COBHAM

SAILOR XTR Ku
Installation manual

SAILOR XTR Ku
Quick guide

Installation wizard

This quick guide is for experienced service personnel who have installed the SAILOR XTR Ku 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 Ku: 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.

For more detailed information about the setup tasks see chapter 4, *Setup of the antenna*.

SAILOR 1000 XTR Ku 8W
SAILOR 1000 XTR Ku 16W

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.

SAILOR 1000 XTR Ku

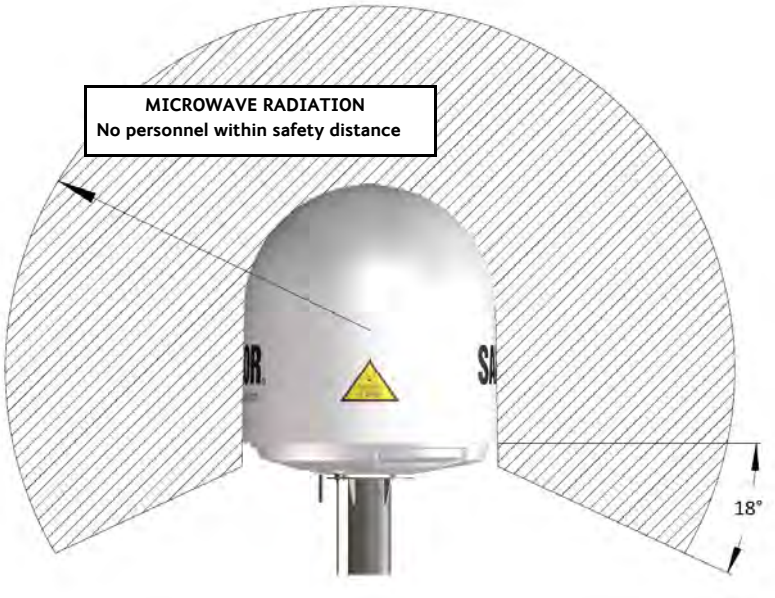
Microwave radiation hazards

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. .

The minimum safety distance to the Above Deck Unit reflector on the focal line is 30 m for SAILOR 1000 XTR Ku 8W and 47 m for SAILOR 1000 XTR Ku 16W, based on a radiation level of 10 W/m^2. No hazard exists >18° 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 further information see *Blocking zones – azimuth and elevation* on page 2-5.



Distance to other equipment

Do not move the Above Deck Unit closer to radars than the minimum safe distance specified in section *Interference from radar, GPS/GNSS, L-band and other transmitters* on page 2-10 — it may cause damage to the Above Deck Unit.

Compass Safe Distance:
SAILOR 1000 XTR Ku 8W and SAILOR 1000 XTR Ku 16W antenna or ADU (Above Deck Unit): min. 170 cm (IEC 60945).
SAILOR 7516A BDU (Below Deck Unit): min. 30 cm (IEC 60945).

Blocking zones with azimuth and elevation on page 3-5*Blocking zones with azimuth and elevation* on page 3-5**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.

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.

Rx and Tx 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.

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!

VSAT restrictions

Note

There are restrictions in use of the frequency band 13.75 to 14 GHz in the following countries. Other countries may have restrictions, consult your airtime provider or relevant authorities for information.

- Belgium
- Hungary
- Latvia
- Malta
- Portugal
- Slovakia

Contact the VSAT modem provider for local setup.

Modification restrictions

This device is granted pursuant to the Japanese Radio Law (電波法).

This device should not be modified (otherwise the granted designation number will become invalid).

About this manual

Intended readers

This is an installation manual for the SAILOR XTR Ku system (100 cm and 60 cm) 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.

Manual overview

This manual has the following chapters:

- *Introduction*
- *Installation*
- *Interfaces*
- *Setup of the antenna*
- *Installation check lists*
- *Service*

This manual has the following appendices:

- *Technical specifications*
- *Dual antenna solution*
- *VSAT modem settings*
- *Command line interface*
- *DVB-S satellites*
- *Grounding and RF protection*
- *Event messages*
- *Approvals*

Software version

The manual covers the software version 3.03.

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** > **LAN**”.

Italic is used to emphasize the paragraph title in cross-references.

Example: “For further information, see *Connecting Cables* on page...”.

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 manufacturers’ 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.

Table of contents

Introduction

This chapter has the following sections:

- *SAILOR XTR Ku system*
- *Part numbers and options*

1.1 SAILOR XTR Ku system

The SAILOR XTR Ku is a unique stabilized maritime VSAT antenna system operating in the Ku-band (10.7 to 14.5 GHz). It provides bi-directional IP data connections both on regional satellite beams and quasi-global Ku-band satellite networks. The system only requires a single 50 Ohm cable to provide the Above Deck Unit 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 Above Deck Unit the built-in stepper motors act as brakes during transport and when the Above Deck Unit is not powered. The ADU system can be accessed remotely and in-depth performance analysis can be done using the built-in web interface.

This manual describes the variants of the SAILOR XTR Ku system (for part numbers, see *Part numbers and options* on page 1-6):

- SAILOR 1000 XTR Ku 8W (includes 8 W BUC and can be converted to GX/Ka)
- SAILOR 1000 XTR Ku 16W (includes 16 W BUC and can be converted to GX/Ka)

The SAILOR XTR Ku system consists of the following units:

- Above Deck Unit (ADU)
- Below Deck Unit (BDU)

The following figure shows the SAILOR XTR Ku system.

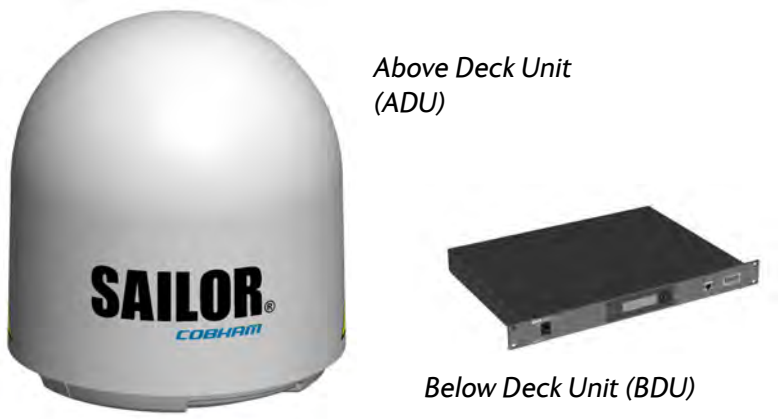


Figure 1-1: Above Deck Unit ADU and Below Deck Unit (BDU)

System features

- Single 50 Ohm coax cable for the ADU
- Support of several VSAT modems
- Standard 8W or High Power 16W BUC options.
- Gyro-free operation
- Ku-to-Ka-band conversion (future use).
- 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
- Global RF configuration.
- 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.
- No scheduled maintenance.
- Few spare parts, easy to service
- Support for Cobham ConnectIT
- Prepared for third-party IP devices in ADU

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 100 cm antenna.

You can do remote diagnostics and service. The built-in test equipment of the antenna checks constantly the antenna modules for proper functioning, it 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 Ku ADU is a 103cm or 60 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 -18° to +118°. The 100 cm antenna weighs 105 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 Ohm cable (with N connector) through the rotary joint. No cable work is required inside the radome. The 100 cm antenna has 4 LAN connectors and a DC power outlet in the ADU to connect third-party equipment.

Modules in the ADU (100 cm)

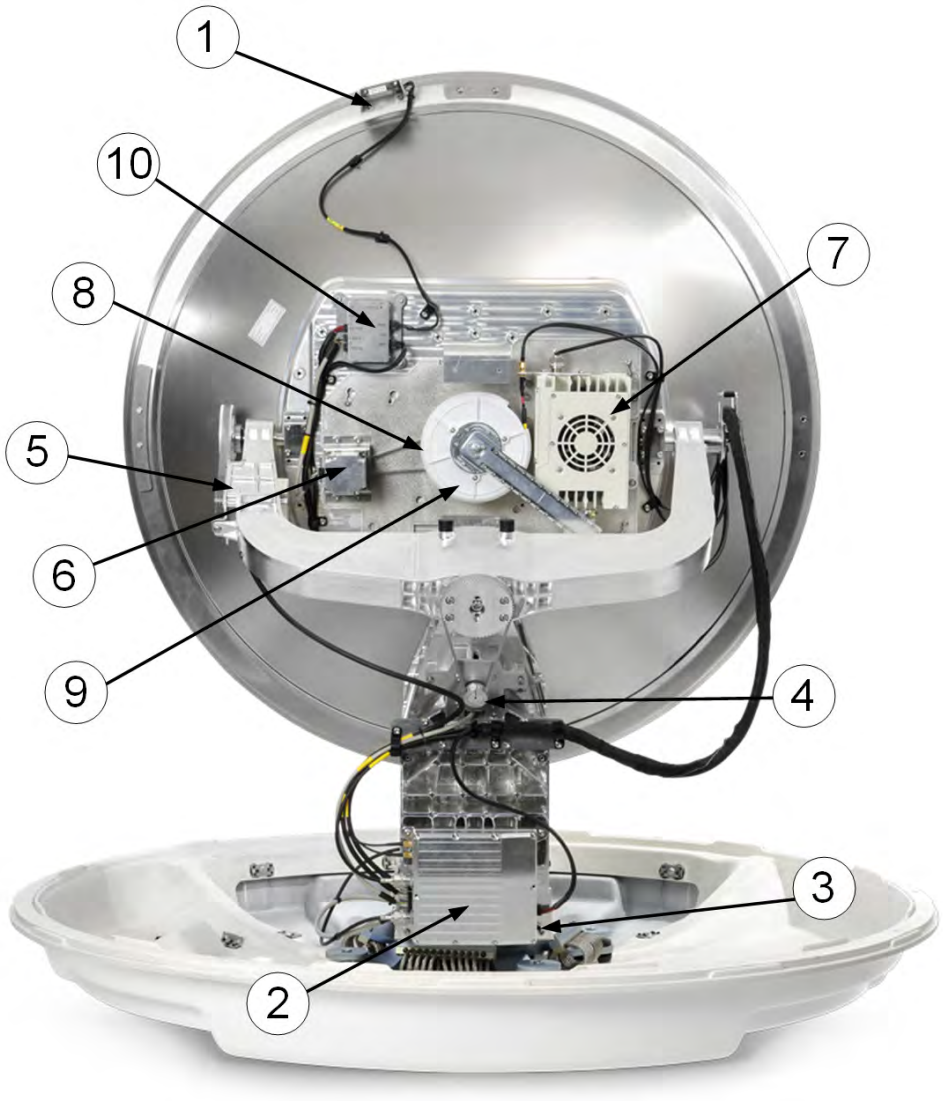


Figure 1-2: SAILOR XTR Ku: ADU modules 1/2

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.
6. Polarization motor.
7. Block Up Converter (BUC).
8. Low Noise Block downconverter (LNB) (x2).
9. Ortho Mode Transducer (OMT) (not visible on photo).
10. Inertial Sensor Module (ISM).

Figure 1-3: SAILOR XTR Ku: ADU modules 2/2

11. Zero Reference Module.
12. Azimuth motor.
13. Azimuth zero reference module.
14. Rotary joint.
15. Feed horn.

The antenna comes with lifting brackets pre-mounted and uses a single coax cable between the ADU and BDU.

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:

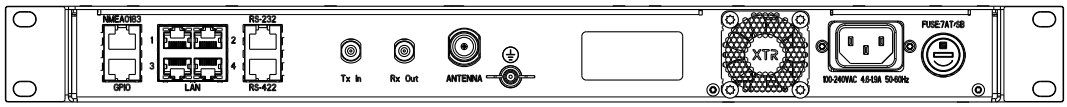


Figure 1-4: BDU, connector overview

BDU connector ID	Type	Function
NMEA0183	RJ-45	Vessel gyro input
GPIO	RJ-45	General Purpose I/O
LAN 1	RJ-45	VSAT modem
LAN 2	RJ-45	User LAN
LAN 3	RJ-45	User LAN
LAN 4	RJ-45	User LAN
RS 232	RJ-45	VSAT modem serial interface
RS422	RJ-45	VSAT modem serial interface
TX In	F	VSAT modem TX (75 Ohm)
RX Out	F	VSAT modem RX (75 Ohm)
Antenna	N	ADU signal and power (50 Ohm)
LAN	RJ45	Front LAN service port (LAN 5)

Table 1-1: BDU connectors

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

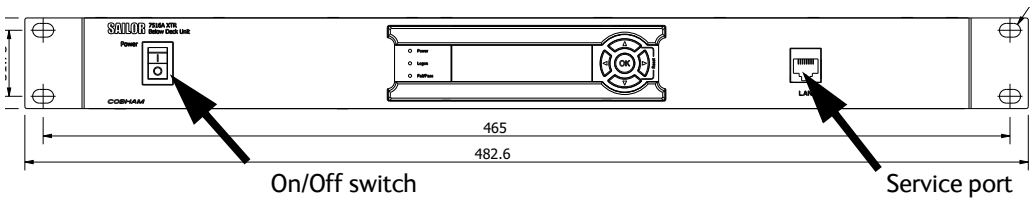


Figure 1-5: BDU front panel

1.1.3 VSAT Modem

SAILOR XTR Ku is designed to be operated with third-party VSAT modems. For a list of supported VSAT modems see the SAILOR XTR Ku product page at www.cobhamsatcom.com.

1.1.4 Satellite type approvals

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

1.1.5 Service activation

Before you can start using the SAILOR XTR Ku, 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 are available for the SAILOR XTR Ku system:

Part number	Model number	Description
407509A-00500	7509A	SAILOR 1000 XTR Ku 8W ADU
407509B-00500	7509B	SAILOR 1000 XTR Ku 16W ADU
407516A-00500	7516A	SAILOR XTR BDU

Table 1-2: Model and part numbers for the SAILOR XTR Ku system

1.2.2 Options

The following options are available for the SAILOR XTR Ku 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
407090A-010	Accessory kit for dual VSAT antenna operation
407090-001	SAILOR 1m SMART Heater, operation down to -55 C

Table 1-3: Model and part numbers for options of the SAILOR XTR Ku system

Installation

This chapter has the following sections:

- *What's in the box*
- *Site considerations*
- *Installation of the ADU*
- *Installation of the BDU*
- *Installation of the modem*
- *Integration of a 3rd party IP 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 ADU (100 cm or 60 cm)
- Accessory kit for SAILOR ADU (100 cm and 60 cm):
  - Package with bolts and washers
- SAILOR 7516A BDU
- Accessory kit for SAILOR 7516A BDU:
  - Coax cable F-F, low loss, 75 Ohm (100 cm, 2 pcs)
  - Power cable (230 VAC) with Schuko (Euro) wall plug
  - Terminal block (DIN Rail Adapter for RJ-45 connector)

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 locks of the service hatch
- Torque wrench to fasten the mounting bolts for the ADU
- Torque wrench to fasten the N connector at the ADU
- 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 from radar, GPS/GNSS, L-band and other transmitters*
- *Condensation and water intrusion*

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 Ku system. You do not have to align the ADU with the bow-to-stern line of the ship. When configuring the SAILOR XTR Ku 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:

Antenna model		Maximum EIRP level	Safety distance
407509A-00500	SAILOR 1000 XTR Ku 8W ADU	49 dBW	30 m
407509B-00500	SAILOR 1000 XTR Ku 16W ADU	52 dBW	47 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 non-metallic based. Painting the radome may impact RF performance and may lead to over-heating, causing the antenna to go in safe mode (switch off).
Cobham SATCOM recommends that the radome should 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 Ku 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 recommends **NOT** to 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.

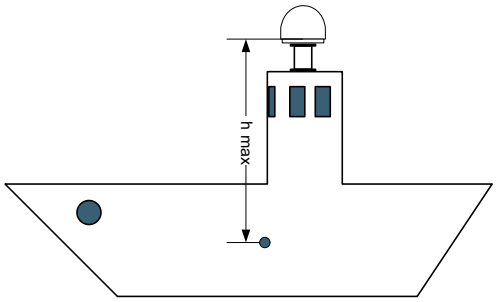


Figure 2-1: Maximum distance from the ship's motion centre (h max)

Even though it is recommended to mount the ADU high, keep the distance between the ADU and the ship's motion center as short as possible.

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 Ku band and the narrow beam width of the ADU even a **6 mm steel wire placed within 50 m** inside the beam can causes 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 degrees 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.

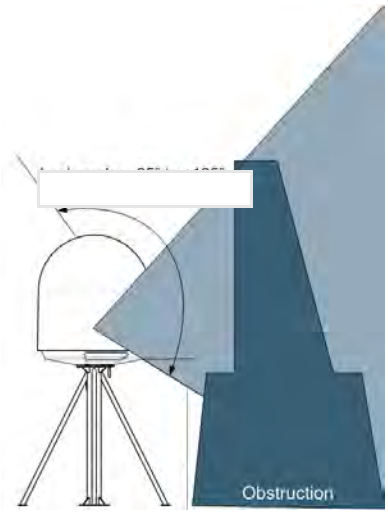


Figure 2-2: Signal degradation because of obstructing objects, look angle -18° to 118°

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. 8 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 of the BDU.

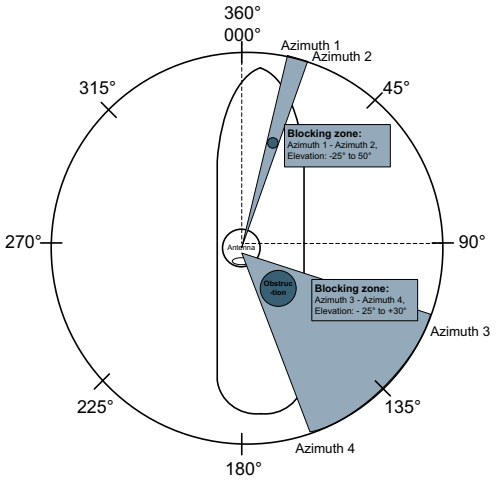


Figure 2-3: 2 Blocking zones with no-transmit zones, azimuth (example)

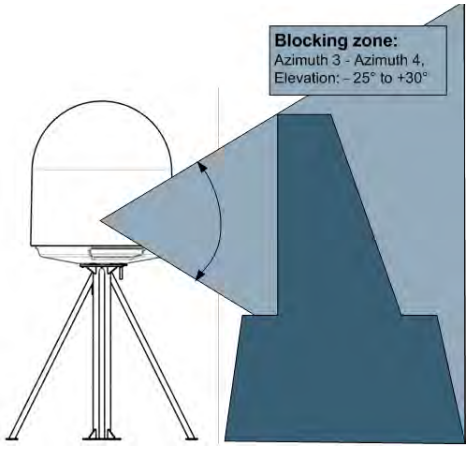


Figure 2-4: Blocking zone with no-transmit zones, elevation angle (example)

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, S355J0).

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 approximately105 kg (+ the weight of the mast flange) for the 100 cm 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 (100 cm)

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 4 gusset plates. No center hole is necessary in the flange.
   - **Flange thickness**: Minimum 15 mm.
   - **4 gusset plates**: Minimum 15 mm thick, must be placed as close as possible to the holes in the mounting plate and evenly distributed.

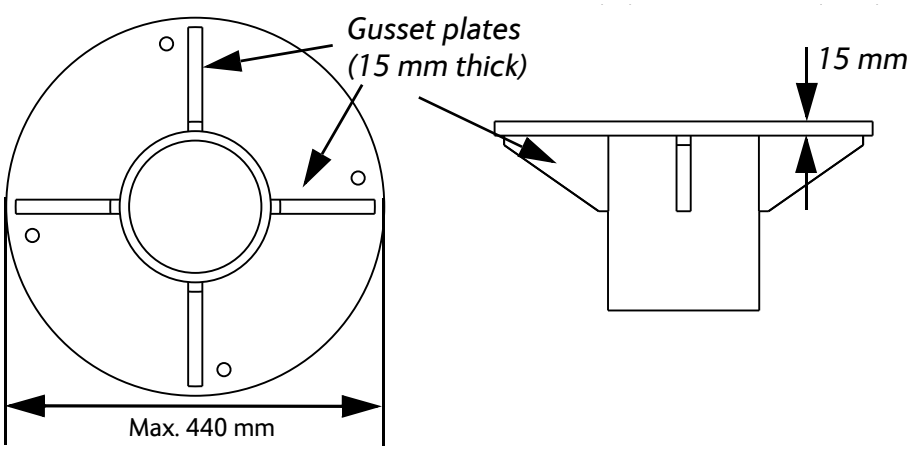


Figure 2-5: ADU mast flange, top and side view

3. Make sure that the flatness on the mast mount plateau is below 3,0 mm.

Figure 2-6: ADU mast flange, recommended flatness on the mast mount plateau

4. Allow sufficient space so the nut is free of the welded seam and there is room for tools (min. 50 mm).

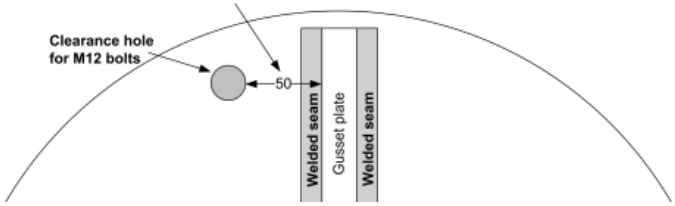


Figure 2-7: ADU mast flange, distance to the welded seam

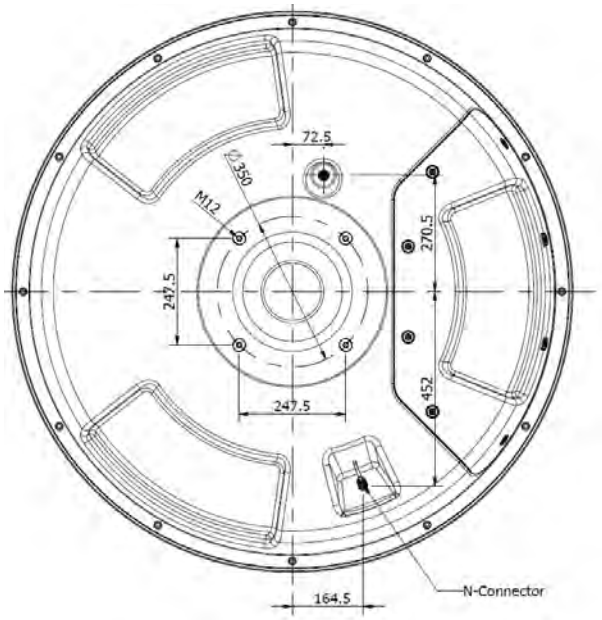


Figure 2-8: ADU, bottom view (100 cm)

Mast length and diameter

The mast wall thickness is in the following design examples set to 5 mm and the brace wall thickness to 4 mm. A larger wall thickness yields more stiffness (valid design) whereas a thinner wall thickness yields a more weak structure (not valid design).

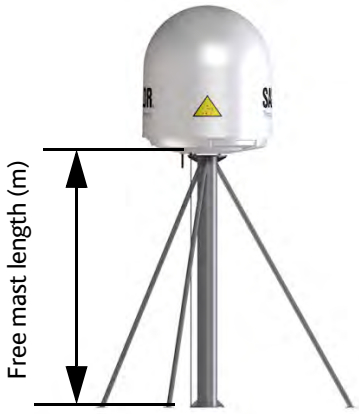


Figure 2-9: Free mast length and bracing for a tall mast

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

Note The tables list the values for **steel masts**. For **aluminium 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 (100 cm)

The below tables show the minimum dimensions for a **SAILOR XTR Ku** ADU mast with and without stays or wires. 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[a]	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

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

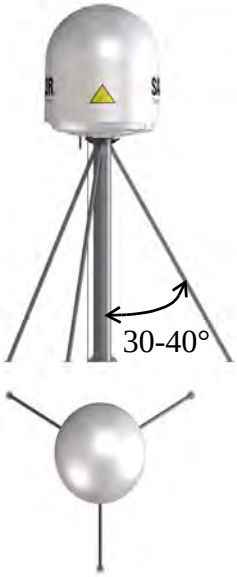
Mast with 3 braces	Max. free mast length (steel), (m)	Outer Diameter (mm)	Wall Thickness (mm)	Outer Diameter for brace (mm)	Thickness for brace (mm)
	1.2	140	10	50	5.0
	1.2	200	5	50	5.0
	1.6	140	10	70	5.0
	1.6	200	5	70	5.0
	2	160	10	70	5.0
	2	220	5	70	5.0
	2.5	180	10	80	5.0
	2.5	220	5	80	5.0

Table 2-4: Mast dimensions with 3 braces

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

2.2.4 Interference from radar, GPS/GNSS, L-band and other transmitters

Note Do not place the antenna close to interfering signal sources or receivers. For allowed distances to other transmitters see Figure 2-11. 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. Further, 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.

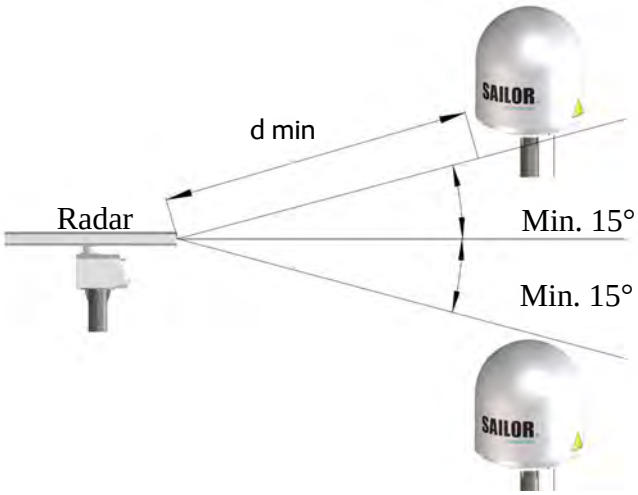


Figure 2-10: Interference with the vessel's radar

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 Ku 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 2-6: Minimum radar separation, X-band

S-band (~ 10 cm / 3 GHz) damage distance		
Radar power	**SAILOR XTR Ku 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 2-7: Minimum radar separation, S-band

Interference from radar, GPS/GNSS receivers, L-band antenna and other transmitters

Even at distances greater than “d min.” in the previous section the radar might still be able to degrade the performance of the SAILOR XTR Ku 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 Ku 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 Ku ADU to the L-band antenna.

The following figure shows the minimum recommended distance to other transmitters in the frequency range below 1000 MHz.

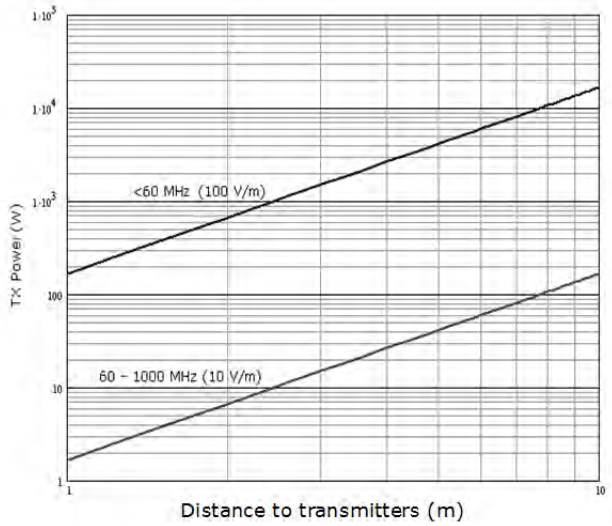


Figure 2-11: Recommended distance to transmitters (m) for frequencies below 1000 MHz

2.2.5 Condensation and water intrusion

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 it 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 2-12: 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 minimum 20 dB RF loss @ 1700 MHz (100 cm antenna) and maximum 35 dB RF loss @4450 MHZ (60 cm antenna) 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 4-32 for more details.

The DC loop resistance of the antenna cable must be maximum 0.9 Ohm. This is to ensure the power requirements from BDU to the antenna and to ensure the performance of the system. Preferably choose one of the cable types listed in the table below.

Cable type	Thickness	Max. length (m)	Max. length (ft)
RG214	3/8"	50 m	164 ft
LMR-400	0.405"	85 m	280 ft
LMR-600	1/2"	135 m	442 ft
LDF4.5-50 Andrew	5/8"	300 m	984 ft

Table 2-8: Alternative antenna cables and lengths

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:
   The RF- attenuation and the DC loop resistance are kept within the maximum specified 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 Ohm

Table 2-9: 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

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 105 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.

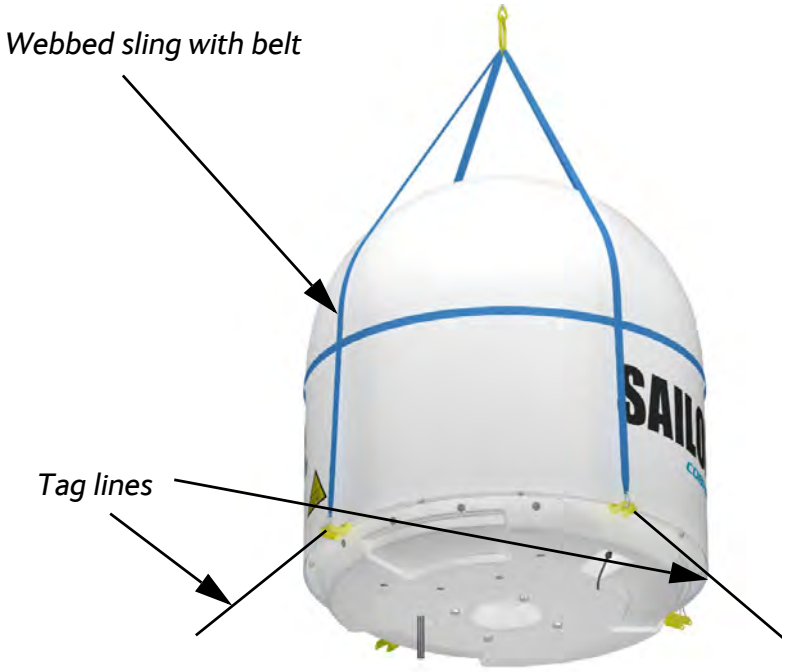


Figure 2-13: Use of strong sling with a belt and tag lines for safe hoisting

Before installing the ADU read the following guidelines.

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 from radar, GPS/GNSS, L-band and other transmitters* on page 2-10.
- 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 4 bolts** when installing the ADU.

Figure 2-14: 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 Ku 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 4 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 4 lifting brackets.

Figure 2-15: ADU installation, webbed sling attached to the 4 lifting brackets

5. Attach 2 tag lines of suitable length to 2 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 4 M12 bolts and washers. Tightening torque value: 30 Nm. Read carefully and follow instructions given in *To ground the ADU* on page E-2.

Figure 2-16: Mounting the ADU on the mast flange

8. Remove the 4 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 fasten it with 2.5 Nm.

Figure 2-17: 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 ≤ 20 dB at 1950 MHz. This is to ensure optimum performance of the system.

Maximum allowed DC loop resistance, screen plus center lead ≤ 0.9 Ohm.

To open the service hatch

Do as follows to open the service hatch:

1. With a Torx TX30 screw driver, loosen the 8 screws that keep the hatch in place.
2. Lower the service hatch and let it hang in the 2 strips

.

Figure 2-18: 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:

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.

1.

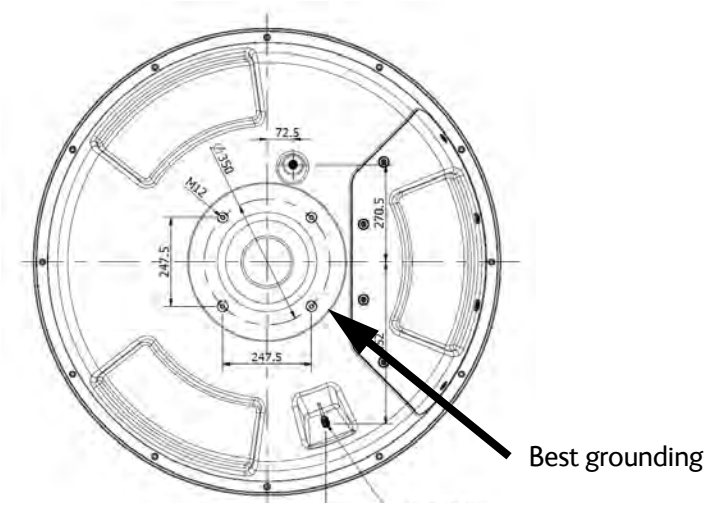


Figure 2-19: ADU, bolt for optimum grounding (100 cm)

2. Tighten the bolt. 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.

2.4 Installation of the BDU

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

2.4.1 To install the BDU

To install the BDU, do as follows:

1. Slide the BDU into a 1U space in a 19” rack.
2. Make sure that the air intakes on the side of the unit are not blocked.
3. 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.
4. Connect all cables. See *Connector panel of the BDU* on page 3-1 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.

2.4.2 To ground the BDU

1. Make sure that the grounding requirements are met. See the appendix *Grounding and RF protection* on page E-1 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.

2.5 Installation of the modem

2.5.1 Mounting considerations

1. Mount the VSAT modem close to the BDU, preferably at a distance < 1 m.
2. Connect all cables. See *VSAT modem settings* on page C-1 for guidelines how to connect one of the supported VSAT modems.
3. For cable specifications see *VSAT modem cables* on page C-1.

For interfaces of the VSAT modem and how to connect it correctly to the BDU see the user documentation of the VSAT modem. You find step-by-step guidelines in the Appendix C, *VSAT modem settings*.

2.6 Integration of a 3rd party IP device

This section describes how to integrate a 3rd party device inside the antenna radome. The antenna has the following interfaces for the integration:

- *Power connector*
- *Communication*
- *Mechanical interface*

2.6.1 Power connector

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

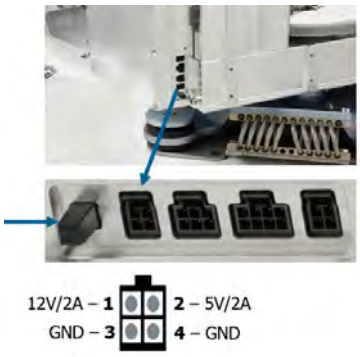


Figure 2-20: ADU power on off (left) and ACM 4-pin nano-fit connector

2.6.2 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 2-21: ACM LAN ports

2.6.3 Mechanical interface

The antenna pedestal is prepared for mounting devices on the side of the pedestal. The mounting screw holes (M5x8mm) can support a special designed mounting bracket to support mounting of a 3rd party hardware device in the antenna.

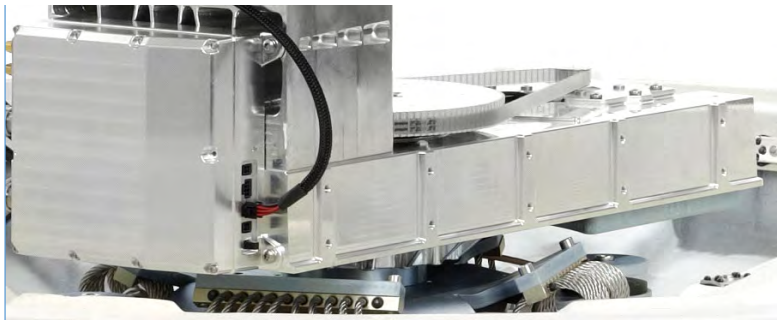


Figure 2-22: Mounting pattern on the pedestal

Fasten the mounting bracket with 4.5 Nm

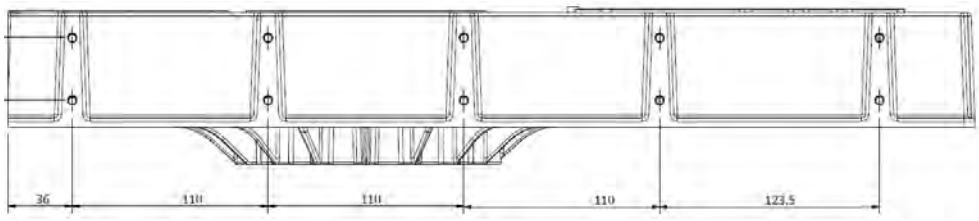


Figure 2-23: Mounting pattern, measures

2.6.4 Example of a 3rd party device integration

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 2-24: 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.

2.7 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
   - Pointing antenna
   - Acquiring Signal
   - Tracking

   This may take some time (up to a couple of minutes).
4. The SAILOR XTR Ku is ready to be calibrated (for first time power up) or receive data from the VSAT modem (when in normal operation).
   The LEDs **Power** and **Fail/Pass** are **steady green**, the LED **Logon** is off.
   Make sure there are no hardware failures or error codes present, check the display of the BDU for events.
5. Follow the instructions in the installation wizard to get the SAILOR XTR Ku system operational, see *Installation wizard* on page 4-26.

2.7.1 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.

Note that a reset via the arrow keys on the front panel is not supported.

Interfaces

3.1 Connector panel of the BDU

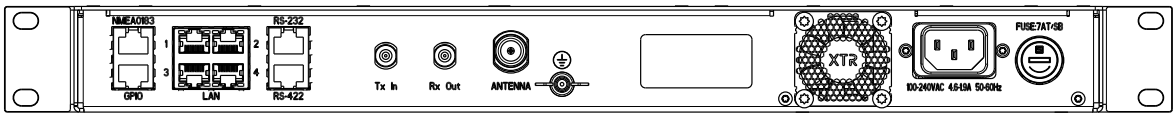


Figure 3-1: BDU: connector panel

3.1.1 AC input connector

Connect the power cable to the AC power connector.

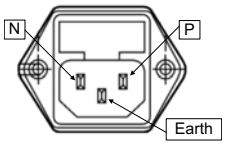
Outline (on the BDU)	Voltage range
	100–240 VAC

Table 3-1: AC power connector

3.1.2 ADU connector

There is just one cable from the BDU to the ADU. This is used to power the ADU, supply 10 MHz 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 10 MHz clock to ADU BDU to ADU internal communication VSAT Rx/Tx
	Outer	GND (Shield)

Table 3-2: 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.

3.1.3 Rx/Tx connectors for modem

Connect the Rx and Tx channels of the modem to the Rx and Tx connectors of the BDU with the 2 supplied Rx/Tx cables (75 Ohm coax, F-F, 1 m).

Outline (on the BDU)	Pin number	Pin function
	1	Inner conductor: 10 MHz clock, VSAT Rx/Tx
	2	Outer conductor: GND (Shield)

Table 3-3: F connector, Rx and Tx, outline and pin assignment

For step-by-step guidelines how to set up the VSAT modem see *VSAT modem settings* on page C-1.

3.1.4 NMEA 0183 RJ-45 connector

Connect the ship's gyro to the RJ45 connector marked NMEA.

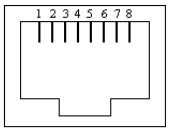
Outline (on the BDU) NMEA	Pin	I/O	Signal	Pin function
	1	O	RS-422 Line B (+)	Future use
	2	O	RS-422 Line A (-)	Future use
	3	I	RS-422 Line B (+)	Heading, balanced
	4	O	RS-232 TxD	Future use
	5		RS-422 shield	Connect only at one end
	6	I	RS-422 Line A (-)	Heading balanced
	7		RS-232 GND	Heading, single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

Table 3-4: NMEA 0183 RJ-45 connector, outline and pin assignment

To accommodate the gyro cable use the terminal block (DIN Rail Adapter 31-208142-000). The pin numbers on the adapter are the same as on the RJ45 plug.

Figure 3-2: Gyro input, terminal block

NMEA 0183

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:

1. HEHDT (North seeking Gyro compass)
2. GPHDT (GPS compass)
3. HNHDT (Non-North seeking gyro compass)
4. IIHDT (Integrated Instrument)
5. HCHDT (Magnetic compass)

Note Any HDT sentence is supported as long as it complies with the following header format: "$xxHDT" where xx can be two characters e.g. IN for $INHDT.

Recommended NMEA 0183 cable: Ethernet Cat. 5 or better.

3.1.5 GPIO RJ-45 connector

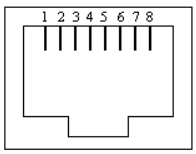
Outline on BDU	Pin	I/O	Signal	Pin function
	1	I	GPIO1	Tx mute (active high)
	2	O	12 VDC / 500 mA	Power output
	3	O	GPIO2	Rx lock (open drain)
	4	N/A	GPIO3	Future use
	5		GND	Ground
	6	O	12 VDC / 500 mA	Power output
	7	N/A	GPIO4	Future use
	8		GND	Ground
	Shield		PCB ground	PCB ground

Table 3-5: 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.

3.1.6 RS-232 RJ-45 connector

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

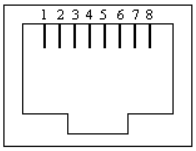
Outline	Pin	Signal	Pin function
	1	RSSI 2	Analog (0 - 14 VDC)
	2	DTR/Rx Lock	Modem Rx lock
	3	RXD	Receive data
	4	GND	Ground
	5	GND	Ground
	6	TXD	Transmit data
	7	DSR/TX Mute	Tx mute
	8	RSSI 1	Analog (0 - 14 VDC)
	Shield	PCB ground	PCB ground

Table 3-6: RJ-45 RS-232 connector, male, outline and pin assignment

3.1.7 RS-422 RJ-45 connector

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

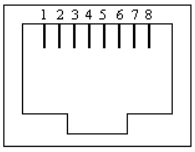
Outline	Pin	Signal	Pin function
	1	Line A RXD (+)	Receive data (non-inverting)
	2	Line A RXD (-)	Receive data (inverting)
	3	Line B TXD (+)	Transmit data (non-inverting)
	4	GND	Ground
	5	GND	Ground
	6	Line B TXD (-)	Transmit data (inverting)
	7	BUC Key line (+)	Key line (non-inverting)
	8	BUC Key line (-)	Key line (inverting)
	Shield	PCB ground	PCB ground

Table 3-7: RS-422 connector, male, outline and pin assignment

3.1.8 LAN connectors

The BDU has four Ethernet connectors (type RJ-45), located at the back of the unit, for PC/laptops, routers, 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: CAT5, shielded.

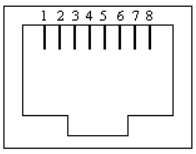
Outline	Pin	Pin function	Wire color
	1	Tx+	White/orange
	2	Tx-	Orange
	3	Rx+	White/green
	4	Not connected	Blue
	5	Not connected	White/blue
	6	Rx-	Green
	7	Not connected	White/brown
	8	Not connected	Brown

Table 3-8: Ethernet connector, outline and pin assignment

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 Ku 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 Ku are exposed to the Internet you must use a strong password as anyone with access and malicious intent can render the system inoperable

4.1 Introduction to the web interface

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

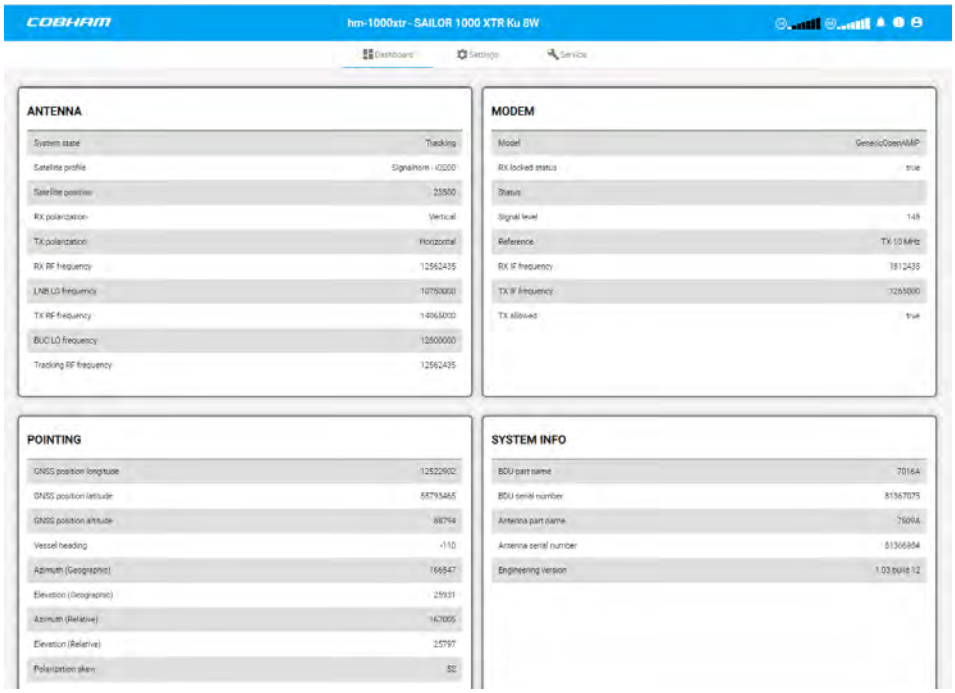


Figure 4-1: Dashboard (example)

The following figure shows the menu items of the sections **Settings** and **Service**.

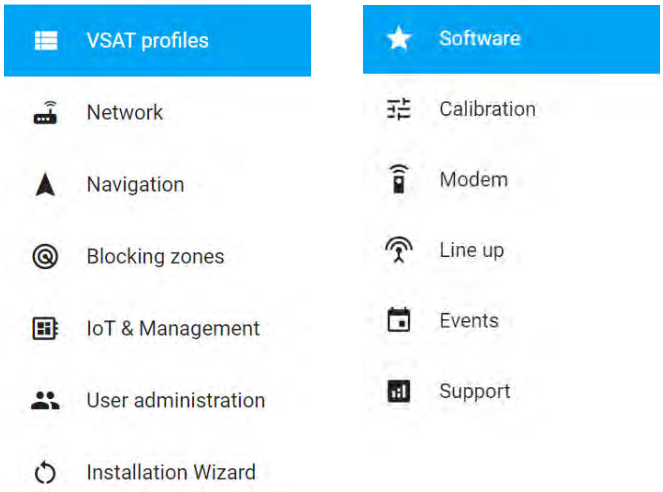


Figure 4-2: Menu items in **Settings** (left), **Service** (right)

4.1.1 Connecting to the web interface

To connect to the web interface do as follows:

1. Switch 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: Flashing 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.

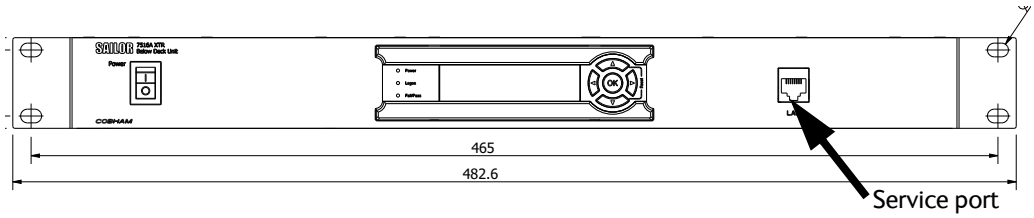


Figure 4-3: BDU, service port

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

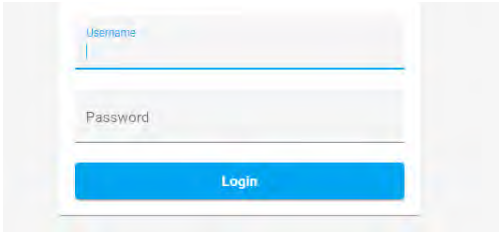


Figure 4-4: Login

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
RX polarization	Horizontal or vertical
TX polarization	Co-pol or X-pol, auto-selected by the modem
RX RF frequency	Receiving transponder frequency
LNB LO frequency	Block-down Local Oscillator, auto-selected by the modem
TX RF frequency	Modem transmit frequency
BUC LO frequency	Block-Down Local Oscillator, depending on antenna hardware
Tracking RF frequency	Antenna tracking frequency
MODEM	
Model	VSAT modem model used with the currently active VSAT profile
RX locked status	Shows whether the modem is in lock with the hub
Status	Status information received from modem. Not available for all models.
Signal level	RSSI information from the modem
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	On or Off. 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).
POINTING	
GNSS position latitude	Current position of the vessel, reported by built-in GNSS module or external GPS source.
GNSS position longitude	Current position of the vessel, reported by built-in GNSS module or external GPS source.
GNSS position altitude	Current position of the vessel, reported by built-in GNSS module or external GPS source.

Table 4-1: Sections and parameters on the Dashboard

Parameter	Description
Vessel heading	Ship's heading in degrees with reference to North, provided by ship's gyro.
Azimuth (Geographic)	Current antenna pointing for geographic azimuth
Elevation (Geographic)	Current antenna pointing for geographic elevation
Azimuth (Relative)	Current antenna pointing for relative azimuth
Elevation (Relative)	Current antenna pointing for relative elevation
Polarization skew	LNB skew angle to the current satellite
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
Engineering version	Active software version

Table 4-1: Sections and parameters on the Dashboard (Continued)

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**.

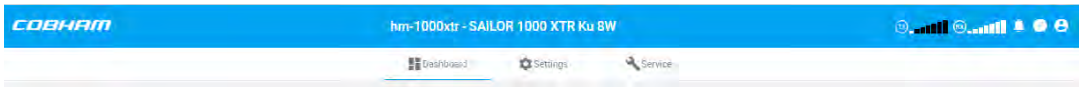


Figure 4-5: Top bar of the web interface (example)

Icon	Explanation
	TX icon, white: BUC unmuted, black: BUC muted
	Tx signal strength
	Rx signal strength
	System messages, 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

Table 4-2: Icons in the top bar

4.2 Settings

In this section you can define a VSAT profile, enter navigation input, set the blocking zones and define settings for added third-party equipment mounted in the antenna. You can also set passwords and user permissions. Furthermore you can access the installation wizard.

4.2.1 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.

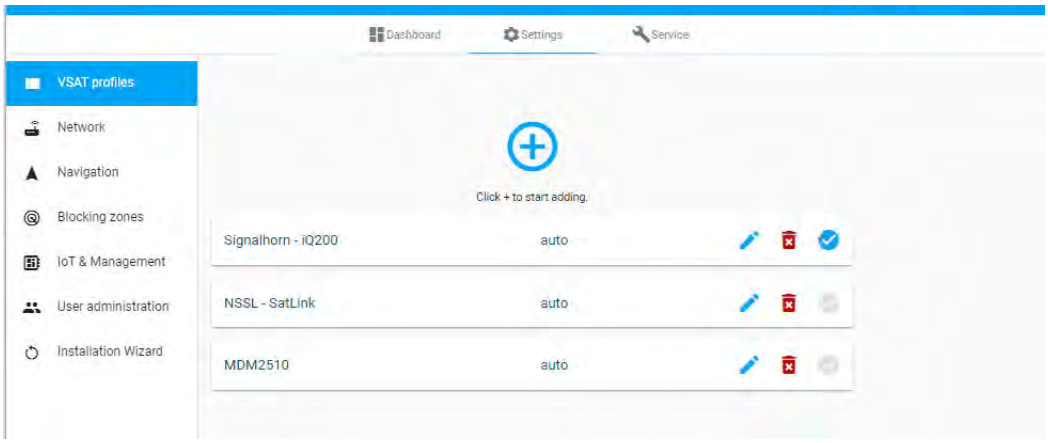


Figure 4-6: Settings - VSAT profiles

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.

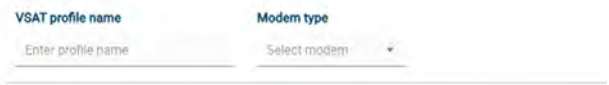


Figure 4-7: Settings - VSAT profile name and Modem type

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.

4.2.2 Modem types

The following modem types are supported:

- *OpenAMIP Modem*
- *SatLink 2910 Modem*
- *Generic Modem*

OpenAMIP Modem

To set up the modem type OpenAMIP, do as follows:

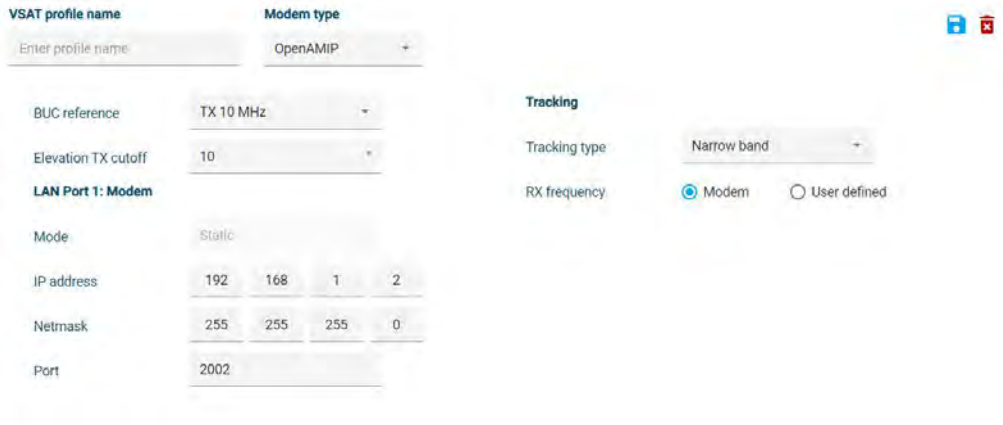


Figure 4-8: Setup of OpenAMIP Modem

1. Select the BUC reference. Recommended setting is: TX 10 MHz.
   Options are:
   - TX 10 MHz, supplied from modem TX connector
   - RX 10 MHz, supplied from modem RX connector
   - Internal, supplied by antenna
2. Set the static **IP address** for the BDU according to the modem OpenAMIP configuration.
3. Set **Netmask** for the BDU according to the modem OpenAMIP configuration.
4. Set **Port** for the OpenAMIP communication
5. Configure **Elevation cutoff** according to the country regulation. Elevation cutoff is the low elevation level according to the horizon where the antenna will seize transmission.
6. Select **Tracking type** for the antenna. Recommended setting is **Narrow band** and check **Modem** at **RX frequency**.
7. Click the Save icon to save the VSAT profile.

SatLink 2910 Modem

To set up the modem type SatLink 2910, do as follows:

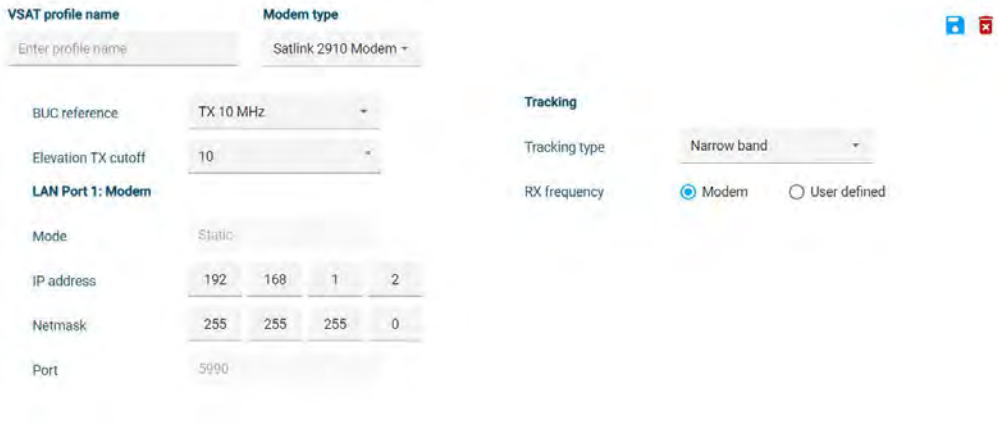


Figure 4-9: Setup of SatLink 2910 Modem

1. Select the appropriate BUC reference. Recommended setting is: TX 10 MHz. Options are:
   - TX 10 MHz, supplied from modem TX connector
   - RX 10 MHz, supplied from modem RX connector
   - Internal, supplied by antenna
2. Set **IP address** for the BDU according to the modem configuration.
3. Set **Netmask** for the BDU according to the modem configuration.
4. The IP Port is fixed to 5990 which is default settings of the SatLink 2910 modem.
5. Configure **Elevation cutoff** according to the country regulation. Elevation cutoff is the low elevation level according to the horizon where the antenna will seize transmission.
6. Select **Tracking type** for the antenna. Recommended setting is **Narrow band** and check **Modem** at **RX frequency**.
7. Click the Save icon to save the VSAT profile.

Generic Modem

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

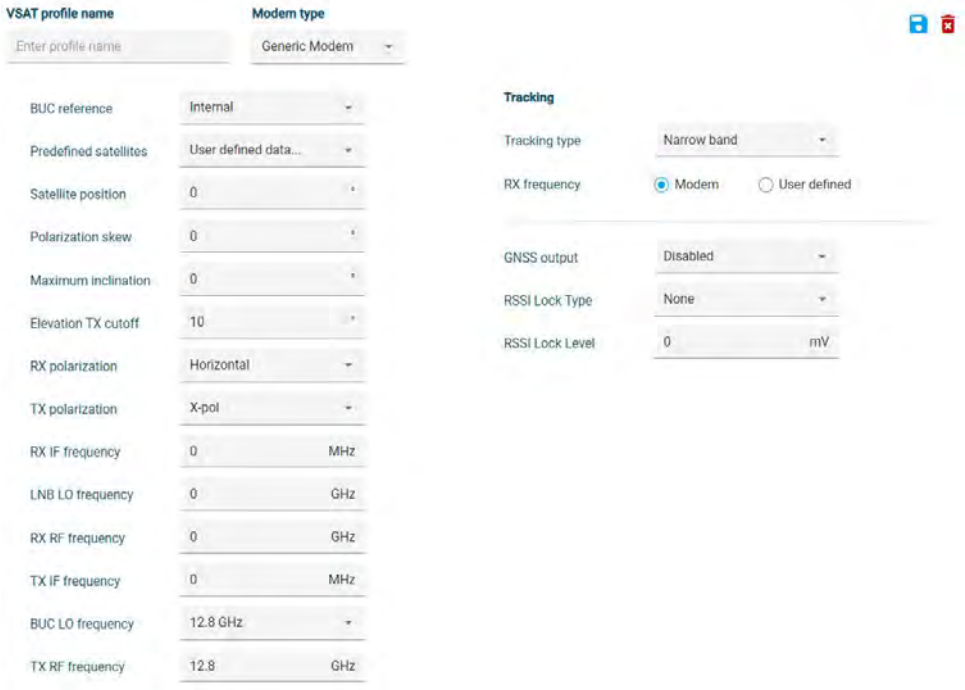


Figure 4-10: Setup of Generic Modem

Use the generic modem profile with any type of single beam VSAT modem.

1. Select the **BUC reference**. Recommended setting is: TX 10 MHz
   Options are:
   - TX 10 MHz, supplied from modem TX connector
   - RX 10 MHz, supplied from modem RX connector
   - Internal, supplied by antenna
2. Use the **Predefined satellites** drop down list to select the VSAT service satellite or enter the satellite position and polarization skew manually.
3. 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.
4. Configure **Elevation TX cutoff** according to the country regulation. It is the low elevation level according to the horizon where the antenna will seize transmission.
5. Configure all the data for the frequency setup and polarization for the VSAT service satellite.
   If the TX RF frequency is unknown just set it to mid-band e.g. 14.25 GHz for normal Ku-band (14.00 to 14.50 GHz).
6. Select **Tracking type** for the antenna. Recommended setting is **Narrow band** and check **Modem** at **RX frequency**.
7. Select **GNSS output** and appropriate baud rate if the modem need GPS input. GPS NMEA strings are available on the RS-232 connector of the BDU.
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. Click the Save icon to save the VSAT profile.

Elevation TX cutoff versus VSAT modem bandwidth and power

1. At **Elevation TX cutoff** enter the minimum elevation angle for the antenna to function in accordance with ETSI (ETSI EN 302 340) and FCC (FCC §25.205) regulations.
   - **FCC (FCC §25.205)**: 5 degrees
   - **ETSI (ETSI EN 302 340)**: The minimum elevation angle depends on the Tx bandwidth and the nominal power of the VSAT modem, see the tables below.

Bandwidth	Nominal modem power								
Modem Power [dBm]	-22	-20	-18	-16	-14	-12	-10	-8	-6
Eirp@14.25 [a]GHz [dBm]	63.4	65.4	67.4	69.4	71.4	73.4	75.4	77.4	79.4
64 kHz	3°	4°	4°	5°	6°	7°	8°	10°	12°
128 kHz	3°	4°	4°	5°	6°	7°	8°	10°	12°
256 kHz	3°	4°	4°	5°	6°	7°	8°	10°	12°
512 kHz	3°	4°	4°	5°	6°	7°	8°	10°	12°
1024 kHz	3°	4°	4°	5°	6°	7°	8°	10°	12°
2048 kHz	3°	3°	3°	4°	5°	5°	6°	8°	9°
4096 kHz	3°	3°	3°	3°	4°	4°	5°	6°	7°
8192 kHz	3°	3°	3°	3°	3°	3°	4°	5°	5°
16384 kHz	3°	3°	3°	3°	3°	3°	3°	4°	4°
32768 kHz	3°	3°	3°	3°	3°	3°	3°	3°	3°

Table 4-3: SAILOR 1000 XTR Ku 8W: Elevation TX cutoff (in degrees) versus VSAT modem bandwidth and power

a. Eirp = Fixed system gain 44 dB + antenna gain @ 14.25 GHz 41.4 dB + modem power

Bandwidth	Nominal modem power								
Modem Power [dBm]	-16	-14	-12	-10	-8	-6	-4	-2	0
Eirp@14.25 GHz [dBm][a]	69.1	71.1	73.1	75.1	77.1	79.1	81.1	83.1	85.1
64kHz-1MHz	6°	7°	8°	9°	11°	13°	16°	19°	22°
2048 kHz	4°	5°	6°	7°	8°	10°	12°	14°	17°
4096 kHz	3°	4°	5°	6°	7°	8°	9°	11°	13°
8192 kHz	3°	3°	4°	4°	5°	6°	7°	8°	10°
16384 kHz	2°	2°	3°	3°	4°	5°	6°	7°	8°
32768 kHz	2°	2°	2°	3°	3°	4°	4°	5°	6°

Table 4-4: SAILOR 1000 XTR Ku 16WElevation TX cutoff (in degrees) versus VSAT modem bandwidth and power

a. Eirp = Fixed system gain 48 dB + antenna gain @ 14.25 GHz 41.1 dB + modem power.

4.2.3 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.

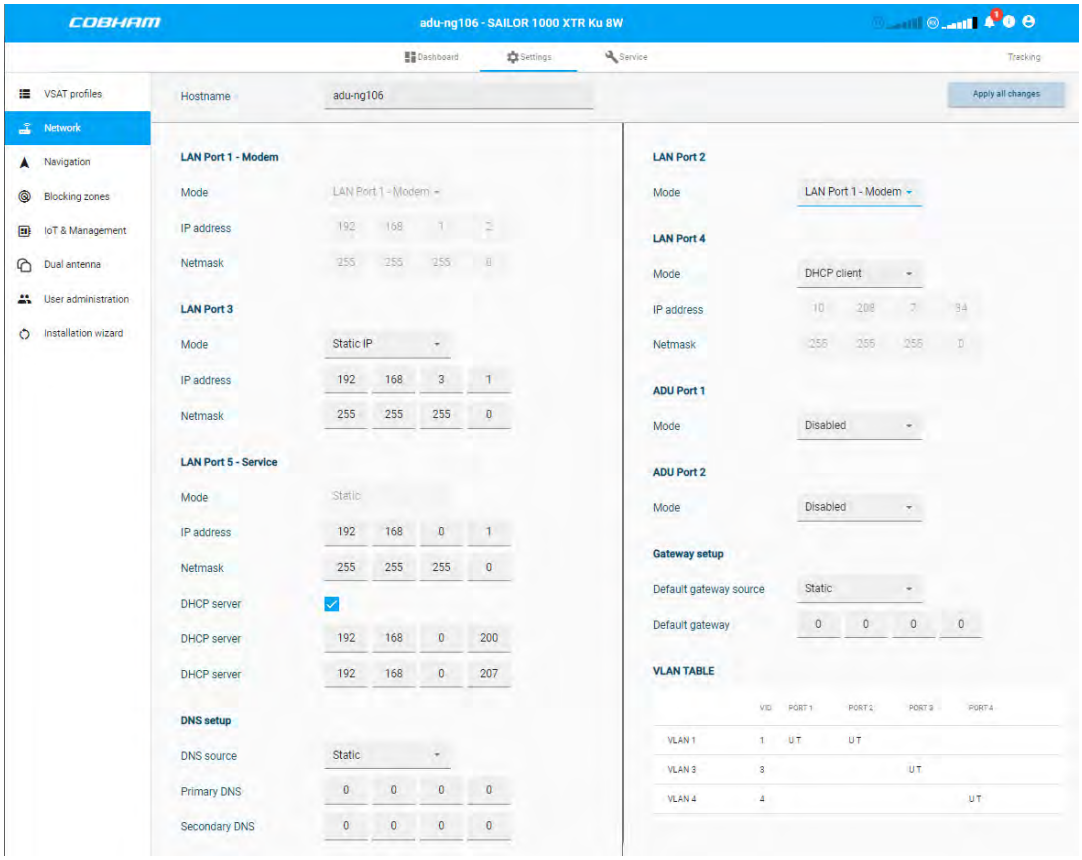


Figure 4-11: Settings, Network page (example)

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.

DNS setup

If you have access to a Domain Name Server (DNS) you can specify the address of the e-mail 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 4-18. 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	RJ-45	Disabled / Service / BDU LAN port 3
2	RJ-45	Disabled / Service / BDU LAN port 4
3	RJ-45	Disabled
4	RJ-45	Disabled

Table 4-5: ADU LAN connectors

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

4.2.4 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 make a new azimuth calibration.

1. Click **Settings > Navigation**.

Figure 4-12: Settings, Navigation (Heading and Position), (example)

2. Select a heading mode.

Heading mode	Description
External	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. **Important: Fixed heading is not allowed for sailing vessels!**
None	**Important: You must make an azimuth and cable calibration with Fixed before you can use this setting. This is required for using blocking zones. After a successful azimuth and cable calibration you must change the heading input setting from Fixed to 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 4-6: Heading modes

3. Click **Apply**.
4. Select the desired position mode.

Position mode	Description
Mode	Select one of the following: • GNSS (default) • Manual • External
GNSS	Select one of the following: • GPS (default) • BEIDOU • GPS + BEIDOU • GLONASS • GPS + GLONASS
Latitude, Longitude, Altitude	Only if **Position Mode** is set to **Manual**: Enter the values

Table 4-7: Position modes

5. Click **Apply**.

4.2.5 Operation in gyro-free mode

Heading input: none

If input from a gyro compass is not available, information from the GPS position is used when searching for a satellite.

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 degrees sky scan and scan until it finds a satellite. The satellite search time to find the satellite and start tracking is therefore raised considerably. 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 current GPS position. This will reduce the search time, but it will still be a longer search time than with heading input.

This mode can be difficult for inclined orbit satellites and elevations <5 and >70 degrees, see the following sections for details.

If a system loses the signal from the satellite, i.e. 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 is an inclined orbit satellite, the system does not have any information of the satellite latitude position but only information about inclination. This means longer search times, depending on the maximum inclination. With the increased search time for a system without heading input the search time can be so long that it will be more or less useless in practice.

Tracking for satellite elevation between 5 and 75 degrees

When the system has found the satellite and is in pointing 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 degrees.

If the satellite is an inclined orbit satellite, the missing heading information introduces a polarization error depending on the satellite elevation and the inclination. Normally it is required that the polarization is controlled within 1 degree towards 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
≤75	0

Table 4-8: Satellite elevation and maximum allowed inclination

Tracking for satellite elevation above 75 degrees

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 degrees because the system will not have the required polarization accuracy of the transmitted signal.

4.2.6 Acquisition process and search pattern

With heading input or fixed heading

1. The antenna starts the acquisition, searches for 10 seconds at the expected position. If RX lock is detected the antenna goes to 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.

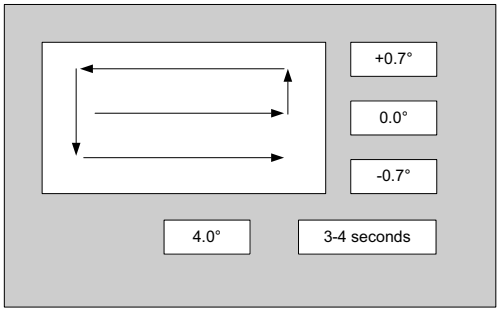


Figure 4-13: Acquisition, search pattern

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 to Tracking.

With heading input or fixed heading, Inclined Orbit Satellite

1. The antenna starts the acquisition, searches for 10 seconds at the expected position. If RX lock is detected the antenna goes to 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.

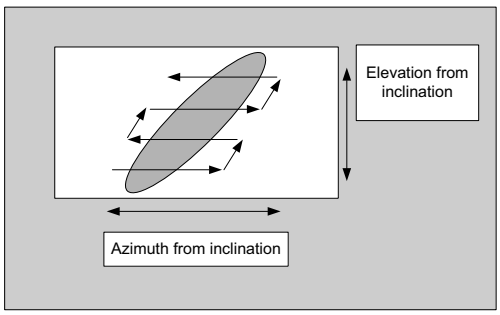


Figure 4-14: Acquisition, search pattern for inclined orbit

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 to Tracking.

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 to Tracking.

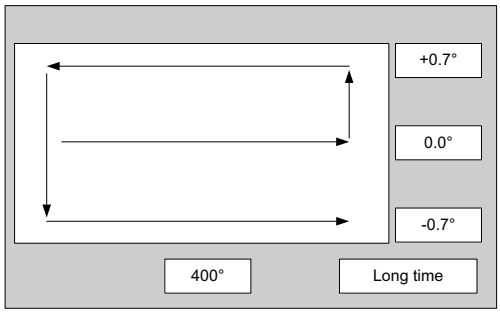


Figure 4-15: Acquisition, search pattern in gyro-free mode

Acquisition times

Activity/Inclination	0˚	1˚	2˚	3˚	4˚
Initial search	10 s	10 s	10 s	10 s	10 s
Scan box pattern	5 s	10 s	15 s	25 s	30 s
Validate result (10 s per result)	10 - 30 s	10 - 30 s	10 - 30 s	10 - 30 s	10 - 30 s
Max. total time	25 - 45 s	30 - 50 s	35 - 55 s	45 - 65 s	50 - 70 s

Table 4-9: Acquisition time

4.2.7 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 looses 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**.

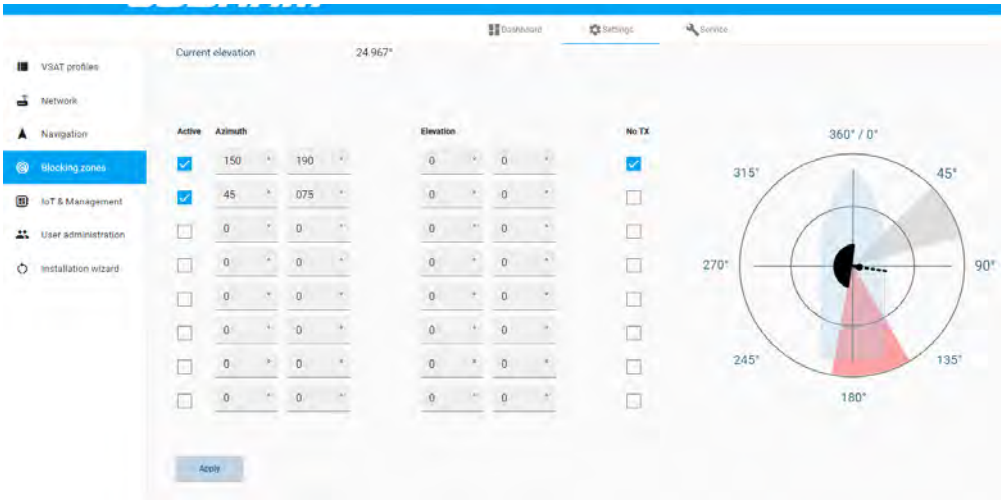


Figure 4-16: Settings, Blocking zones

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 degrees. 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 degrees.

   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.

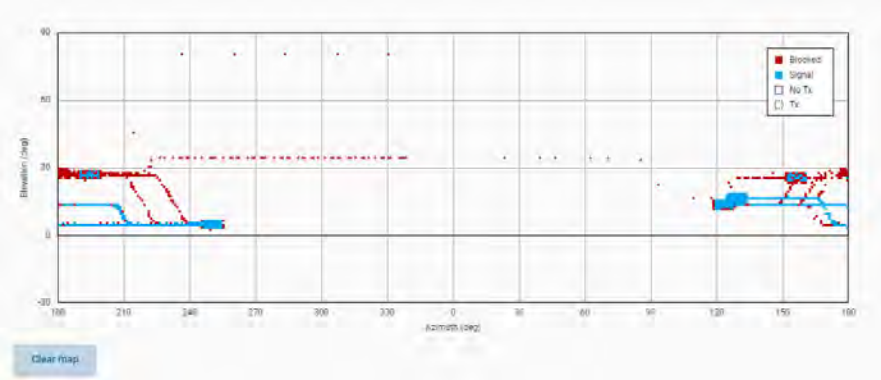


Figure 4-17: Populated blocking map (example)

4.2.8 IoT & management

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

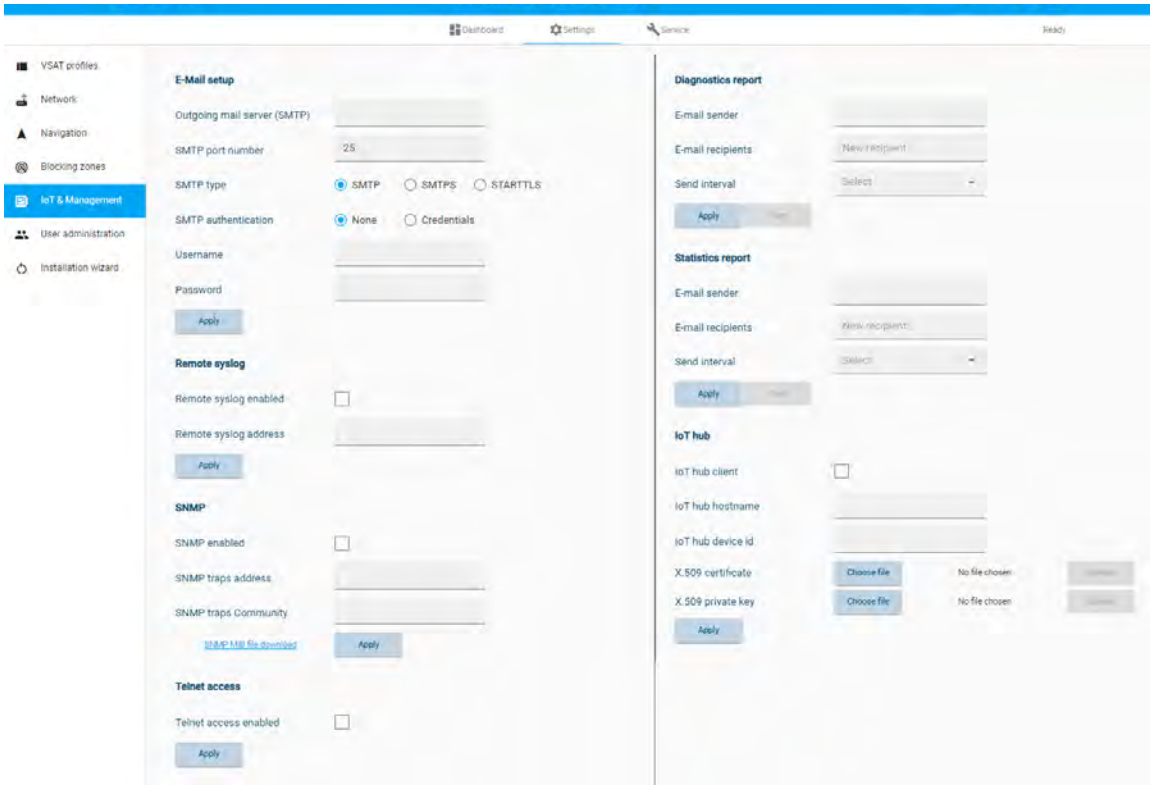


Figure 4-18: Settings, IoT & management (example)

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 > E-mail setup**.
2. 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 4-10.

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, do as follows:

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**.

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, do as follows:

1. Select **Settings > IoT & Management**.
2. In the section **SNMP** select **SNMP enabled** (default: not ticked).
3. Enter the SNMP traps address.
4. 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.
5. Click **Apply**.

The SAILOR XTR Ku supports SNMP v2 requests to retrieve configuration and present settings. SNMP is always enabled on all Ethernet interfaces. The SNMP community string is **public**. The SAILOR XTR Ku 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. 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 Ku.

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.

Diagnostics report

This report contains information from the ADU and BDU that are relevant for the service personnel during troubleshooting. The report contains data for the selected download intervals. 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:

- Software
- System
- Hardware
- Setup - System data
- Calibration - Calibration Data
- Blocking zones - Blocking zone configuration
- Network - LAN Configuration
- Modems - Modem profiles
- Satellites - Satellite profiles
- Operation - Current modem and navigation parameters.
- POST - results of the Power-On-Self-Test
- Active Events - lists the currently active events
- Events - List of all cleared events.
- System log

To set up sending a diagnostics report, do as follows:

1. Click **Settings > IoT & Management**.
2. In the section **Diagnostics report** enter the following:
   - E-mail sender.
   - E-mail recipients (comma separated).
   - Send interval: Select **Daily**, **Weekly** or **Monthly**.
3. Click **Apply**.

Statistics report

This report contains historical information from the SAILOR XTR Ku of up to 1 month. It is sent as a zipped attachment to an e-mail. 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, do as follows:

1. Configure e-mail first, see *E-mail setup (secure e-mail)* on page 4-18.
2. Go to **Settings > Reporting**.
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**.

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 Ku 8W (example)

Table 4-10: Statistics report, header record

Parameter recorded	Description
UTC. (s) UTC (YYYY-MM-DD hh:mm)	UTC in seconds and date format for the data set.
RSSI.Av RSSI.Max RSSI.Min	Received signal strength (average, maximum and minimum value) for the sampling interval.
POS.Lat (degree) POS.Long (degree) POS.Valid	Latitude value of position. Longitude value of position. Fix = valid position, No Fix = invalid position.
Heading.Samp (degree) Heading.Max (degree) Heading.Min (degree) Heading.Range (+/-degree)	Ship's heading (sample, maximum and minimum value, range) for the sampling interval. See Figure 4-19: *Statistics — how to read data for a range*.
Antenna.Azi (degree) Antenna.Azi Max (degree) Antenna.Azi Min (degree) Antenna.Azi Range (+/-degree)	Current antenna azimuth (sample, maximum and minimum value, range) for the sampling interval. See Figure 4-19: *Statistics — how to read data for a range*.
Antenna.Ele (+/-degree) Antenna.Ele Max (+/-degree) Antenna.Ele Min (+/-degree)	Current antenna elevation (sample, maximum and minimum value) for the sampling interval.
Vsat.rx_lo_freq (GHz) Vsat.tx_lo_freq (GHz)	Rx frequency of VSAT modem for this record. Tx frequency of VSAT modem for this record.
Tracking.rf freq (GHz) Tracking.type	Tracking RF frequency for this record. Narrow filter, DVB-S2 decoder and VSAT modem RSSI.
Sat.long (degree)	Longitude position of the satellite.
Carrier rf.rx (GHz) Carrier rf.tx (GHz)	Rx frequency of carrier for this record. Tx frequency of carrier for this record.
Pol.rx Pol.tx	Current Rx and Tx polarization modes

Table 4-11: Parameters in a statistics report

Parameter recorded	Description
Rx Lock (%) Logon (%)	Rx locked and 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 DualAntenna.logon_remote (%) DualAntenna.active (%)	Shows the current mode and the time active and remote logon.

Table 4-11: Parameters in a statistics report (Continued)

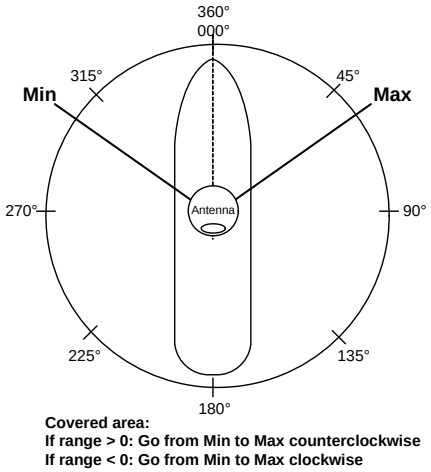


Figure 4-19: Statistics — how to read data for a range

Processing the statistics report in a spreadsheet application

The statistics report is in a data format that can be imported into spreadsheet applications, e.g. Microsoft Excel, for further processing.

1. Save the zipped file to your computer and extract the text file. The file name contains the identification of the system (example: adu-acu3_stat_20111021110901_day.csv).
2. Open the spreadsheet application. On the tab Data click the tab Import from text. Import the unzipped text file and follow the instructions in the wizard. When asked about the delimiter, select 'comma'.

IoT hub configuration

The IoT hub supports the monitoring solution from Cobham SATCOM where antenna data are sent directly into the Cobham SATCOM IoT hub. This monitoring solution requires a subscription.

Important

The IoT hub will not work without a subscription.

It is not possible to connect to the IoT hub or the data stream from external systems.

Once the subscription has been purchased from Cobham SATCOM a list of IoT Keys will be provided. Each IoT key is unique and will be bound to the antenna the first time it connects. After a connection has been made, the IoT key cannot be used on other antennas.

To enable IoT management on the page **IoT & Management**, do as follows:

1. Enter one of the provided IoT keys in the **IoT key** field.
2. Check the **IoT hub client** field.
3. For release 3.03 X.509 certificate and X.509 private key: you must manually upload them to the antenna. Contact Cobham SATCOM to receive a valid certificate and key.
4. Click **Apply**.

Figure 4-20: Setup of the IoT hub

4.2.9 Dual antenna

For details how to set up Dual antenna operation see Appendix B, *Dual antenna solution*.

4.2.10 User administration

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

- *To change a password*
- *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. You can bypass the admin password by pressing the left arrow key on the BDU for 5 seconds.

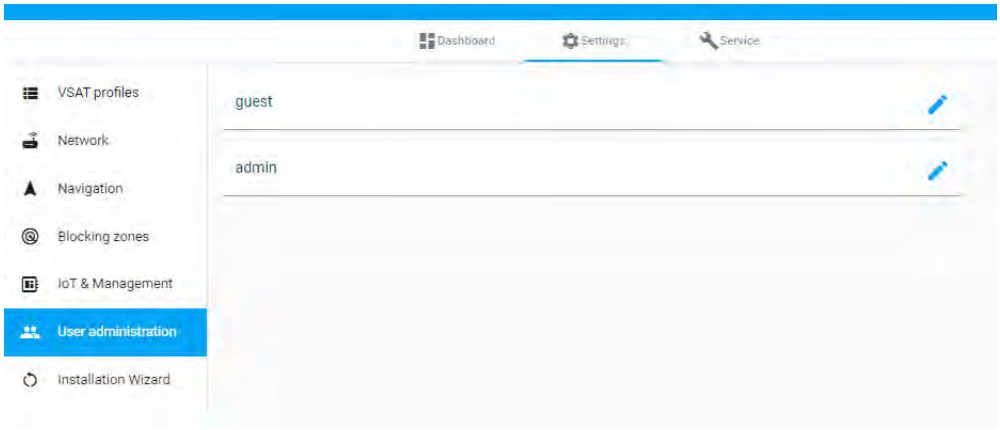


Figure 4-21: User administration, change password for admin

To change the current password, do as follows:

1. Click **Settings** and **User administration**.
2. Click the pen icon for **guest** or **admin**.
3. Enter the current password.
4. Type in the new password using minimum 8 characters, one lower and upper case letter, one number and one special character and retype it on the next line.
5. Click the icon for saving. At the next login the new password is required.

To set up permissions for guest user

You can manage user access (guest) to certain functions of the SAILOR XTR Ku 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 Ku functions you want to give guest users access to.

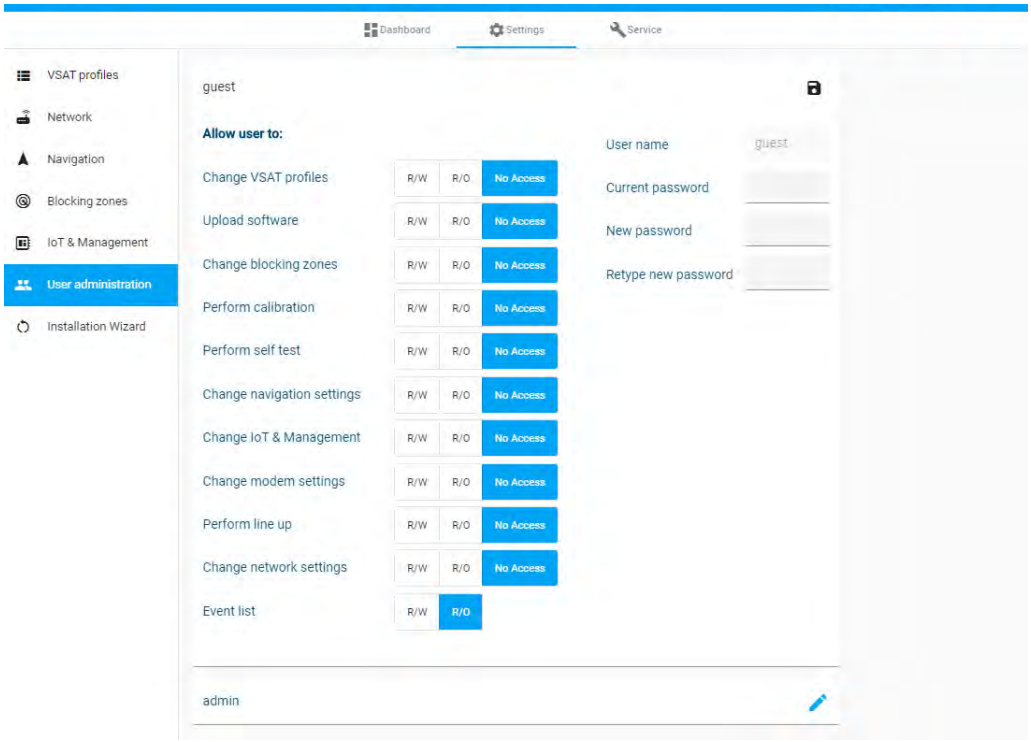


Figure 4-22: Permissions for guest users

To set up the user permissions, do as follows:

1. From the left navigation pane, select **Settings > User administration**.
2. Click the pen icon for **guest**
3. For each item under **Allow user to**: select
   - **R/W** to allow access
   - **R/O** to block access to the settings. Then the pages are read-only.
   - **No Access**, then the page is not available.
4. Click the icon for saving.

4.2.11 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**.

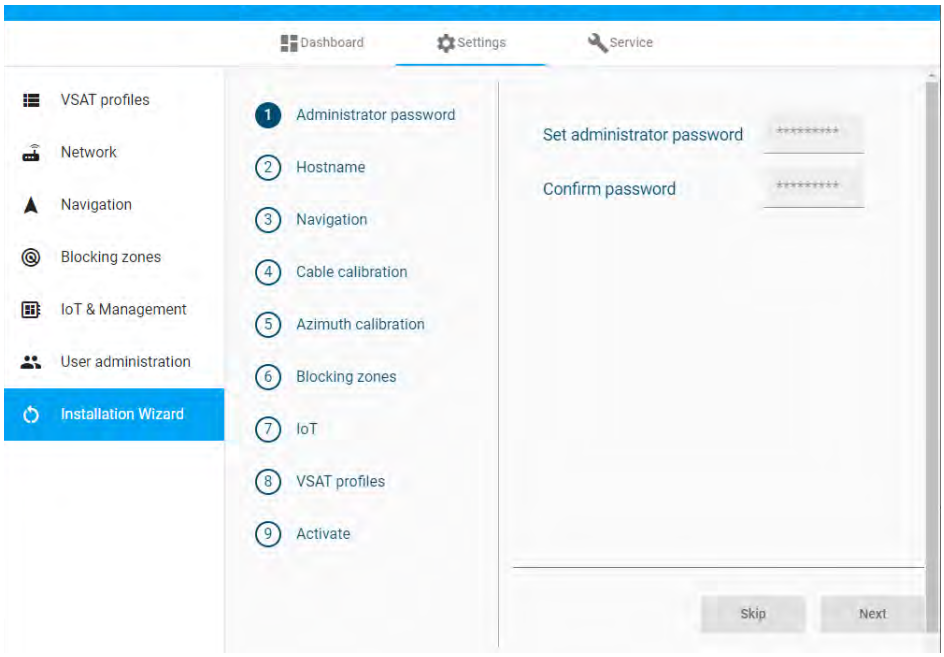


Figure 4-23: Installation wizard

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.

4.3 Service

4.3.1 Software

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

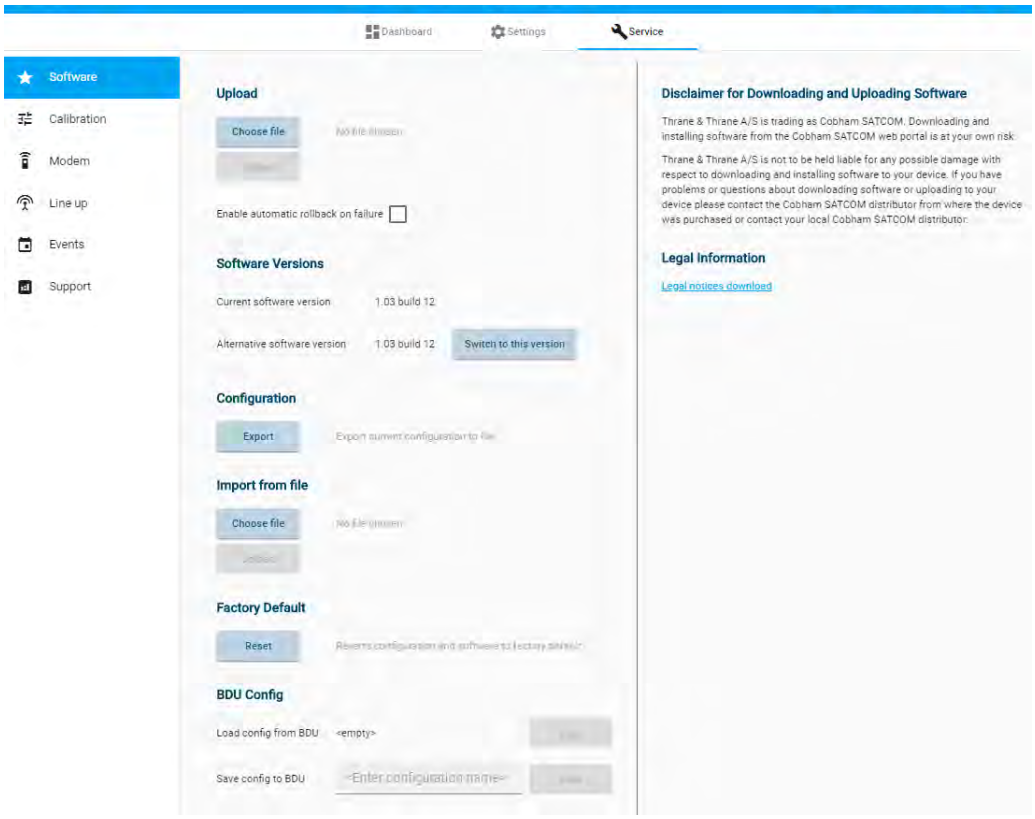


Figure 4-24: Service - Software

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 Ku system, i.e. switch on the BDU. Wait until the text INITIALISING has disappeared from the BDU display.
2. Connect a PC to he 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 an error occurs during the POST 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 (SAFE MODE)

To recover from a failed software upload, turn off the BDU and turn it on again., then the normal software image is restored.

1. Wait for the safe image.
2. Install install the software and reboot.
3. When the new software version is visible in the safe image, make a physical power cycle with the power button on the BDU.

The upload procedure takes a couple of minutes. When done, the BDU 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.

After completing the software update procedure, the SAILOR XTR Ku 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 flashing 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 in the **Dashboard i**n the box **SYSTEM INFO**.

To import and export a system configuration

If you need to reuse a configuration in another SAILOR XTR Ku, you can save the current configuration to a file, which can then be loaded into another SAILOR XTR Ku. You can also use this feature for backup purposes. The configuration file contains all the settings you have entered during system setup: VSAT 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 Ku,

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 U**pload**.

Factory default

When resetting SAILOR XTR Ku 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**, click **Reset**.

BDU Config (save antenna settings in the BDU)

You can save the current antenna/ACU 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: satellite profiles, , LAN setup, blocking zones, etc.

To save an antenna/ACU 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**.

4.3.2 Calibration

Before the SAILOR XTR Ku 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.

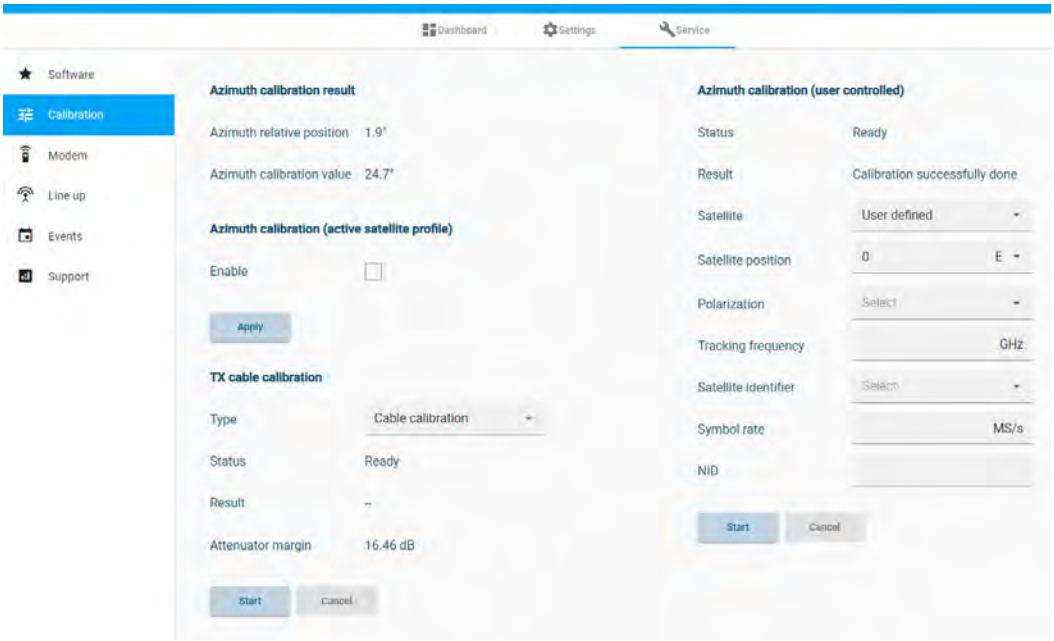


Figure 4-25: Service - Calibration

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 in inclined orbit, the elevation range is extended accordingly.

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. Create a VSAT profile
2. Click **Settings** and **Activate** the satellite profile.
3. Click **Service > Calibration**.
4. Select **Enable** in the section **Azimuth calibration (active satellite profile)**.
5. Click **Apply**.
6. Switch on the modem.

Azimuth calibration (user controlled)

To make a user-controlled azimuth calibration, do as follows:

1. On the page **Service > Calibration**, in the Satellite drop down list select **User defined**.

Note Check that the satellite transponder is visible from the location of the installation and that it is at an elevation angle between 5 and 70 degrees.

2. Enter the satellite position and polarization skew. The polarization skew is provided by the satellite operator, it is typically 0 degrees. For satellite data see *DVB-S satellites* on page G-1, www.lyngsat.com.
3. Select the polarization of a transponder and type in its frequency and symbol rate.
4. Select the LNB to be used.
5. Select which satellite identifier to use for identification of the signal.

Satellite identifier	NID value	Description
NID	0	Satellite identifier is not used.
NID	1–65535	Supplied NID is matched against Network ID broadcast by the satellite.
Orbital position	n.a.	Supplied longitude is matched with orbital position broadcast by satellite. Not all service providers broadcast the orbital position.

Table 4-12: Satellite identifier and NID values

6. Click **Start** and wait typically 5 minutes for the 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.

Table 4-13: Possible error codes during calibration

Error code	Explanation
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 4-13: Possible error codes during calibration (Continued)

Cable calibration

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. If the attenuator margin changes by 2 dB or more after a cable calibration, it is recommended to do a P1dB compression measurement to verify that the VSAT modem configuration is correct.

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).
   - User defined system gain: Allows you to set a fixed gain. Note that this may decrease the maximum allowed cable length.
   - 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 Ku is calibrated now. If the calibration failed there will be a message.

Important If input from the vessel's gyro compass is not available: Change the heading input setting from **Fixed** to **None** at **Heading** – **Input**.
Fixed heading is not allowed for sailing vessels!

4.3.3 Flow chart for calibration (user controlled)

The following flow chart gives an example of the steps in a user controlled azimuth and cable calibration.

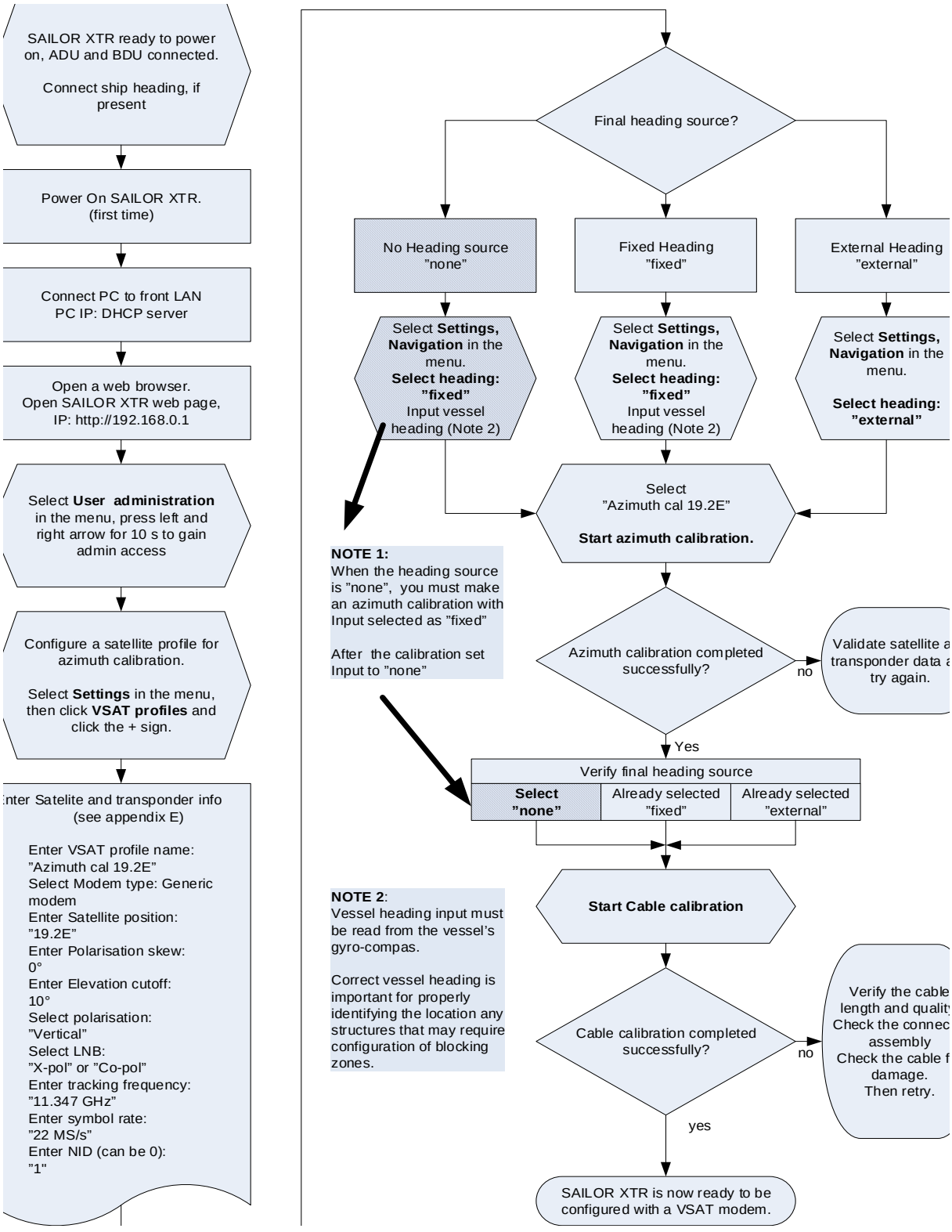


Figure 4-26: Example of a calibration (user controlled) – step by step

4.3.4 Modem access configuration (port forwarding)

For ease-of-use, you can access the modem (e.g. modem web interface) through the BDU using port forwarding. To make the modem accessible via the BDU, do as follows:

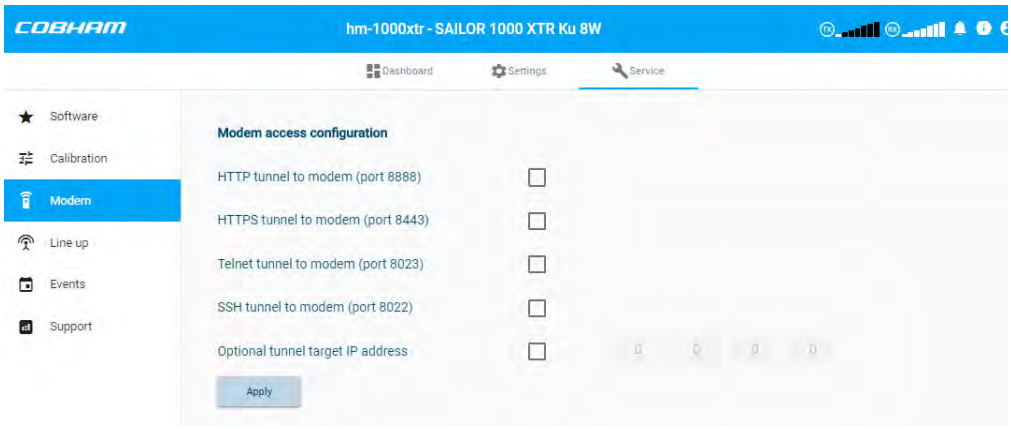


Figure 4-27: Service - Modem

1. In the BDU web interface, select **Service** > **Modem**.
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)

   Note For Ku terminals, you must always enter the modem IP address here, it cannot be left blank.
3. 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.

4.3.5 Line up

The SAILOR XTR Ku 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.

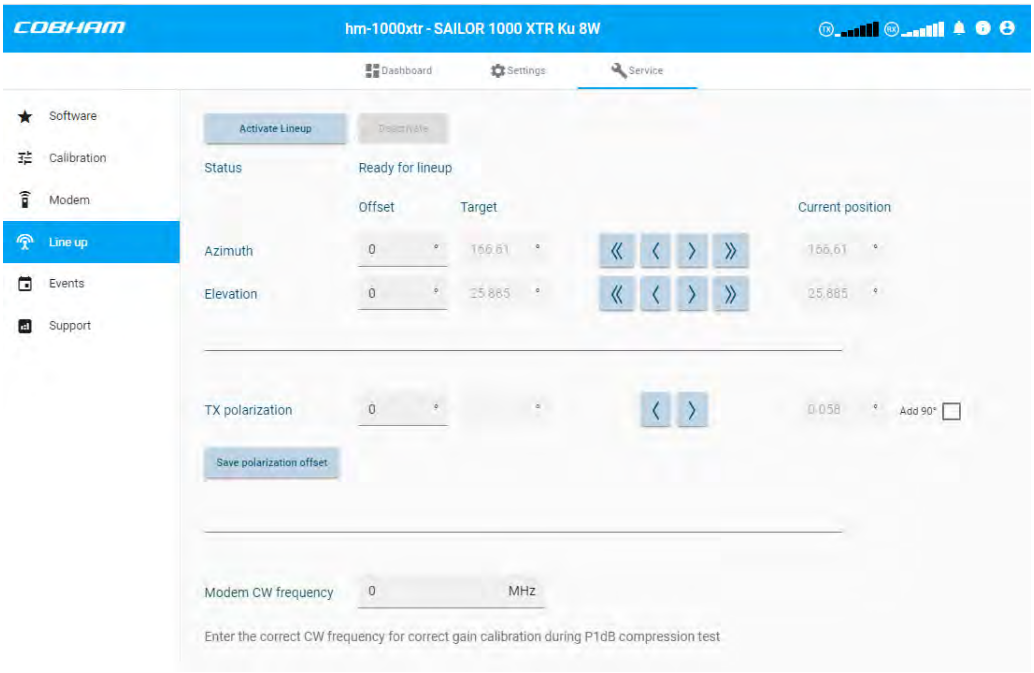


Figure 4-28: Service - Line up

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 s**hows **Antenna ready**. Follow the instructions from your service provider for Azimuth and Elevation Offset.
6. Enter the Modem CW frequency (Continuous Wave) in MHz.
   This is provided by the satellite operator, typically when talking to the satellite operator on the phone.
7. Set the values as advised by the service provider:
   - Azimuth
   - Elevation
   - TX polarization
8. If needed, add 90 degrees to the TX polarization by selecting the field.
9. Click the button **Save polarisation offset**.
10. Follow the instructions from the service provider to make a P1dB compression test (VSAT modem).
11. Click the button **Deactivate** to leave the line up procedure.

When finished, the saved value for TX polarization is visible the next time the line up procedure is selected.

4.3.6 Fixed TX gain principle

The SAILOR XTR Ku uses a fixed-gain transmitter chain concept. After calibration it provides a fixed gain from the Tx-port of the BDU to the output of the BUC. The advantages of the fixed TX gain principle are:

- Fixed TX gain over frequency and cable length
- TX gain independent of antenna cable length
- Utilization of the full BUC power over frequency
- P1dB compression point the same over frequency @ -5dBm

When installing the SAILOR XTR Ku you make a cable calibration. At that point every installation finds the same P1dB compression setting regardless of cable length. The P1dB compression point is approximately -5 dBm at the BDU Tx-port. Additionally the system monitors the TX gain in real time according to the Tx frequency reported by the modem.

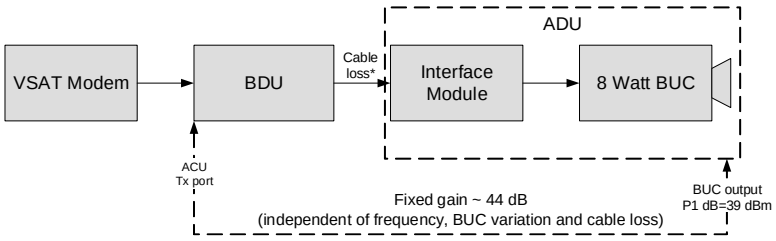


Figure 4-29: Fixed TX gain principle

Example: BDU Tx-port power:
SAILOR 1000 XTR Ku 8W: -5 dBm, BUC output: +39 dBm (Fixed gain = 44 dB)
SAILOR 1000 XTR Ku 16W: -5 dBm, BUC output: +42 dBm (Fixed gain = 47 dB)

4.3.7 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 or ERROR. The event time is UTC time. Active events are cleared from the event list when the error 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 and after 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**.

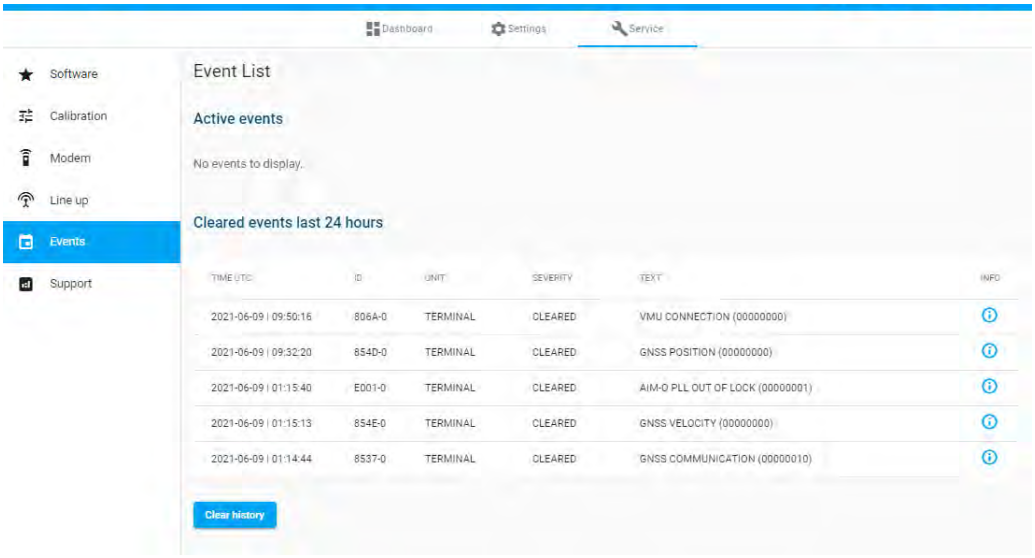


Figure 4-30: Service - Event list (example)

4.3.8 Support

On this page you can download this manual as pdf, download various reports and start a self test of the antenna. You can enable extra diagnostic logging, i.e. include data for modem communication in the diagnostics report.

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. This test lasts longer and checks more components than the regular self test.

Important | Warning! The SAILOR XTR Ku rebooted to perform the self test. Rebooting terminates all existing connections.

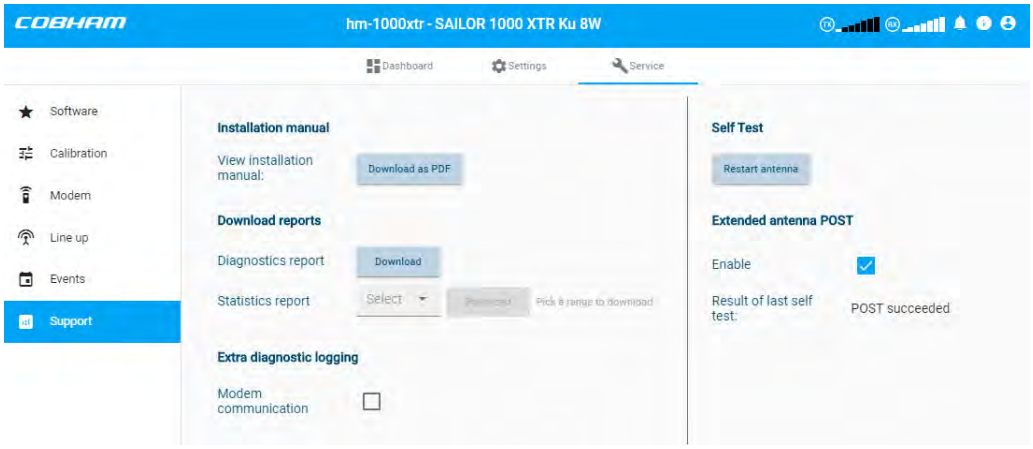


Figure 4-31: Service - Support

BUC TX information

The BUC TX information is displayed on the **Dashboard** in the section **TX**. **BUC TX** indicates if the SAILOR XTR Ku has enabled the BUC or not. It can show **On** or **Off**. This information is also shown in the display of the BDU as TX ON or TX OFF. **BUC TX On** is shown when the following conditions are met:

- The SAILOR XTR Ku must sense the 10 MHz Tx reference 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.

4.4 Keypad and menus of the BDU

4.4.1 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.

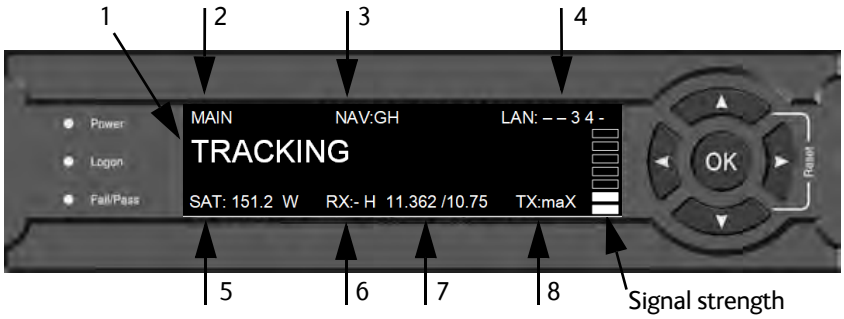


Figure 4-32: Display (example) and keypad of the BDU

1. Current status of the SAILOR XTR Ku.
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 satellite profile.
6. **RX: 1** (Rx Lock: **-** or **1**), **H** (horizontal) or **V** (vertical) (RX polarization of currently active satellite profile).
7. RF tracking frequency in GHz and LNB LO 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.

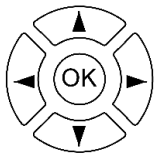
Adjusting brightness of the display

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**.

4.4.2 List of menus

The following tables show the main menu and submenus.

Top-level	Description
MAIN	View with current status of the SAILOR 1000 XTR Ku 8W. 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 4-14: Top-level menus of the BDU

ANTENNA	Description
POINTING	ANTENNA STATE: Current state of the antenna, e.g. TRACKING ELEVATION: Current elevation angle of the antenna AZIMUTH: Current azimuth of the antenna, with reference to North
POLARISATION	RX POLARISATION: HORIZONTAL or VERTICAL, read from connected VSAT modem. TX POLARISATION: X-POL or Co-POL, read from connected VSAT modem.
GNSS	LATITUDE: current latitude, read from GNSS module. LONGITUDE: current longitude, read from GNSS module. FIX TYPE: 2D or 3D
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 ADU: Serial number of the antenna
LOCAL ADMINISTRATION	Select LOCAL ADMINISTRATION to get administrator access for 1 hour or until next reboot

Table 4-15: 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	On or off, information delivered by the connected VSAT modem.
SIGNAL LEVEL	Current input signal level from VSAT modem. iDirect openAMIP modem: (PWR) 0-500, delivered by the connected modem. For values <250 the antenna searches after a new signal. Other modem: Signal level in dB.

Table 4-16: 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 LAN 1.
MASK 1	Current netmask for LAN 1.
PORT 2 IP	Current IP address for LAN 2.
MASK 2	Current netmask for LAN 2.
PORT 3 IP	(LAN 3) Current IP address of the SAILOR 1000 XTR Ku 8W web interface (default: 192.168.0.1).

Table 4-17: NETWORK menu of the BDU

NETWORK	Description
MASK 3	(LAN 3) Current netmask of the SAILOR 1000 XTR Ku 8W web interface (default: 255.255.255.0).
PORT 4 IP	Current IP address for LAN 4.
MASK 4	Current netmask for LAN 4.
DEFAULT GATEWAY	Current default gateway.
PORT 5 IP	Current IP address for LAN 5.
MASK 5	Current netmask for LAN 5.
DEFAULT GATEWAY	Current default gateway.

Table 4-17: NETWORK menu of the BDU (Continued)

SATELLITE	Description
POSITION	Position of the current satellite.
RX POLARISATION	HORIZONTAL, VERTICAL.
TX POLARISATION	X-polarization or Co-polarization, auto-selected by VSAT modem
RX FREQUENCY	Ku band receiving frequency of the active satellite, auto-selected by VSAT modem.
LNB LO	Auto selected by VSAT modem.
TX FREQUENCY	Transmission frequency, auto-selected by VSAT modem
BUC LO	12.8 GHz, system parameter

Table 4-18: SATELLITE menu of the BDU

EVENT	Description
<EVENT>	In this menu all active events are listed. Use ▼ and ▲ to go through the active events. 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. A **>** means the event text is longer than the display can show. Press to **>** to see the remaining text.

Table 4-19: EVENTS 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.

4.5 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.

5.1 Installation check list: Antenna

Step	Task	Further information	Done
1.	Check that the antenna is free of obstructions.	See *Obstructions (ADU shadowing)* on page 2-4.	
2.	Make sure there is sufficient space for access through the service hatch.	See *To install the ADU* on page 2-15.	
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 2-5 and *Blocking zones* on page 4-15.	
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 2-3.	
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 2-6.	
9.	Make sure that the distances to radar, Inmarsat systems, GPS receivers and other transmitters are as required.	See *Interference from radar, GPS/GNSS, L-band and other transmitters* on page 2-10.	
10.	Make sure that the drain tube is open and risk for water intrusion is at a minimum.	See *Condensation and water intrusion* on page 2-13.	
11.	Check that the ADU is grounded correctly, using the mounting bolts.	See *To ground the ADU* on page 2-18 and *Grounding and RF protection* on page E-1.	

Table 5-1: Installation check list: Antenna

5.2 Installation check list: BDU, connectors and wiring

Step	Task	Verification and further information	Done
1.	Check that the BDU is grounded correctly, using the mounting bolts and washers.	See *To ground the BDU* on page 2-19 and *Grounding and RF protection* on page E-1.	
2.	Make sure you strain relieved the cables.	See *To install the BDU* on page 2-19.	
3.	Make sure that the VSAT modem is mounted close to the BDU.	See *Mounting considerations* on page 2-19.	
4.	Check that the ADU antenna N-connector is properly connected with the 50 Ohm RF cable.	Visual inspection of the cover plate at the bottom of the ADU.	
5.	Check that the BDU antenna N-connector is properly connected with the 50 ohm RF cable.	Visual inspection of the connector panel of the BDU.	
6.	Check that the BDU's **Rx Out** is connected to the VSAT modem's Rx in using the included 1 m F-F 75 ohm cable.	Visual inspection of the connector panel of the BDU and the VSAT modem.	
7.	Check that the BDU's **Tx In** is connected to the VSAT modem's Tx out using the included 1 m F-F 75 ohm cable.	Visual inspection of the connector panel of the BDU and the VSAT modem.	
8.	Check connection of the VSAT modem:	Visual inspection of the connector panel of the BDU and the VSAT modem. See also: *OpenAMIP setup* on page C-3 *SatLink 2910 VSAT modem* on page C-6	
9.	Check that the ADU's NMEA 0183 connector is connected to the NMEA 0183 bus of the vessel using the included multi-connector	Visual inspection of the connector panel of the BDU connector.	

Table 5-2: Installation check list: BDU, connectors and wiring

5.3 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**. 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.). 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.). 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 5-3: 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*
- *Troubleshooting basics*
- *Returning units for repair*

6.1 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.
- Self Test, (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 in 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 F-1).

6.1.1 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	Boot loader/SW Upload

Table 6-1: LEDs of the ADU modules

6.1.2 LEDs in the BDU

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

Figure 6-1: BDU — LEDs

LED	Behavior	Description
Power	Steady green	Power supply OK
	Steady red	Power supply failure
	Off	No power
Logon	Flashing green	Current status is displayed: • Searching satellite • Identifying satellite • 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).
	Flashing green	A Power On Self Test (POST) or Self Test in progress. The current status is displayed.
	Flashing red	Active BITE failure or warning. The event is shown in the BDU display.
	Steady green	No faults.

Table 6-2: LEDs on the BDU

6.2 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.

6.3 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, ISM and motors).

6.4 Troubleshooting basics

6.4.1 Overview

This section describes an initial check of the primary functions of the SAILOR XTR Ku 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 F.

6.4.2 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 **left arrow key** for 5 seconds.
2. Wait for the very 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.

6.4.3 To verify that the antenna can go into tracking mode

In case there is no RX lock on the connected VSAT modem you can activate a VSAT profile using the generic modem to verify that the transponder data used during calibration are received correctly. If the SAILOR XTR Ku can go into tracking mode it is most likely not defective.

1. Go to **Settings** > **VSAT profiles**.
2. Activate a VSAT profile that is used for azimuth calibration. This is a satellite profile that uses the VSAT modem profile **Service & Calibration**.

3. Go to DASHBOARD and monitor the system status. If the field ends up showing Tracking, the SAILOR XTR Ku can track the satellite and is most likely not the reason why the VSAT modem is not in RX lock.

6.5 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 www.cobhamsatcom.com and select **COBHAM SYNC PARTNER PORTAL**, 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*
- *Patents*
- *Outline drawings*
- *VSAT LNB Data Sheet (physical LNB)*
- *VSAT 8W BUC Data Sheet*
- *VSAT 16W BUC Data Sheet*

A.1 Specifications

SPECIFICATIONS S1000 XTR Ku (LAMINAT RADOME)

Frequency band	Ku-Band
Reflector size	103 cm / 40.6”
Certification	Compliant with CE (Maritime), ETSI
System power supply range	100 - 240 VAC, 50-60 Hz
Total system power consumption	8.0W: 155W typ. 185W max. (excl. modem) 16.0W: 240W typ. 280W max. (excl. modem)

FREQUENCY BAND

Rx	10.70 to 12.75 GHz
Tx	13.75 to 14.50 GHz (extended band)

ANTENNA CABLE & CONNECTORS

BDU to ADU cable	Coax cable (50 Ω) for Rx, Tx, MoCA and DC power on a single cable
ADU cable connector	Female N-Connector (50 Ω)
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 supporting GPS, GLONASS and Beidou
Antenna type, reflector system	Reflector/sub-reflector, ring focus
Transmit Gain	41.6 dBi typ. @ 14.25 GHz (excl. radome)
Receive Gain	40.6 dBi typ. @ 11.70 GHz (excl. radome)
System G/T	19.9 dB/K typ. @ 12.75 GHz, at ≥30° elevation and clear sky (incl. radome)
BUC	8 W or 16 W, extended frequency, LO: 12.8 GHz
EIRP	8W: 50.1 dBW (incl. radome) 16W: 53.1 dBW (incl. radome)
LNB	2x multi-band LNBs
Polarisation	Linear X-Pol and Co-Pol
Tracking Receiver	Internal “all band/modulation type” including e.g. power, DVB-S2X, GSC and modem RSSI
Satellite acquisition	Automatic - with Gyro/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: EN60945 (8.7.2), DNV 2.4A, MIL-STD-167-1 (5.1.3.3.5). Random: Maritime
Vibration, survival	Sine: EN60945 (8.7.2) dwell, MIL-STD-167-1 (5.1.3.3.5) dwell. Random: EN60721-3-6 class 6M3 mod. by EN60721-4-6
Shock	EN60721-3-6 class 6M3 mod. by EN60721-4-6. MIL-STD-810F 516.5 (Proc. II)
Temperature (ambient)	Operational: -25°C to +55°C / -13°F to +131°F Storage: -40°C to +85°C / -40°F to +185°F
With SAILOR SMART heater option: P/N: 407090-001	Operational: -55°C to +55°C / -67°F to +131°F
Humidity	95%, condensing
Rain / IP class	EN 60945 Exposed / IPx6
Wind	80 knots operational / 110 knots Survival
Ice, survival	25 mm
Solar radiation	1120 W/m^2 to MIL-STD-810F 505.4
Compass safe distance	1.5 m / 59” to EN 60945
Maintenance, scheduled	None
Maintenance, unscheduled	All modules, motor, RF parts and belts are replaceable through service hatch
Built In Test	Power On Self-Test, Person Activated Self-Test and Continuous Monitoring w. error logging
Dimensions (over all)	Height: H 150 cm / 59” Diameter: Ø 130 cm / 51.2”
Weight	105 kg / 231 lb

BELOW DECK UNIT (BDU)

Dimensions	1U 19" rack mount HxWxD: 4.4 x 48 x 33 cm / 1.73" x 18.9" x 13"
Weight	3.6 kg / 8 lb
Temperature (ambient)	Operational: -25°C to +55°C / -13°F to +131°F Storage: -40°C to +85°C / -40°F to +185°F
Humidity	EN 60945 Protected, 95% (non-condensing)
IP class	IP30
Compass safe distance	0.3 m / 12" to EN60945
Interfaces	1 x Male N-Connector for antenna RF Cable (50Ω) with automatic cable loss compensation. 2 x F-Connectors (75 Ω) for Rx and Tx to VSAT modem 1 x Ethernet Data (VSAT Modem Control) 2 x Ethernet (User) 1 x Ethernet (Remote access) 1 x Ethernet for Service and Configuration 1 x RJ-45, RS-422 Data (VSAT Modem Control) 1 x RJ-45, RS-232 Data (VSAT Modem Control) 1 x RJ-45, NMEA 0183 (RS-422 / RS-232) for Gyro/GPS Compass input and external GPS input 1 x RJ-45, 4 x General purpose GPIO, Tx mute and Rx lock. 1 x AC Power Input 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, MQTT

VSAT Modem Support

Modem protocols	OpenAMIP SatLink roaming protocol Generic modem with optional analogue RSSI input and GPS output
Modem hardware	iDirect X7 iDirect iQ200 Newtec MDM2510 SatLink 2900/2910

A.2 Patents

The patents listed below apply to SAILOR 1000 XTR Ku 8W and SAILOR 1000 XTR Ku 16W

Patent application number	Description
11749202.5; 10-2013-7008607; 13/819,621	An assembly comprising a movable and brakable/dampable part and a method for braking a movable part
WO 2012/175705	Virtual 4-band LNB
PCT/EP2012/063849	Combined antennas without switch

Table A-1: Patents

A.3 Outline drawings

A.3.1 ADU SAILOR 1000 XTR

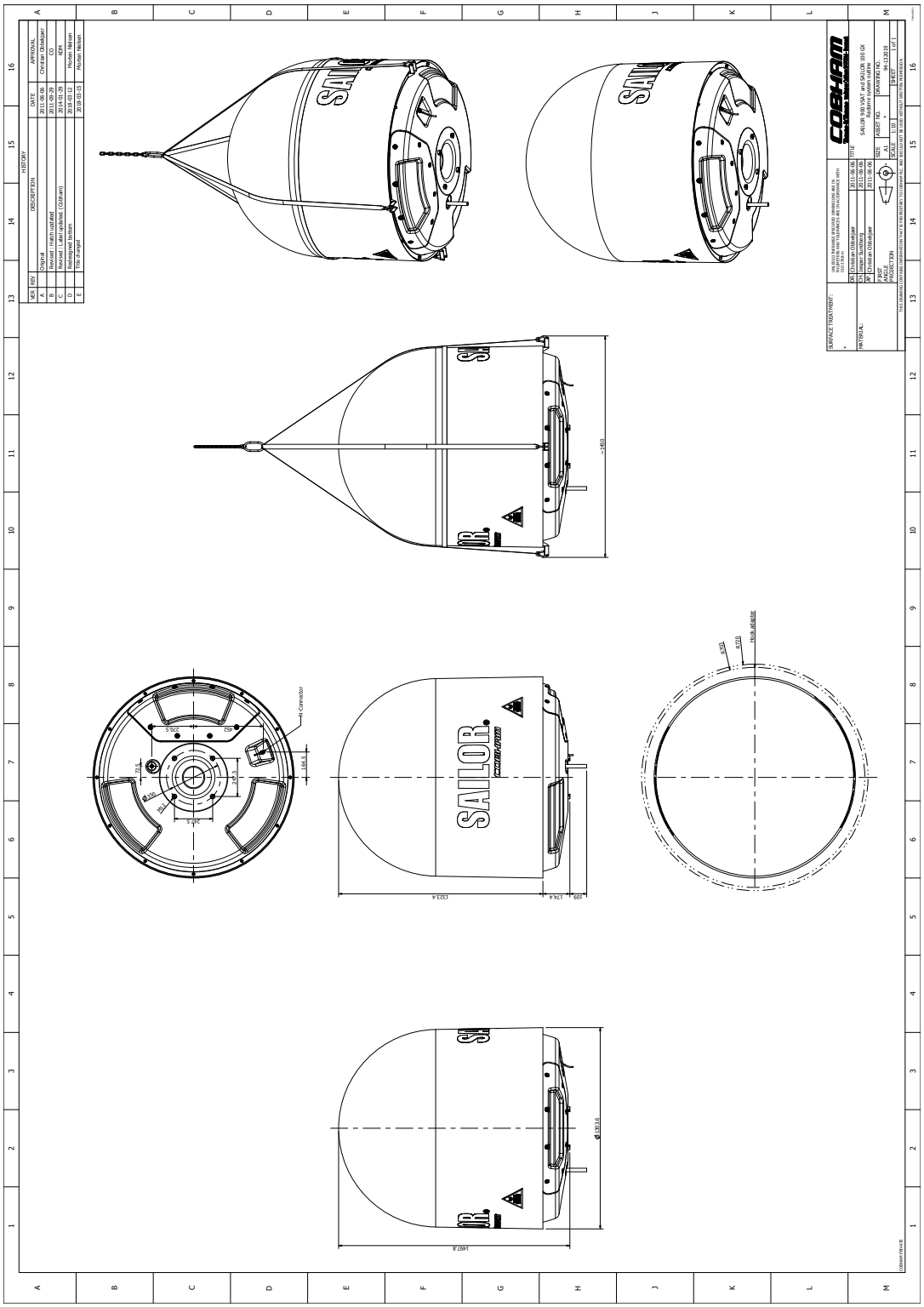


Figure A-1: Outline drawing: ADU (1 m)

A.3.2 BDU

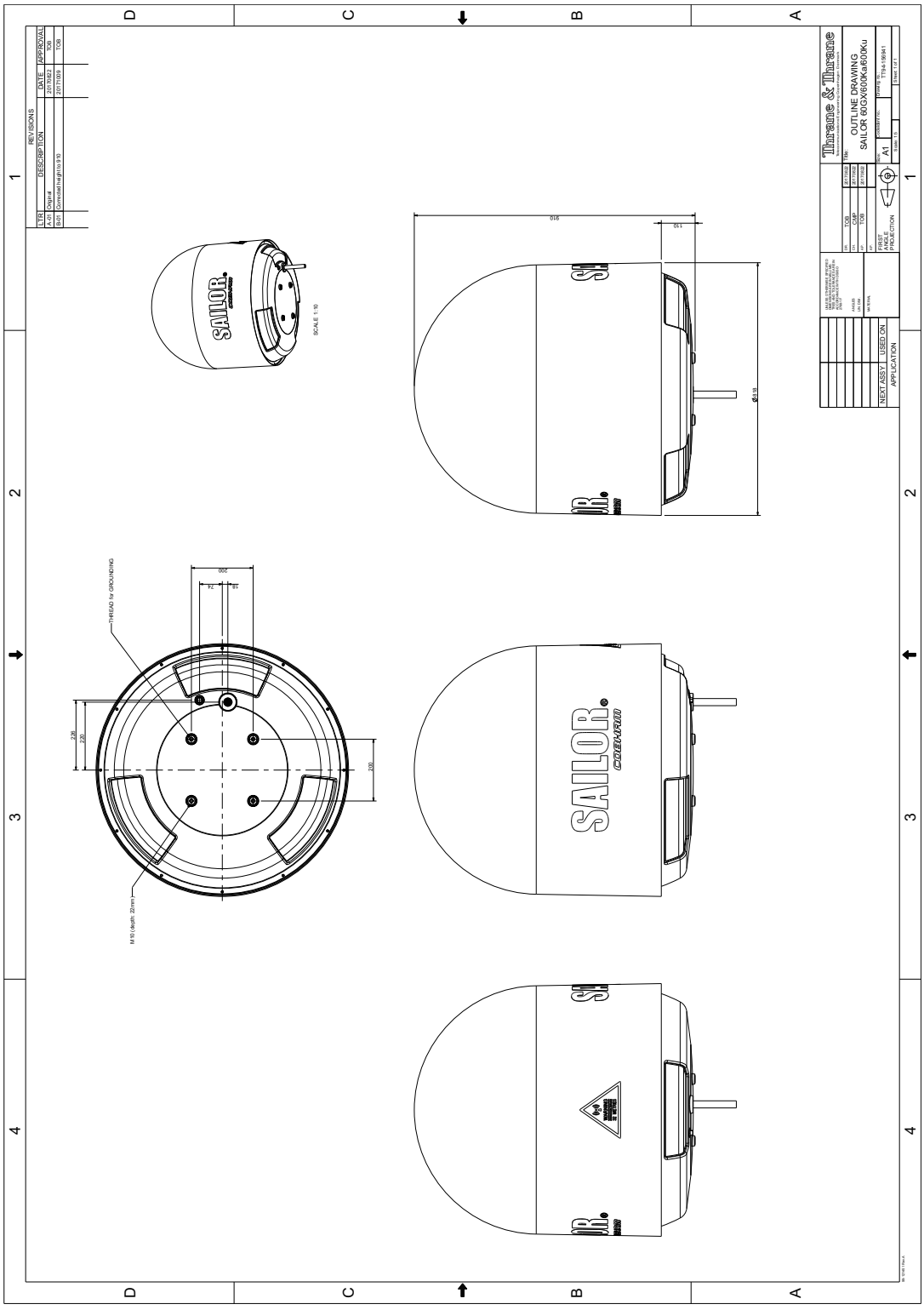


Figure A-2: Outline drawing: ADU (60 cm)

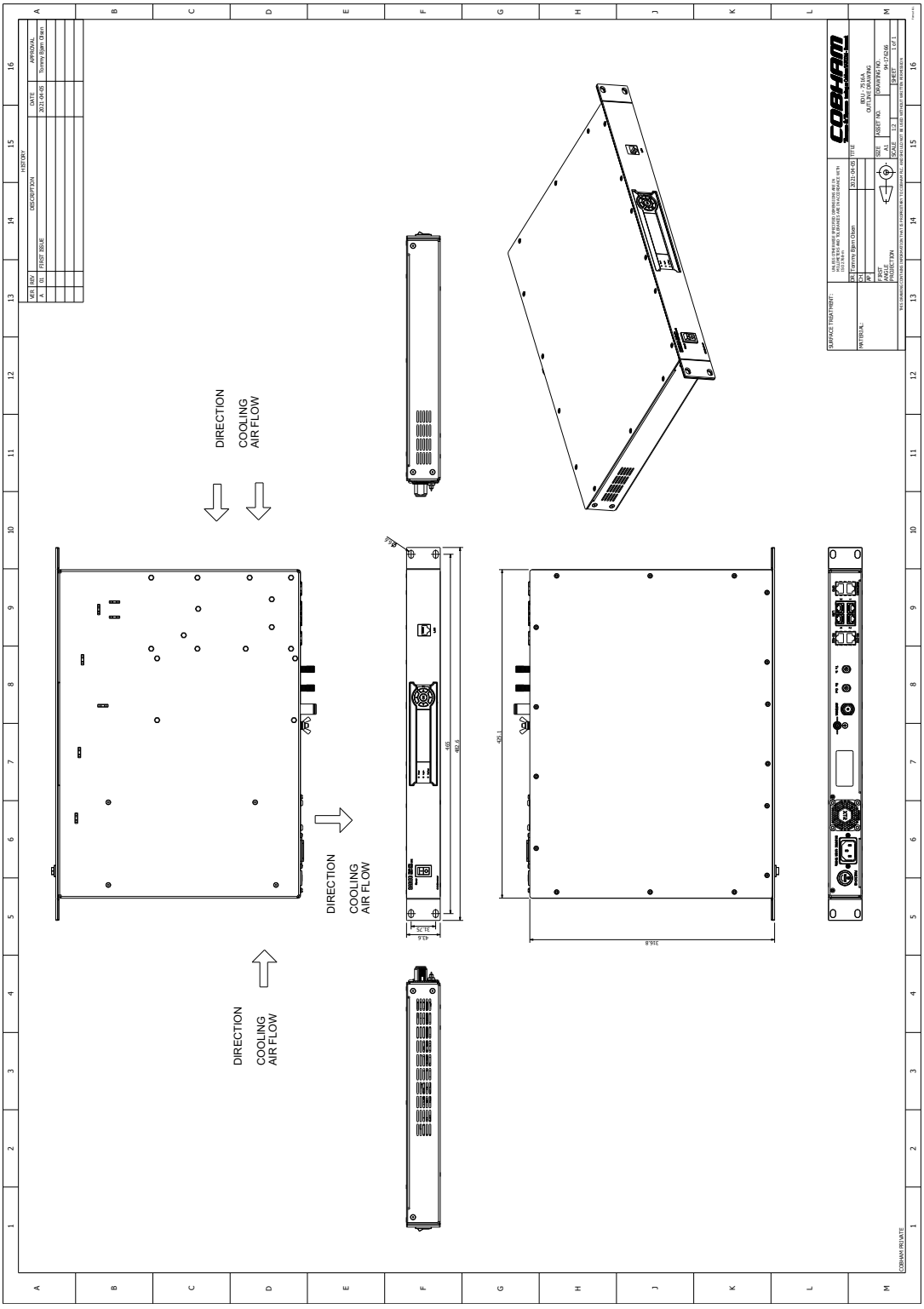


Figure A-3: Outline drawing: BDU

A.4 VSAT LNB Data Sheet (physical LNB)

The following table shows the data of the LNBs which are fitted in the ADU. The SAILOR XTR Ku is designed to make any Ku Band frequency in the range of 10.7 GHz to 12.75 GHz available to a VSAT modem by allowing the user to select the LNB LO of his choice – without having to exchange the physical LNBs in the ADU. This is achieved by the sophisticated single-cable solution. See A.4.1 for configuration information.

Interface	Model	Specification
Input, Ku-band	2-band	WR75 waveguide
Output, IF	2-band	F (50 Ohm)
LO type	2-band	Locked to 10 MHz external reference over IF interface or ADU internal
LO frequencies	2-band	9.75, 10.75 GHz

Table A-2: Technical specifications for VSAT LNB 1/2

Parameter	Condition/remark	Unit	Min.	Typical	Max.
Input frequency range	VSAT	GHz	10.7		12,75
Output (IF) frequency range	2-band	MHz	950		2150
VSWR	Input	-			2.0 : 1
	Output	-			1.7 : 1
Noise Figure	At 25 ˚C	dB		0,8	
LO stability	Over temp. range	kHz	-10	0	10
Gain		dB		60	
Gain (relative)	Over 500 MHz BW	dB	-2.0	0	2.0
Gain (relative)	Over 36 MHz BW	dB	-0.5	0	0.5
External ref. freq. (input)	Nominal	MHz		10	
Power supply voltage	DC	V	11.0		19.0
Supply current	DC	mA			350
LO selection voltage	Voltage, low (L) (input)	V	11.0		14.0
	Voltage, high (H) (input)	V	16.0		19.0
Temperature range (ambient)	Operation	˚C	-30		75
	Storage	˚C	-40		85
Weight	Total	g			350
Dimensions (incl. connector) over all	L	mm			140
	W	mm			58
	H	mm			50

Table A-3: Technical specifications for VSAT LNB 2/2

A.4.1 VSAT LNB user installation and configuration information

The SAILOR XTR Ku can interpret 4-band LNB switching signals and exact LO information acquired directly from the attached VSAT modem by means of a data connection. When using a VSAT modem which is integrated to use LO information transferred via a data connection, the LO must be in the range of 9.6 GHz to 11.3 GHz (Optimum values are 9.75 GHz and 10.75 GHz as these match the physical LNB values). All VSAT modems that can be used with SAILOR XTR Ku use this approach for selecting the LO frequency, except a COMTECH modem with ROSS server. A COMTECH modem with ROSS server reads switching signals by means of a data connection instead of using voltage and tone signals.

Example configuration for an iDirect i5100 (L-Band range 950 - 1700 MHz)

Ku-Band frequency:	11.7389 GHz
L-Band frequency:	1638.9 MHz
LO:	10.1 GHz

Since the LO frequency of 10.1 GHz is in the range of 9.6 GHz to 11.3 GHz, this is a valid set of data. The SAILOR XTR Ku will tune to 11.7389 GHz and provide the carrier on the L-Band frequency 1638.9 MHz.

Example configuration for a special VSAT modem (L-Band range 950 - 1450 MHz)

Ku-Band frequency:	12.750 GHz
L-Band frequency:	1450 MHz
LO:	11.3 GHz

Since the LO frequency of 11.3 GHz is in the range of 9.6 GHz to 11.3 GHz, this is a valid set of data. The SAILOR XTR Ku will tune to 12.750 GHz and provide the carrier on the L-Band frequency 1450 MHz.

4-band switching

When using 4-band switching and a VSAT modem which is integrated with SAILOR XTR Ku to use voltage and tone for switching, the switching is done according to the following table:

LO frequency	Voltage 11-19 V	Tone 22 kHz	Ku band frequency (L-band 950-2150 MHz)
9.75 GHz	11-14 V	Tone off	10.7-11.9 GHz
10.25 GHz	11-14 V	Tone on	11.2-12.4 GHz
10.75 GHz	16-19 V	Tone off	11.7-12.75 GHz
11.25 GHz	16-19 V	Tone on	12.2-12.75 GHz

Table A-4: 4-band switching

Currently none of the VSAT modems which are integrated with the SAILOR XTR Ku use voltage and tone switching.

A.5 VSAT 8W BUC Data Sheet

SAILOR 1000 XTR Ku 8W (NJT8318UNMR)		
1. Electrical Specifications		
1-1.	Output Frequency Range	13.75 to 14.5 GHz
1-2.	Input Frequency Range	950 to 1,700 MHz
1-3.	Maximum IF Input Level (without damage)	+13 dBm max.
1-4.	Conversion Type	Single, fixed L.O.
1-5.	L.O. Frequency	12.80 GHz
1-6.	Frequency Sense	Positive
1-7.	Output Power @ 1dB G.C.P. (P1dB)	+39 dBm min. over temperature
1-8.	Linear Gain	65 dB nom., 59 dB min.
1-9.	Gain Variation over frequency @ fixed temperature	5 dBp-p max. over 750 MHz 2 dBp-p max. over 54 MHz
1-10.	Gain Stability over temperature @ fixed frequency	4 dBp-p max. 2 dBp-p typ.
1-11.	IM3	-28 dBc typ., -24 dBc max. @ total power <= +39 dBm - 3 dB
1-12.	ACPR	-28 dBc typ. @ Pout = +38 dBm
1-13.	Requirement for External Reference [Frequency] [Input Power] [Phase Noise]	10 MHz (sine-wave) -5 to +5 dBm @ Input port -125 dBc/Hz max. @ 100 Hz -135 dBc/Hz max. @ 1 kHz -140 dBc/Hz max. @ 10 kHz
1-14.	L.O. Phase Noise	-60 dBc/Hz max. @ 100 Hz -70 dBc/Hz max. @ 1 kHz -80 dBc/Hz max. @ 10 kHz -90 dBc/Hz max. @ 100 kHz -100 dBc/Hz max. @ 1MHz
1-15.	Spurious @ P1dB Output [in band] [in receive and] [Out-of-band]	 -50 dBc max. @ RF Frequency -70 dBm max. @ 10.95 to 12.75 GHz -50 dBc max.
1-16.	Receive Band Noise Density	Tx: 14.0 to 14.5 GHz -156 dBm/Hz max. @10.95 to 12.75 GHz Tx: 13.75 to 14.0 GHz -156 dBm/Hz max. @10.95 to 12.25 GHz -125 dBm/Hz max. @12.25 to 12.75 GHz
1-17.	Noise Figure	20 dB max.
1-18.	Group Delay over any 54MHz	2.5 nS p-p max.
1-19.	Input Impedance	50 ohms nom.
1-20.	Input V.S.W.R.	2 : 1 max.
1-21.	Output V.S.W.R.	2 : 1 max.
1-22.	Output Load VSWR for Non Damage	2 : 1 max.
1-23.	DC Power Requirement [Voltage Range] [Power Consumption]	+24 / +48 VDC (+18 to +60 VDC) 65 W typ. @ No IF signal 80W typ., 90 W max. @ Pout = +39 dBm
1-24.	Mute	Shut off the HPA in case of L.O. unlocked, no 10 MHz reference signal, or Over temperature.

1-25.	LED Indicator	GREEN: L.O. locked RED: L.O. unlocked (or no 10 MHz reference signal)
	Monitor and Control <RS-232C Interface M&C > [Interface] [Functions] [Performance] 	 RS-232C Interface on MS connector Monitor: Tx Output Power / Temperature / Tx Status / Alarm (Over temperature) / L.O. unlock) / Step Attenuator Control: Transmit On/Off / Step Attenuator Tx Output Power: Detector Range: 15 dB (up to P1dB) Reading Accuracy: +/- 1.0 dB Step Attenuator: Attenuator Range: 0 to 15.5 dB Attenuator Step: 0.5 dB
2. Mechanical Specifications		
2-1.	Input Interface [IF Connector] [DC Input]	 N-type, female IF Connector
2-2.	Output Interface	Waveguide, WR-75 (with Groove)
2-3.	Cooling	Forced-air-cooled
2-4.	Dimension & Housing	180(L) × 130(W) × 80(H) mm [7.09” (L) x 5.12” (W) x 3.15” (H)] without interface connectors and screws
2-5.	Weight	2.4 kg, [5.3 lbs]
3. Environmental Specifications		
3-1.	Temperature Range (ambient) [Operating] [Storage]	Operation: -40 to +75 °C Performance: -40 to +55 °C -40 to +75 °C
3-2.	Humidity	0 to 100 %
3-3.	Altitude	15,000 feet (4,572 m)
3-4.	Vibration	5 G [49.03 m/s2] (3 axis, 50 Hz to 2 kHz) 1 mm p-p (3 axis, 5 to 50 Hz)
3-5.	Shock	30 G [294.20 m/s2] (3 axis)
3-6.	Waterproof / Dustproof (IP Code)	IP 67
3-7.	Regulations	EU Directive (CE Marking) EMC (2004/108/EC)
3-8.	Comply with RoHS (Restricting the use of Hazardous Substances) directives	

A.6 VSAT 16W BUC Data Sheet

SAILOR 1000 XTR Ku 16W (NJT8319UNMR)		
1. Electrical Specifications		
1-1.	Output Frequency Range	13.75 to 14.5 GHz
1-2.	Input Frequency Range	950 to 1,700 MHz
1-3.	Maximum IF Input Level (without damage)	+13 dBm max.
1-4.	Conversion Type	Single, fixed L.O.
1-5.	L.O. Frequency	12.80 GHz
1-6.	Frequency Sense	Positive
1-7.	Output Power @ 1dB G.C.P. (P1dB)	+42 dBm min. over temperature
1-8.	Linear Gain	68 dB nom., 62 dB min.
1-9.	Gain Variation over frequency @ fixed temperature	5 dBp-p max. over 750 MHz 2 dBp-p max. over 54 MHz
1-10.	Gain Stability over temperature @ fixed frequency	4 dBp-p max. 2 dBp-p typ.
1-11.	IM3	-28 dBc typ., -24 dBc max. @ total power <= +42 dBm - 3 dB
1-12.	ACPR	-28 dBc typ. @ Pout = +41 dBm
1-13.	Requirement for External Reference [Frequency] [Input Power] [Phase Noise]	10 MHz (sine-wave) -5 to +5 dBm @ Input port -125 dBc/Hz max. @ 100 Hz -135 dBc/Hz max. @ 1 kHz -140 dBc/Hz max. @ 10 kHz
1-14.	L.O. Phase Noise	-60 dBc/Hz max. @ 100 Hz -70 dBc/Hz max. @ 1 kHz -80 dBc/Hz max. @ 10 kHz -90 dBc/Hz max. @ 100 kHz -100 dBc/Hz max. @ 1MHz
1-15.	Spurious @ P1dB Output [in band] [in receive and] [Out-of-band]	 -50 dBc max. @ RF Frequency -70 dBm max. @ 10.95 to 12.75 GHz -50 dBc max.
1-16.	Receive Band Noise Density	Tx: 14.0 to 14.5 GHz -156 dBm/Hz max. @10.95 to 12.75 GHz Tx: 13.75 to 14.0 GHz -156 dBm/Hz max. @10.95 to 12.25 GHz -125 dBm/Hz max. @12.25 to 12.75 GHz
1-17.	Noise Figure	20 dB max.
1-18.	Group Delay over any 54MHz	2.5 nS p-p max.
1-19.	Input Impedance	50 ohms nom.
1-20.	Input V.S.W.R.	2 : 1 max.
1-21.	Output V.S.W.R.	2 : 1 max.
1-22.	Output Load VSWR for Non Damage	2 : 1 max.
1-23.	DC Power Requirement [Voltage Range] [Power Consumption]	+48 VDC (+36 to +60 VDC) 140 W typ. @ No IF signal 160W typ., 180 W max. @ Pout = +42 dBm
1-24.	Mute	Shut off the HPA in case of L.O. unlocked, no 10 MHz reference signal, or Over temperature.

1-25.	LED Indicator	GREEN: L.O. locked RED: L.O. unlocked (or no 10 MHz reference signal)
	Monitor and Control <RS-232C Interface M&C > [Interface] [Functions] [Performance]	 RS-232C Interface on MS connector Monitor: Tx Output Power / Temperature / Tx Status / Alarm (Over temperature) / L.O. unlock) / Step Attenuator Control: Transmit On/Off / Step Attenuator Tx Output Power: Detector Range: 15 dB (up to P1dB) Reading Accuracy: +/- 1.0 dB Step Attenuator: Attenuator Range: 0 to 15.5 dB Attenuator Step: 0.5 dB
2. Mechanical Specifications		
2-1.	Input Interface [IF Connector] [DC Input]	 N-type, female IF Connector
2-2.	Output Interface	Waveguide, WR-75 (with Groove)
2-3.	Cooling	Forced-air-cooled
2-4.	Dimension & Housing	180(L) × 130(W) × 80(H) mm [7.09” (L) x 5.12” (W) x 3.15” (H)] without interface connectors and screws
2-5.	Weight	2.4 kg, [5.3 lbs]
3. Environmental Specifications		
3-1.	Temperature Range (ambient) [Operating] [Storage]	 Operation: -40 to +75 °C Performance: -40 to +55 °C -40 to +75 °C
3-2.	Humidity	0 to 100 %
3-3.	Altitude	15,000 feet (4,572 m)
3-4.	Vibration	5 G [49.03 m/s2] (3 axis, 50 Hz to 2 kHz) 1 mm p-p (3 axis, 5 to 50 Hz)
3-5.	Shock	30 G [294.20 m/s2] (3 axis)
3-6.	Waterproof / Dustproof (IP Code)	IP 67
3-7.	Regulations	EU Directive (CE Marking) EMC (2004/108/EC)
3-8.	Comply with RoHS (Restricting the use of Hazardous Substances) directives	

Dual antenna solution

This appendix has the following sections:

- *Introduction*
- *Installation of the dual antenna solution*
- *Configuration of the dual antenna solution*
- *Flow chart for installation of the dual antenna solution*

B.1 Introduction

The SAILOR XTR Ku 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 Ku in dual antenna mode with 2 ADUs, 2 BDUs and the dual-antenna accessories kit. The kit consists of two 75 Ohm RF cables, an RF splitter and an RF combiner. 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 Master BDU and a Slave BDU. The VSAT modem is connected to and configured in the Master BDU. The Slave BDU is configured as a slave unit. It is connected with an Ethernet cable to the Master ACU from which it gets all satellite information. You can use any LAN port as long as the Master and the Slave are in the same 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 cranes etc.

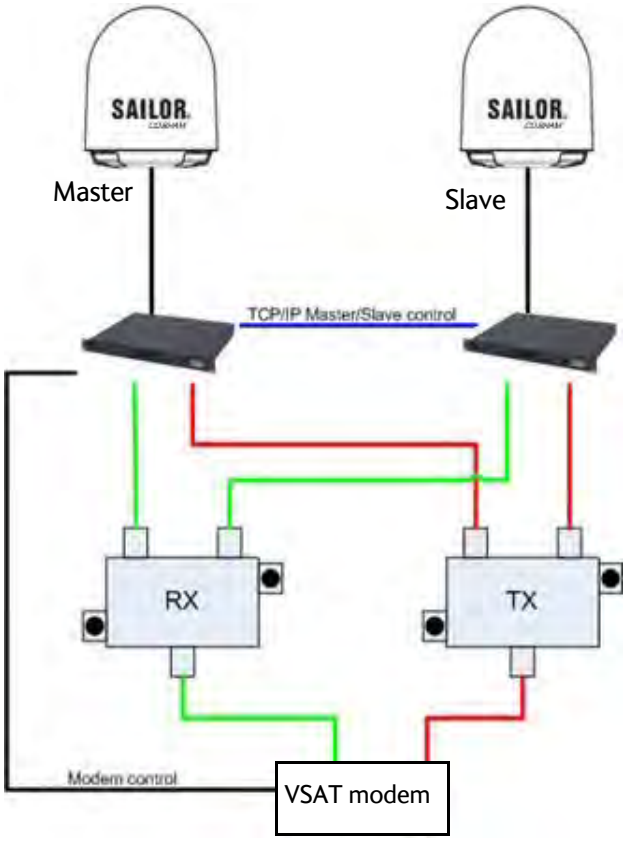


Figure B-1: Dual mode antenna, overview

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 the antenna can see 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 Ku Dual antenna solution:

- 1 x SAILOR XTR Ku System (Master System)
- 1 x SAILOR XTR Ku ADU (Slave Above Deck Unit)
- 1 x SAILOR XTR Ku BDU (Slave 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)

B.2.2 Installation

To install the dual antennas, do as follows:

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

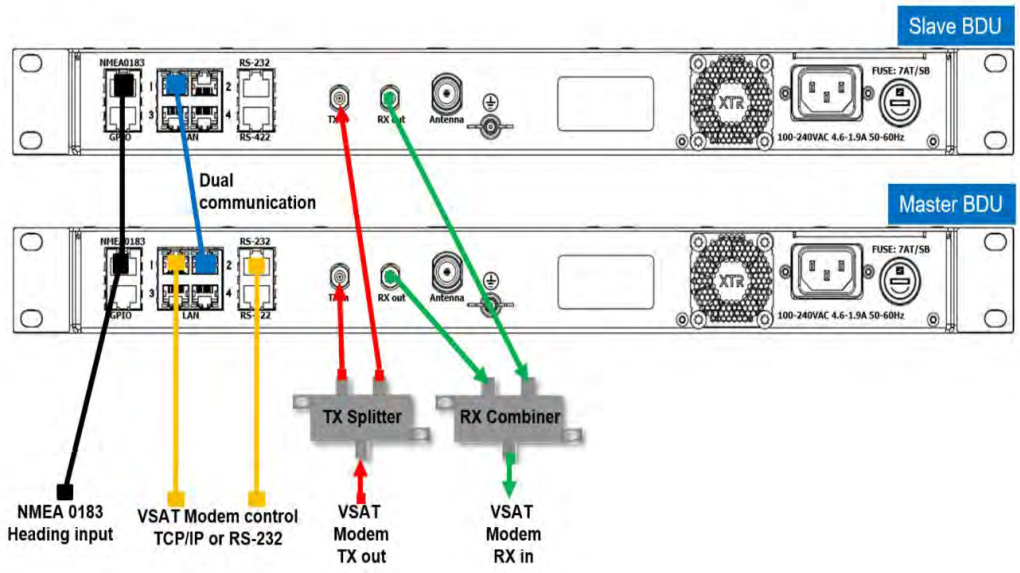


Figure B-2: Dual mode antenna, connecting cables (example)

Connect cables	Purpose
NMEA0183 Slave BDU to Master BDU	NMEA heading input
LAN 1 Slave BDU to LAN 2 on Master BDU	Dual communicaation
Master BDU LAN1 or RS-232 for VSAT Modem control TCP/IP	Modem control
Master BDU TX In to TX Splitter	TX when Master is active
Slave BDU TX In to TX Splitter	TX when Slave is active

Table B-1: Dual mode antenna, cabling

Connect cables	Purpose
Master BDU Rx Out to RX Combiner	RX when Master is active
Slave BDU Rx Out to RX Combiner	RX when Slave active
VSAT modem TX out to TX Splitter	Input from VSAT modem
RX combiner to VSAT modem RX In	Outpur to VSAT modem

Table B-1: Dual mode antenna, cabling (Continued)

B.3 Configuration of the dual antenna solution

B.3.1 Configuration task

The master antenna is configured the same way as a stand-alone antenna. The master always listens for a slave connection. The slave antenna initiates the master/slave connection. When master has connectivity to a slave it will forward satellite pointing data to the slave. If the master then loses connection to the slave it will continue in stand-alone operation.

The following list shows the tasks for setting up a dual-antenna system:

- *To configure the Master BDU*
- *To configure the Slave BDU*
- *Blocking zone setup for dual antenna setup*
- *Lineup and commissioning for dual antenna setup*

On the DASHBOARD, section SYSTEM INFO, there is a link saying **Slave ADU** or **Master ADU** where you can switch to the other dashboard. Below the top bar you can see whether the currently shown ADU is active or not.

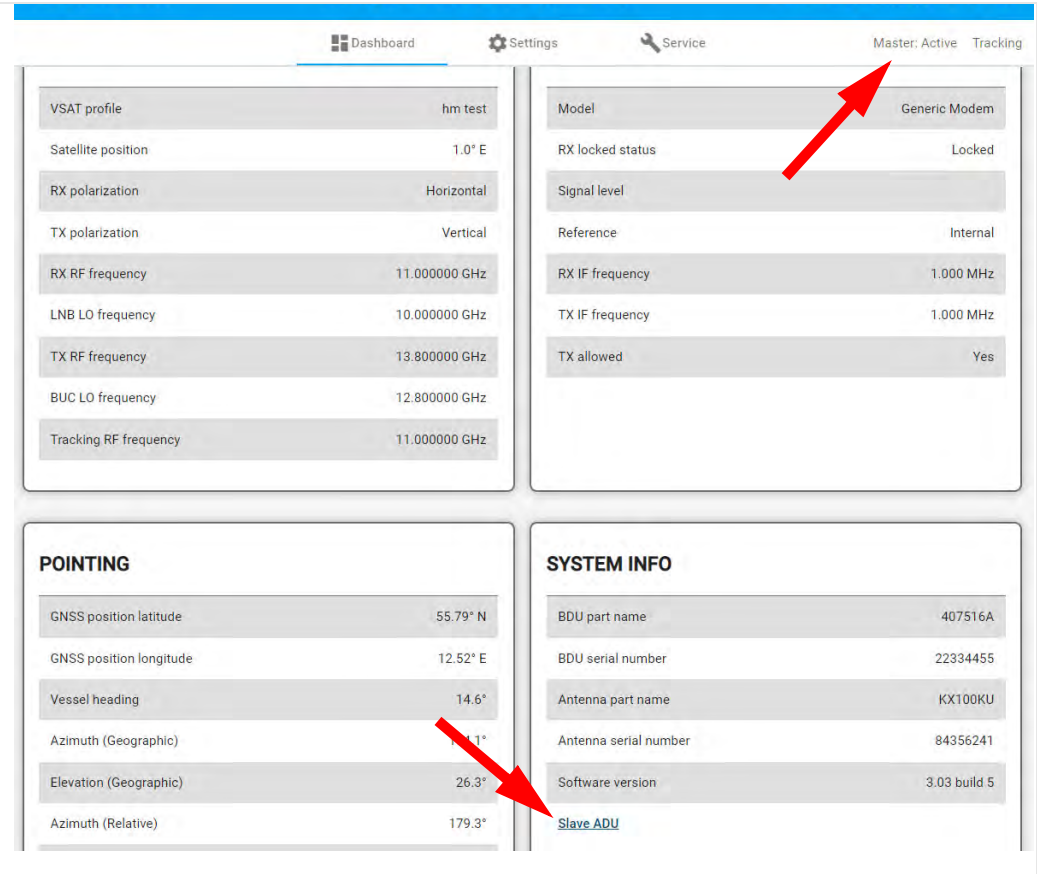


Figure B-3: Dual-antenna mode, link on DASHBOARD (example for Ku antenna)

The dual-antenna system switches between the 2 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.

B.3.2 To configure the Master BDU

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

Important

Before you enable dual mode, set up the master and the slave to be on the same subnet but with different IP addresses. This is done on the page **Settings > Network**.

If you use the slave port 1, this is done on the page **VSAT profiles** of the slave.

Configure the Master BDU exactly the same way as a stand-alone SAILOR XTR Ku system. When the Master BDU is configured, do as follows:

1. Click **SETTINGS > Dual antenna**.

2. Select **Set this antenna as master in dual configuration** and click **Apply**.

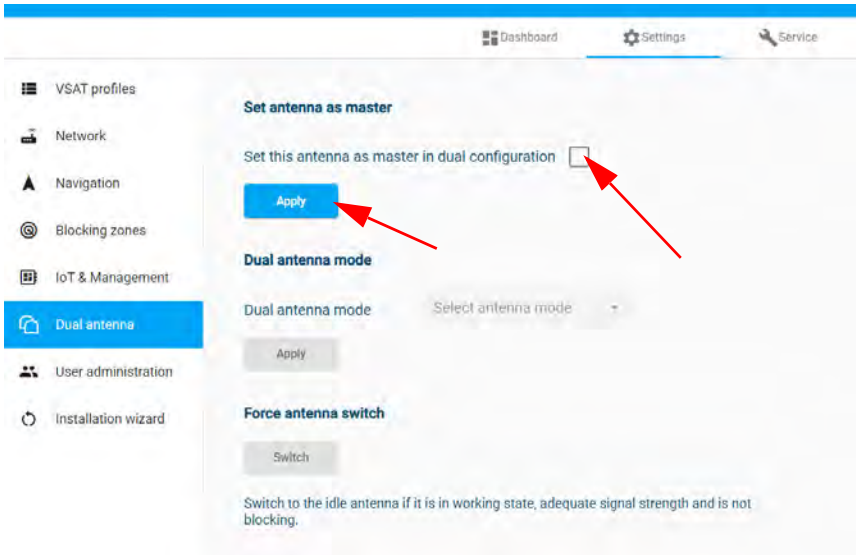


Figure B-4: Enabling dual-antenna mode in Master BDU

3. Dual antenna mode, select **Automatic Dual Mode**.
4. If needed, click **Switch** to the other antenna in the dual antenna system.

B.3.3 To configure the Slave BDU

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

Important

Set up the master and the slave to be on the same subnet but with different IP addresses. This is done on the page **Settings > Network**.

If you use the slave port 1, this is done on the page **VSAT profiles** of the slave.

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 Master**.
3. Select **Master ADU**.
4. If LAN port 1 is used for the slave: Set the IP address and netmask for the slave BDU. In other cases configure on the page **Settings > Network**.

5. Set the IP address for the master BDU. Both IP addresses must be in the same subnet.

Figure B-5: IP addresses for Modem and Master BDU (example)

6. Click the disc icon to save the profile.
7. Click **SETTINGS > VSAT profiles**.
8. Click **Activate** to activate the VSAT profile **Dual Antenna Master**.

B.3.4 Blocking zone setup for dual antenna setup

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

1. Actual blocking zones on the vessel (No TX)
2. Switching blocking zones (TX allowed)
3. Personnel safety zones (No TX)

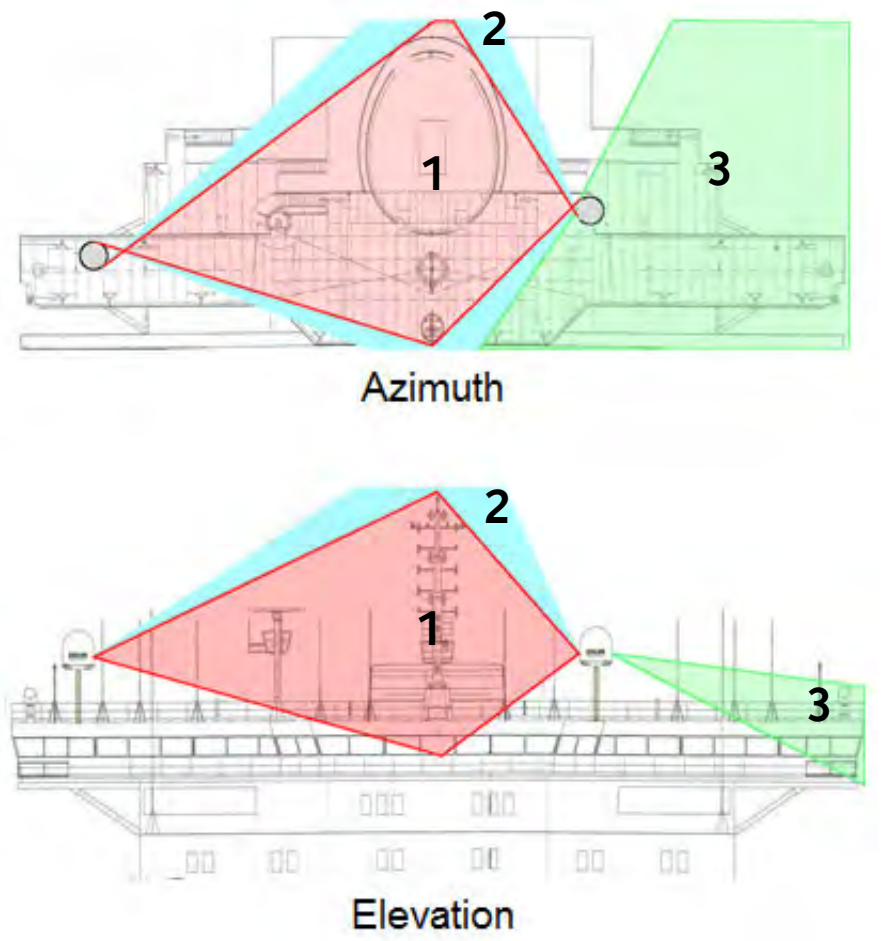


Figure B-6: Dual-antenna mode, blocking zones — azimuth and elevation

B.3.5 Lineup and commissioning for dual antenna setup

The SAILOR XTR Ku antenna systems must be lined up and commissioned one by one. The line-up procedure is done for each antenna as it would have been done for a single antenna system. In order to be able to do the line-up for each antenna you must force the dual system to use one or the other antenna at a time. Do as follows:

1. Enter the web interface of the Master BDU, go to the page **SETTINGS > Dual antenna**.

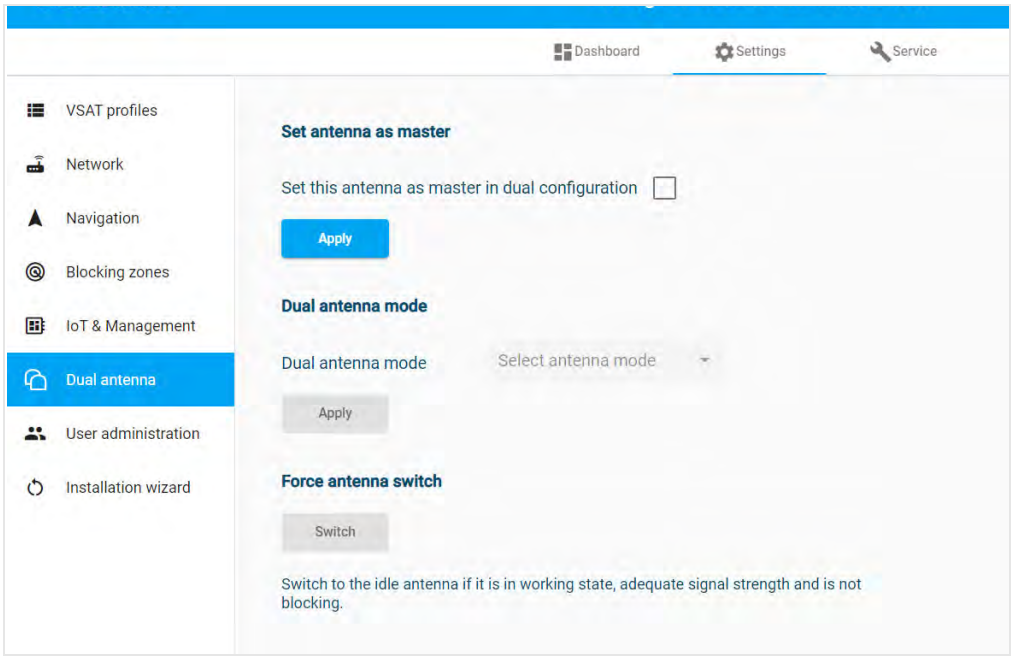


Figure B-7: Dual-antenna mode, line up for both antennas

2. Set the **Dual antenna mode** to either **Master active** or **Slave active** to force the system to use that antenna until it is changed again or the Master system is rebooted. After reboot the dual antenna mode will be set to **Automatic dual mode** (default).
3. Make a lineup procedure for both the Master and the Slave BDU as described in *Line up* on page 4-33.

B.4 Flow chart for installation of the dual antenna solution

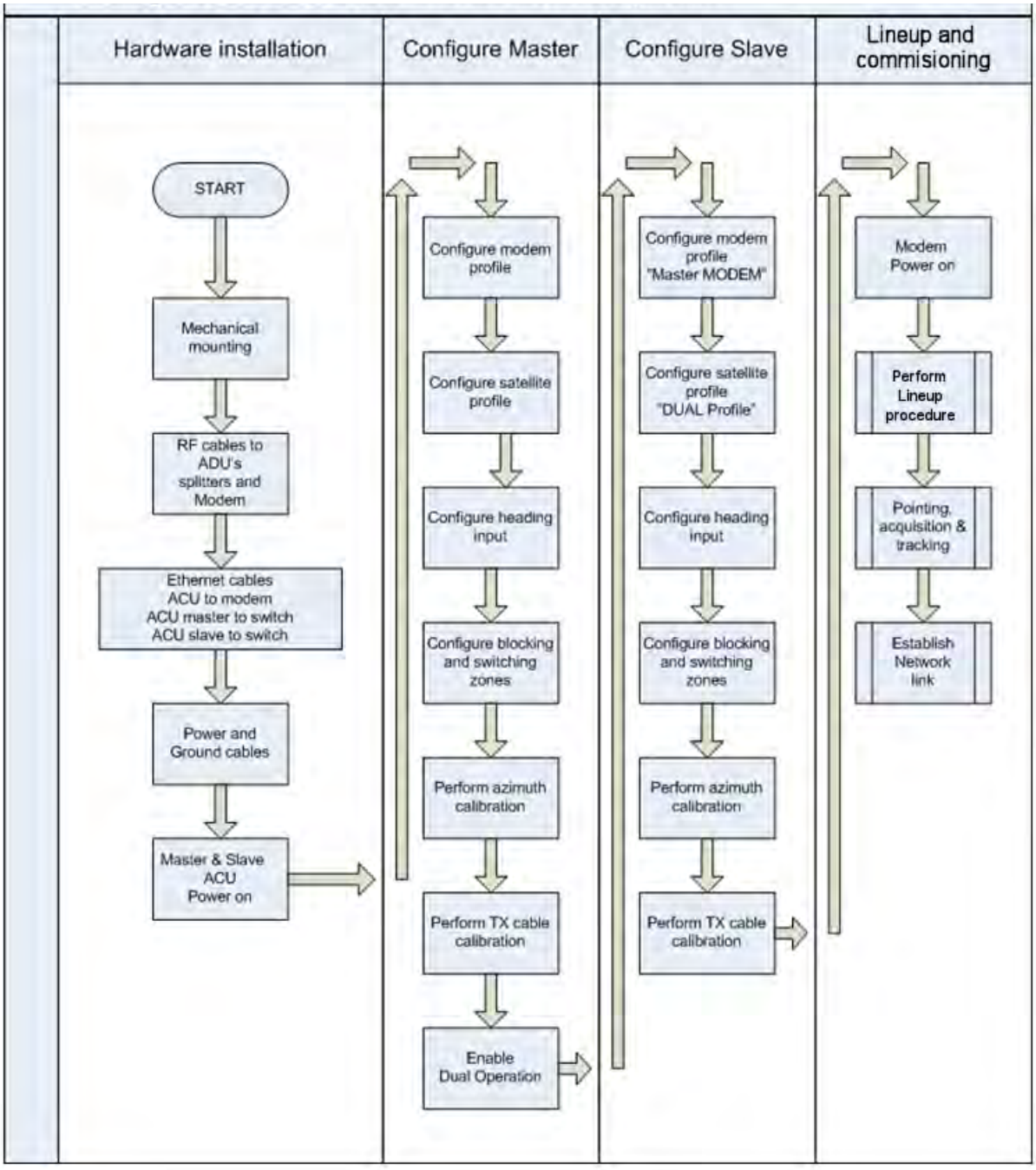


Figure B-8: Flow chart for dual antenna installation

VSAT modem settings

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

- *Performance optimization for blockage*
- *OpenAMIP setup*
- *SatLink 2910 VSAT modem*

C.1 Performance optimization for blockage

C.1.1 Encountering 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* on page 4-15.

When blockage occurs, the BDU can inform the VSAT modem (if the blocking zones have been typed correctly into the BDU 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 towards 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 OpenAMIP setup

C.2.1 Protocol and interfaces

Introduction

The following sections describe the protocol and interface between the SAILOR XTR Ku BDU and OpenAMIP VSAT modem. OpenAMIP operation is normally used by service providers offering global VSAT service as the protocol supports roaming between satellites (Automatic Beam Switching).

OpenAMIP, an ASCII message based protocol invented and Trademarked by iDirect is a specification for the interchange of information between an antenna controller (BDU) and a VSAT modem (VMU). This protocol allows the VSAT modem to command the BDU to search and lock to a particular satellite as well as allowing exchange of information necessary to permit the VSAT modem to initiate and maintain communication via the antenna and the satellite. In general, OpenAMIP is not intended for any purpose except to permit a modem and the BDU to perform synchronized automatic beam switching.

Connections

Connect the BDU and modem with the following cables:

- Ethernet cable for TCP/IP data communication
- 75 Ohm RF cables F-F connectors for Rx and Tx frequencies.

Protocol

The SAILOR XTR Ku BDU supports all OpenAMIP commands except the X command which is optional. All the supported OpenAMIP commands are shown in the following table.

OpenAMIP Message	Message originator	# Parameters	Description
A	Modem	1	Alive interval
B	Modem	2	Beat frequency, rx_lcl_osc, tx_lcl_osc
C	Modem	5	Carrier to Noise Ratio
F	Modem	0	Find satellite
H	Modem	2	Hunt frequency, hunt bandwidth
K	Modem	2	Maximum skew
L	Modem	2	Lock status, Tx enable
P	Modem	2	Rx polarization, Tx polarization
S	Modem	3	Satellite long., latitude variance, pol skew
T	Modem	2	Tx frequency, Tx bandwidth

Table C-1: Supported OpenAMIP commands

OpenAMIP Message	Message originator	# Parameters	Description
W	Modem	1	Where (location) interval
a	Antenna	1	Alive interval
c	Antenna	5	CNR reporting rate
s	Antenna	3	Functional, May transmit, Search count
w	Antenna	4	Valid, latitude, longitude, time

Table C-1: Supported OpenAMIP commands (Continued)

For more detailed information contact iDirect for latest OpenAMIP standard.

Messages from VSAT modem	Explanation
S -15.000000 0.000000 0.000000	Longitude, Max_lat, Pol_skew
H 1451.815000 1.905000	Hunt_frequency, Hunt_bandwidth
P H V	Rx_polarity, Tx_polarity
B 11250.000000 12800.00000	Rx-lcl_osc, Tx_lcl_osc
T 1403.290000 0.618000	Tx_frequency, Tx_bandwidth
A 15	Keepalive_interval in ms [BDU: s message]
W 300	latlong_interval in seconds [BDU: w message]
L 1 1	Rx lock, Tx allowed
K 90.000000	Max_skew

Table C-2: Messages sent from the VSAT modem to the BDU (examples)

Messages sent from the BDU to the VSAT modem	Explanation
s 1 1	Functional, Tx OK
w 1 55.794010 12.52272 985523005	GPS valid, Latitude, Longitude, Time

Table C-3: Messages sent from the BDU to the VSAT modem (examples)

C.2.2 Configuration example (OpenAMIP)

Examples of modem profile and satellite configuration from the web interface are shown in the figures below. Add a VSAT profile (**Settings > VSAT profiles**) as shown below

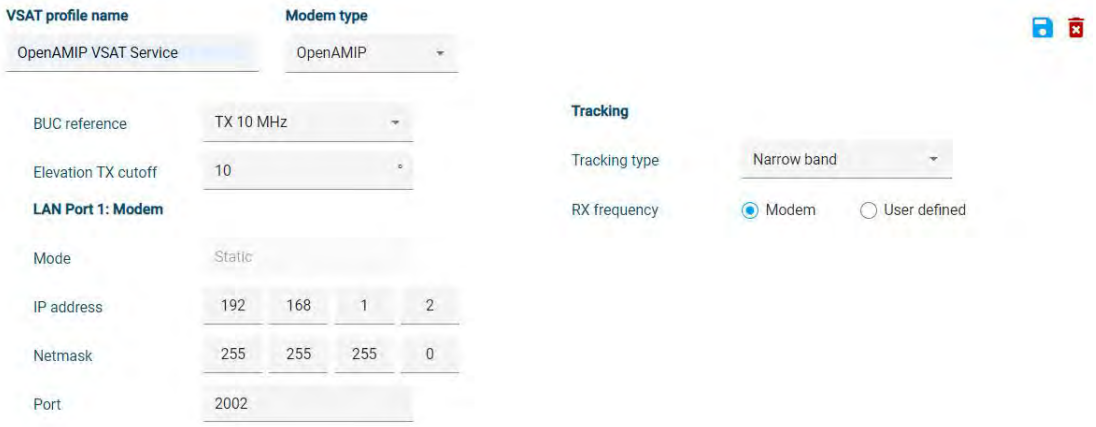


Figure C-1: VSAT profile, OpenAMIP (example)

C.3 SatLink 2910 VSAT modem

C.3.1 Interfaces and VSAT modem configuration

The following sections describe how to connect an BDU to a SatLink 2910 VSAT modem.

Connections and login

1. Connect the BDU and SatLink 2910 with the following cables:
   - Ethernet cable for TCP/IP data communication. Connect LAN A on the VSAT modem to LAN 1 on the BDU.
   - 75 Ohm RF cables F-F connectors for RX and TX frequencies
2. Connect a PC to the modem via serial (setting: 38400, 8, N, 1).
3. Login to the modem with the user name and password received from the VSAT service provider.

Modem configuration requirements

Type the following command in a modem console to set up the Satlink 2910 modem to use the SAILOR XTR Ku:

Command	Description
`odu antctrl waitstablize 300`	This configures the antenna stability tries which is the amount of times the modem should try to log on before it tries the next beam in its transponder list.
`odu antctrl periodictime 5`	This configures the polling frequency in seconds between the modem and BDU.
`odu antctrl port 0 (zero)`	This configures the IP communication port to default (5990).
`odu antenna 30`	This configures the antenna type to a Thrane & Thrane / Cobham SATCOM antenna.
`odu txtype 62`	This configures the BUC type to a SAILOR VSAT BUC
`odu lnb 62`	This configures the LNB type to SAILOR VSAT LNB
`odu antctrl enable all`	This will enable the communication between the modem and BDU including GPS input.
`dvb rx autostart on`	This will enable modem rx.

Table C-4: Configuration of the SatLink 2910 VSAT modem

Command	Description
`dvb tx autostart on`	This will enable modem tx. Save the new ODU Configuration:
`save config`	This will save the above settings to flash in the modem. And restart the modem:
`restart`	

Table C-4: Configuration of the SatLink 2910 VSAT modem (Continued)

Example:

```
odu antctrl show
Antenna Controller Configuration
--------------------------------
Type                     : Thrane & Thrane SAILOR 900
Enabled                  : All
IP address               : 10.110.2.226
Polling frequency        : 5 sec
Antenna Stability Tries  : 300

Antenna Controller Status
--------------------------------
Controller detected   : no
Packets sent          : 0
Packets received      : 0
```

C.3.2 BDU configuration

To set up the BDU to work with a SatLink 2910 VSAT modem, do as follows:

1. Add a VSAT profile with the SatLink 2910 modem. See *VSAT profiles* on page 4-5.
2. Activate the VSAT profile.

C.3.3 Configuration example (Satlink 2910)

An example of a VSAT profile in the web interface is shown in the figure below.

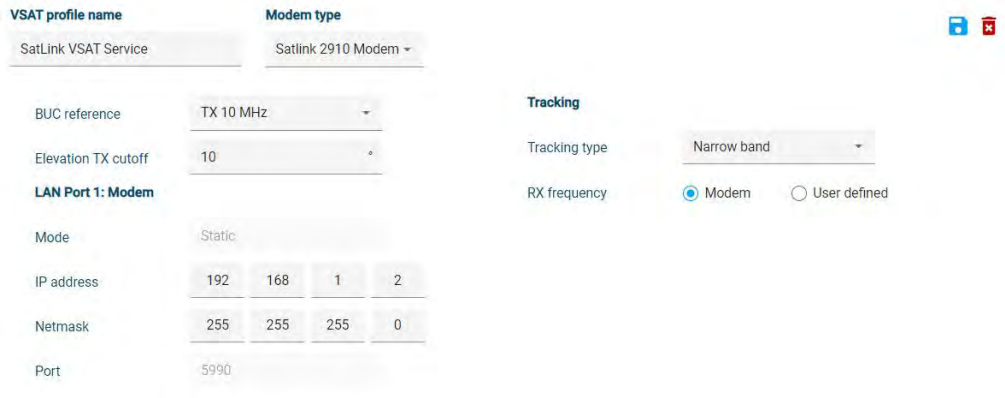


Figure C-2: VSAT profile, SatLink 2910 (example)

Command line interface

D.1 Supported connection modes

After you have done the initial configuration and connected the SAILOR XTR Ku to your network, you can use SSH to configure the SAILOR XTR Ku. You can also set up VSAT modem parameters. Note that the following sections cover the command line interface for all SAILOR VSAT antennas.

Some of the commands may not be relevant for the antenna described in this manual.

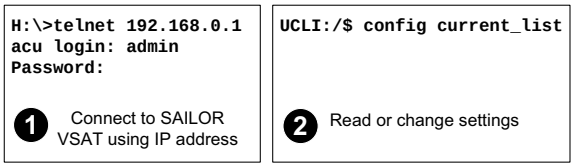


Figure D-1: How to use the command line interface (example)

After successful login you can read the settings.

SSH connection

You can access the command line interface via SSH.

Access to the SAILOR XTR Ku system is protected by a user name and password. This is the same user name and password that is used in the web interface.

The interface is on the standard SSH port 22. Use any LAN port and corresponding IP address (except LAN 2 on GX/Ka BDU). To start an SSH session do as follows:

1. Open an SSH client of your choice.
2. At the prompt, enter the IP address, login **admin** and password.

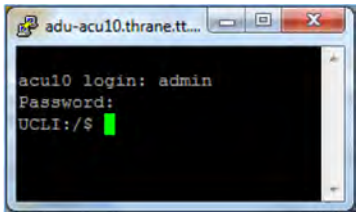


Figure D-2: Command line interface, login

Telnet connection

You can access the command line interface via Telnet.

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

Access to the SAILOR VSAT system system is protected by a user name and password. This is the same user name and password that is used in the web interface under **ADMINISTRATION**.

The interface is on the standard Telnet port 23 or SSH port 22. Use any LAN port and corresponding IP address of the BDU (except LAN 2 on GX/Ka BDU). To start telnet session do as follows:

1. Open a Telnet client of your choice.
2. At the prompt, enter the IP address of the BDU, login **admin** and password.

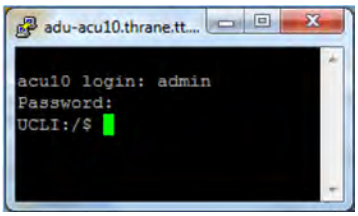


Figure D-3: Command line interface, login

Help

If you enter **`help`** directly at the prompt **`UCLI:/$`** all available commands are listed. Additionally any command will take **`help`** as first argument and display detailed information of the specific command.

Conventions

The command description below uses the following special typography:

Convention	Description
`Courier font`	Information that is displayed on the screen.
`Bold Courier font`	Text the user must enter.
`<argument>`	Required argument
`[argument]`	Optional argument

Table D-1: Command typography

Example: `navigation heading [mode [value]]`

D.2 List of commands

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

- *antenna_data*
- *calib*
- *config*
- *demo*
- *dual_antenna (not supported yet)*
- *exit*

- *help*
- *navigation*
- *status*
- *system*
- *test*
- *iothub*

D.2.1 antenna_data

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

Table D-2: UCLI command: `antenna_data`

D.2.2 calib

Command	Description
calib	Shows the commands for encoder, ZRM and compass calibration
calib zrm	Start XEL/ELE ZRM calibration
calib ?	Other calibrations currently not supported

Table D-3: UCLI command: `calib`

D.2.3 config

Command	Description
config	Shows detailed information of this specific command.
config current_list	Shows the current configuration.

Table D-4: UCLI command: `config`

D.2.4 demo

Command	Description
demo	Shows detailed information of 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 D-5: UCLI command: demo

D.2.5 dual_antenna (not supported yet)

Command	Description
dual_antenna mode	Shows the current dual antenna mode • single • master • slave
dual_antenna status	• Shows the current dual-antenna mode status • active • inactive

Table D-6: UCLI command: dual_antenna

D.2.6 exit

Command	Description
exit	Exits the connection to the SAILOR XTR Ku.

Table D-7: UCLI command: exit

D.2.7 help

Command	Description
help	Shows detailed information of this specific command.
help status	Shows the sub commands and description for the command status.
help system	Shows the sub commands and a short description for the command system.
help config	Shows the sub commands, unit and description for the command config.

Table D-8: UCLI command: **help**

Command	Description
help demo	Shows the sub commands, unit and description for the command demo
help dual antenna	Shows the sub commands, unit and description for the command dual antenna
help exit	Shows the sub commands, unit and description for the command exit

Table D-8: UCLI command: **help** (Continued)

D.2.8 navigation

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

Table D-9: UCLI command: **navigation**

D.2.9 status

Command	Description
status	Shows detailed information of this specific command.
status system	Shows the current status of the SAILOR XTR Ku.
status track_all	Shows the current values for all tracking parameters: • vessel heading • azimuth relative • elevation relative • polarization skew • GPS latitude and longitude
status event_list	Shows a list of active events.

Table D-10: UCLI command: **status**

D.2.10 system

Command	Description
system	Shows detailed information of 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 SAILOR 1000 XTR Ku 8W.

Table D-11: UCLI command: **system**

D.2.11 test

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

Table D-12: UCLI command: test

D.2.12 iothub

Command	Description
iothub	Shows detailed information of this specific command.
iothub set <hostname|deviceid|enable> <value>	Sets iothub configuration parameters.
iothub read <hostname|deviceid|enable>	Shows iothub configuration parameters
iothub_cert set <key|cert>	iothub_cert iothub certificate/private key You have 30 s to enter the certificate key.
iothub_cert read <key|cert>	Shows iothub certificate/private key
iothub_schedule set <group> [parameter] <value>	Sets iothub scheduler configuration parameters.
iothub_schedule read <group> [parameter] <value>	Reads iothub scheduler configuration parameters.

Table D-13: UCLI command: iothub

Grounding and RF protection

E.1 Introduction to grounding

E.1.1 Reasons for grounding

Grounding the SAILOR 1000 XTR Ku 8W system is required for at least two reasons:

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

E.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.

E.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.

E.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 1000 XTR Ku 8W 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.

E.2 Grounding Recommendations

E.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 2-19.

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 E-9.

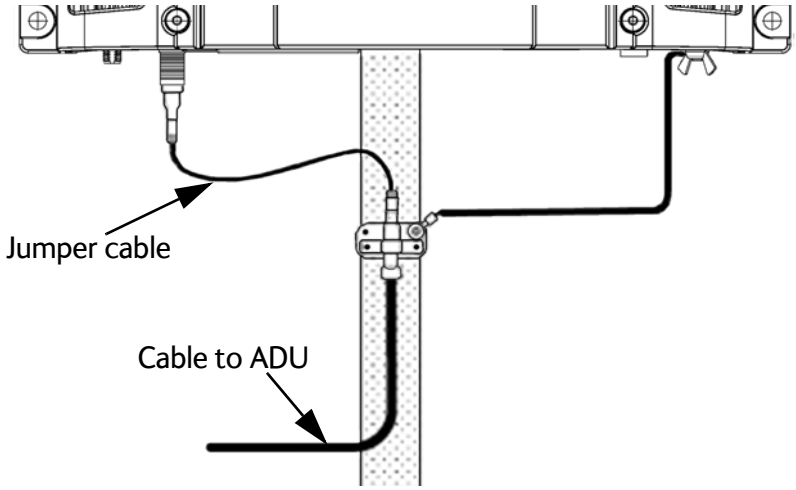


Figure E-1: Extending the ground plane

E.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.

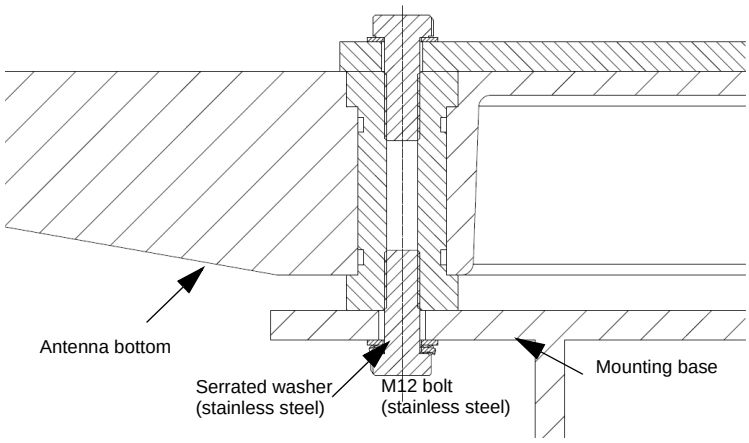


Figure E-2: Grounding the ADU

Note For optimum grounding use the mounting bolt located closest to the ADU cable plate, see *To ground the ADU* on page 2-18.

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[2]. However, due to the fact that this is not possible on e.g. fiberglass hulls (nor is it preferable on aluminium hulls) a number of alternative grounding methods are suggested in the following paragraphs.

E.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).

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.

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

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 2-18.

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 E-8.

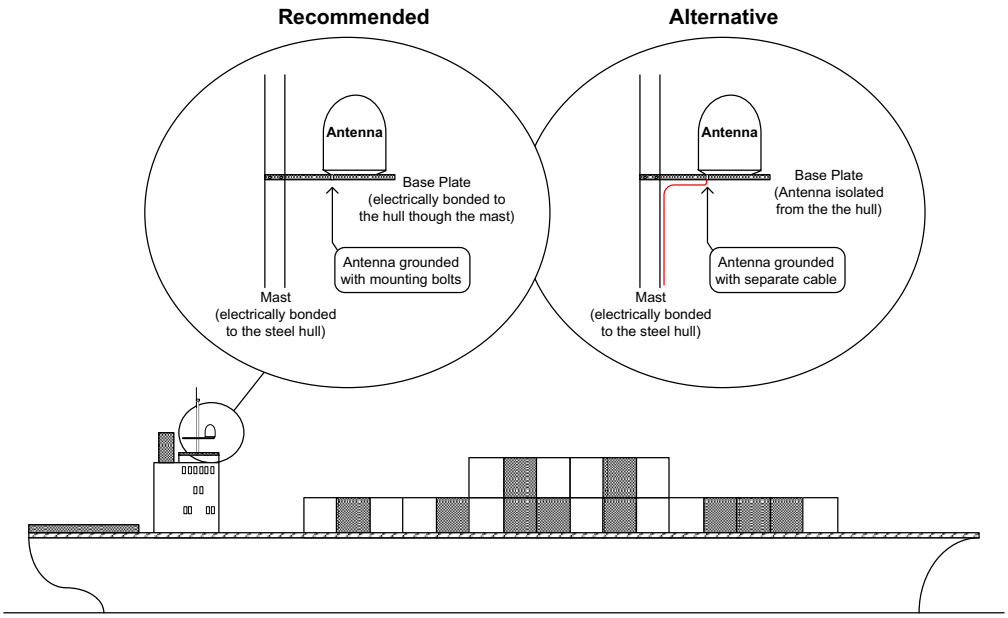


Figure E-3: Grounding at a dedicated RF ground (alternative)

E.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 . 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.

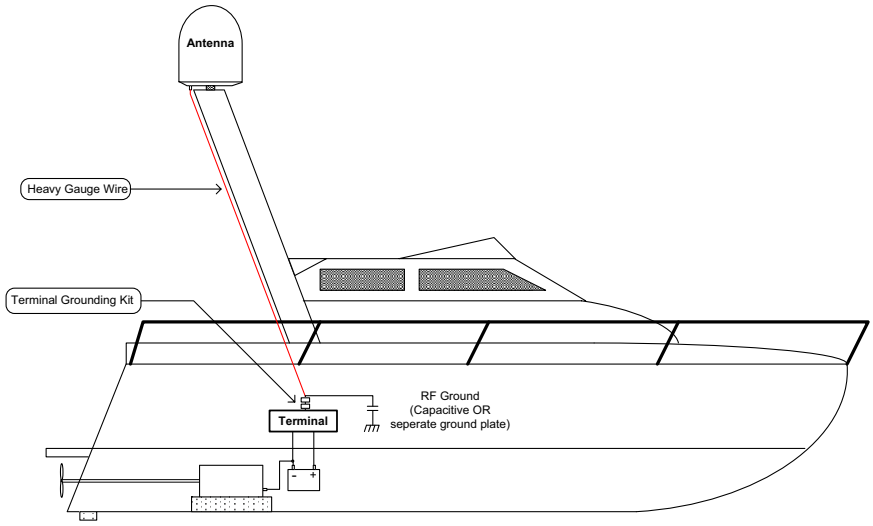


Figure E-4: Alternative grounding for aluminium hulls

E.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 .

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.

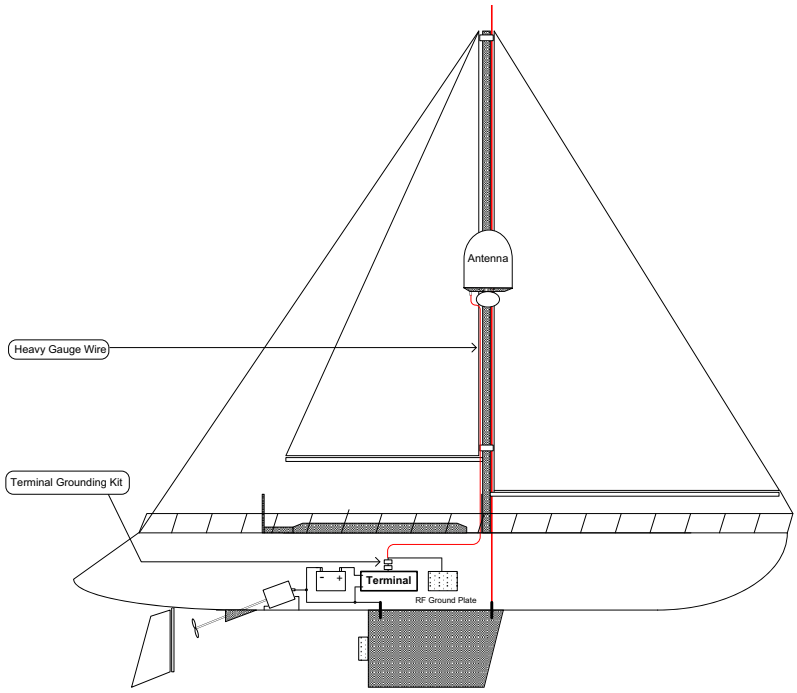


Figure E-5: Alternative grounding for fiberglass hulls

E.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 illustration

below. The crimp terminals must be a marine approved type e.g. the DuraSeal series from Raychem.

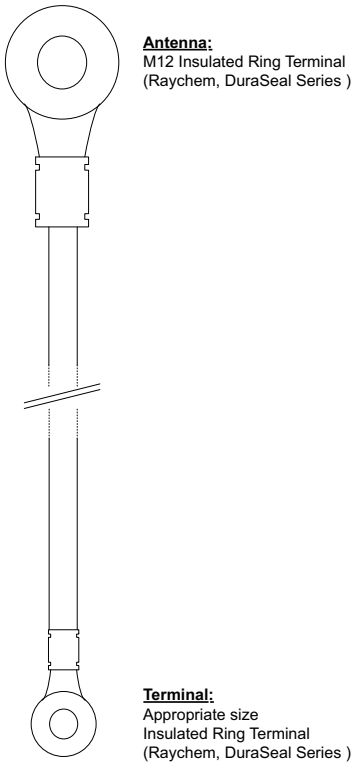


Figure E-6: Separate ground cable

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 E-7, *Isolation of the ADU from the mounting base* on page E-8.

At the other end, connect the ground cable as described in *To ground the BDU* on page E-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 below. Please note that the isolation has to be implemented on all four mounting bolts (including the bolt securing the ground cable).

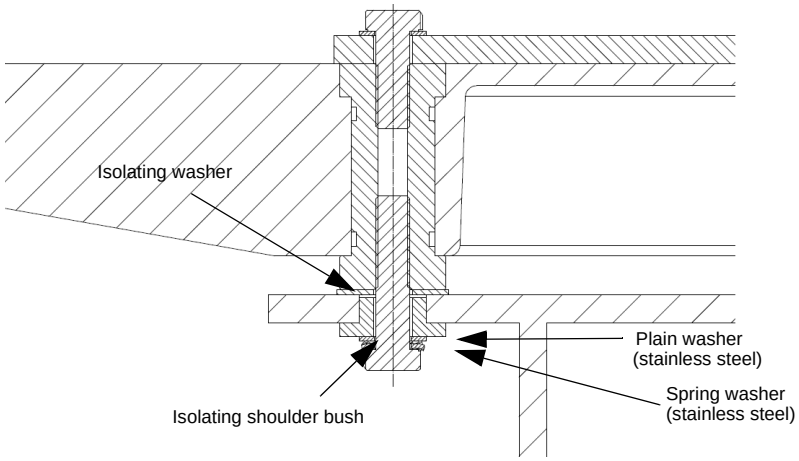


Figure E-7: Isolation of the ADU from the mounting base

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

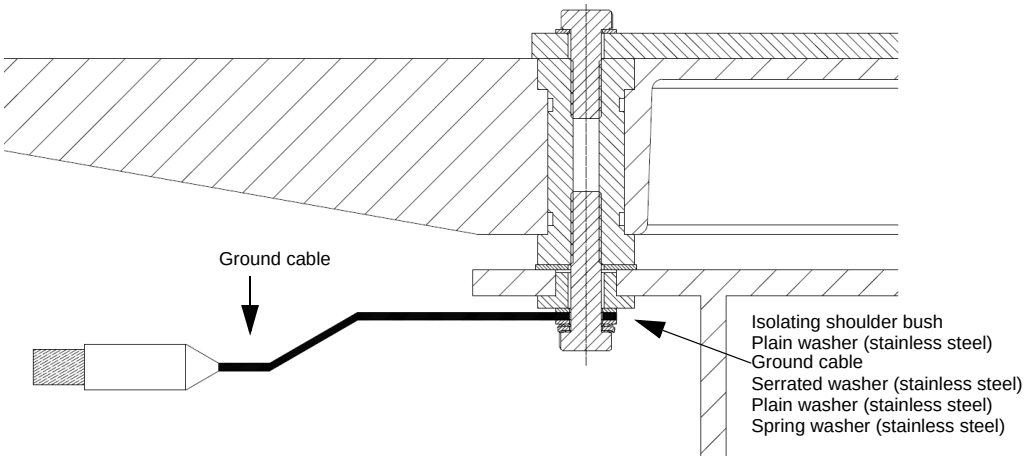


Figure E-8: ADU isolation and grounding cable

E.3 Jumper cable for grounding

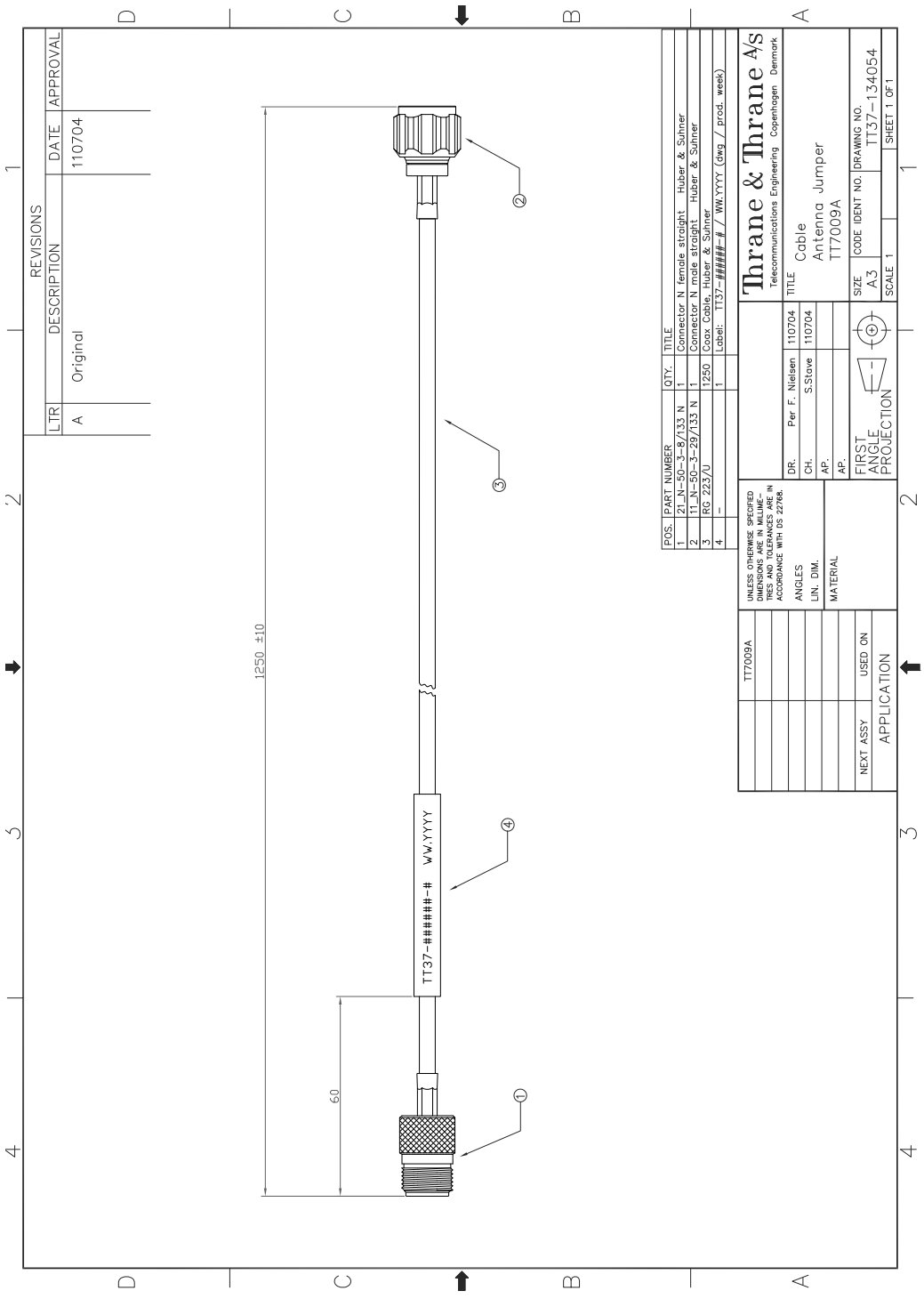


Figure E-9: Jumper cable for grounding (specifications)

Event messages

F.1 Overview

The SAILOR XTR Ku 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 Ku 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.

F.2 List of events

(260921)

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. (!T,!G,!S)
08062-0	ADM	WARNING	VMU debug shell password	The specified password (user) for the satellite modem is not accepted by the modem. (!T,!G,!S)
08069-0	ADM	WARNING	Blocking Zone	The antenna has entered a blocking zone. (!S)
0806A-0	ADM	WARNING	VMU connection	The ACU has lost connection to the satellite modem. (!T)
0806C-0	ADM	ERROR	VMU frequency setup	There is a mismatch in the frequency setup. Probably the satellite modem is not configured correctly to match the requirements of the ACU and antenna. A common mismatch is the absence of Rx or Tx LO parameter in the satellite modem. (!T)
08073-0	ADM	WARNING	Slave connection	The system is configured as a dual antenna master, but no dual antenna slave is connected to it. Either disable the dual antenna master in the web interface or configure a another system as a dual antenna slave. (!T,!S)
08074-0	ADM	WARNING	Master connection	The system is configured as a dual antenna slave, but it was not possible to connect to the dual antenna master. Check that the IP address entered in the modem profile is correct and check that the master and slave systems are physically connected as described in the manual. (!T,!S)
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 system setup is invalid. The dual mode function may not work properly or performance could be degraded. Info code: xxxxxxx1 = Antenna types are different, they must be identical xxxxxxx2 = Master or Slave hardware does not support dual mode operation. xxxxxxx3 = Software version on master and slave are different, they must be identical. (!T,!S)

Table F-1: Event messages

ID	Module	Type	Description	Explanation
08077-0	ADM	WARNING	BUC LO frequency invalid	The satellite modem provided an invalid BUC LO frequency. A default BUC LO frequency is assumed based on antenna type. To remove this warning re-configure the modem to provide a valid BUC LO frequency. (!T)
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. (!T)
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. (!T)
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. (!T,!V,!S)
0807E-0	ADM	WARNING	Keyline signal	The keyline signal on the dual antenna master does not match the keyline signal on the slave. Check that the keyline splitter cable is connected to the RS422 connectors. When fixed, the ACU's needs to be rebooted to clear the event. (!S,!V)
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 1 hour or next reboot.
08081-0	ADM	WARNING	BUC communication	Missing communication between VMU and BUC. Info: 0x00000001: From VMU to BUC Info: 0x00000002: From BUC to VMU (!T,!V,!S)
08082-0	ADM	WARNING	Modem configuration load	Unable to load configuration on modem. Info: 0x00000001: Configuration index invalid 0x00000002: Changing parameter not permitted 0x00000004: Modem not in Remote Mode (!T,!G,!S)
08083-0	ADM	ERROR	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.

Table F-1: Event messages (Continued)

ID	Module	Type	Description	Explanation
08085-0	ADM	WARNING	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. (!T)
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: 0x00000002 ISCM 0x00000004 Azimuth IFDM 0x00000008 Cross elevation IFDM 0x00000010 Elevation IFDM 0x00000020 Polarisation IFDM (!T)
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: 0x00000001: Azimuth IFDM 0x00000002: Cross Elevation IFDM 0x00000004: Elevation IFDM 0x00000008: ISCM 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
0850A-0	ADM	ERROR	GNSS Initialization	GNSS initialization failed.
0851E-0	ADM	ERROR	Sensor sanity	Too many invalid values measured by the ISM during initialisation. Check for vibrations or malfunctioning ISM.
08521-0	ADM	ERROR	Azi axis calibration	Azimuth axis zero reference not found. Check belt and zero reference module. Info: 0x00000001: Timeout (operation did not complete in time) 0x00000010: Encoder or mechanical problem 0x00000020: Zero reference not found 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.

Table F-1: Event messages (Continued)

ID	Module	Type	Description	Explanation
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.
08524-0	ADM	ERROR	Pol axis calibration	Polarisation axis zero reference or end stops not found at expected locations. Check movement of the polarisation unit and the zero reference module. Info: See 08521-0. (!T,!G)
08525-0	ADM	ERROR	Antenna calibration	One or more errors occurred during antenna start-up Info: 0x00000001: Timeout (calibration did not complete in time) 0x00000010: Azimuth axis 0x00000020: Cross-elevation axis 0x00000040: Elevation axis 0x00000080: Polarisation axis
08534-0	ADM	WARNING	ACU communication	The communication link between ACU and antenna is not working.
08535-0	ADM	WARNING	ISM data valid	Sensor measurements from the ISM are invalid. This indicates a malfunctioning ISM.
08536-0	ADM	WARNING	ISM data range	Sensor measurements from the ISM are out of range.
08537-0	ADM	WARNING	GNSS communication	Lost connection to the GNSS device.
08538-0	ADM	WARNING	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.
0853F-0	ADM	WARNING	AMB timing	This indicates a busy situation. It may occur during installation procedures. No user interaction is required unless it occurs repeatedly.
08540-0	ADM	WARNING	VIM cable attn	The output power cannot be controlled correctly. Check the Tx chain. (!T)
08541-0	ADM	WARNING	BUC voltage low	The voltage for the BUC is too low, probably caused by a malfunctioning VIM or BUC. (!T,!G)
08542-0	ADM	WARNING	BUC voltage high	The voltage for the BUC is too high probably caused by a malfunctioning VIM. (!T,!G)
08543-0	ADM	WARNING	LNB voltage low	The voltage for the LNB is too low probably caused by a malfunctioning VIM or LNB.
08544-0	ADM	WARNING	LNB voltage high	The voltage for the LNB is too high probably caused by a malfunctioning VIM.
08546-0	ADM	WARNING	Antenna temperature	The temperature of the antenna is too high. Check if the fan is working. (!T,!G)

Table F-1: Event messages (Continued)

ID	Module	Type	Description	Explanation
08547-0	ADM	ERROR	VIM PLL lock	The PLL of the VIM is out of lock. Check the 10 MHz reference signal.
08548-0	ADM	WARNING	VIM tuner lock	The PLL of the second receiver (DVB) is out of lock. Check the 10 MHz reference signal.
08549-0	ADM	WARNING	Azi encoder slip	A slip of the azimuth encoder has been detected. If this event is not resolved by itself after some time, check the belt and encoder of the azimuth axis.
0854A-0	ADM	WARNING	Xel encoder slip	A slip of the cross-elevation encoder has been detected. If this event is not resolved by itself after some time, check the belt and encoder of the cross-elevation axis.
0854B-0	ADM	WARNING	Ele encoder slip	A slip of the elevation encoder has been detected. If this event is not resolved by itself after some time, check the belt and encoder of the elevation axis.
0854C-0	ADM	WARNING	Pol encoder slip	A slip of the polarisation encoder has been detected. If this event is not resolved by itself after some time, check the belt and encoder of the polarisation axis. (!T,!G)
0854D-0	ADM	WARNING	GNSS position	No position available from the GNSS device or position too old.
0854E-0	ADM	WARNING	GNSS velocity	No velocity available from the GNSS device.
0854F-0	ADM	WARNING	Heading data	Heading information is missing in the antenna.
08559-0	ADM	WARNING	Azi cal. limits	Check limits of the calibration result for the azimuth axis are exceeded. Pointing performance may be degraded. Info: 0x00000040: End stop detected before expected limit 0x00000100: Zero width is low 0x00000200: Zero width is high 0x00000400: Zero slack is high 0x00001000: Friction average is high 0x00002000: Friction peak is high 0x00004000: Friction asymmetry is high Zero width low/high: Zero reference module placement may be incorrect. Zero slack high: Mechanical slack may be too high. Friction average/peak high: Mechanical friction is higher than expected. Friction asymmetry high: Mechanical imbalance may be too high.
0855A-0	ADM	WARNING	Xel cal. limits	Check limits of the calibration result for the cross-elevation axis are exceeded. Pointing performance may be degraded. Info: See 08559-0.
0855B-0	ADM	WARNING	Ele cal. limits	Check limits of the calibration result for the elevation axis are exceeded. Pointing performance may be degraded. Info: See 08559-0.

Table F-1: Event messages (Continued)

ID	Module	Type	Description	Explanation
0855C-0	ADM	WARNING	Pol cal. limits	Check limits of the calibration result for the polarisation axis are exceeded. Pointing performance may be degraded. Info: See 08559-0. (!T,!G)
0855D-0	ADM	WARNING	ISM warning	The ISM has temporarily observed an unusual situation for temperature or voltage. No user interaction required. If repeated after cooldown and reboot, check if the ISM or cables around it are defective.
0855E-0	ADM	WARNING	Low elevation	The antenna is not allowed to transmit because the elevation is too low. (!T)
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.
08563-0	ADM	WARNING	BCM warning	The BCM has observed an unusual situation with regards to the PLL. If the situation persists, check the BCM. (!T,!V)
08564-0	ADM	ERROR	BCM communication	Communication error between PCM and BCM. Check SUB-D connectors and cables. (!T,!V)
08565-0	ADM	ERROR	Deploy/Stow	Deploy/stow error. The antenna did not properly unlock (deploy), or the stow switch never closed (stow).
08566-0	ADM	ERROR	OMT error	Problem with OMT. Temperature out of range or OMT cable may be broken.
08567-0	ADM	WARNING	Automatic stow	The antenna automatically stowed because it detected significant movement.
08568-0	ADM	WARNING	Polarisation tuning	Polarisation tuning was not successful. Polarisation may be incorrect.
08569-0	ADM	ERROR	BCM error	The BCM PLL failed to initialize.
0856A-0	ADM	WARNING	Missing BUC response	No response received from the BUC. (!T,!V,!S)
0856B-0	ADM	WARNING	mpTRIA communication	Communication from the mpTRIA has failed. (!G)
0856C-0	ADM	FATAL	Antenna base tilt	Antenna base tilted beyond limit.
0856D-0	ADM	WARNING	VMU reference distribution	VMU reference signal not present at BCM, but is present at ACU. Check coax cable between VIM and BCM. (!T,!V)
0856E-0	ADM	WARNING	Antenna orientation	The terminal is oriented in a way that prevents it from pointing to the selected satellite.
08841-0	ADM	ERROR	Tuner lock	The internal tuner PLL was unable to lock. (!V,!T)

Table F-1: Event messages (Continued)

ID	Module	Type	Description	Explanation
08842-0	ADM	WARNING	GSC demodulator	The GSC demodulator has reported an error. (!V,!T)
08843-0	ADM	WARNING	DVBS demodulator	The DVBS demodulator cannot be initialised and loaded correctly. (!V,!T)
08844-0	ADM	ERROR	BUC voltage out of range	The BUC voltage is out of range. (!V,!T)
08845-0	ADM	ERROR	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 satellite profile to try again, check LNB cable and surroundings if the problem persists. (!V,!T)
08846-0	ADM	ERROR	AIM-O supply voltage out of range	Supply voltage measured at AIM-O is not within expected range (!V,!T)
08847-0	ADM	ERROR	AIM-O Master PLL lock	The AIMO master PLL has lost lock. Check the input reference signal. (!T)
08848-0	ADM	WARNING	TX Calibration missing	Tx calibration not performed. (!T)
08880-0	ADM	ERROR	WLAN configuration error	Configuration of WLAN module failed. (!V,!T)
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.
08A00-0	ADM	WARNING	GX Core Module fan	There is a problem with the Core Module fan. Check/clean and replace if necessary. (!V,!T)
08A01-0	ADM	WARNING	GX Core Module heater	There is a problem with the Core Module heater. Check and replace if necessary. (!V,!T)
08A02-0	ADM	WARNING	GX Core Module temperature	The Core Module temperature is out of range. This may affect performance, and the Core Module will be shut down if the situation gets worse. If the "GX core module heating" event is also present, the internal heater is currently warming up the unit to its operational temperature. (!V,!T)
08A03-0	ADM	ERROR	GX Core Module power	The Power Good signal from the Core Module is low. The issue can either be: - Internal Core Module or internal cable failure - Temperature of Core Module is too high and it has been turned off (*) - GMU has been manually switched off on the front panel (*) (*) = Only on systems with GMU. (!V,!T)

Table F-1: Event messages (Continued)

ID	Module	Type	Description	Explanation
08A04-0	ADM	WARNING	iDirect modem	The ACU detected a warning/error in the iDirect modem. Log into the modem for more information. Info: 0x00000001: Temperature error 0x00000002: Test error 0x00000004: Fan error (!V,!T)
08A05-0	ADM	WARNING	GX Core Module heating	The GX core module heater is active. It will automatically be cleared when the core module reaches the operational temperature level. (!V,!T)
08B00-0	ADM	INFO	IoT med priority msg rate exceeded.	The message rate limit has been reached for the medium priority queue. The iothub client will pause transmission of medium priority messages for a short while.
08B01-0	ADM	INFO	IoT low priority msg rate exceeded.	The message rate limit has been reached for the low priority queue. The iothub client will pause transmission of low priority messages for a short while.
08B02-0	ADM	INFO	Iothub disabled	The iothub client has been disabled.
09000-0	KDM	ERROR	KDM 3V3 supply	Internal 3V3 voltage supply error in the KDM.
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 - if the system software has just been updated - the software is too old and is not compatible with the KDM hardware.
0A080-0	Antenna	ERROR	EBUS loop interrupted	EBUS communication error.
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.
0A104-0	Antenna	ERROR	ISCM OMT analog	No analog communication to OMT. Check cable.
0A105-0	Antenna	ERROR	ISCM OMT digital	No digital communication to OMT. Check cable.
0A106-0	Antenna	ERROR	ISCM ADC volt	Voltage out of range.
0A107-0	Antenna	ERROR	ISCM Power good	Internal PSU error.
0A108-0	Antenna	ERROR	ISCM Prod data	Internal production data invalid.

Table F-1: Event messages (Continued)

ID	Module	Type	Description	Explanation
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	ERROR	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	ERROR	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	ERROR	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.
0A385-0	Antenna	ERROR	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.

Table F-1: Event messages (Continued)

ID	Module	Type	Description	Explanation
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	ERROR	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	ERROR	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.
0A500-0	Antenna	ERROR	Pol Motor prod data	Internal production data invalid.
0A501-0	Antenna	ERROR	Pol Motor ZRM	No zero reference found. Check from motor to ZRM and free movement of the antenna.
0A580-0	Antenna	ERROR	Pol Motor Driver fault	Driver could not move antenna. Check free movement of the antenna.
0A581-0	Antenna	ERROR	Pol Motor Power fault	No power to motor driver. Check input power to system.
0A582-0	Antenna	ERROR	Pol Motor Shutdown	Internal error. Motor is shut down.
0A583-0	Antenna	ERROR	Pol Motor Over temperature warning	Motor temperature too high.
0A584-0	Antenna	ERROR	Pol Motor Over temperature fault	Motor temperature too high. Motor shut down.
0A585-0	Antenna	ERROR	Pol Motor Over current fault	Over current protected activated. Check free movement of antenna.
0A586-0	Antenna	ERROR	Pol Motor No response	No communication with motor. Check cable.
0B060-0	APSM	WARNING	NMEA 0183 parse error	No valid NMEA input. Check NMEA 0183 cable. (!T,!S)
0B061-0	APSM	WARNING	Heading data	No valid heading input received. Check NMEA 0183 cable. (!T,!S)
0B062-0	APSM	WARNING	APSM AUX temperature warning	Temperature too high. (!T,!S)
0B063-0	APSM	ERROR	APSM AUX temperature failure	Temperature too high. AUX shut down. (!T,!S)
0B064-0	APSM	WARNING	APSM EBUS temperature warning	Temperature too high. (!T,!S)

Table F-1: Event messages (Continued)

ID	Module	Type	Description	Explanation
0B065-0	APSM	ERROR	APSM EBUS temperature failure	Temperature too high. EBUS shut down. (!T,!S)
0B066-0	APSM	WARNING	APSM LNB temperature warning	Temperature too high. (!T,!S)
0B067-0	APSM	ERROR	APSM LNB temperature failure	Temperature too high. LNB shut down. (!T,!S)
0B068-0	APSM	WARNING	APSM Main temperature warning	Temperature too high. (!T,!S)
0B069-0	APSM	ERROR	APSM Main temperature failure	Temperature too high. APSM shut down. (!T,!S)
0B070-0	APSM	INFO	APSM AUX Under voltage lockout	Voltage too low. (!T,!S)
0B071-0	APSM	INFO	APSM BUC Under voltage lockout	Voltage too low. (!T,!S)
0B072-0	APSM	INFO	APSM EBUS Under voltage lockout	Voltage too low. (!T,!S)
0B073-0	APSM	INFO	APSM LNB Under voltage lockout	Voltage too low. (!T,!S)
0B074-0	APSM	INFO	APSM Main Under voltage lockout	Voltage too low. (!T,!S)
0B080-0	APSM	INFO	APSM AUX Over current protection	Too high current. AUX shut down. (!T,!S)
0B081-0	APSM	INFO	APSM BUC Over current protection	Too high current. BUC shut down. (!T,!S)
0B082-0	APSM	INFO	APSM EBUS Over current protection	Too high current. EBUS shut down. (!T,!S)
0B083-0	APSM	INFO	APSM LNB Over current protection	Too high current. LNB shut down. (!T,!S)
0B084-0	APSM	INFO	APSM Main Over current protection	Too high current. APSM shut down. (!T,!S)
0B090-0	APSM	INFO	APSM AUX Over voltage protection	Voltage too high. (!T,!S)
0B092-0	APSM	INFO	APSM EBUS Over voltage protection	Voltage too high. (!T,!S)
0B093-0	APSM	INFO	APSM LNB Over voltage protection	Voltage too high. (!T,!S)
0B094-0	APSM	INFO	APSM Main Over voltage protection	Voltage too high. (!T,!S)

Table F-1: Event messages (Continued)

ID	Module	Type	Description	Explanation
0B0A0-0	APSM	ERROR	APSM Communication error	No communication with APSM. Check internal connections in ACM. (!T,!S)
0B0A1-0	APSM	ERROR	BDCM Communication error	No communication with BDCM. Check main antenna cable. (!T,!S)
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 invalid	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 invalid	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 invalid	BIM-O calibration data is invalid
0F004-0	BIMO	ERROR	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 LO PLL	BIMO LO PLL out of lock

Table F-1: Event messages (Continued)

DVB-S satellites

This appendix contains examples of satellite data for azimuth calibration.

VSAT coverage	Satellite name	Satellite position	RX polarization	RX frequency	Symbol rate	NID
Americas 	EchoStar9/ Galaxy23	121°W	Vertical	12.016 GHz	20.000 MS/s	0
Europe & Americas	**Hispasat**	30°W	Vertical	12.052 GHz	27.500 MS/s	51
East Asia 	**NSS6**	95°E				
	Transponder (South East)		Horizontal	11.635 GHz	27.500 MS/s	8192
	Backup (North East)		Horizontal	12.729 GHz	26.400 MS/s	100
Europe & ME 	**SES 4**	22°W	Horizontal	12.674 GHz	20.74 MS/s	65535
Europe 	**THOR 6 BEAM K2**	0.8°W	Horizontal	11.747 GHz	28.000 MS/s	4369

Table G-1: Examples of DVB-S satellites for azimuth calibration

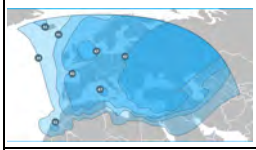
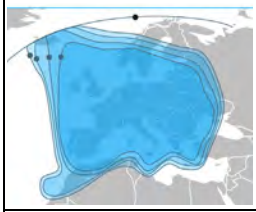
VSAT coverage	Satellite name	Satellite position	RX polarization	RX frequency	Symbol rate	NID
Europe 	**THOR 5 BEAM T2**	0.8˚W				
	Backup		Vertical	12.418 GHz	28.000 MS/s	70
Europe 	**Astra 4A**	4.8˚E				
			Vertical	12.360 GHz	27.500 MS/s	94
Europe 	**Astra 1N**	19.2˚E				
			Horizontal	12.032 GHz	27.500 MS/s	133
China 	**Apstar6**	134˚E				
	Transponder		Vertical	12.435 GHz	27.500 MS/s	65
	Backup		Vertical	12.675 GHz	27.500 MS/s	65
Australia 	**Optus D1**	160˚E -45˚skew	Horizontal	12.391 GHz	14.294 MS/s	0
Australia 	**Optus D1**	160˚E -45˚skew	Horizontal	12.407 GHz	12.294 MS/s	0

Table G-1: Examples of DVB-S satellites for azimuth calibration (Continued)

VSAT coverage	Satellite name	Satellite position	RX polarization	RX frequency	Symbol rate	NID
Australia 	**Optus D2**	152˚E -45˚skew	Vertical	12.546 GHz	22.500 MS/s	0
Singapore	**Thaicom 5** Transponder	78.5˚E	 Horizontal Vertical	 12.272 GHz 12.313 GHz	 30.000 MS/s 30.000 MS/s	 88 1
China, Japan, Korea, Burma	**Apstar 2R (Telstar 10) / Apstar 7**	76.5˚E	Vertical	11.167 GHz	45.000 MS/s	0
Osaka, Japan, Philippines, Korea 	KT 5	113˚E	Vertical	12.430 GHz	25.6 Ms/s	57

Table G-1: Examples of DVB-S satellites for azimuth calibration (Continued)

For satellite data of other regions or transponders see www.lyngsat.com.

Example:

Freq. Tp		Provider Name Channel Name		System Encryption	SR-FEC SID-VPID	ONID-TID APID Lang.	Beam EIRP (dBW) C/N lock	Source Updated
11038 V tp 38	CANAL+	Canal +	P	DVB-S Mediaguard 2 Nagravision 3	22000-5/6	1-1038	Europe 51 6.5	D Shimoni 111119

Figure G-1: Satellite data, example from www.lyngsat.com

The above transponder has following parameters:

- Frequency: 11.038 GHz
- Polarization: V-Vertical
- Symbol Rate: 22.000 MS/s
- NID: 1
- Coverage: Europe.
-

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 Harzardous Substances including delegated directive (EU) 2015/863.

Equipment included in this declaration

		Consists of								
Ku-Band		**Above Deck Unit**			**Below Deck Unit**			**Modem**		
Model	Description	Model	Description	Part no.	Model	Description	Part no.	Model	Description	Part no.
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						
Ka-band		**Above Deck Unit**			**Below Deck Unit**			**Modem**		
Model	Description	Model	Description	Part no.	Model	Description	Part no.	Model	Description	Part no.
7560A	SAILOR 600 XTR Ka 4.5W System	7506A	SAILOR 600 XTR Ka, 4.5W ADU	407506A-xxx	7516A	SAILOR XTR Below Deck Unit	407516A-xxx	7023A	SAILOR GX Modem Unit (GMU)	407023A-xxx
7560D	SAILOR 600 XTR Ka 9W System	7506D	SAILOR 600 XTR Ka, 9W ADU	407506D-xxx						
7590C	SAILOR 1000 XTR Ka 4.5W System	7509C	SAILOR 1000 XTR Ka, 4.5W ADU	407509C-xxx						
7590D	SAILOR 1000 XTR Ka 9W System	7509D	SAILOR 1000 XTR Ka, 9W ADU	407509D-xxx						

“xxx” is 3 characters, that determine the product branding, where only labels, logo and user interface varies.

The full text of the EU declaration of conformity is available at the following internet address:
http://sync.cobham.com/satcom/support/downloads

Glossary

A

ACU	Antenna Control Unit
ADM	ACU Digital Module. A main processor board in the ACU.
ADS	Antenna Diversity Solution
ADU	Above Deck Unit
AIMO	Antenna Interface Module
AMIP	Antenna-Modem Interface Protocol
APSM	Antenna Power Supply Module

B

BDCM	BDU Control Module
BDU	Below Deck Unit
BEIDOU	Chinese satellite navigation system
BIMO	BDU Interface MOdule
BITE	Built-In Test Equipment
BUC	Block Up Converter

C

CM	Continuous Monitoring

D

DHCP	Dynamic Host Configuration Protocol. A protocol for assigning dynamic IP addresses to devices on a network. With dynamic addressing, a device can have a different IP address every time it connects to the network.
DNS	Domain Name Server
DVB	Digital Video Broadcasting, a set of standards relating to digital television.

E

Eirp	Effective Isotropically-Radiated Power
ESD	ElectroStatic Discharge
ETSI	European Telecommunication Standard Institute

F

FCC	Federal Communications Commission
FPGA	Field Programmable Gate Array

G

GLONASS	GLObal'naya NAvigatsionnaya Sputnikovaya Sistema. Global Navigation Satellite System in English.
GNSS	Global Navigation Satellite System, e.g. GPS.
GPL	General Public License, Software license, which guarantees individuals, organizations and companies the freedom to use, study, share (copy), and modify the software.
GPS	Global Positioning System

H

HDT	HeaDing True, NMEA sentence.

I

IEC	International Electrotechnical Commission
IoT	Internet of Things
IP	Internet Protocol

ISM	Inertial Sensor Module
K	
KDM	Keyboard and Display Module of the ACU
L	
LAN	Local Area Network
LED	Light Emitting Diode
LGPL	Lesser General Public License
LNB	Low Noise Block
LO	Local Oscillator. LO frequency used by BUC and LNB.
LTE	Long-Term Evolution (also called 4G)
M	
MIB	Management Information Base
N	
NMEA	National Marine Electronics Association (standard)
O	
OID	Object Identifier, in the context of the Simple Network Management Protocol (SNMP), consists of the object identifier for an object in a Management Information Base (MIB).
OMT	Ortho Mode Transducer
OTC	One Touch Commissioning
P	
PLL	Phase Locked Loop
POST	Power On Self Test. A system test that is activated each time the system is powered on.
R	
RF	Radio Frequency. Electromagnetic wave frequencies between about 3 kilohertz and about 300 gigahertz including the frequencies used for communications signals (radio, television, cell-phone and satellite transmissions) or radar signals.
RFI	Radio Frequency Interference. A non-desired radio signal which creates noise or dropouts in the wireless system or noise in a sound system.
ROSS	Roaming Oceanic Satellite Server
S	
SNMP	Simple Network Management Protocol. An Internet-standard protocol for managing devices on IP networks. It is used mostly in network management systems to monitor network-attached devices for conditions that warrant administrative attention.
U	
UCLI	User Command Line Interface ,
V	
VIM	VSAT Interface Module
VLAN	Virtual LAN
VMU	VSAT Modem Unit
VSAT	Very Small Aperture Terminal
Z	
ZRM	Zero Reference Module

Index

D

E

F

G

H

I

J

L

M

N

O

P

R

S

T

U

V

W