AsteRx SB

User Manual

User Manual Revision 1.1
Applicable to version 4.4.0 of the AsteRx SB firmware

September 10, 2018

Septentrio
Greenhill Campus, Interleuvenlaan 15i
3001 Leuven, Belgium

http://www.septentrio.com
support@septentrio.com
Phone: +32 16 300 800
Fax: +32 16 221 640
@Septentrio

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1 Introduction

1.1 User Notices

1.1.1 CE Notice

AsteRx SB receivers carry the CE mark and are as such compliant with the 2004/108/EC - EMC Directive and amendments, 2006/95/EC - Low Voltage Directive, both amended by the CE-marking directive 93/68/EC.

With regards to EMC, these devices are declared as class B, suitable for residential or business environment.

1.1.2 ROHS/WEEE Notice

AsteRx SB receivers comply with European Union (EU) Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS Directive).

AsteRx SB receivers comply with the European Union (EU) Directive 2002/96/EC on waste electrical and electronic equipment (WEEE). The purpose of this Directive is the prevention of waste electrical and electronic equipment (WEEE), and in addition, the reuse, recycling and other forms of recovery of such wastes so as to reduce the disposal of waste. If purchased in the European Union, please return the receiver at the end of its life to the supplier from which it was purchased.

1.1.3 Safety information

Statement 1: The power supply provided by Septentrio (if any) should not be replaced by another. If you are using the receiver with your own power supply, it must have a double isolated construction and must match the specifications of the provided power supply.

Statement 2: Ultimate disposal of this product should be handled according to all national laws and regulations.

Statement 3: The equipment and all the accessories included with this product may only be used according to the specifications in the delivered release note, manual or other documents delivered with the receiver.

1.1.4 Support

For first-line support please contact your AsteRx SB dealer.

Additional documentation can be found in the following manuals:

- **The AsteRx SB Reference Guide** (contained inside the Firmware Package zip on our website) includes information on the receiver operation, the full list of receiver commands and a description of the format and contents of all SBF (Septentrio Binary Format) blocks.
- **The RxTools Manual** covers the RxTools software suite, including RxControl and RxLogger.

The Septentrio website has a dedicated Support section (http://www.septentrio.com/support), where the User Manual, the Firmware Reference Guide and the latest officially supported Firmware version are readily available for download.

Further information can be found on our website or by contacting Septentrio's Technical Support department.

In case the AsteRx SB does not behave as expected and you need to contact Septentrio's Technical Support department, you should attach a short SBF log file containing the support blocks and a Diagnostic Report of the receiver (see Section 7.2).


http://www.septentrio.com


support@septentrio.com

Headquarters

Septentrio NV
Greenhill Campus
Interleuvenlaan 15i,
3001 Leuven,
Belgium

Phone: +32 16 300 800
Fax: +32 16 221 640
sales@septentrio.com

2 AsteRx SB Overview

The AsteRx SB is an IP68 compliant, multi-constellation, multi-frequency GNSS receiver ideal for rapid integration into machine control or sensor fusion applications. It offers an extensive range of cable and wireless connections for maximum flexibility.

2.1 Key features

- Quad-constellation, multi-frequency all-in-view RTK receiver
- Robust and compact IP68 weatherproof housing
- AIM+ interference monitoring and mitigation system
- Base and Rover operation
- Bluetooth, WiFi, Ethernet, Serial and USB communications

2.1.1 GNSS specifications

448 hardware channels to track the following supported signals:

- GPS: L1CA, L1PY, L2PY, L2C, L5
- GLONASS: L1CA, L2P, L2CA, L3
- Galileo[1]: E1 BC (CBOC), E5 (a, b, AltBoc)
- BeiDou[1]: B1, B2
- SBAS: EGNOS, WAAS, GAGAN, MSAS, SDCM (L1, incl. L5 tracking)
- IRNSS[1]: L5
- QZSS: L1CA, L2C, L5
- Integrated dual-channel L-band tracking

[1]Optional feature

Navigation performance

	Horizontal	*Vertical*
Standalone	1.2 m	1.9 m
SBAS (WAAS, EGNOS, MSAS)	0.6 m	0.8 m
DGPS	0.4 m	0.7 m
RTK (Fixed)	0.6 cm + 0.5 ppm	1 cm + 1 ppm
SeCoRx (PPP)	4 cm	6 cm

Time to first fix

Cold Start[2]	<45s
Warm Start[3]	<20s
Re-acquisition	avg. 1s

[2] No information available (no almanac, no approximate position)
[3] Ephemeris and approximate position known

2.1.2 Physical and Environmental

Size:	102 x 36 x 111 mm (4.0 x 1.4 x 4.4 in)
Weight:	460 g (1.01 lb)
Input voltage:	5 to 36 V DC
Power consumption:	1.5 W typical
Operating temperature:	-30 °C to +65 °C (-22 °F to +149 °F)
Storage temperature:	-40 °C to +75 °C (-40 °F to +167 °F)
Ingress Protection:	IP68
Humidity	MIL-STD810G, Method 507.5, Procedure I
Dust	MIL-STD-810G, Method 510.5, Procedure I
Shock	MIL-STD-810G, Method 516.6, Procedure I/II
Vibration	MIL-STD-810G, Method 514.6, Procedure I

2.2 AsteRx SB variants

The AsteRx SB is available in two variants:

Variant (Part number)	Connections	
AsteRx SB PRO Connect (410228)	• Serial • USB and micro-USB • Ethernet • Bluetooth • WiFi • External Power	 **PRO Connect**
AsteRx SB Wireless (410227)	• micro-USB (powered by USB OTG) • Bluetooth • WiFi	 **Wireless**

Certain receiver features are controlled by permissions, which can be purchased via our Sales department.

2.3 Shipping case contents

Cables for the AsteRx SB system are not included but a cable kit, extra cables and accessories are available:

Figure 2-1: The AsteRx SB available items

Item (Part Number)	Purpose
AsteRx SB PRO Connect Cable kit (410284)	Basic cable kit for AsteRx SB PRO Connect model
AsteRx SB Wireless Cable kit (410285)	Basic cable kit for AsteRx SB Wireless model
CBL_AxSB_PWR_ADPT_EU (215607)	Power adapter with EU power cable for AsteRx SB (using ODU connector)
CBL_AxSB_PWR_ADPT_UK (215608)	Power adapter with UK power cable for AsteRx SB (using ODU connector)
CBL_AxSB_PWR_ADPT_AUS (215609)	Power adapter with AUS power cable for AsteRx SB (using ODU connector)
CBL_AxSB_PWR_ADPT_USA (215610)	Power adapter with USA power cable for AsteRx SB (using ODU connector)
CBL_MicroUSB_1M (214855)	Micro-USB cable to USB Type A male
CLB_AxSB_USB (215656)	ODU to USB Type A male
CBL_MicroUSB_OTG (215661)	Micro-USB male to USB female Type A (OTG cable) for connecting external memory
CBL_MicroUSB_PWR_ADAPT (215641)	USB Power adaptor - recommended adaptor for powering the unit via USB - comes with adapters for EU, UK, AUS and USA.
CBLe_COM_DUO_7 (201204)	ODU to 2 serial ports (DB9) COM2 & COM3, no RTS/CTS for AsteRx SB
CBL_AxSB_OPEN1 (215424)	ODU to open ended cable for the *PWR COM2&3/USB* connector of the AsteRx SB PRO Connect model (usable for Power, COM2 & COM3 RS232 serial communication or USB communication)
CBLe_COM_1,8 (200416)	ODU to serial (DB9) - COM1 (Female) cable to connect to a PC. With RTS/CTS. Receiver is seen as a DCE (Data Control Equipment)
CBL_AxSB_OPEN2 (215559)	ODU to open ended cable for the *COM1-GPIO* connector of the AsteRx SB PRO Connect model (usable for EVENTA, 5V Power output, COM1 RS232 serial communication with CTS/RTS or EVENTB & PPS-Out signals)
CBLe_ETH_MS (200418)	ODU to Ethernet cable (for Hub/switch) (RJ45)

Item (Part Number)	Purpose
AxSB_MOUNT_ACCESSORY (215662)	Flexible mount accessory for AsteRx SB
AxSB_SHIPPING_CASE (410262)	Pelican shipping case for 1 AsteRx SB receiver and space for cables. Dimensions: 10.62" x 9.68" x 6.85" (27.0 x 24.6 x 17.4 cm) (Pelican 1300)

2.4 AsteRx SB design

2.4.1 Front Panel

The AsteRx SB has an intuitive front panel with status LEDs and a central power button.

Figure 2-2: The front panel of the AsteRx SB

Tables 2.4-1 below provides an overview of the LED indicators.

Icon	LED Behaviour
 WiFi	**Off**: WiFi disabled ***Access point:*** **Green, Blinking slow**: No connected **Green, On**: Connected ***Client mode:*** **Yellow**: Not connected / Connection error **Green, On**: Connected
 Bluetooth	**Off**: Not connected **Blue, Blinking fast**: Not discoverable **Blue, Blinking slow**: Discoverable **Blue, On**: Connected
 Ethernet	**Off**: Not connected **Green, On**: Connected
 Positioning Mode	**Off**: No position can be calculated **Green, On**: The reported position is 'RTK Fixed or PPP' **Green, Blinking slow**: Static Base station **Yellow, On**: SBAS, DGPS or RTK Float **Red, On**: Stand alone
 Power Button	**Off**: Receiver is powered off **White**: Receiver is booting **Blue**: Power-over-Ethernet (PoE), powered **Green**: VIN, USB or OTG powered
 Function Button	**Off**: There is currently no functionality linked to toggling the function button
Failsafe Mode	**Blinking White**: All RGB LEDs are blinking white

Table 2.4-1: AsteRx SB LED Behaviour

2.4.2 Rear Panel

Figure 2-4 shows the layout of the rear-panel connectors on the PRO Connect variant of the AsteRx SB. The rear panel of the Wireless variant only has the antenna TNC connector. A description of the connector PIN layout and cable-colour assignments can be found in Appendix A.

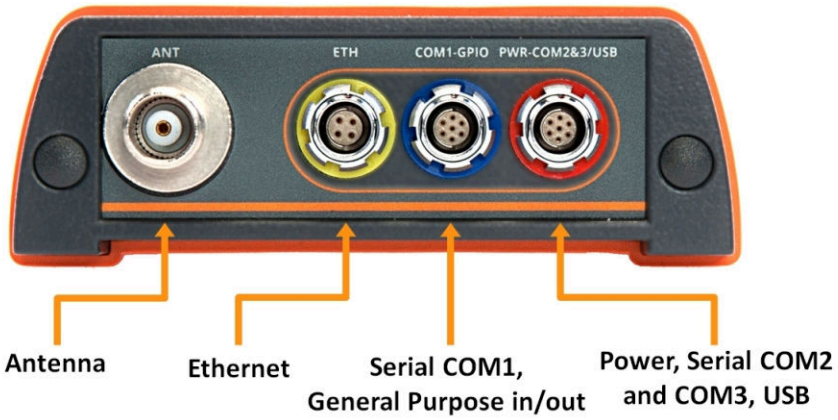


Figure 2-3: The rear panel of the PRO Connect variant of the AsteRx SB

Figure 2-4: The rear panel of the Wireless variant of the AsteRx SB

3 Getting started with the AsteRx SB

This section details how to power-up, connect to and communicate with the AsteRx SB. The AsteRx SB has an on-board web interface which you can connect to in three ways: Ethernet, USB or WiFi. The AsteRx SB is fully configurable using the web interface. Please note that older versions of certain browsers may not properly display the web interface. In addition, the AsteRx SB can also be configured using the RxTools Software which is included in the standard package delivery.

3.1 Powering the AsteRx SB

You can power the AsteRx SB by connecting the micro-USB cable between the front panel of the receiver and either the recommended Septentrio USB adapter or the USB socket of a PC as shown in Figure 3-1. If the AsteRx SB was turned on before last power outage, it will start up automatically otherwise, press firmly on the power button.

Figure 3-1: Front-panel power socket

The AsteRx SB can also be powered over Ethernet (PoE) as described in Appendix B or by supplying 5 to 36 V via the open-ended power cable connected to PIN 1 of the rear-panel PWR connector as detailed in Appendix A.

3.2 Connecting an antenna

The rear panel of the AsteRx SB has a TNC connector labelled **ANT** to connect a GNSS antenna. Connect an antenna to the AsteRx SB using an antenna cable as shown in Figure 3-2. The connector can provide 3.3V or 5V DC and 200 mA to power an antenna (see Appendix A.4 for more information).

Figure 3-2: Rear-panel antenna connector

After connecting an antenna, the AsteRx SB will start to track satellites and be able to calculate the position of the antenna. When the AsteRx SB has a position fix, the front-panel Positioning Mode LED will be lit (see Section 2.4.1 for LED behaviour).

3.3 Connecting to the AsteRx SB via the Web Interface

You can connect to the receiver on any device with a web browser using the receiver's on-board Web Interface. The connection can be made over USB, Ethernet or WiFi. The following sections describe each of the connection methods.

3.3.1 Using the micro-USB cable

Connect the micro-USB cable to the front panel of the AsteRx SB and to your PC as in Figure 3-3.

Figure 3-3: Connecting to the front-panel USB socket

The first time that the USB cable is connected to your PC, you may be prompted to allow installation of drivers which can take several minutes. When the drivers have been installed, it is recommended to unplug then re-plug the USB cable into your PC and make sure the drivers are fully activated.

If the USB drivers do not install automatically, they can be installed manually by double clicking on the executable installer file found in the folder **driver** as shown in Figure 3-4.

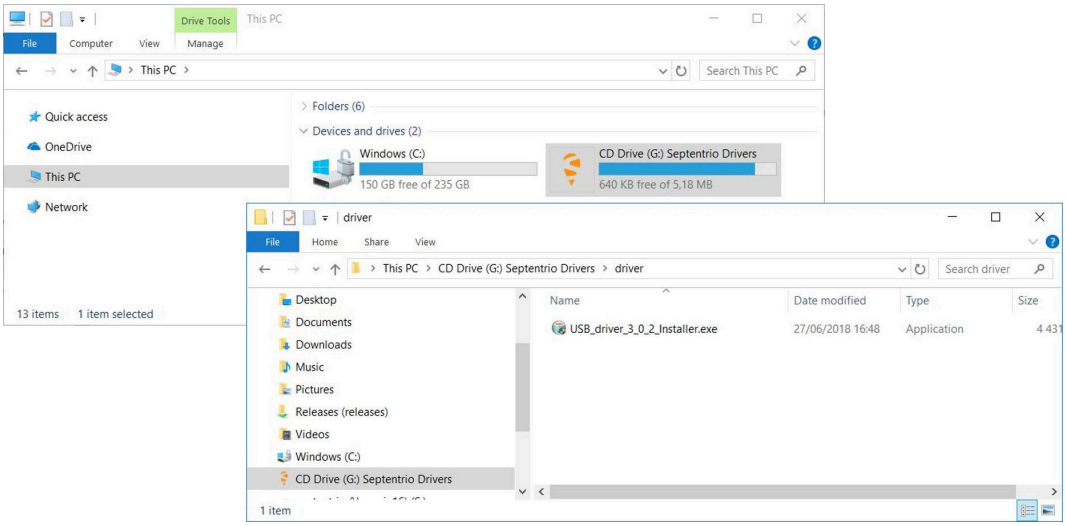


Figure 3-4: Manually installing the USB drivers

Again, when the drivers have been installed, it is recommended to unplug then re-plug in the USB cable on your device to fully activate the drivers.

The USB connection on the AsteRx SB functions as network adapter and the DHCP server running on the receiver will always assign the AsteRx SB the IP address 192.168.3.1.

To connect to the AsteRx SB, you can then simply open a web browser using the IP address **192.168.3.1** as shown in Figure 3-5.

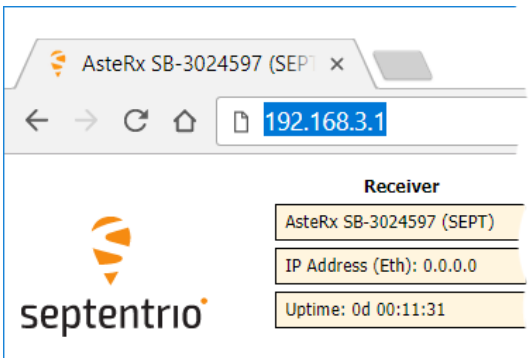


Figure 3-5: Connect to the Web Interface of the AsteRx SB over USB using the IP address **192.168.3.1** on any web browser

3.3.2 Over WiFi

The Web Interface can also be accessed over a WiFi connection when the WiFi Mode of the receiver is configured in Access Point Mode (default setting). However, to access the Web Interface when your receiver has been configured as a Client, you will have to follow the steps as detailed in Appendix D.
The WiFi modem is turned on by default and is indicated by the green WiFi led indicated in Figure 3-6.

Figure 3-6: The green WiFi LED indicates that the WiFi modem is turned on

On your PC or tablet, search for visible WiFi networks: the AsteRx SB identifies itself as a wireless access point named 'AsteRx_SB-*serial number*'. The serial number of the AsteRx SB can be found on an identification sticker on the receiver housing. Select and connect to the AsteRx SB as shown in Figure 3-7.

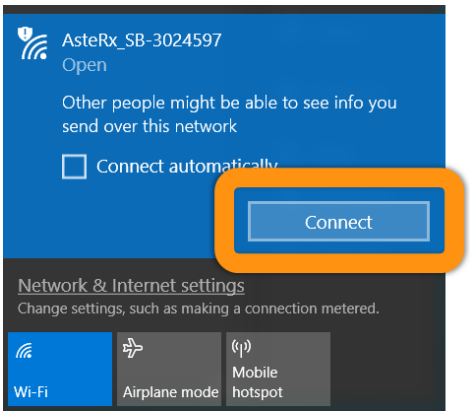


Figure 3-7: Select the AsteRx SB from the list of detected wireless signals and connect

When your PC has connected to the AsteRx SB WiFi signal, you can open a web browser using the IP address **192.168.20.1** as shown in Figure 3-8 or by entering **http://asterxsb.local** or **http://asterxsb-*xxxxxxx*.local** where xxxxxxx' is the 7-digit serial number of the receiver.

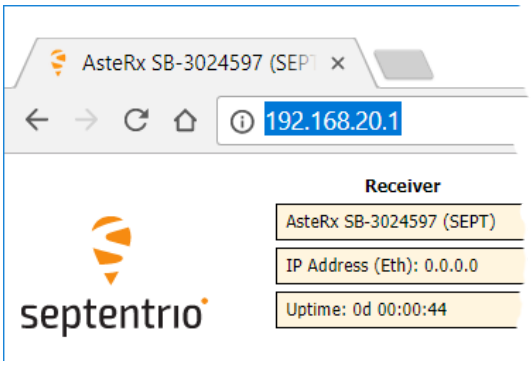


Figure 3-8: Connect to the Web Interface of the AsteRx SB over WiFi using the IP address **192.168.20.1** on any web browser

3.3.3 Using the Ethernet cable

Connect the Ethernet cable to the socket labelled **ETH** on the rear panel of the AsteRx SB as shown in Figure 3-9.

Figure 3-9: Connecting to the rear-panel Ethernet socket

For the most straightforward setup, the RJ45 socket of the Ethernet cable should be connected to a network running a DHCP server. The IP address assigned to the receiver will be associated with the hostname 'AsteRxSB-*xxxxxxx*', where *xxxxxxx* are the 7 digits of the AsteRx SB serial number. The serial number can be found on a WiFi identification sticker on the receiver housing. You can then make a connection to the receiver using the web address **http://asterxsb-*xxxxxxx*** or using its IP address. How to configure IP settings of the AsteRx SB is explained in Section 8.4

Figure 3-10 shows a screenshot of an Ethernet connection to an AsteRx SB receiver with serial number 3024596 using **http://asterxsb-3024596**.

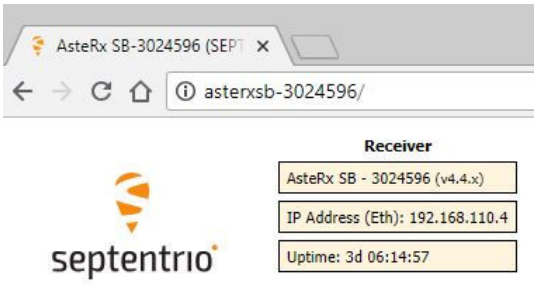


Figure 3-10: Connecting to the Web Interface over Ethernet

3.4 Basic operational monitoring

The 'Overview' page of the web interface in Figure 3-11 shows at a glance a summary of the AsteRx SB's operational status.

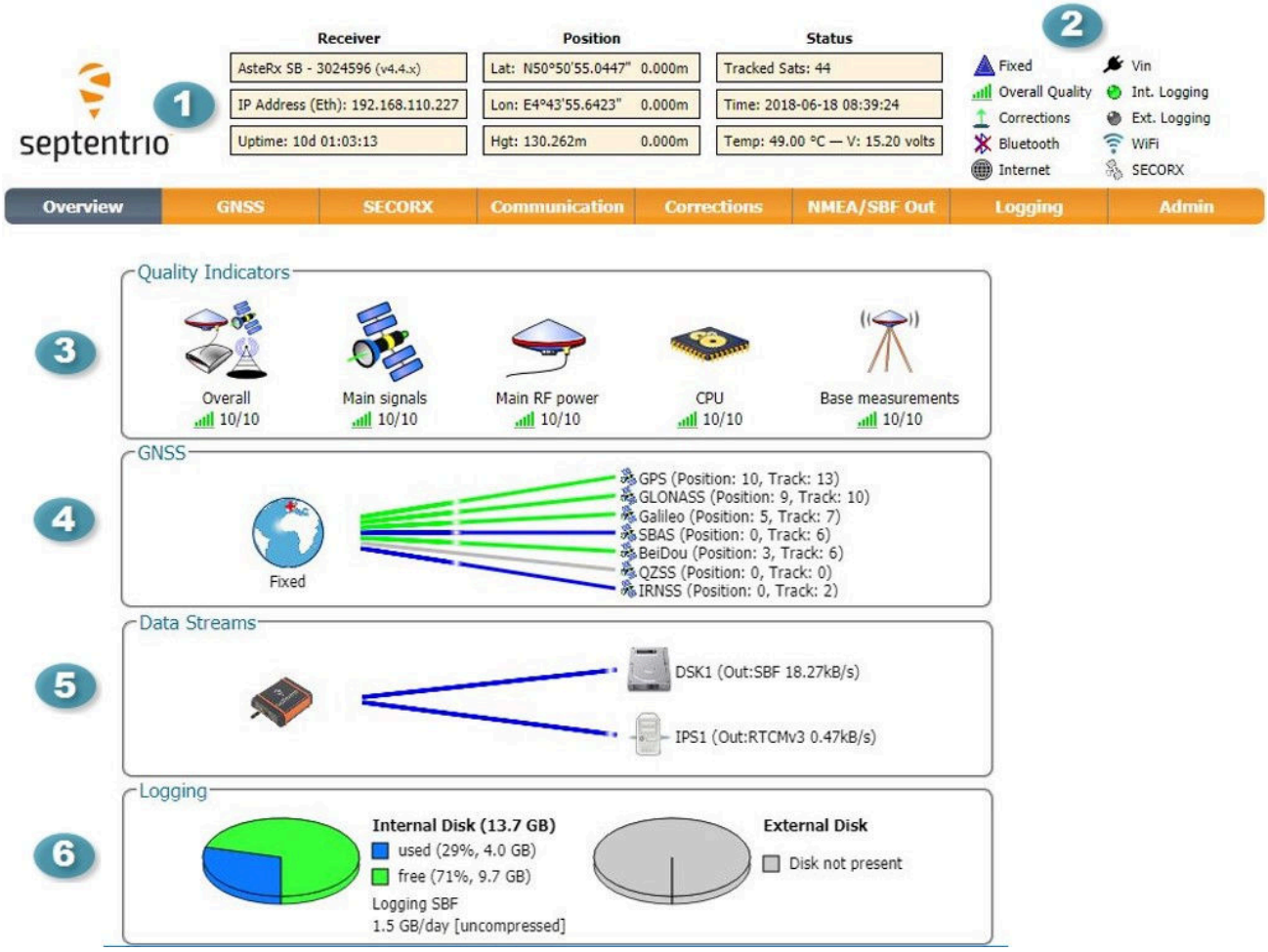


Figure 3-11: Overview page of the web interface

1 The main information bar at the top of the window gives some basic receiver information: receiver type, serial number and position, the length of time since the last power cycle (Uptime) and the total number of satellites tracking. The temperature of the receiver board and the voltage supplied is also shown.

2 The icons to the right of the information bar show that, in this example, the position of the receiver is fixed, the overall performance (signal quality and CPU) is Excellent (5 out of 5 bars) and the receiver is logging to the internal disk. The Corrections icon indicates that differential corrections are being sent out to a rover receiver. The active WiFi icon shows that the on-board WiFi modem is turned on. A detailed overview of the status icons can be found in Appendix C.

3 The Quality indicators give a simple overview of signal quality, RF antenna power and CPU load of the receiver.

4 The GNSS field details how many satellites for each constellation are being tracked and used in the position solution (PVT). A green line indicates that at least one satellite in the constellation is being used in the PVT, a blue line indicates that satellites are being tracked but not used and a grey line that there are no satellites from that particular constellation in tracking. More information can be found in the **Satellites and Signals** page on the **GNSS** menu.

5 The **Data Streams** field gives an overview of the data streams into (green lines) and out from (blue lines) the receiver. In this example, the receiver is logging SBF data to the internal memory (DSK1) and sending out RTCMv3 differential correction data over the IPS1 port.

6 The Logging field summarises the current logging sessions and disk capacities. The complete logging information and configuration windows can be found via the **Logging** menu.

3.5 Connecting the AsteRx SB to the internet

While Differential corrections can be received via a communication port (e.g. serial communication), in some cases it might be practical to be able to get corrections over the Internet. Getting Differential corrections over the Internet can be achieved using either the WiFi, Ethernet or USB connectivity of the receiver.

3.5.1 Connecting the AsteRx SB over WiFi

Connecting the AsteRx SB to a WiFi Access Point

If you can connect to the receiver over WiFi using the Web Interface then it is already configured in Access Point mode. Configuring the Base station receiver as an Access Point will allow Rover receivers to connect to it. The Access Point setting is the default configuration however, if your receiver has been configured as a Client you can reconfigure it over USB. To do this, connect the AsteRx SB to your PC using the (micro) USB cable. You can now open an internet browser and connect to Web Interface using the IP address **192.168.3.1** as shown in Figure 3-12

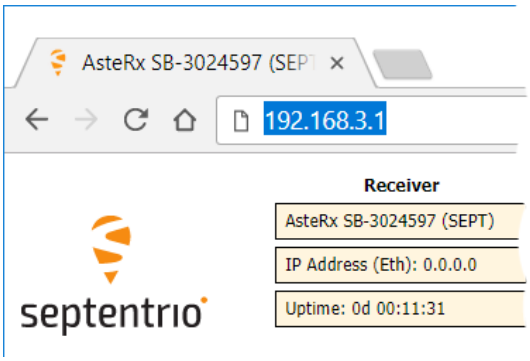


Figure 3-12: Connecting over USB to the Web Interface using the URL 192.168.3.1

In the **Communication/WiFi** window **AccessPoint** can then be selected as the WiFi mode as indicated in Figure 3-13.

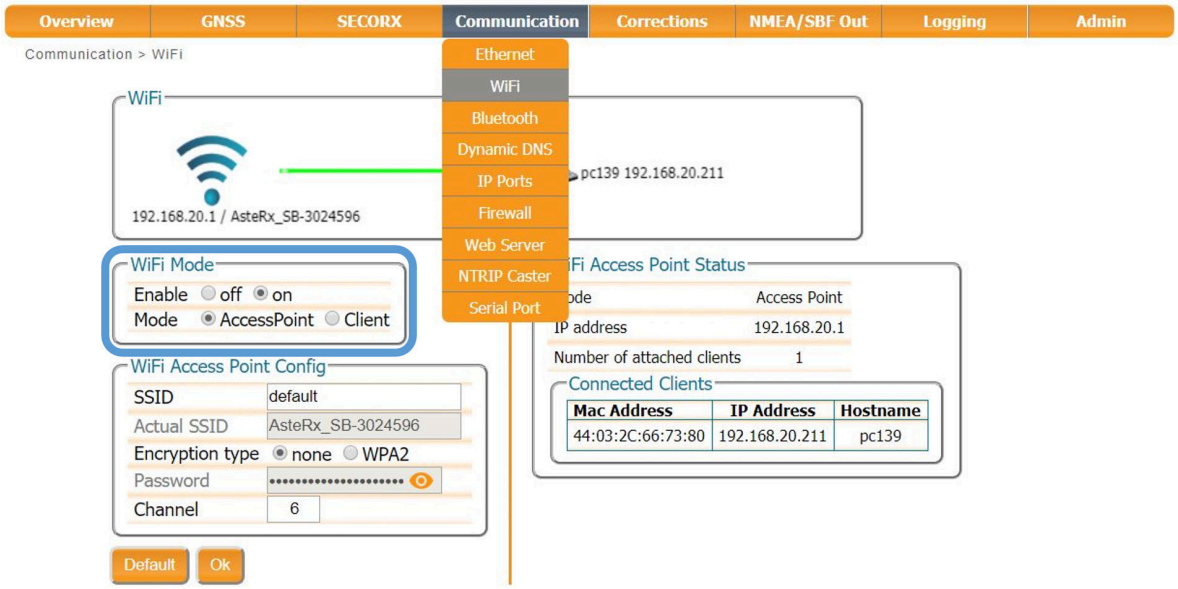


Figure 3-13: Select 'AccessPoint' in the WiFi Mode field

Configuring the AsteRx SB in a WiFi Client mode

In case the receiver is configured in WiFi client mode you will need to access the Web Interface using the USB connection. You will not be able to connect using **192.168.20.1**. Appendix D describes how to access the web interface once in Client WiFi mode configuration.

1. Connect the Rover unit over a USB cable to your PC and connect to the web interface using **192.168.3.1**
2. On the **Communications/WiFi** window, enable the Client WiFi mode and click on **OK** as shown in Figure 3-14

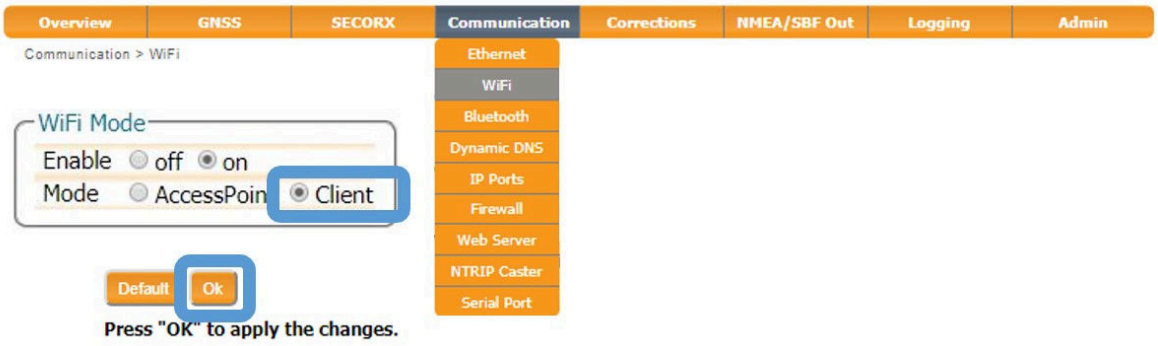


Figure 3-14: WiFi client mode of the Web Interface

2. Click on **Configure Networks** in the WiFi Client Config panel. This will display a list of reachable WiFi networks. From the list of networks, select to connect to the internet network or mobile device hotspot network by clicking **Add**. Confirm by **OK** as shown in Figure 3-15.

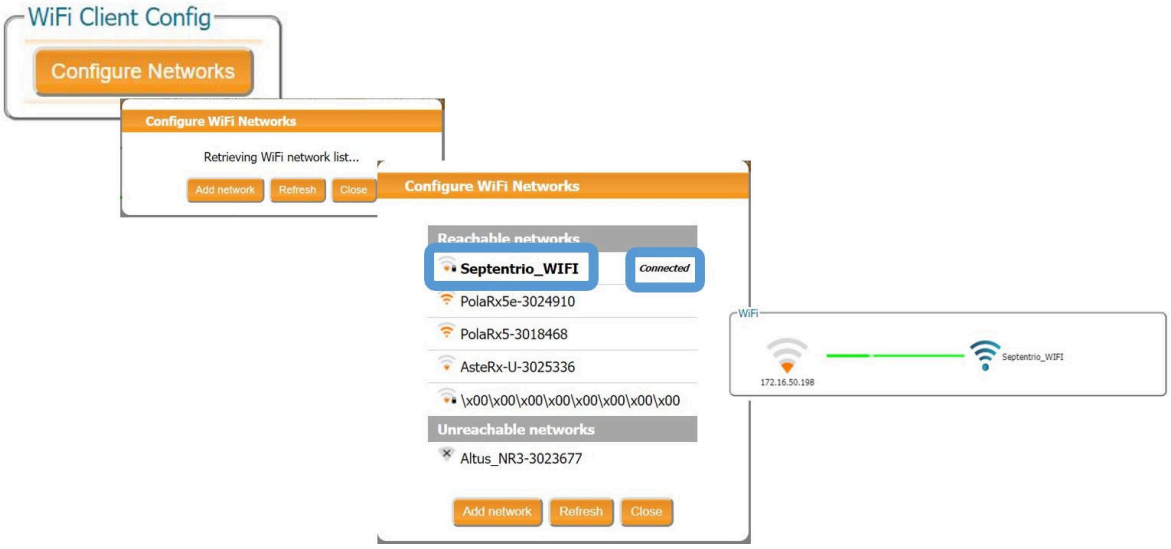


Figure 3-15: Connect to Septentrio WiFi network

3.5.2 Connecting the AsteRx SB over a network with internet access

An internet connection can also be achieved by using the Ethernet connector or the USB connector (OTG socket or rear-panel USB connector) of the AsteRx SB. When using Ethernet, make sure your network has internet access. Contact your system administrator to confirm that your network is a properly configured. Extra settings are available on the Ethernet settings menu as explained in Section 8.4.

Internet access can be enabled via USB (RNDIS IP interface), however this will depend on the PC or device you are connected to. Specific settings on the PC or device will be necessary so that internet can be shared over USB (e.g. by ssh port forwarding). Please contact your system administrator or PC/device manufacturer to guide you in realizing this connectivity.

4 Configuring the AsteRx SB as a Rover

The configurations described in the manual cover both AsteRx SB variants, however some configurations are only applicable to the AsteRx SB PRO Connect.

Step 1: Preparing the AsteRx SB as an RTK Rover

Configuring the Rover general settings

The AsteRx SB can use correction data to calculate a cm-level RTK position.

For the AsteRx SB to operate as a Rover and accept differential correction data from a Base station, check that **Rover** and **RTK** are selected in the **Position Mode** field in the **GNSS** menu as shown in Figure 4-1. This is the default operating mode of the AsteRx SB.

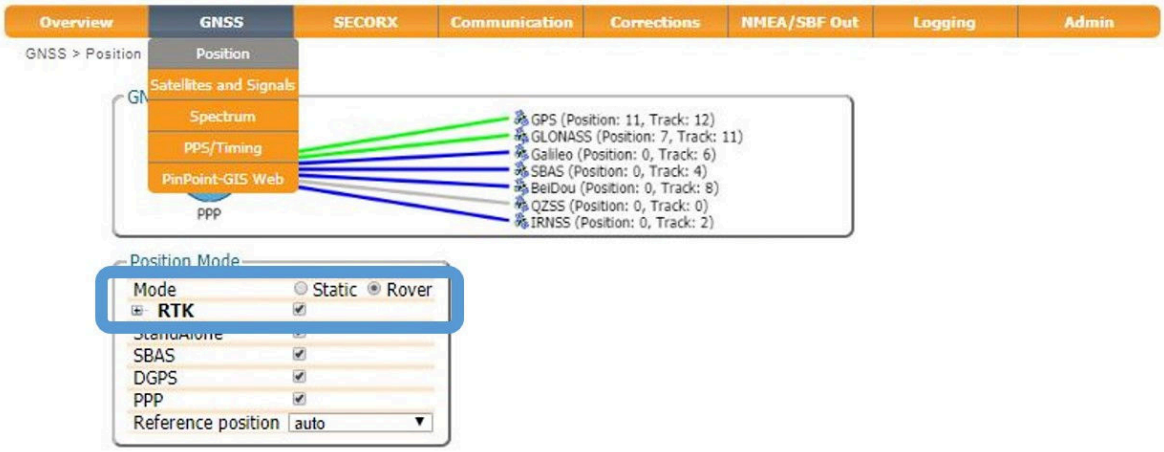


Figure 4-1: Setting the AsteRx SB Rover and RTK positioning mode

Configure input of differential corrections

The format of the differential corrections output by the Base station should be compatible with what is accepted by the Rover. In the **Corrections Input** window of the **Corrections** menu, you can configure the AsteRx SB to only accept differential corrections of a particular format. The default 'auto' setting will accept correction data format RTCMv2, RTCMv3 or CMR+.

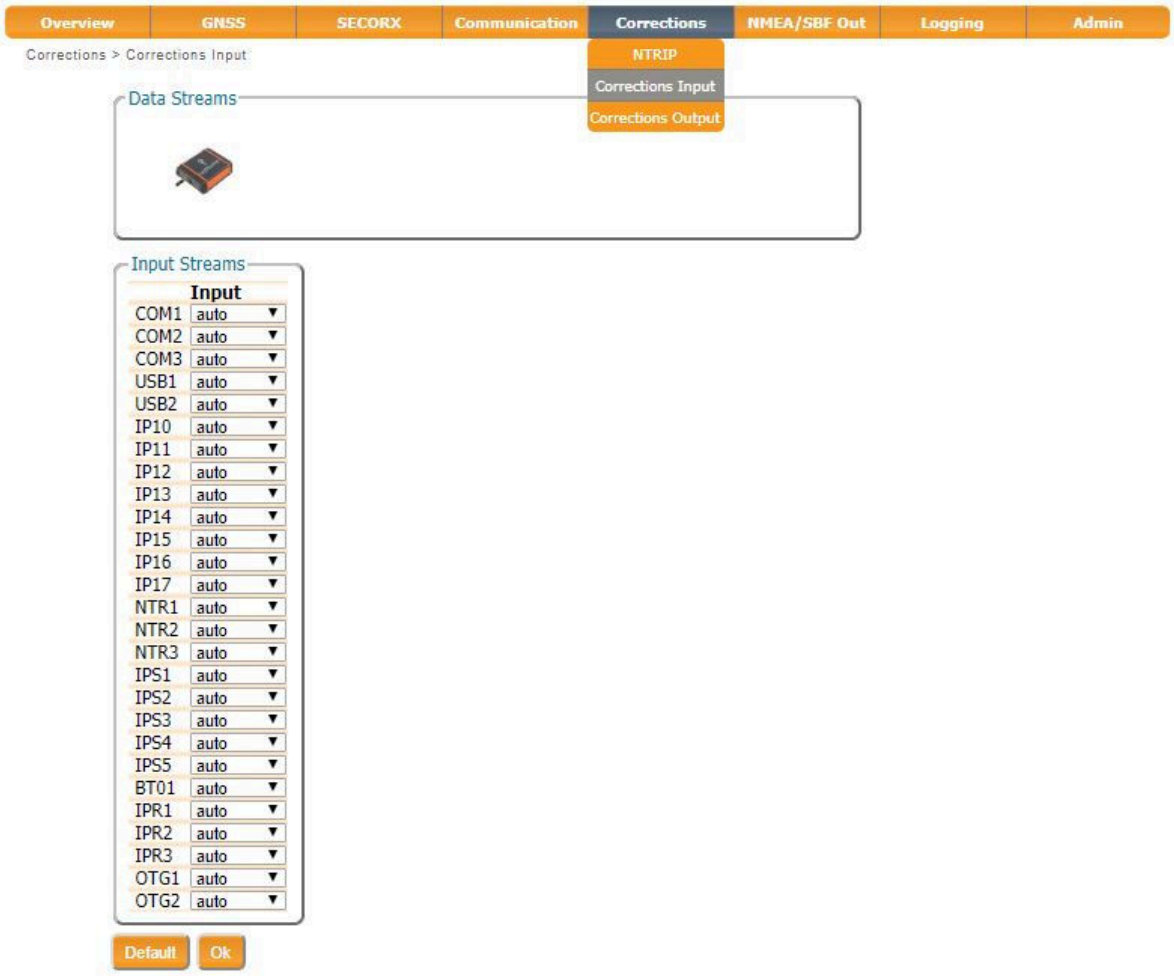


Figure 4-2: With the default 'auto' setting, AsteRx SB will accept RTCMv2, RTCMv3 or CMR+ format as incoming differential corrections.

Step 2: Configure internet connection

Section 3.5 details how to connect the AsteRx SB to the internet.

Step 3a: Configure the NTRIP Client settings

1. On the **Corrections/NTRIP** window, click on **New NTRIP client** as shown in Figure 4-3

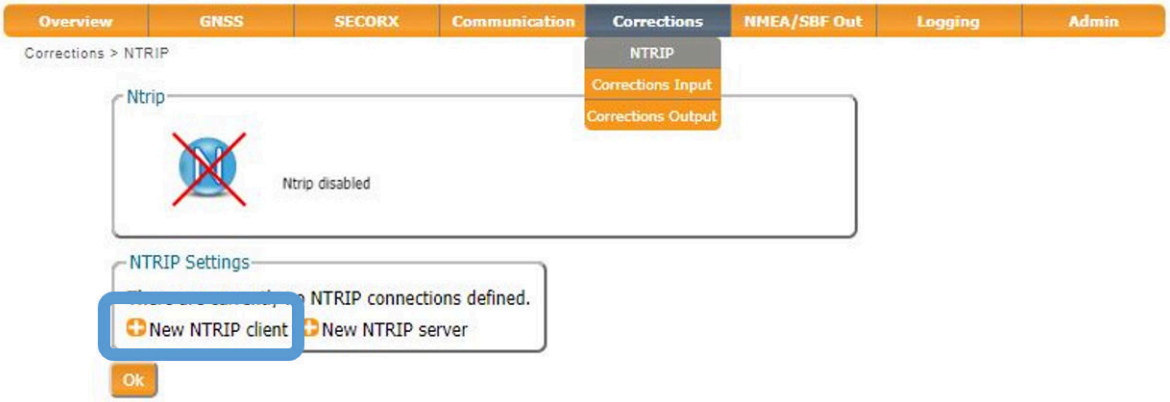


Figure 4-3: NTRIP tab of the Web Interface

3. Enter the NTRIP caster details as shown in Figure 4-4 and click **Ok**. The mount point list will only be populated when the caster details have been entered correctly and when you have an active internet connection.

Figure 4-4: NTRIP client mode settings

4. If the configuration is correct, the graphic should show a green line to the NTRIP Caster, indicating a successful connection with the NTRIP Caster, as in Figure 4-5, with details of the correction stream.

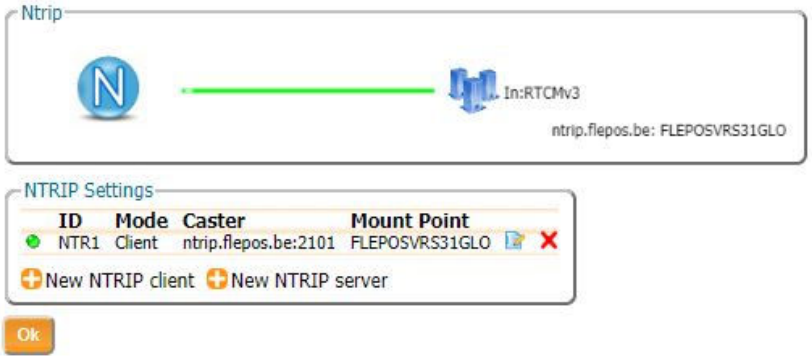


Figure 4-5: Receiving differential corrections via NTRIP

If the NTRIP Mode Field is set to **Client** and the configuration saved to boot, the AsteRx SB will auto-connect to the NTRIP Caster each time it is powered.

If the Mode Field is set to **Off**, no corrections will be received and the AsteRx SB will not auto-connect to the Caster when switched on.

Step 3b: Configure corrections using an IP connection

Configure the IP connection of the Rover receiver

Alternatively, corrections can also be received using an IP connection in which case no internet connection is required but an IP connection to a Base station is necessary.

On the **IP Ports** window of the Rover receiver, click on **New IP Receive Connection** as shown in Figure 4-6 to start the connection configuration sequence. The **Port** and **TCP Address** should match the port and IP address of the Base station receiver.

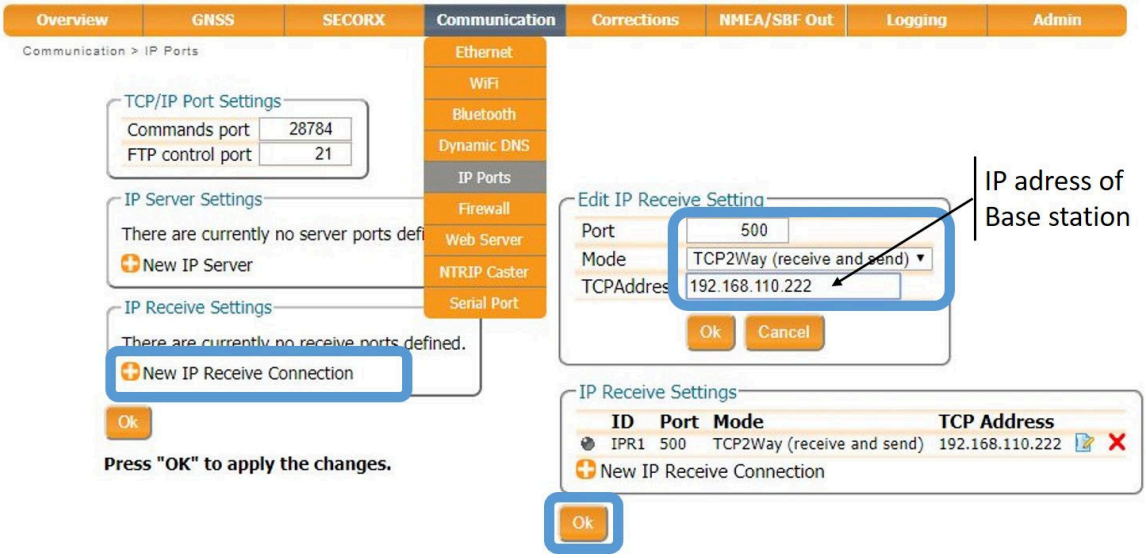


Figure 4-6: In the **IP Ports** window, click on **New IP Receive Connection** to configure the connection with the Base station

Verifying the configuration

If the Base station and Rover receivers have been configured correctly then graphics in the Communication Ethernet windows of the Rover and the Base station should appear similar to those shown in Figures 4-7 and 4-8.

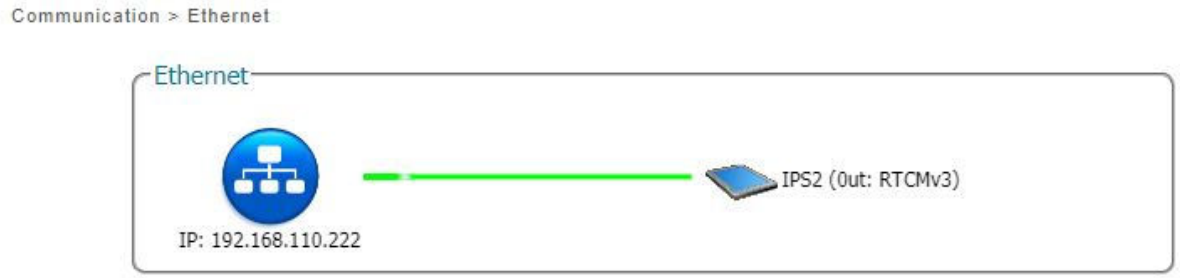


Figure 4-7: Ethernet window of the **Base station receiver** showing an active output of RTCMv3 differential corrections on server port IPS1

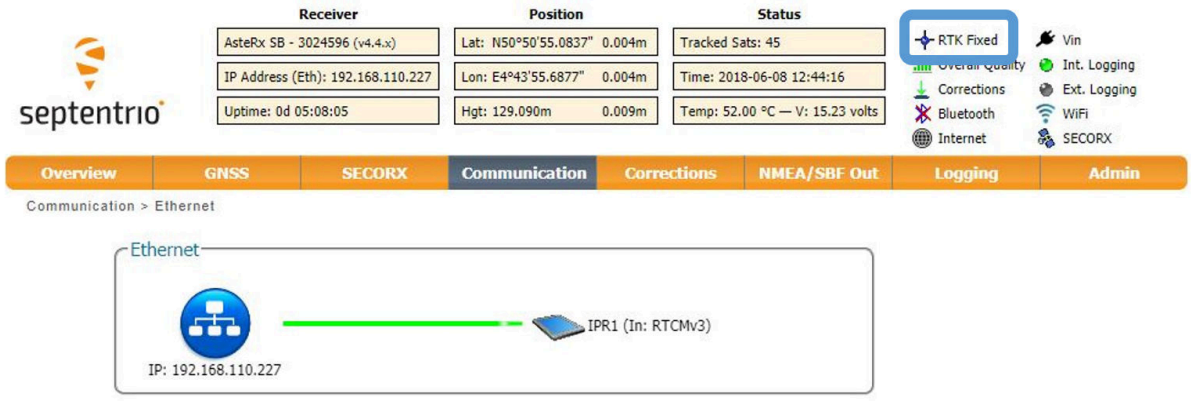


Figure 4-8: Ethernet tab of the **Rover receiver** showing a fixed RTK position in the header and reception of RTCMv3 differential corrections on receiver port IPR1

Step 4: Configure data output

Section 6.2 details the settings needed to configure data output.

Step 5: Configure any additional settings

Chapter 6 details some additional settings that you may need.

4.1 Using L-band PPP correction data with the AsteRx SB

PPP (Precise Point Positioning) is high-accuracy positioning without the need for a local Base station or VRS service. PPP uses precise satellite clock and orbit corrections computed by a global network of reference stations and broadcast in real time by geostationary satellites transmitting in the L-band. To receive PPP correction data, your receiver will need to be connected to an L-Band capable antenna[1]. The AsteRx SB can use PPP correction data from SECORX [2] as described in the steps below.

Step 1: Check you have PPP permissions on your AsteRx SB

The use of PPP services is permission-file controlled on the AsteRx SB. You can make sure that you have PPP permissions enabled on the **About** page selected from the **Admin** menu. Click on **Permitted Capabilities** and scroll down the list of permissions: **PPP** and **Augmentation Data Svc** will appear as permitted as shown in Figure 4-9.

Figure 4-9: Check that PPP is enabled in the AsteRx SB permission file

If you don't have PPP permissions on your AsteRx SB, you can purchase this option from the Septentrio Sales department: sales@septentrio.com.

[1] Please note that PPP correction data is also available over an Ethernet connection using NTRIP and for this, an L-Band antenna is not required

[2] SECORX uses TerraStar technology and brings sub-decimeter positioning to applications on land and with an extension to nearshore (SECORX-60).

Step 2: Activating SECORX

SECORX is a PPP service aimed at land and on-shore applications and SECORX-60 at applications up to 60 km offshore.

SECORX activation

To be able to get PPP correction data from SECORX, you will also have to have a SECORX subscription which can be purchased from your AsteRx SB dealer or from Septentrio Sales department: sales@septentrio.com. To activate SECORX you will need to provide the **Product Activation Code** (PAC) of the receiver. The PAC can be found on the **Admin, About** window as shown highlighted in Figure 4-10. This PAC code will only be visible if you have purchased and installed the PPP permissions.

Figure 4-10: The Product Activation Code (PAC) required for SECORX activation

SECORX services are activated over the air at a scheduled activation time. The AsteRx SB needs to know the GPS time and will therefore have to be powered on with an antenna connected and tracking L-Band satellites (see Steps 3 and 4) in a clear sky view, starting just before the scheduled activation time, in order to compute GPS time and to receive the activation signal. In case the activation is missed, please keep the receiver running for minimum of 4 hours (the activation is sent out every 3.5 hours). To guarantee successful activation, the LBand signal should be received with a carrier-to-noise ratio of 36 dB-Hz or higher. In case of any issues, please contact Septentrio Support department on support@septentrio.com.

Step 3: Connect an L-Band antenna

Ensure that you have an L-band capable antenna connected to the main antenna rear-panel connector as shown in Figure 4-11.

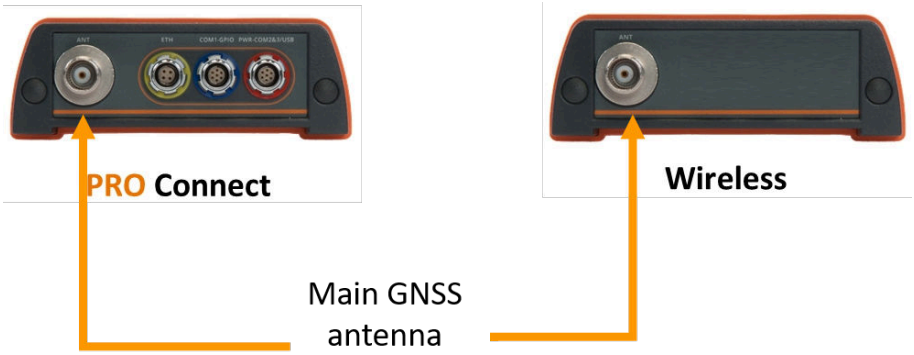


Figure 4-11: Rear panel antenna connectors

Step 4: Select PPP positioning

Ensure that PPP is selected as a positioning mode in the GNSS Position tab as shown in Figure 4-12. The PPP mode is enabled by default on the AsteRx SB.

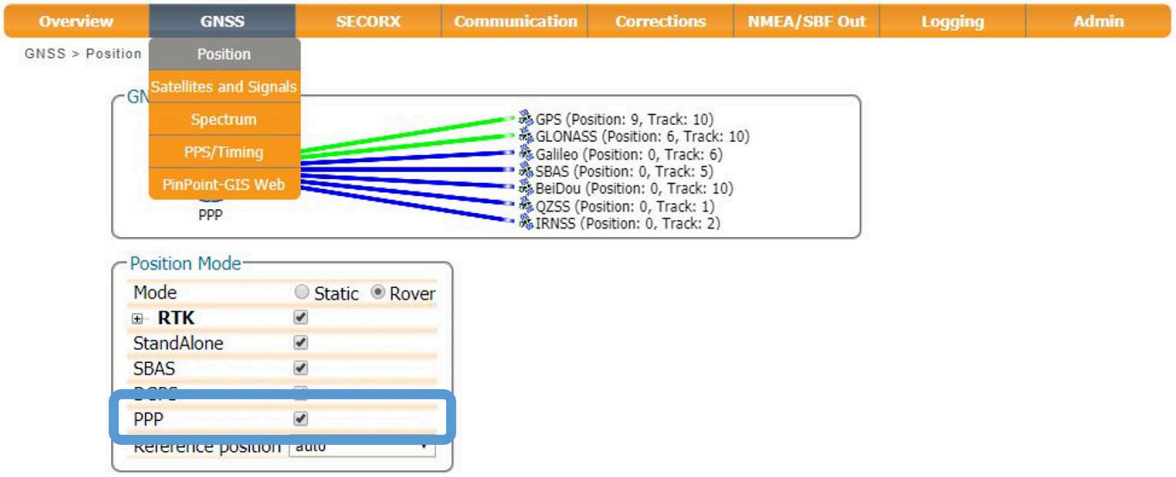


Figure 4-12: Enable PPP positioning mode

Step 5: Beam Selection Mode and Service

For SECORX configuration, select the tab named **SECORX** in the web interface.

The default L-band beam selection mode is **auto** as shown in Figure 4-13. In this mode, the demodulator will try to lock on to a visible beam, preferring beams to which access has been granted.

In **manual** mode, the demodulator will attempt to lock on to the beam selected from the **Manual beam selection** drop-down list ignoring all other beams. The beams in this list can be pre-set in the **Advanced Settings** expandable field. A beam is characterized by a frequency and data rate.

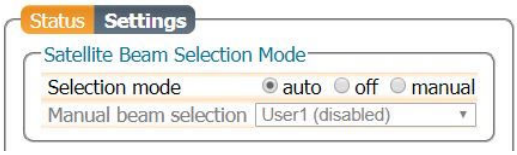


Figure 4-13: Select L-Band beam

Without a SECORX subscription, the AsteRx SB will still be able to track visible L-Band signals. Figure 4-14 shows the L-Band Tracker Status field when the AsteRx SB is locked onto signals from the AORE satellite which transmits at 1545.8550 MHz. After purchasing a subscription you will need to track one of the beams for activation over the air.

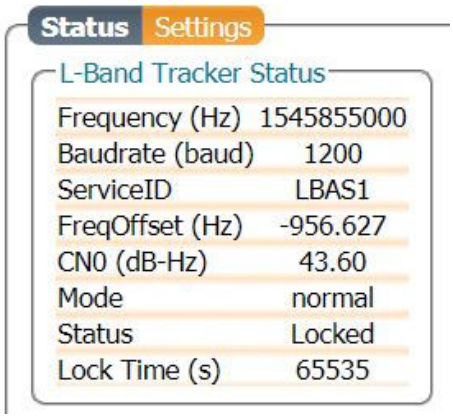


Figure 4-14: L-Band Tracker Status field when locked on to an L-Band signal

Step 6: Verifying the configuration

With an activated, valid SECORX subscription, the AsteRx SB will be able to decode PPP correction data. The **Access** line in the **L-band decoder Information** field should shows **Access Enabled** as in Figure 4-15.

After a few moments, the AsteRx SB positioning mode should change to PPP as indicated by the highlighted icon in the upper status field.

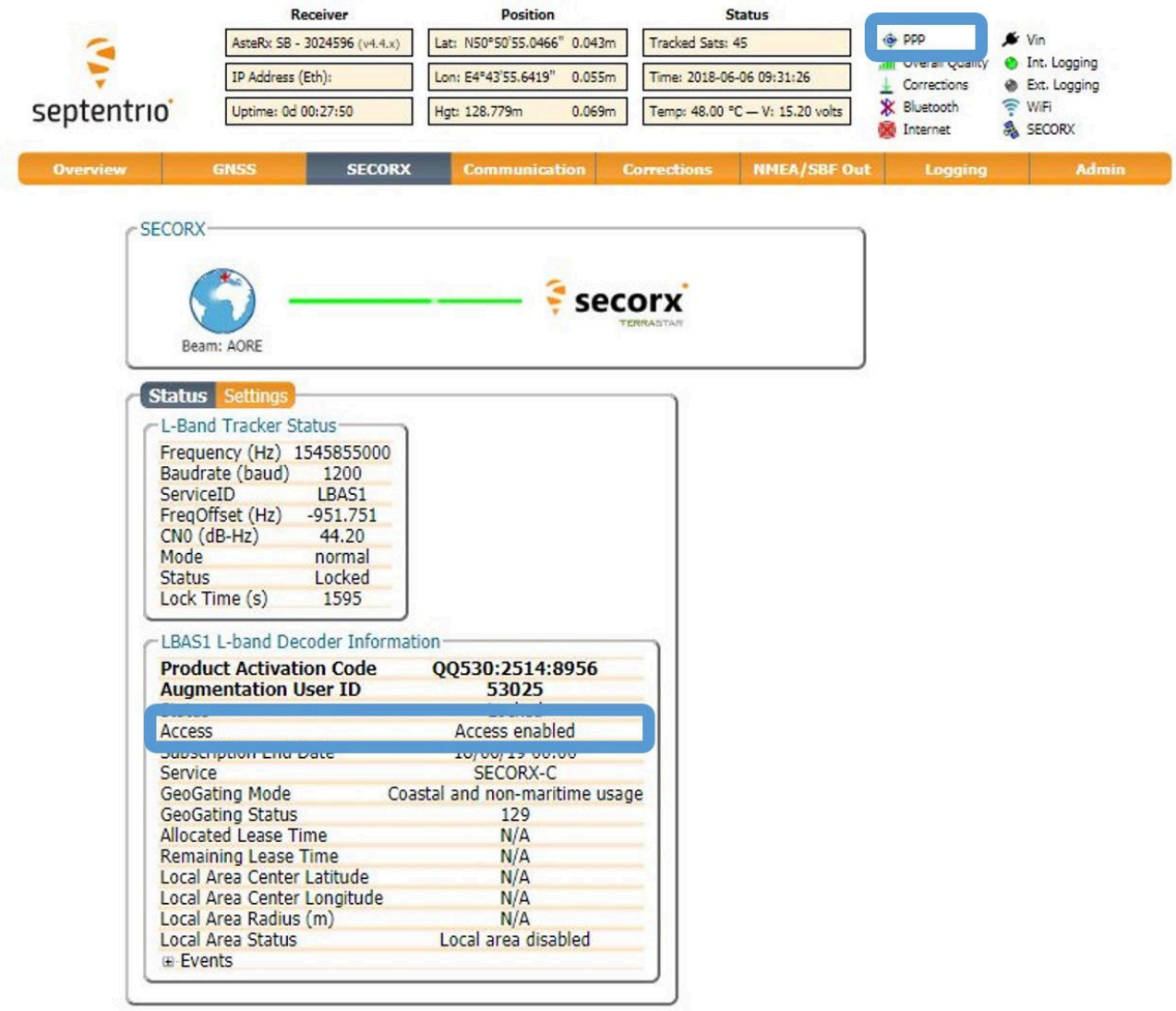


Figure 4-15: L-Band decoder Information field showing that SECORX decoding is enabled

Step 7: Additional optional settings: RTK seeding

The AsteRx SB can use an RTK or DGPS position to reduce the PPP convergence time: a process known as seeding. The configuration fields for seeding can be found in the **GNSS, Position** window as shown in Figure 4-16.

RTK positions are typically expressed in a regional datum which depends on the local RTK provider whereas SECORX PPP positions relate to the global ITRF2014 reference frame. To avoid coordinate jumps each time the PVT engine switches between RTK and PPP modes and to ensure accurate seeding of the PPP engine from RTK, the regional datum used by your RTK provider must be provided to the receiver. This can be done in the **Geodetic Datum** field using the drop-down datum list.

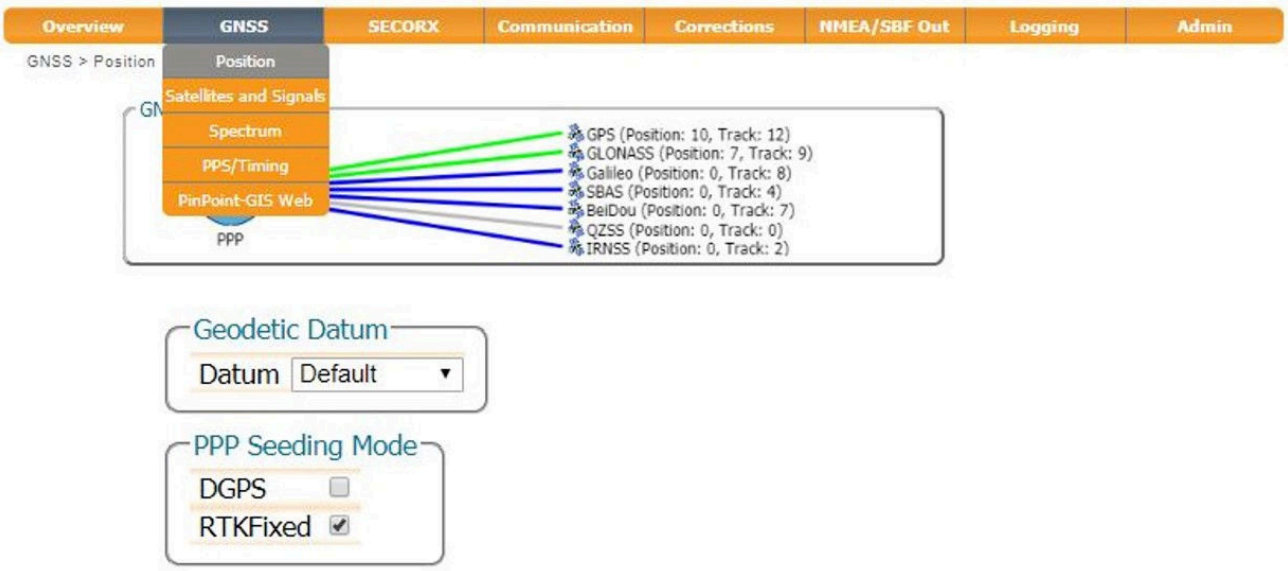


Figure 4-16: Configuration fields of RTK/DGPS seeding

5 Configuring AsteRx SB as a Base station

The configurations described in the manual cover both AsteRx SB variants, however some configurations are only applicable to the AsteRx SB PRO Connect.

The AsteRx SB can be set up as a Base station receiver and provide differential correction data to one or more Rover receivers.

Step 1: Preparing the AsteRx SB as a Base station

Set the Base station position as static

To work as a Base station, the position of the AsteRx SB should be set to static. The **Static** position mode can be selected in the **GNSS** tab as shown in Figure 5-1.

Figure 5-1: Setting the AsteRx SB Base station position to static

Set the correct position

An accurate position of the antenna that is connected to the AsteRx SB should also be set (see Section 6.1). A Rover receiver in RTK mode calculates a position relative to the Base station receiver. The default setting of 'auto' can be used for demonstrations however, for most other purposes, a properly surveyed position is advisable. In the example shown in Figure 5-2, the position stored under 'Geodetic1' is used. The stored positions can be entered via the **Advanced Settings** menu on the same page. Pre-set positions can be entered in either Geodetic or Cartesian coordinates as shown.

In the **Datum** field, you can select the datum to which the antenna coordinates refer. The selected value is stored in the Datum field of position-related SBF blocks (e.g. `PVTCartesian`) and also in any output differential corrections. Please note that the **Datum** setting does not apply any datum transformation to the antenna position coordinates.

Click **OK** to apply the new settings

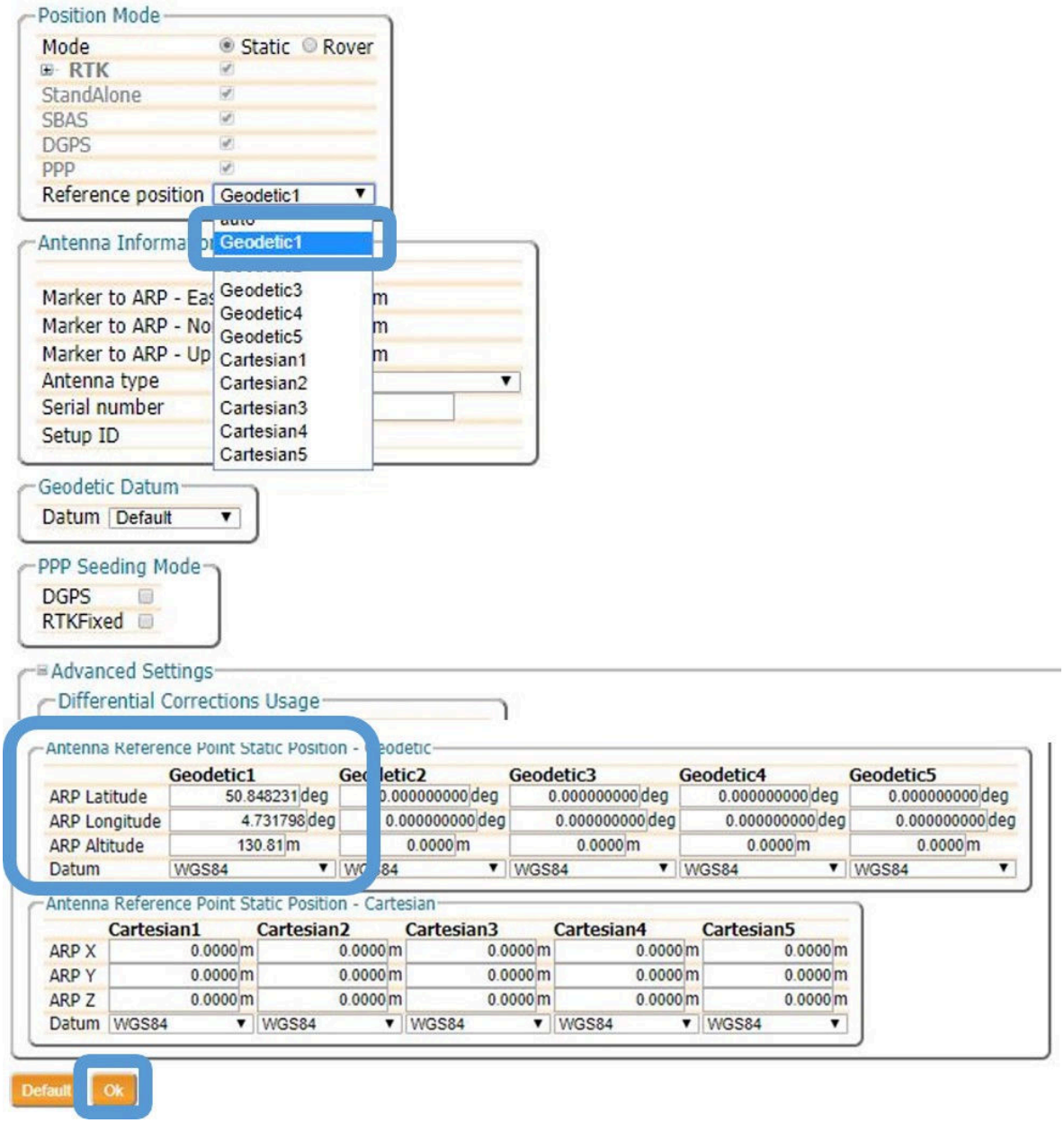


Figure 5-2: Setting the static position to the pre-set 'Geodetic1' position

Set Marker/Station name

A **Marker name** and **Station code** can also be defined through the **GNSS/Name and Marker** menu as shown in Figure 5-3.

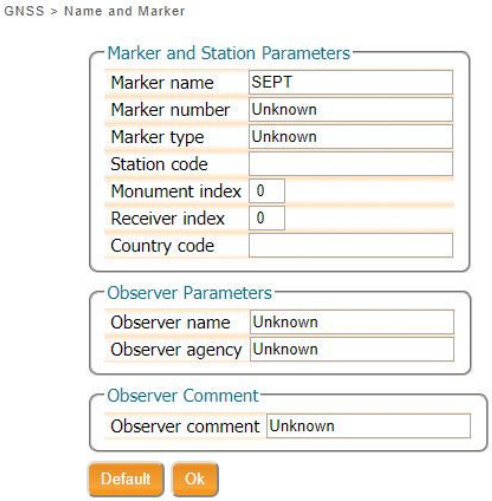


Figure 5-3: Setting the Station settings

Step 2: Configure internet connection

Section 3.5 details how to connect the AsteRx SB to the internet.

Step 3a: Configure the output of differential corrections using an NTRIP Caster

The AsteRx SB includes a built-in NTRIP Caster that makes correction data from the AsteRx SB available to up to 10 NTRIP clients over the internet. The caster supports up to three mount points and can also broadcast correction data from a remote NTRIP server.

All settings relating to the AsteRx SB NTRIP Caster can be configured on the **NTRIP Caster** window from the **Communication** menu.

Define a new mount point

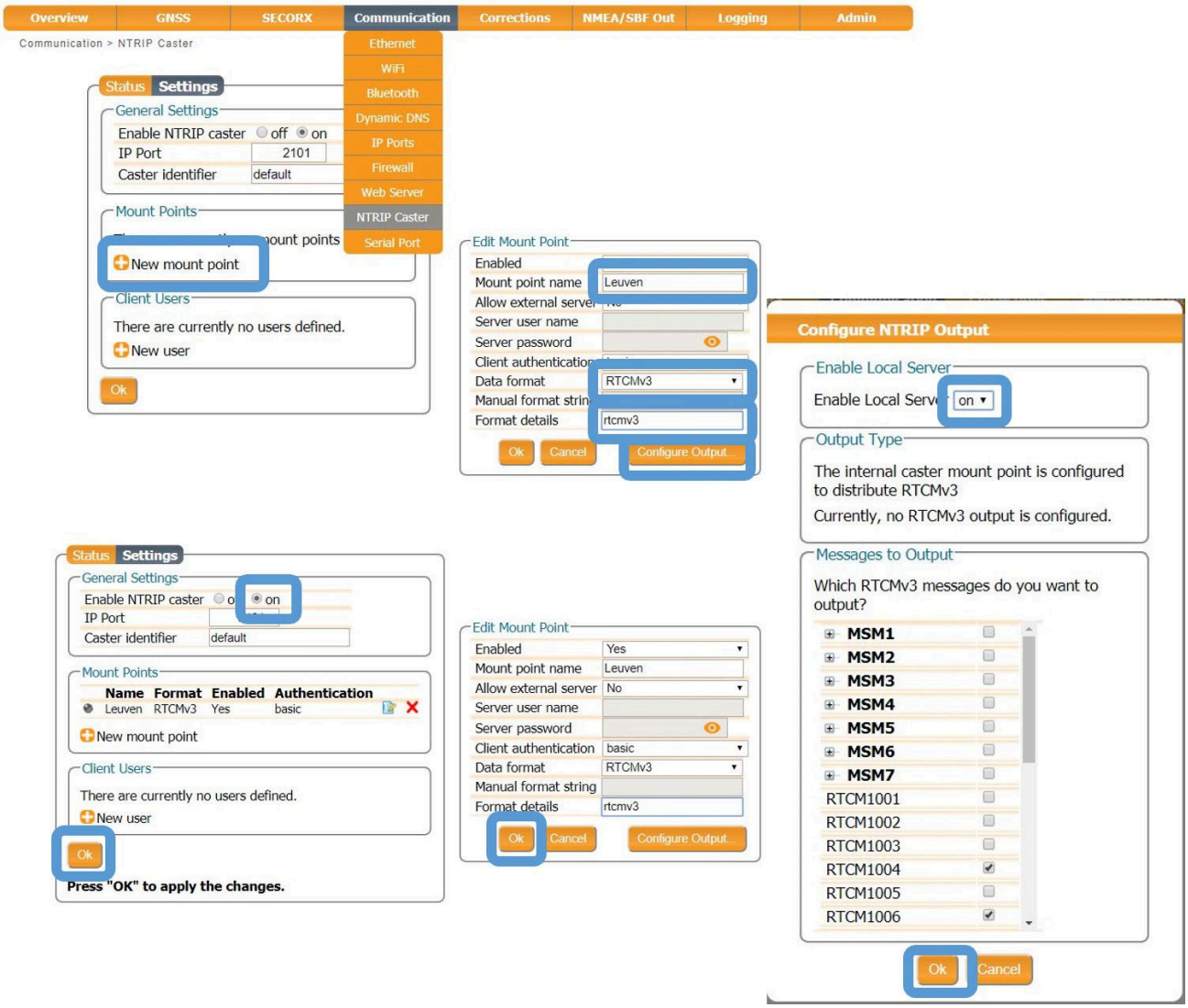


Figure 5-4: The configuration sequence for defining a new mount point

In the NTRIP Caster window, click on the **Settings** tab.

In the General Settings field, enable the NTRIP Caster and select the IP port over which you wish to send correction data: the default port is 2101.

Click on **New mount point** as indicated in Figure 5-4. Select **Yes** to enable the mount point and give it a name. This is the name that will appear in the caster source table. Up to 3 mount points can be defined each with a different name. You can also select the type of **Client authentication** for the mount point: **none** - any client can connect without logging in or, **basic** - clients have to login with a username and password.

By default, the field **Allow external server** is set to **No**. By setting **Allow external server** to **Yes** the mount point can receive a stream from a remote NTRIP server.

Click on the **Configure Output ...** button to enable the local NTRIP server of the AsteRx SB and to select the individual messages you want to broadcast. By default, correction messages necessary for RTK are pre-selected. Click **Ok** to apply the settings.

Define a new user

If you selected **basic** client authentication when configuring the mount point in the previous step, you will need to define at least one user. The user name and password are the credentials needed for the NTRIP client to access the correction stream.

In the **Client Users** section, click on **New User** as shown in Figure 5-5. Enter a User Name and Password for the user and select the mount points that they will have access to. Up to 10 NTRIP clients can log in as a particular user. Click **Ok** to apply the settings.

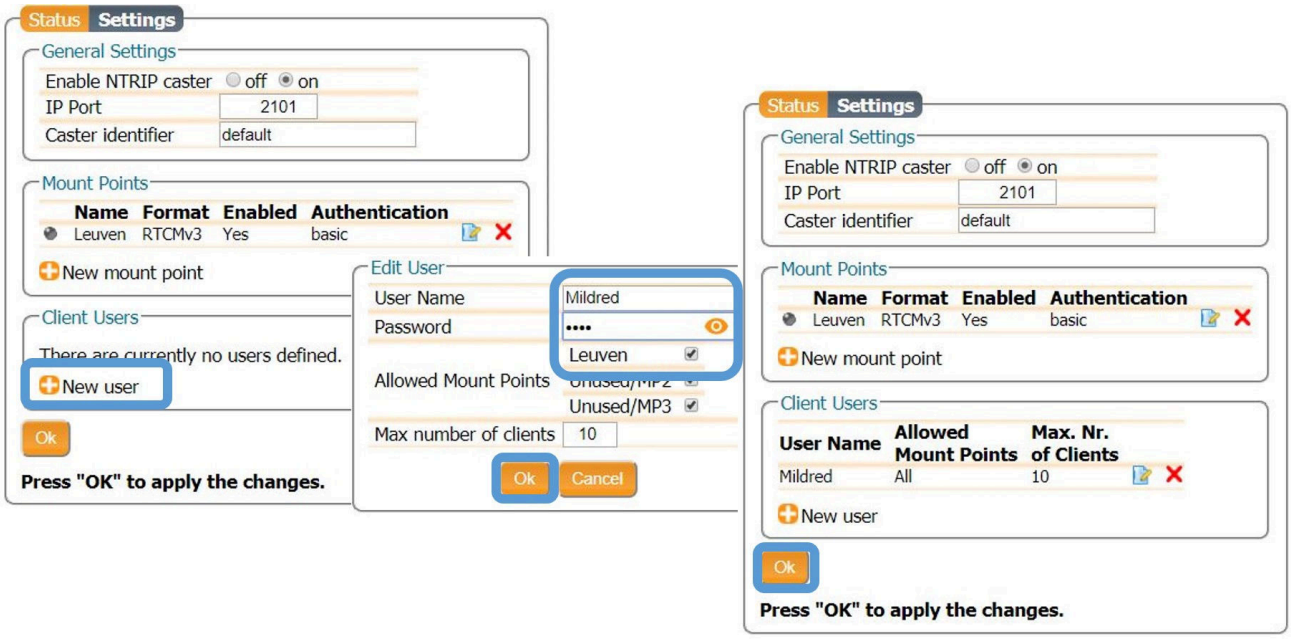


Figure 5-5: Configuring the login credentials for a user

Is the NTRIP Caster working?

In the **Status** tab of the NTRIP Caster window, you can see a summary of the NTRIP Caster to make sure that it has been properly configured. In the example shown in Figure 5-6, a client is connected to the mount point named **Leuven** as user **Mildred**.

If the client receivers are configured to send a GGA message to the caster (as was the case in Figure 5-7), then their position will also be visible.

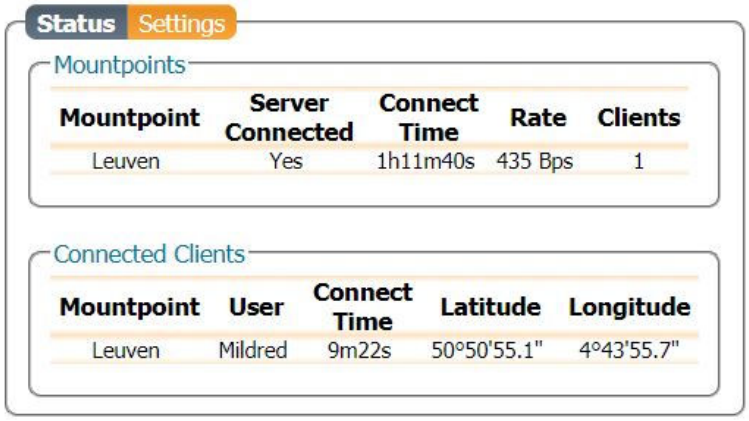


Figure 5-6: Connecting as a client to the AsteRx SB NTRIP Caster

On the NTRIP Client side

Rover receivers can connect to the NTRIP Caster by entering its IP address and Port as shown in Figure 5-7. After clicking **Ok**, the mount point source table will be filled and a mount point can be selected. The user name and password can then be entered and within a few seconds, the Rover receiver should report an RTK fixed position.

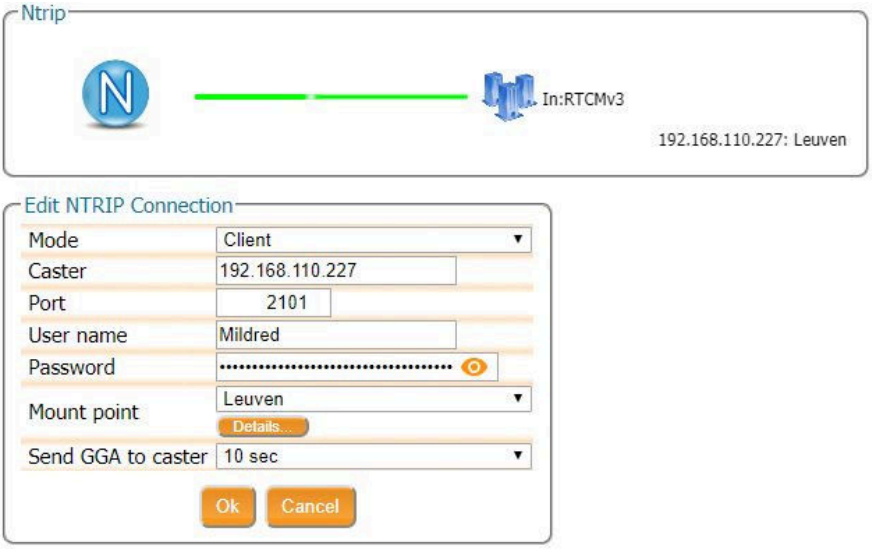


Figure 5-7: Connecting as a client to the AsteRx SB NTRIP Caster

Step 3b: Configure the output of differential corrections using a TCP/IP in a closed network

Configure the IPS connection

Setup an IPS connection over which the differential corrections can be streamed. On the **IP Ports** page, click on **New IP Server** as shown in Figure 5-8, then insert the port number and mode of the connection. When choosing a port number avoid conflicts with other applications such as the commands port (28784), the webserver port (80), the FTP port (21) as well as the default NTRIP port (2101) and the NTP port (123).

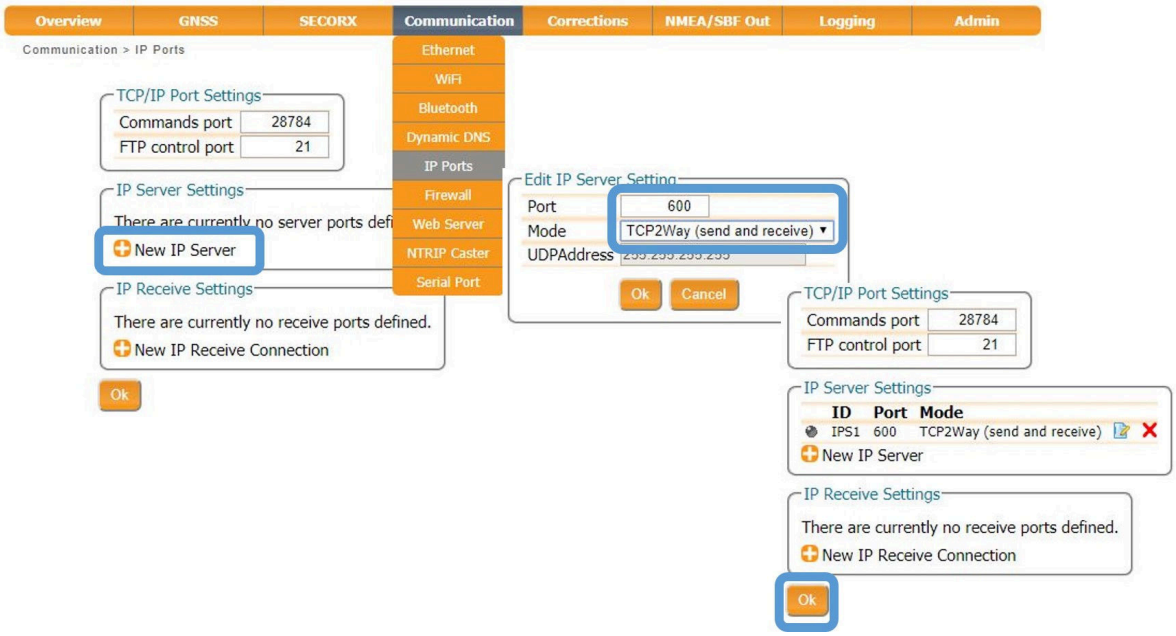


Figure 5-8: Select and configure an IP Server port on which to output differential corrections

Configure the correction stream

On the **Corrections Output** window, click on **New RTCM3 output** as shown in Figure 5-9. You can then select the IPS connection configured in the previous step. The messages necessary for RTK and DGNSS are selected by default[1] but you can select any combination of correction messages that you want to output. A summary of other RTCM messages can be found in the 'AsteRx SB Reference Guide'.

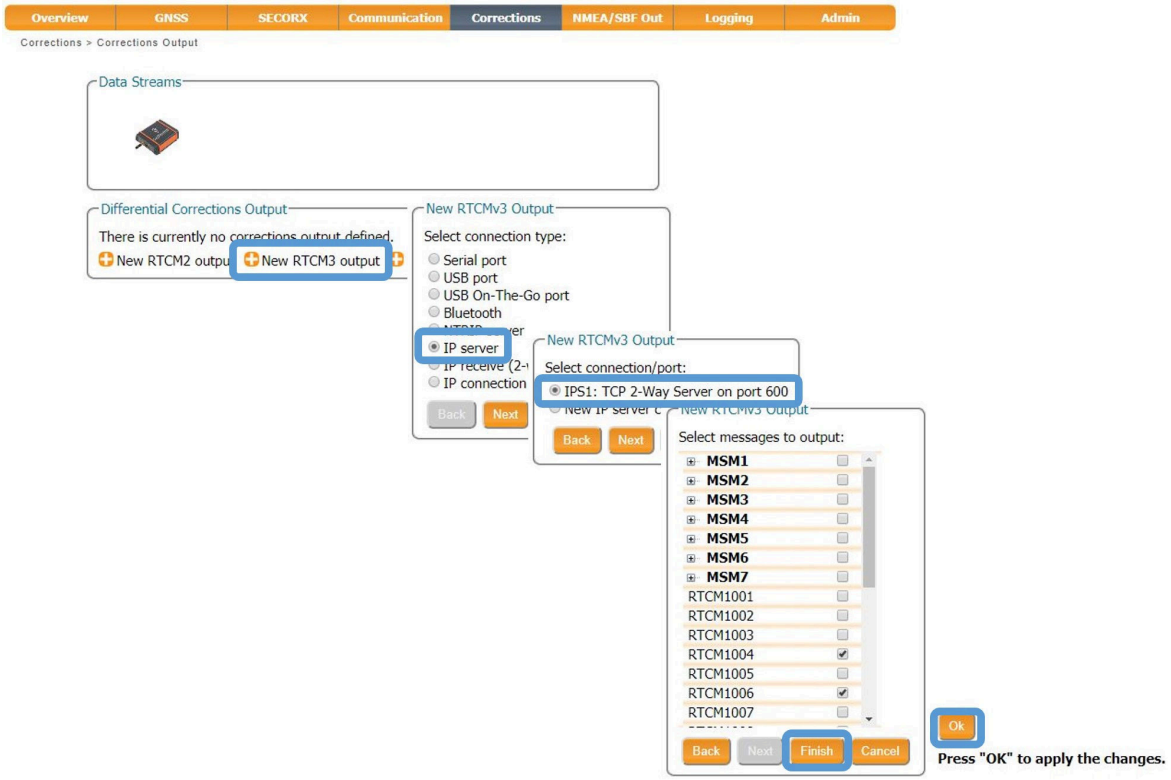


Figure 5-9: Output RTCMv3 differential corrections on the configured TCP/IP server port of the Base station receiver

[1] Note that if you do not have permissions for RTK Base corrections, you will only be allowed to output RTCM2 DGPS messages

Verifying the configuration

Having configured the settings and clicked **Ok** to apply them, you can now connect to the configured Ethernet port of the AsteRx SB using a terminal emulator tool such as Data Link[2]. The Ethernet IP address is the WiFi IP address **192.168.20.1**.

This IP address and the port number 600 can then be used to configure a Data Link connection as shown in Figure 5-10.

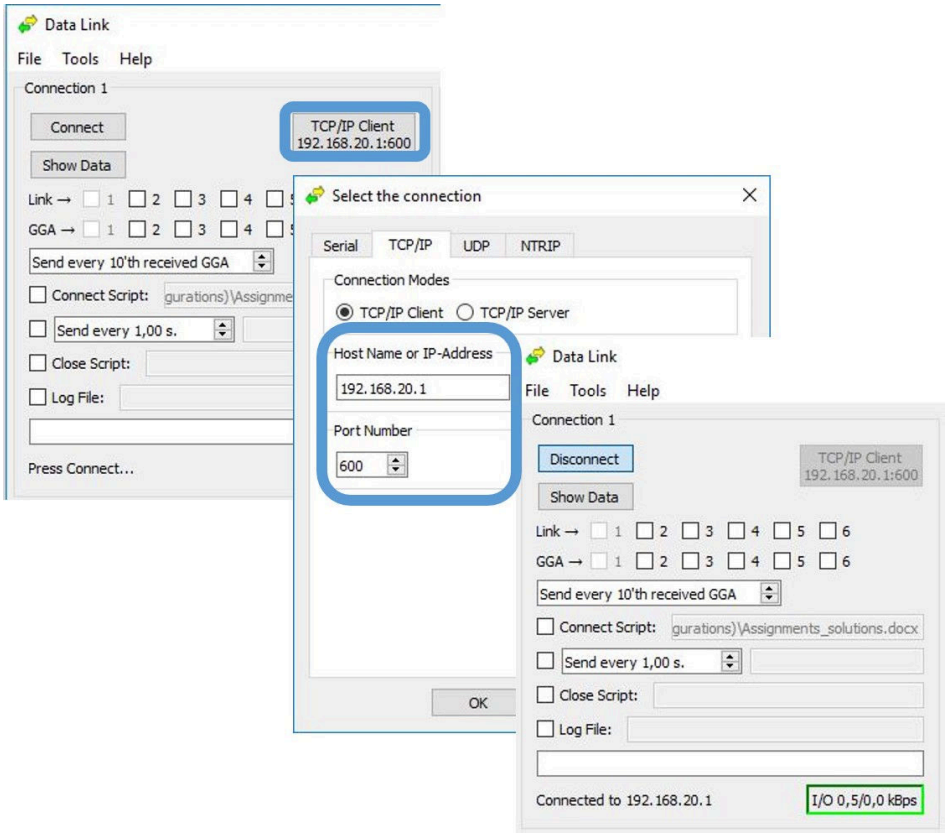


Figure 5-10: Configure the Data Link terminal emulator tool to connect to the AsteRx SB Ethernet port over which differential corrections have been configured

When connected to the output correction stream, click on the **Show Data** button on Data Link and you should see output similar to that shown in Figure 5-11.

[2]Data Link is part of Septentrio's RxTools suite of GUI Tools supplied with the AsteRx SB

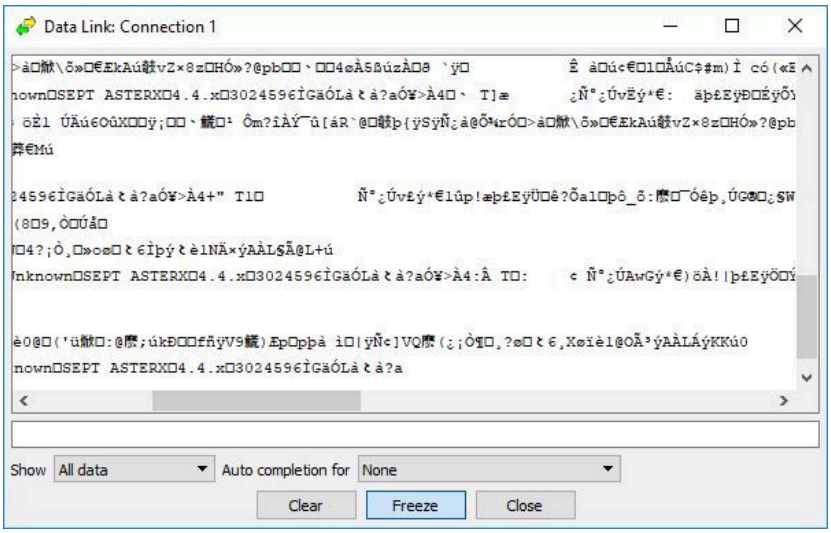


Figure 5-11: The RTCMv3 differential correction stream output from the IPS1 Ethernet connection of the AsteRx SB

When a connection to the configured Ethernet port has been established, in this example using Data Link, the **Data Streams** field on the Corrections Output window should now show the active blue connection shown in Figure 5-12 and the corrections output icon in the information panel should appear active.

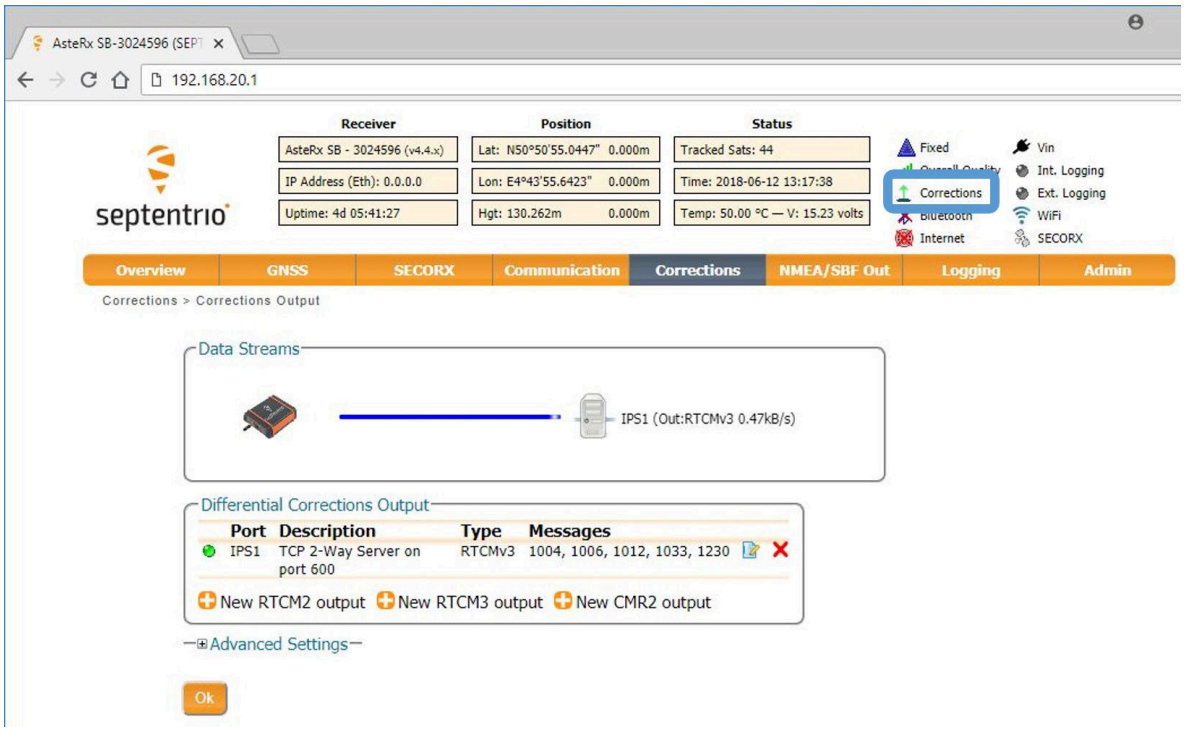


Figure 5-12: Web Interface showing differential corrections output over an Ethernet connection

6 Other receiver operations

6.1 Setting the antenna height

The antenna height is the offset between the height of the measured position and the Antenna Reference Point which is usually the length of the survey pole.

1. Click on the **GNSS/Status** tab and enter the antenna height
2. Click **Apply** when finished. In the example shown in Figure 6-1, an offset of 2.0 meters was used.

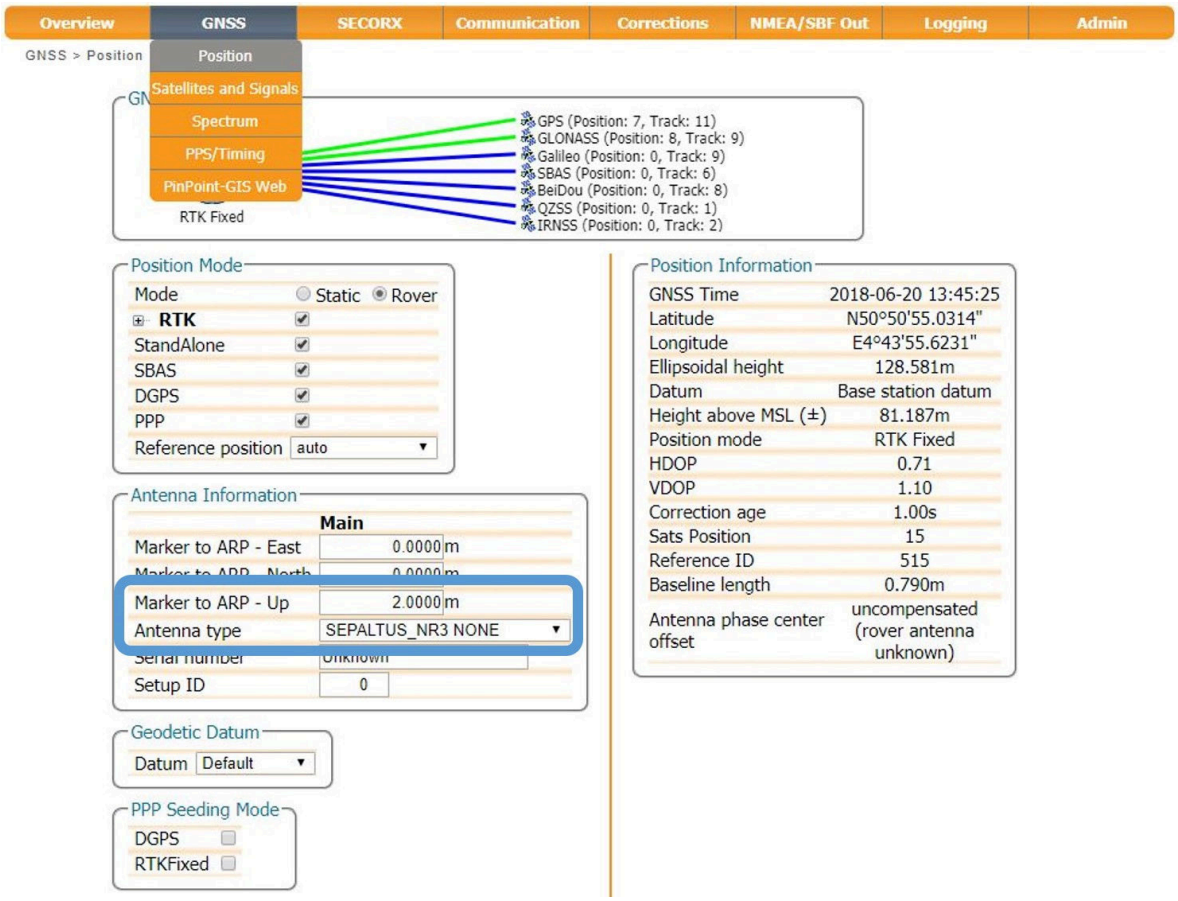


Figure 6-1: GNSS Tab: setting Antenna Offset

By selecting the correct antenna type, the AsteRx SB will automatically compensate for the Antenna Phase Centre offset using the approved calibration of the product in order to provide the most accurate position out of the box.

6.2 How to configure SBF and NMEA output

The AsteRx SB can output position and GNSS data in both standard NMEA format and Septentrio's proprietary compact binary format SBF. This following sections detail how to configure connections to other devices in order to send data.

SBF and NMEA can also be logged on the internal 16 GB disk of the AsteRx SB. Section 6.3.1 and 6.4 detail how to log data on the receiver and how to download data logged on the receiver.

6.2.1 Output over a serial COM connection

The AsteRx SB can be connected via a serial COM cable to an RS-232 compatible secondary device.

Step 1: Configure the serial COM port

The COM port of the AsteRx SB should be configured with the same baud rate and flow control setting of the coupled device. These settings can be configured via the **Communication/Serial Port** tab as shown in Figure 6-2. In this example, COM3 is set with a speed of 19200 baud.

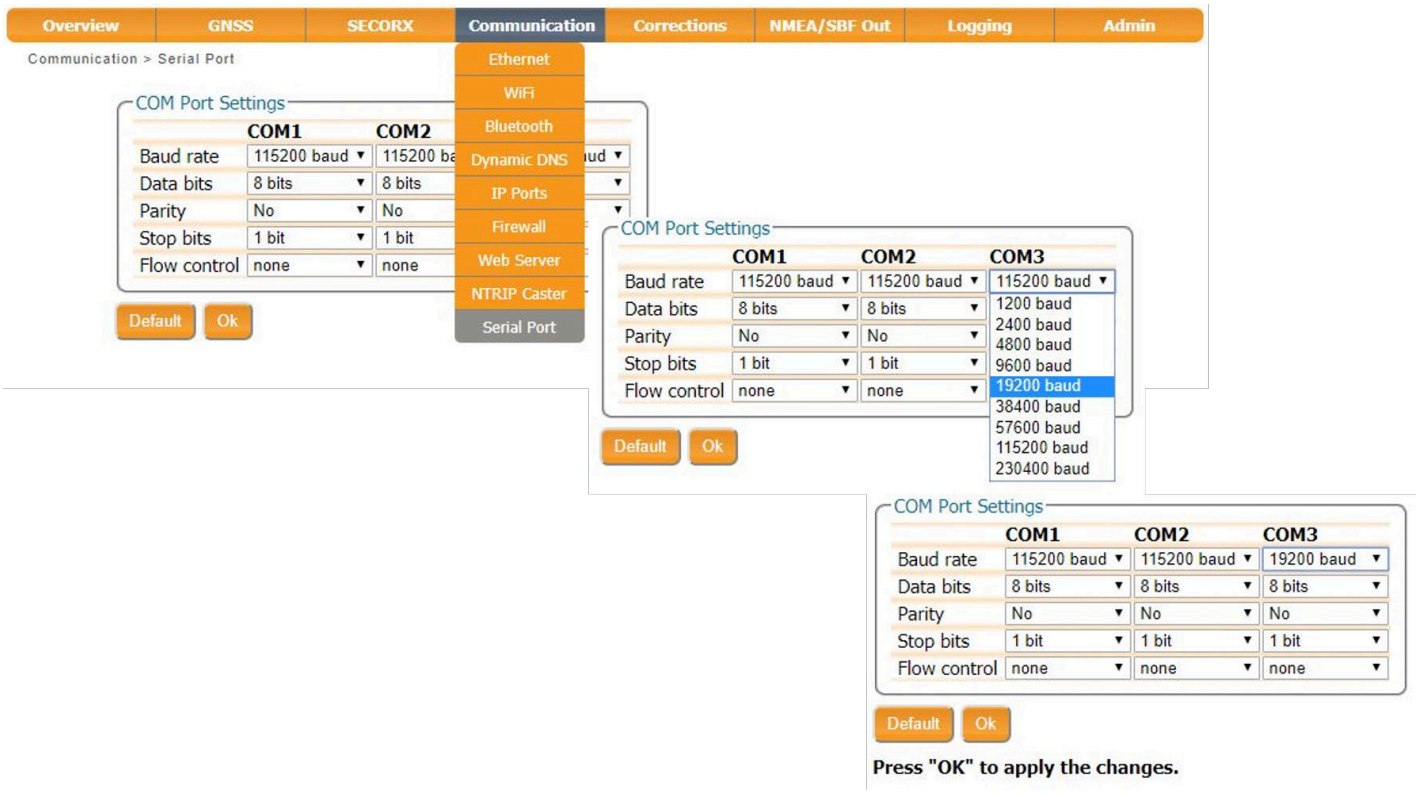


Figure 6-2: Configure the baud rate and flow control of the AsteRx SB

Step 2: Configure data output

NMEA

In the **NMEA/SBF Out** tab, clicking on **New NMEA Stream** will guide you through the steps needed to configure NMEA output as shown in Figures 6-3 and 6-4.

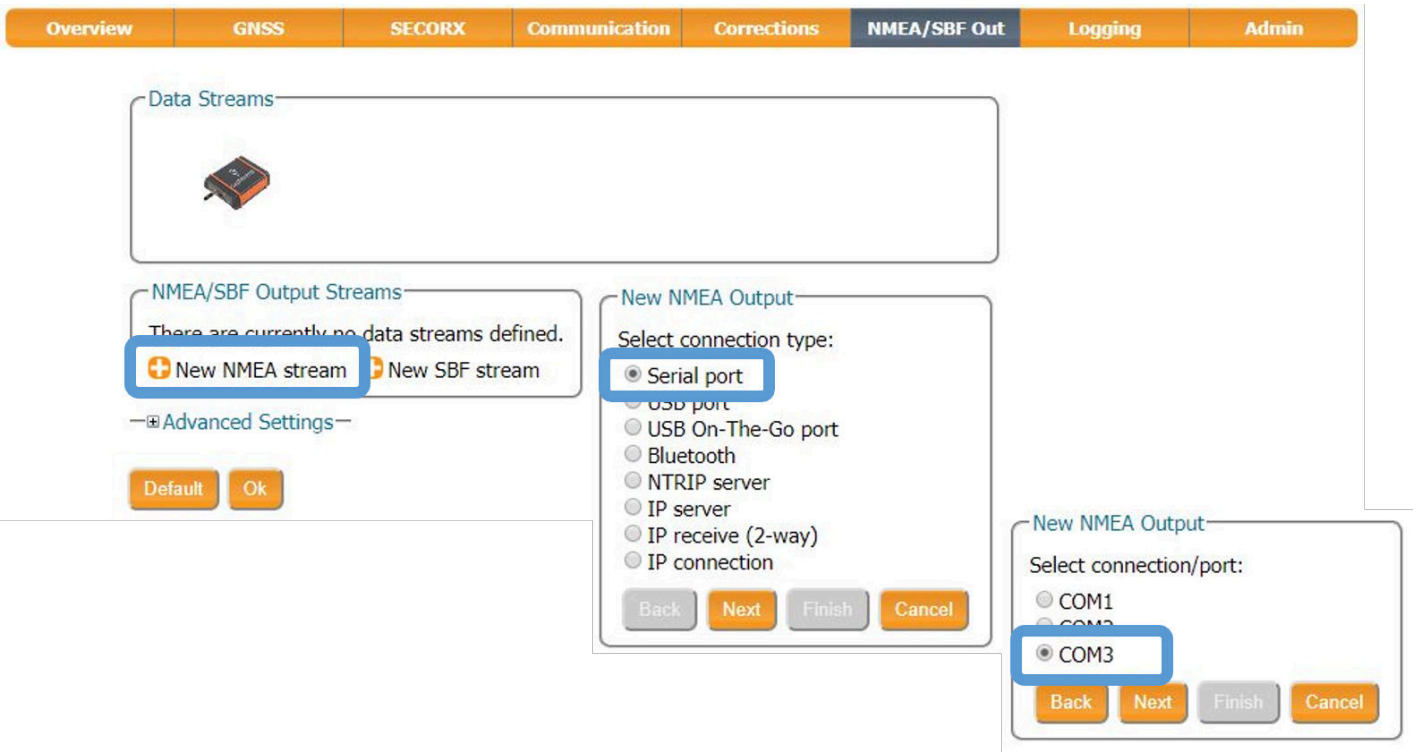


Figure 6-3: Selecting to output NMEA data on COM3

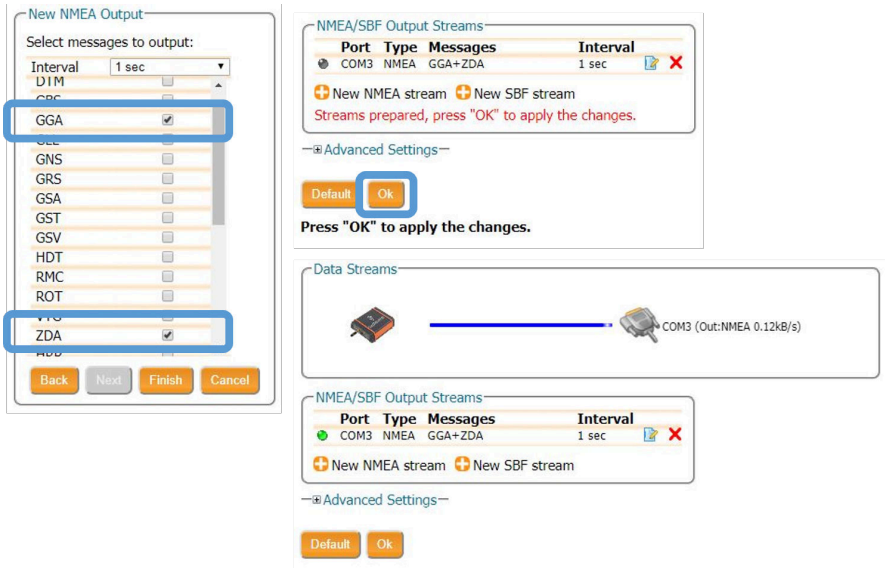


Figure 6-4: Selecting to output the GGA and ZDA NMEA message every second

SBF

By clicking **New SBF stream** in the **NMEA/SBF Out** window, a second output stream can be configured. In the example shown in Figures 6-5 and 6-6 the PVTCartesian SBF data block will be output over COM1 once per second.

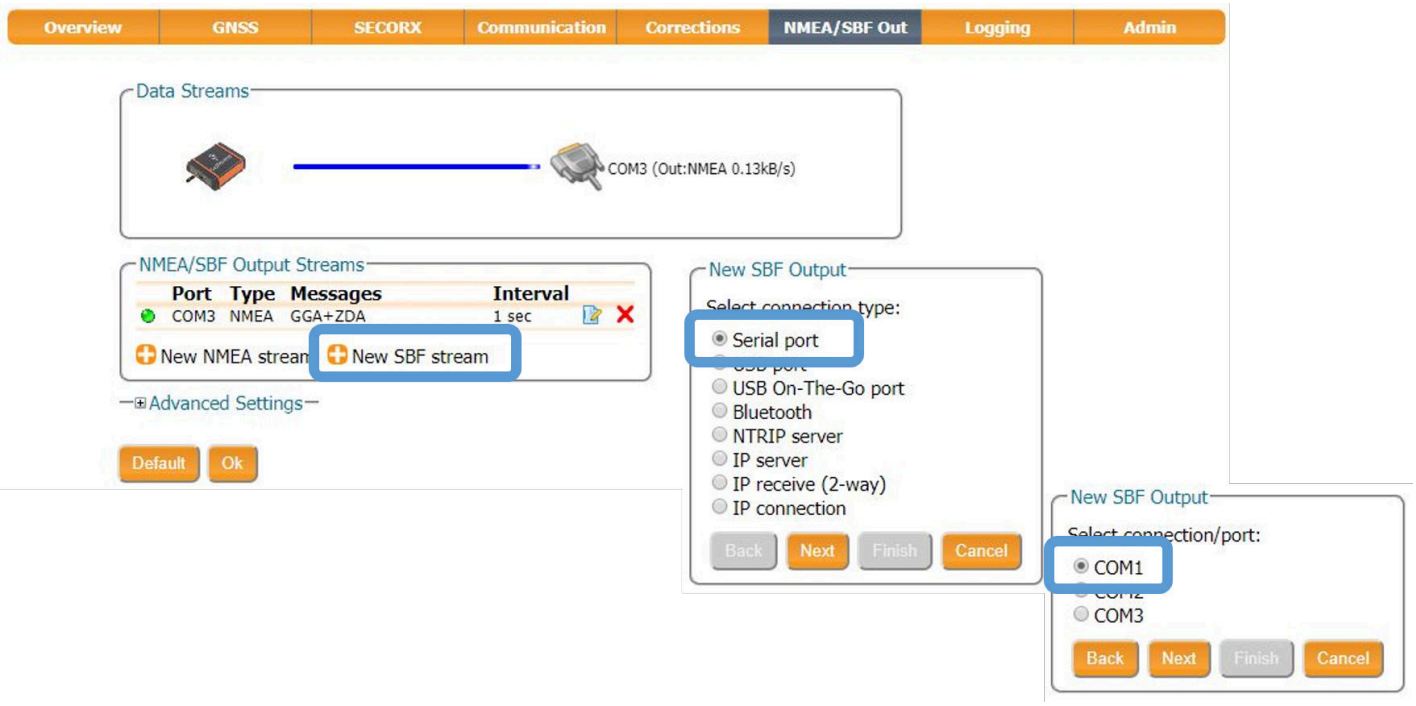


Figure 6-5: Selecting to output SBF data on COM1

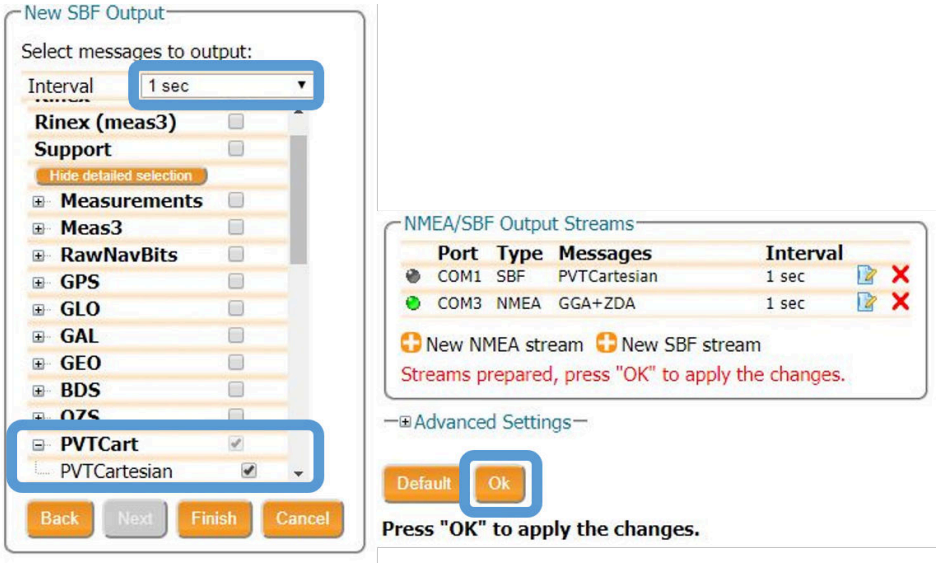


Figure 6-6: Selecting to output the PVTCartesian SBF block every second

Step 3: Verifying the configuration

Having configured data output and clicked on **Ok** the **NMEA/SBF Out** page will now display a summary of all data output as shown in Figure 6-7.

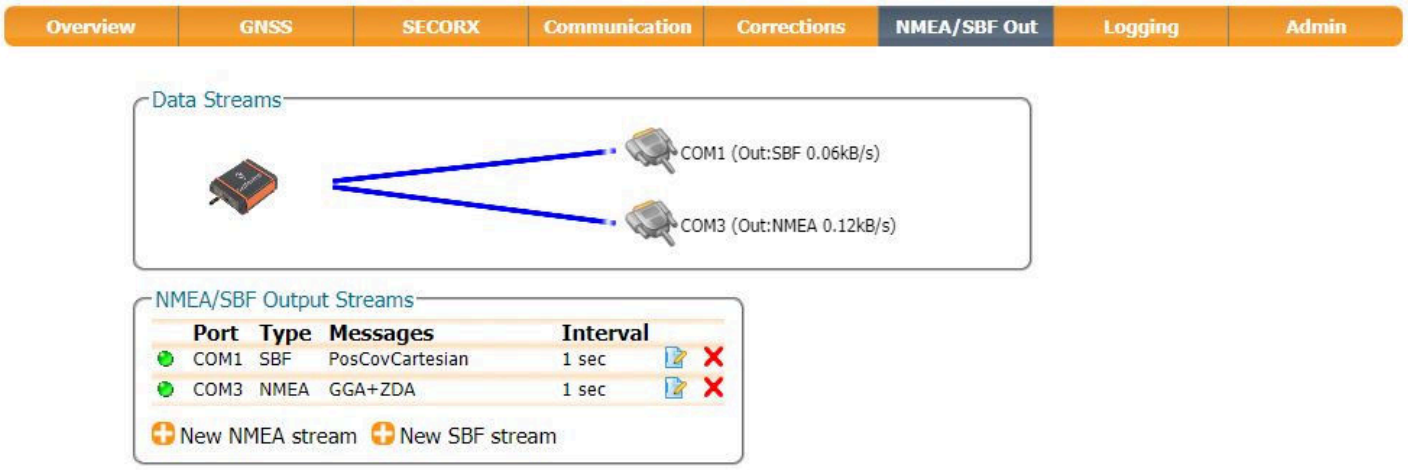


Figure 6-7: Summary of all configured data output streams

Figure 6-8 shows the actual data output. NMEA is in ASCII and is thus readable unlike SBF which is formatted in binary. In this example, the serial COM was connected to a PC via a USB adapter which maps the serial connection to a virtual COM9 of the PC.

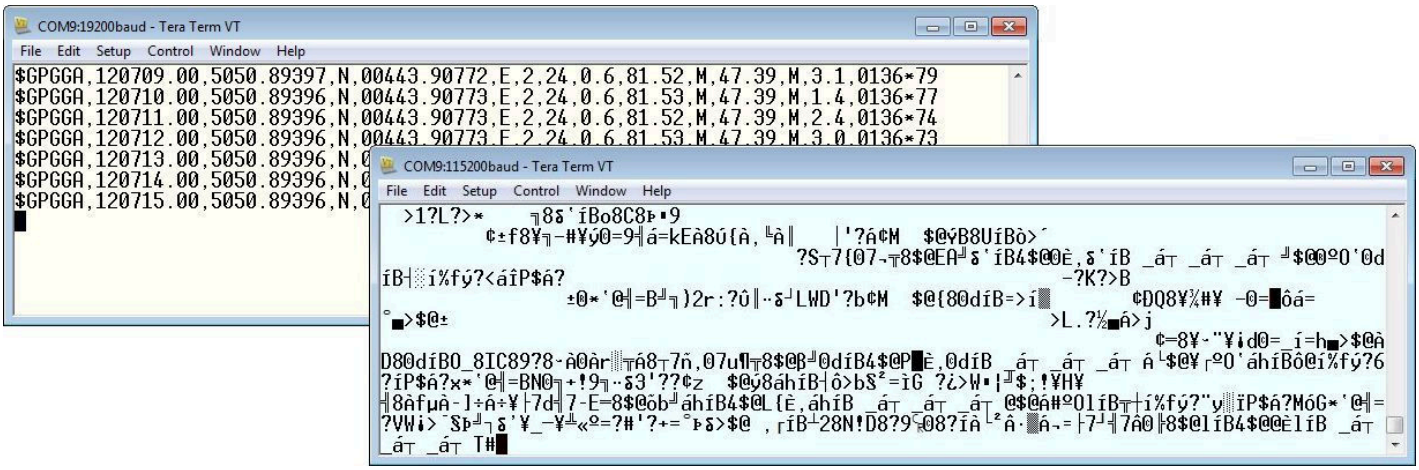


Figure 6-8: Example showing output NMEA GGA (left panel) and SBF PVTCartesian (right panel)

6.2.2 Output over Ethernet

SBF and NMEA data can be sent over an Ethernet connection from the AsteRx SB. Ethernet settings are explained in Section 8.4.

Step 1: Configure an IP connection on the AsteRx SB

The Ethernet port settings can be configured by selecting **IP Ports** from the **Communication** menu. In the example shown in Figure 6-9, port 600 has been configured as connection IPS1 in **TCP2Way** mode so data can be received as well as transmitted over the connection. When choosing a port number avoid conflicts with other applications such as the commands port (28784), the webserver port (80), the FTP port (21) as well as the default NTRIP port (2101) and the NTP port (123).

Note that a new IP port can also be configured by followings the sequence of settings for NMEA output described in ***Step 2***.

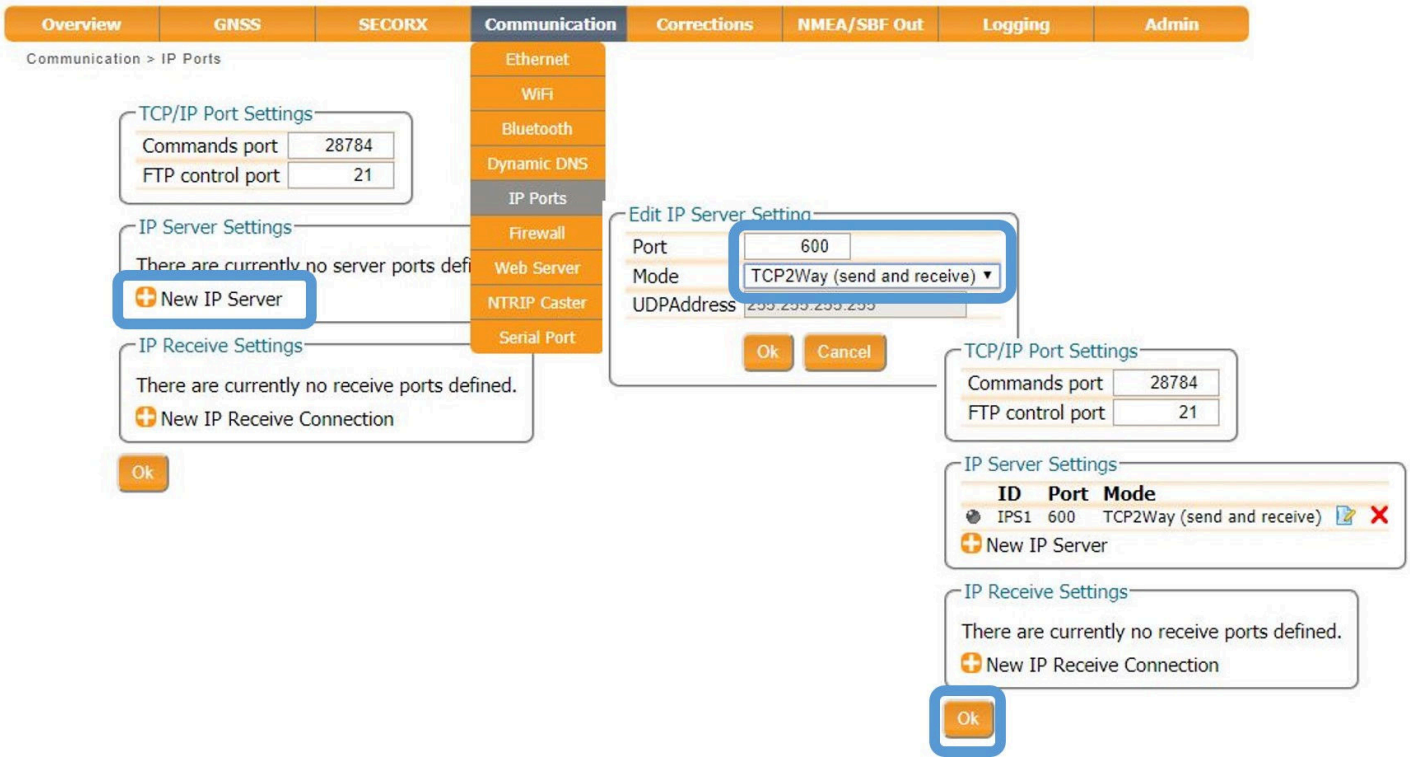


Figure 6-9: Configure the TCP/IP server port setting for data output

Step 2: Configure output of NMEA messages

In the **NMEA/SBF Out** window, click on **New NMEA stream** and follow the sequence of windows to configure the data you want to output. In the example shown in Figure 6-10, the NMEA GGA message will be output every second. Ensure that the previously configured IPS1 port is selected for output as highlighted.

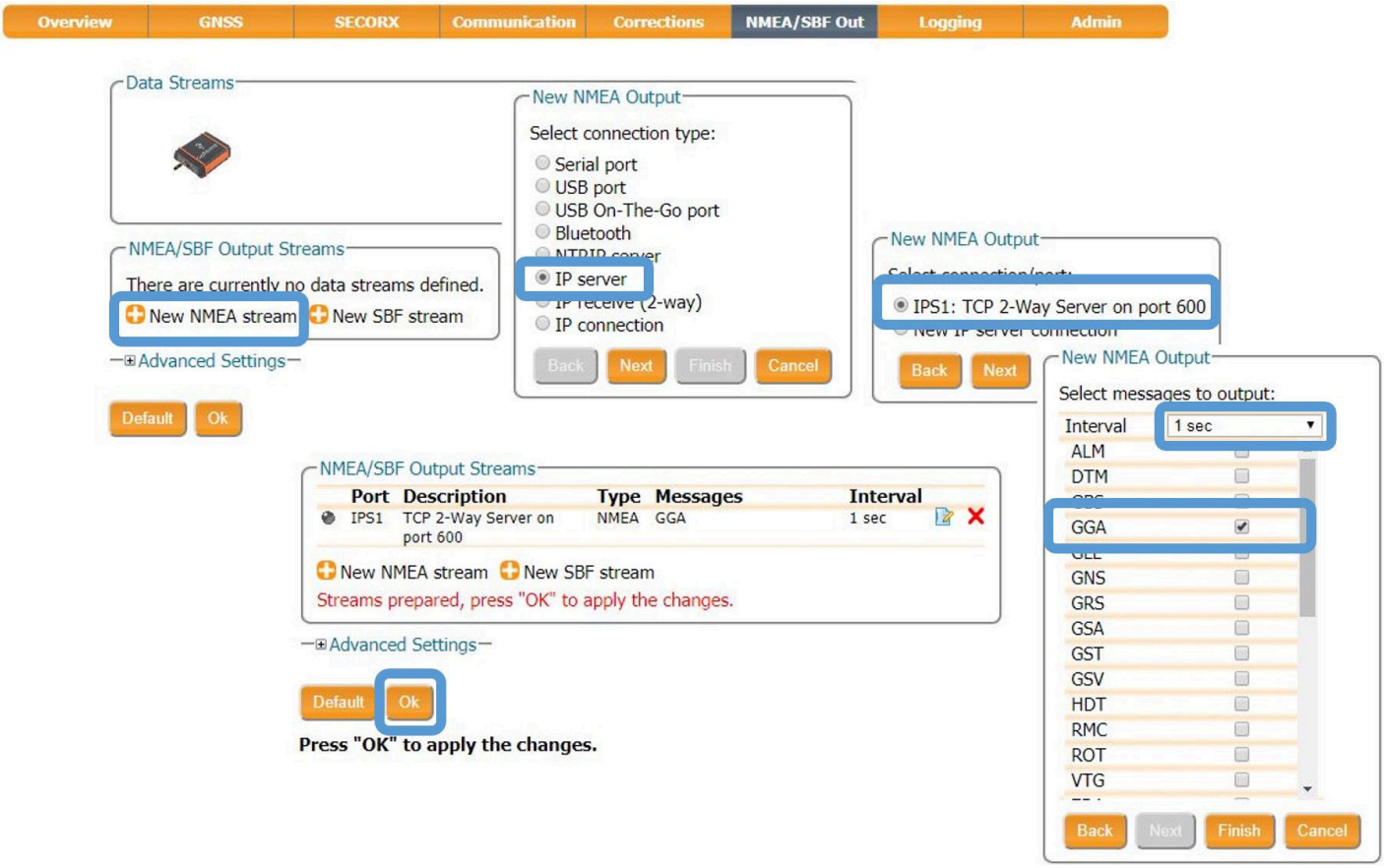


Figure 6-10: Select to output NMEA GGA over the configured IPS1 connection

Similar steps can be followed to output SBF messages.

Step 3: Configure Data Link to listen for NMEA output

The screenshots in Figure 6-11 show how the Septentrio GUI tool Data Link can be configured to listen for the AsteRx SB GGA output.

Click on the **TCP/IP Client** button to configure the connection. In the highlighted fields insert the IP address or hostname of the receiver and the port number configured in ***Step 1*** . Click on **Connect**.

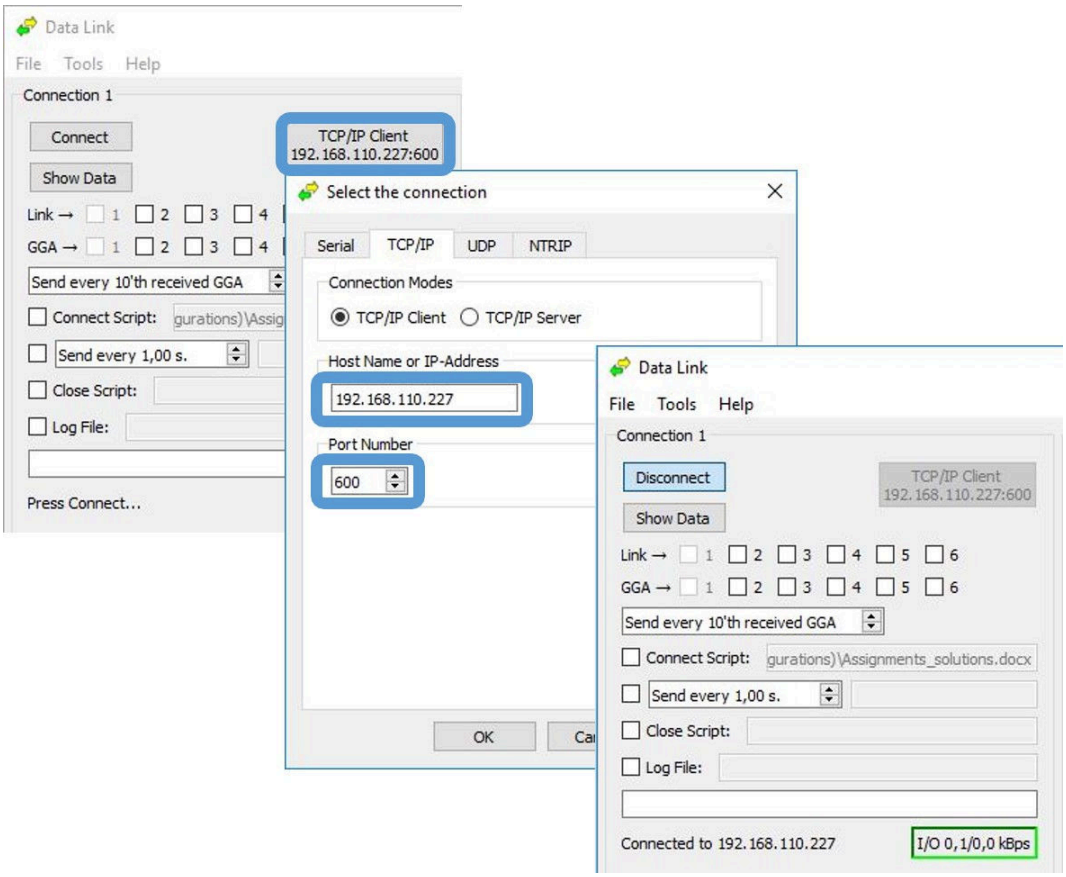


Figure 6-11: Configure the TCP/IP connection settings in Data Link

The info line at the bottom of the window should indicate that a connection has been made. Click on the **Show Data** button to display the GGA data from the receiver as in Figure 6-12.

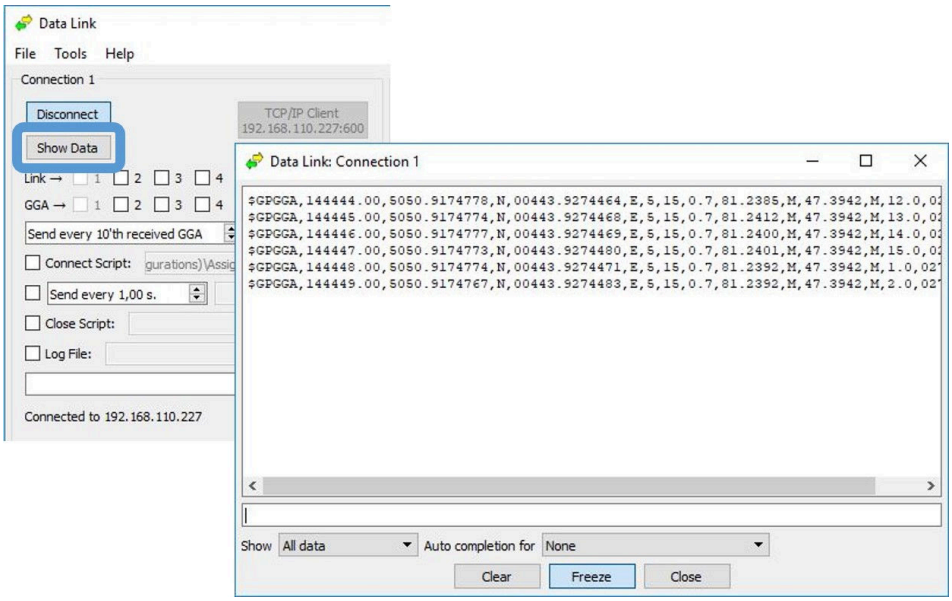


Figure 6-12: The **Show data** window of Data Link showing GGA from the AsteRx SB

6.2.3 Output over Bluetooth

Step 1: Connect Bluetooth

1. Select the **Communications/Bluetooth** tab on the AsteRx SB's Web Interface.
2. The Bluetooth tab shows the Device name and Pairing code used to connect to your Bluetooth device.
3. On your Bluetooth device, open the Bluetooth application and find the Bluetooth device name of your AsteRx SB and pair. By default, the Bluetooth device name is **AsteRx_SB-*serial-number*** .

The device name and pairing code may be changed for user preference. Also, the Bluetooth module may be powered on/off and set to discoverable from this tab. It is however advised to leave the Discoverable option switched on.

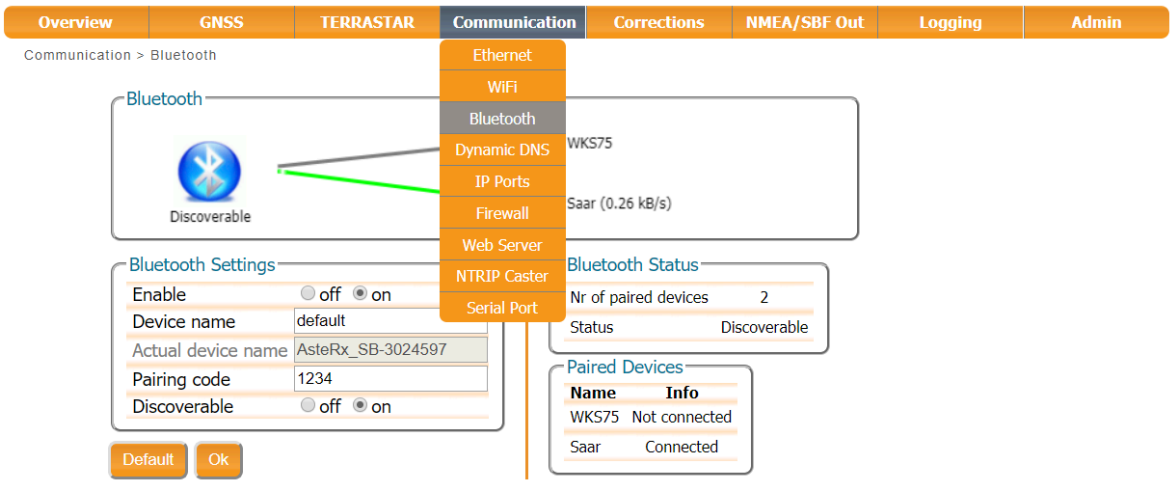


Figure 6-13: Configuring the Bluetooth connection to an external device

Step 2: Configure data output

Similar steps as in Section 6.2.1 Step 2 can be followed to configure data output, by selecting Bluetooth in the **NMEA/SBF Output** connection type

6.3 How to log data

The AsteRx SB has a 16 GB memory for internal data logging. Data can also be logged to an external USB memory disk of up to 128 GB. Logging to an external disk is an optional feature and can be purchased via our Sales department.

6.3.1 Internal logging

Step 1: Defining the Disk Full action

When setting up a logging session for the first time, it is a good idea to define what you would like to happen when the internal memory is full. This can be configured on the **Disk Full Action** of the **Global Log Settings** page of the **Logging** menu as shown in Figure 6-14. There are two options, either the receiver stops logging when the memory is full or it continues logging by making space for new files by deleting the oldest. The default setting is 'Stop logging in all sessions'.

Figure 6-14: Selecting what you wish to happen when the internal 16 GB memory is full

Step 2: Configuring a logging session

On the **Log Sessions** window of the **Logging** menu you can check which logging sessions have already been defined and define new ones. Up to 2 simultaneous logging sessions can be defined independently. Basic logging functionality for logging Septentrio Binary Format (SBF) and NMEA is always included. The Advanced Logging option, requiring a special permission, allows RINEX[1] onboard logging, FTP Push and USB Host external disk function.

[1] RINEX is an optional feature. If you don't have this permission on your AsteRx SB, you can purchase this option from the Septentrio Sales department: sales@septentrio.com

To define a new logging session, click on a **Create** button as shown in Figure 7-7.

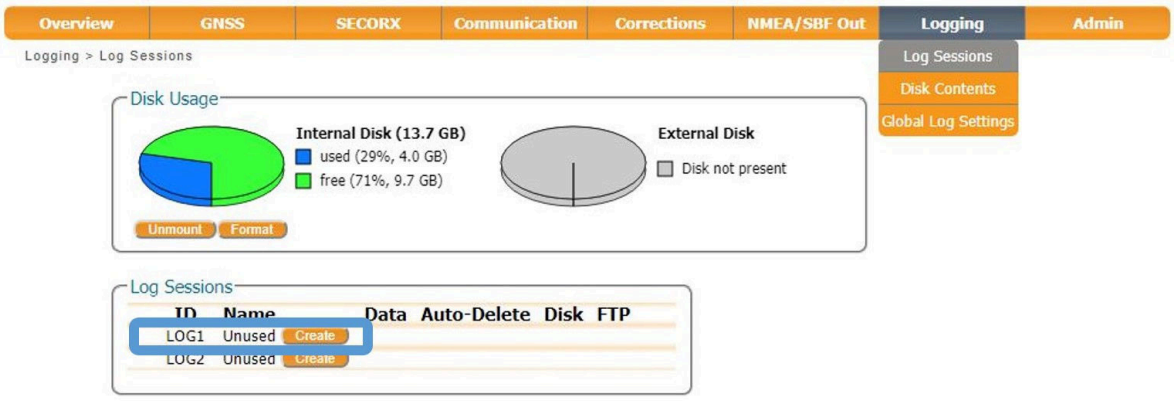


Figure 6-15: Click on a 'Create' button to start defining a new logging session

You can then follow the sequence of steps shown in Figure 6-16 selecting the various configuration settings for the logging session. In the **SBF Logging Parameters** field you can select the naming convention. The **IGS** options names files according to IGS convention but files can also be freely named using either **Filename** or **Incremental** options. In this example, the default settings of 'Internal' Disk and 'Never' for Auto-Delete[2] have been selected. In the **Edit SBF Stream** window, the messages required for RINEX generation have been selected as well as those useful for the Support department for diagnosing problems. SBF messages can also be selected individually.

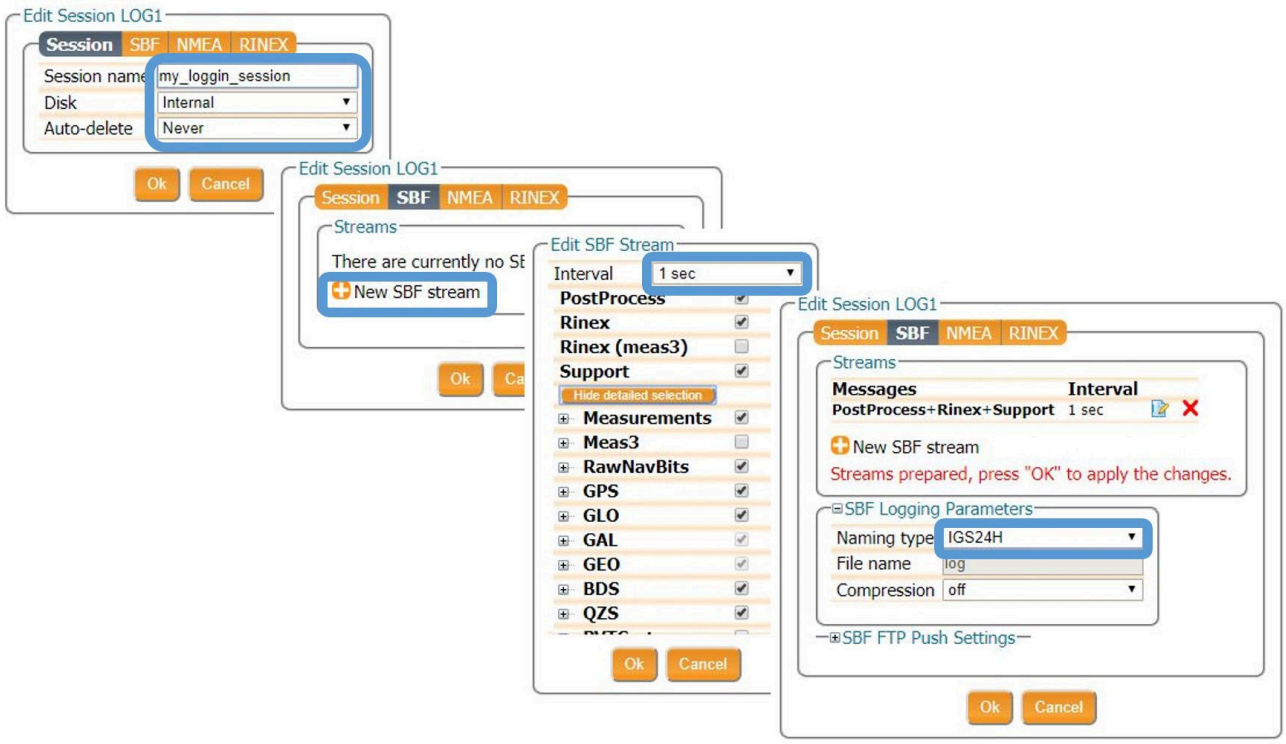


Figure 6-16: Follow the sequence of windows to fully configure the logging session

[2]Please note that, this setting is overruled by the **Disk Full Action** setting defined in the **Global Log Settings** window.

Step 3: Verifying the configuration

When you have finished configuring the logging session, the **Log Sessions** window will show a summary of the defined logging sessions as in Figure 6-17. An estimate of the daily size of data generated with the current logging configuration is also given.

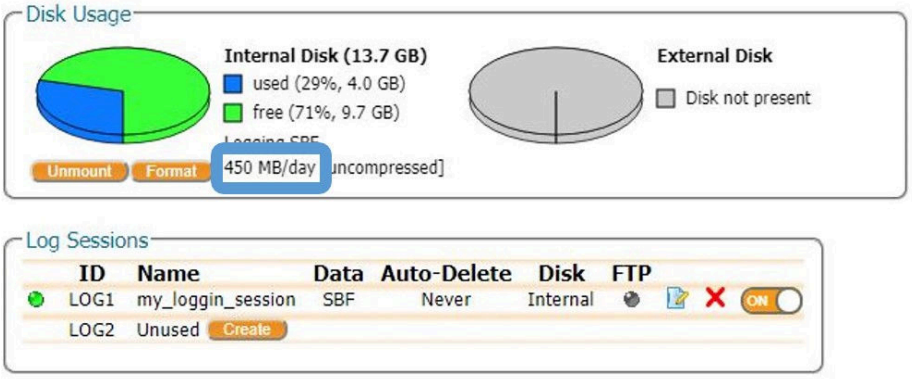


Figure 6-17: A summary of the newly defined logging sessions showing the expected amount of data generated daily

6.3.2 Logging to an external USB memory device

The AsteRx SB can also log data to an external memory device[3]. To connect the device, you will need a micro-USB cable (CLB_OTG_USB_Micro) to connect to the front-panel socket indicated by the USB icon.

A high-quality memory device is recommended for external logging as multiple logging sessions can result in a large throughput of data. The 4K random write speed should be greater than 0.1 MBps, and the 4K random read speed should be at least 2 MBps[4].

With an external memory device connected, the new device should be visible in the **Log Sessions** window. If the device is not formatted or the formatting is not compatible with the receiver file system, you will be prompted to format the device. This can be done by clicking on the **Format** button as shown in Figure 6-18

Figure 6-18: With a 2 GB external USB memory device connected to the AsteRx SB

New logging sessions can then be defined in a similar way as in Section 6.3.1 making sure to select **External** from the drop-down list in the **Disk** field as shown in Figure 6-19.

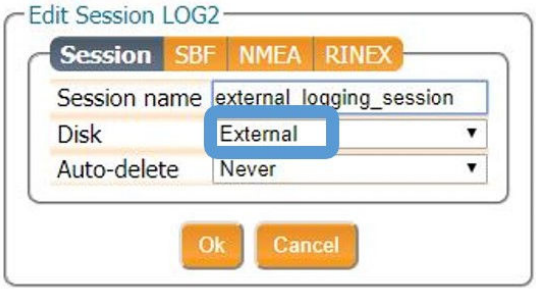


Figure 6-19: Select **External** from the drop-down list to log data to an external memory device

[3] If you don't have permissions to log data to an external memory device on your AsteRx SB, you can purchase this option from the Septentrio Sales department: sales@septentrio.com

[4] The 4K random read/write speed is a standard specification for memory devices. More information and a list of benchmarked devices can be found on: http://usb.userbenchmark.com

6.4 Downloading logged data from the receiver

Data files logged by the AsteRx SB, both on its internal memory and to an external USB device, can be downloaded using the web interface on the **Disk Contents** window of the **Logging** menu. Each logging session is logged to a separate folder. Individual files can be downloaded by clicking on the green download arrow next to the file name as shown in Figure 6-20. Obsolete files can be deleted by clicking the .

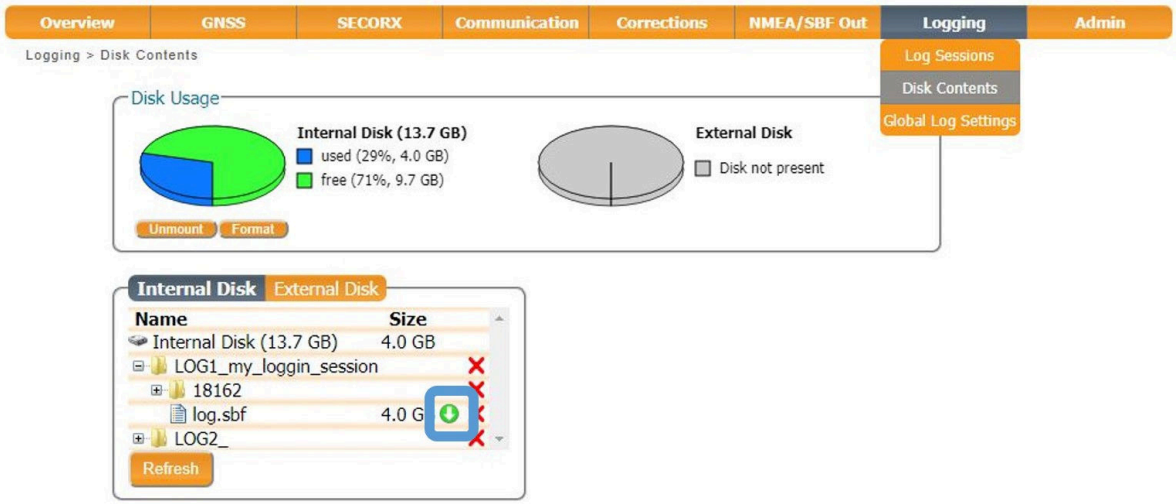


Figure 6-20: Downloading logged files

6.4.1 How to FTP push logged data to a remote location

SBF and RINEX files can also be automatically sent to a remote FTP server (FTP push[5]). A different FTP server can be configured for each logging session and, SBF and RINEX files logged in the same session can be sent to different servers.

The FTP server settings can be entered in the **Edit Session** window, after configuring SBF or RINEX logging, as shown in Figure 6-21. FTP push will create the folder **data** on the remote server if it does not yet exist. If file transfer fails, the receiver will retry after the **Retry Interval** which has been selected as 15 minutes in this example.

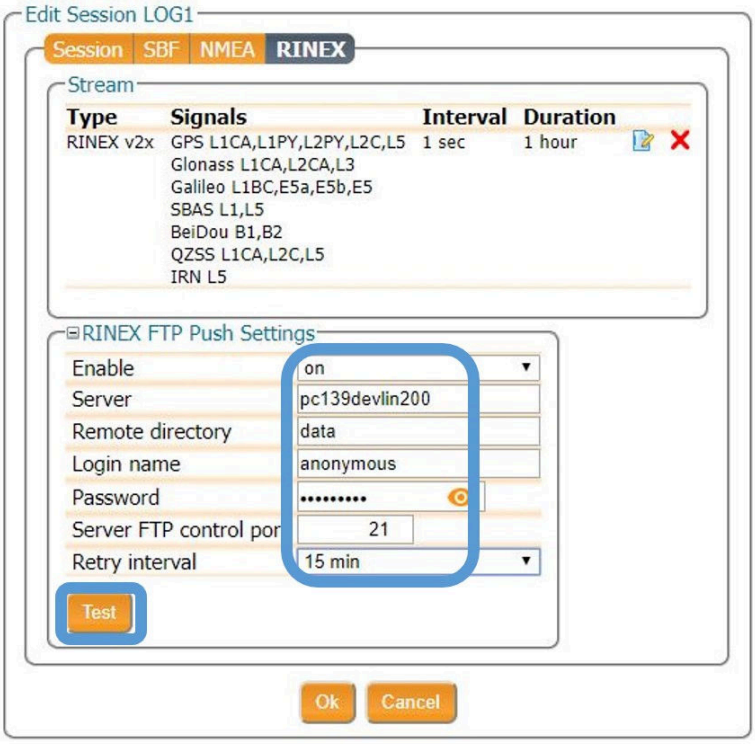


Figure 6-21: Configure pushing of RINEX files to an external FTP server

You can check that the FTP server credentials are correct by clicking on the **Test** button. This will push a small test file to the remote folder and then delete it. The receiver reports whether or not the file was successfully sent and deleted as shown in Figure 6-22. If the server is configured such that files cannot be deleted then the receiver will also report this and the test file will remain in the remote folder.

[5] FTP push is an optional feature. If you don't have this permission on your AsteRx SB, you can purchase this option from the Septentrio Sales department: sales@septentrio.com

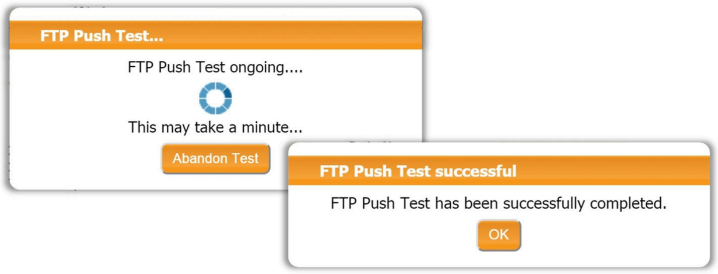


Figure 6-22: Testing the remote FTP server credential are correct

7 Receiver Monitoring

7.1 AIM+: Using the spectrum analyser to detect and mitigate interference

The AsteRx SB is equipped with a sophisticated RF interference monitoring and mitigation system (AIM+). To mitigate the effects of narrow-band interference, 3 notch filters can be configured either in auto or manual mode. These notch filters effectively remove a narrow part of the RF spectrum around the interfering signal. The L2 band being open for use by radio amateurs is particularly vulnerable to this type of interference. The effects of wideband interference both intentional and unintentional can be mitigated by turning on the WBI mitigation system. The WBI system also reduces, more effectively than traditionally used pulse-blanking methods, the effects of pulsed interferers.

The spectrum view plot

In the Spectrum window of the GNSS menu, you can monitor the RF spectrum and configure three separate notch filters to cancel out narrowband interference. Figure 7-1 shows the L2 frequency band with the GPS L2P signal at 1227.60 indicated. Different bands can be viewed by clicking on the 'Show table' button as shown. The spectrum is computed from baseband samples taken at the output of the receiver's analog to digital converters.

Figure 7-1: The RF spectrum of the L2 Band

7.1.1 Narrowband interference mitigation

Configuring the notch filters

In the default auto mode of the notch filters, the receiver performs automatic interference mitigation of the region of the spectrum affected by interference. In manual mode as shown configured for Notch1 in Figure 7-2, the region of the affected spectrum is specified by a center frequency and a bandwidth which is effectively blanked by the notch filter.

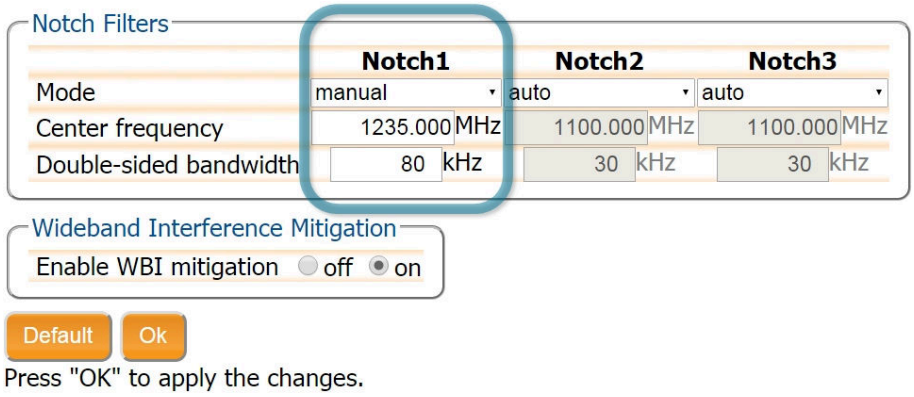


Figure 7-2: Configuring the first notch filter Notch1 at 1235 MHz

With the Notch1 settings as shown in Figure 7-2, the L2-band after the notch filter (After IM) is shown in Figure 7-3 with the blanked section clearly visible.

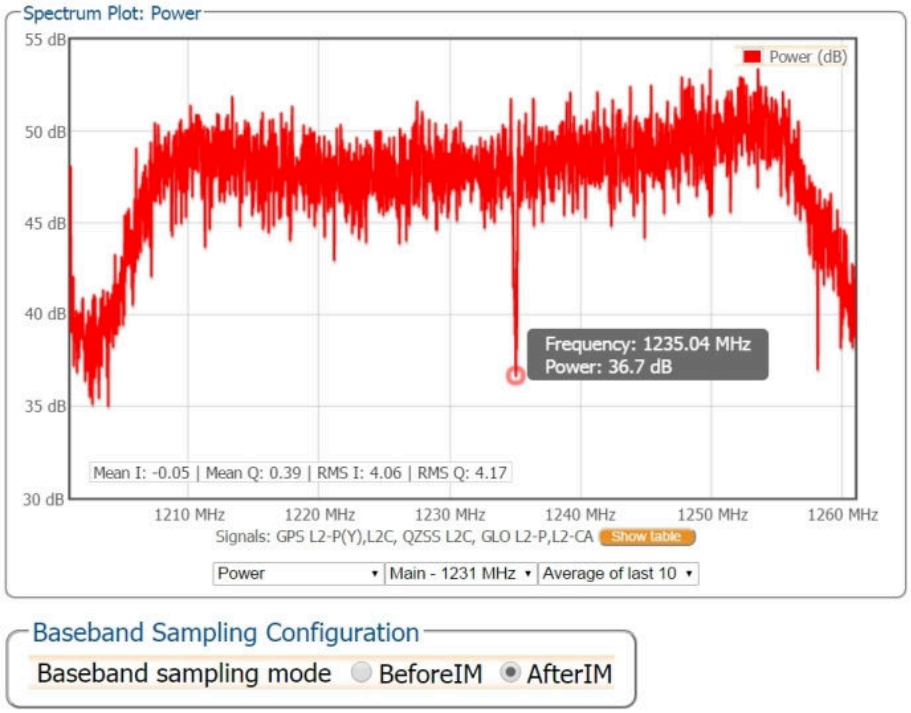


Figure 7-3: The RF spectrum of the L2 Band after applying the notch filter at 1235 MHz

7.1.2 Wideband interference mitigation

Wideband interference of GNSS signals can be caused unintentionally by military and civilian ranging and communication devices. There are also intentional sources of interference from devices such as chirp jammers. The wideband interference mitigation system (WBI) of the AsteRx SB can reduce the effect of both types of interference on GNSS signals.

Configuring WBI mitigation

The wideband interference mitigation system (WBI) can be enabled by selecting 'on' as shown in Figure 7-4.

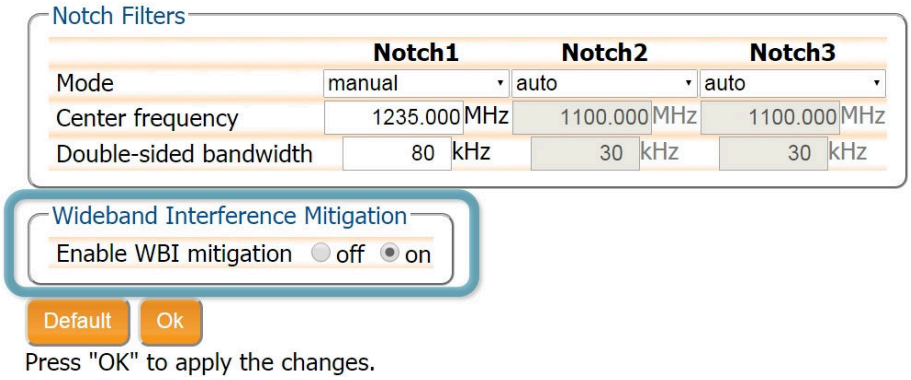


Figure 7-4: Select 'on' to enable wideband interference mitigation then 'OK' to apply the new setting.

WBI mitigation in action

The GPS L1 band interference shown in Figure 7-5 is produced by combining the GNSS antenna signal with the output from an in-car GPS chirp jammer.

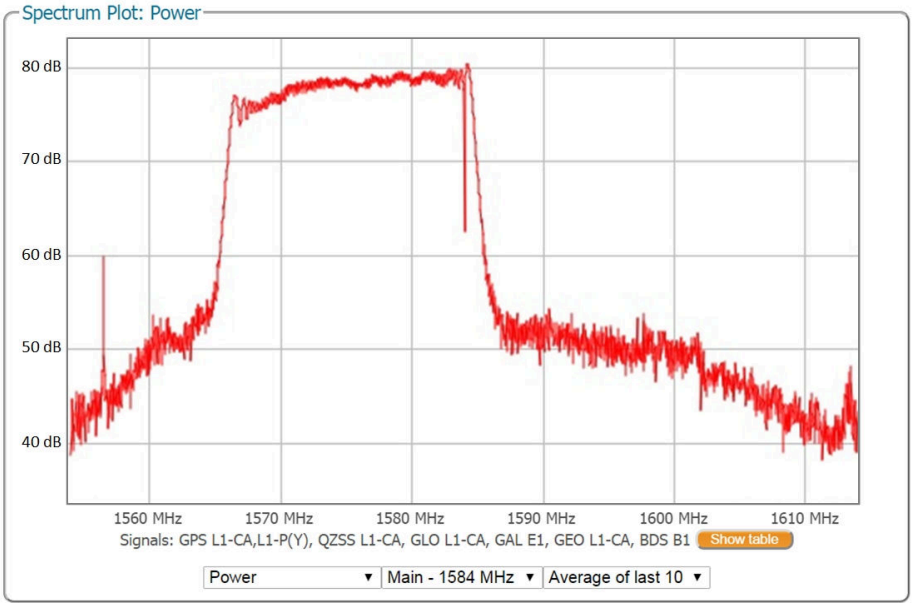


Figure 7-5: Simulated wideband interference in the GPS L1 band using an in-car chirp jammer.

When WBI mitigation is enabled, the effect of the interference is dramatically reduced to the extent that, the small signal bump at the GPS L1 central frequency of 1575 MHz is clearly visible as Figure 7-6 shows.

In this particular test, the interference signal caused the receiver to fall back to the less precise DGNSS or standalone positioning modes. With WBI mitigation enabled however, the receiver was able to maintain an RTK fix position throughout.

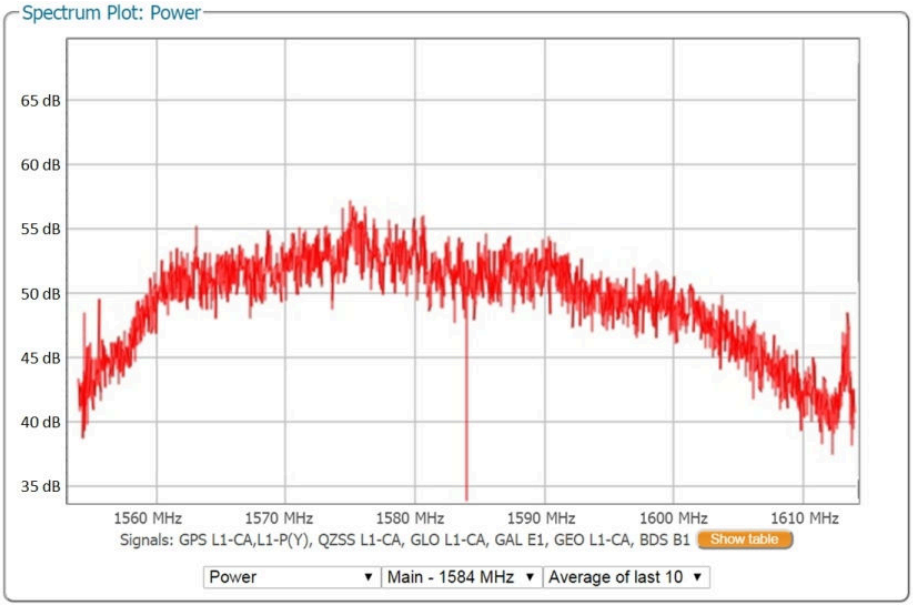


Figure 7-6: Enabling WBI interference mitigation greatly reduces the effect of the interference caused by the chirp jammer.

7.2 How to log data for problem diagnosis

If the AsteRx SB does not behave as expected and you need to contact Septentrio Support Department, it is often useful to send a short SBF data file that captures the anomalous behaviour, as well as a Diagnostic Report from the receiver.

7.2.1 Support SBF file

Step 1: Configuring a logging session

On the menu bar select **Logging** then the **Log Sessions** window where you can define a new logging session.

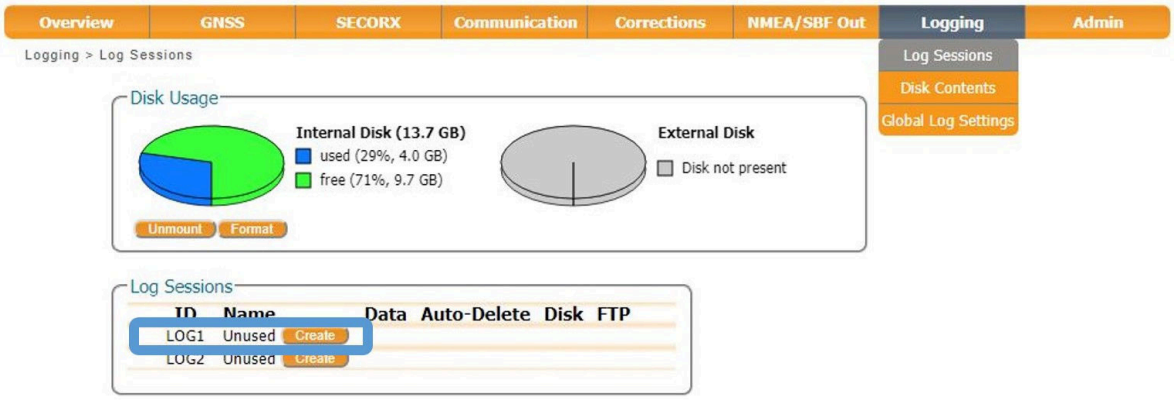


Figure 7-7: Click on a 'Create' button to start defining a new logging session

Step 2: Select to log the Support data blocks

In the **Edit Session** click on **SBF** and **New SBF stream**. In the final **Edit SBF Stream** field, make sure to select the **Support** option as shown in Figure 7-9. This option automatically selects all the SBF blocks that are useful for the Support Department to help diagnose receiver problems. If you suspect interfering signals, as described in Section 7.1, it can be useful to provide SBF log files before/after and during the interference, by logging the **BBSamples** blocks located in the **Detailed selection**, in addition to the **Support** blocks.

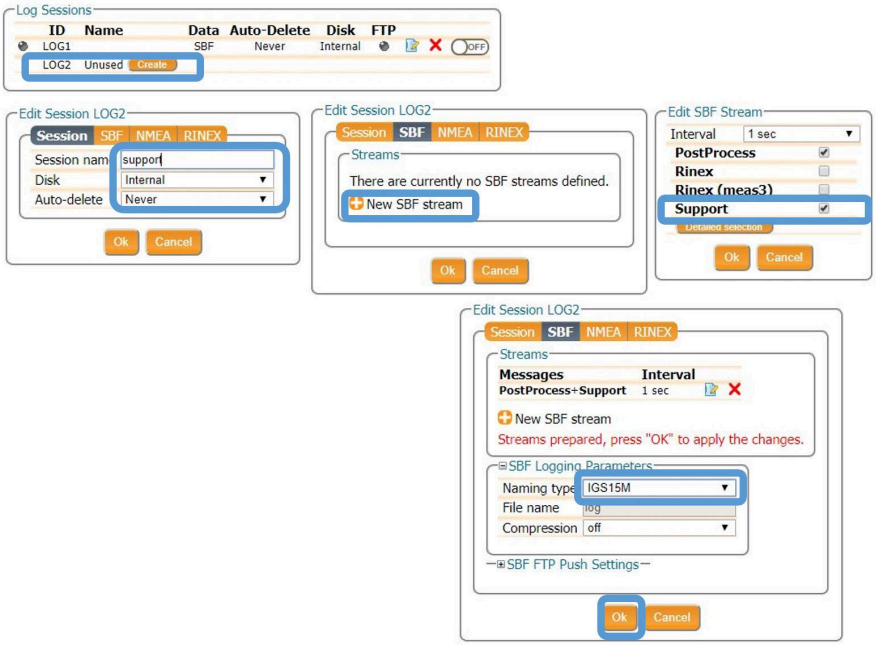


Figure 7-8: Configure a logging session selecting **Support** in the **Edit SBF Stream** field

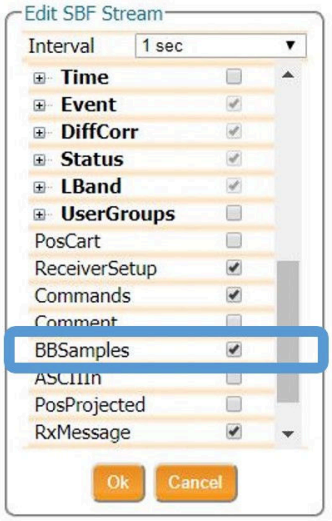


Figure 7-9: Selecting **BBSamples** in the **Edit SBF Stream** field for logging interference

Please note that logging the **Support** data blocks requires a large throughput of data that may not be compatible with other CPU-intensive tasks such as data output at higher rates.

When data logging has been correctly configured, the **Logging** window will show the newly defined session as active as indicated in Figure 7-10.

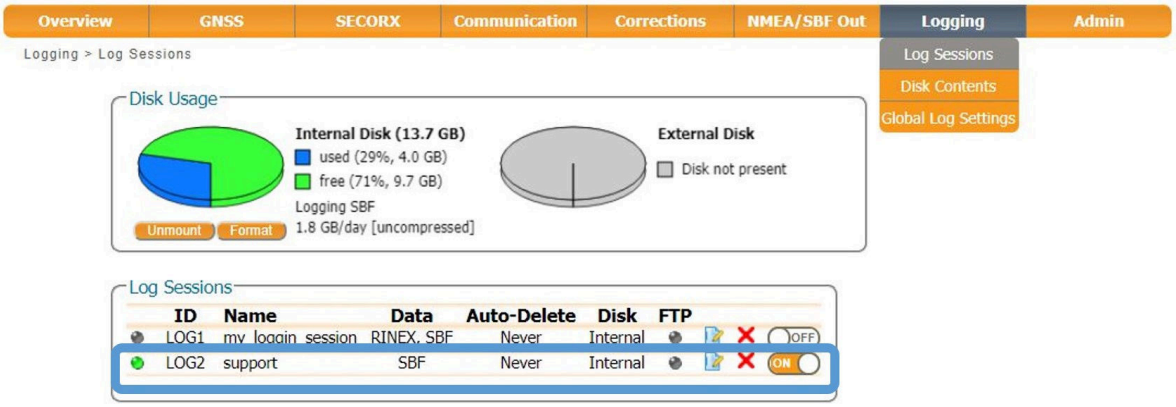


Figure 7-10: The **Logging** window showing an active logging session

Step 3: Downloading the logged SBF file

To download a data file logged on the AsteRx SB, click the download icon next to the filename on the **Disk Contents** page as shown in Figure 7-11

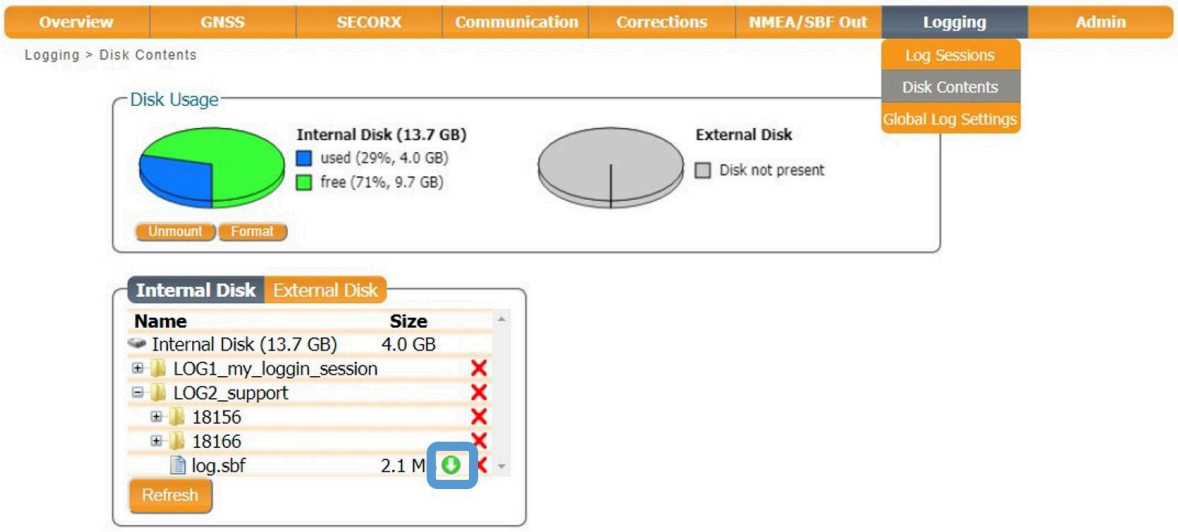


Figure 7-11: Click the icon next to the file you want to download

7.2.2 Diagnostic Report

A **Diagnostic Report** can be generated under the **Admin/About** tab on the Web interface as shown in Figure 7-12 and saved to your PC.

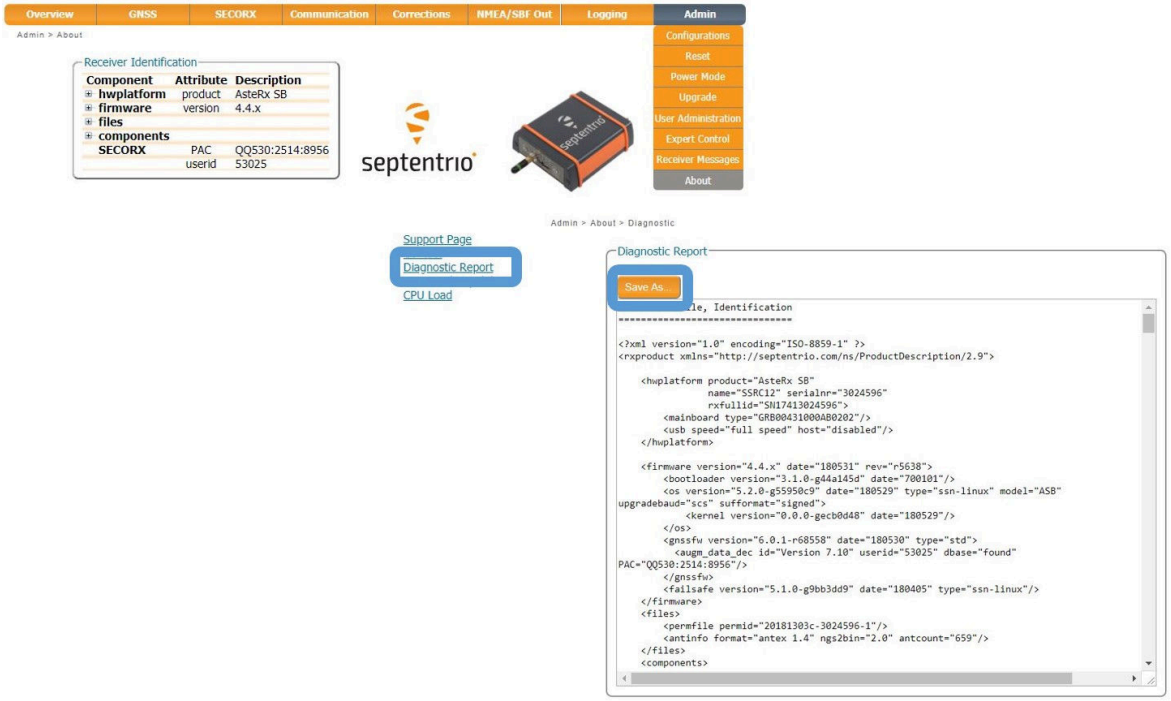


Figure 7-12: Generate a Diagnostic Report

7.3 Activity logging

The AsteRx SB reports various events in the **Receiver Messages** window of the **Admin** menu that can be used to check receiver operations. The example in Figure 7-13 shows that four, 15 minutes SBF files have been successfully FTP pushed to a remote location.

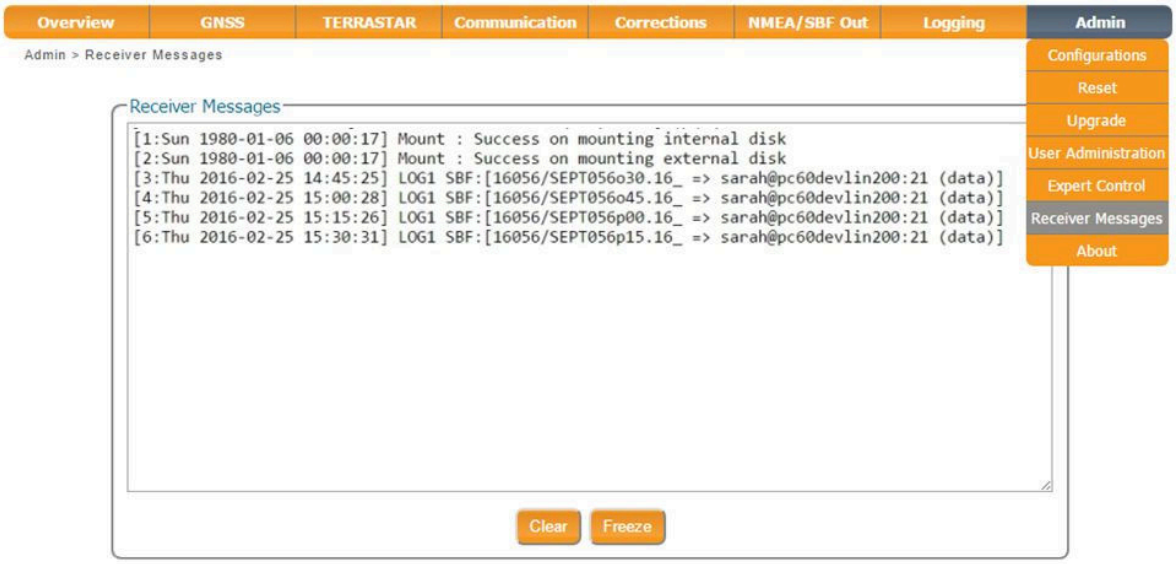


Figure 7-13: Events reported by the AsteR SB in the **Receiver Messages** window

8 Receiver Administration Operations

8.1 Configurations

A configuration is a collection of all settings and values that determine the behaviour of the receiver. The table below gives an overview of the AsteRx SB's configurations.

Configuration	Persists after power cycle	Writable	Description
RxDefault	Yes	No	The factory default configuration
Current	No	Yes	Settings that are actually being used
Boot	Yes	Yes	The receiver configuration on start up
User1, User 2	Yes	Yes	Two configurations can be stored for later use

With the Web Interface, you can perform the following operations on configurations:

Copy	The Copy operation allows the user to copy any of the five configurations into another configuration
Download	The Download operation allows the user to export a selected configuration to a text file
Upload	The Upload operation allows the user to import a selected configuration from a text file

8.1.1 Saving the configuration

After each change made to the configuration of the AsteRx SB, the pop-up shown in Figure 8-1 will appear. Clicking on 'Save' will cause the new configuration to be applied the next time the receiver is powered. Configurations can also be saved as text files and uploaded to other receivers. See Section 8.1.2 for more information on managing configurations.

Figure 8-1: The 'save to Boot' pop-up

If you have consistently pressed 'Save' when the pop up appears on the screen, all settings will be persistent and will be applied again when the device powered on.

You can also save the current configuration as the boot configuration on the **Admin/Configurations** window as shown in Figure 8-2. Select **Current** and **Boot** from the drop-down lists as shown then click on **Ok** to apply the setting.

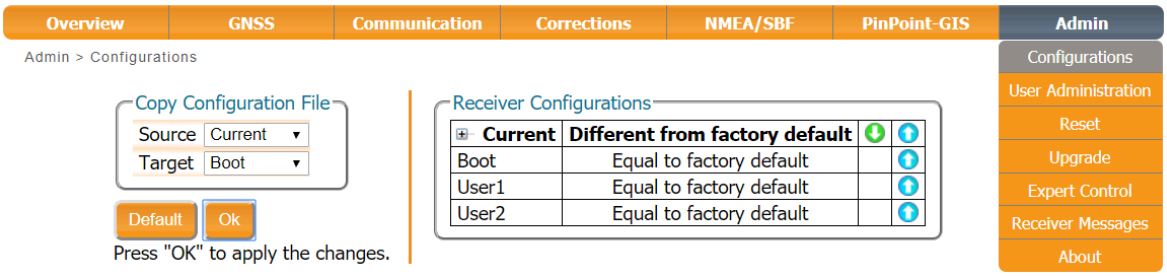


Figure 8-2: Select 'Current' as Source and 'Boot' as Target to save the current configuration

8.1.2 Managing Configurations

In the **Admin Configurations** tab, the configuration of an AsteRx SB can be easily saved to a PC as a text file. A saved configuration can also be uploaded to an AsteRx SB.

1. Click the **Admin** tab.
2. Select **Configurations**. The Configurations tab will resemble Figure 8-3.

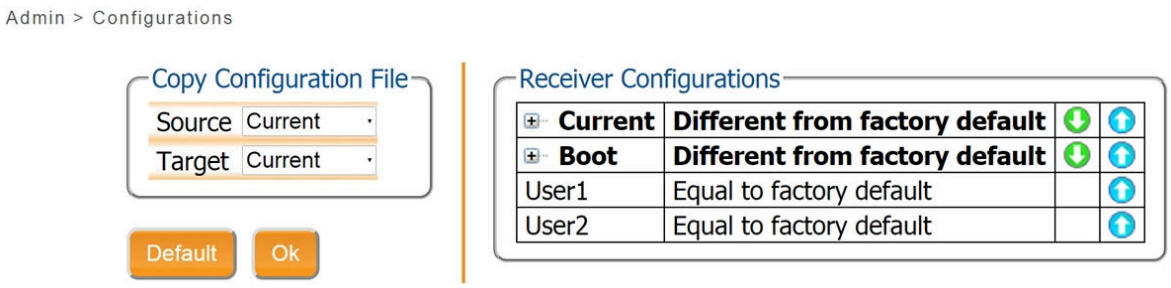


Figure 8-3: Web Interface Admin-Configurations

Copy Configuration File

1. Select the configuration to be copied in the Source drop down box.
2. Select where the Source configuration is to be copied into using the Target drop down box.
3. Click OK

Download Configuration

1. Click the next to the configuration to be downloaded.
2. The download is started immediately.
3. The configuration will be saved as a .txt file in the browser's download folder.

Upload Configuration

1. Click the next to the configuration to be uploaded.
2. A window pops up for the user to select a file.
3. After a file has been selected the upload is started immediately.

If the uploaded file contains invalid commands, the complete file is ignored and the configuration remains unchanged.

8.1.3 How to set the AsteRx SB to its default configuration

You can set the AsteRx SB configuration to its default settings via the **Admin Configurations** tab as shown in Figure 8-4. Select **RxDefault** from the **Source** drop-down list and either **Current** or **Boot** in the **Target** menu. You will then be prompted to Save or Ignore the new current configuration as the boot configuration.

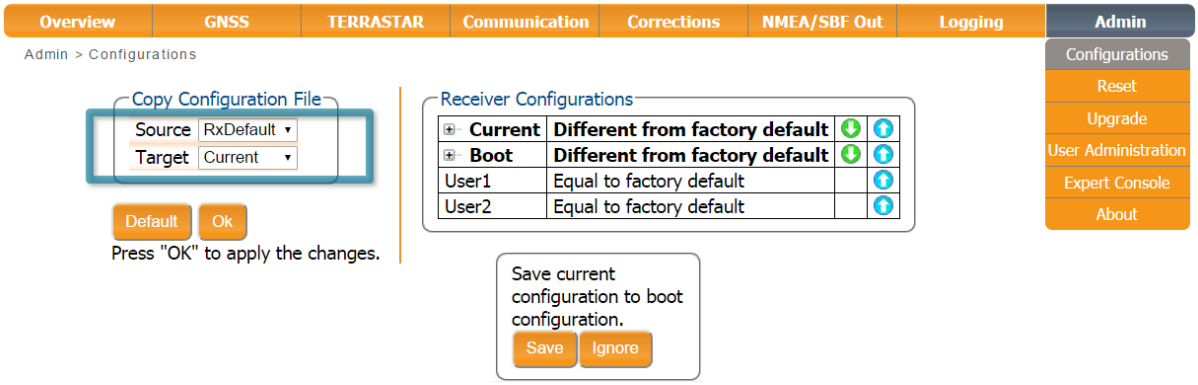


Figure 8-4: Setting the AsteRx SB to the default configuration

Please note that this procedure will not erase the IP settings of the receiver. This can only be done on the **Ethernet** page of the **Communication** menu.

8.2 Resetting the AsteRx SB

When the AsteRx SB is not operating as expected, a simple reset may resolve matters. The AsteRx SB can be fully power-cycled using the front-panel button, however via the **Admin Reset** tab, different functionalities can be individually reset as shown in Figure 8-5. The reset options are described in Tables 8.2-1 and 8.2-2.

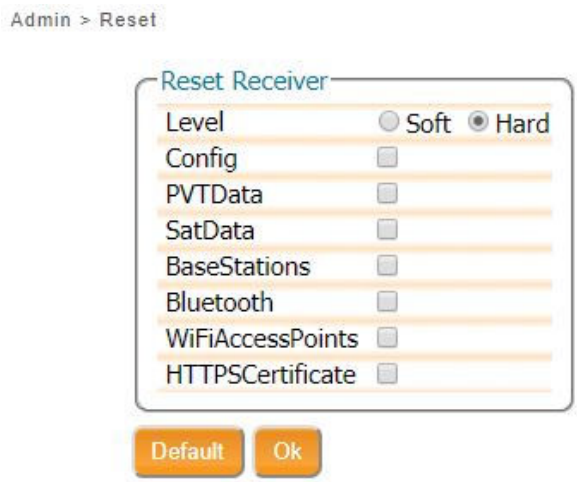


Figure 8-5: Admin - Reset

Level	Description
Soft	This is a reset of the receiver's firmware. The receiver will restart operating in the same configuration as before the command was issued, unless the 'Config' option has been ticked.
Hard	This is similar to a power off/on sequence. After hardware reset, the receiver will copy the Boot configuration into the Current configuration..

Table 8.2-1: AsteRx SB Reset Levels

Erase	Description
Config	The RxDefault configuration is copied into the receiver's Boot and Current configurations. The User1 and User2 configurations remain unchanged.
PVTData	The latest computed PVT data stored is erased.
SatData	All satellite navigation data (ephemeris, almanac, ionosphere parameters, UTC, ...) stored is erased.
BaseStations	All Base stations stored are erased.
Bluetooth	All information about previously known Bluetooth devices is erased.
WiFiAccessPoints	The list of known WiFi access points is erased.
HTTPSCertificate	The current HTTPS certificate is removed and will be replaced by self-signed certificate at boot.

Table 8.2-2: AsteRx SB Reset- Memory Erase Options

8.3 Upgrading the firmware or upload a new permission file

The AsteRx SB firmware and permission files both have the extension .suf (Septentrio Upgrade Format). Firmware upgrades for the AsteRx SB are freely available for the lifetime of the receiver and can be downloaded from the Support section of the Septentrio website. All upgrade files and documentation relating to the upgrade are bundled together in a single upgrade zip file. We recommend that you read the release notes for the firmware upgrade beforehand in case there are any changes that may affect your use of the receiver. Permission files enable additional features on the AsteRx SB and can be purchased via our Sales department.

On the **Admin** menu select **Upgrade** and then click the **Choose file** button. You can then select the upgrade .suf file. For major upgrades, two or more files may have to be upgraded separately. The files to be upgraded and the order for upgrading is documented in release notes. After selecting the upgrade .suf file click on **Start upgrade**.

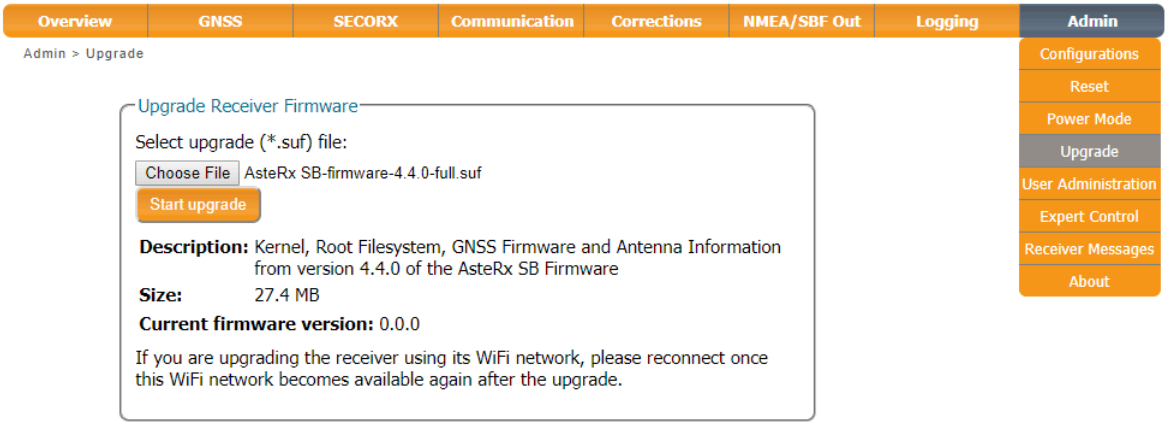


Figure 8-6: Upgrading the AsteRx SB firmware

Upgrading firmware can take several minutes during which the receiver will reset. When connected via WiFi, the connection may not be automatically re-established.

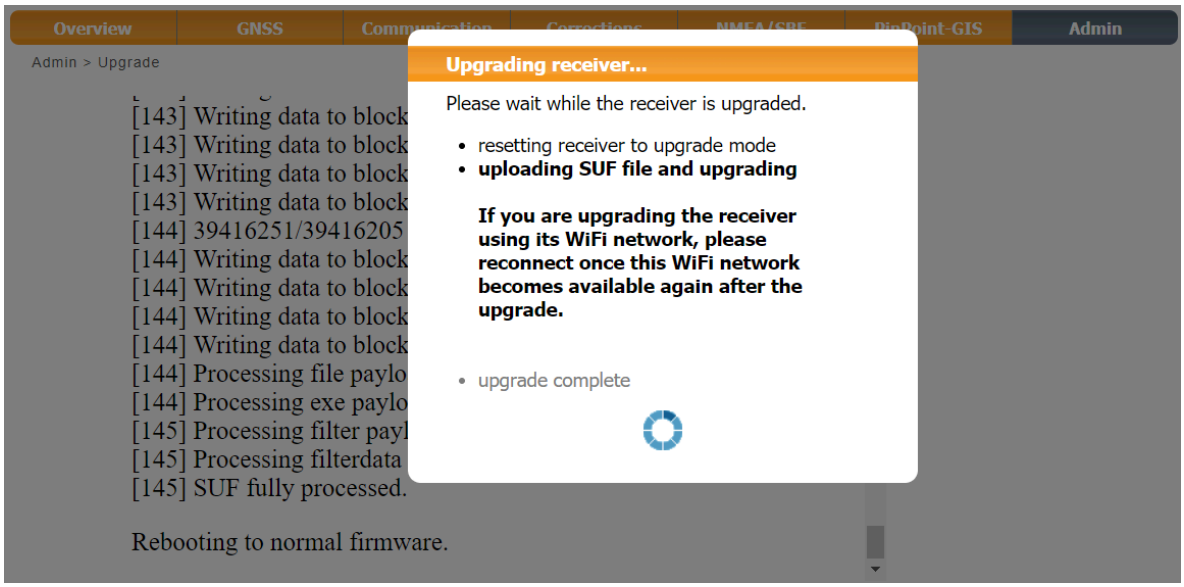


Figure 8-7: The AsteRx SB upgrade procedure

If there were no problems with the upgrade the message **Upgrade successful** will appear. You can then check on the **Admin About** tab that the AsteRx SB firmware or permission file has the correct, new version.

8.4 How to change IP settings of the AsteRx SB

The IP settings of the AsteRx SB can be configured on the **Ethernet** window of the Web Interface. By default, the AsteRx SB is configured to use DHCP to obtain an IP address but, a static IP address can also be configured as shown in Figure 8-8. The *lif,ipparameters* command shows the current ip configuration available and can be helpful for debugging network issues.

In Static mode, the receiver will not attempt to request an address via DHCP but will use the specified IP address, netmask, gateway, domain name and DNS. DNS1 is the primary DNS, and DNS2 is the backup DNS. In DHCP mode, the arguments IP, Netmask, Gateway, Domain, DNS1, and DNS2 are ignored.

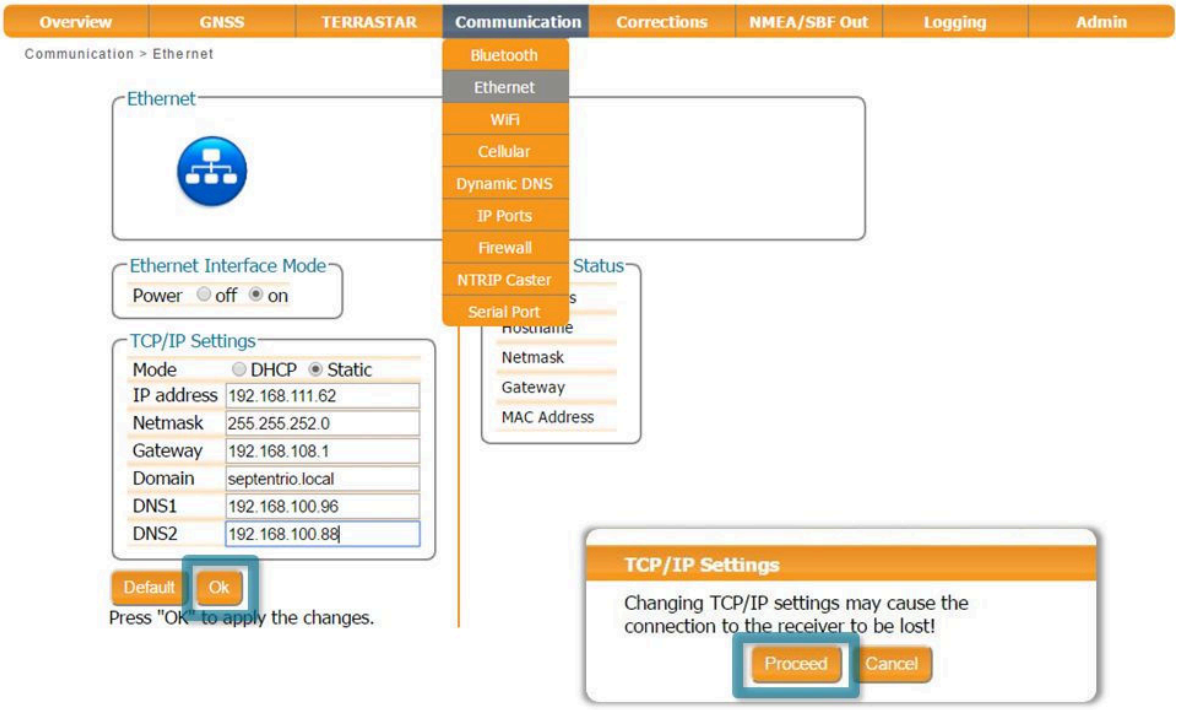


Figure 8-8: Configuring a static IP address

The new IP address should now appear in the **Ethernet Status** field as shown in Figure 8-9.

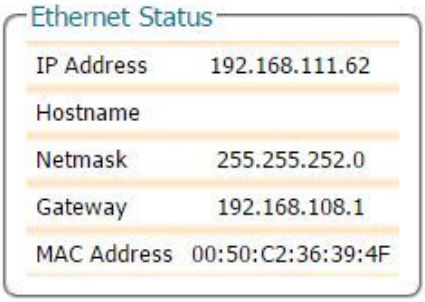


Figure 8-9: TCP/IP settings

Note that the IP settings will keep their value after a power cycle and even after a reset to factory default in order to avoid accidentally losing an Ethernet connection to the receiver.

8.5 How to configure Dynamic DNS

Dynamic DNS allows remote contact with the AsteRx SB using a hostname.

When devices are connected to the internet, they are assigned an IP address by an internet service provider (ISP). If the IP address is *dynamic*, then it may change over time resulting in a loss of connection. Dynamic DNS (DynDNS or DDNS) is a service that addresses this problem by linking a user-defined hostname for the device to whichever IP address is currently assigned to it.

Step 1: Open a Dynamic DNS account

To make use of this feature on the AsteRx SB, you should first create an account with a Dynamic DNS provider to register a hostname for your receiver. The AsteRx SB supports the following two services:

- Dyn DNS: http://dyn.com/
- No IP: http://www.noip.com/

Having opened account, you can then create a host service for which you will need to specify a URL or hostname for the receiver (e.g. axsb.ddns.net).

Step 2: Configure the Dynamic DNS settings of the receiver

In the **Dynamic DNS** window of the **Communication** menu, the hostname of the receiver and other Dynamic DNS settings can be entered.

In the example shown in Figure 8-10, the hostname *axsb.ddns.net* has been registered with ddns.net. The *Bind* option tells the Dynamic DNS provider to automatically update IP addresses assigned over either an Ethernet or WiFi connection.

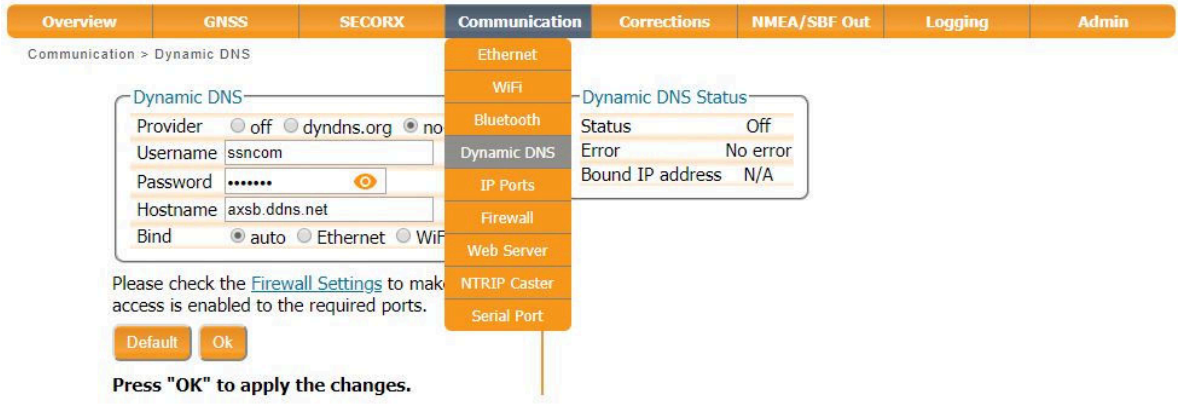


Figure 8-10: Configuring Dynamic DNS

8.6 How to control access using the AsteRx SB Firewall

You can control access to the AsteRx SB using the receiver's firewall in the **Firewall** window. By default, all Ethernet and WiFi ports are open (i.e. those defined on the **IP Ports** menu).

In the example shown in Figure 8-11, Ethernet ports 2101, 2102 and 2103 are accessible but only from devices with the IP address 84.199.9.148. Similarly, all WiFi ports are open but only those from IP 84.199.9.148.

Please note that the firewall settings do not apply when connecting to the web interface using USB. In the case of WiFi, firewall settings only apply when the receiver is in WiFi client mode.

Figure 8-11: Configuring the Firewall of the AsteRx-U

8.7 Using the Expert Console

Commands can be sent to the AsteRx SB using the **Expert Console** window on the accessible via the **Admin** menu as shown in Figure 8-12

- The command responses will be shown the window below the label 'Expert Console'.
- Clicking the up and down arrows of your keyboard will allow you to scroll through previously entered commands
- Specific messages may be viewed via the Message Inspector
- The command set of the AsteRx SB is described in the 'Command Line Interface Reference Guide.pdf'

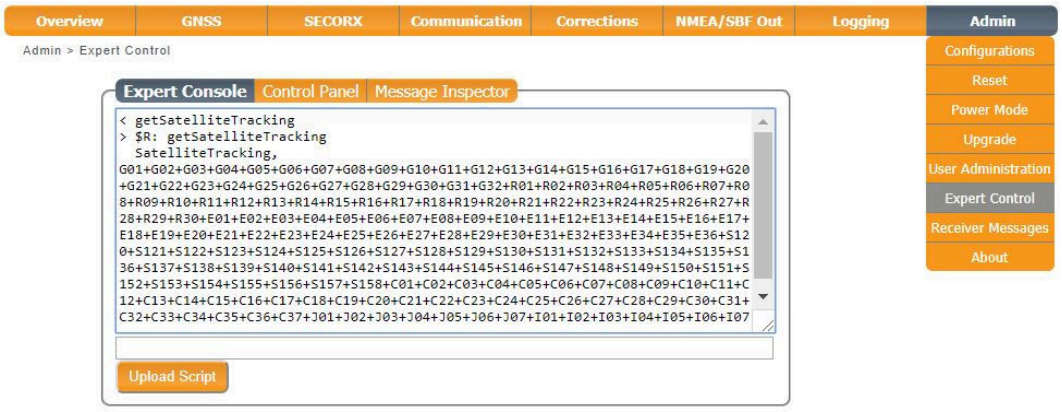


Figure 8-12: Web Interface Admin-Expert Console

9 Security

9.1 How to manage access to the AsteRx SB

You can manage the access that users have to the AsteRx SB in the **User Administration** window of the **Admin** menu. By default, all communication interfaces are assigned User-level access as shown in Figure 9-1. 'User' level allows full control of the receiver while 'Viewer' level only allows viewing graphics and configurations.

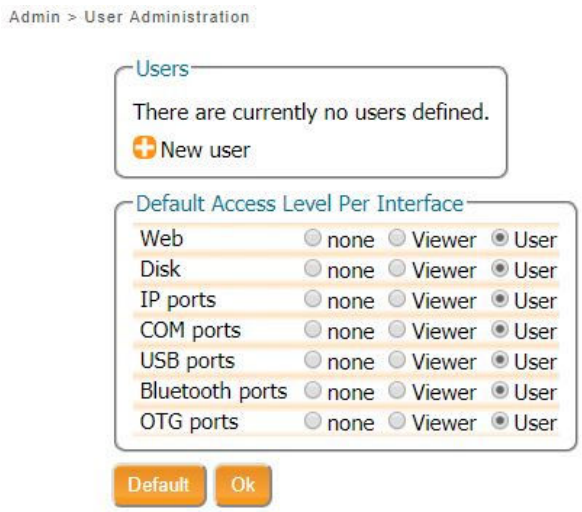


Figure 9-1: The default access levels of the AsteRx SB

To configure a new user, click on the **New user** button as shown in Figure 9-1 and enter the name and password of the user as well as their access level. For added security, an SSH key can be used. This is described in Section 9.1.1.

In the example shown in Figure 9-2:

Web Interface: Anonymous users (without password) can connect to the receiver via the web interface as Viewers. They can browse the various windows but cannot change any of the settings. Only George, who has User access, can change receiver settings via the web interface.

FTP: Anonymous users have full access over FTP so can download and delete logged data files.

IP, COM, USB, and Bluetooth ports: Only George has User access to these ports so can change receiver settings over these connections. Mildred has only viewer access, so can only send commands to show the configuration. Anonymous users can neither change or view the receiver configuration over these connections.

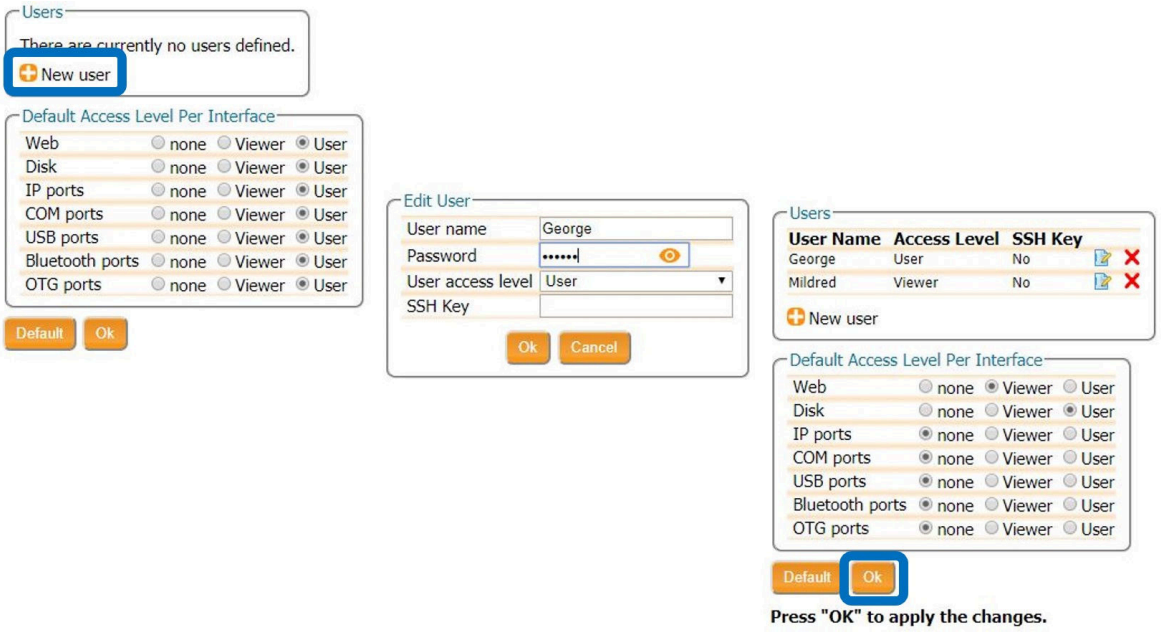


Figure 9-2: Defining user access

After defining the Users/Viewers and their access levels, they can then login on the web interface by clicking on **Log in** on the upper-right corner as shown in Figure 9-3.

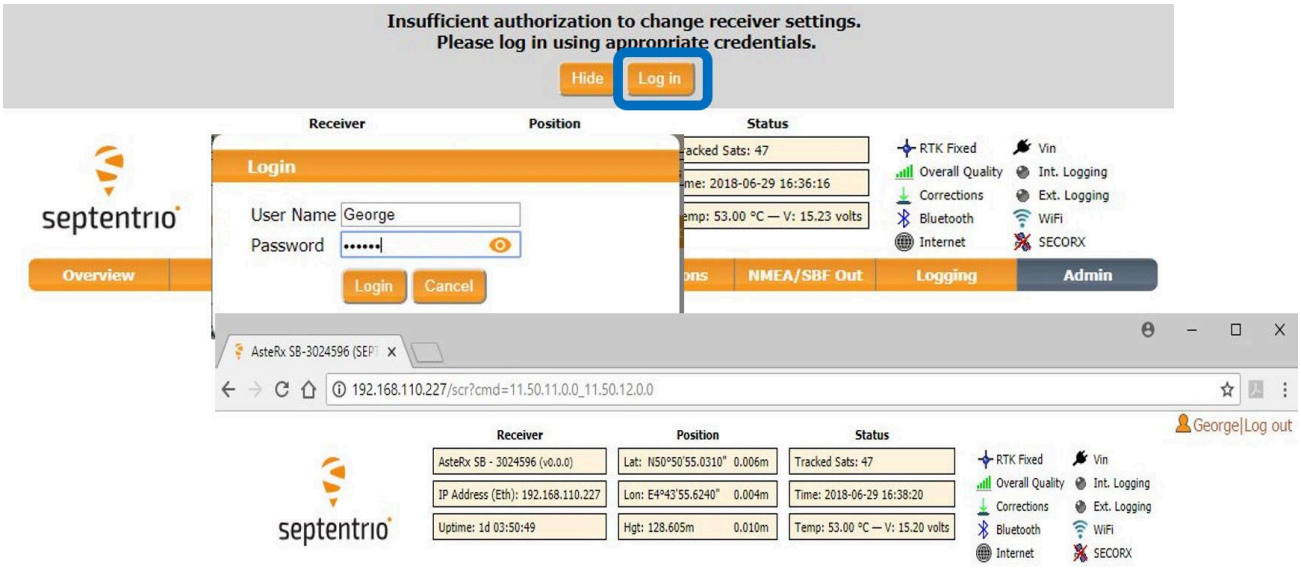


Figure 9-3: Logging in to the Web Interface

9.1.1 SSH key authentication

By default, anonymous users have full access over FTP, SFTP and rsync to the files logged on the AsteRx SB. FTP, SFTP and rsync access can be limited by configuring user access, as described in Section 9.1. For added security, user authentication for SFTP and rsync access can be configured using an SSH public key. When an SSH key is defined, the configured user can download files using SFTP or rsync without entering a password provided of course, that the matching private key is known by the key agent running on the same PC.

You can generate public and private keys using for example, **PuTTY Key Generator** as shown in Figure 9-4.

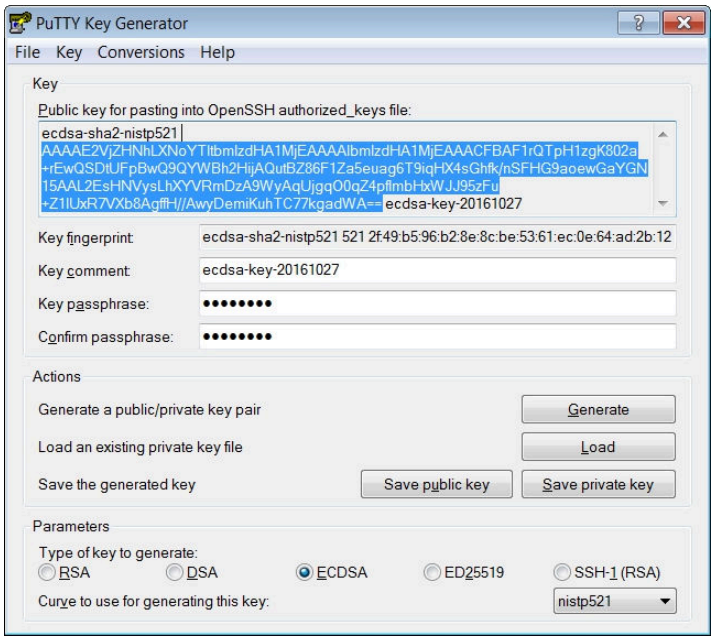


Figure 9-4: Generating SSH keys using the PuTTY Key Generator. The public key is highlighted.

The generated public key is the highlighted text that can be pasted directly into the **SSH Key** field of the AsteRx SB Web Interface as shown in Figure 9-5.

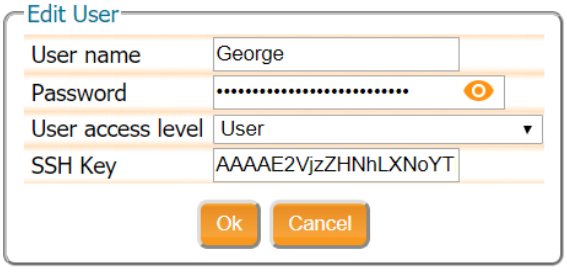


Figure 9-5: Using an SSH Key for access for user George

521-bit ECSDA keys offer the best security however, ECSDA 256 and 384-bit keys can also be used. Alternatively, RSA 512 and 1024 key encryption is also supported.

10 GIS Collection with PinPoint-GIS or other applications

10.1 Introduction

Key Features

- Access to your ArcGIS Online maps on the field
- Straightforward GIS data collection
- Reliability and scalable accuracy guaranteed
- Any platform, any where

PinPoint-GIS is a powerful utility software suite enabling straightforward GIS data collection of accurate and reliable GNSS positioning from your Septentrio receiver. It provides seamless integration of this data directly into GIS database workflows.

PinPoint-GIS exists in 2 forms:

- **PinPoint-GIS Web**: which allows use of ArcGIS Online maps
- **PinPoint-GIS Rx**: a generic GIS system independent of any GIS tool set allowing you to store data into CSV files

PinPoint-GIS is an extension of Septentrio's web interface with a direct link to ArcGIS. Online via PinPoint-GIS Web and with a generic on-board data collection mechanism for any GIS workflow thanks to PinPoint-GIS Rx (not linked to ArcGIS accounts). It offers a unique solution with the power to run GIS collection inside Septentrio GNSS receivers. No extra applications are needed, simply use your preferred web browser for full GIS workflow - from accurate data collection in the field directly to either the ArcGIS Online Cloud or to your preferred GIS toolset.

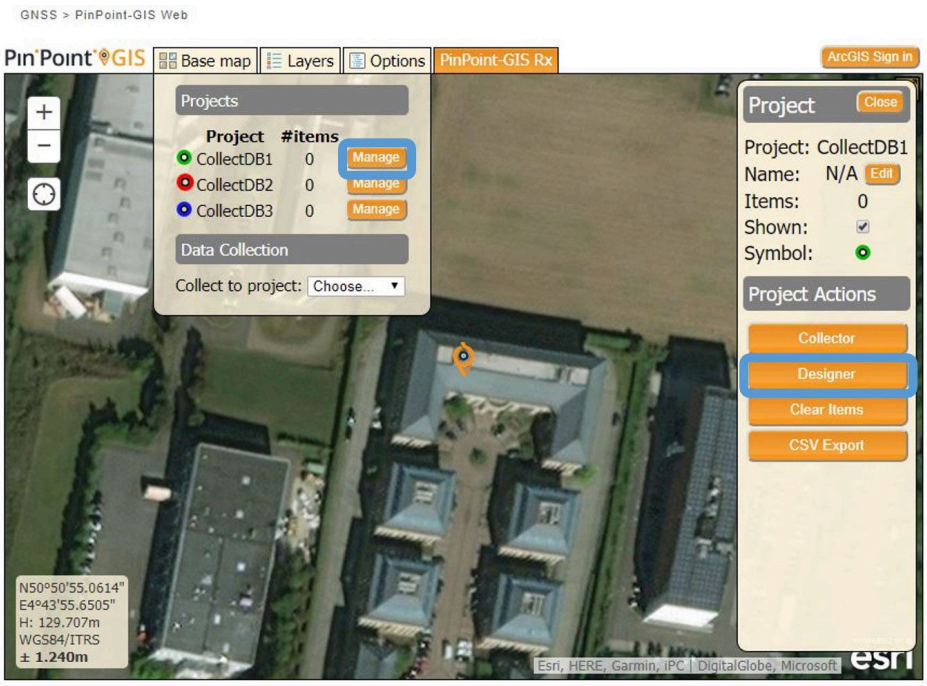
PinPoint-GIS Rx also allows integrators to implement their own collection system by using the command line interface of the receiver to easily allow data collection in their own applications while benefiting from all receiver fields and internal memory.

10.2 Using the AsteRx SB on-board simple data collector

To be able to use PinPoint-GIS Web, your browser should be connected to the internet and the receiver should have the Data Collection permission option.

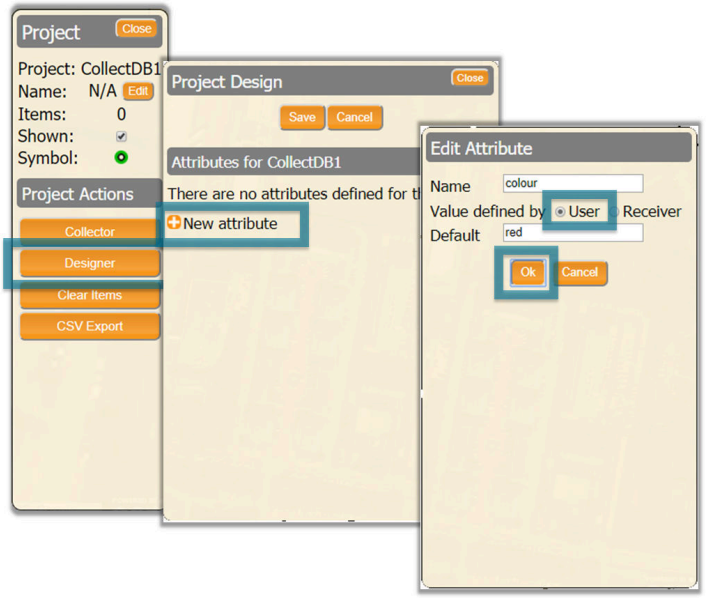
10.2.1 Designing a collection project

On the **GNSS** menu of the Web Interface, select **PinPoint-GIS Web**, click on **PinPoint-GIS Rx** to select and to edit a collection project. There are three collection projects that can be configured. Select the project you want to edit and click **Manage** then **Designer**.



Adding a user-defined attribute

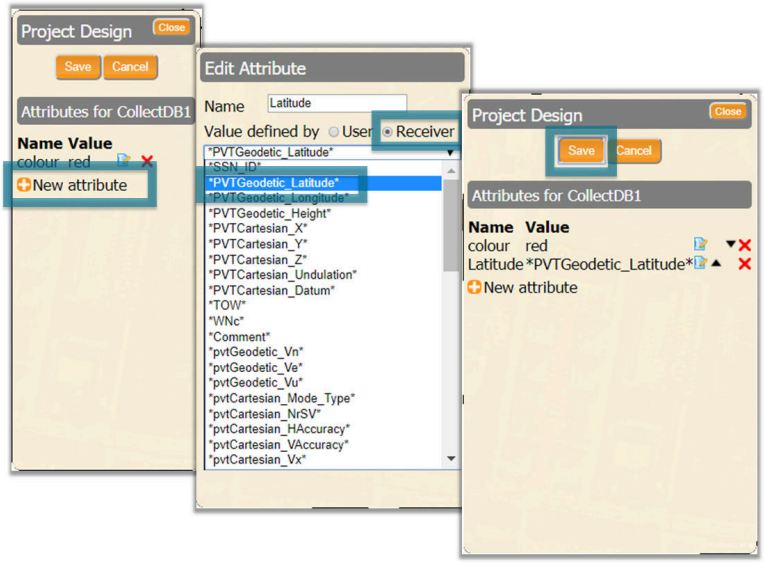
On the project pop-up, click **Designer/New attribute** then select **User** to define a user-defined attribute. Fill in the name of the attribute and default value you want it to take.



Adding a receiver output attribute

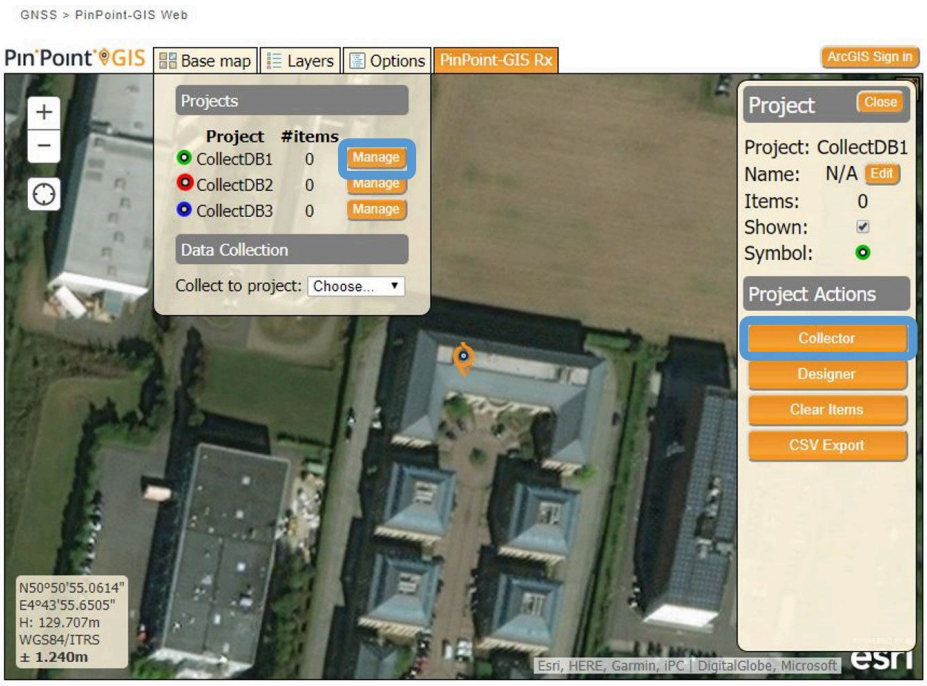
Click on **New attribute** again, then select **Receiver**. This will generate a drop-down list from which you can select the receiver data output that you want to collect.

When all attributes have been added, click on **Save** and close the project design window.



10.2.2 Performing a collection

On the **GNSS** menu of the Web Interface, select **PinPoint-GIS Web**, click on **PinPoint-GIS Rx** and then the **Manage** button next to the project you want to use. You can then click on the **Collector** button to start a collection.

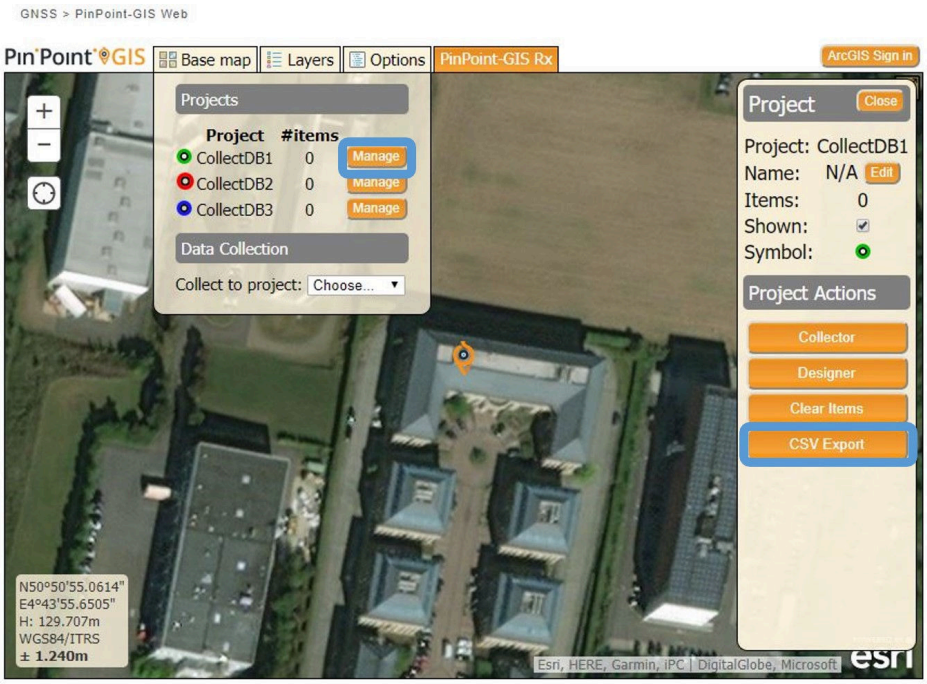


At each collection point, click on **collect** and enter the details of the user-defined attribute then click **Save**. When the collection is finished, you can click on **Close** to close the collection window.

Please note that, points cannot be collected at more than 1 point per second.

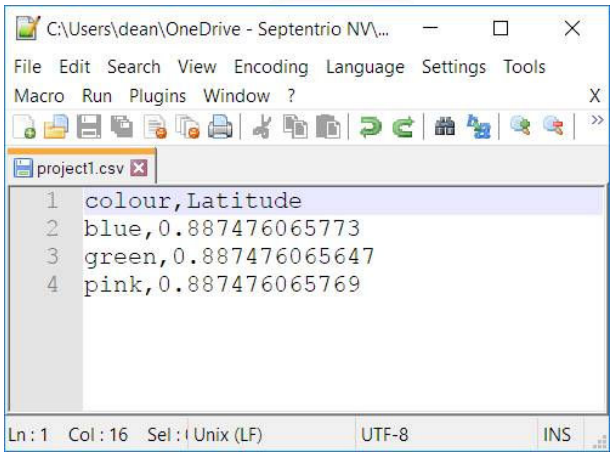
10.2.3 Downloading collected data

On the **GNSS** menu of the Web Interface, select **PinPoint-GIS Web**, click on **PinPoint-GIS Rx** and then the **Manage** button next to the project you want download. The project window will pop-up where you can click on the **CSV Export** button.



In the export pop-up window, enter a name for the file and select the column separator. Click on **Export** to generate the file and then on **Download**.

The file can be opened in Excel or any text editor.



10.3 Using PinPoint-GIS Web

PinPoint-GIS Web allows you to access your ArcGIS Online maps. It works on any platform with a web browser and makes the bridge between GIS and accurate data collection.

The following steps will guide you through the main functionalities of PinPoint-GIS Web.

GNSS menu of the Web Interface, select **PinPoint-GIS Web**

The PinPoint-GIS view is located in the **GNSS/PinPoint-GIS Web** menu of the web interface. Within this view you have full access to your ArcGIS Online user maps. The system allows you to select your ArcGIS Online user maps, change the background of your user map using the multiple Basemaps available from Esri, Display or hide the different layers and filters of your map, and will allow you to have configurability for Portal for ArcGIS in the case your data is located in a specific secured ArcGIS Server.

Navigation within the PinPoint-GIS Web view is straightforward and allows you to visualize all the main GIS and GNSS information in a single view. The view can easily be maximized using the maximize/minimize button in the right corner of the map . This is handy when working in the field with tablet screens.

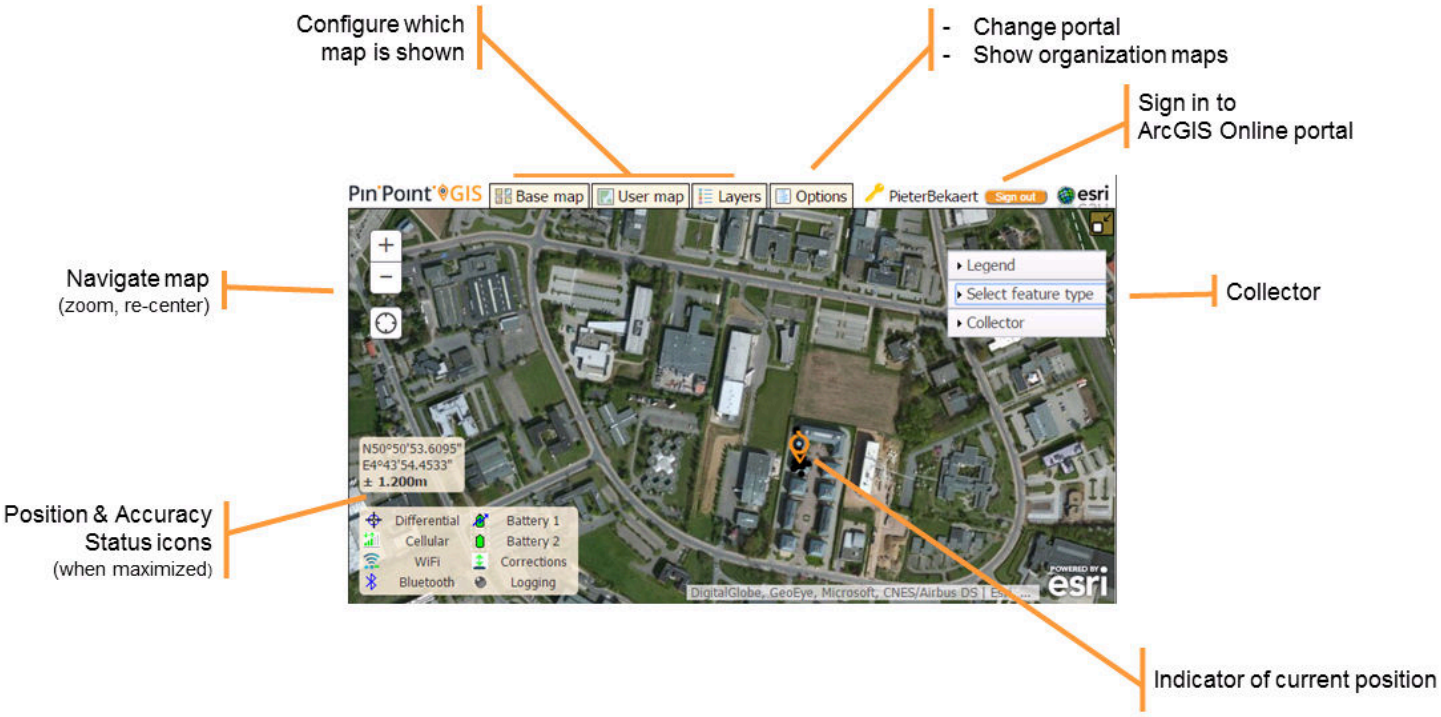


Figure 10-8: Functions within PinPoint-GIS Web

A Rear-panel port descriptions

A.1 PWR-COM2&3/USB

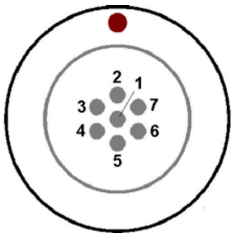


Figure A-1: Solder view of the 7-pin female PWR-COM2&3/USB socket on the rear panel of the AsteRx SB

The 7-pin connector type is an ODU MINI-SNAP F Circular Connector Series S40F1C-P07MCD0-500S.

PIN #	Colour	COM mode	USB mode	Comment
1	Red	PWR	Not connected	5-36 VDC input (1.3A) Pink wire with Red heat-shrink tube
2	Black	GND	GND	Ground Brown wire with Black heat-shrink tube
3	Green	RxD3	USB D-	**EITHER** Serial COM3 receive line **OR** Negative USB 2.0 FS device node. Selection is done via pin 7.
4	Yellow	TxD3	Not connected	Serial COM3 transmit line
5	Grey	RxD2	USB D+	**EITHER** Serial COM2 receive line **OR** Positive USB 2.0 FS device node. Selection is done via pin 7.
6	White	TxD2	Not connected	Serial COM2 transmit line
7	Blue	Not connected	VBus	4.4-5.25 V input. **If present**, USB-mode is selected. **If not present**, UART Serial COM mode is selected.

A.2 COM1-GPIO

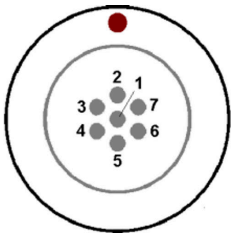


Figure A-2: Solder view of the 7-pin female COM1-GPIO socket on the rear panel of the AsteRx SB

The 7-pin connector type is an ODU MINI-SNAP F Circular Connector Series S40F1C-P07MCD0-500S.

PIN #	Colour	Name	Comment
1	Pink	EVENTA	First EVENT input (Max. V_{IL} = 1V, Min. V_{IH} = 2V, Max. V_{IH} = 24V, Internal delay to detection < 1 μs, 15 KΩ pull-down)
2	Black	GND	Ground Brown wire with Black heat-shrink tube
3	Green	COM1 CTS/ EVENTB	COM1 Clear to Send. This also connects to the second event EVENTB input. It has the same electrical specifications as EVENTA (see pin 1).
4	Yellow	COM1 RTS/ PPS_OUT	COM1 Request To Send or PPS_OUT (PPS_OUT low = 0V, PPS_OUT high = 5V). PPS_OUT polarity is consistent with command line reference of OEM module.
5	Grey	RxD1	Serial COM1 receive line
6	White	TxD1	Serial COM1 transmit line
7	Red	5V OUT	5V +/- 5%, 300 mA DC output Blue wire with Red heat-shrink tube

A.3 ETH

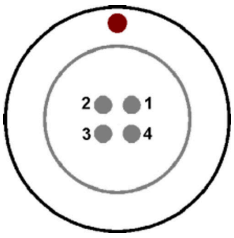


Figure A-3: Solder view of the 4-pin female ETH socket on the rear panel of the AsteRx SB

The 4-pin connector type is an ODU MINI-SNAP F Circular Connector Series S40F1C-P04MFG0-50OO.

PIN #	Name	Description
1	TXP	Ethernet TX+
2	TXN	Ethernet TX-
3	RXP	Ethernet RX+
4	RXN	Ethernet RX-

A.4 MAIN (TNC)

Connect an active GNSS antenna to this connector. The gain at the connector (antenna gain minus cable losses) must be in the range 15 to 50dB.

By default, the receiver provides a 3.3V DC supply on the MAIN connector to feed the antenna. The supplied antenna voltage can be changed to 5V DC with the command *setAntennaVoltage*. The maximum supported current is 200mA.

Never inject a DC voltage into the MAIN connector as it may damage the receiver. When using a splitter to distribute the antenna signal to several receivers, make sure that no more than one output of the splitter passes DC. Use DC-blocks otherwise.

B Powering the AsteRx SB

There are 4 ways to power the AsteRx SB:

- The PWR connector (5-36 VDC)
- The Ethernet connector (Power over Ethernet - PoE, 37-57 VDC). Please note that only mode A, as specified in the 802.3af standard, is supported.
- The rear-panel USB connector connected to a PC or a USB adapter.
- The front-panel USB OTG socket connected to either a PC or a USB adapter. A micro-USB cable and adapter are supplied as standard.

If power is provided through the Ethernet, the PWR or USB connectors

- If PWR voltage is above 12V, PWR takes precedence.
- If PWR voltage is below 12V, Ethernet takes precedence.
- If power is supplied through USB, together with any other supply (Ethernet or PWR), USB is always used as backup power supply.
- For delivering power through USB, both USB ports are considered equal.

If the receiver is supplied from a voltage source > 5.5V:

- The USB OTG port is only usable as USB device (not as USB host).
- No power should be drawn from the 5V OUT pin of the COM1-GPIO connector.

When powered via Ethernet, this allows the connection of a back-up battery to the ODU PWR connector. The battery will only be used in case of an outage of the power over Ethernet.

The current power source (PWR or Ethernet connector) and the voltage at the PWR connector are reported in the `PowerStatus` SBF bock.

Be aware that if you are using your own cables for powering the AsteRx SB at low voltage (5V), care should be taken of voltage drops if the cables are too thin.

C Status icons and front-panel LEDs

C.1 Status Icons on the Web Interface

The icons on the right-hand side of the top banner quickly show the user the status of the AsteRx SB.

Position mode	 Static	 Standalone	 SBAS	 Differential	 Float	 Fixed	 PPP
Overall Quality	 Bad				 Good		
Corrections	 None	 Output	 Input	 Output & Input			
Bluetooth	 Off		 On				
Internet [1]	 Connected		 Not Connected				
Power Mode	 PWR Connector	 Power over USB	 Power over Ethernet				
Logging	Off	 Logging	 Disk full or not mounted				
Wi-Fi	 Off		 On				
SeCoRx	 Disabled		 Enabled				

Table C.1-1: Web Interface Status Icons

[1] By default the Internet access is continuously checked every 1 minute and one of the icons will show up. The check can be enabled or disabled with the command *setCheckInternetAvailability*. When this setting is disabled the icons will disappear.

D Connecting to the Web Interface in Client WiFi mode

Using your iOS mobile device as a personal hotspot can be useful for sharing the internet connection of your mobile device to the AsteRx SB. In this case you need to configure the receiver in WiFi client mode and the web interface needs to be accessed in a different way (you will not be able to connect using **192.168.20.1**).

The following steps describe the way the AsteRx SB can be configured for using the mobile connection of your mobile device and the way to connect to the web Interface.

1. Make sure your mobile device has been configured with personal hotspot (a user and a password will be displayed to the user)
2. Plug the USB cable of the Rover unit and connect to the web interface using **192.168.3.1**
3. On the **Communications/WiFi** window, enable the Client WiFi mode and click on **OK** as shown in Figure D-1

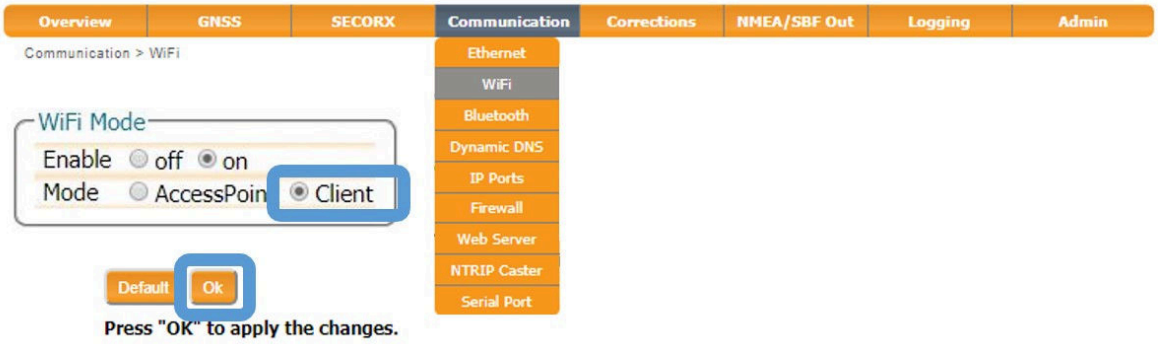


Figure D-1: WiFi client mode of the Web Interface

2. Click on **Configure Networks** in the WiFi Client Config panel. This will display a list of reachable WiFi networks. From the list of networks, select to connect to the mobile device by clicking **Add**. Confirm by **OK** as shown in Figure D-2.

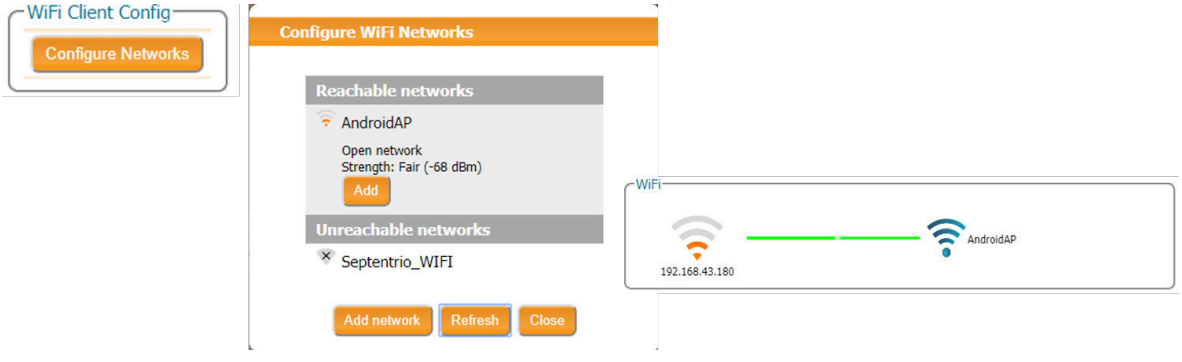


Figure D-2: Connect to WiFi network

3. Access the web interface via your mobile device:
   - **iOS devices**: You can easily access the web interface by using **http://asterxsb.local** or **http://asterxsb-*xxxxxxx*.local** in your web browser. Where 'xxxxxxx' is the 7-digit serial number of the receiver.
   - **Android and Windows devices**: To access web interface you need to know the IP address assigned to the receiver by your mobile device. Most Android devices allow you to see the assigned IP address within the network settings. Alternatively, you can connect to the receiver using USB in order to find the IP address assigned to the receiver (displayed in the WiFi graphical widget).