

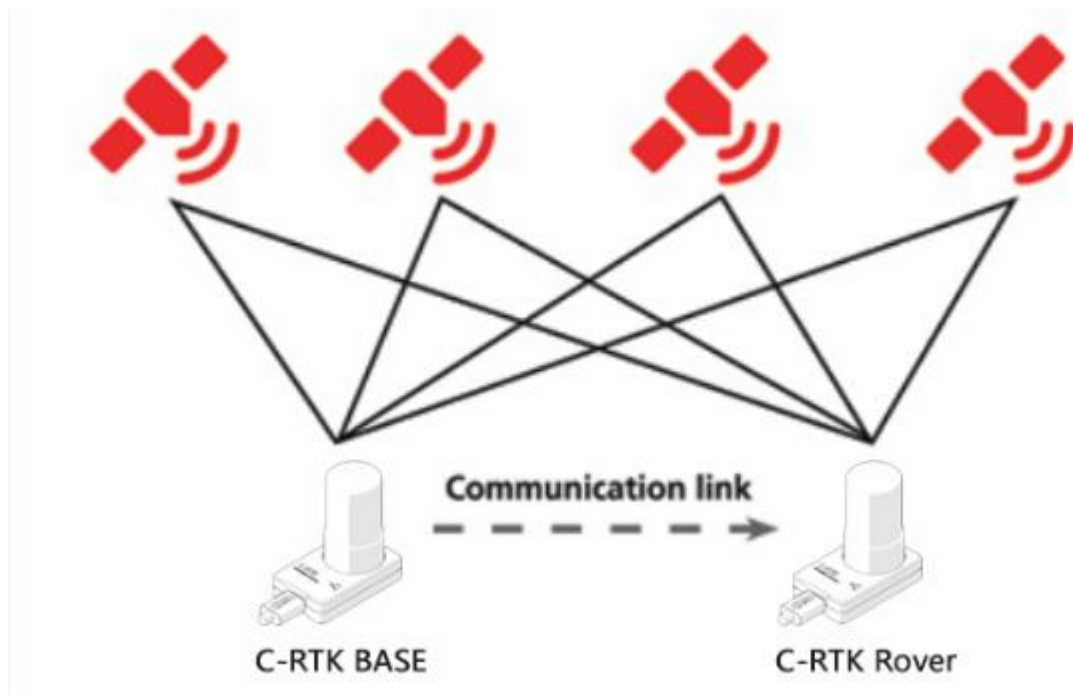
# C\_RTK centimeter positioning system

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## Description

High-precision positioning: Many drone applications require higher accuracy than traditional GNSS offerings, such as drone mapping, agricultural surveying, and high accuracy takeoff and landing.

C-RTK is a Real Time Kinematics module for mass market launched by CUAV. The complete RTK system can be composed of two C-RTK modules (one for aircraft and one for base station)



Small size, big power

**Integrated RTK GPS (M8P) + GNSS system dual positioning module and a COMPASS geomagnetic compass in only 53MMX32MM volume, greatly reducing the installation volume requirements for the aircraft, but also improve the reliability and greatly reduce the hardware cost**

CNC aviation aluminum alloy shell

C-RTK uses a CNC formed aluminum alloy shell, in addition to reducing external electromagnetic interference, reliability and durability also have some improvement

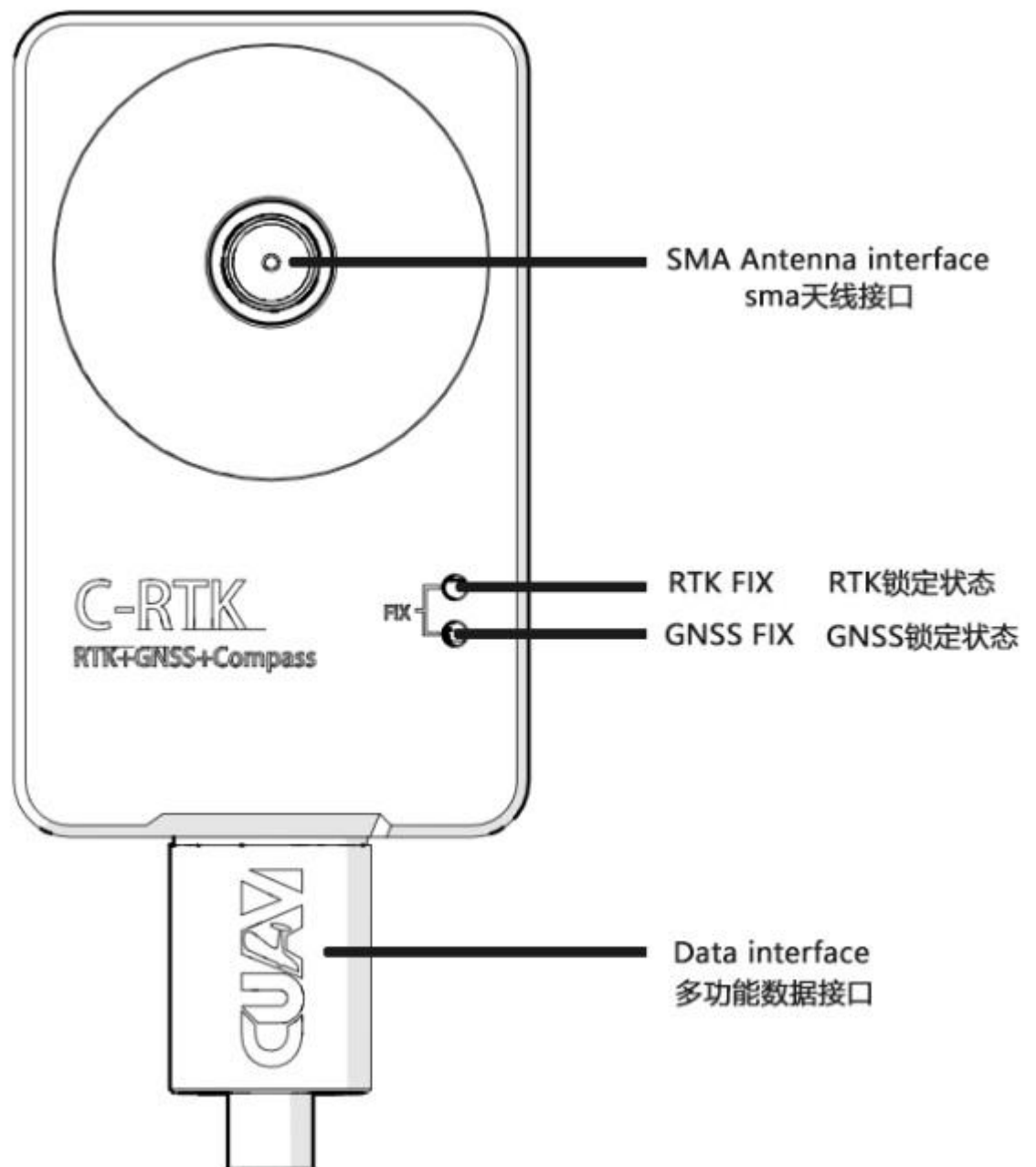
Double-ended design

D-The use of TYPE-C interface design, clever use of port redundancy design, the aircraft end and ground end only need to insert different specific data line can be double-ended switching, convenient and rapid iteration, reduce operating costs

Centimeter level positioning

Run advanced differential algorithm, so that the positioning accuracy of centimeter level positioning accuracy.

## C\_RTK interface definition diagram

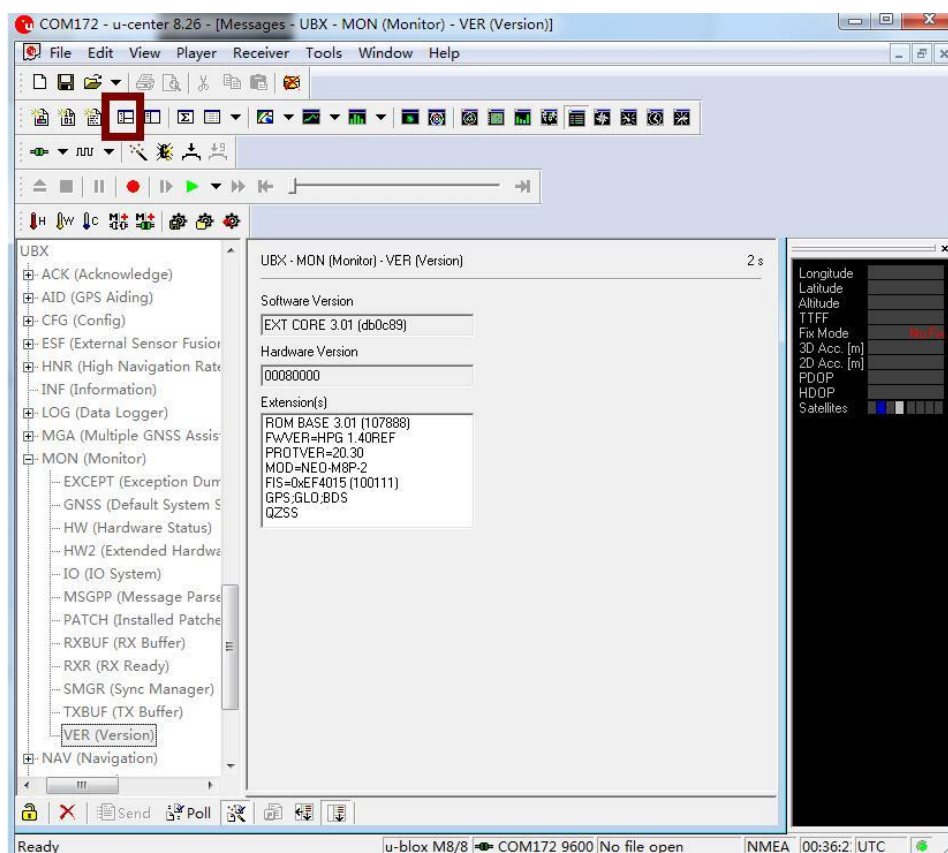


E-RTK uses the same module on both ends, its interface definition and indicator light are the same.

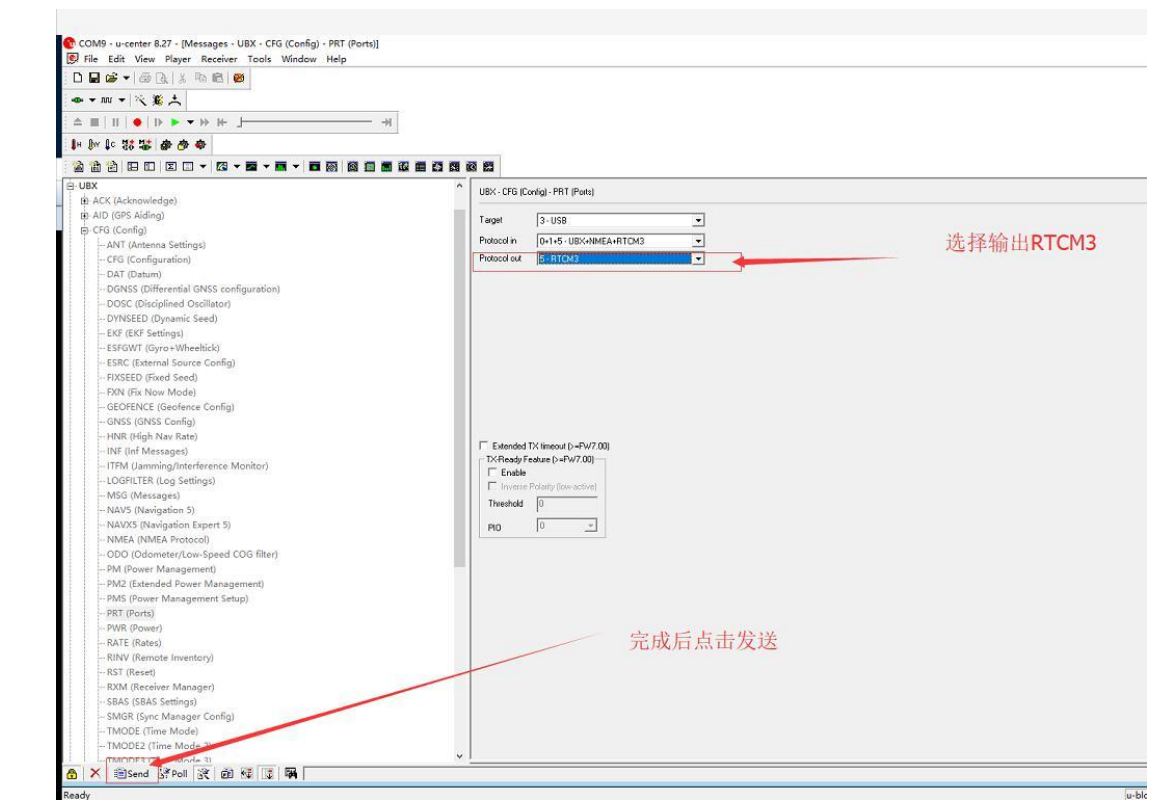
# parameter settings

## C-RTK parameter setting

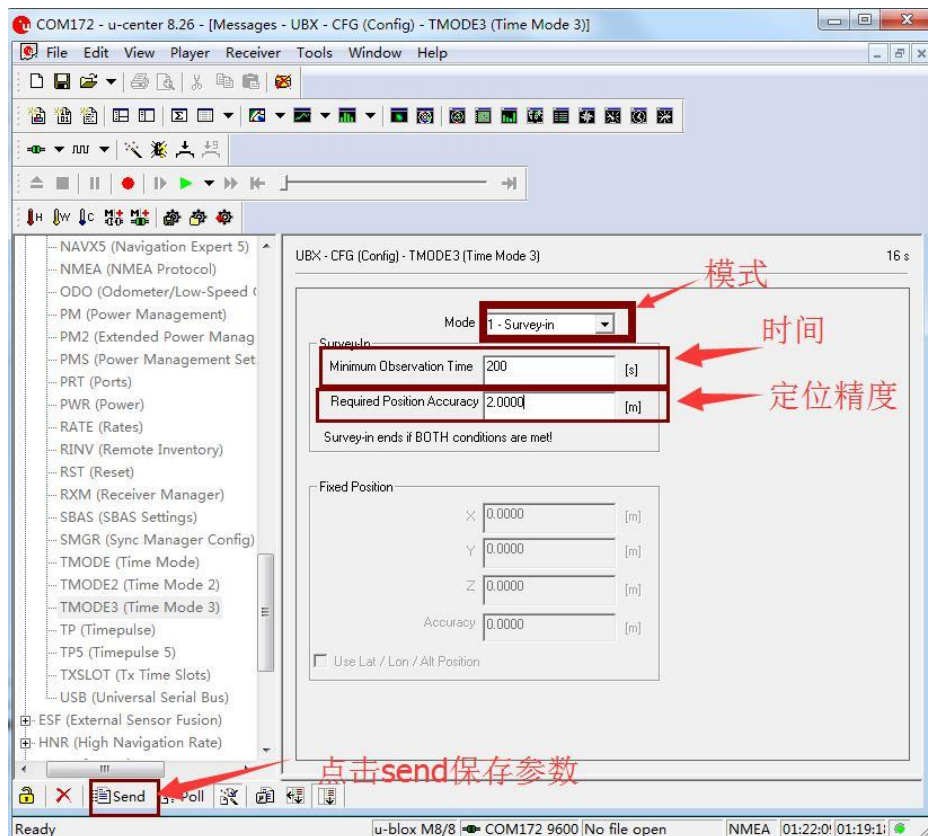
- Before using the C-RTK parameters need to be set, please refer to the following settings
- Please connect the base station to the u-center software and click the View option to enter the icon in the box below Message View -> UBX -> MON -> VER, as shown in the following figure:



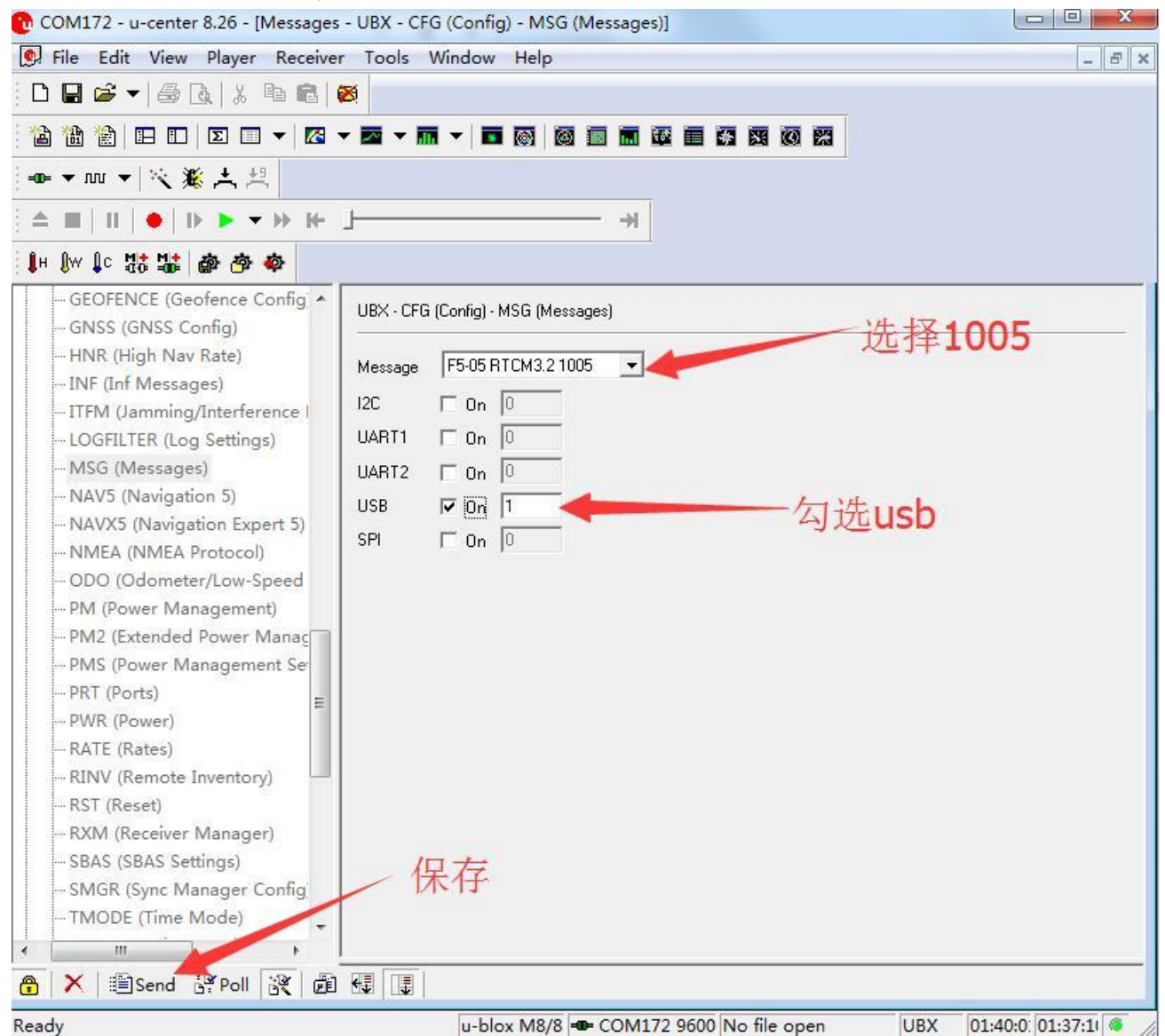
- Click UBX> CFG> PRT, set the C-RTK protocol to RTCM3, and click send to save the settings



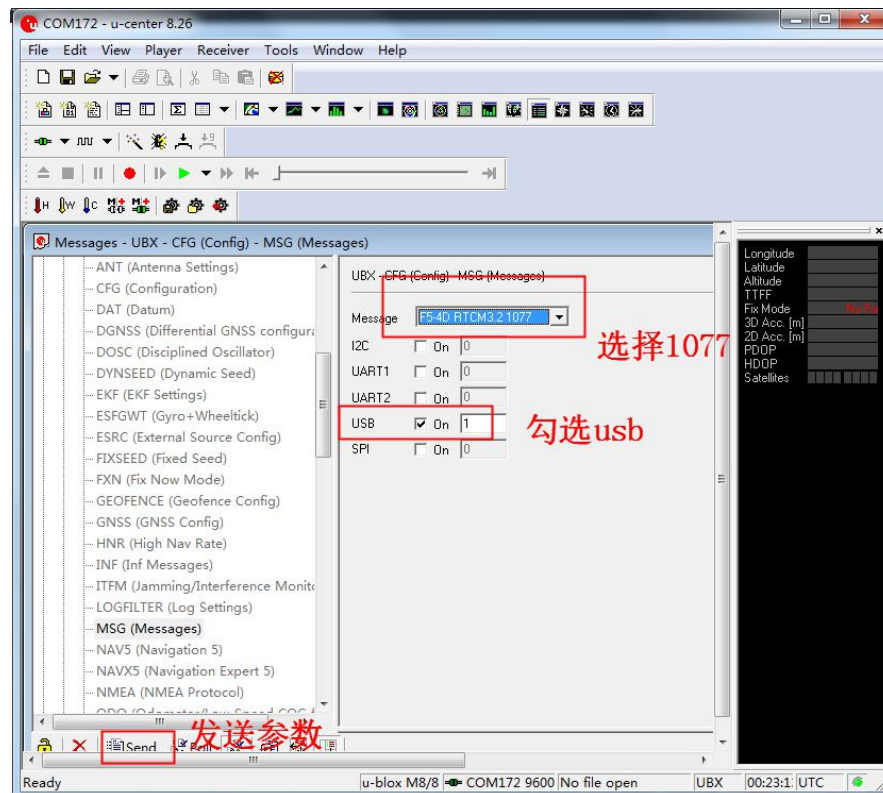
- Click UBX> CGF> TMODE3 and set the mode to Survey-in mode to set the time and accuracy you expect.



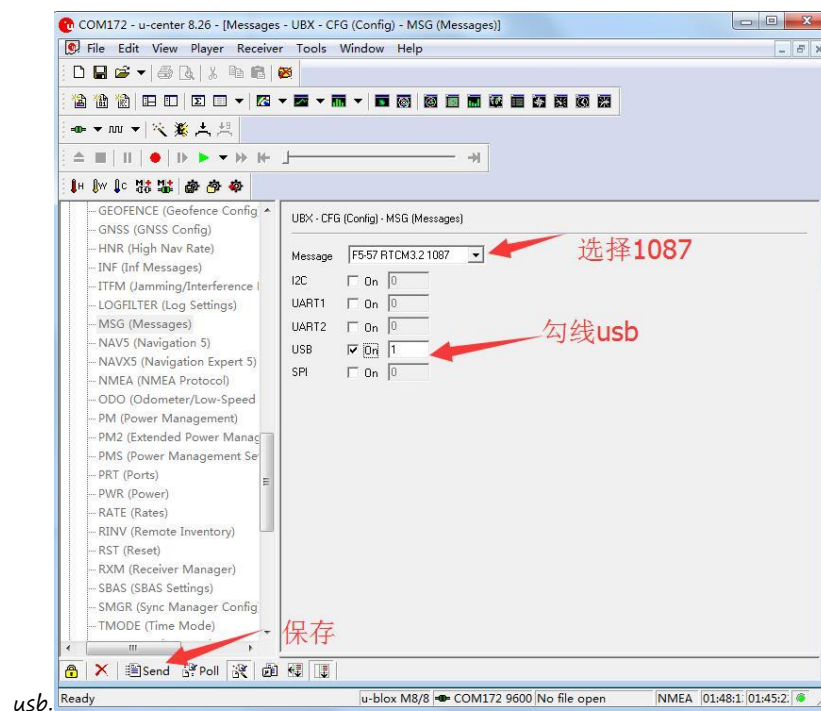
Click UBX> CFG> Set the MSG parameters as shown below



Change the same parameter to 1077, tick usb

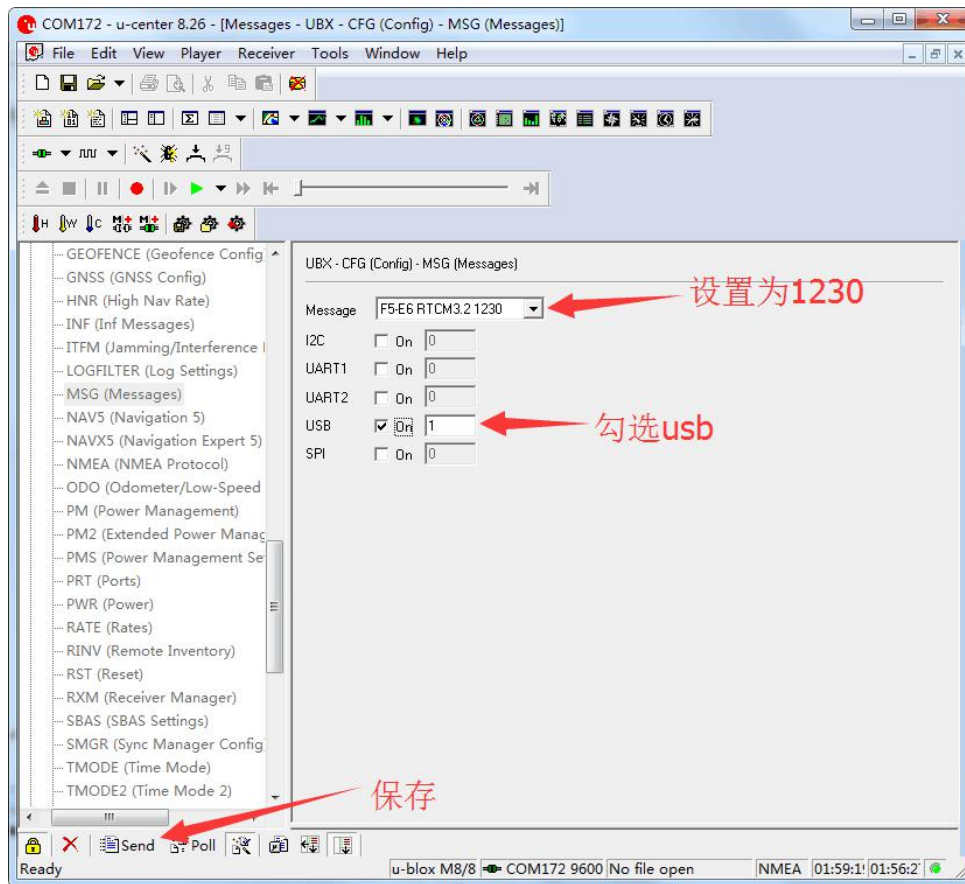


Change the same parameter to 1087, check

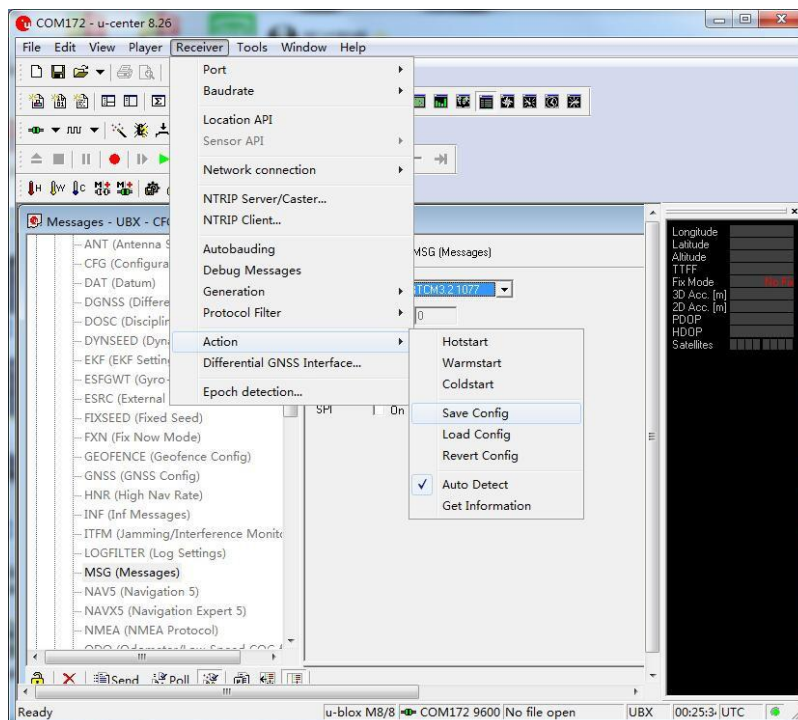




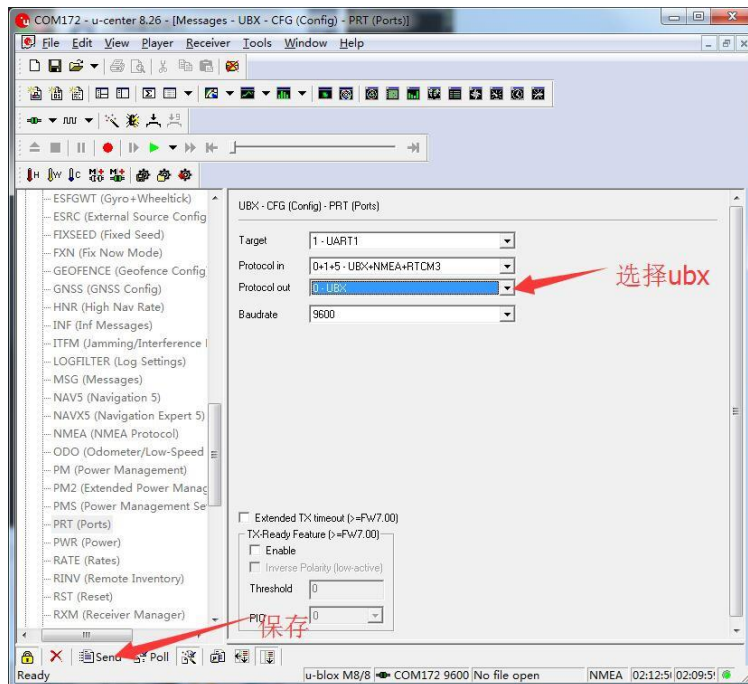
Change the same parameter to 1230, check usb.



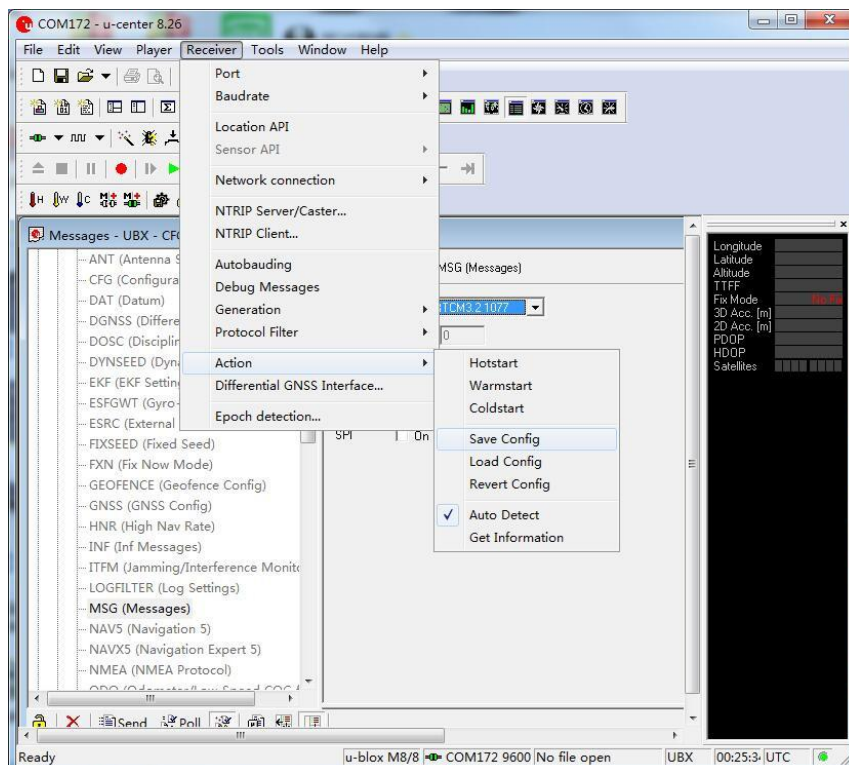
Set the base station to complete, please connect the mobile terminal and u\_center, set the mobile terminal



Set the base station to complete, please connect the mobile terminal and u\_center, set the mobile terminal



Open Receiver> Action> SAVE config to save the configuration

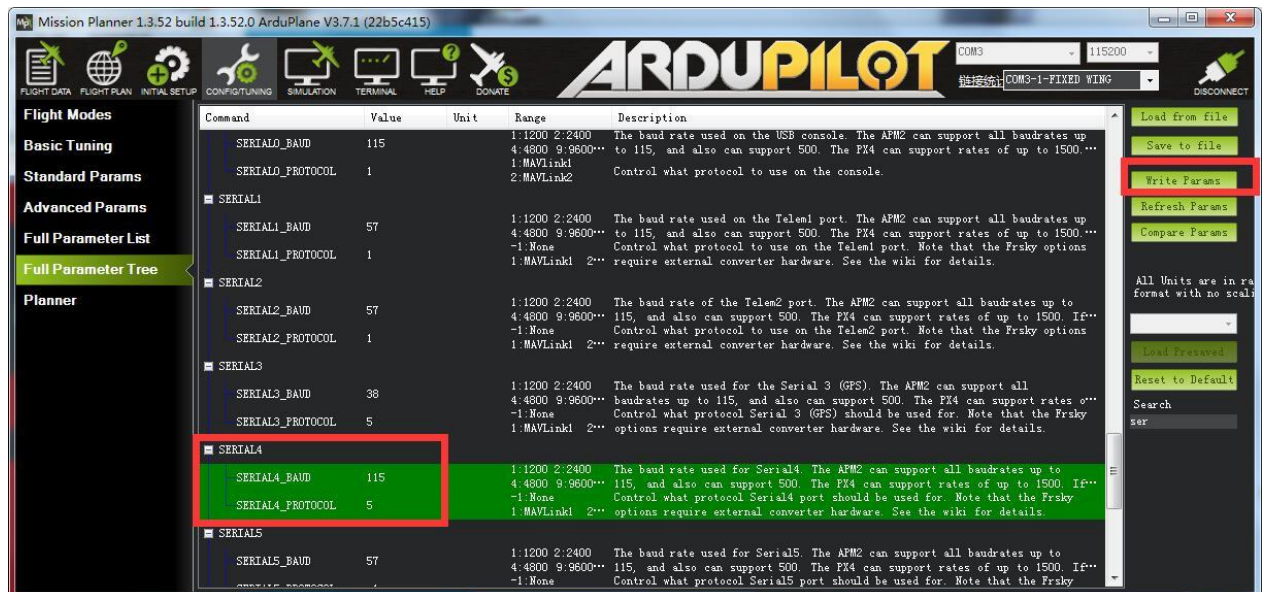


C-RTK setting completed.

Flight control parameter setting



Flight control connected to the mission planner "debug / configuration> all parameters tree" rtk GPS serial port serial parameters inserted serialx\_BAUD (x serial number, GPS serial port serial3; GPS2 serial4) to 115, click write.



The pictures shows above the rtk gps inserted into the flight control serial / serial5 (flight control interface identification) setting method

Flight Control Connection on mission planner Commissioning / Configuration> All Parameters Tree> Set the following parameters

RTK as GPS2:

GPS+GLONASS+SBAS GPS\_GNSS\_MODE2 to 67 (if rtk is GPS2) is set to GPS + GLONASS + SBAS

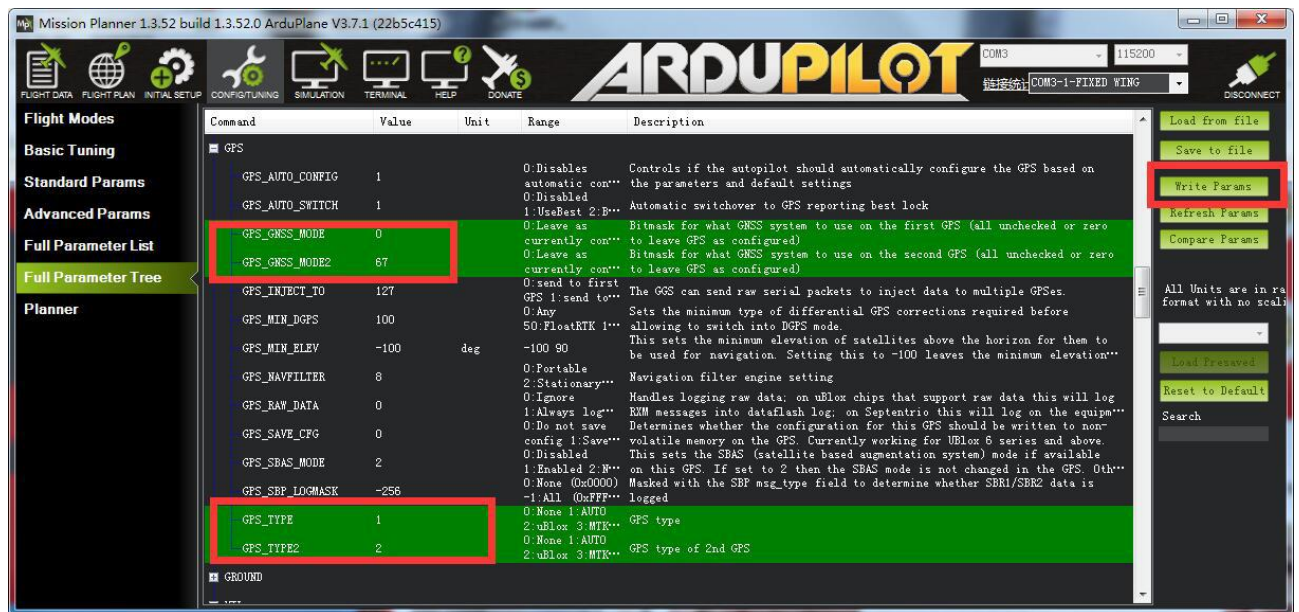
GPS\_TYPE2 is changed to 2 (if rtk is GPS2) to UBOX mode

RTK as GPS:

Change GPS\_GNSS\_MODE to 67 (if rtk as GPS) to GPS + GLONASS + SBAS

Change GPS\_TYPE to 2 (if rtk is GPS) to UBOX mode

GPS\_TYPE changed to 1 (such as rtk as GPS) Turn on GPS2



## Trial tutorial

Tutorials Using the Mission Planner for Satellite Search / Mobile Station Location

This tutorial uses the Mission Planner ground station software and the Arducopter-3.5 UAV firmware. If you are using PX4 firmware and QGroundControl ground station software, refer to the link:

[https://docs.px4.io/en/advanced\\_features/rtk-gps.html](https://docs.px4.io/en/advanced_features/rtk-gps.html).

i) Please prepare the following hardware devices before

use:

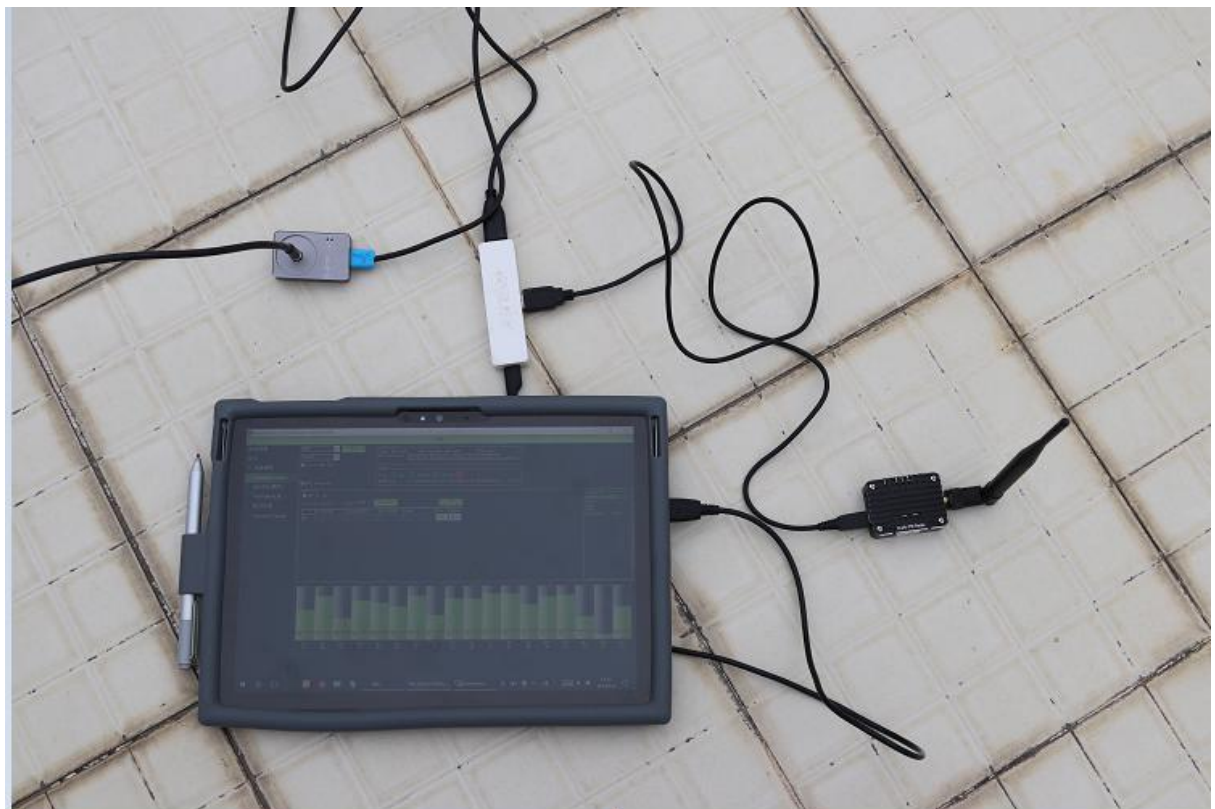


Please follow the instructions below to connect the hardware:

Please put the two ends of the antenna into the module;

The base station module is connected to the USB port of the computer through the type c cable; a data transmission module is connected to the other port of the computer.

Mobile: C-RTK mobile station 6P line connected to the flight control GPS interface; 4P line connected to the ser4 / 5 interface; digital module connected to the TELEM (radio) interface

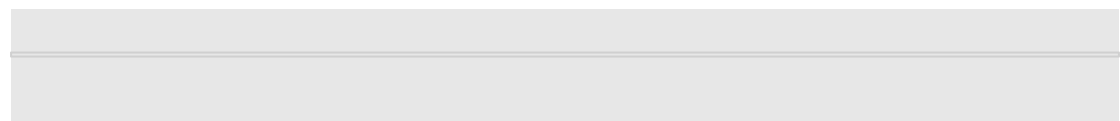


Please use the base station placed in the outdoor environment with sufficient sky coverage, in order to obtain a good satellite signal. Place the base station on a stable and elevated platform, such as a tripod.



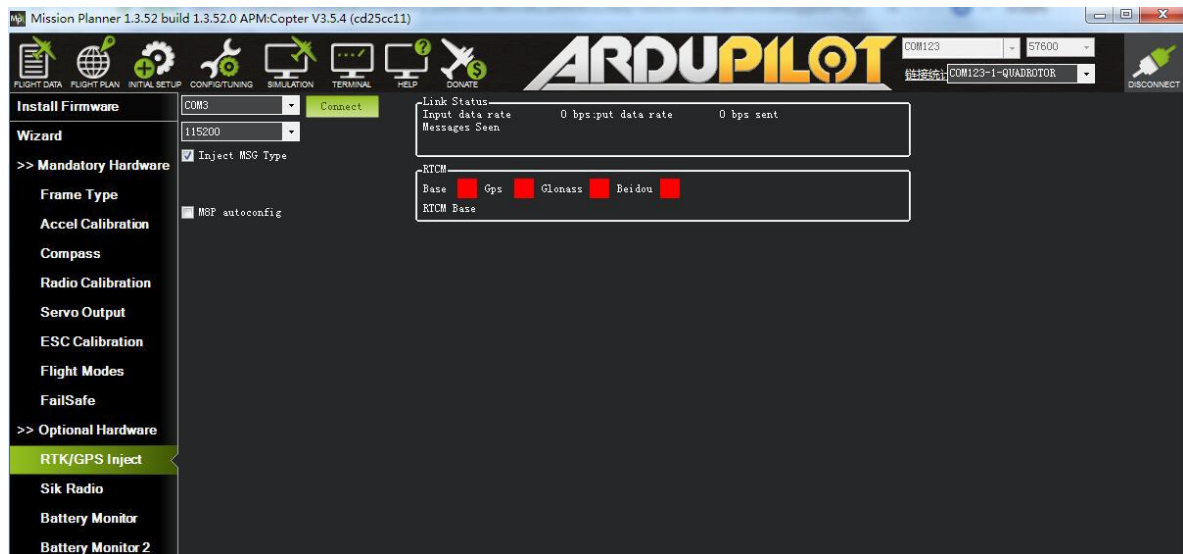


## Mission Planner Base station settings



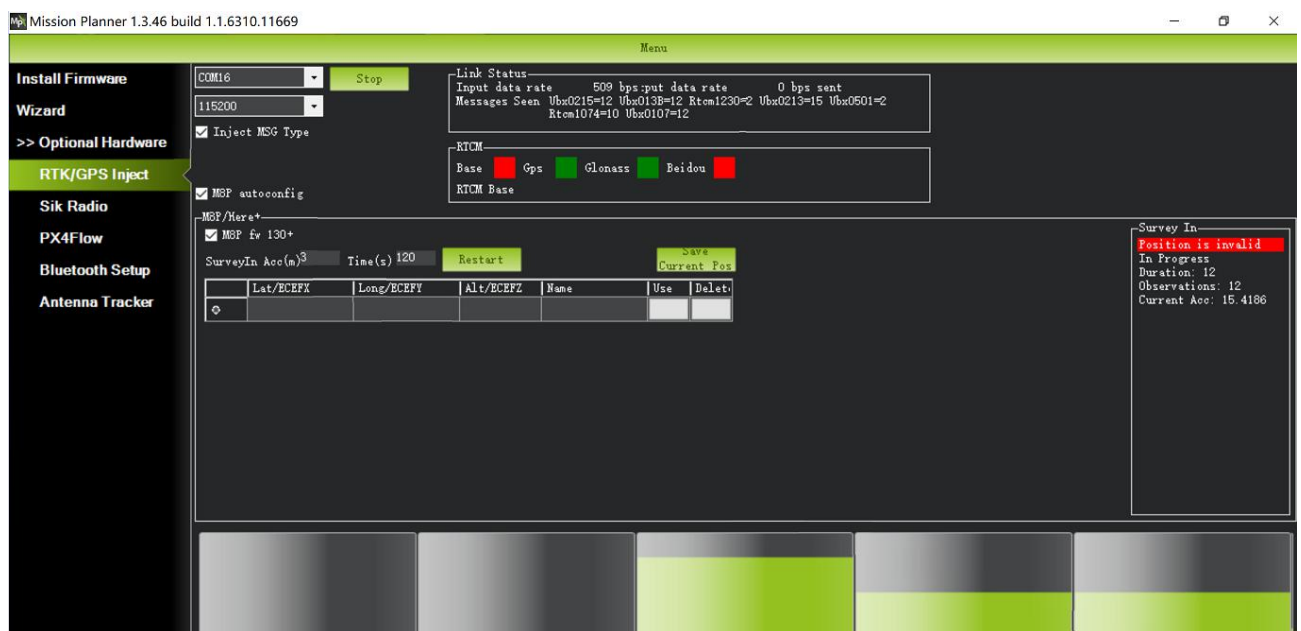
First base station settings. During base station setup, the mobile and UAV flight controls need not be turned on. Open the Mission Planner ground station software on your computer and go to the initial setup -> Optional Hardware -> RTK / GPS Inject page (if you do not have this interface please update the mission planner to the latest version), you You will see the following page





Select the correct base station port in the upper left and click connect. In the SurveyIn Acc column, enter the absolute geographic accuracy that you expect your C-RTK base station to achieve. In the Time field, enter the minimum search time you want. Click Restart, the ground station will be your input data transmission to the C-RTK base station, the base station will start a new round of search satellite positioning work. You will see the following page: During the search process, the box to the right of the Mission Planner page displays the current search

*position:*



- 1)Position is invalid: The base station has not reached a valid position yet
- 2)In Progress: The search star is still in progress. Duration: The number of seconds the current star search task has been executed.
- 3)Observation: The number of observations obtained

4)Current Acc: The absolute geographic accuracy that the current base station can achieve.

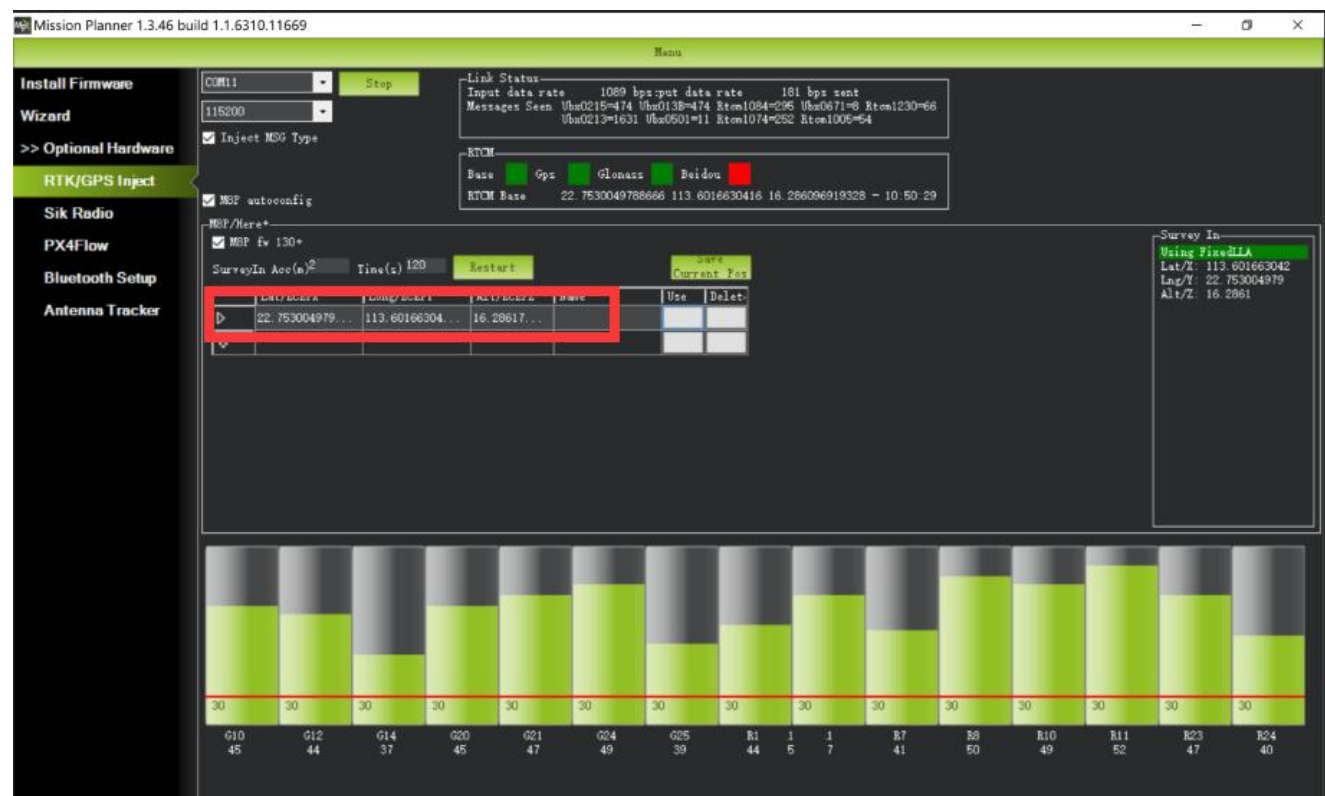
5)Mission Planner The green bar below the Mississippi Planner shows the satellite and satellite signal strengths found by the current base station. Base station takes a certain amount of time to search for the accuracy of your input requirements. After testing, it takes a few minutes to reach an absolute accuracy of 2 m in an open and unobstructed area, and an absolute accuracy of less than 30 cm can take about an hour, and precision within 10 cm can take hours. It should be noted that the absolute geographical accuracy of the base station here will affect the absolute geographical accuracy of the mobile station without affecting the relative accuracy of the base station and the mobile station. If your application does not require a drone with a high degree of absolute geographic accuracy, you do not need to set the accuracy of the base station too high, resulting in a long satellite search time. Even if the accuracy of the base station is 1.5 ~ 2m, the position accuracy of the mobile station relative to the base station can still reach the centimeter level.

After the C-RTK Node finishes its search, the Mission Planner will display the following page:



The figure shows that the status of the base station is green and both the GPS and Glonass systems are green (if you want to change the satellite system, please refer to the later chapters). The box on the right shows Position is valid.

Store the current position in the Mission Planner: Click Save Current Pos, enter a name in the dialog, and click OK. As shown below, you can see where you saved the list. Click the Use button corresponding to the location you saved, the base station will enter the fixed-point mode, the box on the right shows the status of Using FixedLLA. In the future, when you set up a base station in the same location, you do not need to search again, just click the Use button corresponding to your storage location.



## Mobile Station Settings

After the base station is set up, you can turn on the drones. Connect the same mission planner ground station with the matched data transfer module. The data of the base station will be transmitted to the C-RTK mobile station on the UAV through the data transfer module. In the main page of the Mission Planner, you can see that the UAV's current GPS status is RTK Float / RTK Fixed / 3D RTK, indicating that the UAV's positioning has entered RTK status.

RTK Float for the floating point solution.

RTK Fixed is a fixed solution.

RTK Fixed has a higher accuracy, high environmental requirements, the signal is good enough, positioning can enter the RTK Fixed state. 3D RTK is the Chinese version of Mission Planner RTK Float

Float	/	RTK	Fixed	unified
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display.



# Upgrade the firmware

1)The default firmware version for the C-RTK module is ublox-1.40 firmware. Compared to the previous version of the firmware

2)Added Glonass / beidou and GPS integration for RTK operation, which effectively improves RTK positioning. The ublox-1.40 firmware has also been released during the preparation of this operating manual.

3)Added functionality for mobile base stations where base stations need not be stationed in one place and can be moved at any time during use. For example, a base station may be placed on a moving car or boat.

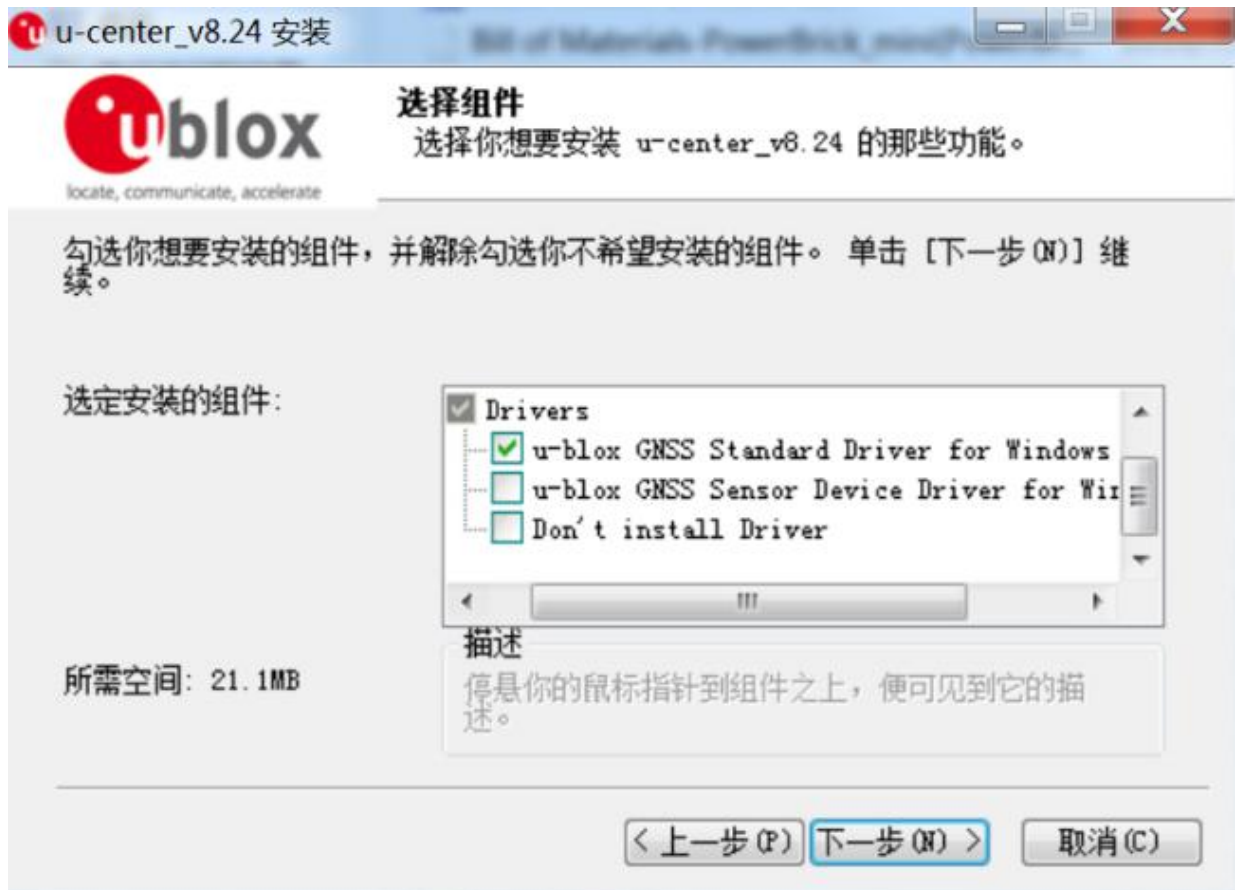
4)The default firmware is already relatively new firmware, so generally do not have to upgrade the firmware, in order to adapt to future firmware updates, the following to explain the firmware upgrade.

## U-centreDownload and install U-center

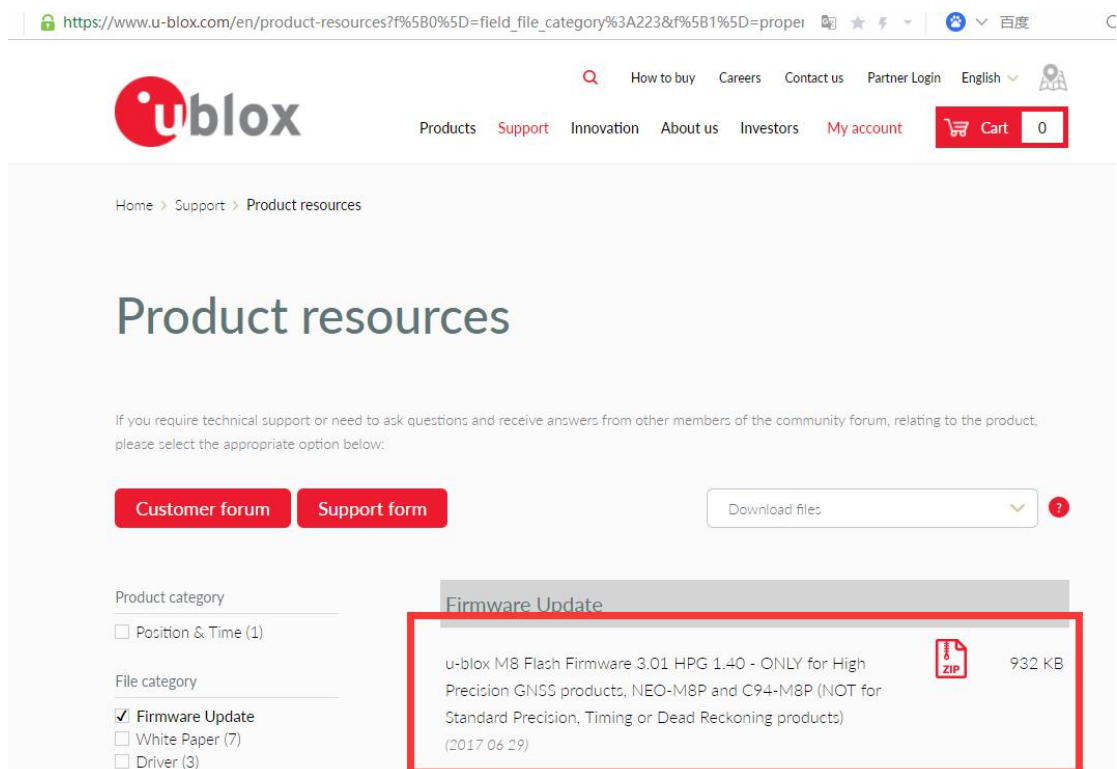
Download software, please click the official website link

Then follow the prompts to install U-center software. During the installation, you will be prompted to install the driver, make sure that only check the Standard Driver For Windows, and then click on the step, follow the prompts to install, as shown below.





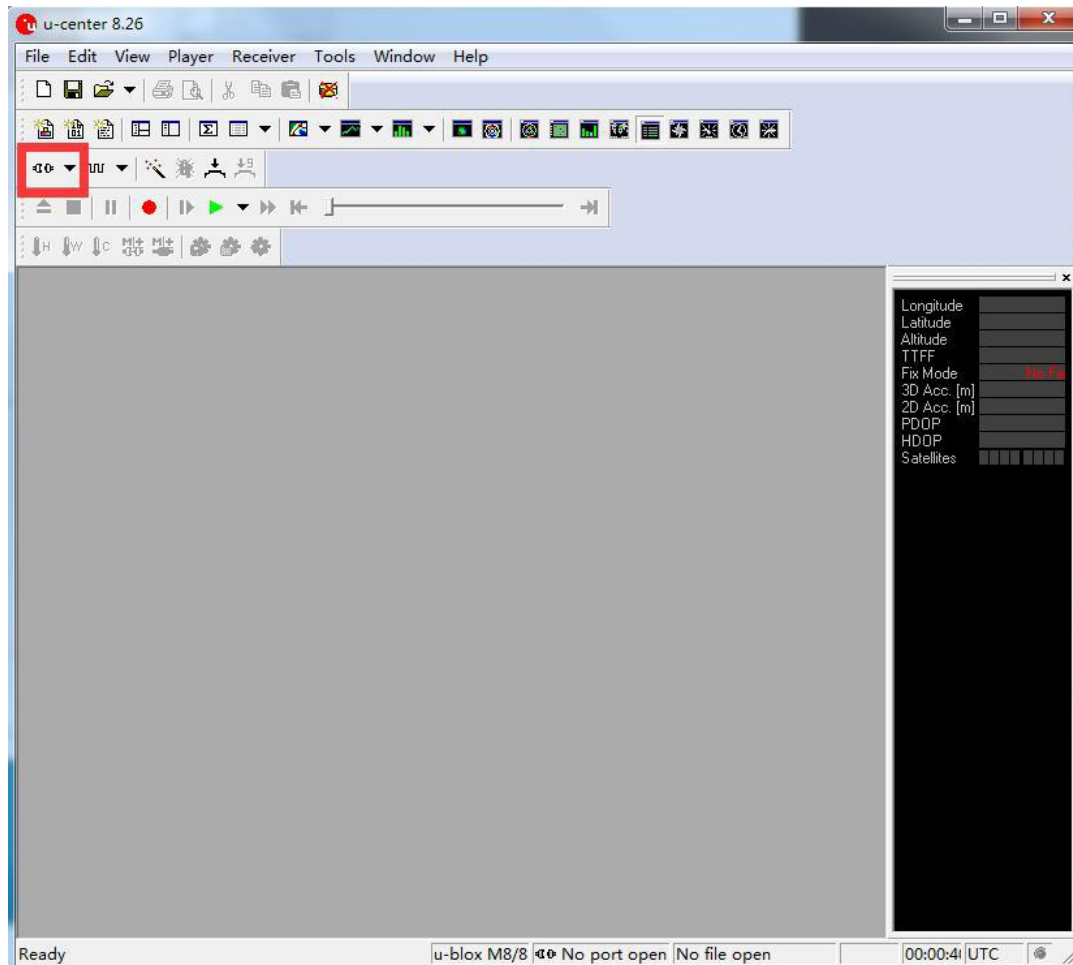
Visit the official website firmware interface, download the required firmware and extract, as shown below



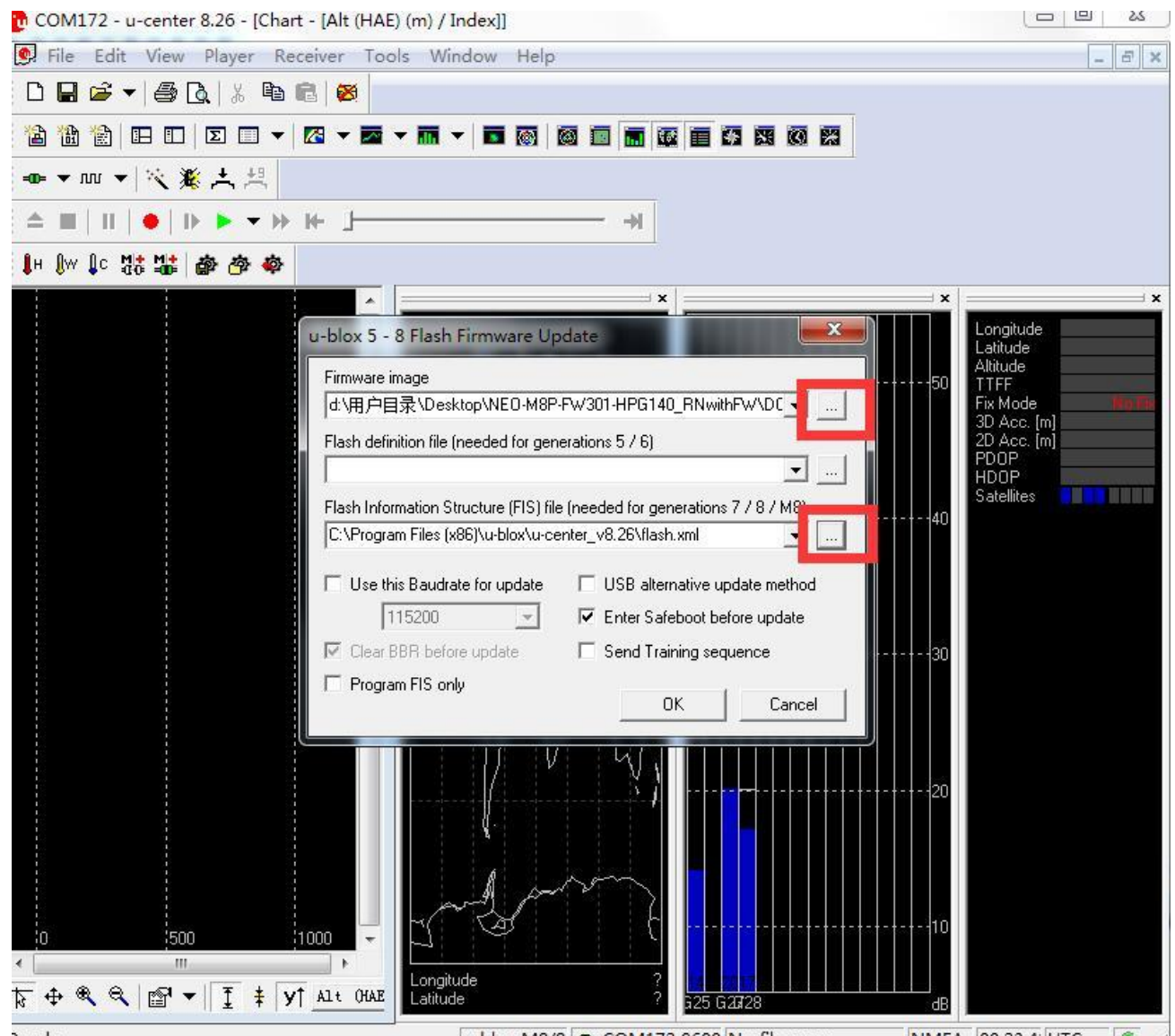
Connect C-RTK Base Station / Mobile Station to PC as shown below:



Upgrade Procedure Open the U-center software and click the Connect button (as shown in the red circle below) to select the corresponding computer port of the base station / mobile station to be upgraded.



Select tools-> u-blox 5-8 Flash Firmware Update and click the red box below to find the corresponding file



Base station selection

is:UBX\_M8\_301\_HPG\_xxx\_REFERENCE\_NEOM8P2.59a07babb501ba6a89ff87cac2f  
2765f.bin

Base station selection

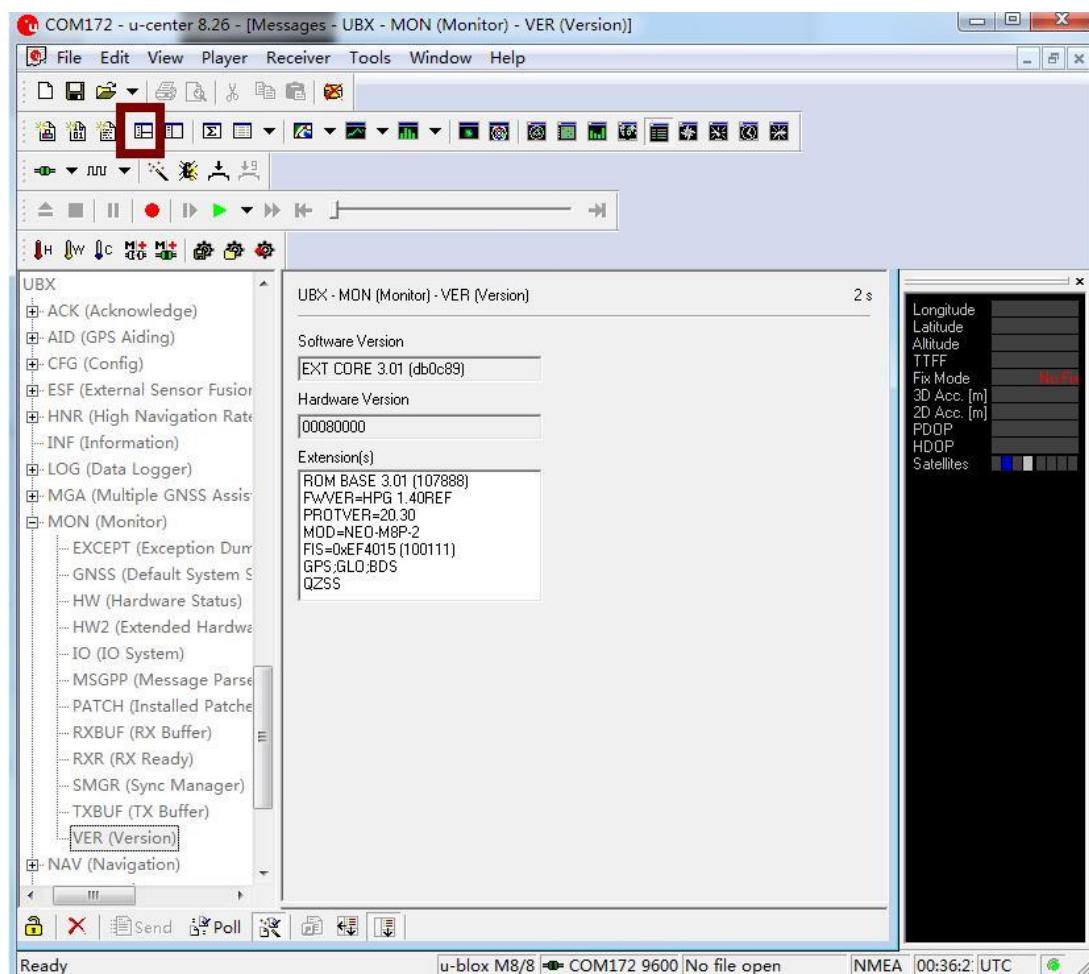
is:UBX\_M8\_301\_HPG\_xxx\_ROVER\_NEOM8P0.3ee86a9e4775e3335e742b53527fa5  
d0.bin (X is the corresponding version number)

Select Flash.xml in the Flash Information Structure (FIS) File, and Flash.xml is under U-center's installation directory, U-center\_vx.xx-> flash.xml. (X is the software version number)

Click OK, wait for the firmware to finish recording. Burn generally takes only about a minute or so. If the programming is successful, the upgrade interface is displayed in green; if the upgrade is aborted, the interface is displayed in red. If the programming process is interrupted, or for a long time it does not respond, you need to re-power on, press the operation to burn once.

## Confirm the base station / mobile station's current firmware version

When the base station / mobile station is connected to the U-center, click on the View tab and go to Message View -> UBX -> MON -> VER, as shown in the following figure:

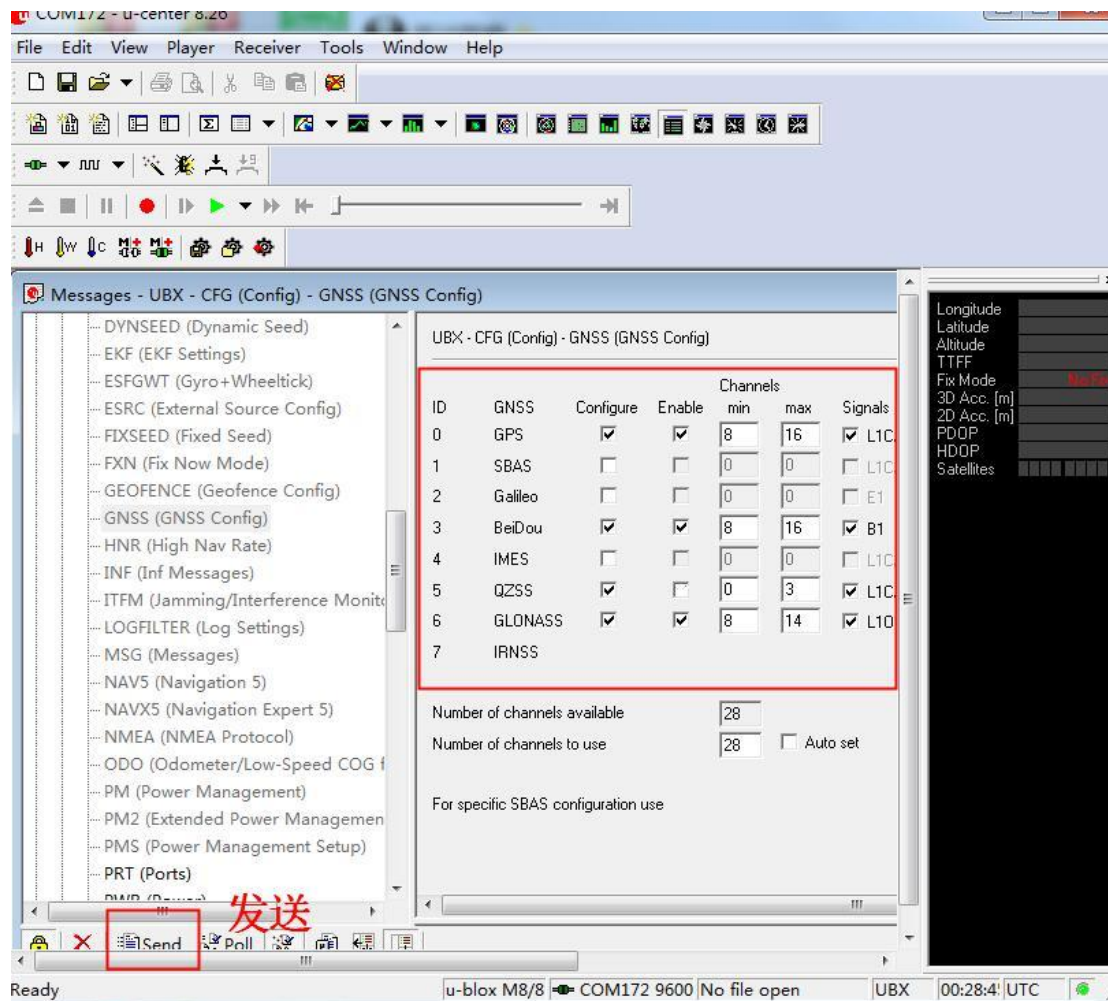


As shown in the figure, the current firmware version is FWVER = HPG 1.40 REF, and REF indicates the current firmware version is the base station.

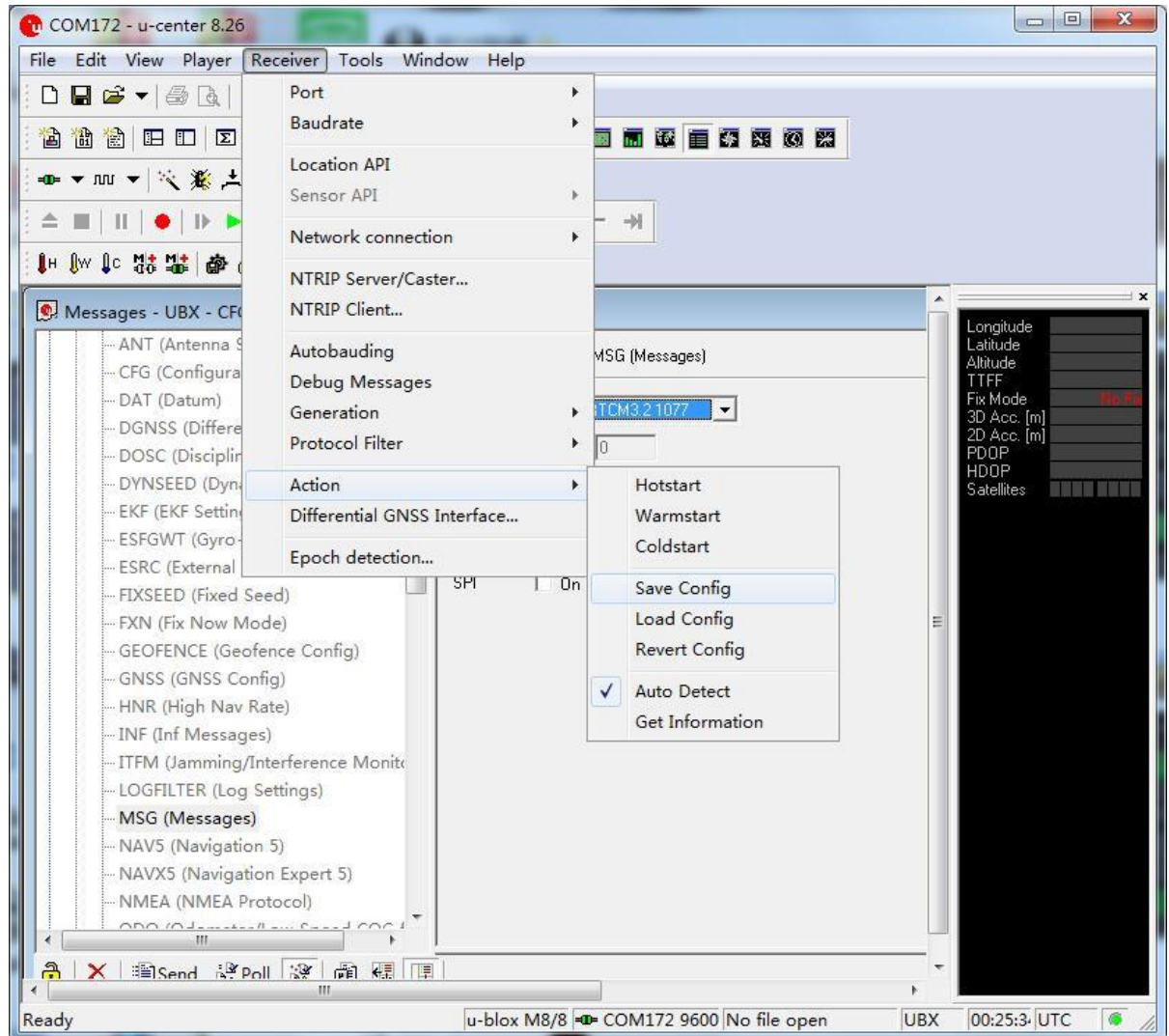


# Use GPS + Beidou

uBlox 1.30 firmware default GPS + GLONASS navigation system for positioning services. If you want to change to GPS + Beidou navigation system, you need to enter the Messages view -> UBX -> CFG -> GNSS directory, GLONASS Enable option to cancel the tick, and then check the Beidou Enable option. After the election, click send to complete the change.



Open Receiver> Action> SAVE config to save the configuration



Note: The base station and rover must have the same settings, use the same navigation system configuration, or can not enter the RTK.