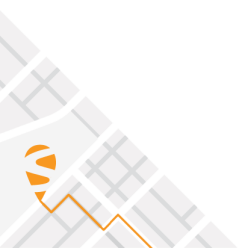
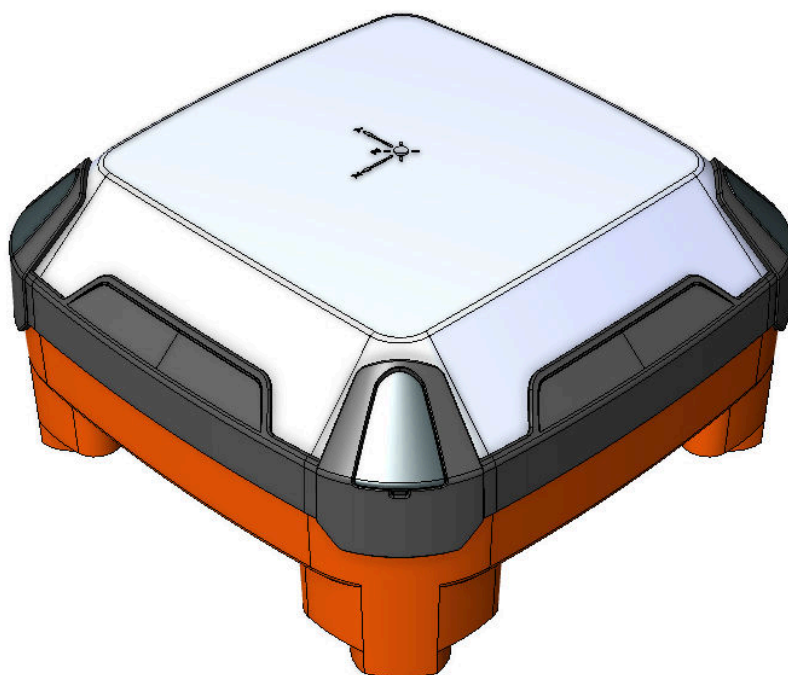




AntaRx-S3 and AntaRx-Si3

User Manual



User Manual Version 1.1

Applicable to version 1.0.4 of the AntaRx-S3 Firmware

Applicable to version 1.0.4 of the AntaRx-Si3 Firmware

January 09, 2025

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

Pictures and screenshots 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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Septentrio
Greenhill Campus, Interleuvenlaan 15i
B-3001 Leuven, Belgium

<http://www.septentrio.com>
support@septentrio.com
Phone: +32 16 300 800
X @Septentrio

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1 Introduction

1.1 User Notices

1.1.1 CE Regulatory Notice



AntaRx 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 AntaRx 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 AntaRx 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 AntaRx dealer. Further information can be found on our website or by contacting Septentrio Technical Support.



<http://www.septentrio.com>

Headquarters

Septentrio NV
Greenhill Campus (HQ)
Interleuvenlaan 15i,
3001 Leuven,
Belgium

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

2 AntaRx overview

The AntaRx-S3 provides multi-frequency, multi-constellation GNSS positioning capability together with GNSS Heading and optional mobile 4G communication within a rugged IP69K housing for the broadest range of applications.

The AntaRx-Si3 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.

AntaRx 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 AntaRx 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
- Integrated cellular modem option
- Industrial-grade IMU (Inertial Measurement Unit) for AntaRx-Si3 variants

2.1.1 AntaRx-S3 GNSS

- 544 hardware channels
- Up to 100 Hz Raw data output (code, carrier, navigation data)
- Up to 100 Hz SBAS, DGNSS and RTK positioning
- 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 (base station and rover)
- Real Time Kinematic (base and rover)
- Moving base positioning
- 16 GB Internal Memory for logging

2.1.2 AntaRx-Si3 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

2.1.3 Connectivity

- High-speed serial ports (2 x RS232 or 1 x RS422)
- Ethernet port (TCP/IP and UDP)
- CAN port
- High-speed USB
- 1 Event marker
- xPPS output (max. 100 Hz)
- Integrated Cellular Modem (EDGE, 2G, 3G, 3.5G, 4G) - optional

2.1.4 Physical and Environmental

Size:	158 x 166 x 83 mm (including connectors)
Weight:	1.1 kg
Input voltage:	9-48 V DC
Power consumption:	15 W maximum
Temperature Range:	-30 to +70 °C (operational, for variants without internal cellular modem) -30 to +60 °C (operational, for variants with internal cellular modem) -40 to +75 °C (storage)
Solar Radiation:	MIL-STD-810H Method 505.7 Procedure 1 Cycle A1 (operational, for variants without internal cellular modem)
Solar Radiation:	MIL-STD-810H Method 505.7 Procedure 1 Cycle A2 (operational, for variants with internal cellular modem)
Ingress Protection:	IPX9K, IP6X (ISO20655)
Humidity:	100% RH (IEC60068-2-38)
Shock:	60 g, 6 msec. (operating)
Vibration:	ISO16750-3:2023 Test VII, Test IX

2.2 AntaRx variants

The AntaRx is available in multiple variants:

Variant (Part number)	Main features
AntaRx-S3 410440	<ul style="list-style-type: none">• AntaRx-S3 GNSS smart antenna
AntaRx-S3 410441	<ul style="list-style-type: none">• AntaRx-S3 GNSS smart antenna with cellular modem• Integrated 4G Cellular modem• For use in Europe & Japan
AntaRx-S3 410442	<ul style="list-style-type: none">• AntaRx-S3 GNSS smart antenna with cellular modem• Integrated 4G Cellular modem• For use in Europe & US
AntaRx-Si3 410443	<ul style="list-style-type: none">• AntaRx-Si3 GNSS/INS smart antenna with cellular modem• Integrated 4G Cellular modem• For use in Europe & US
AntaRx-Aux 410444	<ul style="list-style-type: none">• AntaRx GNSS Auxiliary antenna• Accessory, for use with AntaRx-S3 or AntaRx-Si3 in dual-antenna applications

2.3 AntaRx design

2.3.1 Connector panel

The connector panel layout of the AntaRx is shown in Figure 2-1. It includes a single connector for power & data and one RF input connector for attaching an auxiliary antenna.

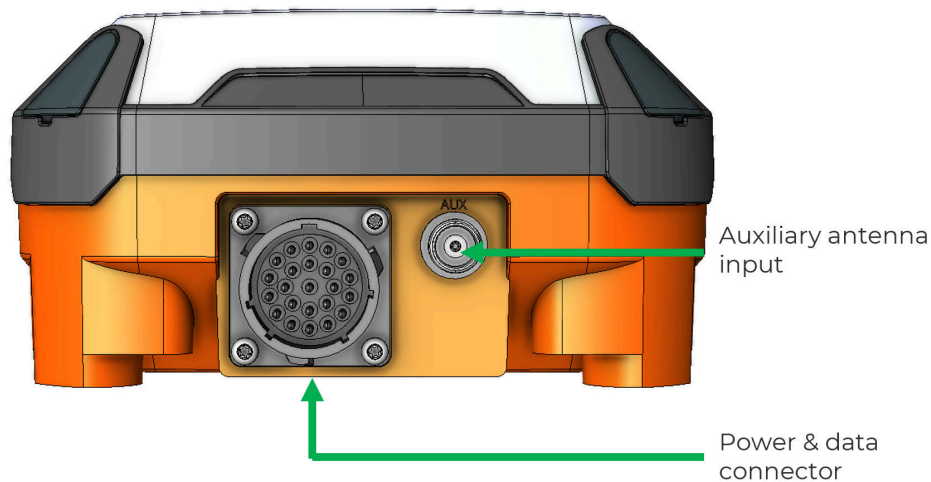


Figure 2-1: AntaRx connector panel layout

The connector for power & data is Souriau UTS-type (P/N UTS01823P). The PIN assignment can be found in the Appendix.

2.3.2 SIM card slot (applicable to units equipped with internal cell modem)

Important: Only insert or remove the SIM card while the unit is powered down.

AntaRx accepts a nano SIM (4FF), required for the operation of the integrated cellular modem. Remove the SIM card door by unscrewing the 4 screws marked with green in Figure 2-2. Insert a nano SIM (4FF) into the SIM lock.

When closing the SIM card door, make sure the rubber seal is seated in its groove. Close the SIM card door by tightening the 4 bolts.

Note: the bolts are captive to the SIM card door

Screw type: M3 x 8mm countersunk

Tightening tool: Torx T10

Tightening torque: max. 1Nm

Note: Multi-carrier SIM cards are not supported.

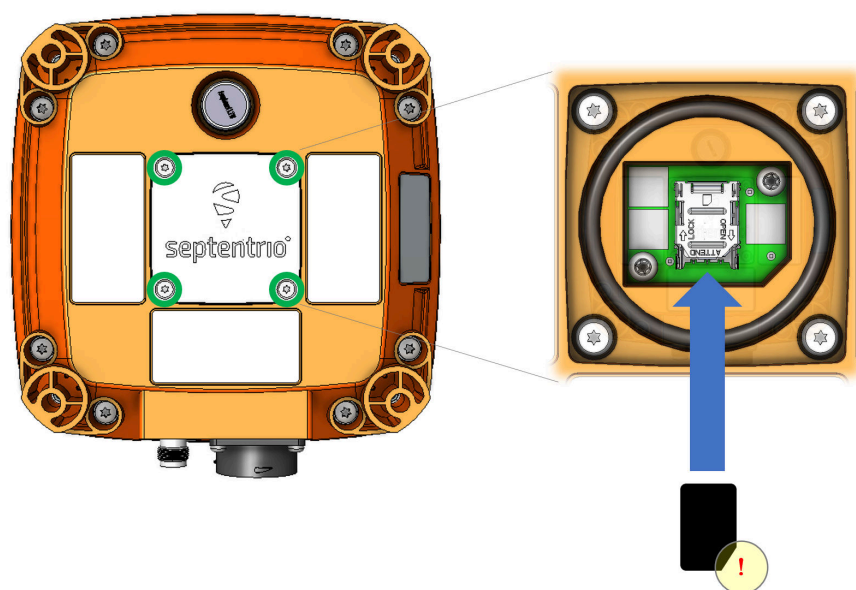


Figure 2-2: SIM card slot on the AntaRx

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.
- Make sure the receiver and the cables will not be damaged, for example by moving parts or sharp edges.
- Make sure the conditions at the installation location never exceed the specifications of the AntaRx.
- Cover unused connectors with caps.
- If the receiver is exposed to marine atmosphere or high humidity, apply dielectric grease inside all connectors and protect them with self-amalgamating tape.

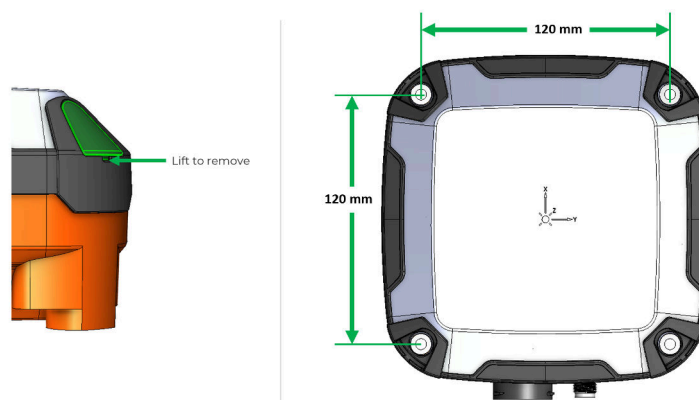


Figure 2-3: AntaRx with corner plugs removed

The AntaRx can be fixed to the rover structure using 4 bolts. Mounting holes are on a square pattern, 120 +/-0.1mm apart. Install on a flat, solid surface with a flatness tolerance of +/-0.2mm.

First, use a 3mm flat head screwdriver to lift the corner caps, covering the mounting holes.

Use 4pcs. hexagon socket cylindrical head stainless steel (A2) screws (DIN912), size M5 or M6. Screw length: 32mm + support thickness + nut thickness.

Tightening torque: max. 5Nm

Thread-locker or self-locking nuts are recommended.

Reinsert the corner caps by pressing them firmly in place.

Important: When installing on a flat surface, make sure water can drain from underneath the unit, especially in the area of the pressure relief vent. It is recommended to provide an opening directly under the vent with a minimum diameter of 35mm as shown in Figure 2-4.

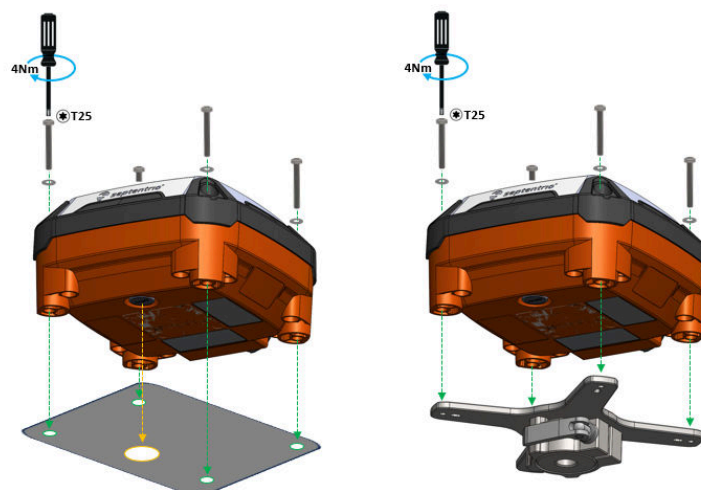


Figure 2-4: AntaRx installation on a plate or on the accessory bracket (P/N 216886)

An example design for the installation plate is given in Figure 2-5.

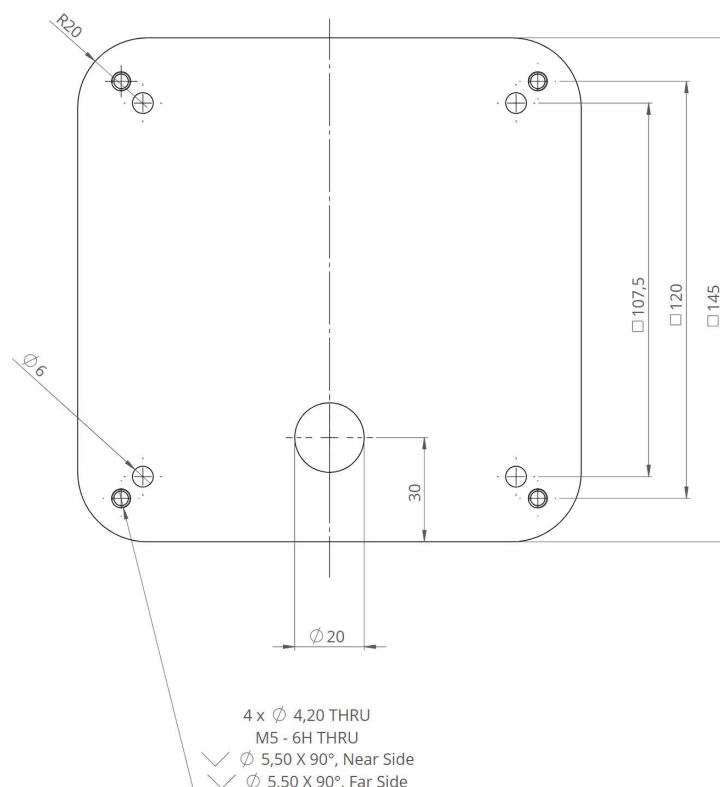


Figure 2-5: Example of installation plate design

2.4 Installation of AntaRx-Si3 INS

In order to properly detect motion it is important to mount the AntaRx-Si3 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 AntaRx-Si3 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).

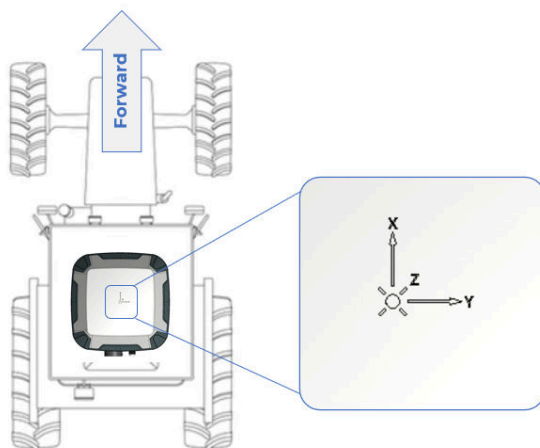


Figure 2-6: AntaRx-Si3 installed with the IMU reference X-axis aligned to the vehicle X-axis

2.4.1 Internal memory

The AntaRx 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 AntaRx. 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.

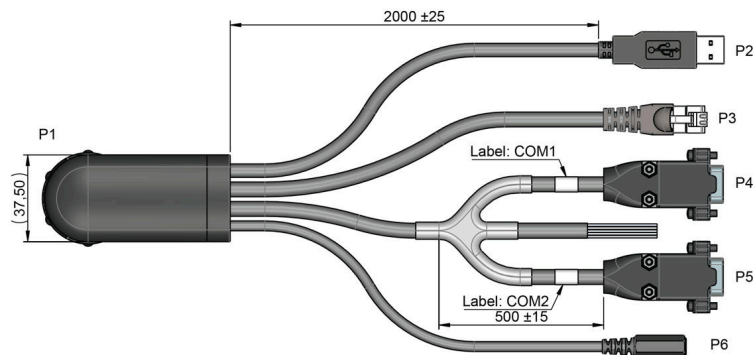


Figure 2-7: Development cable, multi-interface (216524)

3 Quick start

This section details on how to power-up, connect to and communicate with the AntaRx. The AntaRx has an on-board web interface which the user can connect to over Ethernet or USB. The AntaRx 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 AntaRx

Using a development cable, connect P6 to a 9-48V DC power source with a 2.1x5.5 DC plug connector or cut the P6 connector and connect the red wire to the positive terminal and the black wire to the negative terminal of a 9-48V DC power source.

Alternatively, connect P3 to a network switch supporting Power over Ethernet. Please note that AntaRx supports mode A, as specified in the 802.3af standard. Supported PoE voltage range is 37-57 VDC).

Then, connect the main connector (P1) of the multi-interface development cable to the receiver.

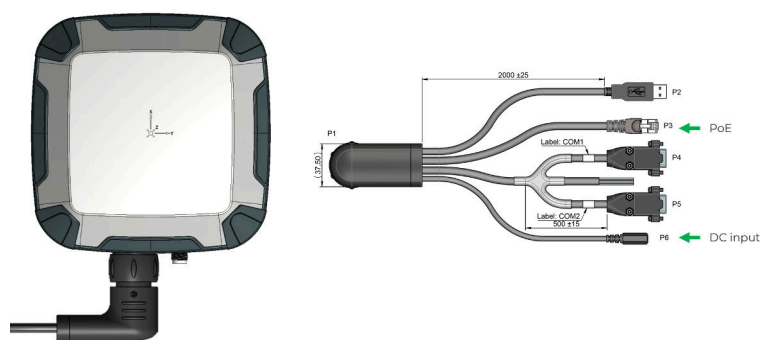


Figure 3-1: Power options

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

3.2 Connecting the auxiliary GNSS antenna - optional

The connector panel of the AntaRx has one TNC connector for the auxiliary GNSS antenna input as indicated in Figure 3-2.

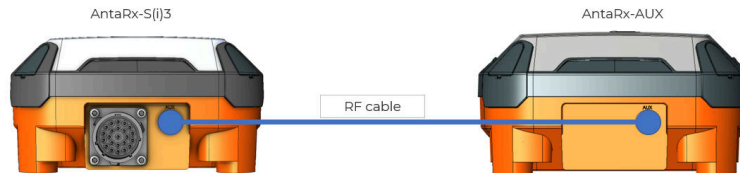


Figure 3-2: Antenna connectors

For the best performance, AntaRx-Aux is recommended as auxiliary antenna. Ensure total cable attenuation between AntaRx and the auxiliary antenna and is below 10dB, between 1.1GHz and 1.6GHz.

3.3 Connecting to the AntaRx 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 P2 to an USB port of a device (e.g. PC).

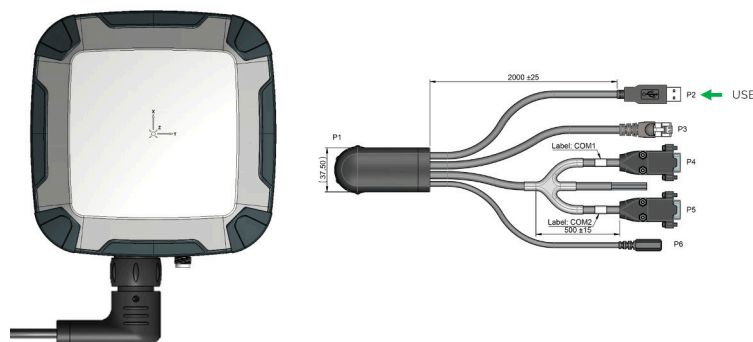


Figure 3-3: USB connection

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 in 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.

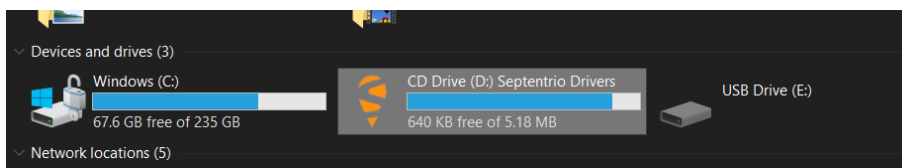


Figure 3-4: Screenshot showing USB connection after driver installation (Windows 10 example)

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

To connect to the AntaRx, 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 AntaRx 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 cable (P3) to a LAN network as indicated in Figure 3-6.

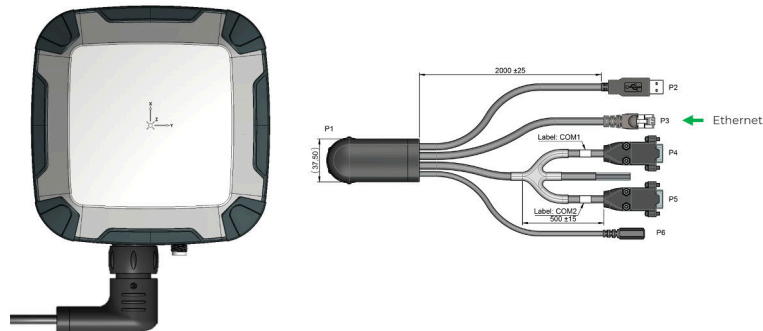


Figure 3-6: Ethernet connection

Step 2: Open a web browser and connect to the AntaRx

By default, the AntaRx has the hostname 'http://AntaRx-s3-xxxxxxx' or 'http://AntaRx-si3-xxxxxxx' depending on the hardware variant, where xxxxxxx are the last 7 digits of the AntaRx serial number. This hostname can be used on a local area network to connect to the AntaRx 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: AntaRx label showing serial number

Figure 3-8 shows a screenshot of an Ethernet connection to a receiver with serial number 3277275 using '**http://AntaRx-s3-3277275**'.

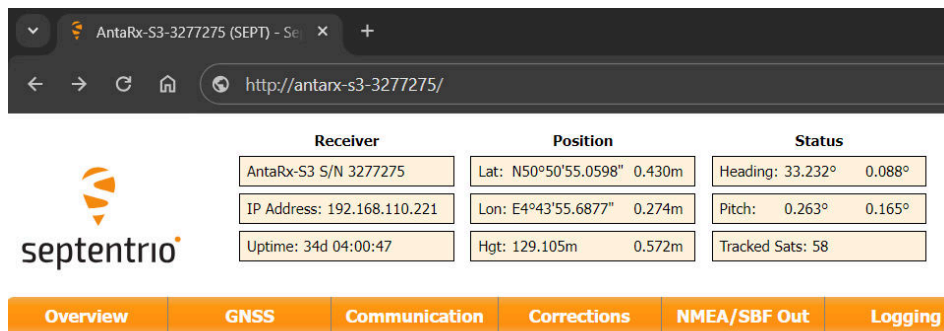


Figure 3-8: Connecting to the Web Interface via Ethernet

3.4 How to configure SBF and NMEA output

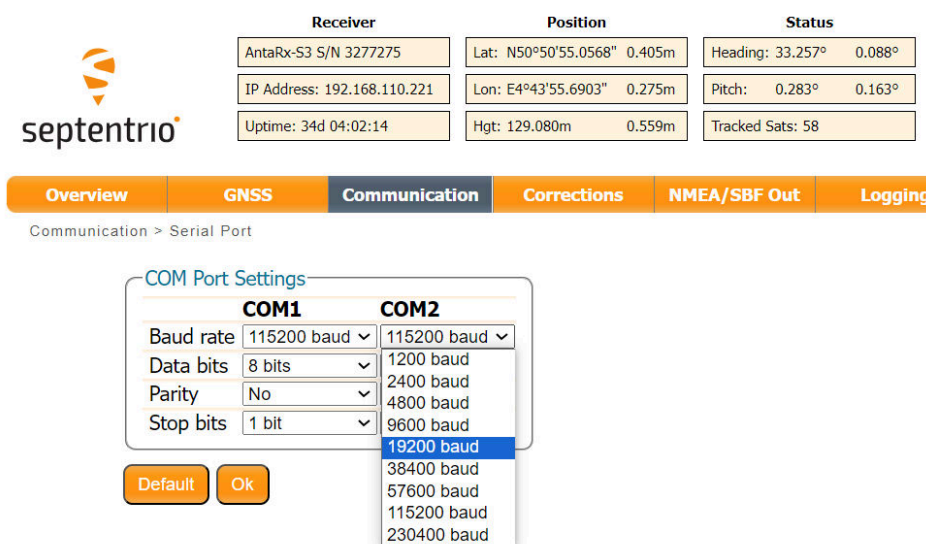
The AntaRx can output position and GNSS data in both standard NMEA format and Septentrio's proprietary compact binary format SBF. The following sections detail how to configure connections to other devices in order to send data.

3.4.1 Output over a serial COM connection

The AntaRx 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 AntaRx 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.



The screenshot shows the Septentrio web interface. At the top, there is a status bar with three sections: Receiver, Position, and Status. Below this is a navigation bar with tabs: Overview, GNSS, Communication (selected), Corrections, NMEA/SBF Out, and Logging. The 'Communication' tab is active, showing 'Communication > Serial Port'. A 'COM Port Settings' dialog box is open, displaying settings for COM1 and COM2. The 'Baud rate' dropdown for COM2 is open, showing a list of baud rates with 19200 baud selected.

Receiver		Position		Status	
AntaRx-S3 S/N 3277275		Lat: N50°50'55.0568" 0.405m		Heading: 33.257° 0.088°	
IP Address: 192.168.110.221		Lon: E4°43'55.6903" 0.275m		Pitch: 0.283° 0.163°	
Uptime: 34d 04:02:14		Hgt: 129.080m 0.559m		Tracked Sats: 58	

Navigation tabs: Overview, GNSS, **Communication**, Corrections, NMEA/SBF Out, Logging

Breadcrumb: Communication > Serial Port

COM Port Settings

	COM1	COM2
Baud rate	115200 baud	115200 baud
Data bits	8 bits	1200 baud
Parity	No	2400 baud
Stop bits	1 bit	4800 baud
		9600 baud
		19200 baud
		38400 baud
		57600 baud
		115200 baud
		230400 baud

Buttons: Default, OK

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

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 (AntaRx-Si3) can output a limited set of NMEA messages.

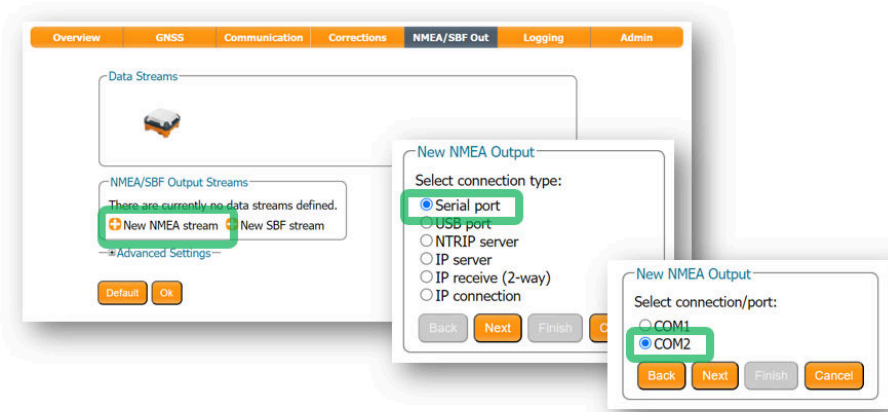


Figure 3-10: Selecting to output NMEA data on COM2

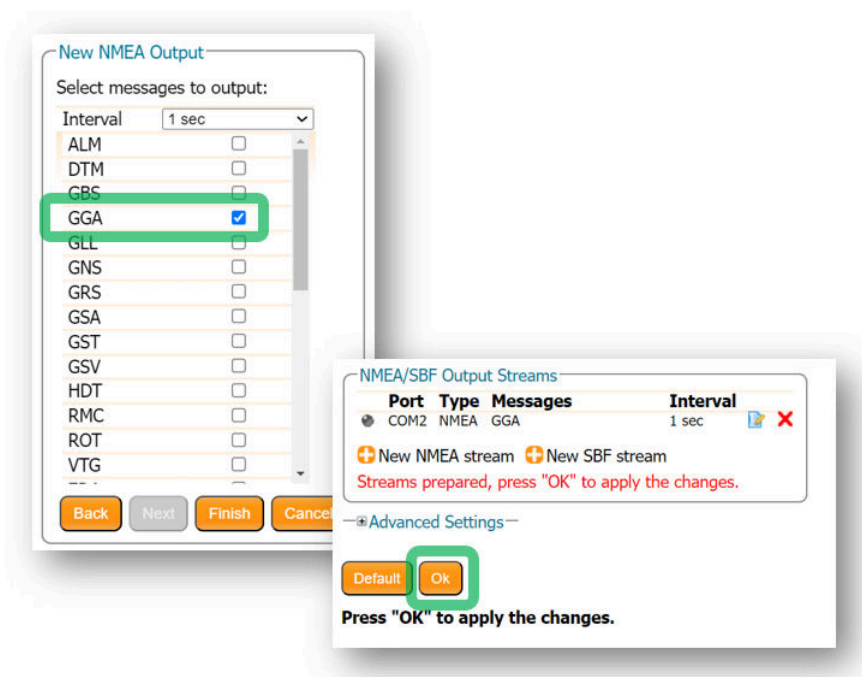


Figure 3-11: Selecting to output the GGA NMEA message every second

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.

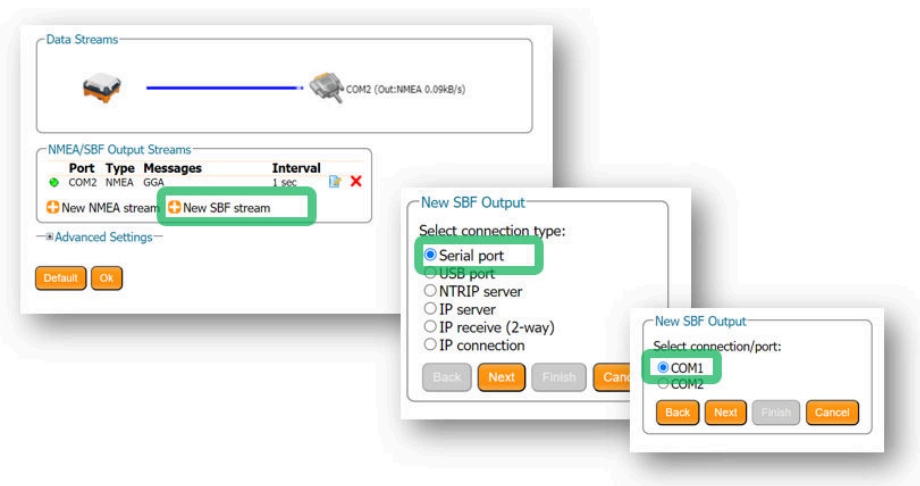


Figure 3-12: Selecting to output SBF data on COM1

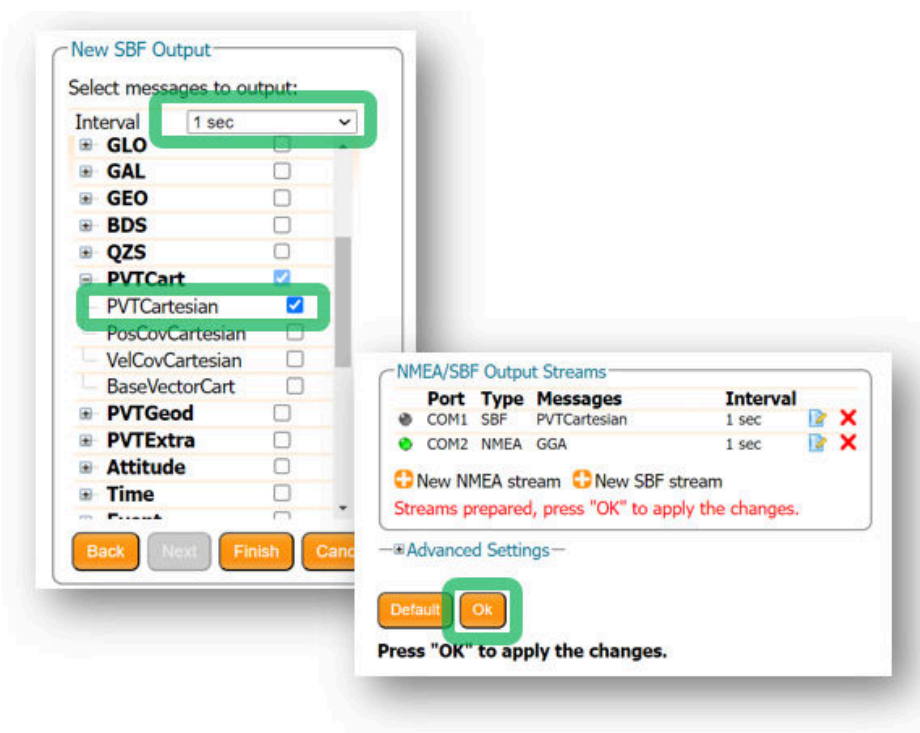


Figure 3-13: Selecting to output the PVTCartesian SBF block every second

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.

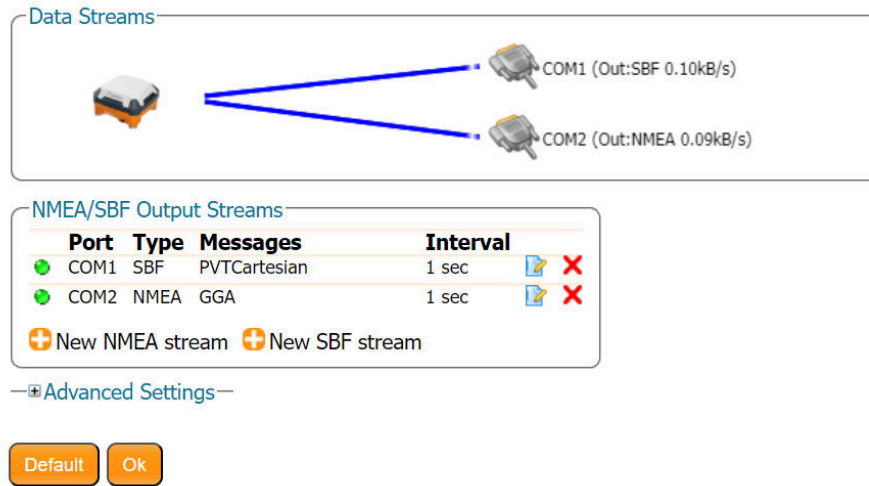


Figure 3-14: Summary of all configured data output streams

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.

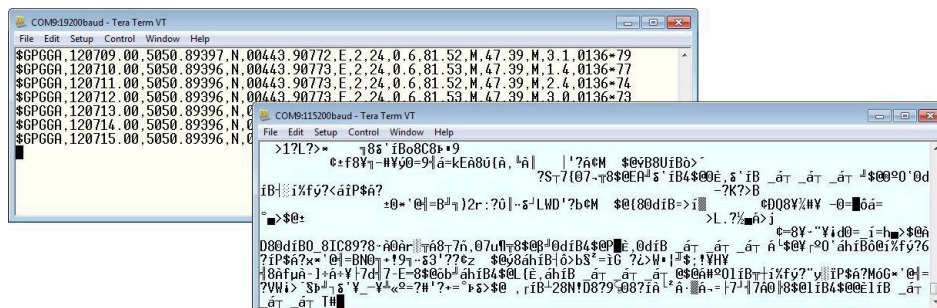


Figure 3-15: Example showing output NMEA GGA (left panel) and SBF PVTCartesian (right panel)

3.4.2 Output over Ethernet

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

Step 1: Configure an IP connection on the AntaRx

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 AntaRx 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**.

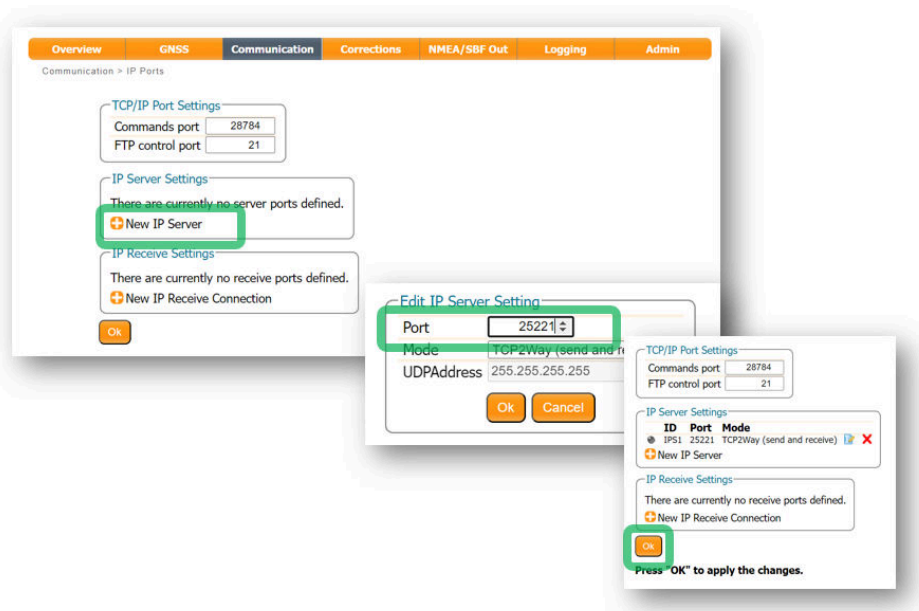


Figure 3-16: Configure the TCP/IP server port setting for data output

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.

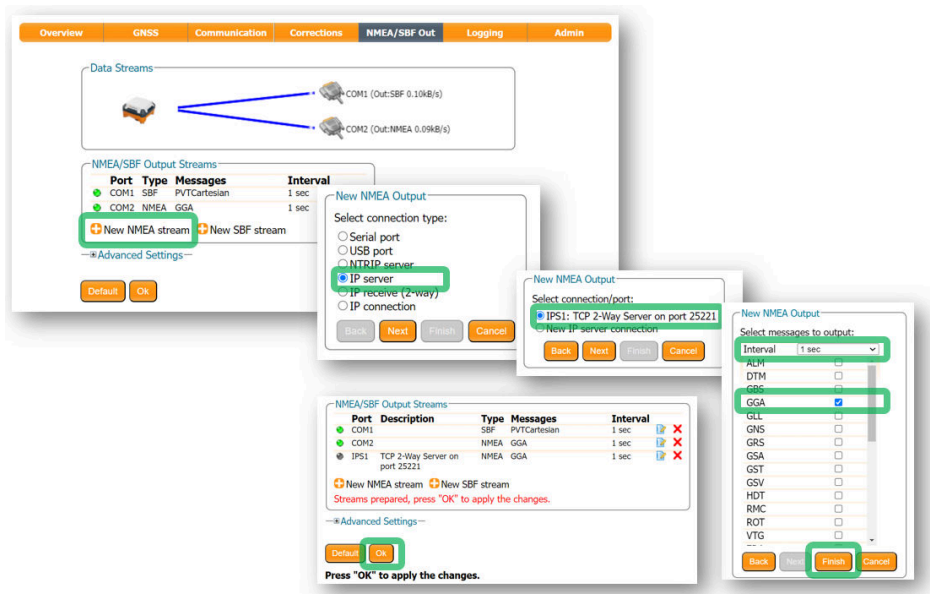


Figure 3-17: Select to output NMEA GGA over the configured IPS1 connection

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 AntaRx 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**.

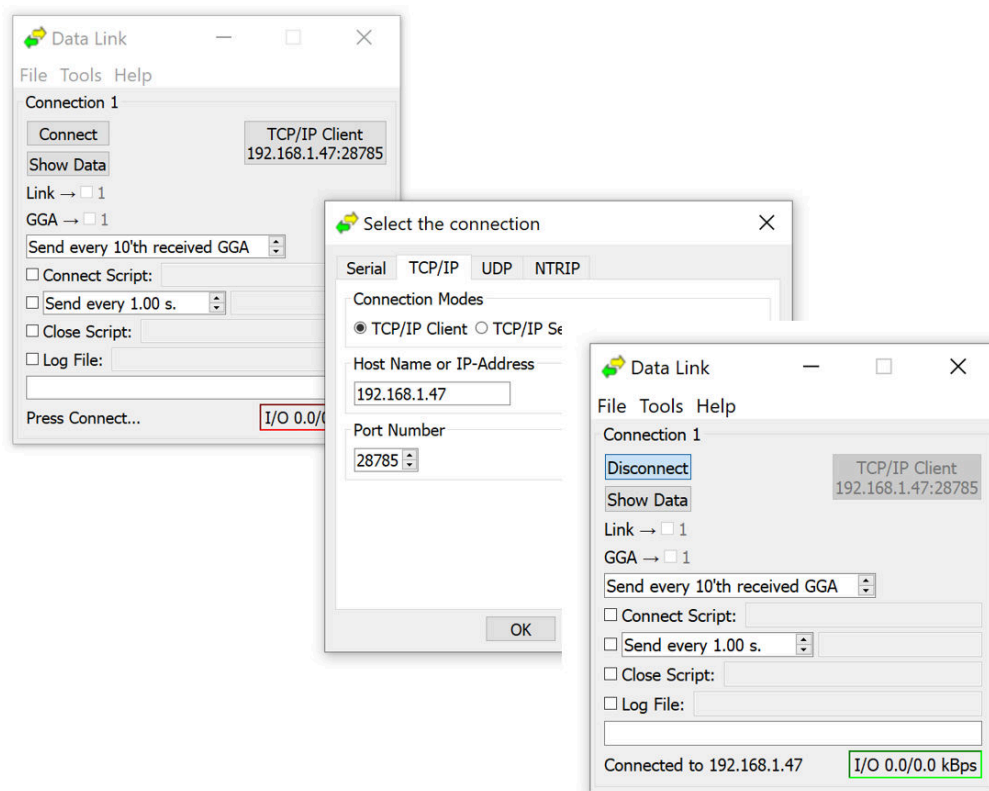


Figure 3-18: Configure the TCP/IP connection settings in Data Link

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.

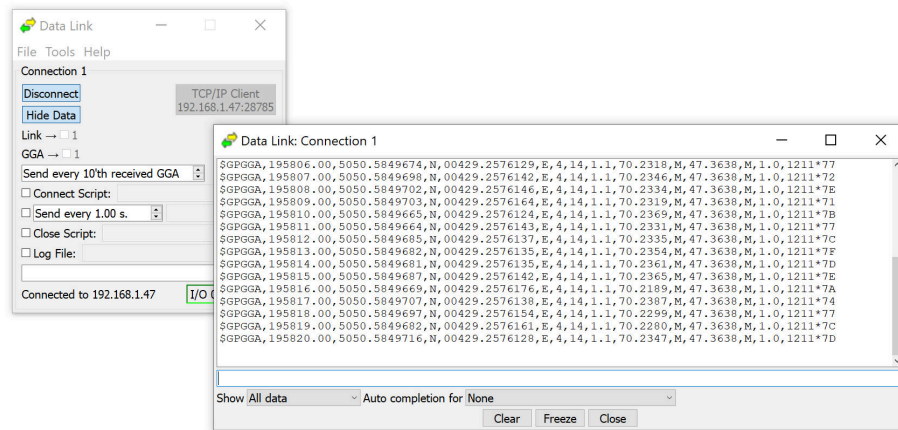
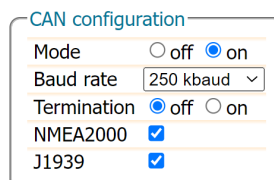


Figure 3-19: The 'Show data' window of Data Link showing GGA from the AntaRx

3.5 How to configure CAN output

The CAN implementation in the AntaRx 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.



CAN configuration

Mode ☐ off ☒ on

Baud rate 250 kbaud

Termination ☒ off ☐ on

NMEA2000 ☒

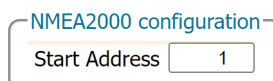
J1939 ☒

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.

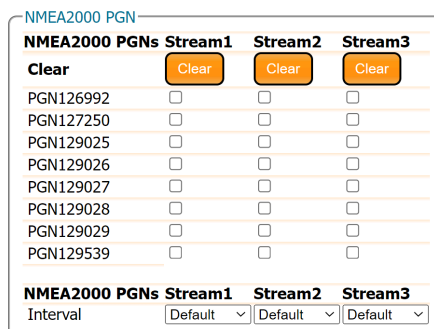


NMEA2000 configuration

Start Address 1

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.



NMEA2000 PGN

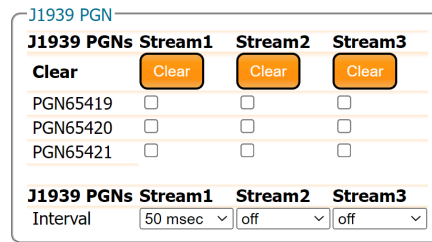
NMEA2000 PGNs	Stream1	Stream2	Stream3
Clear	Clear	Clear	Clear
PGN126992	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PGN127250	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PGN129025	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PGN129026	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PGN129027	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PGN129028	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PGN129029	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PGN129539	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

NMEA2000 PGNs Stream1 Stream2 Stream3

Interval Default Default Default

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.



J1939 PGN

J1939 PGNs	Stream1	Stream2	Stream3
Clear	<input type="button" value="Clear"/>	<input type="button" value="Clear"/>	<input type="button" value="Clear"/>
PGN65419	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PGN65420	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PGN65421	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

J1939 PGNs Stream1 Stream2 Stream3

Interval

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.

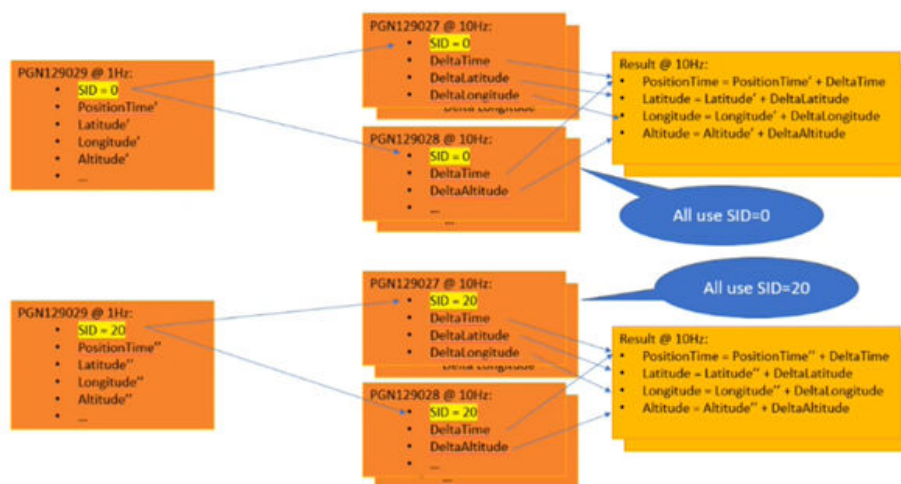


Figure 3-24: Calculating position and altitude with high update rate

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 AntaRx for RTK

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

4.1.1 How to configure the AntaRx in RTK rover mode using the cellular modem and NTRIP

Step 1: Enable RTK mode

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 4-1.

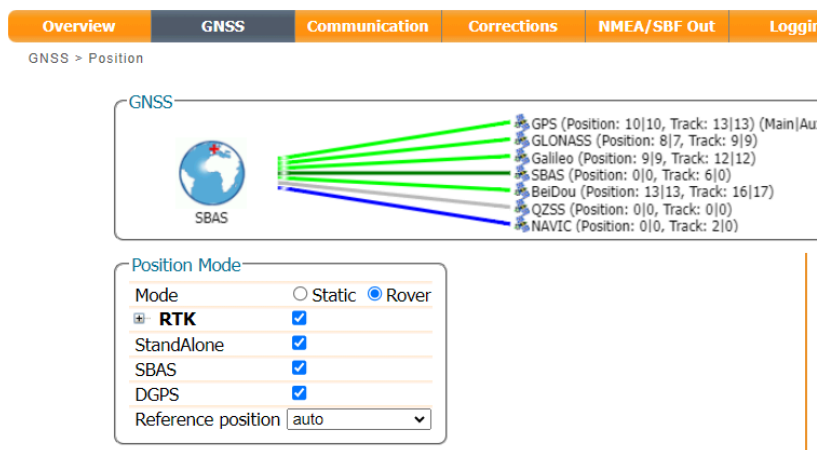
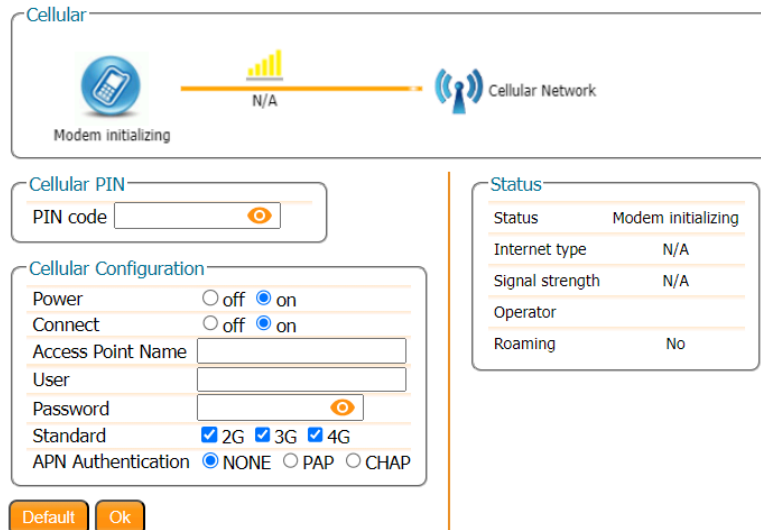


Figure 4-1: Ensure that RTK has been enabled as a positioning mode

Step 2: Configure the cellular modem

The on-board cellular modem of the AntaRx can be configured in the **Communication > Cellular** window as shown in Figure 4-2. A PIN number may or may not be required depending on the SIM configuration. In the **Cellular Configuration** field, the Access Point Name (APN) should be inserted with other fields being optional.



Cellular

Modem initializing

N/A

Cellular Network

Cellular PIN

PIN code

Cellular Configuration

Power ☐ off ☒ on

Connect ☐ off ☒ on

Access Point Name

User

Password

Standard ☒ 2G ☒ 3G ☒ 4G

APN Authentication ☒ NONE ☐ PAP ☐ CHAP

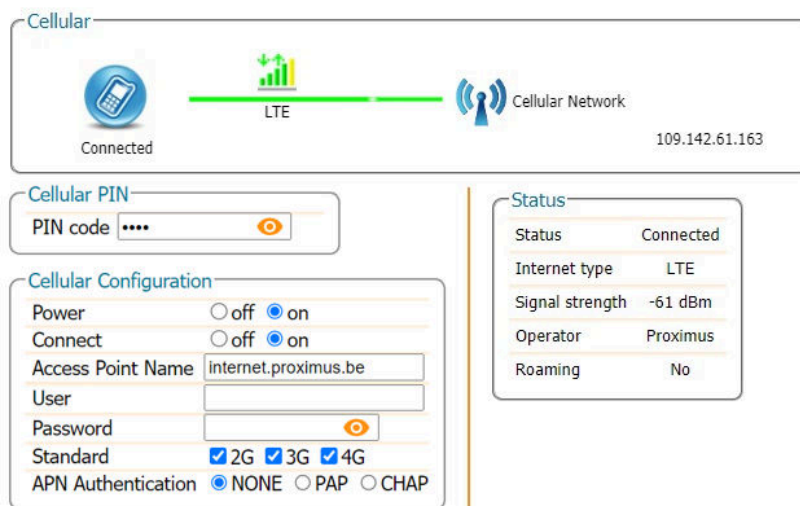
Status

Status	Modem initializing
Internet type	N/A
Signal strength	N/A
Operator	
Roaming	No

Default Ok

Figure 4-2: Configuring the cellular modem

Click on Ok and if the settings are correct, the cellular graphic should appear as shown in Figure 4-3. The connection type may appear as HSUPA, HSPA or in this example LTE.



Cellular

Connected

LTE

Cellular Network

109.142.61.163

Cellular PIN

PIN code

Cellular Configuration

Power ☐ off ☒ on

Connect ☐ off ☒ on

Access Point Name internet.proximus.be

User

Password

Standard ☒ 2G ☒ 3G ☒ 4G

APN Authentication ☒ NONE ☐ PAP ☐ CHAP

Status

Status	Connected
Internet type	LTE
Signal strength	-61 dBm
Operator	Proximus
Roaming	No

Figure 4-3: Correctly configured cellular modem

Step 3: Configure the NTRIP connection

Using a cellular connection, you can get RTK correction data from an NTRIP service. Figure 4-4 shows the settings required to retrieve correction data from the FLEPOS NTRIP Caster. Select 'Client' from the drop-down **Mode** menu. The Caster, Port, User Name and Password should be provided by the NTRIP service. NTRIP Casters typically provide multiple correction data streams known as **Mount Points**. When a connection has been made to the Caster, the 'Mount Point' drop-down list will become active.

When using correction data from a virtual base station it is often necessary to provide your position to the NTRIP Caster in the form of an NMEA GGA message. This can be configured in the '**Send GGA to caster**' drop-down list.

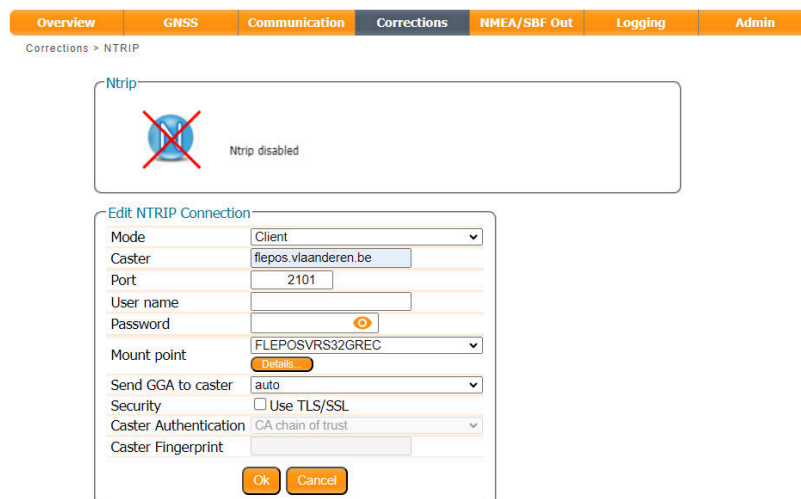


Figure 4-4: Configuring the NTRIP connection

Step 4: Verifying the configuration

When both the cellular modem and NTRIP connection have been correctly configured, the Ntrip figure in Corrections NTRIP window will indicate differential correction reception as shown in Figure 4-5 with the positioning mode icon indicating RTK fixed.

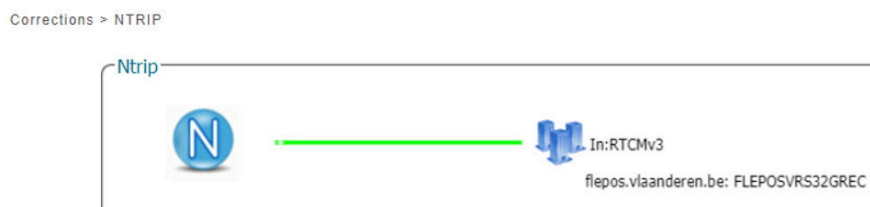


Figure 4-5: Correctly configured NTRIP connection


4.1.2 How to configure the AntaRx 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 5 describes how to configure the AntaRx 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 4-6, RTCMv3 correction data are sent out over port 28785. The RTCMv3 messages necessary for RTK positioning are selected by default.

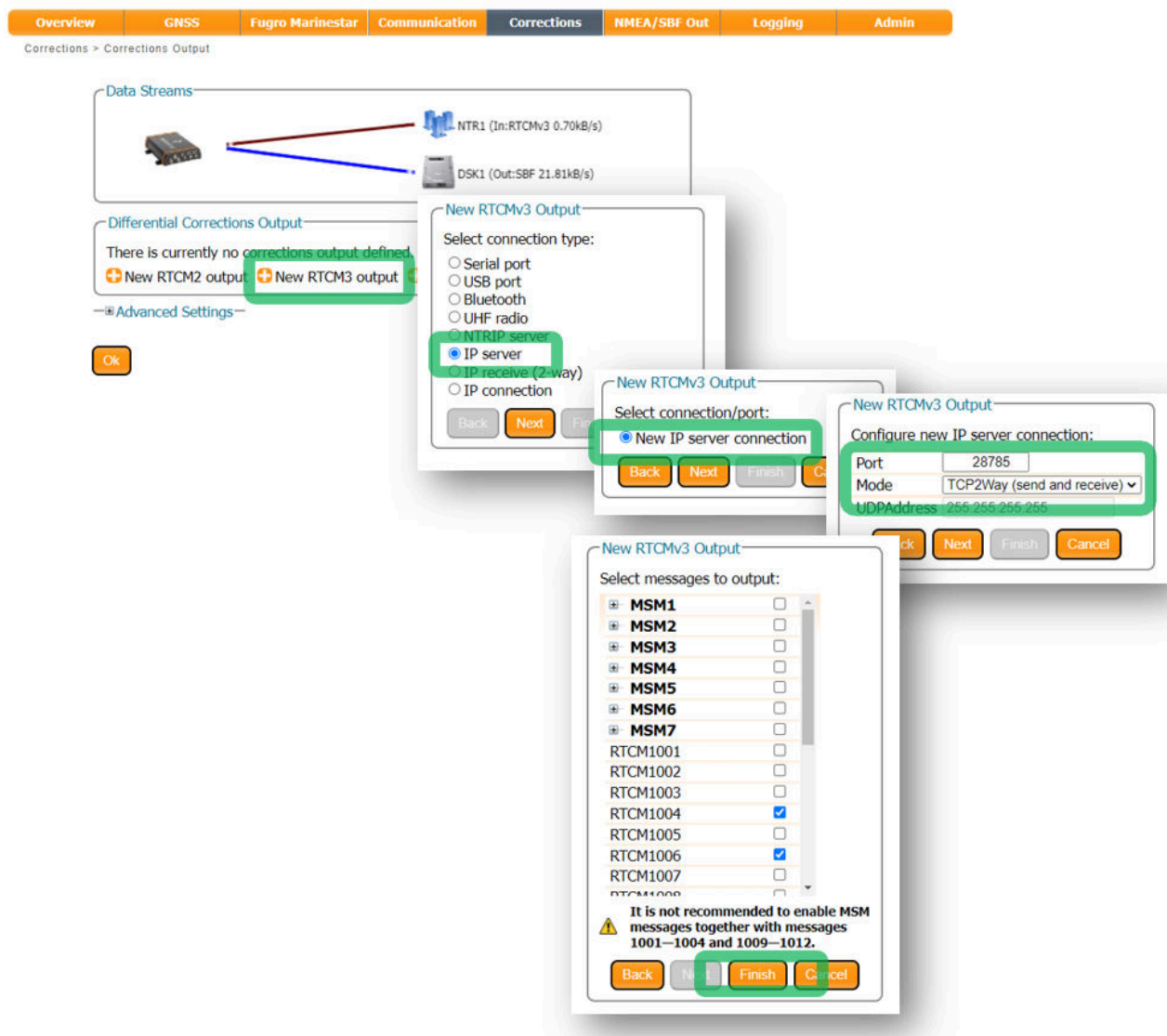


Figure 4-6: Configuring RTK differential corrections output over an Ethernet connection

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 4-7.

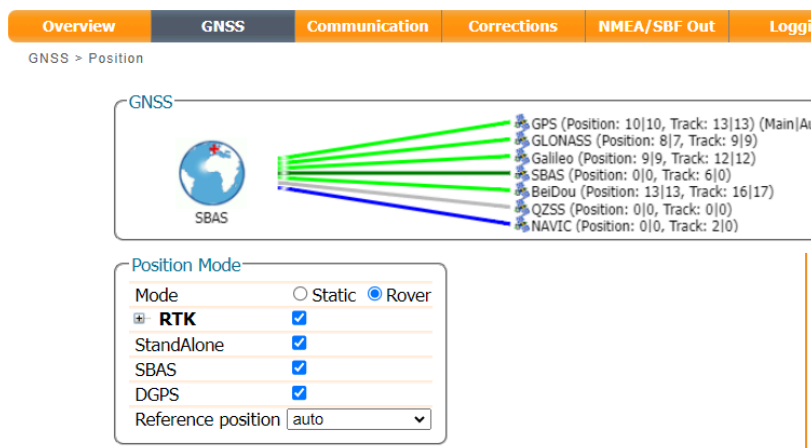


Figure 4-7: Ensure that RTK is enabled as a positioning mode

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 4-8 to start configuration sequence. The **Port** and **TCPAddress** should match the port and IP address of the Base station receiver.

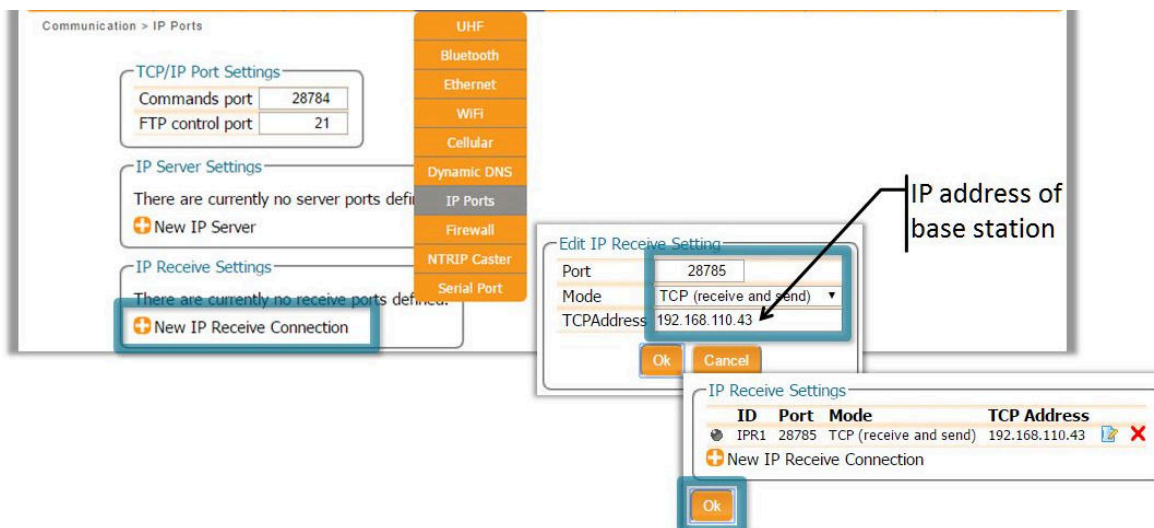


Figure 4-8: In the **IP Ports** window, click on **+ New IP Receive Connection** to configure the connection with the base station

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 4-9 and 4-10.

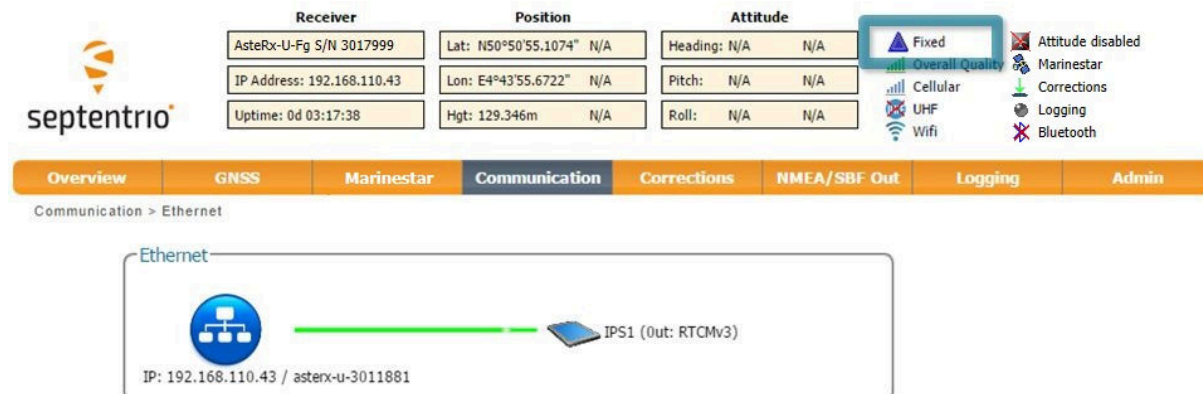


Figure 4-9: Ethernet window of the **Base station receiver** showing the position as static and an active output of RTCMv3 differential corrections on server port IPS1

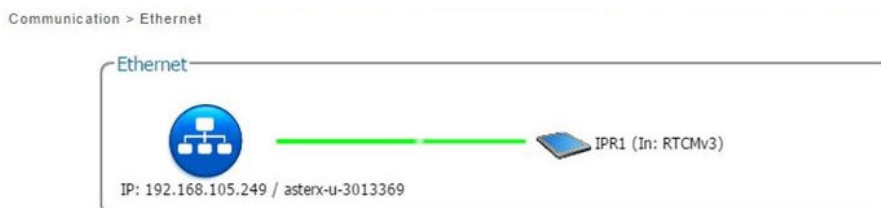


Figure 4-10: Ethernet tab of the **rover receiver** showing a fixed RTK position and reception of RTCMv3 differential corrections on receiver port IPR1

4.2 How to configure the AntaRx for Attitude

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

Step 1: Connect the auxiliary antenna

Connect an auxiliary antenna to the connector labeled **AUX** as indicated in Figure 4-11.

Note: For optimal performance, it is recommended to use AntaRx-AUX as auxiliary antenna.



Figure 4-11: Auxiliary antenna connection

Step 2: Compensate for deviations in the antenna orientation

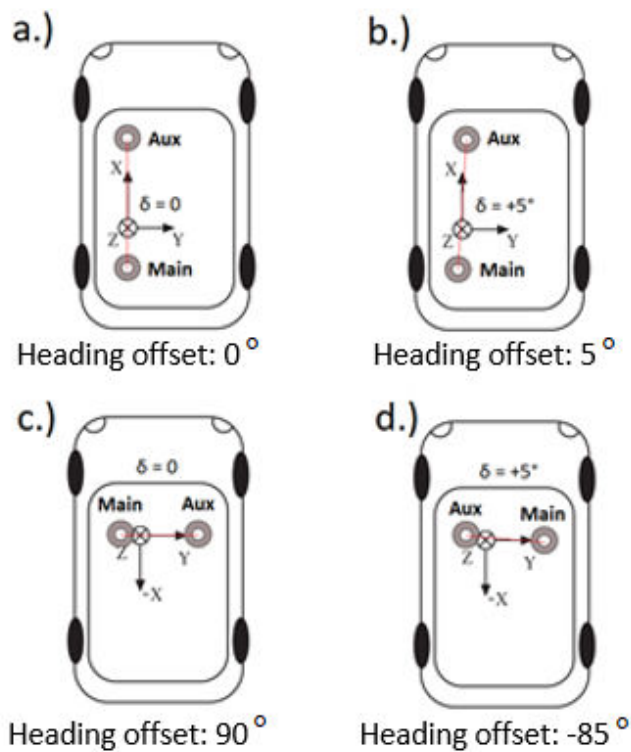


Figure 4-12: Setup examples to understand how to handle heading offsets.

- 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.
- A slight deviation (5°) from the longitudinal axis in the clockwise direction is reflected by a positive heading offset.
- An alternative antenna configuration where the antennas are placed perpendicular to the longitudinal axis.
- 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 4-13. Providing this information will let the receiver compensate for the offsets before calculating the attitude by subtracting them from the attitude angles.

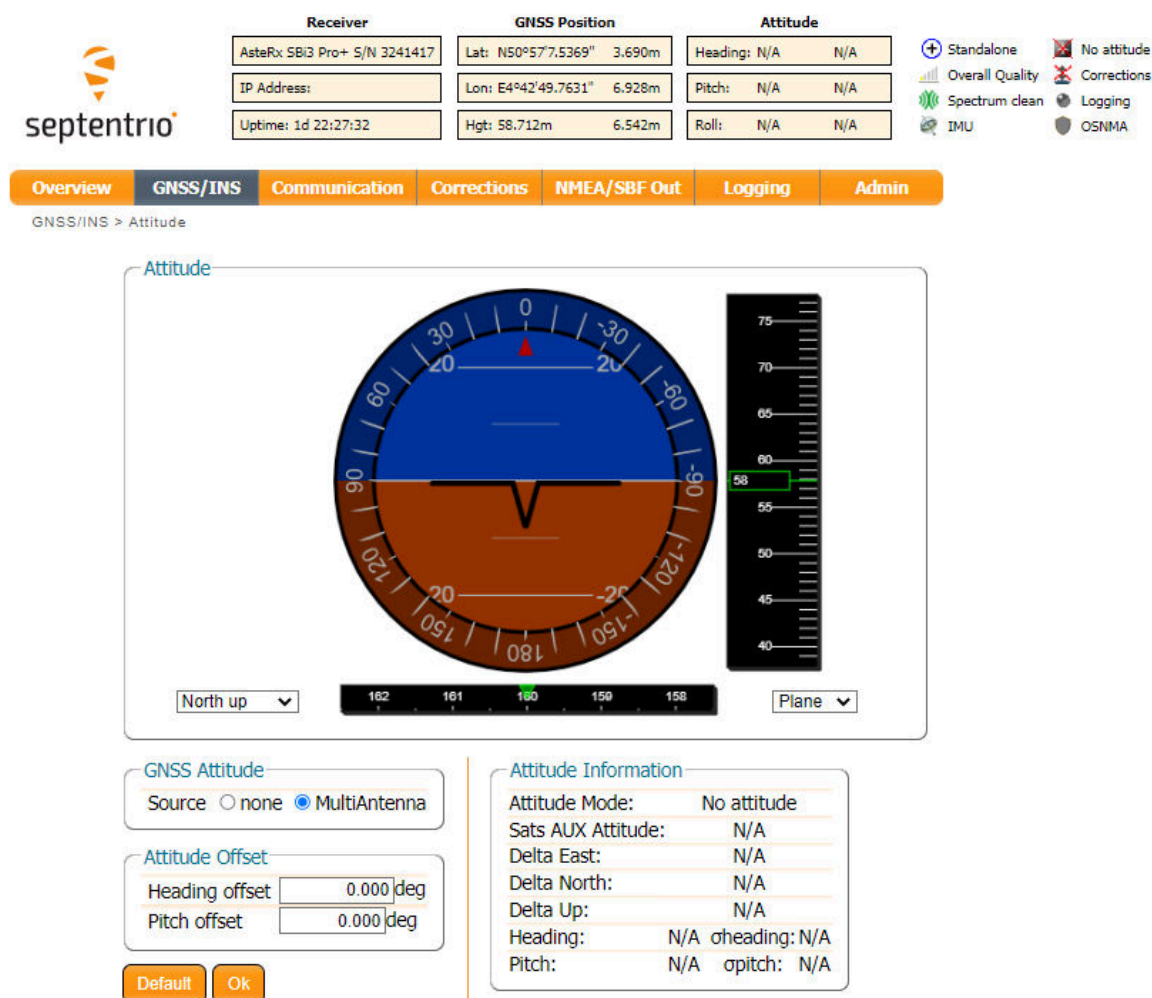


Figure 4-13: Setting the attitude offset.

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 4-12.

The examples in Figure 4-12 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 as shown in Figure 4-14.

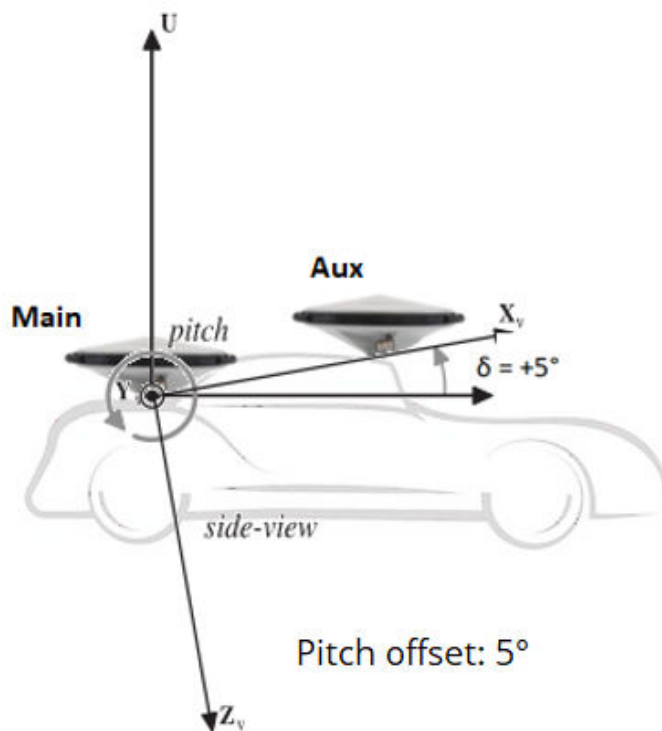


Figure 4-14: Visual representation of the effect of vertical offset between the two antennas on the Pitch offset. Assuming the default antenna configuration, the aux antenna being mounted higher will result in a positive value for the pitch.

Note that in order to correctly reference to the antenna's 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 "Antenna Information" 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 4-15 shows.

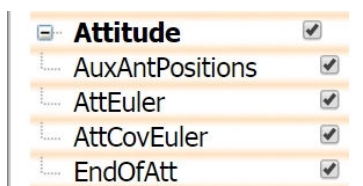


Figure 4-15: SBF blocks containing attitude information

NMEA

You can output the attitude information from the AntaRx in NMEA format by selecting the standard NMEA HDT sentence or the Septentrio proprietary HRP sentence as shown in Figure 4-16.

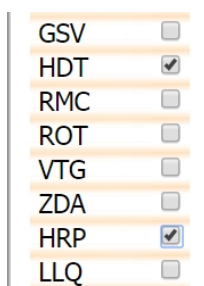


Figure 4-16: NMEA sentences containing attitude information

4.3 How to align IMU orientation and vehicle orientation

Only applicable to AntaRx-Si3 INS smart antenna. Examples of typical receiver installations in a vehicle frame are given in Figure 4-17.

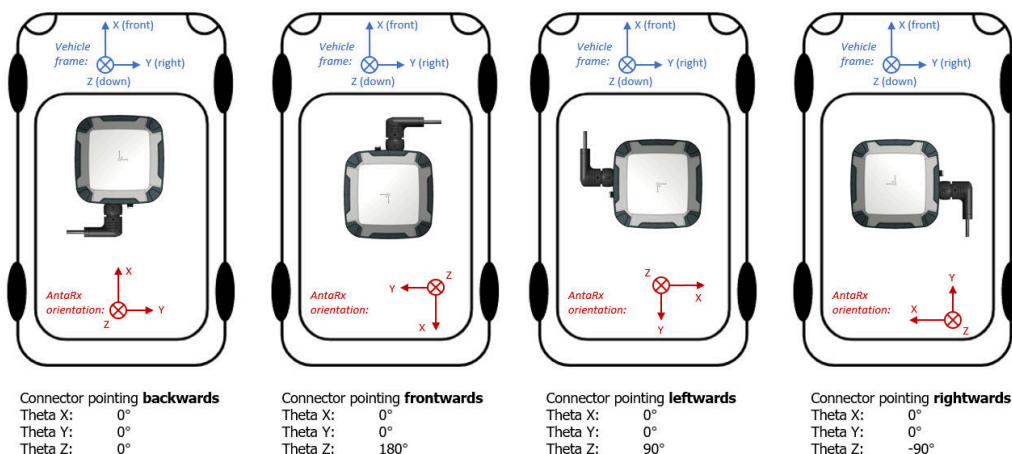


Figure 4-17: Examples illustrating the orientation of the IMU reference frame with the associated IMU orientation for the depicted installation.

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).

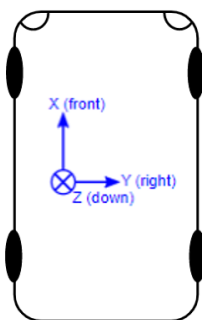


Figure 4-18: The vehicle frame and its orientation.

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 4-19.

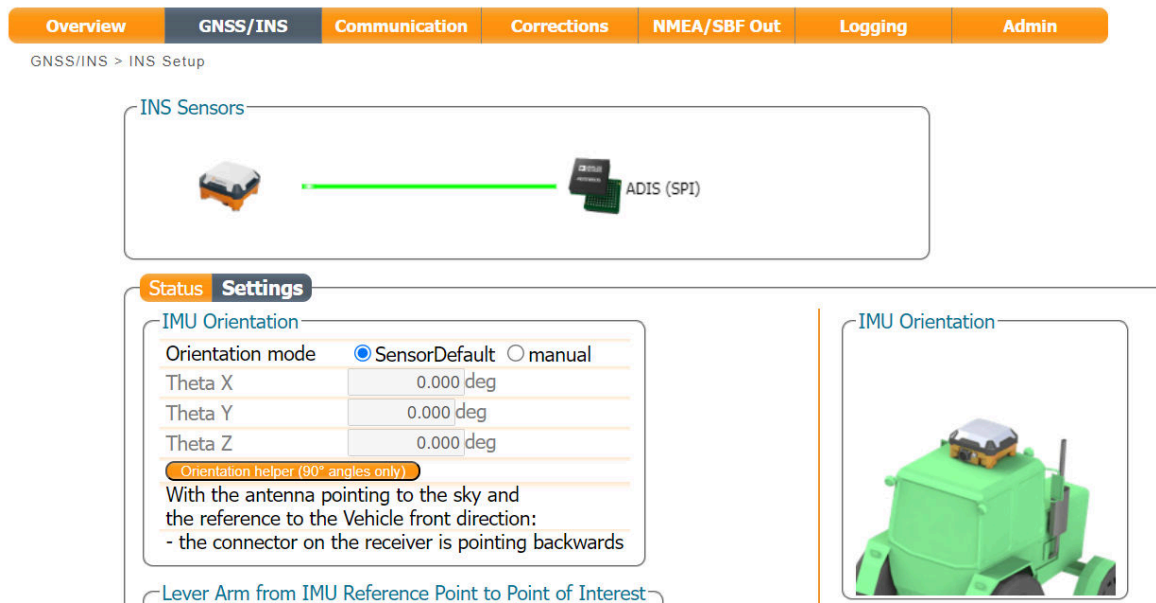


Figure 4-19: Setting the IMU orientation.

If the angles are not known it is also possible to use the orientation helper, that will automatically suggest orientation angles based on a single question:

- With the antenna pointing to the sky and the reference to the Vehicle front direction, the connector on the receiver is pointing in which 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 displayed on the right side.

4.4 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 AntaRx and SPI as shown in Figure 4-20.

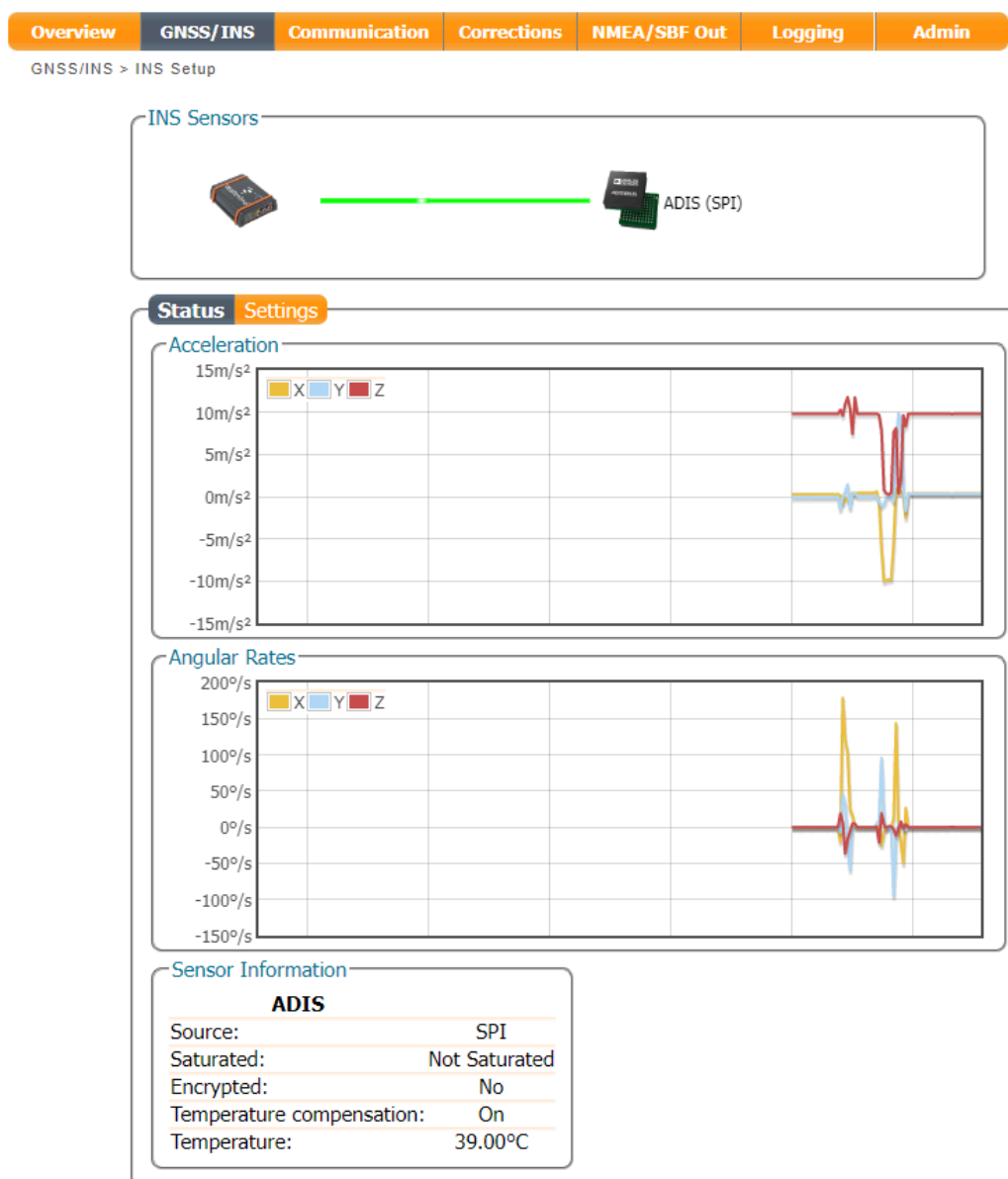


Figure 4-20: The Data Stream window on the Overview page should show a line symbolizing a connection between the AntaRx and the IMU which is connected to SPI.

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 AntaRx using RxControl, navigate to View > IMU View. The acceleration and angular rate plots should display information similar as shown in Figure 4-21. These plots are based on the unfiltered IMU sensor measurements and provide an unambiguous way of checking that the IMU is outputting data.

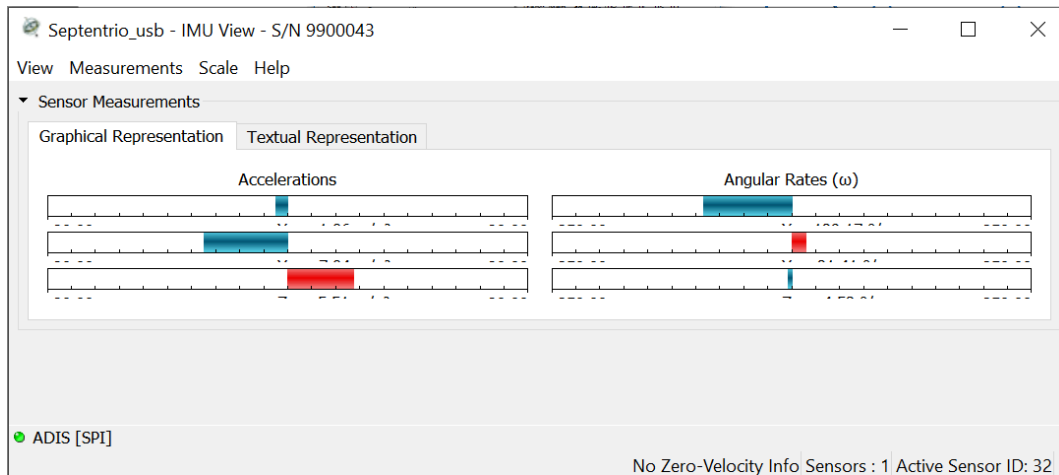


Figure 4-21: Checking the IMU view in RxControl provides an unambiguous way of checking whether or not the IMU is outputting data

4.5 Vehicle velocity input

The AntaRx-Si3 can receive vehicle velocity information and use it as part of the integrated position. The use of the vehicle velocity 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 AntaRx-Si3 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 AntaRx-Si3 Firmware Reference Guide.

AntaRx-Si3 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 AntaRx-Si3 only the velocity values leaving blank the standard deviation. The Fuse+ technology of Septentrio will then assign a confidence value automatically.

4.6 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 Base station operation

5.1 Configuring the AntaRx NTRIP Caster

The AntaRx-S3 includes a built-in NTRIP Caster that makes correction data from the AntaRx 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 the AntaRx-Si3.

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

Step 1: Define a new mount point

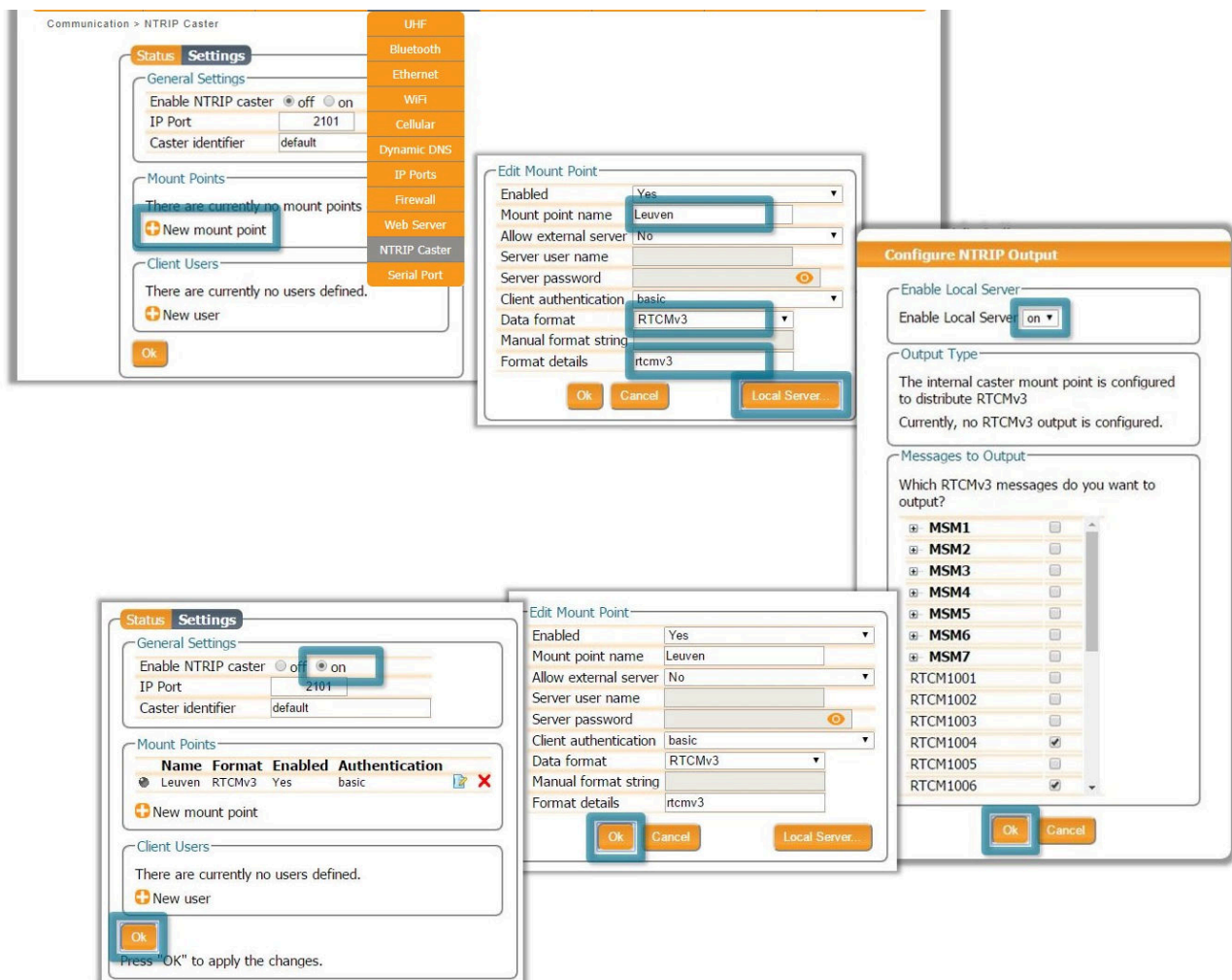


Figure 5-1: The configuration sequence for defining a new mount point

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 5-1. 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 AntaRx, select **'No'** in the 'Allow external server' field¹.

Click on the **'Local Server ...'** button to enable the local NTRIP server of the AntaRx 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 5-2. 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.

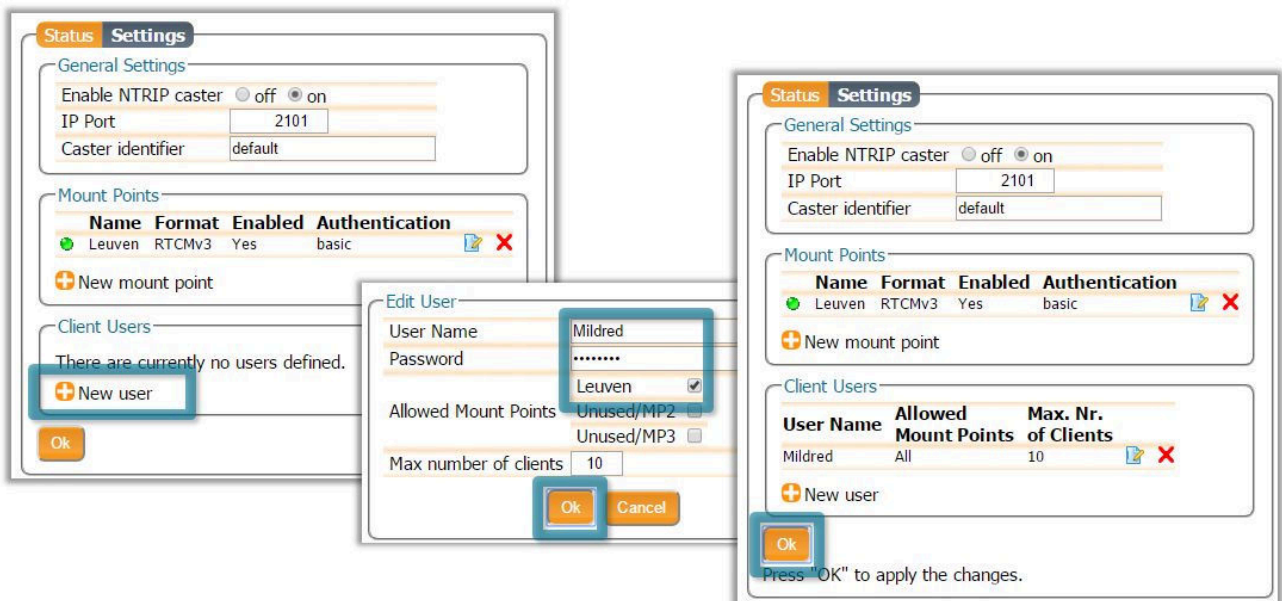


Figure 5-2: Configuring the login credentials for a user

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 5-3, 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 5-4), then their position will also be visible.


Status Settings				
Mountpoints				
Mountpoint	Server Connected	Connect Time	Rate	Clients
Leuven	Yes	6m24s	464 Bps	1
Connected Clients				
Mountpoint	User	Connect Time	Latitude	Longitude
Leuven	Mildred	3m6s	50°50'55.1"	4°43'55.8"

Figure 5-3: Connecting as a client to the AntaRx 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 5-4. 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.

Ntrip



In:RTCMv3

192.168.110.119: Leuven

Edit NTRIP Connection

Mode

Client

Caster

192.168.110.119

Port

2101

User name

Mildred

Password

.....

Mount point

Leuven

Details

Send GGA to caster

10 sec

Ok

Cancel

Figure 5-4: Connecting as a client to the AntaRx NTRIP Caster

6 Receiver Monitoring

6.1 Basic operational monitoring

The 'Overview' page of the web interface in Figure 6-1 shows at a glance a summary of the AntaRx's operational status.

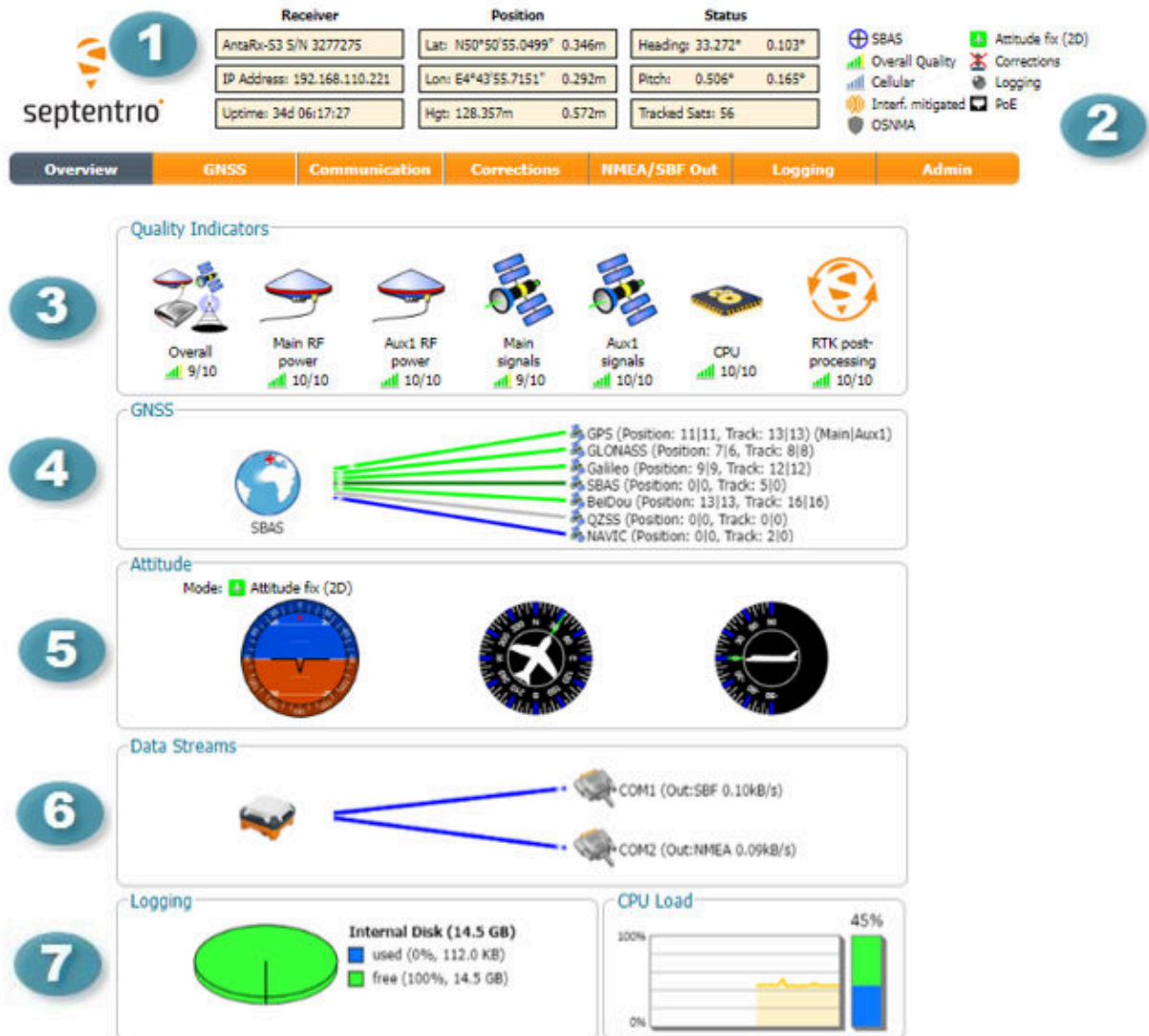


Figure 6-1: Overview page of the web interface

- 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 be 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.

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

The AntaRx 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 6-2 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.

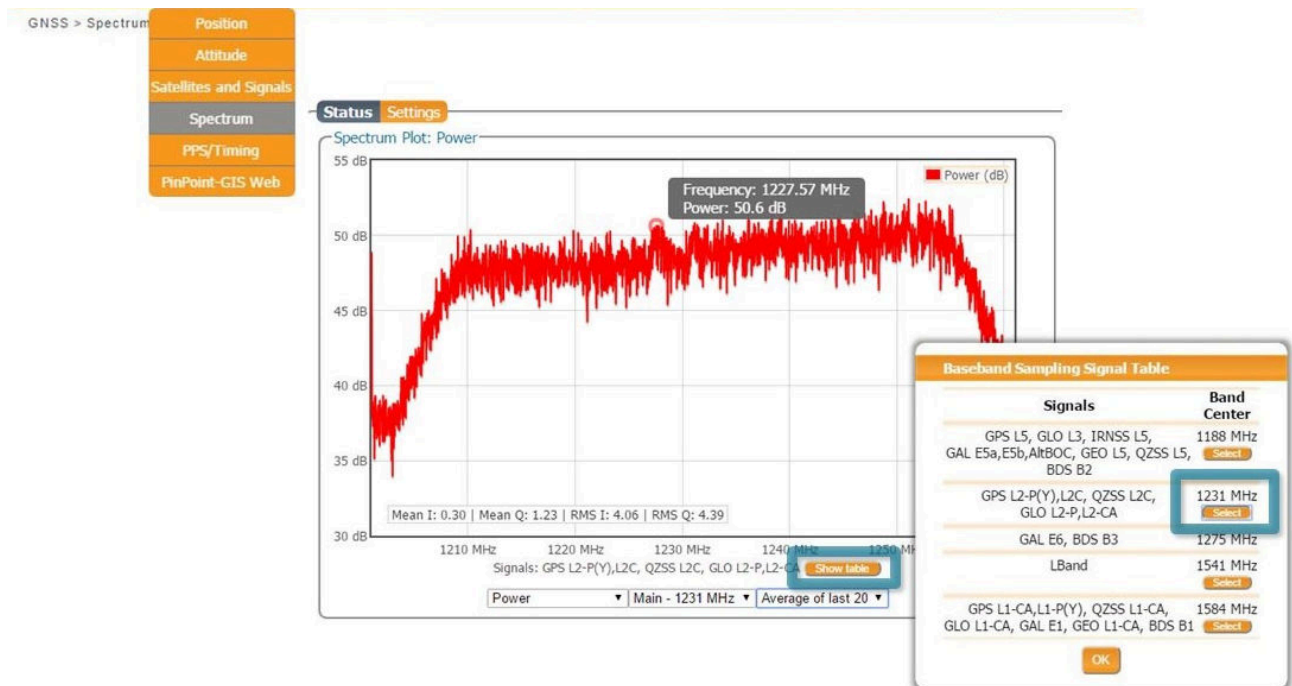


Figure 6-2: The RF spectrum of the L2 Band

6.2.1 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 6-3, the region of the affected spectrum is specified by a center frequency and a bandwidth which is effectively blanked by the notch filter.

Notch Filters

	Notch1	Notch2	Notch3
Mode	manual	auto	auto
Center frequency	1235.000 MHz	1100.000 MHz	1100.000 MHz
Double-sided bandwidth	80 kHz	30 kHz	30 kHz

Wideband Interference Mitigation

Enable WBI mitigation ☐ off ☒ on

Default

Ok

Press "OK" to apply the changes.

Figure 6-3: Configuring the first notch filter Notch1 at 1235 MHz

With the Notch1 settings as shown in Figure 6-3, the L2-band after the notch filter (After IM) is shown in Figure 6-4 with the blanked section clearly visible.

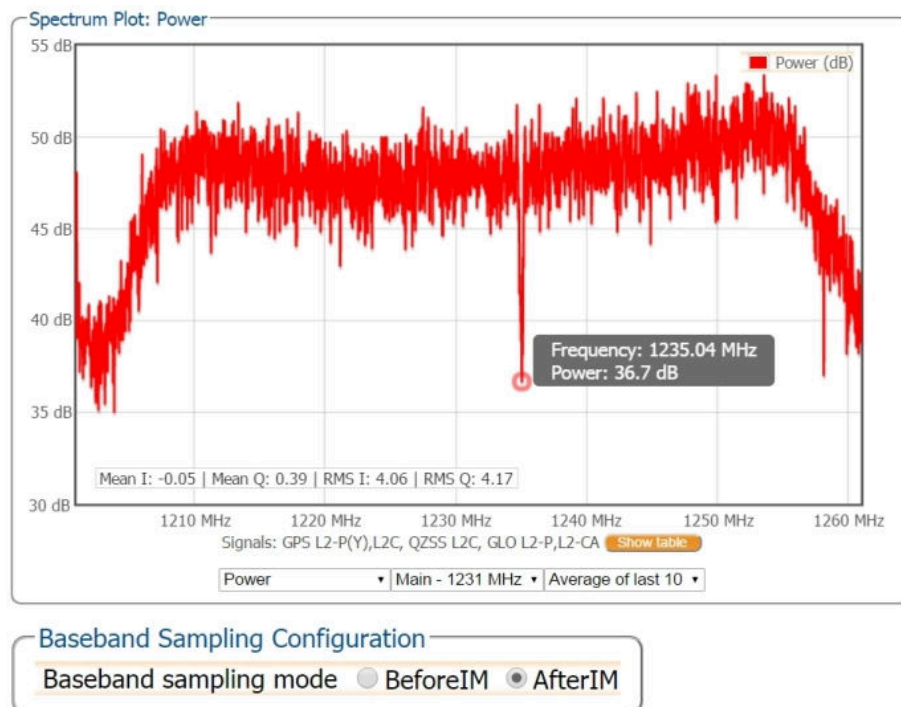


Figure 6-4: The RF spectrum of the L2 Band after applying the notch filter at 1235 MHz

6.2.2 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 AntaRx 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 6-5.

The screenshot shows the 'Notch Filters' configuration window with three columns: Notch1, Notch2, and Notch3. Below this is the 'Wideband Interference Mitigation' section, which is highlighted with a blue border. It contains a toggle switch for 'Enable WBI mitigation' set to 'on'. At the bottom are 'Default' and 'Ok' buttons.

	Notch1	Notch2	Notch3
Mode	manual	auto	auto
Center frequency	1235.000 MHz	1100.000 MHz	1100.000 MHz
Double-sided bandwidth	80 kHz	30 kHz	30 kHz

Wideband Interference Mitigation
 Enable WBI mitigation ☐ off ☒ on

Default Ok

Press "OK" to apply the changes.

Figure 6-5: 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 6-6 is produced by combining the GNSS antenna signal with the output from an in-car GPS chirp jammer.

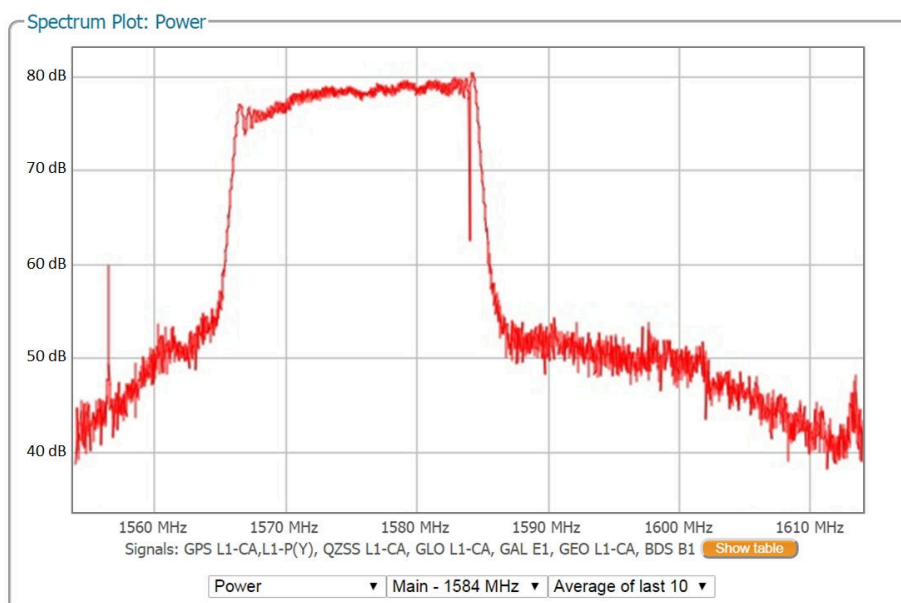


Figure 6-6: Simulated wideband interference in the GPS L1 band using an in-car chirp jammer.

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 6-7 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.

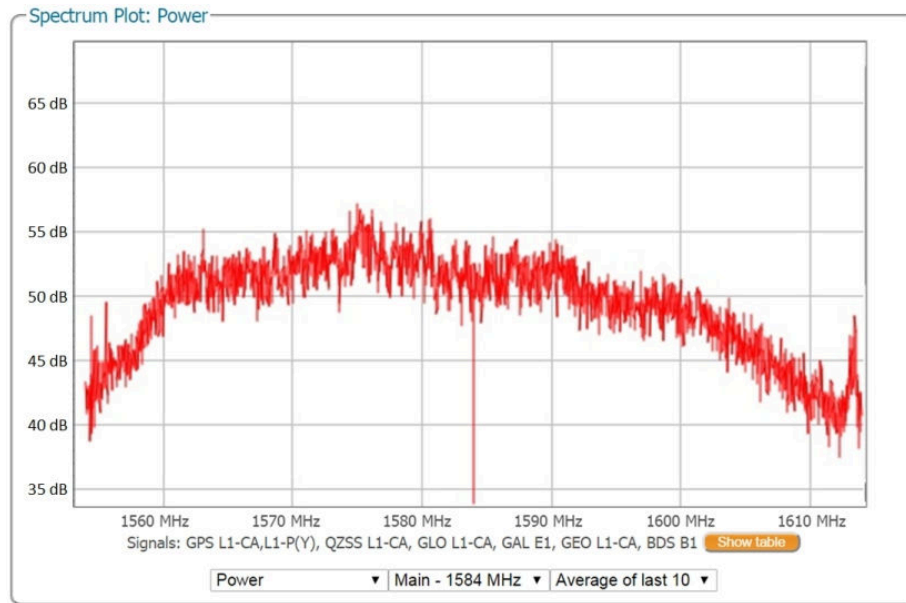


Figure 6-7: Enabling WBI interference mitigation greatly reduces the effect of the interference caused by the chirp jammer.

6.3 How to log data for problem diagnosis

If the AntaRx 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.

6.4 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 6-8 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.

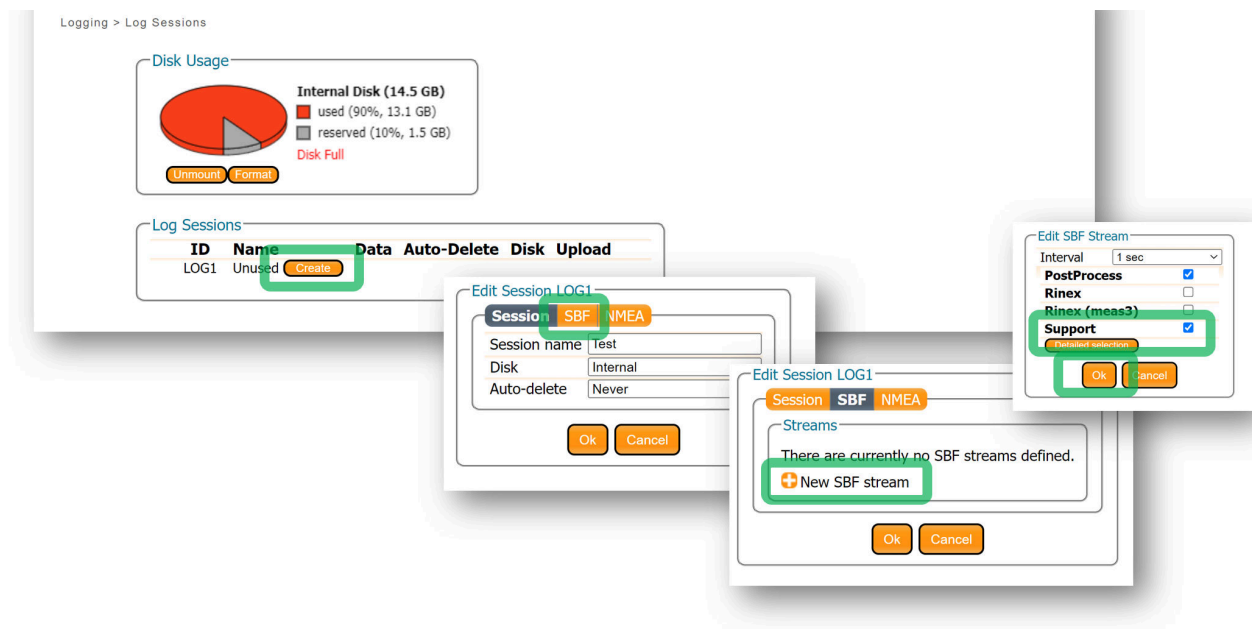


Figure 6-8: Click on **+ New SBF stream** and select **Support**

i 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 6-9.

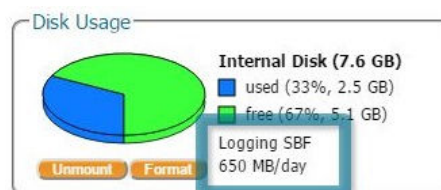



Figure 6-9: The **Logging** window showing an active logging session

Step 2: Downloading the logged SBF file

To download a data file logged on the AntaRx, click the download icon  next to the filename on the **Disk Contents** tab as shown in Figure 6-10

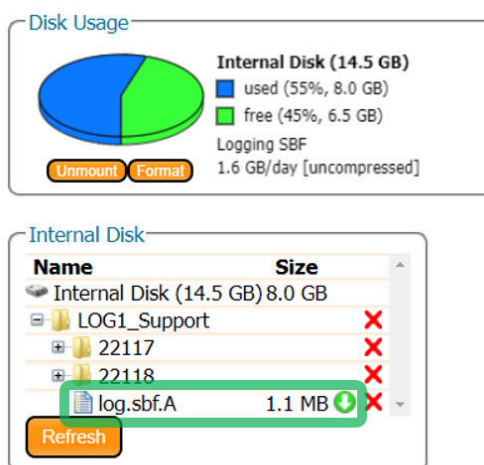



Figure 6-10: Click the  icon next to the file you want to download

6.5 Activity logging

The AntaRx reports various events in the **Receiver Messages** window of the **Admin** menu that can be used to check receiver operations. The example in Figure 6-11 shows that four, 15 minute SBF files have been successfully FTP pushed to a remote location.

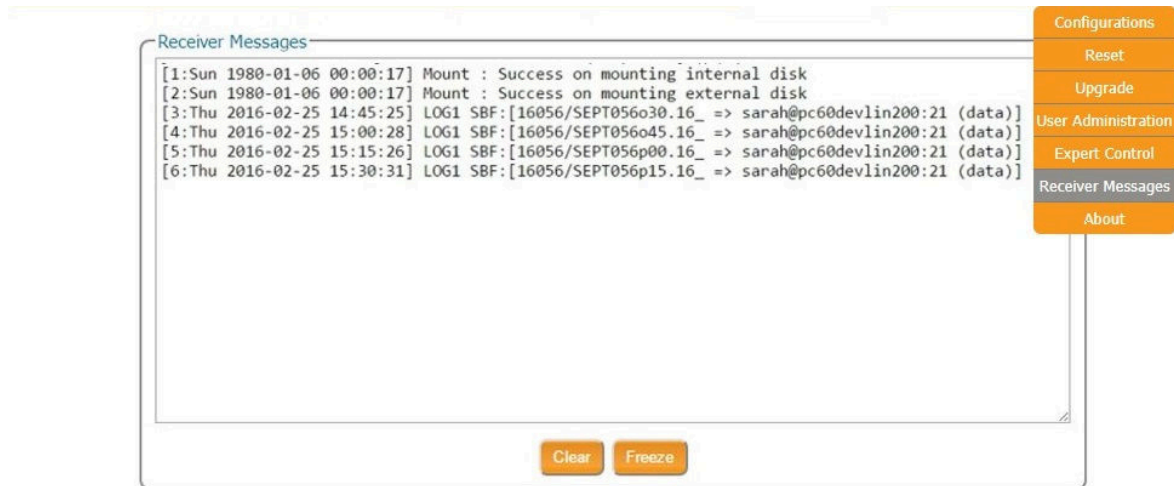


Figure 6-11: Events reported by the AntaRx in the **Receiver Messages** window

7 Receiver Administration Operations

7.1 How to change IP settings of the AntaRx

The IP settings of the AntaRx can be configured in the **Ethernet** window of the Web Interface. By default, the AntaRx is configured to use DHCP to obtain an IP address but, a static IP address can also be configured as shown in Figure 7-1.

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.

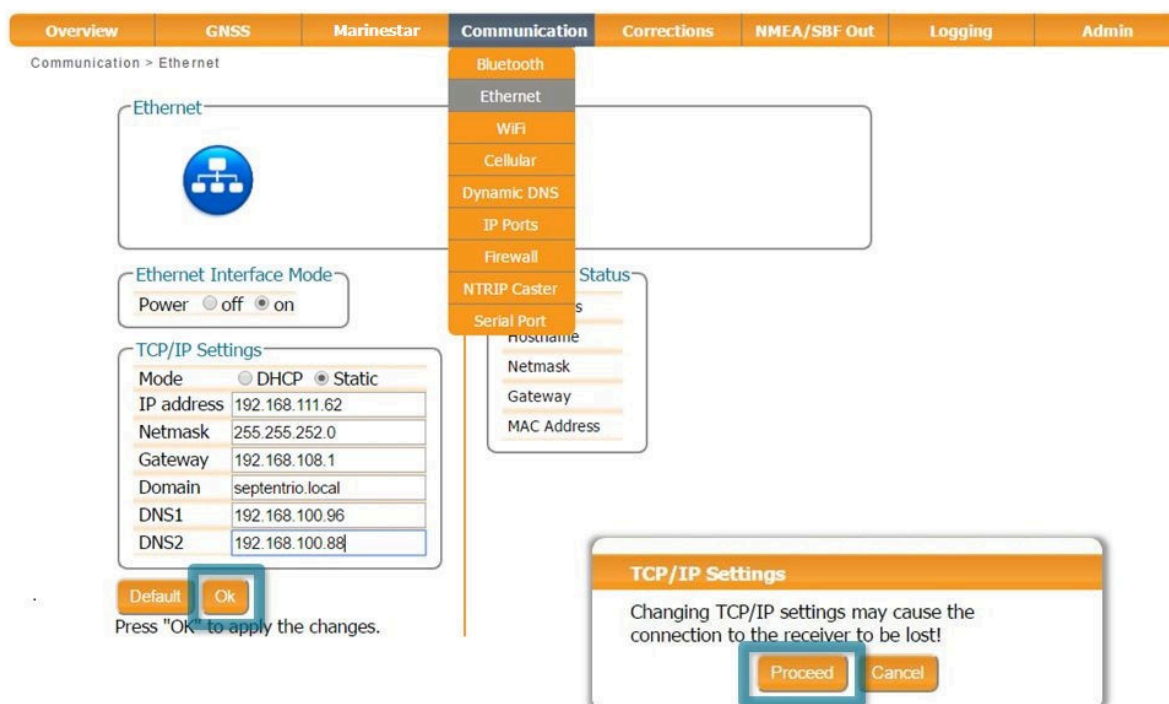


Figure 7-1: Configuring a static IP address

The new IP address should now appear in the **Ethernet Status** field as shown in Figure 7-2.

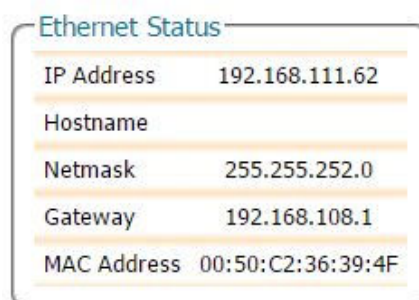


Figure 7-2: TCP/IP settings



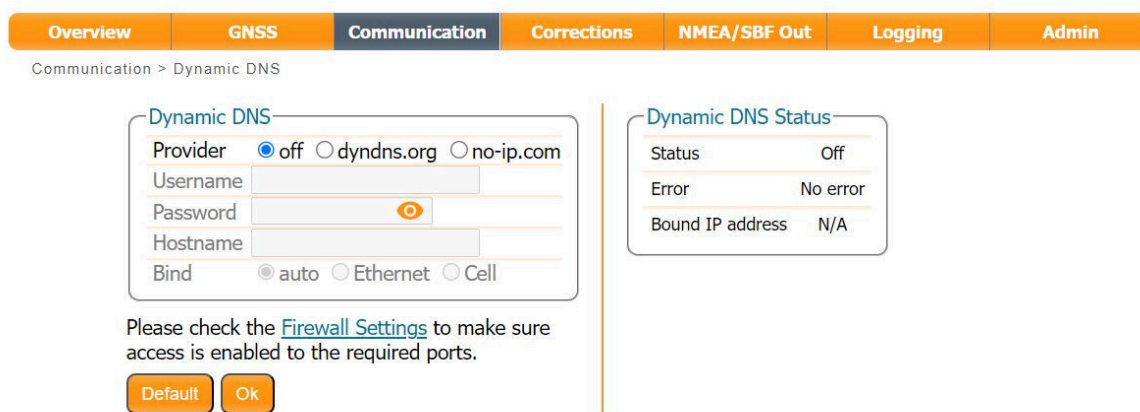
Note that the IP settings will keep their value after a power cycle and even after a reset to factory default in order to avoid accidentally losing an Ethernet connection to the receiver.

7.2 How to configure Dynamic DNS

Dynamic DNS allows remote contact with the AntaRx 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 AntaRx, 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 7-3, 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.



Communication > Dynamic DNS

Dynamic DNS

Provider ☒ off ☐ dyndns.org ☐ no-ip.com

Username

Password

Hostname

Bind ☒ auto ☐ Ethernet ☐ Cell

Please check the [Firewall Settings](#) to make sure access is enabled to the required ports.

Dynamic DNS Status

Status	Off
Error	No error
Bound IP address	N/A

Figure 7-3: Configuring Dynamic DNS

7.3 How to control access using the AntaRx Firewall

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

In the example shown in Figure 7-4, Ethernet ports 2101, 2102 and 2103 are accessible but only from devices with the IP address 84.199.9.148. No access is possible via cellular ports.



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

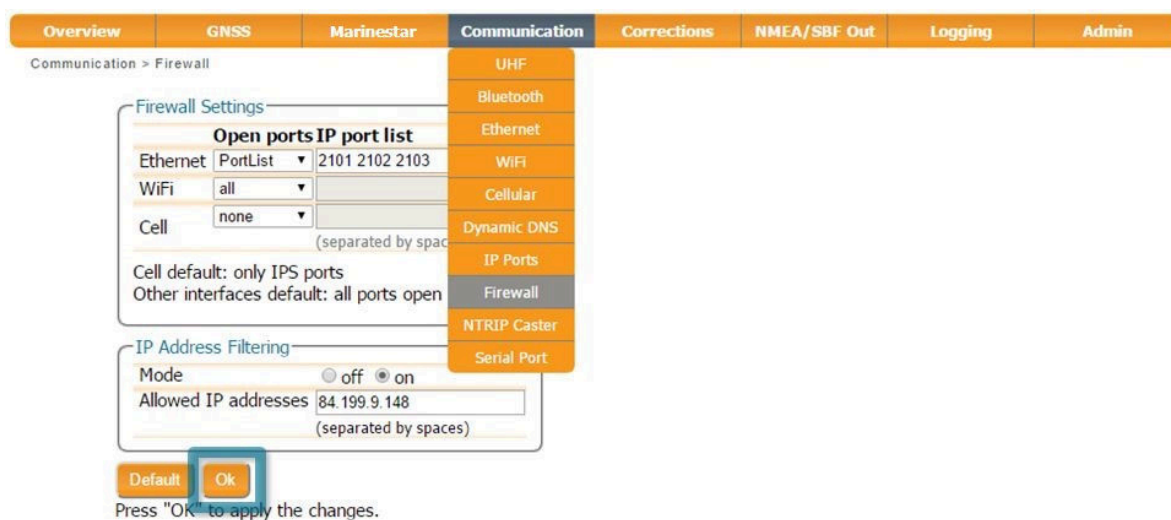


Figure 7-4: Configuring the Firewall of the AntaRx

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

The AntaRx firmware and permission files both have the extension .suf (Septentrio Upgrade Format) and can be uploaded to the AntaRx 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 7-5.



Figure 7-5: The AntaRx 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 7-6 .

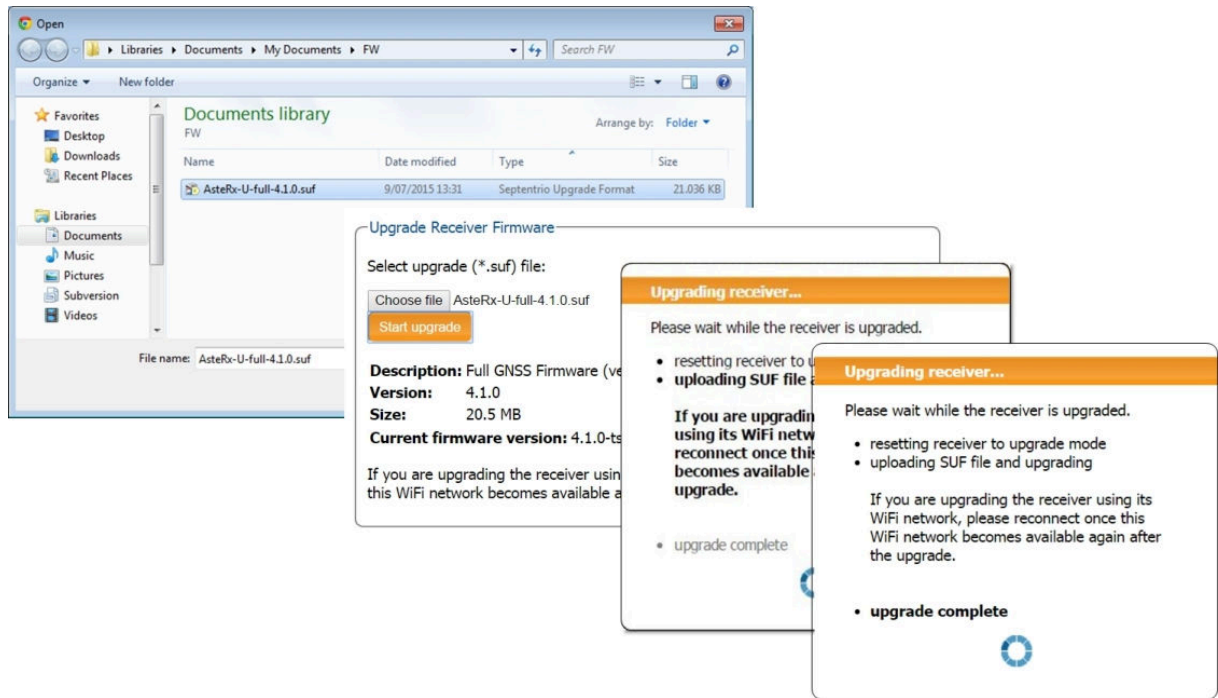


Figure 7-6: The AntaRx upgrade window

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

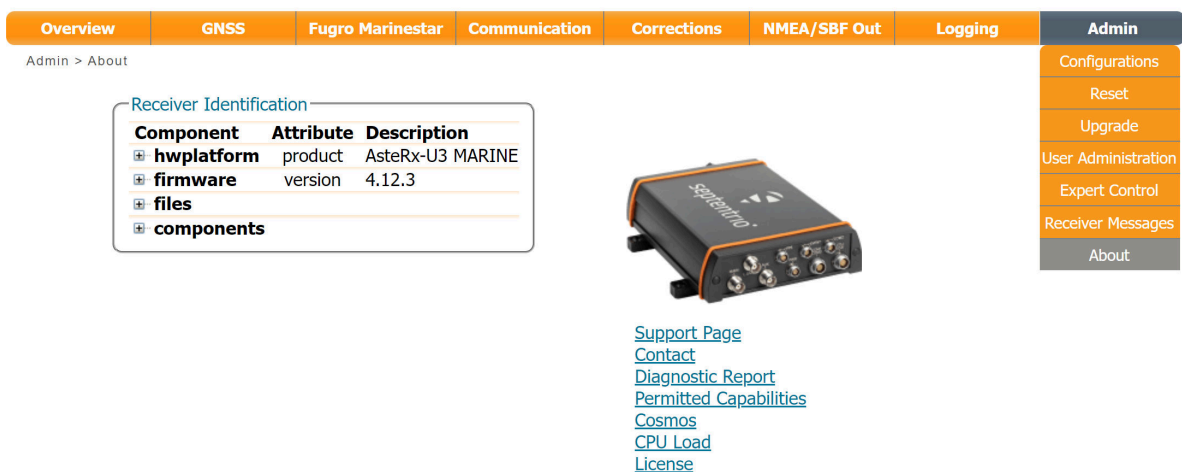
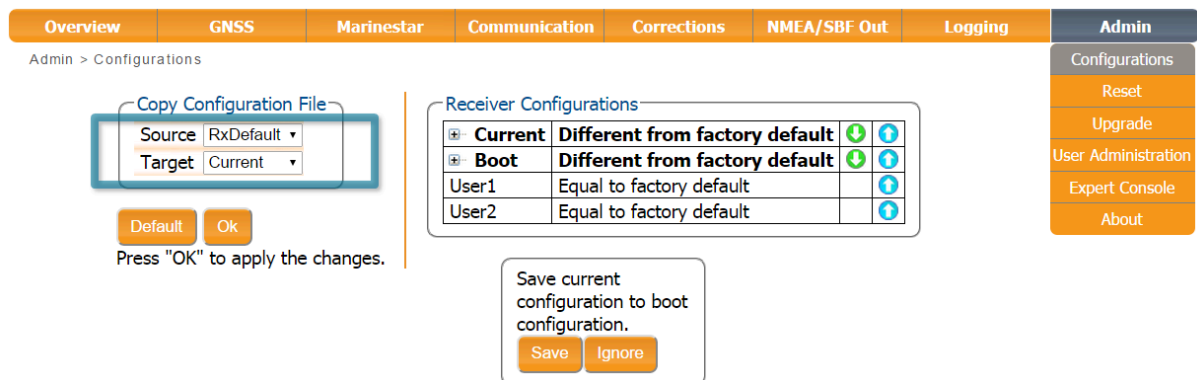


Figure 7-7: Checking the firmware and permission file versions

7.5 How to set the AntaRx to its default configuration

You can set the AntaRx configuration to its default settings via the Admin Configurations tab as shown in Figure 7-8. 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.



Admin > Configurations

Copy Configuration File

Source: RxDefault
Target: Current

Default Ok

Press "OK" to apply the changes.

Receiver Configurations

		Different from factory default	
Current			
Boot			
User1	Equal to factory default		
User2	Equal to factory default		

Save current configuration to boot configuration.

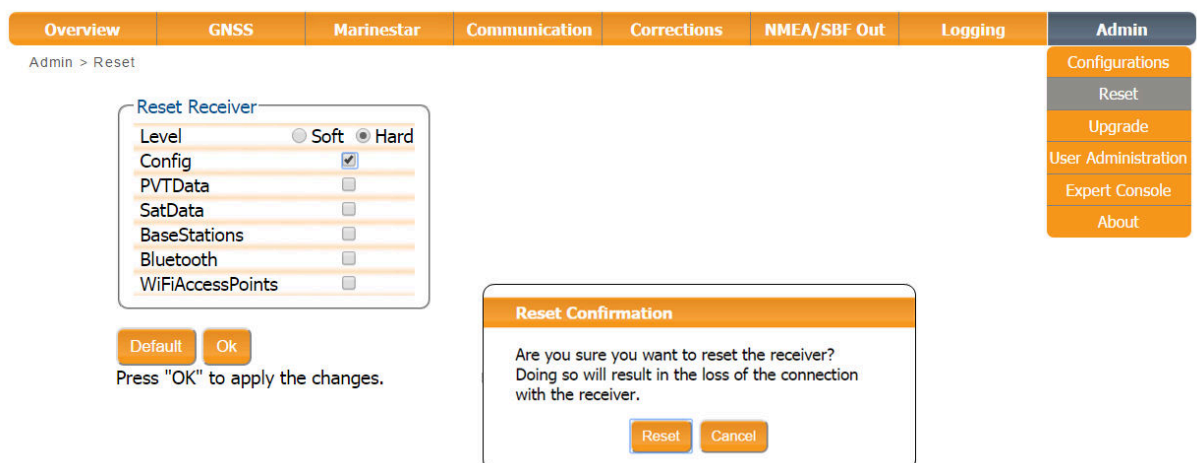
Save Ignore

Figure 7-8: Setting the AntaRx to the default configuration

i 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.

7.6 How to reset the AntaRx

If the AntaRx is not operating as expected, a simple reset may resolve matters. Via the Admin > Reset tab as shown in Figure 7-9, different functionalities can be individually reset. A 'Soft' level reset will cause the AntaRx to boot up with its current configuration while a 'hard' reset will use the configuration stored in the boot file.



Admin > Reset

Reset Receiver

Level: ☐ Soft ☒ Hard

Config ☒

PVTData ☐

SatData ☐

BaseStations ☐

Bluetooth ☐

WiFiAccessPoints ☐

Default Ok

Press "OK" to apply the changes.

Reset Confirmation

Are you sure you want to reset the receiver?
Doing so will result in the loss of the connection with the receiver.

Reset Cancel

Figure 7-9: Resetting the AntaRx configuration to its boot configuration

7.7 How to copy the configuration from one receiver to another

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

Step 1: Downloading the configuration from an AntaRx

Click the green download arrow next the configuration you wish to download as shown in Figure 7-10. The configuration will be saved as a .txt file in the same downloads location used by the internet browser.

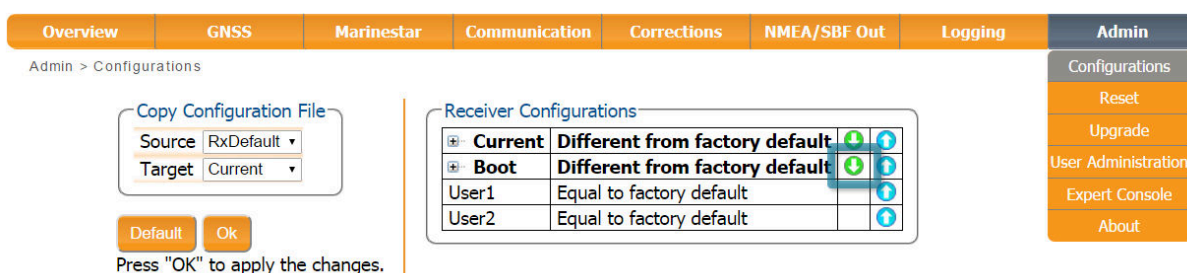


Figure 7-10: Downloading a configuration from an AntaRx

Step 2: Uploading the configuration to a second AntaRx

Click on the blue upload arrow, as indicated in Figure 7-11, to upload a configuration file stored on your PC. In this example, the saved file will be uploaded as the Boot configuration.

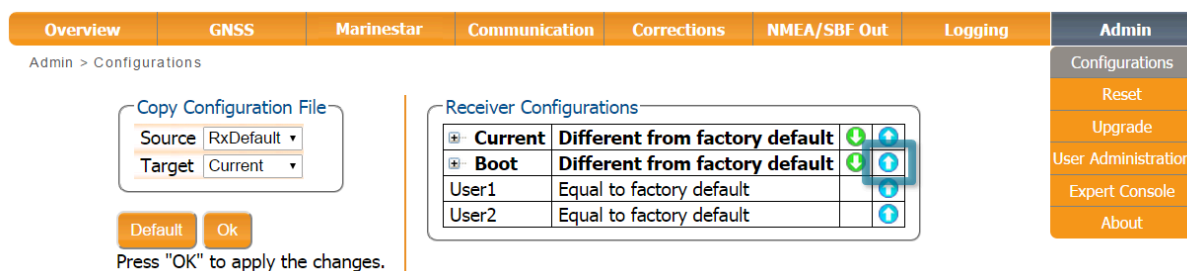


Figure 7-11: Uploading a configuration to an AntaRx

Select the configuration file to be uploaded then click on OK on the status pop-up as shown in Figure 7-12.

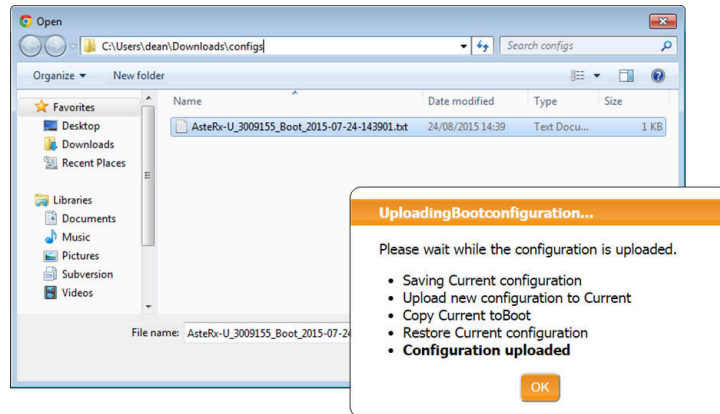


Figure 7-12: Select the configuration file to upload

7.8 How to share cellular Internet connection over Ethernet

If AntaRx is equipped with a cellular modem, the Internet connection can be shared with other devices connected to the same local network. To enable this feature, go to Admin > Expert Control > Control Panel > Communication > Cellular Settings > General Cell Settings and enable Cellular Gateway Configuration as shown in Figure 7-13.

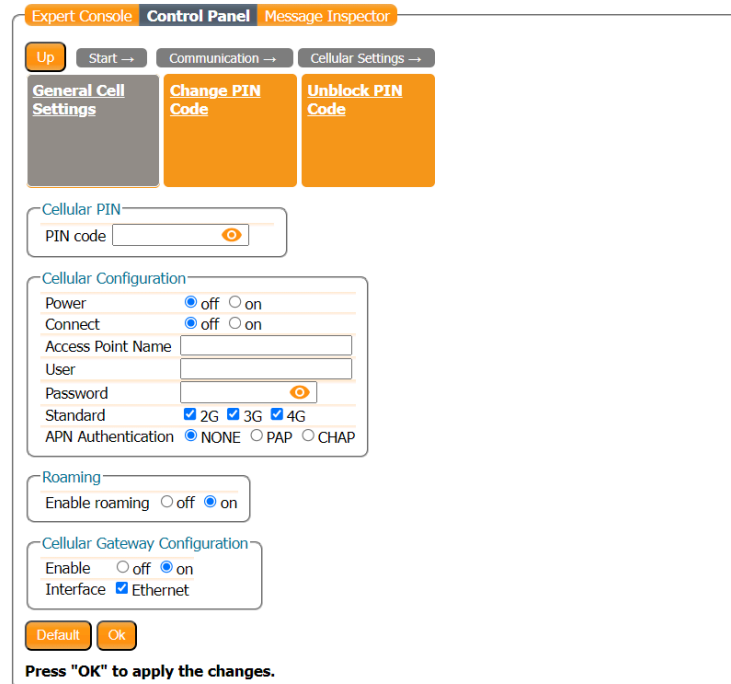
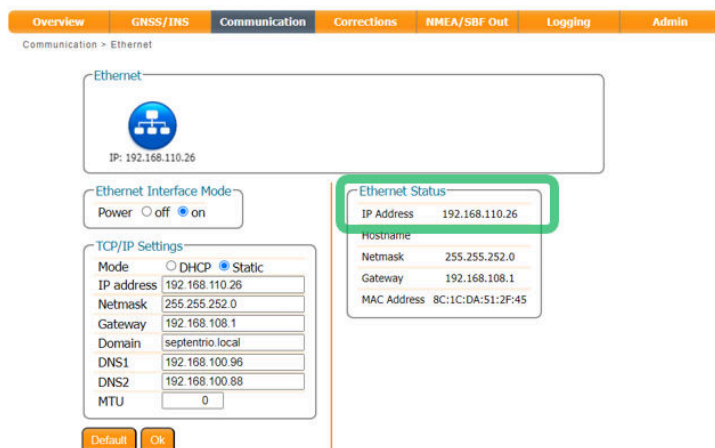


Figure 7-13: Enable cellular gateway

Devices connected to the same network as AntaRx can access the internet by using the IP address of the AntaRx as gateway. The IP address of AntaRx can be set under the Communication > Ethernet menu, as shown in Figure 7-14.



Communication > Ethernet

Ethernet

IP: 192.168.110.26

Ethernet Interface Mode

Power ☐ off ☒ on

TCP/IP Settings

Mode ☐ DHCP ☒ Static

IP address 192.168.110.26

Netmask 255.255.252.0

Gateway 192.168.108.1

Domain septentrio.local

DNS1 192.168.100.96

DNS2 192.168.100.88

MTU 0

Default Ok

Ethernet Status

IP Address 192.168.110.26

Hostname

Netmask 255.255.252.0

Gateway 192.168.108.1

MAC Address 8C:1C:DA:51:2F:45

Figure 7-14: Setting IP address on AntaRx

8 Security

8.1 Default access to the AntaRx

You can manage the access that users have to the AntaRx in the **'User Administration'** window of the **'Admin'** menu.

By default, all communications are assigned User-level access as shown in Figure 8-1. 'User' level allows full control of the receiver while 'Viewer' level only allows monitoring the receiver and viewing its configuration.

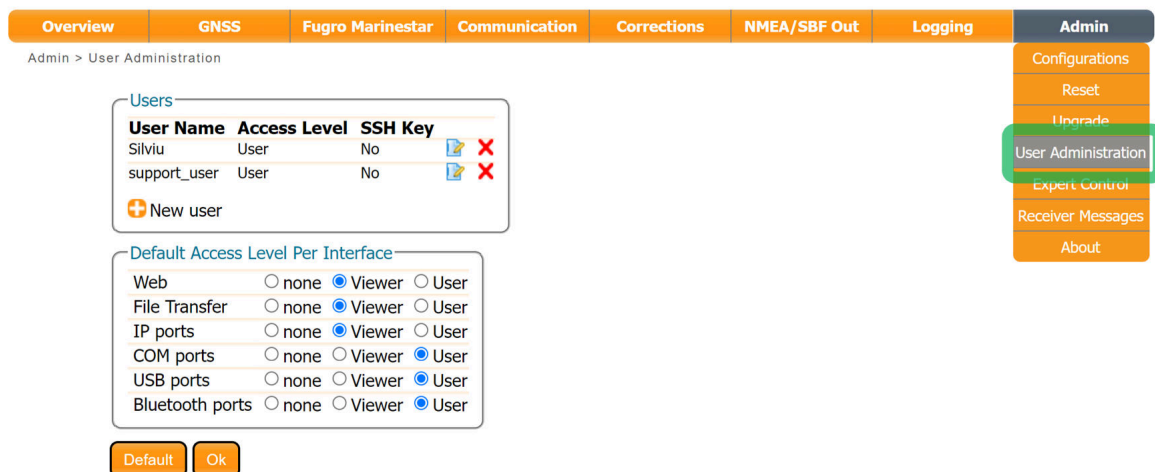


Figure 8-1: The default access levels of the AntaRx

8.2 Defining user access to the AntaRx

You can add users and define their access levels by clicking on the **'New user'** button as shown in Figure 8-2. You can also define the default access when not logged in.

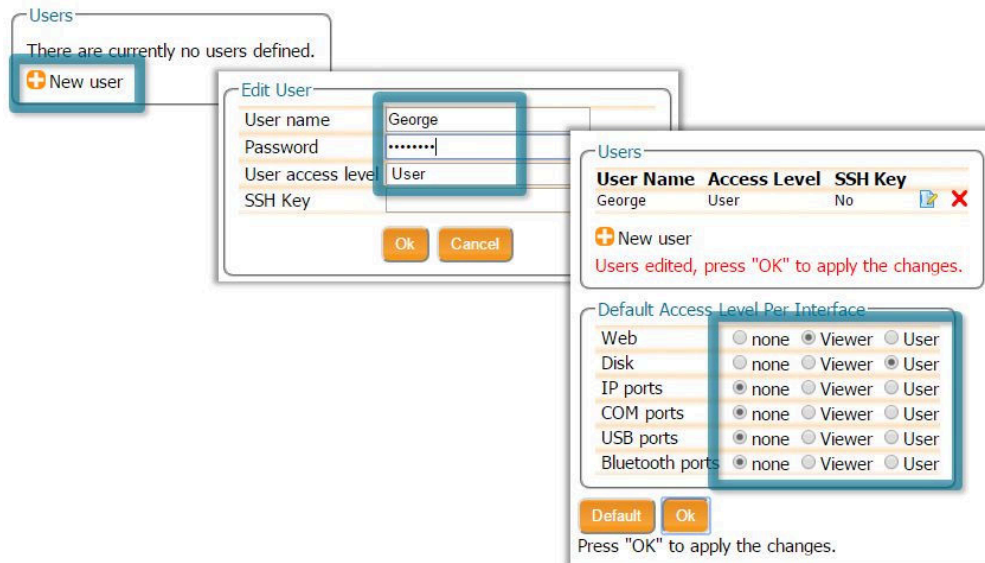


Figure 8-2: Click on 'New user' and fill in the user details and the default access when not logged in

8.3 User access: an example

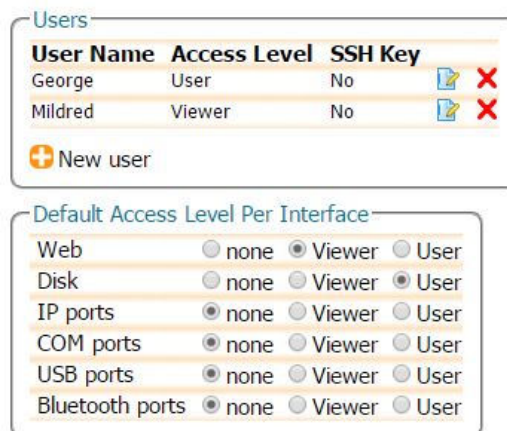


Figure 8-3: An example with two defined users

In the example shown in Figure 8-3:

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 8-4.

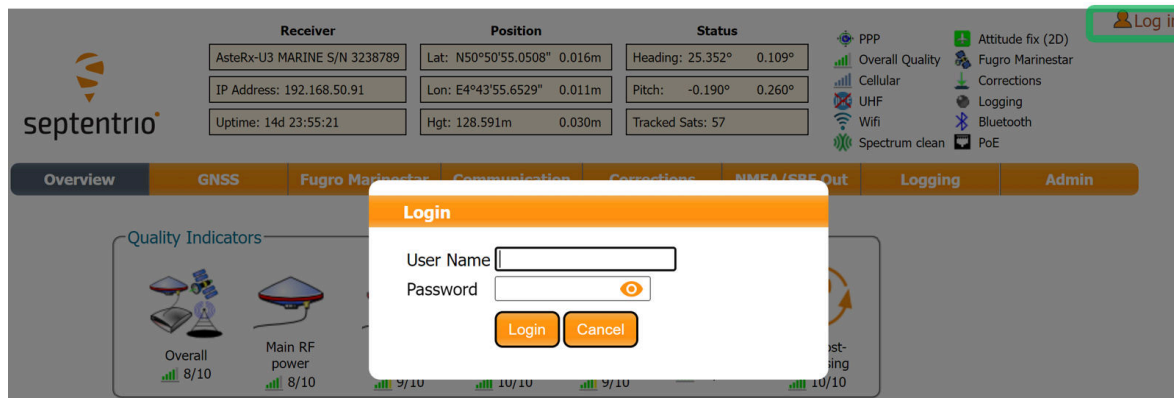


Figure 8-4: Logging in to the AntaRx web interface

8.3.1 Using SSH key authentication

By default, anonymous users have full access over FTP, SFTP and rsync to the files logged on the AntaRx. FTP, SFTP and rsync access can be limited by configuring user access, as described in Section 8.1. 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 8-5.

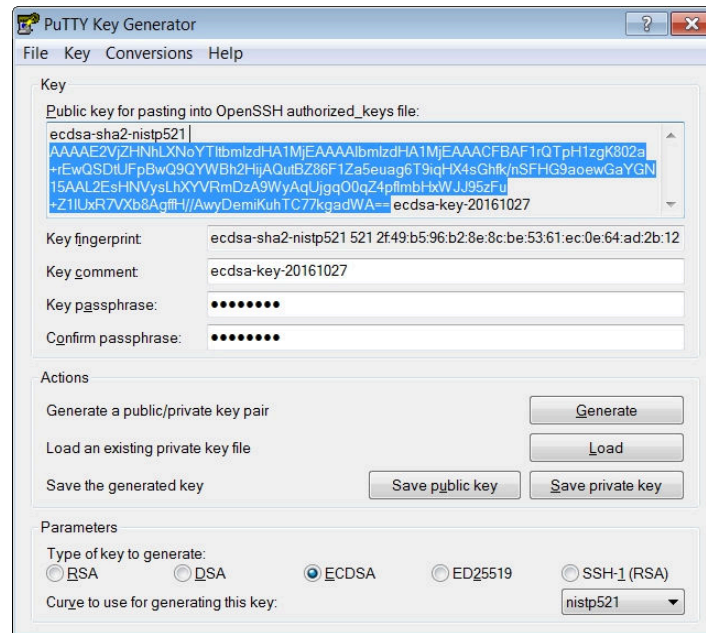


Figure 8-5: Generating SSH keys using the PuTTY Key Generator. The public key is highlighted.

The generated public key is the highlighted text that can be pasted directly into the **SSH Key** field of the AntaRx Web Interface as shown in Figure 8-6.



Figure 8-6: Using an SSH Key

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

8.4 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 8-7, 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.

Overview

GNSS

Fugro Marinestar

Communication

Corrections

NMEA/SBF Out

Logging

Admin

Communication > Web Server/TLS

Settings

Certificate

Select *.pem certificate file to upload:

Choose File

No file chosen

Upload Certificate

Figure 8-7: Uploading a certificate to the receiver

9 Appendix

9.1 Power & data connector description

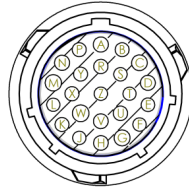


Figure 9-1: 23-pin male socket pin-numbering guide as viewed end on.

PIN #	Name	Comment
A	GND (USB)	USB Ground
B	USB D-	USB 2.0 data signal negative
C	TxD+	Ethernet 10/100 TX+
D	TxD-	Ethernet 10/100 TX-
E	RxD+	Ethernet 10/100 RX+
F	RxD-	Ethernet 10/100 RX-
G	GND (Event)	Event Ground
H	Event B	Event B digital input
J	GND (COM)	COM Ground
K	RX2/RX1+	
L	RX1/RX1-	
M	GND (Power)	Power Ground
N	Power_IN	Power input, 9 to 48 VDC
P	CAN_H	CAN high
R	USB V_BUS	USB Power. Cannot be used to power the receiver
S	USB D+	USB 2.0 data signal positive
T	GND (PPS)	PPS Ground
U	DIN_NRST	Reset
V	Event A	Event A digital input
W	TX1/TX1-	
X	TX2/TX1+	
Y	CAN_L	CAN low
Z	PPS Out	PPS Out

The COM port protocol can be changed from RS232 (default) to RS422 by going to Admin > Expert Control > Control Panel > Communications > COM Port Settings.