AsteRx RB3
AsteRx RBi3

User Manual

User Manual   Version 1.0
Applicable to version 1.0.0 of the AsteRx RB3 Firmware
Applicable to version 1.5.0 of the AsteRx RBi3 Firmware

August 28, 2025
Thank you for choosing the Septentrio! This user manual provides detailed instructions on how to use the product and we recommend that you read it carefully before you start using the device.

Please note that this manual provides descriptions of all functionalities of the product family however, the particular configuration you purchased may not support functions specific to certain variants.

Pictures and screen-shots are shown for illustration purpose only and actual product may vary. While we try to keep the manual as complete and up-to-date as possible, it may be that future features, functionality or other product specifications change without prior notice or obligation. The information contained in this manual is subject to change without notice. We recommend you to look for new or updated information in our Knowledge Base at https://customersupport.septentrio.com/s/topiccatalog

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Contents

1 Introduction

1.1 User Notices

1.1.1 CE Regulatory Notice

AsteRx RB3 receivers carry the CE mark and are as such compliant with the 2014/53/EU - Radio Equipment Directive (RED), 2011/65/EU - Restriction of Hazardous Substances (RoHS) Directive and 93/68/EC - CE-marking Directive.

With regards to EMC, the AsteRx RB3 receiver is declared as class A, suitable for residential or business environment. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

1.1.2 FCC Regulatory Notice

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) this device may not cause harmful interference, and
(2) this device must accept any interference received, including interference that might cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

1.1.3 ROHS/WEEE Notice

The AsteRx RB3 receivers are compliant with the latest WEEE, RoHS and REACH directives. For more information see www.septentrio.com/en/environmental-compliance.

1.1.4 Safety information

⚠	The power supply used must match the specifications of the receiver.
⚠	Ultimate disposal of this product should be handled according to all national laws and regulations.
⚠	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.
⚠	The device should be installed by skilled or instructed personnel.

1.1.5 Support

For first-line support please contact your Septentrio dealer. Further information can be found on our website or by contacting Septentrio Technical Support.

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2 Overview

AsteRx RB3 provides multi-frequency, multi-constellation GNSS positioning capability together with GNSS Heading within a rugged IP69K housing for the broadest range of applications.

AsteRx RBi3 adds sensor fusion capabilities, using the internal INS and the optional vehicle velocity input, ensuring 3D attitude, increased position accuracy in difficult GNSS environments, dead reckoning and increased integrity.

AsteRx RB3 can be easily monitored and configured without any special software via the built-in web user interface accessible via Ethernet or USB connections.

2.1 Key features

- Full-constellation, triple-frequency satellite tracking
- Precise and robust heading calculation (with optional Auxiliary antenna)
- cm-level (RTK) with high update rate and low latency
- RTK Rover or Base operation
- Septentrio GNSS+ algorithms for robust industrial performance
- Industrial-grade IMU (Inertial Measurement Unit) for AsteRx RBi3 variants

2.1.1 AsteRx RB3 GNSS

- 544 hardware channels
- Up to 100 Hz Raw data output (code, carrier, navigation data) - variant dependent
- Up to 100 Hz SBAS, DGNSS and RTK positioning - variant dependent
- A Posteriori Multipath Estimator Technique (APME+), including code and phase multipath mitigation
- AIM+ interference unit mitigates against wide and narrow-band interference
- IONO+ Advanced scintillation mitigation
- RAIM Receiver Autonomous Integrity Monitoring
- Differential GNSS rover
- Real Time Kinematic rover
- DGNSS/RTK base - only for Pro+
- Moving base positioning - only for Pro+
- 16 GB Internal Memory for logging - only for Pro+

2.1.2 AsteRx RBi3 GNSS/INS

- 544 hardware channels
- Up to 100 Hz Raw data output (code, carrier, navigation data)
- Up to 100 Hz SBAS, DGNSS and RTK positioning
- 200Hz IMU raw data
- FUSE+ Sensor fusion positioning technology

- A Posteriori Multipath Estimator Technique (APME+), including code and phase multipath mitigation
- AIM+ interference unit mitigates against wide and narrow-band interference
- IONO+ Advanced scintillation mitigation
- RAIM Receiver Autonomous Integrity Monitoring
- Real Time Kinematic (rover)
- 16 GB Internal Memory for logging - only for Pro+

2.1.3 Connectivity

- High-speed serial ports (2 x RS232)
- Ethernet port (TCP/IP and UDP)
- CAN port
- Full-speed USB
- 1 Event marker
- xPPS output (max. 100 Hz)

2.1.4 Physical and Environmental

Size:	168 x 118 x 51 mm (including connectors)
Weight:	0.85 kg
Input voltage:	9-32 V DC
Power consumption:	7.5 W maximum
Temperature Range:	-40 to +70 °C (operational)
	-40 to +85 °C (storage)
Ingress Protection:	IPX9K, IP6X (ISO20655)
Shock:	ISO16750-3 Shock II
Vibration:	ISO16750-3:2023 Test VII, Test IX

2.2 Product variants

The AsteRx RB3 is available in multiple variants:

Variant (Part number)	**Main features**
AsteRx RB3 Pro 410549	• AsteRx RB3 Pro GNSS receiver
AsteRx RB3 Pro+ 410563	• AsteRx RB3 Pro+ GNSS receiver
AsteRx RBi3 Pro 410550	• AsteRx RBi3 Pro GNSS/INS receiver
AsteRx RBi3 Pro+ 410564	• AsteRx RBi3 Pro+ GNSS/INS receiver

2.3 Design

2.3.1 Top view

A top view of AsteRx RB3 and RBi3 is shown in Figure 2-1. Main design elements are:

- There are 4 mounting holes that can accept mounting bolts up to M6.
- One LED is used to indicate the receiver is powered. A second LED is software configurable.
- The vent is recessed for protection against damage.
- The IMU reference point marker is useful for the determination of the lever arm in Inertial Navigation Systems (only on AsteRx RBi3 units).

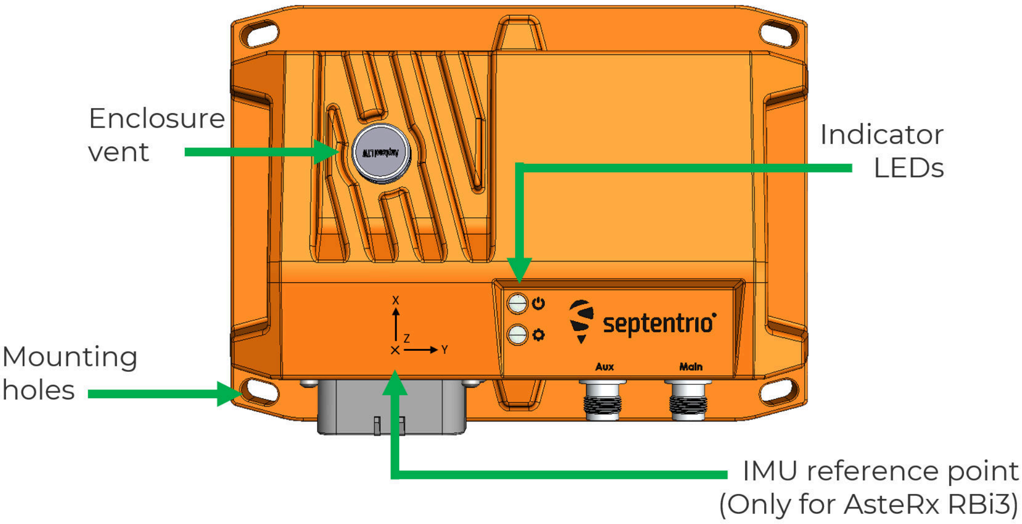

Figure 2-1: AsteRx RB3 and RBi3 top view

2.3.2 Connector panel

The connector panel layout of the AsteRx RB3 is shown in Figure 2-2. It includes a single connector for power & data and two RF input connectors for attaching GNSS main and auxiliary antennas.

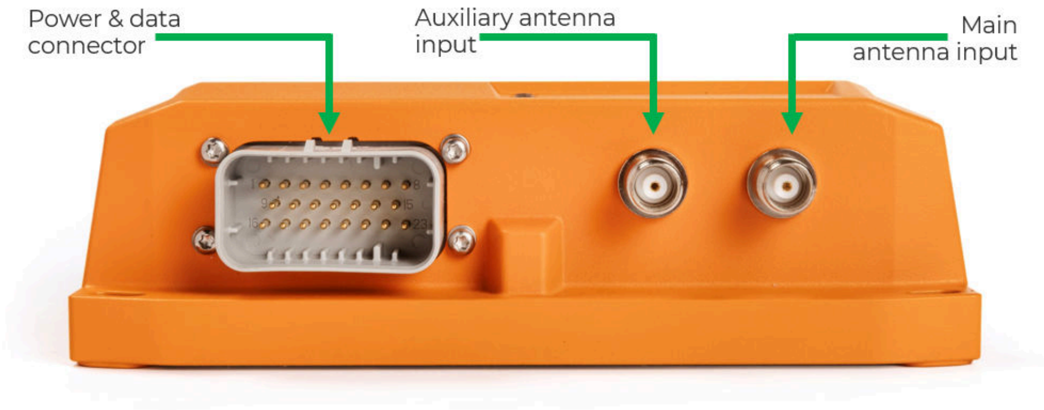

Figure 2-2: AsteRx RB3 connector panel layout

The connector for power and data is TE Ampseal-type (P/N 1-776087-1). The PIN assignment can be found in the Appendix.
The compatible connector on the cable side is TE Ampseal-type (P/N 770680-1)

2.3.3 Mounting instructions

Important: When selecting a mounting location for the receiver, please take into account the following precautions:

- When installed in vehicles, the unit should be properly secured to avoid injuries or damaging the receiver or nearby equipment.
- Select a mounting location that allows enough space for connectors and cables.
- It is preferred to install the receiver with the connectors pointing downwards. This avoid water or dust accumulation around connectors.
- Make sure the receiver and the cables will not be damaged, for example by moving parts or sharp edges.
- We recommend clamping the cables to the support structure as close as possible from the connectors.
- The vent should be protected from mechanical damage and it should not be blocked or clogged.
- Make sure the conditions at the installation location never exceed the specifications of the product.
- Cover unused connectors with caps.
- If the receiver is exposed to marine or corrosive atmosphere, apply dielectric grease inside all connectors and protect them with self-amalgamating tape.

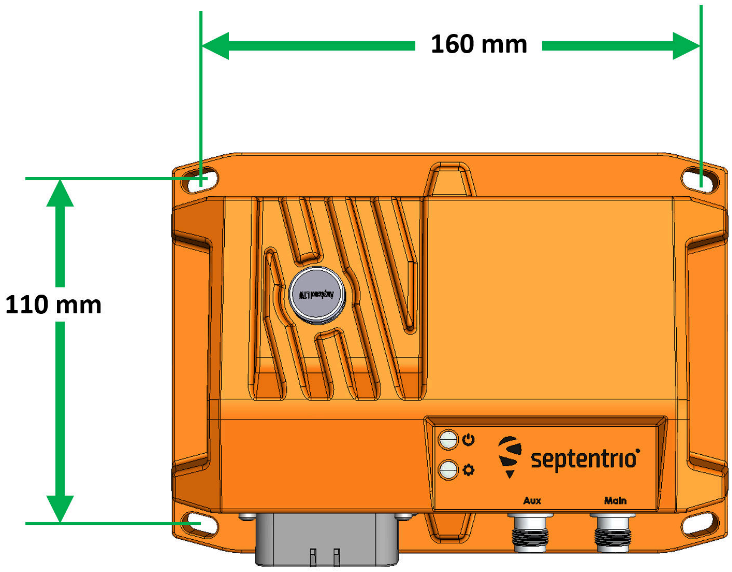

Figure 2-3: AsteRx RB3 top view with mounting holes pattern

The AsteRx RB3 can be fixed to the rover structure using 4 bolts. Mounting holes are on a rectangular pattern. Install on a flat, solid surface.

Use 4pcs. stainless steel (A2) screws (DIN912), size M5 or M6. Screw length: 14mm + support thickness + nut thickness.
Tightening torque: max. 7Nm
Thread-locker or self-locking nuts are recommended.

2.4 Installation of AsteRx RBi3 INS

In order to properly detect motion it is important to mount the AsteRx RBi3 rigidly on the vehicle frame. If possible, to further simplify the setup process, we recommend installing the receiver with the IMU reference X-axis aligned to the vehicle X-axis.

Also note that in order to obtain the best positioning performance from the AsteRx RBi3 it is advised to install the unit on the vehicle part that is less effected by vibrations and shocks, and in a position where the vehicle dynamics are optimally captured (i.e. do not install the system in the axis of rotation of a vehicle that can rotate on its own).

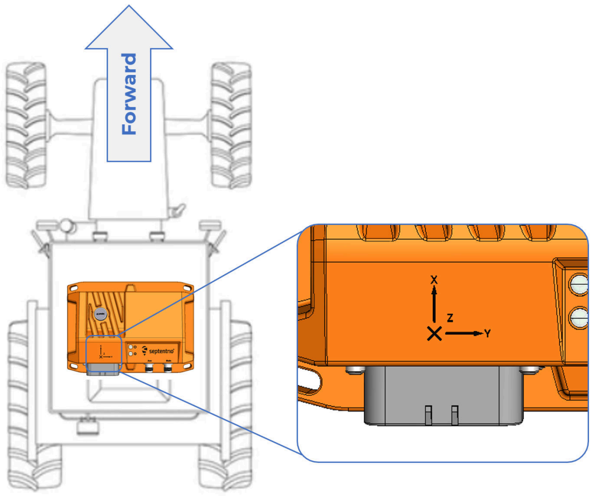

Figure 2-4: AsteRx RBi3 installed with the IMU reference X-axis aligned to the vehicle X-axis

2.4.1 Internal memory

The product has 16 GB of internal memory for data logging. Data can be logged in SBF or NMEA format and may be retrieved via the logging tab of the web interface.

2.4.2 Optional items

A multi-interface development cable is available for AsteRx RB3 and RBi3. This is intended for use in temporary set-ups, not for permanent installation on machines.
For permanent installation, it is advised to create a suitable cable harness, according to the specific needs of the vehicle.

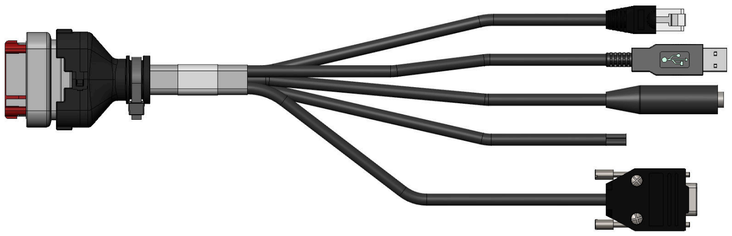

Figure 2-5: Development cable, multi-interface

3 Quick start

This section details on how to power-up, connect to and communicate with the AsteRx RB3 and RBi3. The product has an on-board web interface which the user can connect to over Ethernet or USB. The product is fully configurable using the web interface. Please note that older versions of certain browsers may not display the web interface properly.

3.1 Powering the AsteRx RB3 and RBi3

Using a development cable, connect DC jack to a 9-32V DC power source with a 2.1x5.5 DC plug connector or cut the connector and connect the red wire to the positive terminal and the black wire to the negative terminal of a 9-32V DC power source.
Then, connect the main connector of the multi-interface development cable to the receiver.

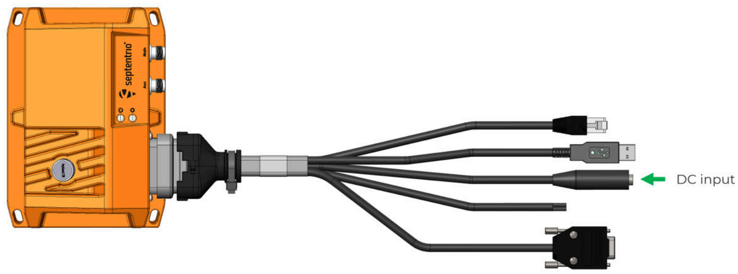

Figure 3-1: Power options

The product does not have a power button and the unit will power up automatically when power is applied.

3.2 Connecting the GNSS antenna

The connector panel of the AsteRx RB3 has one TNC connector for the main antenna and one for the auxiliary antenna as indicated in Figure 3-2.

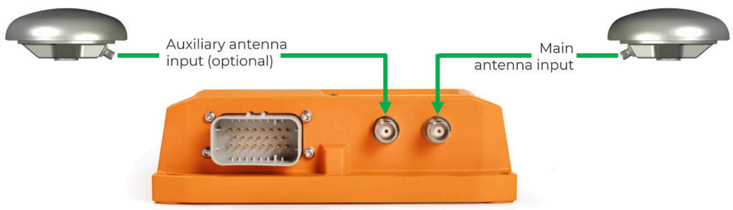

Figure 3-2: Antenna connectors

Ensure total cable attenuation difference between main and the auxiliary antenna and is below 10dB, between 1.1GHz and 1.6GHz.

3.3 Connecting to the AsteRx RB3 via the Web Interface

The user can connect to the receiver on any device that supports a web browser using the receiver's on board Web Interface. The connection can be made using either USB or Ethernet. The following sections describe each of the connection methods.

3.3.1 Using the USB cable

Connect the USB connector to an USB port of a device (e.g. PC).

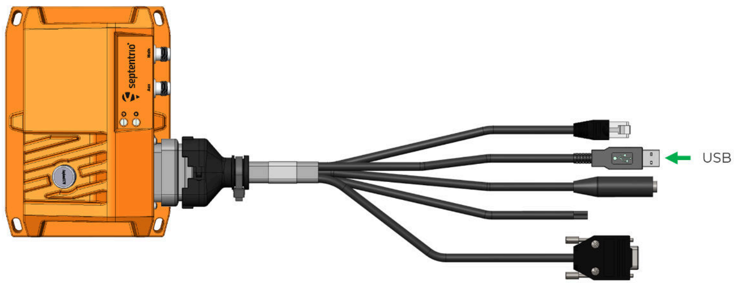

Figure 3-3: USB connection

The first time that the USB cable is connected to a device, the user 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 on your device to fully activate the drivers.
When the drivers have been correctly installed, the USB connection will appear as a removable storage device as shown in Figure 3-4.

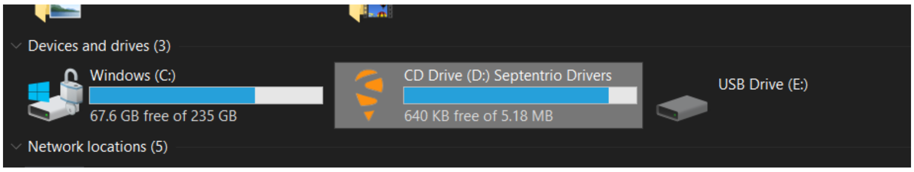

Figure 3-4: Screenshot showing USB connection after driver installation (Windows 10 example)

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

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

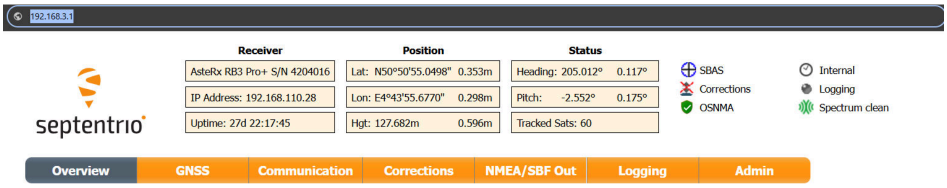

Figure 3-5: Connect to the Web Interface of the AsteRx RB3 over USB using the IP address **192.168.3.1** on any web browser

3.3.2 Using the Ethernet cable

Step 1: Connect the Ethernet cable

Connect the Ethernet connector (RJ45) to a LAN network as indicated in Figure 3-6.

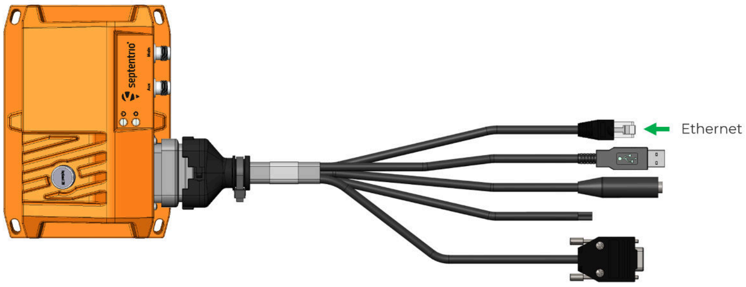

Figure 3-6: Ethernet connection

Step 2: Open a web browser and connect to the AsteRx RB3

By default, the product has the hostname 'http://asterx-rb3-xxxxxxx' or 'http://asterx-rbi3-xxxxxxx' depending on the hardware variant, where xxxxxxx are the last 7 digits of the GNSS serial number. This hostname can be used on a local area network to connect to the web interface if the IP address assigned by the DHCP server is unknown. The serial number can be found on a sticker on the receiver.

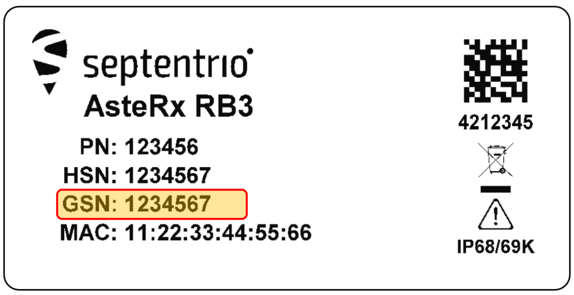

Figure 3-7: AsteRx RB3 label showing serial number

Figure 3-8 shows a screenshot of an Ethernet connection to a receiver with serial number 4204016 using '**http://asterx-rbi3-4204016**'.

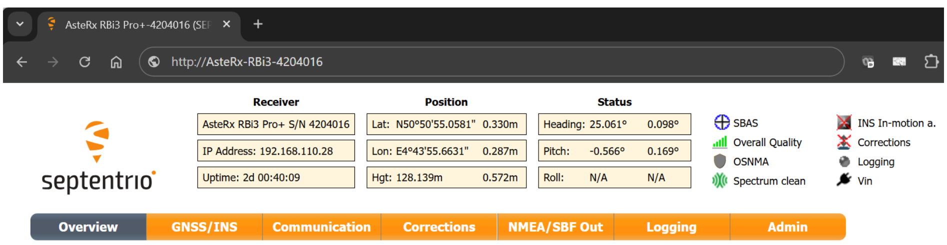

Figure 3-8: Connecting to the Web Interface via Ethernet

3.4 How to configure SBF and NMEA output

The AsteRx RB3 can output position and GNSS data in both standard NMEA format and Septentrio's proprietary compact binary format SBF. The following sections detail how to configure connections to other devices in order to send data.

3.4.1 Output over a serial COM connection

The AsteRx RB3 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 RB3 should be configured with the same baud rate and flow control setting of the coupled device. These settings can be configured via the 'Communication' tab as shown in Figure 3-9. In this example, COM2 is set with a speed of 19200 baud.

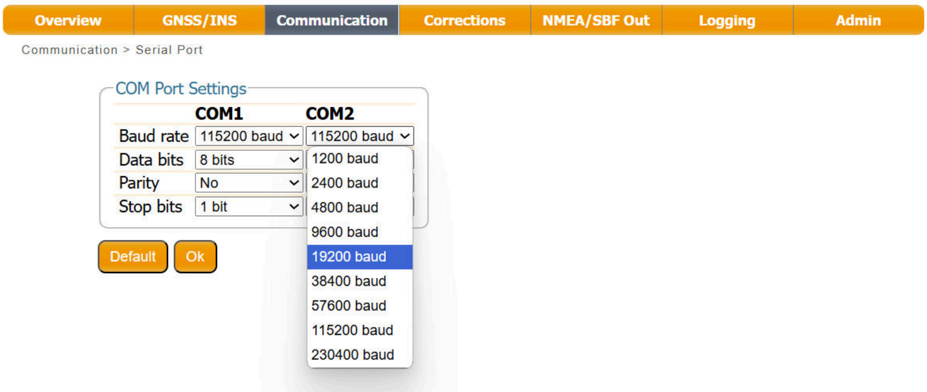

Figure 3-9: Configure the baud rate and flow control of the AsteRx RB3

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 3-10 and 3-11.
Note: the GNSS/INS variant (AsteRx RBi3) can output a limited set of NMEA messages.

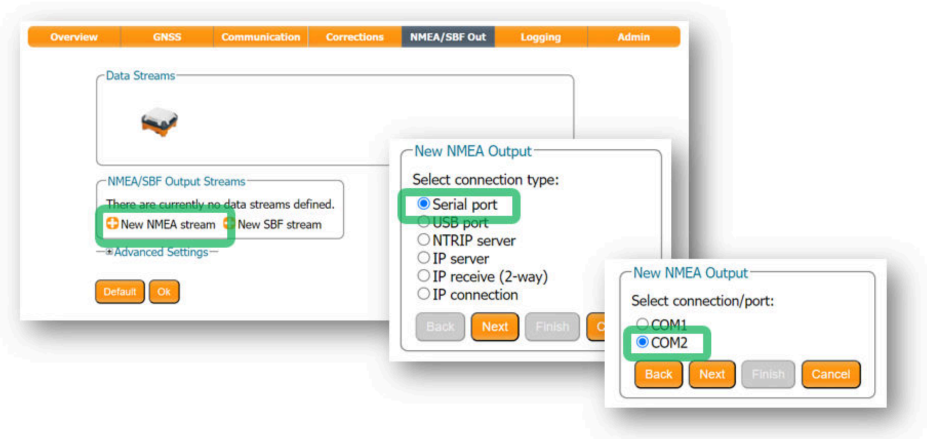

Figure 3-10: Selecting to output NMEA data on COM2

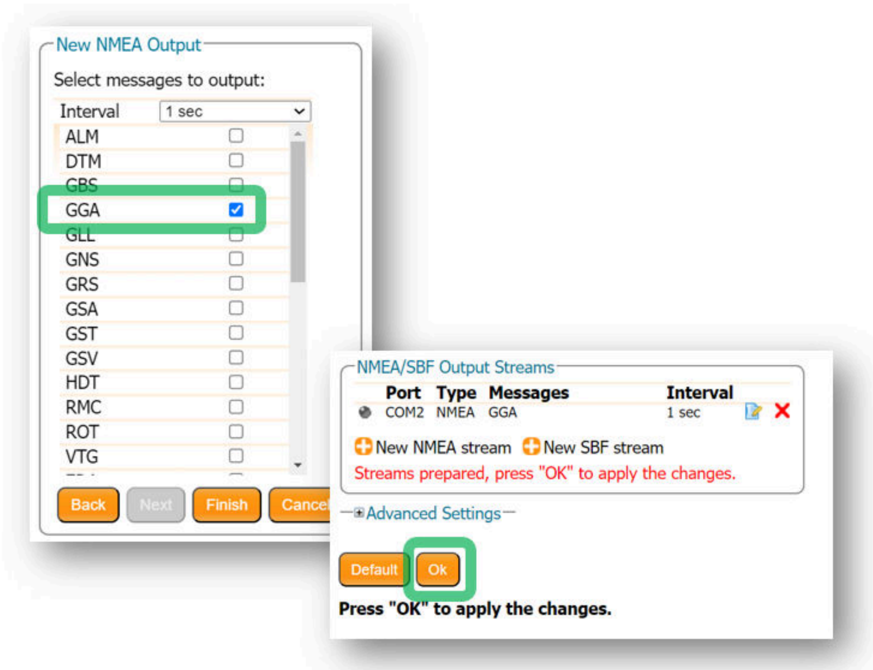

Figure 3-11: Selecting to output the GGA NMEA message every second

SBF

By clicking '**New SBF stream**', a second output stream can be configured. In the example shown in Figures 3-12 and 3-13 the PVTCartesian SBF data block will be output over COM1 once per second.

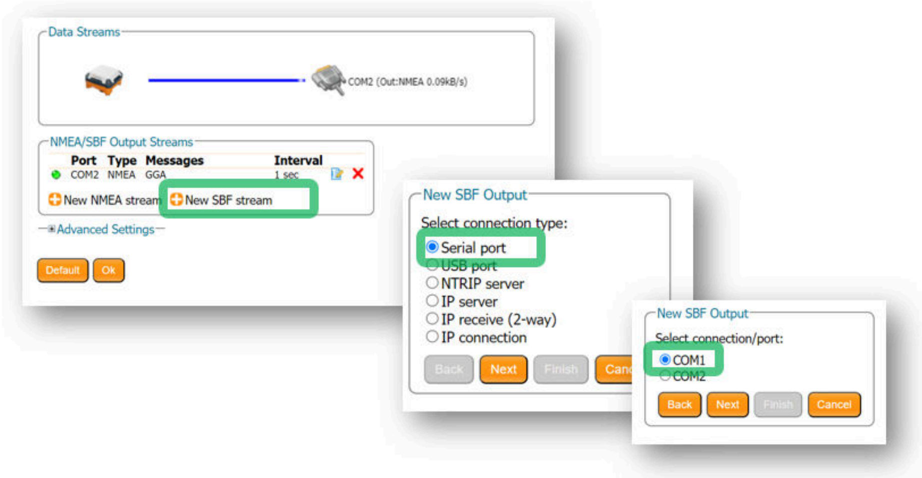

Figure 3-12: Selecting to output SBF data on COM1

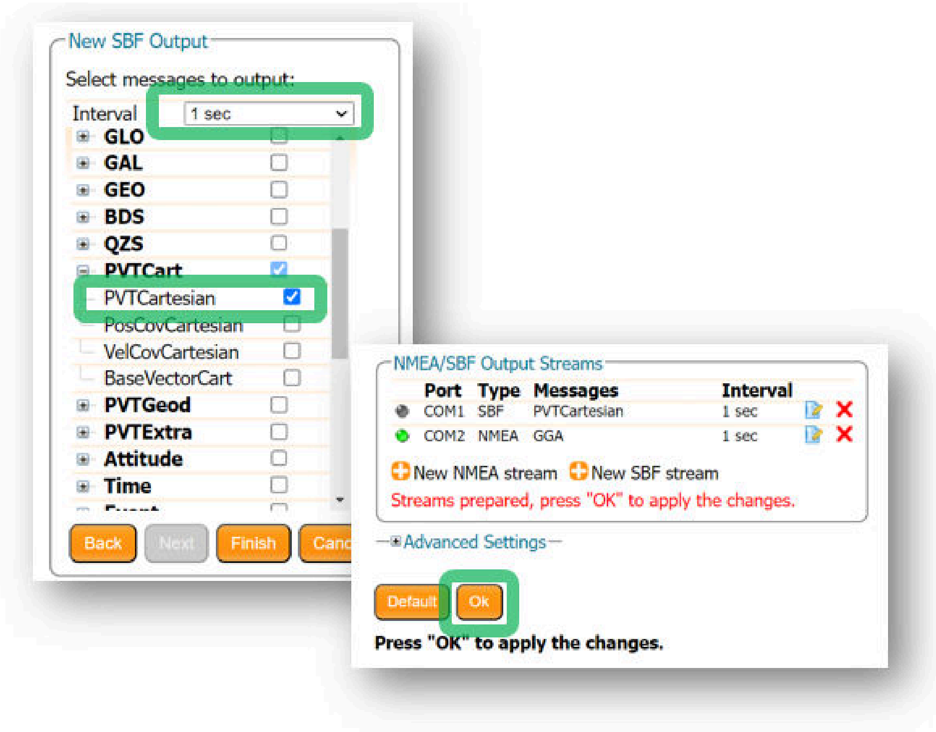

Figure 3-13: Selecting to output the PVTCartesian SBF block every second

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 3-14.

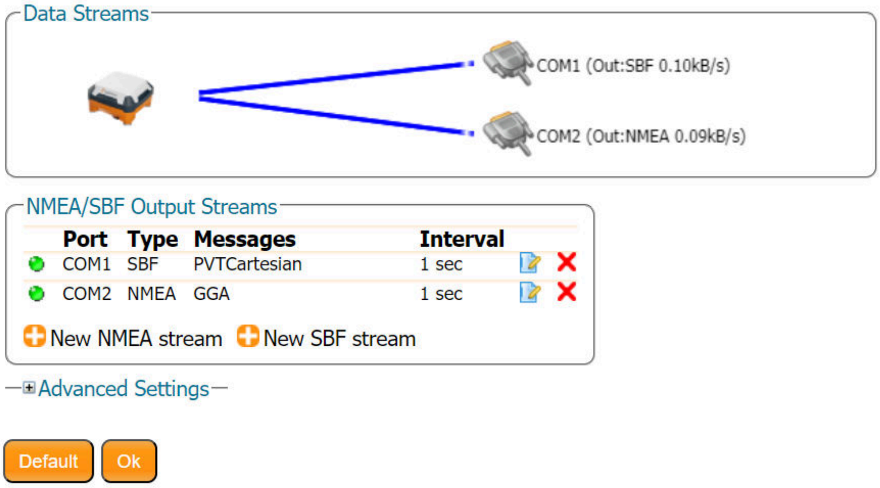

Figure 3-14: Summary of all configured data output streams

Figure 3-15 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.

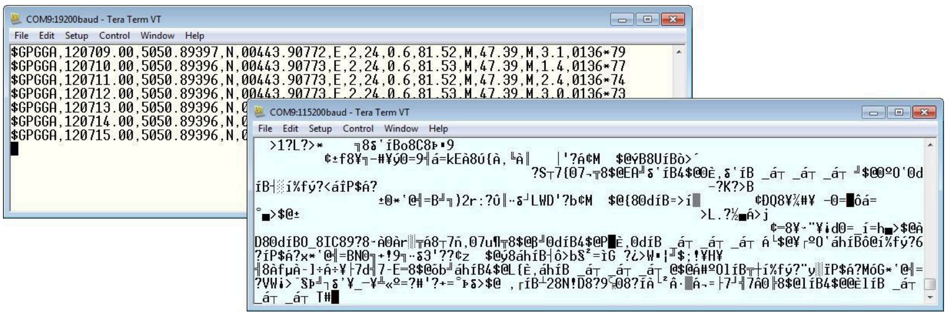

Figure 3-15: Example showing output NMEA GGA (left panel) and SBF PVTCartesian (right panel)

3.4.2 Output over Ethernet

SBF and NMEA data can be sent over an Ethernet connection to the AsteRx RB3.

Step 1: Configure an IP connection on the AsteRx RB3

The Ethernet port settings can be configured by selecting '**IP Ports**' from the **Communication** menu. In the example shown in Figure 3-16, port 25221 has been configured as connection IPS1 in **TCP2Way** mode so data can be received as well as transmitted over the connection. It is advisable to select a higher-range port to avoid those reserved for other purposes such as the webserver and FTP. Also, port 28784 is reserved by default on the AsteRx RB3 for commands.

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

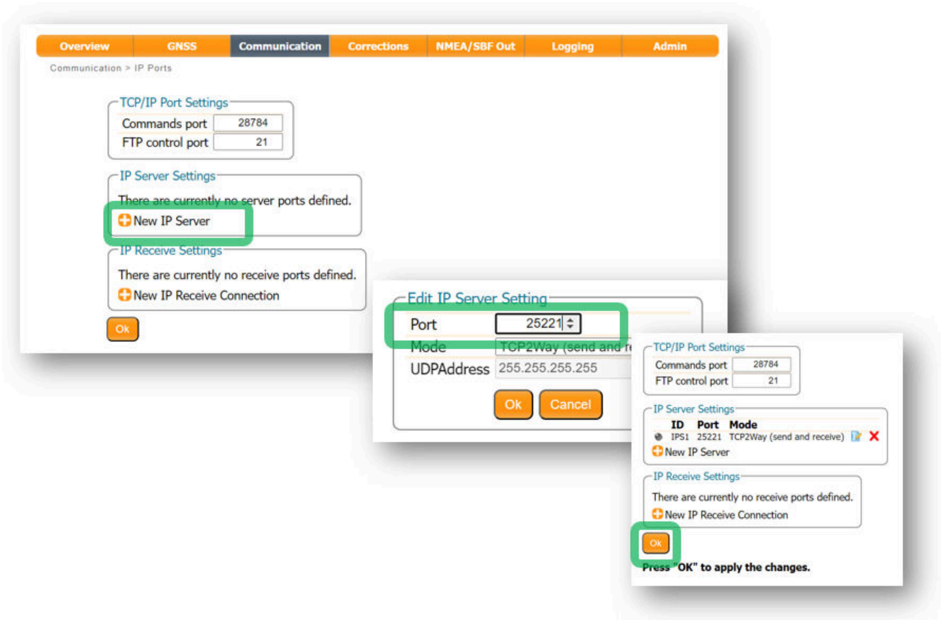

Figure 3-16: Configure the TCP/IP server port setting for data output

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 3-17, the NMEA GGA message will be output every second. Ensure that the previously configured IPS1 port is selected for output as highlighted.

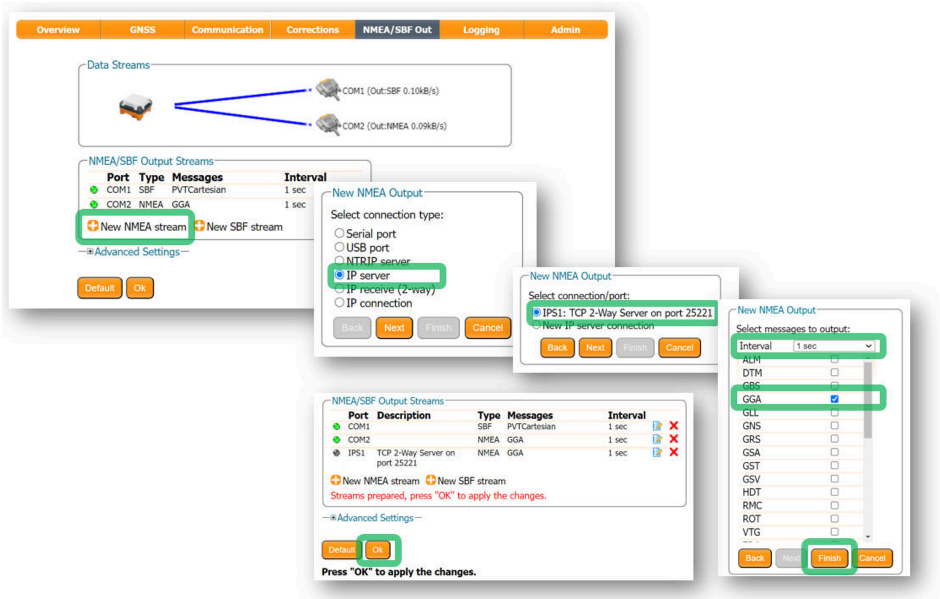

Figure 3-17: Select to output NMEA GGA over the configured IPS1 connection

Step 3: Configure Data Link to listen for NMEA output

The screenshots in Figure 3-18 show how the Septentrio GUI tool Data Link can be configured to listen for the AsteRx RB3 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**'.

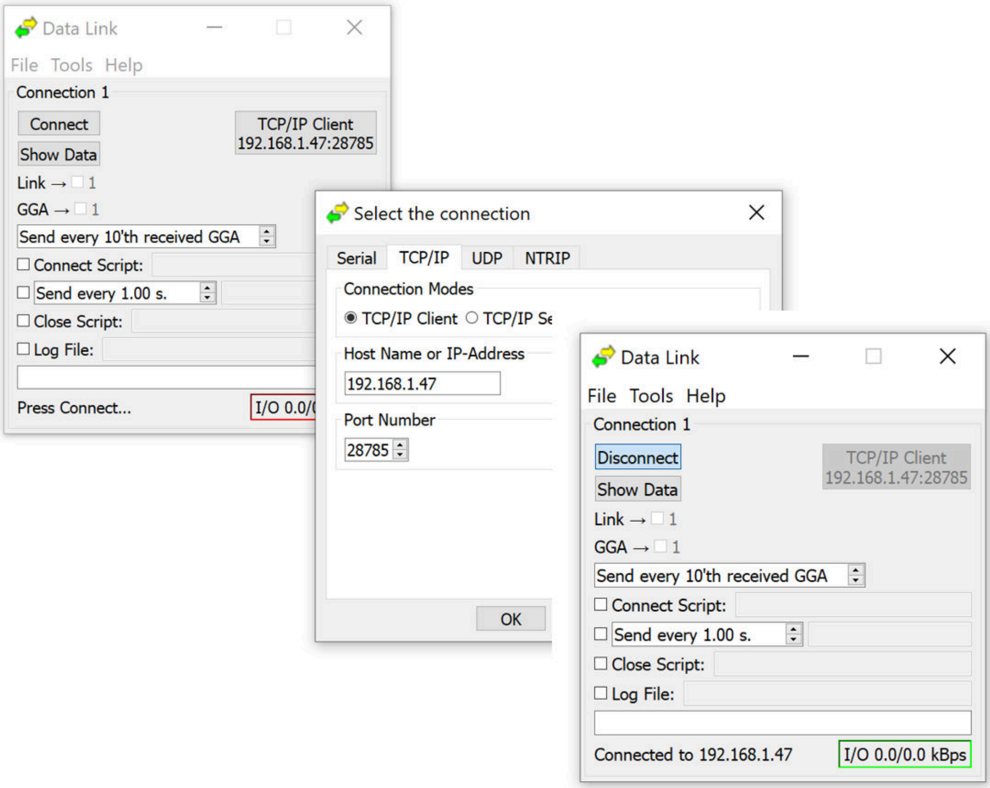

Figure 3-18: Configure the TCP/IP connection settings in Data Link

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 shown in Figure 3-19.

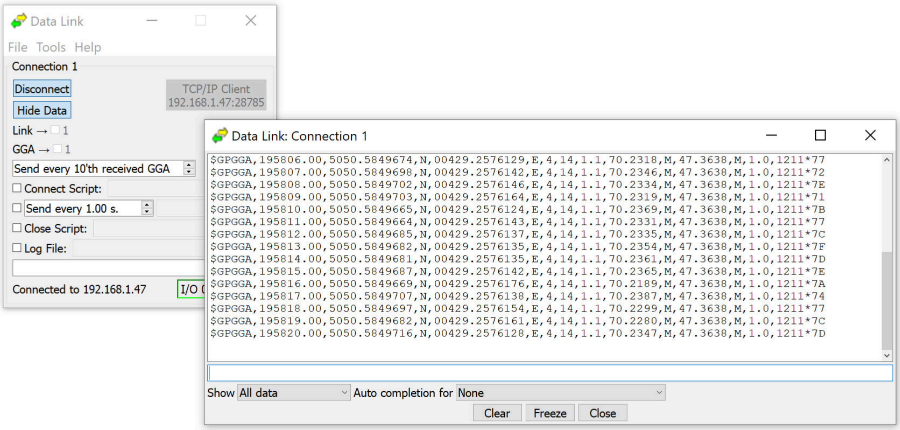

Figure 3-19: The 'Show data' window of Data Link showing GGA from the AsteRx RB3

3.5 How to configure CAN output

The CAN implementation in the AsteRx RB3 allows the transmission of several messages, as specified below. To configure CAN using the web interface, go to the Communication menu and select CAN.

By default, CAN output is turned off. By default, the Baud rate is set to 250 kbaud (as per the NMEA2000 standard) however, this can be changed.

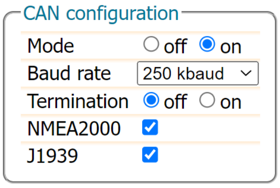

Figure 3-20: CAN configuration

The receiver can serve as a terminator on the CAN bus backbone. By default, the internal termination resistor is turned off, but if the receiver functions as one of the end points of the CAN network, the resistor can be enabled.
Finally, support for the NMEA2000 and/or J1939 standards can be turned on or off.
Every piece of equipment in the CAN network needs to have a source address. NMEA2000 uses address claiming whereby the first available address is assigned automatically to the piece of equipment on the CAN network. By default, the address from which the query for available addresses is started is zero but it can also be set to another value, as shown in Figure 3-21.

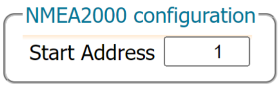

Figure 3-21: NMEA2000 start address setting

It is possible to configure up to three different NMEA2000 output streams. For each stream, a different subset of messages to be output and interval can be selected. The interval can be set to 50ms, 100ms, 200ms, 500ms or 1s. When enabled, PGN 126992, PGN 219029 and PGN 129539 have a fixed interval of 1 second, regardless of the chosen interval.

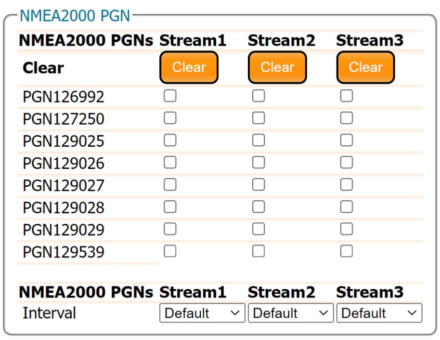

Figure 3-22: NMEA2000 PGN configuration

In a similar way, up to three streams can be configured to output the proprietary J1939 messages. Supported intervals are again 50ms, 100ms, 200ms, 500ms or 1s.

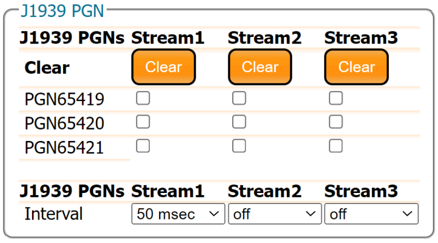

Figure 3-23: J1939 PGN configuration

3.5.1 Supported NMEA2000 and J1939 CAN messages

Septentrio receivers which support the CAN bus interface are able to output the NMEA2000 messages listed below:

PGN	*Description*	*Max. update rate*
PGN129029	NMEA2000 GNSS Position	1Hz
PGN129028	NMEA2000 Altitude Delta, High Precision Rapid Update	20Hz
PGN129027	NMEA2000 Position Delta High Precision Rapid Update	20Hz
PGN127250	NMEA2000 Vessel Heading	20Hz
PGN129539	NMEA2000 GNSS DOPs	1Hz
PGN129025	NMEA2000 GNSS Position Rapid Update	20Hz
PGN126992	NMEA2000 System Time	1Hz
PGN129026	NMEA2000 COG and SOG Rapid Update	20Hz

Detailed descriptions of the PGN messages are found in the NMEA2000 specification which can be purchased directly from the National Marine Electronics Association.
Messages PGN129028 and PGN129027 are special messages which depend on PGN129029. These messages contain delta values which can be used to calculate the current position (latitude, longitude, altitude) and time by comparing them to PGN129029. Since the maximum allowed update rate of PGN129028 and PGN129027 is much higher than that of PGN129029, this allows the user to obtain the positioning information at a higher update rate as compared to what would be possible using just PGN129029. Messages PGN129028 and PGN129027 can be related to the corresponding PGN129029 message by comparing the Sequence ID's (SID's). An example of how to calculate the current Altitude (using PGN129028 and PGN129029) and Position (using PGN129027 and PGN129029 is shown in Figure 3-24.

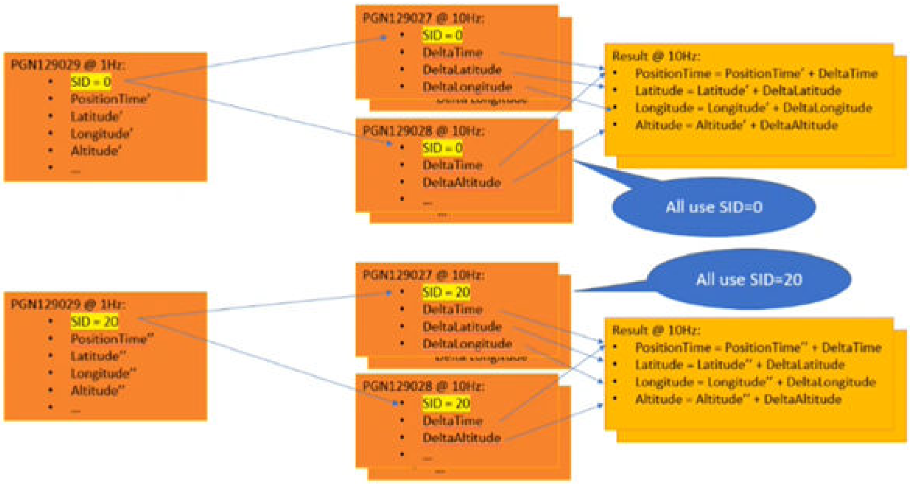

Figure 3-24: Calculating position and altitude with high update rate

Apart from the NMEA2000 messages listed earlier, the receiver also supports a number of proprietary messages. It should be noted that due to the restrictive nature of the NMEA2000 format, these messages follow the SAE J1939 standard.

Message	*Description*	*Max. update rate*
65419	Altitude	20Hz
65420	Latitude	20Hz
65421	Longitude	20Hz

4 Rover operation

4.1 How to configure the AsteRx RB3 for RTK

The AsteRx RB3 can use correction data to calculate a cm-level RTK position. The AsteRx RB3 can get this correction data in several ways: using the COM port or Ethernet.

4.1.1 How to configure the AsteRx RB3 in RTK rover mode using TCP/IP in a closed network

Step 1: Configure the Base station receiver

Set the Base station position as static

Section 6 describes how to configure the AsteRx RB3 as an RTK base station.

Configure the Ethernet connection and differential corrections output from the Base station receiver

In the **Corrections Output** window click on **New RTCM3 output** to start the sequence of steps to configure the RTK differential corrections stream and Ethernet connection over which the differential corrections will be sent. In the example shown in Figure 4-1, RTCMv3 correction data are sent out over port 28785. The RTCMv3 messages necessary for RTK positioning are selected by default.

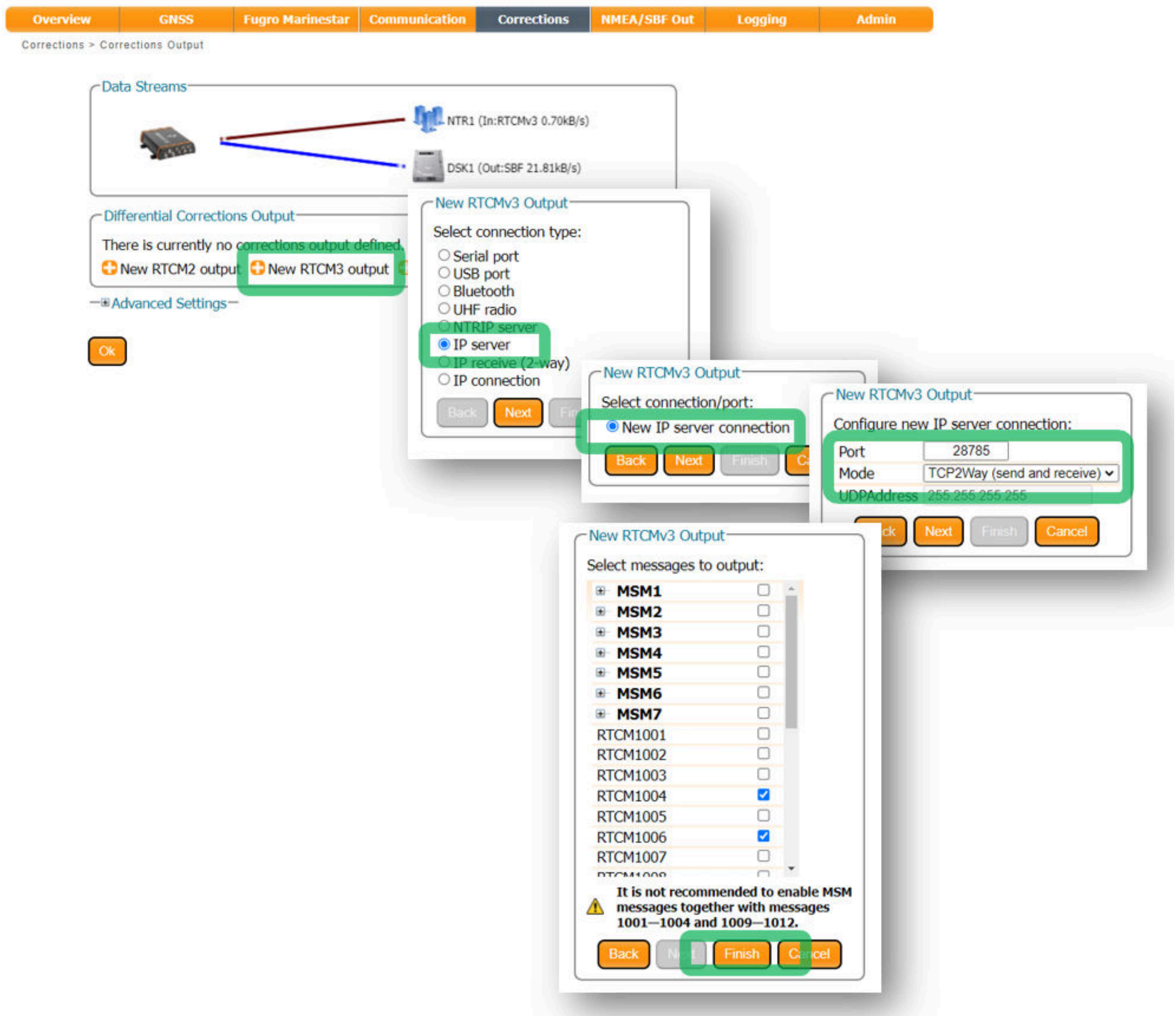

Figure 4-1: Configuring RTK differential corrections output over an Ethernet connection

Step 2: Configure the Rover receiver

Enable RTK positioning mode on the rover receiver

Ensure that RTK is enabled as a positioning mode. This can be done in the GNSS Position tab by checking the 'RTK' box in the 'Position Mode' field as shown in Figure 4-2.

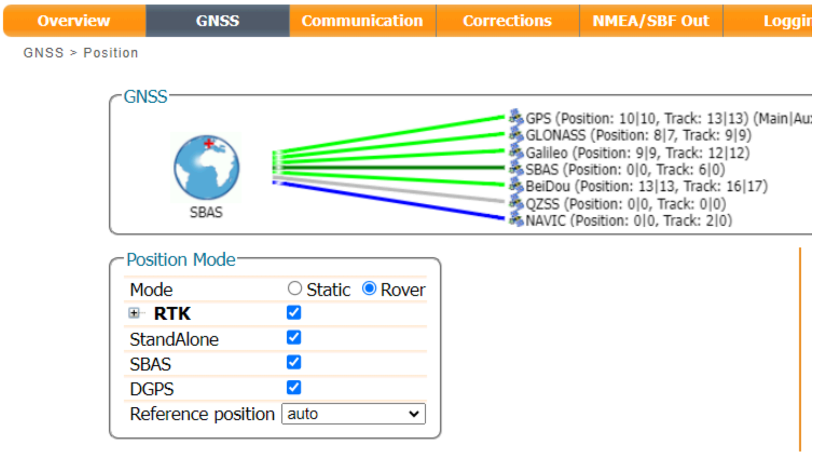

Figure 4-2: Ensure that RTK is enabled as a positioning mode

Configure the Ethernet connection of the rover receiver

On the **IP Ports** window of the rover receiver, click on **New IP Receive Connection** as shown in Figure 4-3 to start configuration sequence. The **Port** and **TCPAddress** should match the port and IP address of the Base station receiver.

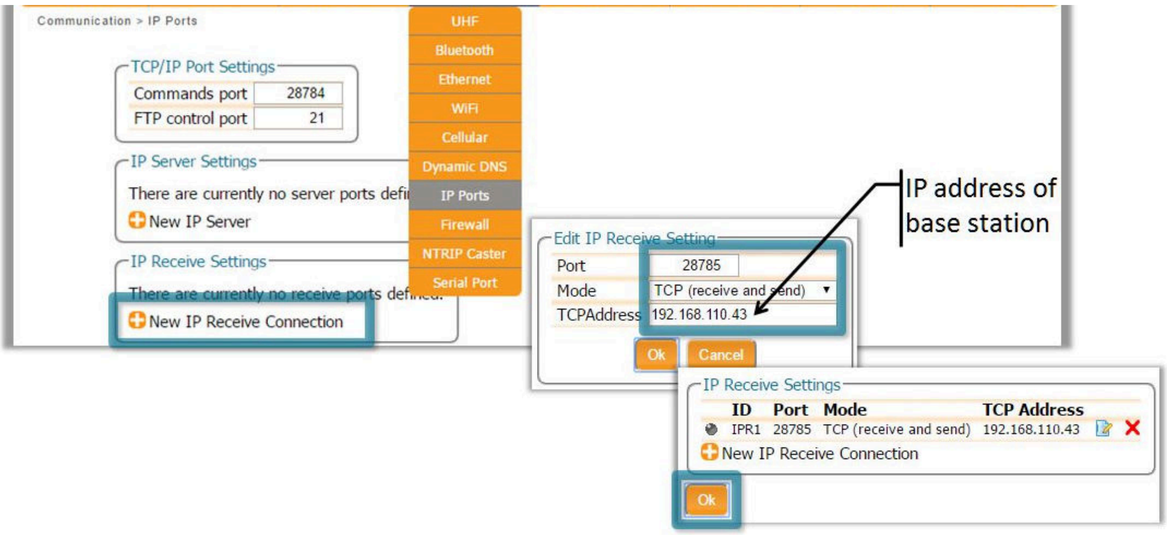

Figure 4-3: In the **IP Ports** window, click on **New IP Receive Connection** to configure the connection with the base station

Step 3: Verifying the configuration

If the Base station and rover receivers have been configured correctly then connections in the Communication Ethernet windows should appear similar to those shown in Figures 4-4 and 4-5.

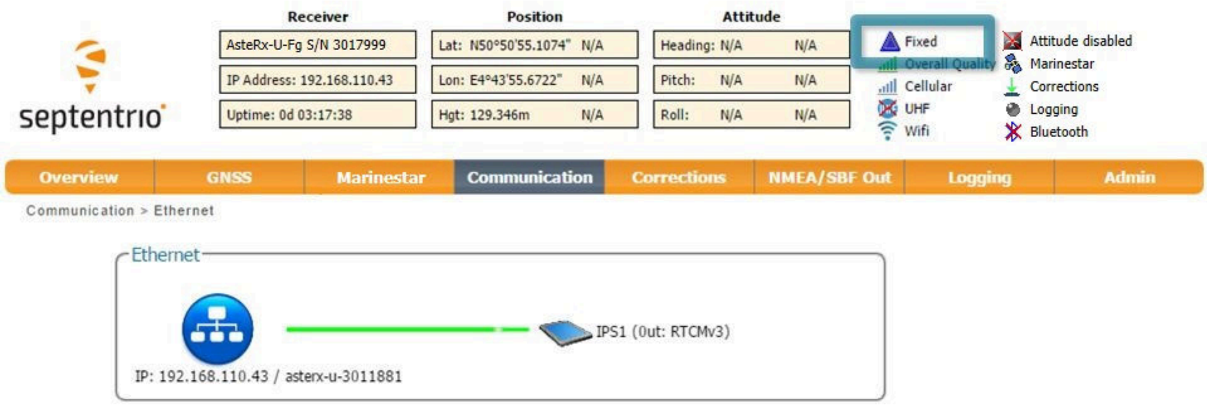

Figure 4-4: Ethernet window of the **Base station receiver** showing the position as static and an active output of RTCMv3 differential corrections on server port IPS1

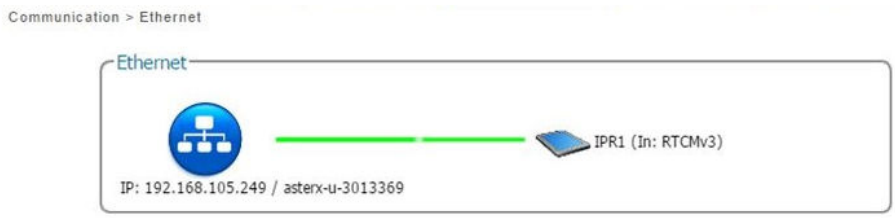

Figure 4-5: Ethernet tab of the **rover receiver** showing a fixed RTK position and reception of RTCMv3 differential corrections on receiver port IPR1

4.2 How to configure the AsteRx RB3 for Attitude

With an auxiliary antenna connected to the AsteRx RB3, the receiver can calculate Heading and either Pitch or Roll. This section details how to configure a two-antenna setup.

Step 1: Connect the auxiliary antenna

Connect an auxiliary antenna to the connector labeled **AUX** as indicated in Figure 4-6.

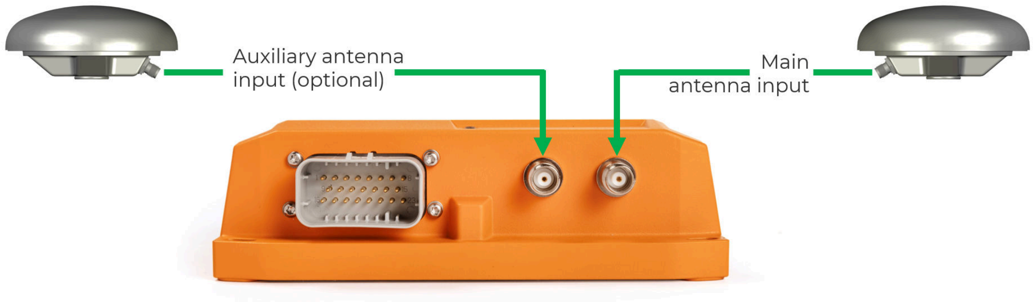

Figure 4-6: Auxiliary antenna connection

Step 2: Compensate for deviations in the antenna orientation

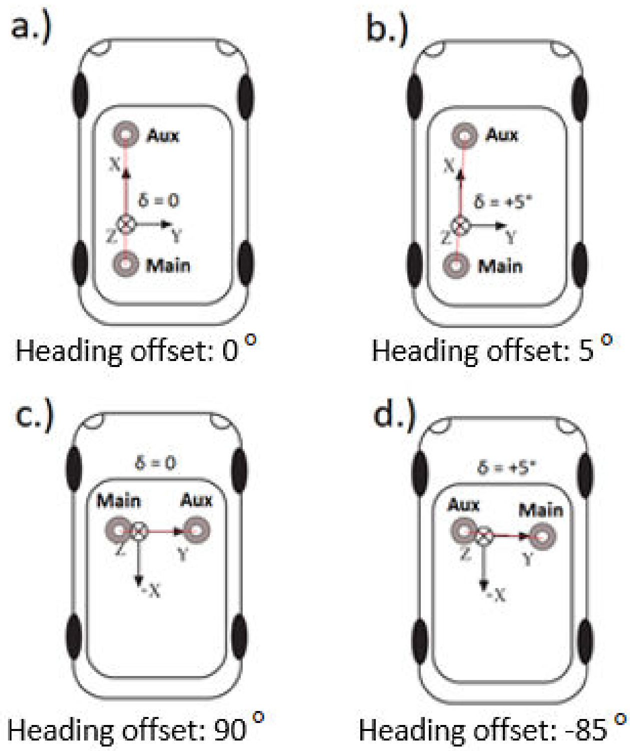

Figure 4-7: Setup examples to understand how to handle heading offsets.

a.) The default setup for which the angle between the antenna baseline and the longitudinal axis is 0 and no heading offset needs to be set.
b.) A slight deviation (5°) from the longitudinal axis in the clockwise direction is reflected by a positive heading offset.
c.) An alternative antenna configuration where the antennas are placed perpendicular to the longitudinal axis.
d.) An alternative antenna configuration where the antennas are placed perpendicular to the longitudinal axis with a small deviation.

The attitude of a vehicle can be determined from the orientation of the baseline between two antennas attached to the vehicle. By default, the receiver determines the attitude angles assuming that the baseline between the antenna ARP is parallel to the longitudinal axis of the vehicle (main antenna mounted behind auxiliary antenna in line with the x-axis of the vehicle frame). As illustrated above, attitude biases appear when this is not the case.
The user can provide the value of the attitude offset angles in the web interface under GNSS/INS > Attitude as shown in Figure 4-8. Providing this information will let the receiver compensate for the offsets before calculating the attitude by subtracting them from the attitude angles.

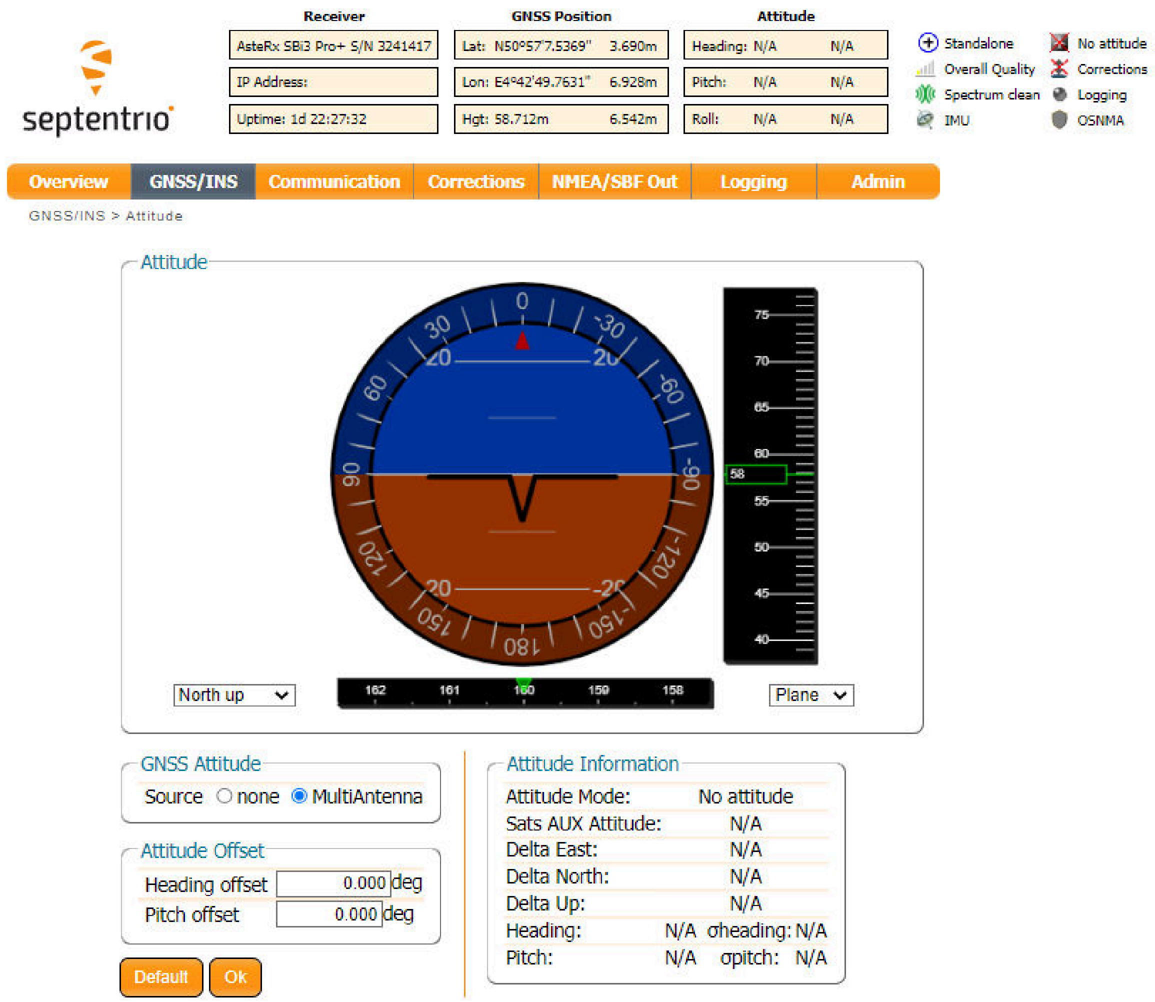

Figure 4-8: Setting the attitude offset.

In many cases the antenna baseline will not align perfectly with the vehicle's longitudinal axis or its perpendicular and in these circumstances the provided attitude offset value can also be used to compensate for small angular deviations.

An increase in angle between the antenna baseline and the vehicle's longitudinal axis in the clockwise direction corresponds to a positive change in the value of the heading offset. To better explain this, a few examples of possible setups are given above in Figure 4-7.

The examples in Figure 4-7 all relate to a heading offset but the antenna orientation can also be characterized by a vertical offset. Vertical offsets can be compensated for by adjusting the Pitch offset. This may be necessary in cases where the antenna baseline is not exactly parallel to the longitudinal axis of the vehicle or in situations where the two antenna ARPs may not be exactly at the same height in the vehicle reference frame. Since pitch is defined as the right-handed rotation about the vehicle Y axis, a situation where the main antenna is mounted lower than the aux antenna (assuming the default antenna setup) will result in a positive pitch a shown in Figure 4-9.

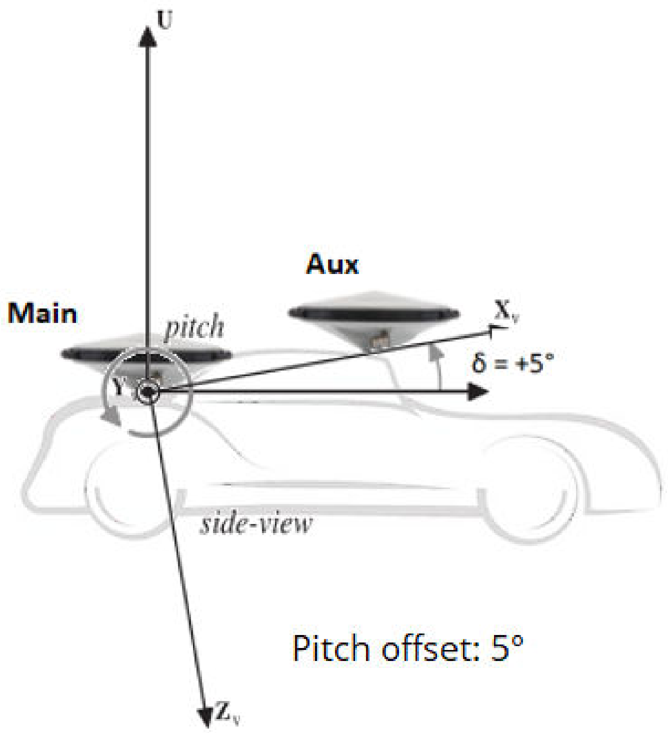

Figure 4-9: Visual representation of the effect of vertical offset between the two antennas on the Pitch offset. Assuming the default antenna configuration, the aux antenna being mounted higher will result in a positive value for the pitch.

Note that in order to correctly reference to the antennaâĂŹs ARP, it is necessary to compensate for phase center variations. This can be done in the web interface by going to GNSS/INS > Position and selecting the correct antenna type in the âĂŹAntenna InformationâĂŹ field.

Step 3: Attitude information in SBF and NMEA data

Details on how to output SBF and NMEA data can be found in Section 3.4.

SBF

Attitude information is contained in the SBF blocks *AuxAntPositions*, *AttEuler*, *AttCovEuler* and *EndOfAtt*. These blocks are selected automatically when checking the 'Attitude' box when configuring SBF output via the **NMEA/SBF Out** window as Figure 4-10 shows.

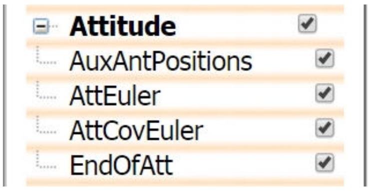

Figure 4-10: SBF blocks containing attitude information

NMEA

You can output the attitude information from the AsteRx RB3 in NMEA format by selecting the standard NMEA HDT sentence or the Septentrio proprietary HRP sentence as shown in Figure 4-11.

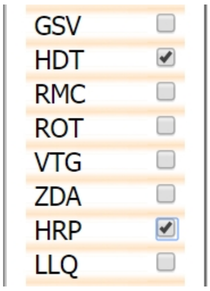

Figure 4-11: NMEA sentences containing attitude information

5 INS configuration (only for AsteRx RBi3)

5.1 How to align IMU orientation and vehicle orientation

Examples of typical receiver installations in a vehicle frame are given in Figure 5-1.

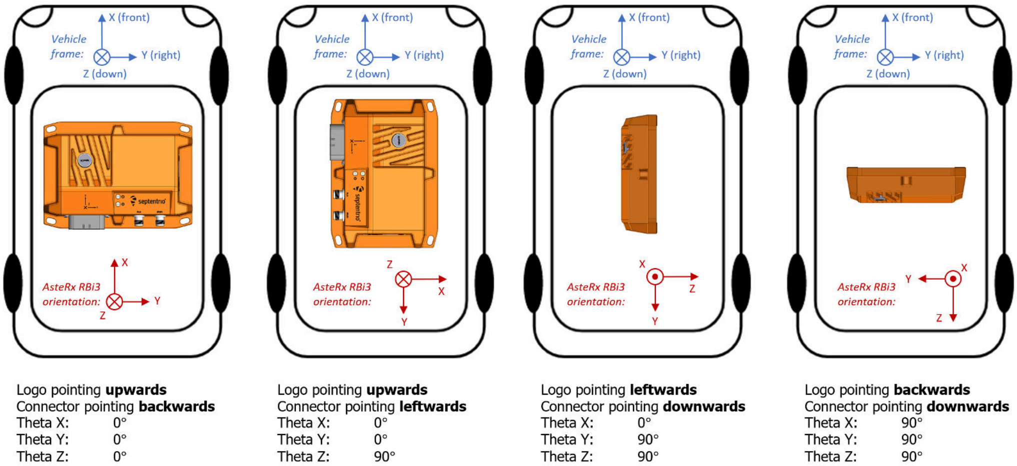

Figure 5-1: Examples illustrating the orientation of the IMU reference frame with the associated IMU orientation for the depicted installation.

First of all we need to establish what is the vehicle frame and its orientation. As for convention in the positioning industry, the x-axis in the direction that goes from the back to the vehicle to the front (positive from the back to the front), y-axis goes from left to right of the vehicle (positive from left to right) and finally the z-axis in the vertical direction (positive from top to bottom).

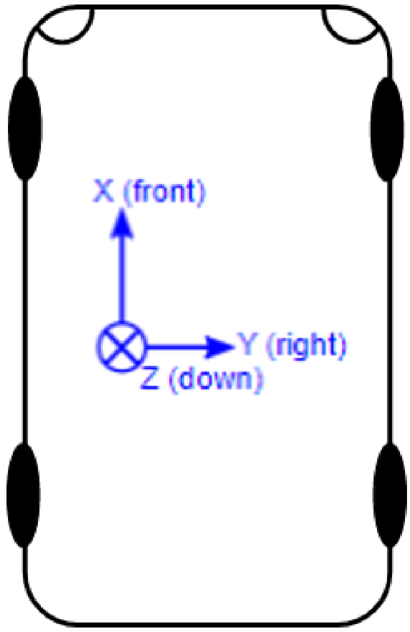

Figure 5-2: The vehicle frame and its orientation.

It is important to take into consideration the mounting direction of the receiver, therefore the IMU, in the body frame of the vehicle.

This is because the motion computed from the INS must be referred not to the IMU orientation but the vehicle orientation.

The IMU's orientation can be changed by specifying the orientation angles (Theta X, Theta Y, Theta Z) as shown in Figure 5-3.

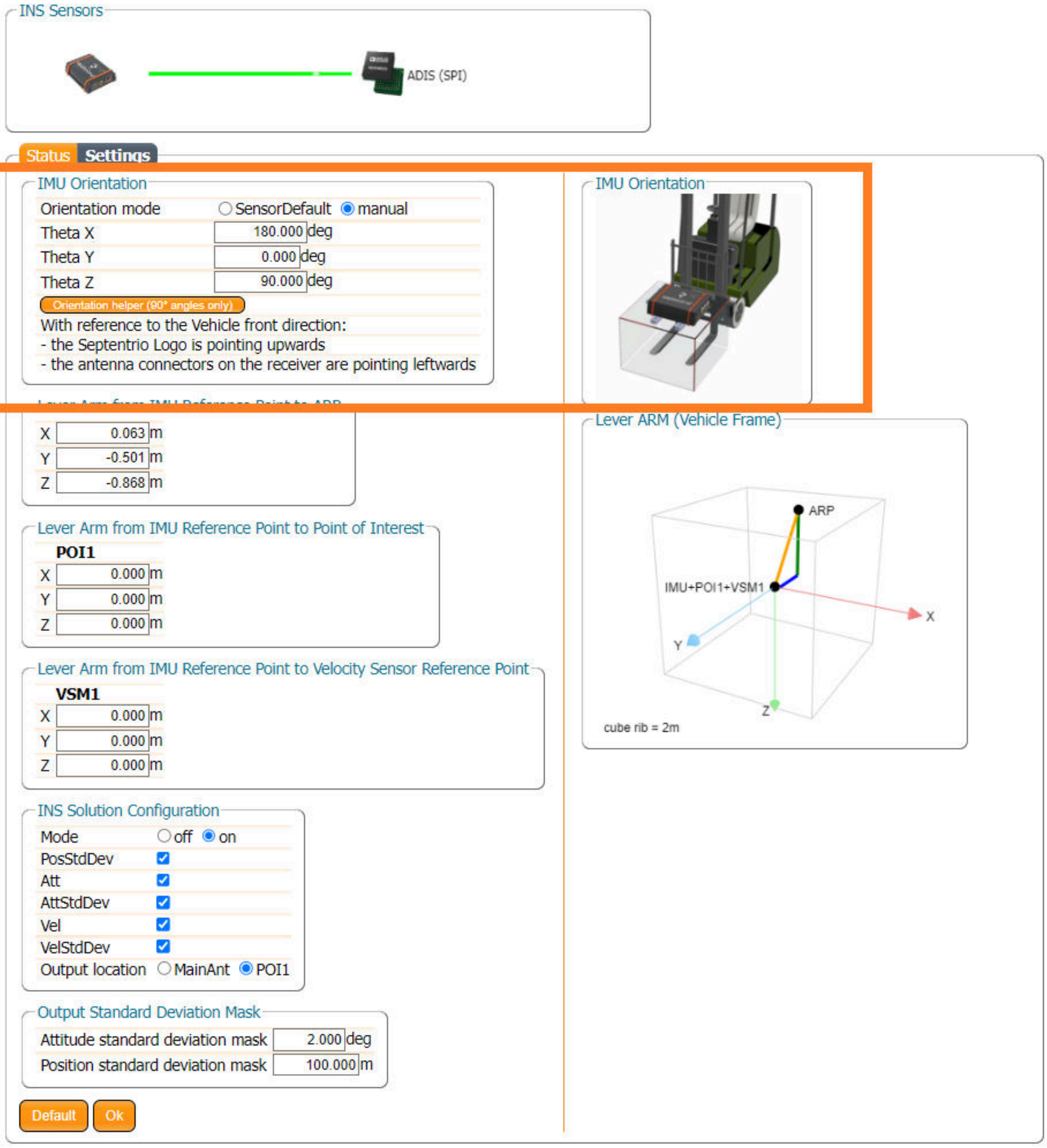

Figure 5-3: Setting the IMU orientation.

If the angles are not known it is also possible to use the orientation helper, that will automatically suggest orientation angles based on 2 simple questions:
- With reference to the vehicle front direction, the septentrio logo is pointing in which direction
- With reference to the vehicle front direction, the antennas connectors on the receiver are pointing with direction

To validate the correctness of the filled-in values, manually or via the helper, an image with the selected orientation (in multiples of deg) is be displayed.

5.2 How to measure and compensate for the Antenna Lever Arm

When measuring the antenna lever-arm, it is important to keep in mind that all the measurements are taken in vehicle frame (not the IMU orientation frame).
The antenna lever-arm is the relative position between the IMU reference point and the GNSS Antenna Reference Point (ARP). The IMU reference point is clearly marked on the top panel of the receiver. For this task we will be using only the the center of the axis engraving and the 1.7 cm offset from the top of the box. Refer to the data sheet of your GNSS antenna for the exact location of the ARP.
It is important to compensate for the effect of the lever arm, otherwise the receiver may not be able to calculate an accurate INS position. The higher the accuracy of the lever-arm dimensions, the better the accuracy of the INS solution calculated by the receiver. As shown in Figure 5-4, lever arm offsets can occur in three dimensions.

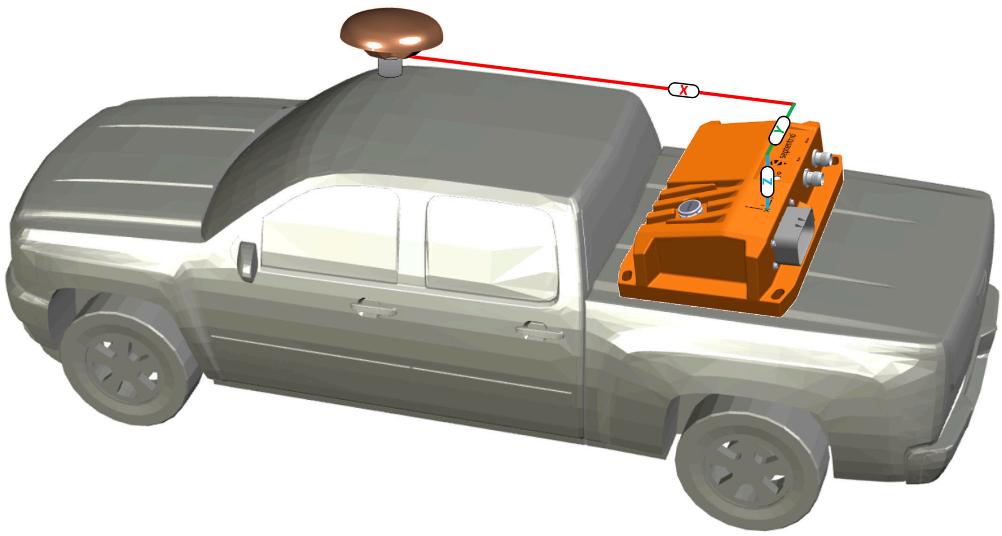

Figure 5-4: This picture shows the vehicle frame and the projection of the ARP position on the axes (x', y', z'), in cm

Values representing the relative position of the main antenna ARP with respect to the IMU reference point in the three dimensions of the vehicle reference frame can be provided to the receiver in the web interface under GNSS/INS > INS setup > Settings as shown in Figure 5-5.

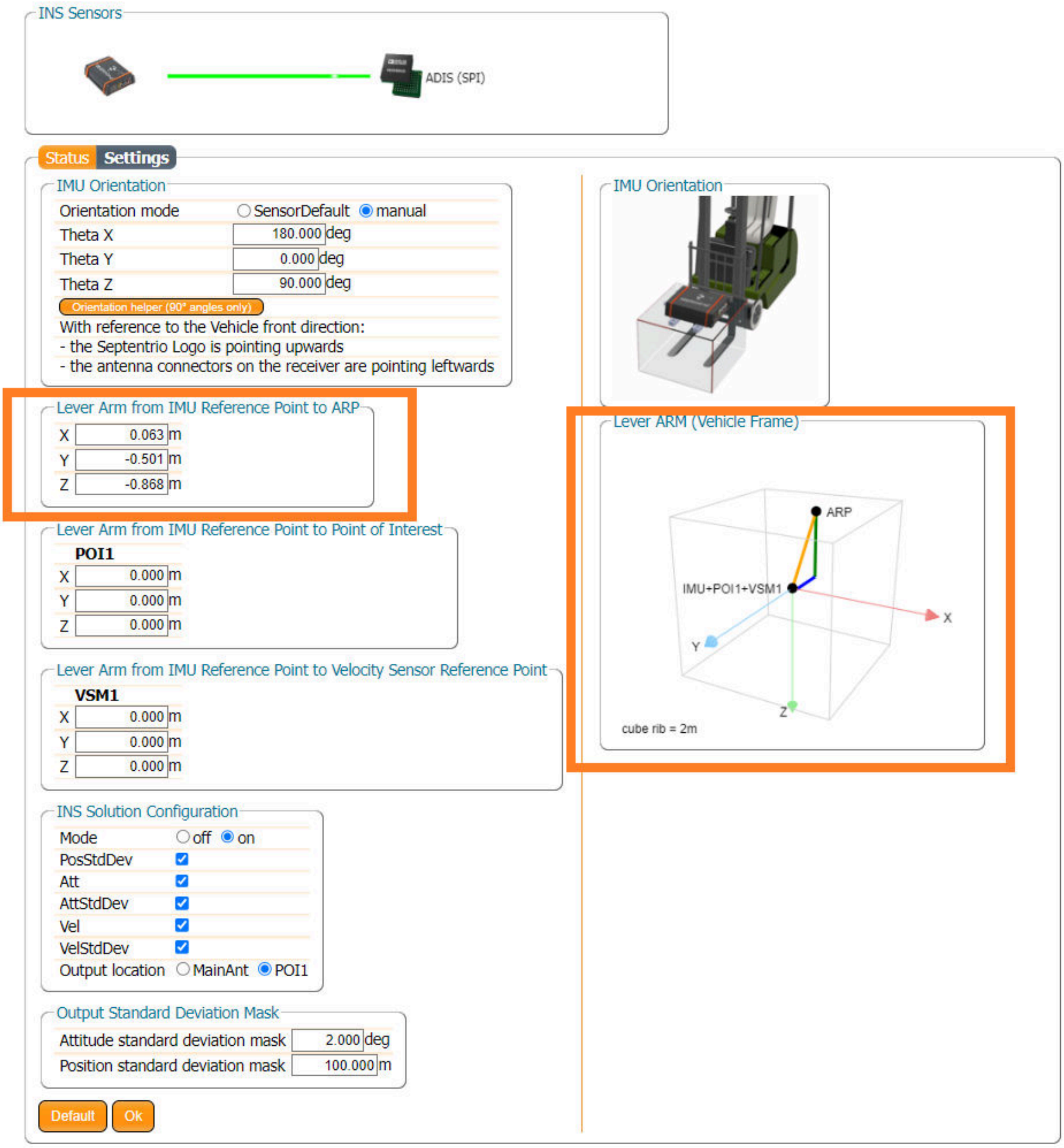

Figure 5-5: Setting the lever arm offsets

The INS Setup page in the receiver web interface provides a visualization tool that allows a first visual validation of the lever-arm settings, especially the signs of the dimension in each axis.

If the AsteRx RB3 is designed in at production of the platform, both the IMU and the antenna are installed in known locations so that existing 3D models can be used to determine the lever-arm offsets in the X, Y and Z dimensions. If the locations of either the antenna or the IMU are not known, point clouds obtained from 3D laser scanning or similar techniques could be used to build a reference frame that allows for the lever-arm to be accurately measured. For temporary setups or test purposes where the accuracy of the INS solution is not of paramount importance, it may be sufficient to measure the lever arm manually, e.g. using a measuring tape. However, if this method is used in permanent installations it is advised to confirm the accuracy of the manual measurement using RxLeverArm, described in the following chapters.

5.3 How to verify if the IMU is outputting data?

An easy way to determine if communication is taking place between the IMU and the GNSS receiver is by inspecting the GNSS/INS > INS Setup > Status page where the data stream connection is indicated and the raw sensor data can be visualized. When the IMU is communicating to the GNSS receiver, there should be a line visible between the AsteRx RB3 and SPI as shown in Figure 5-6.

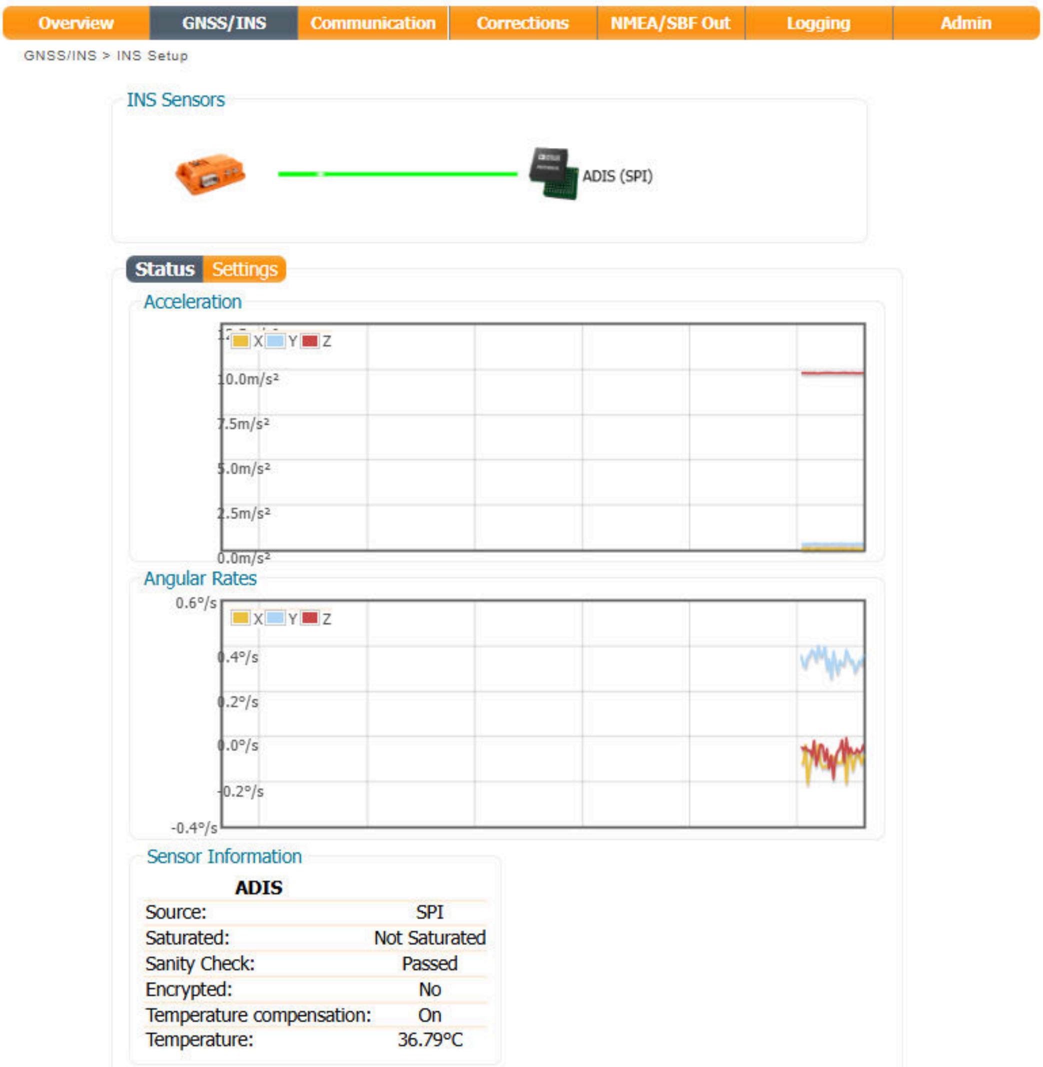

Figure 5-6: The Data Stream window on the Overview page should show a line symbolizing a connection between the AsteRx RB3 and the IMU which is connected to SPI.

A more robust way of verifying that the IMU is not only connected but that the IMU data is being received and processed correctly involves inspecting the IMU View in RxControl or web interface. After establishing a connection with the AsteRx RB3 using RxControl, navigate to View > IMU View. The acceleration and angular rate plots should display information similar as shown in Figure 5-7. These plots are based on the unfiltered IMU sensor measurements and provide an unambiguous way of checking that the IMU is outputting data.

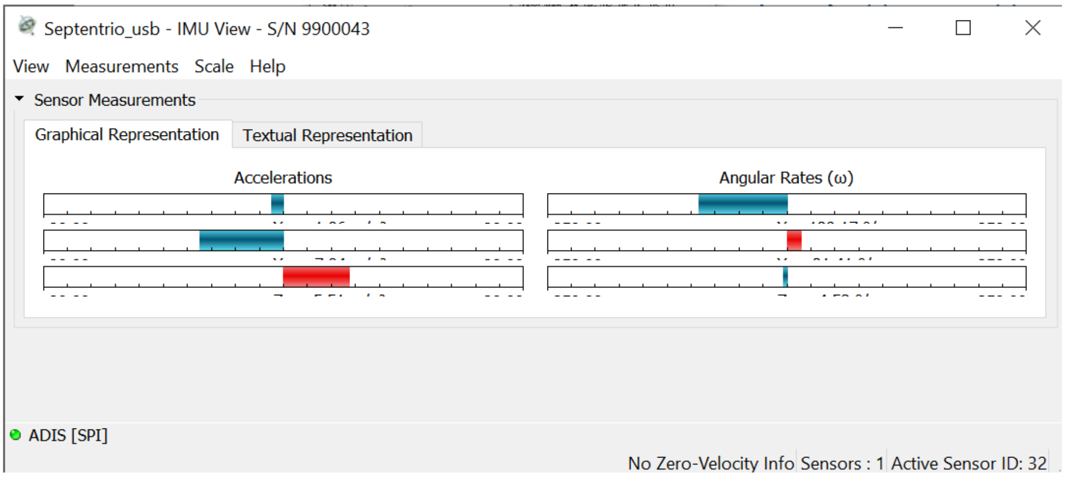

Figure 5-7: Checking the IMU view in RxControl provides an unambiguous way of checking whether ot not the IMU is outputting data

5.4 Vehicle velocity input

The AsteRx RBi3 can receive vehicle velocity information and use it as part of the integrated position. The use of the vehicle velocity it is not required for the function of the device. Vehicle velocity input improves the dead reckoning performance and heading performance in single antenna. It is important to highlight that the contribution of the vehicle velocity input to the AsteRx RBi3 performance is function of the velocity computation accuracy and latency. The expected velocity input is an already computed vehicle speed, NMEA VSM stream, and not raw sensor data. For the communication details please look into the AsteRx RBi3 Firmware Reference Guide.

AsteRx RBi3 will automatically detect errors in the velocity input:

- Large latencies
- Axis errors
- Large errors in the velocity (detected during GNSS reception)

It is advised to compute the standard deviation of the velocity computation, which will be a function of the sensors used, and pass it to the receiver together with the velocity values. If the velocity accuracy is not known or not certain, it is possible to provide to the AsteRx RBi3 only the velocity values leaving blank the standard deviation. The Fuse+ technology of Septentrio will then assign a confidence value automatically.

5.5 Initialize INS filters

In order to calibrate the IMU measurements with the GNSS data and perform sensor fusion, it is necessary for the receiver to actually measure a small amount of dynamic data in all the directions in order for the position engine to decouple the measured motion from the IMU noise and inaccuracies.
In practical terms it means that from the start-up of the unit the system will go through a series of status stages:
- static alignment: the receiver expects to have no movements in order to record the noise floor the the IMU
- dynamic alignment: the receiver expects to have the vehicle moving forward and take a few turns with enough dynamics to measure all the IMU axes.

During the alignment phase the receiver is outputting the best known position and heading, which comes from only GNSS and not INS because the filters are not yet initialized. The update rate remains the selected one but the information about position and heading are repeated until a new update would be available.

5.6 Verify the setup: RxLeverArm

This chapter will focus on the use of the RxLeverArm, one of the tools available as part of the RxTools (from release 22.0.0). RxLeverArm will be found in RxTools launcher.

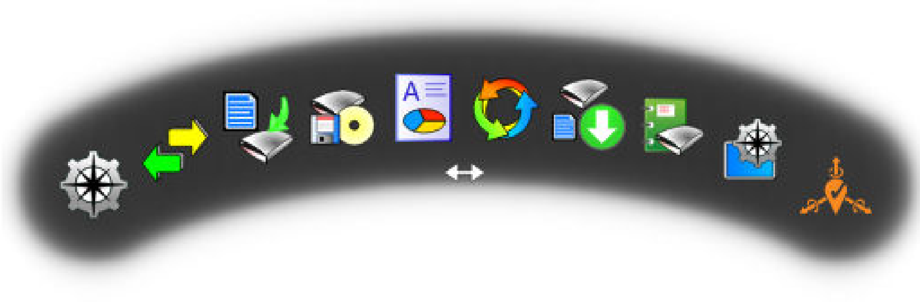

Figure 5-8: RxLeverArm icon in RxTools launcher

The RxLeverArm is a tool that allows the user to select a data set with all the required information (see section below) and to double check if the lever arm measurements are correct or could be better measured. It also allows to change (if need being) other parameters such as IMU orientation, to ensure setup accuracy and allow the user to optimize installation and configuration.

5.6.1 Data requirements

RxLeverArm needs to have a good set of data to check the lever arm accuracy and propose the optimized solution, such a data set shall be at least 15 minutes long (from INS solution initialization), recorded in good sky view (ideally with an RTK correction source) and with enough turns in multiple directions.
In order to minimize the user effort in setting-up the receiver to record all the needed information at the needed data rate you can find in the receiver (starting from FW release 114.05) a new data group called âĂIJINScalibrationâĂİ that will automatically instruct the receiver to output the needed data for the host platform to log (RxLogger could be used as well to log directly on a laptop) or internally log in the receiver memory (only available for AsteRx RBi3 Pro+).

The description of the indicated maneuver and of the receiver setup to record the data can be found also in the âĂIJintroâĂİ tab of the software.

Data loading and basics validation of the data can be done in the Check page, where clicking on the âĂIJfolderâĂİ button will allow the user to browse to the wished SBF file and open it. Once the SBF file is opened in RxLeverArm the software will perform basics checks on the data to ensure that the correct data set is selected.

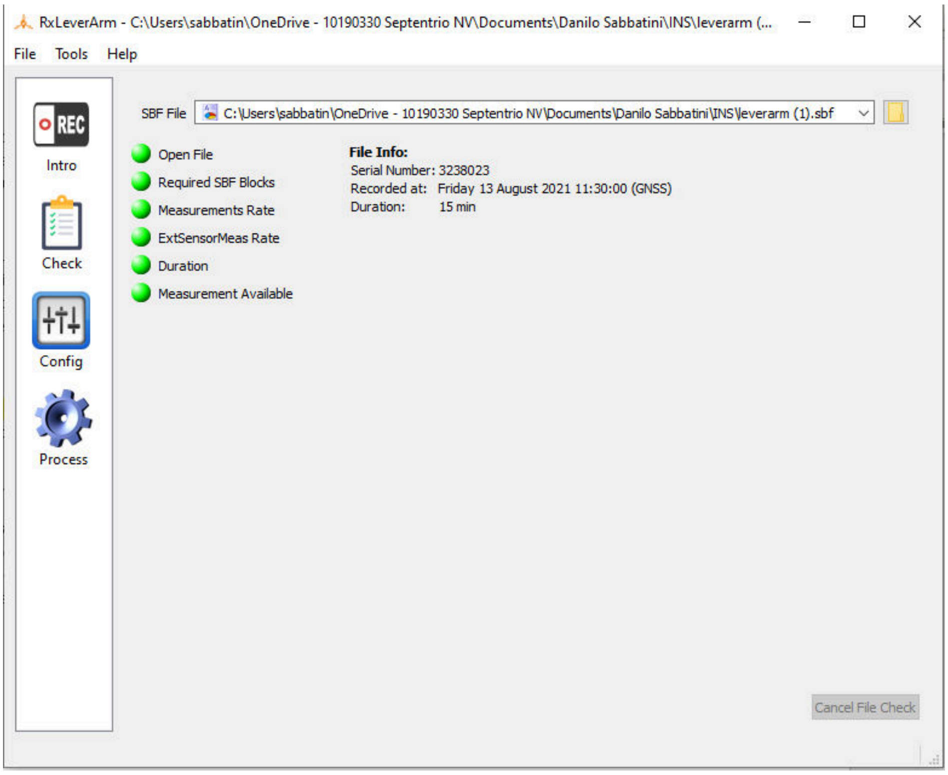

Figure 5-9: RxLeverArm data check

5.6.2 Setup verification

In the âĂIJConfigurationâĂİ tab of the RxLeverArm the installation setup used to record the data can be visualized both numerically and visually, particularly in this tab will be found:

âĂć lever arm from IMU reference point to ARP
âĂć IMU Orientation
âĂć Attitude Offset (only in dual antenna configuration)

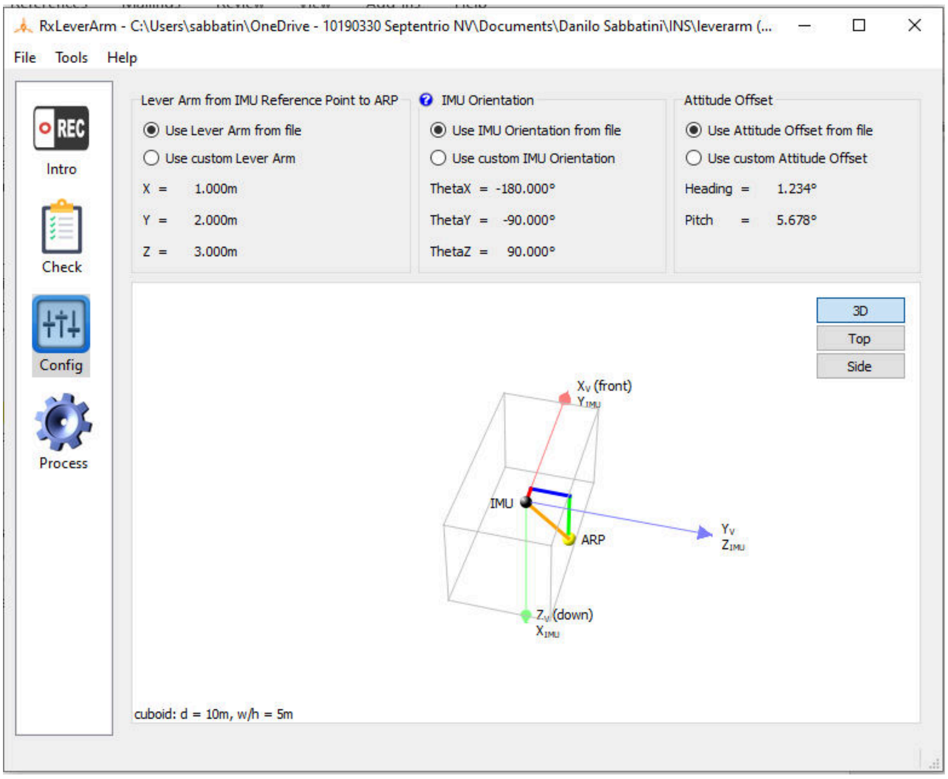

Figure 5-10: RxLeverArm configuration

For each of the above-mentioned settings it is possible to confirm the ones in the original SBF file, or it is also possible for the user to modify each value. For the IMU Orientation it is also possible to visualize an online help that contains several images with examples of installations and corresponding angles for the IMU Orientation.

5.6.3 Setup optimization

The âĂIJprocessâĂİ tab allows to process the available data to optimize the âĂIJlever arm from IMU reference point to ARPâĂİ, visualize the suggested values and compare with the values used in the original setup.

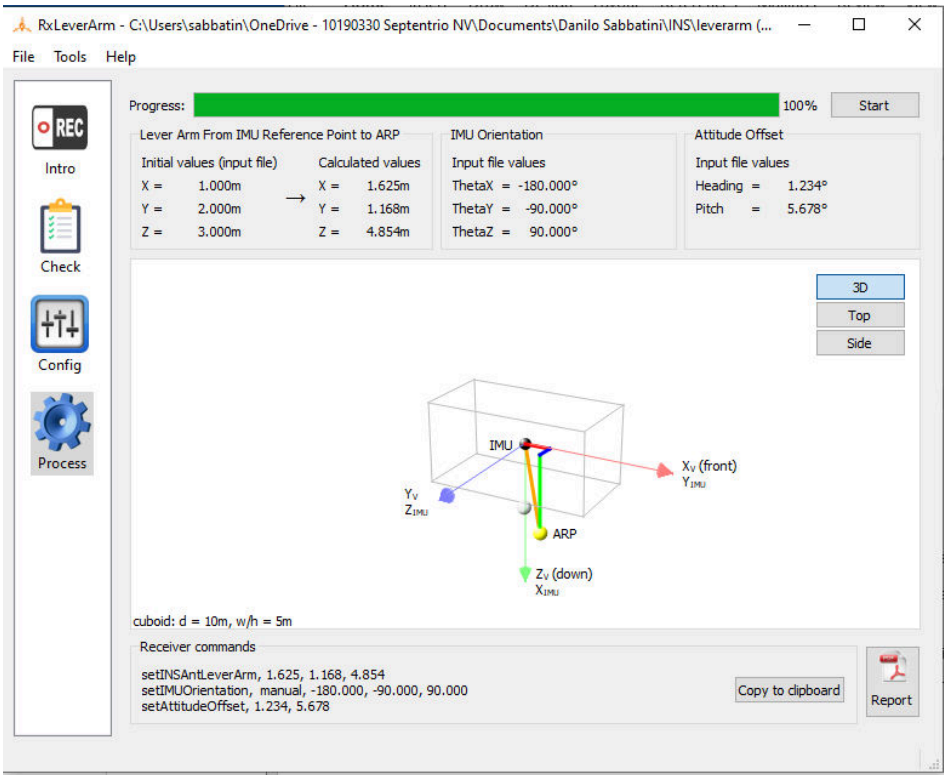

Figure 5-11: RxLeverArm optimization

This allows users to compensate for possible errors done during the measurement of the lever arm allowing to focus on the other aspects of the installation.
Once the computation of the new lever arm is completed the RxLeverArm will display the series of command lines to write into the receiver in order to update the receiver setup, it is also possible to use the copy to clipboard button to just paste in the Web User Interface.

septentrio

6 Base station operation

6.1 Configuring the AsteRx RB3 NTRIP Caster

The AsteRx RB3 Pro+ includes a built-in NTRIP Caster that makes correction data from the AsteRx RB3 available to up to 10 NTRIP clients (or rovers) over the internet. The caster supports up to three mount points and can also broadcast correction data from a remote NTRIP server.
This feature is not available on he AsteRx RBi3.

All settings relating to the AsteRx RB3 NTRIP Caster can be configured in the **NTRIP Caster** window from the **Communication** menu.

Step 1: Define a new mount point

Figure 6-1: 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 6-1. 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.

To select a correction stream from the NTRIP server of the AsteRx RB3, select '**No**' in the 'Allow external server' field[1].

Click on the '**Local Server ...**' button to enable the local NTRIP server of the AsteRx RB3 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.

Step 2: 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 (rover) to access the correction stream.

In the 'Client Users' section, click on **New User** as shown in Figure 6-2. 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.

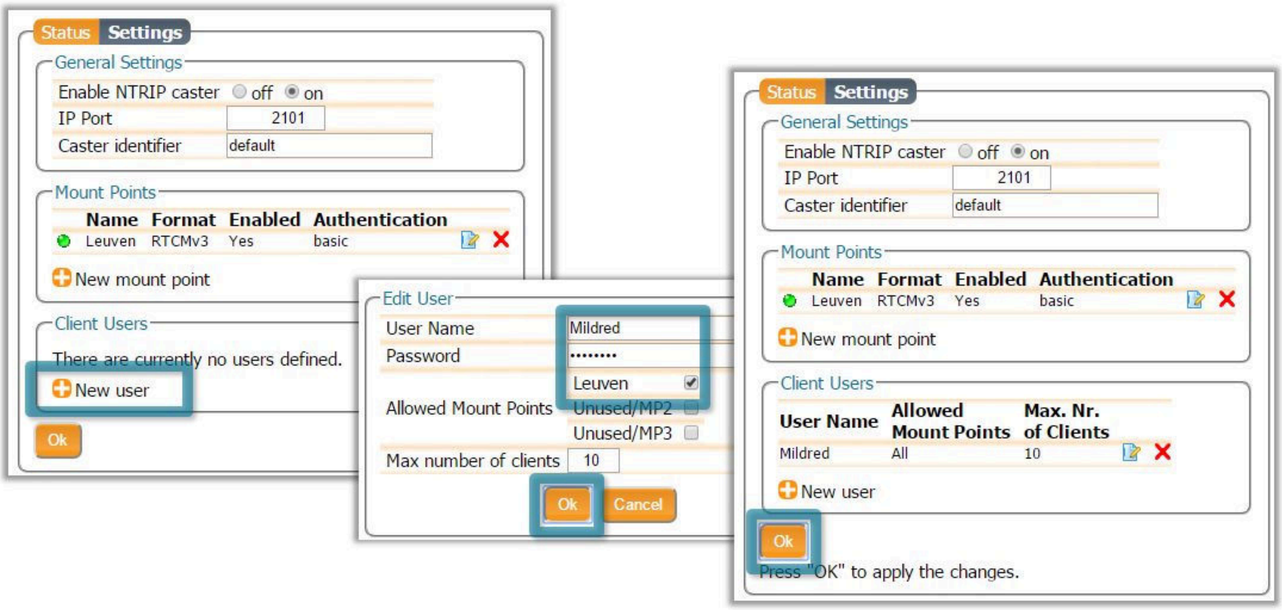

Figure 6-2: Configuring the login credentials for a user

Step 3: 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 6-3, a rover client is connected to the mount point named **Leuven** as user **Mildred**.

[1] By setting **Allow external server** to **Yes** the mount point can receive a stream from a remote NTRIP server

If the client rover receivers are configured to send a GGA message to the caster (as was the case in Figure 6-4), then their position will also be visible.

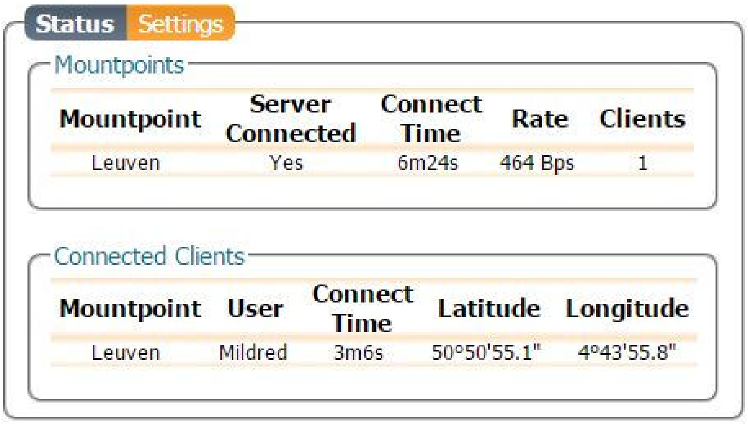

Figure 6-3: Connecting as a client to the AsteRx RB3 NTRIP Caster

On the NTRIP Client side

Rover receivers can connect to the NTRIP Caster by going to '**Corrections > NTRIP**' clicking **New NTRIP client** and entering its IP address and Port as shown in Figure 6-4. 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.

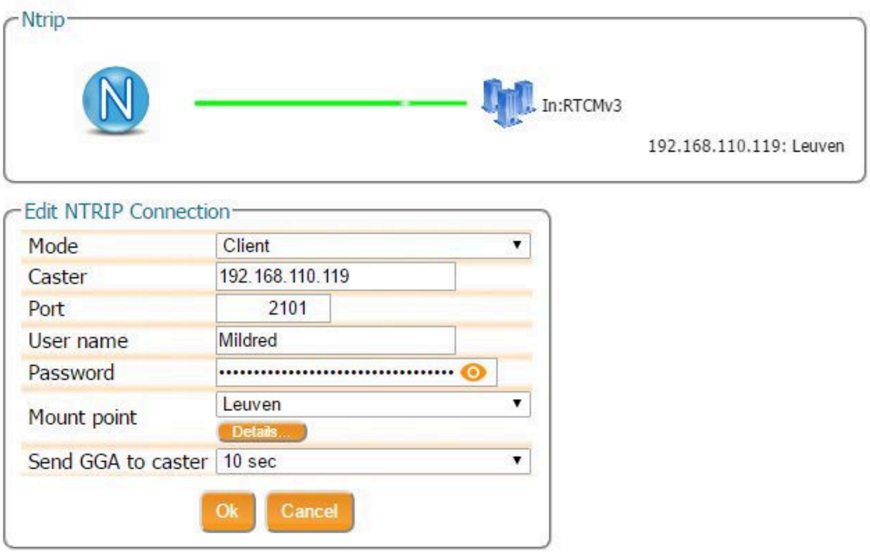

Figure 6-4: Connecting as a client to the AsteRx RB3 NTRIP Caster

7 Receiver Monitoring

7.1 Basic operational monitoring

The ‘Overview’ page of the web interface in Figure 7-1 shows at a glance a summary of the AsteRx RB3’s operational status.

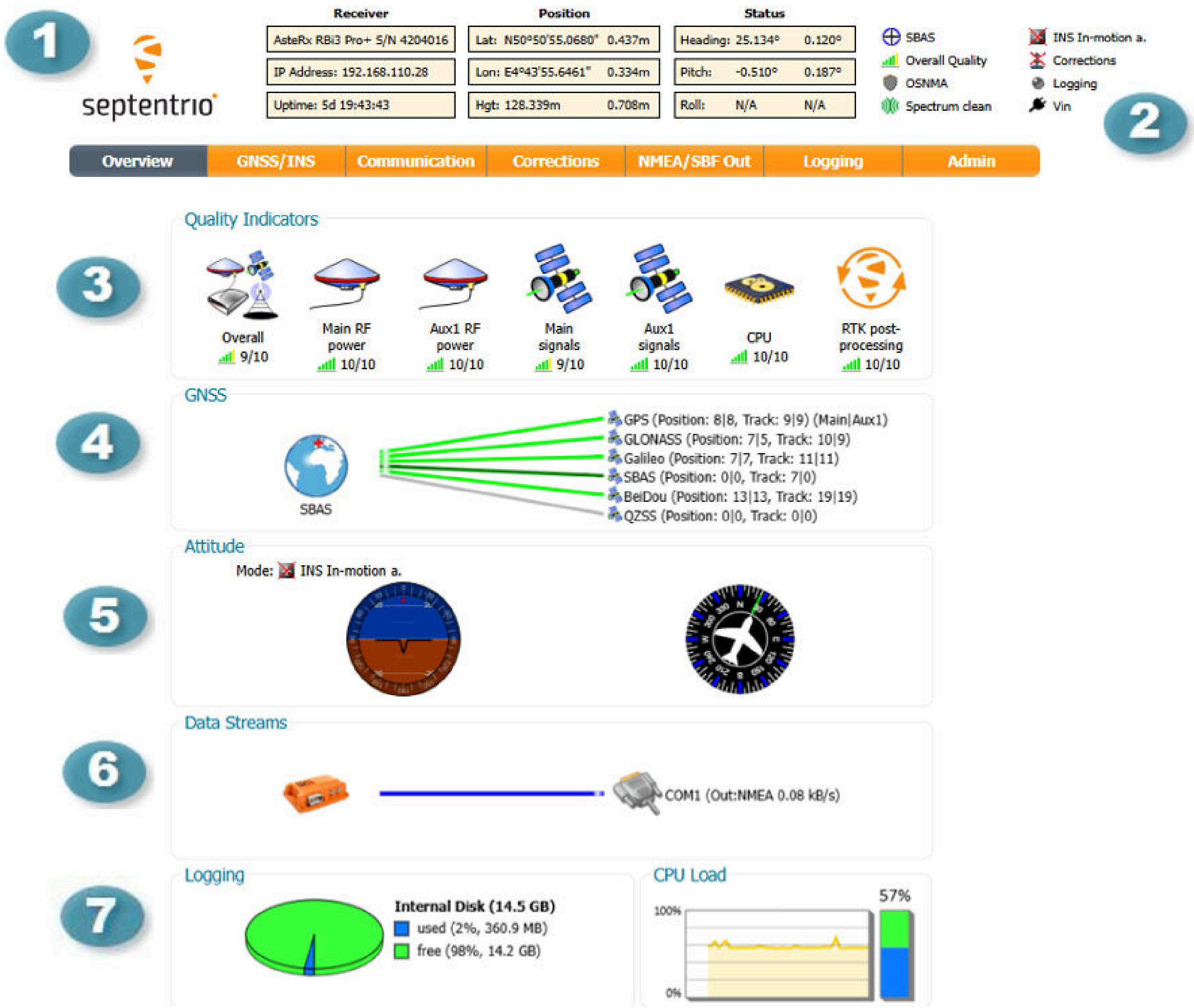

Figure 7-1: Overview page of the web interface

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 attitude when a second antenna is connected, are also given.

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.

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 found in the **Satellites and Signals** page on the **GNSS** menu.

5 The **Attitude** field gives an overview of the attitude status.

6 The **Data Streams** field gives an overview of the data streams into (green lines) and out from (blue lines) the receiver.

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

7.2 AIM+: Using the spectrum analyzer to detect and mitigate interference

The AsteRx RB3 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 7-2 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.

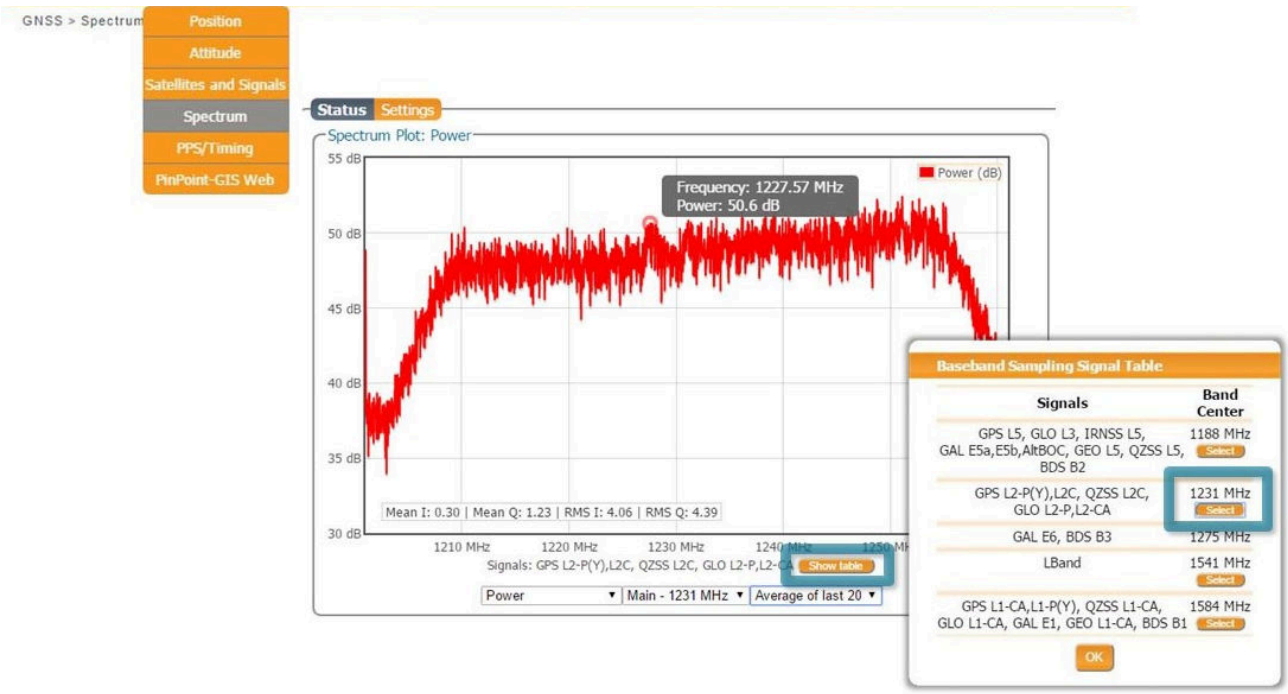

Figure 7-2: The RF spectrum of the L2 Band

7.2.1 Narrowband interference mitigation

Configuring the notch filters

When the notch filters are set to their default auto mode, 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 7-3, the region of the affected spectrum is specified by a center frequency and a bandwidth which is effectively blanked by the notch filter.

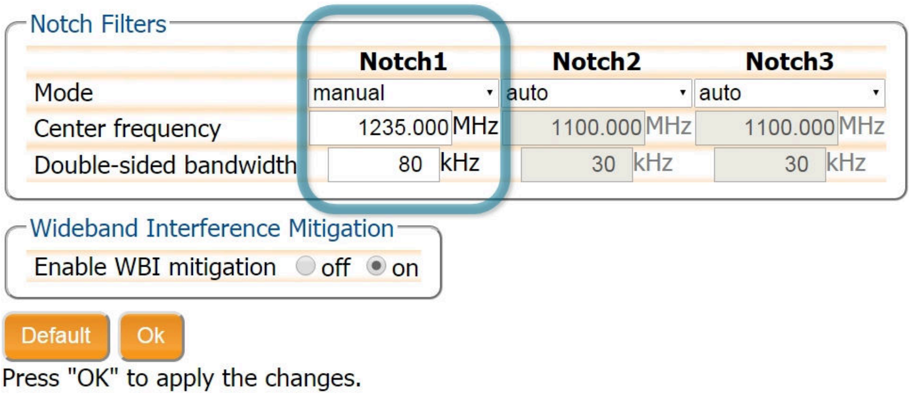

Figure 7-3: Configuring the first notch filter Notch1 at 1235 MHz

With the Notch1 settings as shown in Figure 7-3, the L2-band after the notch filter (After IM) is shown in Figure 7-4 with the blanked section clearly visible.

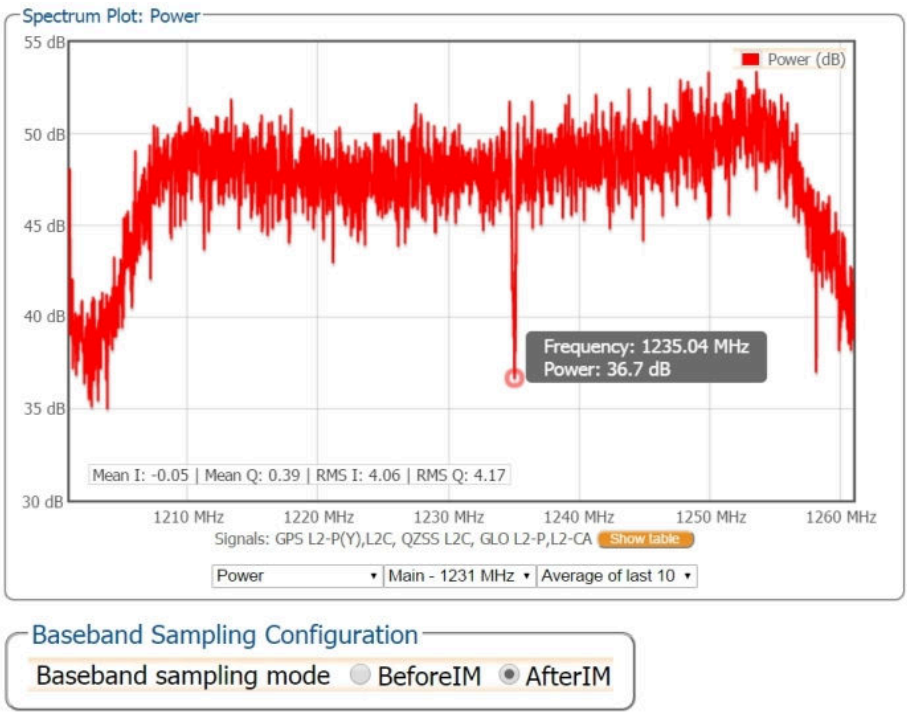

Figure 7-4: The RF spectrum of the L2 Band after applying the notch filter at 1235 MHz

7.2.2 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 RB3 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 7-5.

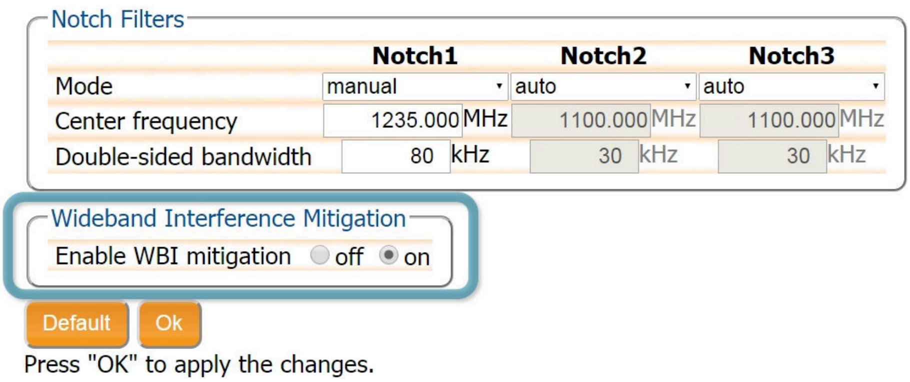

Figure 7-5: Select 'on' to enable wideband interference mitigation then 'OK' to apply the new setting.

WBI mitigation in action

The GPS L1 band interference shown in Figure 7-6 is produced by combining the GNSS antenna signal with the output from an in-car GPS chirp jammer.

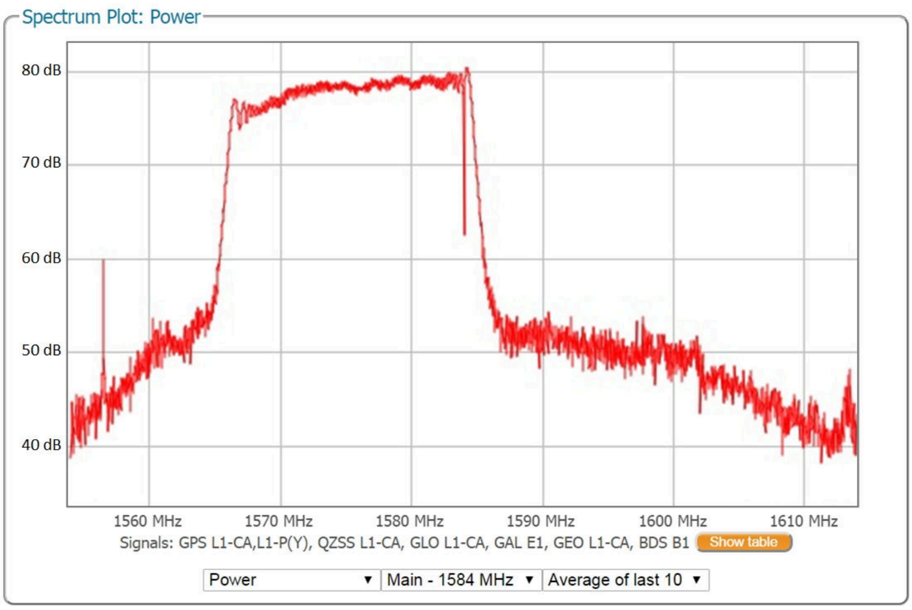

Figure 7-6: Simulated wideband interference in the GPS L1 band using an in-car chirp jammer.

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 7-7 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.

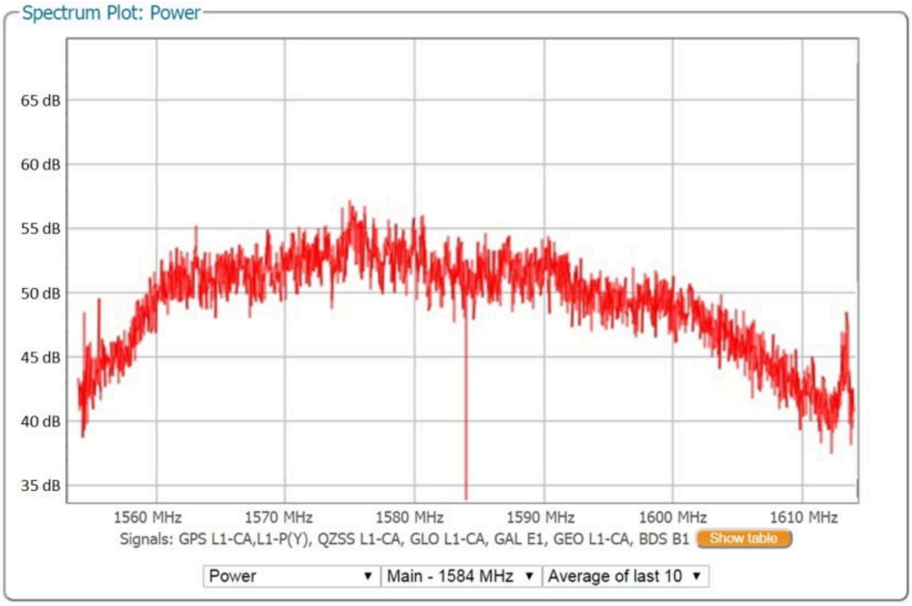

Figure 7-7: Enabling WBI interference mitigation greatly reduces the effect of the interference caused by the chirp jammer.

7.3 How to log data for problem diagnosis

If the AsteRx RB3 does not behave as expected and you need to contact Septentrio's Support Department, it is often useful to send a short SBF data file that captures the anomalous behavior.

7.4 Support SBF file

Step 1: Log the Support SBF data blocks

On the **Logging** page, click on **New SBF stream**. In the next window, you can select the SBF blocks you wish to log. By selecting **Support** as shown in Figure 7-8 the most useful SBF blocks for problem diagnosis will be automatically selected. Click **OK** then turn **on** logging. Again click **OK** to start data logging.

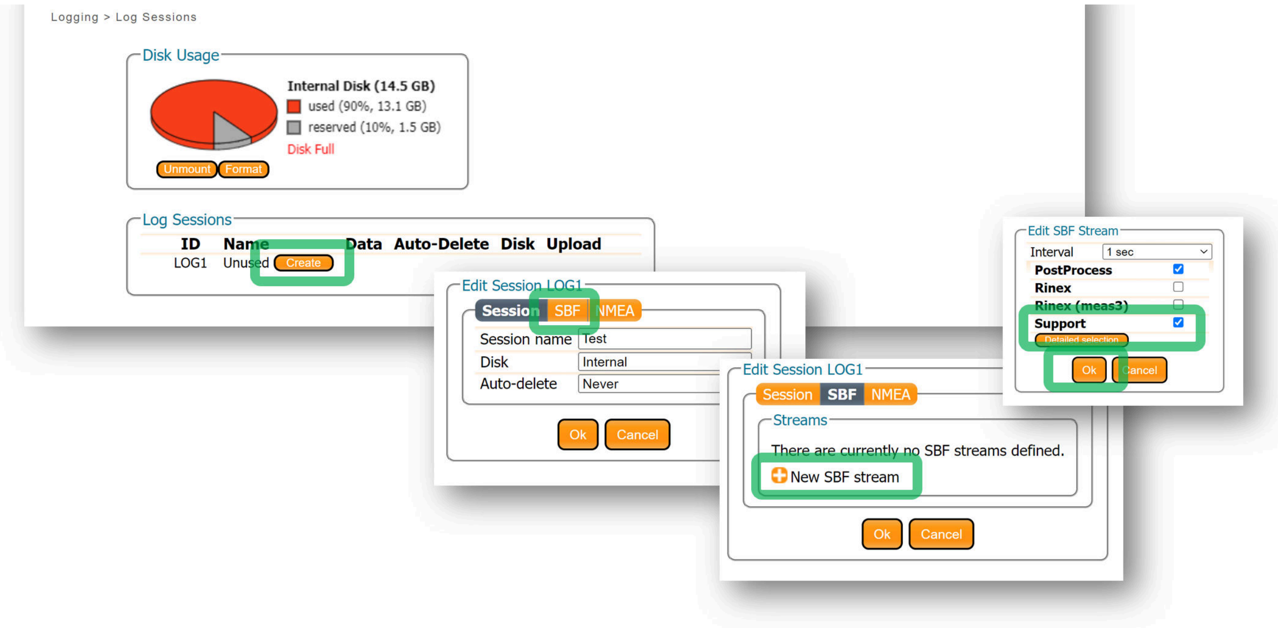

Figure 7-8: Click on **New SBF stream** and select **Support**

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 7-9.

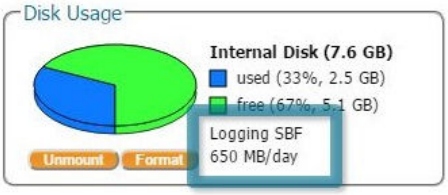

Figure 7-9: The **Logging** window showing an active logging session

Step 2: Downloading the logged SBF file

To download a data file logged on the AsteRx RB3, click the download icon next to the filename on the **Disk Contents** tab as shown in Figure 7-10

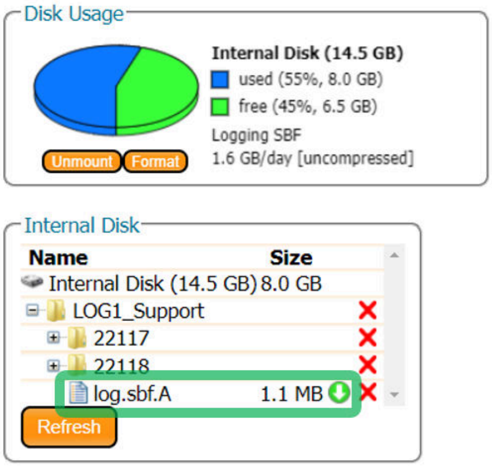

Figure 7-10: Click the icon next to the file you want to download

7.5 Activity logging

The AsteRx RB3 reports various events in the **Receiver Messages** window of the **Admin** menu that can be used to check receiver operations. The example in Figure 7-11 shows that four, 15 minute SBF files have been successfully FTP pushed to a remote location.

Figure 7-11: Events reported by the AsteRx RB3 in the **Receiver Messages** window

8 Receiver Administration Operations

8.1 How to change IP settings of the AsteRx RB3

The IP settings of the AsteRx RB3 can be configured in the **Ethernet** window of the Web Interface. By default, the AsteRx RB3 is configured to use DHCP to obtain an IP address but, a static IP address can also be configured as shown in Figure 8-1.

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.

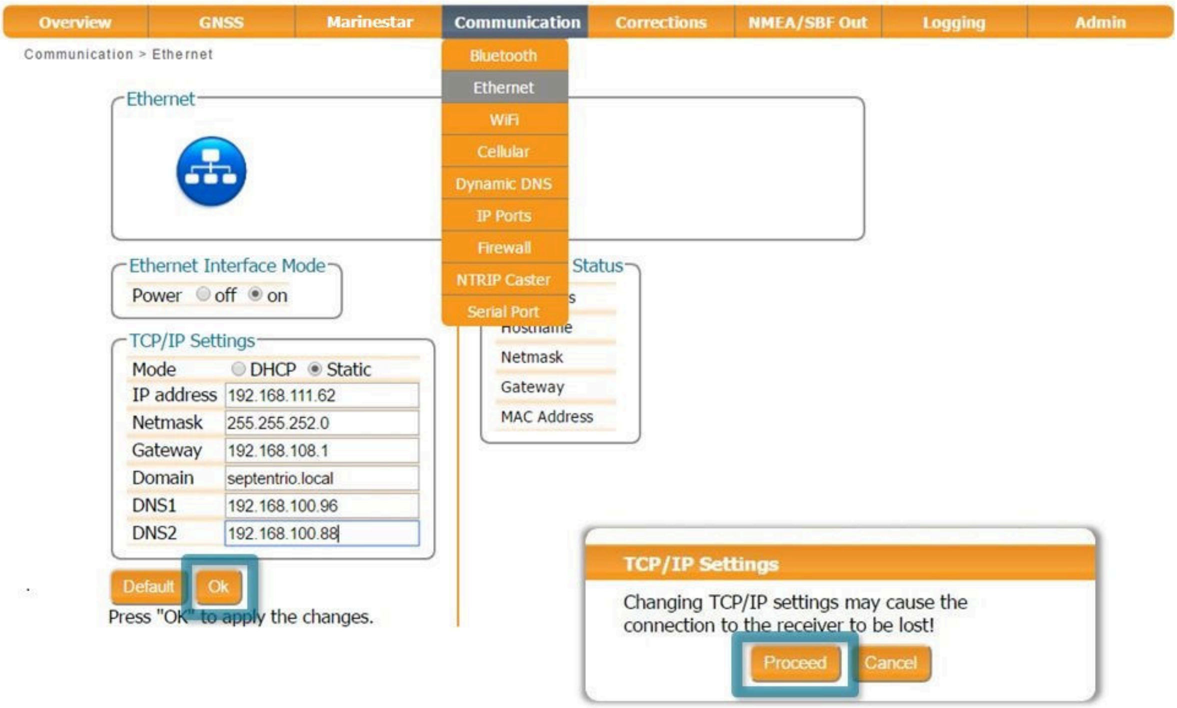

Figure 8-1: Configuring a static IP address

The new IP address should now appear in the **Ethernet Status** field as shown in Figure 8-2.

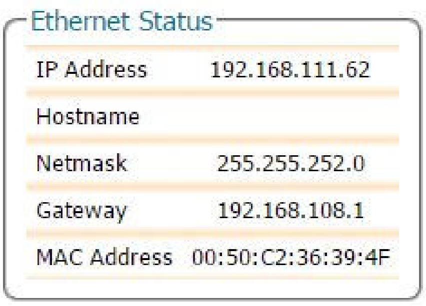

Figure 8-2: TCP/IP settings

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.

8.2 How to configure Dynamic DNS

Dynamic DNS allows remote contact with the AsteRx RB3 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.

To make use of this feature on the AsteRx RB3, you should first create an account with a Dynamic DNS provider (**dyndns.org** or **no-ip.org**) to register a hostname for your receiver. In the example shown in Figure 8-3, the hostname *asterxu.mine.nu* has been registered with dyndns.org. The **Bind** option, selected in this case, tells the Dynamic DNS provider only to update IP addresses assigned over an Ethernet LAN connection.

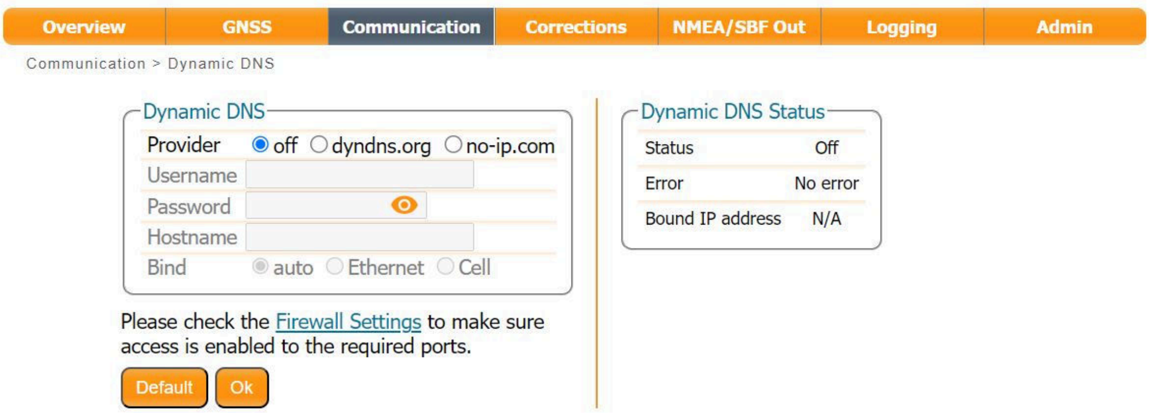

Figure 8-3: Configuring Dynamic DNS

8.3 How to control access using the AsteRx RB3 Firewall

You can control access to the AsteRx RB3 using the receiver's firewall in the **Firewall** window. By default, all Ethernet ports are open (i.e. those defined on the **IP Ports** menu).

In the example shown in Figure 8-4, Ethernet ports 2101, 2102 and 2103 are accessible but only from devices with the IP address 84.199.9.148.

Please note that the firewall settings do not apply when connecting to the web interface using USB.

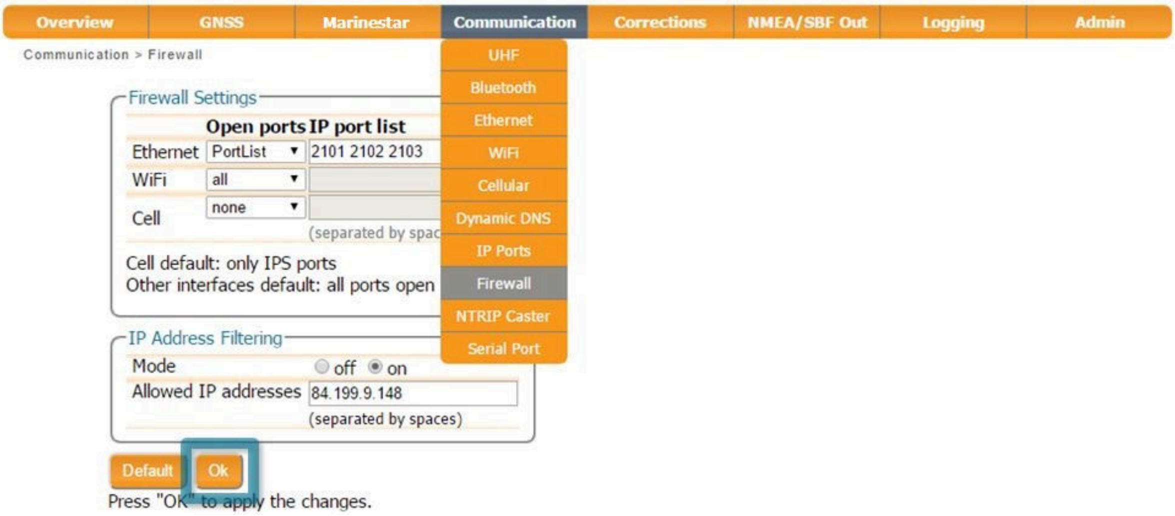

Figure 8-4: Configuring the Firewall of the AsteRx RB3

8.4 How to upgrade the firmware or upload a new permission file

The AsteRx RB3 firmware and permission files both have the extension .suf (Septentrio Upgrade Format) and can be uploaded to the AsteRx RB3 as shown in the steps below. Firmware upgrades can be downloaded from the Septentrio website and are free for the lifetime of the receiver.

Step 1: Select the .suf file and start upgrade

The upgrade procedure is started by clicking on Choose file in the Admin Upgrade tab as shown in Figure 8-5.

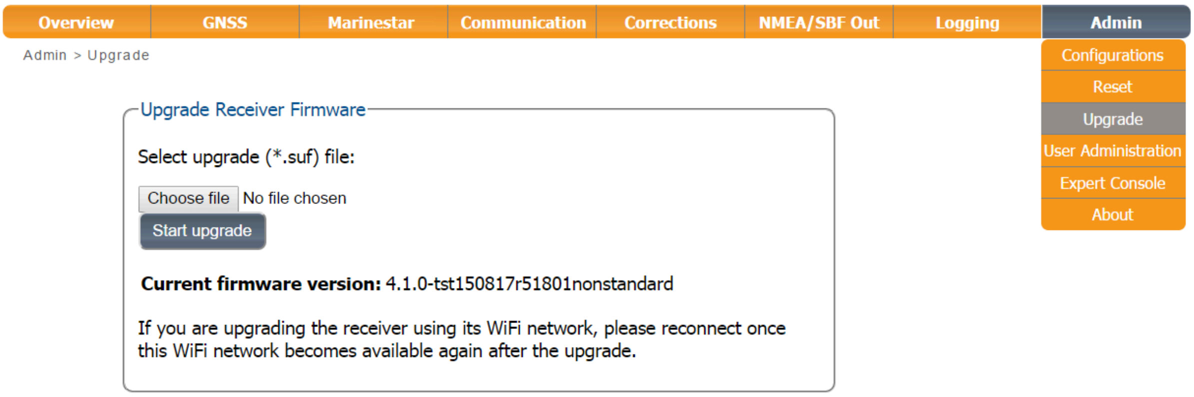

Figure 8-5: The AsteRx RB3 upgrade window

After saving the .suf file to your PC, you can then select this file, start the upgrade and follow its progress as shown in Figure 8-6 .

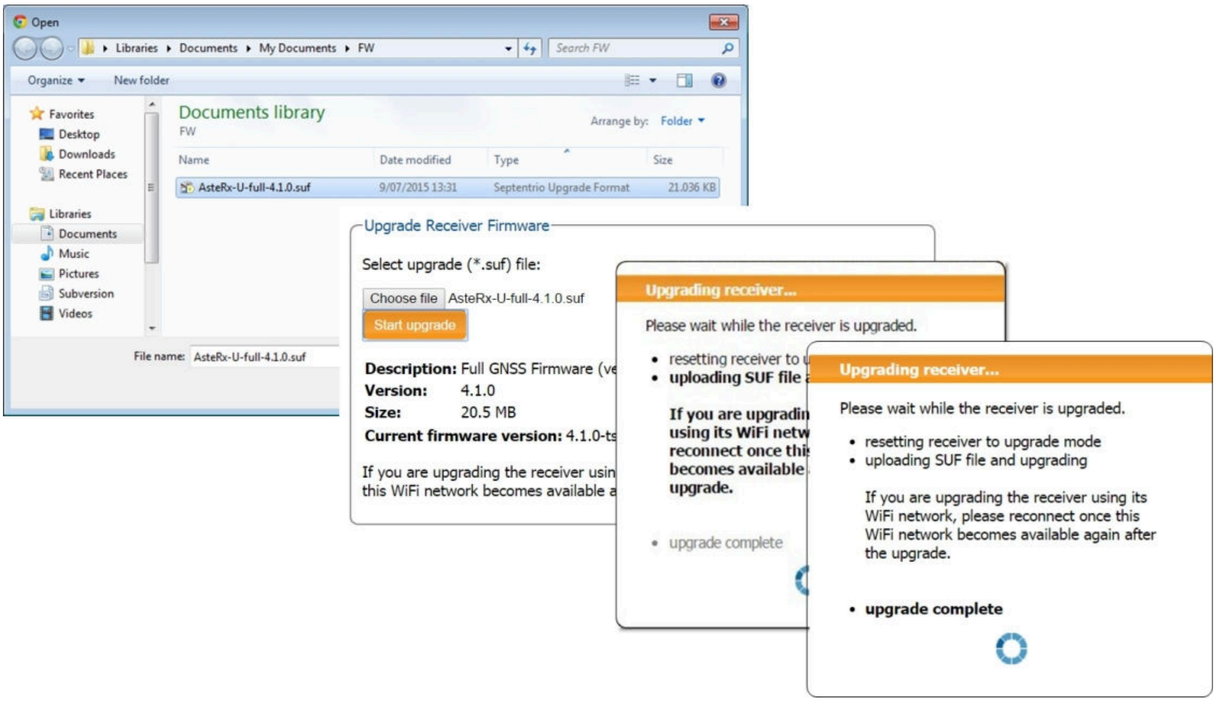

Figure 8-6: The AsteRx RB3 upgrade window

Step 2: Verifying the upgrade

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 RB3 firmware or permission file has correctly been updated to the new version as indicated in Figure 8-7.

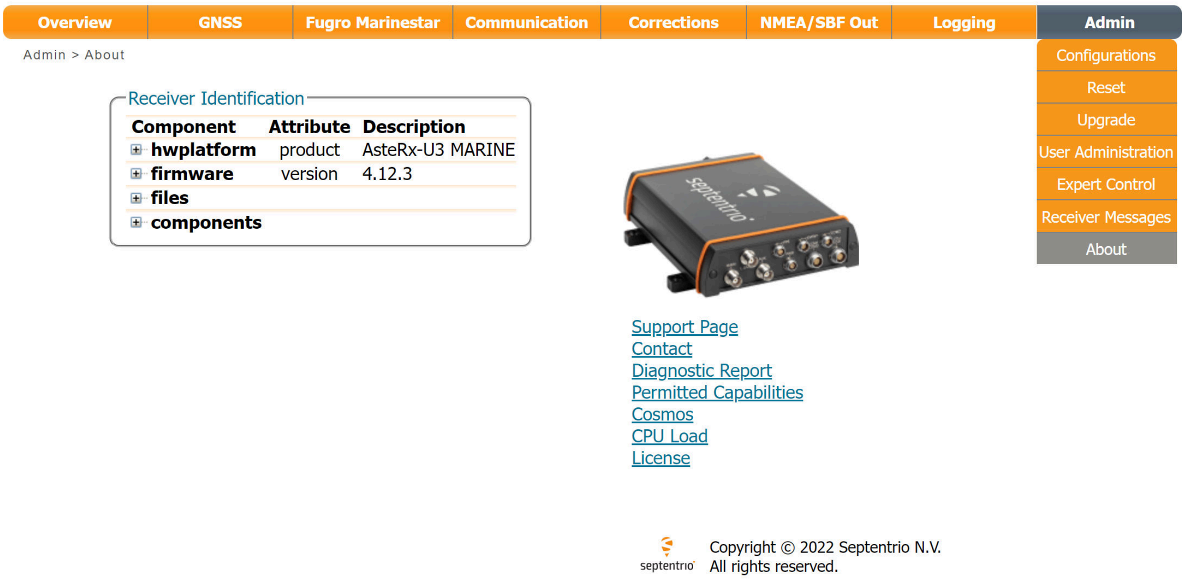

Figure 8-7: Checking the firmware and permission file versions

8.5 How to set the AsteRx RB3 to its default configuration

You can set the AsteRx RB3 configuration to its default settings via the Admin Configurations tab as shown in Figure 8-8. 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.

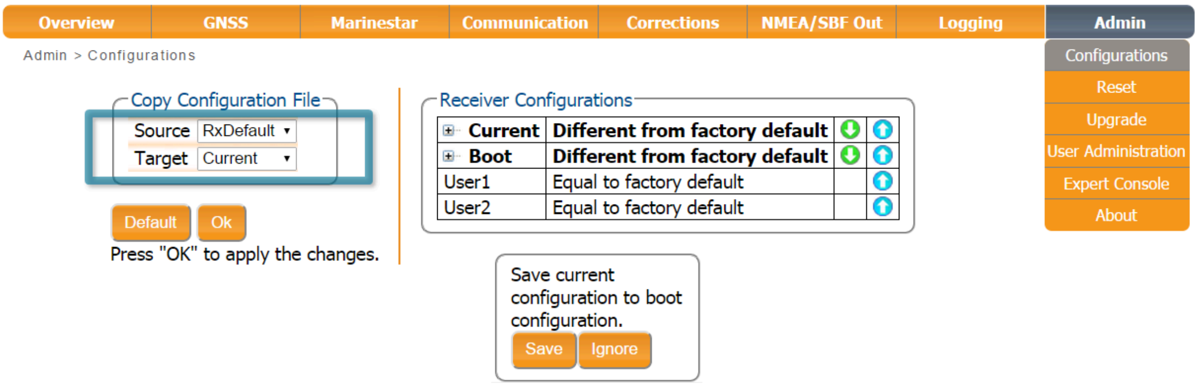

Figure 8-8: Setting the AsteRx RB3 to the default configuration

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.

8.6 How to reset the AsteRx RB3

If the AsteRx RB3 is not operating as expected, a simple reset may resolve matters. Via the Admin > Reset tab as shown in Figure 8-9, different functionalities can be individually reset. A 'Soft' level reset will cause the AsteRx RB3 to boot up with its current configuration while a 'hard' reset will use the configuration stored in the boot file.

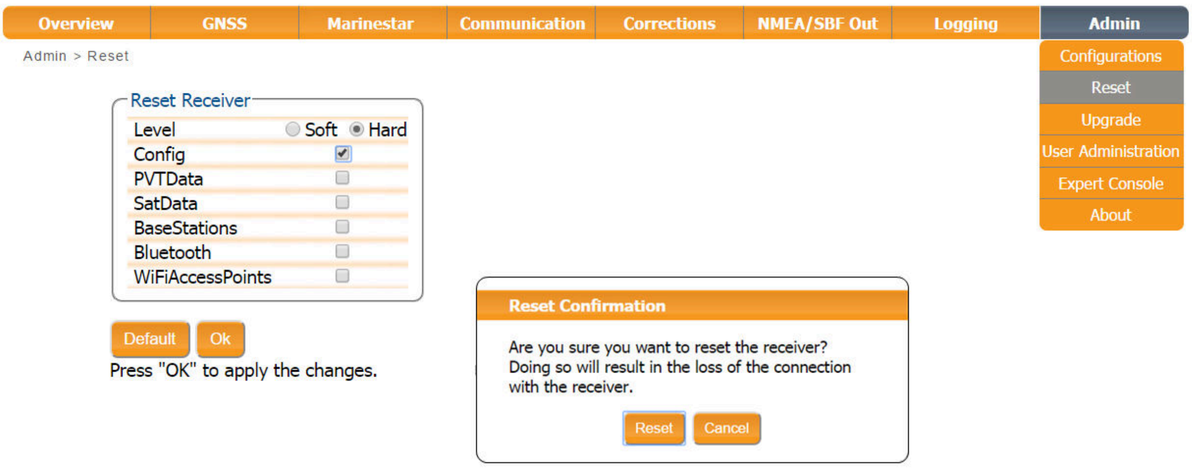

Figure 8-9: Resetting the AsteRx RB3 configuration to its boot configuration

8.7 How to copy the configuration from one receiver to another

In the Admin > Configurations tab, the configuration of an AsteRx RB3 can be easily saved to a PC as a text file. A saved configuration can also be uploaded to an AsteRx RB3.

Step 1: Downloading the configuration from an AsteRx RB3

Click the green download arrow next the configuration you wish to download as shown in Figure 8-10. The configuration will be saved as a .txt file in the same downloads location used by the internet browser.

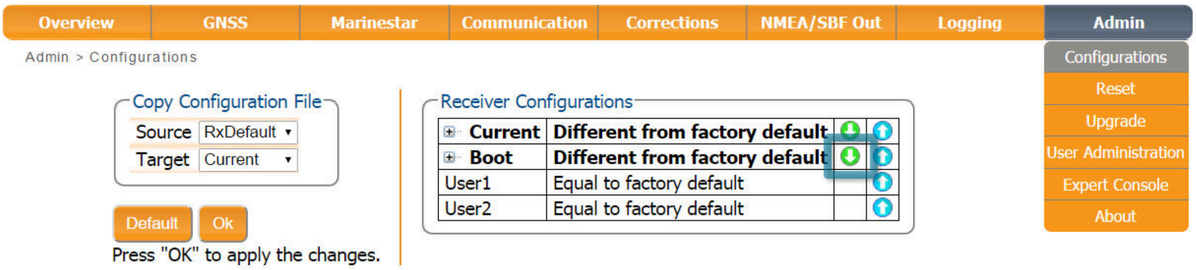

Figure 8-10: Downloading a configuration from an AsteRx RB3

Step 2: Uploading the configuration to a second AsteRx RB3

Click on the blue upload arrow, as indicated in Figure 8-11, to upload a configuration file stored on you PC. In this example, the saved file will be uploaded as the Boot configuration.

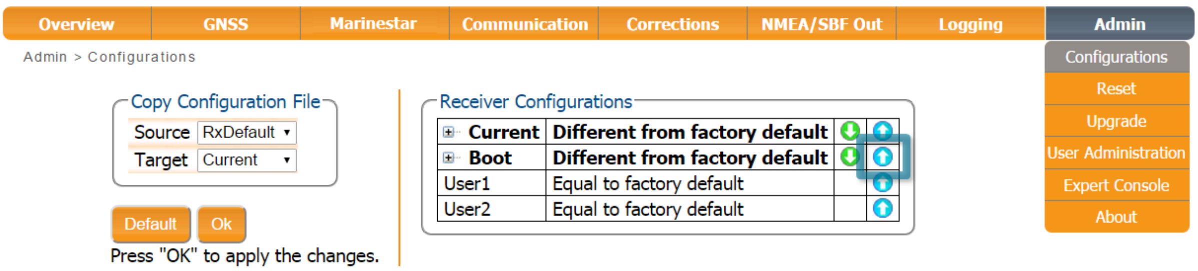

Figure 8-11: Uploading a configuration to an AsteRx RB3

Select the configuration file to be uploaded then click on OK on the status pop-up as shown in Figure 8-12.

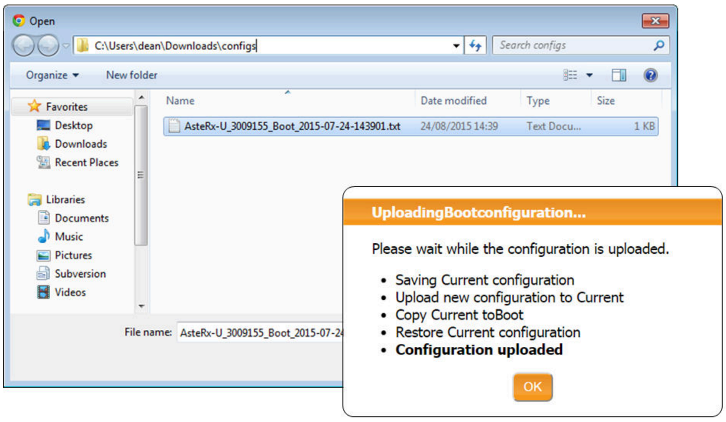

Figure 8-12: Select the configuration file to upload

9 Security

9.1 Default access to the AsteRx RB3

You can manage the access that users have to the AsteRx RB3 in the ‘**User Administration**’ window of the ‘**Admin**’ menu.

By default, all communications are assigned User-level access as shown in Figure 9-1. ‘User’ level allows full control of the receiver while ‘Viewer’ level only allows monitoring the receiver and viewing its configuration.

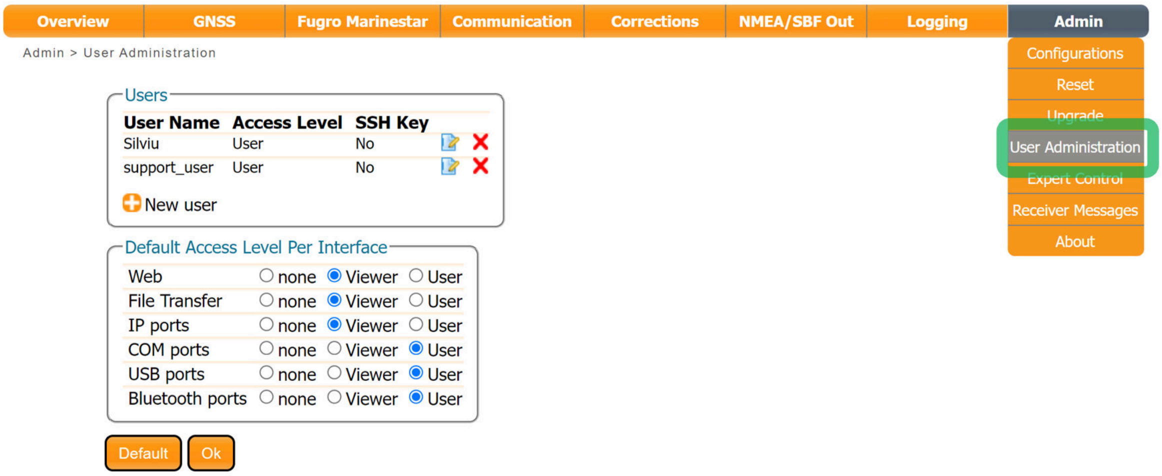

Figure 9-1: The default access levels of the AsteRx RB3

9.2 Defining user access to the AsteRx RB3

You can add users and define their access levels by clicking on the ‘**New user**’ button as shown in Figure 9-2. You can also define the default access when not logged in.

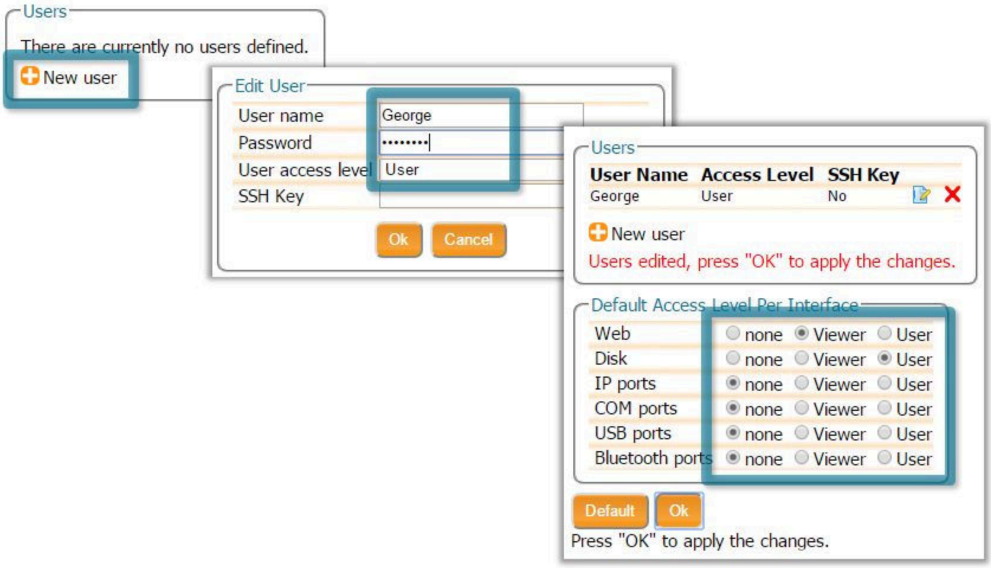

Figure 9-2: Click on '**New user**' and fill in the user details and the default access when not logged in

9.3 User access: an example

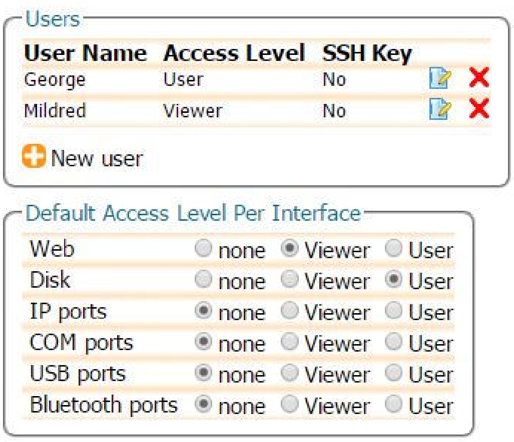

Figure 9-3: An example with two defined users

In the example shown in Figure 9-3:

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 to the disk over FTP so can download and delete logged data files.

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

After defining the Users/Viewers and their access levels, they can login on the web interface by clicking on **Log in** on the upper-right corner as shown in Figure 9-4.

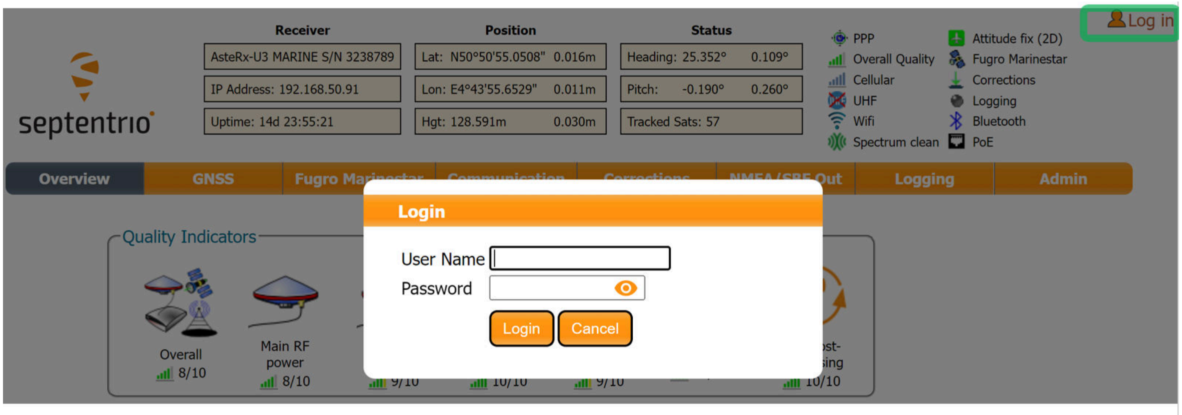

Figure 9-4: Logging in to the AsteRx RB3 web interface

9.3.1 Using SSH key authentication

By default, anonymous users have full access over FTP, SFTP and rsync to the files logged on the AsteRx RB3. 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 9-5.

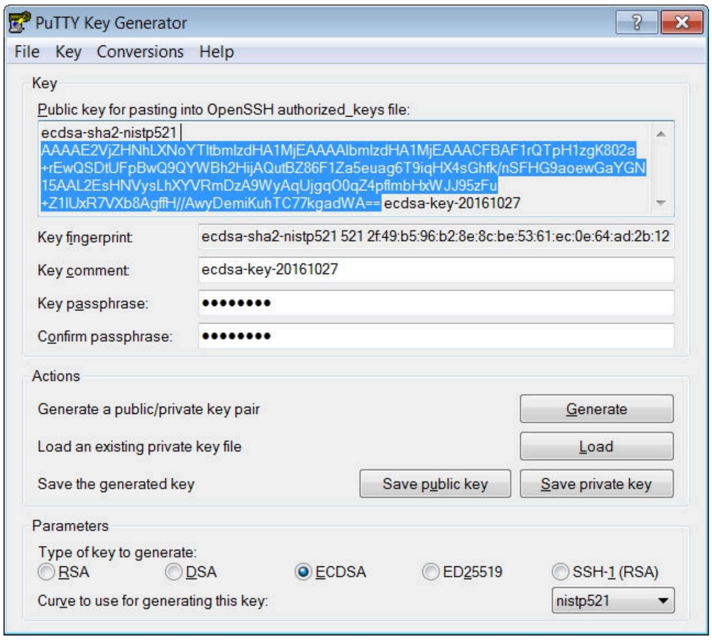

Figure 9-5: Generating SSH keys using the PuTTY Key Generator. The public key is highlighted.

The generated public key is the highlighted text that can be pasted directly into the **SSH Key** field of the AsteRx RB3 Web Interface as shown in Figure 9-6.

Figure 9-6: Using an SSH Key

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.

9.4 HTTP/HTTPS

By default, both http and https are enabled, however, http and/or https access to the receiver can be disabled through the web interface by going to the Communication/Web Server page or using the **setHttpsSetting** command. Secure http access requires the user to provide a certificate to the receiver which can be done by again navigating to the Communication/Web Server page of the web interface as shown in Figure 9-7, and uploading a .pem file containing the certificate. By default, if no user-provided certificate is available, the receiver will use a self-signed certificate instead.

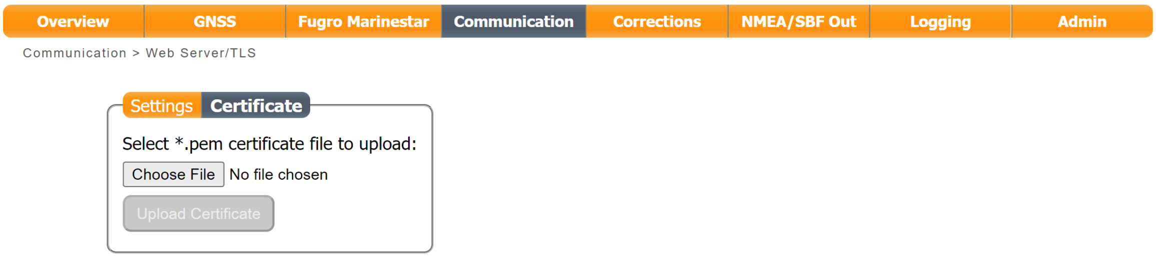

Figure 9-7: Uploading a certificate to the receiver

10 Appendix

10.1 Power & data connector description

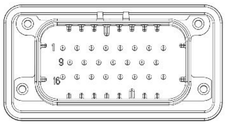

Figure 10-1: 23-pin male socket pin-numbering guide as viewed end on.

PIN #	Name	Comment
1	CAN_H	CAN high
2	USB D-	USB data signal negative
3	RxD-	Ethernet 10/100 RX-
4	TxD-	Ethernet 10/100 TX-
5	GND (COM2)	COM2 Ground
6	Event A	Event A digital input (max. 24V)
7	RX2	COM2 RX
8	TX2	COM2 TX
9	CAN_L	CAN low
10	USB D+	USB data signal positive
11	RxD+	Ethernet 10/100 RX+
12	TxD+	Ethernet 10/100 TX+
13	GND (USB)	USB Ground
14	PPS Out	PPS Out (5V TTL)
15	GND (Power)	Power Ground
16	GND (CAN)	CAN Ground
17	USB V_BUS	USB V_BUS (5V). Cannot be used to power the receiver
18	RX1	COM1 RX
19	TX1	COM1 TX
20	GND (COM1)	COM1 Ground
21	Event B	Event B digital input
22	Power_IN	Power input, 9 to 32 VDC
23	Power_IN	Internally shorted to pin 22