



Accurate  
positioning

22°39'48.37"N 114°02'10.91"E



# P-Box-AP55

## PRODUCT SPECIFICATION

### Data Sheet



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## Update description

| Version | Date       | Content and modification                                         | Writer  |
|---------|------------|------------------------------------------------------------------|---------|
| V1.0    | 2020-3-08  | the front page                                                   | LPF     |
| V1.1    | 2021-06-19 | Optimized RF circuit, compatible with single and double antennas | WANGWEI |
| V1.2    | 2022-05-13 | Firmware V4.9.1 to V4.12.1, supporting B3I                       | WANGWEI |
| V1.3    | 2023-06-19 | Firmware V4.12.1 to V4.14.0                                      | WANGWEI |
|         |            |                                                                  |         |
|         |            |                                                                  |         |
|         |            |                                                                  |         |
|         |            |                                                                  |         |
|         |            |                                                                  |         |

The document applies to the following products:

| Type  | Name           | Product Condition   |
|-------|----------------|---------------------|
| P_BOX | JS-P-Box-AP55  | Quantity production |
| P_BOX | JS-P-Box-AP55H | Quantity production |

# 1 Functional description

## 1.1 Overview

P-Box-AP55 is a new multi-band, multi-constellation satellite receiver with multiple data interfaces. It is suitable for unmanned aerial vehicles, fully automatic robots, precise control, unmanned driving, and other applications. It can track all global satellite navigation system (GNSS), support all current satellite signals, and has unique AIM+ anti-jamming technology, which is especially effective in complex environments. At present, it is widely used in GNSS mass market.

## 1.2 Product characteristics

- uses high-performance chips
- Full view satellite tracking, multi-constellation, multi-frequency
- 448 hardware channels, which can track all visible satellite signals simultaneously
- Up to 100Hz update rate
- Ultra-low latency of less than 10ms
- AIM + Interference Monitoring and Suppression
- IONO + Ionospheric scintillation suppression
- Lock + Excellent tracking robustness
- APME + Multipath Suppression Technology
- RAIM + Autonomous integrity monitoring of receiver
- Can be used as a mobile base station
- When vibrating at high frequency and moving quickly, the satellite signal can be tracked smoothly
- Gps, GLONASS, BDS, Galileo, qzss, Navi c and sbas satellites are supported
- Integrated TCXO,LNA, and a TF card slot up to 32G
- Compact size (59 \* 59 \* 12mm±0.3mm), suitable for relatively compact space, weighing only 60g
- Standard NMEA 0183, SBF, RINEX, RTCM, CMR/CMR+
- It has functions of interference indicator, interference mitigation and spectrum measurement
- Support OSNMA anti-deception

### 1.3 Performance indicators

| Parameter                                 | Description                                                                                                                                                                                                                                            |                           |            |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|------------|
| Satellite( P-Box-AP55)                    | ■GPS:L1C/A, L1C, L1PY, L2C, L2P, L5      ■BDS:B1I, B1C, B2a, B2I, B2b,B3I<br>■GLONASS:L1CA, L2CA, L2P, L3 CDMA      ■Navic:L5<br>■Galileo:E1, E5a, E5b, E5 AltBoc,E6      ■QZSS:L1C/A, L1C/B, L2C, L5<br>■SBAS:EGNOS, WAAS, GAGAN, MSAS, SDCM (L1, L5) |                           |            |
| Satellite( P-Box-AP55H) <sup>1</sup>      | ■GPS:L1C/A, L2P(Y), L2C      ■BDS:B1, B2I, B3I<br>■GLONASS:L1C/A, L2C/A<br>■Galileo:E1, E5b      ■QZSS:L1C/A, L1C/B, L2C<br>■SBAS:EGNOS, WAAS, GAGAN, MSAS, SDCM (L1)                                                                                  |                           |            |
| Sensitivity<br>(C/N0 threshold)           | Tracking & Navigation                                                                                                                                                                                                                                  | 20 dB-Hz                  |            |
|                                           | Acquisition                                                                                                                                                                                                                                            | 33 dB-Hz                  |            |
| Positioning time test <sup>2</sup>        | Cold Start                                                                                                                                                                                                                                             | 45s                       |            |
|                                           | Hot Start                                                                                                                                                                                                                                              | ≤20s                      |            |
|                                           | Restart                                                                                                                                                                                                                                                | ≤1s                       |            |
| Horizontal position accuracy <sup>3</sup> | Horizontal                                                                                                                                                                                                                                             | 0.6cm+0.5ppm <sup>4</sup> |            |
|                                           | Vertical                                                                                                                                                                                                                                               | 1cm+1ppm <sup>4</sup>     |            |
|                                           | Initialization                                                                                                                                                                                                                                         | 7s                        |            |
| Speed accuracy                            | 0.03m/s                                                                                                                                                                                                                                                |                           |            |
| Timing accuracy                           | XPPS output                                                                                                                                                                                                                                            | 5ns                       |            |
|                                           | Event accuracy                                                                                                                                                                                                                                         | < 20ns                    |            |
| Directional accuracy<br>(P-Box-AP55H)     | Antenna separation                                                                                                                                                                                                                                     | Heading                   | Pitch/Roll |
|                                           | 1m                                                                                                                                                                                                                                                     | 0.15°                     | 0.25°      |
|                                           | 5m                                                                                                                                                                                                                                                     | 0.03°                     | 0.05°      |
| limiting condition                        | Acceleration limit                                                                                                                                                                                                                                     | ≤ 4 g                     |            |
|                                           | Height limit                                                                                                                                                                                                                                           | 18,000m                   |            |
|                                           | Speed limit                                                                                                                                                                                                                                            | 515m/s                    |            |
| Refresh frequency                         | 15200-4M bps (Default 115200 bps)                                                                                                                                                                                                                      |                           |            |

|                          |                                   |        |
|--------------------------|-----------------------------------|--------|
| Update frequency of data | Position only                     | 100 Hz |
|                          | Measurements only                 | 100 Hz |
|                          | Standalone, SBAS, DGPS + attitude | 50 Hz  |
|                          | RTK + attitude                    | 20 Hz  |

✎1 Dual antenna mode B3I and E5b are not supported at the same time

✎2 All satellites are at  $\geq -130\text{dBm}$

✎3 CEP 50%, 24-hour static,  $\geq -130\text{dBm}$ ,  $\geq 12$  satellites in use

✎4 For every 10km from the base station, the accuracy error is increased by 1cm (based on the range within 40 km)

## 1.4 Protocol description

| Protocol                       | Type                |
|--------------------------------|---------------------|
| NMEA 0183 v2.3,v3.03,v4.0      | Input/output, ASCII |
| Septentrio Binary Format (SBF) | Input/output        |
| Rtcv2.x, v3.x (Including MSM)  | Input/output        |
| RINEX v2.x,v3.x                | Logging             |
| CMR v2.0                       | Input/output        |
| CMR+                           | Input               |

## 1.5 Antenna

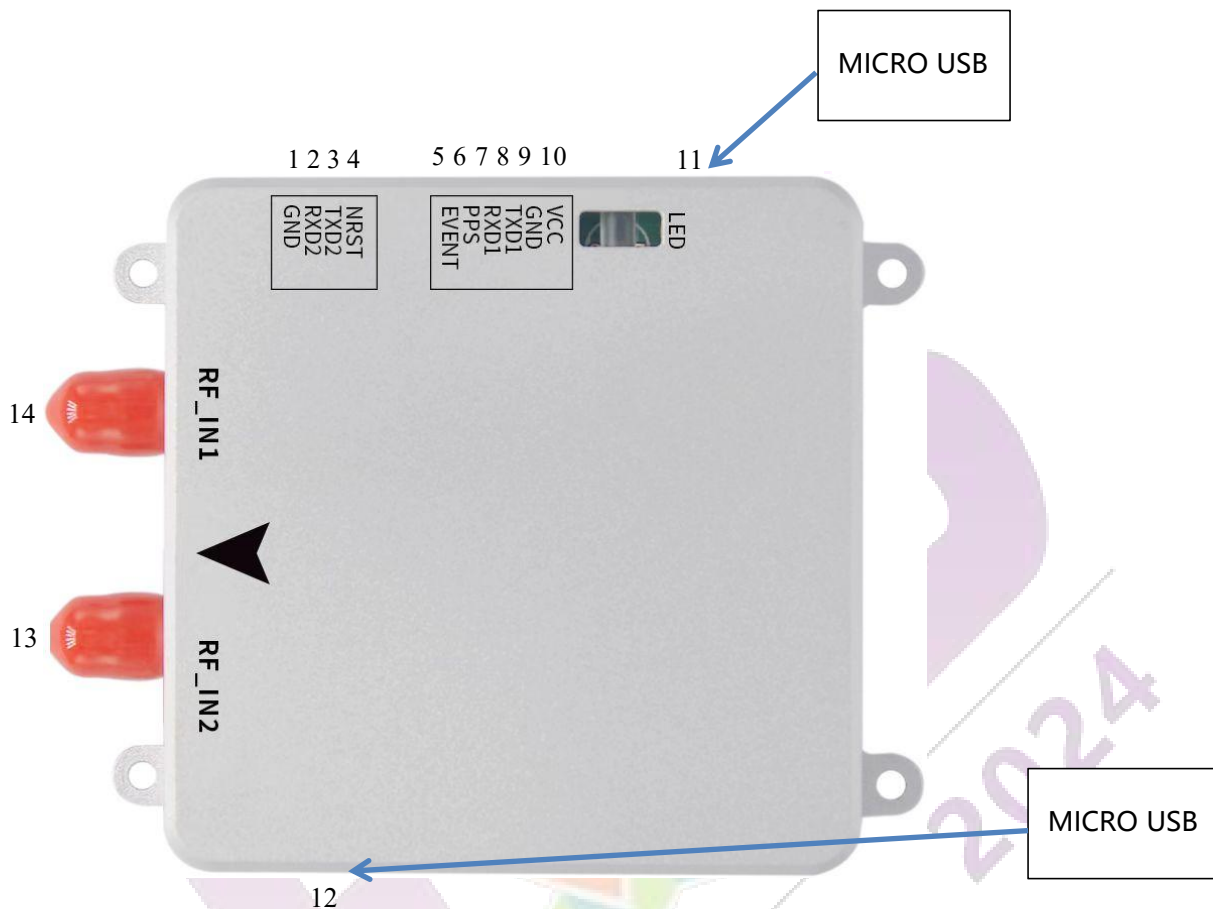
| Parameter                       | Specification                            |             |
|---------------------------------|------------------------------------------|-------------|
| Antenna pre-amplification range | P-Box-AP55                               | P-Box-AP55H |
|                                 | 15-50dB                                  | 15-35dB     |
| Antenna bias voltage            | 3.0-5.5V (Built-in current limit: 150mA) |             |

## 1.6 Product application

- UAV
- surveying and mapping
- Intelligent logistics scheduling
- Intelligent robot
- Surveying precision agriculture service
- Personnel protection
- Geographic survey
- Precision agriculture and location services
- Vehicle-mounted equipment application
- Precise control
- Construction works
- Autonomous driving

## 2 Pin definition

### 2.1 Pin assignment



| PIN | Name      | I/O | Describe                           |
|-----|-----------|-----|------------------------------------|
| 1   | GND       | -   | Ground                             |
| 2   | RXD2      | I   | Serial 2 port receives data        |
| 3   | TXD2      | O   | Serial 2 port sends data           |
| 4   | NRST      | -   | Reset foot, low Level On           |
| 5   | EVENAT    | I   | EVENAT input                       |
| 6   | PPS       | O   | Pulse output                       |
| 7   | RXD1      | I   | Serial 1 port receives data        |
| 8   | TXD1      | O   | Serial 1 port sends data           |
| 9   | GND       | -   | Ground                             |
| 10  | VCC       | I   | Power supply (Default 5V)          |
| 11  | USB       | I/O | Power supply and data transmission |
| 12  | MICRO USB | -   | Reserved                           |
| 13  | RF_IN1    | I   | Main antenna                       |
| 14  | RF_IN2    | I   | AUX Antenna                        |

## 2.2 LED Indicator Status

| LED Indicator | COLOUR | Working condition                          |
|---------------|--------|--------------------------------------------|
| GPLED         | BLUE   | The indicator blinks after being located   |
| LOGLED        | GREEN  | Indicator light is on                      |
| POWER         | RED    | After power-on, the indicator is steady on |

## 3 Electrical characteristics

| Parameter                           | Symbol      | Min       | General   | Max       | Unit |
|-------------------------------------|-------------|-----------|-----------|-----------|------|
| Power supply voltage range          | VCC         | 4.5       | 5.0       | 12.0      | V    |
| Average current *                   | Acquisition | 160 @5.0V | 185@5.0V  | 240 @5.0V | mA   |
|                                     | Track       | 160 @5.0V | 185 @5.0V | 215 @5.0V | mA   |
| Antenna supply current <sup>1</sup> | RF_VCC      | -         | -         | 70 @5.0V  | mA   |
| Maximum ripple of VCC port          | Vrpp        | 0         | 50        | 50        | mV   |
|                                     | Vin         | -0.5      | Vcc +0.2  | -         | mV   |
| Electrostatic protection            | VESD(HBM)   | --        | 2000      | 2000      | V    |
| Storage temperature                 | Tstg        | -55       | -         | 85        | °C   |
| Working temperature                 | Tstg        | -40       | -         | 85        | °C   |

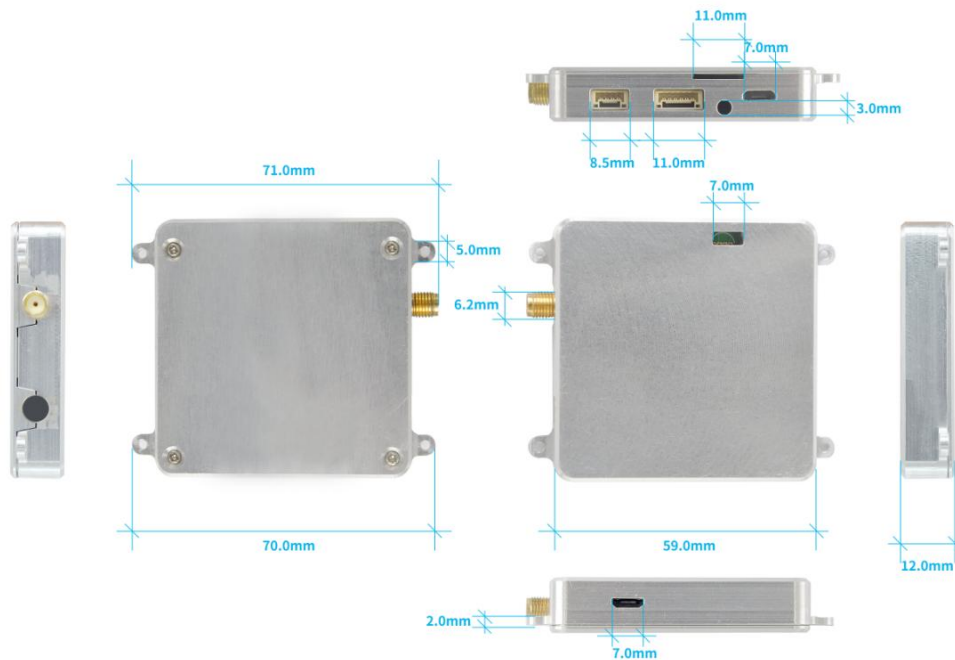
\* Passive antenna test

<sup>1</sup> The maximum current supported by a single antenna



## 4 Mechanical size

### Overall structure size

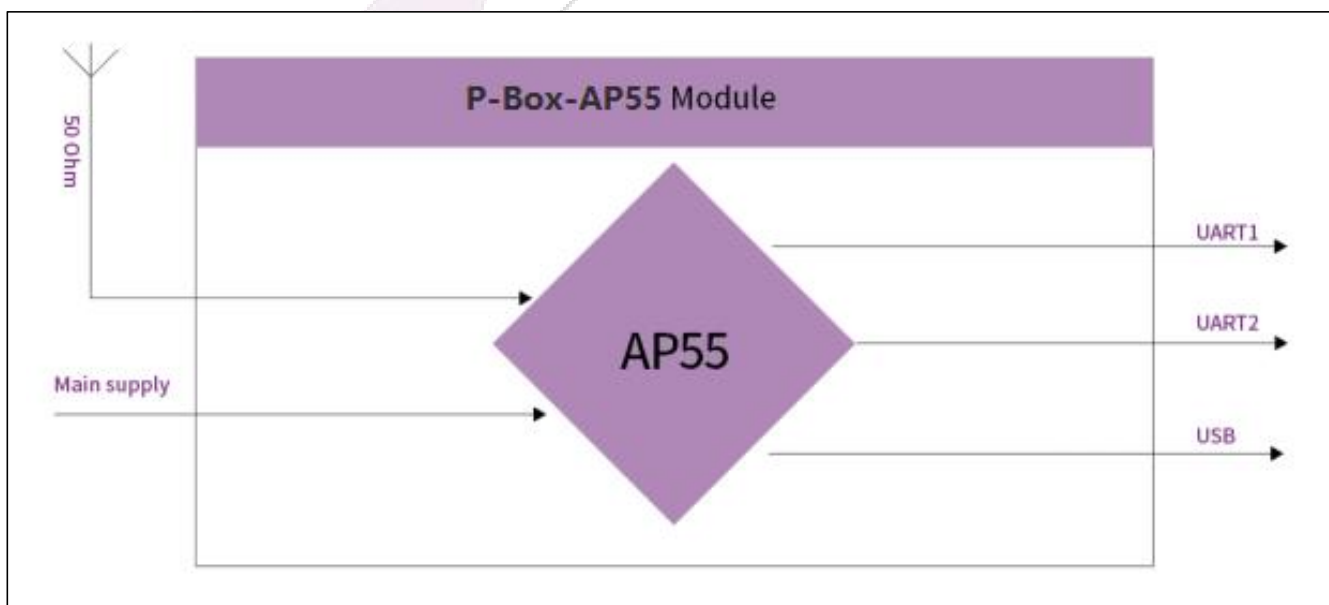


Unit: mm dimensional error:  $\pm 0.3\text{mm}$

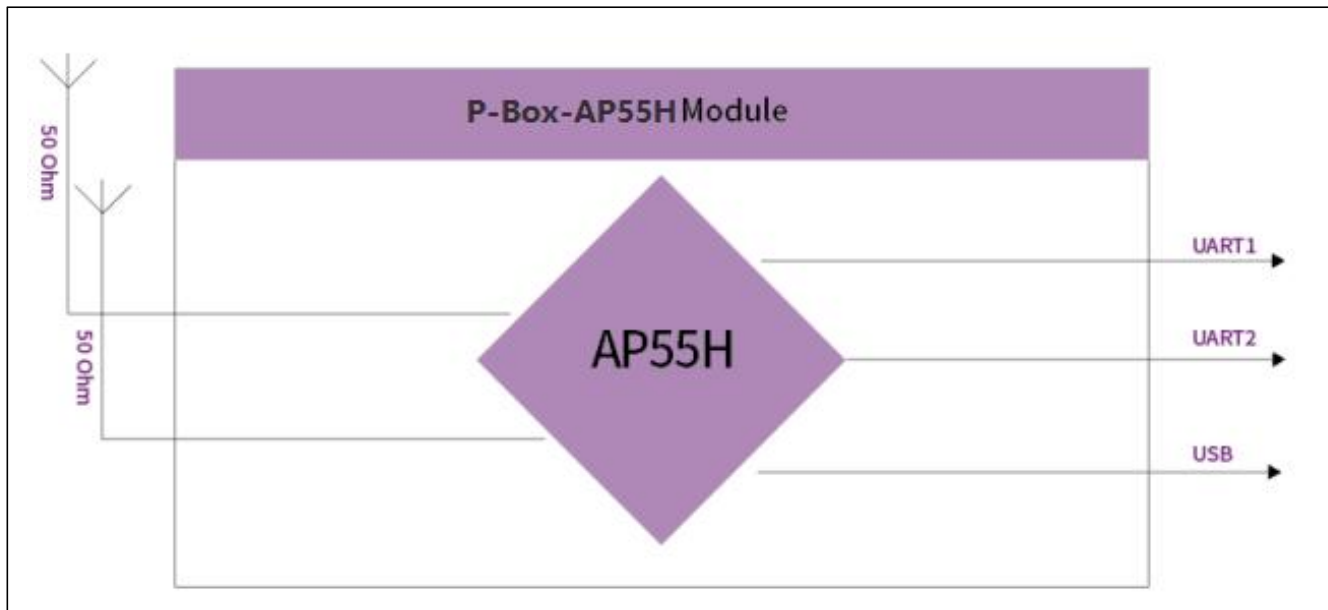
## 5 Interface configuration selection

The P-Box-AP55 module includes two UART ports and one USB port, which can be used to communicate with the host. Different interfaces can be selected through the connection of different hardware interfaces. 1 PPS and 2 event pins are used to output time pulses and external event triggers.

### P-Box-AP55 application block diagram



## P-Box-AP55H application block diagram



## 6 Operating instructions

### 6.1 Download and install RxTools software

RxTools software installer and user manual can be downloaded through the following link:

1. Septentrio official website download:

<https://www.septentrio.com/en/support/software/rxtools>

2. Domestic network disk Baidu cloud download v22.0.0:

Link: [https://pan.baidu.com/s/13BPfxRtgQxreB\\_XPI-wxPA](https://pan.baidu.com/s/13BPfxRtgQxreB_XPI-wxPA)

Pick up code: smnf

3. Download v22.0.0 from domestic network disk weiyun:

Link: <https://share.weiyun.com/xpz5qqgE>

Download and install directly, and avoid Chinese characters in the installation directory. After the software is successfully installed, there will be the following assemblies:

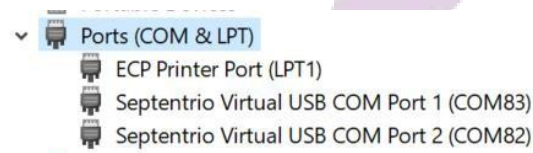


## 6.2 Hardware connection

1. Connect the satellite antenna after using MMCX connector to TNC or SMA interface.

2. Connect the device to the computer using Micro USB

2.1 The board will be connected to two serial ports on the computer side virtually, and the serial port number can be viewed through the interface of the device manager:



2.2 At the same time, the USB connection will also be a virtual road network port, with the fixed IP address of 192.168.3.1.

Note:

① P-Box-AP55 is connected by USB and can be powered at the same time, without external power supply. As shown in the following figure

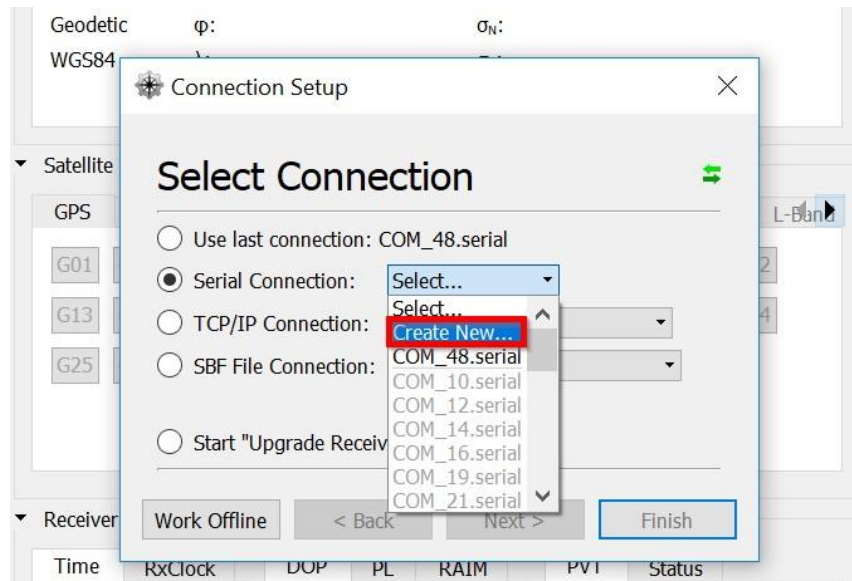
② The P-Box-AP55H uses the MICRO USB port external power supply for power supply. As shown in the following picture



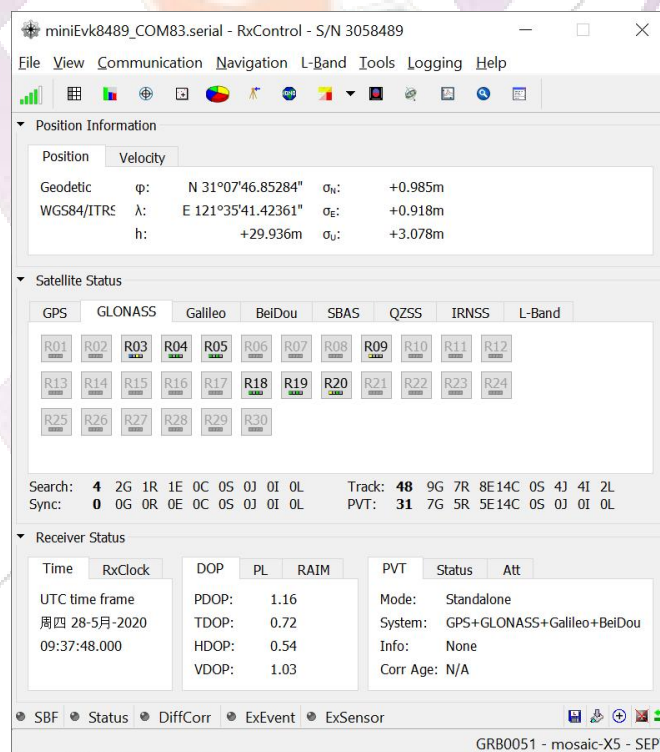
### 6.3 RxControl software connection board

1. Start RxControl software, and the Connection Setup dialog box will pop up. select Serial Connection/Create New...

1.1 For the first time to connect, need to build; Select the created serial port connection again.



2. After successful connection, you can see the interface of RxControl as follows:



### 6.4 Check firmware and upgrade

1. Confirm the firmware version of the board

1.1 Check the firmware version through RxControl software Help/Receiver Identification.

|          |          |
|----------|----------|
| firmware |          |
| version  | 4.7.0    |
| date     | 191108   |
| rev      | g1171818 |

1.2 The latest firmware version of mosaic is 4.14.0 (Junel 2023), which can also be accessed through

<https://www.septentrio.com/en/products/gps/gnss-receiver-modules>

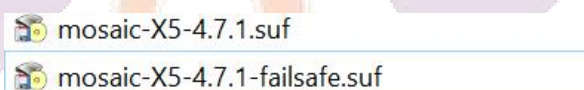
check whether there is a firmware version update and download it.

## 2. Firmware upgrade

If it is found in the previous step that the firmware is not the latest version, upgrade the firmware through the following steps, taking version 4.7.1 as an example:

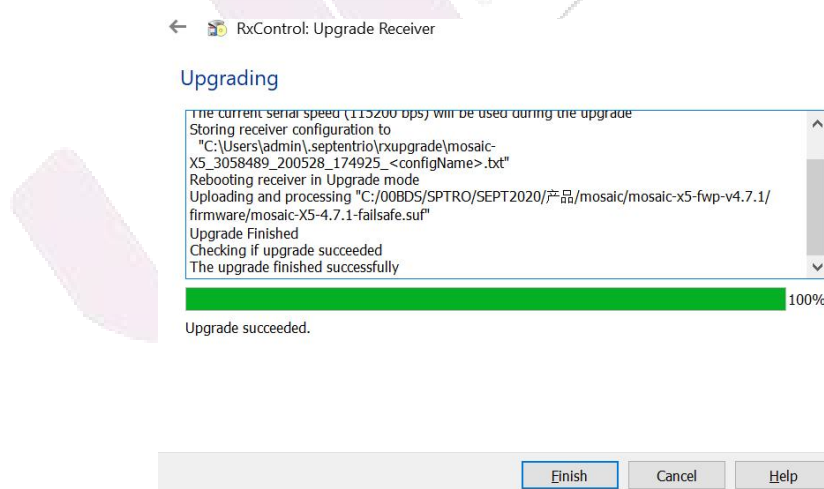
2.1 RxControl software file/upgrade receiver using current connection ...

2.2 Select the latest firmware file, there are two firmware files, first upgrade the failsafe.suf firmware file, and then upgrade.



4.7.1.suf firmware file

2.3 Upgrade succeeded.



2.4 RxControl reconnects and confirms that the firmware version information has been updated through Help/Receiver Identification.

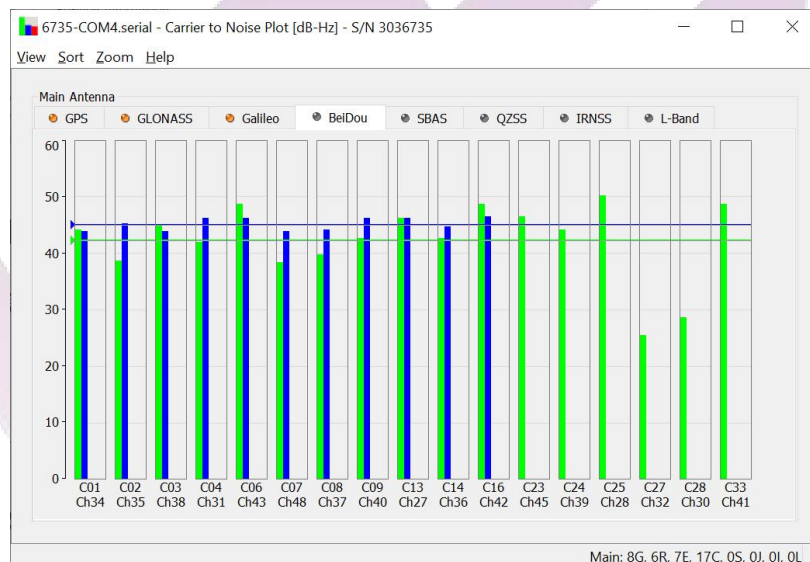
## 6.5 Check the board status

The antenna gain of the board that can work normally is between 15-50dB. If the gain is too high, the antenna connection is poor, or the cable loss is too large. The antenna gain value can be determined by RxControl->View->AGC Table.

|                 | Front End 0 | Front End 1 | Front End 2 | Front End 3 | Front End 4 | Front End 5 | Front End 6 |
|-----------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Front End Code  | GPSL1/E1    | GL0L1       | B1I         | L5/E5a      | ESb/B2I     | GPSL2       | GL0L2       |
| Antenna         | MAIN        | MAIN        | MAIN        | MAIN        | MAIN        | MAIN        | MAIN        |
| Gain (dB)       | 30          | 31          | 29          | 34          | 25          | 24          | 25          |
| Sample Variance | 107         | 98          | 98          | 98          | 96          | 93          | 102         |
| Blanking (%)    | 0           | 0           | 0           | 0           | 0           | 0           | 0           |

## 6.6 Check the satellite reception and signal-to-noise ratio

See Satellite Status of RxControl main interface for satellite search status, and the signal-to-noise ratio can be viewed through View -> Carrier to Noise Plot.



## 6.7 View differential data

RxControl software View/DiffCorr Info View is used to enter the following interface, where you can see the differential source signal system, baseline length and data of RTCMv2 or RTCMv3.

| ID | Streaming | Signal                     | Connection | Baseline                   | Baseline Quality   |
|----|-----------|----------------------------|------------|----------------------------|--------------------|
| 3  | RTCM3     | GPS+Galileo+GLONASS+BeiDou | NTRIP      | ~0.003m (Base:PC-Rover:PC) | submeteral-solvent |

| Message                                                        | Count | Age  | Base Station ID |
|----------------------------------------------------------------|-------|------|-----------------|
| RTCMv2                                                         |       |      |                 |
| RTCMv3                                                         |       |      |                 |
| 1004: Extended L1&L2 GPS RTK Observables                       | 67    | 0.4s | 3               |
| 1006: Stationary RTK Reference Station ARP with Antenna Height | 67    | 0.4s | 3               |
| 1012: Extended L1&L2 GLONASS RTK Observables                   | 67    | 0.4s | 3               |
| 1033: Receiver and Antenna Descriptors                         | 67    | 0.4s | 3               |
| 1074: GPS MSM4                                                 | 67    | 0.4s | 3               |
| 1084: GLONASS MSM4                                             | 67    | 0.4s | 3               |
| 1094: GALILEO MSM4                                             | 67    | 0.4s | 3               |
| 1104: SBAS MSM4                                                | 67    | 0.4s | 3               |
| 1114: QZSS MSM4                                                | 67    | 0.4s | 3               |
| 1124: BeiDou MSM4                                              | 67    | 0.4s | 3               |
| 1230: GLONASS L1 and L2 Code-Phase Biases                      | 67    | 0.4s | 3               |
| RTCMv                                                          |       |      |                 |
| CMRv2                                                          |       |      |                 |



## 6.8 Check the board positioning and orientation status

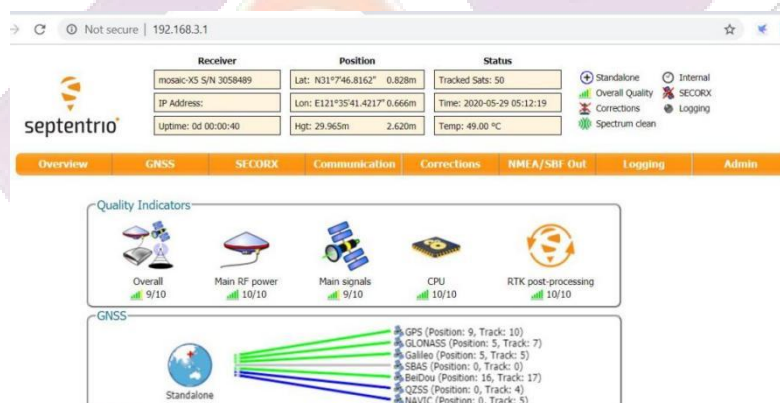
The positioning status can be viewed in the main interface of RxControl. The Position Information is the antenna position information, and the PVT column in the lower right corner shows the positioning status of the board and the satellite systems used for positioning.

## 6.9 RxControl Command Line Window

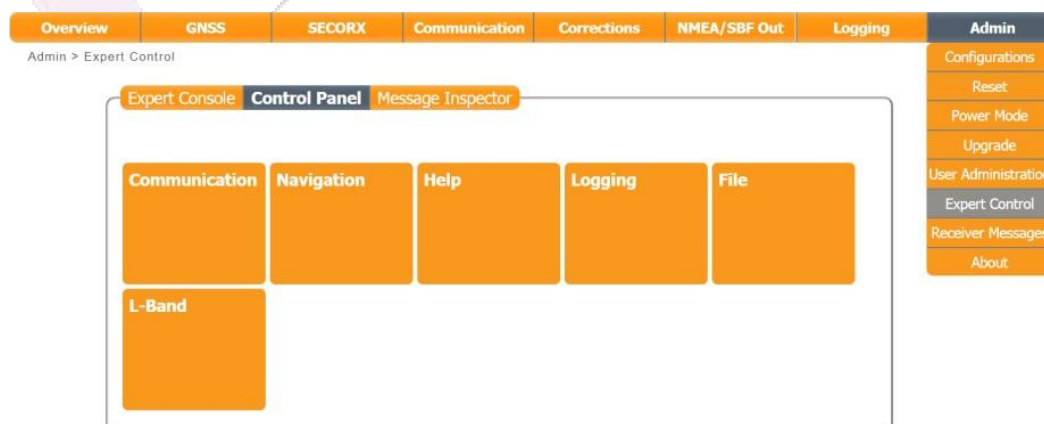
Enter the command through the RxControl software, Tools/Expert Console/GRB0051 window, and the window will automatically prompt the command prompt information when entering. You can also enter help to return all supported commands.

## 6.10 Web interface

Through USB connection, there will be a virtual network port on the computer side, with a fixed IP address of 192.168.3.1. Open it with a browser, and the interface is as follows:



You can set the receiver through admin/expert control/control panel. Refer to the third chapter below for the setting method.



## 7 Satellite and frequency point setting

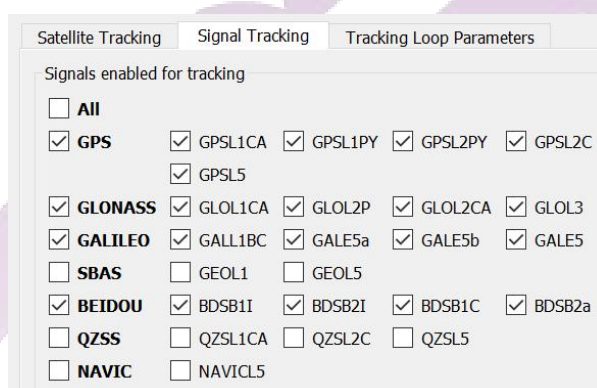
### 7.1 Tracking satellite

1. Set up tracking satellites, navigation/advanced user setting/tracking/satellites tracking of RxControl software, and check GPS+Glonass+Galileo+Beidou.

*Command line: sst,GPS+Glonass+Galileo+Beidou*

### 7.2 Tracking frequency points

1. Set the Tracking frequency,RxControl software Navigation/Advanced User Setting/Tracking/Signal Tracking, all check GPS+Glonass+Galileo+Beidou all frequency points.



*Command line: snt,GPS+Glonass+Galileo+Beidou*

### 7.3 PVT solution satellite

1. Set up the calculation satellite, navigation/advanced user setting/PVT/satellites usage of RxControl software, and check GPS+Glonass+Galileo+Beidou.

*Command line: ssu,GPS+Glonass+Galileo+Beidou*

### 7.4 PVT solution frequency point

1. Set the frequency points for calculation, navigation/advanced user setting/PVT/signal usage of RxControl software, and check all the frequency points of GPS+Glonass+Galileo+Beidou.

*Command line: snu,all,all*

## 8 Performance optimization settings

### 8.1 Anti-interference

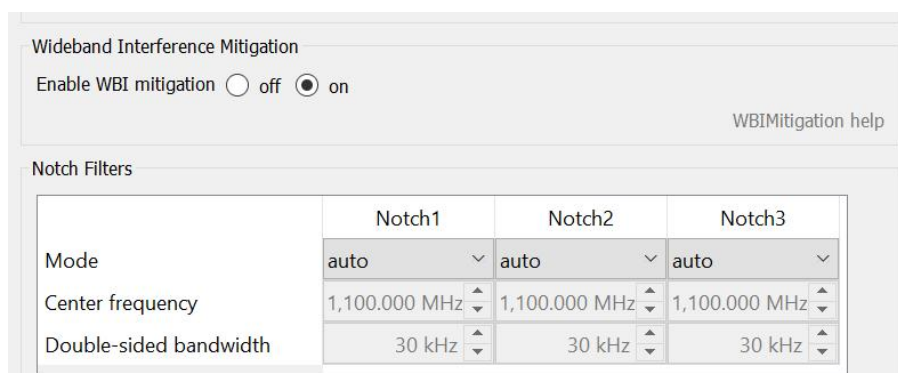
Set the option to turn on anti-jamming function through the following steps:



RxControl/navigation/advanced user setting/frontier and interference mitigation:

Wideband Interference Mitigation/Enable WBI mitigation: **ON**

Notch Filters: Notch 1 – **Auto**; Notch 2 – **Auto**; Notch 3 – **Auto**



|                        | Notch1        | Notch2        | Notch3        |
|------------------------|---------------|---------------|---------------|
| Mode                   | auto          | auto          | auto          |
| Center frequency       | 1,100.000 MHz | 1,100.000 MHz | 1,100.000 MHz |
| Double-sided bandwidth | 30 kHz        | 30 kHz        | 30 kHz        |

Command line: `setWBIMitigation,on///broadband interference suppression-enable`

`setNotchFiltering,all,auto,,, auto,,,/narrowband interference suppression-enabled`

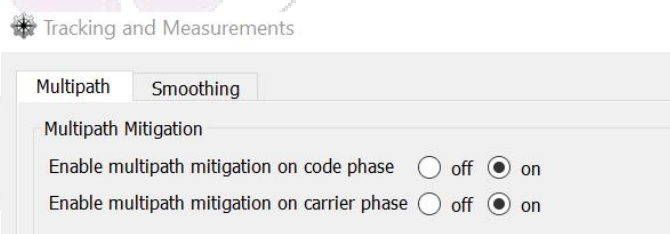
## 8.2 multipath suppression

Select and set the multipath suppression options through the following steps:

RxControl/navigation/receiver operation/tracking and measurements/multipath:

Enable multipath mitigation on code phase: **ON**

Enable multipath mitigation on carrier phase: **ON**



Command line: `setmultipath initialization, on, on///multipath suppression-enable`

## 8.3 Cut-off height angle

It is recommended to set the cutoff height angle to 10°. You can view and set the cutoff height angle options through the following steps: RX Control/Navigation/Mask/Elevation Mask:

Discard satellite if below: Tracking: **10** degree; PVT: **10** degree;

Masks

Elevation Mask

Tracking

PVT

Discard satellite if below:

10 deg

10 deg

Command line: `setElevationMask,tracking,10`// Set the tracking cutoff height angle of 10°.

`setElevationMask,pvt,10`// Set PVT cutoff height angle of 10°

## 8.4 Satellite Time System

The default satellite time system of the board adopts GPS time. If it is found in the actual application scene that the GPS signal interferes with the positioning quality and the RTK is not fixed, it is suggested to change the time system to Beidou satellite system time. The method is as follows:

RxControl/Navigation/Rover Operation/Timing / Timing System: **Beidou**

Timing

Timing System

System

☐ GST
☒ GPS
☐ BeiDou

Command line: `setTimingSystem,Beidou` // Set the time system to Beidou satellite system time

# 9 RTK mode

## 9.1 Base station mode

1. The board is configured in Static mode: RX control/navigation/position mode.

Positioning Mode

PVT Mode

SBAS Corrections

PPP and Differential Corrections

GNSS Attitude

PVT Mode

Mode

☒ Static
☐ Rover

Rover mode

☒ All
☒ RTK
☒ RTKFloat
☒ RTKFixed
☒ StandAlone
☒ SBAS
☒ DGPS
☒ PPP

Reference position

auto

Antenna Reference Point Static Position - Geodetic

|               | Geodetic1          | Geodetic2          | Geodetic3 |
|---------------|--------------------|--------------------|-----------|
| ARP Latitude  | N 00°00'00.00000"  | N 00°00'00.00000"  | N 00°     |
| ARP Longitude | E 000°00'00.00000" | E 000°00'00.00000" | E 000°    |
| ARP Altitude  | 0.0000 m           | 0.0000 m           |           |
| Datum         | WGS84              | WGS84              | WGS84     |

Set the Reference position to Auto, or specify the latitude and longitude coordinates, for example, enter

the latitude and longitude coordinates in Geodetic1, and then select Geodetic1 in the Reference position.

*Command line: setpvtmode,static,,auto//Set to static base station, automatically obtain the position*

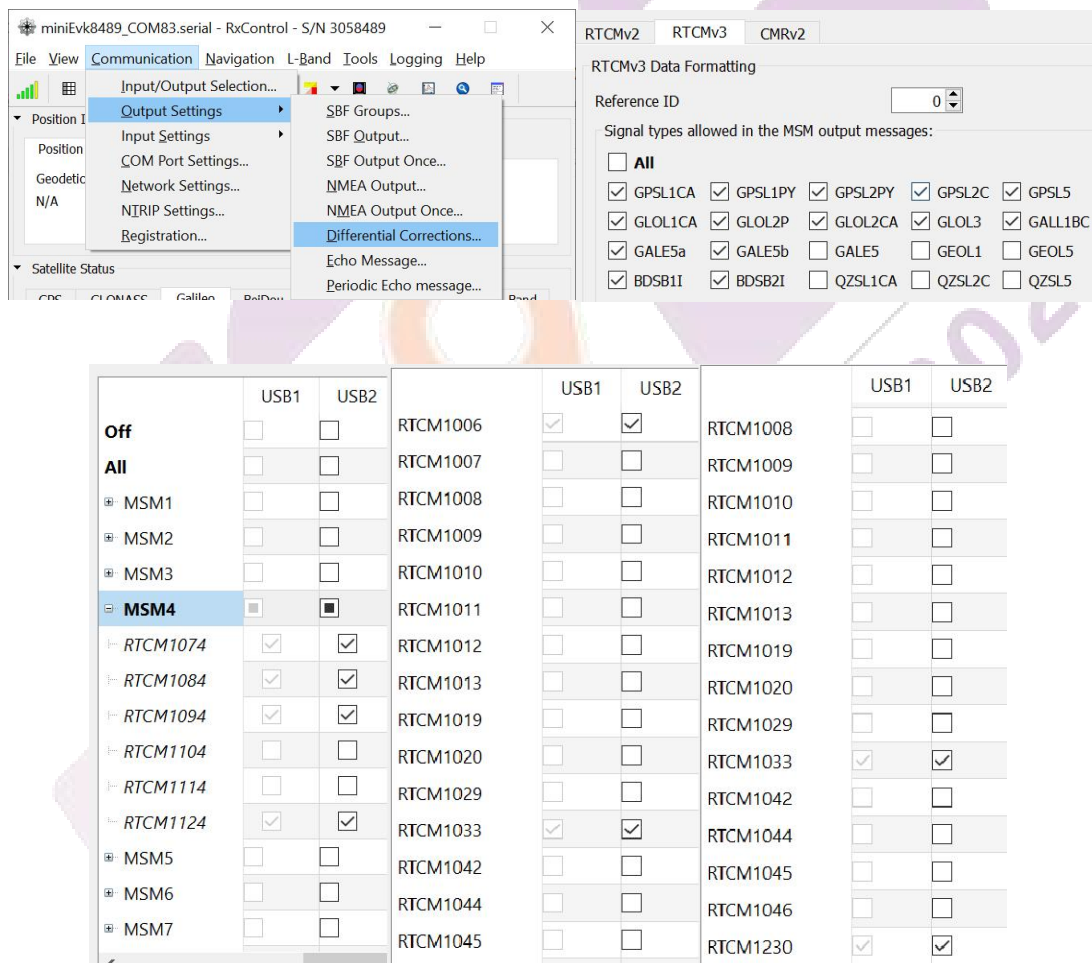
*Command line:*

*Setstaticposgeodetic, Geodetic1, 11.1234, 22.1234, 33.123//Set the latitude and longitude of*

*Geodetic1*

*setpvtmode, static, Geodetic 1//Set the location as the base station and use Geodetic1*

## 2. Setting RTCMv3 output



Set the output of RTCMv3 data, set the satellite frequency used by RTCMv3, and output the data type of RTCMv3 as shown in the screenshot above.

*Command:*

*setRTCMv3Formatting,0,GPSL1CA+GPSL1PY+GPSL2PY+GPSL2C+GPSL5+GLOL1CA+GLOL2P+GLOL2CA+*

`GL0L3+GALL1BC+GALE5a+GALE5b+BDSB1I+BDSB2I`

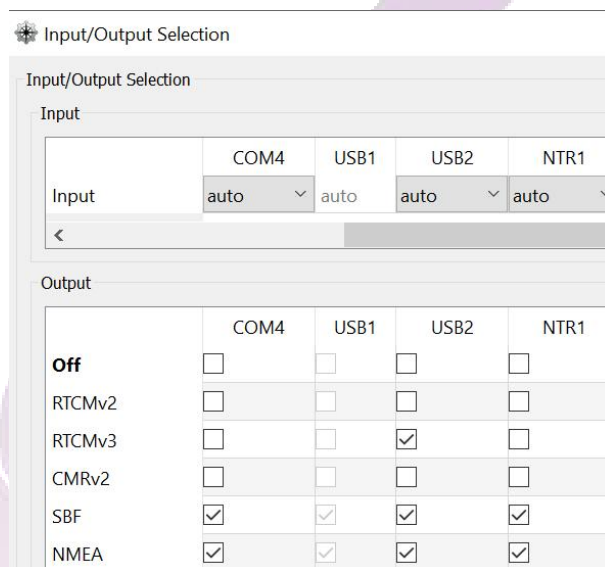
`//Set the satellite frequency point used for RTCMv3 output`

`setRTCMv3Output,usb2,RTCM1006+RTCM1033+RTCM1074+RTCM1084+RTCM1094+RTCM1124+`

`RTCM1230`

`// Set the output of RTCMv3 and output it through usb2 port`

### 3. Enable port to output RTCMv3 data



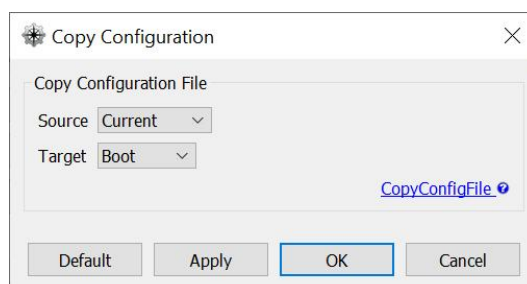
| Input/Output Selection |                                     |                                     |                                     |                                     |  |
|------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|--|
| Input/Output Selection |                                     |                                     |                                     |                                     |  |
| Input                  |                                     |                                     |                                     |                                     |  |
|                        | COM4                                | USB1                                | USB2                                | NTR1                                |  |
| Input                  | auto                                | auto                                | auto                                | auto                                |  |
| <                      |                                     |                                     |                                     |                                     |  |
| Output                 |                                     |                                     |                                     |                                     |  |
|                        | COM4                                | USB1                                | USB2                                | NTR1                                |  |
| Off                    | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |  |
| RTCMv2                 | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |  |
| RTCMv3                 | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |  |
| CMRv2                  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            | <input type="checkbox"/>            |  |
| SBF                    | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |  |
| NMEA                   | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |  |

`Command line: setdatainout, USB2, auto, RTCMv3//Open usb2 port to output`

### 4. Save settings

No matter in RxControl, command line or web interface, after changing the settings, you need to save them, so that they will take effect after power failure and restart.

Under RxControl software, you can save the Current to Boot through the File/Copy Configuration interface, and then you can save it to the boot file.

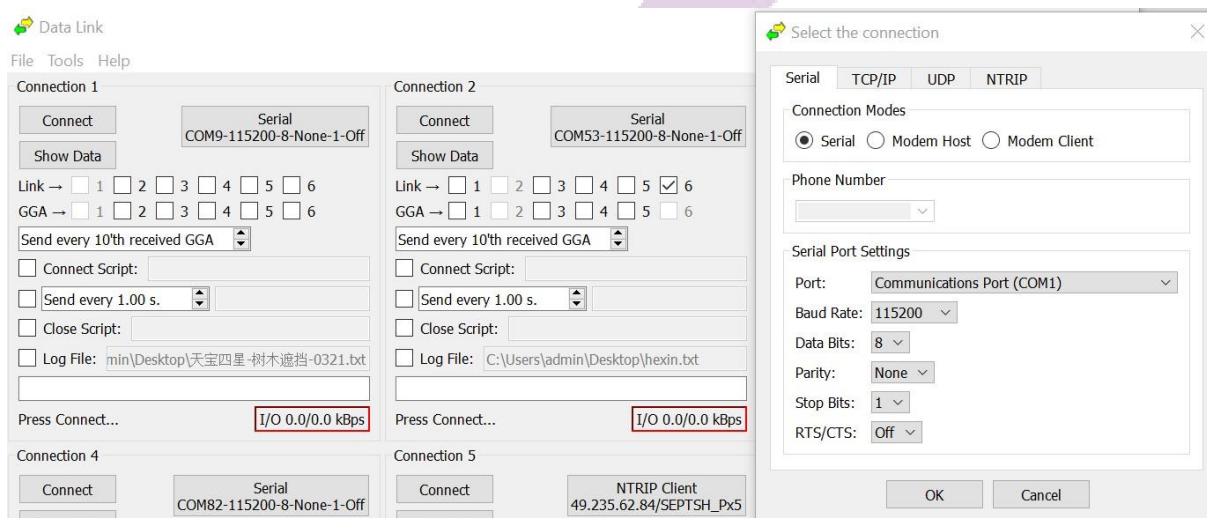


`Command line: eccf,current,boot // Save settings`

## 9.2 Datalink program

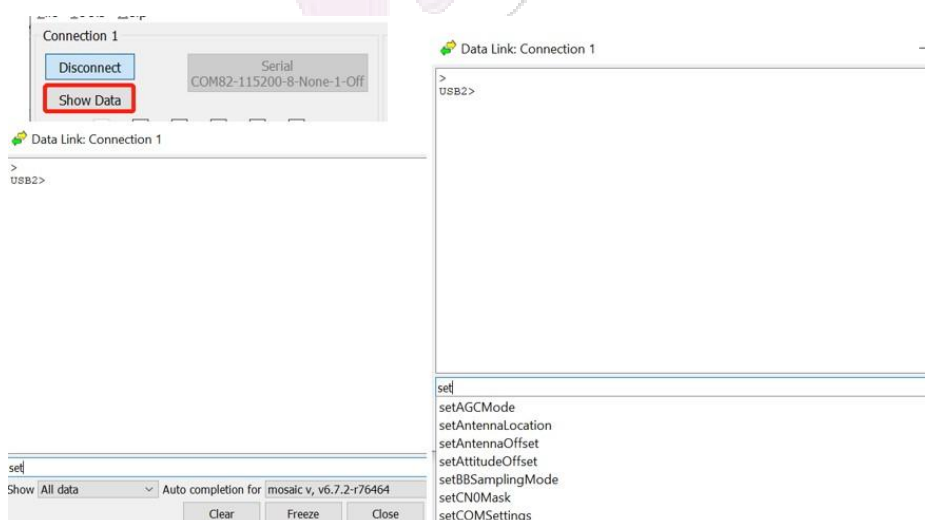
### Function: port link, data distribution

Datalink program can establish direct data links of different connections, and can forward the data of one port to other connections through Datalink. For example, there are six Connections in Datalink program, so connection1 can receive serial port or NTRIP difference, and then distribute it to other different Connections.



### Function: Serial Assistant

Use Serial serial port to Connect the board. The default baud rate is 115200. Click Connect to connect, and then click Show Data serial port monitoring interface is displayed



Select Auto completion for mosaic v in the lower right corner of the serial interface, so that when you enter the

command line, the input box will automatically prompt you for the command format.

### Function: the output data of the port is recorded to a file

After the serial port monitoring interface picks up the port data, return to the main interface of Datalink, and click Log File to save the data to the file.

☒ Log File: C:\Users\admin\Desktop\test.txt

## 9.3 Roving station mode

1. firstly, set the board to switch to Rover rover rover mode, and navigate/position it through RxControl software.

*Command line: setpytmode, rover, RTK+standalone//Set PVT Rover mode.*

Interface PVT mode: Rover

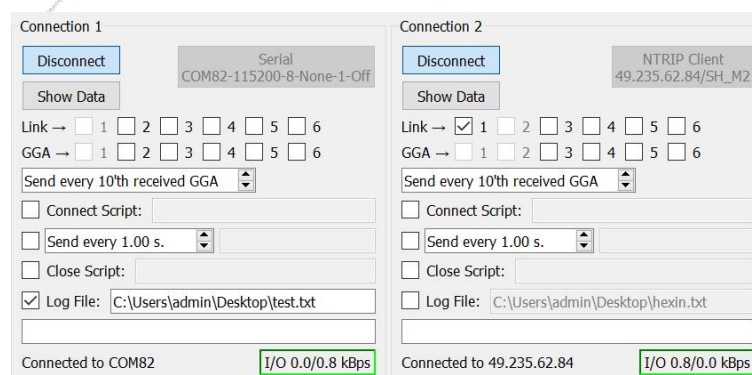
2. RxControl software file/copyconfiguration/current-> Boot

*Command line: eccf,current,boot // Save settings*

3. Setting differential input in Datalink software

- Set Connection1 to connect to USB2 port of Mosaic MiniEVK (the corresponding virtual serial port can be viewed through the device manager of the computer)
- Set Connection2 to connect the differential source through serial port or NTRIP, and confirm the effective reception of differential data through Show Data.
- Link the differential data of Connection2 to Connection1, so that the MiniEvk board can obtain the differential data.

**Note: If Sixents NTRIP or other CORS station difference data is used, it is necessary to set the board card receiving difference port to output 1Hz GGA data. For details, see [NMEA Data port real-time output](#)**



The screenshot displays the Datalink software interface with two connection configurations side-by-side.

- Connection 1:**
  - Buttons: Disconnect, Show Data
  - Port: Serial COM82-115200-8-None-1-Off
  - Link →: 1 2 3 4 5 6 (all unchecked)
  - GGA →: 1 2 3 4 5 6 (all unchecked)
  - Send every 10th received GGA: [dropdown]
  - Connect Script: [text box]
  - Send every 1.00 s.: [dropdown]
  - Close Script: [text box]
  - ☒ Log File: C:\Users\admin\Desktop\test.txt
  - Status: Connected to COM82, I/O 0.0/0.8 kbps
- Connection 2:**
  - Buttons: Disconnect, Show Data
  - Port: NTRIP Client 49.235.62.84/SH\_M2
  - Link →: 1 2 3 4 5 6 (1 is checked)
  - GGA →: 1 2 3 4 5 6 (all unchecked)
  - Send every 10th received GGA: [dropdown]
  - Connect Script: [text box]
  - Send every 1.00 s.: [dropdown]
  - Close Script: [text box]
  - Log File: C:\Users\admin\Desktop\hexin.txt
  - Status: Connected to 49.235.62.84, I/O 0.0/0.8 kbps

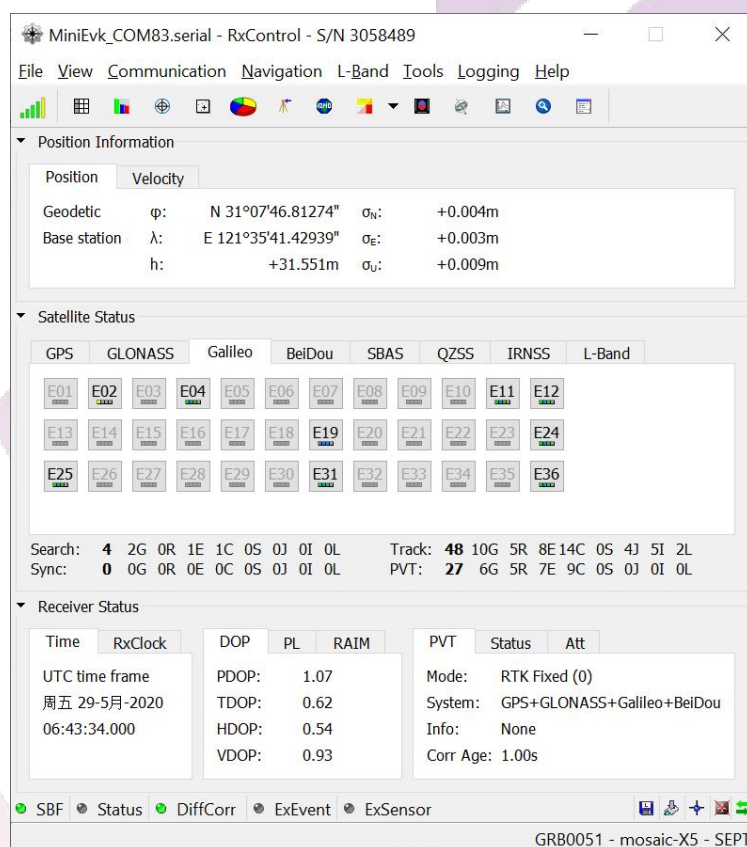


#### 4. RTK Fixed status verification

4.1 Return to RxControl software, and the positioning accuracy can be seen in the Position Information information bar.

4.2 The PVT information bar in the lower right corner can see whether the current RTK status is RTK Fixed and the satellite system calculated by PVT.

4.3 The DiffCorr light in the lower left corner flashes, indicating that the differential data is being received in real time.



## 10 NMEA Data

### 10.1 Real-time output through the port

1. Through RxControl software, communication/output settings/NMEA output/NMEA output Intervals settings

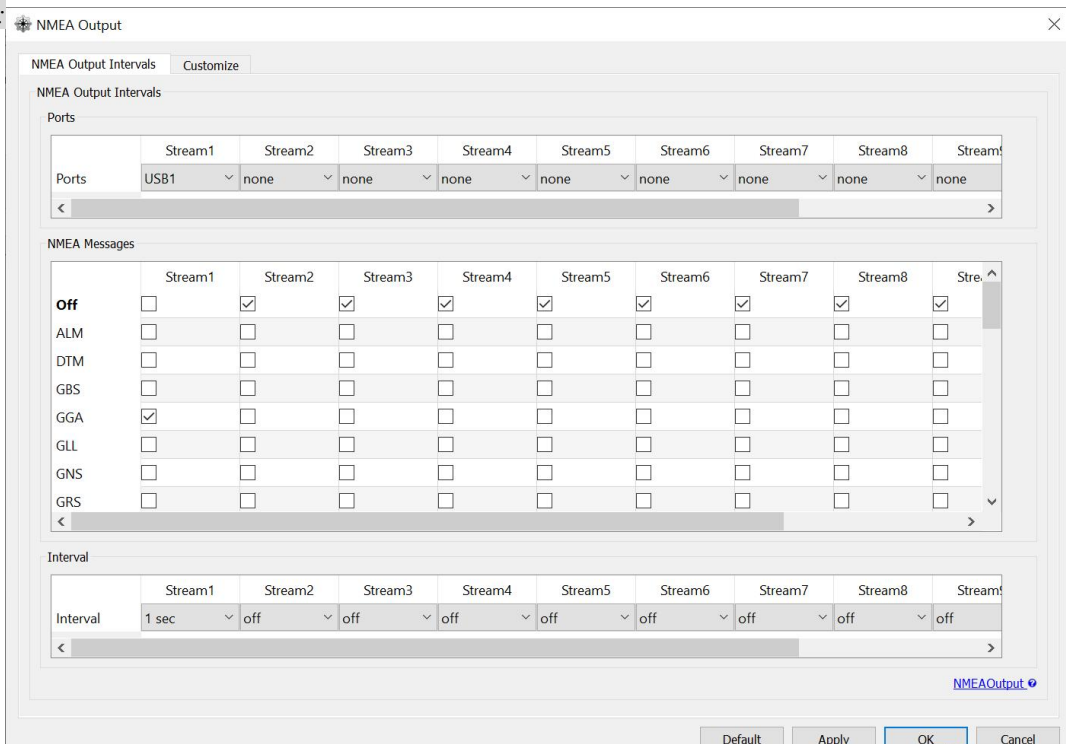
a. output port

b. NMEA data type

### c. Output frequency

## 2. Save settings , File/Copy Configuration/Current-> Boot

Command line:



*sno,stream1,ubs2,gga,sec1 // set the USB2 port to output 1hz GGA.*

Command line: *eccf,current,boot* // Save settings

## 10.2 Record data computer files

Mosaic MiniEvk supports loading TF memory card, which can record data to the memory card.

### 1. RxControl software, Communication/Output Settings/NMEA Output/NMEA Output Intervals Settings

#### 1.1 The output port is DSK1

#### 1.2 NMEA data type

*Command line: sno,stream1,ubs2,gga,sec1 // set the USB2 port to output 1hz GGA.*

#### 1.3 Output frequency

## 2. Save the settings, File/Copy Configuration/Current-> Boot

Command line: *eccf,current,boot* // Save settings



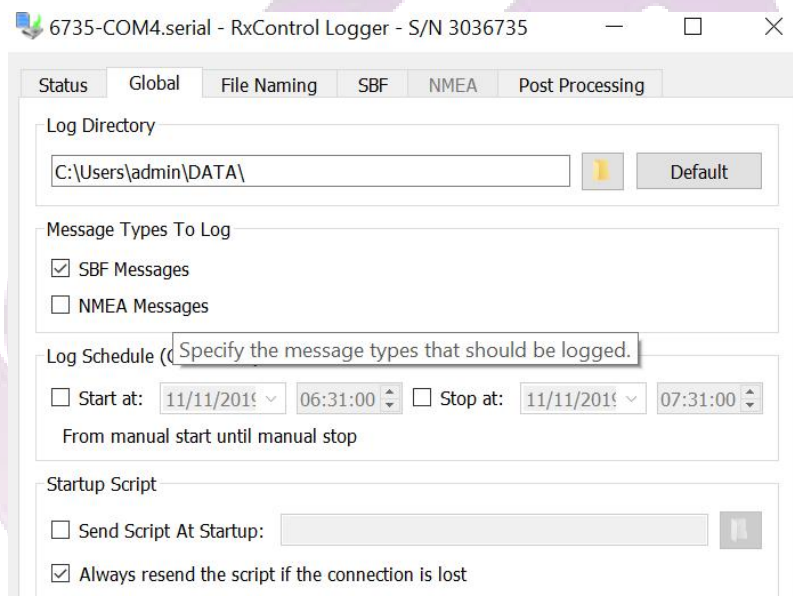
### 10.3 record data computer files

#### Method 1: through Datalink

1. Datalink program can be connected to USB2 port of Mosaic MiniEVK, input instructions to set output data through serial port monitoring interface, and check Log to file (see [Datalink program](#))

#### Method 2: log by RxLogger or RxControl software

1. Run the Logging/RxControl Logging function of the RxControl software or run the RxLogger program, connect the USB port of the Mosaic MiniEvk, and enter the following interface



2. Under the Global menu, set Message Types To Log and select NMEA.

*Note: If it is select here, it needs to be set and recorded. If SBF is not needed, it needs to be cancelled.*

3. Under the **File Naming** menu, set the file path and file name, and optionally set the size and duration of a single file.

4. Under the NMEA menu, set the output data type and interval.

5. Click **Start Logging** to start recording to computer files.

# 11 SBF raw data

SBF-Septentrio Binary Format file is a proprietary binary format file of Septentrio, and the recorded information is relatively complete.

## 11.1 port output raw data

RxControl software interface, **Communication/Output Settings/SBF Output**, and set

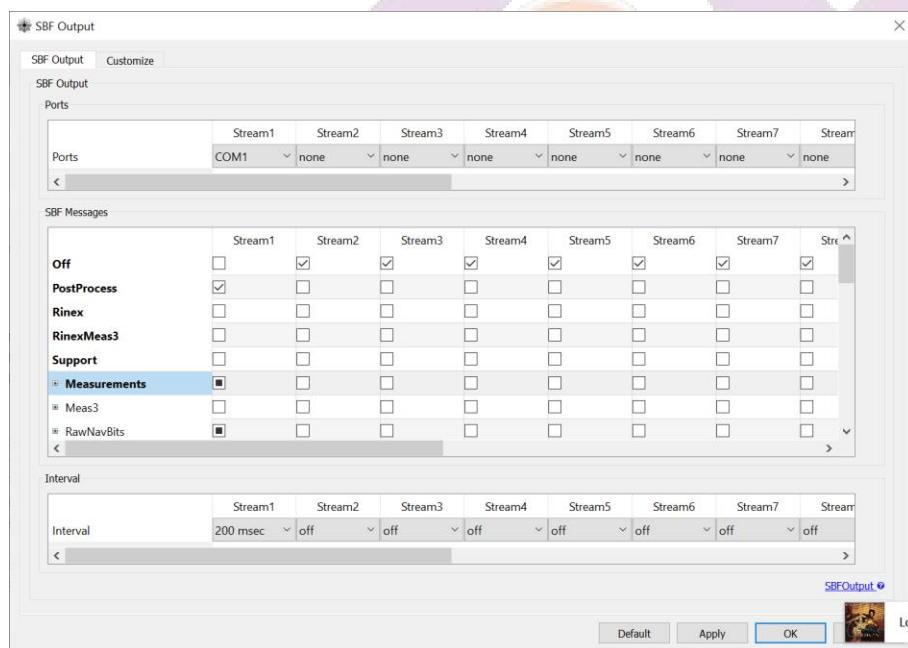
1. Output port

2. Data type

For data types, see Chapter 4 SBF Reference in the **Mosaic Firmware Guide**

3. Output interval

4. Save the Settings, File/Copy Configuration/Current->Boot



**Command line:**

`sso,stream1,ubs2,PostProcess,msec200//Set USB2 port to output 5hz PostProcess data`

**Command line:** `eccf,current,boot// Save settings`

## 11.2 Record raw data to memory card

The way of recording to the memory card is basically the same as that of serial port output, just change the serial port number to DSK1.

## 11.3 Record data computer files

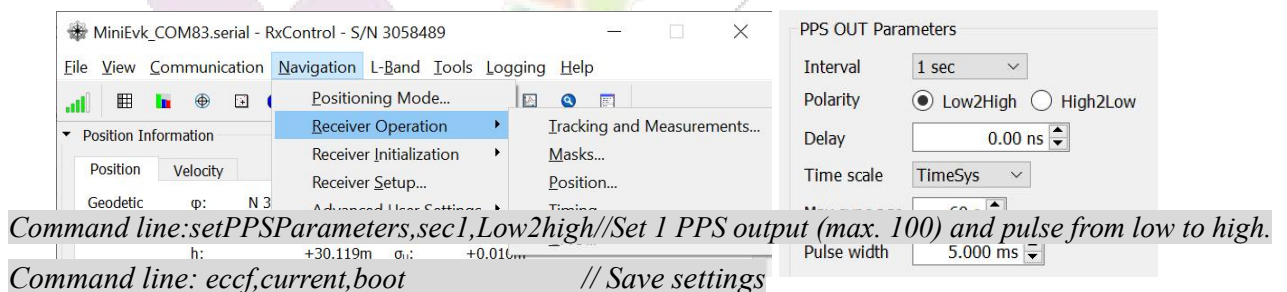
The setup procedure is the same as that of recording NMEA data into a computer file, except that NMEA data is changed to SBF data, and the required SBF data type is select.

Note :SBF data is recorded to the computer. If you need to change the recording interval, you need to use the RxLogger program to record. The recording SBF under RxControl cannot be set and the default is 1Hz.

# 12 External event

## 12.1 PPS output

RxControl software interface, **Navigation/Receiver Operation/Timing** to set PPS output, and save the settings.



## 12.2 Event

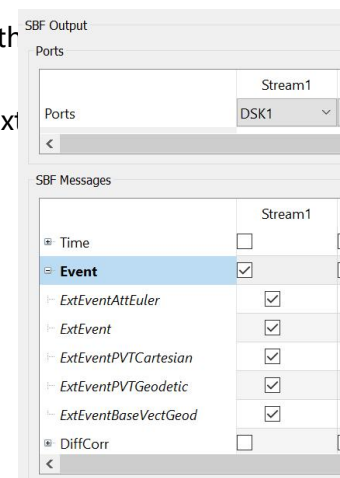
1. RxControl software interface, navigation/receiver operation/timing to set the Event data type to record the position information of external event.

You need to select the Event data type to record the position information of external event.

Command line:  
`sso,stream1,ubs2,PostProcess+Event,msec100`  
 //Set USB2 port to output 10hz PostProcess+Event data

2. Save settings

Command line: `eccf,current,boot // Save settings`

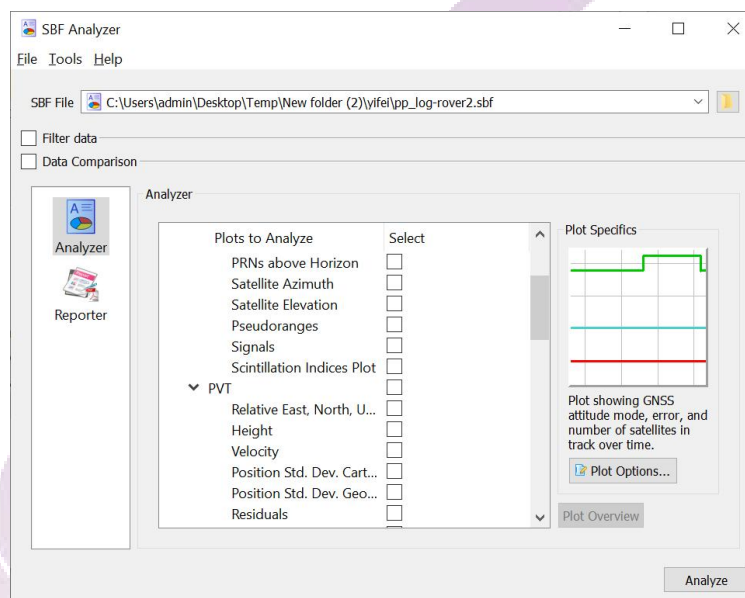


## 13 SBF data analysis

### 13.1 SBF Analyzer

When installing RxTools software, SBF Analyzer will be installed automatically. The following is a brief introduction to the use of SBF Analyzer program:

1. Double-click the **SBF Analyzer** program, or right-click the SBF format file to select SBF Analyzer.

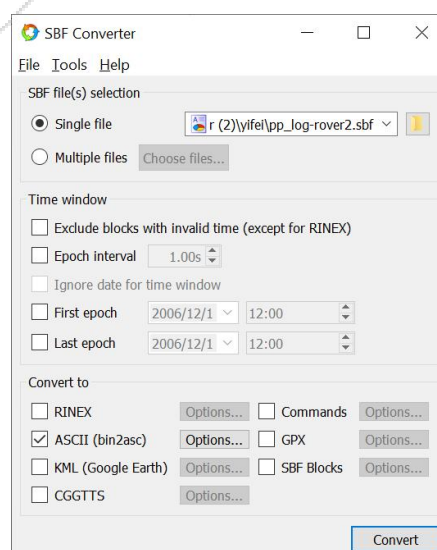


2. Select the items to be analyzed and click **Analyze**.

### 13.2 SBF Convertor

Sbconverter program can convert SBF into the required general format.

1. Run the SBF Convertor program or SBF file and right-click Convert SBF



2. SBF can be converted into Rinex, ASCII files, etc.

3. For the Event application, view the location data recorded at the external trigger time through

ExtEventPVTGeodetic1

## 14 Troubleshooting

### 14.1 diagnosis report

1. There are several ways to get the diagnosis report or report content:

RxControl software can connect the board, File/Display Diagnostic Report or press the shortcut key Ctrl+C, and then save the report as a pdf file.

2. Through the web interface Admin/About/Diagnostic Report, then Save As as a text file.

3. Or through the serial assistant, enter the following instructions and copy the contents returned by the board to the file

- a. lstInternalFile, Identification
- b. lstInternalFile, Permissions
- c. getReceiverCapabilities
- d. getReceiverInterface
- e. lstConfigFile, Boot
- f. lstConfigFile, Current
- g. lstInternalFile, Ipparameters
- h. getSbfOutput
- i. getDataInOut
- j. lstInternalFile, Error
- k. lstInternalFile, SetupError
- l. lstInternalFile, rxMessages
- m. lstDiskInfo, all

### 14.2 support SBF files

If technical support is needed to analyze data quality and troubleshoot board abnormality, it is necessary to record Support SBF data. The operation steps for recording SBF are as follows [SBF raw data](#) Introduction.

The Support SBF data can be set to 10Hz by default, and the recording frequency of the Support SBF can be adjusted according to whether the scene is still or moving. It is recommended that you select Support+BBSamples for recording to a memory card or computer file.

*Command line: sso,stream1,dsk1,support+BBSamples,msec100//record support+bb samples to the*

*Command line: eccf,current,boot // Save*