COBHAM SATCOM

# SAILOR XTR GX-R2

## Installation manual

# SAILOR XTR GX-R2
# Quick guide

## Installation wizard

This quick guide is for experienced service personnel who have installed the SAILOR XTR GX-R2 system before. It lists the minimum configuration tasks you have to make before the system can be used on-air on a satellite.

1. Connect a PC to the front LAN connector of the Below Deck Unit (BDU).
2. Open an Internet Browser and type the default IP address of the SAILOR XTR GX-R2 system: https://192.168.0.1.
3. Bypass the admin password by pressing the left arrow key on the BDU for 5 seconds.
4. After opening the web interface for the first time after power up you can step through the installation wizard.
5. Enter the necessary data on each page and click **Next.**
6. On the last screen click **Finish** to activate the VSAT profile.

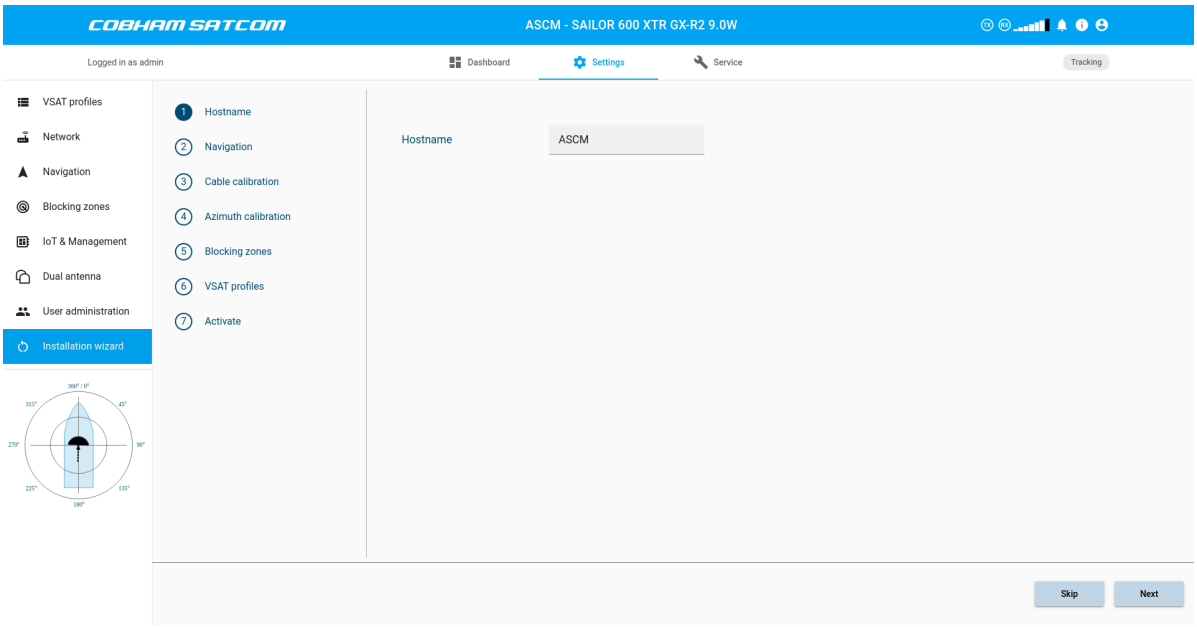


Figure 0.1: Installation wizard.

For more detailed information about the setup tasks see chapter 3, *Setup of the Antenna*.

# SAILOR XTR GX-R2
# Installation manual

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# Safety Summary

The following general safety precautions must be observed during all phases of operation, service and repair of this equipment. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture and intended use of the equipment. Thrane & Thrane A/S assumes no liability for the customer's failure to comply with these requirements.

**Microwave Radiation Hazards**

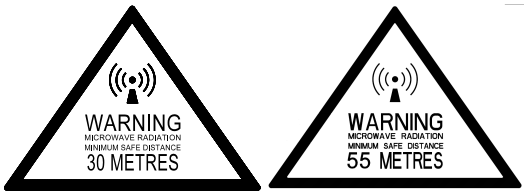
During transmission the Above Deck Unit (antenna) in this system radiates Microwave Power. This radiation may be hazardous to humans close to the Above Deck Unit. During transmission, make sure that nobody gets closer than the recommended minimum safety distance.

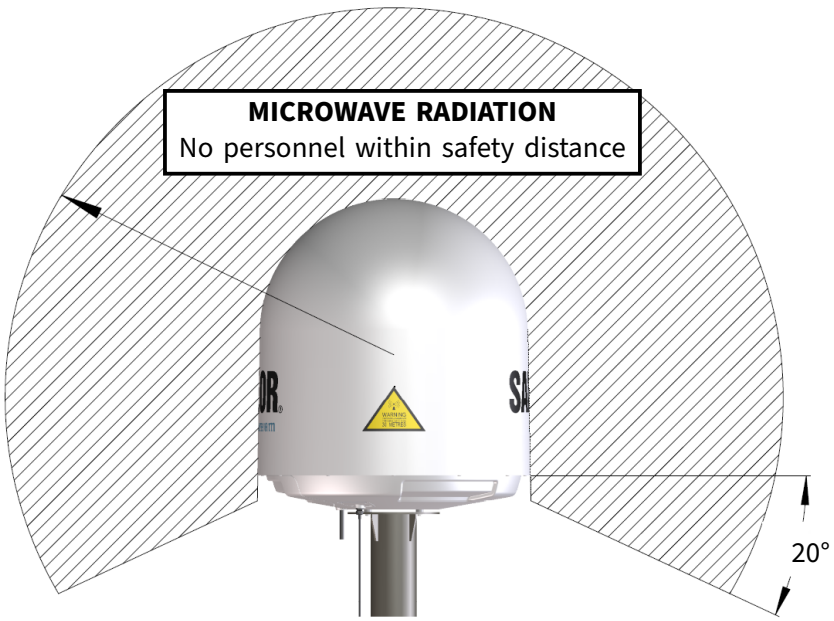
**SAILOR 1000 XTR GX-R2**

The minimum safety distance to the Above Deck Unit reflector on the focal line is:

30 m for SAILOR 1000 XTR GX-R2 4.5 W
55 m for SAILOR 1000 XTR GX-R2 9 W

based on a radiation level of 10 W/m$^2$.
No hazard exists >20° below the Above Deck Unit's mounting plane. Refer to the drawing below.



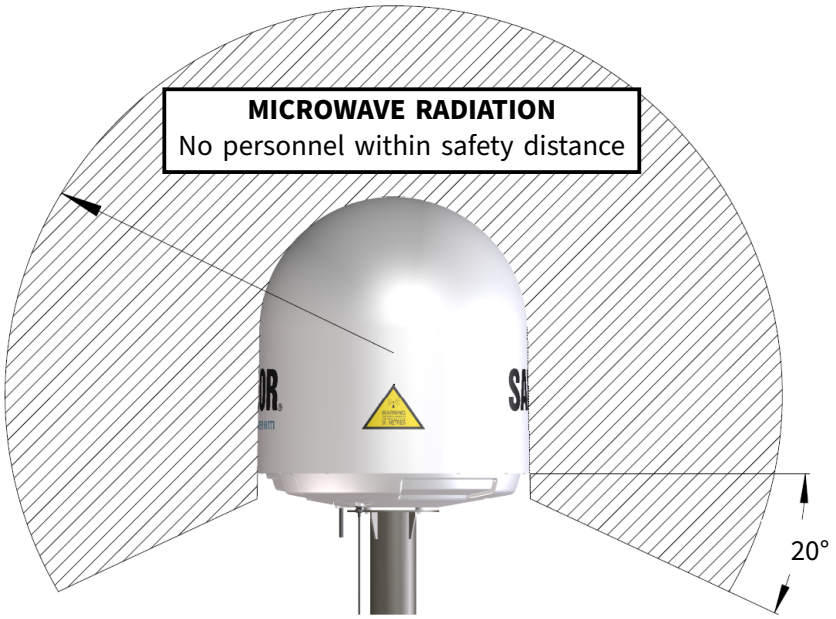



**SAILOR 600 XTR GX-R2**

The minimum safety distance to the Above Deck Unit reflector on the focal line is :

30 m for SAILOR 600 XTR GX-R2 4.5 W
44 m for SAILOR 600 XTR GX-R2 9 W

based on a radiation level of 10 W/m$^2$.
No hazard exists >20° below the Above Deck Unit's mounting plane. Refer to the drawing below.




**No-Transmit Zones**
In order to protect personnel no-transmit zones can be programmed. For futher information see *Blocking Zones – Azimuth and Elevation* on page 2-6.

**Distance to Other Equipment**
Do not move the Above Deck Unit closer to radars than the minimum safe distance specified in the section *Interference Between Radar, GPS/GNSS, L-band and Other Transmitters/Receivers* on page 2-16 – it may cause damage to the Above Deck Unit.

**Compass Safe Distance**

SAILOR 1000 XTR GX-R2 4.5 W and 9.0 W antenna (ADU): min. 150 cm (IEC 60945).
SAILOR 600 XTR GX-R2 4.5 W and 9.0 W antenna (ADU): min. 150 cm (IEC 60945).
SAILOR 7023A GMU (GX Modem Unit): min. 40 cm (IEC 60945).
SAILOR 7523A GMU (GX-R2 Modem Unit): min. 40 cm (IEC 60945).
SAILOR 7516A BDU (Below Deck Unit): min. 30 cm (IEC 60945).

**Service**

User access to the interior of the BDU is prohibited. Only a technician authorized by Cobham SATCOM may perform service - failure to comply with this rule will void the warranty. Access to the interior of the Above Deck Unit is allowed. Replacement of certain modules and general service may only be performed by a technician authorized by Cobham SATCOM.

**Do not service alone**

Do not attempt internal service unless another person, capable of rendering first aid resuscitation, is present.

**Grounding, Cables and Connections**

To minimize shock hazard and to protect against lightning, the equipment chassis and cabinet must be connected to an electrical ground. The BDU must be grounded to the ship. For further grounding information see the respective sections and appendix in this manual. Do not extend the cables beyond the lengths specified for the equipment. The cable between the BDU and Above Deck Unit can be extended if it complies with the specified data concerning cable losses etc. All coaxial cables for the system are shielded and should not be affected by magnetic fields. However, try to avoid running cables parallel to high power and AC/RF wiring as it might cause malfunction of the equipment.

**Power Supply**

SAILOR 7516A BDU: Voltage range 100-240 VAC. The ADU is powered by the BDU.
SAILOR 7523A GMU: Voltage range 100-240 VAC.

**Do Not Operate in an Explosive Atmosphere**

Do not operate the equipment in the presence of flammable gases or fumes. Operation of any electrical equipment in such an environment constitutes a definite safety hazard.

**Keep Away From Live Circuits**

Operating personnel must not remove equipment covers. Component replacement and internal adjustment must be made by qualified maintenance personnel. Do not replace components with the power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

**Failure to comply with the rules above will void the warranty!**

# About This Manual

**Document revision:** F.8

## Intended Readers

This is an installation manual for the SAILOR XTR GX-R2 intended for installers of the system and service personnel. Personnel installing or servicing the system must be properly trained and authorized by Cobham SATCOM It is important that you observe all safety requirements listed in the beginning of this manual, and install the system according to the guidelines in this manual.

## SAILOR XTR GX-R2 Variants in This Manual

The following variants of the SAILOR XTR GX-R2 are described in this manual:

- SAILOR 1000 XTR GX-R2 4.5 W.
- SAILOR 1000 XTR GX-R2 9 W.
- SAILOR 600 XTR GX-R2 4.5 W.
- SAILOR 600 XTR GX-R2 9 W.

In the installation chapter the antennas are also named S1000 and S600.

## Software Version

This manual is released for software version 3.15.

## Typography

In this manual, typography is used as indicated below:
**Bold** is used for the following purposes:

- To emphasize words. Example: “Do **not** touch the antenna”.
- To indicate what the user should select in the user interface. Example: ”Select **Settings > Network**”.

***Italic*** is used to emphasize the paragraph title in cross-references. Example: ”For further information, see *SAILOR XTR GX-R2 System* on 1-1”.

## Warnings, Cautions, and Notes

Text marked with **Warning**, **Caution**, **Note** or **Important** show the following type of data:

- **Warning:** A Warning is an operation or maintenance procedure that, if not obeyed, can cause injury or death.
- **Caution:** A Caution is an operation or maintenance procedure that, if not obeyed, can cause damage to the equipment.

- **Note:** A Note gives information to help the reader.
- **Important:** A text marked Important gives information that is important to the user, e.g. to make the system work properly. This text does not concern damage on equipment or personal safety.

## General Precautions

All personnel who operate equipment or do maintenance as specified in this manual must know and follow the safety precautions. The warnings and cautions that follow apply to all parts of this manual.

| | | |
|---|---|---|
| | **WARNING!** | Before using any material, refer to the manufacturer's material safety data sheets for safety information. Some materials can be dangerous. |
| | **CAUTION!** | Do not use materials that are not equivalent to materials specified by Cobham SATCOM. Materials that are not equivalent can cause damage to the equipment. |
| | **CAUTION!** | The system contains items that are electrostatic discharge sensitive. Use approved industry precautions to keep the risk of damage to a minimum when you touch, remove or insert parts or assemblies. |

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# Introduction

This chapter has the following sections:

- *SAILOR XTR GX-R2 System*
- *Part Numbers and Options*

## 1.1 SAILOR XTR GX-R2 System

The SAILOR XTR GX-R2 is a unique stabilized maritime GX-R2 antenna system operating in the Ka-band (17.7 to 30 GHz). It is used with the Global Xpress service from Inmarsat, delivering consistent high-performance download speeds of up to 50 Mbps and 5 Mbps over the uplink. The following figure shows the coverage map of the GX-R2 service.

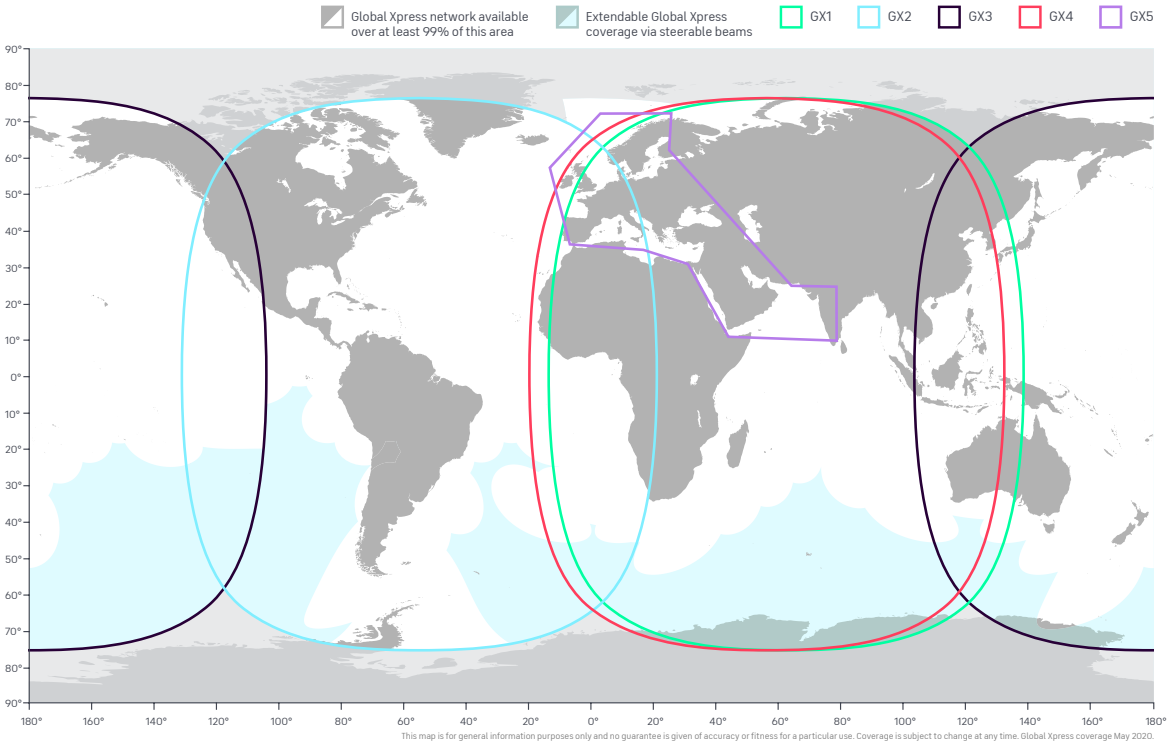



Figure 1.1: Coverage Map.

The system requires a single 50 Ω coaxial cable to provide the Above Deck Unit (ADU) with both DC power, data and control information. The radome does not have to be removed neither before nor after the installation. To protect the ADU the built-in motors act as brakes during transport and when the ADU is not powered. You can access the SAILOR XTR GX-R2 remotely and make in-depth performance analysis using the built-in web interface.

*Above Deck Unit (ADU)*

*Below Deck Unit (BDU)*
*Global Xpress Modem Unit (GMU)*

Figure 1.2: ADU, BDU and GMU.

## System features

- Single 50 Ω coax cable for the ADU.
- Gyro-free operation.
- One Touch Commissioning.
- GX-R2 support, wideband and dual polarization.
- Standard 4.5 W or High Power 9 W BUC.
- Ka-to-Ku-band conversion (SAILOR 1000 XTR GX-R2).
- Dual antenna operation to minimize blocking issues.
- SNMP traps, IoT and syslog support for real-time monitoring.
- REST API.
- Remote service access via FleetBroadband, Iridium, LTE or other IP connection.
- Remote or local simultaneous software update of ADU and BDU via PC and Internet browser.
- Built-in test equipment (BITE) for troubleshooting purpose.
- BDU with 5 x LAN, NMEA 0183, RS-232 and RS-422, TX Mute.
- All interfaces at the BDU, no additional units required.
- GMU with 4 LAN, RS-232 and RS-422 connector.
- No scheduled maintenance.
- Few spare parts, easy to service.
- Prepared for third-party IP devices in ADU (SAILOR 1000 XTR GX-R2).

The system is set up in minutes using the built-in web interface Installation wizard.

Service friendly system

The system configuration is saved in several modules, there is no loss of data at repair. There is a switch in the ADU to turn off the power to the antenna. All modules have an LED status indicator. Each module is encapsulated in a metal box with self-contained mounting bolts. If necessary, belts and modules can be exchanged through the service hatch on site for the SAILOR 1000 XTR GX-R2 or by removing the radome for the SAILOR 600 XTR GX-R2. You can do remote diagnostics and service. The built-in test equipment of the antenna constantly checks the antenna modules for proper functioning and monitors and logs information for all modules. The ADU performs a POST (Power On Self Test) and you can request a self test (PAST, Person Activated Self Test). Continuous Monitoring (CM) is always enabled. Error codes are read out in the web interface and in the display of the BDU. ADU software is updated automatically when making a software update through the BDU.

### 1.1.1 Above Deck Unit (ADU)

The SAILOR XTR GX-R2 ADU is a 103 cm or 65 cm VSAT stabilized tracking antenna, consisting of a suspended antenna with a standard global RF configuration. It is stabilized by heavy-duty vibration dampers in 3-axis (plus skew) and can be used in environments with elevations of -20° to +120° for SAILOR 1000 XTR GX-R2 and -25° to +120° for SAILOR 600 XTR GX-R2 The SAILOR 1000 XTR GX-R2 antenna weighs 113 kg, and the SAILOR 600 XTR GX-R2 antenna weighs 35 kg. The antenna is powered by the BDU and protected by a radome. All communication between the ADU and the BDU passes through a single standard 50 Ω cable (with N-connector) through the rotary joint. No cable work is required inside the radome. The antenna has 4 LAN connectors and a DC power outlet in the ADU to connect third-party equipment. The SAILOR 1000 XTR GX-R2 antennas come with lifting brackets pre-mounted. The SAILOR 600 XTR GX-R2 comes with a sling pre-mounted.

Modules in the ADU (SAILOR 1000 XTR GX-R2)

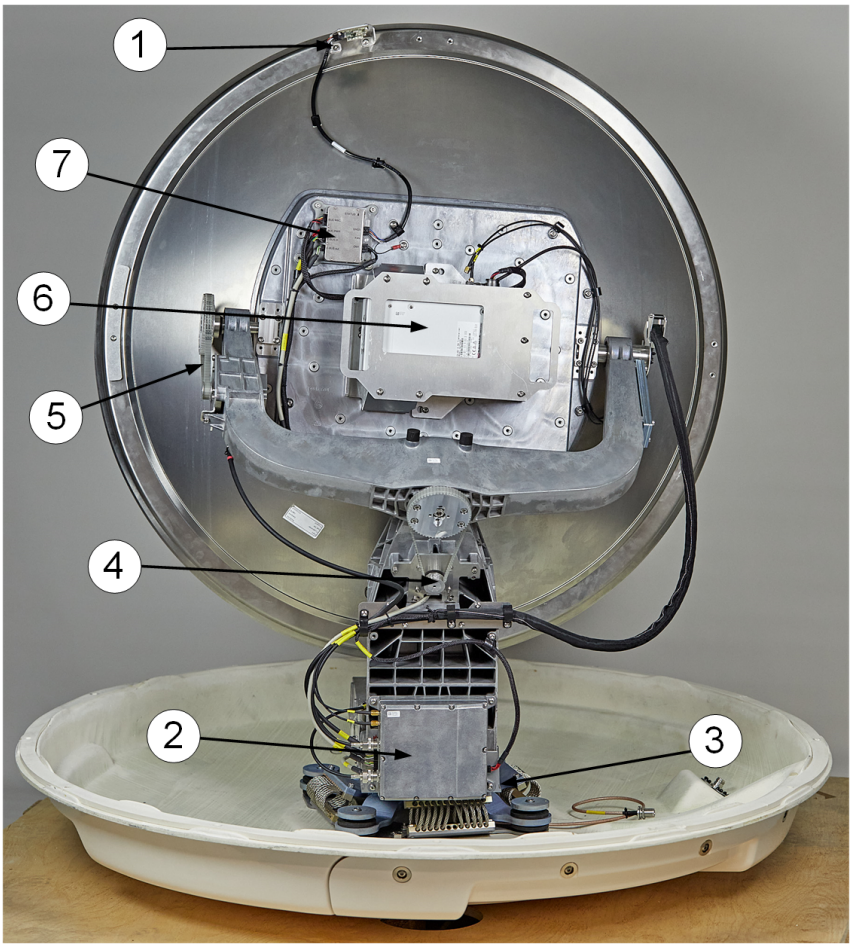



Figure 1.3: SAILOR 1000 XTR GX-R2 ADU modules 1/2.

1. GNSS module (GPS, GLONASS, BEIDOU).
2. XTR Antenna Control Module (ACM).
3. ADU power on/off.
4. Cross elevation motor and encoder.
5. Elevation motor and encoder.
6. Ka transceiver.
7. Inertial Sensor Module (ISCM).

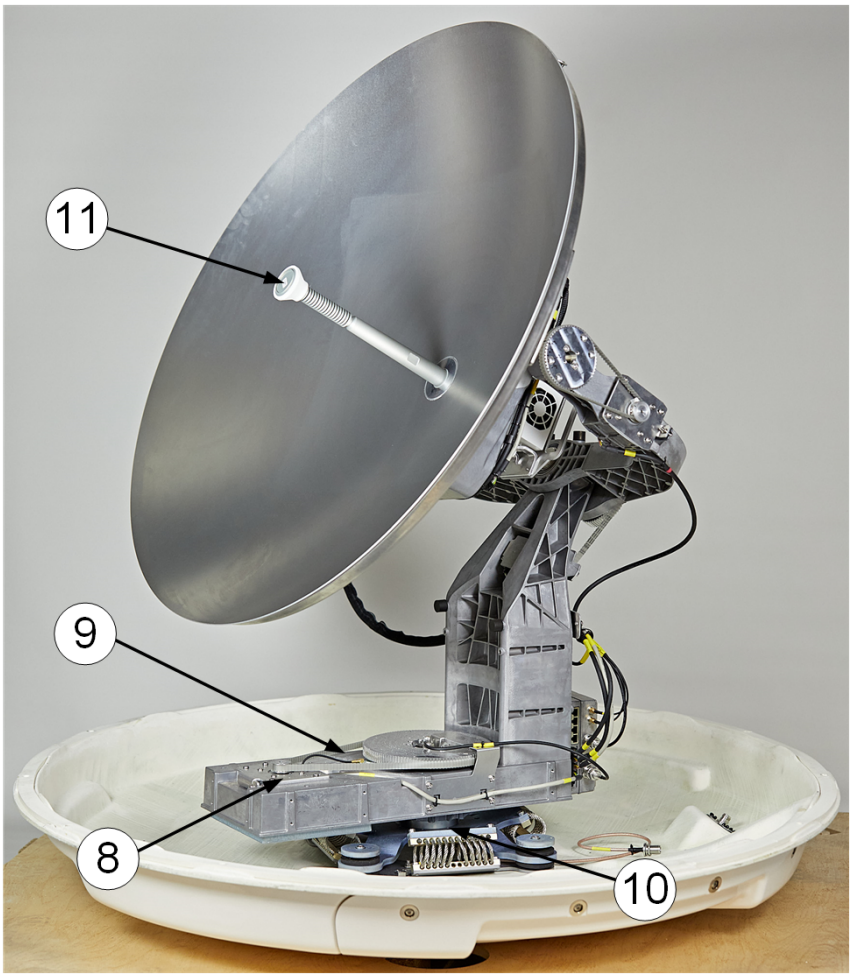



Figure 1.4: SAILOR 1000 XTR GX-R2 ADU modules 2/2.

8. Azimuth motor and encoder.
9. Azimuth zero reference module.
10. Rotary joint.
11. Feed horn.

Modules in the ADU (SAILOR 600 XTR GX-R2)

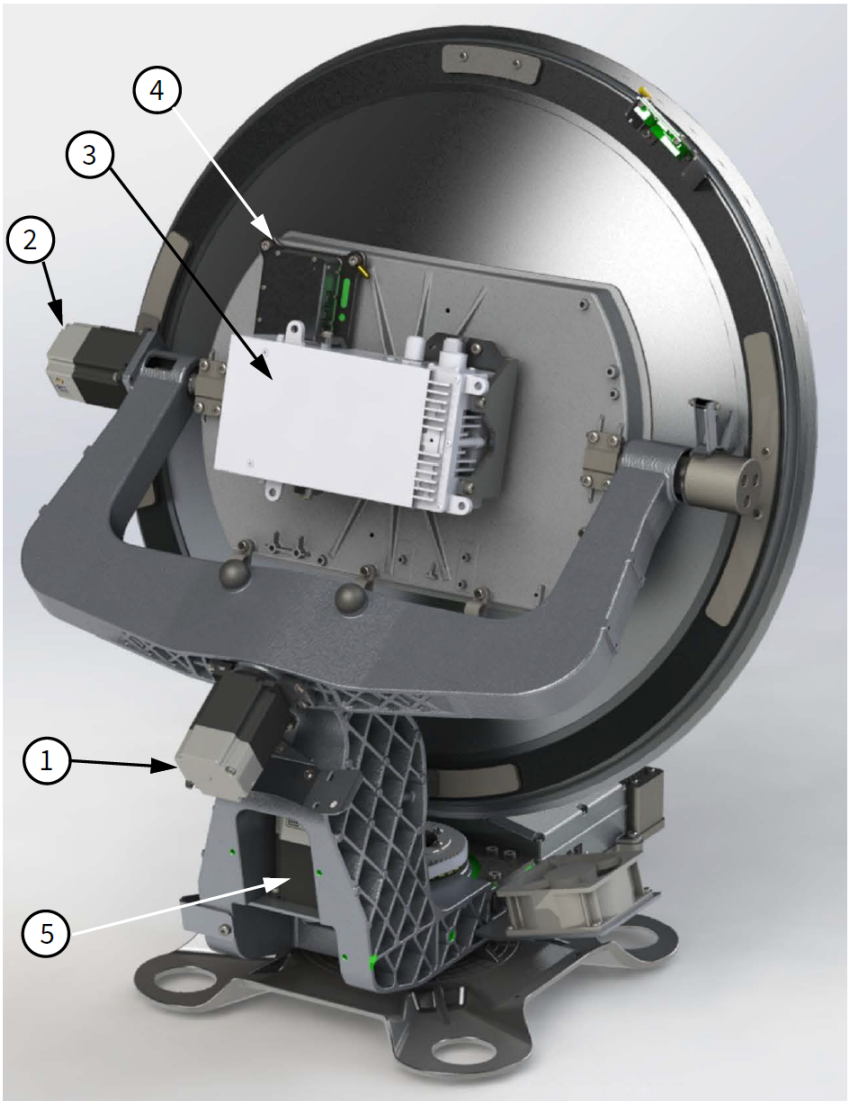



Figure 1.5: SAILOR 600 XTR GX-R2 ADU modules 1/2.

1. Cross elevation motor and encoder.
2. Elevation motor and encoder.
3. Ka transceiver.
4. Inertial Sensor Module (ISCM).
5. Azimuth motor and encoder.

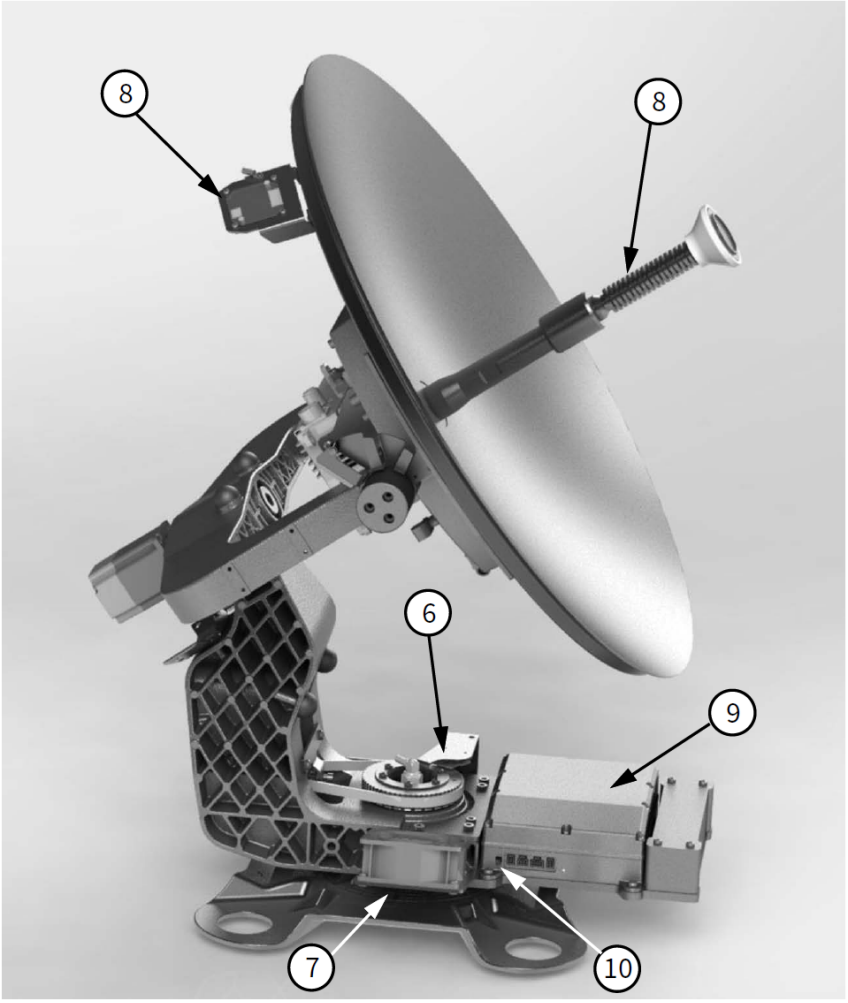



Figure 1.6: SAILOR 600 XTR GX-R2 ADU modules 2/2.

6. Azimuth zero reference module.
7. Rotary joint (not visible in photo).
8. Feed horn.
9. XTR Antenna Control Module (ACM).
10. ADU power on/off.
11. GNSS module (GPS, GLONASS, BEIDOU).

### 1.1.2 Below Deck Unit (BDU)

The BDU contains all user interfaces and manages all communication between the ADU and the connected VSAT modem, a connected PC and an optional FleetBroadband service communication line. The BDU comes in a 19" rack version, it has a display, status LEDs and a keypad. It provides a DHCP server and client mode. The BDU provides DC power to the ADU through a single coaxial cable. The BDU has the following interfaces:

| BDU ID | Connector Type | Function |
|---|---|---|
| NMEA 0183 | RJ-45 | Vessel Gyro Input |
| GPIO | RJ-45 | General Purpose Input/Output |
| LAN1 | RJ-45 | VSAT Modem |
| LAN2 | RJ-45 | User LAN |
| LAN3 | RJ-45 | User LAN |
| LAN4 | RJ-45 | User LAN |
| RS-232 | RJ-45 | VSAT Modem Serial Interface |
| RS-422 | RJ-45 | VSAT Modem Serial Interface |
| TX In | F-Type | VSAT modem TX (75 Ω) |
| RX Out | F-Type | VSAT modem RX (75 Ω) |
| Antenna | N-Type | ADU Signal and Power (50 Ω) |
| LAN5 | RJ-45 | Front LAN Service Port (LAN5) |

Table 1.1: BDU connectors.

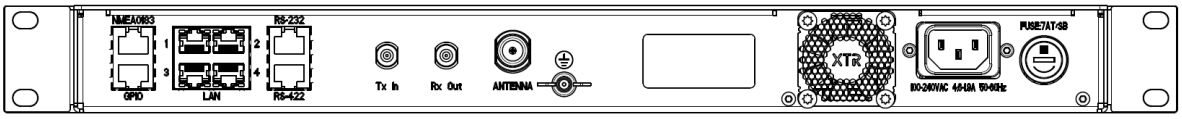



Figure 1.7: BDU, connector overview.

The BDU has an On/Off power switch and a LAN connector at the front for accessing the service port. The unit is AC powered.

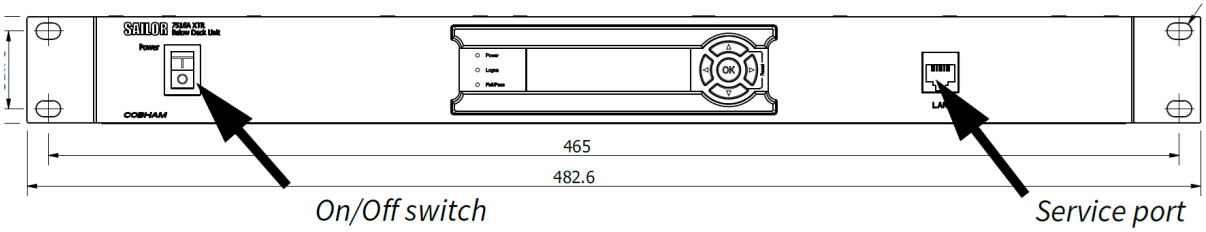



Figure 1.8: BDU, front panel.

## 1.1.3 Modem Unit (GMU)

The GX Modem Unit (GMU) comes in two different variants.

1. 407023A SAILOR GX Modem Unit with CX751 iDirect Core Module
2. 407523A SAILOR GX-R2 Modem Unit with SMB3315 iDirect Core Module

Both modems can be used with all SAILOR GX and SAILOR GX-R2 antenna systems. The GMU comes in a 19" rack version. The modem has the following interfaces and switch:

GMU (407523A)

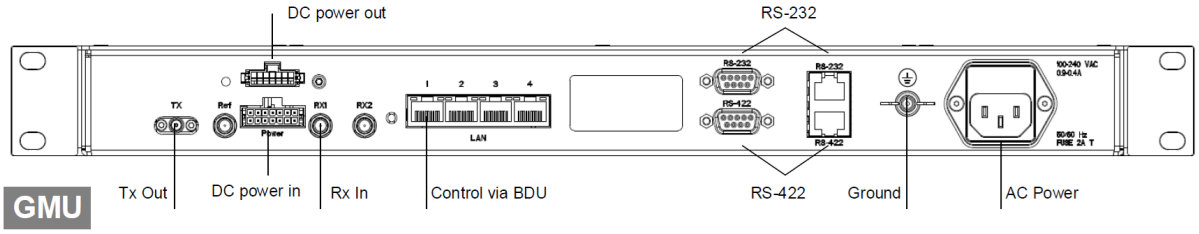



Figure 1.9: GMU (407523A, connector panel).

- 4 x RJ-45 Ethernet (Modem control and user data).
- 2 x SMA connectors (50 Ω) for Rx1 and Tx to BDU (+ 2 x SMA not active, Rx2 and Ref).
- 2 x RS-422 interface for modem control (one DB9 and one RJ-45).
- 2 x RS-232 interfaces for modem control (one DB9 and one RJ-45).
- DC power in and out.
- AC Power connector.
- Ground stud with wing nut.
- On/Off power switch (at the front).

GMU (407023A)

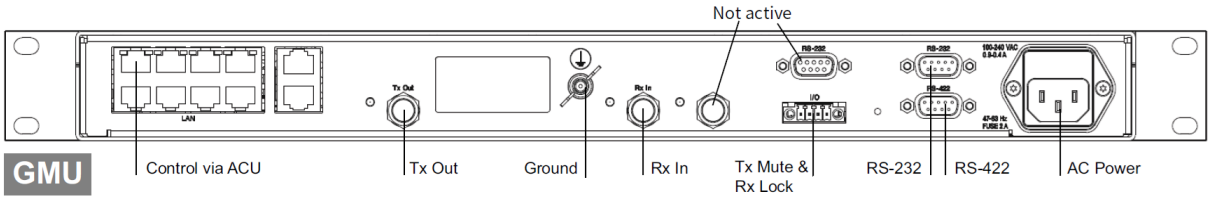



Figure 1.10: GMU (407023A, connector panel).

- 8 + 2 ports, for modem control and user data.
- 2 x F connectors (75 Ω) for Rx and Tx to BDU (+ one not active).
- RS-422 interface for modem control.
- RS-232 interface for modem control (+ one not active).
- I/O connector for Tx Mute and Rx Lock.
- AC Power connector.
- Ground stud with wing nut.
- On/Off power switch (at the front).

## 1.1.4 Satellite Type Approvals

For a list of satellite type approvals see the SAILOR XTR GX-R2 product page at www.cobhamsatcom.com.

### 1.1.5 Service Activation

Before you can start using the SAILOR XTR GX-R2 you need to activate the system for VSAT service. Contact your service provider for activation.

## 1.2 Part Numbers and Options

### 1.2.1 Applicable Model and Part Numbers

The following model and part numbers exist for the SAILOR XTR GX-R2 system:

| Part Number | Model Number | Description |
|---|---|---|
| 407509C-00540 | 7509C | SAILOR 1000 XTR GX-R2 4.5 W ADU (With composite radome) |
| 407509D-00540 | 7509D | SAILOR 1000 XTR GX-R2 9.0 W ADU (With composite radome) |
| 407509C-00541 | 7509C | SAILOR 1000 XTR GX-R2 4.5 W ADU (With eDome) |
| 407509D-00541 | 7509D | SAILOR 1000 XTR GX-R2 9.0 W ADU (With eDome) |
| 407506A-00540 | 7506A | SAILOR 600 XTR GX-R2 4.5 W ADU (With carbon pedestal and composite radome) |
| 407506A-00541 | 7506A | SAILOR 600 XTR GX-R2 4.5 W ADU (With carbon pedestal and eDome) |
| 407506A-00542 | 7506A | SAILOR 600 XTR GX-R2 4.5 W ADU (With aluminum pedestal and composite radome) |
| 407506A-00543 | 7506A | SAILOR 600 XTR GX-R2 4.5 W ADU (With aluminum pedestal and eDome) |
| 407506D-00540 | 7506D | SAILOR 600 XTR GX-R2 9.0 W ADU (With carbon pedestal and composite radome) |
| 407506D-00542 | 7506D | SAILOR 600 XTR GX-R2 9.0 W ADU (With aluminum pedestal and composite radome) |
| 407516A-00500 | 7516A | SAILOR XTR BDU |
| 407523A-00500 | 7523A | SAILOR Global Xpress R2 Modem Unit GMU (SMB3315, only compatible with SAILOR XTR systems) |
| 407523A-00510 | 7523A | SAILOR Global Xpress R2 Modem Unit GMU (SMB3315) |
| 407023A-00500 | 7023A | SAILOR Global Xpress Modem Unit GMU (CX751) |

Table 1.2: Model and part numbers for the SAILOR XTR GX-R2 system.

NOTE

The above model and part numbers are either currently available, have previously been available, or will soon be available for the SAILOR XTR GX-R2 system.

### 1.2.2 Options

The following options are available for the SAILOR XTR GX-R2 system:

| **Part Number** | **Description** |
|---|---|
| 407090A-950 | Antenna cable 50 m, N-Conn (not mounted), male/male |
| 407090A-925 | Pigtail Cable 1.25 m, N-Conn, female/male |
| 407590C-010 | Accessory kit for Dual XTR Antenna Operation |
| 407090-001 | SAILOR 1m SMART Heater, operation down to -55 C |
| 407590C-020 | SAILOR XTR Dual Modem Kit |

Table 1.3: Model and part numbers for options of the SAILOR XTR GX-R2 system.

# Installation

This chapter has the following sections:

- *What's in the Box*
- *Site Considerations*
- *Installation of the ADU (SAILOR 1000 XTR GX-R2)*
- *Installation of the ADU (SAILOR 600 XTR GX-R2)*
- *Installation of the BDU*
- *Installation of the Modem*
- *Installation of the 407523A GX-R2 Modem Unit (SMB3315)*
- *Installation of the 407023A GX Modem Unit (CX751)*
- *Integration of a 3rd Party Device*
- *Power and Startup*

## 2.1 What's in the Box

### 2.1.1 To Unpack

Unpack the ADU and BDU. Check that the following items are present:

- SAILOR XTR GX-R2 ADU.
- Accessory kit for SAILOR ADU:
  - Package with bolts and washers.
- SAILOR 7516A BDU.
- Accessory kit for SAILOR 7516A BDU:
  - Coax cable F-F, low loss, 75 Ω (100 cm, 2 pcs).
  - Power cable (230 VAC) with Schuko (Euro) wall plug.
  - Terminal block (RJ45 Wire Connector Terminal, S-31-208142).
- SAILOR 7023A or 7523A GMU.
- Accessory kit for SAILOR 7023A:
  - Wiecon 3.5 mm spacing, 4 pol connector for cable.
  - RJ-45 patch cable (1 pce).
  - Power cable (230 VAC) with Schuko (Euro) wall plug.
  - RS-232 cable.
  - RS-422 cable.
- Accessory kit for SAILOR 7523A:
  - Power cable (230 VAC) with Schuko (Euro) wall plug.
  - SMA-F Adapters (2 pcs).

### 2.1.2 Initial Inspection

Inspect the packing material immediately upon receipt for evidence of damage during transport. If the shipping material is severely damaged or water stained, request that the carrier's agent be present when opening the cartons and wooden box. Save all box packing material for future use.

**WARNING!** To avoid electric shock, do not apply power to the system if there is any sign of shipping damage to any part of the front or rear panel or the outer cover. Read the safety summary at the front of this manual before installing or operating the system.

After unpacking the system, inspect the units thoroughly for hidden damage and loose components or fittings. If the contents are incomplete, if there is mechanical damage or defect, or if the system does not work properly, notify your dealer.

### 2.1.3 Tools Needed

The following tools may be needed during the installation:

- Torx TX 30 to open the service hatch (if any).
- Torque wrench to fasten the mounting bolts for the ADU.
- Torque wrench to fasten the N-connector at the ADU.
- HEX key (5mm) to take off the SAILOR 600 XTR GX-R2 radome.
- PC and Internet browser.
- Crimping tools for RF and RJ-45 connectors.
- Ethernet cable.
- RJ-45 connectors.

### 2.1.4 Transport of the Antenna

During transport the antenna must be able to move freely inside the radome. You must follow the instructions below to keep a valid warranty:

**CAUTION!** Do not strap parts of the antenna. This might cause damage to the antenna. Damage due to actions listed above will void the warranty.

## 2.2 Site Considerations

Consider the following topics when installing the ADU:

- *General Considerations*
- *Obstructions (ADU Shadowing)*
- *Blocking Zones – Azimuth and Elevation*
- *Safe access to the ADU: Radiation hazard*
- *Ship Motion and Offset from the Ship's Motion Centre*
- *ADU Mast Flange and Mast Length*
- *Interference Between Radar, GPS/GNSS, L-band and Other Transmitters/Receivers*
- *Condensation and Water Ingress*

### 2.2.1 General Considerations

For optimum system performance, follow the guidelines on where to install or mount the different units of the SAILOR XTR GX-R2 system. You do not have to align the ADU with the bow-to-stern line of the ship. When configuring the SAILOR XTR GX-R2 system, the azimuth calibration provides the correct azimuth of the ADU.
Mount the ADU on stiffened structures with a **minimum of exposure to vibrations.**

#### Safe access to the ADU: Radiation hazard

The radiation and safety distances are:

| Part Number | Antenna Model | Radome type | Maximum EIRP Level | Safety Distance |
|---|---|---|---|---|
| 407509C-xxxxx | SAILOR 1000 XTR GX-R2 4.5 W ADU | Composite | 54.8 dBW | 30 m |
| 407509C-xxxxx | SAILOR 1000 XTR GX-R2 4.5 W ADU | eDome | 54.1 dBW | 30 m |
| 407509D-xxxxx | SAILOR 1000 XTR GX-R2 9.0 W ADU | Composite | 57.8 dBW | 55 m |
| 407509D-xxxxx | SAILOR 1000 XTR GX-R2 9.0 W ADU | eDome | 57.1 dBW | 55 m |
| 407506A-xxxxx | SAILOR 600 XTR GX-R2 4.5 W ADU | Composite | 50.1 dBW | 30 m |
| 407506A-xxxxx | SAILOR 600 XTR GX-R2 4.5 W ADU | eDome | 50.46 dBW | 30 m |
| 407506D-xxxxx | SAILOR 600 XTR GX-R2 9.0 W ADU | Composite | 53.1 dBW | 44 m |

Table 2.1: Radiation and safety distance.

NOTE | The safety distance is based on a radiation level of 10 $W/m^2$.

#### Painting the Radome

Customers may wish to paint the radome in order to match the vessel's color. Any paint used must be nonmetallic. Painting the radome may impact RF performance

and may lead to overheating, causing the antenna to go into safe mode (become inactive). Cobham SATCOM recommends that the radome **NOT** be painted. Painting the radome will not void the general warranty regarding material and workmanship etc. It is only the performance that cannot be guaranteed.

## Modifying the Radome or Using Another Radome

The SAILOR XTR GX-R2 antenna comes with a type approved radome fitted from the factory. This radome is specifically designed for a minimal loss of RF performance for this specific antenna. Insertion loss reduces the available signal and decreases the effective radiated power and G/T (the ability to receive a weak signal). Modifying the radome or using another radome may increase the antenna side lobes, resulting in interference with other communication systems and thereby void satellite operator approvals. Other electrical effects on antenna performance of another radome, or of modifying the radome, include a change in the antenna beam width and shifting of the antenna bore sight.
Cobham SATCOM strongly recommends that you do **NOT** modify the radome or change it to another type. Exchanging or modifying the radome will not void the general warranty for material and workmanship etc. but the performance cannot be guaranteed, and the satellite operator approvals will not be valid.

## Ship Motion and Offset from the Ship's Motion Centre

When installing the ADU you must consider the mounting height carefully. The higher up the ADU is mounted, the higher is the linear g-force applied to the ADU. The g-force also depends on the roll period of the ship, see Table 2.2. If the g-force applied is too high, performance and ADU signal stabilization may be reduced and eventually the ADU may be damaged.

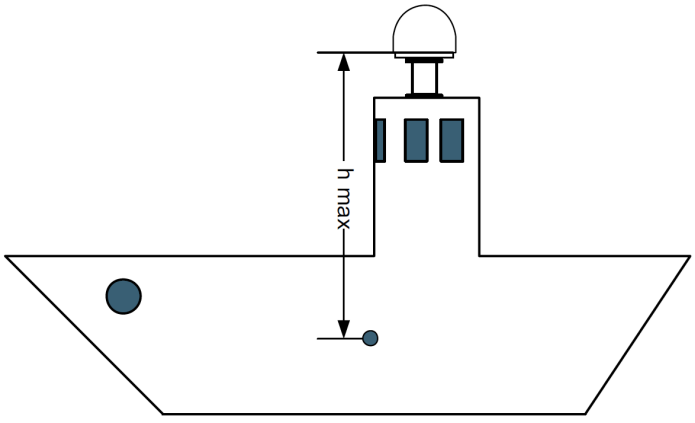



Figure 2.1: Maximum distance from the ship's motion centre (h max).

| Minimum Roll Period | Maximum ADU Mounting Height (h max) | |
|---|---|---|
| | **Full Performance** | **Potential Risk of Damage** |
| 4 s | 12 m | 16 m |
| 6 s | 27 m | 35 m |
| 8 s | 48 m | 62 m |
| 10 s | 75 m | 98 m |

Table 2.2: Maximum distance from the ship's motion center versus ship's roll period.

### 2.2.2 Obstructions (ADU Shadowing)

The ADU beam is approximately 1 m in diameter for the first 30 m from the ADU. Beyond 30 m the beam gradually widens so that it is approximately 5 m in diameter at 100 m distance. This beam expansion continues with increasing distance. Any obstructions, such as masts, funnels, bridge house etc. within this field can cause signal degradation or signal loss.

**NOTE** Due to the short wavelength at the Ka band and the narrow beam width of the ADU, even a 6 mm steel wire placed within 50 m inside the beam can cause signal degradation.

For optimum performance adhere to the following guidelines:

1. Place the ADU so that it has as much free line of sight to the satellite as possible without any structures in the beam through one full 360° turn of the vessel.

2. Do not place the ADU close to large objects that may block the signal.

3. Elevate the ADU by mounting it on a mast or on a mounting pedestal on a deck or deck house top to avoid obstruction.

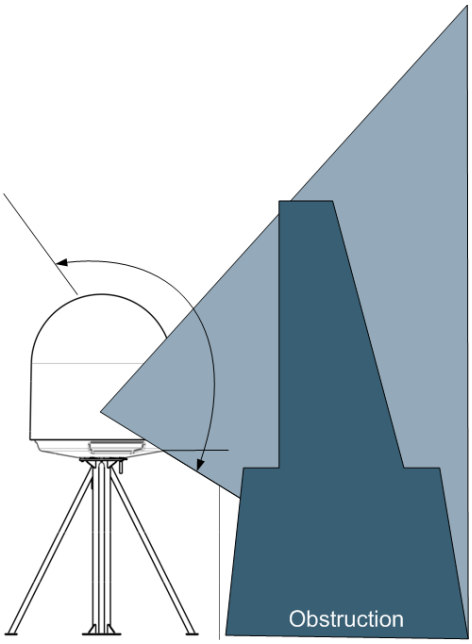



Figure 2.2: Signal degradation because of obstructing objects.

## Blocking Zones – Azimuth and Elevation

The installation may require to set up blocking zones for the ADU , i.e. areas where the ADU will not transmit and areas where transmit power is potentially dangerous for persons frequently being in these zones. Eight blocking zones can be set up. Each blocking zone is set up with azimuth start and stop, and elevation angle. The blocking zones are set up in the built-in web interface.

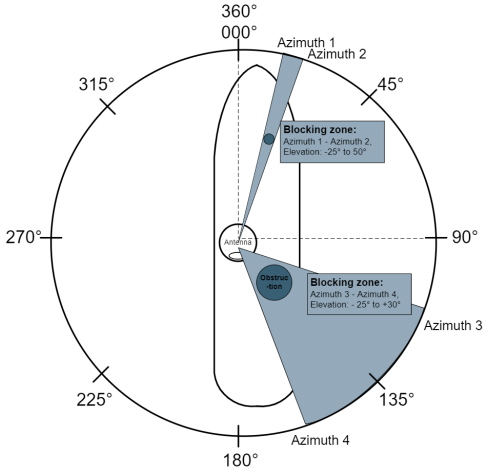



Figure 2.3: Blocking zones with no transmit zones, azimuth (example).

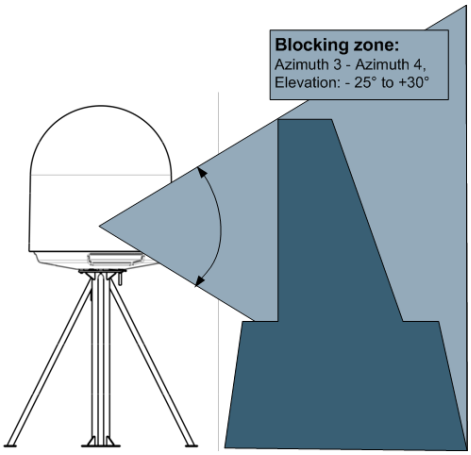



Figure 2.4: Blocking zone with no transmit zones, elevation angle (example).

### 2.2.3 ADU Mast Flange and Mast Length

The system is designed for harsh environmental conditions at sea, both in regards to vibration amplitude and speed. The antenna system performs optimally when mounted on a properly designed foundation. When mounting the antenna the overall goal is to establish a foundation which is as rigid as possible. However, in some scenarios establishing a very rigid foundation can be difficult. This section aims at defining the minimum design criterion for the mast. In addition, some specific design suggestions are presented. Note that the design values given below depend on rigid interfaces between antenna and ship, the values are furthermore given based on a standard steel type (e.g. S235JR, S355JO).
The placement of the ADU must ensure a rigid structural connection to the hull or structure of the ship. Parts of the ship with heavy resonant vibrations are not suitable places for the ADU. A small platform or short mast must provide rigid support for the ADU fastening bolts and a rigid interface to the ship. If it is necessary to use a tall mast, you must stabilize the mast with bracing. In regards to stiffness the overall criterion is that the first structural mode of the mast or foundation (where the antenna system is mounted) should be above 30 Hz. All the designs presented in the following sections respect this standard.

**Important** An antenna mounted on a less stiff structure might be functional, but could lead to a decrease in the operational lifetime of the antenna system and possibly a decreased performance under operation.

The ADU mast must carry the weight of the ADU unit, that is approximately 113 kg (+ the weight of the mast flange) for the SAILOR 1000 XTR GX-R2 antenna and 35 kg (+ the weight of the mast flange) for the SAILOR 600 XTR GX-R2 antenna. The mast must also withstand on-board vibrations and wind speeds up to 110 knots on the radome, even in icing conditions.

**CAUTION!** Avoid sharp edges where the flange is in direct contact with the radome. Round all edges as much as possible to avoid damaging the surface of the radome.

## ADU Mast Flange (SAILOR 1000 XTR GX-R2)

For best performance, do as follows:

1. Provide a mast flange with a minimum of four gusset plates.
2. Fit the top of the ADU mast with a flange with clearance holes matching the bushings in the radome and with minimum four gusset plates. No center hole is necessary in the flange.
   - **Flange thickness:** Minimum 15 mm.
   - **Four gusset plates:** Minimum 15 mm thick, must be placed as close as possible to the holes in the mounting plate while leaving space for the bolt head and welded seam.

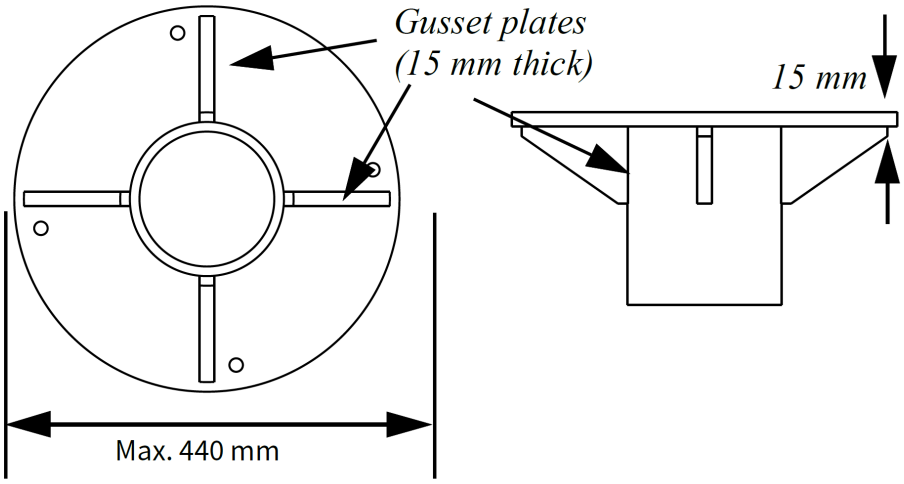



Figure 2.5: ADU mast flange, top and side view (S1000).

3. Make sure that the flatness on the mast mount plateu is below 3.0 mm.

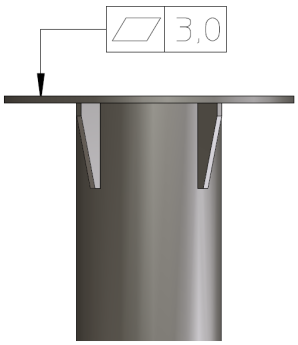



Figure 2.6: ADU mast flange, recommended flatness on the mast mount plateau.

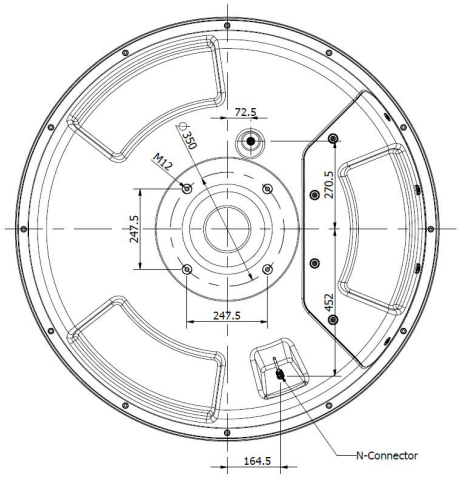



Figure 2.7: ADU, bottom view (S1000).

ADU Mast Flange (SAILOR 600 XTR GX-R2)

For best performance, do as follows:

1. Provide a mast flange with a minimum of four gusset plates.
2. Fit the top of the ADU mast with a flange with clearance holes matching the bushings in the radome and with minimum four gusset plates. No center hole is necessary in the flange.
   - **Flange thickness:** Minimum 5 mm.
   - **Four gusset plates:** Minimum 5 mm thick, must be placed as close as possible to the holes in the mounting plate while leaving space for the bolt head and welded seam.

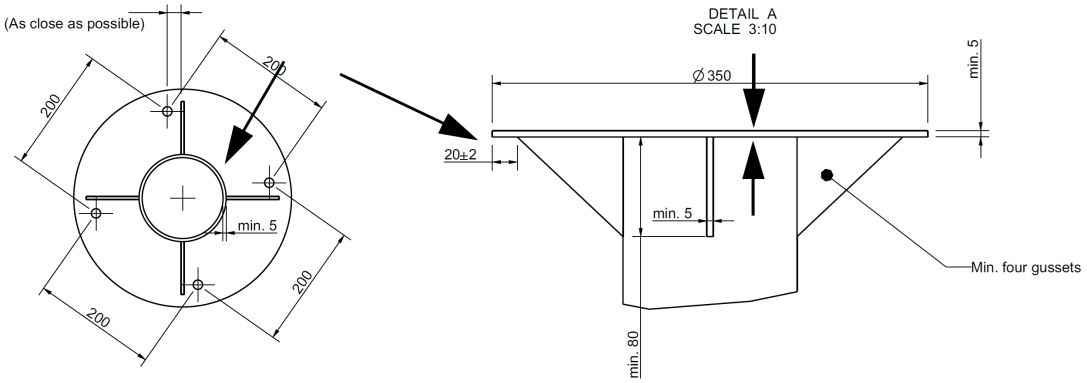



Figure 2.8: ADU mast flange, top and side view (S600 antenna).

3. Make sure that the flatness on the mast mount plateau is below 3.0 mm.

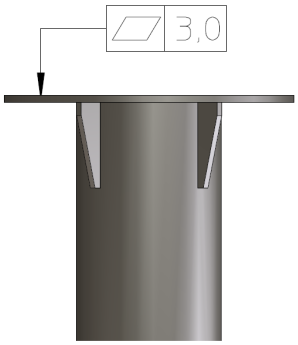



Figure 2.9: ADU mast flange, recommended flatness on the mast mount plateau.

4. Use the dimensions in the following figure to prepare the mast flange for mounting of the ADU.

The following figure shows the bottom view of an antenna.

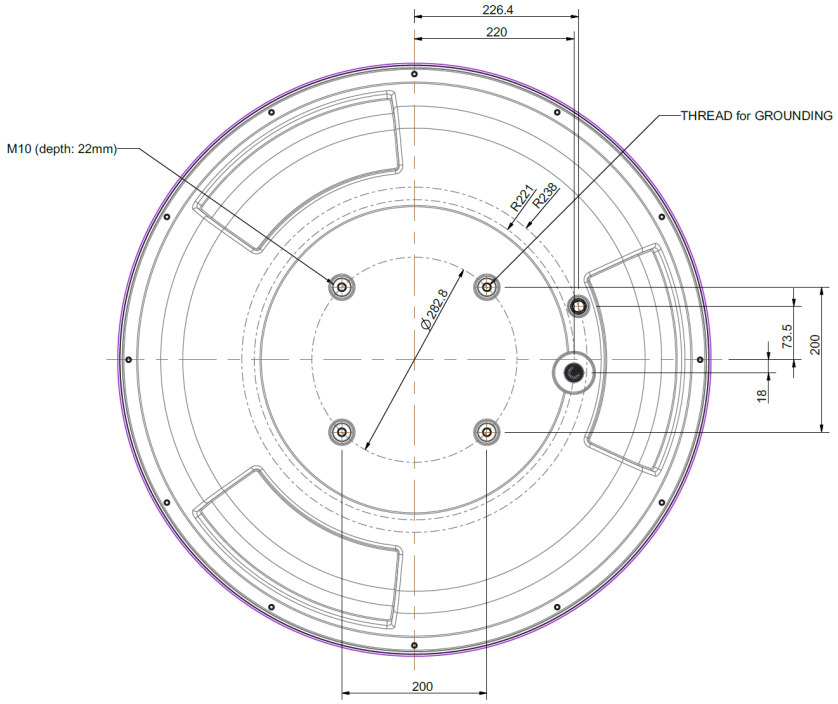



Figure 2.10: ADU, bottom view (S600 antenna).

## Mast Length and Diameter

The following sections provide guidelines for choosing mast diameter and wall thickness for a given mast length (height). A larger wall thickness yields more stiffness (valid design) whereas a thinner wall thickness yields a more weak structure (not valid design).

Figure 2.11: Free mast length and bracing for a tall mast.

**NOTE** Make sure that there is free space below the drain tube.

NOTE The tables list the values for **steel masts**. For **aluminum masts**, the free mast length is reduced to 75% of the values for steel.

NOTE Bracing and rigid masts can still not prevent vertical vibration if the mast is attached to a deck plate that is not rigid. Make every effort to mount the mast on a surface that is well supported by ribs. If this is not possible, provide extra deck plate propping.

## Mast Length (SAILOR 1000 XTR GX-R2)

The below tables show the minimum dimensions for a SAILOR 1000 XTR GX-R2 antenna mast with and without stays/braces. Note that the values are only guidelines - always consider the environment and characteristics of the ship before deciding on the mast dimensions.

| Mast Without Braces | Max. Free Mast Length (steel), (m) | Outer Diameter (mm) | Wall Thickness (mm) | Weight (kg/m) |
|---|---|---|---|---|
| | 0.4[1] | 200 | 5 | 24.0 |
| | 0.6 | 220 | 5 | 26.5 |
| | 0.8 | 250 | 5 | 30.2 |
| | 1 | 270 | 5 | 32.7 |

Table 2.3: Mast dimensions without braces (SAILOR 1000 XTR GX-R2).

[1]The height of 0.4 m is not recommended to be used as it will make access through the ADU's service hatch difficult.

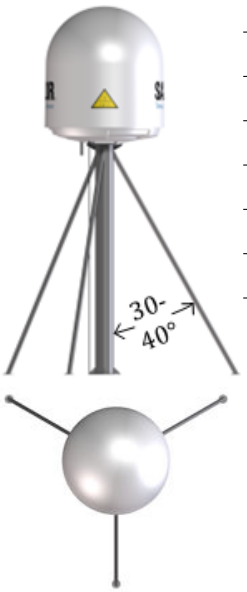
| Mast With 3 Braces | Max. Free Mast Length (steel), (m) | Outer Diameter (mm) | Wall Thickness (mm) | Outer Diameter For Brace (mm) | Thickness For Brace (mm) |
|---|---|---|---|---|---|
|  | 1.2 | 140 | 10 | 50 | 5.0 |
| | 1.2 | 200 | 5 | 50 | 5.0 |
| | 1.6 | 140 | 10 | 70 | 5.0 |
| | 1.6 | 200 | 5 | 70 | 5.0 |
| | 2 | 160 | 10 | 70 | 5.0 |
| | 2 | 220 | 5 | 70 | 5.0 |
| | 2.5 | 180 | 10 | 80 | 5.0 |
| | 2.5 | 220 | 5 | 80 | 5.0 |

Table 2.4: Mast dimensions with 3 braces (SAILOR 1000 XTR GX-R2).

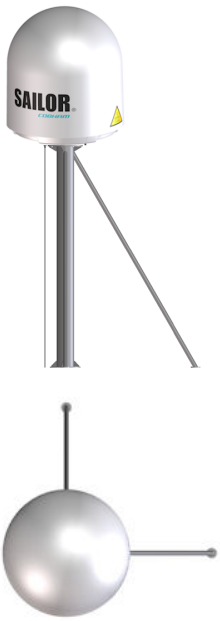
| Mast With 2 Braces | Max. Free Mast Length (steel), (m) | Outer Diameter (mm) | Wall Thickness (mm) | Outer Diameter For Brace (mm) | Thickness For Brace (mm) |
|---|---|---|---|---|---|
|  | 1.2 | 160 | 10 | 80 | 5.0 |
| | 1.2 | 200 | 5 | 80 | 5.0 |
| | 1.6 | 180 | 10 | 80 | 5.0 |
| | 1.6 | 220 | 5 | 80 | 5.0 |
| | 2 | 180 | 10 | 80 | 5.0 |
| | 2 | 240 | 5 | 80 | 5.0 |
| | 2.5 | 200 | 10 | 80 | 5.0 |
| | 2.5 | 260 | 5 | 80 | 5.0 |
|  | | | | | |

Table 2.5: Mast dimensions with 2 braces (SAILOR 1000 XTR GX-R2).

Mast Length (SAILOR 600 XTR GX-R2)

The below tables show the minimum dimensions for a SAILOR 600 XTR GX-R2 antenna mast with and without stays/braces. Note that the values are only guidelines - always consider the environment and characteristics of the ship before deciding on the mast dimensions.

| Mast Without Braces | Max. Free Mast Length (steel), (m) | Outer Diameter (mm) | Wall Thickness (mm) | Weight (kg/m) |
|---|---|---|---|---|
| | 0.4 | 90 | 5 | 10.8 |
| | 0.6 | 116 | 5 | 13.9 |
| | 0.8 | 142 | 5 | 17.0 |
| | 1 | 168 | 5 | 20.2 |
| | 1.2 | 194 | 5 | 23.3 |
| | 1.4 | 220 | 5 | 26.4 |

Table 2.6: Mast dimensions without braces (SAILOR 600 XTR GX-R2).

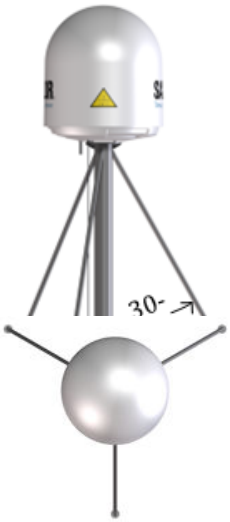
| Mast With 3 Braces | Max. Free Mast Length (steel), (m) | Outer Diameter (mm) | Wall Thickness (mm) | Outer Diameter For Brace (mm) | Thickness For Brace (mm) | Brace Connection Point From Top of mast (m) |
|---|---|---|---|---|---|---|
|  | 1.5 | 80 | 5 | 30 | 5.0 | 0.2 |
| | 2.0 | 115 | 5 | 50 | 5.0 | 0.4 |
| | 2.5 | 150 | 5 | 65 | 5.0 | 0.6 |
| | 3.0 | 185 | 5 | 80 | 5.0 | 0.8 |
| | 3.5 | 220 | 5 | 100 | 5.0 | 1.0 |

Table 2.7: Mast dimensions with 3 braces (SAILOR 600 XTR GX-R2).

## 2.2.4 Interference Between Radar, GPS/GNSS, L-band and Other Transmitters/Receivers

NOTE

Do not place the antenna close to interfering signal sources or receivers. For allowed distances to other transmitters see Figure 2.13. It is recommended to test the total system by operating all equipment simultaneously and verifying that there is no interference.

The ship's radar and high power radio transmitters may compromise the ADU performance. RF emission from radars might actually damage the ADU. The ADU itself may also interfere with other radio systems.

### Radar

It is difficult to give exact guidelines for the minimum distance between a radar and the ADU because radar power, radiation pattern, frequency and pulse length/shape vary from radar to radar. Furthermore, the ADU is typically placed in the near field of the radar ADU and reflections from masts, decks and other items in the vicinity of the radar are different from ship to ship. But it is possible to give a few guidelines. Since a radar radiates a fan beam with a horizontal beam width of a few degrees and a vertical beam width of up to +/- 15°, the worst interference can be avoided by mounting the ADU at a different level – meaning that the ADU is installed minimum 15° above or below the radar antenna. Due to near field effects the benefit of this vertical separation could be reduced at short distances (below approximately 10 m) between radar antenna and the ADU. Therefore it is recommended to ensure as much vertical separation as possible when the ADU has to be placed close to a radar antenna.

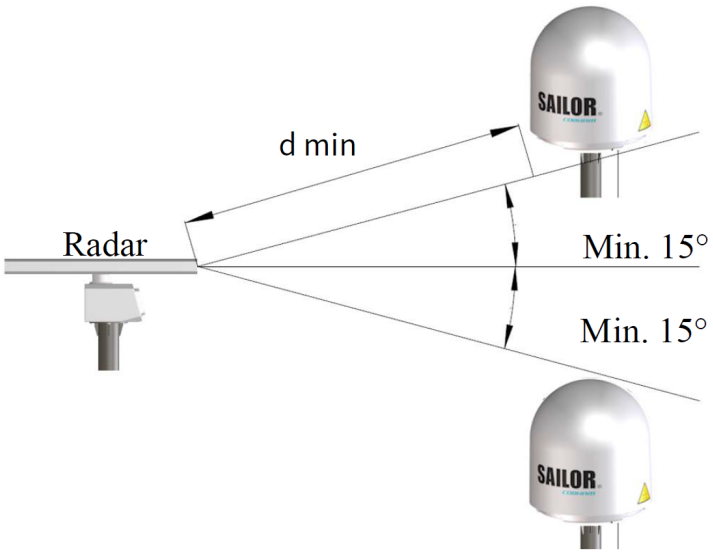



Figure 2.12: Interference with the vessel's radar.

The minimum acceptable separation (d min.) between a radar and the ADU is

determined by the radar wavelength/frequency and the power emitted by the radar. The tables below show some "rule of thumb" minimum separation distances as a function of radar power at X and S band. If the d min. separation listed below is applied, antenna damage is normally avoided. The separation distance for C-band (4-8 GHz) radars should generally be the same as for S-band and X-band radars. "d min." is defined as the shortest distance between the radar antenna (in any position) and the surface of the ADU.

| **X-band ( 3 cm / 10 GHz) Damage Distance** | | |
|---|---|---|
| **Radar Power** | **SAILOR XTR GX-R2 ADU** | |
| | **d min. at 15° Vertical Separation** | **d min. at 60° Vertical Separation** |
| 0 – 10 kW | 1.0 m | 1.0 m |
| 30 kW | 2.0 m | 1.0 m |
| 50 kW | 3.3 m | 1.7 m |

Table 2.8: Minimum radar separation, X-band.

| **S-band ( 10 cm / 3 GHz) Damage Distance** | | |
|---|---|---|
| **Radar Power** | **SAILOR XTR GX-R2 ADU** | |
| | **d min. at 15° Vertical Separation** | **d min. at 60° Vertical Separation** |
| 0 – 10 kW | 2.0 m | 1.0 m |
| 30 kW | 3.0 m | 1.5 m |
| 50 kW | 5.0 m | 2.5 m |

Table 2.9: Minimum radar separation, S-band.

## Interference (radar, GPS/GNSS, L-band antenna etc.)

Even at distances greater than "d min." mentioned in the previous section, the radar might still be able to degrade the performance of the SAILOR XTR GX-R2 system. The presence of one or more S or X-band radars within a radius up to 100 m may cause a minor degradation of the Ka band connection. The degradation will be most significant at high radar pulse repetition rates.
As long as receiving conditions are favorable, this limited degradation is not important. However, if receiving conditions are poor – e.g. due to objects blocking the signal path, heavy rainfall or icing, low satellite elevation and violent ship movements – the small extra degradation due to the radar(s) could cause poor connection quality. The presence of S-band radar(s) is unlikely to cause any performance degradation – as long as the minimum distances (d min.) listed in the previous section are applied. **It is strongly recommended that interference-free operation is verified before the installation is finalized.**

**CAUTION!** Never install the antenna closer to a radar than "d min." - even if experiments show that interference free operation can be obtained at shorter distances than "d min." in the previous section.

Good quality GPS/GNSS receivers will work properly very close to the ADU - typically down to one meter outside the main beam. If L-band antennas are installed on the same vessel, keep a minimum distance of 3 meters from the SAILOR XTR GX-R2 ADU to the L-band antenna. The following figure shows the minimum recommended distance to other transmitters in the frequency range below 1000 MHz.

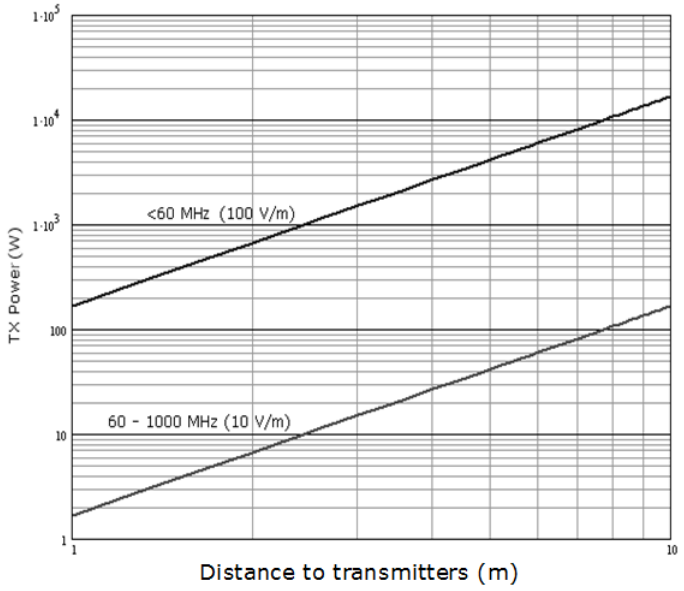



Figure 2.13: Recommended distances to other transmitters.

## 2.2.5 Condensation and Water Ingress

In some weather conditions there may occur condensation inside the radome.

1. If possible, install the radome in such a way that direct spray of seawater is avoided.

2. Make sure the ADU's drain tube is open and that there is free space between the drain tube and the mounting surface so water can escape from inside the radome and there is ventilation for the ADU.

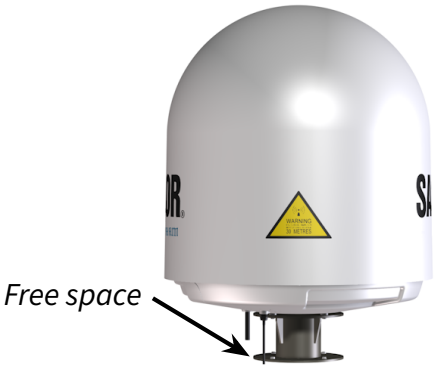



Figure 2.14: Drain tube with free space.

3. Do not use pneumatic tools for cleaning the radome, especially at a short distance and directly at the split between top and bottom.

4. Do not place the ADU close to a funnel, as smoke deposits are corrosive. Furthermore, deposits on the radome can degrade performance.

### 2.2.6 Alternative ADU Cable

The allowed RF loss in the antenna cable is determined by the attenuators of the antenna. The electronic design guarantees that a minimum of 20 dB RF loss and a maximum of 35 dB RF loss at 4450 MHz in the antenna cable will work, but typically an RF loss of about 25 dB will be within the limits of the cable calibration. You can verify the cable attenuation margin with the cable calibration. See *Cable Calibration* on page 3-41 for more details. The DC loop resistance of the antenna cable must be a maximum of 0.9 Ω. This is to ensure the power requirements from the BDU to the antenna and to ensure the performance of the system.

| Cable Type | Absolute Max. Length (m) | Absolute Max. Length (ft) |
|---|---|---|
| RG223-D | 25 | 80 |
| RG214/U | 50 | 160 |
| GX_07272_D | 40 | 125 |
| LMR-600-50 | 160 | 510 |

Table 2.10: ADU cable types and maximum lengths.

NOTE All table values are guidelines, always check the cable data sheet for the most accurate information.

If you want to use an alternative ADU cable make sure that the following requirements are fulfilled:

1. Check the data sheet from the cable supplier and verify the values:

| **Antenna Cable Data** | |
|---|---|
| ADU cable RF-attenuation at 1950 MHz: | Max. 20 dB including connector |
| ADU cable RF-attenuation at 4450 MHz: | Max. 35 dB including connector |
| ADU cable modem-attenuation at 10 MHz: | Max. 2 dB |
| ADU cable DC loop resistance max: | 0.9 Ω |

Table 2.11: Antenna cable data.

2. Ensure that the specified minimum bending radius is respected. If this is not the case, the loss in the cable will increase. Check the documentation from the cable supplier.

## 2.3 Installation of the ADU (SAILOR 1000 XTR GX-R2)

The following sections describe the installation and grounding of the ADU. The ADU is shipped fully assembled. Install it on the mast and attach the ADU cable.

**WARNING!** Use a strong webbed sling with a belt to lift the ADU without damaging the radome. Make sure that the sling can carry 113 kg.

**WARNING!** The ADU may be subject to swaying motions in windy conditions. Always use tag lines to stabilize the ADU during hoisting. It is the crane operator's responsibility to determine whether the environmental conditions are suitable for a safe lift.

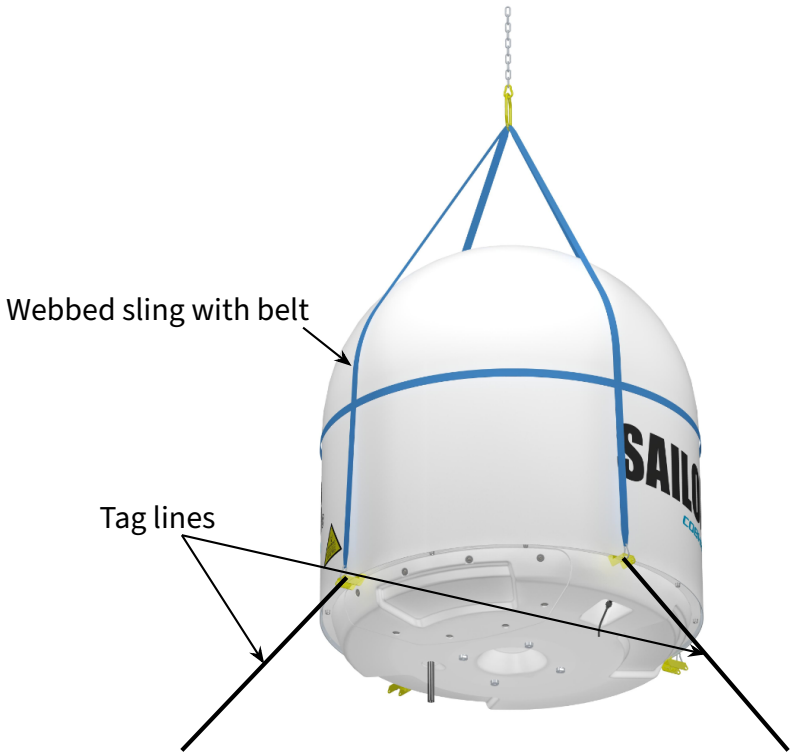



Figure 2.15: Use of strong sling with a belt and tag lines for safe hoisting.

### 2.3.1 To Install the ADU

Prerequisites

- Ensure that the crane hook has a closing mechanism to prevent accidental slippage of the lifting straps.

- Mount the antenna as far away as possible from the ship's radar and high power radio transmitters, read more in *Interference Between Radar, GPS/GNSS, L-band and Other Transmitters/Receivers* on page 2-16.
- Install the ADU at a location where **vibrations are limited to a minimum.**
- Make sure that there is sufficient space underneath the ADU to open the service hatch.

  Important | Maintain the vertical orientation of the ADU center line.

- Always use **all four bolts** when installing the ADU.

Figure 2.16: Free space for access to the service hatch.

You do not need to align the ADU with the bow-to-stern line of the ship. When configuring the SAILOR XTR GX-R2 you make an automated azimuth calibration to obtain the correct azimuth of the ADU.

## Installation Procedure

To install the ADU, do as follows:

1. Install the mast with the mast flange and have the four M12 bolts ready.
2. Undo all shipping buckles, take off the wooden top and remove the casing.
3. Remove the wooden platform.
4. Attach a webbed, four-part sling with a belt to all four lifting brackets.

Figure 2.17: ADU installation, webbed sling attached to the four lifting brackets.

5. Attach two tag lines of suitable length to two lifting brackets and man them.
6. With a crane lift the ADU off the wooden platform and move it on top of the ADU mast.
7. Install the ADU on the mast flange with four M12 bolts and washers. Tighten to 30 Nm. Read carefully and follow instructions given in *To Ground the ADU* on page 2-25.

Figure 2.18: Mounting the ADU on the mast flange.

8. Remove the four lifting brackets. Keep the lifting brackets on the vessel for future use.
9. Attach the N-connector of the ADU cable to the ADU and tighten it to 2.5 Nm.

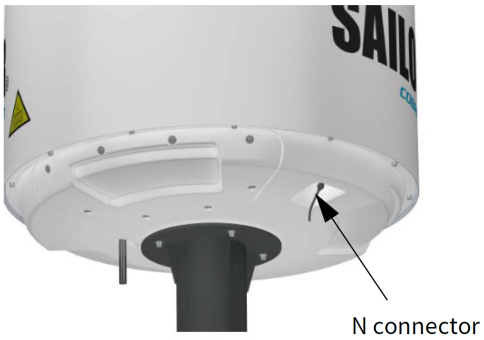



Figure 2.19: Connecting the ADU cable.

10. Ensure that the connector is properly protected against seawater and corrosion. As a minimum, wrap it with self-amalgamating rubber.
11. Where the cables are exposed to mechanical wear — on deck, through bulkheads, etc. — protect the cables with steel pipes. Otherwise, follow standard procedures for cabling in ship installations.

### Maximum Allowed RF Loss In the ADU Cable

Maximum allowed cable loss is $\leq$ 20 dB at 1950 MHz. This is to ensure optimum performance of the system.
Maximum allowed DC loop resistance, screen plus center lead $\leq$ 0.9 $\Omega$.

### To Open the Service Hatch

Do as follows to open the service hatch:

1. With a Torx TX30 screw driver, loosen the eight screws that keep the hatch in place.
2. Lower the service hatch and let it hang in the two strips.

Figure 2.20: Opening the service hatch.

## 2.3.2 To Ground the ADU

Ground the ADU at the mounting bolts. To ground the ADU do as follows:

1. Clean the metal underneath the head of **at least** one bolt of insulating protective coating and use a serrated washer to obtain a good ground connection. For optimum grounding connect the ground wire to the bolt marked in the figure below.

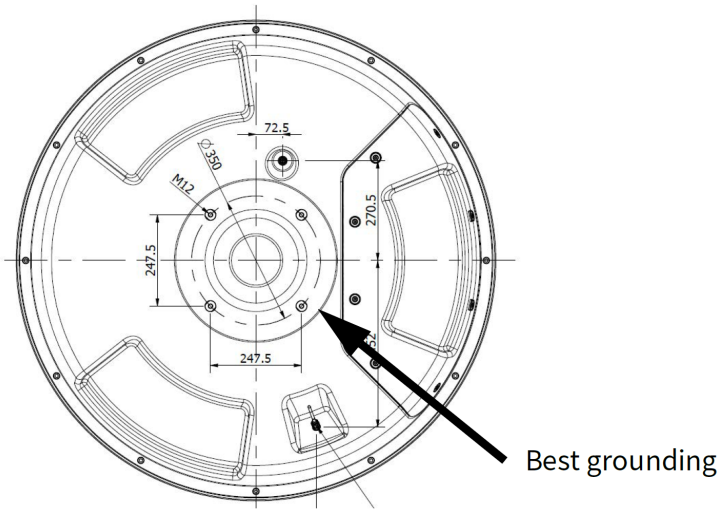



Figure 2.21: Connecting the ADU grounding cable.

2. Tighten the bolt to 30 Nm. Use stainless steel bolts and washers.
3. Seal the area suitably in order to avoid corrosion of the grounding point (recommended).

If the ADU cannot or should not be electrically connected directly to the mounting surface, use a separate grounding cable to make the connection between the ADU and the common ground to which the BDU is also connected. See more in appendix *Grounding and RF Protection* on page G-1.

## 2.4 Installation of the ADU (SAILOR 600 XTR GX-R2)

The ADU is shipped fully assembled.
You have to install it on the mast and attach the ADU cable.

**WARNING!** Use the already mounted lifting harness to lift the ADU without damaging the radome.

**WARNING!** The ADU may be subject to swaying motions in windy conditions. Always use tag lines to stabilize the ADU during hoisting. It is the crane operator's responsibility to determine whether the environmental conditions are suitable for a safe lift.

The antenna comes with a lifting harness already fitted. The lifting harness is provided solely for the purpose of the installation of the antenna. The belt of fiber material prevents the antenna from toppling during the lifting process.

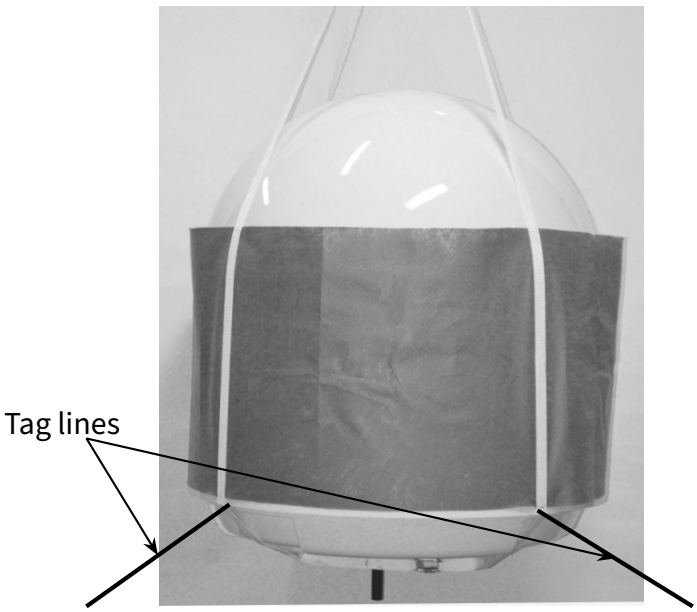



Figure 2.22: Use of the lifting harness and tag lines for safe hoisting.

**WARNING!** Use the lifting harness only to lift the SAILOR 600 XTR GX-R2 antenna. Do not lift other objects or persons with the harness.

The lifting harness (Cobham SATCOM part number TT 48-149056) is designed, tested and conforms to the requirements for lifting equipment in DIRECTIVE 2006/42/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 17 May 2006 on machinery, and amending Directive 95/16/EC (recast).

## 2.4.1 To Install the ADU

### Prerequisites

- Ensure that the crane hook has a closing mechanism to prevent accidental slippage of the lifting straps.
- Mount the antenna as far away as possible from the ship's radar and high power radio transmitters, read more in *Interference Between Radar, GPS/GNSS, L-band and Other Transmitters/Receivers* on page 2-16.
- Install the ADU at a location where **vibrations are limited to a minimum.**
- Always use all four bolts when installing the ADU.

Important **Maintain the vertical orientation of the ADU center line.**

You do not need to align the ADU with the bow-to-stern line of the ship. When configuring the SAILOR XTR GX-R2 you make an automated azimuth calibration to obtain the correct azimuth of the ADU.

- Ensure that the crane hook has a closing mechanism to prevent accidental slippage of the lifting straps.

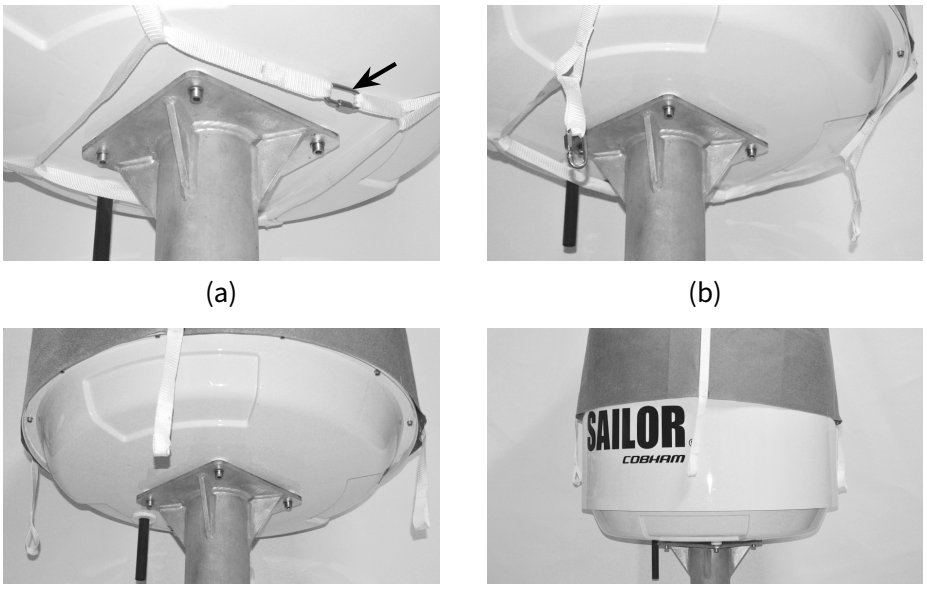
### Installation Procedure

To install the ADU, do as follows:

1. Install the mast with the mast flange and have the four M10 bolts ready.
2. Open the ADU cardboard packaging.
3. Remove the foam protection layer at the top.
4. Take the four lifting straps and connect them to the crane hook.

Figure 2.23: ADU installation, four lifting straps on crane hook.

5. Attach two tag lines of suitable length to the harness and man them.
6. With a crane lift the ADU off the packaging and move it on top of the mast. Maintain **vertical orientation of the ADU center line.**
7. Install the ADU on the mast flange with four M10 bolts and washers. Tighten to 30 Nm.
8. Read carefully and follow instructions given in the next section on grounding.
9. Remove the harness as shown in figure 2.24a–2.24d.




(a) (b)

(c) (d)

Figure 2.24: Removal of the harness.

(a) Locate the quick link (figure 2.24a) and open it (figure 2.24b).

(b) Pull the strap with the quick link through the harness to remove it (figure 2.24c).

(c) Slide the harness over the top of the ADU (figure 2.24d).

10. Dispose of the harness in a responsible manner.

11. Attach the N-connector of the ADU cable to the ADU.

    Tightening torque value: 2.5 Nm.

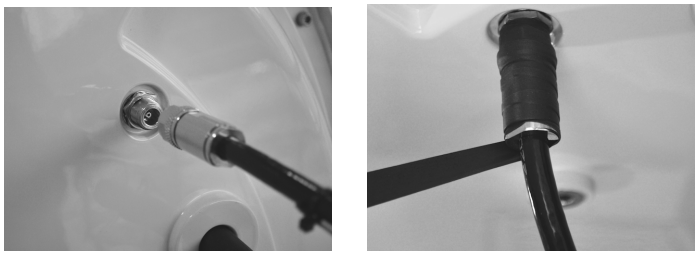


Figure 2.25: Attaching the N-connector.

12. Ensure that the connector is properly protected against seawater and corrosion. As a minimum, wrap it with self-amalgamating tape.

13. Where the cables are exposed to mechanical wear – on deck, through bulkheads, etc. – protect the cables with steel pipes. Otherwise, follow standard procedures for cabling in ship installations.

## 2.4.2 To Ground the ADU

The ADU must be grounded using one of the mounting bolts. To ground the ADU do as follows:

1. Clean the metal underneath the head of **at least** one bolt of insulating protective coating and use a serrated washer to obtain a good ground connection. For optimum grounding connect the ground wire to the bolt marked in the figure below.

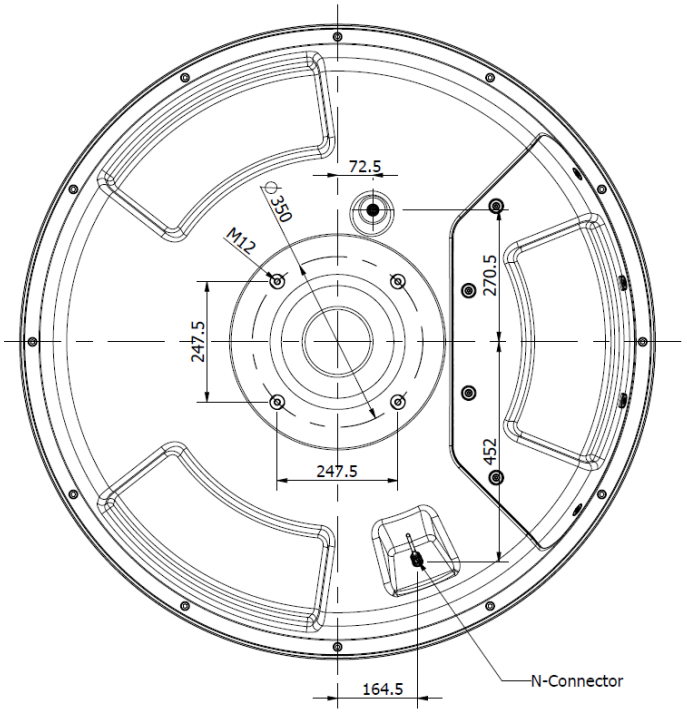



Figure 2.26: ADU, thread for optimum grounding (S600)

2. Tighten the bolt. Use stainless steel bolts and washers.
   Tightening torque value: 30 Nm.
3. Seal the area suitably to avoid corrosion of the grounding point (recommended).

If the ADU cannot or should not be electrically connected directly to the mounting surface, use a separate grounding cable to make the connection between the ADU and the common ground to which the BDU is also connected. see more in appendix *Grounding and RF Protection* on page G-1.

## 2.5 Installation of the BDU

The following sections describe the installation and grounding of the BDU.

### 2.5.1 BDU Interfaces

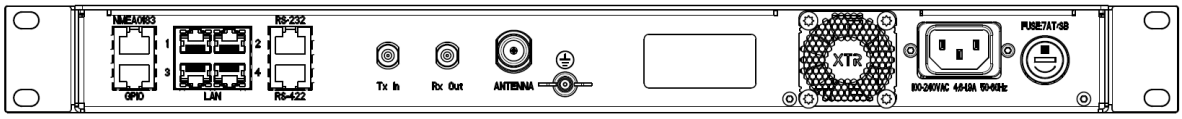



Figure 2.27: BDU connector panel.

AC Input Connector

Connect the power cable to the AC power connector.

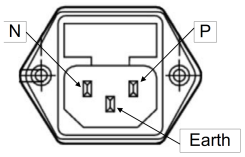
| Outline (on the BDU) | Voltage Range |
|---|---|
|  | 100-240 VAC |



Table 2.12: AC power connector.

ADU Connector

There is just one cable from the BDU to the ADU. This is used to power the ADU, supply reference clock, handle all communication between BDU and ADU, and deliver the VSAT Rx and Tx signals.

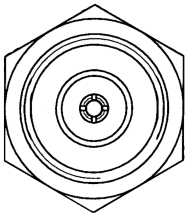
| Outline (on the BDU) | Conductor | Pin Function |
|---|---|---|
|  | Inner | DC to ADU<br>Reference clock to ADU<br>BDU to ADU Internal Communication<br>VSAT Rx/Tx |
| | Outer | GND (Shield) |

Table 2.13: N connector, outline and pin assignment.

**Important** Do not use TNC connectors on the ADU antenna cable or on pigtails. TNC connectors cannot carry the DC current for operating the ADU.

## Rx/Tx Connectors for the Modem

Connect the Rx and Tx channels of the modem to the Rx and Tx connectors of the BDU with the two supplied Rx/Tx cables (75 Ω coax, F-F, 1 m).

| Outline (on the BDU) | Pin Number | Pin Function |
|---|---|---|
| | 1 | Inner Conductor:<br>Reference clock, VSAT Rx/Tx<br>BDU to ADU Internal Communication |
| | 2 | Outer Conductor:<br>GND (Shield) |

Table 2.14: F connector, Rx and Tx, outline and pin assignment.

For step-by-step guidelines how to set up the VSAT modem see *Miscellaneous* on page C.

## NMEA 0183 RJ-45 Connector

Connect the ship's gyro to the RJ-45 connector marked NMEA.

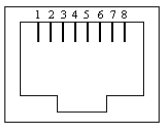
| Outline (on the BDU) NMEA | Pin | I/O | Signal | Pin Function |
|---|---|---|---|---|
|  | 1 | O | RS-422 Line B (+) | Future use |
| | 2 | O | RS-422 Line A (-) | Future use |
| | 3 | I | RS-422 Line B (+) | Heading, balanced |
| | 4 | O | RS-232 TxD | Future use |
| | 5 | | RS-422 shield | Connect only at one end |
| | 6 | I | RS-422 Line A (-) | Heading, balanced |
| | 7 | | RS-232 GND | Heading, single |
| | 8 | I | RS-232 RxD | Heading, single |
| | Shield | | PCB ground | PCB ground |

Table 2.15: NMEA 0183 RJ-45 connector, outline and pin assignment.

To accommodate the gyro cable use the terminal block (RJ45 Wire Connector Terminal, S-31-208142). The pin numbers on the adapter are the same as on the RJ-45 plug.

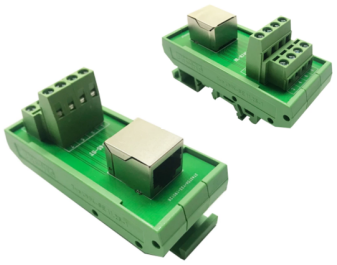


Figure 2.28: Gyro input, terminal block.

**The NMEA 0183 connection supports IEC 61162-1 and IEC 61162-2.**

- IEC 61162-1, baud rate 4800, format 8N1.
- IEC 61162-2, baud rate 38400, format 8N1.

The baud rate is auto detected by the BDU, the user cannot configure this interface.

**Supported NMEA strings in order of priority (Talker ID):**

1. HExxx (North seeking Gyro compass).
2. GPxxx (GPS compass).
3. HNxxx (Non-North seeking gyro compass).
4. IIxxx (Integrated Instrument).
5. HCxxx (Magnetic compass).

Any HDT sentence is supported as long as it complies with the following header format: $xxHDT where xx e.g. GP for $GPHDT.

Any HDG sentence is supported as long as it complies with the following header format: $xxHDG where xx e.g. GP for $GPHDG.

**Recommended NMEA 0183 cable:** Minimum CAT 5e, shielded.

GPIO RJ-45 Connector

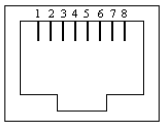
| Outline (on the BDU) | Pin | I/O | Signal | Function |
|---|---|---|---|---|
|  | 1 | I | GPIO1 | Tx Mute (active high) |
| | 2 | O | 12 VDC / 500 mA | Power Output |
| | 3 | O | GPIO2 | Rx Lock (open drain) |
| | 4 | O | GPIO3 | Generic VSAT Profile Active |
| | 5 | | GND | Ground |
| | 6 | O | 12 VDC / 500 mA | Power output |
| | 7 | N/A | GPIO4 | Future use |
| | 8 | | GND | Ground |
| | Shield | | PCB ground | PCB ground |

Table 2.16: RJ-45 GPIO connector, outline and pin assignment.

The Tx mute function can be controlled with a simple switch connected between pin 1 (Tx mute) and pin 2 (12 VDC). The Rx lock function is high and becomes low when the modem is not in Rx lock.

RS-232 RJ-45 Connector

Use the following connector to connect the BDU to the VSAT modem.

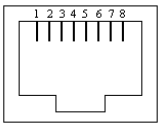
| Outline (on the BDU) | Pin | I/O | Signal | Function |
|---|---|---|---|---|
|  | 1 | I | RSSI 2 | CM temp out of range |
| | 2 | I | DTR/Rx lock | CM power good |
| | 3 | I | RXD | BUC TXD |
| | 4 | - | GND | Ground |
| | 5 | - | GND | Ground |
| | 6 | O | TXD | BUC RXD |
| | 7 | I | DSR/TX mute | GMU reset |
| | 8 | I | RSSI 1 | CM RSSI |
| | Shield | - | PCB ground | PCB ground |

Table 2.17: RJ-45 RS-232 connector, male, outline and pin assignment.

RS-422 RJ-45 Connector

Use the following connector to connect the BDU to the VSAT modem.

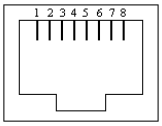
| Outline (on the BDU) | Pin | Signal | Pin Function |
|---|---|---|---|
|  | 1 | Line A RXD (+) | Receive data (non-inverting) |
| | 2 | Line A RXD (-) | Receive data (inverting) |
| | 3 | Line B TXD (+) | Transmit data (non-inverting) |
| | 4 | GND | Ground |
| | 5 | GND | Ground |
| | 6 | Line B TXD (-) | Transmit data (inverting) |
| | 7 | BUC Keyline (+) | Keyline (non-inverting) |
| | 8 | BUC Keyline (-) | Keyline (inverting) |
| | Shield | PCB ground | PCB ground |

Table 2.18: RJ-45 RS-422 connector, male, outline and pin assignment.

LAN Connectors

The BDU has four Ethernet connectors (type RJ-45), located at the back of the unit, for PC/laptops, routers and wireless access points. LAN port 5 is for service access at the front.

Depending on the VSAT modem, one LAN connector may be used for modem control.

The maximum cable length per connection is 100 m.

Cable type: Minimum CAT 5e, shielded.

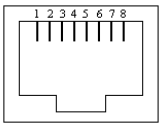
| Outline (on the BDU) | Pin | Pin Function | Wire Color |
|---|---|---|---|
|  | 1 | Tx+ | White/orange |
| | 2 | Tx- | Orange |
| | 3 | Rx+ | White/green |
| | 4 | Not connected | Blue |
| | 5 | Not connected | White/blue |
| | 6 | Rx- | Green |
| | 7 | Not connected | White/brown |
| | 8 | Not connected | Brown |
| | Shield | PCB ground | Metallic gray |

Table 2.19: Ethernet connector, outline and pin assignment.

## 2.5.2 To Install the BDU

To install the BDU, do as follows:

1. Slide the BDU into a 1U space in a 19” rack.

**Important** Make sure that the air intakes on the side of the unit are not blocked.

2. Support the BDU in the 19” rack with standard 19” rack rails or 19” shelf and mount the screws in each side through the holes in the front and fasten the screws to the rack. Make sure that the unit is mounted securely according to the requirements for your 19” rack.
3. Connect all cables. See the previous sections for a description of the BDU connectors.

The BDU has an additional LAN connector at the front, for accessing the service port from the BDU front panel.

To Ground the BDU

1. Make sure that the grounding requirements are met. See the appendix *To Ground the BDU* on page G-2 for details about grounding.
2. At the BDU end, connect the shield of the ADU cable to ship ground.
3. Make sure the rack is connected to ship ground.

To ensure that the BDU is grounded – also if the ADU cable is disconnected from the BDU, connect an extra ground wire from the rack to the ground stud on the BDU. This ground wire must be a heavy wire or braid cable with a larger diameter than the coax cable.

## 2.6 Installation of the Modem

The GX Modem Unit comes in two different variants.

1. 407023A Sailor GX Modem Unit with CX751 iDirect Core Module.
2. 407523A Sailor GX-R2 Modem Unit with SMB3315 iDirect Core Module.

Both modems can be used with all SAILOR GX and SAILOR GX-R2 antenna systems.

**NOTE** **For information of a dual modem system, see *Dual Modem Operation* on page C-3.**

# 2.7 Installation of the 407523A GX-R2 Modem Unit (SMB3315)

The following sections describe how to install and connect the 407523A modem to the BDU.

## 2.7.1 Interfaces on the 407523A GX-R2 Modem Unit

### Connector Panel

The connector panel of the modem can be seen in figure 2.29.

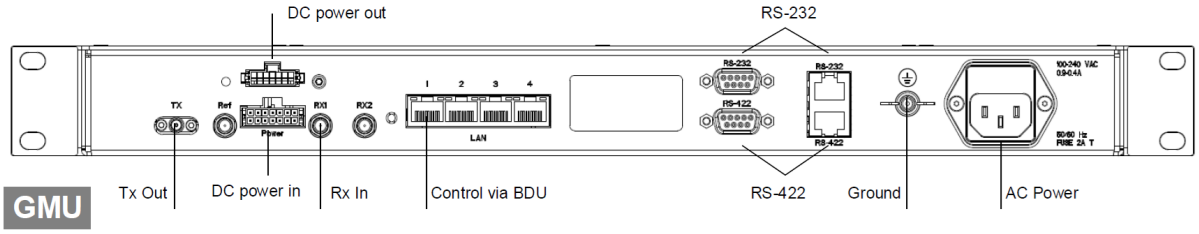



Figure 2.29: Connector panel of the modem (407523A).

### Rx In and Tx Out Connectors

The modem has an Rx In and a Tx Out connector. Use these connectors to connect the BDU to the modem.

| Outline (on the BDU) | Pin Number | Pin Function |
|---|---|---|
| | 1 | Inner conductor:<br>50 MHz clock, Rx/Tx |
| | 2 | Outer conductor:<br>GND (Shield) |

Table 2.20: F connector, Rx and Tx, outline and pin assignment.

### RS-232 and RS-422 Connectors

The 407523A GX-R2 Modem Unit has two sets of serial interfaces (RS-232 and RS-422) for control information to and from the BDU. The two sets of serial ports on the backplane are of two different physical interface standards:
One set DB9 and one set RJ-45.
The RJ-45 RS-232 and RS-422 are used for connection to 407516A SAILOR XTR BDU.

NOTE The DB9 interface is not used with SAILOR XTR GX-R2 but is used for backwards compatibility when replacing a GMU in a legacy SAILOR GX or SAILOR GX-R2 system.

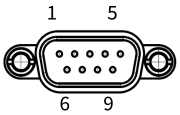
| Outline (on the modem) | Pin | Pin Function |
|---|---|---|
|  | - | **Not used** with 407516A BDU.<br>**Used** with 407016B or 407016C ACU. |

Table 2.21: RS-232 connector, male. Used with **407016B or 407016C ACU**, **NOT 407516A BDU.**

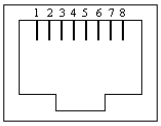
| Outline (on the modem) | Pin | I/O | Pin Function |
|---|---|---|---|
|  | 1 | - | NC |
| | 2 | O | CM power good |
| | 3 | O | CM TxD |
| | 4 | - | Ground |
| | 5 | - | Ground |
| | 6 | I | CM RxD |
| | 7 | - | NC |
| | 8 | - | NC |
| | Shield | PCB ground | PCB ground |

Table 2.22: RJ-45 RS-232 connector (407523A), female, outline and pin assignment, modem. **Used with 407516A BDU.**

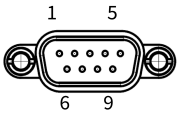
| Outline (on the modem) | Pin | Pin Function |
|---|---|---|
|  | - | **Not used** with 407516A BDU.<br>**Used** with 407016B or 407016C ACU. |

Table 2.23: RS-422 connector, male. Used with **407016B or 407016C ACU**, **NOT 407516A BDU.**

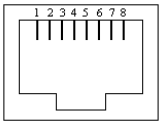
| Outline (on the modem) | Pin | I/O | Pin Function |
|---|---|---|---|
|  | 1 | - | NC |
| | 2 | - | NC |
| | 3 | I | RESET_CM_P |
| | 4 | - | Ground |
| | 5 | - | Ground |
| | 6 | I | RESET_CM_N |
| | 7 | O | KEYLINE_CM_P |
| | 8 | O | KEYLINE_CM_N |
| | Shield | PCB ground | PCB ground |

Table 2.24: RJ-45 RS-422 connector (407523A), female, outline and pin assignment, modem. **Used with 407516A BDU.**

### LAN Connectors

The modem has several Ethernet connectors (type RJ45). Port 1 connects to the BDU and is used for modem control. The other ports are not used. The maximum cable length per connection is 100 m. The Ethernet cable type must be at least CAT 5e, shielded. For outline and pin allocation see *LAN Connectors* on page 2-35.

### GMU Cables for 407523A (RS-232 and RS-422)

The serial connections of the SAILOR GMU 407523A and the SAILOR XTR BDU 407516A use standard Ethernet LAN cables (RJ-45 male to RJ-45 male) with 8 straight-through wires. These serial cables are Customer Furnished Equipment (CFE) and must be acquired locally.

## 2.7.2 To Install the Modem

To install the modem, do as follows:

1. Slide the modem into a 1U space in a 19" rack, preferably directly below or above the BDU.

**Important** Make sure that the ventilation grills at the sides of the unit are not blocked.

2. Mount the screws in each side through the holes in the front and fasten the screws to the rack. Make sure that the unit is mounted securely according to the requirements for your 19" rack.

## To Ground the Modem

Make sure that the grounding requirements are met. See the appendix *Grounding and RF Protection* for details about grounding.

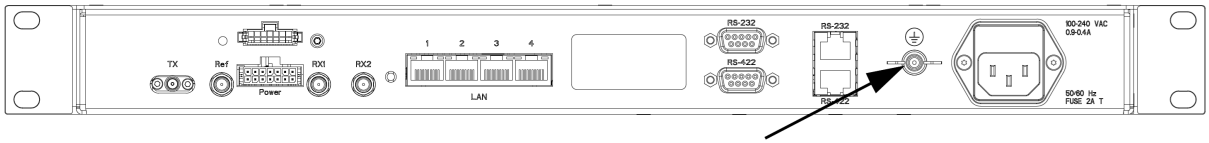



Figure 2.30: Ground stud, GMU (407523A).

## To Connect the ADU, BDU and Modem

The following sections show how to connect the ADU, BDU and the modem.

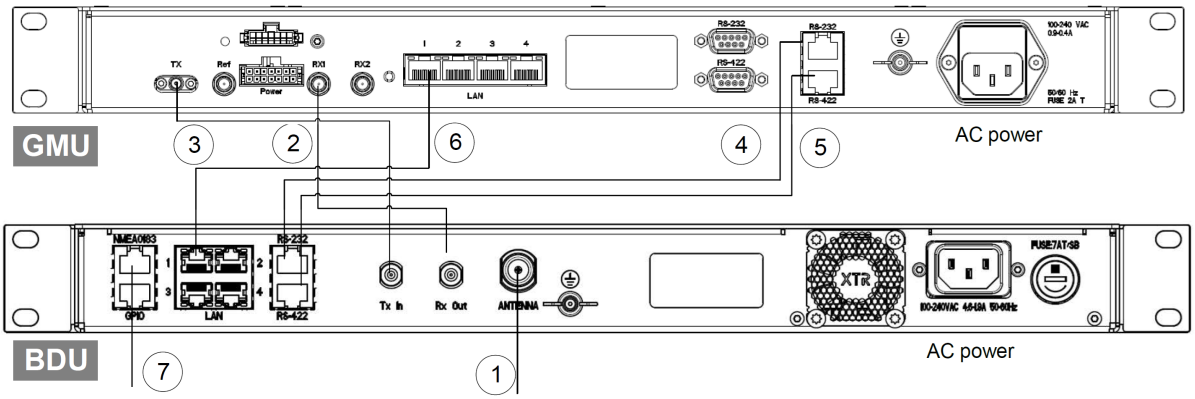



Figure 2.31: Connection between ADU, BDU and modem (407523A).

1. Connect the antenna cable to **Antenna** at the BDU and the antenna.
2. Connect **Rx Out** at the BDU to **Rx In** at the modem with the supplied cable (coax, F-F, 1 m) and F-to-SMA adapter.
3. Connect **Tx In** at the BDU to **Tx Out** at the modem with the supplied cable (coax, F-F, 1 m) and F-to-SMA adapter.
4. Connect **RS-232** on the BDU to **RS-232** at the modem.
5. Connect **RS-422** on the BDU to **RS-422** at the modem.
6. Connect **LAN1** at the BDU to **LAN1** at the modem.
7. Connect the green terminal block for the heading input from the gyro. For pin allocation see *NMEA 0183 RJ-45 Connector* connector on page 2-32.

# 2.8 Installation of the 407023A GX Modem Unit (CX751)

The following sections describe how to install and connect the 407023A modem to the BDU.

## 2.8.1 Interfaces on the 407023A GX Modem Unit

### Connector Panel

The connector panel of the modem can be seen in figure 2.32.

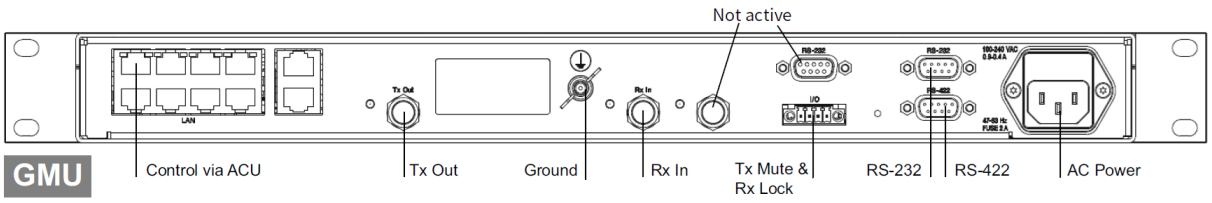



Figure 2.32: Connector panel of the modem (407023A).

### Rx In and Tx Out Connectors

The modem has an Rx In and a Tx Out connector. Use these connectors to connect the BDU to the modem.

| Outline (on the BDU) | Pin Number | Pin Function |
|---|---|---|
| | 1 | Inner conductor:<br>50 MHz clock, Rx/Tx |
| | 2 | Outer conductor:<br>GND (Shield) |

Table 2.25: F connector, Rx and Tx, outline and pin assignment.

### RS-232 and RS-422 Connectors

The modem has one RS-232 and one RS-422 connector for control information to and from the BDU.

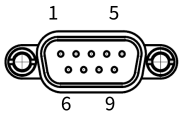
| Outline (on the modem) | Pin | Pin Function |
|---|---|---|
|  | 1 | NC |
| | 2 | BUC TxD |
| | 3 | BUC RxD |
| | 4 | NC |
| | 5 | GND |
| | 6 | Power good |
| | 7 | GMU reset |
| | 8 | Temperature out of range |
| | 9 | Core Module RSSI |

Table 2.26: RS-232 connector, male, outline and pin assignment, modem.

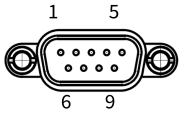
| Outline (on the modem) | Pin | Pin Function |
|---|---|---|
|  | 1 | GND |
| | 2 | Keyline P |
| | 3 | Reset P |
| | 4 | GND |
| | 5 | GND |
| | 6 | NC |
| | 7 | Keyline N |
| | 8 | Reset N |
| | 9 | NC |

Table 2.27: RS-422 connector, male, outline and pin assignment, modem.

## LAN Connectors

The modem has several Ethernet connectors (type RJ45). Port 1 connects to the BDU and is used for modem control. The other ports are not used. The maximum cable length per connection is 100 m. The Ethernet cable type must be at least CAT 5e, shielded. For outline and pin allocation see *LAN Connectors* on page 2-35.

## I/O Connector for Tx Mute and Rx Lock (Future Use)

The GMU 407023A has one I/O connector for Tx Mute and Rx Lock.

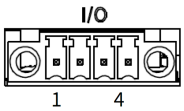
| Outline (on the modem) | Pin | Pin Function |
|---|---|---|
|  | 1 | GND |
| | 2 | NC |
| | 3 | Rx lock out |
| | 4 | Tx mute in |

Table 2.28: I/O connector, outline and pin assignment, modem (future use) (407023A).

GMU Cables for 407023A (RS-232 and RS-422)

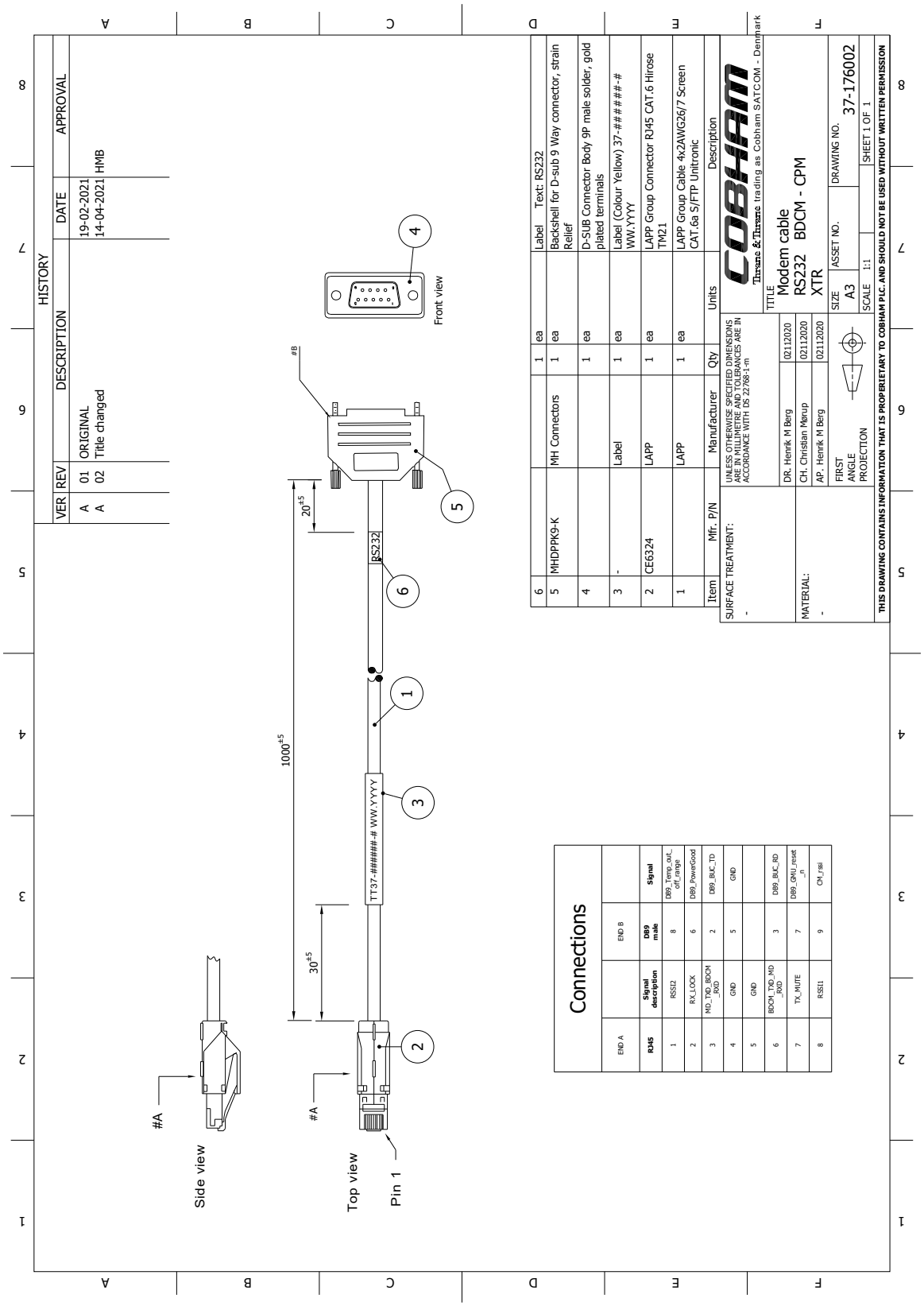



Figure 2.33: GMU cable (RS-232) (407023A)

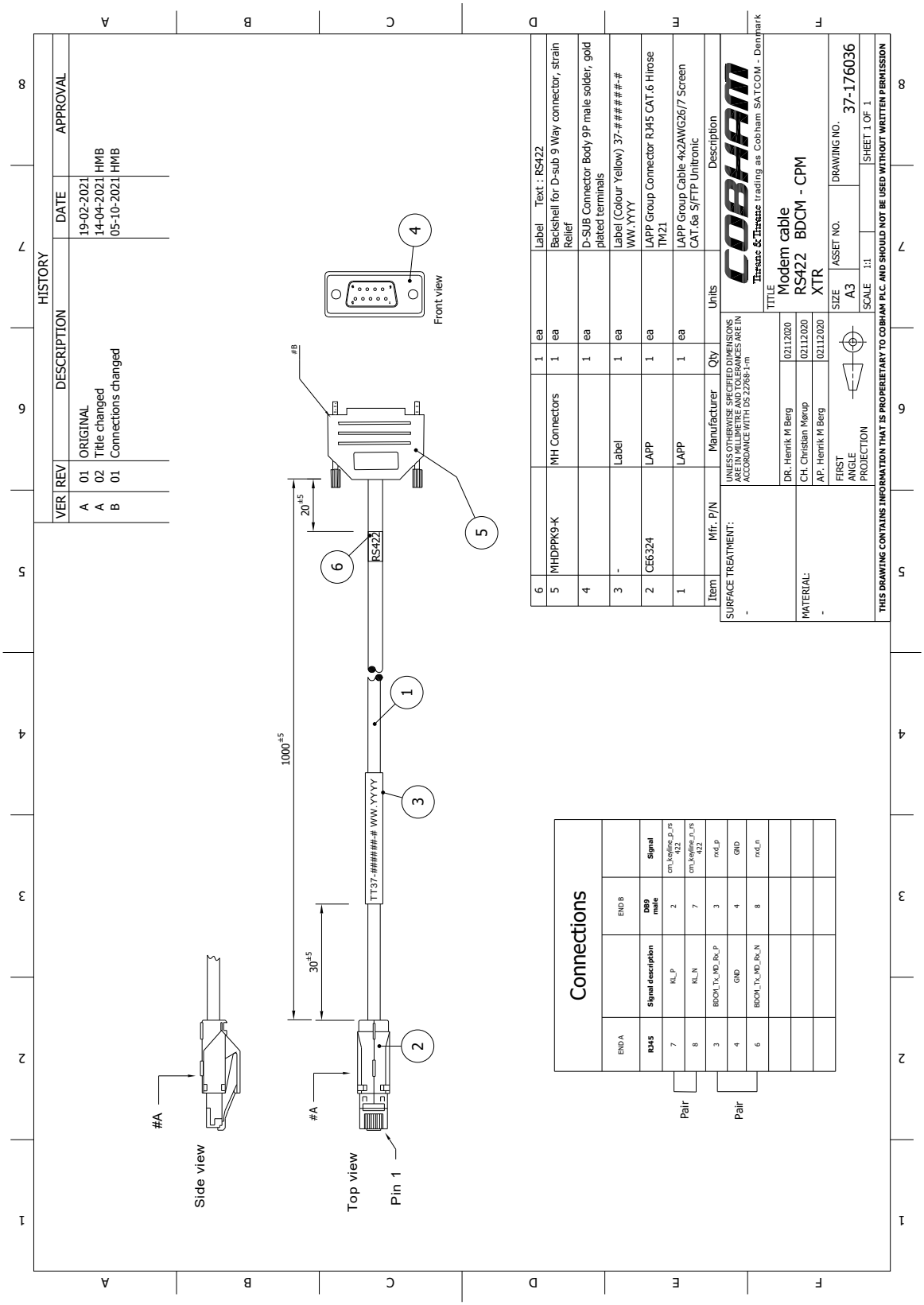



Figure 2.34: GMU cable (RS-422) (407023A)

## 2.8.2 To Install the Modem

To install the modem, do as follows:

1. Slide the modem into a 1U space in a 19" rack, preferably directly below or above the BDU.

**Important** Make sure that the ventilation grills at the sides of the unit are not blocked.

2. Mount the screws in each side through the holes in the front and fasten the screws to the rack. Make sure that the unit is mounted securely according to the requirements for your 19" rack.

### To Ground the Modem

Make sure that the grounding requirements are met. See the appendix *Grounding and RF Protection* for details about grounding.

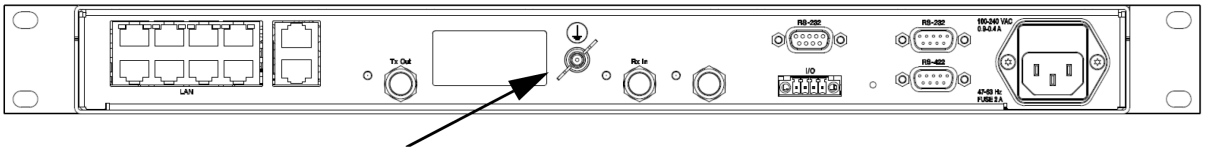


Figure 2.35: Ground stud, GMU (407023A).

### To Connect the ADU, BDU and Modem

The following sections show how to connect the ADU, BDU and the modem.

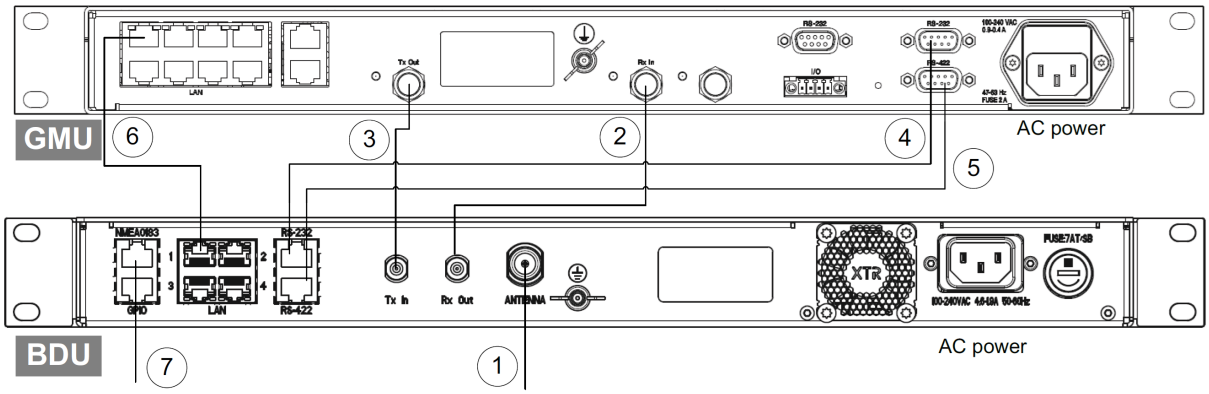



Figure 2.36: Connection between ADU, BDU and modem (407023A).

1. Connect the antenna cable to **Antenna** at the BDU and the antenna.
2. Connect **Rx Out** at the BDU to **Rx In** at the modem with the supplied cable (coax, F-F, 1 m) and F-to-SMA adapter.

3. Connect **Tx In** at the BDU to **Tx Out** at the modem with the supplied cable (coax, F-F, 1 m) and F-to-SMA adapter.
4. Connect **RS-232** on the BDU to **RS-232** at the modem.
5. Connect **RS-422** on the BDU to **RS-422** at the modem.
6. Connect **LAN1** at the BDU to the upper left RJ45 connector at the modem.
7. Connect the green terminal block for the heading input from the gyro. For pin allocation see *NMEA 0183 RJ-45 Connector* on page 2-32.

## 2.9 Integration of a 3rd Party Device

This section describes how to integrate a 3rd party IP device inside the antenna radome of SAILOR 1000 XTR GX-R2. The antenna has the following interfaces for the integration with an example:

- *Power Connector*
- *Communication*
- *Mechanical Interface*
- *Power Connector (LTE modem example)*

### 2.9.1 Power Connector

The power output options are 12 VDC / 2A and 5 VDC / 2A. The physical interface is a Molex 105308 4-pin nano-fit connector on the Antenna Control Module (ACM).

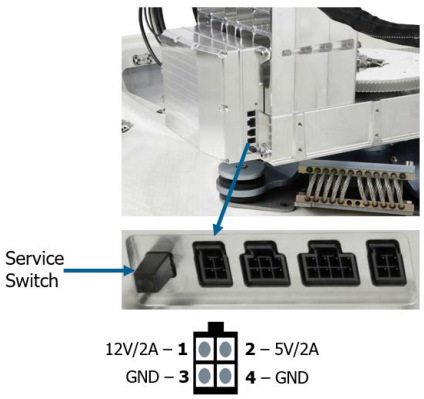



Figure 2.37: ADU power on/off (left) and ACM 4-pin nano-fit connector.

### 2.9.2 Communication

The ACM has four Ethernet LAN ports. LAN port 1 and 2 can be tunneled to the LAN ports of the BDU. The BDU LAN port and ACM LAN port are a transparent data channel that connects two devices. The ACM LAN ports are set up in the web interface.

Figure 2.38: ACM LAN ports.

## 2.9.3 Mechanical Interface

The antenna pedestal is prepared for mounting devices on the side of the pedestal. The mounting screw holes (M5 x 8mm) can support a special designed mounting bracket to support mounting of a 3rd party hardware device in the antenna.

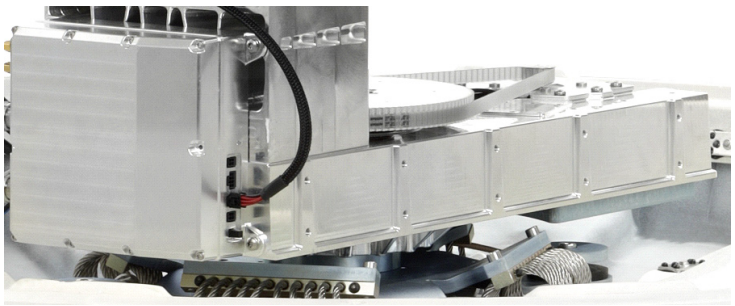


Figure 2.39: Mounting pattern on the pedestal.

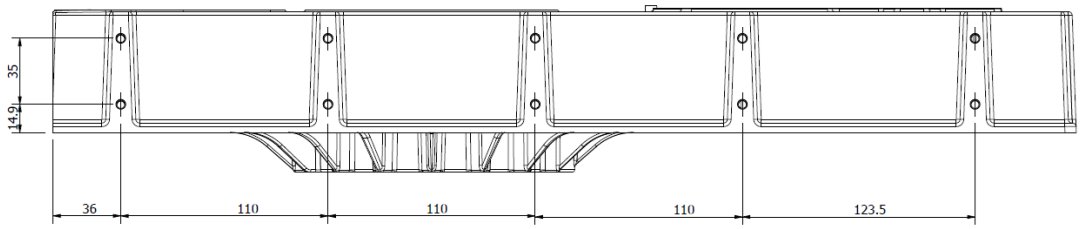



Figure 2.40: Mounting pattern, measurements.

## 2.9.4 Power Connector (LTE modem example)

The nano-fit connector supplies 12 VDC to power the LTE modem, which interconnects to the antenna system on one of the LAN ports on the ACM.

Figure 2.41: LTE modem connection, example.

The LTE modem enables remote access and/or near-shore high speed Internet. Having the LTE modem inside the antenna is the ideal position for best possible LTE signal reception.

NOTE Make sure that there is sufficient space for reflector and cable movement.

## 2.10 Power and Startup

1. Connect power to the BDU.
2. Connect power to the VSAT modem.
3. Switch on the BDU. The unit starts up and goes through an initialization procedure:
   - Antenna POST pending.
   - Antenna SW upload (If the software versions in the ADU and BDU are not the same, a software update is done during startup).
   - Antenna POST.
   - Not ready.
   - Ready.
   - Acquiring Signal.
   - Tracking.

This may take some time (up to a couple of minutes). The SAILOR XTR GX-R2 is ready to be calibrated (for first time power up) or receive data from the VSAT modem (when in normal operation) when the antenna enters the state Ready.
On the BDU, the LEDs **Power** and **Fail/Pass** are **steady green**, the LED **Logon** is off.

4. Make sure there are no hardware failures or error codes present, check the display of the BDU for events.
5. You may follow the instructions in the installation wizard to get the SAILOR XTR GX-R2 system operational, see *Installation Wizard* on page 3-33.

### 2.10.1 Power Cycle

To power cycle the BDU and ADU do as follows:

1. Flip the on/off switch at the front panel of the BDU.
2. Wait until the system has rebooted and is operational again (the display shows **TRACKING**). The last active satellite  profile will be used.

# Setup of the Antenna

This chapter has the following sections:

- *Introduction to the Web Interface*
- *Settings*
- *Service*
- *Keypad and Menus of the BDU*
- *Startup Sequence*

**Important**

The SAILOR XTR GX-R2 system is not designed to be connected directly to the Internet. It must be connected behind a dedicated network security device such as a firewall. If any ports of the SAILOR XTR GX-R2 are exposed to the Internet you must use a strong password as anyone with access and malicious intent can render the system inoperable.

**NOTE**

All antennas are set up in the same way as the SAILOR 1000 XTR GX-R2 antenna.

# 3.1 Introduction to the Web Interface

Use the built-in web interface to set up the SAILOR XTR GX-R2. Use a standard Internet browser. The menus are grouped in three sections: **Dashboard**, **Settings** and **Service**.

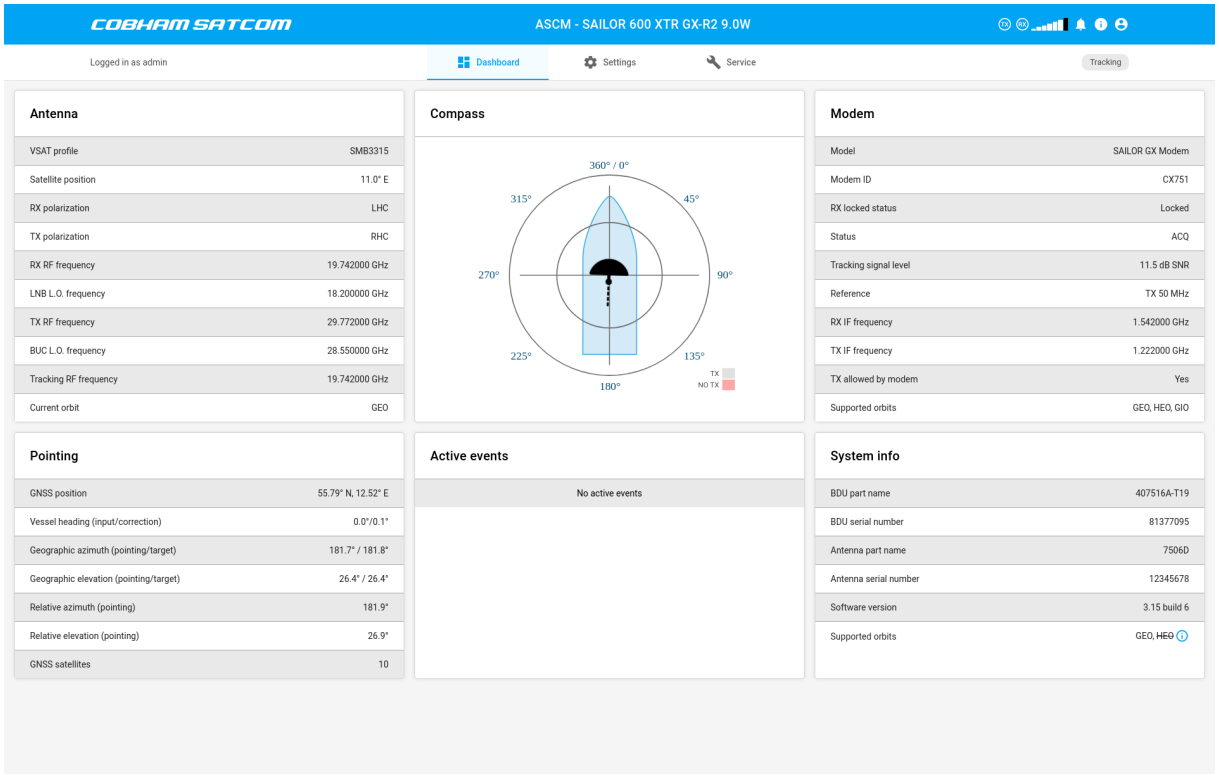
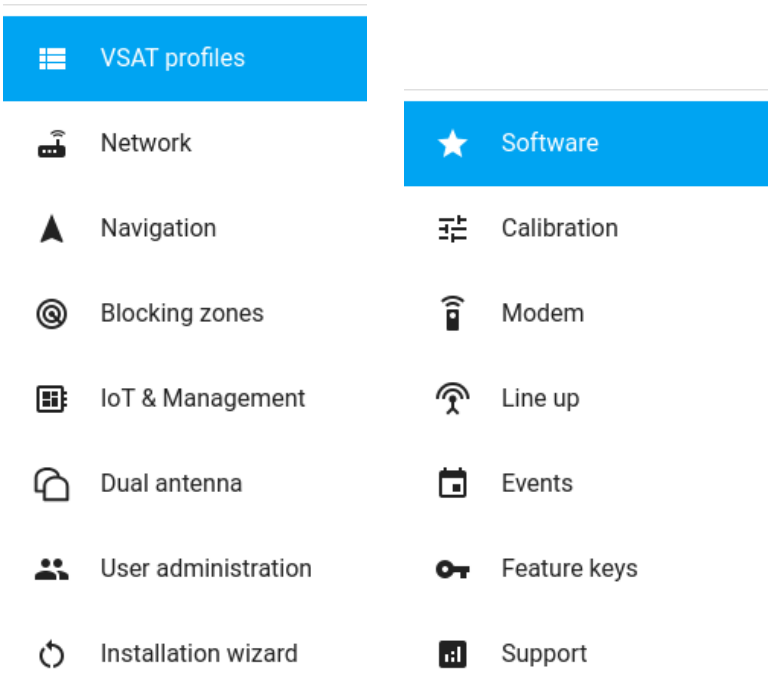



Figure 3.1: Dashboard (example).

The menu items of **Settings** and **Service** are shown in figure 3.2a and 3.2b.




(a) Menu items in **Settings**. (b) Menu items in **Service**.

Figure 3.2: Menu items in the web interface.

### 3.1.1 Connecting to the Web Interface

To connect to the web interface do as follows:

1. Power on the BDU.
2. Wait until the LEDs on the front plate of the BDU show that the system is ready to be configured.
   - Power LED: Green.
   - Logon LED: Off.
   - Fail/Pass LED: Blinking green during power-on self test, after that steady green.
3. Connect a PC to the service port on the front panel of the BDU.

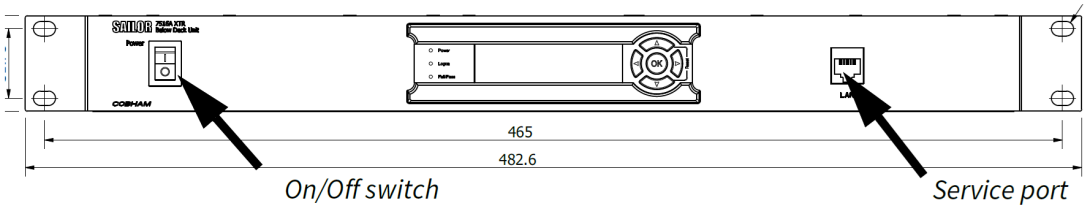



Figure 3.3: BDU Service port.

4. Open an Internet browser and enter the IP address of the BDU. The default IP address is **https://192.168.0.1**. When the login screen is displayed you have verified that the connection to the SAILOR XTR GX-R2 can be established.

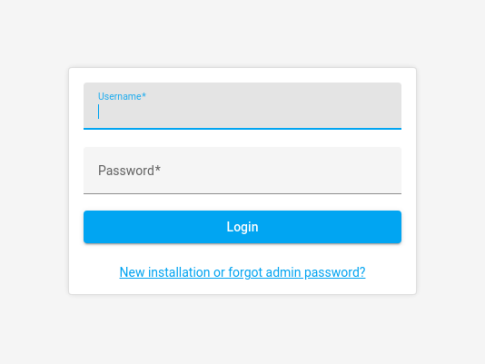



Figure 3.4: Login.

There is an admin and a guest login. A guest can only access the functions that are allowed by an administrator. With the guest login (user name: guest, password: configured by the administrator) you can protect the system from accidental changes of the configuration.

## Sections on the Dashboard

| **Parameter** | **Description** |
|---|---|
| **ANTENNA** | |
| VSAT profile | Name of the currently active VSAT profile. |
| Satellite position | Longitude position of the satellite (When current Orbit is GEO). |
| Sub-satellite point | Satellite position when projected on Earth surface (When current Orbit is not GEO). |
| RX polarization | Left Hand Circular or Right Hand Circular. |
| TX polarization | Left Hand Circular or Right Hand Circular. |
| RX RF frequency | Receiving Transponder Frequency. |
| LNB L.O. frequency | Low-Noise Block Local Oscillator frequency, auto-selected by the modem. |
| TX RF frequency | Modem transmit frequency. |
| BUC L.O. frequency | Block-Up Converter Local Oscillator frequency, depending on antenna hardware. |
| Tracking RF frequency | Antenna tracking frequency. |
| Current Orbit | GEO, GEO TLE or HEO TLE. Orbits other than GEO require a feature key. |

Continued on next page

Table 3.1: Sections and parameters on the Dashboard.

| Parameter | Description |
|---|---|
| Latest TLE Age | Timestamp of the latest TLE data. Only available if Current Orbit is set to TLE. |
| Latest TLE Time | When was the latest TLE data received. Only available if Current Orbit is set to TLE. |
| **MODEM** | |
| Model | VSAT modem model used with the currently active VSAT profile. |
| Modem ID | CX751 or SMB3315 if one of those modems are detected. |
| RX locked status | Indicates whether the modem is locked to the signal from the satellite. |
| Status | Status information received from the modem. |
| Analog RSSI | RSSI information from the modem. The measured signal strength is in mV. This field is optional and can be enabled for certain modems. |
| Tracking signal level | The tracking signal level is either in mV, dB or dB SNR depending on the tracking type e.g narrow band. |
| Reference | Shows the BUC and LNB reference source. |
| RX IF frequency | Shows the L-band RX frequency selected by the modem. |
| TX IF frequency | Shows the L-band TX frequency used by the modem. |
| TX allowed by modem | Yes or No. Indicates if the modem supplies BUC reference signal on its TX connector and if the modem indicates Rx locked and Tx ON (e.g., OpenAMIP message L (L 1 1)). |
| Supported Orbits | Modem supported Orbits: GEO, GEO,HEO. |
| **POINTING** | |
| GNSS position | Current vessel position, reported by the built-in GNSS module or external GPS source. |
| Vessel heading (input/correction) | Ship's heading in degrees with reference to North, provided by the ship's gyro. The value provided by user or external compass is shown as input. The antenna, once in tracking, determines corrections to the given input. |
| Geographic azimuth (pointing/target) | Current antenna pointing for geographic azimuth. |
| Geographic elevation (pointing/target) | Current antenna pointing for geographic elevation. |

Continued on next page

Table 3.1: Sections and parameters on the Dashboard. (Continued)

| Parameter | Description |
|---|---|
| Relative azimuth (pointing) | Current antenna pointing for relative azimuth. |
| Relative elevation (pointing) | Current antenna pointing for relative elevation. |
| GNSS satellites | Number of currently visible GNSS satellites. |
| **SYSTEM INFO** | |
| BDU part name | BDU model. |
| BDU serial number | BDU serial number, used for service cases. |
| Antenna part name | ADU model. |
| Antenna serial number | ADU serial number, used for service cases. |
| Software version | Active software version. |
| Supported Orbits | Antenna supported Orbits: A subset of the following: GEO, HEO, LEO, MEO. Orbits other than GEO require a feature key. |
| **ACTIVE EVENTS** | |
| Will show any Active events. | |
| **COMPASS** | |
| Graphical visualization of ship heading and antenna pointing direction compared to geographical north. | |

Table 3.1: Sections and parameters on the Dashboard.

Top Bar

The top bar shows the host name and antenna model. It also has icons to report on the current status of the antenna. Underneath the top bar, to the right, the current antenna status is shown, e.g. **Tracking**.

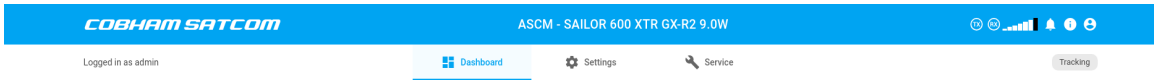



Figure 3.5: Top bar of the web interface (example).

| Icon | Explanation |
|---|---|
| | BUC status. White: BUC unmuted, black: BUC muted. |
| | Receive signal strength. |
| | Number of active errors and warnings. Mouse over will show a list of the first 5 messages, a click on the list will display the event list. |
| | About and contact information. |
| | Logout. |

The **TX icon** is white when the following conditions are met:

- The SAILOR XTR GX-R2 must sense the reference clock signal from the connected VSAT modem.
- The VSAT modem must have Rx lock.
- The antenna must point correctly to the satellite.
- The antenna must be in tracking mode.

## 3.2 Settings

In this section you can define VSAT profiles and network settings, enter navigation input, set blocking zones and define settings for logging of antenna syslogs and diagnostics reports. You can also administer a Dual Antenna setup and set passwords and user permissions. Furthermore you can access the installation wizard.

### 3.2.1 VSAT Profiles

In this section you set up the VSAT profile, including modem and satellite data. Once you have created a VSAT profile, you can edit or delete it. AUTO means that the modem selects automatically which satellite to connect to.

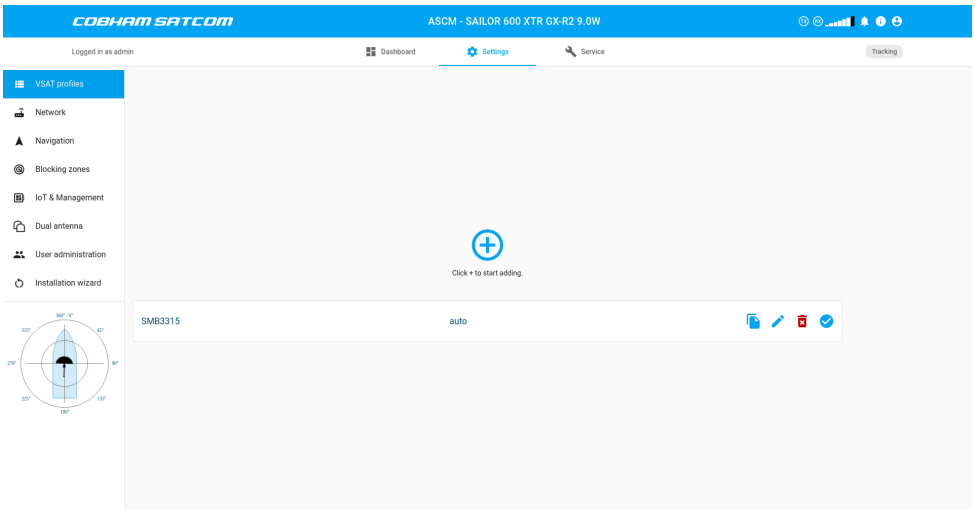



Figure 3.6: Settings - VSAT Profiles.

To set up a VSAT profile and activate it, do as follows:

1. Click **Settings** and then **VSAT profiles**.
2. Click the **+** icon to add a VSAT profile.

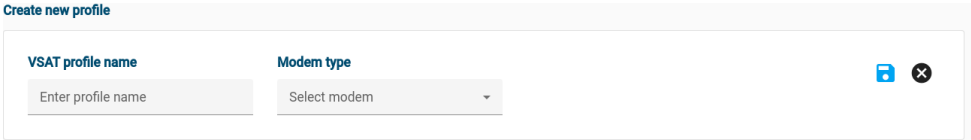



Figure 3.7: Settings - VSAT Profiles - Add.

3. At **VSAT profile name** enter a name of your choice.
4. Select the modem from the **Modem type** drop down list.
5. Fill in the data for your modem setup and desired tracking options.
6. Click the Save icon to save the VSAT profile.
7. Click the check mark icon to activate the VSAT profile.

## 3.2.2 Modem Types

The following modem types are supported:

- *SAILOR GX-R2 Modem (GMU)*
- *Generic Modem*
- *Dual Mode Secondary Antenna*

NOTE

For information on configuration of a **dual modem** system, see *Dual Modem Operation* on page C-3.

### SAILOR GX-R2 Modem (GMU)

To set up the modem type **SAILOR GX-R2 Modem**, do as follows:

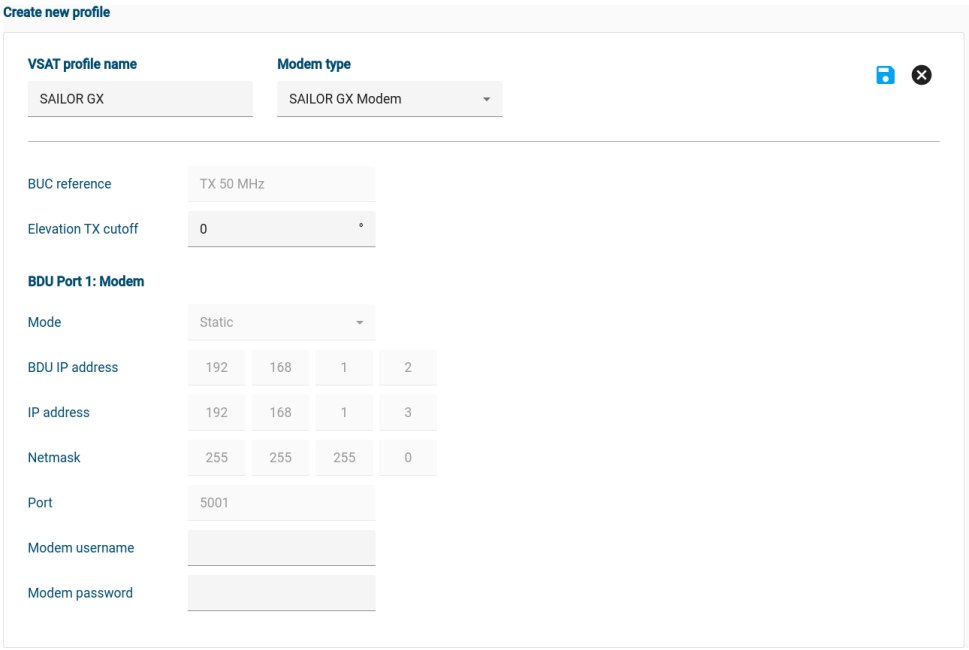



Figure 3.8: Setup of SAILOR GX-R2 Modem.

1. Select the **Elevation TX cutoff**.
2. Enter **Modem user name** and **Modem password**.
3. Select **Tracking type** for the antenna (Recommended setting is **Narrow band** and check **Modem** at **RX frequency**).
4. Click the **Save** icon to save the VSAT profile.

## Generic Modem

To set up the modem type **Generic**, do as follows:

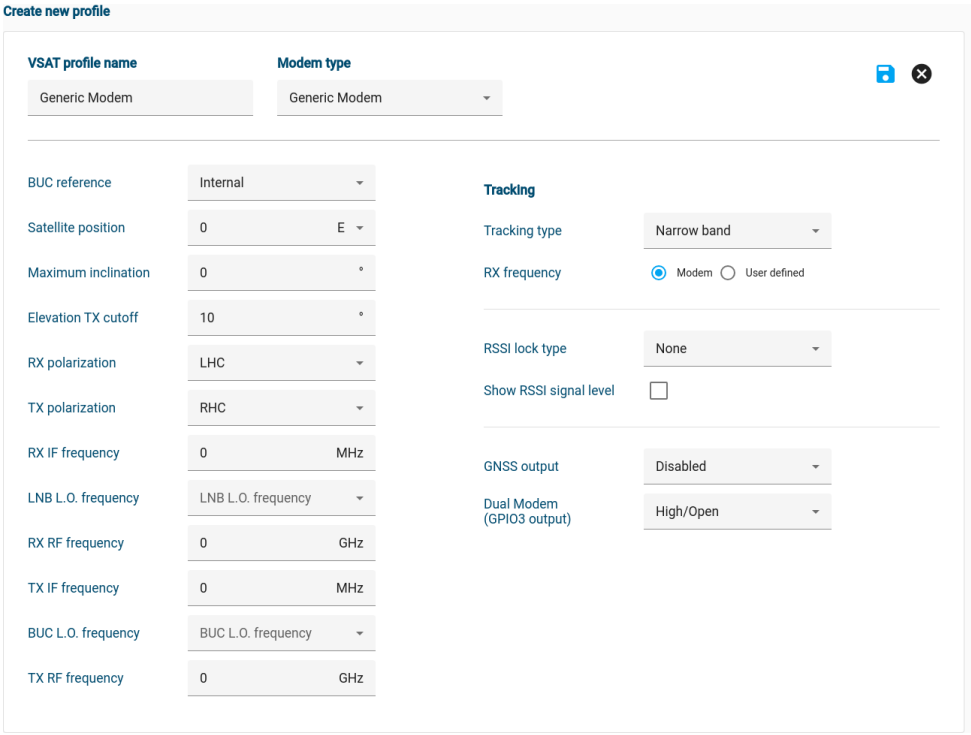



Figure 3.9: Setup of Generic Modem.

1. Use the generic modem profile with any type of single beam VSAT modem.
2. Select the **BUC reference**. Recommended setting is: TX 50 MHz. Options are:
   - TX 10 MHz, supplied from modem TX connector.
   - RX 10 MHz, supplied from modem RX connector.
   - Internal, supplied by antenna.
   - TX 50 MHz, supplied from modem TX connector.
3. Enter the **satellite position.**
4. Enter the **Maximum Inclination** for the VSAT service satellite. Normally 0°, but older satellites might have an inclination where it moves in a larger area in the sky.
5. Configure **Elevation TX cutoff** according to the country regulations. Elevation cutoff is the low elevation level relative to the horizon where the antenna will seize transmission.
6. Configure all the data for the frequency setup and polarization for the VSAT service satellite.
7. Select **Tracking type** for the antenna (Recommended setting is **Narrow band** and check **Modem** at **RX frequency**).
8. Select **RSSI lock type** and **RSSI lock level** if the modem can supply analog RX lock information. Input the RSSI lock to the RS-232 connector of the BDU.
9. Select **GNSS output** and appropriate baud rate if the modem needs GPS input. GPS NMEA strings are available on the RS-232 connector of the BDU.

10. Select **Dual Modem (GPIO3 output)** according to the modem setup.
11. Click the Save icon to save the VSAT profile.

### Dual Mode Secondary Antenna

To set up the **Dual Mode Secondary Antenna**, follow the instructions in Appendix B.

## 3.2.3 Network Settings

On this page you enter the host name and set up the network settings for the LAN ports of the BDU and the LAN ports of the ADU.

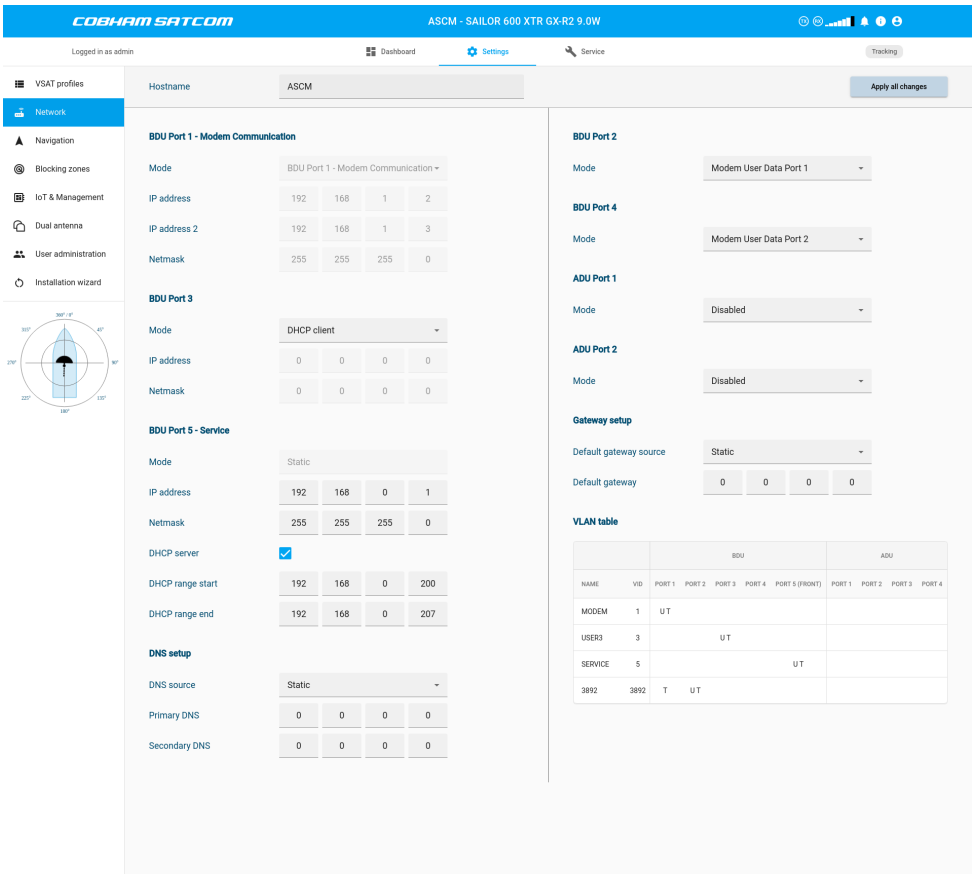



Figure 3.10: Settings, Network page (example).

### Static IP or DHCP Client

The default setting for LAN Port 3 is DHCP client. If you select **DHCP client** the network IP address and sub-net mask must be provided by a DHCP server on that network. If you select **Static IP** address you must specify a unique IP address and a sub-net mask.

### DHCP Server Settings

On the service LAN port 5 at the front you can select to run a DHCP server. Select the check box **DHCP Server**. The DHCP start and end addresses must be on the same

network as the port's static IP. The default setting for service LAN port 5 at the front is DHCP server.

### DNS Setup

If you have access to a Domain Name Server (DNS) you can specify the address of the email server by using the server name instead of its IP address. This can be used in **Outgoing mail server** in *E-Mail Setup (Secure E-mail)* on page 3-23. You may statically specify the address of one or two DNS. Select the DNS source as static and fill in IP address or addresses. Alternatively, if your DHCP server can provide a DNS address and you have selected DHCP client above, then select the same LAN as your DNS source.

### Gateway Setup

If the BDU needs to communicate with network units outside the specified sub-nets, you must specify a default gateway (typically a router). The default gateway can be set as a static IP address. Then set the default gateway source to **static** and enter the IP address of the default gateway. To remove the default gateway set it to 0.0.0.0. Alternatively, if your DHCP server is able to provide a default gateway address and you have selected DHCP client above, then select the same LAN as your default gateway source.

### ADU Port Setup

The LAN ports in the ADU can be set up according to the following table.

| ADU Connector ID | Type | Function |
|---|---|---|
| 1 | RJ45 | Disabled / Service / BDU Port 3 |
| 2 | RJ45 | Disabled / Service / BDU Port 4 |
| 3 | RJ45 | Disabled |
| 4 | RJ45 | Disabled |

Table 3.2: ADU LAN Connectors.

- **Disabled**: No access to antenna system.
- **Service**: Access to the built-in web interface for service and configuration at ADU.
- **BDU port #**: Tunnels ACM LAN port to BDU LAN port. Used for integration of 3rd party IP devices.

### BDU / ADU LAN Port Modes

**BDU Port 1 - Mode Modem Communication:** Parameters are based on the modem type selected in the VSAT profile.

| **BDU Port 2 - Mode** | |
|---|---|
| **Mode** | **Description** |
| BDU Port 1 - Modem Communication | BDU Port 2 assigned to BDU Port 1 VLAN / IP-subnet |
| BDU Port 5 - Service | BDU Port 2 assigned to BDU Port 5 VLAN / IP-subnet |
| Static | User defined IP subnet - VLAN 2 |
| DHCP Client | Network parameters obtained via DHCP - VLAN 2 |
| Disabled | Port can be disabled |
| Modem User Data Port 1 | User defined VLAN configured by modem via SNMP (Modem Port 1) |

Table 3.3: BDU Port 2 Modes.

| **BDU Port 3 - Mode** | |
|---|---|
| **Mode** | **Description** |
| BDU Port 1 - Modem Communication | BDU Port 3 assigned to BDU Port 1 VLAN / IP-subnet |
| BDU Port 5 - Service | BDU Port 3 assigned to BDU Port 5 VLAN / IP-subnet |
| ADU Port 1 | BDU Port 3 + ADU Port 1 assigned to VLAN 6 |
| Static | User defined IP subnet - VLAN 3 |
| DHCP Client | Network parameters obtained via DHCP - VLAN 3 |
| Disabled | Port can be disabled |

Table 3.4: BDU Port 3 Modes.

| **BDU Port 4 - Mode** | |
|---|---|
| **Mode** | **Description** |
| BDU Port 1 - Modem Communication | BDU Port 4 assigned to BDU Port 1 VLAN / IP-subnet |
| BDU Port 5 - Service | BDU Port 4 assigned to BDU Port 5 VLAN / IP-subnet |
| ADU Port 2 | BDU Port 4 + ADU Port 2 assigned to VLAN 7 |
| Static | User defined IP subnet - VLAN 4 |
| DHCP Client | Network parameters obtained via DHCP - VLAN 4 |
| Disabled | Port can be disabled |
| Modem User Data Port 2 | User defined VLAN configured by modem via SNMP (Modem Port 2) |

Table 3.5: BDU Port 4 Modes.

**BDU Port 5 - Mode** Static + DHCP server: User defined network setup - VLAN 5.

| ADU Port 1 - Mode | |
|---|---|
| **Mode** | **Description** |
| Disabled | ADU Port 1 disabled |
| Service | ADU Port 1 assigned to BDU Port 5 VLAN / IP-subnet |
| BDU Port 3 | BDU Port 3 + ADU Port 1 assigned to VLAN 6 |

Table 3.6: ADU Port 1 Modes.

| ADU Port 2 - Mode | |
|---|---|
| **Mode** | **Description** |
| Disabled | ADU Port 2 disabled |
| Service | ADU Port 2 assigned to BDU Port 5 VLAN / IP-subnet |
| BDU Port 4 | BDU Port 4 + ADU Port 2 assigned to VLAN 7 |

Table 3.7: ADU Port 2 Modes.

### VLAN Table

The VLAN table shows which VLANs are set up per physical Ethernet port on the BDU. U means Untagged, T means Tagged.

Important

VLAN 1 through 8 are used internally by the SAILOR XTR GX-R2 antenna system. Do not use them with external equipment connected to the LAN ports of the BDU/ACM. A maximum of 12 additional user VLAN is supported.

### System VLANs

The VLANs 1-8 are defined as System VLANs, used by the BDU/ADU switch. They are not available for the user.

| VLAN | Description |
|---|---|
| VLAN 1 + IP-subnet | Default VLAN + Native VLAN (untagged frames on a T port) OPENAMIP traffic from modem + SAILOR Management (ADU CPU - WEB MMI, SSH, IoT) |
| VLAN 2 + IP-subnet | Assigned to BDU Port 2 in Mode: Static and DHCP client Management of the SAILOR VSAT (ADU CPU) |
| VLAN 3 + IP-subnet | Assigned to BDU Port 3 in Mode: Static and DHCP client Management of the SAILOR VSAT (ADU CPU) |
| VLAN 4 + IP-subnet | Assigned to BDU Port 4 in Mode: Static and DHCP client Management of the SAILOR VSAT (ADU CPU) |
| VLAN 5 + IP-subnet | Assigned to BDU Port 5 Management of the SAILOR VSAT (ADU CPU) |
| VLAN 6 | Assigned to BDU Port 3 and ADU Port 1 User traffic, third party equipment in the ADU |
| VLAN 7 | Assigned to BDU Port 4 and ADU Port 2 User traffic, third party equipment in the ADU |
| VLAN 8 | Assigned to BDU Port 7 and ADU Port 7 Internal SAILOR system traffic, BDU/ADU |

Table 3.8: System VLANs.

### Modem Defined VLANs (SNMP from the iDirect Core Module / GMU)

Modem defined VLANs are used to transfer user related traffic to the modem, via the BDU.

12 modem defined VLANs are supported. The IDs of the modem defined VLANs must be outside the 1-8 range used internally by the SAILOR BDU switch. (System VLANs, see previous section).

When a modem defined VLAN is set up, the BDU LAN Port 2 and 4 will be listed on the network page VLAN table as either a T or a U (trunk or access port), and will automatically set up the BDU LAN 1 as a T.

For the modem to use modem defined VLANs on BDU LAN Port 2 and/or 4 those ports need to be configured as modem User Data Port (see Table 3.3 and Table 3.5).

The example below shows a VLAN table with modem defined VLANs.

**Example: Network Configuration**

BDU LAN 1 mode: Modem

BDU LAN 2 mode: Modem User Data Port 1

BDU LAN 3 mode: Modem

BDU LAN 4 mode: ADU port 2

BDU LAN 5 mode: Service

ADU LAN 1 mode: Service

ADU LAN 2 mode: LAN port 4

**Example: Modem Defined VLANs**

1010 (trunk port)

1020 (trunk port)

1030 (trunk port)

| | | BDU | | | | | ADU | |
|---|---|---|---|---|---|---|---|---|
| **NAME** | **VID** | **Port 1** | **Port 2** | **Port 3** | **Port 4** | **Port 5** | **Port 1** | **Port 2** |
| MODEM | 1 | U | | U | | | | |
| ADU2-BDU4 | 7 | | | | U | | | U |
| BDU5 | 5 | | | | | UT | | |
| 1010 | 1010 | T | T | | | | | |
| 1020 | 1020 | T | T | | | | | |
| 1030 | 1030 | T | T | | | | | |

Table 3.9: VLAN Table, Based on the Example.

## 3.2.4 Navigation

You must set the heading and position before you start the calibration procedure.

**NOTE** If you change the heading settings from external to fixed or vice versa you must perform a new azimuth calibration.

1. Click **Settings > Navigation.**

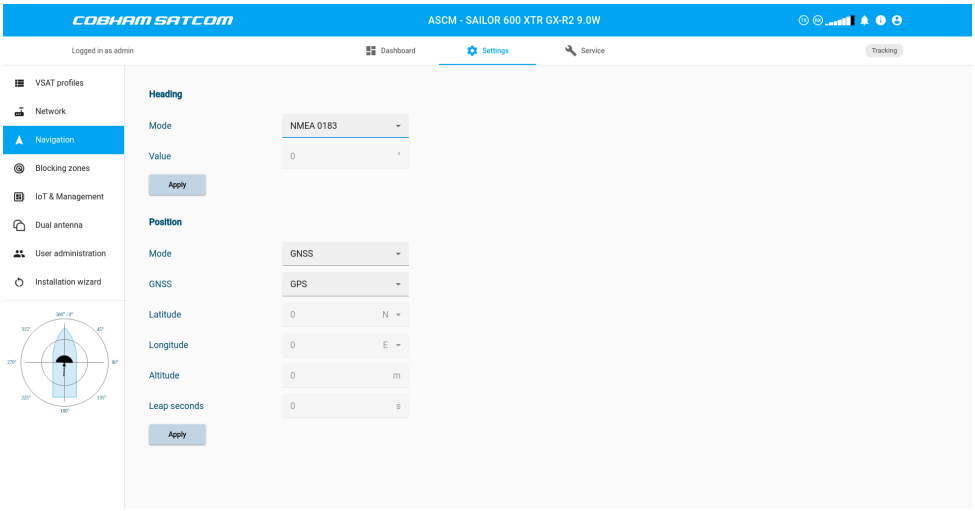



Figure 3.11: Settings, Navigation (Heading and Position), (example).

2. Select a heading mode.

| **Heading Mode** | **Description** |
|---|---|
| NMEA 0183 | Heading input from the vessel's gyro compass (default). If there is no heading input due to failure, alarms are raised and the antenna continues in gyro-free mode. When heading input is available again and a new acquisition is made, alarms are cleared. |
| Fixed | Use this setting for an azimuth and cable calibration if there is no input from the vessel's gyro compass and for permanent installations like remote areas or oil rigs, or during training and test. For Fixed, enter the vessel heading in degrees. If the heading is not known, set it to 0.<br>Important: Fixed heading is **not** allowed for sailing vessels! |
| None | Select this setting after a successful azimuth calibration with Fixed heading if the system does not have input from the vessel's gyro compass. |

Table 3.10: Heading modes.

3. Click **Apply**.

4. Select the desired position parameters.

| Position | Description |
|---|---|
| Mode | Select one of the following:<br>• GNSS (default)<br>• Manual<br>• External |
| GNSS | Select one of the following:<br>• GPS (default)<br>• BEIDOU<br>• GPS + BEIDOU<br>• GLONASS<br>• GPS + GLONASS |
| Latitude, Longitude, Altitude | Only if **Position Mode** is set to **Manual**: Enter the values |
| Leap seconds | The Coordinated Universal Time (UTC) is corrected due to variations in Earths rotation. The value is increased roughly every 5 years. In 2023 the leap second was 16 seconds. This field is only vital if manual position is used while tracking LEO/MEO/HEO satellites, otherwise it can be disregarded. |

Table 3.11: Position modes.

5. Click **Apply**.

About NMEA 0183 Heading Mode

NMEA 0183 input is connected to the BDU on the heading input using RS-232 or RS-422. The supported baud rates are 4800, 1N8 or 38400, 1N8.
The baud rate is autodetected by the BDU after boot up. If the baud rate has been changed during operation, the BDU must be rebooted to detect a new baud rate.
NMEA 0183 Heading mode supports NMEA 0183 Version 4.10 GPRMC string with checksum. The GPRMC string must have 12 data fields all with values in them. Empty fields are not supported.
Example:

```
$GPRMC,122801.000,A,5547.6343,N,01231.3279,E,0.00,59.75,261020,0,D,A*24
```

The GPS format in the GPRMC string is Degrees and Decimal Minutes (DDD° MM') e.g.: 5547.6343 N, 01231.3279 E.
The GPS format on the DASHBOARD is shown as Decimal Degrees (DDD.DDDDD°) e.g.: 55.79 N, 12.52 E.

If the checksum or format of the GPRMC string is wrong the BDU will generate following warning message:

`B060-0 Terminal WARNING NMEA 0183 parse error (00000000)`

If the external GPS input is lost or invalid the BDU will fall back to the built-in GNSS and generate the following warning message:

`8084-0 Terminal WARNING External GPS data (00000041)`

### 3.2.5 Operation in Gyro-Free Mode

#### Heading Input: None

When the antenna does not have ship heading input from the vessel's gyro compass, the azimuth direction of the satellite is not known. In this case the antenna will start a 360° sky scan and scan until it finds the satellite. The satellite search time to find the satellite and start tracking is therefore increased compared to an installation with accurate external heading. If the ship is on a steady course and sails at a speed over ground above 5 kn, the system can use an estimated heading from the GNSS velocity measurements. This will reduce the search time, but it will still be a longer search time than with accurate external input. This mode can be difficult for inclined orbit satellites and elevations <5 and >70°, see the following sections for details. If a system loses the signal from the satellite, e.g., due to blockage, and the duration of signal loss is longer than approximately 1 minute, a system without heading input must do a new sky scan to find the satellite when the antenna is out of blockage.

#### Inclined Orbit Satellites

If the wanted satellite has an inclined orbit, the system expands the acquisition scan area. This means longer search times, depending on the maximum inclination. If there is no heading information to the system a polarization error is introduced depending on the satellite elevation and the inclination. Normally it is required that the polarization is controlled within 1° toward the satellite. This gives the following limit for use of inclined orbit satellites (a purely physical limit), and all systems without heading input have this limit.

| **Satellite Elevation** | **Maximum Allowed Inclination** |
|---|---|
| <20 | 2.5 |
| <50 | 0.7 |
| <70 | 0.3 |
| $\leq$75 | 0 |

Table 3.12: Satellite elevation and maximum allowed inclination.

#### Tracking for Satellite Elevation Between 5 and 75°

When the system has found the satellite and is in tracking mode, the performance of a system with heading input and a system without heading input will be very similar. Note that this is only the case for a satellite elevation range from 5 to 75°.

### Tracking for Satellite Elevation Above 75°

It is not possible to use a system without heading input from the vessel's gyro compass with satellites at an elevation of higher than 75° because the system will not have the required polarization accuracy of the transmitted signal.

## 3.2.6 Acquisition Process and Search Pattern

### With Heading Input or Fixed Heading and Inclined Orbits

1. The antenna starts the acquisition, searches for 10 seconds at the expected position. If RX lock is detected the antenna goes into Tracking.
2. If no RX lock is detected, a box search pattern is started and the positions where RF power can be received are stored.

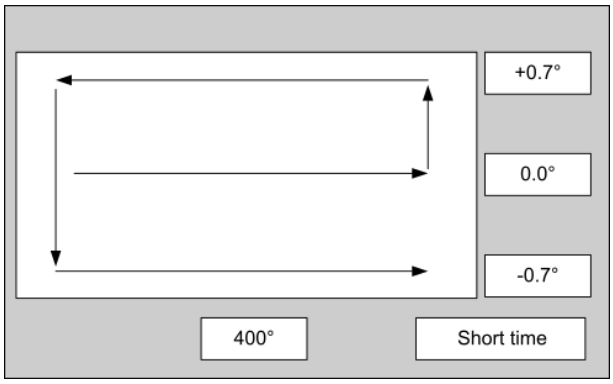



Figure 3.12: Acquisition, search pattern.

3. The antenna checks each stored position for up to 10 seconds. If RX lock is detected for more than 20% of the time, the antenna goes into Tracking.

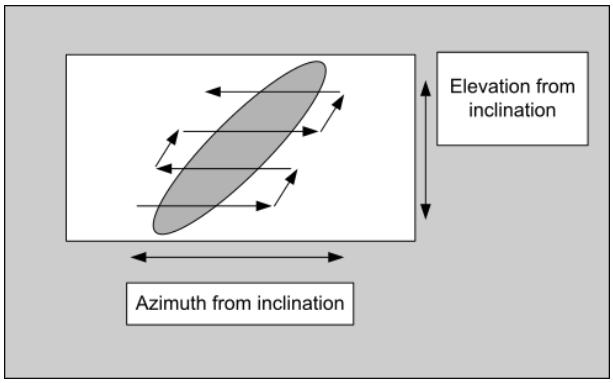



Figure 3.13: Acquisition, search pattern for inclined orbit.

### Without Heading Input and Not Fixed Heading (Gyro-Free)

1. A box search pattern is started and the positions with reception of RF power are checked for up to 10 seconds. If RX lock is detected for more than 20% of the time, the antenna goes into Tracking.

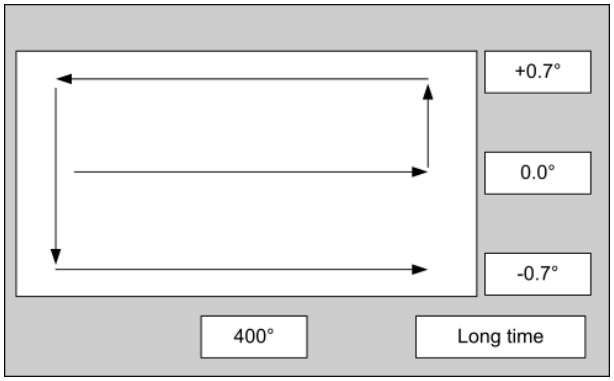



Figure 3.14: Acquisition, search pattern in gyro-free mode.

## 3.2.7 Blocking Zones

You can define blocking zones, i.e. No TX and RX zones by entering azimuth and elevation angles for each blocking zone. The system's blocking map is built up over some weeks and shows where the actual blocking zones are. This is useful if the antenna loses the signal frequently and you might want to check whether the blocking zones are set up correctly. To enable a blocking zone and display it on the blocking map you must select **Active**.

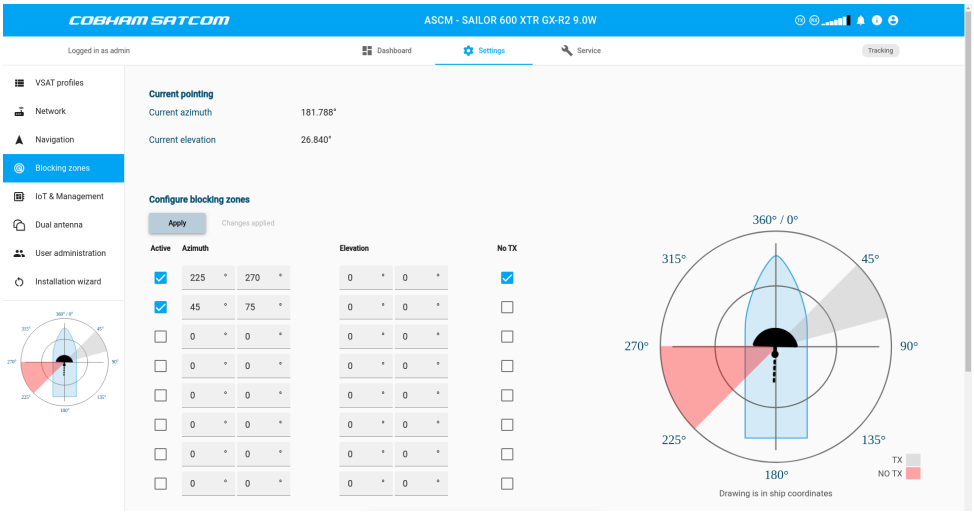



Figure 3.15: Settings, Blocking zones.

To set up a blocking zone, do as follows:

1. Select **Settings > Blocking zones**.
2. Select **Active** to enable the blocking zone and display it in the blocking map. Gray shading shows a blocking zone, red shading shows a **No TX** zone.
3. Enter start and stop **azimuth** value in degrees for the blocking zone. Values allowed: 0 to 360°. Enter clockwise.
4. Enter the start and stop **elevation** angle for the blocking zone. If you enter nothing, there will be no blocking zone. Values allowed: -30 to 90°.

**Important** You must enter 2 different elevation angles to have an active blocking zone.

5. Select **No TX** for zones if you don't want the system to transmit when the antenna points within this zone (e.g. no radiation exposure on sun deck or bridge). If **No TX** is not selected, the system also transmits when pointing through areas with blocking objects. The VSAT modem will shut off for TX if no signal is received.

   **NOTE** If a blocking zone is defined with **No TX** not checked, the modem is not informed about the blocking zone. Modems may react differently when informed about a blocking zone, this has influence on recapturing the link. The worst case is that the modem will search the entire list of available satellites and frequencies when unaware of the blocking zone, resulting in prolonged down times until the link is recaptured. For optimum performance it is recommended to check **No TX**.

6. Click **Apply** to save the blocking zones.

## Blocking Map for Optimization of Blocking Zones

The blocking map is intended as a tool to optimise the blocking zones in order to reduce the antenna's downtime. It shows the active blocking zones and an automatic evaluation of the antenna reception. Over time the antenna can determine where the signal is blocked by structures on the ship. The blocking map helps you to set more accurate blocking zones. To enable a blocking zone and display it on the blocking map you must select **Active**. The re-defined zones will show immediately on the map. The blocking map is updated every 12 hours, showing whether the antenna has been in a blocking zone or has received a signal. After a voyage of days, weeks, months the blocking map will display where the blocking zones are. The time it takes to draw a meaningful map depends on the ship's size and motions throughout the voyage. A small ship following a school of fish will have a populated map faster than a larger tanker sailing across the Atlantic ocean. The following figure shows an example. You can clear the map at any time.

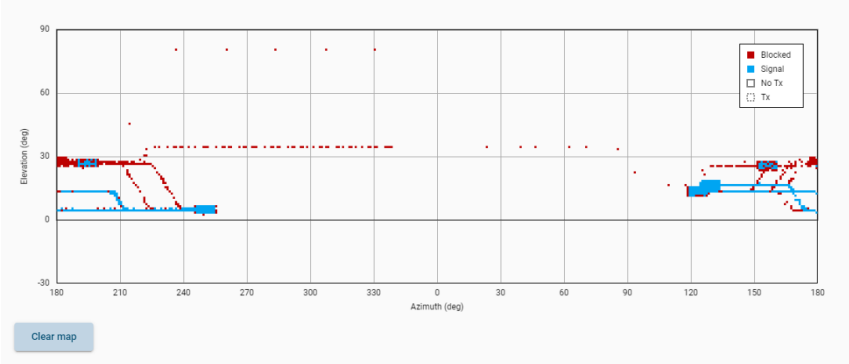



Figure 3.16: Populated blocking map (example).

## 3.2.8 IoT & Management

On this page you can set up e-mail, remote syslog, SNMP, diagnostics and statistics reporting. You can also set up the IoT and management features.

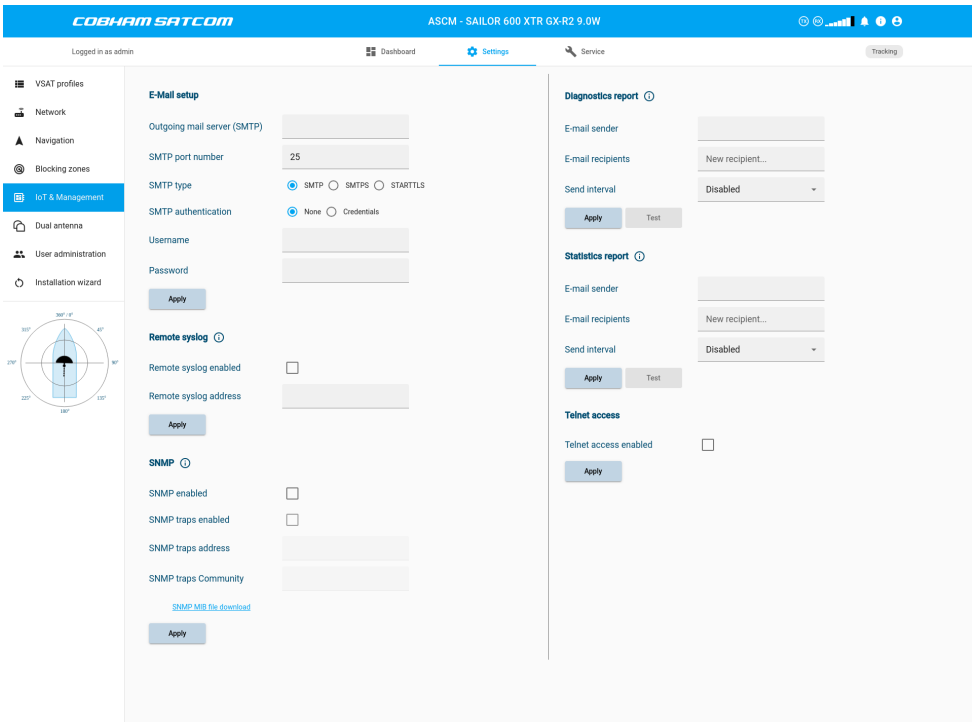



Figure 3.17: Settings - IoT & Management.

### E-Mail Setup (Secure E-mail)

To send e-mails from the antenna you must set up some parameters. SMTP port numbers:

- Insecure Simple Mail Transfer Protocol: SMTP port number 25.
- SMTPS for secure Simple Mail Transfer Protocol: IP port 465.
- STARTTLS to upgrade SMTP to Secure Socket Layer (SSL) or Transport Layer Security (TLS): IP port 587. Contact your IT department for the specific data.

To set up e-mail, do the following:

1. Go to **Settings > IoT & Management**.
2. In the section **Email Setup** enter the data for Outgoing mail server (SMTP) and SMTP port number.

   SMTP: SMTP over port 25 SMTPS: SMTP SSL/TLS encrypted over port 465. STARTTLS: SMTP with STARTTLS upgrading to encrypted over port 587.
3. Select SMTP type.
4. Select SMTP authentication. If you have selected **Credentials**, you must specify a User name and password. This data is typically provided by your IT department.

NOTE

You must set **Outgoing mail server** to an IP address if DNS has not been set up in **DNS setup** in *Network Settings* on page 3-11.

## Remote Syslog

The antenna can send each syslog message to a syslog server to advise the system administrator of the current status of the antenna.

**To set up sending syslog messages to a syslog server:**

1. Select **Settings > IoT & Management**.
2. In the section **Remote syslog** select **Remote syslog enabled** (default: not ticked).
3. Enter the address of the remote syslog server.
4. Click **Apply**.

NOTE

Contains GNSS data.

## SNMP

SNMP traps, or notifications, are network packets which advise the system administrator about significant events in the antenna, e.g. alarms and system error messages. They are generated by the antenna and can be sent automatically to an SNMP trap receiver/manager. The event time is UTC time. In this section there is a link from which you can download the SNMP MIB file.

**To set up reporting SNMP traps to an SNMP server**:

1. Select **Settings > IoT & Management**.
2. In the section **SNMP** select **SNMP enabled** (default: not ticked).
3. Select **SNMP traps enabled** (default: not ticked).
4. Enter the SNMP traps address.
5. Enter the SNMP traps Community name. This is the name of the SNMP trap receiver/manager. This is needed for authentication of the SNMP trap request.
6. Click **Apply**.

The SAILOR XTR GX-R2 supports SNMP v2 requests to retrieve configuration and present settings. SNMP can be enabled on interfaces configured to provide access to the Antenna. The SNMP community string is **public**. The SAILOR XTR GX-R2 offers via SNMP most of the data that are available from the DASHBOARD web pages. Detailed documentation about supported OIDs can be found in the MIB file.

Since the SNMP provides GNSS information it is important to secure the SNMP access. For more information on securing SNMP access, see *Unsecure protocol usage recommendations* on page D-2.

**The MIB entries are grouped as shown below:**

- System configuration.
- Navigation coordinates.
- Antenna pointing.
- Dashboard and profile.
- Tracking receiver.

NOTE None of the SNMP values need to be polled more often than once a minute. Polling SNMP values more frequently will impact the performance of the SAILOR XTR GX-R2.

To download the BDU MIB file directly, do as follows:

1. Click the link **SNMP MIB file download** and save the file on your computer.

## Telnet Access

You can enable **Telnet access** to access the antenna via a command line interface. SSH command line interface is enabled by default.

We recognize that some of our customers are still operating with legacy systems that require Telnet for configuration and management. While we can enable Telnet to support these older setups, it is crucial to understand that Telnet is not an encrypted protocol. This means that any data transmitted over Telnet, including sensitive information such as usernames and passwords, is vulnerable to interception by unauthorized parties.
To mitigate these security risks look at recommendations in *Unsecure protocol usage recommendations* on page D-2.

## Diagnostics Report

This report contains information from the ADU and BDU that are relevant for the service personnel during troubleshooting. You can send automatically generated diagnostic reports at fixed intervals. It is also useful documentation of the current setup and contains all parameters set during configuration.
**The main sections of the diagnostics report are:**

- Report.
- Software.
- Certificates.
- System.
- Memory Usage.
- Hardware.
- BUC/LNB.
- Setup - System data.
- Calibration - Calibration Data.
- Blocking zones - Blocking zone configuration.
- Network - LAN Configuration.
- Modems - Modem profiles.
- Satellites - VSAT profiles.
- Operation - Current modem and navigation parameters.
- Antenna Data.
- VSAT Profiles.
- Antenna Calibration POST Results.
- POST - results of the Power-On-Self-Test.
- Active Events - lists the currently active events.
- Events - List of all cleared events.
- Statistics.
- System log.
- Process logs.

NOTE | Contains GNSS data.

**To set up sending a diagnostics report:**

1. Configure e-mail first, see *E-Mail Setup (Secure E-mail)* on page 3-23
2. Click **Settings > IoT & Management**.
3. In the section **Diagnostics report** enter the following:
   - E-mail sender.
   - E-mail recipients (comma separated).
   - Send interval: Select **Daily** (2- minute samples), **Weekly** (hourly samples) or **Monthly** (hourly samples).
4. Click **Apply**.

## Statistics Report

This report contains historical information from the SAILOR XTR GX-R2 of up to 1 month. It is sent as a zipped attachment to an e-mail. The report contains data for the selected download intervals. The file format is a comma separated value file (csv). The report can then be processed in spreadsheet applications, e.g. Microsoft Excel.

**To set up sending a statistics report:**

1. Configure e-mail first, see *E-Mail Setup (Secure E-mail)* on page 3-23.
2. Go to **Settings > IoT & Management**.
3. In the section **Statistics report** enter the following:
   - Email sender.
   - Email recipients (comma separated).
   - Send interval: Select **Daily** (2-minute samples), **Weekly** (hourly samples) or **Monthly** (hourly samples).
4. Click **Apply**.

NOTE | Contains GNSS data.

**The following parameters are recorded in the statistics report:**

| Parameter Recorded | Description |
|---|---|
| Host name | Host name, entered in the web interface on the page **Settings > Network.** |
| BDU SN | BDU serial number |
| ADU SN | ADU serial number |
| SW ver. | Software version |
| System type | SAILOR 1000 XTR GX-R2 4.5 W (example) |

Table 3.13: Statistics report, header record.

| Parameter Recorded | Description |
|---|---|
| UTC. (s) | UTC in seconds for the data set. |
| UTC (YYYY-MM-DD hh:mm) | UTC in date format for the data set. |
| RSSI.Av | Modem-reported Received Signal Strength Index average for the sampling interval. |
| RSSI.Max | Modem-reported Received Signal Strength Index maximum for the sampling interval. |
| RSSI.Min | Modem-reported Received Signal Strength Index minimum for the sampling interval. |
| POS.Lat (degree) | Latitude value of position. |
| POS.Long (degree) | Longitude value of position. |
| POS.Valid | Fix = valid position, No Fix = invalid position. |
| NAV.Speed (m/s) | Speed above ground. |
| Heading.Samp (degree) | Ship's heading sample-value for the sampling interval. |
| Heading.Max (degree) | Ship's heading maximum-value for the sampling interval. |
| Heading.Min (degree) | Ship's heading minimum-value for the sampling interval. |
| Heading.Range (+/-degree) | Ship's heading range for the sampling interval. See figure 3.18: *Statistics — how to read data for a range* |
| Antenna.Azi (degree) | Current antenna azimuth sample-value for the sampling interval. |
| Antenna.Azi Max (degree) | Current antenna azimuth maximum-value for the sampling interval. |
| Antenna.Azi Min (degree) | Current antenna azimuth minimum-value for the sampling interval. |
| Antenna.Azi Range (+/-degree) | Current antenna azimuth-range for the sampling interval. See figure 3.18: *Statistics — how to read data for a range* |
| Antenna.Ele (+/-degree) | Current antenna elevation sample-value for the sampling interval. |
| Antenna.Ele Max (+/-degree) | Current antenna elevation maximum-value for the sampling interval. |
| Antenna.Ele Min (+/-degree) | Current antenna elevation minimum-value for the sampling interval. |
| Vsat.rx_lo_freq (GHz) | LNB L.O. Frequency. |
| Vsat.tx_lo_freq (GHz) | Tx frequency of VSAT modem for this record. |
| Tracking.rf freq (GHz) | Tracking RF frequency for this record. |

Continued on next page

Table 3.14: Parameters in a statistics report.

| Parameter Recorded | Description |
|---|---|
| Tracking.type | Narrow filter, DVB-S2 decoder or GSC power. |
| Sat.long (degree) | Longitude position of the satellite. |
| Carrier rf.rx (GHz) | Rx frequency of carrier for this record. |
| Carrier rf.tx (GHz) | Tx frequency of carrier for this record. |
| Pol.rx | Current Rx polarization mode. |
| Pol.tx | Current Tx polarization mode. |
| Rx Lock (%) | Rx locked in percent, for the sampling interval. |
| Logon (%) | Logon time in percent, for the sampling interval. |
| Pos Ok (%) | Valid position, in percent of the sampling interval. |
| VMU Connection (%) | Link with VSAT modem, in percent of the sampling interval. |
| Blocking (%) | Ship in blocking zone, in percent of the sampling interval. |
| DualAntenna.mode | Shows the current mode. |
| DualAntenna.active (%) | Shows the time active. |
| DualAntenna.logon_remote (%) | Shows the remote logon. |
| RSSI (Antenna).Avg | Antenna-reported Received Signal Strength Index average for the sampling interval. |
| RSSI (Antenna).Max | Antenna-reported Received Signal Strength Index maximum for the sampling interval. |
| RSSI (Antenna).Min | Antenna-reported Received Signal Strength Index minimum for the sampling interval. |
| Voltage.PSM.Avg (v) | Power Supply Module voltage-average for the sampling interval. |
| Voltage.PSM.Max (v) | Power Supply Module voltage-maximum for the sampling interval. |
| Voltage.PSM.Min (v) | Power Supply Module voltage-minimum for the sampling interval. |
| Voltage.BUC.Avg (v) | BUC voltage average for the sampling interval. |
| Voltage.BUC.Max (v) | BUC voltage maximum for the sampling interval. |
| Voltage.BUC.Min (v) | BUC voltage minimum for the sampling interval. |
| Voltage.LNB.Avg (v) | LNB voltage average for the sampling interval. |
| Voltage.LNB.Max (v) | LNB voltage maximum for the sampling interval. |
| Voltage.LNB.Min (v) | LNB voltage minimum for the sampling interval. |

Continued on next page

Table 3.14: Parameters in a statistics report. (Continued)

| Parameter Recorded | Description |
|---|---|
| Temp.BDCM.Avg (deg) | Below Deck Communication Module temperature-average for the sampling interval. |
| Temp.BDCM.Max (deg) | Below Deck Communication Module temperature-maximum for the sampling interval. |
| Temp.BDCM.Min (deg) | Below Deck Communication Module temperature-minimum for the sampling interval. |
| Temp.ISCM.Avg (deg) | Inertial Sensor Control Module temperature-average for the sampling interval. |
| Temp.ISCM.Max (deg) | Inertial Sensor Control Module temperature-maximum for the sampling interval. |
| Temp.ISCM.Min (deg) | Inertial Sensor Control Module temperature-minimum for the sampling interval. |
| Ship Roll.Avg (degree) | Ship roll average. |
| Ship Roll.MaxSwing (degree) | Ship roll max. |
| Ship Pitch.Avg (degree) | Ship pitch average. |
| Ship Pitch.MaxSwing (degree) | Ship pitch max. |
| Vib.X.Avg | X-axis vibrations experienced by the antenna average for the sampling interval. |
| Vib.X.Max | X-axis vibrations experienced by the antenna maximum for the sampling interval. |
| Vib.X.Min | X-axis vibrations experienced by the antenna minimum for the sampling interval. |
| Vib.Y.Avg | Y-axis vibrations experienced by the antenna average for the sampling interval. |
| Vib.Y.Max | Y-axis vibrations experienced by the antenna maximum for the sampling interval. |
| Vib.Y.Min | Y-axis vibrations experienced by the antenna minimum for the sampling interval. |
| Vib.Z.Avg | Z-axis vibrations experienced by the antenna average for the sampling interval. |
| Vib.Z.Max | Z-axis vibrations experienced by the antenna maximum for the sampling interval. |
| Vib.Z.Min | Z-axis vibrations experienced by the antenna minimum for the sampling interval. |

Continued on next page

Table 3.14: Parameters in a statistics report. (Continued)

| Parameter Recorded | Description |
|---|---|
| Lnb.mode | Shows the current LNB mode. |

Table 3.14: Parameters in a statistics report.

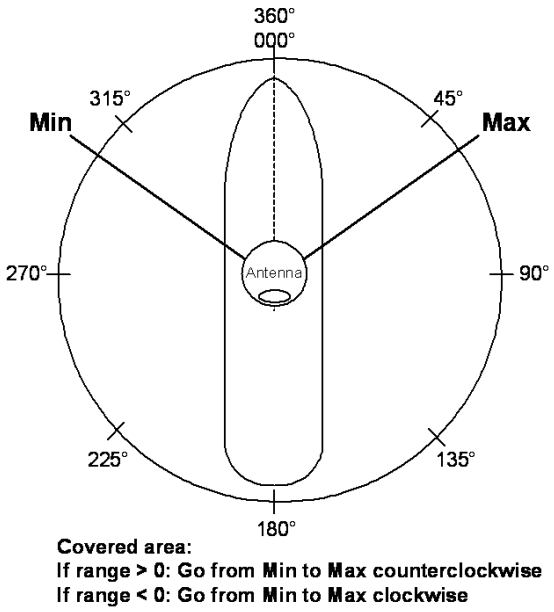



Figure 3.18: Statistics — how to read data for a range.

## 3.2.9 Dual Antenna

For details on how to set up dual antenna operation see Appendix B, *Dual Antenna Solution*

## 3.2.10 User Administration

In this section of the web interface you can configure the following administrative settings:

- *To Change a Password*
- *Password Policy Setup*
- *To Set Up Permissions for Guest User*

### To Change a Password

On the page **User Administration** you can change the password for admin or guest or add a new user. You can bypass the admin password by pressing the left arrow key on the BDU for 5 seconds.

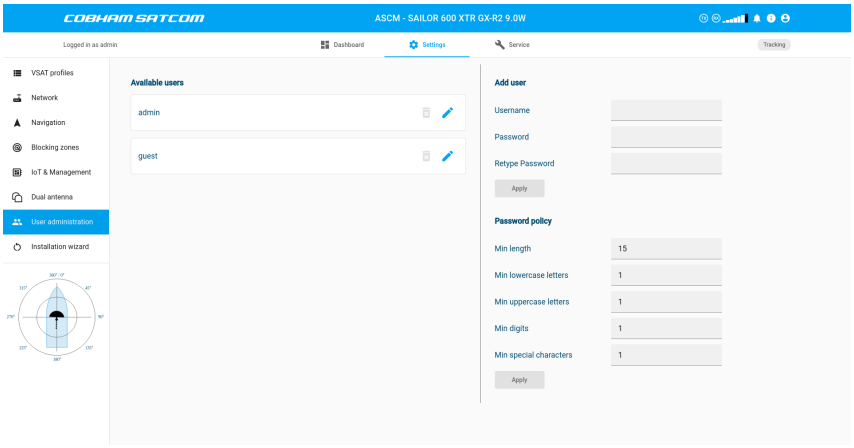



Figure 3.19: User Administration, edit or add user.

To change the current password for a user, do as follows:

1. Click **Settings** and **User Administration**.
2. Click the pen icon for the user.
3. Enter the current password.
4. Type in the new password in both fields. The password must comply with the password policy set by admin. When typing the password, the policy is shown until the password complies with the policy.
5. Click the icon for saving. At the next login the new password is required.

## Password Policy Setup

On the page **User Administration**, the admin can change the password policy. The password policy is enforced when creating new passwords. Existing password are not affected.

The admin can change the Password policy rules listed in Table 3.15.

| Policy Rule | Default Minimum Values |
|---|---|
| Password length | 15 |
| Number of lowercase characters | 1 |
| Number of uppercase characters | 1 |
| Number of digits | 1 |
| Number of special characters | 1 |

Table 3.15: List of mimimum requirements Password Policy Rules

To Set Up Permissions for Guest User

You can manage user access (guest) to certain functions of the SAILOR XTR GX-R2 system. You can select R/W, R/O or no access to a number of functions. This is useful if you want to protect the system against unintended changes or tampering of the system. The guest account is disabled before the administrator gives it a password.

**Important** Study this screen thoroughly and decide which areas of the SAILOR XTR GX-R2 you want to give guest users access to.

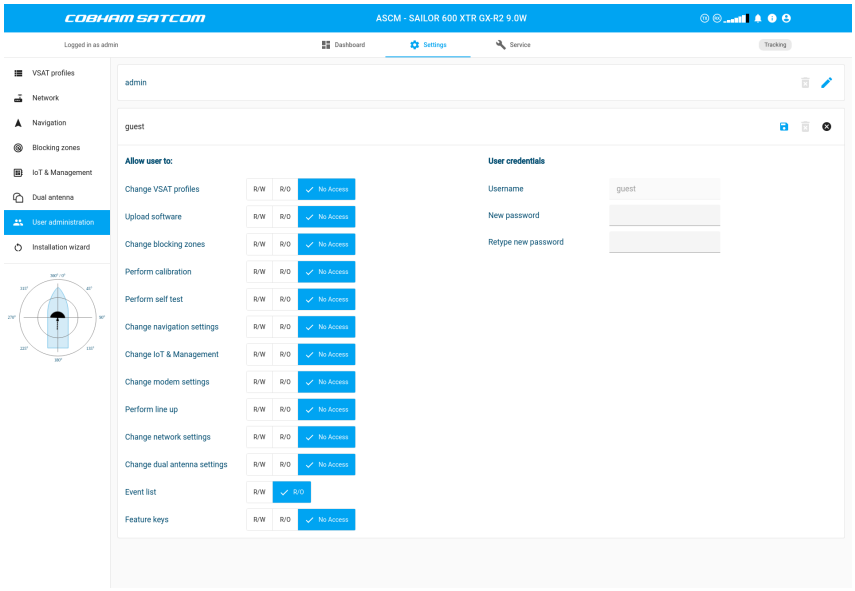



Figure 3.20: Permissions for guest users.

To set up the user permissions, do as follows:

1. Select **Settings > User administration**.
2. Click the pen icon for guest.
3. For each item under **Allow user to:** select
   - **R/W** to allow Read and Write access to the settings.
   - **R/O** allow Read Only access to the settings.
   - **No Access**, then the page is not available.
4. Click the icon for saving.

## 3.2.11 Installation Wizard

The installation wizard guides you through the necessary steps to set up the antenna. You start the installation wizard from the section **Settings**.

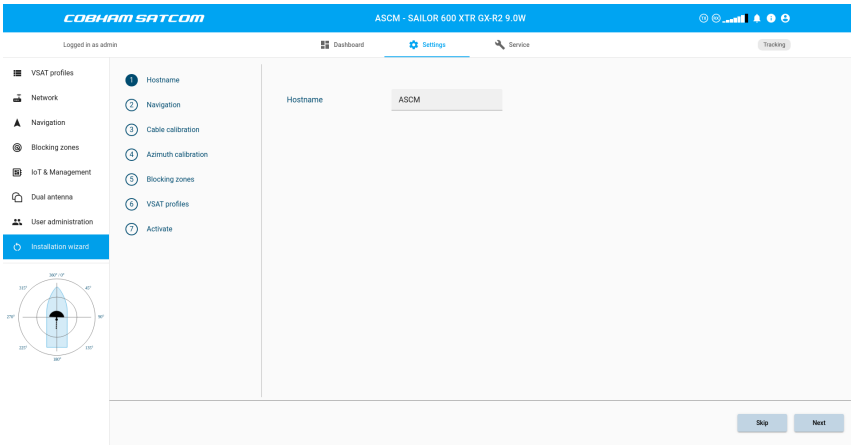



Figure 3.21: Installation Wizard.

1. Enter the necessary data on each page and click **Next**.
2. If there are no changes on a page click **Skip**.
3. On the last screen click **Finish** to activate the VSAT profile.

## 3.3 Service

### 3.3.1 Software

In this section you can manage software versions, upload and save configurations and reset the SAILOR XTR GX-R2 to factory default.

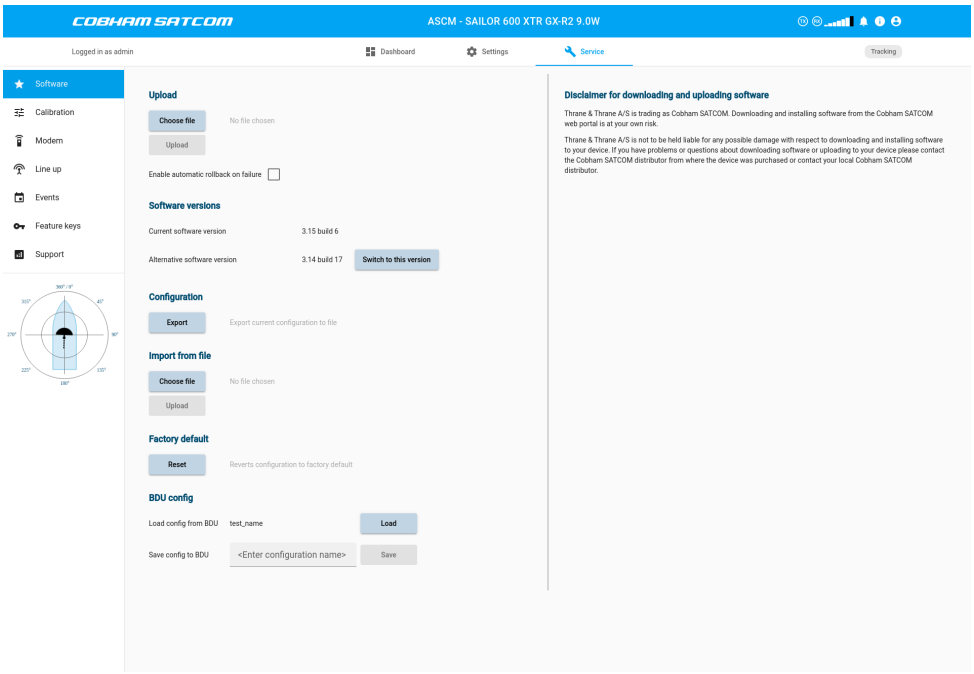



Figure 3.22: Service - Software.

### Upload

The following items are required before the software can be updated:

- One computer with a standard Ethernet port available.
- A standard Internet browser.
- One straight LAN cable.
- The file with the new software.

NOTE

Only qualified service personnel should make a software update.

1. Power up the SAILOR XTR GX-R2 system, i.e. switch on the BDU. Wait until the text **INITIALISING** has disappeared from the BDU display.
2. Connect a PC to the front LAN connector of the BDU.
3. Open your Internet browser and enter the IP address of the BDU. The IP address is **http://192.168.0.1** (default).
4. Type in the user name (admin or guest) and password.
5. The web interface opens directly with the **Dashboard** page.
6. Click **Service** in the top bar. The **Software** page is displayed.
7. Click **Choose file** and locate the new software file.
8. Click **Upload**. The upload procedure takes a couple of minutes. When done, the system automatically restarts with the new software version.

   Important

   Do not browse away from the upload page. This will terminate the upload process. Wait for the browser to reload automatically.
9. To make the system return to the previous software if POST fails after boot of the updated software, select **Enable automatic rollback on failure**.
10. Click **Switch to this version** if you want to force the system to use the alternative software version.

### Software Recovery Procedure (SAFESET)

To recover from a failed software upload or other problems where the antenna is unable to boot, the antenna should be booted up in SAFESET mode. In this mode an extra software image is started with fixed settings and configuration. The antenna is not operational but allows software upload and activation of reset to factory default.

The BDU ethernet port 5 is set to a fixed IP of 192.168.0.1.

NOTE Depending on the bootloader version installed the front display on the BDU will either show “SAFEMODE” with a small font in the upper right corner (old version) or “SAFESET” with large font in the middle of the display (newer version).

1. To boot up in SAFESET press and hold left and right arrows on the front keypad on the BDU , while power cycling the antenna on the power button on the BDU.
2. Access the Web interface on 192.168.0.1 on BDU port 5 (front ethernet port).
3. Upload the new software image.
4. When the new software version is visible in the safeset, make a physical power cycle with the power button on the BDU.

NOTE The upload procedure takes a couple of minutes. When done, the BDU automatically restarts with the new software version.

After completing the software update procedure, the SAILOR XTR GX-R2 will perform a POST (Power On Self Test). When the POST has finished, the green Pass/Fail LED on the front of the BDU must become steadily green. Verify that the Pass/Fail LED is not red nor blinking orange once every 2 seconds. Wait until the Pass/Fail LED is green. You can verify that the software update has been completed successfully. Check the software version number on the Dashboard in the box **SYSTEM INFO**.

To Import and Export a System Configuration

If you need to reuse a configuration in another SAILOR XTR GX-R2, you can save the current configuration to a file, which can then be loaded into another SAILOR XTR GX-R2. You can also use this feature for backup purposes. The configuration file contains all the settings you have entered during system setup: profiles, network setup, blocking zones, etc. To save a configuration to a file, do as follows:

1. Select **Service > Software** and locate the section **Configuration**.
2. Click the button **Export**. Follow the download instructions on the screen. You can use this configuration file for upload into another SAILOR XTR GX-R2.

To load a configuration from a file, do as follows:

1. Select **Service > Software** and locate the section **Import from file**.
2. Click the button **Choose file** and locate the configuration file (.cfg file) you want to upload. Then click the button **Upload**.

Factory Default

When resetting SAILOR XTR GX-R2 to factory default, the following settings are deleted:

- Passwords.
- VSAT profiles.
- Blocking zones.
- Heading settings.
- Network setup.
- User permissions for guest.
- BDU display: brightness setting.

NOTE

Calibration data for azimuth and cable calibration are not reset during factory default.

To reset to factory default settings, do as follows:

1. From the left navigation pane, select **Service > Software**.
2. Locate the section **Factory Default**, then click **Reset**.

Important

After a factory reset the Admin/guest password is cleared. Bypass the admin password by pressing the left arrow key on the front of the BDU for 5 seconds.

BDU Config (Save Antenna Settings in the BDU)

You can save the current antenna settings in the BDU and upload these settings at a later stage to another antenna. The configuration file contains all the settings you have entered during system setup: VSAT profiles, LAN setup, blocking zones, etc. To save an antenna/ADU configuration to the BDU, do as follows:

1. Click **Service > Software**.
2. Locate the section **BDU Config**.
3. At **Save config to BDU** enter the name for the configuration file and click **Save**.

To load an antenna configuration from a file in the BDU into the antenna, do as follows:

1. Select **Service > Software**.
2. Locate the section **BDU Config**.
3. At **Load config from BDU** click **Load**.

## 3.3.2 Calibration

Before the SAILOR XTR GX-R2 can be used you must select a heading input in order to make an azimuth and cable calibration. The azimuth calibration is required in order to determine the offset of the ADU zero direction to the bow-to-stern line of the ship. This procedure is fully automatic. The satellite data for calibration can be entered directly on the calibration page. A cable calibration is required in order to record the cable characteristics of the antenna cable which is used in the fixed gain feature.

**Important** You must log in as an administrator to do a calibration.

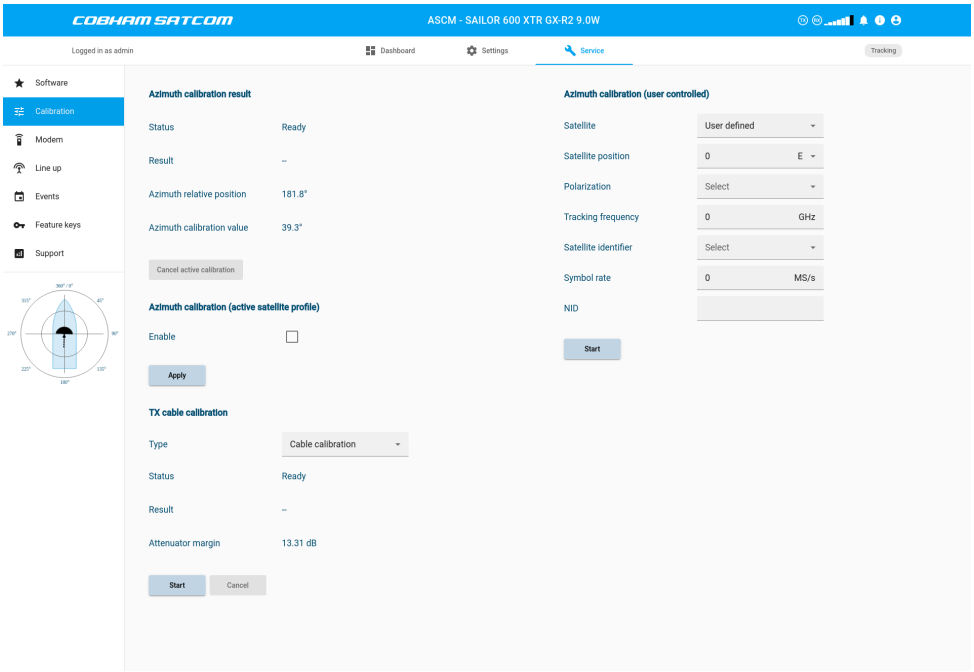



Figure 3.23: Service - Calibration.

### Azimuth Calibration

Azimuth calibration is done toward a satellite of a known position. After finding the satellite, the system can calculate the azimuth offset of the ADU. The satellite and transponder properties for the calibration can be selected

from a list of service profiles or supplied manually. The **Azimuth relative position** is the momentary azimuth value of the ADU, a dynamic value. The **Azimuth calibration value** is the calculated ADU azimuth value after an azimuth calibration, a fixed value.

NOTE

If the target satellite is inclined orbit, the elevation range is extended.

Automatic Azimuth Calibration With an Active VSAT Profile

You can enable automatic azimuth calibration, even if there is no line of sight to an azimuth calibration satellite from the place of installation. To use this feature you must have made a valid VSAT profile and have activated it. When the vessel leaves the harbor and gets line of sight to the satellite, the system automatically finds and tracks the satellite and makes the azimuth calibration. After a successful azimuth calibration the BDU will automatically disable the setting **Azimuth calibration (active satellite profile)** on the page **Service > Calibration**. To enable automatic azimuth calibration, do as follows:

1. Go to **settings > VSAT profiles** and create a VSAT profile.
2. Then **Activate** the VSAT profile.
3. Click **Service > Calibration**.
4. Select **Enable** in the section **Azimuth calibration (active VSAT profile)**.
5. Click **Apply**.
6. Switch on the modem.

Azimuth Calibration (User Controlled)

1. On the page **Service > Calibration**, in the section **Azimuth calibration (user controlled)**, select **User defined** in the **Satellite** drop down list.
2. Type in the longitude of the satellite.

| Satellite | Position | Frequency | Polarisation | Satellite Identifier |
|---|---|---|---|---|
| GX1-IOR | 62.6 E | 19.707 GHz | LHC | GSC |
| GX2-AOR | 55 W | 19.707 GHz | LHC | GSC |
| GX3-POR | 179.6 E | 19.707 GHz | LHC | GSC |
| GX4-IOR | 56.6 E | 19.707 GHz | LHC | GSC |
| GX5-EME | 11.0 E | 19.701 GHz | LHC | GSC |

Table 3.16: Inmarsat GSC satellite information.

Important

The calibration function is not able to verify the correctness or precision of the supplied longitude. It is therefore important to supply the correct longitude including the first decimal.

3. Type in its tracking frequency, according to table 3.16.
4. Select **Satellite identifier**: GSC, NID, Orbital position (DVB-S, DVB-S2)[1].
5. Click **Start** and wait typically 5 minutes for the azimuth calibration to finish. A message is displayed when the calibration has completed. In case of failure, see the table in the following section for a description of error codes during calibration.

Important

It is strongly recommended to verify the result of a calibration performed with user defined data. This can be done by making a new calibration on a different satellite and verify that the resulting Azimuth calibration value differs less than one degree.

The following table shows the error codes that might be displayed during a calibration:

| Error Code | Explanation |
|---|---|
| 1 | The elevation of the selected satellite is too low. Select another satellite. |
| 2 | The elevation of the selected satellite is too high. Select another satellite. |
| 4 | The calibration values could not be saved. Possibly due to defective hardware. |
| 5 | The antenna could not point with sufficient precision. Check that the antenna is mounted in a stable way. Other possible causes might be electrical or mechanical faults. |
| 6 | No signal received. Check that there is free line of sight. Try again or try with another satellite. |
| 7 | RF setup error, e.g. missing or invalid RX frequency. |
| 8 | Invalid satellite, e.g. satellite not visible. |

Table 3.17: Possible error codes during calibration.

[1] Use Orbital position and NID if you want to use NID or orbital position or other KA band satellites with DVB-S2 support. The DVB symbol rate must be >5 Ms/s. For NID use preferably a unique NID (ONID). An azimuth calibration without NID can be useful in regions where the satellite operators do not broadcast NID (US, China, Australia etc.). For NID=0 the NID is not used when checking the satellite link. For NID 1 to 65535 the supplied NID is matched against the Network ID broadcast by the satellite. For orbital position the supplied longitude is matched with the orbital position broadcast by the satellite. Not all service providers broadcast the orbital position.

Cable Calibration

When setting up the system for the first time, you **must** make a cable calibration. It is also recommended to make a cable calibration when servicing the system to check if the antenna cable is still in good order.

Important

If input from the vessels' gyro compass is not available: Change the heading input setting from **Fixed** to **None** at **Settings > Heading**. **Fixed heading is not allowed for sailing vessels!**

1. Select **Service > Calibration**.
2. In the section **TX cable calibration**, select the **Type**:
   - Cable calibration: The system will make a complete cable calibration (recommended).
   - Disable TX cable calibration: The gain is set at a maximum and no cable calibration is made. It is up to the modem to make the necessary adjustments.
3. Click **Start**.
4. Wait typically for 2 minutes for the calibration to finish. A message is displayed when the calibration has been completed successfully.The screen shows how much attenuation margin is left for the antenna cable. This indicates whether the antenna cable and connectors are in good condition and well crimped.

The SAILOR XTR GX-R2 is calibrated now. If the calibration failed there will be a message.

### 3.3.3 Manual OTC (BUC Calibration) and Modem Access

This section describes manual OTC and modem access configuration.

Manual One Touch Commissioning (OTC)

When the modem starts up for the first time it will automatically register with the BUC and perform P1dB compression on multiple frequencies and thereafter register with the network. During the P1dB compression the antenna will point away from the satellite and transmit on 950 to 1950 MHz in 50 MHz steps. The BDU will show **BUC calibration** on the **Dashboard** and the BDU display. This may take up to 10 minutes. If a new cable calibration is made, the BDU displays the warning **BUC calibration outdated**. Then you must make a manual OTC.

**WARNING!** For your safety: Active RF transmission may occur during an OTC procedure. Software updates may also occur, yet the system is in a receive-only mode during such auto-updates.

To make a manual OTC for the modem, do as follows:

1. Connect a PC to the service port on the front panel of the BDU.
2. Enter the web interface (via *Google Chrome* or *Mozilla Firefox* browser) and go to **Service > Modem**.

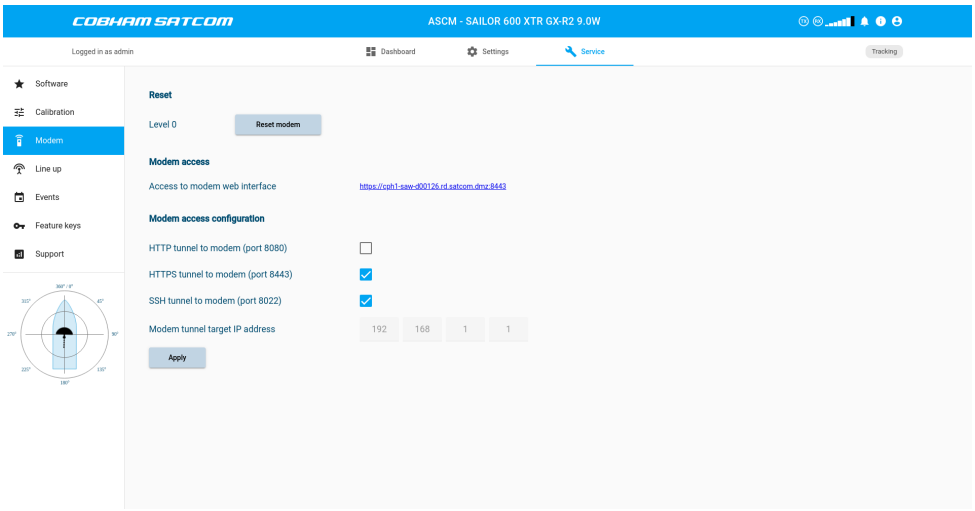



Figure 3.24: Web Interface: **Service > Modem**.

3. At **Modem access** click the link.
4. Type the user name **admin** (default) and the password **iDirect** (default).

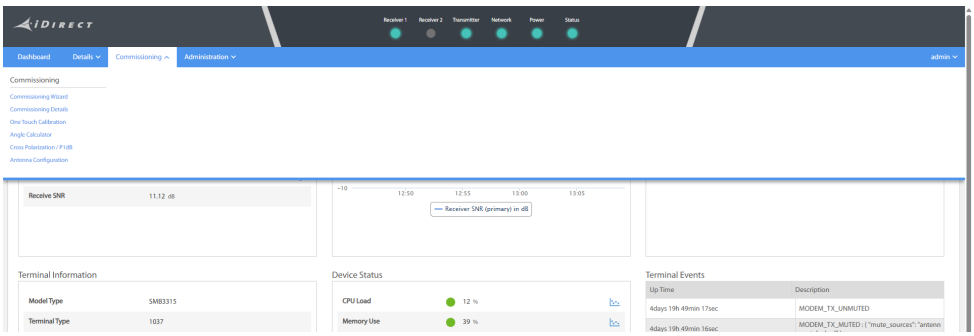



Figure 3.25: Modem Web Interface.

5. In the menu **Commissioning** click **One Touch Commissioning**.
6. Click **Start**. One Touch Commissioning takes place. When commissioning is completed the antenna will search for the I5 satellite with the highest elevation.

7. The antenna will find the satellite and the modem will perform the necessary steps to enter the network (software upgrades, if available).
8. The web interface of the iDirect core module will indicate that the modem is in network and the modem status is shown on the **Dashboard** in the menu **Modem** of the SAILOR XTR GX-R2 system web interface.
9. When commissioning is completed, test all subscribed services.
10. Exit the iDirect web interface.

### 3.3.4 Fixed TX Gain Principle

The SAILOR XTR GX-R2 uses a fixed TX IF gain concept. After calibration it provides a fixed average gain from the TX-port of the BDU to the input of the BUC. Advantages of the fixed TX IF gain principle are:

- Average TX IF gain independent of cable length[2].
- Compatibility with the TX Power control feature.

When installing the SAILOR XTR GX-R2 you make a cable calibration. At that point every installation adjusts to the same average TX IF gain regardless of the ADU cable length. Additionally the SAILOR XTR GX-R2 system also compensates for variations of the cable characteristics or loss over frequency.

### 3.3.5 Modem Access (Port Forwarding)

You can access the modem (e.g. modem web interface) through the BDU using port forwarding, see figure 3.26. To establish a connection to the modem via the BDU , do as follows:

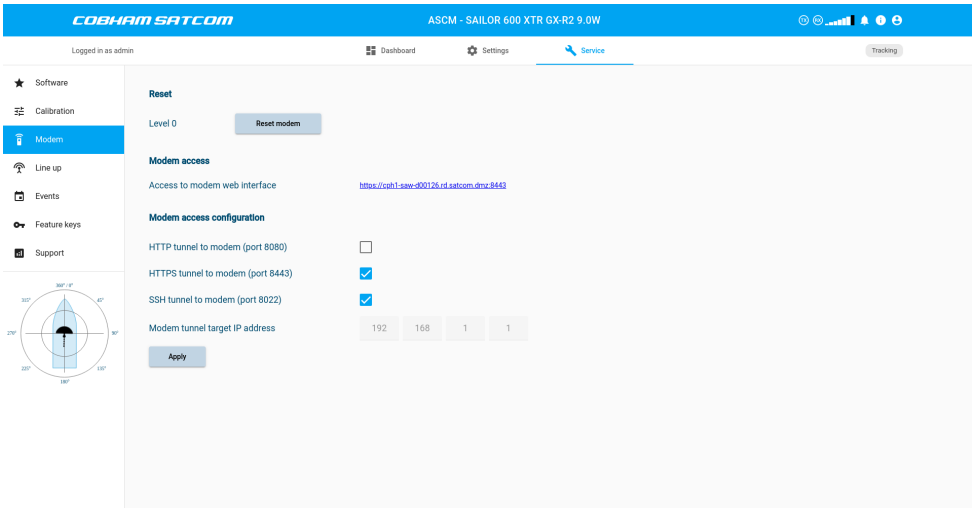



Figure 3.26: Modem setup.

1. In the built-in web interface, select **Service > Modem**.

[2]You can find the maximum allowed cable loss at *Alternative ADU Cable* on page 2-19.

2. Select one of the following methods to access the modem.
   - HTTP tunnel to modem (port 8080).
   - HTTPS tunnel to modem (port 8443).
   - SSH tunnel to modem (port 8022).
   - Optional tunnel target IP address (blank to disable).
3. If not automatically set, you must enter the modem IP address here. It cannot be left blank.
4. Check that the modem IP address is on the same subnet as set in the modem profile.
5. Click **Apply**.

**Example:** To access the web interface of your modem using HTTPS, select **HTTPS tunnel to modem (port 8443)** and click Apply. Then, in the address bar of your browser, enter: **https://<BDU IP address or hostname>:8443** You should now see the web interface of the modem.

### 3.3.6 Line Up

The SAILOR XTR GX-R2 has been tested at the factory and online on a live satellite link to calibrate the TX polarization unit. You can fine-tune the TX polarization by doing a line up.

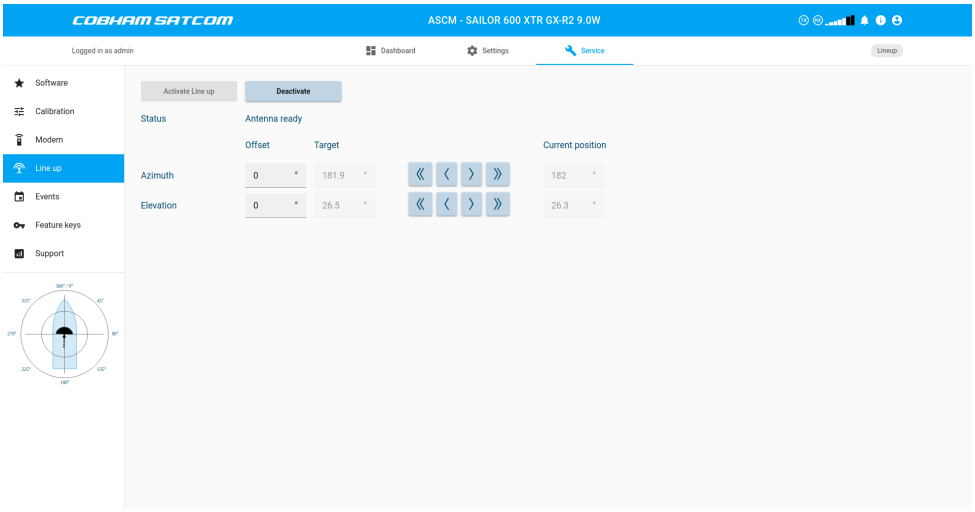



Figure 3.27: Service - Line Up.

**NOTE** The ship must not move during the line-up procedure.

To do the line up, do as follows:

1. Open an Internet browser and enter the IP address of the BDU (default IP address: **http://192.168.0.1**).

2. Activate a VSAT profile.
3. Click **Service > Line up**. The antenna must be in tracking mode and point to the satellite.
4. Wait until **Status** shows: **Ready for lineup**.
5. Click the button **Activate Lineup** and wait until the **Status** shows **Antenna ready**. Follow the instructions from your service provider for Azimuth and Elevation Offset.
6. Set the values as advised by the service provider:
   - Azimuth.
   - Elevation.
7. Follow the instructions from the service provider to make a P1dB compression test (VSAT modem).
8. Click the button **Deactivate** to leave the line up procedure.

### 3.3.7 Events

This page shows a detailed list of active events and notifications including the time of the first occurrence, ID and severity of the event message, and a short text describing the error. Events can be of the type **WARNING**, **ERROR** or **INFO**. The event time is UTC time. Active events are cleared from the event list when their issue is cleared. They are moved to the section **Cleared events last 24 hours** and are displayed for 24 hours. All entries in this section are cleared automatically after 24 hours or after a restart of the system. When an event is registered, the web interface shows an event icon (bell) in the top bar as long as the event is active. The number of new events since last viewing is also shown. To view the event list with active events, click the event icon from the icon bar at the top of the web interface, or select **Service > Events**.

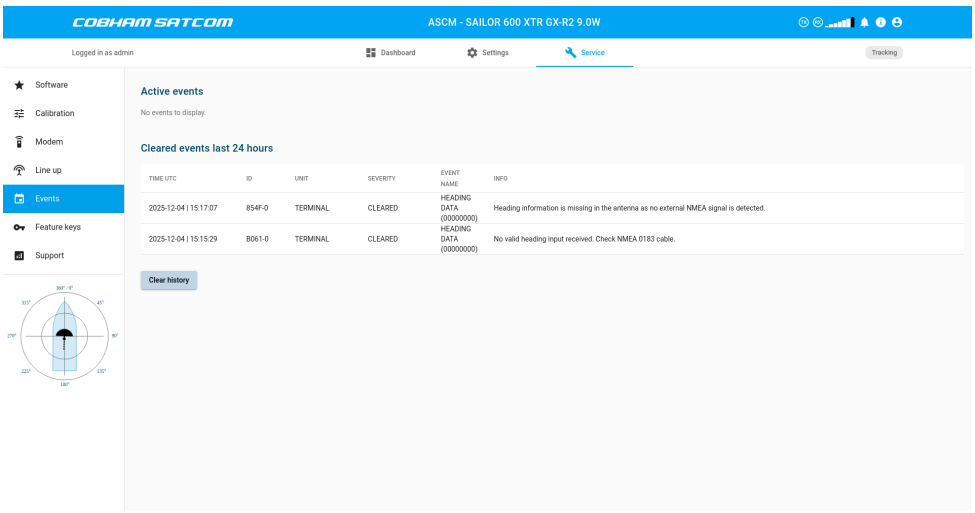



Figure 3.28: Service - Events list (example).

### 3.3.8 Support

On this page you can:

- Download this manual from the SAILOR XTR as pdf.
- Download various reports.
  - Diagnostics report.
  - Statistics report.
  - User log (smaller version of the Diagnostic log).
  - Audit log.
- Restart antenna to trigger selftest.
- Enable extended POST.
- You can enable extra diagnostic logging, i.e. include data for modem communication in the diagnostics report.
- Write a system use description.

NOTE | Diagnostics Report and Statistics Report contain GNSS data.

**Self test**

The self test checks all vital parts of the antenna and BDU. If a malfunction is detected after restart, the unit provides system messages with a description of the failing test. This will be indicated in the icon bar in the web interface and also in the BDU display. An extended antenna POST is available[3]. This test lasts longer and checks more components than the regular self test.

**Audit log**

The audit logging feature is designed to help you keep track of important security related events and actions that occur within the antenna. This feature ensures that all significant activities are recorded, providing a clear and organized audit trail. Audit logging is a process where the system records detailed information about various actions and events. These logs include user logins, configuration changes, data access, and other critical operations. The purpose of audit logging is to provide a transparent record of what happened, when it happened, and who was involved.
The audit log is not deleted at reset to factory default.

Important | The SAILOR XTR GX-R2 reboots to perform the self test. Rebooting terminates all existing connections.

[3] For SAILOR 600 XTR GX-R2 the extended POST is mainly the same as the normal POST.

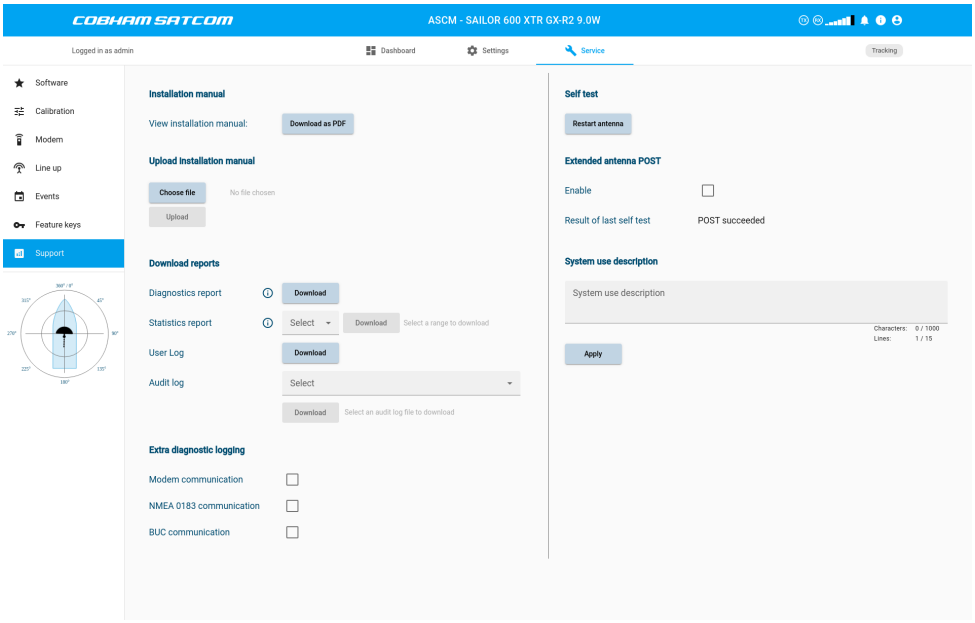



Figure 3.29: Service - Support.

## 3.4 Keypad and Menus of the BDU

### 3.4.1 BDU Display and Keypad

In the BDU display you can see the current state of the system. You can also see events (warnings, errors and information) and how the system has been configured. Use the keypad to navigate through the menu tree.

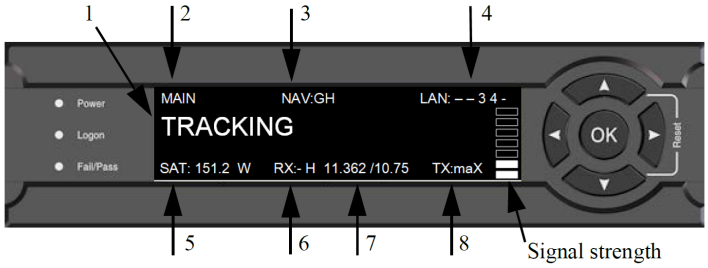



Figure 3.30: Display (example) and keypad of the BDU.

1. Current status of the SAILOR XTR GX-R2.
2. Current menu.
3. **NAV:** Navigational information
   First letter: **G** (Valid GPS signal received from the GPS module) or **g** (No valid GPS fix).
   Second letter: **H** (Valid ship heading data received from the ship's gyro) or **h** (No valid heading data).
4. **LAN:** LAN connectors used, **1, 2, 3, 4, 5,** –.

5. **SAT:** Longitude, satellite position of the currently active VSAT profile.
6. **RX: 1** (Rx Lock: **-** or **1**), **H** (horizontal) or **V** (vertical) RX polarization of currently active VSAT profile.
7. RF tracking frequency in GHz and LNB L.O. Frequency.
8. **TX:** <External Un-mute> <Modem TX allowed> <ADU TX allowed> <TX pol> Read the TX status as follows: Upper case: Ok, lower case: Not ok, - unknown. <External Un-mute> = [U,u], <Modem TX allowed> = [m,M], <ADU TX allowed> = [a,A] <Tx pol>=[-,X,C]

After 1 hour the display is dimmed to lowest intensity. Press any key to light up the display.

Power Cycle of the BDU and ADU (Reset)

To power cycle the BDU and ADU do as follows:

1. Press and hold ▲ and ▼ until the BDU display shuts down and the BDU reboots.

Figure 3.31: Reset the system (example).

2. Wait until the system has rebooted and is operational again. The last active VSAT profile will be used.

Adjusting Brightness of the Display

To adjust the brightness do the following:

1. Press and hold **OK** for a short moment until BRIGHTNESS XXX% is displayed (XXX is the current brightness value).
2. Hold **OK** pressed + press ▲ for lighter or ▼ for darker display.
3. Release **OK** to leave the brightness menu.

Navigating the Menus

Use the keypad to navigate the menus.

- Press **OK** or ► to select a menu item.
- Use the arrow keys ▲ and ▼ to go through the menu items.

- Use the arrow keys ◄ and ► to go through the settings and move from one digit to the next.

- Press ◄ again to move one level up. If applicable, confirm to store the new setting by pressing **OK**.

### 3.4.2 List of Menus

The following tables show the main menu and sub-menus.

| **Top-level** | **Description** |
|---|---|
| MAIN | View with current status of the SAILOR XTR GX-R2. This view is displayed after a time out of 10 minutes. Press any key (except left arrow) to enter the menu at **MAIN**. New events are shown in this display. If an event is displayed, press **OK** to jump directly to the menu **EVENTS** for viewing the currently active events. |
| ANTENNA | Shows the current ADU parameters, position, software version and serial numbers of the ADU and BDU. |
| MODEM | Selected VSAT modem type and setup, including signal level. |
| NETWORK | Shows the IP addresses and netmasks of the LAN connectors of the BDU and the management mask. |
| SATELLITE | Current satellite information. This information is entered using the web interface. |
| EVENTS | View system events. Active events are shown as: **X ACTIVE EVENTS** in the **MAIN** display. Press **OK** to update the list. |

Table 3.18: Top-level menu of the BDU.

| **ANTENNA** | **Description** |
|---|---|
| POINTING | ANTENNA STATE: Current state of the antenna, e.g. **TRACKING**<br>ELEVATION: Current elevation angle of the antenna<br>AZIMUTH: Current azimuth of the antenna, with reference to North |
| POLARISATION | RX POLARISATION: **RHC** or **LHC** read from connected VSAT modem.<br>TX POLARISATION: **RHC** or **LHC** read from connected VSAT modem. |
| GNSS | LATITUDE: current latitude, read from GNSS module.<br>LONGITUDE: current longitude, read from GNSS module.<br>FIX TYPE: **None**, **2D**, **3D**, or **User** |
| HEADING | Ship's heading in degrees with reference to North, provided by the ship's gyro. |
| VERSIONS | Current software version. |
| SERIAL NUMBERS | BDU: BDU serial number<br>Antenna: Serial number of the antenna |
| LOCAL ADMINISTRATION | Select **LOCAL ADMINISTRATION** to get administrator access for 1 hour or until next reboot. |

Table 3.19: ANTENNA menu of the BDU.

| **MODEM** | **Description** |
|---|---|
| MODEM TYPE | Activated modem type. |
| TX ENABLE | On or off, information delivered by the connected VSAT modem. |
| RX LOCK | Locked or not locked, information delivered by the connected VSAT modem. |
| NET LED | LED indication from modem. Steady or blinking green/amber/red, OFF |
| STAT LED | |
| TX LED | |
| RX1 LED | |
| RX2 LED | |
| PWR LED | |
| TEMP LED | |
| FAN LED | |

Table 3.20: MODEM menu of the BDU.

| NETWORK | Description |
|---|---|
| HOST NAME | The host name is used for identification purposes, e.g. in reports. |
| PORT 1 IP | Current IP address for BDU Port 1. |
| MASK 1 | Current netmask for BDU Port 1. |
| PORT 2 IP | Current IP address for BDU Port 2. |
| MASK 2 | Current netmask for BDU Port 2. |
| PORT 3 IP | Current IP address for BDU Port 3. |
| MASK 3 | Current netmask for BDU Port 3. |
| PORT 4 IP | Current IP address for BDU Port 4. |
| MASK 4 | Current netmask for BDU Port 4. |
| PORT 5 IP | Current IP address for BDU Port 5 - Service. |
| MASK 5 | Current netmask for BDU Port 5 - Service. |
| DEFAULT GATEWAY | Current default gateway. |

Table 3.21: NETWORK menu of the BDU.

| SATELLITE | Description |
|---|---|
| POSITION | Position of the current satellite. |
| RX POLARISATION | Right Hand Circular, Left Hand Circular, auto-selected by the VSAT modem. |
| TX POLARISATION | X-polarization or Co-polarization, auto-selected by VSAT modem. |
| RX FREQUENCY | Ka band receiving frequency of the active satellite, auto-selected by VSAT modem. |
| LNB L.O. | Auto-selected by VSAT modem. |
| BUC L.O. | Auto-selected by VSAT modem. |

Table 3.22: SATELLITE menu of the BDU.

| EVENT | Description |
|---|---|
| <EVENT> | In this menu all active events are listed. Use ▲ and ▼ to go through the active events.<br>If a new event occurs or there is a change in the event list while you are in the **EVENTS** menu, a ***** is shown in the upper left corner of the display, next to the menu name. Press **OK** to update the EVENTS list, the ***** will be removed.<br>**A >** means the event text is longer than the display can show. Press ► to see the remaining text. |

Table 3.23: EVENT menu of the BDU.

**Example:**

**EVENT 1/4*:** This is the first event out of a list of 4 and there has been a

change in the list. EVENT 1/4 will always be shown, the ***** indicates that there has been a change.

## 3.5 Startup Sequence

Once the system is configured and a VSAT profile is active, the startup sequence is as follows:

- Antenna POST pending.
- Antenna SW upload (If the software versions in the ADU and BDU are not the same, a software update is done during startup).
- Antenna POST.
- Ready.
- Acquiring Signal.
- Tracking.

When the display shows **TRACKING** and the LED **Logon** is steady green, the system is operational.

# Installation Check Lists

Use the following sections to verify that the system is ready for customer delivery.

## 4.1 Installation Check List: Antenna

| Step | Task | Further Information | Done |
|---|---|---|---|
| 1. | Check that the antenna is free of obstructions. | See *Obstructions (ADU Shadowing)* on page 2-5. | |
| 2. | Make sure there is sufficient space for access through the service hatch. | See *To Install the ADU* on page 2-27. | |
| 3. | Make sure to maintain the vertical orientation of the ADU center line. | | |
| 4. | Check that the ADU is installed where vibrations are limited to a minimum. | | |
| 5. | Check that you programmed the blocking zones correctly. | See *Blocking Zones – Azimuth and Elevation* on page 2-6 and *Blocking Zones* on page 3-21. | |
| 6. | Check that the safety distance for radiation hazard is obeyed. | See *Safe access to the ADU: Radiation hazard* on page 2-3. | |
| 7. | Check that the mounting height of the antenna is in accordance with the ship's min. roll period. | See *Ship Motion and Offset from the Ship's Motion Centre* on page 2-4. | |
| 8. | Make sure that the requirements for mast foundation and height, including flatness, gusset plates and distance from welding seams are met. | See *ADU Mast Flange and Mast Length* on page 2-7. | |
| 9. | Make sure that the distances to radar, satellite systems, GPS receivers and other transmitters are as required. | See *Interference Between Radar, GPS/GNSS, L-band and Other Transmitters/Receivers* on page 2-16. | |
| 10. | Make sure that the drain tube is open and risk for water intrusion is at a minimum. | See *Condensation and Water Ingress* on page 2-18. | |
| 11. | Check that the ADU is grounded correctly, using the mounting bolts. | See *To Ground the ADU* on page G-3 and *Grounding and RF Protection* on page G-1. | |

Table 4.1: Installation check list: Antenna.

## 4.2 Installation Check List: Functional Test in Harbor

| Step | Task | Further Information | Done |
|---|---|---|---|
| 1. | Check that the antenna is tracking the satellite. | The logon LED in the BDU display must be steady green and the display shows: **TRACKING**.<br>In the web interface top bar check that the system status shows Tracking. | |
| 2. | Check that the VSAT modem is in lock and ready for Tx. | In the web interface Dashboard on modem card check RX frequency and signal level shows values. | |
| 3. | Connect a user PC LAN (not the service PC) to the Internet LAN connector of the VSAT system. | Check the VSAT modem documentation for details. | |
| 4. | Make sure that the computer has no access to the Internet through other means (Wifi, 3G, 4G etc.).<br>Open a command prompt and type: ping 4.2.2.2. | Check that you get a response. | |
| 5. | Make sure that the computer has no access to the Internet through other means (Wifi, 3G, 4G etc.).<br>Open a web browser and browse to e.g. www.google.com. | Check that the web page is downloaded. | |
| 6. | If step 4 is successful and step 5 is not then it seems like the DNS is not configured correctly. | Check the VSAT modem documentation how to set up the DNS server, "Obtain DNS server address automatically" or enter specific DNS server addresses. | |

Table 4.2: Installation check list: Functional test in harbor.

# Service

This chapter has the following sections:

- *Built-in Test and LEDs*
- *Removal and Replacement of the BDU*
- *Removal and Replacement of ADU Modules*
- *Cleaning of the eDome*
- *Troubleshooting Basics*
- *Returning Units for Repair*

## 5.1 Built-in Test and LEDs

The ADU and the BDU have a Built-In Test Equipment (BITE) function in order to make fault diagnostics easy during service and installation. The BITE test is performed during:

- Power On Self Test (POST), which is automatically performed each time the system is powered on.
- Extended antenna POST (web interface at **Service** > **Support**).

LEDs on the front panel of the BDU are used to signal:

- Power on/off.
- Logon.
- Fail/Pass.

The built-in web interface shows events (BITE error codes) with a short message describing each error or warning. This is also displayed on the BDU. In an error situation, one of the following system status messages may be shown:

- BDU POST error.
- ADU POST error.
- SAFE MODE (plus information about the specific error, see *Event Messages* on page H-1).

### 5.1.1 LEDs of the Modules in the ADU

Each ADU module has one multi-color LED.

| LED | Behavior | Description |
|---|---|---|
| RED | Steady | Powered but CPU not booted. |
| RED | Blinking | Module failure. |
| GREEN | Steady | Module OK. |
| GREEN | Blinking | Bootloader/SW Upload. |

Table 5.1: LEDs of the ADU modules.

### 5.1.2 LEDs in the BDU

The BDU has 3 LEDs: Power, Logon and Fail/Pass LED.

Figure 5.1: BDU – LEDs.

| LED | Behavior | Description |
|---|---|---|
| Power | Steady green | Power supply OK. |
| | Steady red | Power supply failure. |
| | Off | No power. |
| Logon | Blinking green | Current status is displayed:<br>• Searching satellite.<br>• Identifying satellite.<br>• Carrier lock & TX enabled from modem. |
| | Steady green | Satellite link established. |
| | Off | No satellite link acquired. |
| Fail/Pass LED | Steady red | A fault which prevents operation is present in the system (ADU, BDU, MODEM). |
| | Blinking green | A Power On Self Test (POST) or Self Test in progress. The current status is displayed. |
| | Blinking red | Active BITE failure or warning. The event is shown in the BDU display. |
| | Steady green | No faults. |

Table 5.2: LEDs on the BDU.

## 5.2 Removal and Replacement of the BDU

There are no parts in the BDU that you can remove or replace. Contact your Cobham SATCOM service partner for repair or replacement.

## 5.3 Removal and Replacement of ADU Modules

All replacement of modules must be done by a Cobham SATCOM service partner. Before contacting your service partner check the LEDs on all modules (ACM, ISCM and motors).

## 5.4 Cleaning of the eDome

All SAILOR 1000 XTR systems come with an eDome for radome. Use a soft brush to avoid damaging the paint when cleaning the radome.

**CAUTION!** Do **NOT** use a high-pressure washer to clean the radomes on the antenna systems. This can cause damage and degraded performance to the system.

## 5.5 Troubleshooting Basics

### 5.5.1 Overview

This section describes an initial check of the primary functions of the SAILOR XTR GX-R2 system, and provides some guidelines for troubleshooting. Generally, if a fault occurs without any obvious reason, it is always recommended to observe the LEDs and the BDU display showing the active events. Possible failure states are shown in the web interface and the display of the BDU :

- SAFE MODE (e.g. hardware error, missing communication link between the ADU and BDU, excessive ship motion).
- ADU POST error (hardware error).
- BDU POST error (hardware error).

For a list of all the error messages and warnings, see Appendix *Event Messages* on page H-1.

### 5.5.2 Administrator Password Forgotten

If you do not know the administrator password you can get temporary access (1 hour) to the system. Do as follows:

1. On the BDU keypad, push and hold the ◄ for 5 seconds.

2. Wait for the short display of **Local administration**, followed by the event text: **0807F-0 WARNING Local administration enabled**. This will give you temporary administrator access for **1 hour or until next restart**.

3. Open your browser and access the web interface.

4. Enter user name: **admin** (no password is required). The **Dashboard** is displayed.

NOTE

Accessing the BDU with the local administration function does not change the current administrator password.

5. To create or change the password select **Settings > User administration**.

6. Click on the pencil-shaped icon next to **Admin**.

7. Type in the new administrator password (minimum 8 characters) and click **Apply**.

8. The web interface shows the **Dashboard** page.

## 5.5.3 Locating an Error in the System

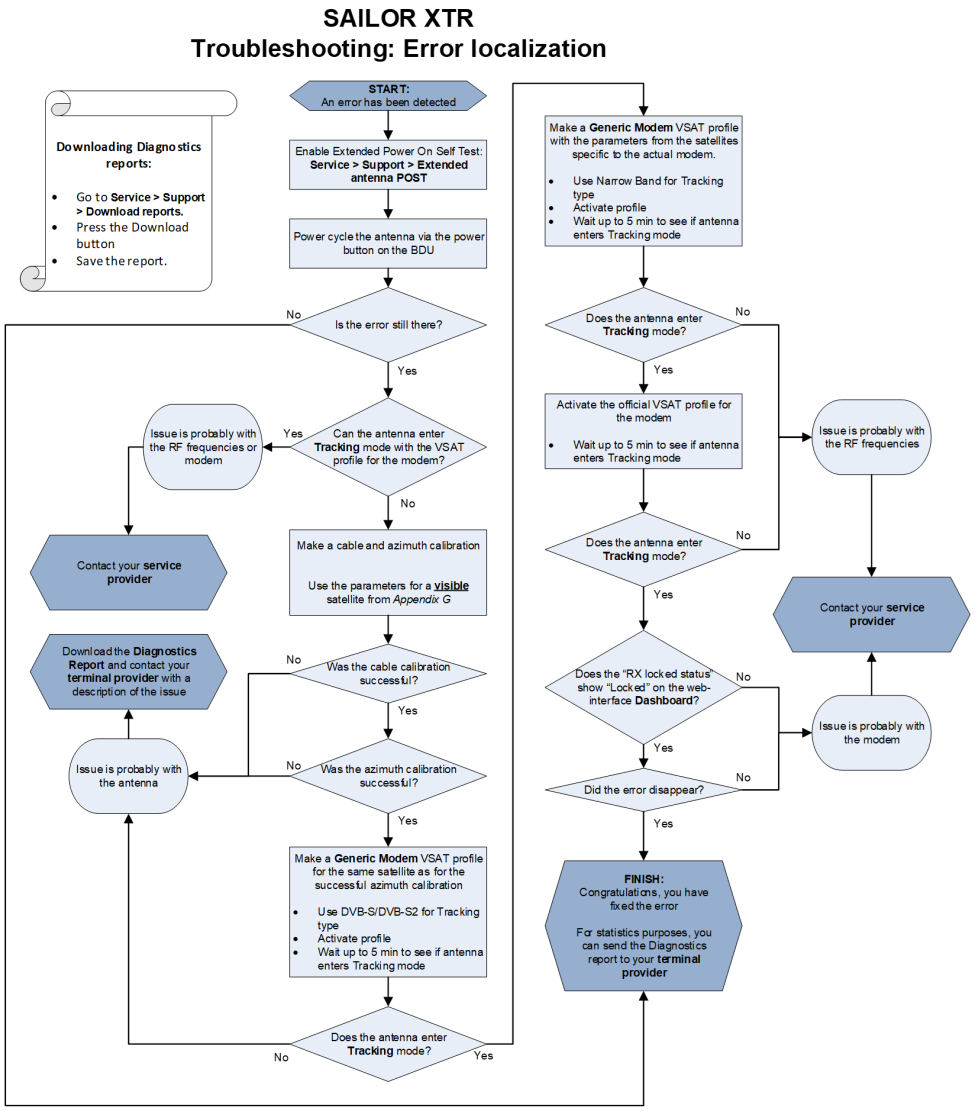



Figure 5.2: Troubleshooting flow chart.

## 5.6 Returning Units for Repair

Should your Cobham SATCOM product fail, contact your dealer or installer, or the nearest Cobham SATCOM partner. You will find the partner details on `www.cobhamsatcom.com/where-to-buy`. You can also access the partner portal at https://partnerportal.cobhamsatcom.com, which may help you solve the problem. Your dealer, installer or Cobham SATCOM partner will assist you whether the need is user training, technical support, arranging on-site repair or sending the product for repair. Your dealer, installer or Cobham SATCOM partner will also take care of any warranty issue.

# Technical Specifications

This appendix has the following sections:

- *Specifications SAILOR 1000 XTR GX-R2 with eDome*
- *Specifications SAILOR 1000 XTR GX-R2 with composite radome*
- *Specifications SAILOR 600 XTR GX-R2 with eDome*
- *Specifications SAILOR 600 XTR GX-R2 with composite radome*
- *Patents*
- *Outline Drawings*
  - *ADU SAILOR S1000 XTR GX-R2 (eDome)*
  - *ADU SAILOR S1000 XTR GX-R2 (composite radome)*
  - *ADU SAILOR S600 XTR GX-R2 (eDome)*
  - *ADU SAILOR S600 XTR GX-R2 (composite radome)*
  - *BDU*
  - *GMU (407023A)*
  - *GMU (407523A)*

# A.1 Specifications SAILOR 1000 XTR GX-R2 with eDome

| SPECIFICATIONS | |
|---|---|
| Reflector size | 103 cm |
| Type approvals | Inmarsat |
| Certification | Compliant with CE (Maritime), ETSI, FCC, |
| System power supply range | 100-240 VAC, 50-60 Hz |
| Total system power consumption | 4.5 W: 135 W typ. 185 W max. (excl. modem)<br>9.0 W: 180 W typ. 215 W max. (excl. modem) |
| **FREQUENCY BAND: GX-Band** | |
| Rx | 17.70 to 20.20 GHz |
| Tx | 27.50 to 30.00 GHz |
| **ANTENNA CABLE & CONNECTORS** | |
| BDU to ADU cable | Coax cable (50 Ω) for Rx, Tx, MoCA and DC power on a single cable |
| ADU + BDU cable connector | Female N-Connector (50 Ω) |
| **ABOVE DECK UNIT (ADU)** | |
| Antenna type, pedestal | 3-axis (plus auto skew) stabilized tracking antenna with integrated GNSS module supporting GPS, GLONASS and Beidou |
| Antenna type, reflector system | Reflector/sub-reflector, ring focus |
| Transmit Gain | 47.6 dBi typ. @ 29.5 GHz (incl. eDome) |
| Receive Gain | 44.4 dBi typ. @ 19.70 GHz (incl. eDome) |
| System G/T | 21 dB/K typ. @ 19.70 GHz, at $\geq$ 10° elevation and clear sky (incl. eDome) |
| GX-R2 transceiver output power | 4.5 W or 9 W |
| EIRP | 4.5 W: $\geq$ 54.1 dBW (incl. eDome)<br>9 W: $\geq$ 57.1 dBW (incl. eDome) |
| LNB | Inmarsat GX-R2 transceiver |
| Polarization | Circular (RHCP, LHCP) independent controlled for Rx and Tx |
| Tracking receiver | Internal "all band/modulation type" and VSAT modem RSSI |
| Satellite acquisition | Automatic - with Gyro- or GPS-compass input. Support for gyro free operation |
| Elevation range | -20° to +120° |
| Cross elevation | -37° to +37° |
| Azimuth range | Unlimited (rotary joint) |
| Ship motion, angular | Roll ± 30° (6 sec), Pitch ± 15° (5 sec), Yaw ± 10° (8 sec) |
| Ship, turning rate and acceleration | 15°/s and 15°/s² |
| ADU motion, linear | Linear accelerations ± 2.5 g max any direction |
| Vibration, operational | Sine: EN 60945 (8.7.2), DNV 2.4 A, MIL-STD-167-1 (5.1.3.3.5). Random: Maritime |
| Vibration, survival | Sine: EN 60945 (8.7.2) dwell, MIL-STD-167-1 (5.1.3.3.5) dwell. Random: Maritime survival. IEC EN 60721-4-6 |
| Shock | IEC EN 60721-3-6 class 6M3 mod. by EN60721-4-6. MIL-STD-810F 516.5 (Proc II) |
| Temperature (ambient) | Operational: -25°C to +55°C<br>Storage: -40°C to +85°C |
| With SAILOR SMART Heater option | Operational: -55°C to +55°C, P/N: 407090-001 |
| Humidity | 95%, condensing |
| Rain / IP class | IEC EN EN60945 Exposed, IPX6 |
| Wind | 80 knots operational / 110 knots survival |
| Ice, survival | 25 mm |
| Solar radiation | 1120 W/m² to MIL-STD-810F 505.4 |
| Compass safe distance | 1.5 meters to IEC EN 60945 |
| Maintenance, scheduled | None |
| Maintenance, unscheduled | All modules, motor, RF parts and belts are replaceable through service hatch |
| Built-in Tests | Power On Self-Test, Person Activated Self-Test and Continuous Monitoring w. error logging |
| Dimensions (overall) | Height: 150 cm<br>Diameter: 133 cm |
| Weight | 113 kg |

| BELOW DECK UNIT (BDU) | |
|---|---|
| Dimensions | 1U 19" rack mount<br>HxWxD: 4.4 x 48 x 33 cm |
| Weight | 3.6 kg |
| Temperature (ambient) | Operational: -25°C to +55°C<br>Storage: -40°C to +85°C |
| Humidity | EN60945 Protected, 95% (non-condensing) |
| IP class | IP30 |
| Compass safe distance | 30 cm to IEC EN 60945 |
| Interfaces | 1 x Male N-Connector for antenna RF cable (50 Ω) with automatic cable loss compensation<br>2 x F-connectors (75 Ω) for Rx/Tx to VSAT modem<br>1 x Ethernet data (VSAT modem control)<br>2 x Ethernet (user)<br>1 x Ethernet (remote access)<br>1 x Ethernet for service and configuration<br>1 x RJ-45, RS-422 Data (VSAT modem control)<br>1 x RJ-45, RS-232 Data (VSAT modem control)<br>1 x NMEA-0183 (RS-422/RS-232) for gyro-/GPS-compass input and external GPS input<br>1 x RJ-45, 4 x general purpose GPIO, Tx Mute and Rx Lock<br>1 x AC power input<br>1 x Grounding Bolt |
| User interface | Webserver, OLED display (red), 5 pushbuttons, 3 discrete indicator LEDs and ON/OFF switch, TX Mute and Modem Lock indicator |
| Temperature control | Built-in fan |
| No transmit zones | Programmable, 8 zones with azimuth and elevation. Real-time blocking map recorder. |
| Remote management and IoT | HTTPS, SSH, Telnet, SNMP Traps, Syslog, CLI, Diagnostic, Statistic, RESTful API, MQTT |
| **VSAT MODEM SUPPORT** | |
| Modem protocols | Generic, OpenAMIP, OpenBMIP, Custom protocol |
| **7523A - SAILOR GX-R2 MODEM UNIT (GMU2)** | |
| Dimensions | 1U 19" rack mount<br>HxWxD: 4.4 x 48 x 33 cm |
| Weight | 2.7 kg |
| Humidity | IEC EN 60945 Protected, 95% (on-condensing) |
| IP class | IP30 |
| Compass safe distance | 40 cm to IEC EN 60945 |
| Interfaces | 2 x SMA-connectors (50 Ω) for Rx and Tx to BDU<br>1 x SMA-connector (RX2, not used)<br>1 x SMA-connector (Ref, not used)<br>2 x Power (DC loop back)<br>4 x RJ-45 EThernet (modem control and user data)<br>1 x RJ-45 & DB9 - RS-422 (modem control)<br>1 x RJ-45 & DB9 - RS-232 (modem control)<br>1 x Universal AC Power Input<br>1 x Grounding Bolt |
| Input Power | 100 - 240 VAC, 50-60 Hz, 40 W peak, 30 W typical |
| Modem Interface (control) | LAN, RS-422, RS-232 |
| Display | Web MMI, On/Off switch and power/status LEDs |
| Temperature control | Built-in fan |

# A.2 Specifications SAILOR 1000 XTR GX-R2 with composite radome

| **SPECIFICATIONS** | |
|---|---|
| Reflector size | 103 cm |
| Type approvals | Inmarsat |
| Certification | Compliant with CE (Maritime), ETSI, FCC, |
| System power supply range | 100-240 VAC, 50-60 Hz |
| Total system power consumption | 4.5 W: 135 W typ. 185 W max. (excl. modem)<br>9.0 W: 180 W typ. 215 W max. (excl. modem) |
| **FREQUENCY BAND: GX-Band** | |
| Rx | 17.70 to 20.20 GHz |
| Tx | 27.50 to 30.00 GHz |
| **ANTENNA CABLE & CONNECTORS** | |
| BDU to ADU cable | Coax cable (50 Ω) for Rx, Tx, MoCA and DC power on a single cable |
| ADU + BDU cable connector | Female N-Connector (50 Ω) |
| **ABOVE DECK UNIT (ADU)** | |
| Antenna type, pedestal | 3-axis (plus auto skew) stabilized tracking antenna with integrated GNSS module supporting GPS, GLONASS and Beidou |
| Antenna type, reflector system | Reflector/sub-reflector, ring focus |
| Transmit Gain | 48.3 dBi typ. @ 29.5 GHz (incl. radome) |
| Receive Gain | 43.9 dBi typ. @ 19.70 GHz (incl. radome) |
| System G/T | 20.6 dB/K typ. @ 19.70 GHz, at $\geq$ 10° elevation and clear sky (incl. radome) |
| GX-R2 transceiver output power | 4.5 W or 9 W |
| EIRP | 4.5 W: $\geq$ 54.8 dBW (incl. radome)<br>9 W: $\geq$ 57.8 dBW (incl. radome) |
| LNB | Inmarsat GX-R2 transceiver |
| Polarization | Circular (RHCP, LHCP) independent controlled for Rx and Tx |
| Tracking receiver | Internal "all band/modulation type" and VSAT modem RSSI |
| Satellite acquisition | Automatic - with Gyro- or GPS-compass input. Support for gyro free operation |
| Elevation range | -20° to +120° |
| Cross elevation | -37° to +37° |
| Azimuth range | Unlimited (rotary joint) |
| Ship motion, angular | Roll ± 30° (6 sec), Pitch ± 15° (5 sec), Yaw ± 10° (8 sec) |
| Ship, turning rate and acceleration | 15°/s and 15°/s² |
| ADU motion, linear | Linear accelerations ± 2.5 g max any direction |
| Vibration, operational | Sine: EN 60945 (8.7.2), DNV 2.4 A, MIL-STD-167-1 (5.1.3.3.5). Random: Maritime |
| Vibration, survival | Sine: EN 60945 (8.7.2) dwell, MIL-STD-167-1 (5.1.3.3.5) dwell. Random: Maritime survival. IEC EN 60721-4-6 |
| Shock | IEC EN 60721-3-6 class 6M3 mod. by EN60721-4-6. MIL-STD-810F 516.5 (Proc II) |
| Temperature (ambient) | Operational: -25°C to +55°C<br>Storage: -40°C to +85°C |
| With SAILOR SMART Heater option | Operational: -55°C to +55°C, P/N: 407090-001 |
| Humidity | 95%, condensing |
| Rain / IP class | IEC EN EN60945 Exposed, IPX6 |
| Wind | 80 knots operational / 110 knots survival |
| Ice, survival | 25 mm |
| Solar radiation | 1120 W/m² to MIL-STD-810F 505.4 |
| Compass safe distance | 1.5 meters to IEC EN 60945 |
| Maintenance, scheduled | None |
| Maintenance, unscheduled | All modules, motor, RF parts and belts are replaceable through service hatch |
| Built-in Tests | Power On Self-Test, Person Activated Self-Test and Continuous Monitoring w. error logging |
| Dimensions (overall) | Height: 150 cm<br>Diameter: 133 cm |
| Weight | 111 kg |

| **BELOW DECK UNIT (BDU)** | |
|---|---|
| Dimensions | 1U 19" rack mount<br>HxWxD: 4.4 x 48 x 33 cm |
| Weight | 3.6 kg |
| Temperature (ambient) | Operational: -25°C to +55°C<br>Storage: -40°C to +85°C |
| Humidity | EN60945 Protected, 95% (non-condensing) |
| IP class | IP30 |
| Compass safe distance | 30 cm to IEC EN 60945 |
| Interfaces | 1 x Male N-Connector for antenna RF cable (50 Ω) with automatic cable loss compensation<br>2 x F-connectors (75 Ω) for Rx/Tx to VSAT modem<br>1 x Ethernet data (VSAT modem control)<br>2 x Ethernet (user)<br>1 x Ethernet (remote access)<br>1 x Ethernet for service and configuration<br>1 x RJ-45, RS-422 Data (VSAT modem control)<br>1 x RJ-45, RS-232 Data (VSAT modem control)<br>1 x NMEA-0183 (RS-422/RS-232) for gyro-/GPS-compass input and external GPS input<br>1 x RJ-45, 4 x general purpose GPIO, Tx Mute and Rx Lock<br>1 x AC power input<br>1 x Grounding Bolt |
| User interface | Webserver, OLED display (red), 5 pushbuttons, 3 discrete indicator LEDs and ON/OFF switch, TX Mute and Modem Lock indicator |
| Temperature control | Built-in fan |
| No transmit zones | Programmable, 8 zones with azimuth and elevation. Real-time blocking map recorder. |
| Remote management and IoT | HTTPS, SSH, Telnet, SNMP Traps, Syslog, CLI, Diagnostic, Statistic, RESTful API, MQTT |
| **VSAT MODEM SUPPORT** | |
| Modem protocols | Generic, OpenAMIP, OpenBMIP, Custom protocol |
| **7523A - SAILOR GX-R2 MODEM UNIT (GMU2)** | |
| Dimensions | 1U 19" rack mount<br>HxWxD: 4.4 x 48 x 33 cm |
| Weight | 2.7 kg |
| Humidity | IEC EN 60945 Protected, 95% (on-condensing) |
| IP class | IP30 |
| Compass safe distance | 40 cm to IEC EN 60945 |
| Interfaces | 2 x SMA-connectors (50 Ω) for Rx and Tx to BDU<br>1 x SMA-connector (RX2, not used)<br>1 x SMA-connector (Ref, not used)<br>2 x Power (DC loop back)<br>4 x RJ-45 EThernet (modem control and user data)<br>1 x RJ-45 & DB9 - RS-422 (modem control)<br>1 x RJ-45 & DB9 - RS-232 (modem control)<br>1 x Universal AC Power Input<br>1 x Grounding Bolt |
| Input Power | 100 - 240 VAC, 50-60 Hz, 40 W peak, 30 W typical |
| Modem Interface (control) | LAN, RS-422, RS-232 |
| Display | Web MMI, On/Off switch and power/status LEDs |
| Temperature control | Built-in fan |

# A.3 Specifications SAILOR 600 XTR GX-R2 with eDome

| SPECIFICATIONS | |
|---|---|
| Reflector size | 65 cm |
| Type approvals | Inmarsat |
| Certification | Compliant with CE (Maritime), ETSI, FCC, |
| System power supply range | 100-240 VAC, 50-60 Hz |
| Total system power consumption | 4.5 W: 135 W typ. 185 W max. (excl. modem)<br>9.0 W: 180 W typ. 215 W max. (excl. modem) |
| **FREQUENCY BAND: GX-Band** | |
| Rx | 17.70 to 20.20 GHz |
| Tx | 27.50 to 30.00 GHz |
| **ANTENNA CABLE & CONNECTORS** | |
| BDU to ADU cable | Coax cable (50 Ω) for Rx, Tx, MoCA and DC power on a single cable |
| ADU + BDU cable connector | Female N-Connector (50 Ω) |
| **ABOVE DECK UNIT (ADU)** | |
| Antenna type, pedestal | 3-axis (plus auto skew) stabilized tracking antenna with integrated GNSS module supporting GPS, GLONASS and Beidou |
| Antenna type, reflector system | Reflector/sub-reflector, ring focus |
| Transmit Gain | 44 dBi typ. @ 29.5 GHz (incl. eDome) |
| Receive Gain | 40.3 dBi typ. @ 19.70 GHz (incl. eDome) |
| System G/T | 16.8 dB/K typ. @ 19.70 GHz, at $\geq$ 10° elevation and clear sky (incl. eDome) |
| GX-R2 transceiver output power | 4.5 W or 9 W |
| EIRP | 4.5 W: $\geq$ 50.46 dBW (incl. eDome)<br>9 W: $\geq$ 53.54 dBW (incl. eDome) |
| LNB | Inmarsat GX-R2 transceiver |
| Polarization | Circular (RHCP, LHCP) independent controlled for Rx and Tx |
| Tracking receiver | Internal "all band/modulation type" and VSAT modem RSSI |
| Satellite acquisition | Automatic - with Gyro- or GPS-compass input. Support for gyro free operation |
| Elevation range | -25° to +120° |
| Cross elevation | -42° to +42° |
| Azimuth range | Unlimited (rotary joint) |
| Ship motion, angular | Roll ± 30° (6 sec), Pitch ± 15° (5 sec), Yaw ± 10° (8 sec) |
| Ship, turning rate and acceleration | 15°/s and 15°/s² |
| ADU motion, linear | Linear accelerations ± 2.5 g max any direction |
| Vibration, operational | Sine: EN 60945 (8.7.2), DNV 2.4 A, MIL-STD-167-1 (5.1.3.3.5). Random: Maritime |
| Vibration, survival | Sine: EN 60945 (8.7.2) dwell, MIL-STD-167-1 (5.1.3.3.5) dwell. Random: Maritime survival. IEC EN 60721-4-6 |
| Shock | IEC EN 60721-3-6 class 6M3 mod. by EN60721-4-6. MIL-STD-810F 516.5 (Proc II) |
| Temperature (ambient) | Operational: -25°C to +55°C<br>Storage: -40°C to +85°C |
| Humidity | 95%, condensing |
| Rain / IP class | IEC EN EN60945 Exposed, IPX6 |
| Wind | 80 knots operational / 110 knots survival |
| Ice, survival | 25 mm |
| Solar radiation | 1120 W/m² to MIL-STD-810F 505.4 |
| Compass safe distance | 1.5 meters to IEC EN 60945 |
| Maintenance, scheduled | None |
| Maintenance, unscheduled | All modules, motor, RF parts and belts are replaceable |
| Built-in Tests | Power On Self-Test, Person Activated Self-Test and Continuous Monitoring w. error logging |
| Dimensions (overall) | Height: 91 cm<br>Diameter: 82 cm |
| Weight | 35.5 kg |

| BELOW DECK UNIT (BDU) | |
|---|---|
| Dimensions | 1U 19" rack mount<br>HxWxD: 4.4 x 48 x 33 cm |
| Weight | 3.6 kg |
| Temperature (ambient) | Operational: -25°C to +55°C<br>Storage: -40°C to +85°C |
| Humidity | EN60945 Protected, 95% (non-condensing) |
| IP class | IP30 |
| Compass safe distance | 30 cm to IEC EN 60945 |
| Interfaces | 1 x Male N-Connector for antenna RF cable (50 Ω) with automatic cable loss compensation<br>2 x F-connectors (75 Ω) for Rx/Tx to VSAT modem<br>1 x Ethernet data (VSAT modem control)<br>2 x Ethernet (user)<br>1 x Ethernet (remote access)<br>1 x Ethernet for service and configuration<br>1 x RJ-45, RS-422 Data (VSAT modem control)<br>1 x RJ-45, RS-232 Data (VSAT modem control)<br>1 x NMEA-0183 (RS-422/RS-232) for gyro-/GPS-compass input and external GPS input<br>1 x RJ-45, 4 x general purpose GPIO, Tx Mute and Rx Lock<br>1 x AC power input<br>1 x Grounding Bolt |
| User interface | Webserver, OLED display (red), 5 pushbuttons, 3 discrete indicator LEDs and ON/OFF switch, TX Mute and Modem Lock indicator |
| Temperature control | Built-in fan |
| No transmit zones | Programmable, 8 zones with azimuth and elevation. Real-time blocking map recorder. |
| Remote management and IoT | HTTPS, SSH, Telnet, SNMP Traps, Syslog, CLI, Diagnostic, Statistic, RESTful API, MQTT |
| **VSAT MODEM SUPPORT** | |
| Modem protocols | Generic, OpenAMIP, OpenBMIP, Custom protocol |
| **7523A - SAILOR GX-R2 MODEM UNIT (GMU2)** | |
| Dimensions | 1U 19" rack mount<br>HxWxD: 4.4 x 48 x 33 cm |
| Weight | 2.7 kg |
| Humidity | IEC EN 60945 Protected, 95% (on-condensing) |
| IP class | IP30 |
| Compass safe distance | 40 cm to IEC EN 60945 |
| Interfaces | 2 x SMA-connectors (50 Ω) for Rx and Tx to BDU<br>1 x SMA-connector (RX2, not used)<br>1 x SMA-connector (Ref, not used)<br>2 x Power (DC loop back)<br>4 x RJ-45 EThernet (modem control and user data)<br>1 x RJ-45 & DB9 - RS-422 (modem control)<br>1 x RJ-45 & DB9 - RS-232 (modem control)<br>1 x Universal AC Power Input<br>1 x Grounding Bolt |
| Input Power | 100 - 240 VAC, 50-60 Hz, 40 W peak, 30 W typical |
| Modem Interface (control) | LAN, RS-422, RS-232 |
| Display | Web MMI, On/Off switch and power/status LEDs |
| Temperature control | Built-in fan |

# A.4 Specifications SAILOR 600 XTR GX-R2 with composite radome

| **SPECIFICATIONS** | |
|---|---|
| Reflector size | 65 cm |
| Type approvals | Inmarsat |
| Certification | Compliant with CE (Maritime), ETSI, FCC, |
| System power supply range | 100-240 VAC, 50-60 Hz |
| Total system power consumption | 4.5 W: 135 W typ. 185 W max. (excl. modem)<br>9.0 W: 180 W typ. 215 W max. (excl. modem) |
| **FREQUENCY BAND: GX-Band** | |
| Rx | 17.70 to 20.20 GHz |
| Tx | 27.50 to 30.00 GHz |
| **ANTENNA CABLE & CONNECTORS** | |
| BDU to ADU cable | Coax cable (50 Ω) for Rx, Tx, MoCA and DC power on a single cable |
| ADU + BDU cable connector | Female N-Connector (50 Ω) |
| **ABOVE DECK UNIT (ADU)** | |
| Antenna type, pedestal | 3-axis (plus auto skew) stabilized tracking antenna with integrated GNSS module supporting GPS, GLONASS and Beidou |
| Antenna type, reflector system | Reflector/sub-reflector, ring focus |
| Transmit Gain | 43.6 dBi typ. @ 29.5 GHz (incl. radome) |
| Receive Gain | 39.1 dBi typ. @ 19.70 GHz (incl. radome) |
| System G/T | 16.4 dB/K typ. @ 19.70 GHz, at $\geq$ 10° elevation and clear sky (incl. radome) |
| GX-R2 transceiver output power | 4.5 W or 9 W |
| EIRP | 4.5 W: $\geq$ 50.1 dBW typ. @ 29.5 GHz (incl. radome)<br>9 W: $\geq$ 53.1 dBW typ. @ 29.5 GHz (incl. radome) |
| LNB | Inmarsat GX-R2 transceiver |
| Polarization | Circular (RHCP, LHCP) independent controlled for Rx and Tx |
| Tracking receiver | Internal "all band/modulation type" and VSAT modem RSSI |
| Satellite acquisition | Automatic - with Gyro- or GPS-compass input. Support for gyro free operation |
| Elevation range | -25° to +120° |
| Cross elevation | -42° to +42° |
| Azimuth range | Unlimited (rotary joint) |
| Ship motion, angular | Roll ± 30° (6 sec), Pitch ± 15° (5 sec), Yaw ± 10° (8 sec) |
| Ship, turning rate and acceleration | 15°/s and 15°/s² |
| ADU motion, linear | Linear accelerations ± 2.5 g max any direction |
| Vibration, operational | Sine: EN 60945 (8.7.2), DNV 2.4 A, MIL-STD-167-1 (5.1.3.3.5). Random: Maritime |
| Vibration, survival | Sine: EN 60945 (8.7.2) dwell, MIL-STD-167-1 (5.1.3.3.5) dwell. Random: Maritime survival. IEC EN 60721-4-6 |
| Shock | IEC EN 60721-3-6 class 6M3 mod. by EN60721-4-6. MIL-STD-810F 516.5 (Proc II) |
| Temperature (ambient) | Operational: -25°C to +55°C<br>Storage: -40°C to +85°C |
| Humidity | 95%, condensing |
| Rain / IP class | IEC EN EN60945 Exposed, IPX6 |
| Wind | 80 knots operational / 110 knots survival |
| Ice, survival | 25 mm |
| Solar radiation | 1120 W/m² to MIL-STD-810F 505.4 |
| Compass safe distance | 1.5 meters to IEC EN 60945 |
| Maintenance, scheduled | None |
| Maintenance, unscheduled | All modules, motor, RF parts and belts are replaceable |
| Built-in Tests | Power On Self-Test, Person Activated Self-Test and Continuous Monitoring w. error logging |
| Dimensions (overall) | Height: 91 cm<br>Diameter: 82 cm |
| Weight | 35 kg |

| **BELOW DECK UNIT (BDU)** | |
|---|---|
| Dimensions | 1U 19" rack mount<br>HxWxD: 4.4 x 48 x 33 cm |
| Weight | 3.6 kg |
| Temperature (ambient) | Operational: -25°C to +55°C<br>Storage: -40°C to +85°C |
| Humidity | EN60945 Protected, 95% (non-condensing) |
| IP class | IP30 |
| Compass safe distance | 30 cm to IEC EN 60945 |
| Interfaces | 1 x Male N-Connector for antenna RF cable (50 Ω) with automatic cable loss compensation<br>2 x F-connectors (75 Ω) for Rx/Tx to VSAT modem<br>1 x Ethernet data (VSAT modem control)<br>2 x Ethernet (user)<br>1 x Ethernet (remote access)<br>1 x Ethernet for service and configuration<br>1 x RJ-45, RS-422 Data (VSAT modem control)<br>1 x RJ-45, RS-232 Data (VSAT modem control)<br>1 x NMEA-0183 (RS-422/RS-232) for gyro-/GPS-compass input and external GPS input<br>1 x RJ-45, 4 x general purpose GPIO, Tx Mute and Rx Lock<br>1 x AC power input<br>1 x Grounding Bolt |
| User interface | Webserver, OLED display (red), 5 pushbuttons, 3 discrete indicator LEDs and ON/OFF switch, TX Mute and Modem Lock indicator |
| Temperature control | Built-in fan |
| No transmit zones | Programmable, 8 zones with azimuth and elevation. Real-time blocking map recorder. |
| Remote management and IoT | HTTPS, SSH, Telnet, SNMP Traps, Syslog, CLI, Diagnostic, Statistic, RESTful API, MQTT |
| **VSAT MODEM SUPPORT** | |
| Modem protocols | Generic, OpenAMIP, OpenBMIP, Custom protocol |
| **7523A - SAILOR GX-R2 MODEM UNIT (GMU2)** | |
| Dimensions | 1U 19" rack mount<br>HxWxD: 4.4 x 48 x 33 cm |
| Weight | 2.7 kg |
| Humidity | IEC EN 60945 Protected, 95% (on-condensing) |
| IP class | IP30 |
| Compass safe distance | 40 cm to IEC EN 60945 |
| Interfaces | 2 x SMA-connectors (50 Ω) for Rx and Tx to BDU<br>1 x SMA-connector (RX2, not used)<br>1 x SMA-connector (Ref, not used)<br>2 x Power (DC loop back)<br>4 x RJ-45 EThernet (modem control and user data)<br>1 x RJ-45 & DB9 - RS-422 (modem control)<br>1 x RJ-45 & DB9 - RS-232 (modem control)<br>1 x Universal AC Power Input<br>1 x Grounding Bolt |
| Input Power | 100 - 240 VAC, 50-60 Hz, 40 W peak, 30 W typical |
| Modem Interface (control) | LAN, RS-422, RS-232 |
| Display | Web MMI, On/Off switch and power/status LEDs |
| Temperature control | Built-in fan |

## A.5 Patents

The patents below apply to SAILOR XTR GX-R2.

| **Patent Application Number** | **Description** |
|---|---|
| 11749202.5<br>10-2013-7008607<br>13/819,621 | An assembly comprising a movable and brakable/dampable part and a method for braking a movable part. |
| PCT/EP2012/063849 | Combined antennas without switch |

Table A.1: Patents for SAILOR XTR GX-R2.

# A.6 Outline Drawings

## A.6.1 ADU SAILOR S1000 XTR GX-R2 (eDome)

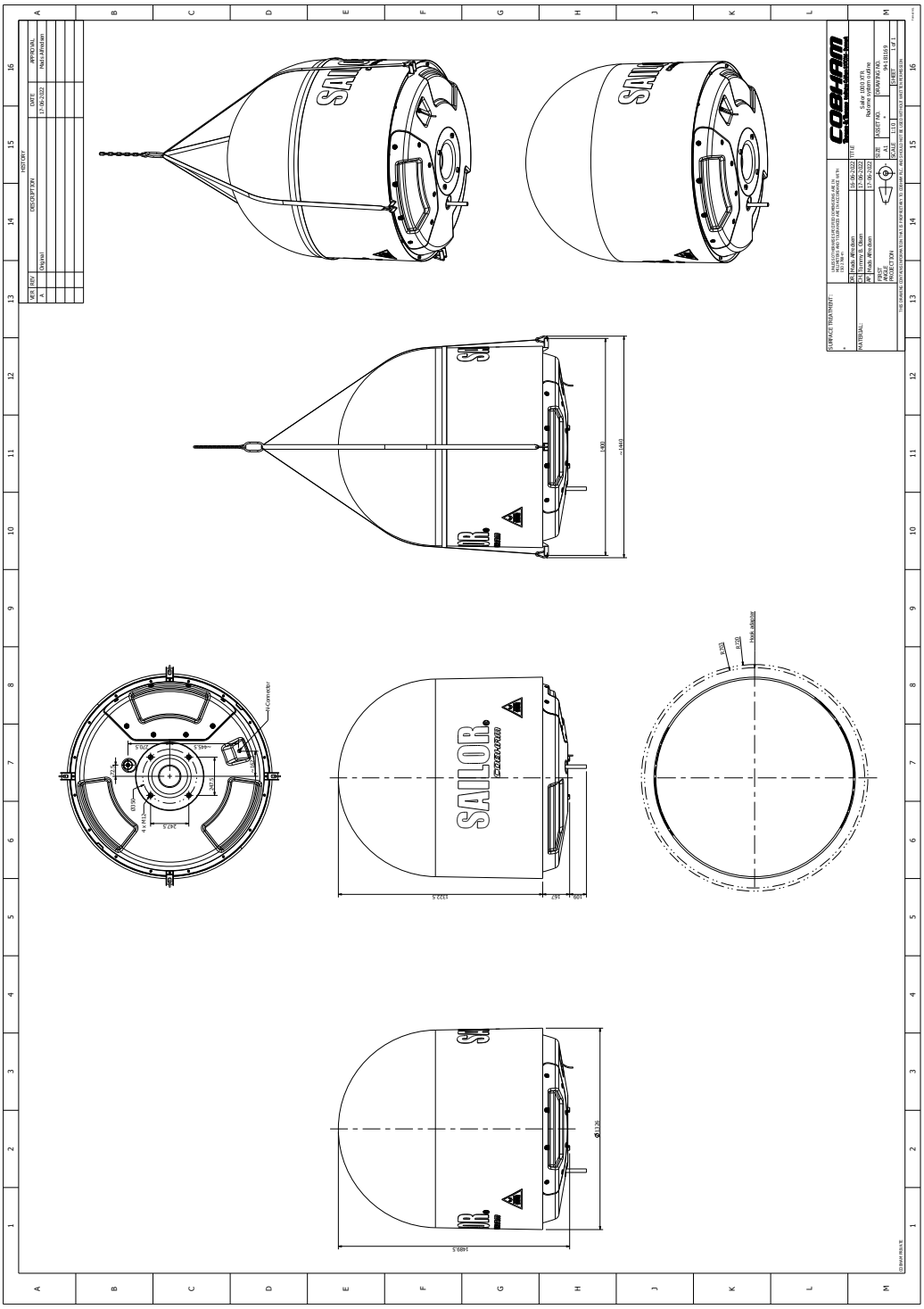



Figure A.1: Outline drawing: ADU SAILOR S1000 XTR GX-R2 (eDome)

## A.6.2 ADU SAILOR S1000 XTR GX-R2 (composite radome)

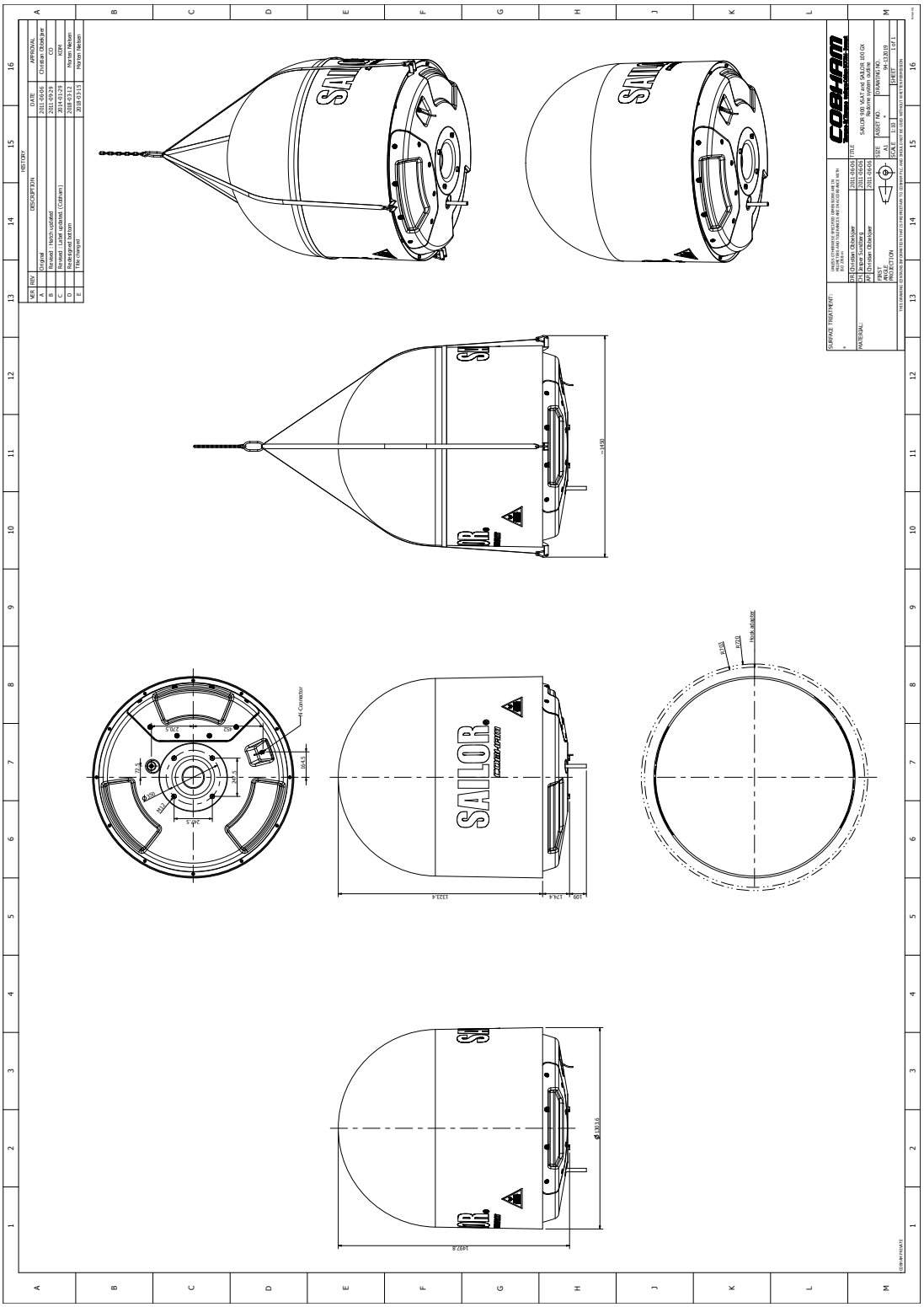



Figure A.2: Outline drawing: ADU SAILOR S1000 XTR GX-R2 (composite radome)

## A.6.3 ADU SAILOR S600 XTR GX-R2 (eDome)

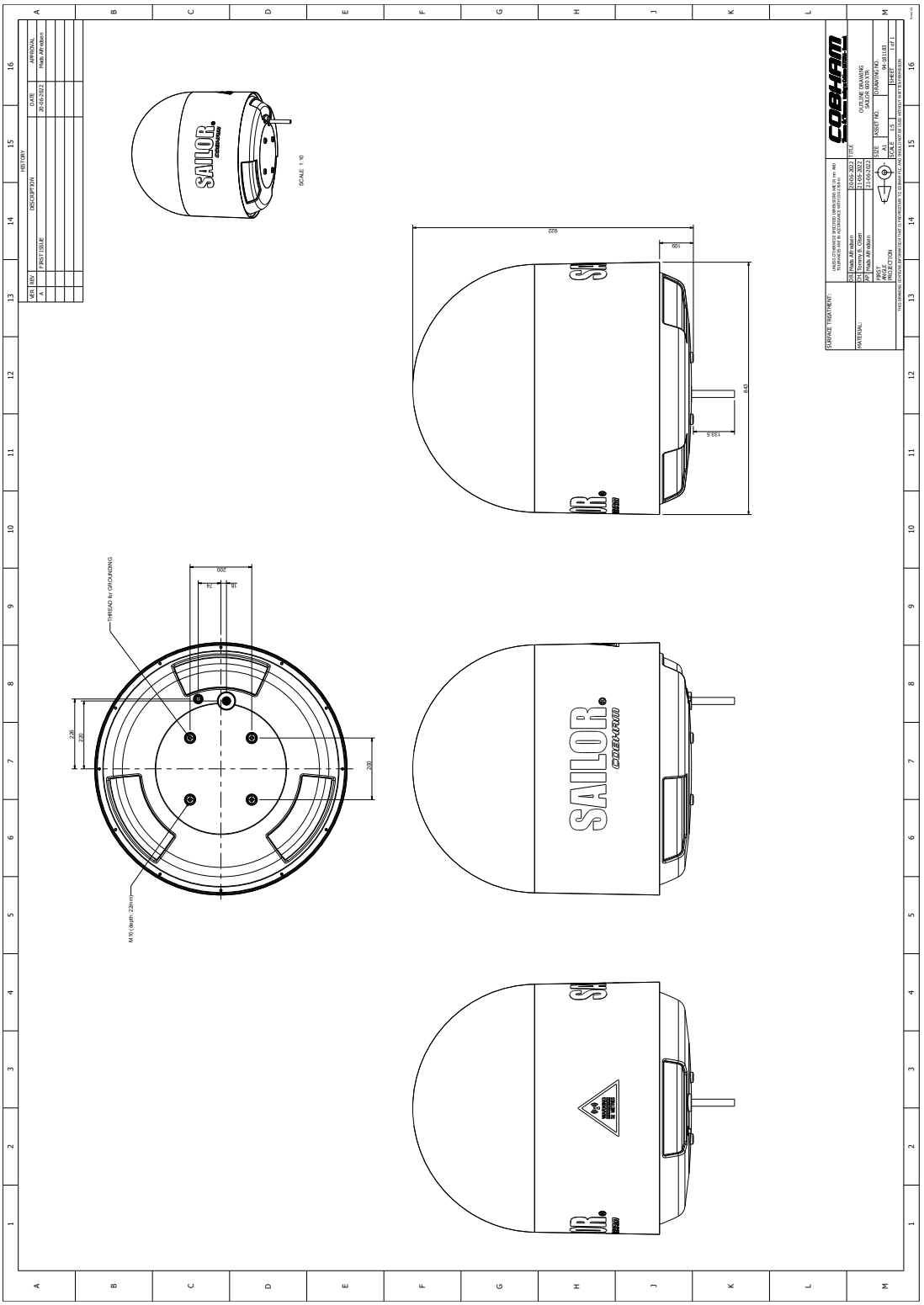



Figure A.3: Outline drawing: ADU SAILOR S600 XTR GX-R2 (eDome)

## A.6.4 ADU SAILOR S600 XTR GX-R2 (composite radome)

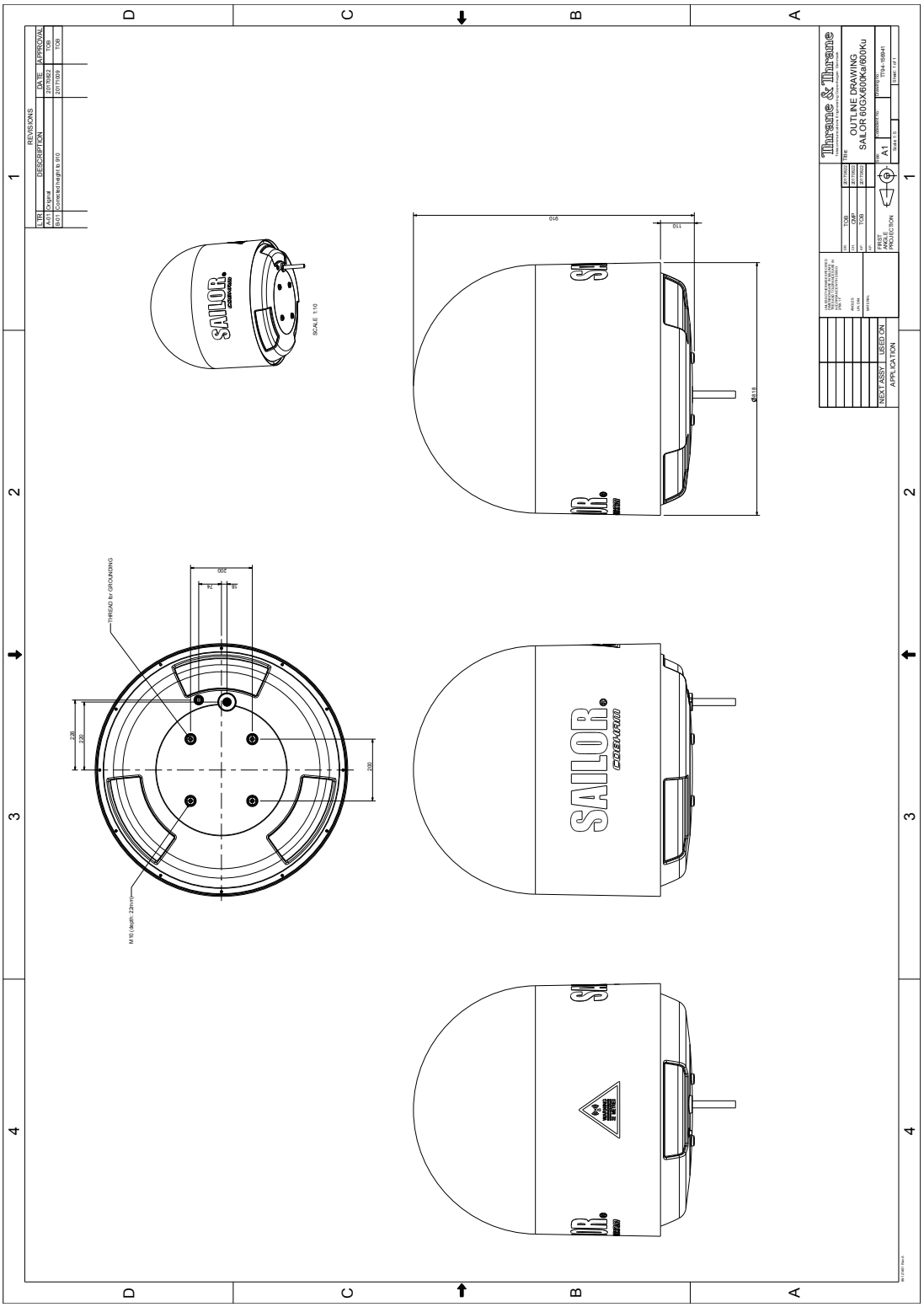



Figure A.4: Outline drawing: ADU SAILOR S600 XTR GX-R2 (composite radome)

## A.6.5 BDU

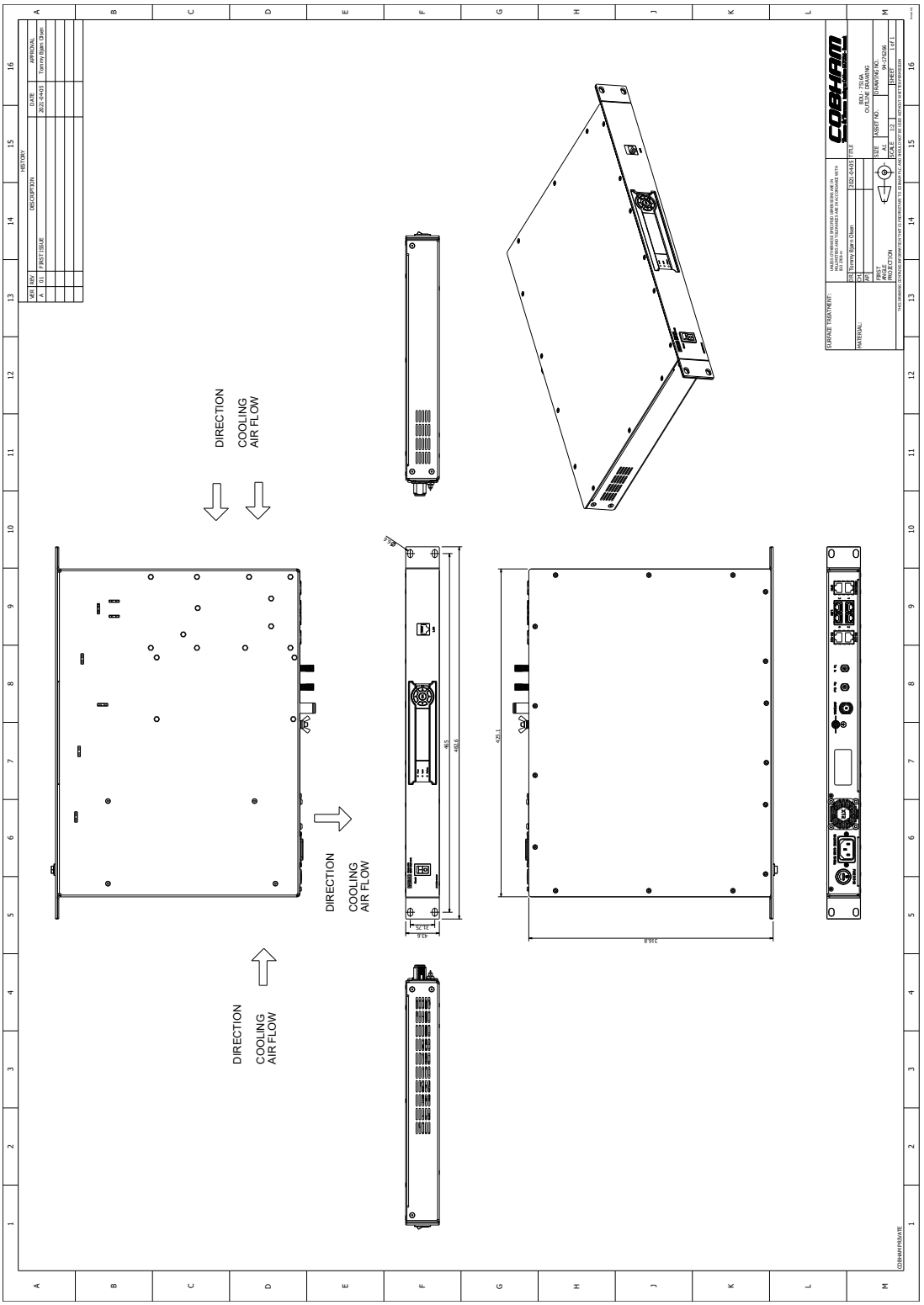



Figure A.5: Outline drawing: BDU

## A.6.6 GMU (407023A)

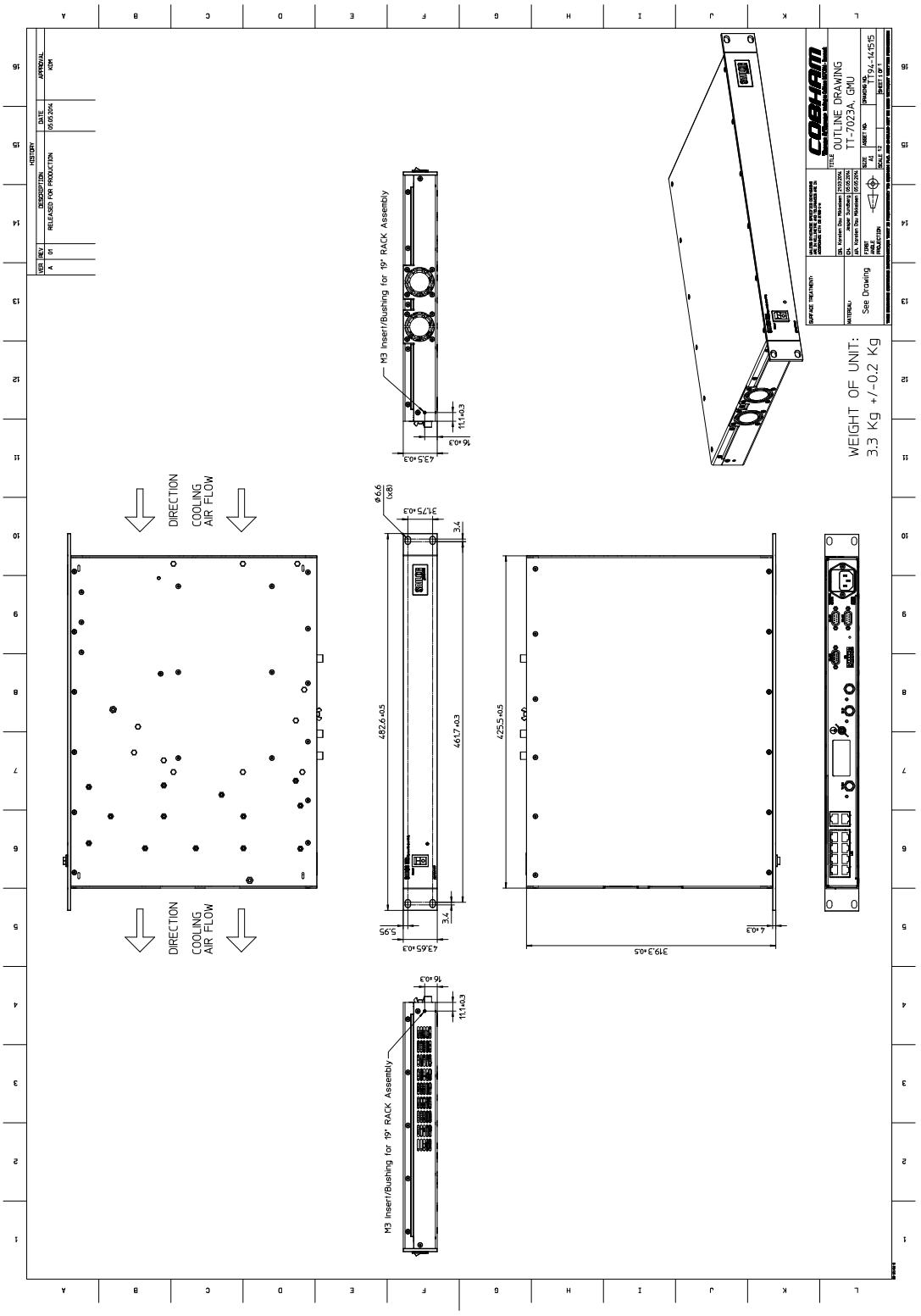



Figure A.6: Outline drawing: GMU (407023A)

## A.6.7 GMU (407523A)

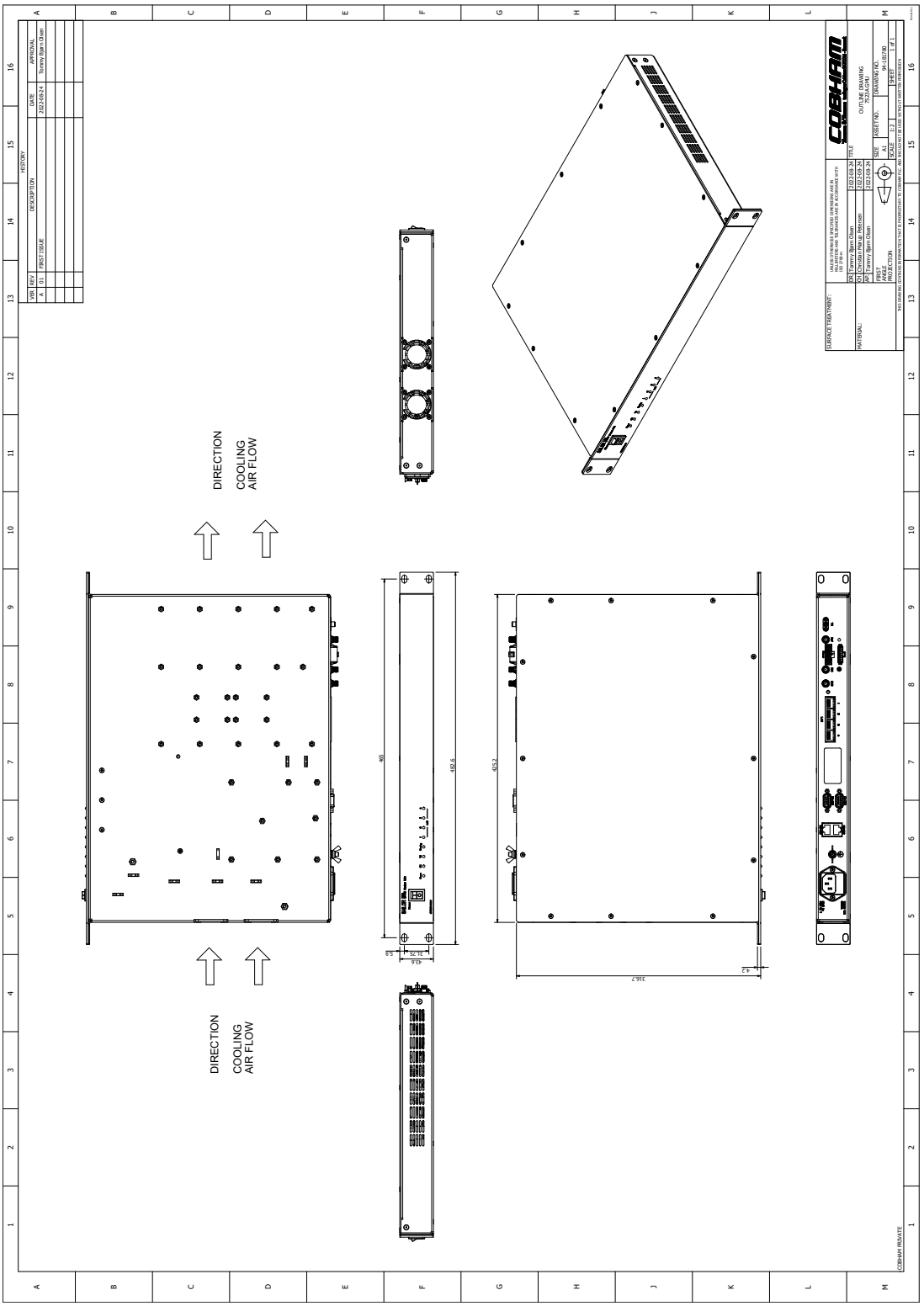



Figure A.7: Outline drawing: GMU (407523A)

# Dual Antenna Solution

This appendix has the following sections:

- *Introduction*
- *Installation of the Dual Antenna Solution*
- *Configuration of the Dual Antenna Solution*
- *Dual Antenna Software Upgrade Procedure*
- *Flowchart for Installation of The Dual Antenna Solution*
- *Dual Antenna Splitter Cable*

## B.1 Introduction

The SAILOR XTR GX-R2 Dual antenna solution has the following features:

- Simple installation due to single cable antenna system.
- Both antennas share the same modem.
- Ensures maximum system uptime.
- Fully automatic switching to other VSAT antenna, no user intervention needed.
- Switching upon programmed blocking zones.
- Switching if tracking signal strength drops 4 dB below the signal strength in the idle antenna.
- Switching if the ADU is malfunctioning.
- Configured using the built-in web server user interface.

# B.2 Installation of the Dual Antenna Solution

## B.2.1 System Overview

You can use the SAILOR XTR GX-R2 in dual antenna mode with 2 ADUs, 2 BDUs and the dual-antenna accessory kit. The kit consists of two 75 Ω RF cables, an RF splitter and an RF combiner plus a modem keyline splitter cable. In case one antenna enters a blocking zone, the other antenna of the dual-antenna system takes over and the system continues working.
There is a Primary BDU and a Secondary BDU. The VSAT modem is connected to and configured in the Primary BDU. The Secondary BDU is configured as a Secondary unit, using a Primary BDU as VSAT profile. The Secondary BDU is connected with an Ethernet cable to the Primary BDU from which it gets all satellite information. You can use any LAN port as long as the Primary BDU and the Secondary BDU are in the same IP subnet. The system switches from one antenna to the other based on the programmed blocking zones in the two antennas and actual signal blockages from vessel structures, cranes etc.

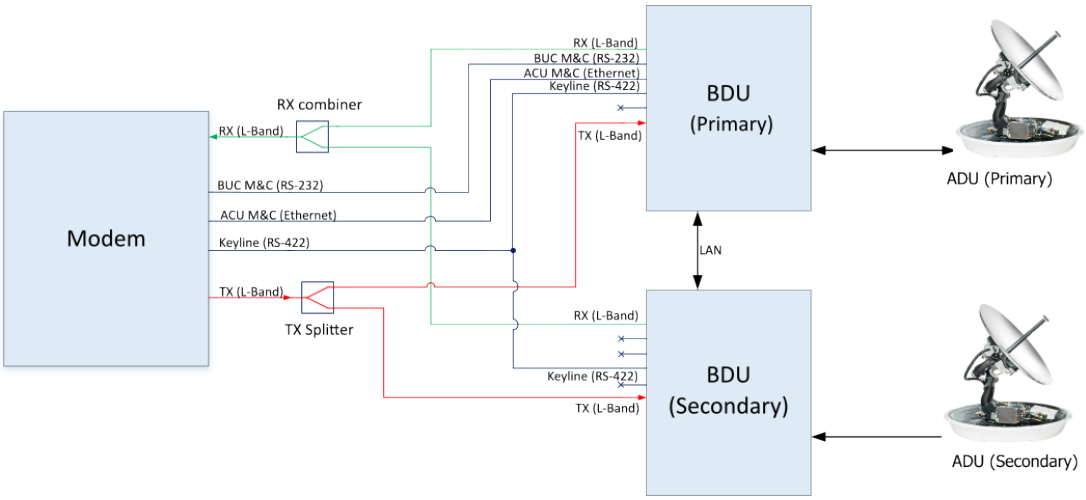



Figure B.1: Dual mode antenna, connection overview.

Important

**OPERATION ON INCLINED ORBIT SATELLITES**
Dual antenna installations might experience degraded performance when operated on inclined orbit satellites. These satellites change their position during the day. The changed satellite position affects the inactive (passive) antenna, resulting in mis-pointing to the satellite at the time the antenna becomes active.

In a dual antenna configuration, the inactive (passive) antenna points where the satellite was found at start-up or where last tracked while the antenna was active. The inactive (passive) antenna uses the following criteria to dynamically maintain the correct relative azimuth and elevation irrespective

of whether the antenna can receive the satellite signal or not (open loop algorithm):

1. The NMEA 0183 heading data, which must come from a gyro compass without drift, deviation, speed or latitude errors.
2. The built-in rate sensors, accelerometers and GNSS receiver.
3. The calculated change in azimuth and elevation of the satellite position (Clarke belt) as the vessel moves.

Parts Needed

The following parts are needed for the SAILOR XTR GX-R2 Dual antenna solution:

- 1 x SAILOR XTR GX-R2 System (Primary System).
- 1 x SAILOR XTR GX-R2 ADU (Secondary Above Deck Unit).
- 1 x SAILOR XTR GX-R2 BDU (Secondary Below Deck Unit).
- 1 x Accessory Kit for Dual Antenna operation consists of 2 x RF Splitter/Combiner and 2 x Coax cables with F-connectors, RS-422 modem keyline/dual antenna splitter cable (37-179069).

## B.2.2 Installation

To install the dual antennas, do as follows:

1. Install the Primary ADU, BDU, the RX combiner and the VSAT modem.
2. Install the Secondary ADU, BDU and the TX splitter.
3. Provide vessel heading input to the Primary BDU and Secondary BDU.
4. Connect the cables.

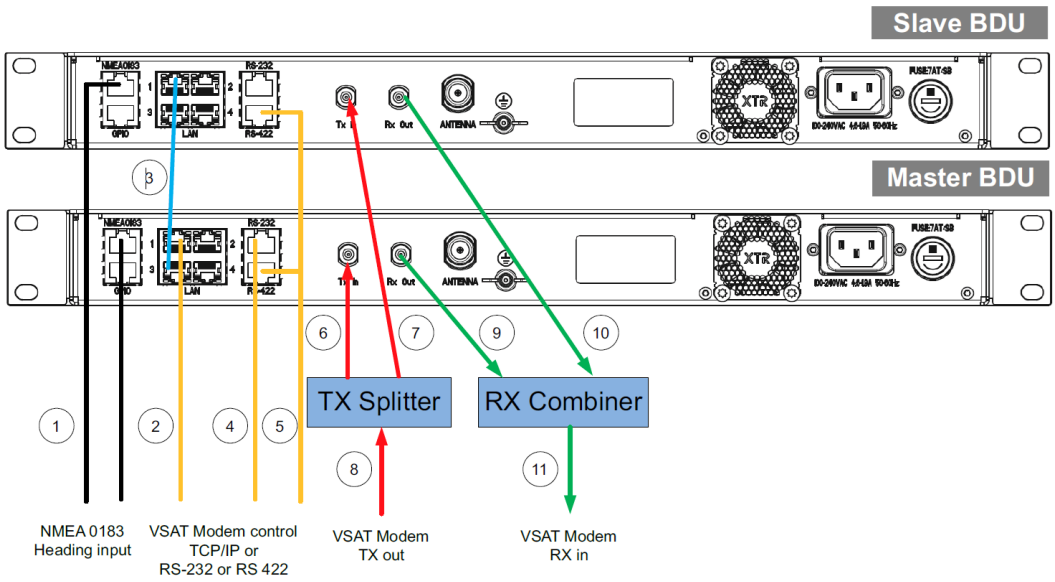



Figure B.2: Dual mode antenna, connecting cables (example).

| Connect cables | Purpose |
|---|---|
| NMEA 0183 to Secondary BDU and to Primary BDU | NMEA Heading Input |
| Primary BDU Port 1 to GMU Port 1 | OpenAMIP Communication |
| Secondary BDU Port 1 to Primary BDU Port 3 | Dual Communication |
| Primary BDU RS-232 to GMU RS-232 | GMU Control |
| Primary and Secondary BDU RS-422 to GMU RS-422 | GMU Keyline Splitter |
| Primary BDU TX In to TX Splitter | TX when Primary is active |
| Secondary BDU TX In to TX Splitter | TX when Secondary is active |
| Primary BDU Rx Out to RX Combiner | RX when Primary is active |
| Secondary BDU Rx Out to RX Combiner | RX when Secondary active |
| GMU TX out to TX Splitter | Input from VSAT Modem |
| RX combiner to GMU RX In | Output to VSAT Modem |

Table B.1: Dual mode antenna, cabling.

## B.3 Configuration of the Dual Antenna Solution

### B.3.1 Overview

The Primary antenna VSAT profile is configured the same way as a single antenna system. The Primary antenna is additionally enabled to be a dual antenna Primary system and will always listen for a Secondary antenna connection. The Secondary antenna initiates the Primary/Secondary connection. When the Primary antenna has connectivity to a Secondary antenna, it will forward satellite pointing data to the Secondary antenna. If the Primary antenna loses connection to the Secondary antenna it will continue in stand-alone operation. The following list shows the tasks for setting up a dual-antenna system:

- *To Configure the Primary BDU*
- *To Configure the Secondary BDU*
- *Blocking Zone Setup for Dual Antenna Setup*
- *To Make an OTC for Dual Antenna Systems*
- *Dual Antenna Software Upgrade Procedure*

On the **DASHBOARD**, section **SYSTEM INFO**, there is a link saying **Secondary ADU** or **Primary ADU** where you can switch between the Primary/Secondary dashboard. Below the top bar you can see whether the current system is active or not.

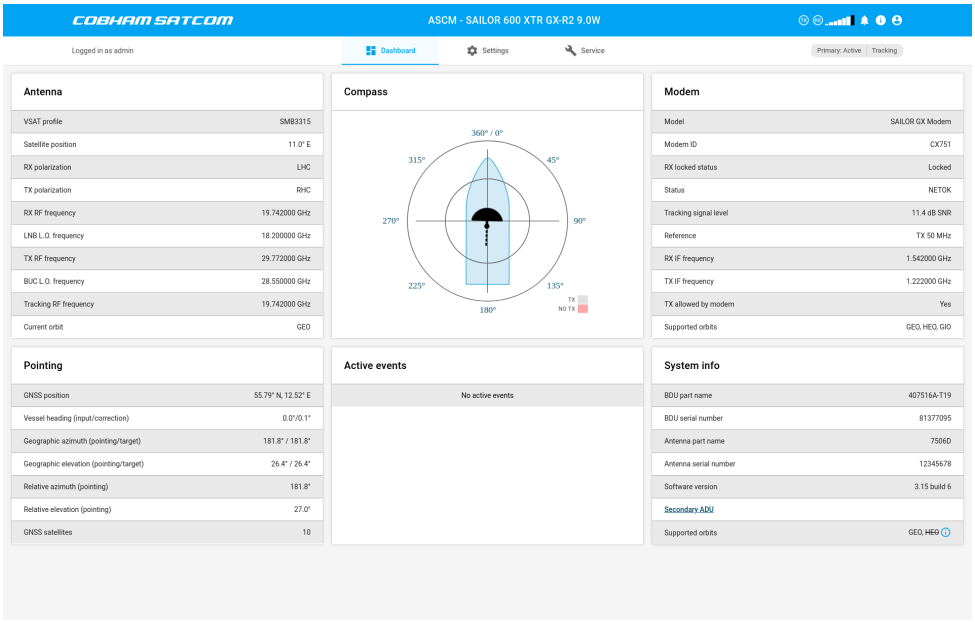



Figure B.3: Dual-antenna mode, link on DASHBOARD (example).

The dual-antenna system switches between the two antennas in the following scenarios:

- When in a programmed blocking zone.
- When the signal for the active antenna is blocked for more than 2 minutes.
- Malfunctioning ADU.
- When signal strength drops 4 dB lower than the inactive antenna.

Flowchart for Installation of The Dual Antenna Solution

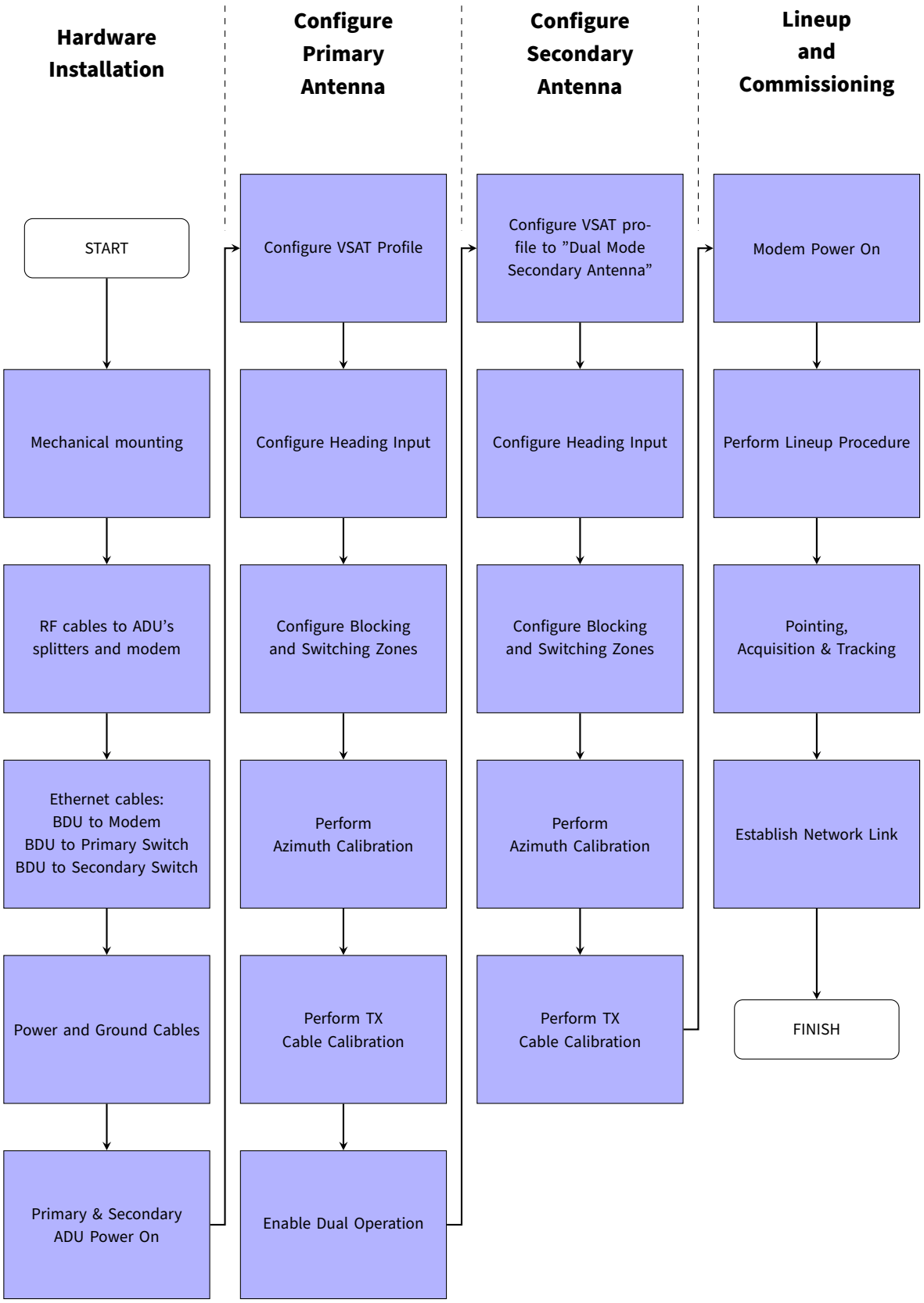



Figure B.4: Flowchart for installation of the dual antenna solution.

## B.3.2 To Configure the Primary BDU

The configuration of the Primary BDU depends on which ports are used and how your network has been configured.

**Important**

Before you enable dual mode, set up the Primary and the Secondary antenna to be on the same subnet but with different IP addresses. This is done on the page **Settings > Network**. If you use the Secondary BDU port 1, this is done on the page **VSAT profiles** of the Secondary antenna. See the example in Figure B.6 and Figure B.7.

Configure the Primary BDU exactly the same way as a single SAILOR XTR GX-R2 system. When the Primary BDU is configured, do as follows:

1. Click **Settings > Dual antenna**.
2. Select **Set this antenna as Primary in dual configuration** and click **Apply**.

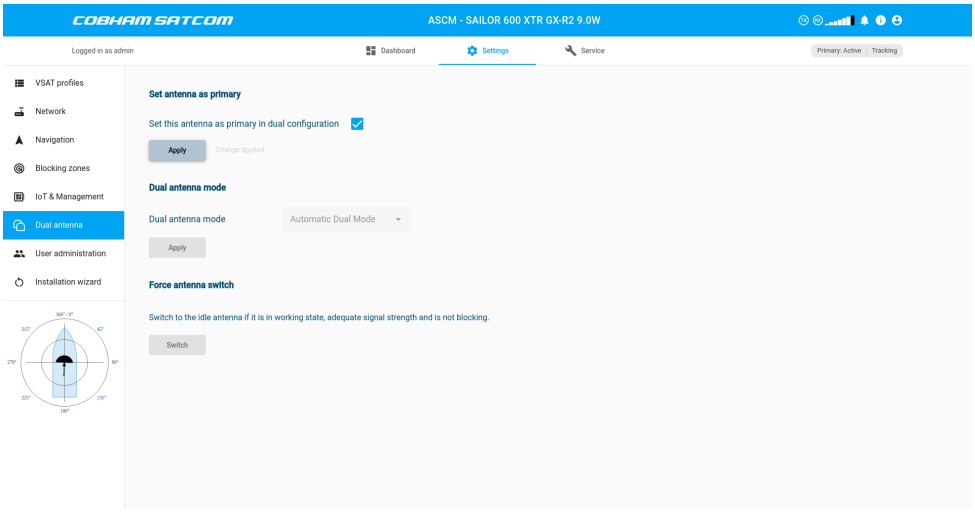



Figure B.5: Enabling dual-antenna mode in Primary BDU.

3. Under **Dual antenna mode**, select **Automatic Dual Mode**.
4. If needed, click **Switch** to the other antenna in the dual antenna system.
5. Click **Settings > Network**.
6. Under **BDU Port 2 > Mode**, select **Static IP**.

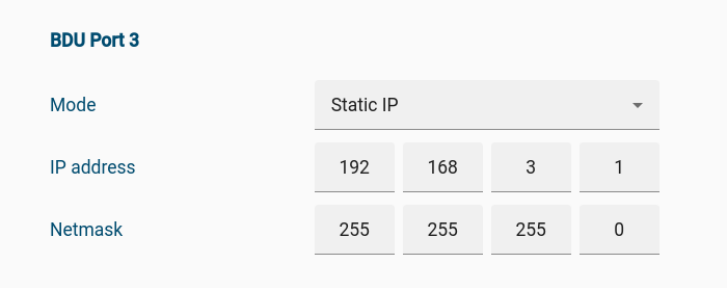



Figure B.6: Example network setup for BDU port 2 in dual antenna setup.

7. Under **IP address**, fill in the IP address. The Primary and the Secondary antenna has to be on the same subnet, with different IP addresses.
8. Under **Netmask**, fill in the netmask.

### B.3.3 To Configure the Secondary BDU

The Secondary BDU is configured to use the Primary BDU as VSAT profile. The VSAT profile must point to the IP address of the Primary BDU, that is the IP address of the LAN port at which the Primary/Secondary communication cable is connected.

**Important**

Set up the Primary and the Secondary antenna to be on the same subnet but with different IP addresses. This is done on the page **Settings > Network**. If you use the Secondary BDU port 1, this is done on the page **VSAT profiles** of the Secondary antenna. See the example in Figure B.6 and Figure B.7.

1. Add a specific VSAT profile for dual antenna mode, go to **Settings > VSAT profiles**.
2. Add a profile, name it for example **Dual Mode Secondary**.
3. Select modem type **Dual Mode Secondary Antenna**.
4. If BDU port 1 is used for the Secondary BDU: Set the IP address and netmask for the Secondary BDU to match the subnet of the Primary BDU, see the example in Figure B.6 and Figure B.7. In other cases configure on the page **Settings > Network**, and set the IP address and netmask accordingly.
5. Set the IP address for the Primary BDU. IP addresses for the Primary and Secondary antenna must be in the same subnet.

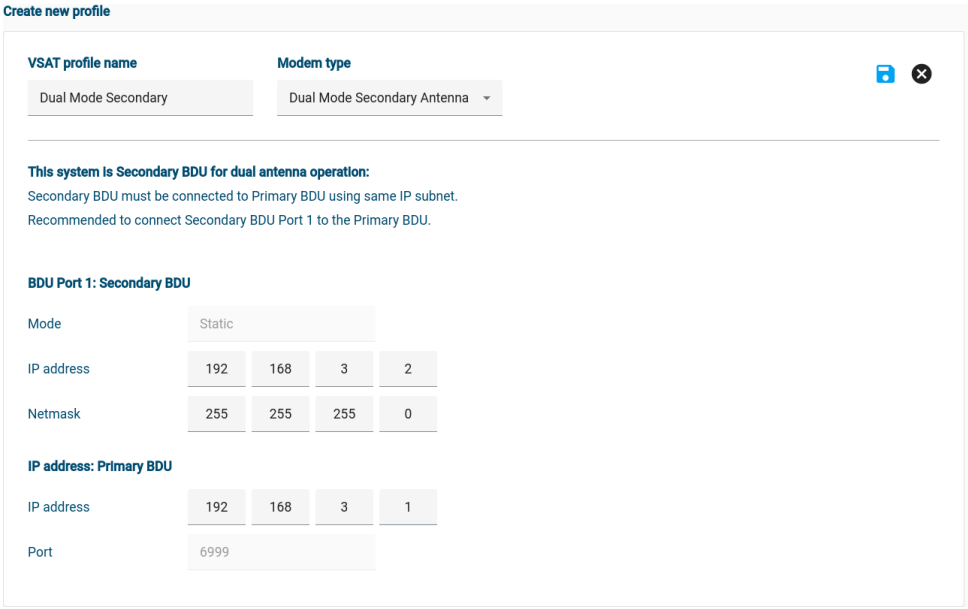



Figure B.7: Secondary BDU VSAT profile example.

6. Click the save icon to save the profile.

7. Click **Settings > VSAT profiles**.

8. Click **Activate** to activate the VSAT profile **Dual Antenna Primary**.

## B.3.4 Blocking Zone Setup for Dual Antenna Setup

It is recommended to define the following 3 blocking zones in each SAILOR XTR GX-R2 system:

1. Actual blocking zones on the vessel (No TX).

2. Switching blocking zones (TX allowed).

3. Personnel safety zones (No TX).

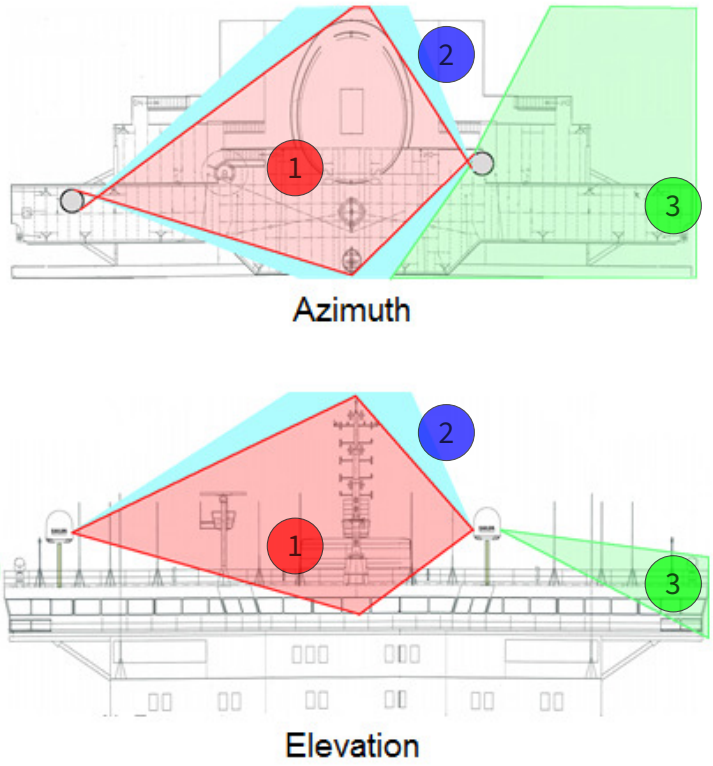



Figure B.8: Dual-antenna mode, blocking zones — azimuth and elevation.

## B.3.5 Lineup and Commissioning for Dual Antenna Systems

The Primary BDU and the Secondary BDU must be lined up and commissioned one by one. Do as follows:

1. Connect cables, RX combiner and TX splitter as described in *Installation*.
2. Primary lineup:
   (a) Configure the Primary VSAT profile to match the modem and activate the profile.
   (b) Wait for the modem to get Rx lock with the satellite.
   (c) Go to the Primary lineup page and make the lineup with the hub.
3. Secondary lineup:
   (a) Disconnect the Ethernet cable from Primary LAN1 and connect it to Secondary LAN1 so the Secondary antenna system can communicate with the modem.
   (b) Configure a Secondary VSAT profile to match the modem and activate the profile.
   (c) Wait for the modem to get Rx lock with the satellite.
   (d) Go to Secondary lineup page and make the lineup with the hub.
   (e) Disconnect the Ethernet cable from Secondary LAN1 and re-connect it to Primary LAN1 so the Primary antenna system can communicate with the modem again.

Now configure the Secondary antenna system:

1. Connect the Secondary antenna system to the Primary antenna system.
2. Log in to the Primary antenna system.
3. Go to **Settings** > **Dual antenna** page to set the antenna as Primary in dual configuration.

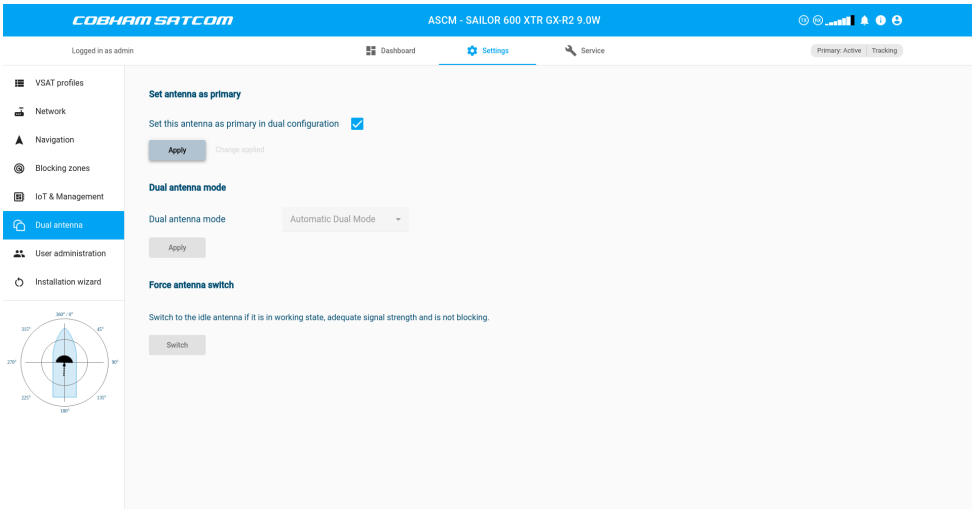



Figure B.9: Enabling dual-antenna mode in Primary BDU.

## B.3.6 To Make an OTC for Dual Antenna Systems

**Important** **Do not power up the GMU at this point in time.**

1. Make an azimuth calibration with both antenna systems (Primary and Secondary) using manual azimuth calibration mode and one of the GX-R2 satellites, **Make sure you have line-of-sight**.
2. Make a TX calibration for the Primary antenna system and for the Secondary antenna system.

The entire dual antenna system is now ready for OTC.

1. Turn on the modem power. The first time the modem is turned on it will perform an OTC both on the Primary and the Secondary antenna systems. During this process the modem will restart several times before pointing toward the satellite and establishing the link.
2. Be patient. The OTC procedure will take at least sixteen minutes.

   **Important** Interrupting the process before it has completed will cause the process to restart.
3. If for some reason you make a TX cable calibration again, the system will request the operator to initiate a manual OTC procedure. You can start the OTC procedure from the modem dashboard.

### B.3.7 Dual Antenna Software Upgrade Procedure

When making a software upgrade of a dual antenna system, it must be done in the correct order to limit downtime of the VSAT service. It is recommended to do the upgrade at a location where both antennas have connection to the satellite and are outside blocking zones. In general a dual antenna system must have the same software version in both antennas, otherwise a software mismatch warning will be active on the system. To make a software upgrade, do as follows:

1. Connect to the Secondary BDU and open the web interface to upload the new software.

2. Wait for the Secondary antenna system to reboot and to have finished its Power On Self-Test (POST) and having connected to the Primary antenna system again. The dual antenna system might show a warning with software mismatch information.

3. Connect to the Primary BDU and open the web interface to upload the new software.

4. Wait for the Primary antenna system to reboot and finish its Power On Self-Test (POST).

The dual antenna system should now be fully functional without any errors or warnings present.

## B.3.8 Dual Antenna Splitter Cable

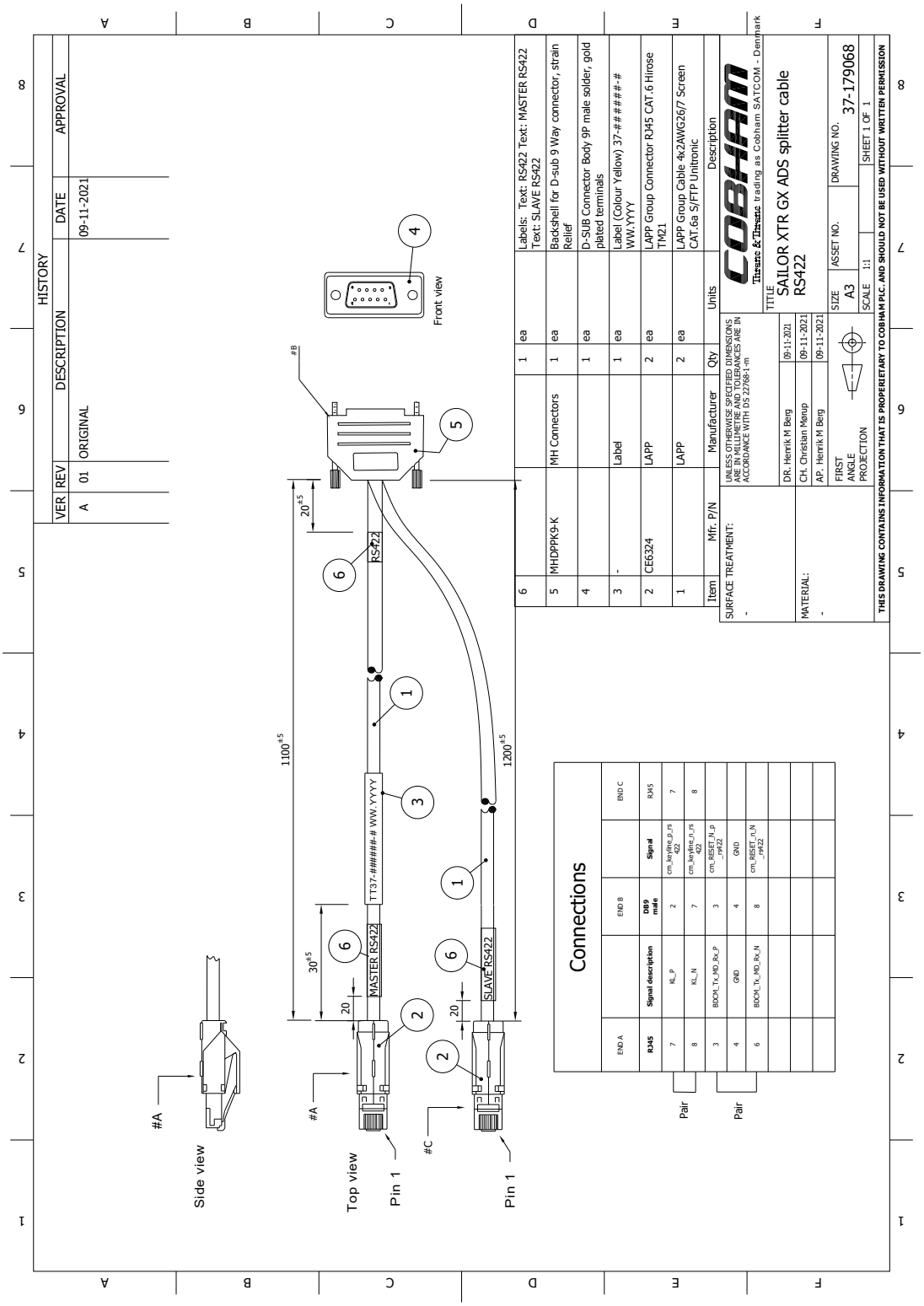



Figure B.10: Splitter cable

Appendix C

# Miscellaneous

In this appendix you find detailed information how to optimize performance in blockage situations and how to set up Dual Modem Operation. The appendix has the following sections:

- *Performance Optimization for Blockage*
- *Dual Modem Operation*

## C.1 Performance Optimization for Blockage

### C.1.1 Encounter Blockage, Configured with Multiple Satellites

Definition of Blockage

In most VSAT installations the VSAT antenna is installed in a position with areas of blockage. Blockage is often caused by the vessel's masts, stacks and other equipment installed on board. During installation the blockage areas should be entered in the web interface, see *Blocking Zones – Azimuth and Elevation* on page 2-6.
When blockage occurs, the BDU can inform the VSAT modem (if the blocking zones have been typed correctly into the web interface). It is often seen that by not informing the VSAT modem of blockage the VSAT system gains a higher uptime, although the quality of the extra gained uptime is not good enough to give the user a stable data connection. Therefore it is not of any value to the user. Another disadvantage of not informing the VSAT modem of blockage is that the VSAT modem does not have the option to switch to a different satellite to avoid the blockage.
VSAT modems can typically[1] only receive one signal from the BDU, which is "TX-mute" / "modem must not transmit", they are therefore not able to perform fast switching, but are limited to use a simple time-out, which is configured as a fixed value in the modem configuration. The simple time-out means that there is a fixed delay, plus the time needed to acquire another satellite, before there is a chance of regaining good link performance. If the signal is not sent to the modem, the system can in some cases remain linked and have a higher uptime, but not provide a stable data connection. Such a link is of no value to the subscriber. Not sending the blockage (TX-Mute) signal also extends the period of the poor-quality link, as the VSAT modem is still relying on a time-out before switching to another satellite, and the time-out may be constantly reset by the link coming and going.

[1] There are VSAT modems that can interpret more detailed information about blockage from the BDU. This allows for increased performance in the event of blockage.

### Better Blockage Communication

A major disadvantage of this single signal is that if the VSAT modem has multiple satellites to choose from, then, when selecting a new satellite, the VSAT modem is again relying on the simple time-out. This continues until a satellite with no obstruction in the view from the satellite terminal is selected. If the VSAT modem was able to receive information from the BDU that the view toward the current satellite is blocked, it would be able to choose a visible satellite much faster without the need to wait for multiple time-outs.

### Minimum Elevation Angle

One safe way of getting optimum performance under the current conditions is to switch to a satellite in view as fast as possible. This is done by having well defined satellite parameters in the VSAT modem configuration. It is the VSAT modem that has the task of selecting the correct satellite, and since the VSAT modem is only concerned about the satellite visibility at the current geographic position, it is very important to enter the minimum elevation of a satellite at which a stable link can be established.
It is often seen that the minimum elevation is set to 0° (zero). A setting of 0° is not only in many cases below the usable limit of the satellite, but also a violation against ETSI EN 302 340, where a calculated minimum elevation ranges from 12° to 3° depending on power and bandwidth must be ensured or FCC §25.205 which states the minimum elevation to be 5°. Unless the vessel is operating in international waters with no other options, a minimum elevation of 10° or higher is recommended.

### Conclusion

Fewer but well-functioning satellites to choose from give better user performance than having many satellites, which may have a longer uptime but do not provide a stable data connection. In the end it is not the actual uptime the subscriber is concerned about, but it is the uptime where the link gives a stable data connection.

# C.2 Dual Modem Operation

## C.2.1 Introduction

The SAILOR XTR GX-R2 Dual Modem feature supports the use of a GX modem unit and a generic modem connected to the same SAILOR XTR GX-R2 antenna system. The SAILOR XTR GX-R2 antenna system uses the GX modem unit when the GX VSAT profile is active and automatically switches to use the generic modem when the generic VSAT profile is activated. The activation of the VSAT profiles can be done remotely or locally from the web interface.

## C.2.2 Required Parts

This section lists the required parts needed for a SAILOR XTR GX-R2 Dual Modem system.

| **Part Number** | **Description** |
|---|---|
| 407506A/D or 407509C/D | SAILOR XTR GX-R2 antenna |
| 407516A | SAILOR XTR BDU |
| 407023A or 407523A | SAILOR GX Modem Unit or SAILOR GX-R2 Modem Unit |
| SLM-5650B (or similar) | Comtech SLM-5650B Modem (or other similar modem) |
| 407590C-020 | SAILOR XTR Dual Modem Kit |

Table C.1: Required parts for Dual Modem setup.

## C.2.3 System Overview

This section describes the system overview and functionality. The below figure shows how the different units are interconnected.

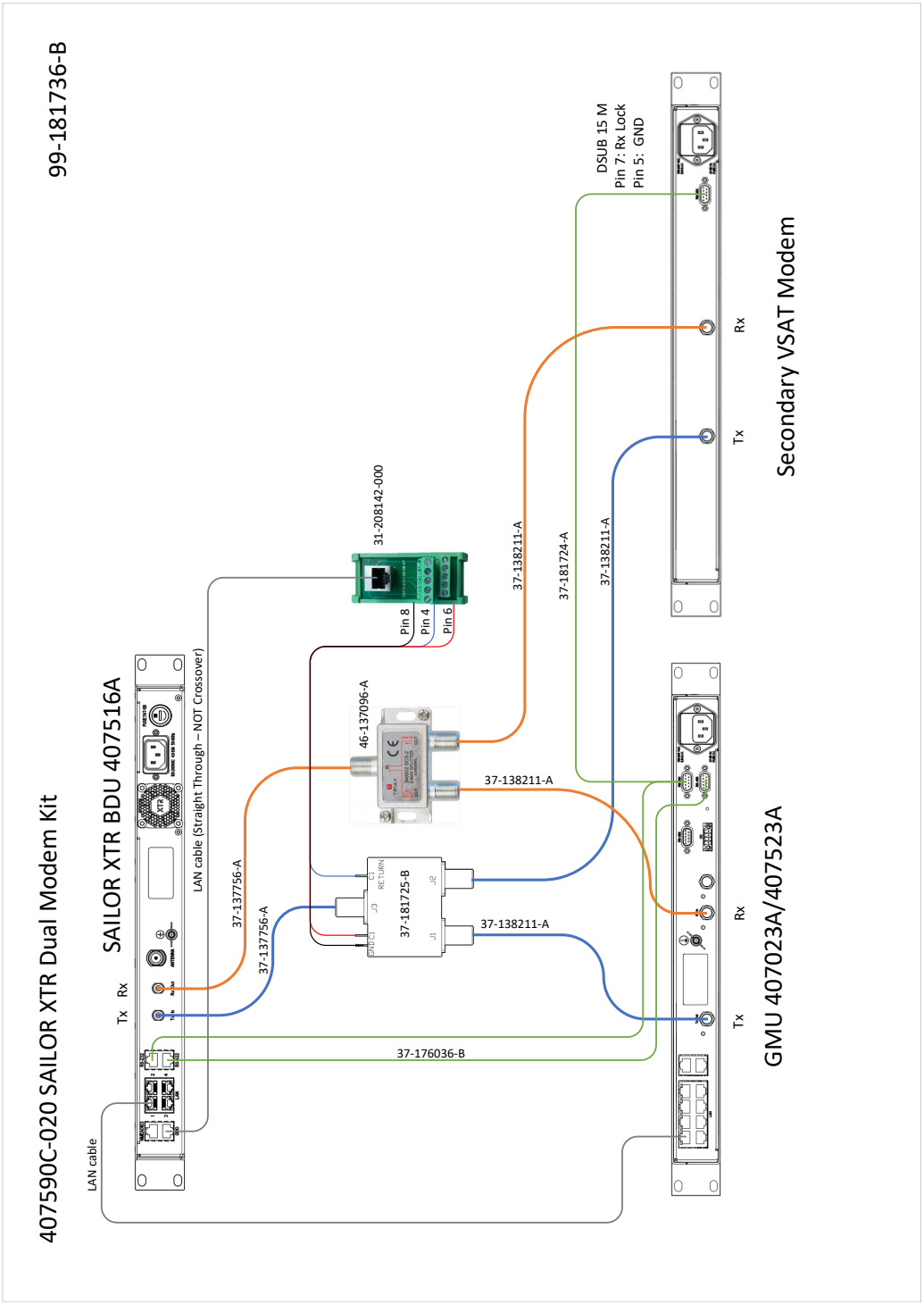



Figure C.1: Dual modem system overview.

The GMU uses the GX VSAT profile of the SAILOR XTR GX-R2 system. The secondary modem e.g. Comtech SLM-5650B Modem uses the generic VSAT

profile of the SAILOR XTR GX-R2 system. The generic VSAT profile must be configured to activate a GPIO pin that activates the RF switch in order to switch in the Tx signal of the secondary modem as well as switch out the Tx signal of the GX modem unit. The below table lists and describes the different cables and accessories.

| **Cables and Accessories** | **Description** |
|---|---|
| LAN cables | **Straight through all 8 wires.**<br>• Used for communication between **GMU** and **BDU**.<br>• Used to connect power from the **BDU GPIO port** to the **RJ45 Wire Connector Terminal**. |
| 37-137756-A | **0.5-meter 75 Ω coax cable.**<br>• Connects **Tx from BDU** to **RF switch**.<br>• Connects **Rx from BDU** to **RF splitter output**. |
| 37-138211-A | **1m 75 Ω coax cable.**<br>• Connects **RF switch** to **Tx connector** of the two modems.<br>• Connects **RF splitter** to **Rx connector** of the two modems. |
| 37-176036-B | **RJ-45 to DB9 serial cable.**<br>• Connects the **BDU RS-422** to **GMU RS-422**.<br>Used for GMU to communicate with the GX Transceiver (BUC communication). |
| 37-181724-A | **RJ-45 to DB9 and DB15 splitter cable**<br>• Connects the **BDU RS-232** to **GMU Keyline** and **Comtech 5650B modem AGC**.<br>Used for RX Lock detection. |
| 37-181725-A | **RF switch.** Controlled by the BDU to automatically switch Tx line depending on which VSAT profile is activated. |
| 46-137096-A | **RF splitter.**<br>• Used to split the **BDU Rx signal** to both modems. |
| 31-208142-000 | **RJ45 Wire Connector Terminal.**<br>• Used to split **power leads from the RJ-45** to the **power input of the RF switch**. |

Table C.2: Required parts for Dual Modem setup.

## C.2.4 Installation

This section describes how to install the SAILOR XTR GX-R2 dual modem GX-R2 antenna system.

### Antenna System Installation

Install the SAILOR XTR GX-R2 antenna system as described in Chapter 2, *Installation*.

### SAILOR GX Modem Installation

Install the GX modem in the rack and connect the RF switch, RF splitter and cables as shown in Figure C.1 on page C-4.

### Comtech SLM-5650 Modem Installation

Install the Comtech SLM-5650 modem in the rack and connect the RF switch, RF splitter and cables as shown in Figure C.1 on page C-4.

## C.2.5 Configuration

This section describes how to configure the SAILOR XTR GX-R2 VSAT profiles to support dual modem operation. For all other standard configurations, see *Settings* on page 3-8. The configuration of the VSAT modems must be done by the service providers.

### SAILOR XTR GX Profile

The GX profile is configured the same way as a stand-alone SAILOR XTR GX-R2 antenna system. See *VSAT Profiles* on page 3-8.

### SAILOR XTR Generic Profile

The generic VSAT profile must be configured with all the satellite parameters, LNB L.O. and BUC L.O. according to the Comtech SLM-5650 modem configuration. See figure C.2.

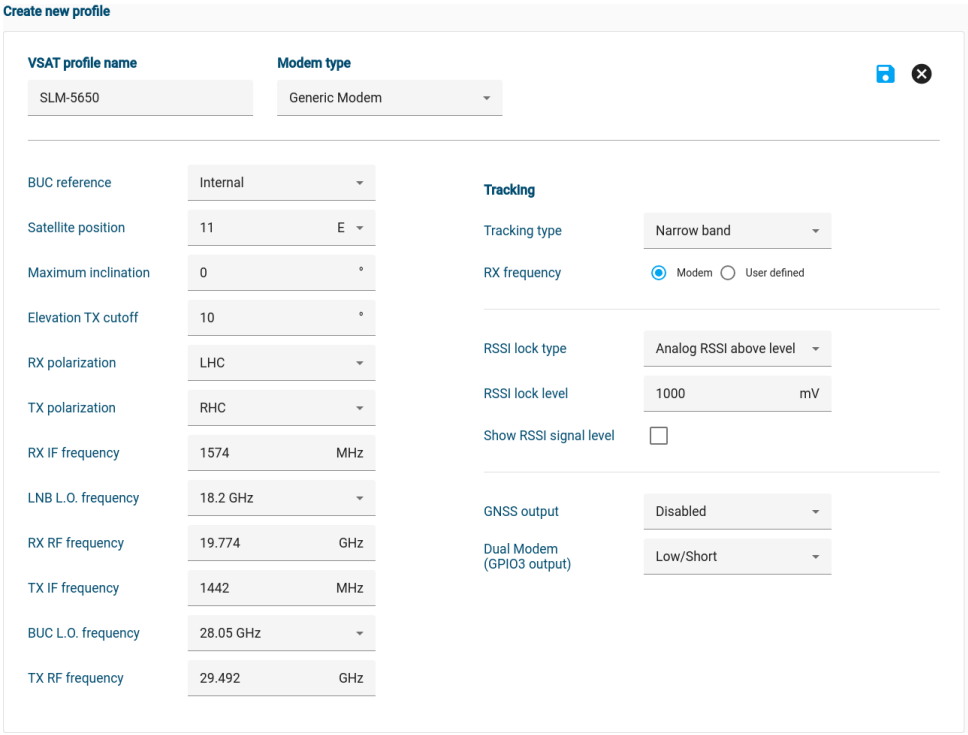



Figure C.2: Generic VSAT Profile.

In the example above, the BUC reference signal is set to use the 10 MHz reference clock generated by the modem on its Tx connector. The antenna will use its built-in narrow-band 300 KHz tracking receiver to lock on the satellite signal. The generic VSAT profile is set to use RSSI to verify modem RX Lock.

**NOTE** The example is a guideline, always check and set up the VSAT profile accordingly.

The antenna will detect modem RX Lock if pin 8 (CM RSSI) on RS-232 port is above 1000 mV. See the table C.3 for pinout.

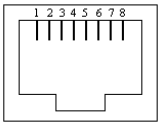
| Outline (on the BDU) | Pin | I/O | Signal | Function |
|---|---|---|---|---|
|  | 1 | I | RSSI 2 | CM temp out of range |
| | 2 | I | DTR/Rx lock | CM power good |
| | 3 | I | RXD | BUC TXD |
| | 4 | - | GND | Ground |
| | 5 | - | GND | Ground |
| | 6 | O | TXD | BUC RXD |
| | 7 | I | DSR/TX mute | GMU reset |
| | 8 | I | RSSI 1 | CM RSSI |
| | Shield | - | PCB ground | PCB ground |

Table C.3: RJ-45 RS-232 connector, male, outline and pin assignment.

The SLM-5650 modem offers an analogue AGC Monitor test point pin on the J9 Auxiliary connector. See table C.4 for pinout.

| Pin | Name | Signal Function |
|---|---|---|
| 1 | I | Demod I Channel |
| 2 | | Spare |
| 3 | | Spare |
| 4 | | Reserved for Redundancy Switch |
| 5 | GND | Chassis Ground |
| 6 | Q | Demod Q Channel |
| 7 | AGC | AGC Monitor Test Point |
| 8 | | Spare |
| 9 | | Reserved for Redundancy Switch |
| 10 | EXT | Ext Carrier Off |
| 11 | | Reserved for Redundancy Switch |
| 12 | | Reserved for Redundancy Switch |
| 13 | TxFLT | Tx TTL Fault |
| 14 | RxFLT | Rx TTL Fault |
| 15 | | Reserved for Redundancy Switch |

Table C.4: SLM-5650 modem, Auxiliary Connector J9.

Pin 7 of the auxiliary connector (Table C.4) provides an analogue signal to aid antenna pointing. The analogue signal will be zero volts when the modem is not locked to a carrier. When locked to a carrier the analogue signal will be 1 volt for Es/No values less than or equal to -4.69 dB, or 10 volts for Es/No values greater than or equal to 20dB as depicted in figure C.3.

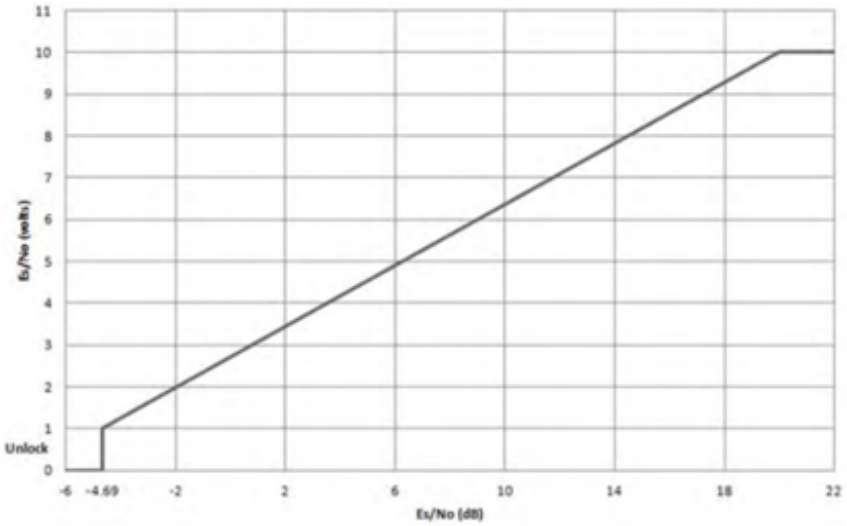



Figure C.3: Modem RX Lock level.

The SAILOR XTR GX-R2 antenna can transmit from 27.5 GHz to 30.0 GHz in five bands of 500 MHz. It is important that the SLM-5650 Tx frequency is configured to match these Tx bands. See table C.5.

| | **L.O. Freq.** | **RF Low Freq.** | **RF High Freq.** | **L-Band Low Freq.** | **L-Band High Freq.** |
|---|---|---|---|---|---|
| **Band 1** | 26.55 GHz | 27.5 GHz | 28.0 GHz | 950 MHz | 1450 MHz |
| **Band 2** | 27.05 GHz | 28.0 GHz | 28.5 GHz | 950 MHz | 1450 MHz |
| **Band 3** | 27.55 GHz | 28.5 GHz | 29.0 GHz | 950 MHz | 1450 MHz |
| **Band 4** | 28.05 GHz | 29.0 GHz | 29.5 GHz | 950 MHz | 1450 MHz |
| **Band 5** | 28.55 GHz | 29.5 GHz | 30.0 GHz | 950 MHz | 1450 MHz |

Table C.5: Tx bands.

The SAILOR XTR GX-R2 antenna can receive from 17.7 GHz to 20.2 GHz in three overlapping bands of 1 GHz. It is important that the SLM-5650 Rx frequency is configured to match these Rx bands. See table C.6.

| | **L.O. Freq.** | **RF Low Freq.** | **RF High Freq.** | **L-Band Low Freq.** | **L-Band High Freq.** |
|---|---|---|---|---|---|
| **Band 1** | 16.75 GHz | 17.70 GHz | 18.70 GHz | 950 MHz | 1950 MHz |
| **Band 2** | 17.50 GHz | 18.45 GHz | 19.45 GHz | 950 MHz | 1950 MHz |
| **Band 3** | 18.25 GHz | 19.2 GHz | 20.20 GHz | 950 MHz | 1950 MHz |

Table C.6: Rx bands.

On the generic VSAT profile, it is possible to enable the profile to activate GPIO3 pin when the profile is active. The GPIO3 pin (VSAT profile active) must be connected to the electronically steered RF switch so the Tx signal is switched to use the Comtech SLM-5650 modem Tx when the profile is activated. See table C.7 for RJ-45 GPIO pinout.

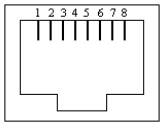
| Outline (on the BDU) | Pin | I/O | Signal | Function |
|---|---|---|---|---|
|  | 1 | I | GPIO1 | Tx Mute (active high) |
| | 2 | O | 12 VDC / 500 mA | Power Output |
| | 3 | O | GPIO2 | Rx Lock (open drain) |
| | 4 | O | GPIO3 | Generic VSAT Profile Active |
| | 5 | | GND | Ground |
| | 6 | O | 12 VDC / 500 mA | Power output |
| | 7 | N/A | GPIO4 | Future use |
| | 8 | | GND | Ground |
| | Shield | | PCB ground | PCB ground |

Table C.7: RJ-45 GPIO connector, outline and pin assignment.

## C.2.6 Commissioning

After installation it is necessary to commission each modem individually. Activate the GX VSAT profile and perform OTC as described in *Manual OTC (BUC Calibration) and Modem Access* on page 3-41. Activate the generic VSAT profile in order to commission the Comtech SLM-5650 modem with the airtime provider.

# Network Information and Recommendations

In this appendix you find information about:

- *Network Interfaces and Services exposed via Network Interfaces after Factory default*
- *Public Network Connection*
- *Unsecure protocol usage recommendations*

## D.1 Network Interfaces and Services exposed via Network Interfaces after Factory default

### D.1.1 Network Interfaces

The SAILOR XTR GX-R2 Network interfaces are as follows:

**BDU Port 1-4**: Ethernet connectors on back of BDU.
These ports can be configured for different situations depending on the network configuration.

**BDU Port 5**: Ethernet connector on front of BDU (service port).
This port is used for service purposes only.

### D.1.2 IP address configuration after Factory default

The SAILOR XTR GX-R2 IP addresses are as follows:

| Ethernet port | IP address configuration |
|---|---|
| BDU Port 1 | 192.168.1.2/24, 192.168.1.3/24 |
| BDU Port 2 | Not active |
| BDU Port 3 | DHCP client |
| BDU Port 4 | Not active |
| BDU Port 5(service) | 192.168.0.1/24 |

Table D.1: IP addresses configuration after Factory default.

### D.1.3 Services running on Interfaces after Factory default

The SAILOR XTR GX-R2 services running on interface are as follows:

| Ethernet port | Services |
|---|---|
| BDU Port 1 | Webserver (https, http redirect), ssh, modem redirect (port 8022 and 8443) |
| BDU Port 2 | N/A |
| BDU Port 3 | Webserver (https, http redirect), ssh, DHCP client, modem redirect (port 8022 and 8443) |
| BDU Port 4 | N/A |
| BDU Port 5(service) | Webserver (https, http redirect), ssh, DHCP server |

Table D.2: Services running after Factory default.

## D.2 Public Network Connection

The antenna system should not be connected to a public network. If remote access is required, it should be performed through a VPN with appropriate Denial of Service (DoS) prevention and logging mechanisms. This ensures secure and monitored access to the system.

## D.3 Unsecure protocol usage recommendations

We recognize that some of our customers are still operating with legacy systems that require unsecure protocols for configuration and management. While we can enable these unsecure protocols to support these older setups, it is crucial to understand that these are sending data unencrypted, which can be intercepted if precautions are not taken.

To mitigate these security risks, we recommend the following best practices:

1. **Limit Physical Access**
   Restrict physical access to communication equipment and facilities. Ensure that only authorized personnel can access communication infrastructure, thereby reducing the risk of tampering or unauthorized interception of signals.
2. **Disallow Routing of Antenna Communication**
   Prevent the routing of antenna communication through unsecured or public networks. By confining antenna communication to secure, private channels, you can significantly reduce the risk of eavesdropping and unauthorized access.
3. **Use a Secure Network**
   Conduct sessions over a secure and private network to minimize exposure to potential threats.
4. **Transition to Secure Protocols**
   We encourage transitioning to more secure protocols.

By implementing these precautions, it is possible to mitigate the inherent security risks in legacy systems.

# Feature Keys

Some features, e.g., Non-Geostationary Orbit (NGSO) support, require a feature key to be activated. A feature key is unique for each system and feature.

## E.1 Feature Key Activation

To activate a feature key from the web interface, do as follows:
Under **Service > Feature keys** click the small **+** mark below the **Action** field seen in Figure E.1. The system will prompt you to write the feature key. After the feature key has been activated, you must reboot the antenna for the feature to be installed.

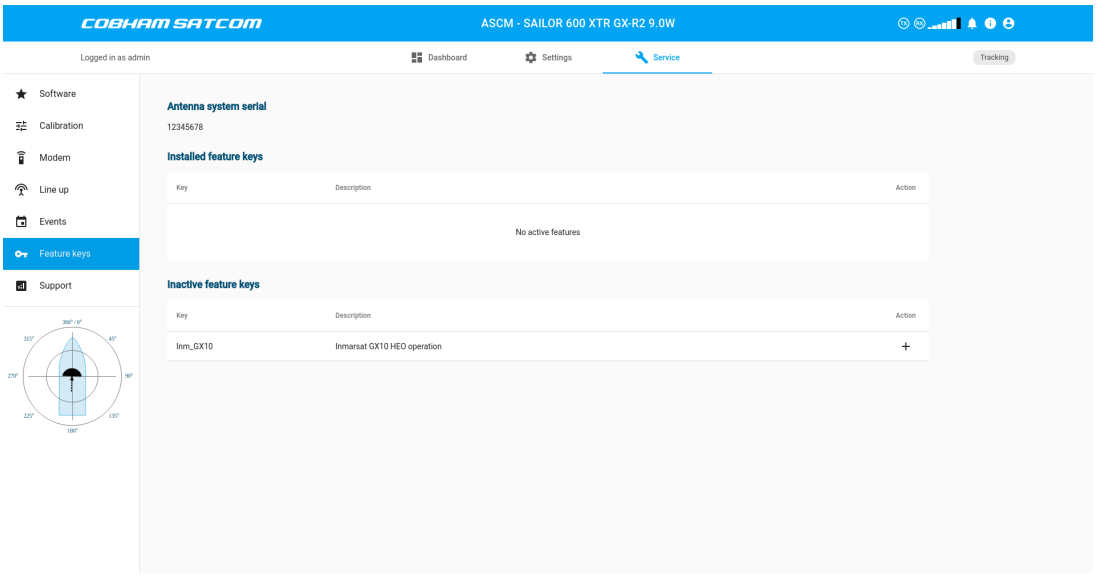



Figure E.1: Adding feature keys.

# Command Line Interface

## F.1 Connection Modes

After you have done the initial configuration and connected the SAILOR XTR GX-R2 to your network, you can use SSH to configure the SAILOR XTR GX-R2. You can also set up VSAT modem parameters.

NOTE

The following sections cover the command line interface for all SAILOR XTR antennas. Some of the commands may not be relevant for the antenna described in this manual.

### SSH and Telnet Connection

You can access the user command line interface (UCLI) via SSH or Telnet. The UCLI interface is available on the standard SSH port 22 or Telnet port 23.

Important

Check that you have **Telnet access** enabled on the page **IoT & Management** in the web interface.

Access to the SAILOR XTR system is protected by the password for the admin account. This is the same password that is used in the web interface. Use any BDU LAN port and corresponding IP address to get access to the UCLI. To start an UCLI session do as follows:

1. Open an SSH or Telnet client of your choice.
2. Enter the IP address for the BDU LAN port, login user: admin and password for admin account.

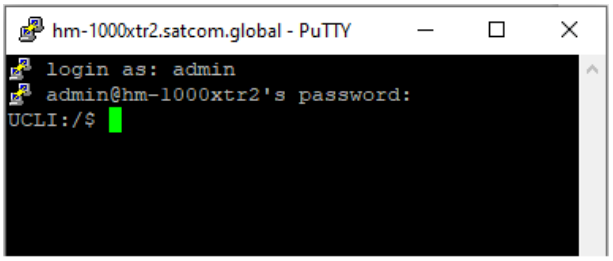



Figure F.1: Command line interface, login.

## F.2 List of Commands

The following commands are described in detail. They are listed in alphabetical order.

- *antenna_data*
- *calib*
- *config*
- *demo*
- *dual_antenna*
- *exit*
- *help*
- *navigation*
- *satellite*
- *status*
- *system*
- *test*
- *zone*

### F.2.1 antenna_data

| Command | Description |
|---|---|
| `antenna_data` | Shows detailed information on this specific command. |
| `antenna_data type` | Shows current antenna type.<br>Example output:<br>`UCLI:/$ antenna_data type`<br>`System: 7509D`<br>`Type: 2`<br>`Oem: generic`<br>`sub type: 0`<br>`lnb type: 1`<br>`buc type: 4` |
| `antenna_data type [<adu-id> [<sub-type>]]` | Sets the antenna type and the optional sub-type. |

Table F.1: UCLI command: `antenna_data`.

### F.2.2 calib

| Command | Description |
|---|---|
| `calib` | Shows the commands for encoder, ZRM and compass calibration. |
| `calib zrm` | Start XEL/ELE ZRM calibration. |

Table F.2: UCLI command: `calib`.

### F.2.3 config

| Command | Description |
|---|---|
| `config` | Shows detailed information on this specific command. |
| `config current_list` | Shows the current configuration. |

Table F.3: UCLI command: `config`.

### F.2.4 demo

| Command | Description |
|---|---|
| `demo` | Shows detailed information on this specific command. |
| `demo start` | Starts a demo pattern where the antenna will turn azimuth, elevation and cross elevation until it receives the command `demo stop`. |
| `demo stop` | Stops the antenna demo pattern. |
| `demo reset` | Resets the antenna to angle 0°. |

Table F.4: UCLI command: `demo`.

### F.2.5 dual_antenna

| Command | Description |
|---|---|
| `dual_antenna` | Shows detailed information on this specific command. |
| `dual_antenna mode` | Shows the current dual antenna mode<br>• Single.<br>• Primary.<br>• Secondary. |
| `dual_antenna status` | Shows the current dual antenna status<br>• Active.<br>• Inactive. |

Table F.5: UCLI command: `dual_antenna`.

### F.2.6 exit

| Command | Description |
|---|---|
| `exit` | Exits the connection to the SAILOR XTR GX-R2 system. |

Table F.6: UCLI command: `exit`.

### F.2.7 help

| Command | Description |
|---|---|
| `help` | Shows brief information on all commands. |

Table F.7: UCLI command: `help`.

### F.2.8 navigation

| Command | Description |
|---|---|
| `navigation` | Shows detailed information on this specific command. |
| `navigation heading` | Shows the current navigation configuration. |
| `navigation heading <mode> [value]` | Sets navigation configuration.<br>Modes can be:<br>• external: Use external NMEA input.<br>• fixed: Use fixed heading.<br>• none: Use headingless. |

Table F.8: UCLI command: `navigation`.

### F.2.9 satellite

| Command | Description |
|---|---|
| `satellite` | Shows VSAT profile configuration parameters. |
| `satellite <param_name> [<param_val1> [<param_val2>]]` | Sets VSAT profile configuration parameters. |

Table F.9: UCLI command: `satellite`.

### F.2.10 status

| Command | Description |
|---|---|
| `status` | Shows detailed information on this specific command. |
| `status system` | Shows the current status of the SAILOR XTR GX-R2. |
| `status track_all` | Shows the current values for all tracking parameters:<br>• Antenna heading angle.<br>• Antenna relative Azimuth angle.<br>• Antenna relative Elevation angle.<br>• Antenna GEO azimuth angle.<br>• Antenna GEO Elevation angle.<br>• Antenna relative Polarization angle.<br>• Antenna GPS latitude.<br>• Antenna GPS longitude. |
| `status event_list` | Shows a list of active events. |

Table F.10: UCLI command: `status`.

### F.2.11 system

| Command | Description |
|---|---|
| `system` | Shows detailed information on this specific command. |
| `system restart` | Sends a command to the BDU to restart the system instantaneously. It makes a power-on self test and then points to the last used satellite. |
| `system info` | Shows the software version, part names and serial numbers of the antenna system. |
| `system logging` | Configure the system log level. |

Table F.11: UCLI command: `system`.

### F.2.12 test

| Command | Description |
|---|---|
| `test` | Shows detailed information on this specific command. |
| `test frict` | Performs a friction test. |
| `test frict [axis]` | Performs a friction test on given axis. Omitted or a = AZI, e = ELE, x = XEL, * = All 3. |

Table F.12: UCLI command: `test`.

### F.2.13 zone

| Command | Description |
|---|---|
| `zone` | Shows detailed information on this specific command. |
| `zone [zone id]` | Valid zone ID: [1..8], Show settings for specific zone. |
| `zone <zone_id> azimuth` | Set azimuth angle for zone. |
| `zone <zone_id> azimuth`<br>`<start_angle> <end_angle>` | Valid zone ID: [1..8]<br>Valid angles: [ 0..360 ] |
| `zone <zone_id> elevation` | Set elevation angle for zone. |
| `zone <zone_id> elevation`<br>`<start_angle> <end_angle>` | Valid zone ID: [1..8]<br>Valid angles: [ -25..90 ] |
| `zone <zone_id> tx_off` | Turn off tx inside zone. |
| `zone <zone_id> tx_off <yes\|no>` | Valid zone ID: [1..8] |
| `zone <zone_id> active` | Activate/deactivate zone profile. |
| `zone <zone id> active [yes\|no]` | Valid zone ID: [1..8] |

Table F.13: UCLI command: `zone`.

# Grounding and RF Protection

## G.1 Introduction

### G.1.1 Reasons for Grounding

Grounding the SAILOR XTR GX-R2 system is required for at least two reasons:

- Safety: Lightning protection of persons and equipment.
- Protection: ESD (Electro Static Discharge) protection of equipment.

### G.1.2 Safety

First of all grounding of the system is required for safety reasons. In the event of a lightning strike at the ADU a proper grounding of the system will provide a low resistance path to divert the strike discharge to seawater.

### G.1.3 ESD Protection

The ESD protection circuits in the BDU rely on proper grounding of the system in order to work properly. Otherwise sensitive circuits within the BDU might be damaged due to ESD when you are handling the equipment.

### G.1.4 RF Interference

Interference induced from nearby high-power RF transmitters might cause system failures and in extreme cases permanent damage to the SAILOR XTR GX-R2 equipment. If there are problems with interference from HF transmitters, it is advisable to mount ferrite clamps on the coax cable in order to provide suppression of induced RF. The ferrites will have no effect on the differential-mode signals but increases the impedance in relation to common-mode RFI.

Recommendations

Use 1-5 pcs. hinged clamp cores (e.g. the RFC or SFC series from Kitagawa) mounted on the ADU cable near the ADU.

# G.2 Grounding Recommendations

## G.2.1 To Ground the BDU

The BDU should be grounded to the ship/hull. For this purpose you may use a short ADU cable and a grounding kit. Further, the BDU must be grounded at its grounding stud in order to ensure proper grounding if the short ADU cable is disconnected. For further information, see *To Ground the BDU* on page 2-36. If you use the Extended cable support, make the ground connections through the cable support. You may need to extend the ground plane using copper foil, see the following section.

To Extend the Ground Plane

In some cases it may not be possible to access the hull and at the same time place the BDU in a suitable place. A way to insure good grounding and at the same time make it possible to ground the coax cable - is to extend the ship ground plane by means of copper foil. The maximum length of the foil is determined by the width of the foil:

Copper foil 5 cm wide: Max 50 cm.

Copper foil 10 cm wide: Max 100 cm.

Copper foil 20 cm wide: Max 200 cm.

NOTE The foil must be at least 0.1 mm thick.

Connect the foil to the hull by plenty of screws or hard – soldering. Run the foil past the place where the short ADU cable is to be grounded and mount a grounding kit on top of the foil. For details on the jumper cable see *Jumper Cable for Grounding* on page G-10.

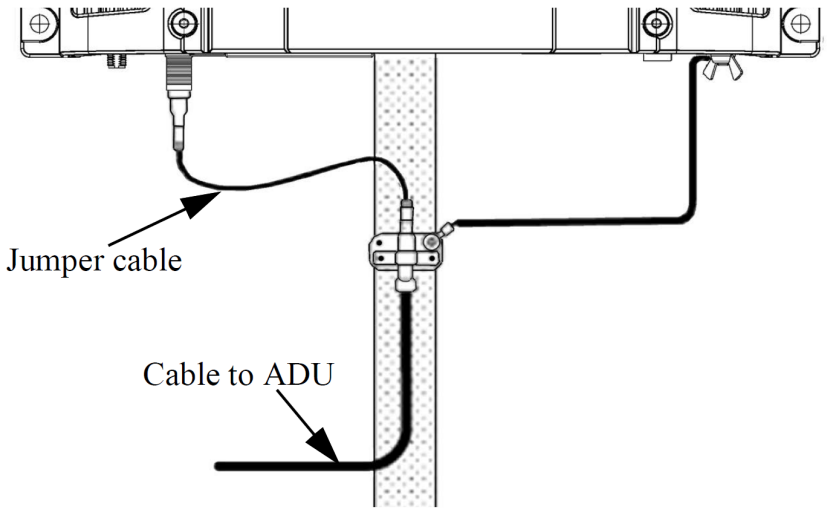



Figure G.1: Extending the Ground Plane.

## G.2.2 To Ground the ADU

You can ground the ADU to the ship/hull via one or more of its mounting bolts. Make sure to remove painting, dirt, grease etc. at the mounting holes in order to make good electrical contact to the hull. Use serrated washers when securing the mounting bolts and seal the joint with protective coating to avoid corrosion.

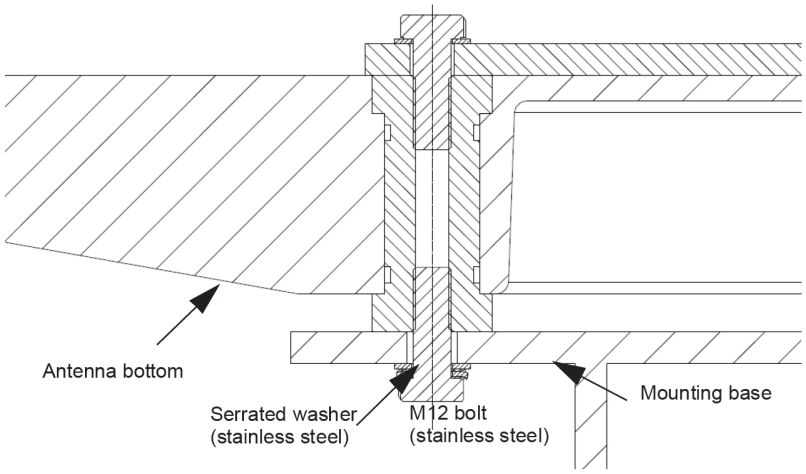



Figure G.2: Grounding the ADU.

NOTE

For optimum grounding use the mounting bolt located clostes to the ADU cable plate, see *To Ground the ADU* on page 2-25

It is always recommended to establish the shortest possible grounding path e.g. on steel hulls the ADU should be grounded directly to the hull[1]. However, due to the fact that this is not possible on e.g. fiberglass hulls (nor is it preferable on aluminum hulls) a number of alternative grounding methods are suggested in the following paragraphs.

## G.2.3 Alternative Grounding for Steel Hulls

The following guidelines assume a two-wire, isolated grounding arrangement; that is no part of the circuit, in particular the battery negative, is connected to any ground potential or equipment.

### To Ground the BDU

The BDU should preferably be grounded to the ship with the short cable. Further, the BDU must be grounded at its grounding stud in order to ensure a proper grounding if the short ADU cable is disconnected.
The ground connection can be established either at the hull (recommended) or at a dedicated RF ground if available (alternative).

[1] Please note that the ADU ground connection is made at the same electrical ground potential as the BDU.

**Important** However, bear in mind that the adu ground connection is to be made at the **same electrical ground potential as the BDU** (see *To Ground the ADU*).

The BDU provides galvanic isolation (as required) from its input power terminals to the chassis/grounding stud. This way the isolated grounding arrangement is maintained.

To Ground the ADU

**NOTE** For optimum grounding use the mounting bolt located closest to the ADU cable plate, see *To Ground the ADU* on page 2-25

Terminal Grounded at the Hull (recommended)

In this case the ADU is grounded to the ship via one (or more) of its mounting bolts. Make sure to remove painting, dirt, grease etc. at the mounting holes in order to make good electrical contact to the hull. Use serrated washers when securing the mounting bolts and seal the joint with protective coating to avoid corrosion.

Terminal Grounded at a Dedicated RF Ground (alternative)

In this case the ADU is grounded with a separate ground cable. The ground cable must be routed parallel and close to the shielded coax cable connecting the ADU to the BDU grounding kit. A heavy gauge wire with tinned strands (min. 6 $mm^2$) can be used for this purpose.

**NOTE** The ADU must be electrically isolated at its mounting bolts by means of shoulder bushings and washers ensuring the isolated RF ground - see *Isolation of the ADU from the mounting base* on page G-9.

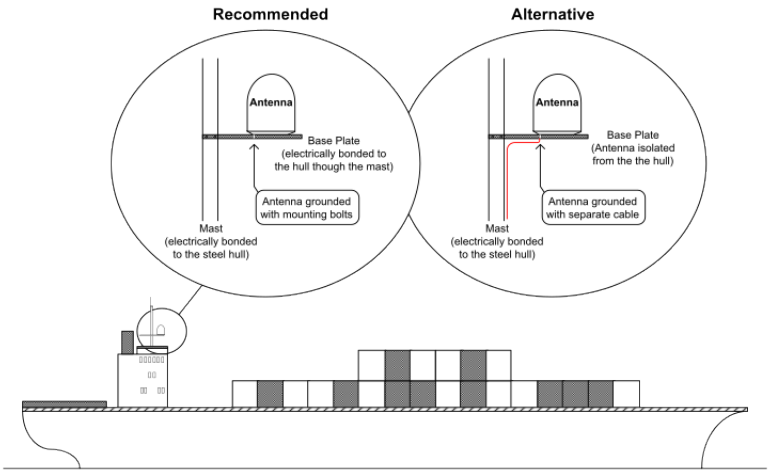



Figure G.3: Grounding at a dedicated RF ground (alternative).

## G.2.4 Alternative Grounding for Aluminum Hulls

The following guidelines assume a two-wire, isolated grounding arrangement; that is no part of the circuit, in particular the battery negative, is connected to any ground potential or equipment.

### To Ground the BDU

The BDU should preferably be grounded with the short cable. Further, the BDU must be grounded at its grounding stud to ensure a proper grounding if the short ADU cable is disconnected.
The ground connection must be established at a dedicated RF ground (either capacitively or electrically coupled).

**Important** Remember to make the ADU ground connection at the **same electrical ground potential** as the BDU (see *To Ground the ADU*).

The BDU provides galvanic isolation (as required) from its input power terminals to the chassis/grounding stud. This way the isolated grounding arrangement is maintained.

### To Ground the ADU

If the mounting base of the ADU is electrically connected to the hull (or any other ground potential than the BDU), the ADU must be isolated at its mounting bolts by means of shoulder bushings and washers, see section *Ground Cable - Connection* and *Isolation of the ADU from the Mounting Base*.

This is done in order to prevent DC currents flowing in the hull thus causing electrolytic corrosion.
However, a ground connection must be established via one of the mounting bolts using a separate ground cable. The ground cable must be routed parallel and in close proximity to the shielded coax cable hence connecting the ADU to the BDU Grounding kit. A heavy gauge wire with tinned strands (min. 6 $mm^2$) can be used for this purpose.

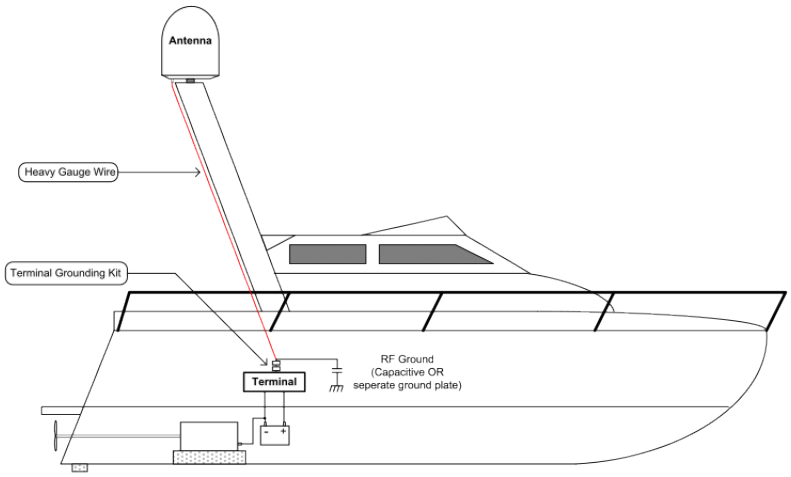



Figure G.4: Alternative grounding for aluminum hulls.

## G.2.5 Alternative Grounding for Fiber Glass Hulls

To Ground the BDU

The BDU should preferably be grounded with the short ADU cable and a grounding kit (available from Cobham SATCOM). Further, the BDU must be grounded at its grounding stud in order to ensure a proper grounding if the short ADU cable is disconnected.
The ground connection must be established at a dedicated RF ground (either capacitive or electrical coupled).

**Important** Bear in mind that the ADU ground connection is to be made at the **same electrical ground potential** as the BDU (see *To Ground the ADU*).

To Ground the ADU

If the mounting base of the ADU is electrically connected to any other ground potential than the BDU (e.g. Lightning Ground), the ADU must be isolated at its mounting bolts by means of shoulder bushings and washers - see section *Separate Ground Cable*.

However, a ground connection must be established via one of the mounting bolts using a separate ground cable. The ground cable must be routed parallel and in close proximity to the shielded coax cable hence connecting the ADU to the BDU Grounding kit. A heavy gauge wire with tinned strands (min. 6 $mm^2$) can be used for this purpose.

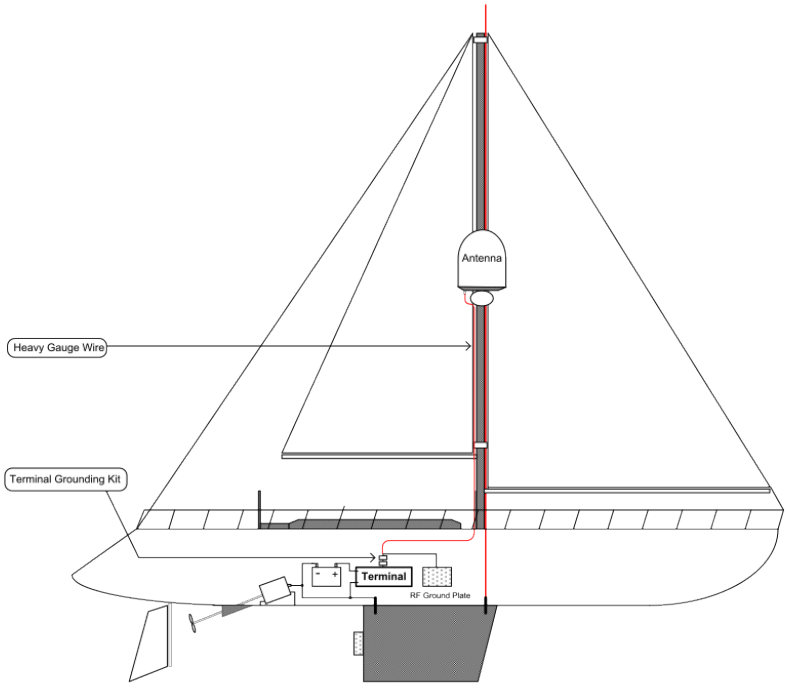



Figure G.5: Alternative grounding for fiber glass hulls.

## G.2.6 Separate Ground Cable

Ground Cable - Construction

When dealing with electrical installations in a marine environment, all wiring must be done with double insulated, tinned strands, high quality and if exposed also UV resistant cables. This shall also apply to the separate ground cable mentioned in the previous paragraphs.

The ground cable is constructed using an appropriate cable with a cross section area of at least 6 $mm^2$ (AWG10) and terminated with insulated ring crimp terminals - see figure G.6. The crimp terminals must be a marine approved type e.g. the DuraSeal series from Raychem.

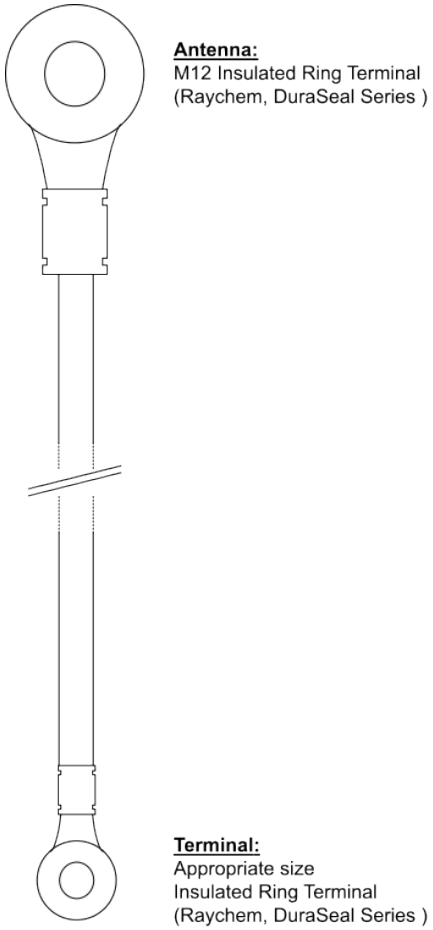



Figure G.6: Separate ground cable.

Ground Cable - Connection

Mount the ground cable close to and parallel to the shielded coax cable thus minimizing ground loop problems. If possible, route the coax cable and the ground cable in metal conduits bonded to the hull or within a mast (depending on the actual installation).
The ground cable must be connected at one of the mounting/grounding bolts on the ADU. Use bolts and washers of stainless steel and seal the joint with protective coating to avoid corrosion. If the ADU is to be isolated from the mounting base, shoulder bushings and washers must be used — see figure G.7, *Isolation of the ADU from the mounting base*, on page G-9.
At the other end, connect the ground cable as described in *To Ground the BDU* on page G-2.

Isolation of the ADU from the Mounting Base

In cases where the ADU is to be isolated from the mounting base, shoulder bushings and washers (accessories) must be used as illustrated in figure G.7. Please note that the isolation has to be implemented on all four mounting bolts (including the bolt securing the ground cable).

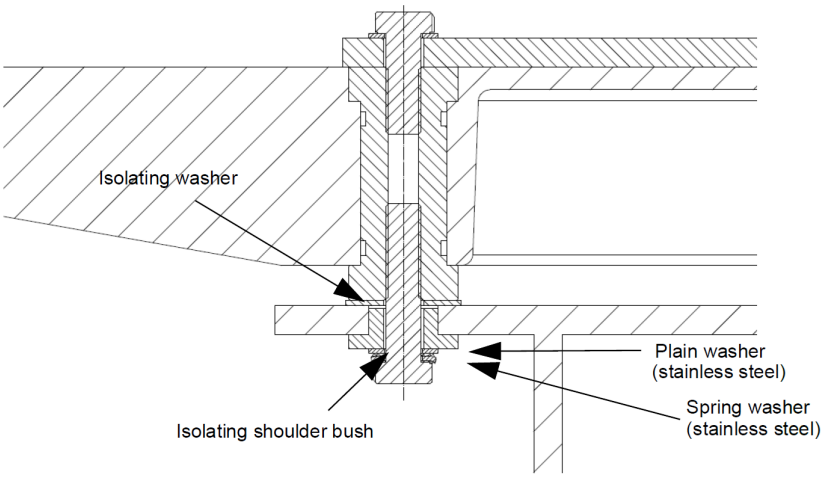



Figure G.7: Isolation of the ADU from the mounting base.

The ground cable must be connected at one of the mounting/grounding bolts on the ADU as illustrated below in figure G.8. Remember to seal the joint with protective coating to avoid corrosion.

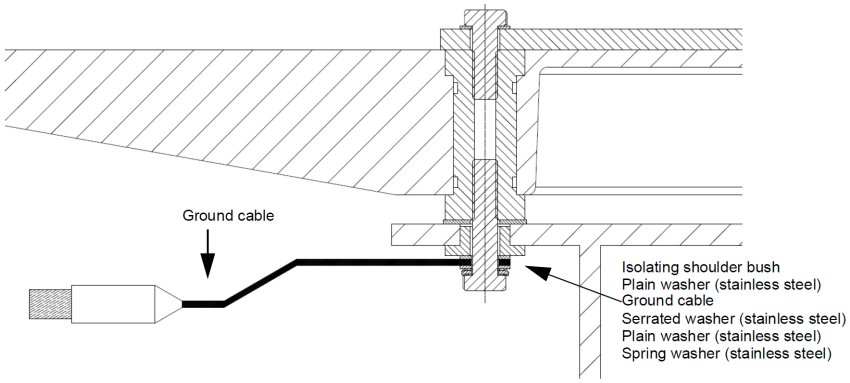



Figure G.8: ADU isolation and grounding cable.

## G.3 Jumper Cable for Grounding

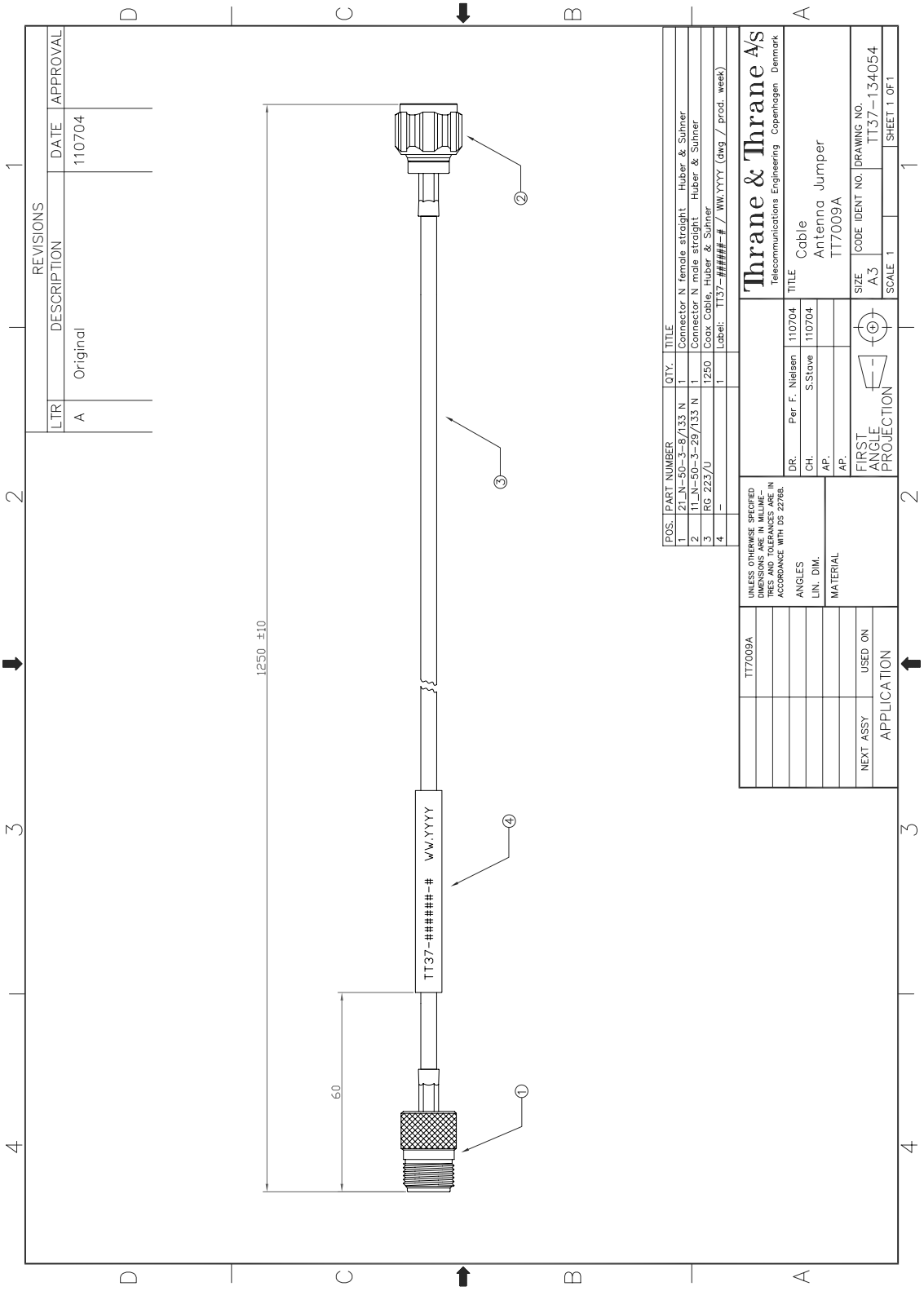



Figure G.9: Jumper cable for grounding (specifications).

# Event Messages

## H.1 Overview

The SAILOR XTR GX-R2 detects events during:

- POST (Power On Self Test) - a self test performed at every power-up.
- Self test - started in the web interface.
- CM (Continuous Monitoring) - automatically performed while the system is in operation.

When the SAILOR XTR GX-R2 detects an event that requires your action, it issues an event message and the red Fail/Pass LED in the LED panel of the BDU is lit. As long as an event is active, it is shown in the BDU display and the web interface in **Service > Events** or click the event icon in the top bar.

NOTE

Active events and notifications are shown. As soon as the event is cleared, it is not displayed any longer. It is then moved to the section **Cleared events last 24 hours.**

State the Event ID when contacting your service partner.
The event description might contain a number of digits in brackets, e.g. (00000005). This is supplemental information and used for service and diagnostics purposes.
Some of the messages may not be relevant for the antenna described in this manual.

## H.2 List of Events

| ID | Module | Type | Description | Explanation |
|---|---|---|---|---|
| 08061-0 | ADM | WARNING | VMU linux shell password | The specified password (root) for the satellite modem is not accepted by the modem. |
| 08062-0 | ADM | WARNING | VMU debug shell password | The specified password (user) for the satellite modem is not accepted by the modem. |
| 08068-0 | ADM | WARNING | Blocking zone nearby | The antenna is close to a blocking zone. |
| 08069-0 | ADM | WARNING | Blocking Zone | The antenna has entered a blocking zone. |
| 0806A-0 | ADM | WARNING | VMU connection | The BDU has lost connection to the satellite modem. |
| 0806B-0 | ADM | WARNING | VMU RF Point not valid | There is a mismatch in the provided RF configuration. Parameters were rejected as invalid. See Diagnostic log for more details. |
| 0806C-0 | ADM | WARNING | VMU RF Point application failed | There is a mismatch in the provided RF configuration. Parameters were validated, but there is a problem applying them. |
| 0806D-0 | ADM | WARNING | VMU RF TX calibration timeout | TX calibration started and exceeded maximum time (10 min). |
| 08073-0 | ADM | WARNING | Secondary Antenna connection | The system is configured as a dual antenna Primary, but no dual antenna Secondary is connected to it. Either disable the dual antenna functionality in the web interface or configure a another system as a dual antenna Secondary. |
| 08074-0 | ADM | WARNING | Primary Antenna connection | The system is configured as a dual antenna Secondary, but it was not possible to connect to the dual antenna Primary. Check that the IP address entered in the modem profile is correct and check that the Primary and Secondary systems are physically connected as described in the manual. |
| 08075-0 | ADM | WARNING | Rx cable calibration | Calibration of the antenna cable failed. The cable could be defective, too long, connectors not properly connected, or the BDU or ADU hardware could be defective. |
| 08076-0 | ADM | WARNING | Dual mode configuration | The system is configured as a dual antenna system, but the Primary and Secondary systems are not identical. The dual mode function may not work properly or performance could be degraded. Info code:<br>xxxxxxx1 = Antenna types are different<br>xxxxxxx2 = Antenna subtypes are different<br>xxxxxxx3 = Software versions on Primary and Secondary are different<br>xxxxxxx4 = LNB types are different<br>xxxxxxx5 = BUC types are different<br>xxxxxxx6 = OEM ids are different |
| 08077-0 | ADM | WARNING | BUC L.O. frequency invalid | The satellite modem provided an invalid BUC L.O. frequency. A default BUC L.O. frequency is assumed based on antenna type. To remove this warning re-configure the modem to provide a valid BUC L.O. frequency. |
| 08078-0 | ADM | WARNING | VMU TX frequency invalid | The satellite modem did not provide a Tx frequency, or it is invalid. A default Tx frequency is assumed, but this may degrade Tx performance. To remove this warning re-configure the modem to provide the correct Tx frequency. |

Continued on next page

Table H.1: List of all possible events.

| ID | Module | Type | Description | Explanation |
|---|---|---|---|---|
| 0807A-0 | ADM | WARNING | Automatic azimuth calibration pending | Automatic azimuth calibration mode is enabled. The system tries to perform an azimuth calibration using the target satellite whenever satellite data is received from the modem. After successful calibration the feature is automatically disabled and the system returns to normal operation. WARNING: If a system has not completed azimuth calibration after the installation, the blocking zones may appear to be at wrong angles. |
| 0807B-0 | ADM | WARNING | OTC required (Calibration outdated) | BUC calibration is outdated. Rerun it from the Core Module by using the One Touch Commissioning in the web interface. |
| 0807E-0 | ADM | WARNING | Keyline signal | The keyline signal on the dual antenna Primary does not match the keyline signal on the Secondary. Check that the keyline splitter cable is connected to the RS422 connectors. When fixed, the BDU's or modem needs to be rebooted to clear the event. Event will also clear when modem looses connection and disable keyline. |
| 0807F-0 | ADM | WARNING | Local administration enabled | Local administration mode is currently enabled. This allows login without providing the admin password. Will be disabled after 5 minutes or next reboot. |
| 08081-0 | ADM | WARNING | BUC communication | Missing communication between VMU and BUC. Info:<br>0x00000001: From VMU to BUC Info:<br>0x00000002: From BUC to VMU |
| 08082-0 | ADM | WARNING | Modem configuration load | Unable to load configuration on modem. Info:<br>0x00000001: Configuration index invalid<br>0x00000002: Changing parameter not permitted<br>0x00000004: Modem not in Remote Mode |
| 08083-0 | ADM | WARNING | Vsat Modem network settings | VSAT Profile activation issue: Modem LAN port settings rejected. |
| 08084-0 | ADM | WARNING | Radome fan blocked/not rotating | Radome fan is blocked or not rotating even if it should. |
| 08085-0 | ADM | INFO | Radome temp too high | The temperature in the radome is too high. |
| 08086-0 | ADM | WARNING | GPIO Tx mute active | Tx has been muted from GPIO on the BDU. |
| 08087-0 | ADM | WARNING | Temperature protection | Temperature too high. BUC shut down. |
| 08088-0 | ADM | WARNING | Antenna data not synchronised | Persistent antenna data not synchronized in all backup locations. Retry will happen on next boot. Info code shows sum of all outdated copies Info:<br>0x00000002 ISCM<br>0x00000004 Azimuth IFDM<br>0x00000008 Cross elevation IFDM<br>0x00000010 Elevation IFDM<br>0x00000020 Polarisation IFDM |
| 08089-0 | ADM | INFO | Socat workaround reboot | A reboot was initiated by the socat workaround. Check diagnostics log to verify no false positive. |
| 0808A-0 | ADM | INFO | POST recovery initiated | A reboot was initiated by the system to clear an error state. |
| 0808B-0 | ADM | INFO | POST recovery failed | The system is staying in SAFE MODE to enable diagnostic and repair. |
| 0808C-0 | ADM | INFO | POST test counter | POST test activations. |
| 0808F-0 | ADM | WARNING | ISCM BUC voltage exceeds limits | The ISCM BUC voltage exceeds limits either high or low. Check BUC voltage connections. |
| 08090-0 | ADM | WARNING | Missing feature key for GSO/NGSO tracking | Feature key for tracking this type of satellite using TLE data is not activated (LEO=1,MEO=2,GEO=3,HEO=4) |

Continued on next page

Table H.1: List of all possible events. (Continued)

| ID | Module | Type | Description | Explanation |
|---|---|---|---|---|
| 08091-0 | ADM | ERROR | Antenna data invalid | Antenna data is invalid. Check antenna configuration (Either wrong antenna type, BUC type, LNB type or subtype has been selected) |
| 08092-0 | ADM | WARNING | Primary Antenna not functional | The primary antenna in a dual antenna setup is not functional. Connect to the primary antenna and examine its event list. |
| 08093-0 | ADM | WARNING | Secondary Antenna not functional | The secondary antenna in a dual antenna setup is not functional. Connect to the secondary antenna and examine its event list. |
| 08094-0 | ADM | WARNING | File integrity monitor - file changed | One of the observed files has changed its state. Probably the content has changed. |
| 08095-0 | ADM | ERROR | Panel connection lost | Lost connection to the antenna panel. |
| 08096-0 | ADM | WARNING | Temperature warning | Antenna panel temperature exceeds safe operating range. |
| 08097-0 | ADM | ERROR | Panel malfunction detected | The antenna panel has reported a malfunction and is not operational. Check panel connections and hardware for faults. |
| 0810A-0 | ADM | ERROR | ASCM production data | Production data has been corrupted. |
| 0810F-0 | ADM | ERROR | ASCM Devices | Startup of ascm_devs application failed. |
| 08110-0 | ADM | ERROR | ASCM - APSM Communication | Communication between ASPM and ASCM. |
| 08111-0 | ADM | ERROR | Presence of EBUS devices | Present EBUS devices matches antenna type. The info code shows the sum of all missing or unexpected modules, see below:<br>0x00000001: Azimuth IFDM<br>0x00000002: Cross Elevation IFDM<br>0x00000004: Elevation IFDM<br>0x00000008: ISCM<br>0x00000010: Polarisation IFDM |
| 08112-0 | ADM | ERROR | Elect of antenna data | No antenna data blob was elected. |
| 08113-0 | ADM | ERROR | APSM production data | APSM production data is corrupted. |
| 08114-0 | ADM | ERROR | ASCM FS | File system partition corrupt. |
| 08118-0 | ADM | ERROR | APSM Operational | APSM didn't reach running state. |
| 08119-0 | ADM | ERROR | APSM ADC communication | Communication with A/D converters in power supply. The info code shows the sum of all missing or unexpected ADC's, see below:<br>0x00000001: U1300<br>0x00000002: U1302 |
| 0850A-0 | ADM | ERROR | GNSS Initialization | GNSS initialization failed. |
| 0851E-0 | ADM | ERROR | Sensor sanity | Too many invalid values measured by the ISCM during initialisation. Check for vibrations or malfunctioning ISCM. |
| 08521-0 | ADM | ERROR | Azi axis calibration | Azimuth axis zero reference not found. Check belt and zero reference module. Info:<br>0x00000001: Timeout (operation did not complete in time)<br>0x00000010: Encoder or mechanical problem<br>0x00000020: Zero reference not found<br>0x00000040: End stop not found. |
| 08522-0 | ADM | ERROR | Xel axis calibration | Cross-elevation axis zero reference or end stops not found at expected locations. Check belt, zero reference module, and end stops. Info: See 08521-0. |
| 08523-0 | ADM | ERROR | Ele axis calibration | Elevation axis zero reference or end stops not found at expected locations. Check belt, zero reference module, and end stops. Info: See 08521-0. |
| 08534-0 | ADM | WARNING | BDU communication | The communication link between BDU and antenna is not working. |

Continued on next page

Table H.1: List of all possible events. (Continued)

| ID | Module | Type | Description | Explanation |
|---|---|---|---|---|
| 08537-0 | ADM | INFO | GNSS communication | Lost connection to the GNSS device. |
| 08538-0 | ADM | INFO | GNSS data range | Received information from the GNSS device which is out of range. |
| 08539-0 | ADM | WARNING | GNSS device warning | Local GNSS device warning. |
| 0853A-0 | ADM | WARNING | GNSS device error | Local GNSS device error. |
| 0853B-0 | ADM | WARNING | GNSS Fallback | Position mode fallback to local GNSS, caused by missing NMEA messages. |
| 0854D-0 | ADM | WARNING | GNSS position | No position available from the GNSS device or position too old. |
| 0854E-0 | ADM | INFO | GNSS velocity | No velocity available from the GNSS device. |
| 0854F-0 | ADM | WARNING | Heading data | Heading information is missing in the antenna as no external NMEA signal is detected. |
| 0855E-0 | ADM | WARNING | Low elevation | The antenna is not allowed to transmit because the elevation is too low. |
| 0855F-0 | ADM | WARNING | Heading range | Heading data range error. External heading unit supplies unreliable data. |
| 08562-0 | ADM | WARNING | High elevation | The antenna cannot perform acquisition in gyro-free mode because the elevation is too high. |
| 08564-0 | ADM | ERROR | Xel/ele axis cables switched | Check cable connections for xel and ele. |
| 08565-0 | ADM | ERROR | Xel/ele axis broken belt | Check motor belt for xel and ele. |
| 08566-0 | ADM | INFO | Excessive ADU acceleration | ADU G-force has exceeded 2.5G |
| 08841-0 | ADM | ERROR | Tuner lock | The internal tuner PLL was unable to lock. |
| 08842-0 | ADM | WARNING | GSC demodulator | The GSC demodulator has reported an error. |
| 08843-0 | ADM | WARNING | DVBS demodulator | The DVBS demodulator cannot be initialised and loaded correctly. |
| 08844-0 | ADM | WARNING | BUC voltage out of range | The BUC voltage is out of range. |
| 08845-0 | ADM | WARNING | LNB voltage out of range | The LNB voltage is out of range. The LNB might be switched off to protect the power supply circuitry. Reactivate VSAT profile to try again, check LNB cable and surroundings if the problem persists. |
| 08846-0 | ADM | WARNING | AIM-O supply voltage out of range | Supply voltage measured at AIM-O is not within expected range. |
| 08847-0 | ADM | WARNING | AIM-O Master PLL lock | The AIMO master PLL has lost lock. Check the input reference signal. |
| 08848-0 | ADM | WARNING | TX Calibration missing | Tx calibration not performed. |
| 08881-0 | ADM | WARNING | DHCP Client address | An IP address was received from an external DHCP server that overlaps another VLAN. Traffic on these VLANs may be unpredictable. Reconfigure the server or IP settings of that VLAN. |
| 08A03-0 | ADM | WARNING | GX Core Module power | The Power Good signal from the Core Module is low. The issue can either be:<br>- Internal Core Module or internal cable failure<br>- Temperature of Core Module is too high and it has been turned off (*)<br>- GMU has been manually switched off on the front panel (*) (*) = Only on systems with GMU. |
| 08A04-0 | ADM | WARNING | iDirect modem | The BDU detected a warning/error in the iDirect modem. Log into the modem for more information. Info:<br>0x00000001: Temperature error<br>0x00000002: Test error<br>0x00000004: Fan error |
| 09000-0 | KDM | ERROR | KDM 3V3 supply | Internal 3V3 voltage supply error in the KDM. |

Continued on next page

Table H.1: List of all possible events. (Continued)

| ID | Module | Type | Description | Explanation |
|---|---|---|---|---|
| 09001-0 | KDM | ERROR | KDM 12V supply | Internal 12V voltage supply error in the KDM. |
| 09002-0 | KDM | ERROR | KDM display | Display hardware error in the KDM. |
| 09010-0 | KDM | ERROR | KDM link/SW version | Link to the KDM module could not be established. Either the KDM board is malfunctioning, or<br>- if the system software has just been updated<br>- the software is too old and is not compatible with the KDM hardware. |
| 0A080-0 | Antenna | ERROR | EBUS loop interrupted | EBUS communication error, loop interrupted. |
| 0A081-0 | Antenna | ERROR | ISCM error | Communication error with ISCM. Info:<br>0x00000001: Keyline signal |
| 0A100-0 | Antenna | ERROR | ISCM Gyro communication | Internal communication error on ISCM. |
| 0A101-0 | Antenna | ERROR | ISCM Accelerometer communication | Internal communication error on ISCM. |
| 0A102-0 | Antenna | ERROR | ISCM Magnetometer communication | Internal communication error on ISCM. |
| 0A103-0 | Antenna | ERROR | ISCM IMU communication | Internal communication error on ISCM. |
| 0A106-0 | Antenna | INFO | ISCM ADC volt | Voltage out of range. |
| 0A107-0 | Antenna | WARNING | ISCM Power good | Internal PSU error. |
| 0A108-0 | Antenna | ERROR | ISCM Prod data | Internal production data invalid. |
| 0A109-0 | Antenna | ERROR | ISCM BUC fan | BUC fan error. Check cable. |
| 0A180-0 | Antenna | WARNING | ISCM Fan error | BUC fan failure. Check fan movement. |
| 0A181-0 | Antenna | ERROR | ISCM No response | No communication with ISCM. Check cable. |
| 0A200-0 | Antenna | ERROR | Azi Motor prod data | Internal production data invalid. |
| 0A201-0 | Antenna | ERROR | Azi Motor ZRM | No zero reference found. Check from motor to ZRM and free movement of the antenna. |
| 0A280-0 | Antenna | ERROR | Azi Motor Driver fault | Driver could not move antenna. Check free movement of the antenna. |
| 0A281-0 | Antenna | ERROR | Azi Motor Power fault | No power to motor driver. Check input power to system. |
| 0A282-0 | Antenna | ERROR | Azi Motor Shutdown | Internal error. Motor is shut down. |
| 0A283-0 | Antenna | WARNING | Azi Motor Over temperature warning | Motor temperature too high. |
| 0A284-0 | Antenna | ERROR | Azi Motor Over temperature fault | Motor temperature too high. Motor shut down. |
| 0A285-0 | Antenna | INFO | Azi Motor Over current fault | Over current protected activated. Check free movement of antenna. |
| 0A286-0 | Antenna | ERROR | Azi Motor No response | No communication with motor. Check cable. |
| 0A300-0 | Antenna | ERROR | Xel Motor prod data | Internal production data invalid. |
| 0A301-0 | Antenna | ERROR | Xel Motor ZRM | No zero reference found. Check from motor to ZRM and free movement of the antenna. |
| 0A380-0 | Antenna | ERROR | Xel Motor Driver fault | Driver could not move antenna. Check free movement of the antenna. |
| 0A381-0 | Antenna | ERROR | Xel Motor Power fault | No power to motor driver. Check input power to system. |
| 0A382-0 | Antenna | ERROR | Xel Motor Shutdown | Internal error. Motor is shut down. |
| 0A383-0 | Antenna | WARNING | Xel Motor Over temperature warning | Motor temperature too high. |
| 0A384-0 | Antenna | ERROR | Xel Motor Over temperature fault | Motor temperature too high. Motor shut down. |

Continued on next page

Table H.1: List of all possible events. (Continued)

| ID | Module | Type | Description | Explanation |
|---|---|---|---|---|
| 0A385-0 | Antenna | INFO | Xel Motor Over current fault | Over current protected activated. Check free movement of antenna. |
| 0A386-0 | Antenna | ERROR | Xel Motor No response | No communication with motor. Check cable. |
| 0A400-0 | Antenna | ERROR | Ele Motor prod data | Internal production data invalid. |
| 0A401-0 | Antenna | ERROR | Ele Motor ZRM | No zero reference found. Check from motor to ZRM and free movement of the antenna. |
| 0A480-0 | Antenna | ERROR | Ele Motor Driver fault | Driver could not move antenna. Check free movement of the antenna. |
| 0A481-0 | Antenna | ERROR | Ele Motor Power fault | No power to motor driver. Check input power to system. |
| 0A482-0 | Antenna | ERROR | Ele Motor Shutdown | Internal error. Motor is shut down. |
| 0A483-0 | Antenna | WARNING | Ele Motor Over temperature warning | Motor temperature too high. |
| 0A484-0 | Antenna | ERROR | Ele Motor Over temperature fault | Motor temperature too high. Motor shut down. |
| 0A485-0 | Antenna | INFO | Ele Motor Over current fault | Over current protected activated. Check free movement of antenna. |
| 0A486-0 | Antenna | ERROR | Ele Motor No response | No communication with motor. Check cable. |
| 0A600-0 | Antenna | ERROR | Azi motor initialisation | Azi motor initialisation failed. |
| 0A601-0 | Antenna | ERROR | Xel motor initialisation | Xel motor initialisation failed. |
| 0A602-0 | Antenna | ERROR | Ele motor initialisation | Ele motor initialisation failed. |
| 0A680-0 | Antenna | ERROR | Azi motor initialisation | Azi motor initialisation failed. |
| 0A681-0 | Antenna | ERROR | Xel motor initialisation | Xel motor initialisation failed. |
| 0A682-0 | Antenna | ERROR | Ele motor initialisation | Ele motor initialisation failed. |
| 0B060-0 | APSM | INFO | NMEA 0183 parse error | No valid NMEA input. Check NMEA 0183 cable. |
| 0B061-0 | APSM | WARNING | Heading data | No valid heading input received. Check NMEA 0183 cable. |
| 0B062-0 | APSM | WARNING | APSM AUX temperature warning | Temperature too high. |
| 0B063-0 | APSM | ERROR | APSM AUX temperature failure | Temperature too high. AUX shut down. |
| 0B064-0 | APSM | WARNING | APSM EBUS temperature warning | Temperature too high. |
| 0B065-0 | APSM | ERROR | APSM EBUS temperature failure | Temperature too high. EBUS shut down. |
| 0B066-0 | APSM | WARNING | APSM LNB temperature warning | Temperature too high. |
| 0B067-0 | APSM | ERROR | APSM LNB temperature failure | Temperature too high. LNB shut down. |
| 0B068-0 | APSM | WARNING | APSM Main temperature warning | Temperature too high. |
| 0B069-0 | APSM | ERROR | APSM Main temperature failure | Temperature too high. APSM shut down. |
| 0B070-0 | APSM | INFO | APSM AUX Under voltage lockout | Voltage too low. |
| 0B071-0 | APSM | INFO | APSM BUC Under voltage lockout | Voltage too low. |
| 0B072-0 | APSM | INFO | APSM EBUS Under voltage lockout | Voltage too low. |
| 0B073-0 | APSM | INFO | APSM LNB Under voltage lockout | Voltage too low. |
| 0B074-0 | APSM | INFO | APSM Main Under voltage lockout | Voltage too low. |
| 0B080-0 | APSM | INFO | APSM AUX Over current protection | Too high current. AUX shut down. |
| 0B081-0 | APSM | INFO | APSM BUC Over current protection | Too high current. BUC shut down. |

Continued on next page

Table H.1: List of all possible events. (Continued)

| ID | Module | Type | Description | Explanation |
|---|---|---|---|---|
| 0B082-0 | APSM | INFO | APSM EBUS Over current protection | Too high current. EBUS shut down. |
| 0B083-0 | APSM | INFO | APSM LNB Over current protection | Too high current. LNB shut down. |
| 0B084-0 | APSM | INFO | APSM Main Over current protection | Too high current. APSM shut down. |
| 0B090-0 | APSM | INFO | APSM AUX Over voltage protection | Voltage too high. |
| 0B092-0 | APSM | INFO | APSM EBUS Over voltage protection | Voltage too high. |
| 0B093-0 | APSM | INFO | APSM LNB Over voltage protection | Voltage too high. |
| 0B094-0 | APSM | INFO | APSM Main Over voltage protection | Voltage too high. |
| 0B0A0-0 | APSM | ERROR | APSM Communication error | No communication with APSM. Check internal connections in ACM. |
| 0B0A1-0 | APSM | ERROR | BDCM Communication error | No communication with BDCM. Check main antenna cable. |
| 0D000-0 | BDCM | WARNING | BDU PSU temperature too high | BDU PSU temperature too high. |
| 0D001-0 | BDCM | WARNING | BDU PSU fan does not work | BDU PSU fan does not work. |
| 0D002-0 | BDCM | ERROR | BDU PSU will shutdown | BDU PSU will shutdown. |
| 0D003-0 | BDCM | ERROR | BDCM prod data | BDCM prod data is invalid. |
| 0E000-0 | AIMO | ERROR | AIM-O Communication | Startup of communication with AIM-O failed. |
| 0E001-0 | AIMO | ERROR | AIM-O PLL out of lock | PLL out of lock. |
| 0E002-0 | AIMO | ERROR | AIM-O voltage range | Voltage measured at AIM-O is not within expected range. |
| 0E003-0 | AIMO | ERROR | AIM-O cal data | AIM-O calibration data is invalid. |
| 0F000-0 | BIMO | ERROR | BIM-O Communication | Startup of communication with BIM-O failed. |
| 0F001-0 | BIMO | ERROR | BIM-O PLL out of lock | PLL out of lock. |
| 0F002-0 | BIMO | ERROR | BIM-O voltage range | Voltage measured at BIM-O is not within expected range. |
| 0F003-0 | BIMO | ERROR | BIM-O cal data | BIM-O calibration data is invalid. |
| 0F004-0 | BIMO | WARNING | VMU reference signal | There is no VMU Rx or Tx reference signal. Whether this is Rx or Tx reference depends on the user's selection on the modem profile page in the web interface. Make sure the VMU Rx/Tx cable is connected and that the VMU is configured to output the RX/TX reference signal. |
| 0F005-0 | BIMO | WARNING | No BIMO Master PLL | BIMO Master PLL out of lock. |
| 0F006-0 | BIMO | WARNING | No BIMO L.O. PLL | BIMO L.O. PLL out of lock. |

Table H.1: List of all possible events.

# GX-R2 Satellites

This appendix contains examples of satellite data for azimuth calibration. The following figure shows the coverage map of the GX-R2 service.

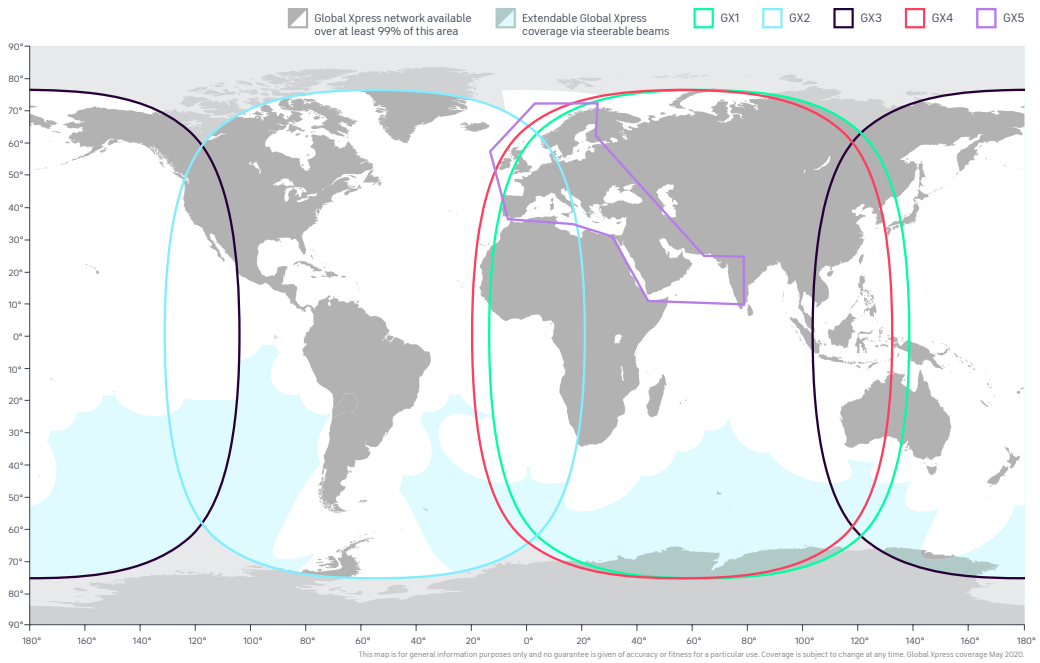



Figure I.1: GX-R2 coverage map.

| Satellite | Position | Frequency | Satellite Identifier |
|---|---|---|---|
| GX1-IOR | 62.6 E | 19.707 GHz | GSC |
| GX2-AOR | 55 W | 19.707 GHz | GSC |
| GX3-POR | 179.6 E | 19.707 GHz | GSC |
| GX4-IOR | 56.6 E | 19.707 GHz | GSC |
| GX5-EME | 11.0 E | 19.701 GHz | GSC |

Table I.1: GX-R2 GSC Satellite Information.

# Approvals

This appendix contains approvals for the SAILOR XTR GX-R2 systems. Additional approvals can be provided by contacting Cobham SATCOM. The appendix has the following sections:

- *CE (RED and RoHS)*
- *Chinese MITT Order 32 (China-RoHS 2)*
- *Inmarsat Type Approval (SAILOR 1000 XTR GX-R2)*
- *Inmarsat Type Approval (SAILOR 1000 XTR GX-R2 with SMB3315)*
- *Inmarsat Type Approval (SAILOR 600 XTR GX-R2)*
- *Inmarsat Type Approval (SAILOR 600 XTR GX-R2 with SMB3315)*

# EU Declaration of Conformity

Hereby **Thrane & Thrane A/S trading as Cobham Satcom** declares that the following equipment complies with the specifications of:

RED directive 2014/53/EU concerning Radio Equipment
RoHS directive 2011/65/EU concerning Restriction of Hazardous Substances including delegated directive (EU) 2015/863.
The full text of the EU declaration of conformity is available at the following internet address: http://sync.cobham.com/satcom/support/downloads

**Equipment included in this declaration:**

| System | | Consists of "xxx" is 3 characters, that determine the product branding, where only labels, logo and user interface varies | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Above Deck Unit | | | Below Deck Unit | | | Modem | | |
| Model | Description | Model | Description | Part no. | Model | Description | Part no. | Model | Description | Part no. |
| **Ku Band** | | | | | | | | | | |
| 7560C | SAILOR 600 XTR Ku 6W System | 7506C | SAILOR 600 XTR Ku, 6W ADU | 407506C-xxx | 7516A | SAILOR XTR Below Deck Unit | 407516A-xxx | N/A | Third Party Ku-band modem | N/A |
| 7580A | SAILOR 800 XTR Ku 8W System | 7508A | SAILOR 800 XTR Ku, 8W ADU | 407508A-xxx | | | | | | |
| 7580B | SAILOR 800 XTR Ku 16W System | 7508B | SAILOR 800 XTR Ku, 16W ADU | 407508B-xxx | | | | | | |
| 7590A | SAILOR 1000 XTR Ku 8W System | 7509A | SAILOR 1000 XTR Ku, 8W ADU | 407509A-xxx | | | | | | |
| 7590B | SAILOR 1000 XTR Ku 16W System | 7509B | SAILOR 1000 XTR Ku, 16W ADU | 407509B-xxx | | | | | | |
| 7590I | SAILOR 1000 XTR Ku 25W System | 7509I | SAILOR 1000 XTR Ku, 25W ADU | 407509I-xxx | | | | | | |
| **Ka-band (GX-R2)** | | | | | | | | | | |
| 7560A | SAILOR 600 XTR GX-R2 4.5W System | 7506A | SAILOR 600 XTR GX-R2, 4.5W ADU | 407506A-xxx | 7516A | SAILOR XTR Below Deck Unit | 407516A-xxx | 7023A or 7523A | SAILOR GX Modem Unit (GMU) or SAILOR GX-R2 Modem Unit (GMU) | 407023A-xxx or 407523A-xxx |
| 7560D | SAILOR 600 XTR GX-R2 9W System | 7506D | SAILOR 600 XTR GX-R2, 9W ADU | 407506D-xxx | | | | | | |
| 7590C | SAILOR 1000 XTR GX-R2 4.5W System | 7509C | SAILOR 1000 XTR GX-R2, 4.5W ADU | 407509C-xxx | | | | | | |
| 7590D | SAILOR 1000 XTR GX-R2 9W System | 7509D | SAILOR 1000 XTR GX-R2, 9W ADU | 407509D-xxx | | | | | | |
| **Ka-band** | | | | | | | | | | |
| 7560B | SAILOR 600 XTR Ka 4.5W System | 7506B | SAILOR 600 XTR Ka, 4.5W ADU | 407506B-xxx | 7516A | SAILOR XTR Below Deck Unit | 407516A-xxx | N/A | Third Party Ka-band modem | N/A |
| 7560E | SAILOR 600 XTR Ka 9W System | 7506E | SAILOR 600 XTR Ka, 9W ADU | 407506E-xxx | | | | | | |
| 7590F | SAILOR 1000 XTR Ka 4.5W System | 7509F | SAILOR 1000 XTR Ka, 4.5W ADU | 407509F-xxx | | | | | | |
| 7590G | SAILOR 1000 XTR Ka 9W System | 7509G | SAILOR 1000 XTR Ka, 9W ADU | 407509G-xxx | | | | | | |

Thrane & Thrane A/S trading as Cobham Satcom. Registered no.: DK - 65 72 46 18. Registered address: Lundtoftegaardsvej 93 D, 2800 Kgs. Lyngby, Denmark
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If you are not the addressee, or the employee or agent responsible for delivering this memo to the addressee, please telephone us as soon as possible and return the memo to us by post. Improper or unauthorised use, disclosure, distribution or copying of this memo is prohibited.

Document no.: 99-175730-F
Date: 05-09-2024

# J.2 Chinese MITT Order 32 (China-RoHS 2)

**Cobham Satcom**
Lundtoftegaardsvej 93 D
2800 Kgs. Lyngby
Denmark

T: +45 39 55 88 00
F: +45 39 55 88 88

**Chinese MIIT Order 32 (China-RoHS 2)**

The declared devices meet the Measures for Restriction of the Use of Hazardous Substances in Electrical & Electronic Products Order No. 32 (China-RoHS II) of the Chinese Ministry of Industry and Information Technology (MIIT).
Hazardous Substance Control Table in compliance with Chinese SJ/T11364-2014 of 21 January 2016 for the declared devices.

| 部件名称<br>Part Name | 部件号<br>Part Number | 有毒有害物质或元素<br>Toxic or hazardous Substances and Elements | | | | | |
|---|---|---|---|---|---|---|---|
| | | 铅<br>(Pb) | 汞<br>(Hg) | 镉<br>(Cd) | 六价铬<br>(Cr (VI)) | 多溴联苯<br>(PBB) | 多溴二苯醚<br>(PBDE) |
| SAILOR 600 XTR GX-R2 4.5W | 407506A-THR | X | O | O | O | O | O |
| SAILOR 600 XTR GX-R2 9W | 407506D-THR | X | O | O | O | O | O |
| SAILOR 1000 XTR GX-R2 4.5W | 407509C-THR | X | O | O | O | O | O |
| SAILOR 1000 XTR GX-R2 9W | 407509D-THR | X | O | O | O | O | O |
| SAILOR XTR Below Deck Unit | 407516A-T19 | O | O | O | O | O | O |
| SAILOR GX-R2 Modem Unit | 407523A-T19 | O | O | O | O | O | O |
| O: 表示该有毒有害物质在该部件所有均质材料中的含量均在GB/T 26572规定的限量要求以下<br>O: Indicates the toxic or hazardous substance contained in all the homogeneous materials for this part is within the limit requirement in GB/T 26572. | | | | | | | |
| X: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出GB/T 26572规定的限量要求。<br>X: Indicates the toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is outside the limit requirement in GB/T 26572 | | | | | | | |
| 环保期限（EFUP）的产品及其部件是每个列出的符号，除非另有标明。使用期限只适用于产品在产品手册中规定的条件下工作<br>The Environmentally Friendly Period (EFUP) for the product and its parts are per the symbol listed, unless otherwise marked. The Period of use is valid only when the product is operated within the conditions defined in the product manual. | | | | | | | |

Table 1: Hazardous Substance Control Table

The EFUP of the declared devices is 10 years.
The units are marked with following EFUP symbol with the year of production:

Doc. No. 99-181617-B

Thrane & Thrane A/S trading as Cobham Satcom
Registered no.: DK - 65 72 46 18. Registered address: Lundtoftegaardsvej 93 D, 2800 Kgs. Lyngby, Denmark

www.cobhamsatcom.com

# J.3 Inmarsat Type Approval (SAILOR 1000 XTR GX-R2)

inmarsat

Inmarsat Global Limited
99 City Road
London EC1Y 1AX
United Kingdom
www.inmarsat.com

T +44 (0)20 7728 1000
F +44 (0)20 7728 1044

Our ref: GXM100TNT-09

Mr. Henrik O. Christensen
Senior Project Manager
Cobham SATCOM
Lundtoftegaardsvej 93 D,
DK-2800, KGS.
LYNGBY, Denmark

10th November 2021

Dear Mr. Christensen

**Type Approval: SAILOR 1000 XTR GX-R2**

We have now completed our review of the submissions made by you in support of your Application for an Inmarsat Type Approval of your User Terminal SAILOR 1000 XTR GX-R2.

The above mentioned UT model is hereby Type Approved as complying with the mandatory specifications in the GX Terminal Specifications and the stated operating environmental conditions and is acceptable for use with the Inmarsat GX Satellite Systems.

This Type Approval by Inmarsat should not be construed to constitute or imply any representation or warranty by Inmarsat in relation to the UT models, including but not limited to:

1. the quality, reliability, durability, adequacy or fitness for purpose of the said UT models, or
2. whether any or all units of the said UT models are free from defects in design, workmanship or materials,

nor does it apply to any capabilities or features not specified by Inmarsat. Any and all warranties or representations, whether express or implied are hereby excluded.

We reserve the right to withdraw the Type Approval at a later date if the UT models are found to be not conforming to the original stated specifications.

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Registered in England and Wales No. 3675885

## J.4 Inmarsat Type Approval (SAILOR 1000 XTR GX-R2 with SMB3315)



inmarsat

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F +44 (0)20 7728 1044

Our ref: GXM100TNT-10

Mr. Henrik O. Christensen,
Senior Project Manager,
Cobham SATCOM
Lundtoftegaardsvej 93 D,
DK-2800, KGS. LYNGBY, Denmark

10th August 2023

Dear Mr. Christensen,

**Type Approval: SAILOR 1000 XTR GX-R2 integrating SMB3315**

We completed in March 2023 our review of the material and test results provided by Cobham Satcom to support the approval of the SMB3315 satellite modem board integration into the existing User Terminal: SAILOR 1000 XTR GX-R2.

Inmarsat was confident that the performance and operation of the terminals conformed to the GX Terminal Specifications captured by the GX System Definition Manual. However, due to existing issues identified in the SMB3315 satellite modem board outside Cobham Satcom's control, Inmarsat gave a temporary Type Approval to the UT model above subjected to the results of a sea trial scheduled in July and a specific test that required the coordination of the Operations team.

The outcome of those dependencies has been positive. For this reason, Inmarsat gives Cobham the Final Type Approval to the UT model above, covers single and dual antenna systems.

This Type Approval by Inmarsat should not be construed to constitute or imply any representation or warranty by Inmarsat in relation to the UT model, including but not limited to:

1. the quality, reliability, durability, adequacy or fitness for purpose of the said UT model, or
2. whether any or all units of the said UT model are free from defects in design, workmanship or materials,

nor does it apply to any capabilities or features not specified by Inmarsat. Any and all warranties or representations, whether express or implied are hereby excluded.

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# J.5 Inmarsat Type Approval (SAILOR 600 XTR GX-R2)

# Type Approval Certificate

## SAILOR 600 XTR GX-R2

**Certificate Number: GXM060TNT-10**

Cobham, the manufacturer of the terminal SAILOR 600 XTR GX-R2 has submitted documents which demonstrate that the user terminal when operating in the environmental conditions set forth in its Type Approval Particulars meets the technical requirements for use with the Inmarsat Satellite Communications System.

Cobham has certified that all other units of the same type will meet all technical requirements in a similar manner to the unit subjected to test, and that the tests have been conducted in accordance with procedures approved by Inmarsat. The full technical details of the SAILOR 600 XTR GX-R2 are documented in its Type Approval Particulars.

Inmarsat does hereby certify that the SAILOR 600 XTR GX-R2 model identified herein is acceptable for use in the Commercial Ka Band with the Inmarsat GX Satellite Communications System as of the date of this Certificate.

Inmarsat Global Limited
99 City Road
London, EC1Y 1AX
United Kingdom.

Inmarsat Global Limited

By

Name: Patrick Sharkey

Title: Senior Director
User Terminal Engineering

Signed: Patrick Sharkey

Approval Date: 5th of April 2022

1. This certificate is intended only as formal notification to the manufacturer that Inmarsat has determined, on the basis of information submitted by Cobham using test procedures approved by Inmarsat that the UT model of the type identified herein meet the standards for use with the Inmarsat System. This certificate is not a warranty of the performance or fitness for purpose of the SAILOR GX XTR GX-R2 and Inmarsat hereby expressly disclaims any and all liability arising out of or in connection with the issuance, use, or misuse of this certificate.
2. This certificate is not intended to replace any required national regulatory type approvals for the placement of market of UT models of the type identified in the Certificate. It is the responsibility of the manufacturer of the UT model to obtain the required national regulatory type approval before the terminal can be placed in the markets within the regulatory sovereignty region of the countries of concern. In addition, the operation of the UT model may also be subject to national licensing requirements.

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# J.6 Inmarsat Type Approval (SAILOR 600 XTR GX-R2 with SMB3315)



inmarsat

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Our ref: GXM60TNT-11

Mr. Henrik O. Christensen,
Senior Project Manager,
Cobham SATCOM
Lundtoftegaardsvej 93 D,
DK-2800, KGS. LYNGBY, Denmark

10th August 2023

Dear Mr. Christensen,

**Type Approval: SAILOR 600 XTR GX-R2 integrating SMB3315**

We completed in March 2023 our review of the material and test results provided by Cobham Satcom to support the approval of the SMB3315 satellite modem board integration into the existing User Terminal: SAILOR 600 XTR GX-R2.

Inmarsat was confident that the performance and operation of the terminals conformed to the GX Terminal Specifications captured by the GX System Definition Manual. However, due to existing issues identified in the SMB3315 satellite modem board outside Cobham Satcom's control, Inmarsat gave a temporary Type Approval to the UT model above subjected to the results of a sea trial scheduled in July and a specific test that required the coordination of the Operations team.

The outcome of those dependencies has been positive. For this reason, Inmarsat gives Cobham the Final Type Approval to the UT model above, covers single and dual antenna systems.

This Type Approval by Inmarsat should not be construed to constitute or imply any representation or warranty by Inmarsat in relation to the UT model, including but not limited to:

1. the quality, reliability, durability, adequacy or fitness for purpose of the said UT model, or
2. whether any or all units of the said UT model are free from defects in design, workmanship or materials,

nor does it apply to any capabilities or features not specified by Inmarsat. Any and all warranties or representations, whether express or implied are hereby excluded.

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# Glossary

A

- ACU: Antenna Control Unit. Legacy version of the BDU used for older systems.
- ADM: ACU Digital Module. A main processor board in the ACU.
- ADS: Antenna Diversity Solution.
- ADU: Above Deck Unit.
- AIMO: Antenna Interface Module.
- APSM: Antenna Power Supply Module.

B

- BDCM: BDU Control Module.
- BDU: Below Deck Unit.
- BEIDOU: Chinese satellite navigation system.
- BITE: Built-In Test Equipment.

C

- CFE: Customer Furnished Equipment.
- CM: Continuous Monitoring.

D

- DHCP: Dynamic Host Configuration Protocol. A protocol for assigning dynamic IP addresses to devices on a network.
- DNS: Domain Name Server.

E

- EPP: Expanded PolyPropylene.
- ESD: ElectroStatic Discharge.

F

- FCC: Federal Communications Commission.

## G

- GEO: Geosynchronous Equatorial Orbit.
- GLONASS: GLObal'naya NAvigatsionnaya Sputnikovaya Sistema. Global Navigation Satellite System in English.
- GMU: Global Xpress Modem Unit.
- GPIO: General Purpose Input/Output.
- GPL: General Public License.
- GPS: Global Positioning System.

## H

- HDT: HeaDing True, NMEA sentence.
- HEO: Highly Elliptical Orbit.

## I

- IEC: International Electrotechnical Commission.
- IoT: Internet of Things.
- IP: Internet Protocol.
- ISCM: Inertial Sensor and Controller Module.

## K

- KDM: Keyboard and Display Module of the BDU.

## L

- LAN: Local Area Network.
- LED: Light Emitting Diode.
- LEO: Low Earth Orbit.
- LGPL: Lesser General Public License.
- LHCP: Left Hand Circular Polarization.

## M

- MEO: Medium Earth Orbit.
- MIB: Management Information Base.

## N

- NID: Network IDentification.
- NMEA: National Marine Electronics Association (standard).

## O

- OID: Object IDentifier.

## P

- POST: Power On Self Test.

## R

- RF: Radio Frequency.
- RFI: Radio Frequency Interference.
- RHCP: Right Hand Circular Polarization.
- ROSS: Roaming Oceanic Satellite Server.
- RSSI: Received Signal Strength Index.

## S

- SNMP: Simple Network Management Protocol.
- SWM: Single Wire Multi-switch.

## T

- TLE: Two-Line Element set.

## U

- UCLI: Unified Command Line Interface.

## V

- VLAN: Virtual LAN.
- VMU: VSAT Modem Unit.
- VSAT: Very Small Aperture Terminal.

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