AsteRx SBi3

User Manual

User Manual Revision 1.6
Applicable to version 1.5.0of the AsteRx SBi3 firmware

October 23, 2025
Thank you for choosing the AsteRx SBi3! This user manual provides detailed instructions on how to use AsteRx SBi3 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 AsteRx SBi3 product family however, the particular AsteRx SBi3 you purchased may not support functions specific to certain variants.

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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1 Introduction

1.1 User Notices

1.1.1 CE Notice

AsteRx SBi3 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 SBi3 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.

Note: To ensure continued compliance with applicable cybersecurity requirements under the EU Radio Equipment Directive (RED), please refer to the Firmware Reference Guide and related technical documentation available on our support website or from your support contact.

1.1.2 ROHS/WEEE Notice

The AsteRx SBi3 is compliant with the latest WEEE, RoHS and REACH directives. For more information see www.septentrio.com/en/environmental-compliance.

1.1.3 Safety information

Caution: Shock hazard. The receiver can have multiple power sources. Make sure you disconnect all power sources when working with the receiver.

The power supply provided by Septentrio (if any) should not be replaced by another. If the receiver is used with a different power supply than provided by Septentrio, it must have a double isolated construction and must match the specifications of the provided power supply. In addition, the power supplies needs to comply with safety standard IEC 62368-1 and SELV.

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.

1.1.4 Support

Online resources e.g. how-to content, instructional videos and complementary documentation can be found on the support section of Septentrio website http://www.septentrio.com/support

When using the AsteRx SBi3, you will found particularly useful the Firmware Reference Guide.

- **The AsteRx SBi3 Firmware 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.

If you need additional information or in the rare eventuality the AsteRx SBi3 does not behave as expected, please contact Septentrio Support for direct sales or your dealer should you have purchased your receiver via a Septentrio business partner. In either case, make sure to include a copy of the diagnostic report of your unit and when possible a sample of SBF data capturing the problem.

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2 AsteRx SBi3 Overview

The AsteRx SBi3 is a housed INS solution which fuses multi-frequency and multi-constellation GNSS with an industrial-grade IMU (Inertial Measurement Unit), delivering precise positioning, 3D orientation and coasting functionality. IP68 compliant, this housed high performance GNSS/INS system is ideal for rapid integration into machine control or safety applications.

The AsteRx SBi3 can be used as a dual antenna GNSS/INS receiver for systems with any kind of motion pattern. It can also be used as a single antenna receiver for systems with no slip motion.

Use of the AsteRx SBi3 as a single antenna INS solution should be limited to use cases where the heading of the vehicle matches the direction of motion.

2.1 Physical and Environmental Specifications

Size:	102 x 36 x 118 mm (4.0 x 1.4 x 4.6 in)
Weight:	490 g (17.3 oz)
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-STD-810G, 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 Power Consumption

DC input voltage:	5 to 36V DC
Maximum power consumption:	2.5W
PoE input voltage:	37 to 57V DC
Maximum power consumption:	4.5W

The power consumption of the AsteRx SBi3 depends on its configuration. The following settings directly influence the amount of power consumed:

- The number of enabled GNSS frequency bands. For example, a receiver configured to track signals only in the L1 and L2 bands will consume less than a receiver configured to track in the L1, L2 and L5 bands. Use the **setSignalTracking** command to enable/disable signals. Note that a given frequency band is disabled only when all GNSS signals in that band are disabled.
- The activation of the Ethernet interface. In power-critical applications, it is recommended to not use Ethernet and to turn off the associated hardware. This can be done with the **setEthernetMode** command.
- The activation of the Wideband Interference mitigation (WBI) with the **setWBIMitigation** command.

The following table shows the nominal power consumption measured when 12 VDC is supplied to the PWR connector:

Configuration	Typical Power Consumption
GPS + GLONASS L1 + L2, RTK, Single antenna (externally powered), 10Hz internal logging active	1.3 W
GPS + GLONASS L1 + L2, RTK, Dual antenna (externally powered), 10Hz internal logging active	1.65 W
Ethernet on	+0.3 W
Antenna powered	Antenna type dependent

2.3 Powering the receiver

The receiver can be powered through either:

- The PWR connector (5 to 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 USB connector. Note: It is recommended to power the AsteRx SBi3 by an unmanaged USB 3.0 port that can supply at least 900mA of current at 5V. Typical USB3.0 ports on PCâĂŹs are managed (charging/current draw negotiation) and powering the unit over such an USB port is not always guaranteed.

2.4 AsteRx SBi3 design

2.4.1 Front Panel

The AsteRx SBi3 's front panel features two antenna TNC connectors for the Main and Aux antennas.

Note: Maximum mating/unmating torque: 1.4Nm. Applying a higher torque can damage connector and housing.

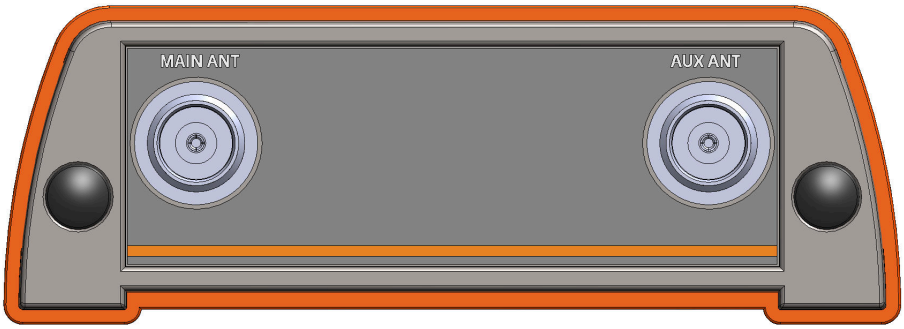

Figure 2-1: The front panel of the AsteRx SBi3

2.4.2 Rear Panel

Figure 2-2 shows the layout of the rear-panel connectors of the AsteRx SBi3. The rear panel has three connectors: a 7-pin female PWR-COM2/3/USB socket, a 7-pin female COM1-GPIO socket and a 4-pin female ETH socket. A full description of the connector PIN layout of the rear panel ports can be found in Appendix A.

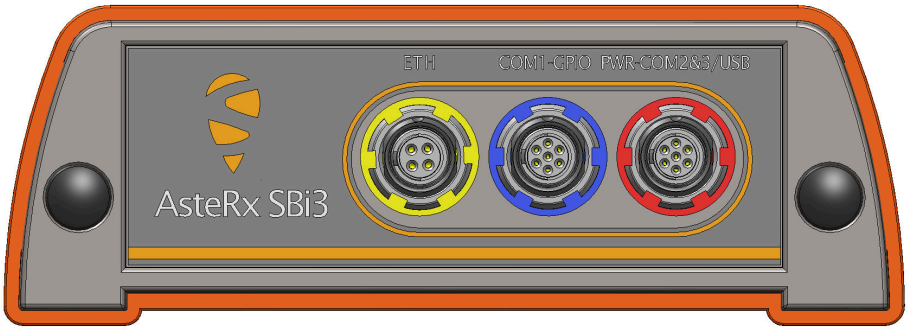

Figure 2-2: The rear panel of the AsteRx SBi3

2.4.3 Top case

The AsteRx SBi3's top of the case shows the Septentrio logo as well as the engraving of the IMU reference point, to be used for defining the antenna lever arm (see section 3.5). There

is an offset of 1.7 cm on the Z axis (as indicated in the engraving) to be accounted for during the lever arm measurement.

Figure 2-3: The top of the AsteRx SBi3

3 Configuring the AsteRx SBi3

3.1 Installation on the vehicle

Before connecting and setting-up the AsteRx SBi3, it should be securely fixed to the rover structure.

In order to properly detect motion it is important to mount the AsteRx SBi3 rigidly on the same vehicle frame with the main GNSS antenna. 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 SBi3 it is advised to install the unit in 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 device that can rotate on its own).

The receiver can be fixed in place using the brackets provided by Septentrio (P/N: 216069). The mounting hole pattern is provided in Figure 3-1. The brackets can be fastened to the rover using bolts up to size M6 or 1/4'".
Make sure enough space is left free for the connectors and cables routing to the receiver.

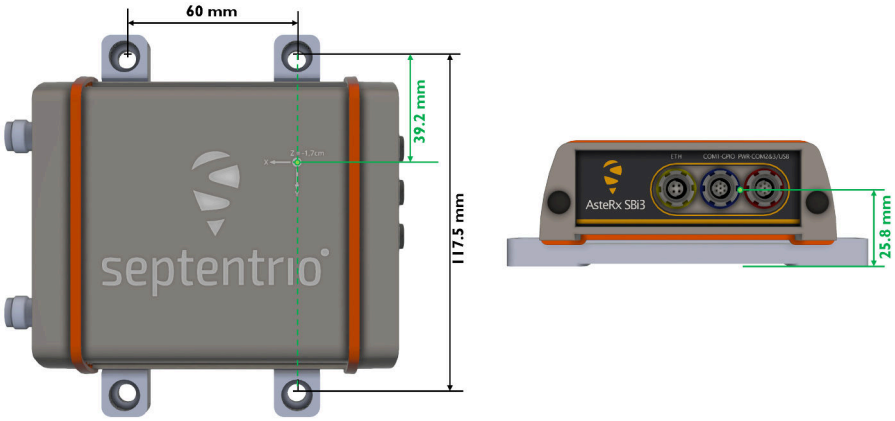

Figure 3-1: AsteRx SBi3 with mounting brackets. The green dot represents the IMU reference point and the green dimensions show the location of the IMU reference point relative to the closest mounting hole.

3.2 Connecting to the AsteRx SBi3

Important notice on handling the ODU connectors

When connecting the cables to the AsteRx SBi3 make sure the red dots on the cable side and on the socket side are aligned. Only push the connector into the socket when properly aligned.
Forcing the connector into the socket while misaligned can damage the connector, the socket or even the internal electronics (in case the cable is connecter to a power supply).

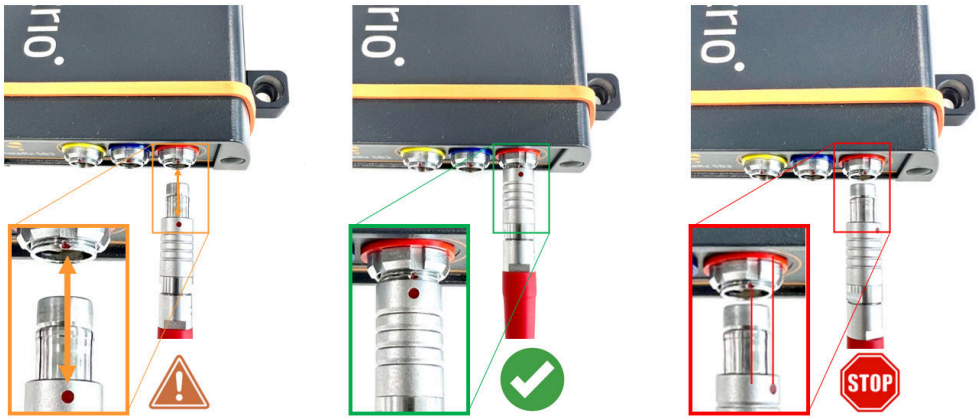

Figure 3-2: Mating ODU connectors: only push the connector in when red dots are aligned

3.2.1 Connecting to the web interface via USB

Step 1: Connect the combined Power/USB cable

Connect the combined Power/USB cable to the 7-pin female PWR-COM2&3/USB socket on the rear panel of the receiver as shown in Figure 3-3 and make sure it is connected to a computer.

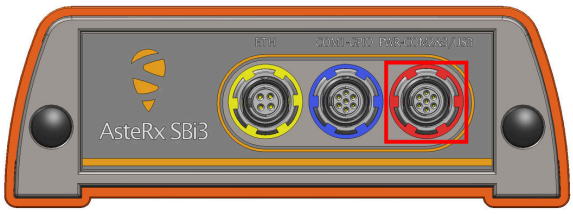

Figure 3-3: Rear panel 7-pin PWR-COM2&3/USB socket

Step 2: Open a web browser and connect to the AsteRx SBi3

Once connected via USB, the AsteRx SBi3 can be reached using the default Ethernet-over-USB IP address 192.168.3.1 as shown in Figure 3-4. Note that this address cannot be changed.

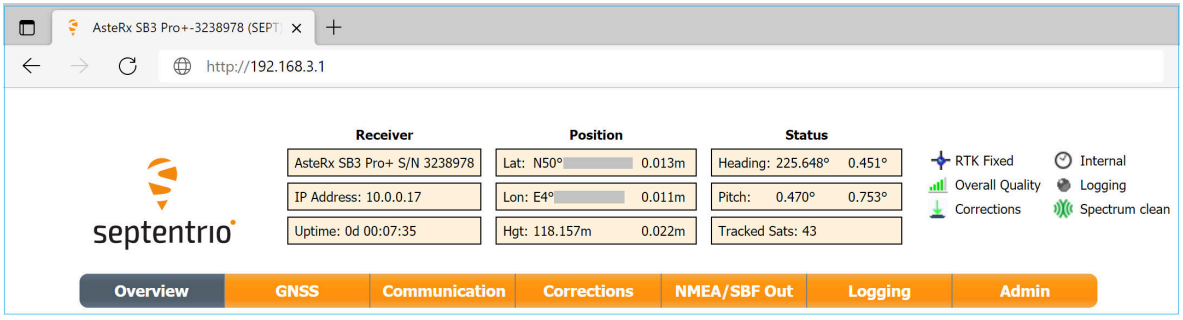

Figure 3-4: Connecting to the Web Interface via USB

3.2.2 Connecting via Ethernet using the web interface

Step 1: Connect the Power and Ethernet cables

Connect the Ethernet cable to the connector labeled 'ETH' on the rear panel of the receiver as shown in Figure 3-5 and make sure it is connected to a LAN network. Then connect the power cable to the receiver and make sure the correct input voltage is applied (between 5 and 36 V DC).

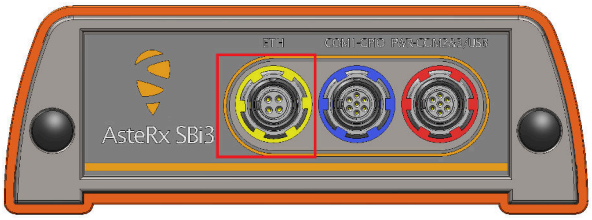

Figure 3-5: Rear panel Ethernet socket

Step 2: Open a web browser and connect to the AsteRx SBi3

By default, the AsteRx SBi3 has the hostname 'http://asterxsbi3-xxxxxxx', where xxxxxxx are the 7 digits of the serial number of the receiver board inside the AsteRx SBi3. This hostname can be used on a local area network to connect to the AsteRx SBi3 if the IP address assigned by the DHCP server is unknown. The hostname can be found on a sticker on the bottom of the receiver housing. Figure 3-6 shows a screenshot of an Ethernet connection to a receiver with serial number 9900035 using 'http://asterxsbi3-9900035'.

Figure 3-6: Connecting to the Web Interface via Ethernet

3.2.3 Connecting via COM

In case you do not have an Ethernet cable or LAN network available, you may still connect to the receiver using one of the receiver's COM ports and RxControl.

Step 1: Connect the Power and COM cables

Connect the COM cable to the connector labeled 'COM-GPIO' on the rear panel of the receiver as shown in Figure 3-7 and connect the other end to a computer. It may be necessary to use a serial-to-USB converter if the computer does not have a serial port. Now connect the power cable to the receiver and make sure the correct input voltage is applied (between 5 and 36 V DC).

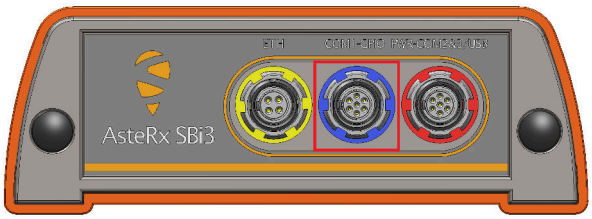

Figure 3-7: Rear panel COM1 socket

Step 2: Open RxControl and connect to the AsteRx SBi3

Once connected, open RxControl on the computer to which the receiver is connected and follow the sequence of steps described in Figure 3-8 to open a connection to the AsteRx SBi3. Note that RxControl is part of the RxTools software suite which can be freely downloaded from the Septentrio website.

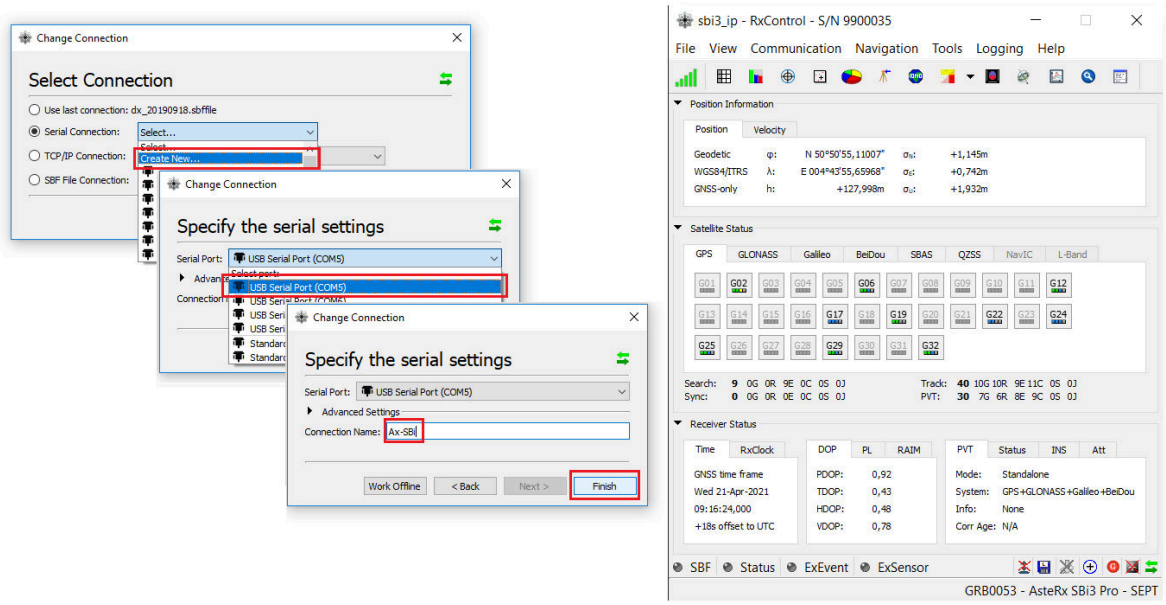

Figure 3-8: Connecting to the receiver via COM using RxControl. Select 'Serial Connection' and choose 'Create New'. Next, choose the correct serial port, define a name for the connection and press Finish.

3.3 How to compensate for deviations in the antenna orientation

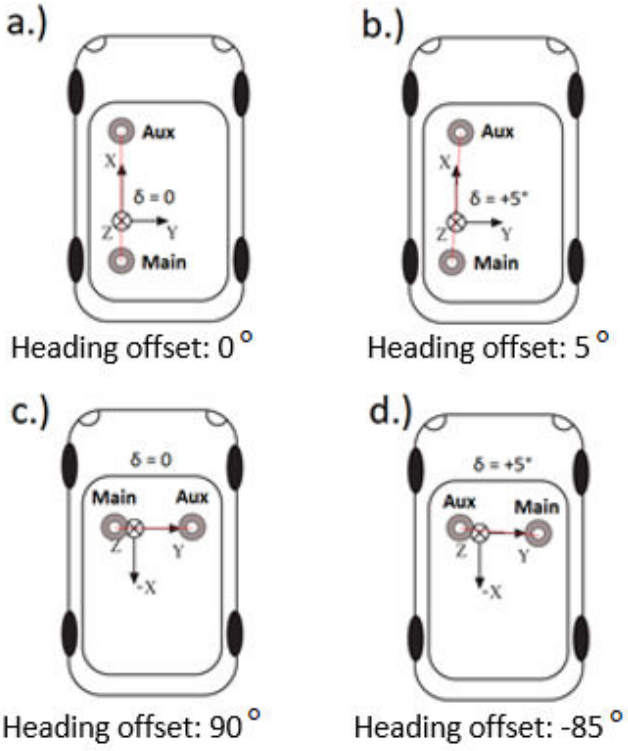

Figure 3-9: Setup examples to understand how to handle heading offsets.

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 (dual antenna available only for AsteRx SBi3 Pro+). 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 3-10. Providing this information will let the receiver compensate for the offsets before calculating the attitude by subtracting them from the attitude angles.

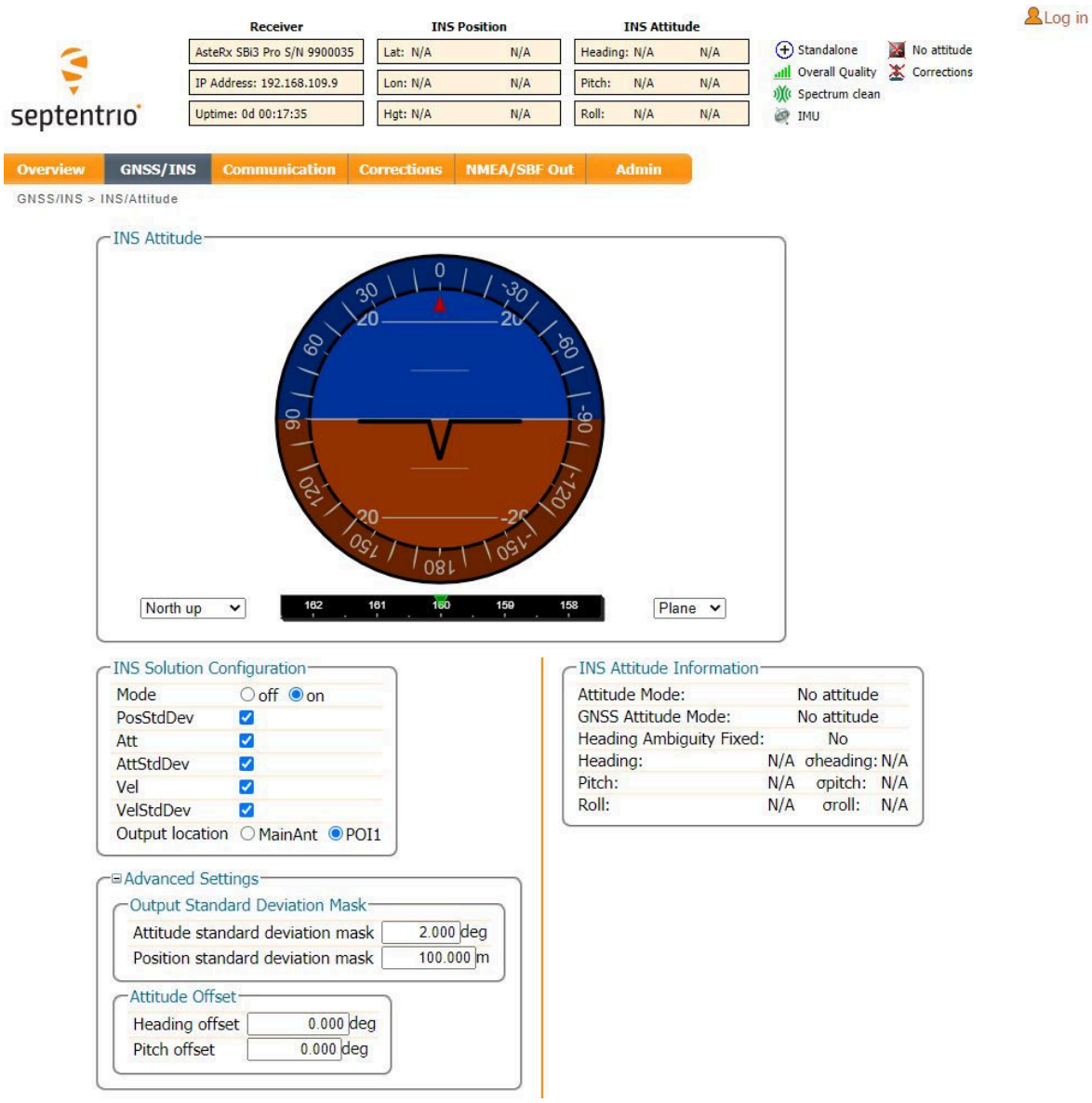

Figure 3-10: Setting the attitude offset.

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 3-9.

The examples in Figure 3-9 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 3-11.

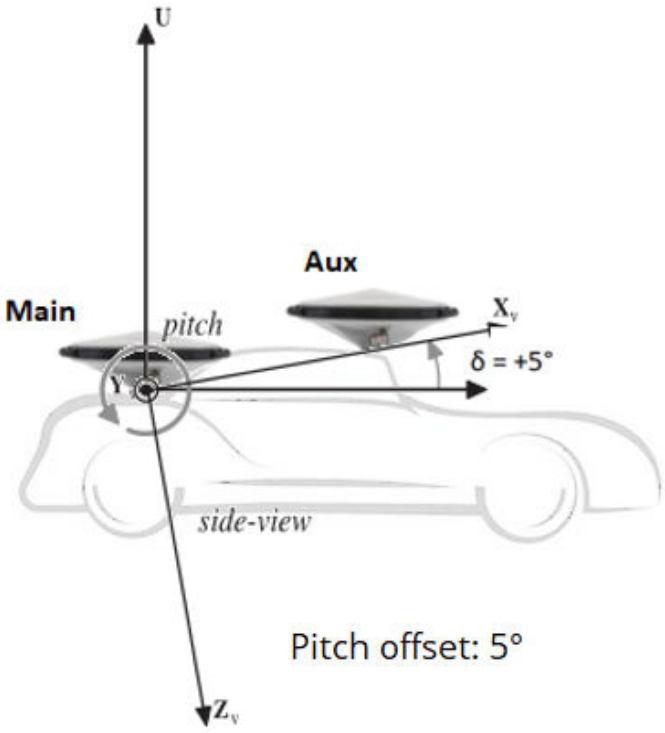

Figure 3-11: Visual representation of the effect of vertical offset between the two antennas on the Pitch offset. Assuming the default antenna configuration, the aux antenna being mounted higher will result in a positive value for the pitch.

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.

3.4 How to align IMU orientation and vehicle orientation

Examples of typical receiver installations in a vehicle frame are given in Figure 3-12.

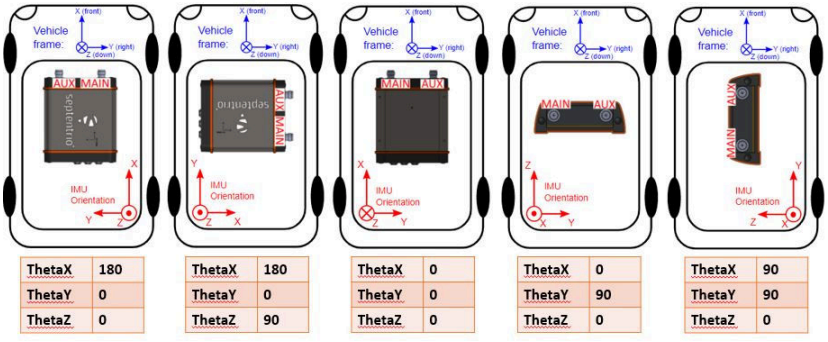

Figure 3-12: Examples illustrating the orientation of the IMU reference frame with the associated IMU orientation for the depicted installation.

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).

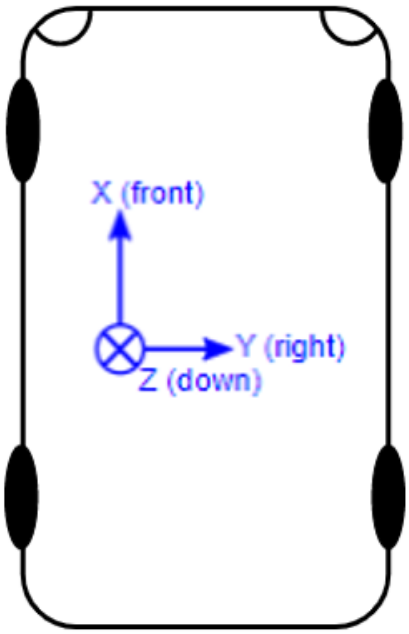

Figure 3-13: The vehicle frame and its orientation.

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 3-14.

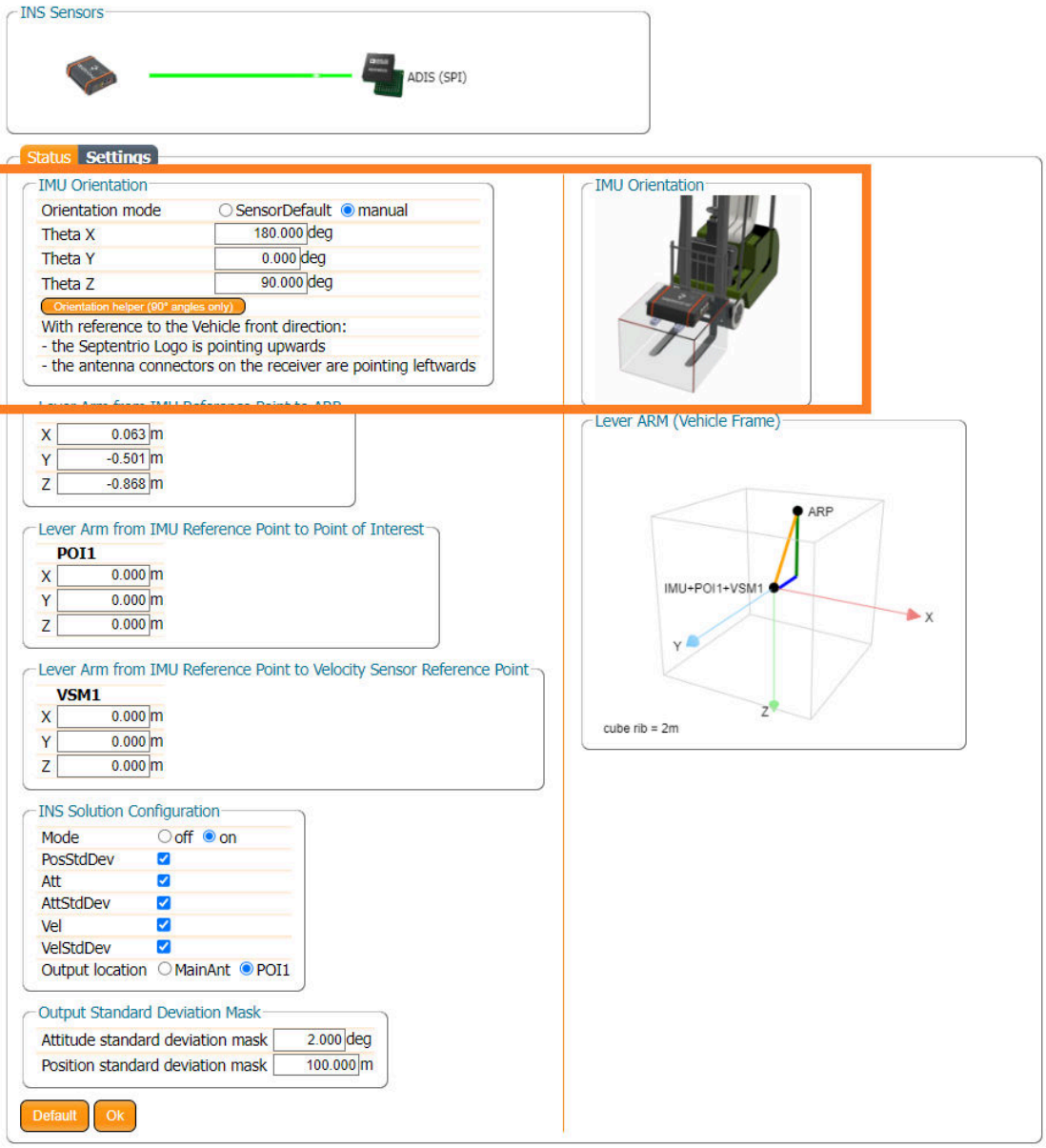

Figure 3-14: Setting the IMU orientation.

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.

3.5 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 3-15, lever arm offsets can occur in three dimensions.

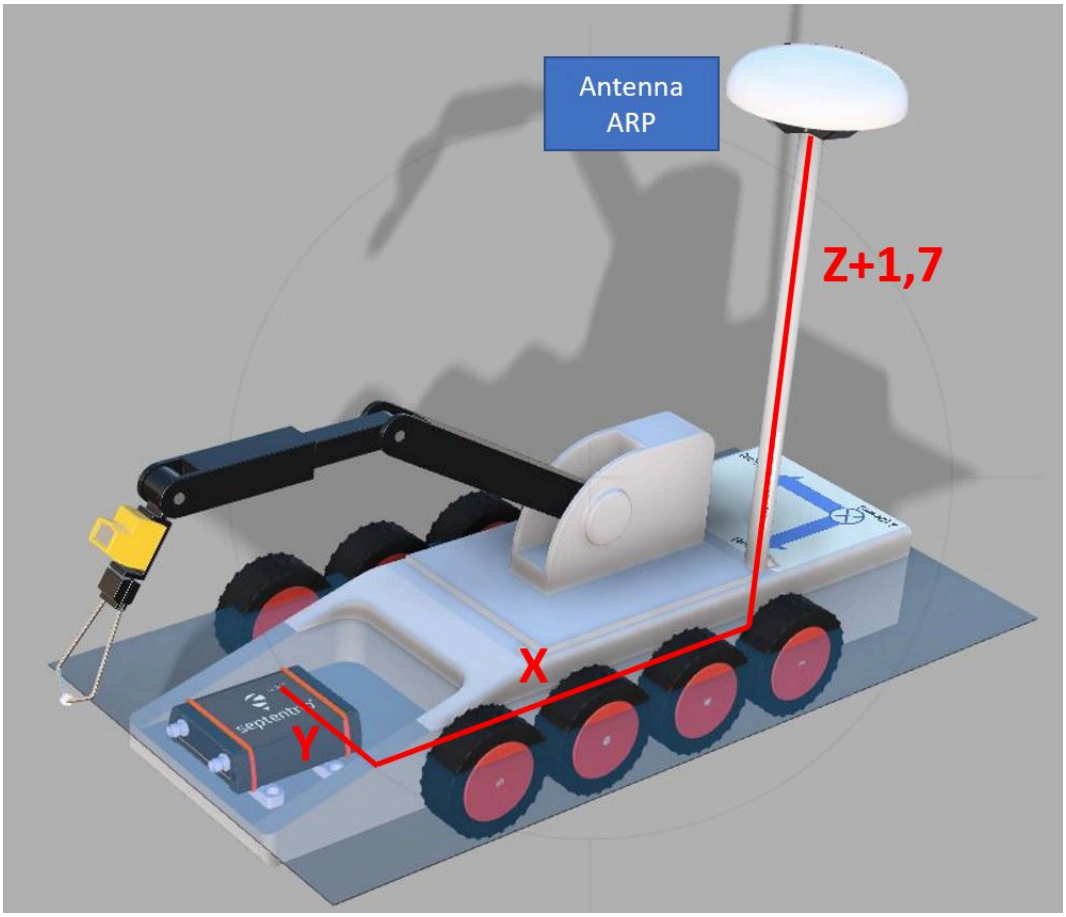

Figure 3-15: This picture shows the vehicle frame and the projection of the ARP position on the axes (x', y', z'), in cm

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 3-16.

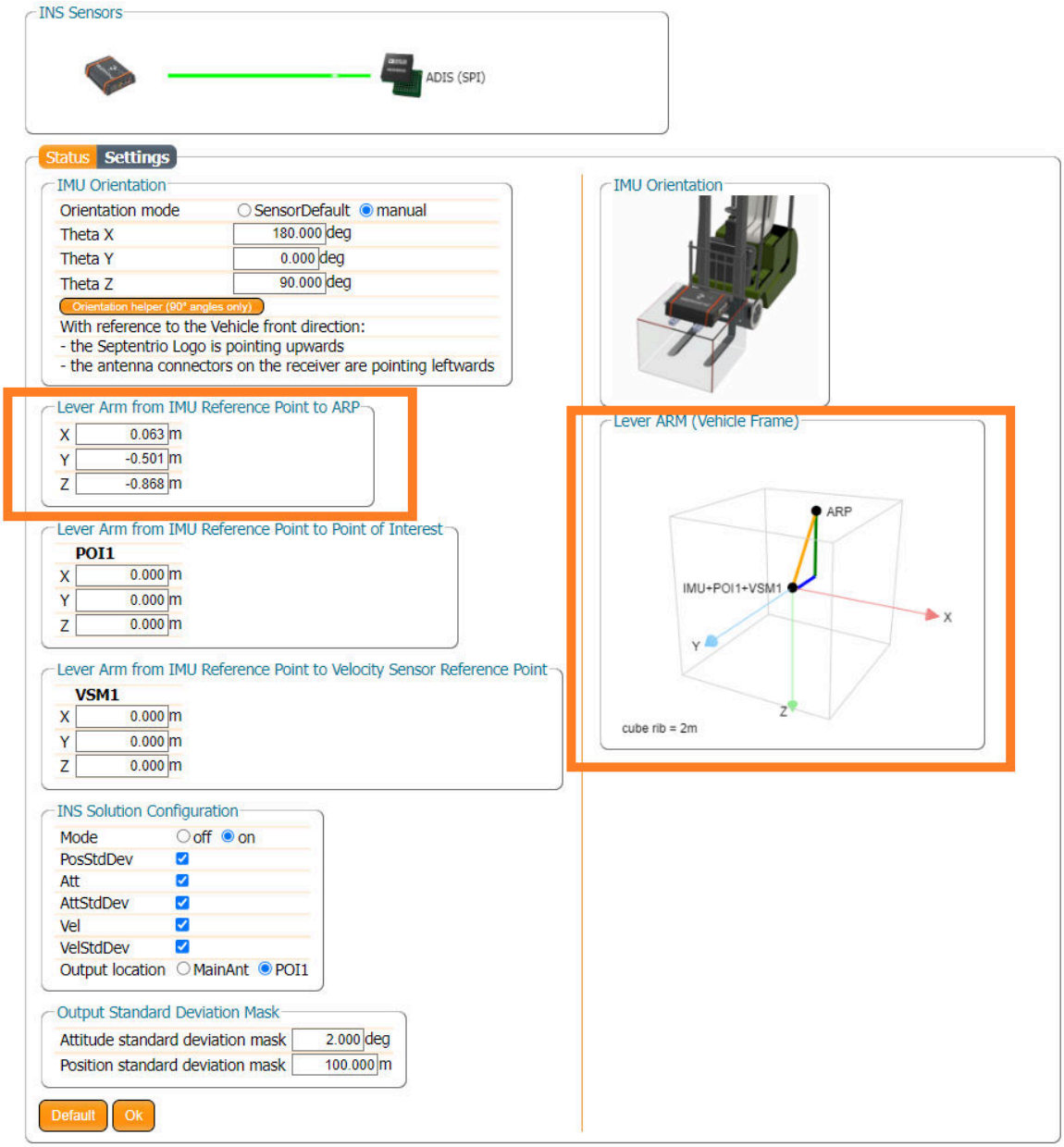

Figure 3-16: Setting the lever arm offsets

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 SBi3 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.

3.6 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 SBi3 and SPI as shown in Figure 3-17.

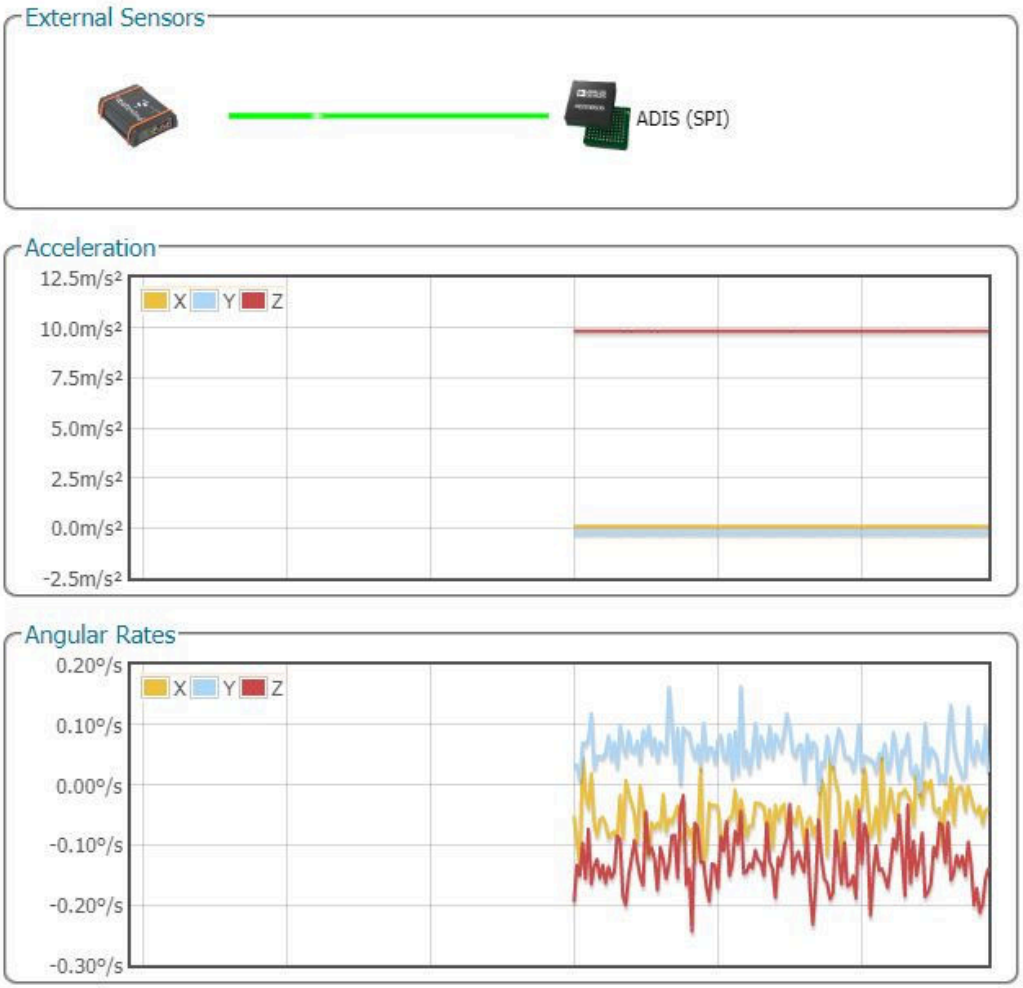

Figure 3-17: The Data Stream window on the Overview page should show a line symbolizing a connection between the AsteRx SBi3 and the IMU which is connected to SPI.

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 SBi3 using RxControl, navigate to View > IMU View. The acceleration and angular rate plots should display information similar as shown in Figure 3-18. These plots are based on the unfiltered IMU sensor measurements and provide an unambiguous way of checking that the IMU is outputting data.

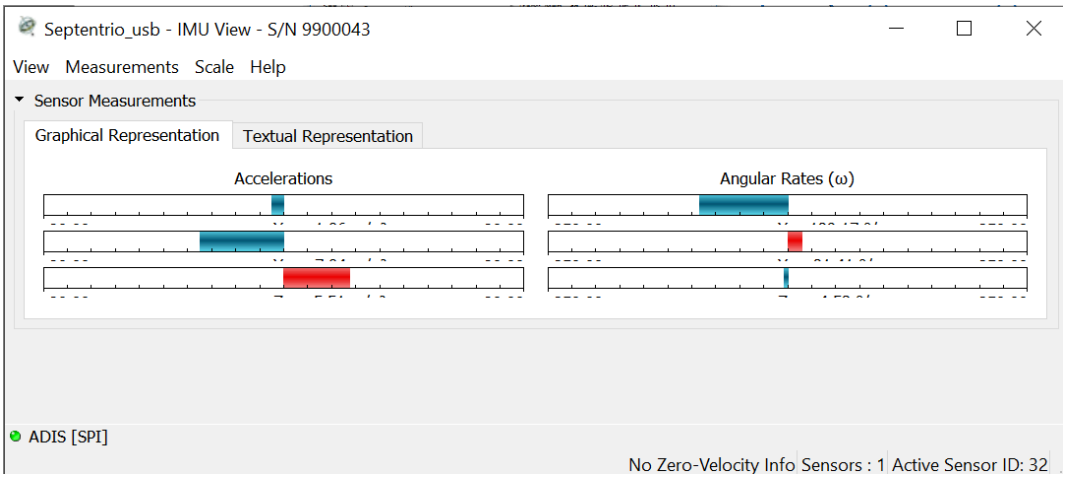

Figure 3-18: Checking the IMU view in RxControl provides an unambiguous way of checking whether ot not the IMU is outputting data

3.7 Vehicle information

Non-holonomic constraints (NHCs) are motion constraints applied to a system based on its physical structure or operating environment. In the context of GNSS/INS (Global Navigation Satellite System / Inertial Navigation System) integration, these constraints improve the accuracy and stability of the inertial navigation solution, particularly in situations where GNSS signals are degraded, intermittent, or unavailable.

A non-holonomic constraint limits the systemâĂŹs motion in specific directions without restricting its overall position. A common example is a wheeled land vehicle that cannot move sideways (i.e., perpendicular to its forward direction).

When used appropriately, NHCs offer the following benefits:

- Reduced position and velocity drift during GNSS outages
- Improved heading stability when vehicle dynamics are low
- Better overall accuracy in challenging environments

However, incorrect application of NHCs (e.g., introducing wrong vehicle information, errors in lever arms or vehicle orientation) can introduce biases or divergence in the navigation solution.

NHCs are not applicable to all vehicles, FUSE+ receivers present to the user a long list of vehicle types and 3 types of steering technology.

Not all vehicle types/steering combinations have an NHC implemented, as shown in the table below. More vehicles will be supported in future releases.

Vehicle type	Akermann Steering	Differential Steering	Omnidirectional Steering
Unknown	-	-	-
Road	Supported	-	-
Tractor	Beta	-	-
Terminal Tractor	Supported	-	-
Reach Stacker	-	-	-
Lift Truck	Beta	-	-
Haul Truck	Beta	-	-
Off-road Robot	Supported	-	-
Road Robot	Supported	-	-
Fixed Wing UAV	-	-	-
Multirotor UAV	-	-	-
Rail	-	-	-
Vessel	-	-	-
Excavator	-	-	-
Loader/Grader	Beta	-	-
Dozer	-	-	-

To select the vehicle the user needs to go to GNSS/INS âĂŞ INS Setup âĂŞ Settings. At the button of the page the user will see a drop-down for the vehicle application, radio buttons for the steering type and three text fields for the steering lever arm. The steering lever arm is the distance from the receiver to the steering center of the vehicle.

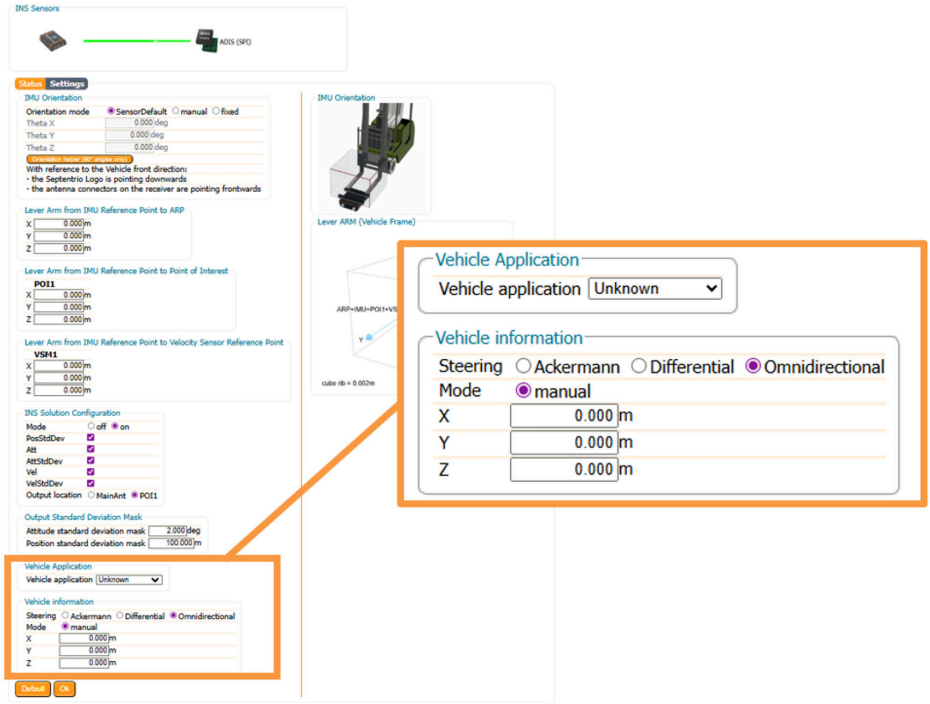

Figure 3-19: Setting the vehicle type

It is also possible to select the vehicle type and provide vehicle information via commands. The relevant information is available in the Firmware Reference Guide.

3.8 Vehicle velocity input

The AsteRx SBi3 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 SBi3 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 SBi3 Firmware Reference Guide.

AsteRx SBi3 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 SBi3 only the velocity values leaving blank the standard deviation. The Fuse+ technology of Septentrio will then assign a confidence value automatically.

3.9 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.

3.10 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.

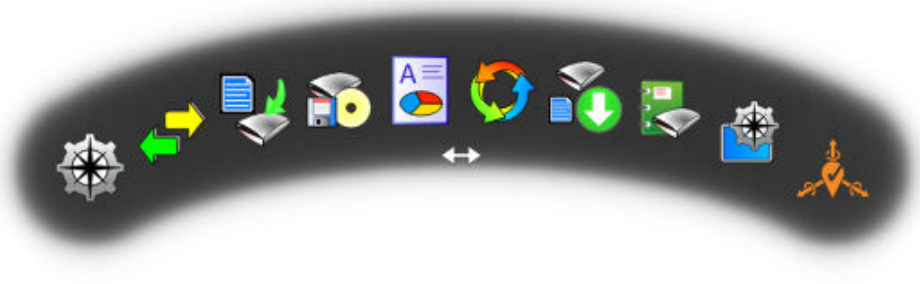

Figure 3-20: RxLeverArm icon in RxTools launcher

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.

3.10.1 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 SBi3 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.

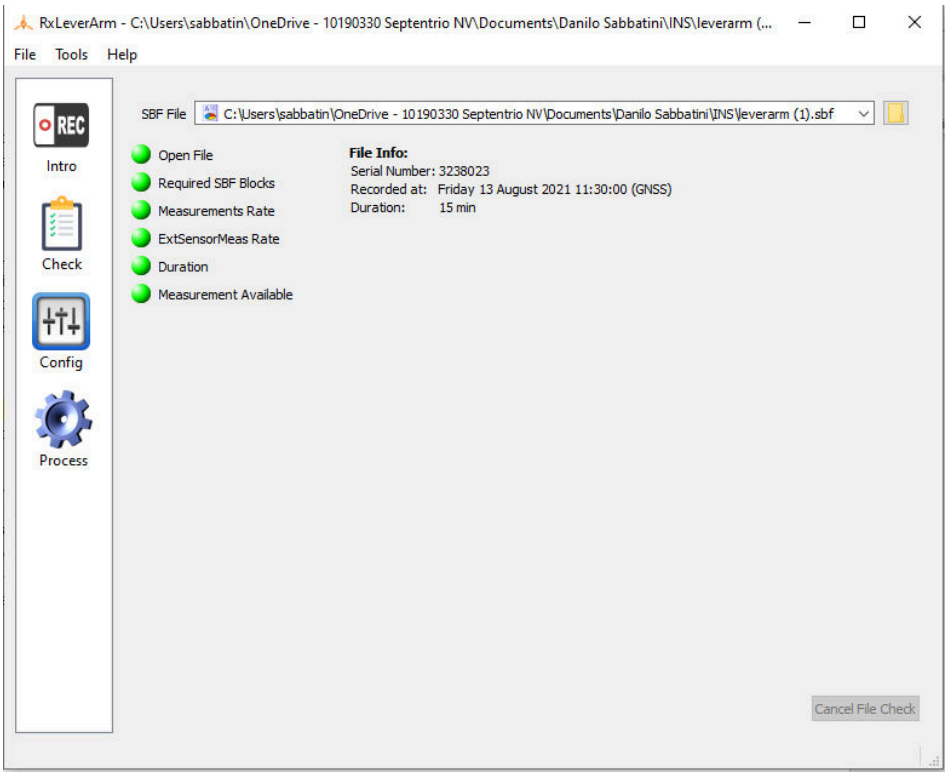

Figure 3-21: RxLeverArm data check

3.10.2 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)

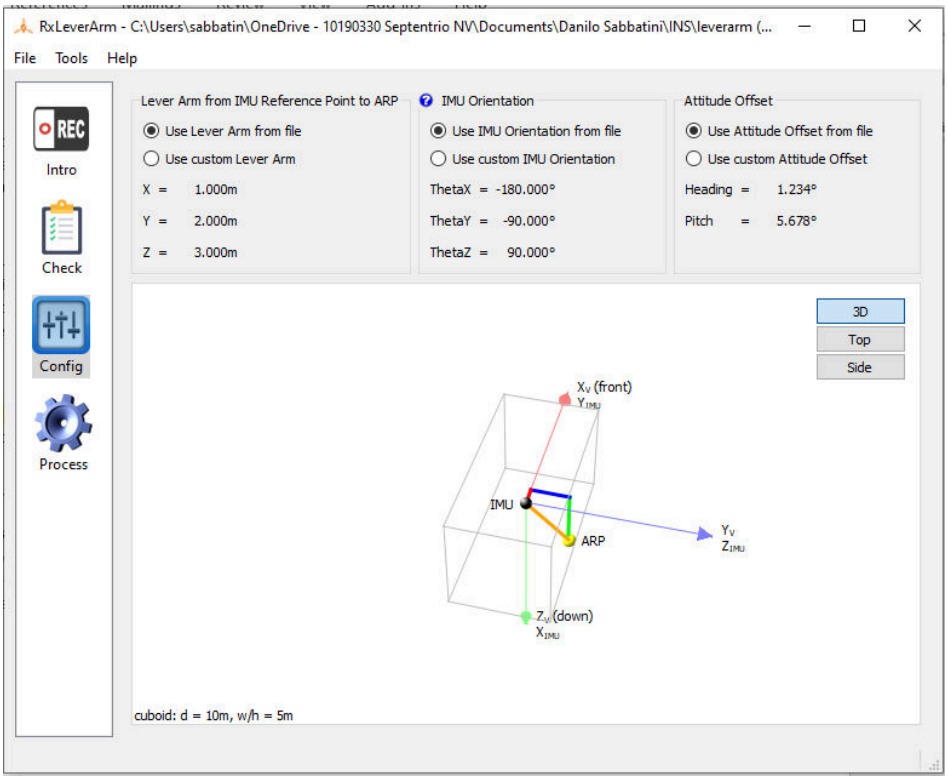

Figure 3-22: RxLeverArm configuration

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.

3.10.3 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.

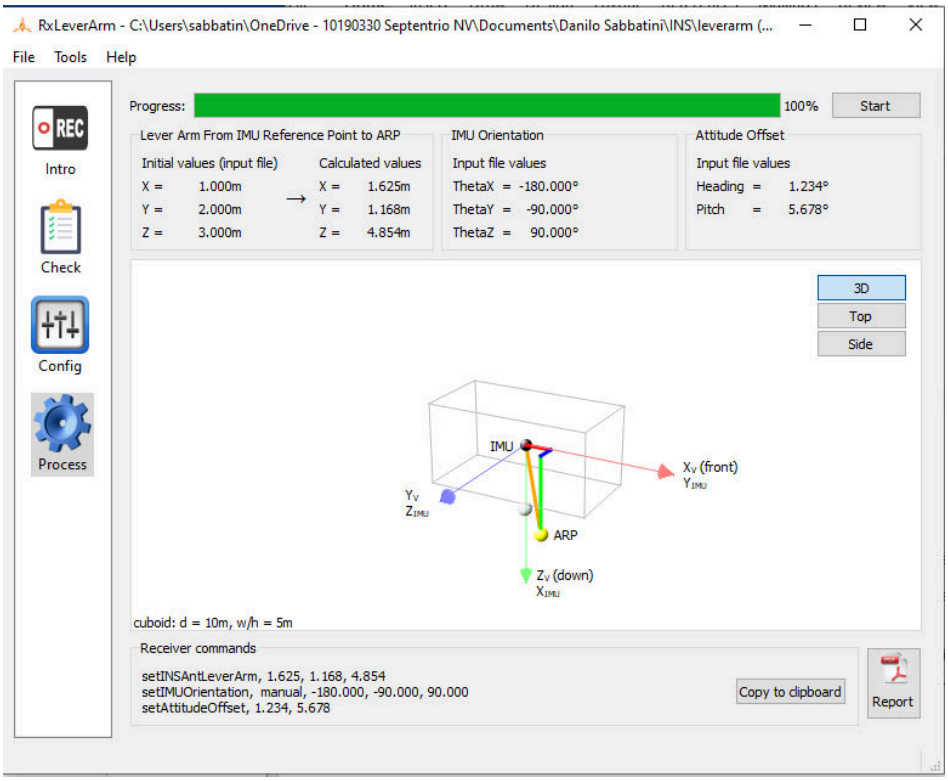

Figure 3-23: RxLeverArm optimization

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.

4 Common Receiver Operations

4.1 How to configure SBF and NMEA output

The AsteRx SBi3 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.

SBF and NMEA can also be logged on the internal 16 GB disk of the AsteRx SBi3 Pro+. Section 4.2.1 and 4.3 detail how to log data on the receiver and how to download data logged on the receiver.

4.1.1 Output over a serial COM connection

The AsteRx SBi3 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 SBi3 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 4-1. In this example, COM3 is set with a speed of 19200 baud.

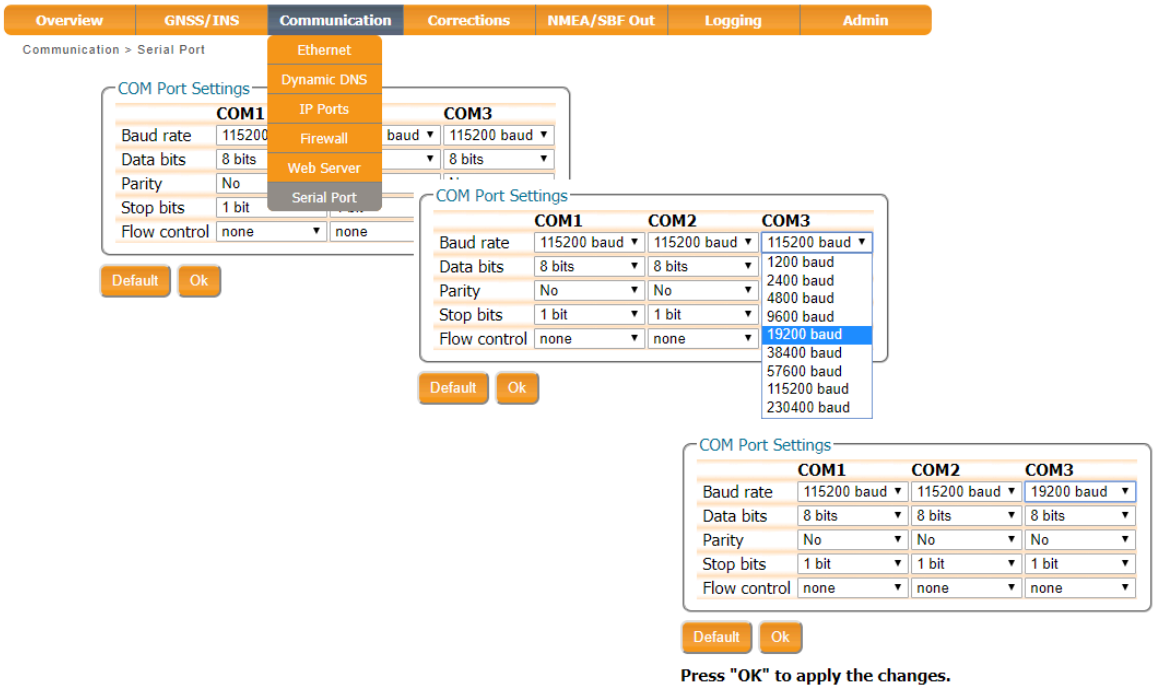

Figure 4-1: Configure the baud rate and flow control of the AsteRx SBi3

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 4-2 and 4-3.

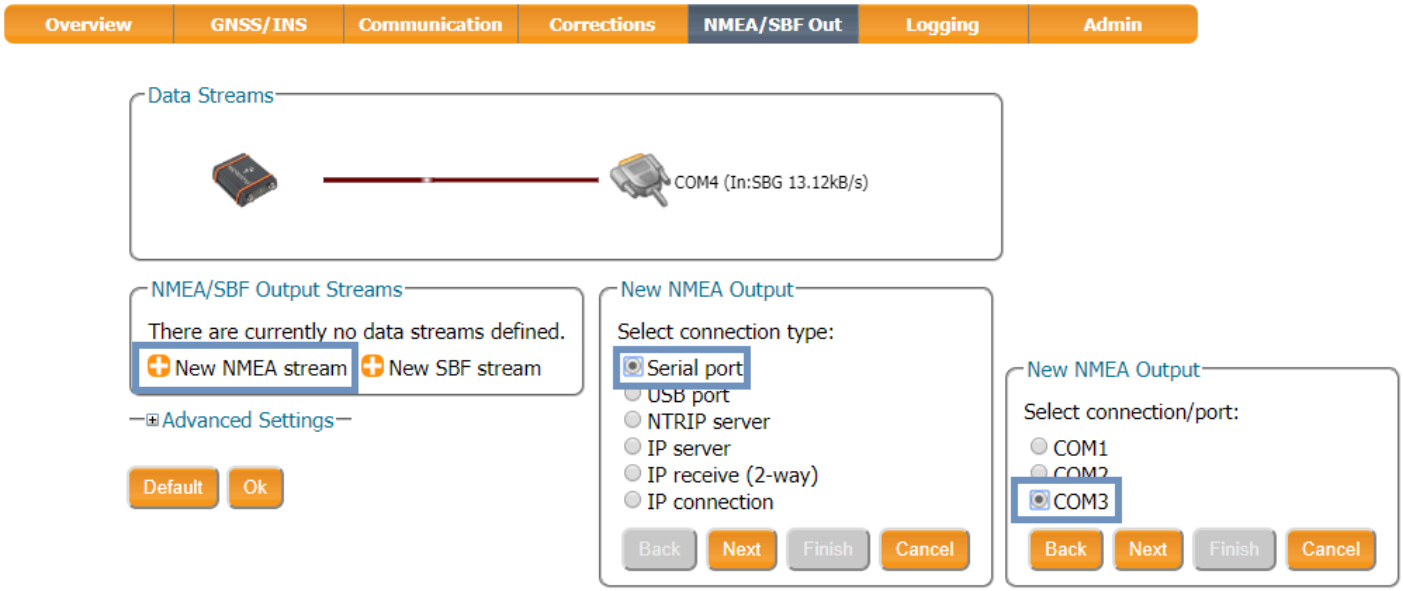

Figure 4-2: Selecting to output NMEA data on COM3

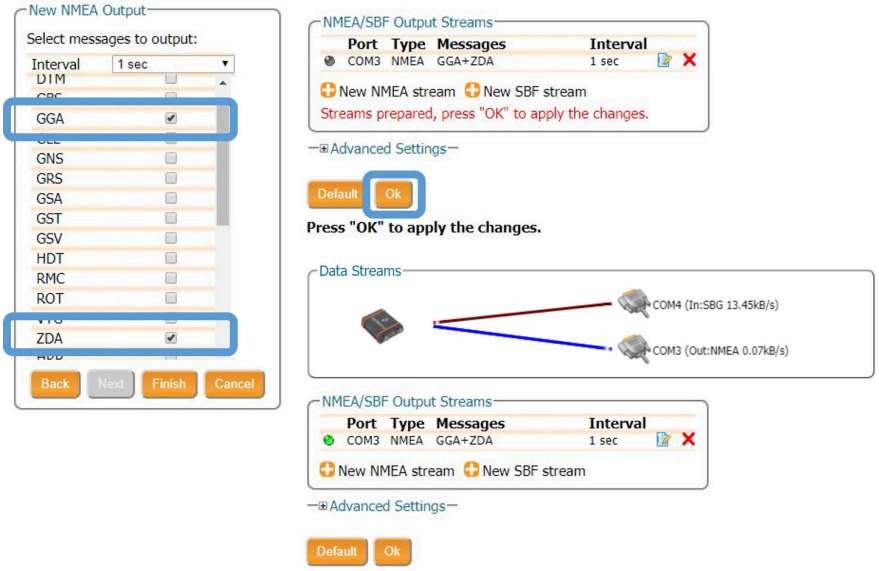

Figure 4-3: Selecting to output the GGA and ZDA NMEA message every second

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 4-4 and 4-5 the PVTCartesian SBF data block will be output over COM1 once per second.

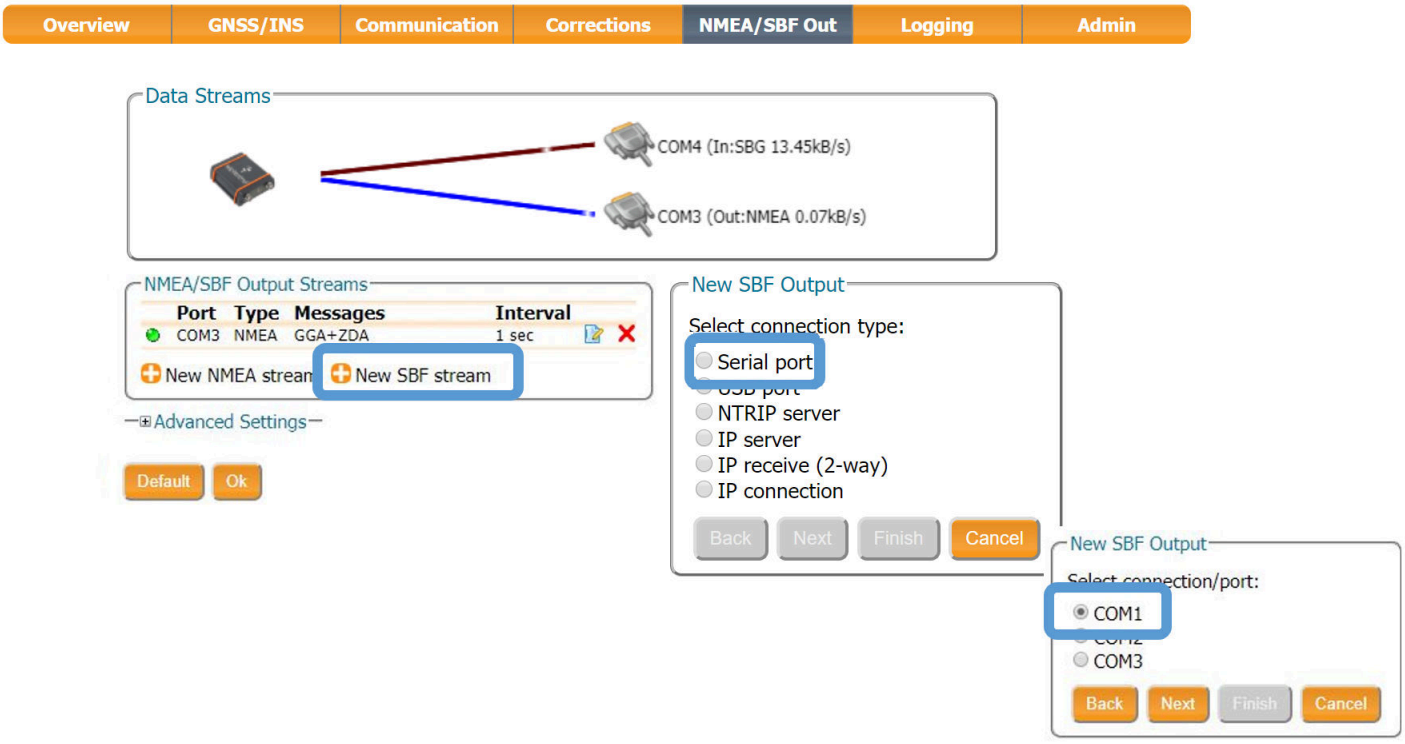

Figure 4-4: Selecting to output SBF data on COM1

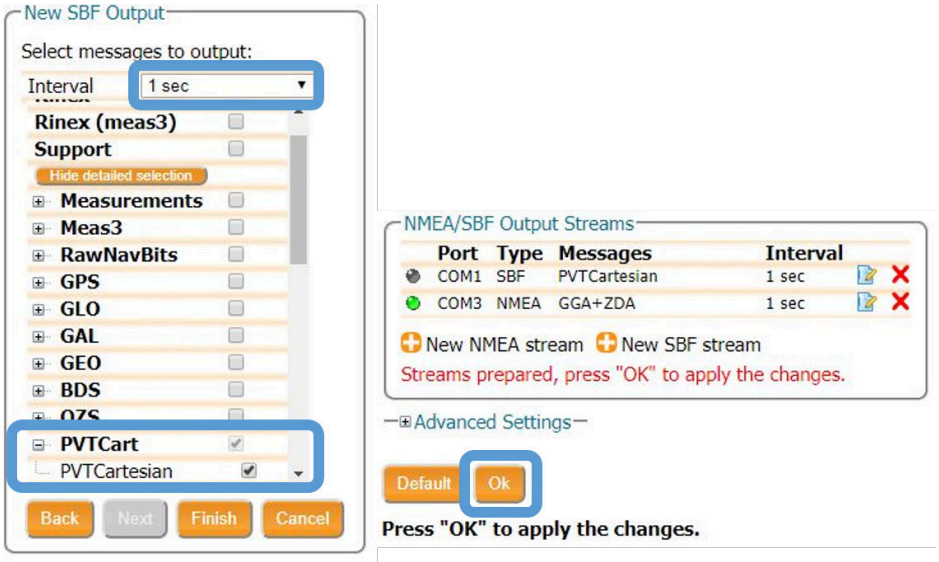

Figure 4-5: Selecting to output the PVTCartesian SBF block every second

Step 3: Verifying the configuration

Having configured the data output and clicked on **Ok**, the **NMEA/SBF Out** page will now display a summary of all data output as shown in Figure 4-6.

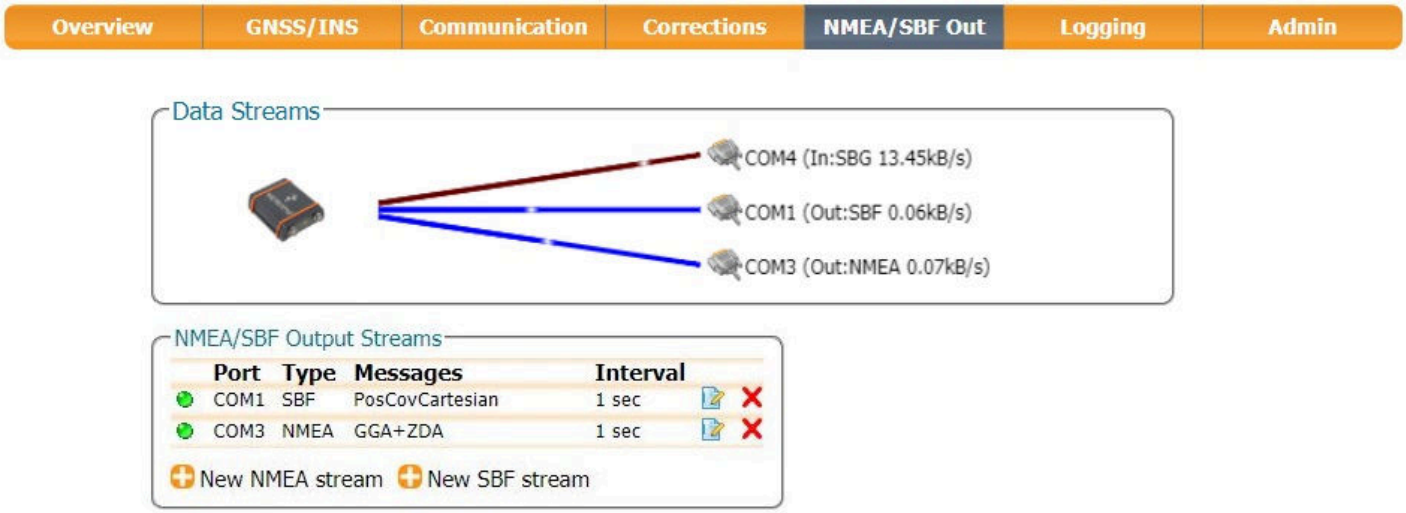

Figure 4-6: Summary of all configured data output streams

Figure 4-7 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.

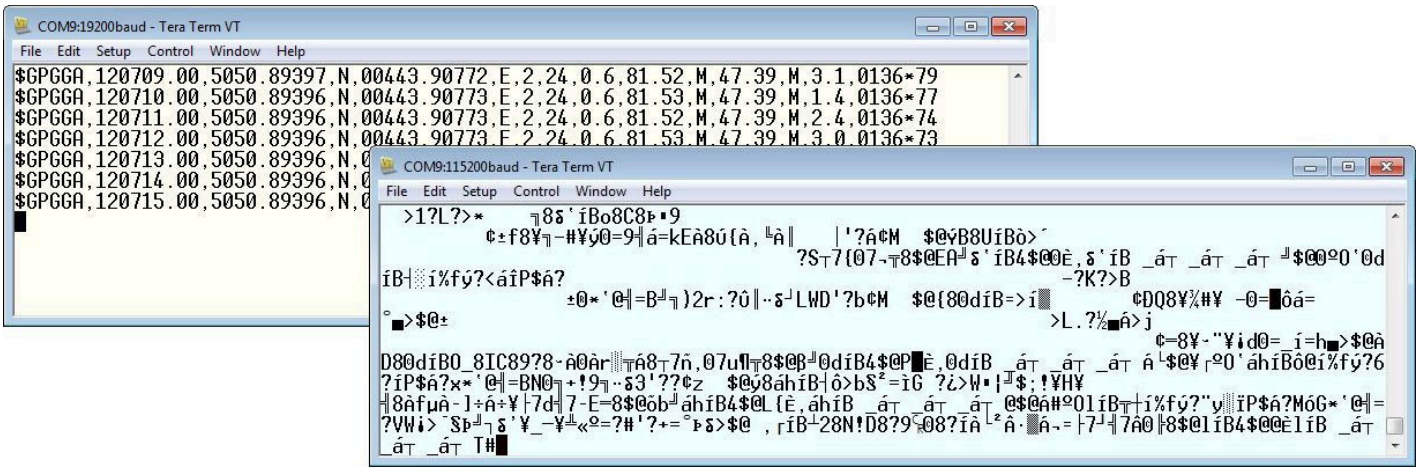

Figure 4-7: Example showing output of NMEA GGA (left panel) and SBF PVTCartesian (right panel) data

4.1.2 Output over Ethernet

SBF and NMEA data can be sent over an Ethernet connection from the AsteRx SBi3.

Step 1: Configure an IP connection on the AsteRx SBi3

The Ethernet port settings can be configured by selecting **IP Ports** from the **Communication** menu. In the example shown in Figure 4-8, 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***.

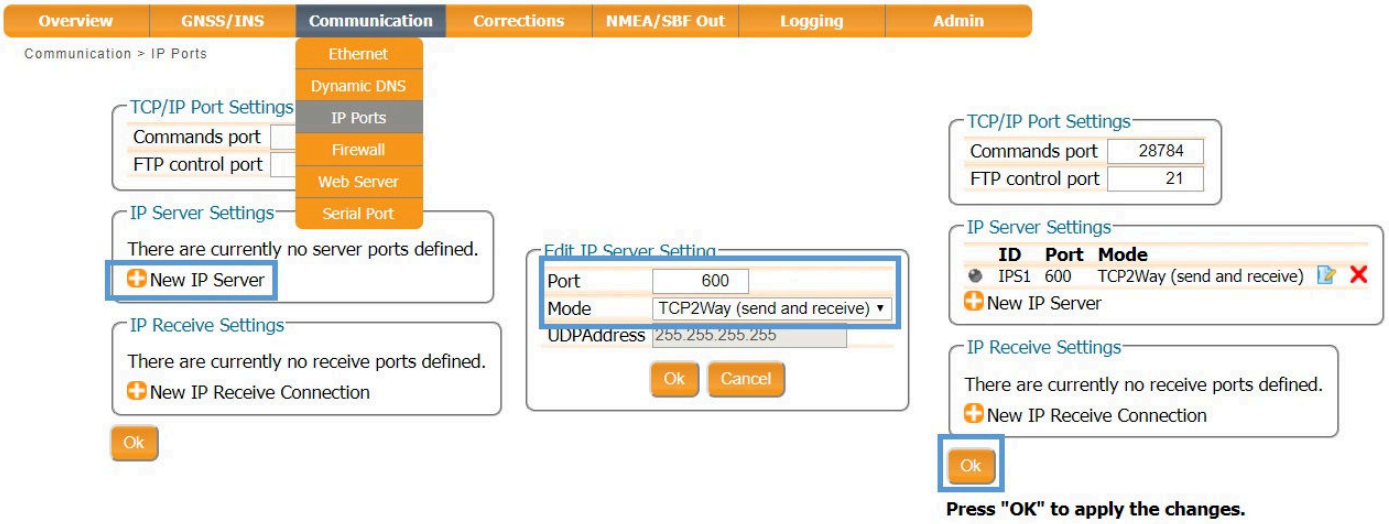

Figure 4-8: Configuring the TCP/IP server port setting for data output

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 4-9, the NMEA GGA message will be output every second. Ensure that the previously configured IPS1 port is selected for output as highlighted.

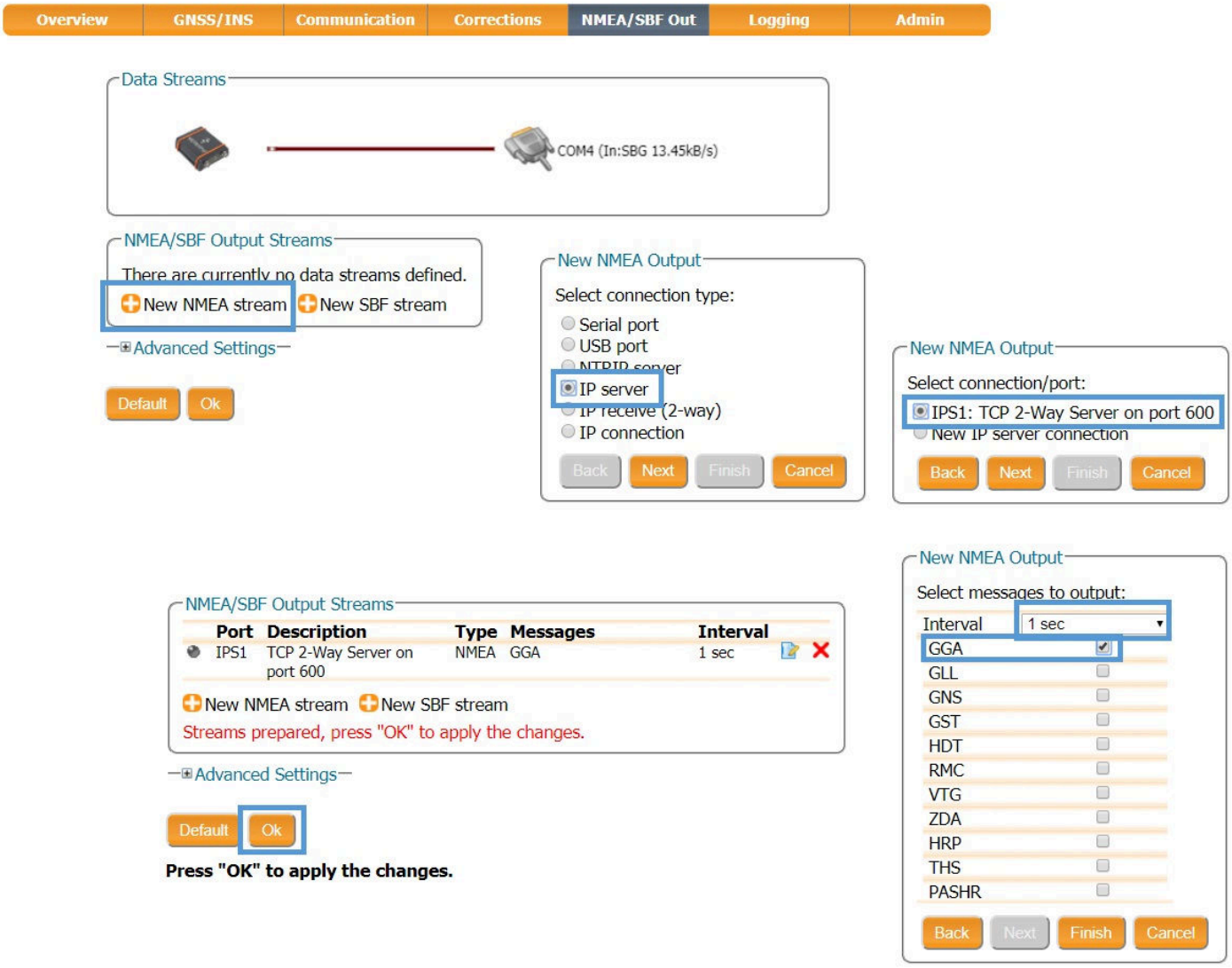

Figure 4-9: Outputting NMEA GGA over the configured IPS1 connection

Similar steps can be followed to output SBF messages.

Step 3: Configure Data Link to listen for NMEA output

The screenshots in Figure 4-10 show how the Septentrio GUI tool Data Link can be configured to listen for the AsteRx SBi3 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**.

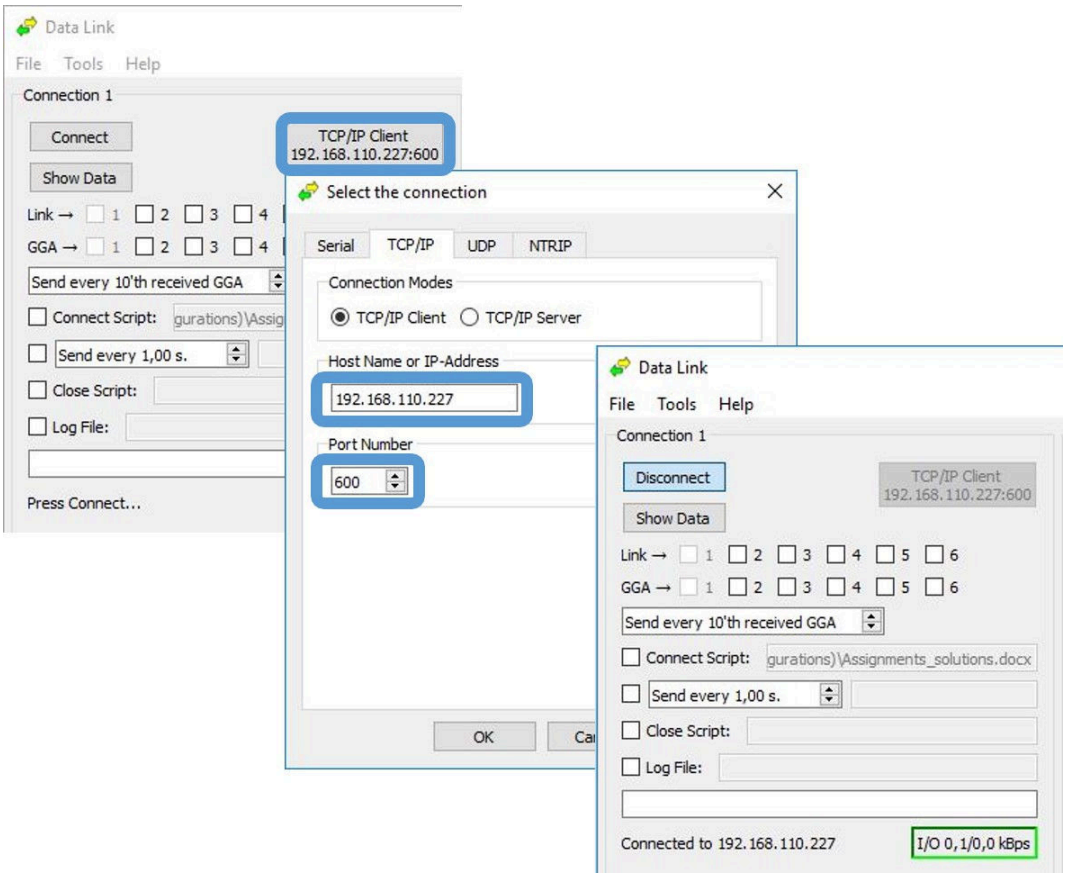

Figure 4-10: Configure the TCP/IP connection settings in Data Link

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 coming from the receiver as in Figure 4-11.

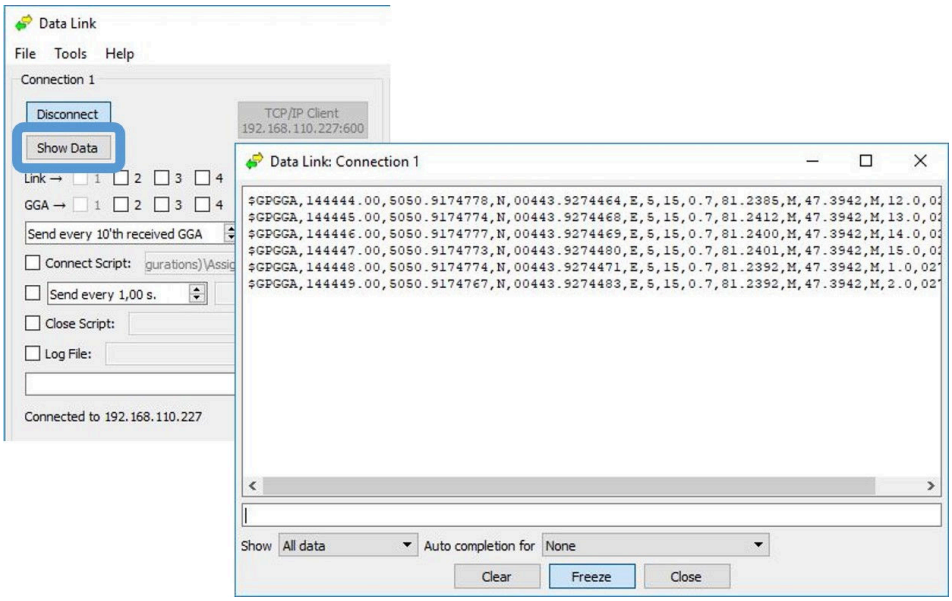

Figure 4-11: The **Show data** window of Data Link showing the NMEA GGA message coming from the AsteRx SBi

4.2 How to log data

The AsteRx SBi3 Pro+ has 16 GB of memory for internal data logging.

4.2.1 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 in the **Advanced** tab of the main page of the **Logging** menu as shown in Figure 4-12. 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 files. The default setting is 'Stop logging in all sessions'.

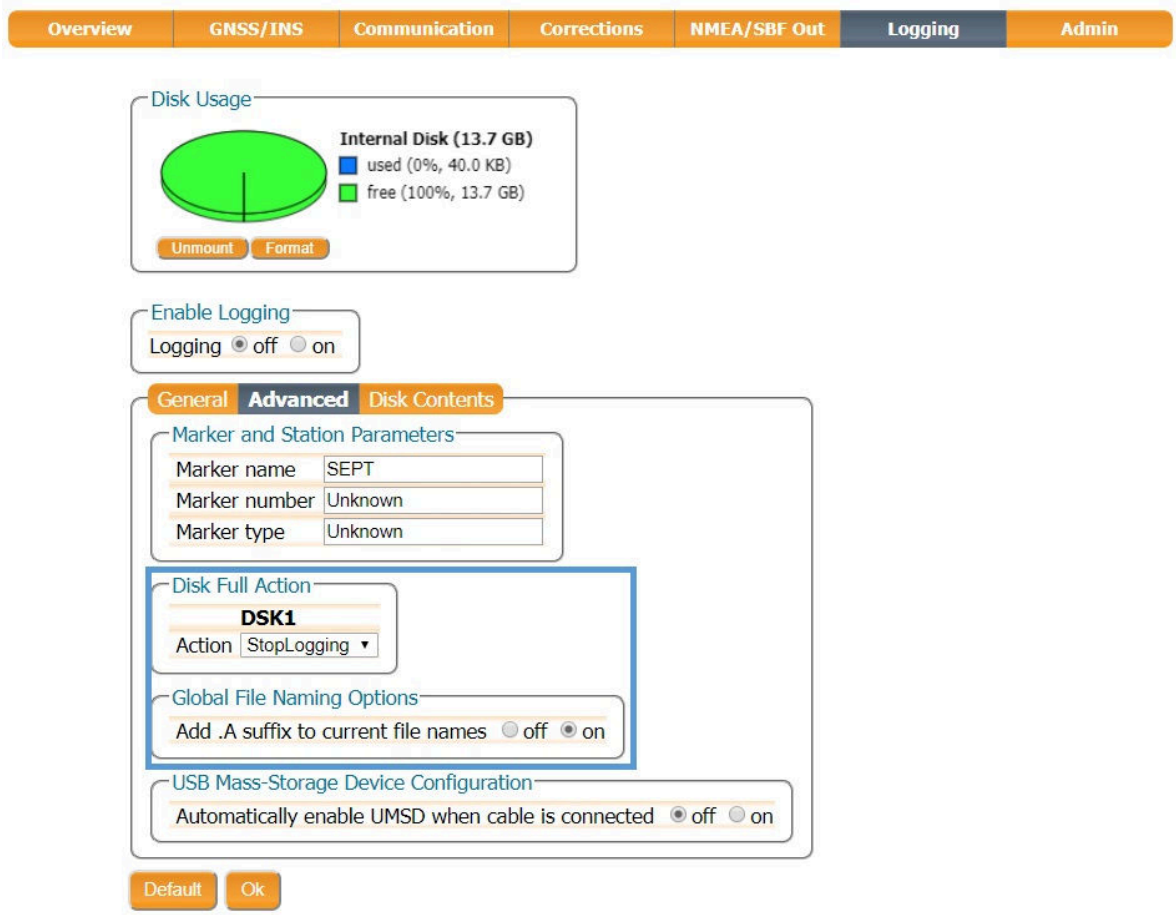

Figure 4-12: Selecting what you wish to happen when the internal 16 GB memory is full

Step 2: Configuring a logging session

To define a new logging session, press **New NMEA Stream** or **New SBF Stream** as shown in Figure 4-13.

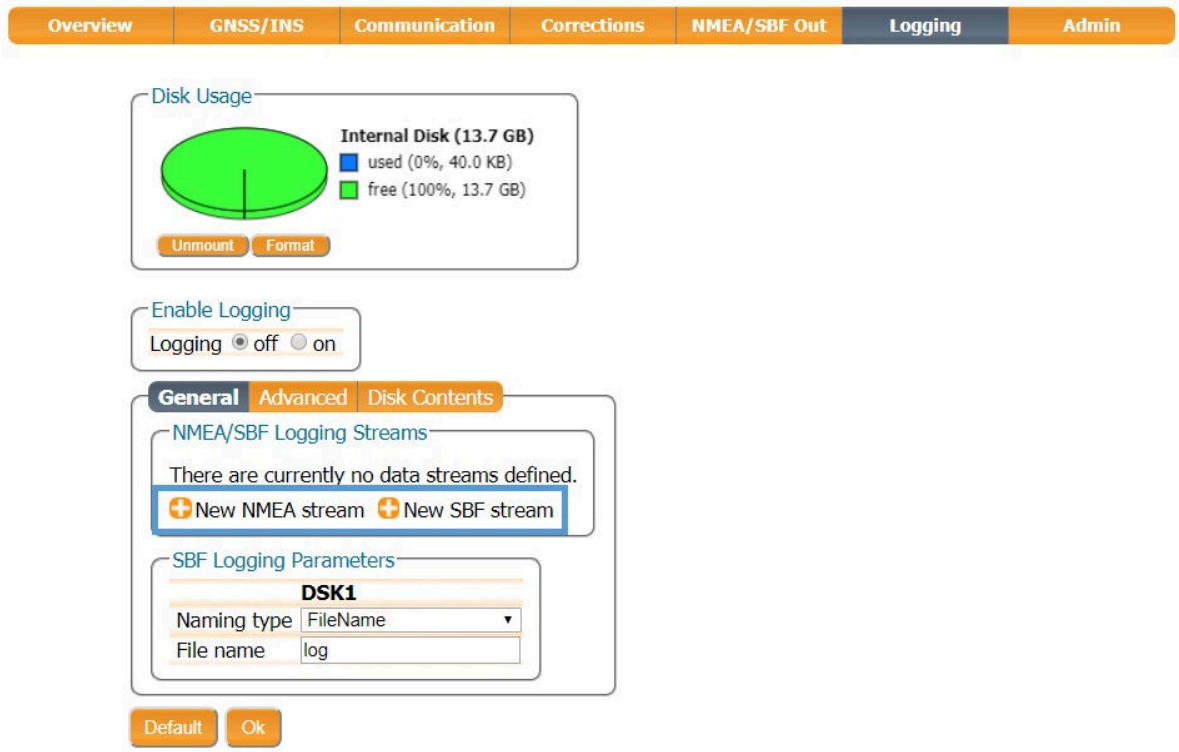

Figure 4-13: Defining a new logging session

You can then follow the sequence of steps shown in Figure 4-14, selecting the various configuration settings for the logging session. 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. 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. After you have finished configuring the log session, do not forget to enable logging and press Ok.

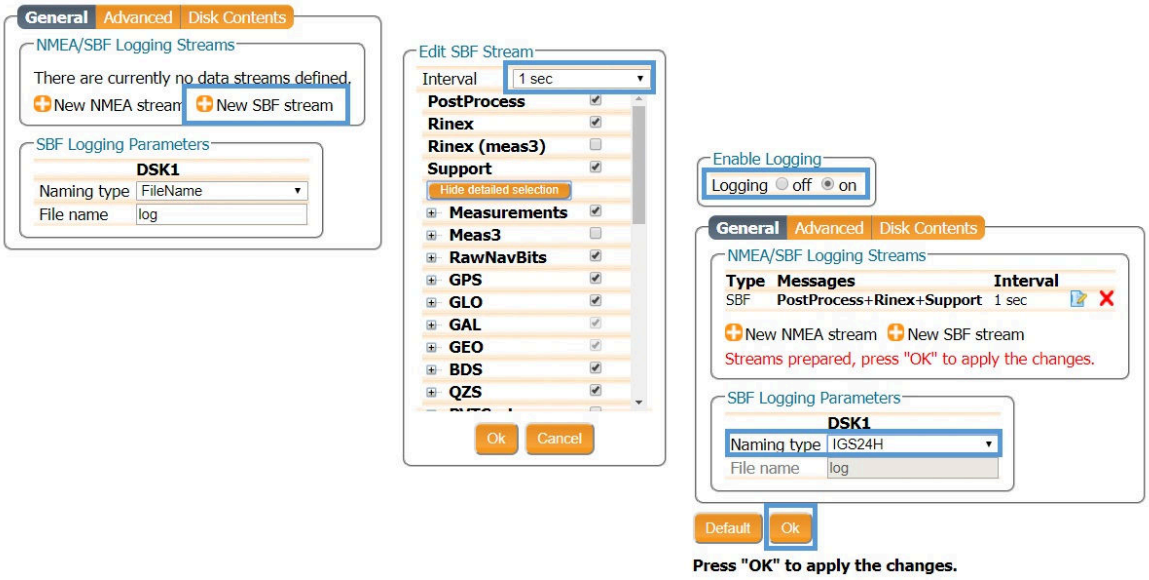

Figure 4-14: Follow the sequence of windows to fully configure the logging session

It is also possible to use the button âĂİAdd INS Support dataâĂİ to automatically select the optimal set of blocks with the right update rate needed to troubleshoot and analyze the receiver functions and the user setup correctness. When logging data in this way, it is recommended to limit the number of other logging sessions to avoid overloading the receiver's memory bandwidth.

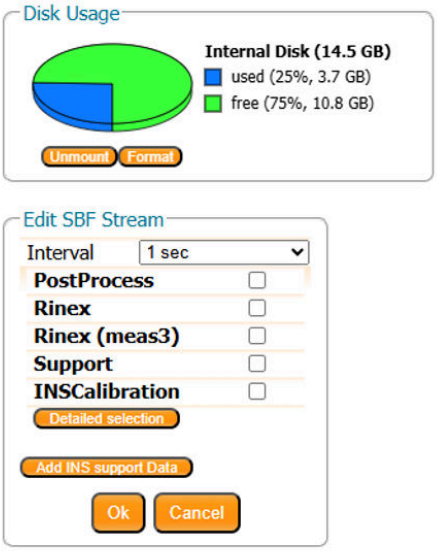

Figure 4-15: Adding INS support data to the logging session

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 4-16. An estimate of the daily size of data generated with the current logging configuration is also given.

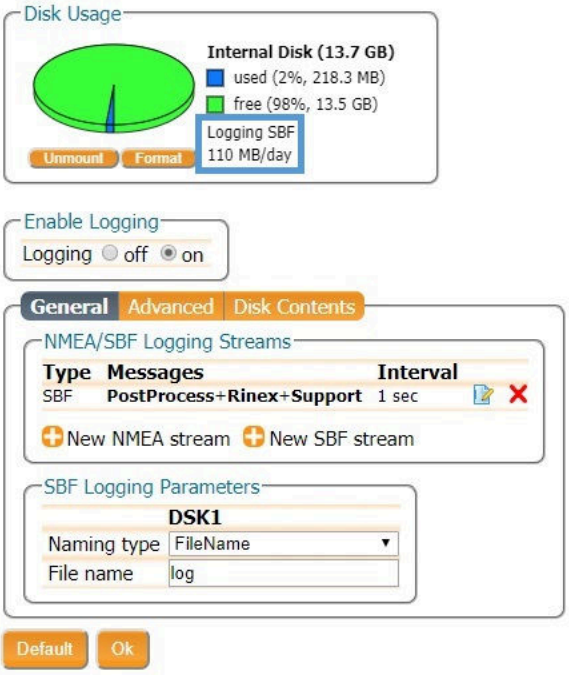

Figure 4-16: A summary of the newly defined logging sessions showing the expected amount of data generated daily

4.3 Downloading logged data from the receiver

Data files logged by the AsteRx SBi3 Pro+ can be downloaded using the web interface using the **Disk Contents** tab on the main page of the **Logging** menu. Individual files can be downloaded by clicking on the green download arrow next to the file name as shown in Figure 4-17. Obsolete files can be deleted by clicking the button.

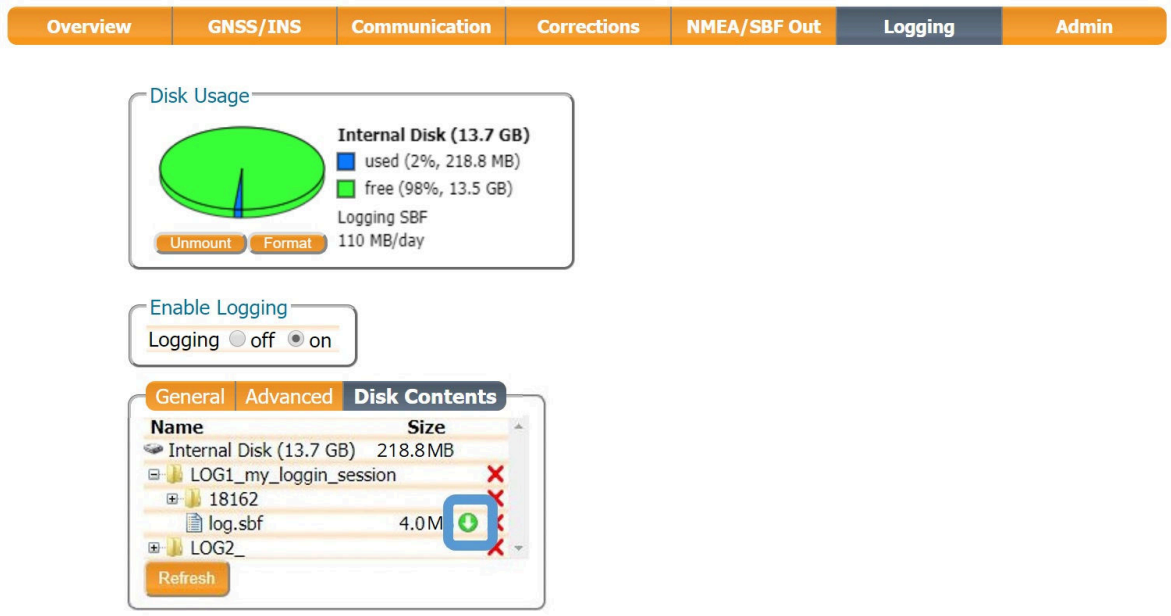

Figure 4-17: Downloading logged files

A Rear-panel port descriptions

A.1 PWR-COM2&3/USB

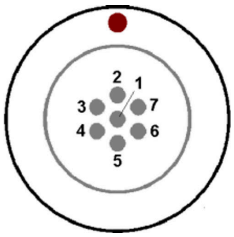

Figure A-1: Front view of the 7-pin female PWR-COM2&3/USB socket on the rear panel of the AsteRx SBi3

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

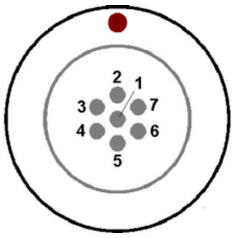

Figure A-2: Front view of the 7-pin female COM1-GPIO socket on the rear panel of the AsteRx SBi3

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 / PPS Out PPS OUT low = 0V, PPS OUT high = 5V
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

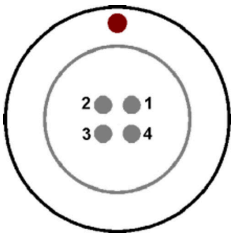

Figure A-3: Front view of the 4-pin female ETH socket on the rear panel of the AsteRx SBi3

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

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

A.4 MAIN ANT / AUX ANT (TNC)

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

By default, the receiver provides a 3.3V DC supply on both the MAIN and AUX connectors to feed the antennas. The supplied antenna voltage can be changed to 5V DC with the command *setAntennaVoltage*. The maximum supported current is 150mA.

Never inject a DC voltage into the MAIN or AUX connectors 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.