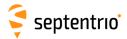


## **AsteRx-U3 Marine**

User Manual







User Manual Version 1.2 Applicable to version 4.14.1 of the AsteRx-U3 Marine Firmware

September 28, 2023

Thank you for choosing the AsteRx-U3 Marine! This user manual provides detailed instructions on how to use AsteRx-U3 Marine 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-U3 Marine product family however, the particular AsteRx-U3 Marine you purchased may not support functions specific to certain variants.

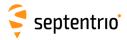
While we try to keep the manual as complete and up-to-date as possible, it may be that future features, functionality or other product specifications change without prior notice or obligation. The information contained in this manual is subject to change without notice. We recommend you to look for new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



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

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



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## **1** Introduction

## 1.1 User Notices

## 1.1.1 Regulatory Notice

# CE

AsteRx-U3 Marine 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-U3 Marine 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.

This product is not authorized to be used with a WiFi access point transmitting on the 80MHz bandwidth channels of the 5 GHz band.

### 1.1.2 ROHS/WEEE Notice



The AsteRx-U3 Marine receivers are compliant with the latest WEEE, RoHS and REACH directives. For more information see www.septentrio.com/en/environmental-compliance.

## 1.1.3 Safety information



The power supply provided by Septentrio (if any) should not be replaced by another. If you are using the receiver with your own power supply, it must have a double isolated construction and must match the specifications of the 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 in a restricted access area and used by skilled or instructed personnel.

## 1.1.4 Support

For first-line support please contact your AsteRx-U3 Marine 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 AsteRx-U3 Marine overview

The AsteRx-U3 Marine provides multi-frequency, multi-constellation GNSS positioning capability together with GNSS Heading, L-Band Precise Point Positioning (PPP) and wireless communication options within a rugged IP68 housing for Marine applications. AsteRx-U3 Marine offers excellent L-band reception, robust against Iridium and Inmarsat uplink interference.

AsteRx-U3 Marine can be easily monitored and configured without any special software via the built-in web user interface accessible via WiFi, Ethernet or USB connection.

## 2.1 AsteRx-U3 Marine key features

- 544 channels for full-constellation, triple-frequency satellite tracking on both antennas
- Precise and robust heading calculation
- 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, Bluetooth, WiFi and UHF radio options

### 2.1.1 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 and rover)
- Real Time Kinematic (base and rover)
- Fugro PPP correction service (optional feature, activation required)
- Moving base positioning
- 16 GB Internal Memory for logging

#### Connectivity

- 3 hi-speed serial ports (RS232)
- Ethernet port (TCP/IP and UDP)
- CAN port
- High-speed USB
- 1 Event marker
- xPPS output (max. 100 Hz)
- Integrated Bluetooth 5.2 optional
- Integrated WiFi (802.11 a/b/g/n/ac) optional
- Integrated UHF (410-475 MHz)
- Integrated Cellular Modem (EDGE, 2G, 3G, 3.5G, 4G)



## 2.1.2 Physical and Environmental

| Size:               | 157 x 200 x 50 mm (not including brackets and connectors) |
|---------------------|---|
| Size:               | 183 x 242 x 56 mm (including brackets and connectors)     |
| Weight:             | 1.1 kg  |
| Input voltage:      | 9-48 V DC   |
| Power consumption:  | 8 W typical   |
| Temperature Range:  | -30 to +65 °C (operational)<br>-40 to +75 °C (storage)    |
| Ingress Protection: | IP68  |
| Humidity            | IEC60721-3-5, Class 5K2                                   |
| Dust                | MIL-STD-810H, Method 510.7, Procedure I                   |
| Shock               | MIL-STD-810H, Method 516.8, Procedure I/II                |
| Vibration           | MIL-STD-810H, Method 514.8, Procedure I                   |
| Corrosion           | IEC60068-2-52, Method 2                                   |



## 2.2 AsteRx-U3 Marine variants

The AsteRx-U3 Marine is available in multiple variants:

| Variant<br>(Part number)   | Main features   |
|----------------------------|---|
| AsteRx-U3<br>Marine AWNNLM | <ul> <li>Dual antenna GNSS receiver for the European market</li> <li>Integrated Wi-Fi modem</li> <li>Integrated Bluetooth modem</li> <li>Rear-panel connector for dedicated L-Band antenna</li> </ul>   |
| AsteRx-U3<br>Marine AFNNLM | <ul> <li>Dual antenna GNSS receiver for the US market</li> <li>Integrated Wi-Fi modem</li> <li>Integrated Bluetooth modem</li> <li>Rear-panel connector for dedicated L-Band antenna</li> </ul>   |
| AsteRx-U3<br>Marine ANEULM | <ul> <li>Dual antenna GNSS receiver for the European market</li> <li>Integrated 4G Cellular modem</li> <li>Integrated UHF modem</li> <li>Rear-panel connector for dedicated L-Band antenna</li> </ul>   |
| AsteRx-U3<br>Marine AWEULM | <ul> <li>Dual antenna GNSS receiver for the European market</li> <li>Integrated Wi-Fi modem</li> <li>Integrated Bluetooth modem</li> <li>Integrated 4G Cellular modem</li> <li>Integrated UHF modem</li> <li>Rear-panel connector for dedicated L-Band antenna</li> </ul> |

Receivers purchased with a specific regional configuration can be deployed to other regions by uploading the correct upgrade file (SUF). The following SUF files are available in the FW package of AsteRx-U3 Marine, available from Septentrio website or from Septentrio Support:

#### **Regional configuration SUF files:**

Regional\_Domain\_CA-v1.0.suf for Canada Regional\_Domain\_ETSI-v1.0.suf for Europe Regional\_Domain\_FCC-v1.0.suf for United States Regional\_Domain\_JP-v1.0.suf for Japan Regional\_Domain\_KR-v1.0.suf for South Korea

Figure 2-1 gives an overview of the regions where specific AsteRx-U3 Marine configuration can be deployed. The corresponding SUF file must be loaded for combinations marked with 'SUF'.



|                           | Can be deployed in: |          |               |                |  |  |  |  |
|---------------------------|---------------------|----------|---------------|----------------|--|--|--|--|
| Model:                    | Europe (ETSI)       | US (FCC) | Canada (ISED) | Japan (Giteki) |  |  |  |  |
| AsteRx U3 Marine (AWNNLM) | ✓                   | SUF      | SUF           | ×              |  |  |  |  |
| AsteRx U3 Marine (AFNNLM) | SUF                 | ~        | SUF           | ×              |  |  |  |  |
| AsteRx U3 Marine (ANEULM) | ✓                   | ×        | ×             | SUF            |  |  |  |  |
| AsteRx U3 Marine (AWEULM) | ✓                   | ×        | ×             | ×              |  |  |  |  |

#### Figure 2-1: AsteRx-U3 Marine regional variants

Check with sales@septentrio.com for details on available features and regional variants of AsteRx-U3 Marine.

## 🗧 septentrio

## 2.3 AsteRx-U3 Marine design

### 2.3.1 Front panel

The front-panel layout of the AsteRx-U3 Marine integrating UHF, Bluetooth/Wi-Fi and Cellular antenna connectors is shown in Figure 2-2. Depending on the configuration, some connectors may be present or not on the device.

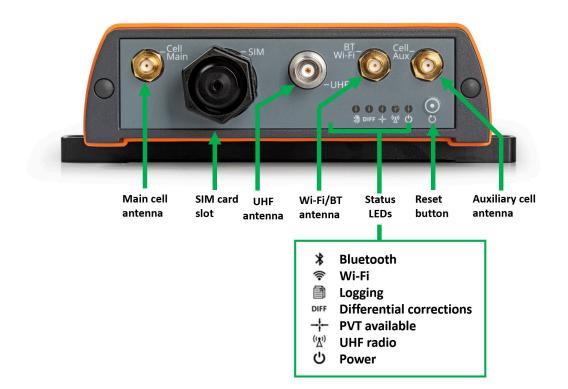


Figure 2-2: AsteRx-U3 Marine front-panel layout



## 2.3.2 LED description

| LED   | lcon | Behavior  |
|-------|------|---|
| blue  | *    | Off: Bluetooth disabled<br>On: Bluetooth connected<br>Blinking slowly: Not connected but discoverable   |
| green | ((1- | Off: WiFi disabled<br>On: Access-point mode or client mode<br>Blinking slowly: Establishing a connection in client mode<br>Blinking quickly: Error, not connected |
| green |      | Off: Not logging<br>On: Logging active, disk is mounted<br>Blinking slowly: Logging active, disk-space is low<br>Blinking quickly: Disk is full or not mounted    |
| green | DIFF | <b>Off</b> : No reception of correction data <b>Blinking</b> : Blinks on reception of correction data   |
| green |      | <b>Off</b> : No PVT available<br><b>On</b> : PVT available  |
| green | (رې) | <b>Off</b> : UHF radio modem disabled or no data transferred <b>Blinking</b> : Data package sent/received   |
| green | ር    | <b>Off</b> : Receiver is powered off<br><b>On</b> : Receiver is powered on  |



### 2.3.3 Rear panel

Figure 2-3 shows the layout of the rear-panel connectors on the AsteRx-U3 Marine. The PIN assignments for each socket can be found in the Appendix.

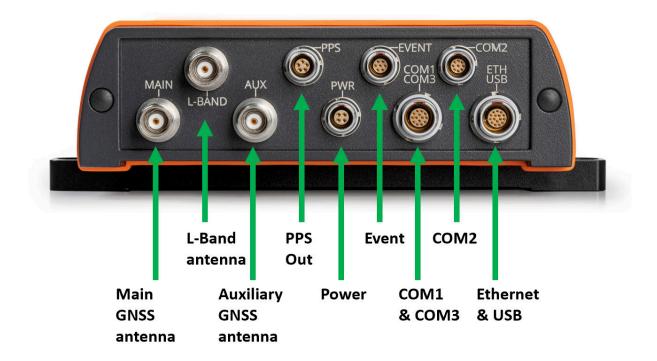


Figure 2-3: AsteRx-U3 Marine rear-panel layout

#### 2.3.4 SIM card slot

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

AsteRx-U3 Marine accepts a nano SIM (4FF), required for the operation of the integrated cellular modem. The SIM card can be inserted into the SIM connector in the front panel of the AsteRx-U3 Marine as shown in Figure 2-4.

Remove the SIM connector cap by unscrewing it, then insert the SIM card until it is locked in place. Close the SIM connector cap carefully, making sure it is properly fastened.

**Note**: Multi-carrier SIM cards are not supported.





Figure 2-4: SIM card slot on the AsteRx-U3 Marine

### 2.3.5 Mounting instructions

The AsteRx-U3 Marine is supplied with mounting brackets for fixing the unit using 4 bolts. The size of the fixing bolts can be M6 or smaller and the distance between the holes is shown in Figure 2-5.

**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 to access the front and rear panel of the AsteRx-U3 Marine.
- 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 AsteRx-U3 Marine.
- Cover all 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.

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Figure 2-5: Mounting brackets fitted to the AsteRx-U3 Marine



## 2.3.6 Internal memory

The AsteRx-U3 Marine 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 Shipping box contents

#### 2.4.1 Supplied as standard

The following items with their part numbers are supplied as standard with AsteRx-U3 Marine.



## 2.4.2 Optional items

The following accessories can be ordered with AsteRx-U3 Marine:

- 201954 COM2 Serial Cable, 9-pin Lemo to DB9 female, 1.5m
- 201956 Ethernet and USB Cable, 16-pin Lemo to RJ45 and USB Type A, 1.5m
- 201955 COM1 and COM3 Serial Cable, 14-pin Lemo to 2 x DB9 female, 1.5m
- 201863 Power Cable, 4-pin Lemo with in-line fuse, unterminated, 3m
- 216111 Power cable, Lemo to DC jack 5.5mmx2.1mm for AsteRx-U3 Marine, 1.3m
- 214878 AC Power Adapter with EU Power cable
- 214879 AC Power Adapter with UK Power cable
- 214880 AC Power Adapter with Australia Power cable
- 214881 AC Power Adapter with US Power cable
- 214903 PPS Cable, 5-pin LEMO to 1 x BNC, 1.5m
- 214917 GPI and Event Cable, 7-pin Lemo Event unterminated, 1.5m
- 214916 PPS Cable, 5-pin LEMO unterminated , 1.5m
- 710083 UHF half wavelength antenna 406-430MHz
- 710081 UHF half wavelength antenna 440-470MHz
- 215170 Replacement LTE Antenna for AsteRx-U3 (1pc 2 needed for each receiver)
- 216140 Replacement Wi-Fi antenna
- 216450 Replacement Wi-Fi antenna (Japan)
- 216363 Replacement mounting brackets AsteRx-U3 (2pcs)



## 3 Quick start

This section details how to power-up, connect to and communicate with the AsteRx-U3 Marine. The AsteRx-U3 Marine has an on-board web interface which the user can connect to in three ways: Ethernet, USB or WiFi. The AsteRx-U3 Marine is fully configurable using the web interface. Please note that older versions of certain browsers may not display the web interface properly.

## 3.1 Powering the AsteRx-U3 Marine

Using a power cable, the receiver can be powered by applying 9 to 48 V via the power-in wire. The power socket is indicated in Figure 3-1.



Figure 3-1: Rear panel power socket

The AsteRx-U3 Marine does not have a power button and the unit will power up automatically when power is applied. When the unit is powered initially, the front-panel LEDs will follow a boot sequence pattern.





## 3.2 Connecting an antenna

The rear panel of the AsteRx-U3 Marine has two TNC connectors for GNSS antennas: one for the main antenna and one for an auxiliary antenna for heading applications. The AsteRx-U3 Marine MARINE has an additional TNC connector for a dedicated L-Band antenna. To get started, connect an antenna via an antenna cable to the main antenna connector of the AsteRx-U3 Marine indicated in Figure 3-2. An overview of the antennas which are directly compatible with the receiver can be obtained using the **IstAntennaInfo** command. For more information regarding these and other commands, please refer to the Firmware Reference Guide.



Figure 3-2: Rear-panel main and auxiliary antenna connectors

# 3.3 Connecting to the AsteRx-U3 Marine via the Web Interface

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

### 3.3.1 Using the USB cable

Connect the USB cable to the connector labeled 'USB' on the rear panel of the AsteRx-U3 Marine and indicated in Figure 3-3.



Figure 3-3: Rear panel USB socket

The first time that the USB cable is connected to a device, you may be prompted to allow installation of drivers which can take several minutes. When the drivers have been installed, it is recommended to unplug then re-plug 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

The USB connection on the AsteRx-U3 Marine functions as network adapter and the DHCP server running on the receiver will always assign the AsteRx-U3 Marine the IP address 192.168.3.1.

To connect to the AsteRx-U3 Marine, you can then simply open a web browser using the IP address **192.168.3.1** as shown in Figure 3-5.

| $\begin{array}{c} \diamondsuit \\                                  $ | +   |  |  |  |
|--|---|--|--|--|
| Şeptentrio   | Receiver           AsteRx-U3 S/N 3238326           IP Address: 192.168.1.47           Uptime: 0d 23:25:30 | Position           Lat: N50°50'35.0979"         0.007m           Lon: E4°29'15.4567"         0.004m           Hgt: 117.574m         0.011m | Status           Heading: 154.415°         0.331°           Pitch:         40.748°         0.643°           Tracked Sats: 37 |  |

Figure 3-5: Connect to the Web Interface of the AsteRx-U3 Marine 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 shown in Section 2.4.1 between a LAN network and the connector labeled 'ETH' on the rear panel of the AsteRx-U3 Marine indicated in Figure 3-6.



Figure 3-6: Rear panel USB and Ethernet socket

# Step 2: Open a web browser and connect to the AsteRx-U3 Marine

By default, the AsteRx-U3 Marine has the hostname 'http://AsteRx-U3 Marine-xxxxxx', where xxxxxx are the last 7 digits of the AsteRx-U3 Marine serial number. This hostname can be used on a local area network to connect to the AsteRx-U3 Marine if the IP address assigned by the DHCP server is unknown. The serial number can be found on a sticker on the corner of the outer casing of the receiver. Figure 3-7 shows a screenshot of an Ethernet connection to a receiver with serial number 3238326 using 'http://AsteRx-U3-3238326'.



Figure 3-7: Connecting to the Web Interface via Ethernet



## 3.4 How to configure SBF and NMEA output

The AsteRx-U3 Marine can output position and GNSS data in both standard NMEA format and Septentrio's proprietary compact binary format SBF. The following sections detail how to configure connections to other devices in order to send data.

#### 3.4.1 Output over a serial COM connection

The AsteRx-U3 Marine 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-U3 Marine 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 3-8. In this example, COM3 is set with a speed of 19200 baud.

| Overview    | GNS              | S      | Communicatio | n Co        | orrections  | NMEA/SBF OL               | it Loggi      | ng A              | dmin                   |              |             |                             |                             |      |
|-------------|------------------|--------|--------------|-------------|-------------|---------------------------|---------------|-------------------|------------------------|--------------|-------------|-----------------------------|-----------------------------|------|
| ommunicatic | on > Serial Port |        |              |             |             |                           |               |                   |                        |              |             |                             |                             |      |
| /           | -COM Port Set    | tinas— |              |             |             |                           |               |                   |                        |              |             |                             |                             |      |
| ſ           |                  | COM1   | Cellular     |             | сомз        | _ ]                       |               |                   |                        |              |             |                             |                             |      |
|             | Baud rate        | 115200 |              | baud $\sim$ | 115200 baud | ~                         |               |                   |                        |              |             |                             |                             |      |
|             | Data bits        | 8 bits | IP Ports     | ~           | 8 bits      | ~                         |               |                   |                        |              |             |                             |                             |      |
|             | Parity           | No     |              | ~           | No          | COM Port Se               | ttinas        |                   |                        |              |             |                             |                             |      |
|             | Stop bits        | 1 bit  |              | ~           | 1 bit       |                           | COM1          | COM2              | СОМЗ                   | _            |             |                             |                             |      |
|             | Flow control     | none   |              | ~           | none        | Baud rate                 | 115200 baud ~ | 115200 baud ~     |                        |              |             |                             |                             |      |
|             |                  | -      | NTRIP Caster |             | -           | Data bits                 |               | 8 bits ~          | 1200 baud<br>2400 baud |              |             |                             |                             |      |
| <b>[</b>    | Default Ok       |        | Serial Port  |             |             | Parity                    |               | No ~              | 4800 baud              |              |             |                             |                             |      |
|             |                  | ·      |              |             |             | Stop bits<br>Flow control |               | 1 bit ~<br>none ~ | 40000 hou              |              |             |                             |                             |      |
|             |                  |        |              |             |             |                           | TIONE         | Tione             | 38400 bau              |              |             |                             |                             | -    |
|             |                  |        |              |             | -           | Default Ok                |               |                   | 115200                 | COM Port Set | COM1        | COM2                        | сомз                        |      |
|             |                  |        |              |             |             |                           |               |                   | 230400                 |              | 115200 baud |                             |                             | id N |
|             |                  |        |              |             |             |                           |               |                   | -                      | Data bits    |             | <ul> <li>8 bits</li> </ul>  | ✓ 8 bits                    |      |
|             |                  |        |              |             |             |                           |               |                   |                        | Parity       | No          | ~ No                        | ∽ No                        | ``   |
|             |                  |        |              |             |             |                           |               |                   |                        |              |             | <ul> <li>✓ 1 bit</li> </ul> | <ul> <li>✓ 1 bit</li> </ul> | ~    |
|             |                  |        |              |             |             |                           |               |                   |                        | Flow control | none        | ~ none                      | ✓ none                      |      |

Figure 3-8: Configure the baud rate and flow control of the AsteRx-U3 Marine



#### 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 3-9 and 3-10.

|  | ew NMEA stread | no data streams defi | ned. | NTR1 (In:RTCMv3 0.85kB/s<br>New NMEA Output<br>Select connection 1<br>Serial port<br>USB port<br>UHF radio<br>NTRIP server<br>IP server<br>IP server<br>IP receive (2-we<br>IP connection<br>Back Next | type: | New NMEA Output<br>Select connection/port:<br>• COM1<br>• COM2<br>• COM3<br>Back Next Finish Ca |
|--|----------------|----------------------|------|--|-------|---|
|--|----------------|----------------------|------|--|-------|---|

Figure 3-9: Selecting to output NMEA data on COM3

|            | 1 sec V         |  |
|------------|-----------------|--|
| ALM        |                 |  |
| DTM        |                 |  |
| GBS        |                 |  |
| GGA        |                 |  |
| GLL        |                 |  |
| GNS        |                 |  |
| GRS        |                 |  |
| GSA        |                 |  |
| GST        |                 |  |
| GSV        |                 |  |
| HDT        |                 | Port Type Messages Interval                        |
| -          |                 | 🜒 COM3 NMEA GGA 1 sec 📝 🎽                          |
| RMC        | 0               |  |
| RMC        |                 |  |
|            |                 | New NMEA stream                                    |
| ROT        |                 | Streams prepared, press "OK" to apply the changes. |
| ROT<br>VTG | lext Finish Can | Streams prepared, press "OK" to apply the changes. |

Figure 3-10: 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 3-11 and 3-12 the PVTCartesian SBF data block will be output over COM1 once per second.

|  | TCMv3 0.70kB/s)<br>NMEA 0.09kB/s)   |                               |
|--|---|-------------------------------|
| -NMEA/SBF Output Streams         Port       Type       Messages       Interview            • COM3       NMEA       GGA       1 sec            • New NMEA stream          • New SBF stream            • Advanced Settings→         Default       Ok | New SBF Output<br>Select connection type:<br>Serial port<br>USB port<br>UHF radio<br>NTRIP server<br>IP server<br>IP receive (2-way)<br>IP connection<br>Back Next Finish | Can<br>Back Next Finish Cance |

Figure 3-11: Selecting to output SBF data on COM1



| Interval 1 sec  | ~        |         |         |          |                   |                  |   |   |
|-----------------|----------|---------|---------|----------|-------------------|------------------|---|---|
|                 |          |         |         |          |                   |                  |   |   |
| <b>∃</b> GAL    |          | ·       |         |          |                   |                  |   |   |
|                 |          |         |         |          |                   |                  |   |   |
| BDS             |          |         |         |          |                   |                  |   |   |
| <b>⊞</b> QZS    |          |         |         |          |                   |                  |   |   |
| PVTCart         |          |         |         |          |                   |                  |   |   |
| PVTCartesian    |          | 1       |         | _        |                   |                  | _ | _ |
| PosCovCartesian |          |         | MEA/SB  | = Outpu  | It Streams        |                  |   | _ |
| VelCovCartesian |          |         | Port    | Type     | Messages          | Interval         |   |   |
| BaseVectorCart  |          |         | COM1    | SBF      | PVTCartesian      | 1 sec            | 2 | × |
| PVTGeod         |          |         | COM3    | NMEA     | GGA               | 1 sec            | 2 | × |
| PVTExtra        |          | 0       | New NR  | MFA str  | eam 🛟 New SBF     | stream           |   |   |
| Attitude        |          |         |         |          | , press "OK" to a |                  |   |   |
|                 |          |         | reams p | reparec  |                   | pry the changes. |   |   |
| Back Next F     | inish Ca | nce —≞A | Advance | d Settir | las-              |                  |   |   |
|                 |          | _       |         |          |                   |                  |   |   |

Figure 3-12: 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 3-13.

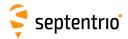
| MEA/SBF Output Streams         Port       Type       Messages       Interval         COM1       SBF       PVTCartesian       1 sec       X |  |
|--|--|
|  |  |
| COM1 SBE DVTCartesian 1 sec 📝 🗙  |  |
|  |  |
| COM3 NMEA GGA 1 sec 📝 🗙  |  |
| New NMEA stream  |  |

Figure 3-13: Summary of all configured data output streams

Figure 3-14 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.

| 🐸 COM9:19200baud - Tera Term VT  |  |
|--|--|
| File Edit Setup Control Window Help  |  |
| \$GPGGA, 120710.00, 5050.89396, N, 0<br>\$GPGGA, 120711.00, 5050.89396, N, 0 | 0443.90772, E, 2, 24, 0.6, 81.52, M, 47.39, M, 3.1, 0136*79<br>0443.90773, E, 2, 24, 0.6, 81.53, M, 47.39, M, 1.4, 0136*77<br>0443.90773, E, 2, 24, 0.6, 81.52, M, 47.39, M, 2.4, 0136*74<br>0443.90773, E, 2, 24, 0.6, 81.53, M, 47.39, M, 3.0, 0136*73 |
| \$GPGGA, 120714.00, 5050.89396, N, 0   | COM9:115200baud - Tera Term VT   |
| \$GPGGA,120715.00,5050.89396,N,0   | $ \begin{array}{c} >1?L?>* \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$  |

Figure 3-14: Example showing output NMEA GGA (left panel) and SBF PVTCartesian (right panel)



#### 3.4.2 Output over Ethernet

SBF and NMEA data can be sent over an Ethernet connection to the AsteRx-U3 Marine.

#### Step 1: Configure an IP connection on the AsteRx-U3 Marine

The Ethernet port settings can be configured by selecting '**IP Ports**' from the **Communication** menu. In the example shown in Figure 3-15, port 28785 has been configured as connection IPS1 in **TCP2Way** mode so data can be received as well as transmitted over the connection. It is advisable to select a higher-range port to avoid those reserved for other purposes such as the webserver and FTP. Also, port 28784 is reserved by default on the AsteRx-U3 Marine 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 3-15: 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 3-16, the NMEA GGA message will be output every second. Ensure that the previously configured IPS1 port is selected for output as highlighted.

| tput Streams-<br>ently no data streams def<br>stream | ined.<br>m Se | NMEA/SBF Out  | Logging  | Admin<br>New NMEA Output<br>Select connection/p<br>© IPS1: TCP 2-Wa<br>New IP server o<br>Back Next | oort:<br>y Server on port 2878 |   | A Output<br>sages to output: |
|--|---------------|---|--|---|--------------------------------|---|------------------------------|
|  |               | MEA/SBF Output Streat<br>Port Description<br>IPS1 TCP 2-Way Server<br>port 28785<br>New NMEA stream<br>itreams prepared, press<br>Advanced Settings | Type I<br>er on NMEA of<br>New SBF stream<br>"OK" to apply the | GGA 1   | interval<br>sec 👔 🗙            | GLL<br>GNS<br>GRS<br>GSA<br>GSV<br>HDT<br>RMC<br>ROT<br>VTG<br>Back |                              |

Figure 3-16: Select to output NMEA GGA over the configured IPS1 connection



#### Step 3: Configure Data Link to listen for NMEA output

The screenshots in Figure 3-17 show how the Septentrio GUI tool Data Link can be configured to listen for the AsteRx-U3 Marine 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'**.

| File Tools Help<br>Connection 1   |  |   |
|---|--|---|
| $\begin{tabular}{ c c c c c } \hline Connect & TCP/IP C \\ \hline Show Data & 1 \\ Link \rightarrow & 1 \\ GGA \rightarrow & 1 \\ \hline Send every 10'th received GGA & $$$$ \hline $$ \hline $$ \hline $$ \hline $$ \hline $$ \hline $$ \hline$ |  | ×                                       |
| Connect Script:  Send every 1.00 s.  Close Script:  | Connection Modes<br>TCP/IP Client O TCP/IP Se                      |   |
| Log File:<br>Press Connect 1/O 0.0/(  | Host Name or IP-Address<br>192.168.1.47<br>Port Number<br>28785 \$ | ✓ Data Link —                           |
| l   | OK   | Connect to 192.168.1.47 I/O 0.0/0.0 kBp |

Figure 3-17: 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 3-18.



| Connection 1                  |   |   |
|-------------------------------|---|---|
|                               | IP Client<br>1.47:28785   |   |
| Link $\rightarrow \square 1$  | net a Link: Connection 1 - 🗆  | × |
| $GGA \rightarrow \square 1$   |   |   |
| Send every 10'th received GGA | <pre>\$GPGGA,195806.00,5050.5849674,N,00429.2576129,E,4,14,1.1,70.2318,M,47.3638,M,1.0,1211*77<br/>\$GPGGA,195807.00,5050.5849698,N,00429.2576142,E,4,14,1.1,70.2346,M,47.3638,M,1.0,1211*72</pre>  |   |
| Connect Script:               | \$GPGGA,195808.00,5050.5849702,N,00429.2576146,E,4,14,1.1,70.2334,M,47.3638,M,1.0,1211*7E   |   |
| Send every 1.00 s.            | \$GPGGA, 195809.00, 5050.5849703, N, 00429.2576164, E, 4, 14, 1.1, 70.2319, M, 47.3638, M, 1.0, 1211*71<br>\$GPGGA, 195810.00, 5050.5849665, N, 00429.2576124, E, 4, 14, 1.1, 70.2369, M, 47.3638, M, 1.0, 1211*7B  |   |
| Close Script:                 | \$GPGGA,195811.00,5050.5849664,N,00429.2576143,E,4,14,1.1,70.2331,M,47.3638,M,1.0,1211*77   |   |
| Log File:                     | <pre>\$GPGGA,195012.00,5050.5849605,N,00429.2576137,E,4,14,1.1,70.2335,M,47.3638,M,1.0,1211*7C<br/>\$GPGGA,195813.00,5050.5849682,N,00429.2576135,E,4,14,1.1,70.2354,M,47.3638,M,1.0,1211*7F</pre>  |   |
|                               | \$GPGGA,195814.00,5050.5849681,N,00429.2576135,E,4,14,1.1,70.2361,M,47.3638,M,1.0,1211*7D   |   |
| Connected to 192.168.1.47 I/O | SGPGGA, 195815.00, 5050.5849687, N, 00429.2576142, E, 4, 14, 1.1, 70.2365, M, 47.3638, M, 1.0, 1211*78<br>SGPGGA, 195815.00, 5505.5849658, N, 00429.2576176, E, 4, 14, 1.1, 70.2189, M, 47.3638, M, 1.0, 1211*74<br>SGPGGA, 195817.00, 5050.5849697, N, 00429.2576154, E, 4, 14, 1.1, 70.2387, M, 47.3638, M, 1.0, 1211*74<br>SGPGGA, 195818.00, 5050.5849682, N, 00429.2576154, E, 4, 14, 1.1, 70.2280, M, 47.3638, M, 1.0, 1211*77<br>SGPGGA, 195819.00, 5050.5849682, N, 00429.25776154, E, 4, 14, 1.1, 70.2280, M, 47.3638, M, 1.0, 1211*77 |   |
|                               | Зоечем, 193619.00, 5030.3649602, №, 09429.2376161, Е, 4,14,1.1,70.2240, В, 47.3636, М, 1.0,1211*70<br>\$GPGGA, 195820.00, 5050.5845716, №, 00429.2576128, Е, 4,14,1.1,70.2347, М, 47.3638, М, 1.0,1211*70   |   |
|                               |   |   |
|                               | Show All data You Auto completion for None  |   |
|                               | Clear Freeze Close  |   |

Figure 3-18: The 'Show data' window of Data Link showing GGA from the AsteRx-U3 Marine





## 3.5 How to configure CAN output

The CAN implementation in the AsteRx-U3 Marine 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.

| ration      |
|-------------|
| 🔾 off 💿 on  |
| 250 kbaud ∽ |
| 🔍 off 🔾 on  |
|             |
|             |
|             |

Figure 3-19: 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 3-20.

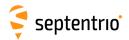
| -NMEA2000 configuration- |               |  |  |  |
|--------------------------|---------------|--|--|--|
|                          | Start Address |  |  |  |

Figure 3-20: 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, PGN 129539 and PGN 129542 have a fixed interval of 1 second, regardless of the chosen interval.

| MEA2000 PGN  | ls Stream1 | Stream2 | Stream3 |
|--------------|------------|---------|---------|
| Clear        | Clear      | Clear   | Clear   |
| PGN126992    |            |         |         |
| PGN127250    |            |         |         |
| PGN129025    |            |         |         |
| PGN129026    |            |         |         |
| PGN129027    |            |         |         |
| PGN129028    |            |         |         |
| PGN129029    |            |         |         |
| PGN129539    |            |         |         |
| PGN129542    |            |         |         |
|              |            |         |         |
| NMEA2000 PGN | ls Stream1 | Stream2 | Stream3 |

Figure 3-21: 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      | Clear     | Clear   | Clear   |
| PGN65419   |           |         |         |
| PGN65420   |           |         |         |
| PGN65421   |           |         |         |
|            |           |         |         |
| J1939 PGNs | Stream1   | Stream2 | Stream3 |
| Interval   | 50 msec 🗸 | r∫off ∽ | r∫off ∽ |

Figure 3-22: 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<br>Rapid Update | 20Hz             |
| PGN129027 | NMEA2000 Position Delta High Precision<br>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 3-23.



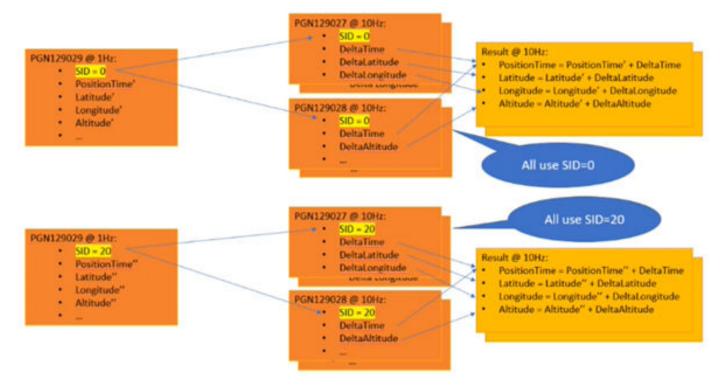


Figure 3-23: Calculating position and altitude with high update rate

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

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

## 4 Rover operation

# 4.1 How to configure the AsteRx-U3 Marine for RTK

The AsteRx-U3 Marine can use correction data to calculate a cm-level RTK position. The AsteRx-U3 Marine can get this correction data in several ways: using the built-in UHF radio, over GSM or Ethernet.

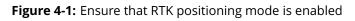
# 4.1.1 How to configure the AsteRx-U3 Marine in RTK rover mode using the UHF radio

When GSM network coverage is either sparse or unreliable, RTK correction data can be transmitted over UHF radio. The AsteRx-U3 Marine has a built-in Satel radio modem that can be used to both receive and transmit data.

#### Step 1: Enable RTK mode

RTK should be enabled as a positioning mode. This can be done in the **GNSS**, **Position** window by checking the **RTK** box in the **Position Mode** field as shown in Figure 4-1. The default setting is for all positioning modes to be enabled.

| Overview      | GNSS               | Fugro Marinestar | Communication  | Corrections   | NMEA/SBF Out | Logging | Admin |
|---------------|--------------------|------------------|--|---|--------------|---------|-------|
| GNSS > Positi | ion                |                  |  |   |              |         |       |
|               | PPP                |                  | GLONASS (<br>Galileo (Po<br>SBAS (Posi<br>BeiDou (Po<br>QZSS (Posi | on: 8 9, Track: 10 10)<br>Position: 7 6, Track: 9<br>sition: 7 6, Track: 9 9)<br>tion: 0 0, Track: 0 0)<br>sition: 11 11, Track: 1<br>tion: 0 0, Track: 0 0)<br>ition: 0 0, Track: 4 0) | 7 17)        |         |       |
|               | Mode               | ○ Static ● Rover |  |   |              |         |       |
|               | ■ RTK              |                  |  |   |              |         |       |
|               | StandAlone         |                  |  |   |              |         |       |
|               | SBAS               |                  |  |   |              |         |       |
|               | DGPS               |                  |  |   |              |         |       |
|               | PPP                |                  |  |   |              |         |       |
|               | Reference position | auto ~           |  |   |              |         |       |





#### Step 2: Configure the UHF radio

To configure the AsteRx-U3 Marine to receive differential correction data from a remote base station, the internal UHF radio should first be powered on as shown in in Figure 4-2.

To configure the remaining settings, you will need to know the following four parameters from the base station transmitter:

- bandwidth (sometimes referred to as channel spacing) of the transmitter
- frequency of the transmitted signal
- protocol of the transmitted data
- error correction method (FEC) of the transmitted data

| Overview          | GNSS                    | Fugro Marinestar                        | Communication    | Corrections | NMEA/SBF Out   | Logging | Admin |
|-------------------|-------------------------|---|------------------|-------------|----------------|---------|-------|
| Communication > l | JHF                     |   |                  |             |                |         |       |
|                   | = / DiffCorr            |   |                  |             |                |         |       |
|                   | UHF                     |   |                  |             |                |         |       |
|                   | N/A                     |   |                  |             |                |         |       |
| CUH               | F Modem Mode            | e                                       |                  | Status      | 6              |         |       |
|                   | Power                   | Mode                                    |                  | Status      | s N/A          |         |       |
| UH                | IF1 off ∽               | Receiver ~                              |                  | Bandv       | vidth N/A      |         |       |
| ⊂UH               | F Receiver Con          | figuration                              |                  | Freque      | ency N/A       |         |       |
|                   |                         | el Forced bandwidth                     | Forced frequency | Error       | Channel undefi | ned     |       |
| UH                | IF1 Ch01 、              | <ul> <li>✓ 25kHz</li> <li>✓ </li> </ul> | 410.00000 MHz    |             |                |         |       |
|                   |                         | Configuration                           |                  |             |                |         |       |
| CUH               | F Protocol and          | Modulation                              |                  |             |                |         |       |
| UH                | Protocol<br>IF1 PCCGMSK | Radio link rat                          | e FEC            |             |                |         |       |
|                   | dvanced Setting         | gs                                      |                  |             |                |         |       |
| _ ر               | JHF Channel Ta          | ible                                    |                  |             |                |         |       |
|                   |                         |   | Tx frequency     |             |                |         |       |
|                   | Ch01 12.5kHz            | ✓ 0.00000 MHz                           | 0.00000 MHz      |             |                |         |       |

Figure 4-2: Configuring the built-in UHF radio for rover operation

After changing the settings click on **OK** to finalize the settings. Each time the configuration is changed, a pop-up in the lower right-hand corner will prompt you to save the new configuration as the boot configuration. Clicking on 'Save' will cause the AsteRx-U3 Marine to boot with the new configuration after a power cycle.

The frequency and bandwidth are configured via the Advanced Settings menu. Note that, the baud rate of the connection depends on the Protocol and Bandwidth settings as given in Appendix 9.2.



#### Step 3: Verifying the configuration

If the UHF radio of the AsteRx-U3 Marine has been correctly configured then you should see in the UHF/DiffCorr field, the grayed-out connection line is now replaced by a 'live' green line as shown in Figure 4-3. The message format of the differential corrections will appear next to the right-hand base station icon: RTCMv3 in this example. All being well, the positioning mode icon in the upper status field should also indicate 'RTK Fixed' after a few seconds.

| CUHF / | DiffCorr        |                   |  |
|--------|-----------------|-------------------|--|
|        |                 | RTCMv3 (0.47kB/s) |  |
| Rece   | eiver (441 MHz) | _                 |  |

**Figure 4-3:** The AsteRx-U3 Marine in RTK mode using differential correction data from a base station transmitting over a UHF radio connection

# 4.1.2 How to configure the AsteRx-U3 Marine 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 4-4.

| Overview        | GNSS               | Fugro Marinestar | Communication   | Corrections  | NMEA/SBF Out        | Logging | Admin |
|-----------------|--------------------|------------------|---|--|---------------------|---------|-------|
| GNSS > Position |                    | _                |   |  |                     |         |       |
| GNS             | PPP                |                  | GLONASS (<br>Galileo (Posi<br>SBAS (Posit<br>BeiDou (Posit<br>QZSS (Posit | on: 8 9, Track: 10 10)<br>Position: 7 6, Track: 9 9<br>ion: 0 0, Track: 9 9<br>ion: 0 0, Track: 0 0)<br>sition: 11 11, Track: 0 0)<br>ition: 0 0, Track: 0 0)<br>ition: 0 0, Track: 4 0) | 9 8)<br>)<br>17 17) |         |       |
|                 | sition Mode<br>ode | ○ Static ● Rover |   |  |                     |         |       |
|                 | RTK                |                  |   |  |                     |         |       |
| Sta             | andAlone           |                  |   |  |                     |         |       |
| SB              | AS                 |                  |   |  |                     |         |       |
| DG              | SPS .              |                  |   |  |                     |         |       |
| PP              | Р                  |                  |   |  |                     |         |       |
| Re              | ference position   | auto ~           |   |  |                     |         |       |

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



### Step 2: Configure the cellular modem

Insert a SIM card into the front-panel slot of the AsteRx-U3 Marine as shown in Figure 2-4 while the unit is powered down.

The on-board cellular modem of the AsteRx-U3 Marine can be configured in the **Communication, Cellular** window as shown in Figure 4-5. 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.

| Overview     | GNSS  | Fugro Marinestar                   | Communication | Correctio    | ons NMEA/S         | BF Out | Logging | Admin |
|--------------|---|------------------------------------|---------------|--------------|--------------------|--------|---------|-------|
| Communicatio | n > Cellular                                      |                                    |               |              |                    |        |         |       |
|              | Cellular -  |                                    | ((2)) Celle   | ular Network |                    |        |         |       |
|              | SIM card not detected<br>Cellular PIN<br>PIN code | <b>o</b>                           | Sta           |              | SIM card not detec | ted    |         |       |
| C            |   |                                    | Inte          | ernet type   | Not connected      |        |         |       |
| ſ            | Cellular Configuratio                             |                                    | Sig           | nal strength | N/A                |        |         |       |
|              | Power   | ○ off ● on                         | Ope           | erator       |                    | _      |         |       |
|              | Connect<br>Access point name                      | ○ off ● on<br>internet.proximus.be | Roa           | aming        | No                 |        |         |       |
|              | User  |                                    |               |              |                    |        |         |       |
|              | Password  | 0                                  |               |              |                    |        |         |       |
|              | Standard  | 🗹 2G 🗹 3G 🗹 4G                     |               |              |                    |        |         |       |
|              | Default Ok<br>ress "OK" to apply                  | the changes.                       |               |              |                    |        |         |       |

Figure 4-5: Configuring the cellular modem

Click on Ok and if the settings are correct, the cellular graphic should appear as shown in Figure 4-6. The connection type may appear as HSUPA, HSPA or in this example LTE.



3

| Connected                | LTE                  | - (1) Cellular Network | 109.142.61.163 |
|--------------------------|----------------------|------------------------|----------------|
| Cellular PIN<br>PIN code |                      | Status<br>Status       | Connected      |
| Cellular Configuratio    |                      | Internet type          | LTE            |
| Power                    | off ● on             | Signal strength        | -61 dBm        |
| Connect                  | ● off ● on           | Operator               | Proximus       |
| Access point name        | internet.proximus.be | Roaming                | No             |
| User                     |                      |                        |                |
| Password                 | 0                    |                        |                |
| Standard                 | ☑ 2G ☑ 3G ☑ 4G       |                        |                |

Figure 4-6: 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 4-7 shows the settings required to retrieve correction data from the Septentrio 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. In this example, the FLEPOS\_HOEG stream has been selected, the details of which are shown in Figure 4-8.

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.

| Corrections > NTRIP                               | NTRIP                 |                        |              |          |   |
|---|-----------------------|------------------------|--------------|----------|---|
| CNtrip  | Corrections Input     |                        |              |          |   |
|   | Corrections Output    |                        |              |          |   |
| Ntrip disabled                                    | Edit NTRIP Connection | on                     |              |          | 1   |
|   | Mode                  | Client                 |              | •        |   |
| NTOID C IN  | Caster                | ntrip.septentrio.local |              |          |   |
| NTRIP Settings                                    | Port                  | 2101                   |              |          |   |
| There are currently no NTRIP connections defined. | User name             | ssn                    |              |          |   |
| 🕄 New NTRIP client 😳 New NTRIP server             | Password              | •••••                  | 0            |          |   |
|   | Mount point           | FLEPOS_HOEG            |              | •        |   |
|   |                       | Details                |              |          |   |
|   | Send GGA to caster    | auto                   |              | *        | 1   |
|   |                       | Ok Cancel              | CNTRIP Se    |          |   |
|   |                       |                        |              |          | e Caster Mount Point<br>ntrip.septentrio.local:2101 FLEPOS_HOEG |
|   |                       |                        |              |          | client GNew NTRIP server  |
|   |                       |                        | Press "OK" ( | to apply | ly the changes.   |

Figure 4-7: Configuring the NTRIP connection

| Mount Point   | FLEPOS_HOEG                                     |
|---------------|---|
| Identifier    | Hoegaarden                                      |
| Format        | RTCM 3.1  |
| Format Detail | s 1004/1012(1),1006/1008/1033(1<br>0),1019,1020 |
| Carrier       | 2   |
| Nav-system    | GPS+GLONASS                                     |
| Network       | FLEPOS  |
| Country       | BEL   |
| Latitude      | 50.78   |
| Longitude     | 4.90  |
| NMEA          | 0   |
| Solution      | 0   |
| Generator     | Leica GRX1200+GNSS                              |
| Compr-encryp  | )   |
| Authenticatio | nB  |
| Fee           | N   |
| Bitrate       |   |
| Misc          | FLEPOS  |

Figure 4-8: Details of the selected mount Point





### 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 4-9 with the positioning mode icon indicating RTK fixed.

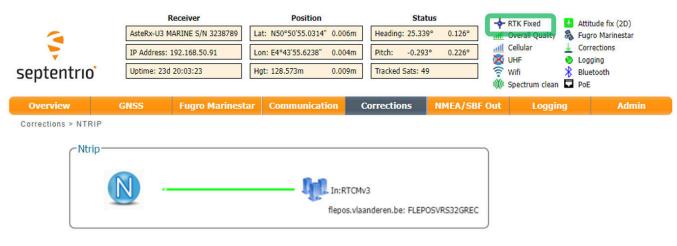


Figure 4-9: Correctly configured NTRIP connection



# 4.1.3 How to configure the AsteRx-U3 Marine 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 5.1 describes how to configure the AsteRx-U3 Marine 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 **CONTOUS 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 4-10, RTCMv3 correction data are sent out over port 28785. The RTCMv3 messages necessary for RTK positioning are selected by default.



| verview       | GNSS                 | Fugro Marinestar  | Commu    | nication | Corrections         | NMEA/SBF Out      | Logging           | Admin         |                            |
|---------------|----------------------|-------------------|----------|----------|---------------------|-------------------|-------------------|---------------|----------------------------|
| rections > Co | rrections Output     |                   |          |          |                     |                   |                   |               |                            |
|               | 100                  |                   |          |          |                     |                   |                   |               |                            |
| (Da           | ata Streams          |                   |          | -        |                     |                   |                   |               |                            |
|               |                      |                   |          | NTR1     | (In:RTCMv3 0.70kB/  | 5)                |                   |               |                            |
|               | A strange            |                   |          |          |                     |                   |                   |               |                            |
|               | 2                    |                   |          | DSK1     | (Out:SBF 21.81kB/s) |                   |                   |               |                            |
|               |                      |                   |          | -        |                     |                   |                   |               |                            |
| CD.           | ifferential Correcti | ons Output        |          | New R    | TCMv3 Output-       |                   |                   |               |                            |
| 1000          |                      |                   |          | Select   | connection type:    |                   |                   |               |                            |
|               | here is currently n  |                   | Jerined. | O Seri   | al port             |                   |                   |               |                            |
| L C           | New RTCM2 outp       | out 😳 New RTCM3 o | utput 🔍  | OUSB     |                     |                   |                   |               |                            |
| -=            | Advanced Settings    | -                 | _        | O Blue   |                     |                   |                   |               |                            |
|               |                      |                   |          | ONTR     |                     |                   |                   |               |                            |
| Ok            |                      |                   |          | ● IP s   |                     |                   |                   |               |                            |
|               |                      |                   |          | OIP      | eceive (2-way)      | New RTCMv3 C      | Dutput            |               |                            |
|               |                      |                   |          | OIPC     | onnection           | Select connection | A CONTRACTOR OF T | New RTCMv3    | Output                     |
|               |                      |                   |          | Back     | Next Fin            |                   |                   |               |                            |
|               |                      |                   |          |          |                     | New IP serv       | er connection     |               | IP server connection:      |
|               |                      |                   |          | -        |                     | Back Next         | Finish            | Port          | 28785                      |
|               |                      |                   |          |          |                     |                   |                   |               | TCP2Way (send and receive) |
|               |                      |                   |          |          |                     |                   |                   | UDPAddress    | 255.255.255.255            |
|               |                      |                   |          |          |                     | -New RTCMv3 Out   | mut.              |               | Next Finish Cancel         |
|               |                      |                   |          |          | (                   |                   |                   | ) <b>– </b> ( |                            |
|               |                      |                   |          |          |                     | Select messages t | to output:        |               |                            |
|               |                      |                   |          |          |                     | B MSM1            |                   |               |                            |
|               |                      |                   |          |          |                     | B MSM2            |                   |               |                            |
|               |                      |                   |          |          |                     | B MSM3            |                   |               |                            |
|               |                      |                   |          |          |                     | MSM4              | 0                 |               |                            |
|               |                      |                   |          |          |                     | MSM5 MSM6         |                   |               |                            |
|               |                      |                   |          |          |                     | MSM0              |                   |               |                            |
|               |                      |                   |          |          |                     | RTCM1001          | 0                 |               |                            |
|               |                      |                   |          |          |                     | RTCM1001          |                   |               |                            |
|               |                      |                   |          |          |                     | RTCM1003          |                   |               |                            |
|               |                      |                   |          |          |                     | RTCM1004          |                   |               |                            |
|               |                      |                   |          |          |                     | RTCM1005          |                   |               |                            |
|               |                      |                   |          |          |                     | RTCM1006          |                   |               |                            |
|               |                      |                   |          |          |                     | RTCM1007          |                   |               |                            |
|               |                      |                   |          |          |                     | DTCM1000          | nmended to ena    | ble MSM       |                            |
|               |                      |                   |          |          |                     | messages tog      | ether with mess   | ages          |                            |
|               |                      |                   |          |          |                     | 1001-1004 a       | nd 1009—1012.     |               |                            |
|               |                      |                   |          |          |                     | Back No t         | Finish C          | ncel          |                            |
|               |                      |                   |          |          |                     |                   |                   |               |                            |

Figure 4-10: 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 4-11.

| Overview                    | GNSS  | Fugro Marinestar | Communication  | Corrections   | NMEA/SBF Out | Logging | Admin |
|-----------------------------|---|------------------|--|---|--------------|---------|-------|
| GNSS > Position             |   |                  |  |   |              |         |       |
| GN<br>Po:<br>Mt<br>St<br>SE | ppp<br>sition Mode-<br>ode<br>RTK<br>andAlone<br>BAS<br>SPS | Static  Rover    | GLONASS (<br>Galileo (Posi<br>SBAS (Posit<br>BeiDou (Po<br>QZSS (Posit | on: 8 9, Track: 10 10)<br>Position: 7 6, Track: 9<br>iion: 0 0, Track: 9 9)<br>siton: 11 11, Track: 10 0)<br>sition: 11 11, Track: 10 0)<br>iition: 0 0, Track: 0 0)<br>ition: 0 0, Track: 4 0) | 7 17)        |         |       |
| Re                          | eference position [   | auto 🗸           |  |   |              |         |       |

Figure 4-11: 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 **P Receive Connection** as shown in Figure 4-12 to start configuration sequence. The **Port** and **TCPAddress** should match the port and IP address of the Base station receiver.

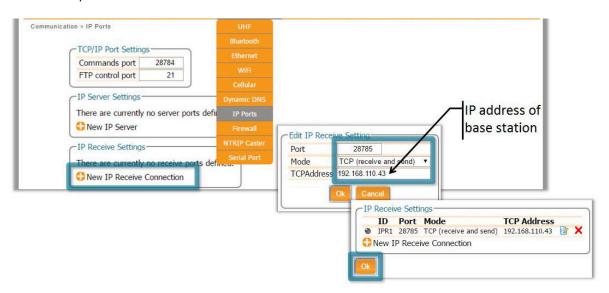


Figure 4-12: In the IP Ports window, click on 🛟 New IP Receive Connection to configure the connection with the base station





## 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 4-13 and 4-14.

**Figure 4-13:** Ethernet window of the **Base station receiver** showing the position as static and an active output of RTCMv3 differential corrections on server port IPS1

|                      | -   | ceiver          | Position  |         | Heading  | Attit | ude<br>N/A | -               | - RTK Fixed               |    | Attitude disabled    |
|----------------------|---|-----------------|---|---------|--|-------|------------|-----------------|---------------------------|----|----------------------|
| 3                    | AsteRx-U-Fg S/N 3017999<br>IP Address: 192.168.105.249<br>Uptime: 0d 12:33:45 |                 | Lon: E4°43'55.6723"         0.005m           Hgt: 129.349m         0.009m |         | Pitch:         N/A         N/A           Roll:         N/A         N/A |       | att        | Overall Quality | Marinestar<br>Corrections |    |                      |
| septentrio           |   |                 |   |         |  |       |            |                 | UHF 🕘                     |    | Logging<br>Bluetooth |
| Overview             | GNSS  | Marinestar      | Communica   | ation ( | orrectio   | ms    | NMEA/SB    | F Out           | Loggir                    | ŋ  | Admin                |
| ommunication > Ether |   |                 | Communic  |         |  |       |            | out             | 1099                      | "9 |                      |
| Etheme               | et —  |                 |   |         |  |       |            | _               |                           |    |                      |
|                      |   |                 |   |         |  |       |            |                 |                           |    |                      |
|                      | <b>- (</b>  |                 |   | IPR1 (  | In: RTCMv  | 3)    |            |                 |                           |    |                      |
| IP: 192.             | 168.105.249 / a   | sterx-u-3013369 |   |         |  |       |            |                 |                           |    |                      |

**Figure 4-14:** Ethernet tab of the **rover receiver** showing a fixed RTK position and reception of RTCMv3 differential corrections on receiver port IPR1

# 4.2 Using Fugro Marinestar L-band PPP correction data with the AsteRx-U3 Marine

PPP (Precise Point Positioning) is high-accuracy positioning without the need for a local base station. PPP uses precise satellite clock and orbit corrections computed by a global network of reference stations and broadcast in real time by geostationary satellites transmitting in the L-band. To receive PPP correction data, your receiver will need to be connected to an L-Band capable antenna<sup>1</sup>. The AsteRx-U3 Marine can use PPP correction data from the Fugro Marinestar service as described in the steps below.

# Step 1: Check you have PPP permissions on your AsteRx-U3 Marine

The use of PPP services is permission-file controlled on the AsteRx-U3 Marine. You can make sure that you have PPP permissions enabled on the **About** page selected from the **Admin** menu. Click on **Permitted Capabilities** and scroll down the list of permissions: **PPP** and **Augmented Data Svc** should appear as permitted as shown in Figure 4-15.

| rview   | GNSS               | Fugro   | Marinestar | Communicatio | n Corrections                   | NMEA/SBF Out                 | Logging        | Admin               |
|---------|--------------------|---------|------------|--------------|---------------------------------|------------------------------|----------------|---------------------|
| > About |                    |         |            |              |                                 |                              |                | Configurations      |
| ~       | Receiver Identific | ration  |            |              |                                 |                              |                | Reset               |
|         | Component          |         | Descriptio | n            |                                 |                              |                | Upgrade             |
|         | hwplatform         | product | AsteRx-U3  |              |                                 | -                            |                | User Administration |
|         | firmware           | version | 4.12.3     |              | B.                              |                              |                | Expert Control      |
|         | ■ files            |         |            |              |                                 |                              |                | Receiver Messages   |
|         | components         |         |            |              |                                 | 5 5. 20                      |                | About               |
|         |                    |         |            |              | 200                             | 0. 600                       |                | About               |
|         |                    |         |            |              |                                 |                              |                |                     |
|         |                    |         |            |              | Support Pag                     | 2                            |                |                     |
|         |                    |         |            |              | Contact<br>Diagnostic R         | trentes.                     |                |                     |
|         |                    |         |            |              | Permitted Ca                    | and the second second second |                |                     |
|         |                    |         |            |              | Cosmos                          | publico                      |                |                     |
|         |                    |         |            |              | CPU Load                        |                              |                |                     |
|         |                    |         |            |              | License<br>DSK1                 | 1                            |                |                     |
| _       |                    |         |            |              | CAN                             | √ Perm                       | tted           |                     |
|         |                    |         |            |              |                                 | √ Mari                       |                |                     |
|         |                    |         |            |              | PPP                             | V Mari                       | nestar         |                     |
|         |                    |         |            |              |                                 | √ Mari<br>n Data Svc √ LBAS  |                | vider type          |
|         |                    |         |            |              | <ul> <li>Augmentatio</li> </ul> |                              |                | vider type          |
|         |                    |         |            |              | Augmentatio Meas Interval       | n Data Svc √ LBAS            | 2 service prov | vider type          |
|         |                    |         |            |              | <ul> <li>Augmentatio</li> </ul> | n Data Svc √ LBAS            |                | vider type          |
|         |                    |         |            |              | Augmentatio Meas Interval       | n Data Svc √ LBAS            | 2 service prov | vider type          |

Figure 4-15: Check that PPP is enabled in the AsteRx-U3 Marine permission file

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

### **Step 2: Activating Fugro Marinestar service**

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To be able to receive PPP correction data from the Fugro Marinestar service, you will also have to have a subscription with Fugro. You can find more information on how to purchase a Marinestar subscription on the Marinestar website: https://fsp.support/marinestar/.

When submitting an order for the Marinestar service, you will be asked to provide the serial number of the AsteRx-U3 Marine. This you can find on the **About** page of the Web Interface shown highlighted in Figure 4-16. The Marinestar ID can also be retrieved from the label on the bottom side of the AsteRx-U3 Marine and starts with the number "'023-".

| verview   | GNSS                           | Fugro                                   | Marinestar | Communication | Corrections | NMEA/SBF Out                  | Logging   | Admin |
|-----------|--------------------------------|---|------------|---------------|-------------|-------------------------------|-----------|-------|
| in > Abou | t                              |   |            |               |             |                               |           |       |
|           | -Receiver Identific            | ation                                   |            |               |             |                               |           |       |
| ſ         | Component                      |   | Descriptio |               |             |                               |           |       |
|           | hwplatform                     |   | AsteRx-U3  |               |             |                               |           |       |
|           | - inspirationin                | name                                    | GRB0053    | T WITTE       |             |                               |           |       |
|           |                                | serialnr                                | 3238789    |               | A MAR       | -10                           |           |       |
|           |                                | 100000000000000000000000000000000000000 |            | 22700         |             | 3.                            |           |       |
|           |                                | rxfullid                                | SN2113323  |               |             | Se 5 50 5                     |           |       |
|           | mainboard                      | type                                    | GRB00531   | 000AA0301     |             | 5 3 5 6 5                     |           |       |
|           | backpanel                      | type                                    | Legacy Ler | no            |             |                               |           |       |
|           | bioboard                       | type                                    | BIO002710  | 00AA02P3      | Support Pa  | ge                            |           |       |
|           |                                | serialnr                                | 3082131    |               | Contact     |                               |           |       |
|           |                                | rxfullid                                | SN2203308  | 32131         | Diagnostic  | <u>Report</u><br>Capabilities |           |       |
|           | usb                            | speed                                   | full speed |               | Cosmos      | capapilities                  |           |       |
|           | 435                            | host                                    | enabled    |               | CPU Load    |                               |           |       |
|           | ■ firmware                     | version                                 | 4.12.3     |               | License     |                               |           |       |
|           |                                | Version                                 | 4.12.5     |               |             |                               |           |       |
|           | <ul> <li>components</li> </ul> |   |            |               |             |                               |           |       |
|           | - components                   |   |            |               | 🤤 c         | opyright © 2022 Septer        | atrio N V |       |

**Figure 4-16:** The serial number of the AsteRx-U3 Marine is required to purchase a subscription for the Fugro Marinestar service

The Fugro Marinestar service is activated over the air. The AsteRx-U3 Marine will therefore have to be powered up with a clear sky view in order to receive the activation signal. For additional information please refer to https://fsp.support/marinestar/.

## Step 3: Connect an L-Band antenna

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Ensure that you have an L-band capable antenna connected to the main antenna rear-panel connector. The AsteRx-U3 Marine offers an additional connector for a dedicated L-band antenna as shown in Figure 4-17.



Figure 4-17: Rear panel antenna connectors

## **Step 4: Select PPP positioning**

The PPP positioning mode is selected by default but, you can check that it has indeed been selected in the **GNSS** > **Position** tab as shown in Figure 4-18.

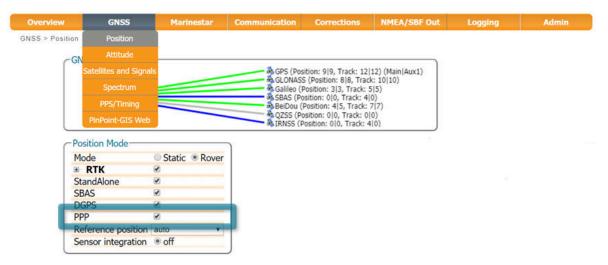


Figure 4-18: The PPP positioning mode should be selected

### **Step 5: Beam Selection Mode and Service**

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You can select the Satellite Beam **Selection mode** in the **Marinestar** page of the web interface as shown in Figure 4-19. The default L-band beam selection mode is **off**. To select a beam, click on **manual** as shown in Figure 4-19 and select a pre-configured beam from the drop-down list. In **manual** mode, the L-band demodulator will attempt to lock on to the selected beam ignoring all other beams. The beams in this list can be pre-set in the **Advanced Settings** expandable field. A beam is characterized by a frequency and data rate.

| Fug | gro Marinestar —    |                       |   |         |    |  |
|-----|---------------------|-----------------------|---|---------|----|--|
|     |                     |                       |   |         |    |  |
|     | <b>(()</b> -        |                       | - TIMARIC   | IESTAR' |    |  |
|     |                     |                       |   |         | 82 |  |
| Bei | ims: EMSAT,WASAT,IC | SAT                   |   |         |    |  |
| ~ 5 | atus Settings       |                       |   |         |    |  |
|     | Satellite Beam Sel  | action Mode           |   |         |    |  |
|     |                     |                       | off () manual   |         |    |  |
|     |                     | election AORET (LBA   |   |         |    |  |
|     |                     | election User2 (disab |   |         |    |  |
|     | i landal boarn E o  | election User3 (disab | Construction of the second s |         |    |  |

Figure 4-19: Selecting an L-Band beam

Without a Fugro Marinestar subscription, the AsteRx-U3 Marine will still be able track visible L-Band signals. Figure 4-20 shows the L-Band Tracker Status field when the AsteRx-U3 Marine is locked onto signals from the EMSAT, WASAT and IOSAT satellites. After purchasing a subscription you will need to track one of the beams for activation over the air.



|   | Fugro Mari   | nestar Comm  | unication C   | orrections   | NMEA/SBF Out  | Logging  |
|---|--|--|---|--|---|--|
| -Fugro Marinesta  |  |  |   |  |   |  |
|   |  |  | MARINEST  |  | - Seried  |  |
| Beams: EMSAT,WAS  | AT,IOSAT   |  |   | Error: Licen   | se Expired  |  |
| Status Settin   | as   |  |   |  |   |  |
| CL-Band Tracke  |  |  |   |  |   |  |
|   |  |  |   |  |   |  |
|   | Beam 1   | Beam 2   | Beam 3  | Beam 4   | Beam 5  | Beam 6   |
| Beam Name   | Beam 1<br>EMSAT  | Beam 2<br>WASAT  | Beam 3<br>IOSAT   | Beam 4<br>EMSAT  | Beam 5<br>WASAT   | Beam 6<br>IOSAT  |
| Beam Name<br>Frequency  | EMSAT  | WASAT  | IOSAT   | EMSAT  | WASAT   |  |
|   | EMSAT  | WASAT  | IOSAT   | EMSAT  | WASAT   | IOSAT  |
| Frequency   | EMSAT<br>1545.9275 MHz   | WASAT<br>1545.8350 MHz   | IOSAT<br>1545.8075 MHz  | EMSAT<br>21545.9275 MH   | WASAT<br>z 1545.8350 MHz  | IOSAT<br>1545.8075 MHz   |
| Frequency<br>Baudrate   | EMSAT<br>1545.9275 MHz<br>1200 Baud  | WASAT<br>1545.8350 MHz<br>600 Baud   | IOSAT<br>1545.8075 MHz<br>1200 Baud   | EMSAT<br>21545.9275 MH<br>1200 Baud  | WASAT<br>z 1545.8350 MHz<br>600 Baud  | IOSAT<br>1545.8075 MHz<br>1200 Baud  |
| Frequency<br>Baudrate<br>Service ID                                     | EMSAT<br>1545.9275 MHz<br>1200 Baud<br>LBAS1   | WASAT<br>1545.8350 MHz<br>600 Baud<br>LBAS1                                | IOSAT<br>1545.8075 MHz<br>1200 Baud<br>LBAS1                                | EMSAT<br>21545.9275 MH<br>1200 Baud<br>0xC685  | WASAT<br>z 1545.8350 MHz<br>600 Baud<br>0xC685  | IOSAT<br>1545.8075 MHz<br>1200 Baud<br>0xC685  |
| Frequency<br>Baudrate<br>Service ID<br>Freq. Offset                     | EMSAT<br>1545.9275 MHz<br>1200 Baud<br>LBAS1<br>1641.386 Hz                                | WASAT<br>1545.8350 MHz<br>600 Baud<br>LBAS1<br>1825.970 Hz                 | IOSAT<br>1545.8075 MHz<br>1200 Baud<br>LBAS1<br>1065.088 Hz                 | EMSAT<br>21545.9275 MH:<br>1200 Baud<br>0xC685<br>1534.601 Hz                        | WASAT<br>z 1545.8350 MHz<br>600 Baud<br>0xC685<br>1246.948 Hz                         | IOSAT<br>1545.8075 MHz<br>1200 Baud<br>0xC685<br>1200.973 Hz                         |
| Frequency<br>Baudrate<br>Service ID<br>Freq. Offset<br>C/N0             | EMSAT<br>1545.9275 MHz<br>1200 Baud<br>LBAS1<br>1641.386 Hz<br>N/A                         | WASAT<br>1545.8350 MHz<br>600 Baud<br>LBAS1<br>1825.970 Hz<br>N/A          | IOSAT<br>1545.8075 MHz<br>1200 Baud<br>LBAS1<br>1065.088 Hz<br>N/A          | EMSAT<br>z1545.9275 MHz<br>1200 Baud<br>0xC685<br>1534.601 Hz<br>45.90 dB-Hz         | WASAT<br>z 1545.8350 MHz<br>600 Baud<br>0xC685<br>1246.948 Hz<br>40.60 dB-Hz          | IOSAT<br>1545.8075 MHz<br>1200 Baud<br>0xC685<br>1200.973 Hz<br>41.40 dB-Hz          |
| Frequency<br>Baudrate<br>Service ID<br>Freq. Offset<br>C/N0<br>AGC Gain | EMSAT<br>1545.9275 MHz<br>1200 Baud<br>LBAS1<br>1641.386 Hz<br>N/A<br>56 dB<br>FrameSearch | WASAT<br>1545.8350 MHz<br>600 Baud<br>LBAS1<br>1825.970 Hz<br>N/A<br>56 dB | IOSAT<br>1545.8075 MHz<br>1200 Baud<br>LBAS1<br>1065.088 Hz<br>N/A<br>56 dB | EMSAT<br>21545.9275 MH<br>1200 Baud<br>0xC685<br>1534.601 Hz<br>45.90 dB-Hz<br>12 dB | WASAT<br>z 1545.8350 MHz<br>600 Baud<br>0xC685<br>1246.948 Hz<br>40.60 dB-Hz<br>12 dB | IOSAT<br>1545.8075 MHz<br>1200 Baud<br>0xC685<br>1200.973 Hz<br>41.40 dB-Hz<br>12 dB |

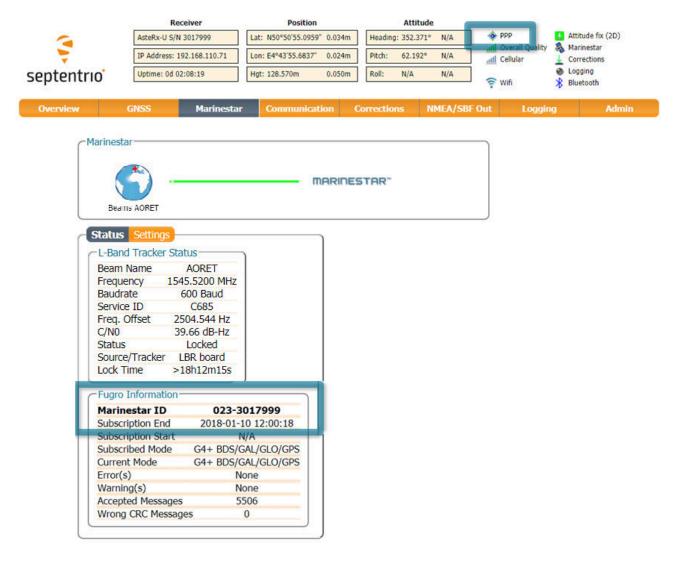
**Figure 4-20:** L-Band Tracker Status field when locked on to an L-Band signal. The AsteRx-U3 Marine will still track L-Band signals without a Fugro Marinestar subscription.

## Step 6: Verifying the configuration

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With a valid Fugro Marinestar subscription, the AsteRx-U3 Marine will be able to decode PPP correction data. The **Fugro Information** field should show a **Marinestar ID** and a **Subscription End** time and date as shown highlighted in Figure 4-21.

After a few moments, the AsteRx-U3 Marine positioning mode should change to PPP as indicated by the highlighted icon in the upper status field.



**Figure 4-21:** The Marinestar page of the AsteRx-U3 Marine web interface when the Marinestar service has been successfully activated



# 4.3 How to configure the AsteRx-U3 Marine for Attitude

With two antennas connected to the AsteRx-U3 Marine, the receiver can calculate Heading and either Pitch or Roll. This section details how to configure the AsteRx-U3 Marine in a two-antenna setup.

# Step 1: Connect a second antenna

Connect a second antenna to the rear-panel connector labeled **AUX ANT** and indicated in Figure 4-22.

**Note:** It is recommended to keep the net gain difference between MAIN and AUX antennas to maximum 10dB.



Figure 4-22: Auxiliary antenna connector on rear panel



## Step 2: Configure attitude settings

The attitude settings of the AsteRx-U3 Marine can be configured in the **GNSS**, Attitude window as shown in Figure 4-23.

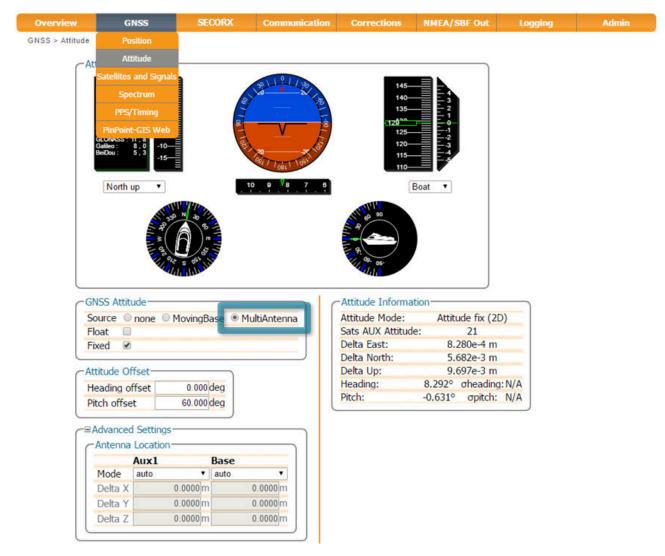


Figure 4-23: GNSS Attitude window when two antennas are connected

### GNSS Attitude field

The recommended settings for a Heading setup are **MultiAntenna** mode with attitude calculated using **Fixed** ambiguities as shown. These setting are configured by default.

#### Antenna Location and Antenna Offset

The AsteRx-U3 Marine assumes that the main and auxiliary antennas are placed along the longitudinal axis of the vehicle with the auxiliary in front of the main antenna. If the antennas cannot be placed in such a configuration, the reported heading and pitch may be biased. The default settings in the **Antenna Offset** and **Antenna Location** fields shown in Figures 4-23 can be altered to compensate for these biases.



### 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 4-24 shows.

| 🖃 Attitude      |   |
|-----------------|---|
| AuxAntPositions |   |
| AttEuler        | 1 |
| AttCovEuler     |   |
| EndOfAtt        | 1 |

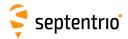
Figure 4-24: SBF blocks containing attitude information

#### NMEA

You can output the attitude information from the AsteRx-U3 Marine in NMEA format by selecting the standard NMEA HDT sentence or the Septentrio proprietary HRP sentence as shown in Figure 4-25.

| GSV |  |
|-----|--|
| HDT |  |
| RMC |  |
| ROT |  |
| VTG |  |
| ZDA |  |
| HRP |  |
| LLQ |  |

Figure 4-25: NMEA sentences containing attitude information



# 4.4 How to output a PPS signal

The AsteRx-U3 Marine can output a PPS (Pulse-per-Second) signal that can be used for example, to synchronize a secondary device to UTC time.

### Step 1: Connect the PPS cable

Connect the PPS\_OUT cable to the rear-panel connector labeled 'PPS' and indicated in Figure 4-26.

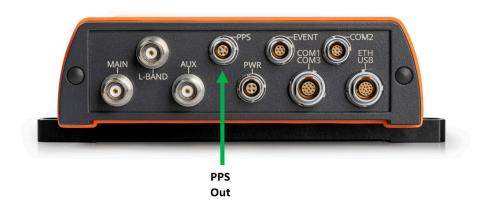


Figure 4-26: PPS connector on rear panel

### **Step 2: Configure the PPS settings**

You can configure the PPS settings on the **PPS/Timing** window on the **GNSS** menu as shown in Figure 4-27.

| NTP Server Co | nfiguration           |
|---------------|-----------------------|
| Enable NTP se | erver  off  on        |
| PPS OUT Parar | meters                |
| Interval      | 1 sec 🗸 🗸             |
| Polarity      | ● Low2High ○ High2Low |
| Delay         | 0.00 ns               |
| Time scale    | GPS 🗸                 |
| Max sync age  | 60 s                  |
| Pulse width   | 5.000 ms              |

Figure 4-27: The GNSS, PPS/Timing window

The **Interval** is the time interval between successive timing pulses and is selectable between 10ms and 60s. The default **Polarity** of the PPS signal is a low-to-high transition which can be alternatively configured as high-to-low.



The **Delay** argument can be used to compensate for signal delays in the system (including antenna, antenna cable and PPS cable). For example, if the antenna cable is replaced by a longer one, the overall signal delay could be increased by say, 20 nsec. If Delay is left unchanged, the PPS pulse will come 20 ns too late. To re-synchronize the PPS pulse, Delay should be increased by 20 ns.

By default, PPS pulses are aligned with the satellite time system (TimeSys) as shown in the **Time Scale** field. PPS signals can alternatively be aligned with UTC, local receiver time (RxClock) or GLONASS time.

When Time Scale is set to anything other than RxClock, the accuracy of the time of the PPS pulse depends on the age of the last PVT computation. During PVT outages, the PPS generation time, which is extrapolated from the last available PVT information, may start to drift. To avoid large biases, the receiver stops outputting the PPS pulse when the last available PVT is older than the specified **MaxSyncAge**. The MaxSyncAge is ignored when TimeScale is set to RxClock.

# 4.4.1 Time synchronization using the PPS signal

The PPS signal is an electronic pulse synchronized with GPS time clock ticks, it doesn't itself specify time. To synchronize a device with GPS time, the AsteRx-U3 Marine can be configured to output both a PPS signal and an NMEA ZDA sentence which contains the time. The PPS signal arrives first followed by the ZDA whose reported time corresponds to the leading edge of the PPS signal.



# 5 Base station operation

# 5.1 How to configure the AsteRx-U3 Marine as an RTK base station using the UHF radio

The AsteRx-U3 Marine can itself also be configured to work as a base station and provide differential correction data to one or more rover receivers.

# Step 1: Setting the AsteRx-U3 Marine base station position

```
Set the position as static
```

To work as a base station, the position of the AsteRx-U3 Marine should be set to static. If not, the AsteRx-U3 Marine will still work as a base station however the position of the rover may show more variation. The 'Static' position mode can be selected in the '**Position**' window of the '**GNSS**' menu as shown in Figure 5-1.

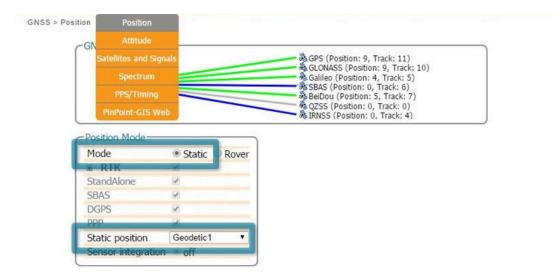


Figure 5-1: Setting the AsteRx-U3 Marine base station position to static

#### Set the correct position

An accurate position of the antenna that is connected to the AsteRx-U3 Marine should also be set. The default setting of 'auto' can be used for demonstrations however, for most other purposes, a properly surveyed position is advisable. In the example shown in Figure 5-2, the position stored under 'Geodetic1' is used. The stored positions can be entered via the '**Advanced Settings**' menu on the same page. Pre-set positions can be entered in either Geodetic or Cartesian coordinates as shown.



### Select the Datum of the antenna position

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

|           | Geodetic1        | Geodetic2       | Geodetic3       | Geodetic4       | Geodetic5       |
|-----------|------------------|-----------------|-----------------|-----------------|-----------------|
| Latitude  | 50.848637300 deg | 0.000000000 deg | 0.000000000 deg | 0.000000000 deg | 0.000000000 deg |
| Longitude | 4.732134260 deg  | 0.000000000 deg | 0.000000000 deg | 0.000000000 deg | 0.000000000 deg |
| Altitude  | 129.2560 m       | 0.0000 m        | 0.0000 m        | 0.0000 m        | 0.0000 m        |
| Datum     | WGS84 V          | WGS84 V         | WGS84 T         | WGS84 V         | WGS84 •         |

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

Click '**OK**' to apply the new settings

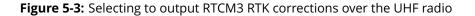
## Step 2: Configure output of differential corrections

#### Selecting the correction format and connection type

Output of differential corrections can be configured in the **Corrections Output** window as Figure 5-3 shows. Click on **New RTCM3 output** to start the sequence of configuration steps. The messages needed for RTK are selected by default.

RTCMv3 is the most compact and robust correction format. It is recommended to use this format wherever possible.

| Data Stream    | ns                           |                                   |               |                              |                        | New RTCMv3 Outp    | out  |
|----------------|------------------------------|-----------------------------------|---------------|------------------------------|------------------------|--------------------|--|
|                |                              |                                   |               |                              |                        | Select messages to | o output:  |
| 3655           |                              |                                   |               |                              |                        | B MSM1             |  |
|                |                              |                                   |               |                              |                        | B MSM2             |  |
|                |                              |                                   |               | 1v3 Output                   |                        | B MSM3             |  |
| Differential   | Corrections Output           |                                   |               | ivs Output                   |                        | B MSM4             |  |
| There is cur   | rently no corrections output | defined.                          | Select con    | nection type:                |                        | B MSM5             |  |
|                | M2 output 😲 New RTCM3 o      |                                   | ○ Serial p    | ort                          |                        | B MSM6             |  |
|                | The Rev Richs                |                                   | OUSB po       |                              |                        | B MSM7             |  |
| — ■ Advanced : | Settings-                    | _                                 | OBluetoc      |                              |                        | RTCM1001           |  |
|                |                              |                                   | OUHF rad      | dio                          |                        | RTCM1002           |  |
| Ok             |                              |                                   | ONTRIP        | server                       |                        | RTCM1003           |  |
|                |                              |                                   | ○ IP serve    | er                           |                        | RTCM1004           |  |
|                |                              |                                   |               | ve (2-way)                   |                        | RTCM1005           |  |
|                |                              |                                   | O IP conr     | ection                       |                        | RTCM1006           | Image: A start and a start |
|                |                              |                                   | Back          | Next Finish                  | Cancel                 | RTCM1007           |  |
|                |                              |                                   | L Dack        | INEAL THISH                  | Cancer                 | It is not recom    | mended to enable MSM   |
|                |                              | Differential Correct              | tions Output- |                              |                        | iges toge          | ther with messages   |
|                |                              |                                   |               |                              |                        | -1004 an           | nd 1009—1012.  |
|                |                              | Port Description     UHF1 UHF Rac | lio RTCMv3    | Messages<br>1074, 1084, 1094 | , 1124, 1006, 1033, 12 | 30 🖹 🗙 Next        | Finish Cancel  |
|                | •                            | New RTCM2 ou                      | tput 🛟 New F  | RTCM3 output 🛟               | New CMR2 output        |                    |  |
|                | -9                           | Advanced Setting                  | js—           |                              |                        |                    |  |
|                |                              |                                   |               |                              |                        |                    |  |



# Step 3: Configuring the UHF radio

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1

The UHF radio can be configured in the '**UHF**' window. In the example show in Figure 5-4, the radio will transmit at a frequency of 410 MHz, channel spacing of 12.5 kHz and at a power of 100 mW<sup>1</sup>. The transmission protocol and error method can also be selected on this page as shown.

The frequency and bandwidth are configured via the **Advanced Settings** menu. Note that, the baud rate of the connection depends on the **Protocol** and **Bandwidth** settings as given in Appendix 9.2.

| UHF / DiffCorr  |           |             |
|---|-----------|-------------|
| UHF disabled  |           |             |
| UHF Modem Mode  | Status-   |             |
| Power Mode  | Status    | Powered off |
| UHF1 on V Transmitter V   | Bandwidth | N/A         |
| UHF Receiver Configuration  | Frequency | N/A         |
| Rx channel Forced bandwidth Forced frequency                                | Error     | No error    |
| UHF1 Ch01 ~ 25kHz ~ 410.0000 MHz  |           |             |
| UHF Transmitter Configuration<br>Tx channel Tx power<br>UHF1 Ch01 V 100mW V |           |             |
| UHF Protocol and Modulation   |           |             |
| ProtocolRadio link rate FECUHF1TRIMTALK450S ~ auto~ on ~                    |           |             |
| — ■ Advanced Settings —   |           |             |
| Default Ok<br>Press "OK" to apply the changes.                              |           |             |

Figure 5-4: Configuring the UHF radio

Please note that, depending on your location, you may be prohibited from transmitting on certain frequencies or at certain power levels.

# Step 4: Verifying the configuration

If the UHF radio has been correctly configured, the transmission line in the top-panel should change to green as shown in Figure 5-5. The format of the corrections stream should also be correctly identified along with the data rate.

| Transmitter (410 MHz)   | RTCMv3 (0.51kB/s)   |
|---|---------------------|
| UHF Modem Mode  | CStatus-            |
| Power Mode  | Status Transmitte   |
| UHF1 on Transmitter   | Bandwidth 12.5 kHz  |
| Offi I on Pransmitter P                                       | Balluwiddi 12.3 KHZ |
|   | Frequency 410 MHz   |
| UHF Receiver Configuration Rx channel Forced bandwidth Forced | Frequency 410 MHz   |

Figure 5-5: The UHF radio configured to transmit RTCMv3 diff corr at 410 MHz



# 5.2 Configuring the AsteRx-U3 Marine NTRIP Caster

The AsteRx-U3 Marine includes a built-in NTRIP Caster that makes correction data from the AsteRx-U3 Marine 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.

All settings relating to the AsteRx-U3 Marine NTRIP Caster can be configured in the **NTRIP Caster** window from the **Communication** menu.

#### Step 1: Define a new mount point

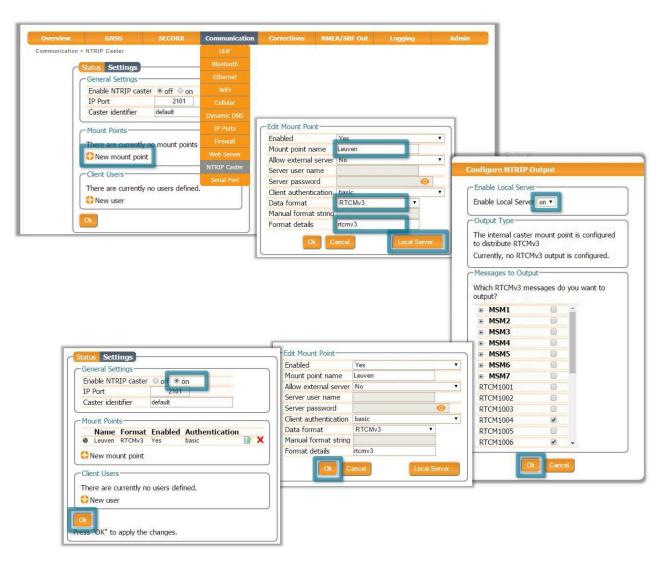


Figure 5-6: The configuration sequence for defining a new mount point

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 **Click mount point** as indicated in Figure 5-6. Select **'Yes'** to enable the mount point and give it a name. This is the name that will appear in the caster source table. Up to 3 mount points can be defined each with a different name. You can also select the type of **Client authentication** for the mount point: **none** - any client can connect without logging in or, **basic** - clients have to login with a username and password.

To select a correction stream from the NTRIP server of the AsteRx-U3 Marine, select 'No' in the 'Allow external server' field<sup>2</sup>.

Click on the '**Local Server** ...' button to enable the local NTRIP server of the AsteRx-U3 Marine 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 5-7. 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.

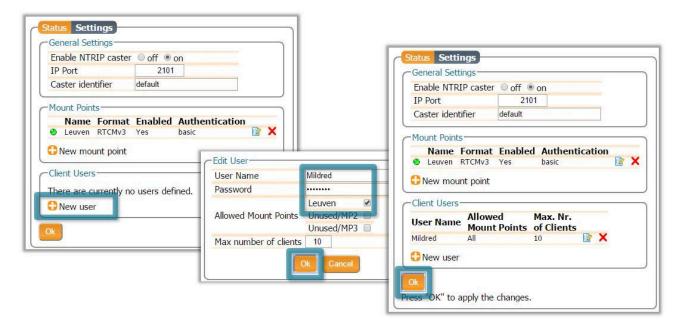


Figure 5-7: Configuring the login credentials for a user

### Step 3: Is the NTRIP Caster working?

2

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 5-8, a rover client is connected to the mount point named **Leuven** as user **Mildred**.

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 5-9), then their position will also be visible.

| Mountpoint                   | Server<br>Connected | Connect<br>Time | Rate    | Clients   |
|------------------------------|---------------------|-----------------|---------|-----------|
| Leuven                       | Yes                 | 6m24s           | 464 Bps | 5 1       |
|                              |                     |                 |         |           |
| Connected Clie               |                     | nort            |         |           |
| Connected Clie<br>Mountpoint | User Con            | nect<br>ne Lati | tude l  | Longitude |

Figure 5-8: Connecting as a client to the AsteRx-U3 Marine 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 5-9. 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.

| •                     |                 |           |                       |
|-----------------------|-----------------|-----------|-----------------------|
| (N) -                 | [               | In:RTCMv3 |                       |
|                       |                 | dir.      | 192.168.110.119: Leuv |
| Edit NTRIP Connection | n               |           |                       |
| Mode                  | Client          | •         |                       |
| Caster                | 192.168.110.119 | 203       |                       |
| Port                  | 2101            |           |                       |
| User name             | Mildred         |           |                       |
| Password              |                 |           |                       |
| Mount point           | Leuven          | •         |                       |
|                       | Details         |           |                       |
| Send GGA to caster    | 10 sec          |           |                       |

Figure 5-9: Connecting as a client to the AsteRx-U3 Marine 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 AsteRx-U3 Marine'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.



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The icons to the right of the information bar show that, in this example, the position of the receiver is fixed, the overall performance (signal quality and CPU) is Excellent (5 out of 5 bars) and the receiver is logging to the internal disk. The Corrections icon indicates that differential corrections are being sent out to a rover receiver. The active UHF and WiFi icons show that the on-board UHF and WiFi modems are turned on.

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

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

5 The **UHF/DiffCorr** field shows the differential correction format being transmitted or received via the UHF radio.

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

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 AsteRx-U3 Marine 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 interference.

#### 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.

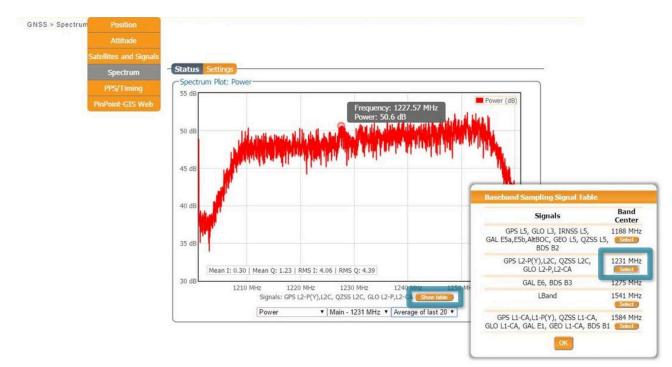


Figure 6-2: The RF spectrum of the L2 Band

# 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 centre frequency and a bandwidth which is effectively blanked by the notch filter.

| -Notch Filters                                   |             |      |              |              |
|--|-------------|------|--------------|--------------|
|  | Notch1      |      | Notch2       | Notch3       |
| Mode   | manual      | • au | ito 🔹        | auto 🔹       |
| Center frequency                                 | 1235.000 MH | z    | 1100.000 MHz | 1100.000 MHz |
| Double-sided bandwidth                           | 80 kHz      |      | 30 kHz       | 30 kHz       |
| Wideband Interference M<br>Enable WBI mitigation |             |      |              |              |
| Default Ok<br>Press "OK" to apply the cha        | nges.       |      |              |              |

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.

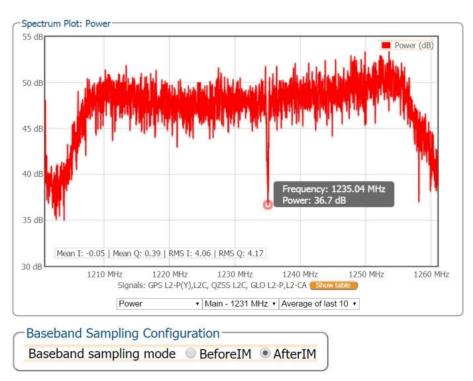


Figure 6-4: The RF spectrum of the L2 Band after applying the notch filter at 1235 MHz

# 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 AsteRx-U3 Marine can reduce the effect of both types of interference on GNSS signals.

### Configuring WBI mitigation

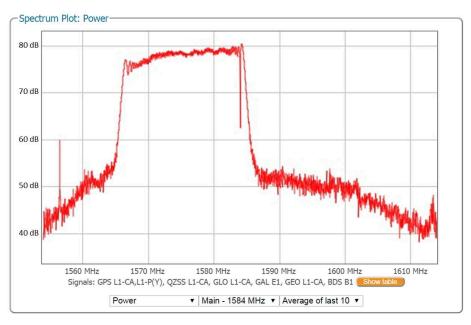
The wideband interference mitigation system (WBI) can be enabled by selecting 'on' as shown in Figure 6-5.

|   | 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 Mi                         | itigation —  |              |              |
| Wideband Interference Mi<br>Enable WBI mitigation |              |              |              |

**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.

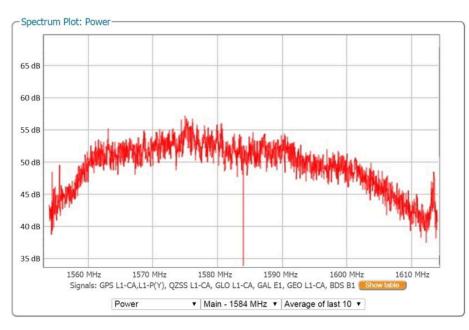


**Figure 6-6:** Simulated wideband interference in the GPS L1 band using an in-car chirp jammer.

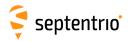


When WBI mitigation is enabled, the effect of the interference is dramatically reduced to the extent that, the small signal bump at the GPS L1 central frequency of 1575 MHz is clearly visible as Figure 6-7 shows.

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 AsteRx-U3 Marine 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 **C** 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.

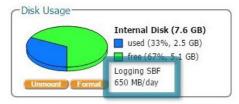
| <br>sions |   |                                 |                    |          |                                     |
|-----------|---|---------------------------------|--------------------|----------|-------------------------------------|
| A Usage   | B)<br>D-Delete Disk U<br>CEdit Session L( | SBF VMEA<br>ne Test<br>Internal | -Stream<br>There a | SBF NMEA | 1 sec<br>ess 2<br>eas3) 2<br>retion |

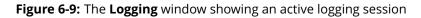
Figure 6-8: Click on 🛟 New SBF stream and select Support

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

When data logging has been correctly configured, the **Logging** window will show the newly defined session as active as indicated in Figure 6-9.







## Step 2: Downloading the logged SBF file

To download a data file logged on the AsteRx-U3 Marine, click the download icon **O** next to the file name on the **Disk Contents** tab as shown in Figure 6-10

|                       | Internal Disk (14.5 GB) Used (55%, 8.0 GB) Free (45%, 6.5 GB) Logging SBF |  |  |  |  |
|-----------------------|---|--|--|--|--|
| Unmount Form          | 1.6 GB/day [uncompressed]   |  |  |  |  |
|                       | )   |  |  |  |  |
| Name                  | Size  |  |  |  |  |
| Name<br>Internal Disk | (14.5 GB) 8.0 GB  |  |  |  |  |
| lame<br>Internal Disk | (14.5 GB) 8.0 GB  |  |  |  |  |
| Name<br>Internal Disk | (14.5 GB) 8.0 GB  |  |  |  |  |
| Name<br>Internal Disk | (14.5 GB) 8.0 GB  |  |  |  |  |
| LOG1_Sup 22117        | k (14.5 GB) 8.0 GB<br>poport X<br>X                                       |  |  |  |  |

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



ſ

# 6.5 Activity logging

The AsteRx-U3 Marine 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.

| Overview | GNSS   | SECORX         | Communication                          | Corrections     | NMEA/SBF Out      | Logging        | Admin             |  |
|----------|--|----------------|--|-----------------|-------------------|----------------|-------------------|--|
|          | -  |                |  |                 |                   |                | Configurations    |  |
| (        | Receiver Messages  |                | Second Second Second Second            |                 |                   |                | Reset             |  |
|          |  |                | ount : Success on<br>ount : Success on |                 |                   |                | Upgrade           |  |
|          | [3:Thu 2016-02-25 14:45:25] LOG1 SBF:[16056/SEPT056o30.16_ => sarah@pc60devlin200:21 (data)]   |                |  |                 |                   |                |                   |  |
|          | <pre>[4:Thu 2016-02-25 15:00:28] LOG1 SBF:[16056/SEPT056o45.16_ =&gt; sarah@pc60devlin200:21 (data)]<br/>[5:Thu 2016-02-25 15:15:26] LOG1 SBF:[16056/SEPT056p00.16_ =&gt; sarah@pc60devlin200:21 (data)]</pre> |                |  | Expert Control  |                   |                |                   |  |
|          | [6:Thu 2016-02-  | 25 15:30:31] L | OG1 SBF:[16056/SEF                     | PT056p15.16_ => | sarah@pc60devlin2 | 200:21 (data)] | Receiver Messages |  |
|          |  |                |  |                 |                   |                | About             |  |
|          |  |                |  |                 |                   |                |                   |  |
|          |  |                | Clear                                  | Freeze          |                   |                |                   |  |

Figure 6-11: Events reported by the AsteRx-U3 Marine in the Receiver Messages window

# 7 Receiver Administration Operations

# 7.1 How to change IP settings of the AsteRx-U3 Marine

The IP settings of the AsteRx-U3 Marine can be configured in the **Ethernet** window of the Web Interface. By default, the AsteRx-U3 Marine 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.

| Overview      | GN          | SS Marinestar      | Communication | Corrections | NMEA/SBF Out                                 | Logging | Admin |
|---------------|-------------|--------------------|---------------|-------------|--|---------|-------|
| Communication | > Ethernet  |                    | Bluetooth     |             |  |         |       |
| -1            | Ethernet —  |                    | Ethernet      |             |  |         |       |
| ſ             | ulemet      |                    | WiFi          |             |  |         |       |
|               |             |                    | Cellular      |             |  |         |       |
|               | 65          | -                  | Dynamic DNS   |             |  |         |       |
|               |             |                    | IP Ports      |             |  |         |       |
|               |             |                    |               |             | ]  |         |       |
| C             | Ethernet In | terface Mode       | Firewall      | tatus       |  |         |       |
|               | Power Oc    |                    | NTRIP Caster  |             |  |         |       |
| C             |             |                    | Serial Port   |             |  |         |       |
|               | TCP/IP Sett |                    | Netmask       |             |  |         |       |
|               | Mode        | DHCP      Static   |               |             |  |         |       |
|               | IP address  | 192.168.111.62     | Gateway       |             |  |         |       |
|               | Netmask     | 255.255.252.0      | MAC Addres    | S           |  |         |       |
|               | Gateway     | 192.168.108.1      |               |             |  |         |       |
|               | Domain      | septentrio.local   |               |             |  |         |       |
|               | DNS1        | 192.168.100.96     |               |             |  |         |       |
|               | DNS2        | 192.168.100.88     | 1             | ·           |  |         |       |
| C             |             |                    | ,<br>,        | TCP/IP Set  | ttings                                       |         |       |
|               | efault O    | apply the changes. |               | Changing TC | CP/IP settings may c<br>o the receiver to be | lost!   |       |
|               |             |                    |               |             | Proceed                                      | Cel     |       |

**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.

| IP Address  | 192.168.111.62    |
|-------------|-------------------|
| Hostname    |                   |
| Netmask     | 255.255.252.0     |
| Gateway     | 192.168.108.1     |
| MAC Address | 00:50:C2:36:39:4F |

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 AsteRx-U3 Marine using a hostname.

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

To make use of this feature on the AsteRx-U3 Marine, 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.

| Overview     | GI                        | VSS         | Marinestar       | Communication | Correction     | s NMEA/SBF OI | rt Logging | Admin |
|--------------|---------------------------|-------------|------------------|---------------|----------------|---------------|------------|-------|
| Communicatio | n > Dynamic [             | DNS         |                  | UHF           |                |               |            |       |
| C            | Dynamic DI                | NS          |                  | Bluetooth     | Dynamic DNS S  | tatus         |            |       |
|              | Provider                  | ⊙ off ● d   | lyndns.org 🔍 no- | Ethernet      | Status         | Off           |            |       |
|              | Username                  | ssncom      |                  |               | Error          | No error      |            |       |
|              | Password                  |             | <                | Cellular      | Bound IP addre | ss N/A        |            |       |
|              | Hostname                  | asterxu.min | e.ru             | Dynamic DNS   | 6              |               |            |       |
| L            | Bind                      | Ethernet    |                  | IP Ports      |                |               |            |       |
|              |                           |             | Settings to make | Firewall      |                |               |            |       |
|              |                           | bled to the | required ports.  | NTRIP Caster  |                |               |            |       |
|              | Default C<br>ress "OK" to | apply the o | hanges.          | Serial Port   |                |               |            |       |

Figure 7-3: Configuring Dynamic DNS



i

# 7.3 How to control access using the AsteRx-U3 Marine Firewall

You can control access to the AsteRx-U3 Marine using the receiver's firewall in the **Firewall** window. By default, all Ethernet and WiFi 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. Similarly, all WiFi ports are open but only those from IP 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. In the case of WiFi, firewall settings only apply when the receiver is in WiFi client mode.

| Overview     |                          | GNSS             |      | Marinestar          | Communication | Corrections | NMEA/SBF Out | Logging | Admin |
|--------------|--------------------------|------------------|------|---------------------|---------------|-------------|--------------|---------|-------|
| Communicatio | n > Firewall             |                  |      | -                   | UHF           |             |              |         |       |
| -            | -Firewall S              | ettinas —        |      |                     | Bluetooth     |             |              |         |       |
| [            |                          |                  | rts  | IP port list        | Ethernet      |             |              |         |       |
|              | Ethernet                 | PortList         | •    | 2101 2102 2103      | WIFI          |             |              |         |       |
|              | WiFi                     | all              | ۲    |                     | Cellular      |             |              |         |       |
|              | Cell                     | none             | •    |                     | Dynamic DNS   |             |              |         |       |
|              |                          | . I              |      | (separated by spac  | IP Ports      |             |              |         |       |
|              | Cell defau<br>Other inte |                  |      | t: all ports open   | Firewall      |             |              |         |       |
| L            |                          |                  |      |                     | NTRIP Caster  |             |              |         |       |
| C            | -IP Addres               | s Filtering      | 1    |                     | Serial Port   |             |              |         |       |
|              | Mode                     |                  |      | ◎ off ● on          |               |             |              |         |       |
|              | Allowed I                | P address        | ses  | 84.199.9.148        |               |             |              |         |       |
| l            | _                        |                  |      | (separated by space | es)           |             |              |         |       |
| -            | Default<br>ress "OK"     | ok<br>to apply t | he c | hanges.             |               |             |              |         |       |

Figure 7-4: Configuring the Firewall of the AsteRx-U3 Marine



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

The AsteRx-U3 Marine firmware and permission files both have the extension .suf (Septentrio Upgrade Format) and can be uploaded to the AsteRx-U3 Marine 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 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 AsteRx-U3 Marine 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 .



| ) 🕞 🚽 🕨 Librarie  | s      Documents      My Documents | • FW   | • 4 Search FW             | ٩   |   |
|---|------------------------------------|--|---------------------------|---|---|
| Organize 👻 New fol  | lder                               |  | 8                         | • 🗊 😡   |   |
| ☆ Favorites ■ Desktop   | Documents library<br>FW            |  | Arrange                   | by: Folder 🕶  |   |
| Downloads   | Name                               | Date modified  | Туре                      | Size  |   |
| 强 Recent Places   | AsteRx-U-full-4.1.0.suf            | 9/07/2015 13:31  | Septentrio Upgrade Format | 21.036 KB   |   |
| Cocuments Cocum | name: AsteRx-U-full-4.1.0.suf      | Start upgrade<br>Description: Fu<br>Version: 4.<br>Size: 20<br>Current firmw<br>If you are upgra |                           | Upgrading receiver<br>Please wait while the receiv<br>• resetting receiver to u<br>• uploading SUF file<br>If you are upgradin<br>using its WiFi netw<br>reconnect once this<br>becomes available<br>upgrade.<br>• upgrade complete | er is upgraded.<br>Upgrading receiver<br>Please wait while the receiver is upgraded.<br>• resetting receiver to upgrade mode<br>• uploading SUF file and upgrading<br>If you are upgrading the receiver using its<br>WiFi network, please reconnect once this<br>WiFi network becomes available again after<br>the upgrade.<br>• upgrade complete |

Figure 7-6: The AsteRx-U3 Marine upgrade window

#### Step 2: Verifying the upgrade

If there were no problems with the upgrade the message 'Upgrade successful' will appear. You can then check on the Admin About tab that the AsteRx-U3 Marine firmware or permission file has correctly been updated to the new version as indicated in Figure 7-7.

| Overview      | GNSS               | Fugro     | Marinestar | Communication | Corrections                  | NMEA/SBF Out                                    | Logging   | Admin               |
|---------------|--------------------|-----------|------------|---------------|------------------------------|---|-----------|---------------------|
| Admin > About |                    |           |            |               |                              |   |           | Configurations      |
| C R           | Receiver Identific | ation ——  |            |               |                              |   |           | Reset               |
|               | Component          | Attribute | Descriptio | on            |                              |   |           | Upgrade             |
|               | hwplatform         |           | AsteRx-U3  | MARINE        |                              |   |           | User Administration |
|               | ➡ firmware ➡ files | version   | 4.12.3     |               | sept                         | 30  |           | Expert Control      |
|               | Thes<br>components |           |            |               |                              | itto.   |           | Receiver Messages   |
|               | •                  |           |            |               |                              | 3. 5. 5. 5                                      |           | About               |
|               |                    |           |            |               |                              | 9 9 9 0 C                                       |           |                     |
|               |                    |           |            |               | Cumment De                   |   |           |                     |
|               |                    |           |            |               | <u>Support Pa</u><br>Contact | ge  |           |                     |
|               |                    |           |            |               | <b>Diagnostic</b>            |   |           |                     |
|               |                    |           |            |               | Permitted C<br>Cosmos        | <u>apabilities</u>                              |           |                     |
|               |                    |           |            |               | CPU Load                     |   |           |                     |
|               |                    |           |            |               | <u>License</u>               |   |           |                     |
|               |                    |           |            |               |                              |   |           |                     |
|               |                    |           |            |               | 🤤 G                          | anuriaht @ 2022 Contants                        | io NIV    |                     |
|               |                    |           |            |               |                              | opyright © 2022 Septentr<br>Il rights reserved. | 10 11. V. |                     |
|               |                    |           |            |               |                              |   |           |                     |

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



# 7.5 How to set the AsteRx-U3 Marine to its default configuration

You can set the AsteRx-U3 Marine 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.

| Overview       | GNSS                    | Marinestar | Communic      | ation Correctio   | ns NMEA/SE     | F Out      | Logging | Admin               |
|----------------|-------------------------|------------|---------------|---|----------------|------------|---------|---------------------|
| Admin > Config | urations                |            |               |   |                |            |         | Configurations      |
| -0             | Copy Configuration File |            | -Receiver Con | figurations   |                |            | \[      | Reset               |
|                |                         |            |               | Different from f  | actory default | 00         |         | Upgrade             |
|                | Target Current •        |            | Boot          | Different from f  | •              | _          |         | User Administration |
|                |                         |            | User1         | Equal to factory d  | efault         | $\bigcirc$ |         | Expert Console      |
|                | efault Ok               |            | User2         | Equal to factory d  | efault         | $\bigcirc$ |         | About               |
|                | ss "OK" to apply the c  | hanges.    | conf          | e current<br>iguration to boot<br>iguration.<br>ve Ignore |                |            | ,       |                     |

Figure 7-8: Setting the AsteRx-U3 Marine to the default configuration

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

### 7.6 How to reset the AsteRx-U3 Marine

If the AsteRx-U3 Marine is not operating as expected, a simple reset may resolve matters. Via the Admin > Reset tab as shown in Figure 7-9, different functions can be individually reset. A 'Soft' level reset will cause the AsteRx-U3 Marine to boot up with its current configuration while a 'hard' reset will use the configuration stored in the boot file.

| Overview     | GNSS                           | Marinestar | Communication | Corrections  | NMEA/SBF Out | Logging | Admin              |
|--------------|--------------------------------|------------|---------------|--|--------------|---------|--------------------|
| dmin > Reset |                                |            |               |  |              |         | Configurations     |
| - Pe         | eset Receiver                  |            |               |  |              |         | Reset              |
|              |                                | Soft  Hard |               |  |              |         | Upgrade            |
|              | onfig                          |            |               |  |              |         | User Administratio |
|              | VTData                         |            |               |  |              |         | Expert Console     |
| Sa           | atData                         |            |               |  |              |         | About              |
| Ba           | aseStations                    |            |               |  |              |         | About              |
| BI           | luetooth                       |            |               |  |              |         |                    |
| W            | /iFiAccessPoints               |            |               |  |              | )       |                    |
|              |                                |            | Reset Confi   | rmation  |              |         |                    |
|              | fault Ok<br>s "OK" to apply th | e changes. |               | you want to reset<br>result in the loss c<br>iver. |              |         |                    |
|              |                                |            |               | Reset  | bel          |         |                    |

Figure 7-9: Resetting the AsteRx-U3 Marine configuration to its boot configuration



A 'Hard' reset can also be triggered by pressing the reset button on the front panel of the receiver for more than 3 seconds.



Figure 7-10: Front pannel button for resetting the AsteRx-U3 Marine



# 7.7 How to copy the configuration from one receiver to another

In the Admin > Configurations tab, the configuration of an AsteRx-U3 Marine can be easily saved to a PC as a text file. A saved configuration can also be uploaded to an AsteRx-U3 Marine.

#### Step 1: Downloading the configuration from an AsteRx-U3 Marine

Click the green download arrow next the configuration you wish to download as shown in Figure 7-11. The configuration will be saved as a .txt file in the same downloads location used by the internet browser.

| Overview       | GNSS                  | Marinestar | Communic                      | ation Corrections      | NMEA/SBF 0   | ut         | Logging | Admin               |
|----------------|-----------------------|------------|-------------------------------|------------------------|--------------|------------|---------|---------------------|
| Admin > Config | urations              |            |                               |                        |              |            |         | Configurations      |
| -(             | Copy Configuration F  |            | Receiver Con                  | figurations            |              |            |         | Reset               |
|                | Source RxDefault •    |            | and the set of the set of the | Different from facto   | ny default 🚺 |            |         | Upgrade             |
| -              | Target Current •      | I   I H    | Boot                          | Different from facto   |              | <b>D</b>   |         | User Administration |
| <u> </u>       |                       |            | User1                         | Equal to factory defau | lt           | 0          |         | Expert Console      |
|                | efault Ok             |            | User2                         | Equal to factory defau | lt           | $\bigcirc$ |         | About               |
|                | ess "OK" to apply the | changes.   |                               |                        |              |            |         |                     |

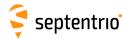
Figure 7-11: Downloading a configuration from an AsteRx-U3 Marine

# Step 2: Uploading the configuration to a second AsteRx-U3 Marine

Click on the blue upload arrow, as indicated in Figure 7-12, to upload a configuration file stored on you PC. In this example, the saved file will be uploaded as the Boot configuration.

| Overview         | GNSS               | Marinestar | Communicatio      | on Corrections        | NMEA/SBF Out   | Logging | Admin               |
|------------------|--------------------|------------|-------------------|-----------------------|----------------|---------|---------------------|
| Admin > Configur | ations             |            |                   |                       |                |         | Configurations      |
| ~ [0             | py Configuration I | Files      | -Receiver Configu | urations              |                | _       | Reset               |
|                  |                    |            |                   | fferent from facto    | rv default 🚺 🙆 | L       | Upgrade             |
|                  | arget Current •    |            |                   | fferent from facto    |                | 1       | User Administration |
|                  |                    |            | User1 Eq          | ual to factory defaul | t 🔽            |         | Expert Console      |
| Def              | ault Ok            |            | User2 Eq          | ual to factory defaul | t 🚺 🚺          |         | About               |
|                  | "OK" to apply the  | e changes. |                   |                       |                |         |                     |

Figure 7-12: Uploading a configuration to an AsteRx-U3 Marine



Select the configuration file to be uploaded then click on OK on the status pop-up as shown in Figure 7-13.

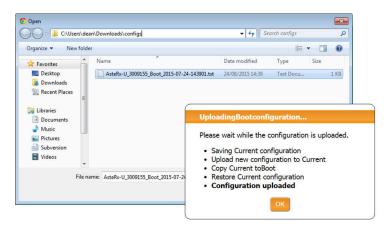


Figure 7-13: Select the configuration file to upload



# 8 Security

### 8.1 Default access to the AsteRx-U3 Marine

You can manage the access that users have to the AsteRx-U3 Marine 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.

| Overview      | GNS  | 5 Fugro  | Marinestar  | Con                          | munication | Corrections | NMEA/SBF Out | Logging | Admin            |
|---------------|--|--|---|------------------------------|------------|-------------|--------------|---------|------------------|
| min > User Ad | dministration  |  |   |                              |            |             |              |         | Configurations   |
|               | Jsers  |  |   |                              | _          |             |              |         | Reset            |
| _             |  | Access Level   | SSH Kev   |                              | - ]        |             |              |         | Upgrade          |
|               |  | User   | No  |                              |            |             |              |         | User Administrat |
| S             | upport_user  | User   | No  |                              |            |             |              |         | Expert Contro    |
| 6             | New user   |  |   |                              |            |             |              |         | Receiver Messac  |
|               |  |  |   |                              |            |             |              |         |                  |
| <u> </u>      | Default Acces  | c Loval Dar Inte   | orface  |                              |            |             |              |         | About            |
|               |  | S Level Fel Ind  | enace   |                              |            |             |              |         |                  |
|               | Web  |  | Viewer Ol   | Jser                         |            |             |              |         |                  |
|               |  | 🔿 none 💿   |   |                              |            |             |              |         |                  |
| F             | Web  | ○ none ● ○ none ●  | Viewer Ol   | Jser                         |            |             |              |         |                  |
|               | Web<br>File Transfer                                       | ○ none ● ○ none ●  | Viewer OL<br>Viewer OL<br>Viewer OL                           | Jser<br>Jser                 |            |             |              |         |                  |
|               | Web<br>File Transfer<br>IP ports                           | <ul> <li>○ none</li> <li>○ none</li> <li>○ none</li> <li>●</li> </ul>            | Viewer OL<br>Viewer OL<br>Viewer OL                           | Jser<br>Jser<br>Jser         |            |             |              |         |                  |
|               | Web<br>File Transfer<br>IP ports<br>COM ports<br>USB ports | <ul> <li>none</li> <li>none</li> <li>none</li> <li>none</li> <li>none</li> </ul> | Viewer OL<br>Viewer OL<br>Viewer OL<br>Viewer OL<br>Viewer OL | Jser<br>Jser<br>Jser<br>Jser |            |             |              |         |                  |

Figure 8-1: The default access levels of the AsteRx-U3 Marine

# 8.2 Defining user access to the AsteRx-U3 Marine

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.



| New user | Edit User        |           |  |
|----------|------------------|-----------|--|
|          | User name        | George    |  |
|          | Password         | ••••••    | CUsers   |
|          | User access leve | User      | User Name Access Level SSH Key   |
|          | SSH Key          |           | George User No 📝 🕽   |
|          |                  | Ok Cancel | ONEW user     Users edited, press "OK" to apply the changes  |
|          |                  | UK        |  |
|          |                  | CALCA     | Users edited, press "OK" to apply the changes  |
|          |                  | Calles    | Users edited, press "OK" to apply the changes  |
|          |                  | UN Uditue | Users edited, press "OK" to apply the changes Default Access Level Per Interface Web Onone OViewer OUser   |
|          |                  | UN Uditud | Users edited, press "OK" to apply the changes  Default Access Level Per Interface  Web  none Viewer User Disk  None Viewer User  |
|          |                  | ON CONCE  | Users edited, press "OK" to apply the changes  Default Access Level Per Interface  Web  none Viewer User Disk  none Viewer User IP ports  none Viewer User Viewer Viewer User Viewer Vie |

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

| User Name               | Access Le  | vel SSH  | Key  |   |
|-------------------------|--|--|--|---|
| George                  | User   | No   |  | × |
| Mildred                 | Viewer   | No   |  | × |
| 🕄 New user              |  |  |  |   |
|                         |  |  |  |   |
| Default Acces           |  |  |  | ١ |
| Web                     | none   | Viewer   | User   |   |
|                         | none   |  | User   |   |
| Web                     | <ul><li>none</li><li>none</li></ul>              | Viewer   | <ul><li>User</li><li>User</li></ul>  |   |
| Web<br>Disk<br>IP ports | <ul><li>none</li><li>none</li></ul>              | <ul> <li>Viewer</li> <li>Viewer</li> <li>Viewer</li> </ul>                 | <ul><li>User</li><li>User</li><li>User</li></ul>                                 |   |
| Web<br>Disk<br>IP ports | <ul><li>none</li><li>none</li><li>none</li></ul> | <ul> <li>Viewer</li> <li>Viewer</li> <li>Viewer</li> <li>Viewer</li> </ul> | <ul> <li>User</li> <li>User</li> <li>User</li> <li>User</li> <li>User</li> </ul> |   |

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.

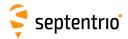
| septentric | )<br>D°    | AsteRx-U3 | Receiver<br>MARINE S/N 32<br>: 192.168.50.91<br>Id 23:55:21 |   | Position<br>Lat: N50°50'55.6529<br>Lon: E4°43'55.6529<br>Hgt: 128.591m | 08" 0.016m | Pitch:    | Status<br>9: 25.352°<br>-0.190°<br>Sats: 57 | 0.109°<br>0.260° | •1) 🔇 🗄 🗐              | PPP<br>Overall Quality<br>Cellular<br>UHF<br>Wifi<br>Spectrum clear | 5 F | ttitude fix (2D)<br>ugro Marinestar<br>orrections<br>ogging<br>luetooth<br>oE | Log in |
|------------|------------|-----------|---|---|--|------------|-----------|---|------------------|------------------------|---|-----|---|--------|
| Overview   | G          |           |   |   | Communica  | ition      | Corroctio | ne I  | MEA/CR           | 5 Qut                  | Loggi   |     |   |        |
| Qu         | Uality Ind | M.        | ain RF<br>power<br>1 8/10                                   | U | Jser Name  |            |           |   | E                | Dist-<br>sing<br>10/10 |   |     |   |        |

Figure 8-4: Logging in to the AsteRx-U3 Marine 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 AsteRx-U3 Marine. 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.



| e Key Conversions                               | Help  |                             |                       |    |
|---|---|-----------------------------|-----------------------|----|
| Key   |   |                             |                       |    |
| Public key for pasting                          | into OpenSSH authorized_                      | keys file:                  |                       |    |
| ecdsa-sha2-nistp521                             |   |                             |                       | *  |
|   | YTItbmlzdHA1MjEAAAAlb<br>WBh2HijAQutBZ86F1Za5 |                             |                       |    |
| 15AAL2EsHNVysLhX                                | YVRmDzA9WyAqUjgqO0q                           | Z4pflmbHxWJJ95zFu           | The salewearen        |    |
| +Z1IUxR7VXb8AgffH/                              | /AwyDemiKuhTC77kgadW.                         | A== ecdsa-key-20161027      |                       | Ŧ  |
| Key fingerprint                                 | ecdsa-sha2-nistp521 52                        | 1 2f.49:b5:96:b2:8e:8c:be:5 | 53:61:ec:0e:64:ad:2b: | 12 |
| Key comment                                     | Key comment ecdsa-key-20161027                |                             |                       |    |
| . –   |   |                             |                       |    |
| Key p <u>a</u> ssphrase:                        | •••••   |                             |                       |    |
| Confirm passphrase:                             | •••••   |                             |                       |    |
| Actions   |   |                             |                       |    |
| Generate a public/priv                          | ate kev pair                                  | 1                           | Generate              | _  |
|   |   |                             |                       | -  |
|   | te key file                                   |                             | Load                  |    |
| Load an existing priva                          |   |                             |                       |    |
| Load an existing priva<br>Save the generated ke | эу  | Save p <u>u</u> blic key    | Save private key      |    |
|   | эу  | Save p <u>u</u> blic key    | Save private key      |    |
| Save the generated ke                           | *** **********************************        |                             | SSH-1 (RSA            |    |

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 AsteRx-U3 Marine Web Interface as shown in Figure 8-6.

| User name         | George                 |   |
|-------------------|------------------------|---|
| Password          | •••••                  | 0 |
| User access level | User                   |   |
| SSH Key           | AAAAE2VjZHNhLXNoYTItbn |   |

Figure 8-6: Using an SSH Key

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

### 8.4 HTTP/HTTPS

A

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 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.



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| Overview                                 | GNSS                           | Fugro Marinestar | Communication | Corrections | NMEA/SBF Out | Logging | Admin |
|--|--------------------------------|------------------|---------------|-------------|--------------|---------|-------|
| Communication >                          | Communication > Web Server/TLS |                  |               |             |              |         |       |
| - <mark>5</mark>                         | ettings Certific               | ate              |               |             |              |         |       |
| Select *.pem certificate file to upload: |                                |                  |               |             |              |         |       |
|  | hoose File No file             | chosen           |               |             |              |         |       |
|  | Jpload Certificate             |                  |               |             |              |         |       |

Figure 8-7: Uploading a certificate to the receiver



# 9 Appendix

# 9.1 Rear-panel port descriptions

### 9.1.1 PWR



**Figure 9-1:** 4-pin female socket pin-numbering guide as viewed end on. Start counting at pin indicated by bold semi-circle and follow the line in an anti-clockwise direction. This socket can be paired with a LEMO multipole male connector of type 0B.

| PIN # | Name     | Comment   |
|-------|----------|---|
| 1     | Power_IN | power input, 9 to 36 VDC. Single power input with |
| 2     | Power_IN | PINs 1 and 2 shorted together internally.         |
| 3     | Ground   |   |
| 4     | Ground   |   |

### 9.1.2 **PPS/GPO**



**Figure 9-2:** 5-pin female socket pin-numbering guide as viewed end on. Start counting at pin indicated by bold semi-circle and follow the line in an anti-clockwise direction. This socket can be paired with a LEMO multipole male connector of type 0B.

| PIN # | Name   | Comment   |
|-------|--------|---|
| 1     | Ground |   |
| 2     | PPS    | 5V, Zout = 50 $\Omega$ , 50mA. The pulse duration is 1.2ms. |
| 3     | Ground |   |
| 4     | GPO    | reserved  |
| 5     | Ground |   |

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### 9.1.3 Event/GP1



**Figure 9-3:** 7-pin female socket pin-numbering guide as viewed end on. Start counting at pin indicated by bold semi-circle and follow the line in an anti-clockwise direction. This socket can be paired with a LEMO multipole male connector of type OB.

| PIN # | Name    | Comment   |
|-------|---------|---|
| 1     | GPI 1   | reserved  |
| 2     | Event A | First EVENT input   |
| Ζ     | EventA  | (Max. V $_{IL}$ = 1V, Min. V $_{IH}$ = 2V, Max. V $_{IH}$ = 24V, 15 K $\Omega$ pull-down) |
| 3     | Event B | Second EVENT input  |
| 5     | LVEIILD | (Max. V $_{IL}$ = 1V, Min. V $_{IH}$ = 2V, Max. V $_{IH}$ = 24V, 15 K $\Omega$ pull-down) |
| 4     | Ground  |   |
| 5     | nRST_IN | Reset signal 3.3V-LVTTL, 5V TTL input. System is reset if the line                        |
| 5     |         | is pulled low (<0.6 V)  |
| 6     | GPI 2   | reserved  |
| 7     | Ground  |   |

### 9.1.4 COM2



**Figure 9-4:** 9-pin female socket pin-numbering guide as viewed end on. Start counting at pin indicated by bold semi-circle and follow the line in an anti-clockwise direction. This socket can be paired with a LEMO multipole male connector of type OB.

| PIN # | Name          | Comment                             |
|-------|---------------|-------------------------------------|
| 1     | RTS2          | Serial COM 2 RTS line               |
| 2     | Ground        |                                     |
| 3     | 5V output     | 5V DC output (500 mA max.)          |
| 4     | RS232         | reserved for future RS422 selection |
| 5     | Not connected |                                     |
| 6     | Rx2           | Serial COM 2 receive line           |
| 7     | Tx2           | Serial COM 2 transmit line          |
| 8     | CTS2          | Serial COM 2 CTS line               |
| 9     | Ground        |                                     |



### 9.1.5 COM1/COM3/Host USB



**Figure 9-5:** 14-pin female socket pin-numbering guide as viewed end on. Start counting at pin indicated by bold semi-circle and follow the line in an anti-clockwise direction. This socket can be paired with a LEMO multipole male connector of type 1B.

The USB Host feature will only become fully functional in later firmware versions.

| PIN # | Name          | Comment                    |
|-------|---------------|----------------------------|
| 1     | USBH_VB       | reserved                   |
| 2     | USBH_DP       | reserved                   |
| 3     | USBH_DM       | reserved                   |
| 4     | not connected |                            |
| 5     | Tx3           | Serial COM 3 transmit line |
| 6     | Rx3           | Serial COM 3 receive line  |
| 7     | not connected |                            |
| 8     | Rx1           | Serial COM 1 receive line  |
| 9     | not connected |                            |
| 10    | Tx1           | Serial COM 1 transmit line |
| 11    | Ground        |                            |
| 12    | not connected |                            |
| 13    | not connected |                            |
| 14    | Ground        |                            |
|       |               |                            |



### 9.1.6 Ethernet/USB



**Figure 9-6:** 16-pin female socket pin-numbering guide as viewed end on. Start counting at pin indicated by bold semi-circle and follow the line in an anti-clockwise direction. This socket can be paired with a LEMO multipole male connector of type 1B.

| PIN # | Name          | Comment  |
|-------|---------------|--|
| 1     | Ground        |  |
| 2     | RXP           | Ethernet 10/100 RX+                              |
| 3     | RXN           | Ethernet 10/100 RX-                              |
| 4     | TXP           | Ethernet 10/100 TX+                              |
| 5     | TXN           | Ethernet 10/100 TX-                              |
| 6     | USB_DP        | USB 2.0 data signal positive D+                  |
| 7     | USB_DM        | USB 2.0 data signal positive D-                  |
| 8     | USB_VBUS      | USB Power. Cannot be used to power the receiver. |
| 9     | CAN high      |  |
| 10    | CAN low       |  |
| 11    | not connected |  |
| 12    | Ground        |  |
| 13    | Ground        |  |
| 14    | Ground        |  |
| 15    | Ground        |  |
| 16    | Ground        |  |



# 9.2 UHF radio baud rates

The receiver automatically adapts the baud rate according to the UHF channel bandwidth (12.5 or 25 kHz). The parameters associated with the different protocols are given in the table below.

6

When sending correction data for multiple constellations and frequencies at rates of 1 Hz and greater, the lowest baud rate configurations (9600 and 4800 baud) may not be sufficient and you should select a protocol/bandwidth combination for 19200 baud. For diff corr rates of 0.5 Hz and less, a 9600 baud setting is sufficient.

| Protocol       | Modulation | Forward<br>Error<br>Correction | Default baud<br>rate 12.5kHz | Default baud<br>rate 25kHz |
|----------------|------------|--------------------------------|------------------------------|----------------------------|
| PCCGMSK        | GMSK       | always on                      | 4800 bps                     | 9600 bps                   |
| PCC4FSK        | 4FSK       | always on                      | 9600 bps                     | 19200 bps                  |
| PCCFST         | 4FSK       | always on                      | 9600 bps                     | 19200 bps                  |
| SATEL          | 4FSK       | configurable                   | 9600 bps                     | 19200 bps                  |
| TRIMTALK450S_P | GMSK       | always on                      | 4800 bps                     | 9600 bps                   |
| TRIMTALK450S_T | GMSK       | always on                      | 4800 bps                     | 9600 bps                   |