”.**

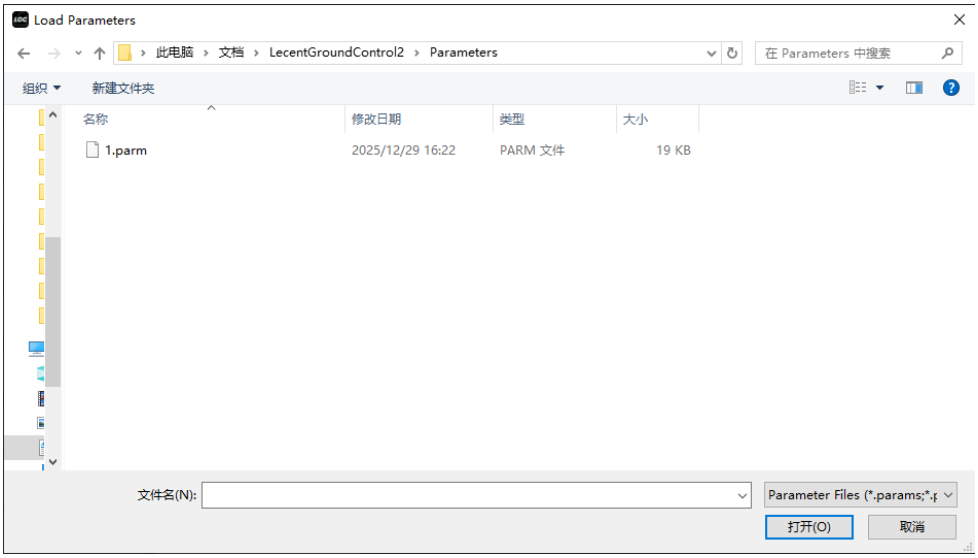




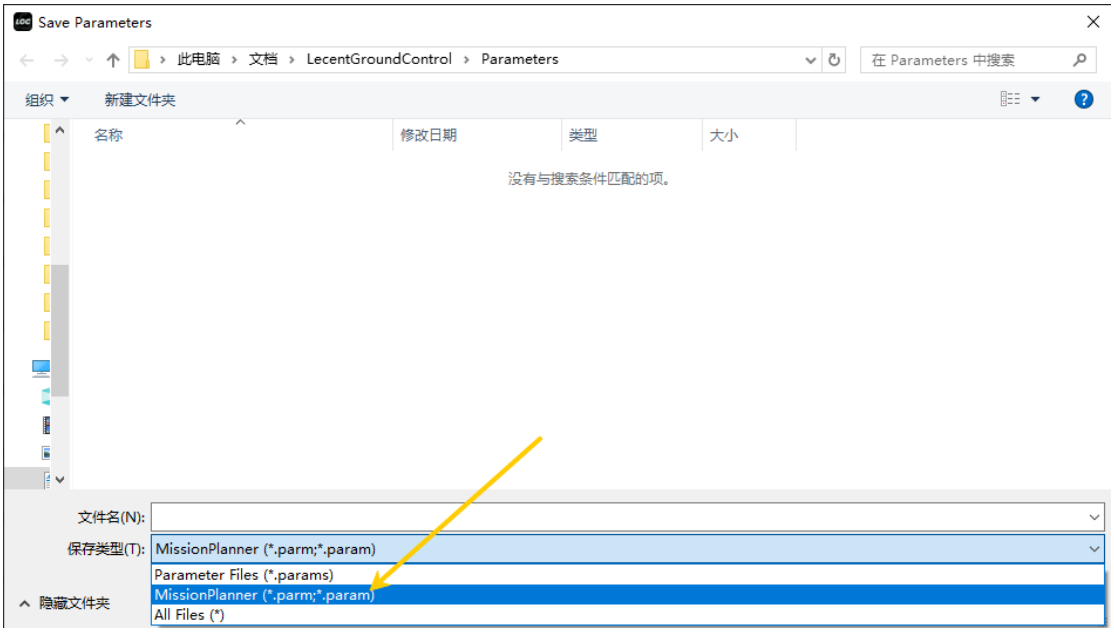
27. Parameter file import/export is compatible with MissionPlanner’s file format

Import: Click "Load from file," locate the directory containing the MP parameter file in the file selection window, select the file, and click Open.



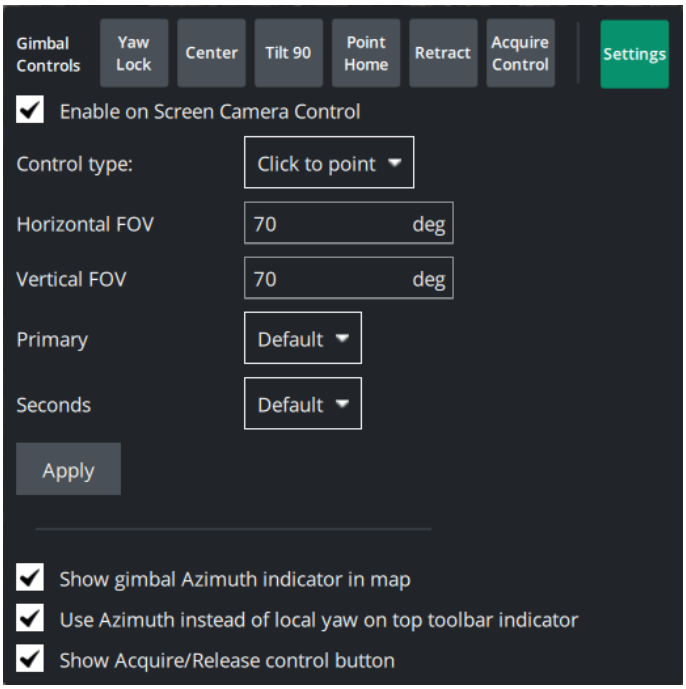


Export: Click "Save to file," then select the second option from the "Save as type" dropdown at the bottom of the file save window.



28. Optimize MAVlink pod gimbal control

⚠When the flight control is running ArduPilot 4.5 and above firmware and equipped with MAVlink compatible gimbal camera, the gimbal and camera can be controlled by LGC; when LGC detects the MAVLINK gimbal it will show the control interface; this function is still in the stage of improvement!



- "Yaw Lock/Follow": control whether the gimbal keeps the earth coordinate system yawing to the target (lock) or follows the carrier yaw movement (follow)

- "Center": center the gimbal back (move it into MNT1_NEUTRAL_X, MNT1_NEUTRAL_Y, MNT1_NEUTRAL_Z)

- "Tilt 90°": the gimbal camera is vertically down.

- "Pint Home: point to the airplane home position.

- "Retract": move it to the roll, pitch and yaw angles maintained in MNT1_RETRACT_X, MNT1_RETRACT_Y, MNT1_RETRACT_Z.

Use the video window to control the gimbal:

- Select the "Settings" button

- Check "Enable on Screen Camera Control" and set "Control Type" to "Click to Point".

- Set the horizontal and vertical viewing angle of the camera

- Adjust the video playback frame to the maximum, and click anywhere on the screen, the PTZ will move the center point to the target orientation according to the field of view.

- Pull the right zoom control bar to control the gimbal for zoom control.

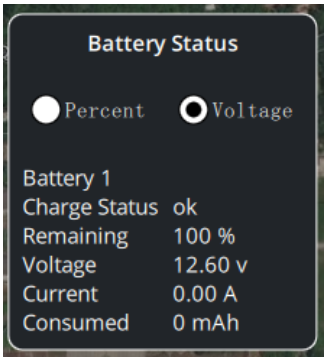
- Seeing light and thermal imaging can be switched through the primary and secondary source settings

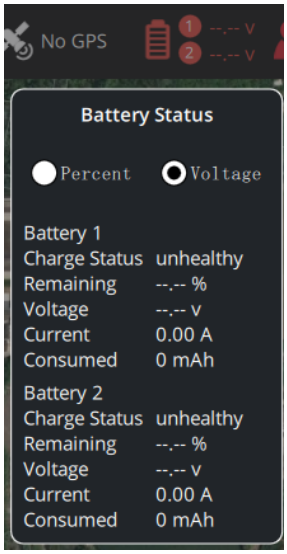
29. Video decoder

To accommodate some H264 video streaming devices, the LGC video encoder has been changed from decodebin3 to decodebin.

30. Battery percentage/voltage switching

In order to take into account the intelligent development of the industry and the actual situation of some users using non-intelligent batteries, the battery information area of the LGC flight information column provides two modes to choose from, supporting the user to choose to display the percentage of power or voltage.



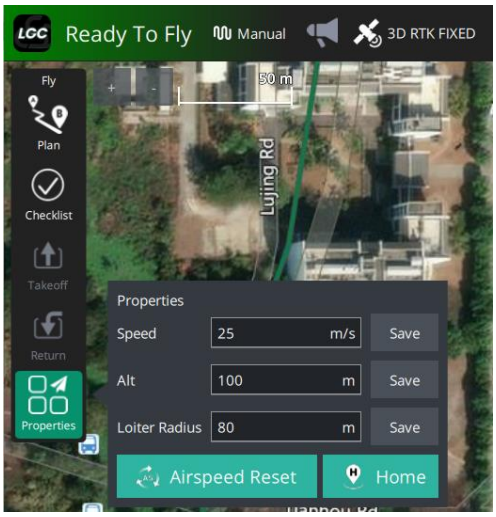


31. Optimized for vertical take-off and landing fixed wing

Real Time Properties

This setting is only available for fixed wing and vertical takeoff and landing UAVs with Ardupilot firmware; the setting can be effective in real time. Typical applications are zeroing airspeed and updating takeoff point before flight, and real-time altitude and speed changes during flight.

Click "Real-time Properties" in the sidebar of the main interface, you can see the interface as below, where Speed is the **cruise speed, Altitude** is the relative altitude, **Hovering Radius** is the radius of hovering during the flight, **Airspeed Zero** button can reset the current airspeed data, and **Start Point** button can set the current position of the drone as the home point.

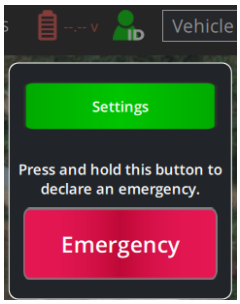


Wind Vane and Wind Speed Indicator

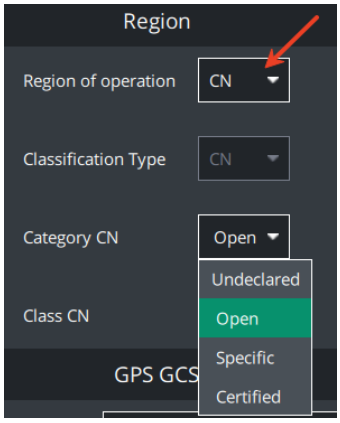
For fixed wing/vertical takeoff and landing fixed wing characteristics (Ardupilot firmware), LGC has added the wind vane indication and wind speed function, which is used to indicate the wind direction and wind speed in the current environment.

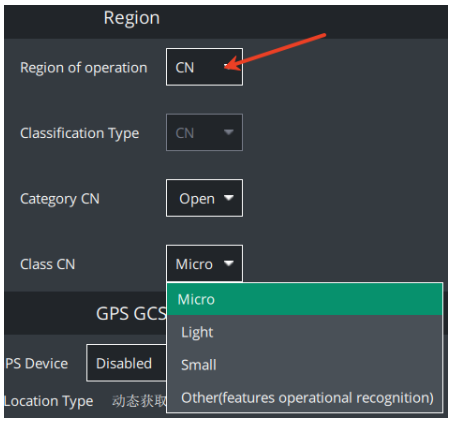
32. Optimize remote ID information setting

Click  icon on the toolbar in the main interface of the system to show the shortcut configuration portal, click "Information Setting" to enter (you can also enter through the menu: LGC icon>Application Setting>Remote ID).



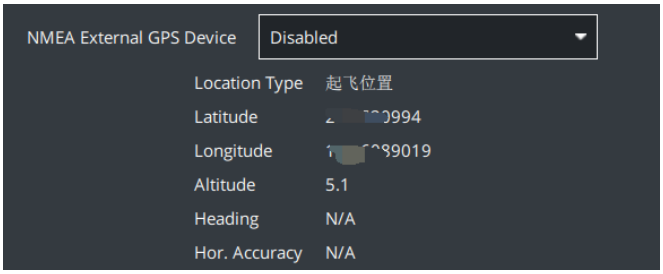
When "CN" is selected for the operation area, the operation category and UA level options will be displayed according to the China policy.



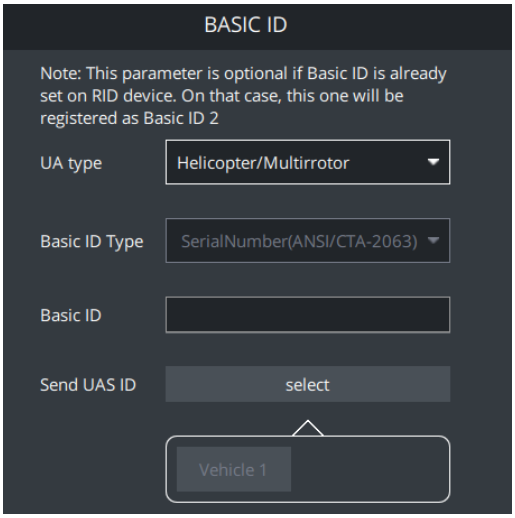


When "CN" is selected as the operating area, location type selection is not supported. If user has external NMEA GPS device, please select NMEA GPS device connection port and baud rate; if there is no corresponding device, NMEA GPS device field can be set to "Disable". According to China's policy, the system will prioritize to get the dynamic positioning data of the device , if it fails to get the data, then the system will use its own positioning data (the type of which is dynamic), and if it fails to get the data, then it will use the aircraft

takeoff position.



Aircraft ID sending function is optimized to send to specified aircrafts on demand instead of continuously to all aircrafts. Only "SerialNumbr(ANSI/CTA-2063)" is supported. UAS ID sending is only supported for Ardupilot controllers.

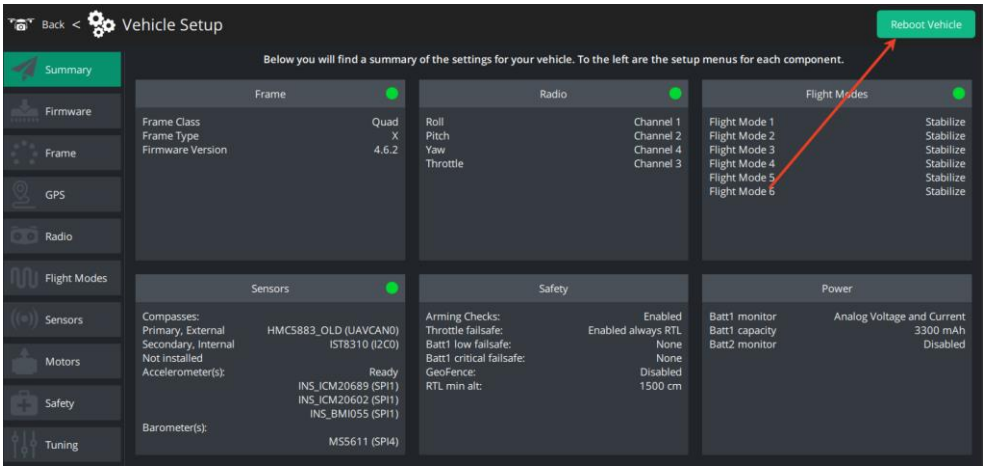


33. Reboot The Drone

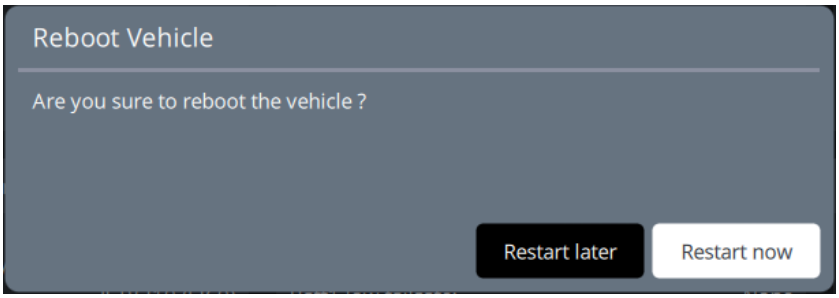
Reboot

A "Restart Vehicle" button has been added to the top right corner of every

menu page in Ardupilot to quickly restart the drone.

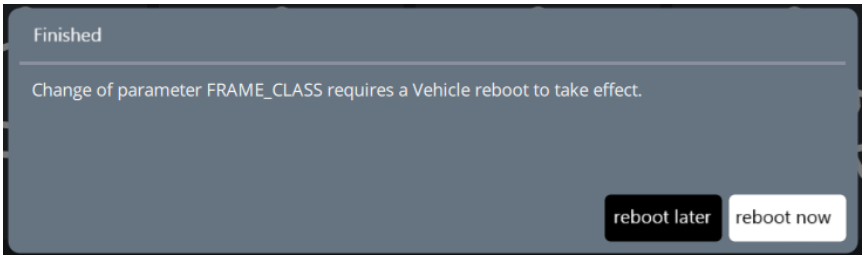


As shown in the picture above, after clicking the button, click "Reboot Now" in the reboot confirmation window that pops up.



Parameter change triggers reboot

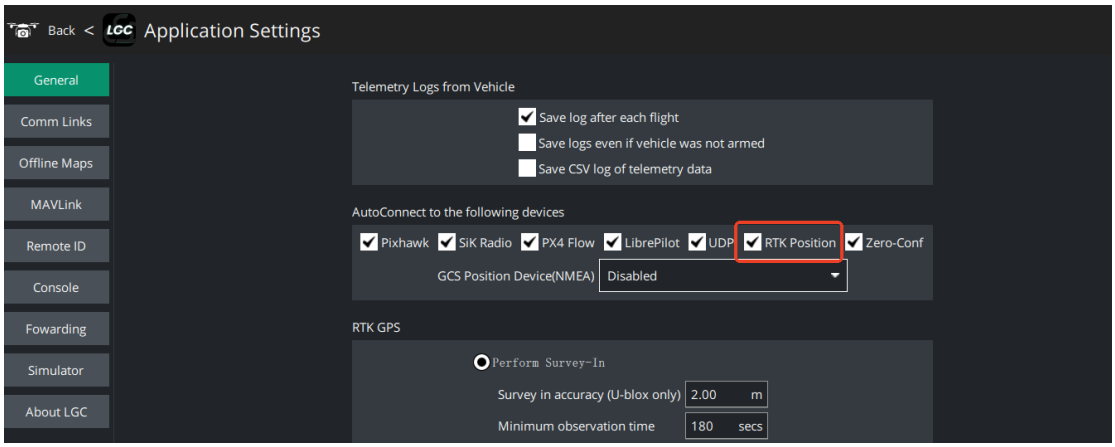
After modifying the key parameters, you need to restart the airplane to take effect, in this case, you can click restart directly in the reminder window, or you can choose not to restart.



34. RTK Base Station Connection

Click  icon on the upper left corner, select **"Application Settings"->"General"**, find "AutoConnect to the following devices" in the right interface, check the box of "**RTK Position**" and no need to set port number.

When the RTK base station device is successfully connected, it can provide RTK service for the UAV in the air and provide positioning information for the current ground station.



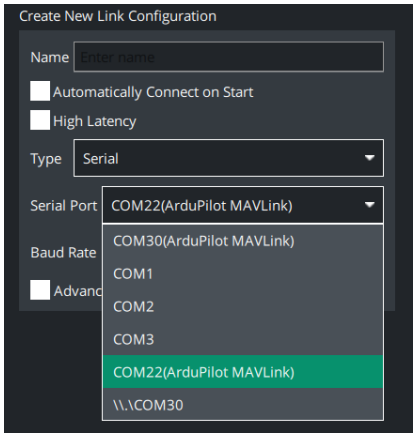
35. Fixed route planning bug in QGC Chinese mode.

LGC fixes the bug that the existing QGC version cannot plan routes under Chinese interface language.

36. Fix the problem that some serial ports cannot be found in connection configuration

After the ground station device connects to the flight control hardware through the serial port, when adding the communication connection in the ground station program, the required serial port will not be found in the feature

scenario, this problem has been solved.



37. Fix the problem of losing the configuration menu of other drones after one drone disconnecting.

When the ground station connects to multiple drones at the same time, disconnect one of them at this time, and then you will find that the setting menu of the rest of the drones is lost. This issue has been fixed.