



RTK differential positioning

User Manual V1.1

Revision date 2017.07

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Description

Disclaimer

Thank you for purchasing this product. There is webpage of RTK in TopXGun Robotics official website www.topxgun.com. you can log in to the website to get the latest product information, technical support and user manual. Please download and use the latest version of the user manual. This manual is subject to change without notice.

Please read this statement carefully before using. It is deemed as recognition and acceptance of the entire contents of this statement once it is used. Please read the instruction carefully and install and use this product in strict accordance with the instruction. TopXGun will not bear legal responsibilities for the results or losses caused by improper use, installation, assembly and modification of this product.

Precautions for use

1. Please ensure that different modules are connected correctly when using for the first time.
2. Don't overbend and fold the antenna feeder during installation.
3. Please make sure that the antenna of DATA-LINK / TDTU in the RTK system is not blocked during use.
4. It is suggested to be used together with the GPS in the flight control system and have dual backup.
5. Please use the original accessories or accessories approved by TopXGun. The use of non-original accessories may pose a risk to the safe use of the system.
6. Make sure that no foreign matters (such as liquid, oil, sand, etc.) are inside the components.

Intellectual property

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1 Introduction

1.1 Product Introduction

TopXGun RTK differential system is designed specially for UAV high-precision flight, including a variety of product mix, which is easy for the user to make selection according to their own needs.

RTK differential system version:

1) Radio version - wider application, able to provide accurate positioning for the area without clear network.

Configuration: single antenna radio version - achieving centimeter-level positioning accuracy

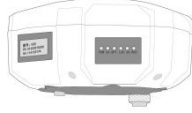


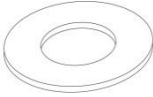
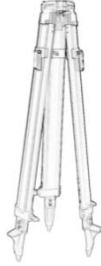
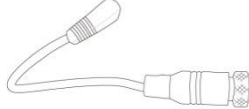
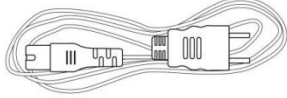
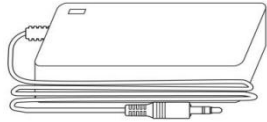
Dual antenna radio version - achieving centimeter-level positioning accuracy, providing accurate heading, free from magnetic-field interference

2) Web version - equipment is simple and light, easy to use


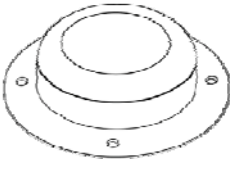

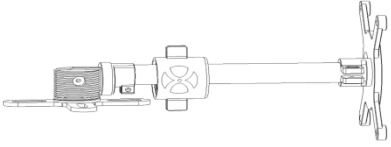




Configuration: single antenna web version - achieving centimeter-level positioning accuracy

Dual antenna web version - achieving centimeter-level positioning accuracy,
providing accurate heading, free from magnetic-field interference

1.2 List of articles

| Integrated mobile base station list | | |
|-------------------------------------|----------|--|
| Name | Quantity | Diagram |
| Mobile base station R20 | 1 |  |
| Antenna | 1 |  |
| Battery | 1 |  |
| Gasket | 1 |  |
| Tripod | 1 |  |
| Power-line | 1 |  |
| Battery charge cable | 1 |  |
| Power adapter | 1 |  |



Radio version of RTK product box list

| Name | quantity | diagram |
|----------------------------|--|--|
| Differential module | 1 |  |
| Aviation Antenna | 1 (single antenna) 2 (double antenna) |  |
| Data module (DATA-LINK) | 1 |  |
| Antenna stand | 1 (single antenna) 2 (double antenna) |  |
| DATA-LINK antenna | 1 |  |
| Antenna feeder | 1 (single antenna) 2 (double antenna) |  |
| Antenna set screw | 4 (single antenna) 8 (double antenna) |  |
| 3Mglue | 2 (single antenna) 4 (double antenna) |  |

1.3 Symbol Description

Universal symbol

| symbol | meaning | description |
|--------|---------|-------------|
|--------|---------|-------------|

| | | |
|---|-------------|---|
|  | notice | The text beginning with this sign indicates potential risk and ignorance of the text may result in equipment damage, loss of data, or other unpredictable consequences. |
|  | Description | The text beginning with this sign is additional information of the text, which is an emphasis and supplement to the text. |

2 Installation

2.1 Installation Steps


Step 1. Fix the aviation antenna to the antenna stand with 3M glue and screws.

Step 2. Fix the antenna stand to the rack and make the arrowhead under the aviation antenna direct to the nose.

Step 3. If you are using the radio version, install the DATA-LINK antenna on DATA-LINK; if you are using the web version, install the TDTU antenna on the TDTU.

Step 4. Fix the DATA-LINK / TDTU to the rack and ensure that the antenna is placed downward vertically.

Step 5. Fix the differential module to the rack.

-
- If you use a dual antenna configuration, the antenna stand connection should be perpendicular to the flight direction of the aircraft; the left antenna is No. 1 antenna, installed at the hole No. 1 of differential module and the right antenna is No. 2 antenna, installed at the hole No. 2 of differential module;
- 
- If it is dual antenna configuration, then the distance between the antennas should be greater than 30 cm.
-

2.2 Installation of the radio version of RTK

Figure 2-1 diagram of radio version installation

Single Antenna version: Install No. 1 aviation antenna only

Dual antenna edition: installation No. 1 and No. 2 aviation antenna

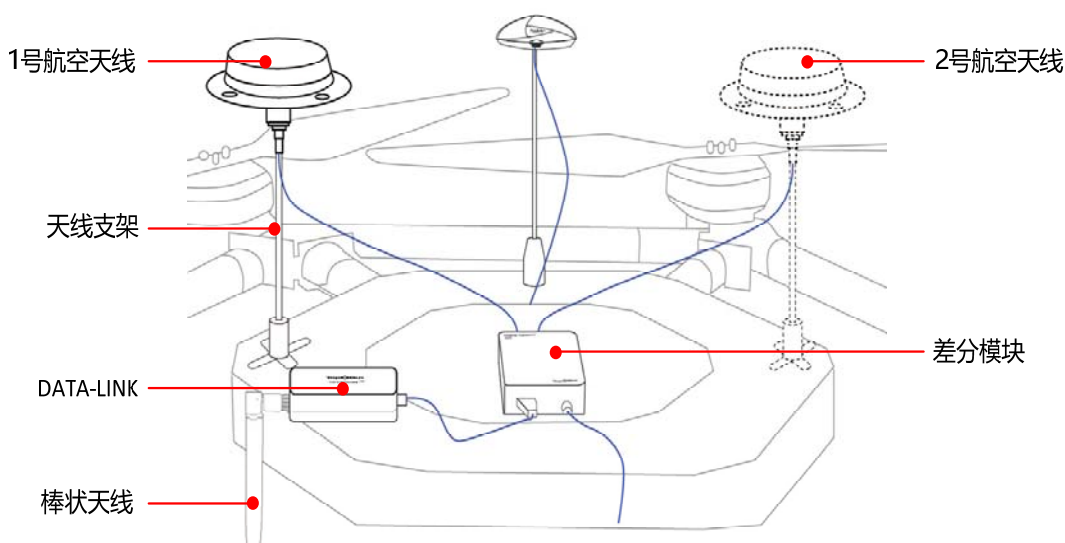


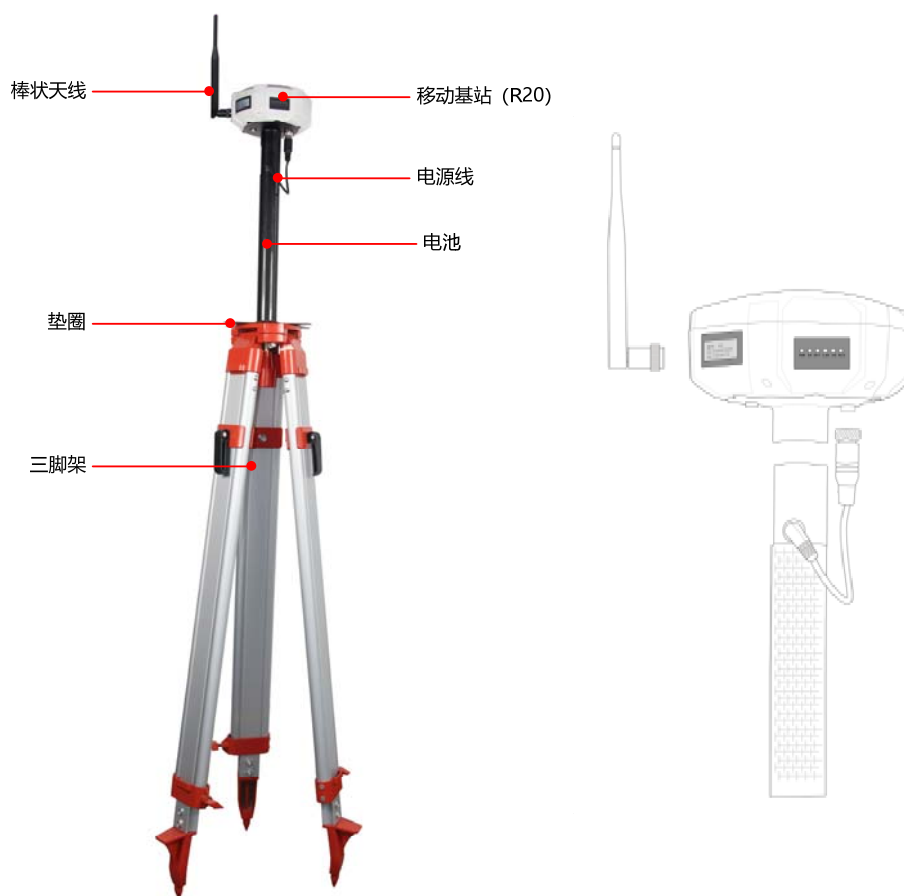
Figure 2-1 diagram of radio version installation

When using the radio version of RTK, an integrated mobile base station should be installed in advance. Following are the installation steps of integrated mobile base station:

- Step 1.** Install the rod antenna on the mobile base station (R20).
- Step 2.** Install the power-line on the mobile base station (R20).
- Step 3.** Connect the mobile base station (R20) to the battery.
- Step 4.** Place the gasket at the bottom of the battery and fix it to the tripod.
- Step 5.** Connect the other end of the power cord to the battery.

The completed installation is shown in Figure 2-2.

Figure 2-2 Integrated base station installation diagram



2.3 Installation of web version of RTK

Figure 2-3 diagram of web version installation

Single Antenna version: Install No. 1 aviation antenna only

Dual antenna edition: installation No. 1 and No. 2 aviation antenna

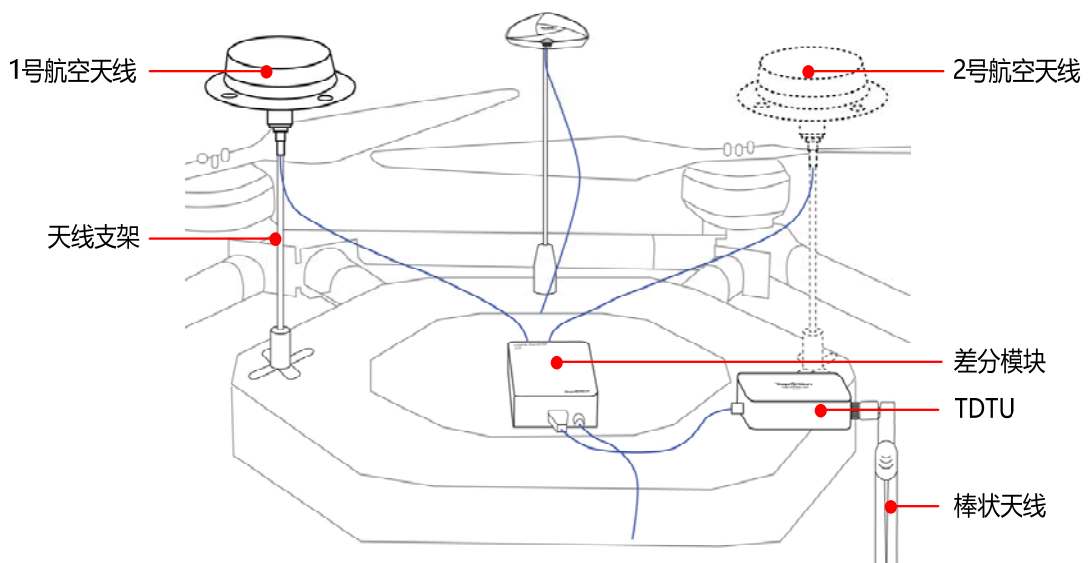


Figure 2-3 installation of the network version

3 Use

3.1 The use of radio version of RTK

3.1.1 Base station location erection and indicator

Base station erection:

- 1, Use it at open area and avoid it from being sheltered by buildings and trees; keep it away from high-voltage wire and high voltage tower;
- 2, If the above conditions can not be met, ensure that 2/3 of the area is open (Figure 3-1);
- 3, Before using, ensure that the power lamp (POW), star-searching light (SA), differential lamp (DIFF) at base station are lightened in the normal way.

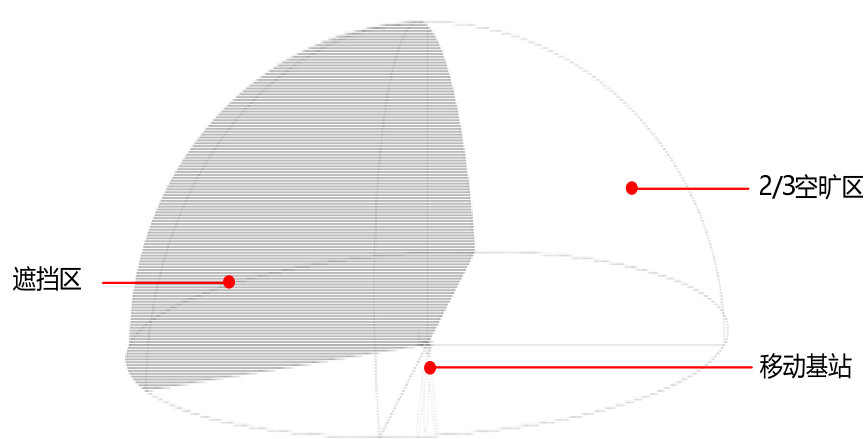


Figure 3-1 airspace diagram

Indicator:

After installation, connect it to the power and open the mobile base station. The meaning of the indicator light at mobile base station is shown in Table 3-1.

Table 3-1 The meaning of the indicator light at mobile base station

| Name of indicator light | Meaning |
|-------------------------|--|
| POW | If the indicator light of power supply is always on, it indicates that the power supply is normal |
| SA | If the indicator light of searching star is always on, it indicates that star-searching is normal |
| DIFF | If the indicator light of differential flashes once every second, it indicates that it is sending or receiving differential data |
| LINK | If the indicator light of Bluetooth is constantly on, it indicates that the Bluetooth device is connected. |
| 3G | If the indicator light of network is constantly on, it indicates that it is using Qianxunweb |
| REC | storage indicator |

3.1.2 RTK mapping (dot)

With the use of mobile base stations, RTK mapping can be made in the "TopXGun agriculture".



- Before use, "TopXGun Agriculture" APP should be installed on the phone.
 - The RTK mapping function in "TopXGun Agriculture" supports Android mobile only.
-

Step 1. install handheld mobile base station. Connect the mobile base station to the battery and install the rod antenna into the mobile base station.

Step 2. Connect the mobile base station.

1. Turn on the mobile base station.
2. Turn on the Bluetooth of the phone and search a device called "TopXGun-RTKxxx" and connect to it.



The default name of the TopXGun RTK device is "TopXGun-RTKxxx", and "xxx" is the three-digit device number.

Step 3. Set the dot mode.

1. Open the "TopXGun Agriculture" APP, select "Personal Center", and enter into the personal center management page, as shown in Figure 3-2.



Figure 3-2 enter into the personal center

2. Select "RTK Settings", and enter the RTK settings page, connect the RTK device, as shown in Figure 3-3.



Figure 3-3 Connecting RTK

3. Set the dot mode as network as shown in Figure 3-4.



Figure 3-4 RTK setting

RTK mapping has two modes:

- 1) network dot mode: only a mobile base station is used as a hand-held device to dot combined with the use of mobile phones;
- 2) Base station dot mode: two mobile base stations are required, one of which is base station mode, and the other one dots.

Step 4. Dot mapping.

1. Select "work plot" to enter into the work plot management page.
2. Click "add plot" and select "RTK mapping", as shown in Figure 3-5.



Figure 3-5 RTK mapping

3. Connect the device as shown in Figure 3-6.



Figure 3-6 Connecting the device

4. After setting the name of the plot, wait until the mobile phone interface displays "RTK status: connected and GPS status: RTK fixed solution", and then carry the mobile phone and mobile base station, to walk along the boundary of the area, and

reach the boundary inflection, as shown in figure 3-7.



Figure 3-7 RTK status

| RTK status | Reason |
|------------|--|
| the reason | Connected to external Bluetooth device |
| Connected | Not connected to external Bluetooth device |

Table 3-2 RTK status

Table 3-3 GPS status

| GPS status | the reason |
|---------------------------|----------------------------------|
| No positioning | No data of 千寻 positioning |
| Single point | satellite data is insufficient |
| Pseudo-range differential | carrier data is insufficient |
| RTK fixed solution | precision positioning mode |
| RTK Floating Solution | Sub-meter positioning mode |
| Under estimation | Calculation time is insufficient |

| | |
|---------------------|----------------------------------|
| Manual input mode | fixed coordinate should be input |
| The simulation mode | Used for simulation calculation |
| WAAS | SBAS positioning mode |
| Unknown | status unknown |

5. At the inflection point of the border, when the mobile base station displays that the star-searching is normal, click the "boundary point" at the mobile page and store it. When you encounter obstacles, click "obstacle" to set and store it, and then the plot mapping is completed, as shown in Figure 3-8.



Figure 3- 8 dot

Step 5. Generate the route and start work

1. After the completion of dot, "TopXGun Agriculture" APP will generate routes automatically, as shown in Figure 3-9.

Figure 3-9 Generate routes

2. Click the boundary point to change the route, as shown in Figure 3-10.



Figure 3-10 Change the route

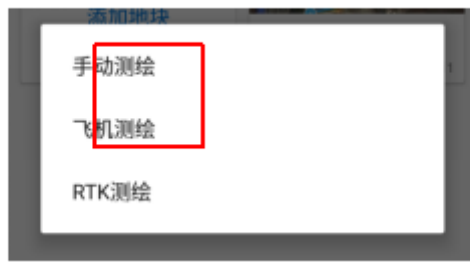
3. Connect the UAV equipment and execute various flight missions according to your needs, as shown in Figure 3-11.



Figure 3-11 Connecting the UAV device



- In the "TopXGun Agriculture" APP, you can choose obstacles, please refer to the "TopXGun Agriculture" APP for details.
- At present, "TopXGun Agriculture" APP supports up to 32 boundary points and an obstacle.



Manual mapping: Select boundary point at the map of "TopXGun Agriculture" APP and set the plot.

Air mapping: Use airplane to take the place of manual mapping dot. The operation method is the same with RTK mapping.

3.2 Use of web version of RTK

Web RTK mapping is divided into manual mapping and airplane mapping. Refer to [manual mapping](#) and [airplane mapping](#) of RTK in the broadcasting station.