SingularXYZ

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S20

GNSS Receiver

User Manual

V2.0, modified on 2024.12.13

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Technical Assistant

If you have any questions that can't be solved in this manual, please contact your local SingularXYZ distribution partner. Alternatively, request technical support from SingularXYZ Intelligent Technology Ltd.

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Your feedback on this manual will help us improve it with future revisions.

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Chapter 1 Overview

1.1 About S20

Equipped with a high-precision GNSS engine, the S20 offers full-constellation tracking and versatile work modes. The S20 receiver integrates the GNSS antenna and GNSS module together, largely streamlining the system components and installation. Featuring a standard DB9 serial port and NMEA-0183 message output, it facilitates seamless integration into navigation system development, ensuring high adaptability and ease of use.

1.2 Specification

Key Features:

Size: Φ150mm*58.4mm

Weight: 424g

1408 channels of simultaneously signal tracking

Precision positioning: centimeter-level RTK accuracy and sub-meter standalone accuracy

IP67 waterproof & dustproof

Designed to survive a 2m drop onto concrete

Cable-free Bluetooth wireless technology

1.3 Specification

Thanks for choosing SingularXYZ S20 GNSS receiver. Please check your package for the items listed below.

bhu7xwTips: Item with * is Optional.

No.	Name	Quantity	Figure
1	S20 GNSS Receiver	1	

2	5-pin Cable	1	
3	Magnetic Base*	1	

Chapter 2 Introduction

2.1 Environmental Requirements

S20 GNSS receiver is so rugged and designed compactly, but to keep the receiver with a reliable performance and have a lengthy life span, we strongly advise you to use S20 under circumstances below:

Operating Temperature: -40 ℃ ~ +65 ℃

Storage Temperature: -40 ℃ ~ +85 ℃

Humidity: 100% non-condensing.

Avoid violent impact (designed to survive a 2m drop onto concrete).

Avoid soaking in fluid.

With a clear view of the sky.

2.2 Installation

The S20 is placed on the roof using a magnetic base. As shown in Figure 2-1, the S20 is connected to the magnetic base and the extension rod, and Figure 2-2 is the S20 installed on the roof.

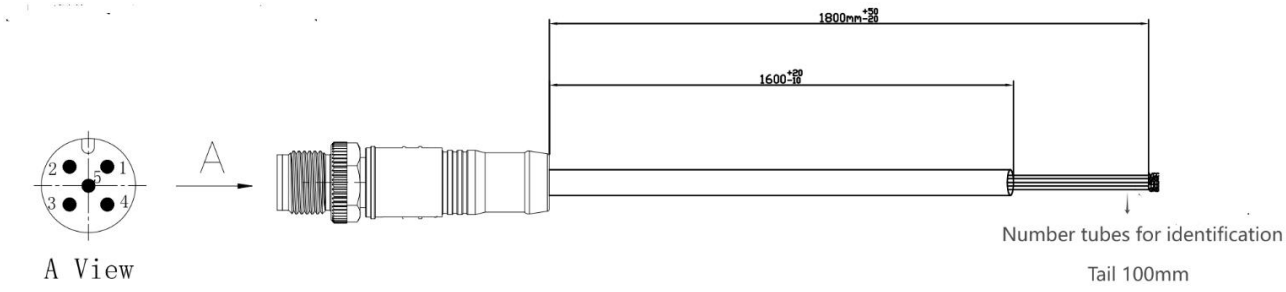
Figure 2-1

Figure 2-2

2.3 Interface Definition

S20 GNSS receiver comes with a 5-pin data cable, which needs to be connected to the power cable and serial port cable by yourself. The following is the definition of the data cable for reference.

Connection Definition		
M12/5PIN Male	Wire color	Description
1	Brown	VCC
2	White	GND
3	Blue	RXD
4	Black	TXD
5	Grey	GND
Shield	Braided wire mesh	



2.4 Power Supply

S20 GNSS Receiver only supports external power supply. Please use a DC2.1 female for power supply.


S20 GNSS Receiver
SingularXYZ

Chapter 3 Output Data

3.1 NMEA-0183

NMEA 0183 is a standard format developed by the National Marine Electronics Association for marine electronic equipment. It has become the unified RTCM (Radio Technical Commission for Maritime services) standard protocol for GPS navigation equipment.

S20 outputs NMEA-0183 messages at 1HZ by default, including GGA, GSA, RMC, GST, GSV. The following is a detailed description of the relevant messages.

Tips: S20 supports changing the message output settings by yourself. In addition, the S20 receiver does not perform "freset" operations on the board by default, and the user-defined settings can be retained. For details, please contact technical support.

$GPGGA

GPS fixed data output statement, this is the main data of a frame of GPS positioning, and it is also the most widely used data.

$GPGGA,<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,<9>,<10>,<11>,<12>,<13>,<14>*<15>

<1> UTC time, the format is hhmmss.sss.

<2> Latitude, the format is ddmm.mmmm (if the leading digit is insufficient, fill in 0).

<3> Latitude hemisphere, N or S (north or south latitude).

<4> Longitude, the format is dddmm.mmmm (if the leading digit is insufficient, fill in 0).

<5> Longitude hemisphere, E or W (east longitude or west longitude).

<6> Positioning quality indication, 0=positioning invalid, 1=positioning valid.

<7> Number of satellites to use, from 00 to 12 (if the leading digits are insufficient, fill with 0).

<8> Horizontal accuracy, from 0.5 to 99.9.

<9> Height of the antenna from sea level, from -9999.9 to 9999.9 meters.

<10> Height unit, M represents the unit of meter.

<11> Height of the geoid relative to sea level (-999.9 to 999.9).

<12> Height unit, M represents the unit of meter.

<13> Differential GPS data period (RTCM SC-104), the number of seconds to establish the last RTCM transmission.

<14> Differential reference base station number, from 0000 to 1023 (if the leading digits are insufficient, fill with 0).

<15> Checksum.

$GPGSA

GPS DOP and Active Satellites（GSA）Current satellite information.

$GPGSA,<1>,<2>,<3>,<3>,<3>,<3>,<3>,<4>,<5>,<6>,<7>

<1>Mode: M = Manual, A = Automatic.

<2>Positioning type 1 = No positioning, 2 = Two-dimensional positioning, 3 = Three-dimensional positioning.

<3>PRN number: 01 to 32 indicates the satellite numbers in use in the sky, and can receive up to 12 satellite information.

<4> PDOP position precision factor (0.5~99.9)

<5> HDOP horizontal precision factor (0.5~99.9)

<6> VDOP vertical precision factor (0.5~99.9)

<7> Checksum

$GPRMC

Recommended Minimum Specific GPS/TRANSIT Data

$GPRMC,<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>,<9>,<10>,<11>,<12>*<13>

<1> UTC time, hhmmss (hour, minute, second) format

<2> Positioning status, A=valid positioning, V=invalid positioning

<3> Latitude, latitude ddmm.mmmm (degrees and minutes) format (if the leading digits are insufficient, fill in 0)

<4> Latitude hemisphere N (Northern Hemisphere) or S (Southern Hemisphere)

<5> Longitude, longitude dddmm.mmmm (degrees and minutes) format (if the leading digits are insufficient, fill in 0)

<6> Longitude hemisphere E (East longitude) or W (West longitude)

<7> Ground speed (000.0~999.9 knots, Knot, if the leading digit is insufficient, fill in 0)

<8> Ground heading (000.0~359.9 degrees, with true north as the reference, if the leading digit is insufficient, fill in 0)

<9> UTC date, ddmmyy (day-month-year) format

<10> Magnetic Variation, magnetic declination (000.0~180.0 degrees, if the leading digit is insufficient, fill it with 0)

<11> Declination, magnetic declination direction, E (east) or W (west)

<12> Mode Indicator, mode indication (only NMEA0183 3.00 version output, A=autonomous positioning, D=differential, E=estimated, N=invalid data)

<13> Checksum

$GPGST

GPS pseudo-range noise statistics, including standard deviation information of three-dimensional coordinates.

$GPGST,<1>,<2>,<3>,<4>,<5>,<6>,<7>,<8>*<9>

<1>UTC Time

<2>RMS deviation

<3>Semi-major deviation

<4>Semi-minor deviation

<5>Semi-major orientation

<6>Latitude error deviation

<7>Longitude error deviation

<8>Altitude error deviation

<9>Checksum

$GPGSV

visible satellite status output statement.

$GPGSV,<1>,<2>,<3>,<4>,<5>,<6>,<7>,…,<4>,<5>,<6>,<7>*<8>

<1> Total number of GSV statement messages.

<2> Current GSV statement number.

<3> Total number of visible satellites, 00 to 12.

<4> Satellite number, 01 to 32.

<5> Satellite elevation, 00 to 90 degrees.

<6> Satellite azimuth, 000 to 359 degrees. Actual value.

<7> Signal-to-noise ratio (C/No), 00 to 99dB; no table means no signal is received.

<8> Checksum

3.2 Serial Port Output

NMEA data can be output via the serial port. After power supply, the output data needs to be connected to the computer via a USB to RS232 converter.

Figure 3-1

After the cable is connected, no configuration is required, and the S20 will output data by default. As shown in Figure 3-2 below, select the serial port software to see the data output.

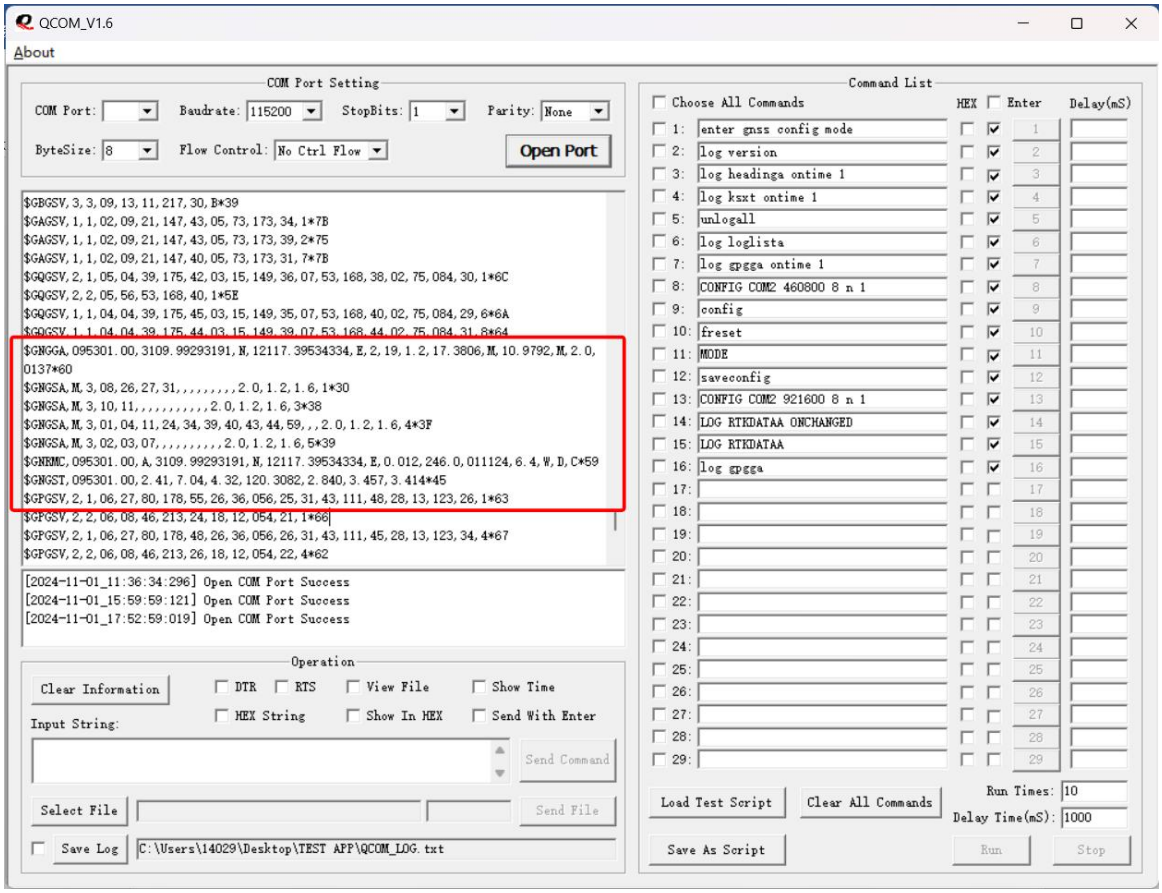


Figure 3-2

3.3 Bluetooth Output

S20 can also output data via Bluetooth. When connected to SingularPAD software or other measurement software, you can see the default output NMEA data. (The following chapters will provide detailed information about connecting to the SingularPAD software.) Figure 3-3 below shows the Bluetooth output NMEA data.


Communication
Shared
Common Commands
Command
Input
RX Data
Save
$GQGSV,1,1,04,04,22,176,40,03,33,13
$GNGGA,095527.00,3109.99291540,N
2.0,0137*60
$GNGSA,M,3,18,26,27,31,,,,,,,,1.4,0.9,1
$GNGSA,M,3,85,86,,,,,,,,,,1.4,0.9,1.1,2*
$GNGSA,M,3,05,36,,,,,,,,,,1.4,0.9,1.1,3*
$GNGSA,M,3,01,04,07,10,11,12,16,24,
$GNGSA,M,3,44,59,,,,,,,,,,1.4,0.9
,1.1,4*38
$GNGSA,M,3,02,03,04,07,,,,,,,,1.4,0.9,1
$GNRMC,095527.00,A,3109.99291540
$GNGST,095527.00,3.38,5.16,3.18,116.
$GPGSV,2,1,07,27,81,176,54,16,56,017
$GPGSV,2,2,07,28,12,124,29,08,47,214
5,1*57
$GPGSV,2,1,05,27,81,176,46,31,42,112
$GPGSV,2,2,05,18,11,053,24,4*5D
$GPGSV,2,1,05,27,81,176,53,26,35,057
Start
Send
Clear

Figure3-3

Chapter 4 Working Mode

4.1 RTK-Ntrip

S20 can use Ntrip to achieve RTK through the Phone Internet.

4.1.1 Device Connection

Take SingularPAD software as an example, connect SingularPad and S20 GNSS receiver via Bluetooth. Search and connect S20 Bluetooth as shown in Figure 4-1 below.

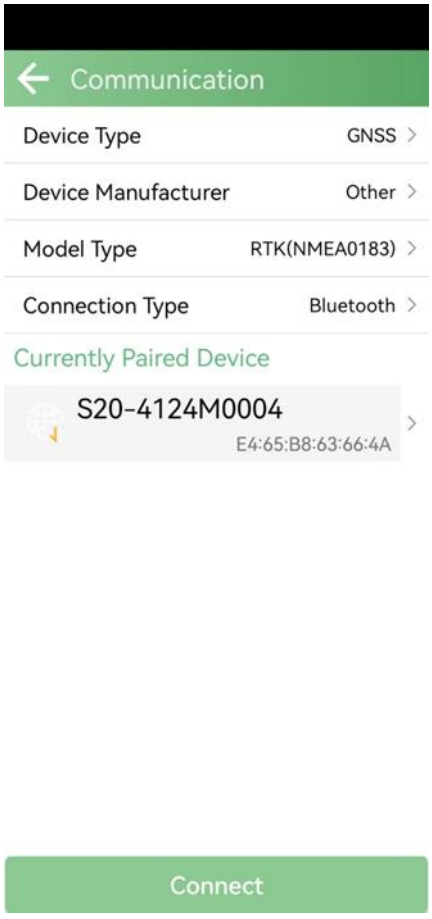


Figure4-1

After the connection is successful, it is shown as shown in Figure 4-2.

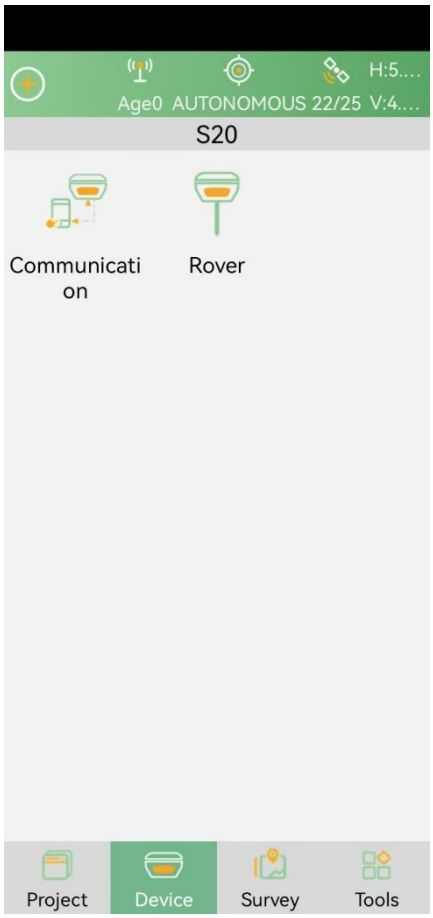
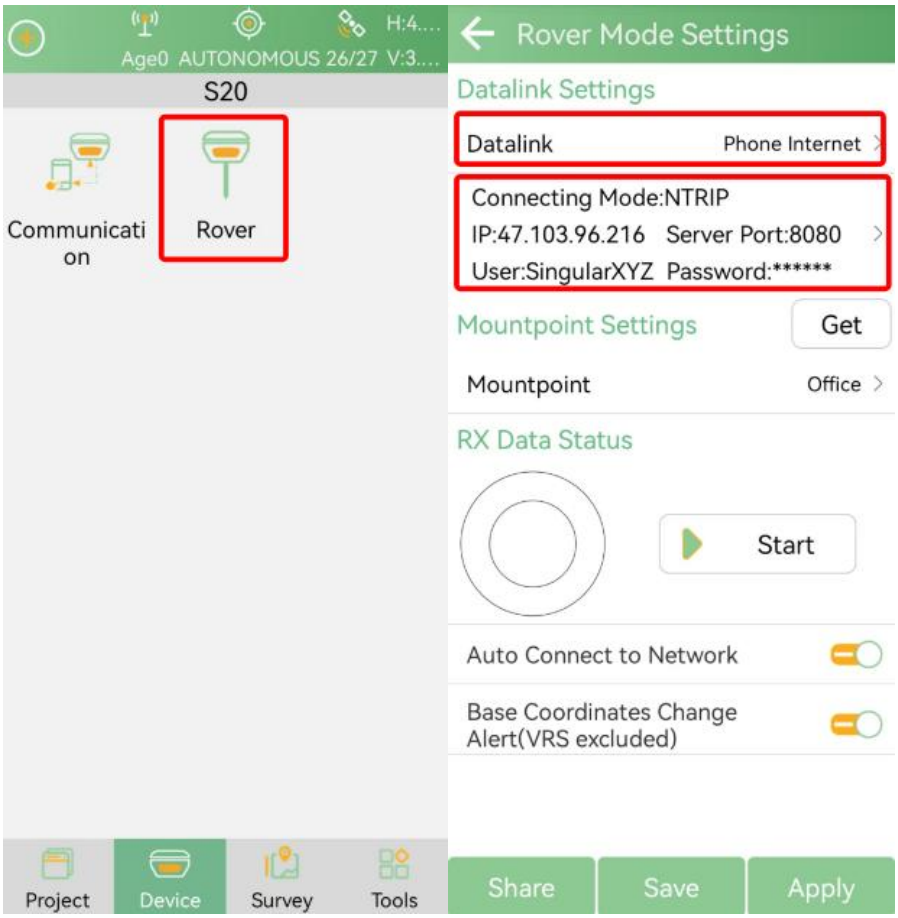
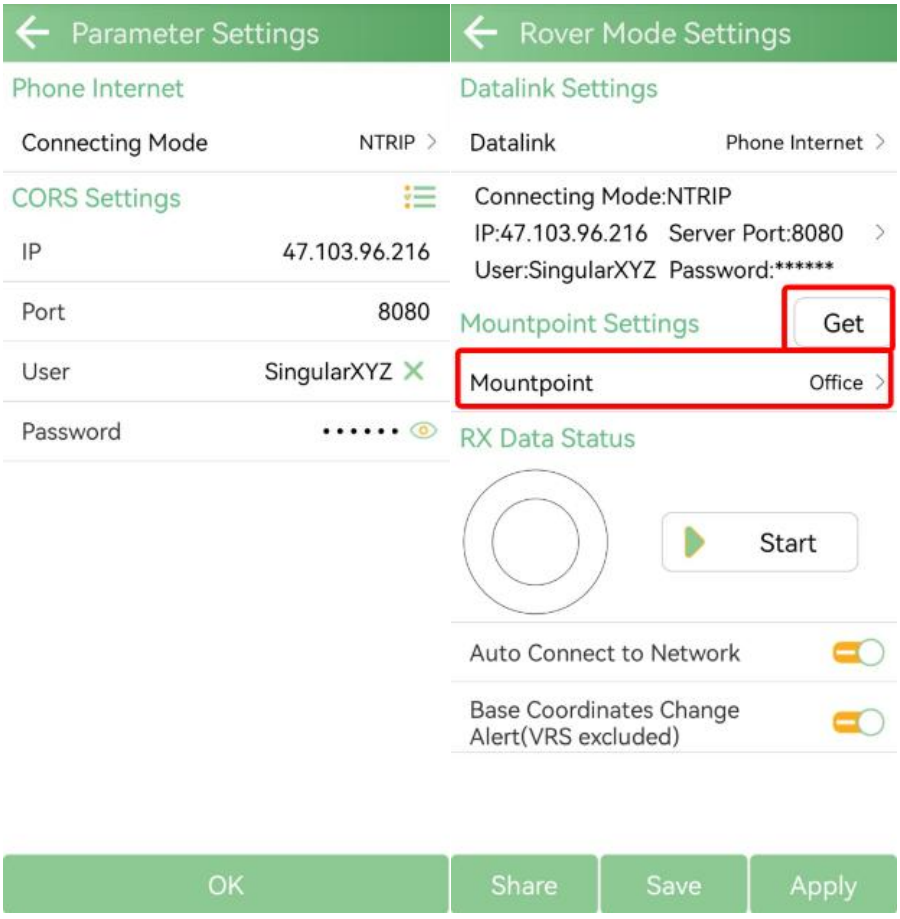


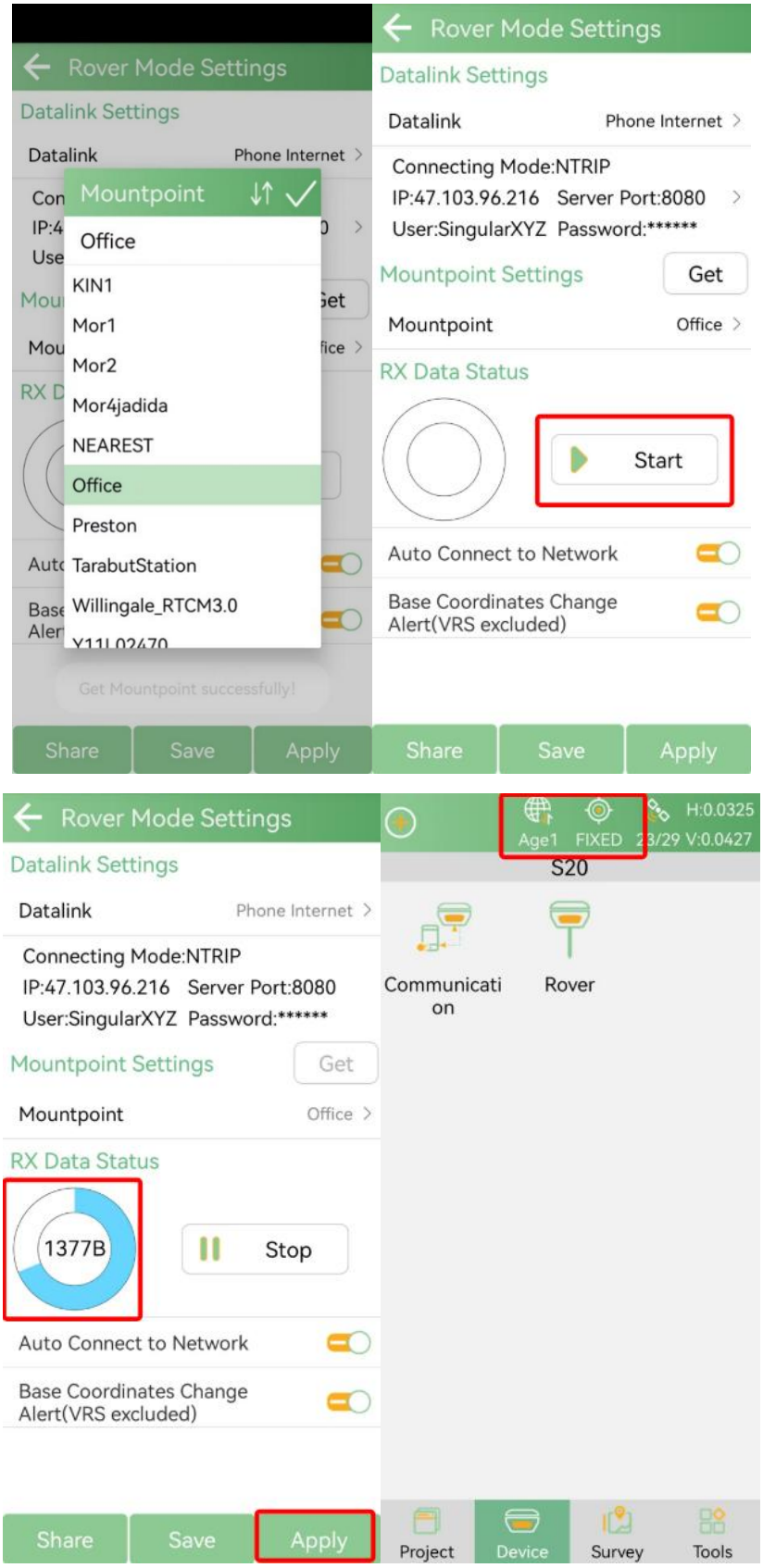
Figure4-2

4.1.2 Ntrip Configuration

S20 can be used as rover in Phone Internet mode. You can set it in Rover interface, set the Data link as Phone Internet and Connecting Mode as NTRIP, enter the IP address, Port, User and Password of your CORS. Click Get to get the mount point, and then select the mount point and click start. You can determine whether the connection is successful by whether you have received data in the RX Data Status circle, if you receive the data, then click Apply, the position status will change to Fixed.


Age0 AUTONOMOUS 26/27 V:3....
S20
Communicati on
Rover
Project
Device
Survey
Tools
Rover Mode Settings
Datalink Settings
Datalink
Phone Internet
Connecting Mode:NTRIP
IP:47.103.96.216 Server Port:8080
User:SingularXYZ Password:******
Mountpoint Settings
Get
Mountpoint
Office
RX Data Status
Start
Auto Connect to Network
Base Coordinates Change Alert(VRS excluded)
Share
Save
Apply


Parameter Settings
Phone Internet
Connecting Mode
NTRIP
CORS Settings
IP
47.103.96.216
Port
8080
User
SingularXYZ
Password
Rover Mode Settings
Datalink Settings
Datalink
Phone Internet
Connecting Mode:NTRIP
IP:47.103.96.216 Server Port:8080
User:SingularXYZ Password:******
Mountpoint Settings
Get
Mountpoint
Office
RX Data Status
Start
Auto Connect to Network
Base Coordinates Change Alert(VRS excluded)
OK
Share
Save
Apply



Figures 4-3

4.2 SBAS

S20 supports activating SBAS mode. Take SingularPAD software as an example, connect to S20 via Bluetooth. You can see the default output NMEA data in the Debug interface as shown in Figure 4-4.

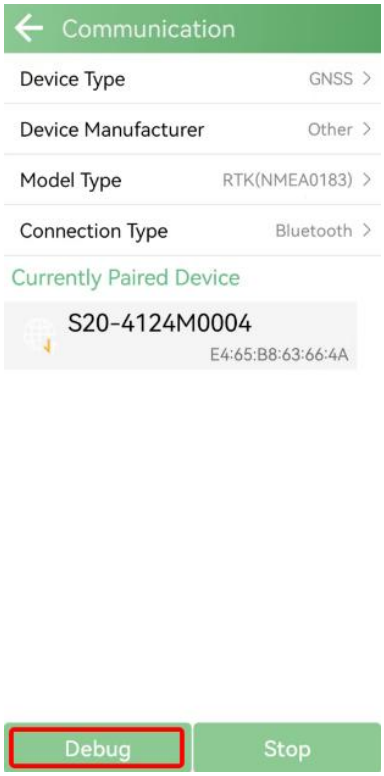


Figure 4-4

S20 needs to disconnect Bluetooth output first to activate SBAS mode.

Click Debug to enter the configuration interface. After sending the command "update4124", the NMEA information will stop being output, and the S20's Wi-Fi will be turned on.

Figure 4-5

Connect your PC to S20's WiFi, visit IP 192.168.4.1 in browser.

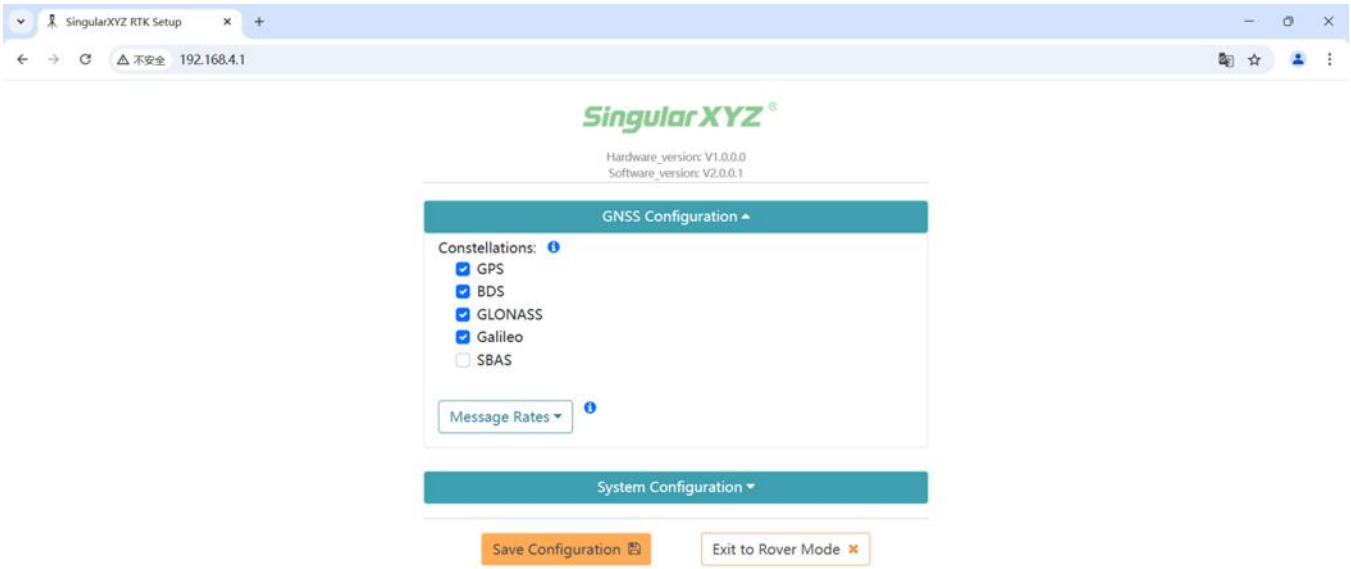


Figure 4-6

Check SBAS and click Save Configuration.

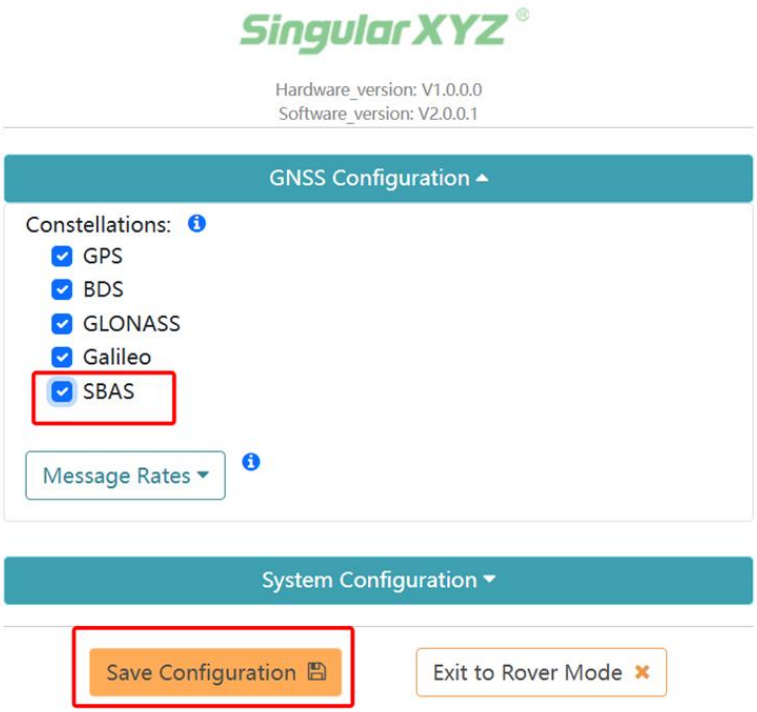


Figure 4-7

After completing these steps, S20 has successfully activated the SBAS mode. Click Exit to Rover Mode to disconnect the WiFi connection, and then reconnect Bluetooth to check the SBAS mode of the S20.

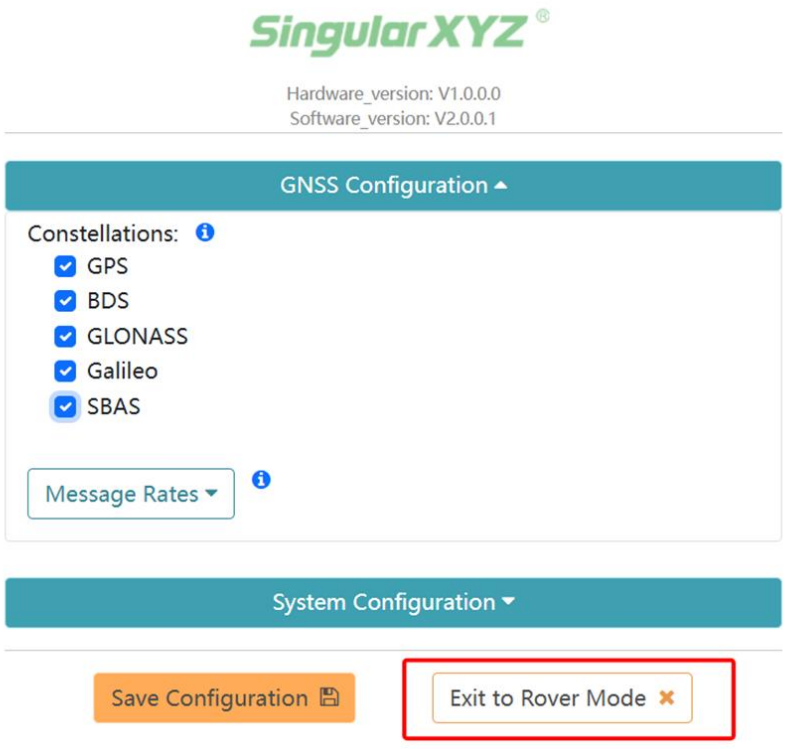


Figure 4-8

The positioning status in the SingularPAD software shows DGNSS, indicating that the S20 has successfully activated the SBAS mode.

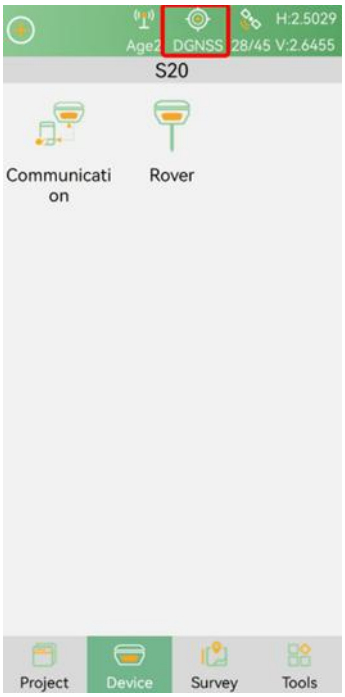


Figure 4-9

Chapter 5 Device Upgrade

5.1 FW Upgrade

Follow the steps in 4.2 to turn off Bluetooth, turn on WIFI, and access 192.168.4.1 to enter the S20's Web UI.

Click System Configuration to enter the upgrade interface. Click Select File as shown in Figure 5-1 and select the corresponding firmware.

Figure 5-1

As shown in Figure 5-2, click Upload to start the firmware upgrade and wait for the upgrade to complete.

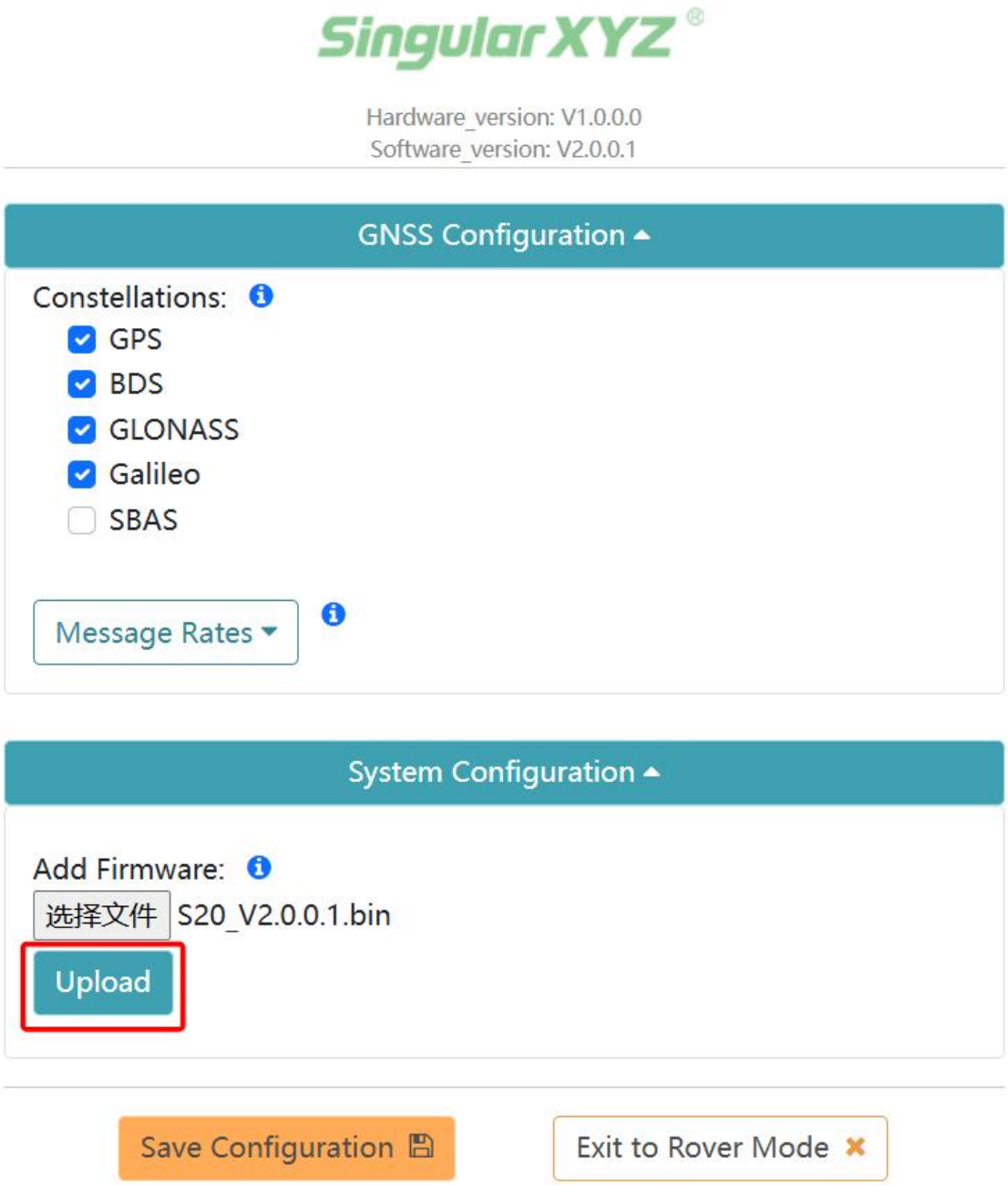


Figure 5-2

The upgrade success interface is shown in Figure 5-3.

Figure 5-3

5.2 GNSS Upgrade

To upgrade GNSS, you need to connect the S20 to a computer using a serial cable and then use the upgrade software to complete.

Tip: Generally, the S20 does not need to be upgraded. If you have any needs, please contact the technical support for firmware and software.