COBHAM SATCOM

SAILOR XTR TVRO

Installation manual

SAILOR XTR TVRO
Quick guide

Installation wizard

This quick guide is for experienced service personnel who have installed the SAILOR XTR TVRO 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 Lite).
2. Open an Internet Browser and type the default IP address of the SAILOR XTR TVRO system: https://192.168.0.1.
3. Bypass the admin password by pressing the left arrow key on the BDU Lite 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 TV profile.

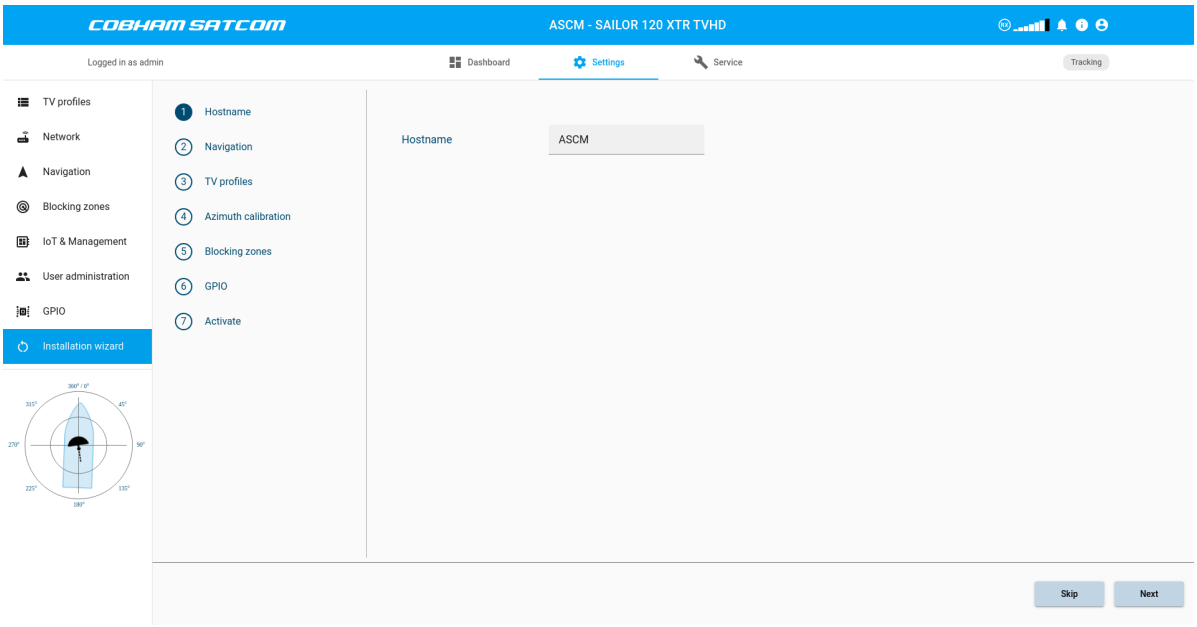

Figure 0.1: Installation wizard.

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

SAILOR XTR TVRO
Installation manual

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Company address

Thrane & Thrane A/S, Lundtoftegårdsvej 93D, DK-2800, Kgs. Lyngby, Denmark

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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.

Compass Safe Distance

The SAILOR XTR TV antenna has a compass safety distance of 150 cm.
Do not mount the antenna closer as it may cause interference with the navigation system of the vessel.

Service

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

Do not service alone

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

Grounding, Cables and Connections

To minimize shock hazard and to protect against lightning, the equipment chassis and cabinet must be connected to an electrical ground. The BDU Lite 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 Lite 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 7516B BDU Lite: Voltage range 100-240 VAC. The +48 VDC voltage to the Above Deck Equipment is supplied by the BDU Lite via a single coaxial cable.

Do Not Operate in an Explosive Atmosphere

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

Keep Away From Live Circuits

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

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

About This Manual

Document revision: E.8

Intended Readers

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

SAILOR XTR TVRO Variants in This Manual

The following variants of the SAILOR XTR TVRO system are described in this manual:

- SAILOR 100 XTR TV (1.0m Ku-band).
- SAILOR 100 XTR TVHD (1.0m Ku-band and DIRECTV Ka-band).
- SAILOR 120 XTR TV (1.2m Ku-band).
- SAILOR 120 XTR TVHD (1.2m Ku-band and DIRECTV Ka-band).

Software Version

This manual is released for software version 3.15.

Typography

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

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

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

Warnings, Cautions, and Notes

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

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

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

General Precautions

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

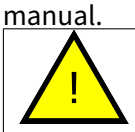
	**WARNING!**	Before using any material, refer to the manufacturer's material safety data sheets for safety information. Some materials can be dangerous.
	**CAUTION!**	Do not use materials that are not equivalent to materials specified by Cobham SATCOM. Materials that are not equivalent can cause damage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

Table of Contents

Introduction

This chapter has the following sections:

- *SAILOR XTR TVRO System*
- *Part Numbers and Options*

1.1 SAILOR XTR TVRO System

The SAILOR XTR TVRO is a unique stabilized maritime TV antenna system operating in the Ku-band (10.70 to 12.75 GHz) and Ka-band (18.30 to 18.80 GHz and 19.70 to 20.20 GHz). It provides TV reception from Ku-band satellite beams (TV) and from DIRECTV satellite in Ka-band (TVHD). The system only requires a single 50/75 Ω cable to provide the Above Deck Unit with both DC power, data and control information. The satellite signals require up to four additional 75 Ω cables to provide the four satellite bands and polarisation to the below deck TV receiver (CFE). The ADU system can be accessed remotely and in-depth performance analysis can be done using the built-in web interface.

Above Deck Unit (ADU)

Below Deck Unit Lite (BDU Lite)

Figure 1.1: ADU and BDU Lite.

System features

- Single 50/75 Ω coax cable to power the ADU and communicate between BDU Lite and ADU.
- Support for global Ku-band satellite TV reception.
- Support for DIRECTV Ka-band satellite TV reception for SAILOR XTR TVHD.
- Software selectable linear or circular polarization for global operation.
- Gyro-free operation.
- 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 Lite via PC and Internet browser.
- Built-in test equipment (BITE) for troubleshooting purpose.
- BDU Lite with 5 x LAN, NMEA 0183, and GPIO pins.
- No scheduled maintenance.
- Few spare parts, easy to service.
- 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 . You can do remote diagnostics and service. The built-in test equipment of the antenna constantly checks the antenna modules for proper functioning and monitors and logs information for all modules. The ADU performs a POST (Power On Self Test) and you can request a self test (PAST, Person Activated Self Test). Continuous Monitoring (CM) is always enabled. Error codes are read out in the web interface and in the display of the BDU Lite. ADU software is updated automatically when making a software update through the BDU Lite.

1.1.1 Above Deck Unit (ADU)

The SAILOR XTR TVRO ADU is a 103 cm or 129.5 cm VSAT stabilized tracking antenna, consisting of a suspended antenna with a global Ku-band/Ku-Ka-band LNB. It is stabilized by heavy-duty vibration dampers in 3-axis (plus skew) and can be used in environments with elevations of -20° to +120° for SAILOR 100 XTR TVRO systems and -15° to +115° for SAILOR 120 XTR TVRO systems. The SAILOR 100 XTR TVRO antenna weighs 102 kg, and the SAILOR 120 XTR TVRO antenna weighs 179 kg. The antenna is powered by the BDU Lite and protected by a radome. 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.

During operation the azimuth cables are coiled in the cable wrap cassette, see Figure SAILOR 120 XTR TV and TVHD ADU modules 2/2 on page 1-6. The antenna automatically detects when a cable unwrap is necessary, then it rotates the entire antenna one revolution in azimuth, to ensure sufficient operational range. The cable unwrap process takes approximately 7.5 seconds. The antenna automatically re-acquires the satellite signal with minimal impact to the performace.

All communications between the ADU and the BDU Lite passes through a single standard coaxial cable. The antenna has 4 LAN connectors and a DC power outlet in

the ADU to connect third-party equipment. The SAILOR XTR TVRO comes with lifting brackets pre-mounted.

Modules in the ADU (SAILOR 100 XTR TV and TVHD)

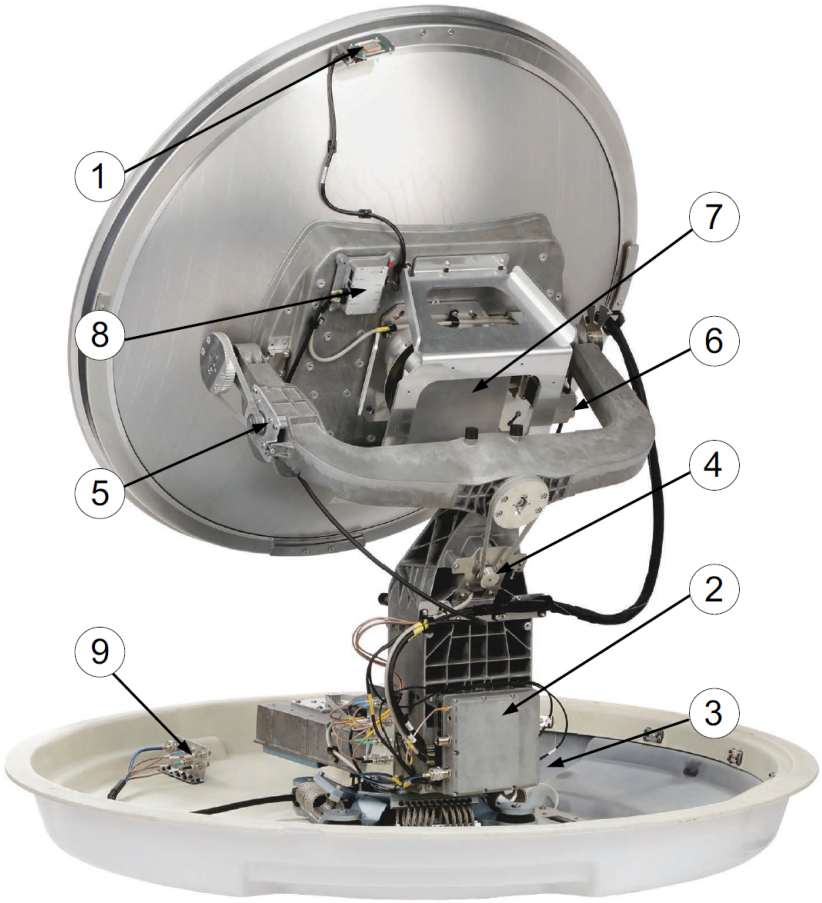


Figure 1.2: SAILOR 100 XTR TV and TVHD ADU modules 1/2.

1. GNSS module (GPS, GLONASS, BEIDOU).
2. XTR Antenna Control Module (ACM).
3. ADU power on/off.
4. Cross elevation motor and encoder.
5. Elevation motor and encoder.
6. Polarization motor and encoder.
7. Low Noise Block downconverter (LNB).
8. Inertial Sensor Module (ISCM).
9. Connections for TV signal cables.

Figure 1.3: SAILOR 100 XTR TV and TVHD ADU modules 2/2.

10. Azimuth motor and encoder.
11. Azimuth cable wrap cassette.
12. Feed horn.

Modules in the ADU (SAILOR 120 XTR TV and TVHD)

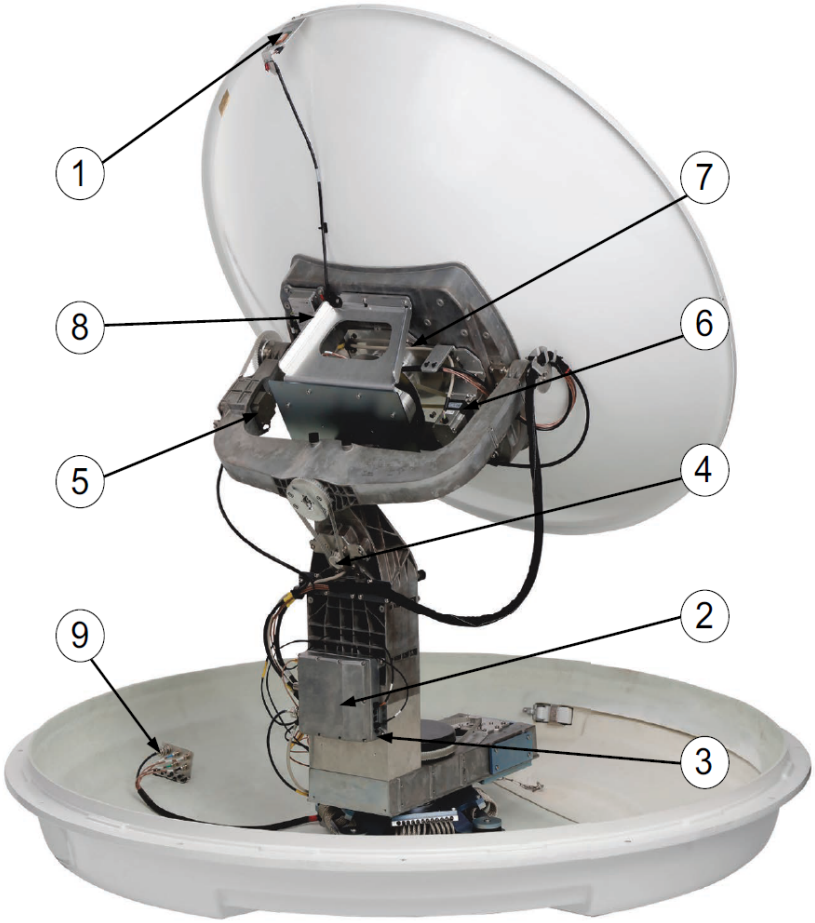


Figure 1.4: SAILOR 120 XTR TV and TVHD ADU modules 1/2.

1. GNSS module (GPS, GLONASS, BEIDOU).
2. XTR Antenna Control Module (ACM).
3. ADU power on/off.
4. Cross elevation motor and encoder.
5. Elevation motor and encoder.
6. Polarization motor and encoder.
7. Low Noise Block downconverter (LNB).
8. Inertial Sensor Module (ISCM).
9. Connections for TV signal cables.

Figure 1.5: SAILOR 120 XTR TV and TVHD ADU modules 2/2.

10. Azimuth motor and encoder.
11. Azimuth cable wrap cassette.
12. Feed horn.

1.1.2 Below Deck Unit (BDU Lite)

The BDU Lite contains all user interfaces and manages all communication between the ADU , a connected PC and an optional FleetBroadband service communication line. The BDU Lite 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 Lite provides DC power to the ADU through a single coaxial cable. The BDU Lite has the following interfaces:

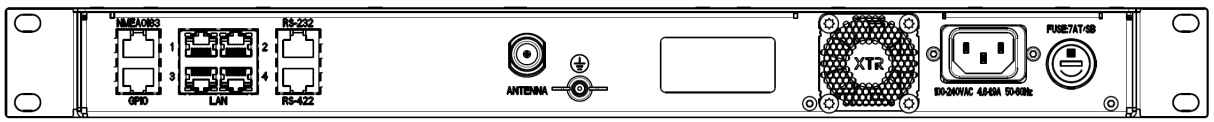


Figure 1.6: BDU Lite, connector overview.

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

BDU Lite Connector ID	Type	Function
NMEA 0183	RJ-45	Vessel Gyro Input
GPIO	RJ-45	General Purpose Input/Output
LAN1	RJ-45	User LAN
LAN2	RJ-45	User LAN
LAN3	RJ-45	User LAN
LAN4	RJ-45	User LAN
RS-232	RJ-45	Serial Interface (not used)
RS-422	RJ-45	Serial Interface (not used)
Antenna	N-Type	ADU Signal and Power (50 Ω)
LAN5	RJ-45	Front LAN Service Port (LAN5)

Table 1.1: BDU Lite connectors.

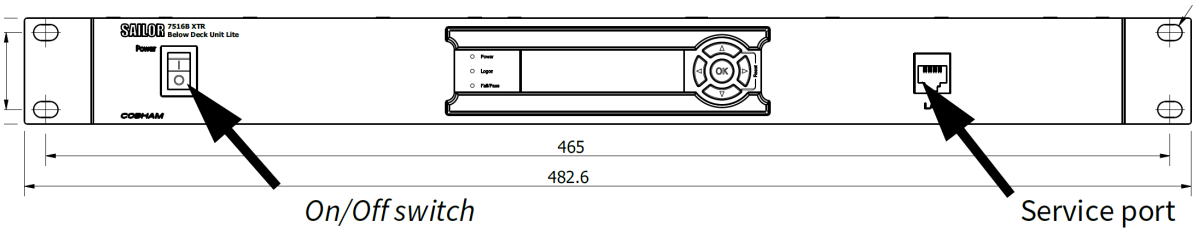


Figure 1.7: BDU Lite, front panel.

1.2 Part Numbers and Options

1.2.1 Applicable Model and Part Numbers

The following model and part numbers exist for the SAILOR XTR TVRO system:

Part Number	Model Number	Description
407510A-00501	7510A	SAILOR 100 XTR TV ADU (With eDome)
407510B-00501	7510B	SAILOR 100 XTR TVHD ADU (With eDome)
407512A-00500	7512A	SAILOR 120 XTR TV ADU (With composite radome)
407512B-00500	7512B	SAILOR 120 XTR TVHD ADU (With composite radome)
407516B-00500	7516B	SAILOR XTR BDU Lite

Table 1.2: Model and part numbers for the SAILOR XTR TVRO system.

NOTE

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

1.2.2 Options

The following options are available for the SAILOR XTR TVRO system:

Part Number	Description
407090A-950	Antenna cable 50 m, N-connector (not mounted), male/male
40-145320	Dual Antenna Arbitrator
407090A-925	Pigtail Cable 1.25 m, N-connector, female/male
407090-001	SAILOR 1m SMART Heater, operation down to -55°C

Table 1.3: Model and part numbers for options of the SAILOR XTR TVRO system.

Installation

This chapter has the following sections:

- *What's in the Box*
- *Site Considerations*
- *Installation of the ADU (SAILOR 100 XTR TVRO and SAILOR 120 XTR TVRO)*
- *Installation of the BDU Lite*
- *Power and Startup*

2.1 What's in the Box

2.1.1 To Unpack

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

- SAILOR XTR TVRO ADU.
- Accessory kit for SAILOR XTR TVRO ADU:
  - Package with bolts and washers.
- SAILOR 7516B BDU Lite.
- Accessory kit for SAILOR 7516B BDU Lite:
  - Power cable (230 VAC) with Schuko (Euro) wall plug.
  - Terminal block (RJ45 Wire Connector Terminal, S-31-208142)
  - N-to-F converter (2 pcs).

2.1.2 Initial Inspection

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

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

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

2.1.3 Tools Needed

The following tools may be needed during the installation:

- Torx TX 30 to open the service hatch (if any).
- Torque wrench to fasten the mounting bolts for the ADU.
- Torque wrench to fasten the N-connector and F-connectors 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*
- *Ship Motion and Offset from the Ship's Motion Centre*
- *ADU Mast Flange and Mast Length*
- *Interference Between Radar, GPS/GNSS, L-band and Other Transmitters/Receivers*
- *Condensation and Water Ingress*

2.2.1 General Considerations

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

Painting the Radome

Customers may wish to paint the radome in order to match the vessel's color. Any paint used must be nonmetallic. Painting the radome may impact RF performance and may lead to overheating, causing the antenna to go into safe mode (become inactive). Cobham SATCOM recommends that the radome **NOT** be painted. Painting the radome will not void the general warranty regarding material and workmanship etc. It is only the performance that cannot be guaranteed.

Modifying the Radome or Using Another Radome

The SAILOR XTR TVRO antenna comes with a type approved radome fitted from the factory. Cobham SATCOM strongly recommends that you do **NOT** modify the radome or change it to another type. Exchanging or modifying the radome will not void the general warranty for material and workmanship etc. but the performance cannot be guaranteed.

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 2.1. If the g-force applied is too high, performance and ADU signal stabilization may be reduced and eventually the ADU may be damaged.

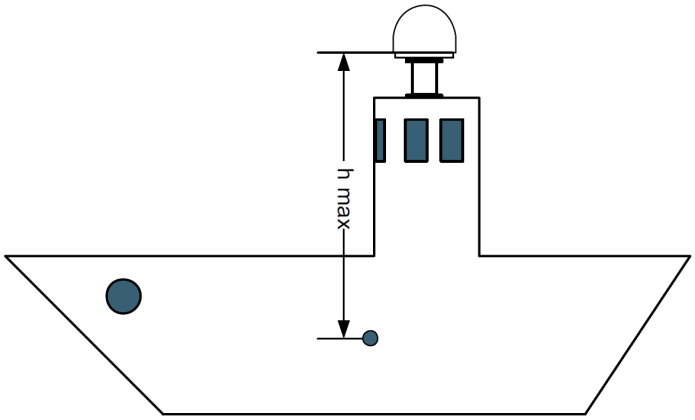


Figure 2.1: Maximum distance from the ship's motion centre (h max).

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

Table 2.1: Maximum distance from the ship's motion center versus ship's roll period.

2.2.2 Obstructions (ADU Shadowing)

Any obstructions, such as masts, funnels, bridge house etc. can cause signal degradation or signal loss.

For optimum performance adhere to the following guidelines:

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

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

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

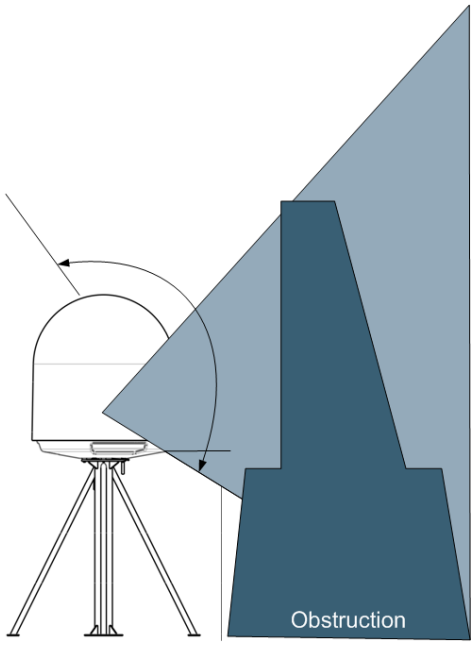


Figure 2.2: Signal degradation because of obstructing objects.

Blocking Zones – Azimuth and Elevation

The installation may require to set up blocking zones for the ADU . Eight blocking zones can be set up. Each blocking zone is set up with azimuth start and stop, and elevation angle. The blocking zones are set up in the built-in web interface.

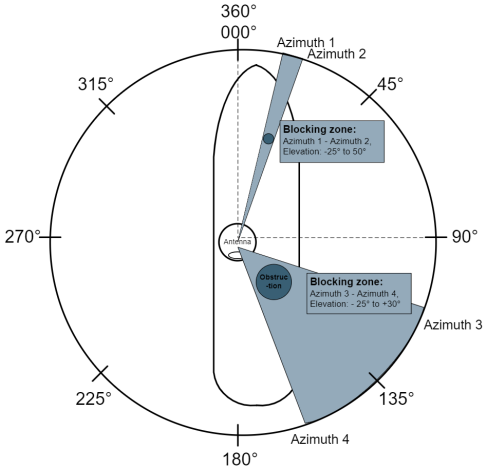


Figure 2.3: Blocking zones with, azimuth (example).

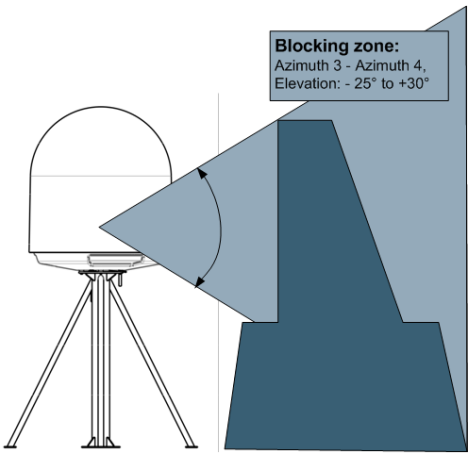


Figure 2.4: Blocking zones with, elevation angle (example).

2.2.3 ADU Mast Flange and Mast Length

The system is designed for harsh environmental conditions at sea, both in regards to vibration amplitude and speed. The antenna system performs optimally when mounted on a properly designed foundation. When mounting the antenna the overall goal is to establish a foundation which is as rigid as possible. However, in some scenarios establishing a very rigid foundation can be difficult. This section aims at defining the minimum design criterion for the mast. In addition, some specific design suggestions are presented. Note that the design values given below depend on rigid interfaces between antenna and ship, the values are furthermore given based on a standard steel type (e.g. S235JR, S355JO).

The placement of the ADU must ensure a rigid structural connection to the hull or structure of the ship. Parts of the ship with heavy resonant vibrations are not suitable places for the ADU. A small platform or short mast must provide rigid support for the ADU fastening bolts and a rigid interface to the ship. If it is necessary to use a tall mast, you must stabilize the mast with bracing. In regards to stiffness the overall criterion is that the first structural mode of the mast or foundation (where the antenna system is mounted) should be above 30 Hz. All the designs presented in the

following sections respect this standard.

Important

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

The ADU mast must carry the weight of the ADU unit, that is approximately 102 kg (+ the weight of the mast flange) for the SAILOR 100 XTR TV/TVHD antenna and approximately 179 kg for the SAILOR 120 XTR TV/TVHD antenna. The mast must also withstand on-board vibrations and wind speeds up to 110 knots on the radome, even in icing conditions.

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

ADU Mast Flange

SAILOR 100 XTR TV

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

SAILOR 120 XTR TV

1. Provide a mast flange with a minimum of four gusset plates.
2. Fit the top of the ADU mast with a flange with clearance holes matching the bushings in the radome and with minimum four gusset plates. No center hole is necessary in the flange.
   - **Flange thickness:** Minimum 20 mm.
   - **Four gusset plates:** Minimum 20 mm thick, must be placed as close as possible to the holes in the mounting plate while leaving space for the bolt head and welded seam.
3. Make sure that the flatness on the mast mount plateu is below 3.0 mm.

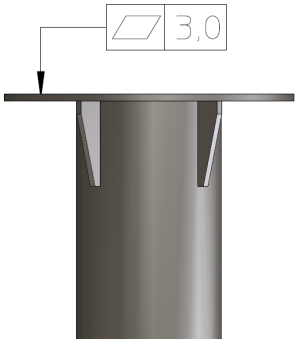


Figure 2.5: ADU mast flange, recommended flatness on the mast mount plateau.

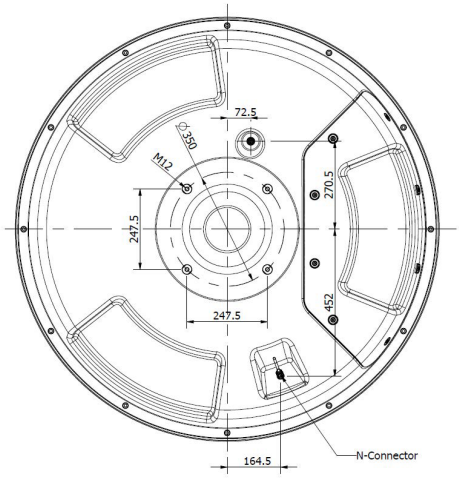


Figure 2.6: ADU, bottom view (SAILOR 100 XTR TV and TVHD).

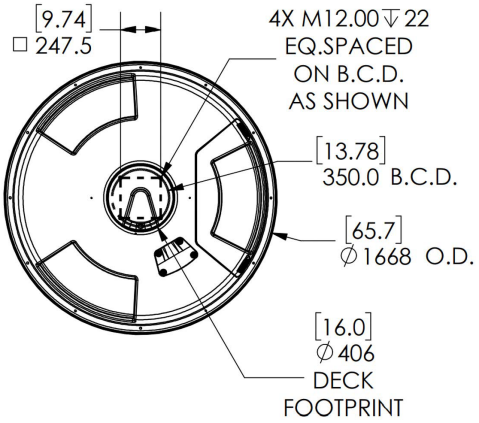


Figure 2.7: ADU, bottom view (SAILOR 120 XTR TV and TVHD).

Mast Length and Diameter

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

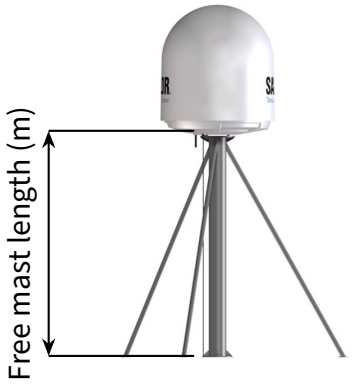


Figure 2.8: Free mast length and bracing for a tall mast.

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

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

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

Mast Length (SAILOR 100 XTR TVRO)

The below tables show the minimum dimensions for a SAILOR 100 XTR TVRO antenna mast with and without stays/braces. Note that the values are only guidelines - always consider the environment and characteristics of the ship before deciding on the mast dimensions.

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

Table 2.2: Mast dimensions without braces (SAILOR 100 XTR TVRO).

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 2.3: Mast dimensions with 3 braces (SAILOR 100 XTR TVRO).

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

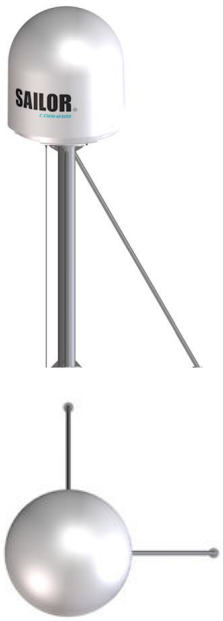
Mast With 2 Braces	Max. Free Mast Length (steel), (m)	Outer Diameter (mm)	Wall Thickness (mm)	Outer Diameter For Brace (mm)	Thickness For Brace (mm)
	1.2	160	10	80	5.0
	1.2	200	5	80	5.0
	1.6	180	10	80	5.0
	1.6	220	5	80	5.0
	2	180	10	80	5.0
	2	240	5	80	5.0
	2.5	200	10	80	5.0
	2.5	260	5	80	5.0

Table 2.4: Mast dimensions with 2 braces (SAILOR 100 XTR TVRO).

Mast Length (SAILOR 120 XTR TVRO)

The below tables show the minimum dimensions for a SAILOR 120 XTR TVRO antenna mast with and without stays/braces. Note that the values are only guidelines - always consider the environment and characteristics of the ship before deciding on the mast dimensions.

Mast Without Braces	Max. Free Mast Length (steel), (m)	Outer Diameter (mm)	Wall Thickness (mm)	Weight (kg/m)
	0.4[2]	200	10	46.5
	0.6	220	10	51.5
	0.8	250	10	58.8
	1	270	10	63.7

Table 2.5: Mast dimensions without braces (SAILOR 120 XTR TVRO).

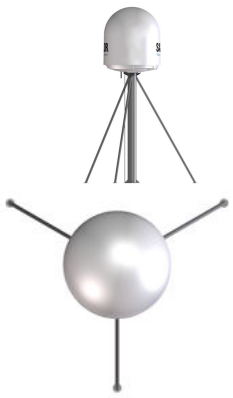
Mast With 3 Braces	Max. Free Mast Length (steel), (m)	Outer Diameter (mm)	Wall Thickness (mm)	Outer Diameter For Brace (mm)	Thickness For Brace (mm)
	1.2	200	10	50	5.0
	1.6	200	10	70	5.0
	2	220	10	70	5.0
	2.5	220	10	80	5.0

Table 2.6: Mast dimensions with 3 braces (SAILOR 120 XTR TVRO).

[2] 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 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	200	10	80	5.0
	1.6	220	10	80	5.0
	2	240	10	80	5.0
	2.5	260	10	80	5.0

Table 2.7: Mast dimensions with 2 braces (SAILOR 120 XTR TVRO).

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

NOTE

Do not place the antenna close to interfering signal sources or receivers. For allowed distances to other transmitters see Figure 2.10. 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.

Compass Safe Distance

The SAILOR XTR TVRO antenna has a compass safety distance of 150 cm. Do not mount the antenna closer as it may cause interference with the navigation system of the vessel.

Radar

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

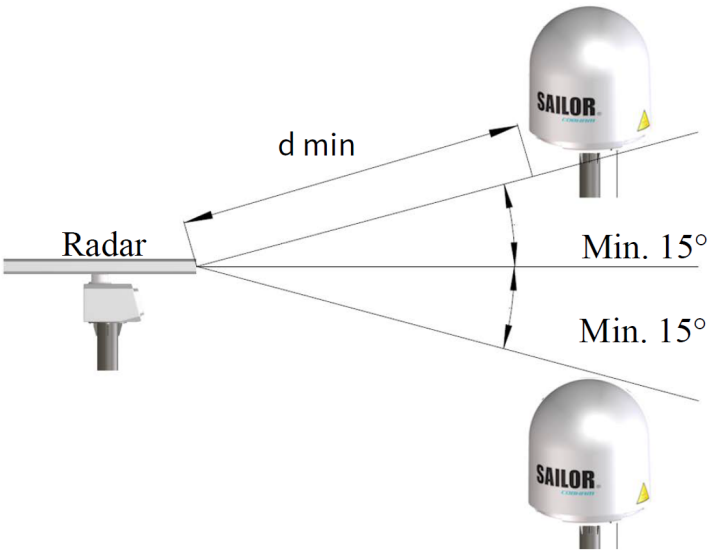


Figure 2.9: Interference with the vessel's radar.

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 TVRO ADU**	
	d min. at 15° Vertical Separation	**d min. at 60° Vertical Separation**
0 – 10 kW	1.0 m	1.0 m
30 kW	2.0 m	1.0 m
50 kW	3.3 m	1.7 m

Table 2.8: Minimum radar separation, X-band.

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

Table 2.9: Minimum radar separation, S-band.

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

Even at distances greater than “d min.” mentioned in the previous section, the radar might still be able to degrade the performance of the SAILOR XTR TVRO 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 TVRO ADU to the L-band antenna. The following figure shows the minimum recommended distance to other transmitters in the frequency range below 1000 MHz.

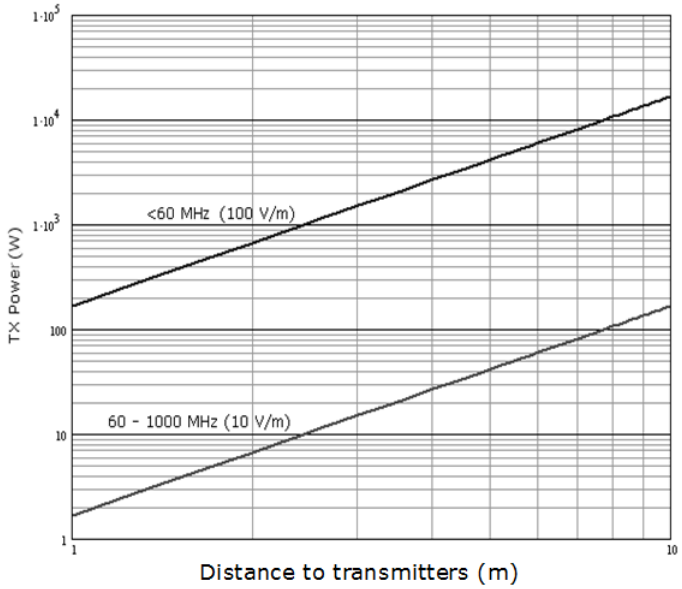


Figure 2.10: Recommended distances to other transmitters.

2.2.5 Condensation and Water Ingress

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

1. If possible, install the radome in such a way that direct spray of seawater is avoided.
2. Make sure the ADU's drain tube is open and that there is free space between the drain tube and the mounting surface so water can escape from inside the radome and there is ventilation for the ADU.

Figure 2.11: 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 single coax cable connecting the BDU Lite with the ADU for communication and power can use either a 50 Ω N-N cable (recommended) or a 75 Ω F-F cable with the use of two 50 Ω N to 75 Ω F adapters. The maximum allowed RF loss in the cable is 25 dB @ 400 MHz. The DC loop resistance of the antenna cable must be maximum 2 Ω. This is to ensure the power requirements from BDU Lite to the antenna.

Cable Type	Absolute Max. Length (m)	Absolute Max. Length (ft)
RG223-D	60	190
RG214/U	155	490
GX_07272_D	130	410
LMR-600-50	360	1150

Table 2.10: 50 Ω cable types and maximum lengths.

Cable Type	Absolute Max. Length (m)	Absolute Max. Length (ft)
RG11BB	55	175
LMR-400-75	150	480
LMR-600-75	240	760

Table 2.11: 75 Ω cable types and maximum lengths.

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

2.3 Installation of the ADU (SAILOR 100 XTR TVRO and SAILOR 120 XTR TVRO)

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 the weight of the ADU.

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.

2.3.1 To Install the ADU (SAILOR 100 XTR TV and TVHD)

Prerequisites

- Ensure that the crane hook has a closing mechanism to prevent accidental slippage of the lifting straps.
- Mount the antenna as far away as possible from the ship's radar and high power radio transmitters, read more in *Interference Between Radar, GPS/GNSS, L-band and Other Transmitters/Receivers* on page 2-12.
- 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.

Maintain the vertical orientation of the ADU center line.

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

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

Installation Procedure

To install the ADU, do as follows:

1. Install the mast with the mast flange and have the four M12 bolts ready.
2. Undo all shipping buckles, take off the wooden top and remove the casing.

3. Remove the wooden platform.
4. Attach a webbed, four-part sling with a belt to all four lifting brackets.
5. Attach two tag lines of suitable length to two lifting brackets and man them.
6. With a crane lift the ADU off the wooden platform and move it on top of the ADU mast.
7. Install the ADU on the mast flange with four M12 bolts and washers. Tighten to 30 Nm. Read carefully and follow instructions given in *To Ground the ADU* on page 2-26.
8. Remove the four lifting brackets. Keep the lifting brackets on the vessel for future use.
9. Remove the blue cable seal module from the slot in the radome bottom by loosening the two hex screws to release tension.

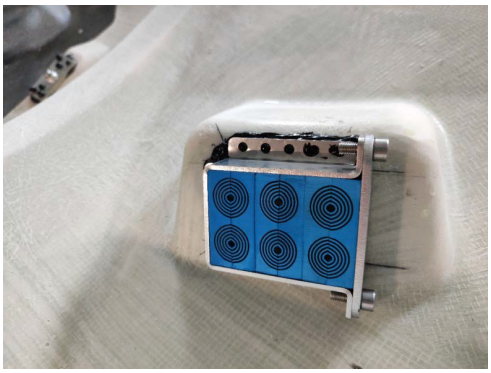


Figure 2.12: Blue cable seal module inside the radome bottom.

10. Route the antenna power and control cable, and the cables for TV reception through the hole in the radome bottom.

Figure 2.13: Blue cable seal module outside the radome bottom.

11. Connect the Antenna Control coax cable to the large N-connector. Tighten to 2.5

Nm.

12. Connect the Low Band Vertical/RHCP coax to the **Blue** F-connector. Tighten to 1 Nm.
13. Connect the Low Band Horizontal/LHCP coax to the **White** F-connector. Tighten to 1 Nm.
14. Connect the High Band Vertical/RHCP coax to the **Green** F-connector. Tighten to 1 Nm.
15. Connect the High Band Horizontal/LHCP coax to the **Black** F-connector. Tighten to 1 Nm.
16. Peel off layers (concentric circles) of the blue cable seal modules to match the guage of the cables used. There should be a small gap of 0.1-1 mm between the modules when assembled on either side of a cable (before tensioning). Remove an equal number of layers on both halves.
17. Apply the lubricant included in the installation kit (Roxtec Lubricant, Natural Grease) to the modules and insert them into the frame in the radome bottom, around the cables.
18. Tighten the two hex screws to tension cable seal assembly. This creates a watertight seal and locks the cables in place.
19. 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.

To Open the Service Hatch

Do as follows to open the service hatch:

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

Figure 2.14: Opening the service hatch.

2.3.2 To Ground the ADU

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

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

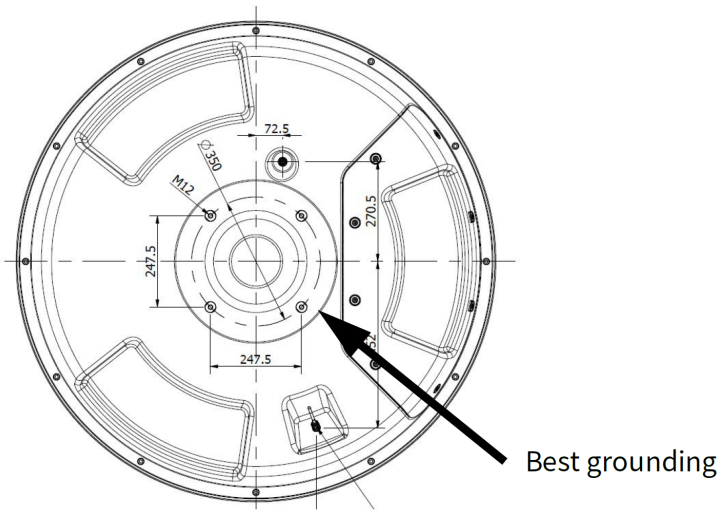


Figure 2.15: Connecting the ADU cable.

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

If the ADU cannot or should not be electrically connected directly to the mounting surface, use a separate grounding cable to make the connection between the ADU and the common ground to which the BDU Lite is also connected.

2.3.3 To Install the ADU (SAILOR 120 XTR TV and TVHD)

Prerequisites

- Ensure that the crane hook has a closing mechanism to prevent accidental slippage of the lifting straps.
- Mount the antenna as far away as possible from the ship's radar and high power radio transmitters, read more in *Interference Between Radar, GPS/GNSS, L-band and Other Transmitters/Receivers* on page 2-12.
- Install the ADU at a location where **vibrations are limited to a minimum.**
- Make sure that there is sufficient space underneath the ADU to open the service hatch.

Important	Maintain the vertical orientation of the ADU center line.

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

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

ADE Mounting Considerations

Mounting the radome directly on the deck/ platform prevents access to the hatch in the base of the radome unless an opening is designed into the mounting surface to allow such entry. If there is no access to the hatch the only way to service the antenna is to remove the radome top. Two people are required to take the top off of the radome without cracking or losing control of it, but even with two people a gust of wind may cause them to lose control and the radome top may be catastrophically damaged (see repair information in the radome specifications). If access to the hatch cannot be provided in the mounting surface, provide a short ADE support pedestal to mount the ADE on which is tall enough to allow access into the radome via the hatch. Ladder rungs must be provided on all mounting stanchions greater than 3-4 feet tall to allow footing for personnel safety when entering the hatch of the radome.

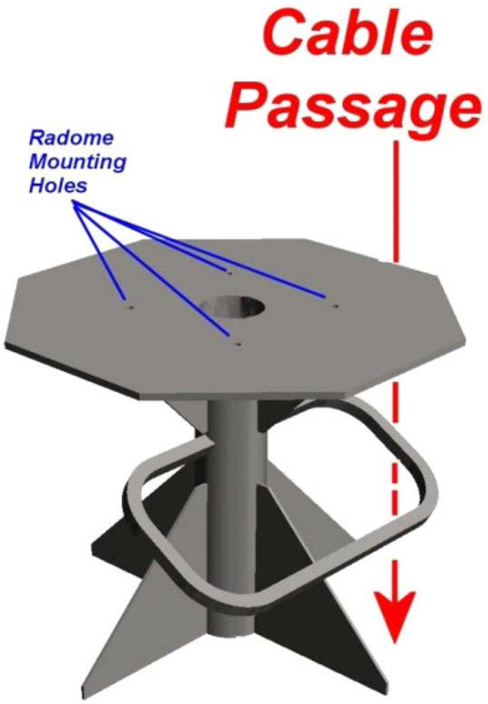


Figure 2.16: ADE mounting considerations.

When strain relief glands are being used the recommended cable passage will be in/out the starboard side of the base of the radome approximately 30 cm from the center of the radome base, down along the side of the pedestal, through the deck and into the interior of the ship.

Removal of the System Crate

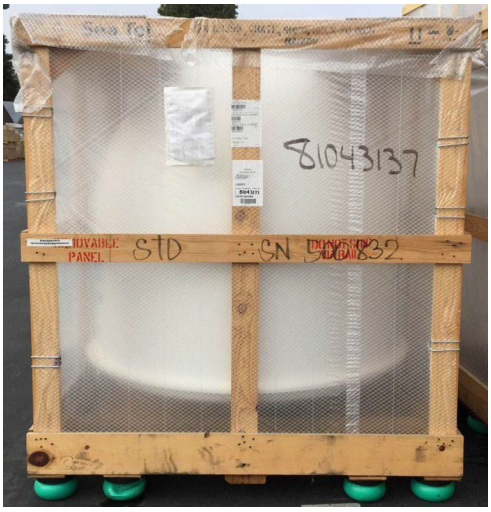


Figure 2.17: SAILOR 120 XTR TVRO System Crate.

1. Open the System Crate. The system Above Decks Equipment (ADE) is shipped to you completely assembled. We recommend that you place the System Crate in the area that you have chosen to prepare for lifting that ADE onto the ship.

2. Remove the wood screws that penetrate through the bottom board of the removable panel into the pallet.

Figure 2.18: Clips on removable crate wall.

3. Remove the clips around the removable crate wall.

4. Remove the removable crate wall to expose the contents.

5. Set the side/top panels aside, where they will not interfere with hoisting the ADE.

Preparation of the Radome Assembly

Figure 2.19: Horizontal bolt in lifting brackets.

1. Lift the pallet using a forklift and/or jacks.
2. From the underside of the pallet, remove the four shipping bolts which attach the ADE to its pallet. Discard this shipping hardware.
3. Remove the horizontal bolt in one of the four the lifting brackets which are installed on the underside of the radome base.
4. Attach a properly load rated web lifting strap to the bracket using the bolt removed in the previous step.
5. Repeat these steps 3 and 4 to install the other three lifting straps.
6. Attach a suitable length tag line to one of the brackets.

Installation of the Radome Assembly

The antenna pedestal is shipped completely assembled in its radome.

1. Hoist the Radome assembly off the shipping pallet, by means of a suitably sized crane or derrick, to allow access to bottom of radome assembly.
2. Open the hatch by pressing the round release button in the latches and gently push the hatch up into the radome. Place the hatch door (gel coat surface up) inside the radome on the far side of the antenna pedestal.

3. Inspect the pedestal assembly and reflector for signs of shipping damage.

Figure 2.20: Sticky side of the mounting pad.

4. Peel off the paper of the mounting pad (provided in the radome installation kit) to expose the sticky side of the pad, align it to the mounting holes and press it in place on the underside of the radome base.

Figure 2.21: Mounting pad installation on radome base.

5. Using Loctite 271, install the four mounting studs (provided in radome mounting kit) into the radome base
6. Man the tag line and have the crane continue lifting the ADE up and hover above the mounting site on the ship.

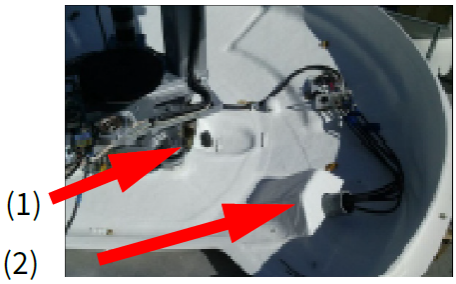


Figure 2.22: Cable entries in radome bottom.

7. Carefully route the ground strap/cable (see Grounding info below) and five power & IF coax cables through the cable passage in the bottom center OR the offset cable entry (as desired). Center Cable Entry (1), Side Cable Entry (2).
8. Allow enough service loop to terminate these cables to the connector bracket respectively. Refer to the High-level block diagram on page A-10.

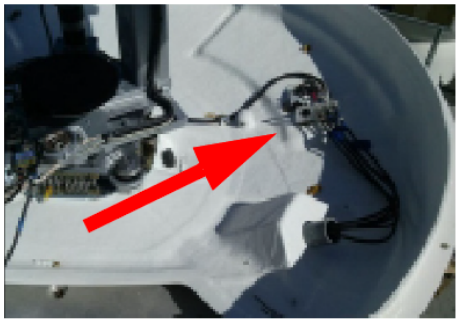


Figure 2.23: N-connector in radome bottom.

9. Connect the Antenna Control coax to the large N-connector. Tighten to 2.5 Nm.
10. Connect the Low Band Vertical/RHCP coax to the **Blue** F-connector. Tighten to 1 Nm.

NOTE

Suitable strain relief should be provided below the mounting surface to prevent the cables from being kinked where the cables exit the bottom of the radome.

11. Connect the Low Band Horizontal/LHCP coax to the **White** F-connector. Tighten to 1 Nm.
12. Connect the High Band Vertical/RHCP coax to the **Green** F-connector. Tighten to 1 Nm.
13. Connect the High Band Horizontal/LHCP coax to the **Black** F-connector. Tighten to 1 Nm.
14. Adjust the cables through the desired cable entry and apply the Silicone Adhesive included in the installation kit (Momentive TSE-392C) to make the cable entry point splash-proof.

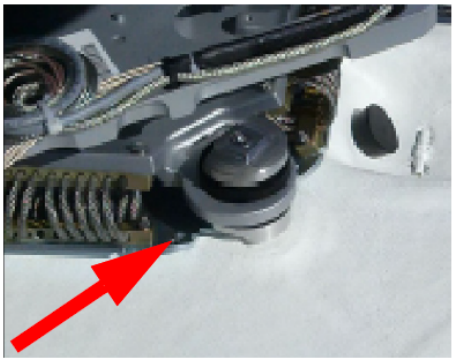


Figure 2.24: Install ADU on the mast flange.

15. Install the ADU on the mast flange with four M12 bolts and washers. Tighten to 30 Nm.
16. Remove the tag lines.
17. Remove the lifting straps.

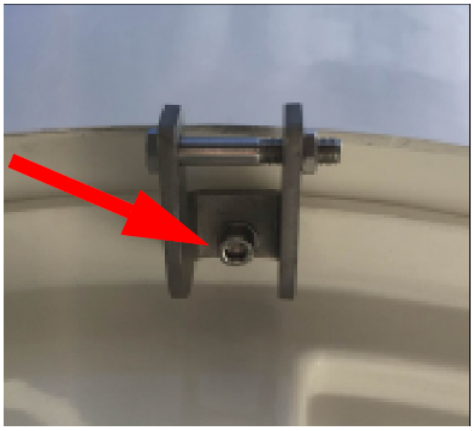


Figure 2.25: Remove lifting brackets.

18. Remove the four M12 screws from the lifting brackets on the underside of the radome base.
19. Apply Loctite to, reinstall and tighten the four M12 bolts.
20. Close the radome hatch.

2.3.4 To Ground the ADU

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

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

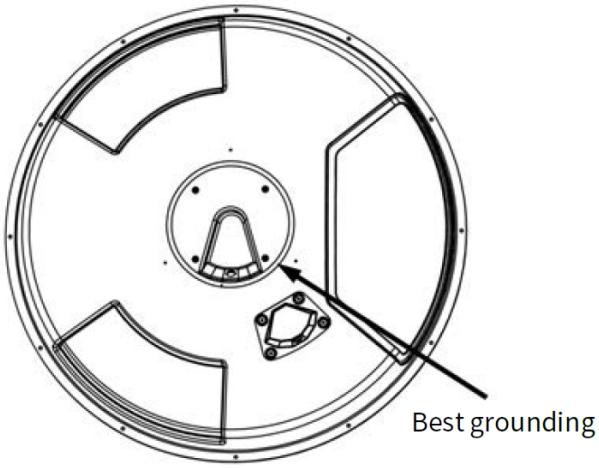


Figure 2.26: ADU, bolt for optimum grounding.

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

If the ADU cannot or should not be electrically connected directly to the mounting surface, use a separate grounding cable to make the connection between the ADU and the common ground to which the BDU Lite is also connected.

2.4 Installation of the BDU Lite

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

2.4.1 Connector panel of the BDU Lite

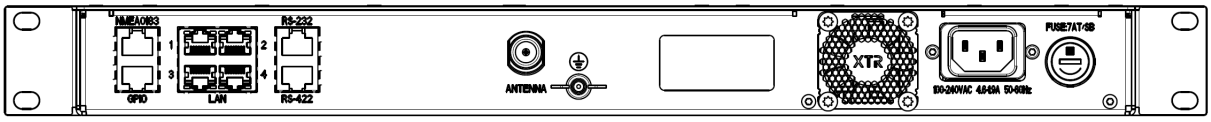


Figure 2.27: BDU Lite connector panel.

AC Input Connector

Connect the power cable to the AC power connector.

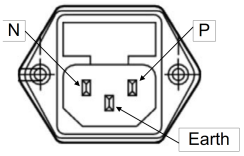
Outline (on the BDU Lite)	Voltage Range
	100-240 VAC

Table 2.12: AC power connector.

ADU Connector

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

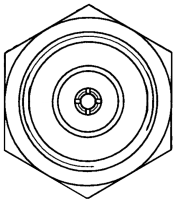
Outline (on the BDU Lite)	Conductor	Pin Function
	Inner	DC to ADU BDU Lite to ADU Communication
	Outer	GND (Shield)

Table 2.13: N-connector, outline and pin assignment.

Important

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

NMEA 0183 RJ-45 Connector

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

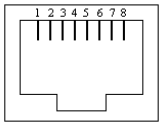
Outline (on the BDU Lite) NMEA	Pin	I/O	Signal	Pin Function
	1	O	RS-422 Line B (+)	Future use
	2	O	RS-422 Line A (-)	Future use
	3	I	RS-422 Line B (+)	Heading, balanced
	4	O	RS-232 TxD	Future use
	5		RS-422 shield	Connect only at one end
	6	I	RS-422 Line A (-)	Heading, balanced
	7		RS-232 GND	Heading,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

Table 2.14: NMEA 0183 RJ-45 connector, outline and pin assignment.

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

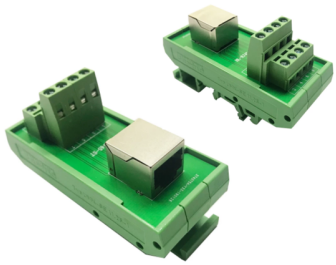


Figure 2.28: Gyro input, terminal block.

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

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

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

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

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

Any HDT sentence is supported as long as it complies with the following header format: $xxHDT where xx e.g. GP for $GPHDT.
Any HDG sentence is supported as long as it complies with the following header format: $xxHDG where xx e.g. GP for $GPHDG.
Recommended NMEA 0183 cable: Minimum CAT 5e, shielded.

GPIO RJ-45 Connector

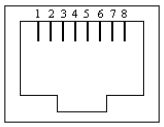
Outline (on the BDU Lite)	**Pin**	**I/O**	**Signal**	**Function**
	1	I	GPIO1	Not used
	2	O	12 VDC / 500 mA	Power Output
	3	O	GPIO2	Rx Lock (open drain). The Rx lock function is high and becomes low when the antenna is not in Rx lock.
	4	O	GPIO3	Dual arbitrator (Part number: 40-145320) signalling. Switches antenna in dual antenna operation.
	5		GND	Ground
	6	O	12 VDC / 500 mA	Power output
	7	N/A	GPIO4	Output for alarm indicator if antenna is non-functional, cable unwrapping or in blocking zone. To be activated in the web interface.
	8		GND	Ground
	Shield		PCB ground	PCB ground

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

RS-232 RJ-45 Connector

Not used.

RS-422 RJ-45 Connector

Not used.

LAN Connectors

The BDU Lite has four Ethernet connectors (type RJ-45), located at the back of the unit, for PC/laptops, routers and wireless access points. LAN port 5 is for service access at the front.
The maximum cable length per connection is 100 m.
Cable type: Minimum CAT 5e, shielded.

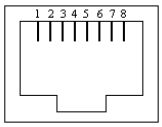
Outline (on the BDU Lite)	**Pin**	**Pin Function**	**Wire Color**
	1	Tx+	White/orange
	2	Tx-	Orange
	3	Rx+	White/green
	4	Not connected	Blue
	5	Not connected	White/blue
	6	Rx-	Green
	7	Not connected	White/brown
	8	Not connected	Brown
	Shield	PCB ground	PCB ground

Table 2.16: Ethernet connector, outline and pin assignment.

2.4.2 To Install the BDU Lite

To install the BDU Lite, do as follows:

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

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

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

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

To Ground the BDU Lite

1. Make sure that the grounding requirements are met. See the appendix *To Ground the BDU Lite* on page E.2.1 for details about grounding.
2. At the BDU Lite 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 Lite is grounded – also if the ADU cable is disconnected from the BDU Lite, connect an extra ground wire from the rack to the ground stud on the BDU Lite. This ground wire must be a heavy wire or braid cable with a larger diameter than the coax cable.

2.5 Power and Startup

1. Connect power to the BDU Lite.
2. Switch on the BDU Lite. 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 Lite are not the same, a software update is done during startup).
   - Antenna POST.
   - Not ready.
   - Ready.
   - Acquiring Signal.
   - Tracking.

This may take some time (up to a couple of minutes). The SAILOR XTR TVRO is ready to be calibrated (for first time power up) or automatic activation of a TV profile (when in normal operation) when the antenna enters the state Ready.
On the BDU Lite, the LEDs **Power** and **Fail/Pass** are **steady green**, the LED **Logon** is off.

3. Make sure there are no hardware failures or error codes present, check the display of the BDU Lite for events.
4. You may follow the instructions in the installation wizard to get the SAILOR XTR TVRO system operational, see *Installation Wizard* on page 3-27.

2.5.1 Power Cycle

To power cycle the BDU Lite and ADU do as follows:

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

Setup of the Antenna

This chapter has the following sections:

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

Important

The SAILOR XTR TVRO 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 TVRO are exposed to the Internet you must use a strong password as anyone with access and malicious intent can render the system inoperable.

3.1 Introduction to the Web Interface

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

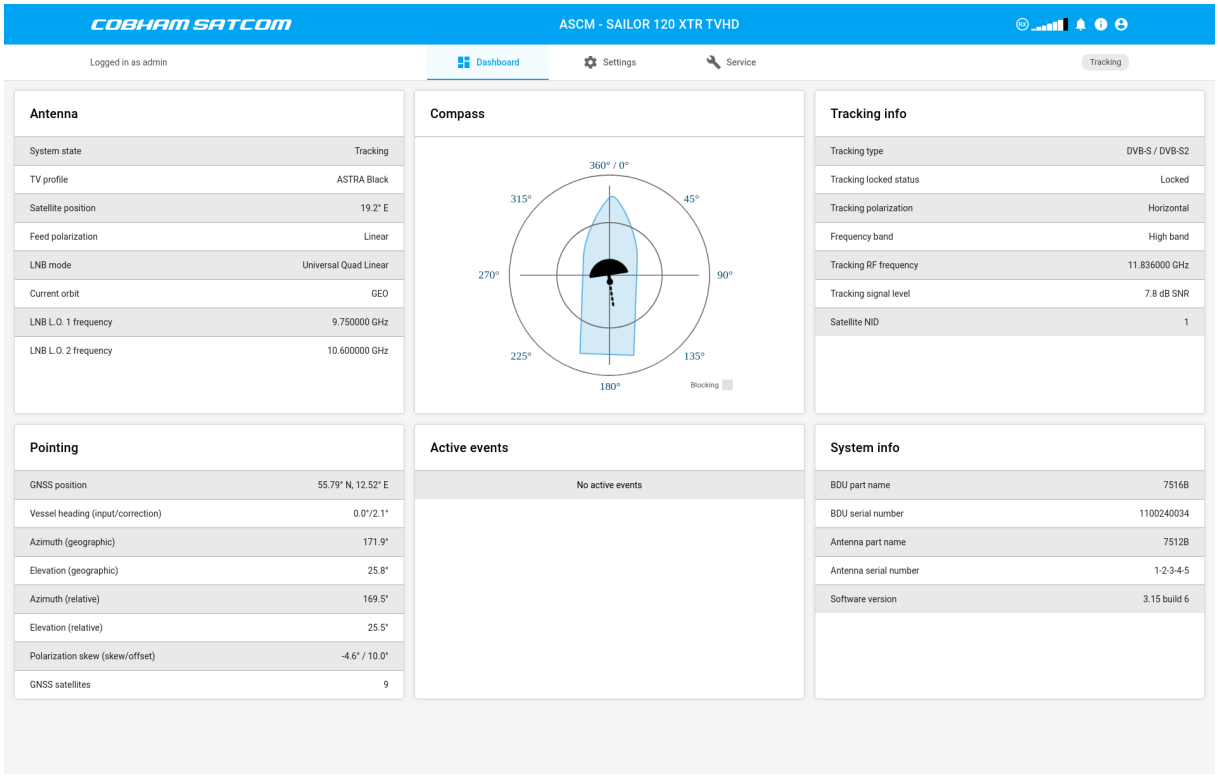
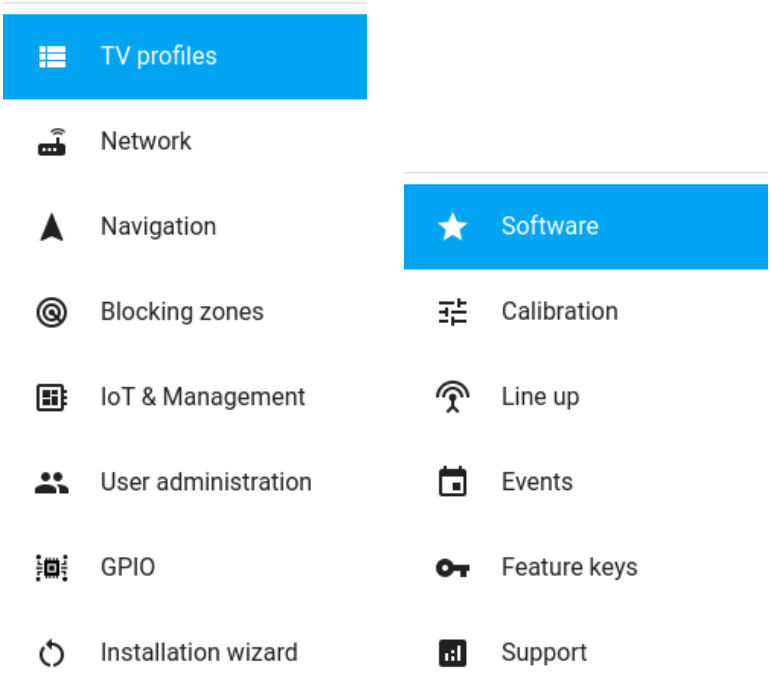


Figure 3.1: Dashboard (example).

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



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

Figure 3.2: Menu items in the web interface.

3.1.1 Connecting to the Web Interface

To connect to the web interface do as follows:

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

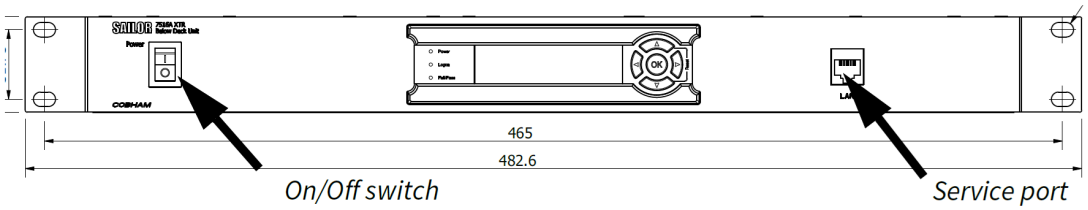


Figure 3.3: BDU Lite Service port.

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

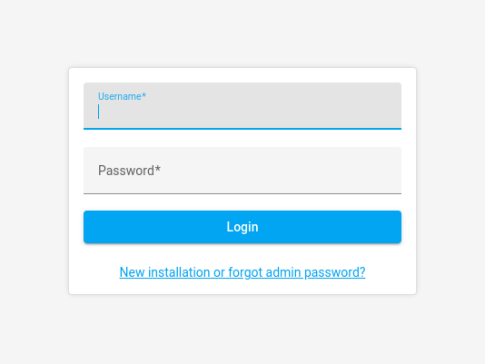


Figure 3.4: Login.

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

Sections on the Dashboard

Parameter	**Description**
ANTENNA	
System state	Current state of the system.
TV profile	Name of the currently active TV profile.
Satellite position	Longitude position of the satellite.
Feed polarization	Linear or Circular.
LNB mode	Regional LNB mode settings.
Current Orbit	GEO.
LNB L.O. 1 frequency	Low-Noise Block Local Oscillator 1 frequency.
LNB L.O. 2 frequency	Low-Noise Block Local Oscillator 2 frequency.
TRACKING INFO	
Tracking type	Narrow band or DVB-S/DVB-S2.
Tracking locked status	Indicates whether the modem is locked to the signal from the satellite.
Tracking polarization	Vertical or Horizontal.
Frequency band	Low or High.
Tracking RF frequency	Antenna tracking frequency.

Continued on next page

Table 3.1: Sections and parameters on the Dashboard.

Parameter	Description
Tracking signal level	Signal strength of the narrow band detector in dB or Signal to Noise Ratio (SNR in dB) from the DVBS chip.
Satellite NID	Network ID of the satellite.
POINTING	
GNSS position	Current vessel position, reported by the built-in GNSS module or external GPS source.
Vessel heading (input/correction)	Ship's heading in degrees with reference to North, provided by the ship's gyro. The value provided by user or external compass is shown as input. The antenna, once in tracking, determines corrections to the given input.
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.
GNSS satellites	Number of currently visible GNSS satellites.
SYSTEM INFO	
BDU part name	BDU Lite model.
BDU serial number	BDU Lite serial number, used for service cases.
Antenna part name	ADU model.
Antenna serial number	ADU serial number, used for service cases.
Software version	Active software version.
ACTIVE EVENTS	
Will show any Active events.	
COMPASS	
Graphical visualization of ship heading and antenna pointing direction compared to geographical north.	

Table 3.1: Sections and parameters on the Dashboard.

Top Bar

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

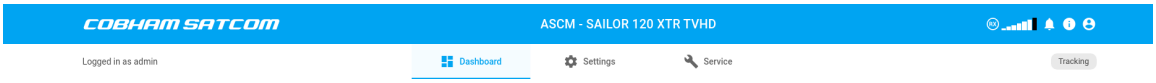


Figure 3.5: Top bar of the web interface (example).

Icon	Explanation
	Receive signal strength.
	Number of active errors and warnings. Mouse over will show a list of the first 5 messages, a click on the list will display the event list.
	About and contact information.
	Logout.

3.2 Settings

In this section you can define a TV 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.

3.2.1 TV Profiles

In this section you set up the TV profile with satellite data. Once you have created a TV profile, you can edit or delete it.

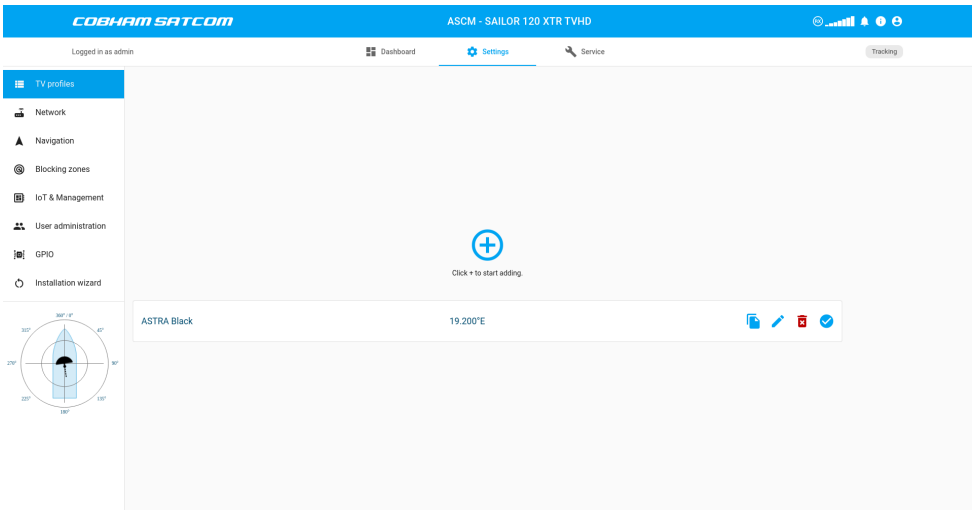


Figure 3.6: Settings - TV Profiles.

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

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

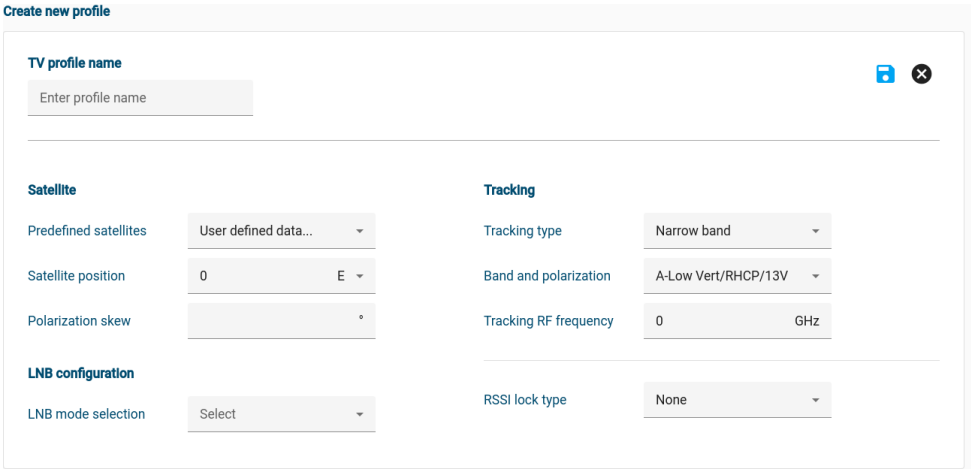


Figure 3.7: Settings - TV Profiles - Add.

3. At **TV profile name** enter a name of your choice.
4. At **Predefined satellites** select from the drop-down list or specify one manually with the Satellite position and Satellite skew.
5. Select the appropriate **LNB mode selection** from the drop-down. The TV LNB can operate in many modes and frequency bands. This setting selects the Local Oscillator frequency (therefore the RF frequency band), linear or circular polarization and whether the LNB will output dual or quad IF outputs. It sets the LNB into the listed modes (each emulating an individual LNB for the cited satellite/service). This **MUST** be set correctly for the desired satellite/service.
6. The **LNB L.O. 1** and **LNB L.O. 2** frequencies will automatically change depending on which LNB Mode is selected. This is for information only for the installer/operator.
7. Select the appropriate **Tracking type**.
8. Select the **Band and Polarization** of the LNB output which contains the desired tracking frequency and signal.

Example: If the signal you wish to track is LHCP (or Horizontal) at 12.224 GHz (high band), you would select ”D-High Horiz/LHCP/18V tone” from the drop-down list.

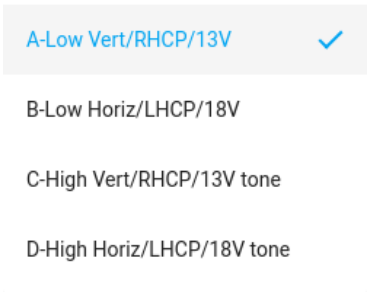


Figure 3.8: LNB Mode selection.

9. Set the **Tracking RF frequency**.
10. For DVB-S: Input the required **Symbol rate**.

11. For DVB-S: Select the **NID** that the antenna should use for verification that the correct satellite and transponder is tracked. Select ”0” for no NID verification.
12. For Narrowband: Input **RSSI lock type** and **RSSI lock level**.
13. Click the **Save** icon to save the TV profile.
14. Click the **check mark** icon to activate the TV profile.

3.2.2 Network Settings

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

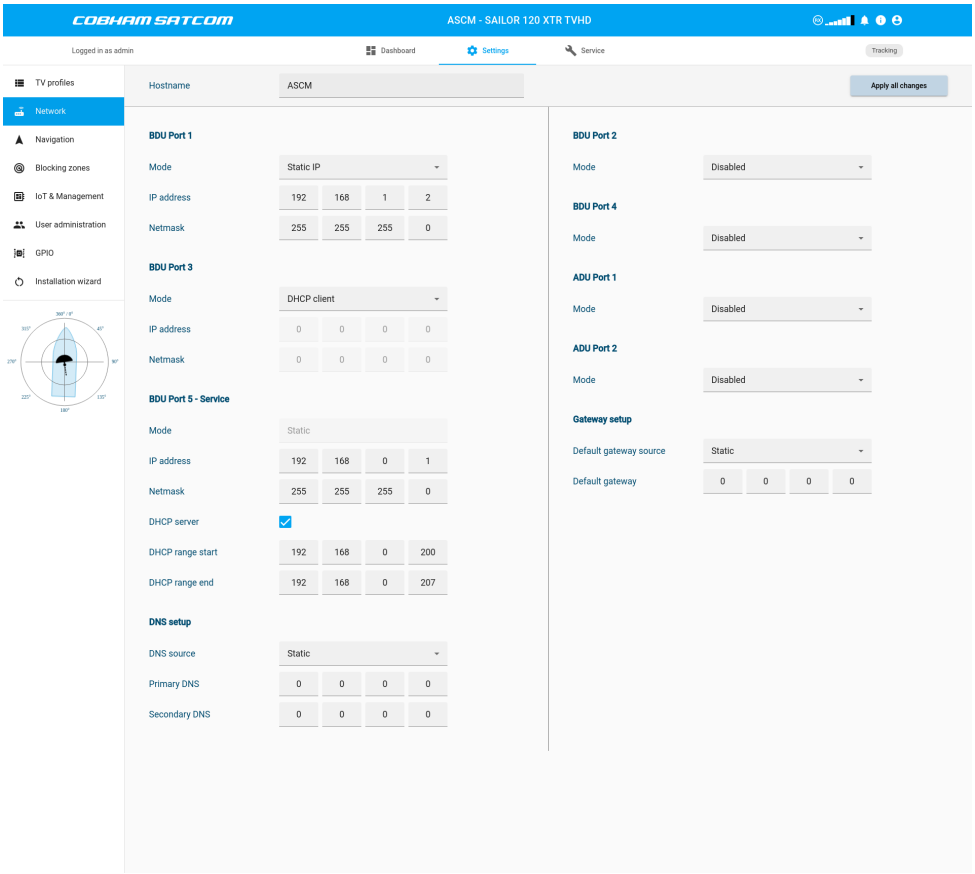


Figure 3.9: Settings, Network page (example).

Static IP or DHCP Client

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

DHCP Server Settings

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

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

DNS Setup

If you have access to a Domain Name Server (DNS) you can specify the address of the email server by using the server name instead of its IP address. This can be used in **Outgoing mail server** in *E-Mail Setup (Secure E-mail)* on page 3-17. 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 Lite needs to communicate with network units outside the specified sub-nets, you must specify a default gateway (typically a router). The default gateway can be set as a static IP address. Then set the default gateway source to **static** and enter the IP address of the default gateway. To remove the default gateway set it to 0.0.0.0. Alternatively, if your DHCP server is able to provide a default gateway address and you have selected DHCP client above, then select the same LAN as your default gateway source.

ADU Port Setup

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

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

Table 3.2: ADU LAN Connectors.

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

BDU / ADU LAN Port Modes

BDU Port 1 - Mode	
Mode	**Description**
BDU 1	BDU 1 assigned to BDU 1 VLAN / IP-subnet
BDU 5 - Service	BDU 1 assigned to BDU 5 VLAN / IP-subnet
Static IP	User defined IP subnet - VLAN 1
DHCP Client	Network parameters obtained via DHCP - VLAN 1

Table 3.3: BDU Port 1 Modes.

BDU Port 2 - Mode	
Mode	**Description**
BDU 1	BDU 2 assigned to BDU 1 VLAN / IP-subnet
BDU 5 - Service	BDU 2 assigned to BDU 5 VLAN / IP-subnet
Static	User defined IP subnet - VLAN 2
DHCP Client	Network parameters obtained via DHCP - VLAN 2

Table 3.4: BDU Port 2 Modes.

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

Table 3.5: BDU Port 3 Modes.

BDU Port 4 - Mode	
Mode	**Description**
BDU 1	BDU 4 assigned to BDU 1 VLAN / IP-subnet
BDU 5 - Service	BDU 4 assigned to BDU 5 VLAN / IP-subnet
ADU Port 2	BDU 4 + ADU Port 2 assigned to VLAN 7
Static	User defined IP subnet - VLAN 4
DHCP Client	Network parameters obtained via DHCP - VLAN 4

Table 3.6: BDU Port 4 Modes.

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

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

Table 3.7: ADU Port 1 Modes.

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

Table 3.8: ADU Port 2 Modes.

3.2.3 Navigation

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

NOTE

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

1. Click **Settings > Navigation.**

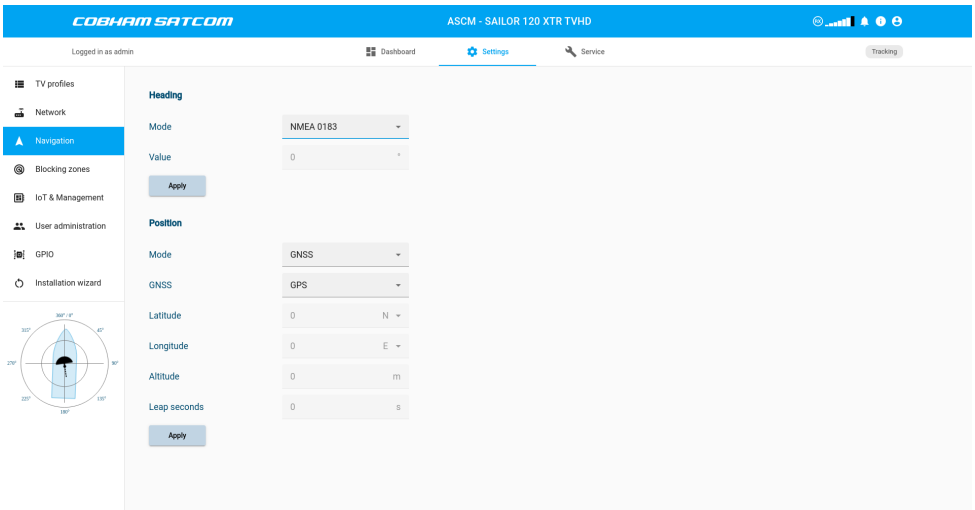


Figure 3.10: Settings, Navigation (Heading and Position), (example).

2. Select a heading mode.

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

Table 3.9: Heading modes.

3. Click **Apply**.

4. Select the desired position parameters.

Position	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
Leap seconds	The Coordinated Universal Time (UTC) is corrected due to variations in Earths rotation. The value is increased roughly every 5 years. In 2023 the leap second was 16 seconds. This field is only vital if manual position is used while tracking LEO/MEO/HEO satellites, otherwise it can be disregarded.

Table 3.10: Position modes.

5. Click **Apply**.

About NMEA 0183 Heading Mode

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

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

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

If the checksum or format of the GPRMC string is wrong the BDU Lite will generate following warning message:
`B060-0 Terminal WARNING NMEA 0183 parse error (00000000)`
If the external GPS input is lost or invalid the BDU Lite will fall back to the built-in GNSS and generate the following warning message:
`8084-0 Terminal WARNING External GPS data (00000041)`

3.2.4 Operation in Gyro-Free Mode

Heading Input: None

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

Inclined Orbit Satellites

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

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

Table 3.11: Satellite elevation and maximum allowed inclination.

Tracking for Satellite Elevation Between 5 and 75°

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

Tracking for Satellite Elevation Above 75°

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

3.2.5 Acquisition Process and Search Pattern

With Heading Input or Fixed Heading and Inclined Orbits

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

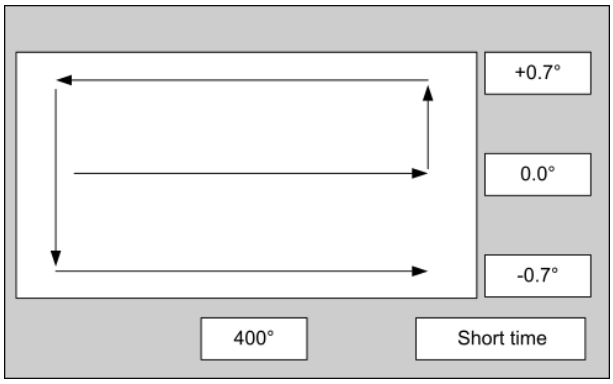


Figure 3.11: Acquisition, search pattern.

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

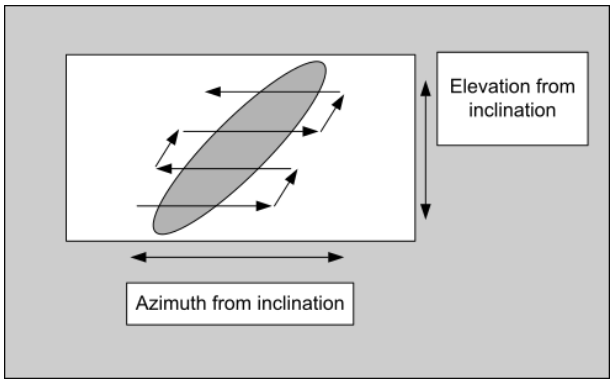


Figure 3.12: Acquisition, search pattern for inclined orbit.

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

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

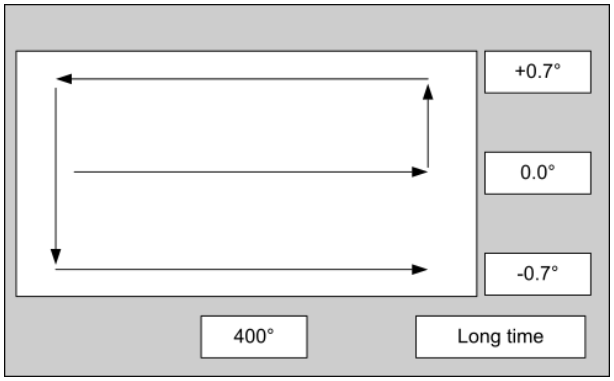


Figure 3.13: Acquisition, search pattern in gyro-free mode.

3.2.6 Blocking Zones

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

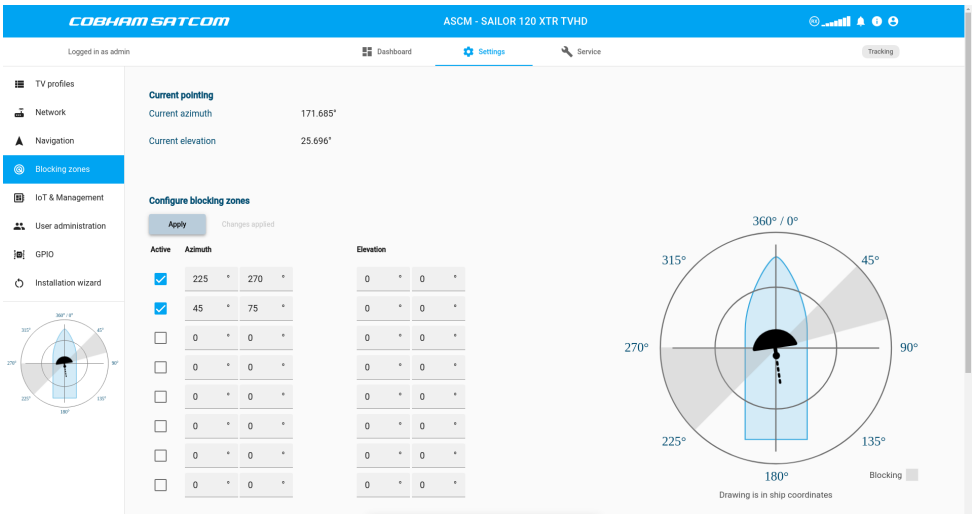


Figure 3.14: Settings, Blocking zones.

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.
3. Enter start and stop **azimuth** value in degrees for the blocking zone. Values allowed: 0 to 360°. Enter clockwise.
4. Enter the start and stop **elevation** angle for the blocking zone. If you enter nothing, there will be no blocking zone. Values allowed: -30 to 90°.

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

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

Blocking Map for Optimization of Blocking Zones

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

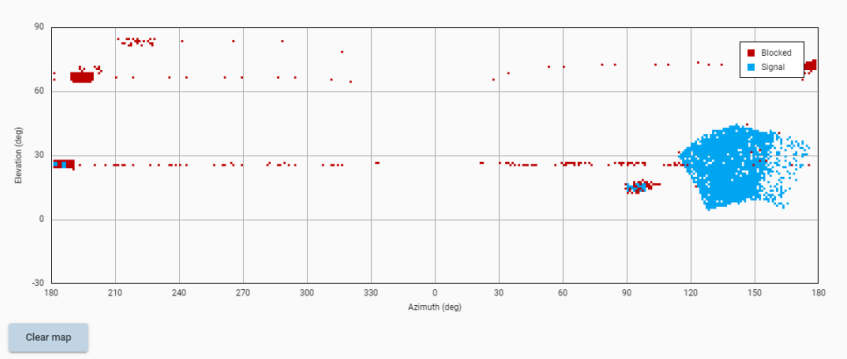


Figure 3.15: Populated blocking map (example).

3.2.7 IoT & Management

NOTE The following features work if the antenna has an Internet connection.

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

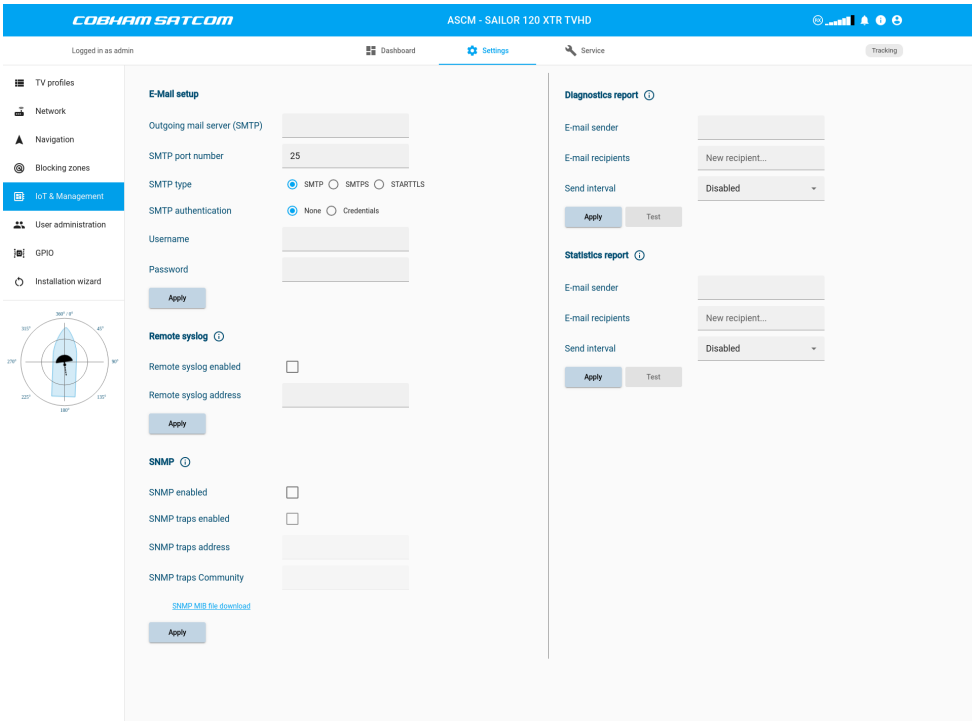


Figure 3.16: Settings - IoT & Management.

E-Mail Setup (Secure E-mail)

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

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

To set up e-mail, do the following:

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

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

NOTE You must set **Outgoing mail server** to an IP address if DNS has not been set up in **DNS setup** in *Network Settings* on page 3-7.

Remote Syslog

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

To set up sending syslog messages to a syslog server:

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

NOTE | Contains GNSS data.

SNMP

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

To set up reporting SNMP traps to an SNMP server:

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

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

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

The MIB entries are grouped as shown below:

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

- Tracking receiver.

NOTE

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

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

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

Diagnostics Report

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

The main sections of the diagnostics report are:

- Software.
- System.
- Hardware.
- Setup - System data.
- Calibration - Calibration Data.
- Blocking zones - Blocking zone configuration.
- Network - LAN Configuration.
- TV 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.

NOTE

Contains GNSS data.

To set up sending a diagnostics report:

1. Configure e-mail first, see *E-Mail Setup (Secure E-mail)* on page 3-17
2. Click **Settings > IoT & Management**.
3. In the section **Diagnostics report** enter the following:
   - E-mail sender.
   - E-mail recipients (comma separated).
   - Send interval: Select **Daily** (2- minute samples), **Weekly** (hourly samples) or **Monthly** (hourly samples).
4. Click **Apply**.

Statistics Report

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

To set up sending a statistics report:

1. Configure e-mail first, see *E-Mail Setup (Secure E-mail)* on page 3-17.
2. Go to **Settings > IoT & Management**.
3. In the section **Statistics report** enter the following:
   - Email sender.
   - Email recipients (comma separated).
   - Send interval: Select **Daily** (2-minute samples), **Weekly** (hourly samples) or **Monthly** (hourly samples).
4. Click **Apply**.

NOTE | Contains GNSS data.

The following parameters are recorded in the statistics report:

Parameter Recorded	Description
Host name	Host name, entered in the web interface on the page **Settings > Network.**
BDU SN	BDU Lite serial number
ADU SN	ADU serial number
SW ver.	Software version
System type	SAILOR 100 XTR TV (example)

Table 3.12: Statistics report, header record.

Parameter Recorded	Description
UTC. (s)	UTC in seconds for the data set.
UTC (YYYY-MM-DD hh:mm)	UTC in date format for the data set.
POS.Lat (degree)	Latitude value of position.
POS.Long (degree)	Longitude value of position.
POS.Valid	Fix = valid position, No Fix = invalid position.
NAV.Speed (m/s)	Speed above ground.
Heading.Samp (degree)	Ship's heading sample-value for the sampling interval.
Heading.Max (degree)	Ship's heading maximum-value for the sampling interval.
Heading.Min (degree)	Ship's heading minimum-value for the sampling interval.
Heading.Range (+/-degree)	Ship's heading range for the sampling interval. See figure 3.17: *Statistics — how to read data for a range*
Antenna.Azi (degree)	Current antenna azimuth sample-value for the sampling interval.
Antenna.Azi Max (degree)	Current antenna azimuth maximum-value for the sampling interval.
Antenna.Azi Min (degree)	Current antenna azimuth minimum-value for the sampling interval.
Antenna.Azi Range (+/-degree)	Current antenna azimuth-range for the sampling interval. See figure 3.17: *Statistics — how to read data for a range*
Antenna.Ele (+/-degree)	Current antenna elevation sample-value for the sampling interval.
Antenna.Ele Max (+/-degree)	Current antenna elevation maximum-value for the sampling interval.
Antenna.Ele Min (+/-degree)	Current antenna elevation minimum-value for the sampling interval.
Vsat.rx_lo_freq (GHz)	LNB L.O. Frequency.
Tracking.rf freq (GHz)	Tracking RF frequency for this record.
Tracking.type	Narrow filter or DVB-S2 decoder.
Sat.long (degree)	Longitude position of the satellite.
Pol.rx	Current Rx polarization mode.
Rx Lock (%)	Rx locked in percent, for the sampling interval.
Pos Ok (%)	Valid position, in percent of the sampling interval.
Blocking (%)	Ship in blocking zone, in percent of the sampling interval.

Continued on next page

Table 3.13: Parameters in a statistics report.

Parameter Recorded	Description
RSSI (Antenna).Avg	Antenna-reported Received Signal Strength Index average for the sampling interval.
RSSI (Antenna).Max	Antenna-reported Received Signal Strength Index maximum for the sampling interval.
RSSI (Antenna).Min	Antenna-reported Received Signal Strength Index minimum for the sampling interval.
Voltage.PSM.Avg (v)	Power Supply Module voltage-average for the sampling interval.
Voltage.PSM.Max (v)	Power Supply Module voltage-maximum for the sampling interval.
Voltage.PSM.Min (v)	Power Supply Module voltage-minimum for the sampling interval.
Voltage.LNB.Avg (v)	LNB voltage average for the sampling interval.
Voltage.LNB.Max (v)	LNB voltage maximum for the sampling interval.
Voltage.LNB.Min (v)	LNB voltage minimum for the sampling interval.
Temp.BDCM.Avg (deg)	Below Deck Communication Module temperature-average for the sampling interval.
Temp.BDCM.Max (deg)	Below Deck Communication Module temperature-maximum for the sampling interval.
Temp.BDCM.Min (deg)	Below Deck Communication Module temperature-minimum for the sampling interval.
Temp.ISCM.Avg (deg)	Inertial Sensor Control Module temperature-average for the sampling interval.
Temp.ISCM.Max (deg)	Inertial Sensor Control Module temperature-maximum for the sampling interval.
Temp.ISCM.Min (deg)	Inertial Sensor Control Module temperature-minimum for the sampling interval.
Ship Roll.Avg (degree)	Ship roll average.
Ship Roll.MaxSwing (degree)	Ship roll max.
Ship Pitch.Avg (degree)	Ship pitch average.
Ship Pitch.MaxSwing (degree)	Ship pitch max.
Vib.X.Avg	X-axis vibrations experienced by the antenna average for the sampling interval.

Continued on next page

Table 3.13: Parameters in a statistics report. (Continued)

Parameter Recorded	Description
Vib.X.Max	X-axis vibrations experienced by the antenna maximum for the sampling interval.
Vib.X.Min	X-axis vibrations experienced by the antenna minimum for the sampling interval.
Vib.Y.Avg	Y-axis vibrations experienced by the antenna average for the sampling interval.
Vib.Y.Max	Y-axis vibrations experienced by the antenna maximum for the sampling interval.
Vib.Y.Min	Y-axis vibrations experienced by the antenna minimum for the sampling interval.
Vib.Z.Avg	Z-axis vibrations experienced by the antenna average for the sampling interval.
Vib.Z.Max	Z-axis vibrations experienced by the antenna maximum for the sampling interval.
Vib.Z.Min	Z-axis vibrations experienced by the antenna minimum for the sampling interval.
Lnb.mode	Shows the current LNB mode.

Table 3.13: Parameters in a statistics report.

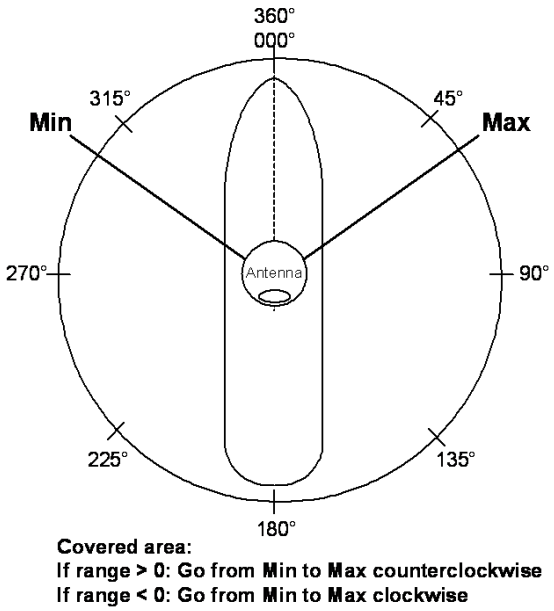


Figure 3.17: Statistics — how to read data for a range.

3.2.8 User Administration

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

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

To Change a Password

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

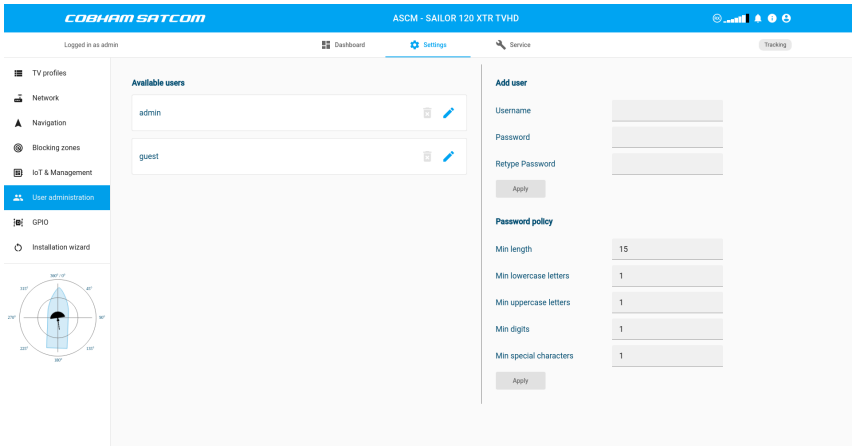


Figure 3.18: User Administration, edit or add user.

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

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

Password Policy Setup

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

The admin can change the Password policy rules listed in Table 3.14.

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

Table 3.14: List of mimimum requirements Password Policy Rules

To Set Up Permissions for Guest User

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

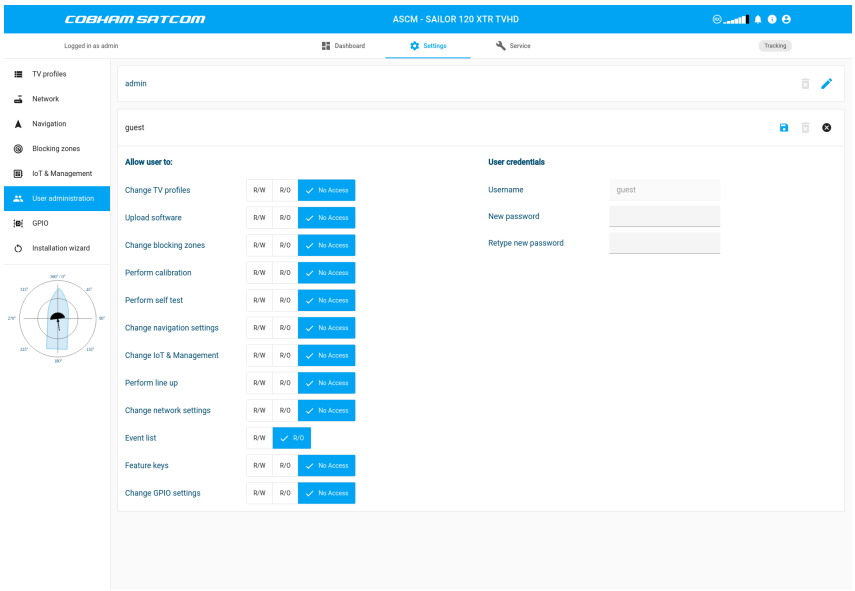


Figure 3.19: Permissions for guest users.

To set up the user permissions, do as follows:

1. Select **Settings > User administration**.
2. Click the pen icon for guest.

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

3.2.9 GPIO

This section describes the GPIO pin functionality and use for verifying dual antenna operation and for alarm output.

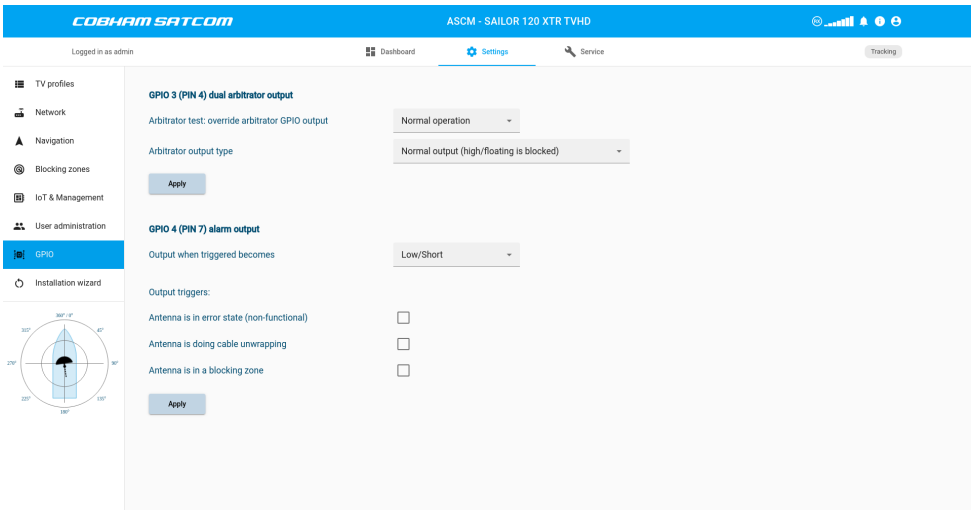


Figure 3.20: General Purpose Input and Output.

1. **Relevant for dual antenna operation:** You can verify the Arbitrator GPIO output GPIO3 (PIN4) by forcing the antenna to operate in the following scenarios:
   - Normal operation (default)
   - Unblocked
   - Blocked

   Wire the GPIO3 (PIN 4) on the GPIO RJ-45 connector to the Arbitrator to signal to switch to the other antenna. The pin is HIGH when the antenna is functional and pointing outside any blocking zone. The pin goes LOW when the antenna is switched OFF, non-functional or inside a blocking zone.
2. The GPIO4 (PIN 7) alarm output on the GPIO RJ-45 connector is used for indicating when the antenna is not operational. Select the scenario to output the signal. From the **Output when triggered becomes** drop-down the polarity of the alarm signal can be selected
   - Low/Short

- High/Open

3.2.10 Installation Wizard

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

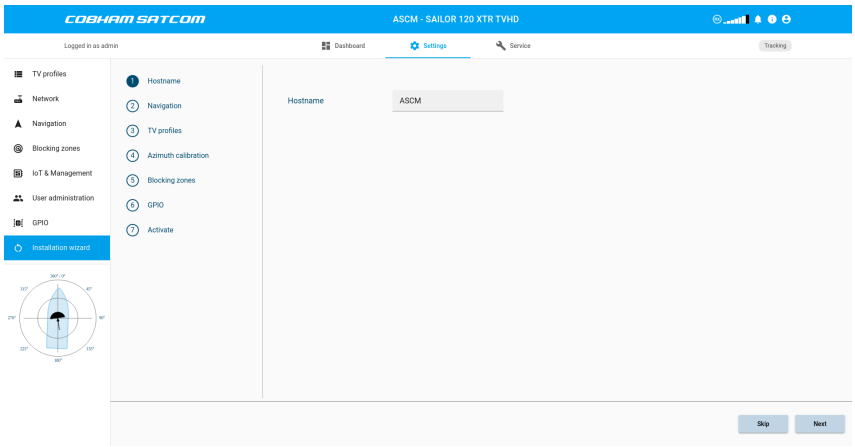


Figure 3.21: Installation Wizard.

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

3.3 Service

3.3.1 Software

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

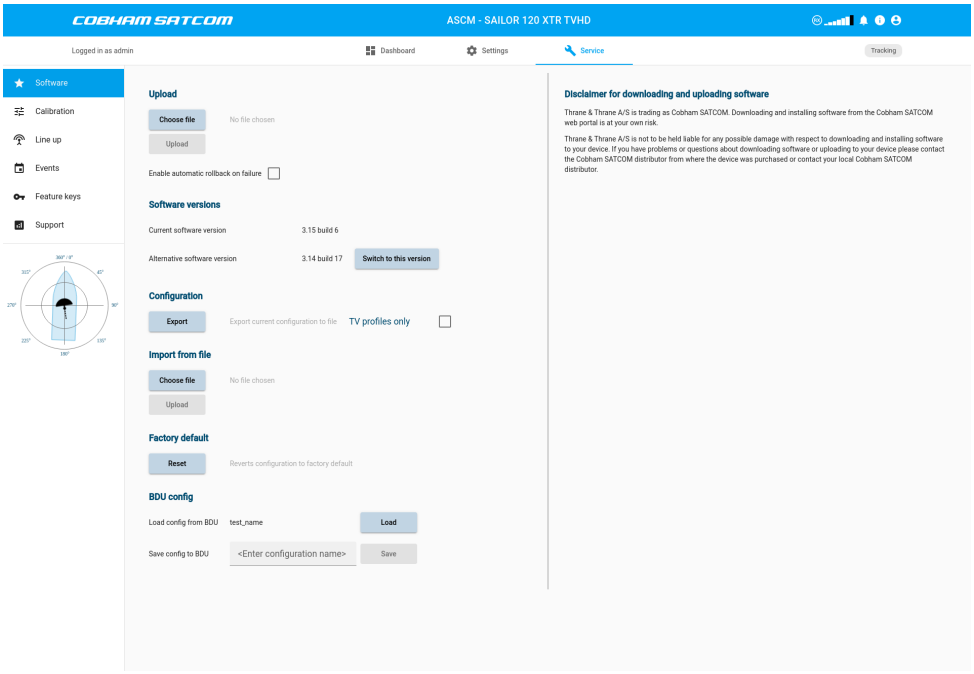


Figure 3.22: Service - Software.

Upload

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

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

NOTE Only qualified service personnel should make a software update.

1. Power up the SAILOR XTR TVRO system, i.e. switch on the BDU Lite. Wait until the text **INITIALISING** has disappeared from the BDU Lite display.
2. Connect a PC to the front LAN connector of the BDU Lite.
3. Open your Internet browser and enter the IP address of the BDU Lite. The IP address is **http://192.168.0.1** (default).

4. Type in the user name (admin or guest) and password.
5. The web interface opens directly with the **Dashboard** page.
6. Click **Service** in the top bar. The **Software** page is displayed.
7. Click **Choose file** and locate the new software file.
8. Click **Upload**. The upload procedure takes a couple of minutes. When done, the system automatically restarts with the new software version.

   Important

   Do not browse away from the upload page. This will terminate the upload process. Wait for the browser to reload automatically.

9. To make the system return to the previous software if POST fails after boot of the updated software, select **Enable automatic rollback on failure**.
10. Click **Switch to this version** if you want to force the system to use the alternative software version.

Software Recovery Procedure (SAFESET)

To recover from a failed software upload or other problems where the antenna is unable to boot, the antenna should be booted up in SAFESET mode. In this mode an extra software image is started with fixed settings and configuration. The antenna is not operational but allows software upload and activation of reset to factory default.
The BDU Lite ethernet port 5 is set to a fixed IP of 192.168.0.1.

NOTE

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

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

NOTE

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

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

To Import and Export a System Configuration

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

1. Select **Service > Software** and locate the section **Configuration**.
2. Optional: Tick the box next to **TV profiles only**, then the system settings are not exported.
3. Click the button **Export**. Follow the download instructions on the screen. You can use this configuration file for upload into another SAILOR XTR TVRO.

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

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

Factory Default

When resetting SAILOR XTR TVRO to factory default, the following settings are deleted:

- Passwords.
- TV profiles.
- Blocking zones.

- Heading settings.
- Network setup.
- User permissions for guest.
- BDU Lite display: brightness setting.

NOTE

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

To reset to factory default settings, do as follows:

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

Important

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

BDU Lite Config (Save Antenna Settings in the BDU Lite)

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

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

3.3.2 Calibration

Before the SAILOR XTR TVRO can be used you must select a heading input in order to make an azimuth 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.

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

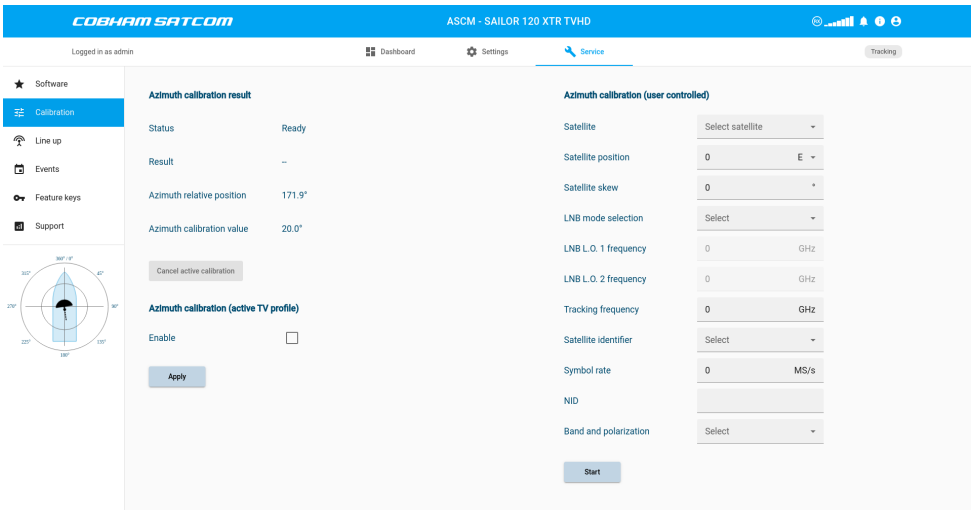


Figure 3.23: Service - Calibration.

Azimuth Calibration

Azimuth calibration is done toward a satellite of a known position. After finding the satellite, the system can calculate the azimuth offset of the ADU. The satellite and transponder properties for the calibration can be selected from a list of service profiles or supplied manually. The **Azimuth relative position** is the momentary azimuth value of the ADU, a dynamic value. The **Azimuth calibration value** is the calculated ADU azimuth value after an azimuth calibration, a fixed value.

NOTE If the target satellite is inclined orbit, the elevation range is extended. As a general rule, there are no TV satellites that are in Inclined Orbit. It is recommended to use orbital position or NID when running an azimuth calibration.

Automatic Azimuth Calibration With an Active TV 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 TV 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 Lite will automatically disable the setting **Azimuth calibration (active satellite profile)** on the page **Service > Calibration**. To enable automatic azimuth calibration, do as follows:

1. Go to **settings > TV profiles** and create a TV profile.
2. Then **Activate** the TV profile.
3. Click **Service > Calibration**.
4. Select **Enable** in the section **Azimuth calibration (active TV profile)**.
5. Click **Apply**.
6. Switch on the below deck's TV distribution equipment.

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 data in the given fields. 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	Satellite 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 3.15: 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.
6	No signal received. Check that there is free line of sight. Try again or try with another satellite.
7	RF setup error, e.g. missing or invalid RX frequency.
8	Invalid satellite, e.g. satellite not visible.

Table 3.16: Possible error codes during calibration.

3.3.3 Line Up

NOTE

The Line up function is typically not used for TV reception.

The antenna can be manually moved in azimuth and elevation using the arrow buttons in the top part. The polarization can be adjusted using the arrow buttons in the lower part and a new polarization calibration can be saved. Opposite polarization can be tested using the **Add 90°** tick box.

Important

It is **NOT** recommended to save any new polarization setting as the antenna has been calibrated for exact polarization from the factory.

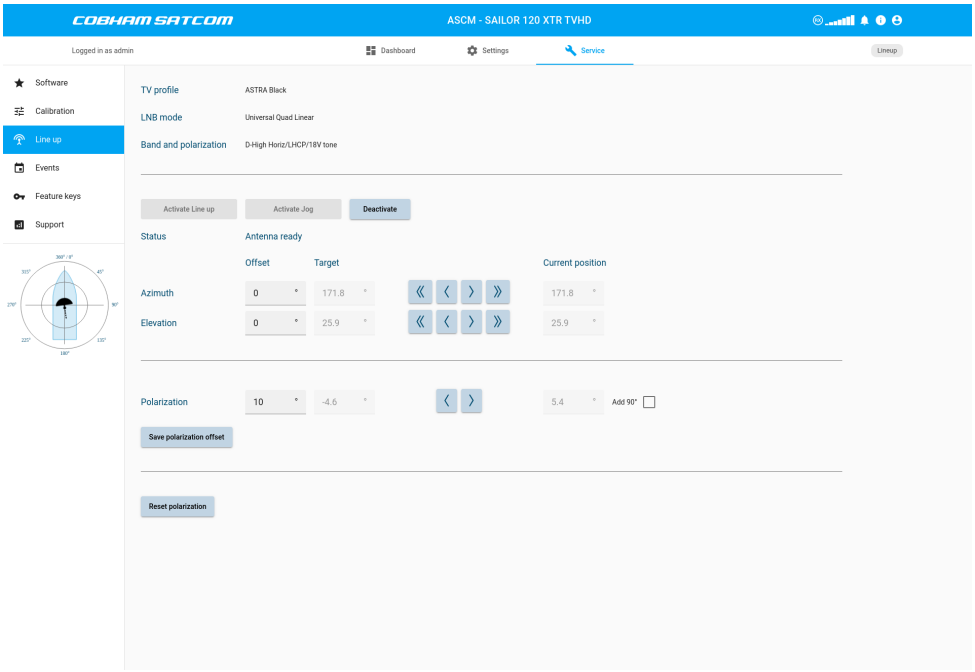


Figure 3.24: Service - Line Up.

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 Lite (default IP address: **http://192.168.0.1**).
2. Activate a TV profile.
3. Click **Service > Line up**. The antenna must be in tracking mode and point to the satellite.
4. Wait until **Status** shows: **Ready for lineup**.
5. Click the button **Activate Lineup** and wait until the **Status** shows **Antenna ready**. Adjust the antenna pointing for Azimuth and Elevation Offset.
6. If needed, add 90° to the polarization by selecting the field.
7. Click the button **Save polarisation offset**.
8. Click the button **Deactivate** to leave the line up procedure.

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

3.3.4 Events

This page shows a detailed list of active events and notifications including the time of the first occurrence, ID and severity of the event message, and a short text describing the error. Events can be of the type **WARNING**, **ERROR** or

INFO. The event time is UTC time. Active events are cleared from the event list when their issue is cleared. They are moved to the section **Cleared events last 24 hours** and are displayed for 24 hours. All entries in this section are cleared automatically after 24 hours or after a restart of the system. When an event is registered, the web interface shows an event icon (bell) in the top bar as long as the event is active. The number of new events since last viewing is also shown. To view the event list with active events, click the event icon from the icon bar at the top of the web interface, or select **Service > Events**.

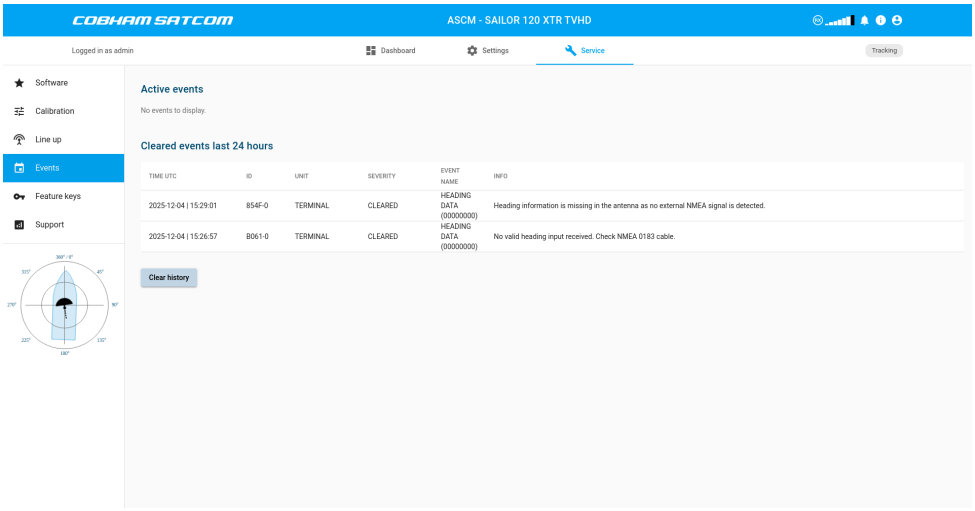


Figure 3.25: Service - Events list (example).

3.3.5 Support

On this page you can:

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

NOTE Diagnostics Report and Statistics Report contain GNSS data.

Self test

The self test checks all vital parts of the antenna and BDU Lite. 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 Lite display. An extended antenna POST is available. This test lasts longer and checks more components than the regular self test.

Audit log

The audit logging feature is designed to help you keep track of important security related events and actions that occur within the antenna. This feature ensures that all significant activities are recorded, providing a clear and organized audit trail. Audit logging is a process where the system records detailed information about various actions and events. These logs include user logins, configuration changes, data access, and other critical operations. The purpose of audit logging is to provide a transparent record of what happened, when it happened, and who was involved.

The audit log is not deleted at reset to factory default.

Important

The SAILOR XTR TVRO reboots to perform the self test. Rebooting terminates all existing connections.

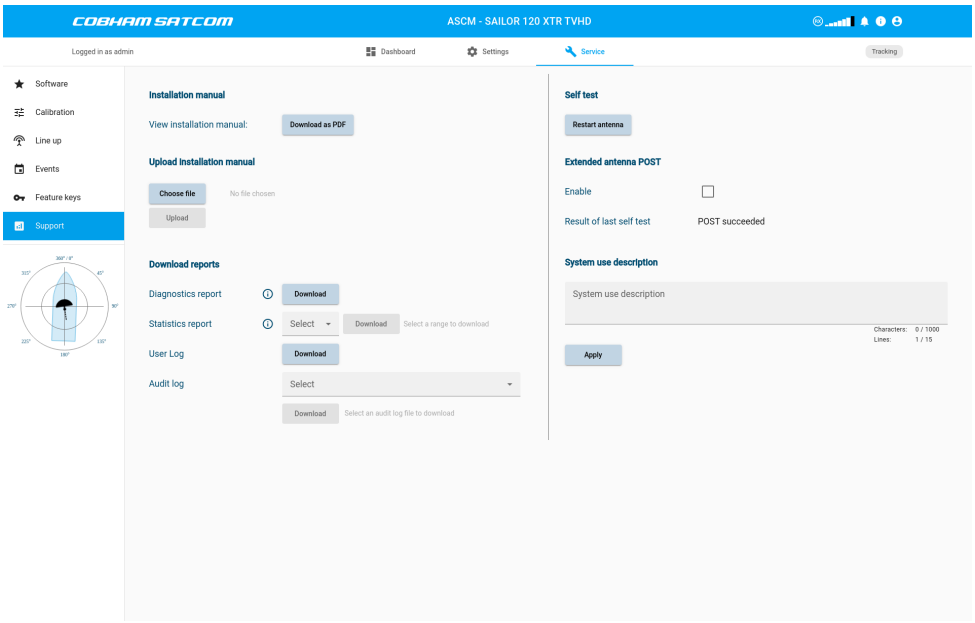


Figure 3.26: Service - Support.

3.4 Keypad and Menus of the BDU Lite

3.4.1 BDU Lite Display and Keypad

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

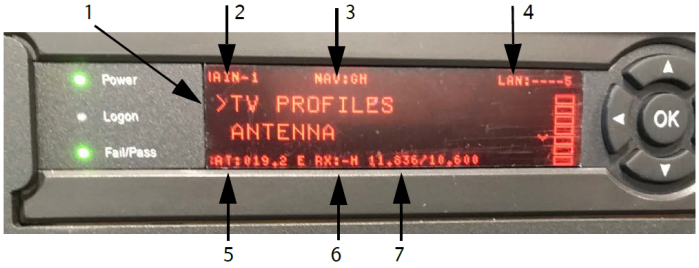


Figure 3.27: Display (example) and keypad of the BDU Lite.

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

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

Selecting and Activating TV Profiles

You can change the active TV profile using the keyboard of the BDU Lite. New profiles cannot be set up here, they are created using the web interface. To select and activate a TV profile do as follows:

1. Press **OK** or ▲, ▼ to go to the menu **TV PROFILES**.
2. Press **OK** to activate the first profile in the list.
3. Use ▲ ▼ to select another TV profile and press **OK** to activate it.

Power Cycle of the BDU Lite and ADU (Reset)

To power cycle the BDU Lite and ADU do as follows:

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

Figure 3.28: Reset the system (example).

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

Adjusting Brightness of the Display

To adjust the brightness do the following:

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

Navigating the Menus

Use the keypad to navigate the menus.

- Press **OK** or ► to select a menu item.
- Use the arrow keys ▲ and ▼ to go through the menu items.
- Use the arrow keys ◄ and ► to go through the settings and move from one digit to the next.
- Press ◄ again to move one level up. If applicable, confirm to store the new setting by pressing **OK**.

3.4.2 List of Menus

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

Top-level	Description
MAIN	View with current status of the SAILOR XTR TVRO. 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.
TV PROFILES	View the available created TV profiles and change between them.
ANTENNA	Shows the current ADU parameters, position, software version and serial numbers of the ADU and BDU Lite.
TRACKING	Shows the current tracking information.
NETWORK	Shows the IP addresses and netmasks of the LAN connectors of the BDU Lite and the management mask.
SATELLITE	Current satellite information. This information is entered using the web interface.
EVENTS	View system events. Active events are shown as: **X ACTIVE EVENTS** in the **MAIN** display. Press **OK** to update the list.

Table 3.17: Top-level menu of the BDU Lite.

TV PROFILES	Description
TV PROFILES	Here all created TV profiles are shown. Pressing Ok when profile is highlighted will acitvate the profile.

Table 3.18: TV PROFILES menu of the BDU Lite.

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**
GNSS	LATITUDE: current latitude, read from GNSS module. LONGITUDE: current longitude, read from GNSS module. FIX TYPE: **None**, **2D**, **3D**, or **User**
HEADING	VESSEL HEADING: Ship's heading in degrees with reference to North. INPUT: The value provided by user or external compass. CORRECTION: The antenna, once in tracking, determines corrections to the given input
VERSIONS	Current software version.
SERIAL NUMBERS	BDU: BDU Lite serial number Antenna: Serial number of the antenna
LOCAL ADMINISTRATION	Select **LOCAL ADMINISTRATION** to get administrator access for 5 min or until next reboot.

Table 3.19: ANTENNA menu of the BDU Lite.

TRACKING	Description
RX LOCK	LOCKED if Antenna has rx lock NOT LOCKED otherwise.
SIGNAL LEVEL	Meassured tracking signal level.

Table 3.20: TRACKING menu of the BDU Lite.

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

Table 3.21: NETWORK menu of the BDU Lite.

SATELLITE	Description
POSITION	Position of the current satellite.
RX POLARISATION	HORIZONTAL, VERTICAL, RHCP, LHCP.
RX FREQUENCY	RF frequency, Ku band receiving frequency of the active satellite.
LNB L.O.	Low-Noise Block Local Oscillator frequency. Depends on selected LNB Mode on active TV profile.

Table 3.22: SATELLITE menu of the BDU Lite.

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 see the remaining text.

Table 3.23: EVENT menu of the BDU Lite.

Example:

EVENT 1/4*: This is the first event out of a list of 4 and there has been a change in the list. EVENT 1/4 will always be shown, the ***** indicates that there has been a change.

3.5 Startup Sequence

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

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

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

Installation Check Lists

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

4.1 Installation Check List: Antenna

Step	Task	Further Information	Done
1.	Check that the antenna is free of obstructions.	See *Obstructions (ADU Shadowing)* on page 2-4.	
2.	Make sure there is sufficient space for access through the service hatch.	See *To Install the ADU (SAILOR 100 XTR TV and TVHD)* on page 2-17 and *To Install the ADU (SAILOR 120 XTR TV and TVHD)* on page 2-20.	
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 2-4 and *Blocking Zones* on page 3-15.	
6.	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.	
7.	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 2-5.	
8.	Make sure that the distances to radar, satellite systems, GPS receivers and other transmitters are as required.	See *Interference Between Radar, GPS/GNSS, L-band and Other Transmitters/Receivers* on page 2-12.	
9.	Make sure that the drain tube is open and risk for water intrusion is at a minimum.	See *Condensation and Water Ingress* on page 2-15.	
10.	Check that the ADU is grounded correctly, using the mounting bolts.	See *To Ground the ADU* on page E-3 and *Grounding and RF Protection* on page E-1.	

Table 4.1: Installation check list: Antenna.

4.2 Installation Check List: BDU Lite and Arbitrator

Step	Task	Further Information	Done
1.	Check that the BDU Lite is grounded correctly, using the mounting bolts and washers.	See *To Ground the BDU Lite* on page E-2 and *Grounding and RF Protection* on page E-1.	
2.	Check that the five cables are properly connected.	Visual inspection of the cover plate at the bottom of the ADU.	
3.	Check that the BDU Lite antenna N-connector is properly connected with the RF cable.	Visual inspection of the connector panel of the BDU Lite.	
4.	Check that the ADU's NMEA 0183 connector is connected to the NMEA0183 bus of the vessel using the included multi-connector.	Visual inspection of the connector panel of the ADU connector.	
5.	If Dual Antenna Configuration, Check the following connections: • BDU Lite to Arbitrator connections. • Antenna Switching control/Power Cable. • IF Coaxial Inputs/Outputs.	Visual inspection.	

Table 4.2: Installation check list: BDU Lite, connectors and wiring.

Service

This chapter has the following sections:

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

5.1 Built-in Test and LEDs

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

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

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

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

The built-in web interface shows events (BITE error codes) with a short message describing each error or warning. This is also displayed on the BDU Lite. 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).

5.1.1 LEDs of the Modules in the ADU

Each ADU module has one multi-color LED.

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

Table 5.1: LEDs of the ADU modules.

5.1.2 LEDs in the BDU Lite

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

Figure 5.1: BDU Lite – LEDs.

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

Table 5.2: LEDs on the BDU Lite.

5.2 Removal and Replacement of the BDU Lite

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

5.3 Removal and Replacement of ADU Modules

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

5.4 Cleaning of the eDome

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

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

5.5 Troubleshooting Basics

5.5.1 Overview

This section describes an initial check of the primary functions of the SAILOR XTR TVRO 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 Lite display showing the active events. Possible failure states are shown in the web interface and the display of the BDU Lite :

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

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

5.5.2 Administrator Password Forgotten

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

1. On the BDU Lite keypad, push and hold the ◄ for 5 seconds.
2. Wait for the short display of **Local administration**, followed by the event text: **0807F-0 WARNING Local administration enabled**. This will give you temporary administrator access for **1 hour or until next restart**.
3. Open your browser and access the web interface.
4. Enter user name: **admin** (no password is required). The **Dashboard** is displayed.

NOTE

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

5. To create or change the password select **Settings > User administration**.
6. Click on the pencil-shaped icon next to **Admin**.
7. Type in the new administrator password (minimum 8 characters) and click **Apply**.
8. The web interface shows the **Dashboard** page.

5.5.3 To Verify That the Antenna Can Go Into Tracking Mode

If the SAILOR XTR TVRO can go into tracking mode it is most likely not defective.

1. Go to **Settings > TV profiles**.
2. Activate a TV profile that is used for azimuth calibration.
3. Go to **DASHBOARD** and monitor the system status. If the field ends up showing **Tracking**, the SAILOR XTR TVRO can track the satellite.

5.6 Returning Units for Repair

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

Technical Specifications

This appendix has the following sections:

- *Specifications SAILOR 100 XTR TVRO with eDome*
- *Specifications SAILOR 120 XTR TVRO with composite radome*
- *Specifications TV and TVHD LNB*
- *Patents*
- *Outline Drawings*
  - *ADU SAILOR 100 XTR TVRO (eDome)*
  - *ADU SAILOR 120 XTR TVRO (composite radome)*
  - *BDU Lite*
- *Block diagram and cables from ADU to TV Receiver*
  - *High-level block diagram*
  - *Cables*

A.1 Specifications SAILOR 100 XTR TVRO with eDome

SPECIFICATIONS	
Reflector size	103 cm
Certification	Compliant with CE (Maritime), ETSI
System power supply range	100-240 VAC, 50-60 Hz
Total system power consumption	50 W typ. 80 W max
FREQUENCY BAND (Ku / Ku-Ka-band)	
TV	10.70 to 12.75 GHz (Ku-band), N/A (Ka-band)
TVHD	10.70 to 12.75 GHz (Ku-band), 18.30 to 18.80 GHz (Ka-band), 19.70 to 20.20 GHz (Ka-band)
ANTENNA CABLE & CONNECTORS	
ADU to BDU & Multi-switch cables	Five 75 Ωcables with F-connectors
Antenna Connections	One 50 ΩN-connection for Antenna Control Four 75 ΩF-connections Two 50 Ωto 75 Ωadapters for Antenna Control Connections included (ADU-BDU).
ABOVE DECK UNIT (ADU)	
Antenna type, pedestal	3-axis (plus auto skew) stabilized tracking antenna with integrated GNSS module supporting GPS, GLONASS and Beidou
Antenna type, reflector system	Reflector/sub-reflector, ring focus
EIRP	TV: 41.5 dBW TVHD: 41.5 dBW (Ku-band), 45 dBW (Ka-band)
LNB	TV: Ku-band: Dual-band worldwide programmable TVHD: Ku-band only: Dual-band worldwide programmable, Ku/Ka-band: Dual-band programable and DIRECTV
Polarization	Linear / Circular selectable
Skew control	Automatic
Tracking receiver	Internal "all band/modulation type" including e.g. Power and DVB-S2X
Satellite acquisition	Automatic - with Gyro- or GPS-compass input. Support for gyro free operation
Satellite verification	NID or DSS
Satellite accuracy	Peak error <0.2° under specified ship motion
Elevation range	-20° to +120°
Cross elevation	-37° to +37°
Azimuth range	680°
Ship motion, angular	Roll ± 30° (6 sec), Pitch ± 15° (6 sec), Yaw ± 10° (6 sec)
Ship, turning rate and acceleration	15°/s and 15°/s^2
ADU motion, linear	Linear accelerations ± 2.5 g max any direction
Vibration, operational	Sine: EN 60945 (8.7.2)
Vibration, survival	Sine: EN 60945 (8.7.2) dwell
Temperature (ambient)	Operational: -25°C to +55°C Storage: -40°C to +85°C
With SAILOR SMART Heater option	Operational: -55°C to +55°C, P/N: 407090-001
Humidity	95%, condensing
Rain / IP class	IEC EN EN60945 Exposed, IPX6
Wind	80 knots operational / 110 knots survival
Ice, survival	25 mm
Solar radiation	1120 W/m^2 to MIL-STD-810F 505.4
Compass safe distance	1.5 meters to IEC EN 60945
Maintenance, scheduled	None
Maintenance, unscheduled	All modules, motor, RF parts and belts are replaceable through service hatch
Built-in Tests	Power On Self-Test, Person Activated Self-Test and Continuous Monitoring w. error logging
Dimensions (overall)	Height: 150 cm Diameter: 133 cm
Weight	102 kg

BELOW DECK UNIT LITE (BDU Lite)	
Dimensions	1U 19" rack mount HxWxD: 4.4 x 48 x 33 cm
Weight	3.6 kg
Temperature (ambient)	Operational: -25°C to +55°C Storage: -40°C to +85°C
Humidity	EN60945 Protected, 95% (non-condensing)
IP class	IP30
Compass safe distance	30 cm to IEC EN 60945
Interfaces	1 x Male N-Connector for antenna control cable (50 Ω) 3 x Ethernet (user) 1 x Ethernet (remote access) 1 x Ethernet on front for service and configuration 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 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.
Temperature control	Built-in fan
Blocking zones	Programmable, 8 zones with azimuth and elevation.
Remote management and IoT	HTTPS, SSH, SNMP Traps, Syslog, CLI, Diagnostic, Statistic, RESTful API, MQTT

A.2 Specifications SAILOR 120 XTR TVRO with composite radome

SPECIFICATIONS	
Reflector size	129.5 cm
Certification	Compliant with CE (Maritime), ETSI
System power supply range	100-240 VAC, 50-60 Hz
Total system power consumption	50 W typ. 80 W max
FREQUENCY BAND (Ku / Ku-Ka-band)	
TV	10.70 to 12.75 GHz (Ku-band), N/A (Ka-band)
TVHD	10.70 to 12.75 GHz (Ku-band), 18.30 to 18.80 GHz (Ka-band), 19.70 to 20.20 GHz (Ka-band)
ANTENNA CABLE & CONNECTORS	
ADU to BDU & Multi-switch cables	Five 75 Ωcables with F-connectors
Antenna Connections	One 50 ΩN-connection for Antenna Control Four 75 ΩF-connections Two 50 Ωto 75 Ωadapters for Antenna Control Connections included (ADU-BDU).
ABOVE DECK UNIT (ADU)	
Antenna type, pedestal	3-axis (plus auto skew) stabilized tracking antenna with integrated GNSS module supporting GPS, GLONASS and Beidou
Antenna type, reflector system	Reflector/sub-reflector, ring focus
EIRP	TV: 40.5 dBW TVHD: 40.5 dBW (Ku-band), 44 dBW (Ka-band)
LNB	TV: Ku-band: Dual-band worldwide programmable TVHD: Ku-band only: Dual-band worldwide programmable, Ku/Ka-band: Dual-band programable and DIRECTV
Polarization	Linear / Circular selectable
Skew control	Automatic
Tracking receiver	Internal "all band/modulation type" including e.g. Power and DVB-S2X
Satellite acquisition	Automatic - with Gyro- or GPS-compass input. Support for gyro free operation
Satellite verification	NID or DSS
Satellite accuracy	Peak error <0.2° under specified ship motion
Elevation range	-15° to +115°
Cross elevation	-37° to +37°
Azimuth range	680°
Ship motion, angular	Roll ± 30° (6 sec), Pitch ± 15° (6 sec), Yaw ± 10° (6 sec)
Ship, turning rate and acceleration	15°/s and 15°/s^2
ADU motion, linear	Linear accelerations ± 2.5 g max any direction
Vibration, operational	Sine: EN 60945 (8.7.2)
Vibration, survival	Sine: EN 60945 (8.7.2) dwell
Temperature (ambient)	Operational: -25°C to +55°C Storage: -40°C to +85°C
Humidity	95%, condensing
Rain / IP class	IEC EN EN60945 Exposed, IPX6
Wind	80 knots operational / 110 knots survival
Ice, survival	25 mm
Solar radiation	1120 W/m^2 to MIL-STD-810F 505.4
Compass safe distance	1.5 meters to IEC EN 60945
Maintenance, scheduled	None
Maintenance, unscheduled	All modules, motor, RF parts and belts are replaceable through service hatch
Built-in Tests	Power On Self-Test, Person Activated Self-Test and Continuous Monitoring w. error logging
Dimensions (overall)	Height: 178.3 cm Diameter: 166.9 cm
Weight	179 kg

BELOW DECK UNIT LITE (BDU Lite)	
Dimensions	1U 19" rack mount HxWxD: 4.4 x 48 x 33 cm
Weight	3.6 kg
Temperature (ambient)	Operational: -25°C to +55°C Storage: -40°C to +85°C
Humidity	EN60945 Protected, 95% (non-condensing)
IP class	IP30
Compass safe distance	30 cm to IEC EN 60945
Interfaces	1 x Male N-Connector for antenna control cable (50 Ω) 3 x Ethernet (user) 1 x Ethernet (remote access) 1 x Ethernet on front for service and configuration 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 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.
Temperature control	Built-in fan
Blocking zones	Programmable, 8 zones with azimuth and elevation.
Remote management and IoT	HTTPS, SSH, SNMP Traps, Syslog, CLI, Diagnostic, Statistic, RESTful API, MQTT

A.3 Specifications TV and TVHD LNB

Ku-Band spec	
Input Frequency Range	10.7 - 12.75 GHz (Linear Polarization) 11.25 - 12.7 GHz (Circular Polarization)
Output Frequency Range	950 - 2150 MHz
L.O. Frequency	Adjustable 10.5 - 11.3 GHz in 2 MHz steps at High Band (11.7 - 12.75 GHz) Fixed 9.75 GHz at Low Band (10.7 - 11.7 GHz)
Input Signal Polarization	Circular (LHCP & RHCP), Linear (Vertical & Horizontal)
IF Output Connector(s)	(4) F-type female connectors
Serial Interface Connector	M12-5
Impedance	75 Ω
Input Flange(s)	C120
D.C. Supply Voltage	13 VDC (min)
D.C. Current Consumption	1.2A (Max.)
Ka-Band spec (Difference or on top of Ku-Band spec)	
Input Frequency Range	(18.3 - 18.8 GHz) & (19.7 - 20.2 GHz)
Output Frequency Range	(250 - 750 MHz) & (1650 - 2150 MHz)
L.O. Frequency	18.05 GHz (fixed)
Input Signal Polarization	Circular (LHCP & RHCP)
L.O. Phase Noise (typical)	-50 dBc @ 1 KHz -75 dBc @ 10 KHz -95 dBc @ 100 KHz -115 dBc @ 1000KHz
L.O. Frequency Stability	+/- 4 MHz (Max.)
Image Rejection	40dBc (Min.) (950 - 2150 MHz) 30dBc (Min.) (250 - 750 MHz)
1db gain compression point	0 dBm (Min.)
Input Flange(s)	(2) C220

Table A.1: TV and TVHD LNB Specifications.

A.4 Patents

The patents below apply to SAILOR XTR TVRO.

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.2: Patents for SAILOR XTR TVRO.

Patent Application Number	Description
18402EP00 2612434	AN ASSEMBLY COMPRISING A MOVABLE AND BRAKABLE/DAMPABLE PART AND A METHOD FOR BRAKING A MOVABLE PART
18402JP00 2013-538550	AN ASSEMBLY COMPRISING A MOVABLE AND BRAKABLE/DAMPABLE PART AND A METHOD FOR BRAKING A MOVABLE PART
18402KR00 10-2013-7008607	AN ASSEMBLY COMPRISING A MOVABLE AND BRAKABLE/DAMPABLE PART AND A METHOD FOR BRAKING A MOVABLE PART
18402US01 9,054,616	AN ASSEMBLY COMPRISING A MOVABLE AND BRAKABLE/DAMPABLE PART AND A METHOD FOR BRAKING A MOVABLE PART
PCT/EP2014/057527 20414PCT00 PCT/EP2015/064100	A VEHICLE/VESSEL/AIRPLANE WITH A ROTATABLE ANTENNA
CN 104641507 A 2873113 US-2015-0200701-A1 10-2015-7003879	Combined antennas without switch Combined antennas without switch Combined antennas without switch Combined antennas without switch
19645PCT00 WO 2014/170270 19645CN00 19645US00 19645EP00 19645KR00	Reflector with enforcement ring Reflector with enforcement ring Reflector with enforcement ring Reflector with enforcement ring Reflector with enforcement ring

Table A.3: Patents for SAILOR XTR TVRO.

A.5 Outline Drawings

A.5.1 ADU SAILOR 100 XTR TVRO (eDome)

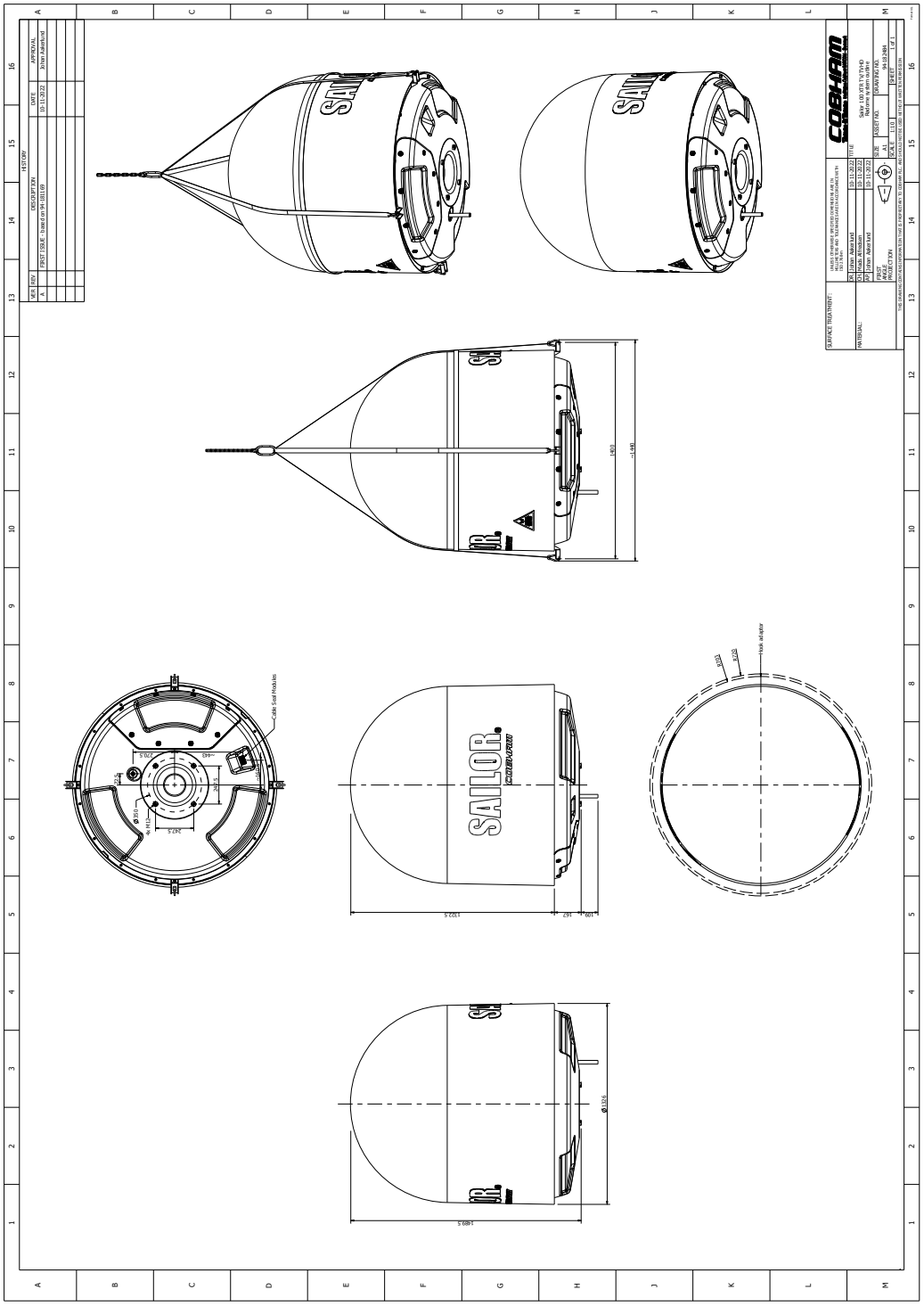


Figure A.1: Outline drawing: ADU SAILOR 100 XTR TVRO (eDome)

A.5.2 ADU SAILOR 120 XTR TVRO (composite radome)

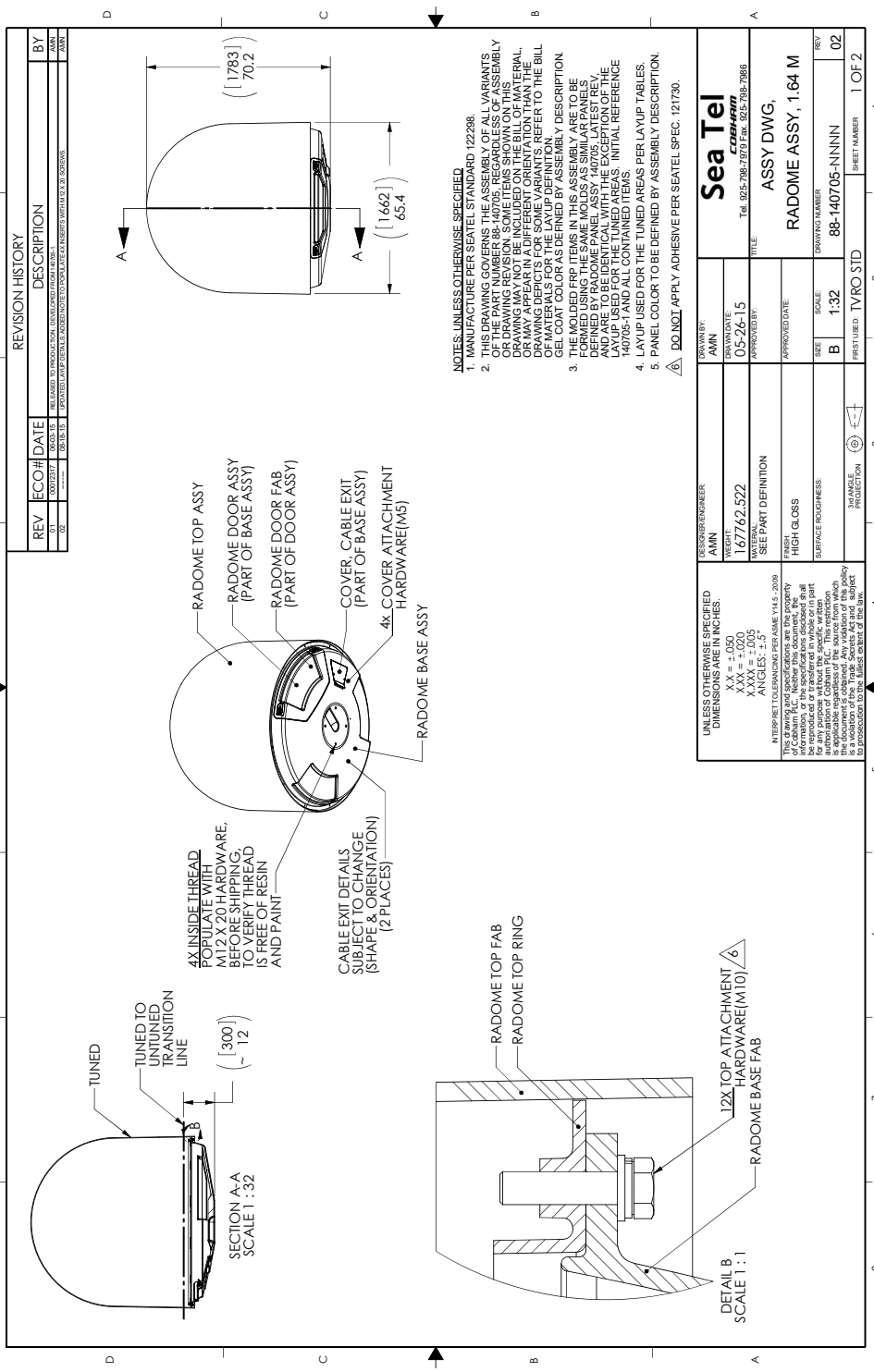


Figure A.2: Outline drawing: ADU SAILOR 120 XTR TVRO (composite radome)

A.5.3 ADU SAILOR 120 XTR TVRO (composite radome)

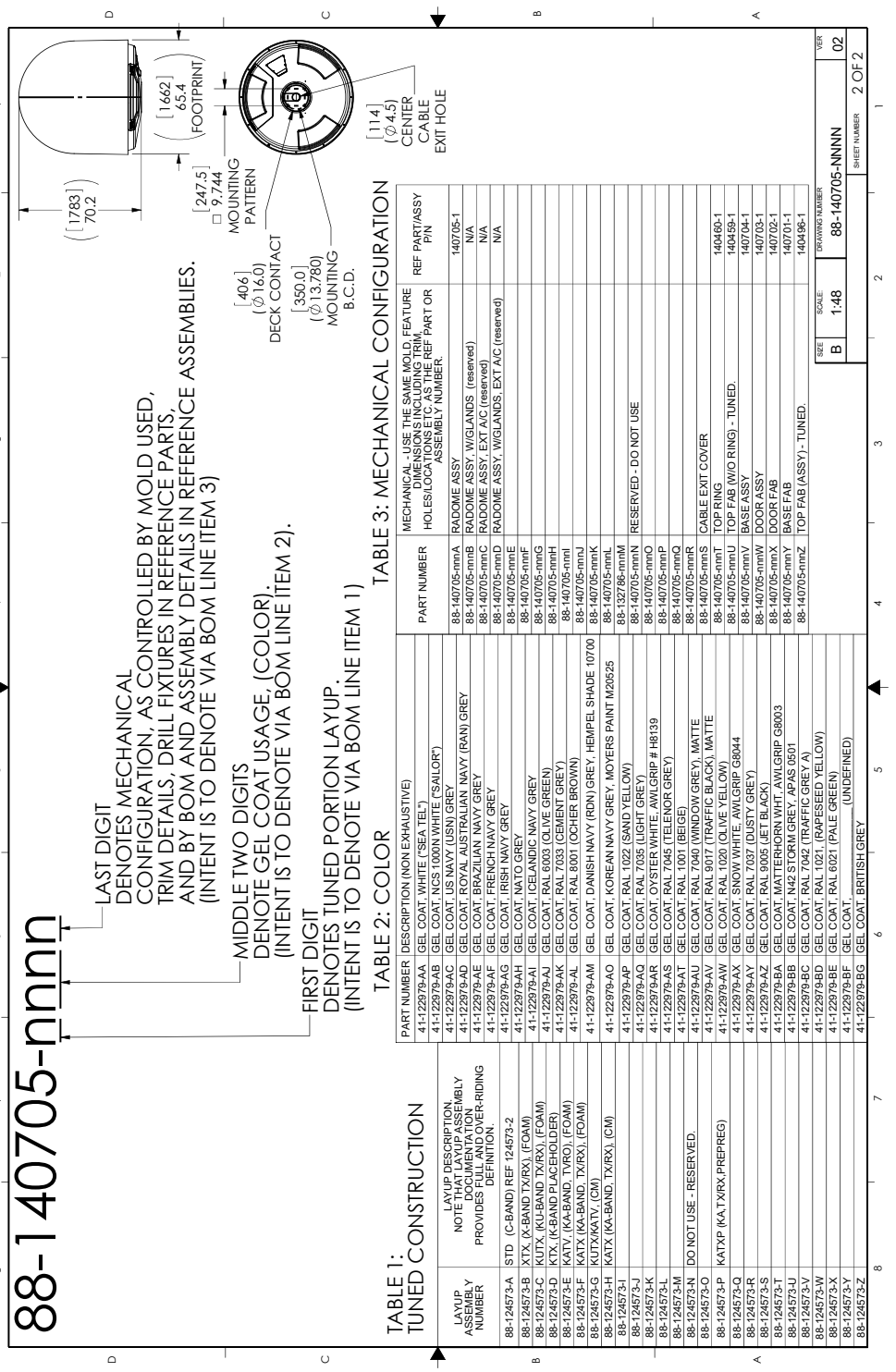


Figure A.3: Outline drawing: ADU SAILOR 120 XTR TVRO (composite radome)

A.5.4 BDU Lite

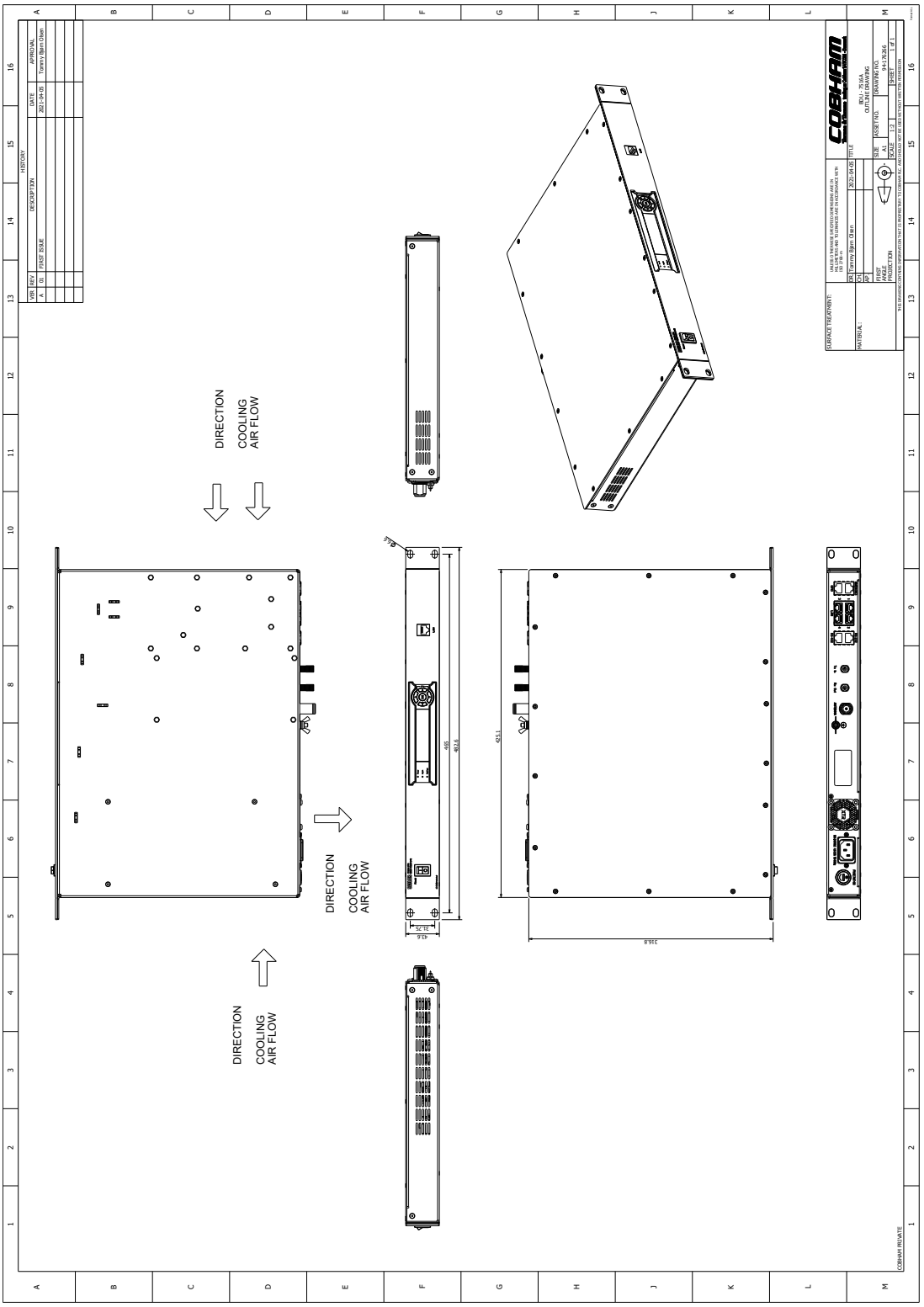


Figure A.4: Outline drawing: BDU Lite

A.6 Block diagram and cables from ADU to TV Receiver

A.6.1 High-level block diagram

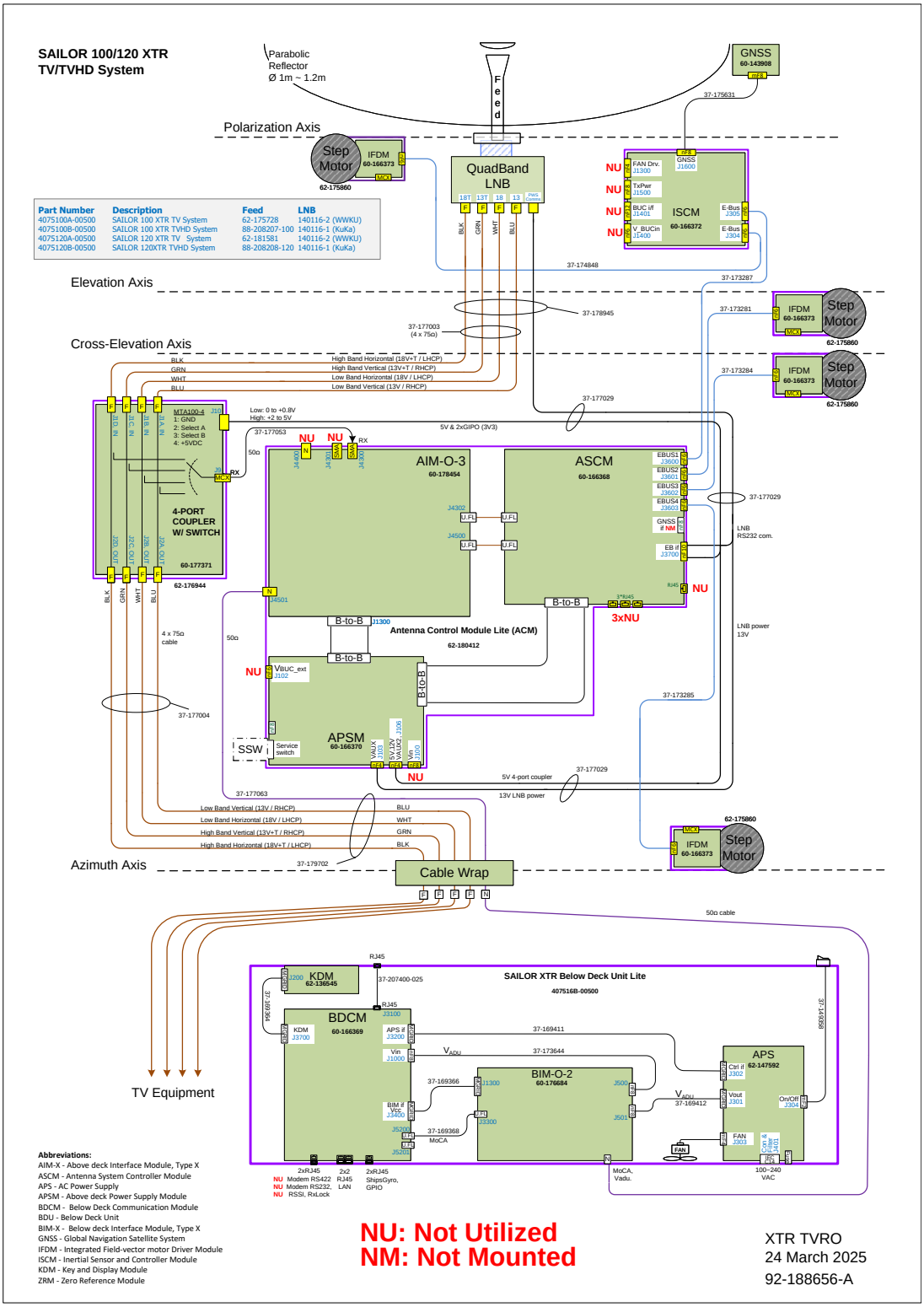


Figure A.5: Block diagram and cables from ADU to TV Receiver

A.6.2 Cables

Blue Coax Cable

This coax carries the Low Band Vertical/RHCP signals from the antenna to a splitter. One output of the splitter goes to the below decks Multiswitch, or other distribution equipment that is feeding the Ku-Band satellite receivers.

1. Connect this output to the Low Band Vertical, or RHCP port, on your Multiswitch, or other distribution equipment.

For DirecTV (only HDTV ADU)

2. Connect the other output from the splitter to the Low Band RHCP (13V) port, on your 8 CH SWM which feeds your DirecTV HD receivers.

White Coax Cable

This coax carries the Low Band Horizontal/LHCP signals from the antenna to a splitter. One output of the splitter goes to the below decks Multiswitch, or other distribution equipment that is feeding the Ku-Band satellite receivers.

1. Connect this output to the Low Band Horizontal, or LHCP port, on your Multiswitch, or other distribution equipment.

For DirecTV (only HDTV ADU)

2. Connect the other output from the splitter to the Low Band RHCP (18V) port, on your 8 CH SWM which feeds your DirecTV HD receivers.

Green Coax Cable

This coax carries the High Band Vertical/RHCP signals from the antenna to a splitter. One output of the splitter goes to the below decks Multiswitch, or other distribution equipment that is feeding the Ku-Band satellite receivers.

1. Connect this output to the High Band Vertical, or RHCP port, on your Multiswitch, or other distribution equipment.

For DirecTV (only HDTV ADU)

2. Connect the other output from the splitter to the High Band RHCP (13V+22KHz) port, on your 8 CH SWM which feeds your DirecTV HD receivers.

Black Coax Cable

This coax carries the High Band Horizontal/LHCP signals from the antenna to a splitter. One output of the splitter goes to the below decks Multiswitch, or other distribution equipment that is feeding the Ku-Band satellite receivers.

1. Connect this output to the High Band Horizontal, or LHCP port, on your Multiswitch, or other distribution equipment.

For DirecTV (only HDTV ADU)

2. Connect the other output from the splitter to the High Band LHCP (18V+22KHz) port, on your 8 CH SWM which feeds your DirecTV HD receivers.

TV IF Coaxial Cables (Customer Furnished)

A minimum of 4 (75 Ω) coaxial cables are required for your system. At a minimum these cables must have solid copper center conductors and, single or double, copper braid shielding. The coaxial cables must be of adequate conductor cross-sectional surface area for the length of the cable run.

1. Make sure that the loop resistance of the cable run is less than 2.0 Ω.
2. Do not use copper clad iron center conductor cables.
3. Make sure that the type F male connectors installed on the cables are the correct type so that they mate properly with the cable you are using.

Due to the dB losses across the length of these coaxial cables at L-Band, it is recommended to use the following 75 Ω coax, or Heliax, cable types (and their equivalent conductor size). See below recommended cable lengths for the IF cables:

Cable type	Cable length (m)	Cable length (ft)	Conductor size
LMR-300-75	25	75	18 AWG
RG-11 or LMR-400-75	45	150	14 AWG
LDF4-75 Heliax	60	200	10 AWG
LMR-600-75	90	300	6 AWG

Table A.4: TV IF Coax Cable Types.

Dual Antenna Solution

This appendix has the following sections:

- *Introduction*
- *Installation of the Dual Antenna Solution*
- *Configuration of the Dual Antenna Solution*

B.1 Introduction

The SAILOR XTR TVRO Dual antenna solution has the following features:

- Ensures maximum system uptime.
- Fully automatic switching to other TV antenna, no user intervention needed.
- Switching upon programmed blocking zones.
- Switching if the ADU is malfunctioning.
- Configured through blocking zones set in web user interface.

B.2 Installation of the Dual Antenna Solution

B.2.1 System Overview

You can use the SAILOR XTR TVRO in dual antenna mode with 2 ADUs, 2 BDU Lites and the Arbitrator. In case one antenna enters a blocking zone or makes a cable unwrap, the other antenna of the dual-antenna system takes over and the system continues to work.
The Arbitrator switches from one antenna to the other based on the programmed blocking zones in the two antennas.

Parts Needed

The following parts are needed for the SAILOR XTR TVRO Dual antenna solution:

- 2 x SAILOR XTR TVRO System (Primary System A, Secondary System B).
- 1 x Arbitrator.

B.2.2 Installation

To install the dual antennas, do as follows:

1. Install the Primary ADU, BDU Lite.
2. Install the Secondary ADU, BDU Lite.

To ensure that one antenna always has line of sight, make sure that its physical mounting is 180° out from the other antenna. This ensures that the antennas are not blocked at the same time as well as ensures that the systems do not go into unwrapping at the same time.

3. Provide vessel heading input to both BDU Lites.
4. Connect all cables as shown in the following sections.

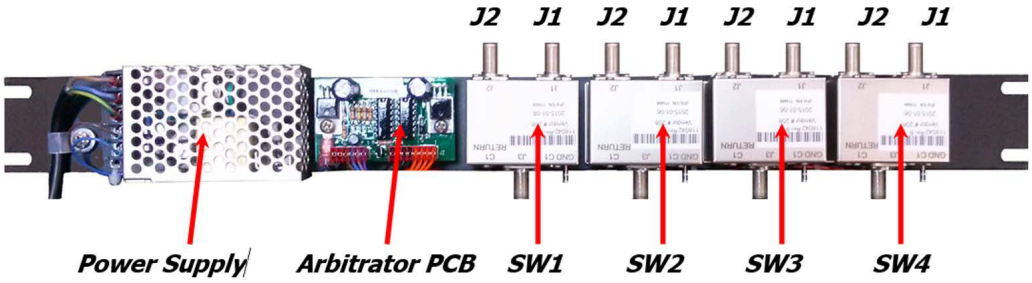


Figure B.1: Connections at the Arbitrator.

1. Install the Dual Antenna Arbitrator panel near the BDU Lite units.
2. Connect the Dual Antenna Arbitrator wires:
   - Connect the GRAY control wire to pin 4 of the GPIO connector on Primary antenna.
   - Connect a BLACK ground wire to pin 5 of the GPIO connector on Primary antenna.
   - Connect the VIOLET control wire to the pin 4 of the GPIO connector on Secondary antenna.
   - Connect a BLACK ground wire to pin 5 of the GPIO connector on Secondary antenna.
3. Connect the Antenna coax cables:
   - Connect the Low band Vertical/RHCP (Blue) coax from Secondary Antenna to J1 (right) connector of Coax Switch SW1.
   - Connect the Low band Vertical/RHCP (Blue) coax from Primary Antenna to J2 (left) connector of Coax Switch SW1.
   - Connect the High band Vertical/RHCP (Green) coax from Secondary Antenna to J1 connector of Coax Switch SW2.
   - Connect the High band Vertical/RHCP (Green) coax from Primary Antenna to J2 connector of Coax Switch SW2.
   - Connect the Low band Horizontal/LHCP (White) coax from Secondary Antenna to J1 connector of Coax Switch SW3.

- Connect the Low band Horizontal/LHCP (White) coax from Primary Antenna to J2 connector of Coax Switch SW3.
- Connect the High band Horizontal/LHCP (Black) coax from Secondary Antenna to J1 connector of Coax Switch SW4.
- Connect the High band Horizontal/LHCP (Black) coax from Primary Antenna to J2 connector of Coax Switch SW4.

4. Connect the Matrix Switch coax cables:

- Connect the Low band Vertical/RHCP (Blue) coax from the bottom connector of Coax Switch SW1 to either the Vertical Low input on the Ku-Band Multiswitch, or the 13V input on the SWM switch, or to a splitter connected to both of these ports.
- Connect the High band Vertical/RHCP (Green) coax from J3 connector of Coax Switch SW2 to either the Vertical High input on the Ku-Band Multiswitch, or the 13V/22kHz input on the SWM switch, or to a splitter connected to both of these ports.
- Connect the Low band Horizontal/LHCP (White) coax from J3 connector of Coax Switch SW3 to either the Horizontal Low input on the Ku-Band Multiswitch, or the 18V input on the SWM switch, or to a splitter connected to both of these ports.
- Connect the High band Horizontal/LHCP (Black) coax from J3 connector of Coax Switch SW4 to either the Horizontal High input on the Ku-Band Multiswitch, or the 18V/22kHz input on the SWM switch, or to a splitter connected to both of these ports.

For easy connection of the two wires for the GPIO input of the BDU Lite you may use a terminal block (RJ45 Wire Connector Terminal, S-31-208142). The pin numbers on the adapter are the same as on the RJ-45 plug.

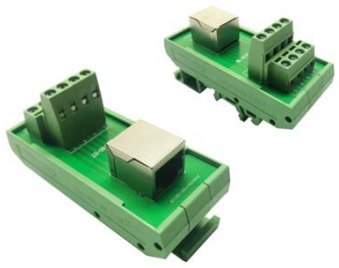


Figure B.2: Easy connection of GPIO input, terminal block (optional).

Diagram for Connecting the Cables for Dual Operation

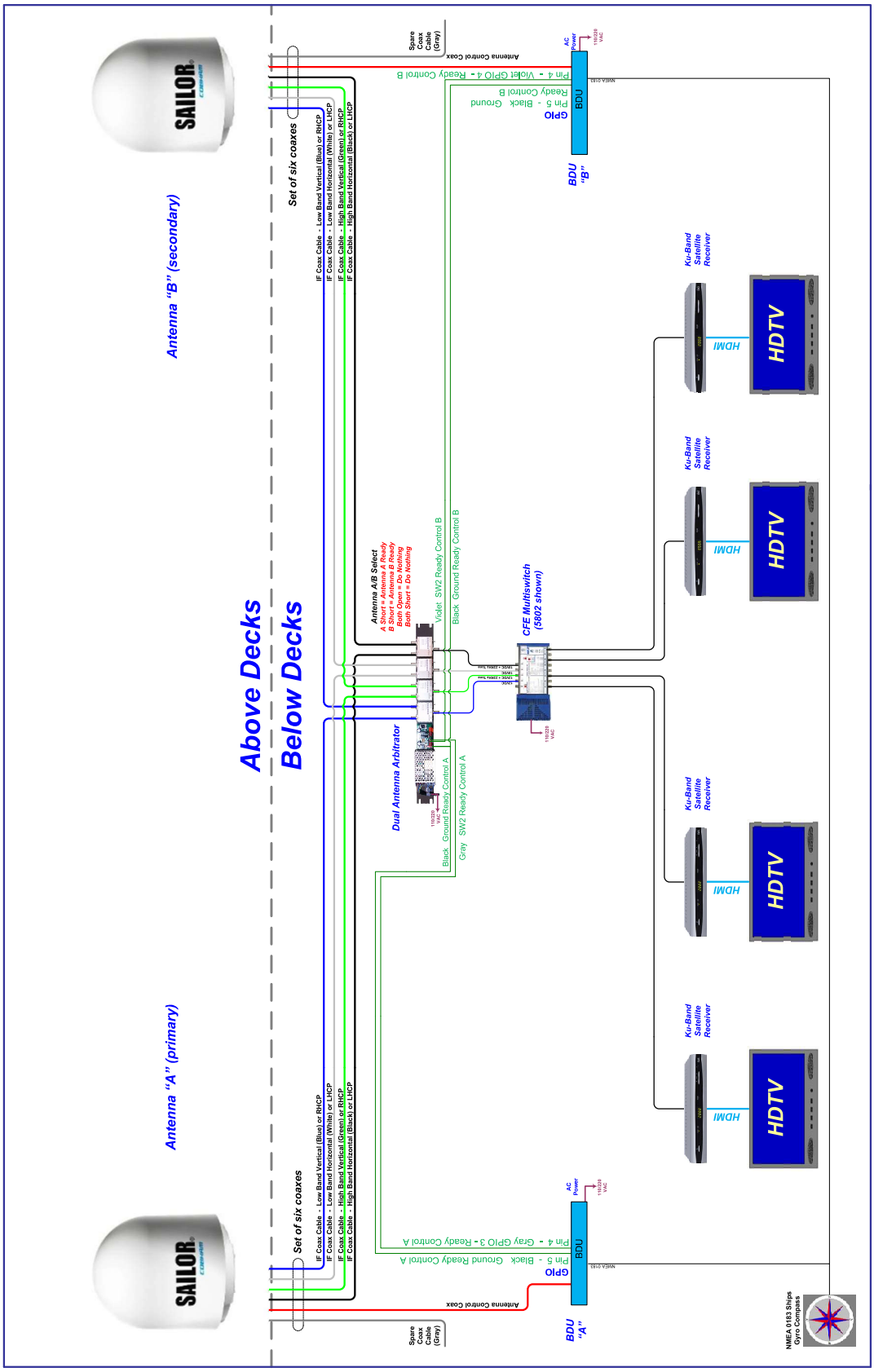


Figure B.3: Connections for dual operation.

B.2.3 Configuration of the Dual Antenna Solution

The dual antenna solution switches when entering the blocking zones programmed in antenna A (primary) and antenna B (secondary). When the antenna enters a blocking zone it will change the state of the GPIO3 pin in the GPIO RJ-45 connector of the BDU Lite. This switches the RF switches on the arbitrator to change the TV signal path to the other antenna.

1. Configure the blocking zones for each antenna to enable the antennas to switch.

B.2.4 Verification of the Dual Antenna Setup

To verify that the Arbitrator and the two antennas work properly together do as follows:

1. Open the web interface for the two antennas in two browser tabs.
2. Verify that both antennas are in **Tracking**.
3. Verify that both antennas are **NOT** in a blocking zone.
4. Place yourself physically near the Arbitrator (you must be able to hear a click sound from the Arbitrator).
5. **Primary antenna**: Go to the page **Settings > GPIO**.

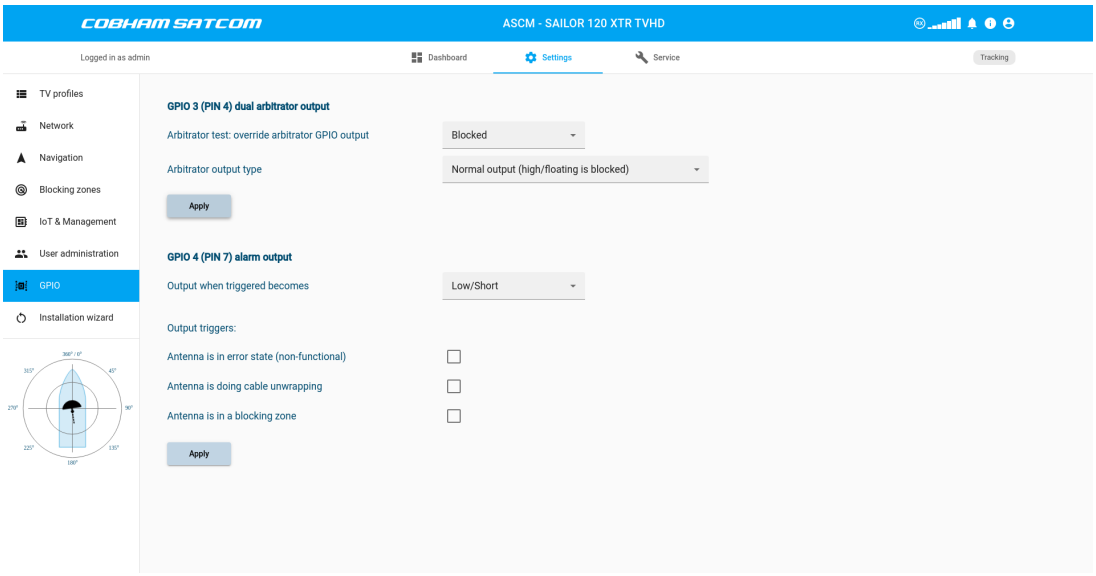


Figure B.4: Verification of the Arbitrator.

6. At **GPIO 3 (PIN 4) Dual arbitrator output** select the drop-down menu **Blocked** and click **Apply**.

NOTE Settings are reset upon reboot.

7. You should hear a click sound and the signals are routed from the secondary antenna to the TV distribution.

8. Verify that the TV receivers are still producing the TV audio and video.

9. At **GPIO 3 (PIN 4) Dual arbitrator output** select the drop-down menu **Unblocked** and click **Apply**.

   NOTE | There should not be a clicking sound.

10. **Secondary antenna**: Go to the page **Settings > GPIO**.

11. At **GPIO 3 (PIN 4) Dual arbitrator output** select the drop-down menu **Blocked** and click **Apply**.

12. You should hear a click sound and the signals are routed from the primary antenna to the TV distribution.

13. Verify that the TV receivers are still producing the TV audio and video.

14. At **GPIO 3 (PIN) Dual arbitrator output** select the drop-down menu **Unblocked** and click **Apply**.

    NOTE | There should not be a clicking sound.

This completes the verification of the Arbitrator.

B.2.5 Configuration of the Dual Antenna Solution for SAILOR XTR TVRO and SeaTel TVRO combination.

To ensure compatibility with the SeaTel system, it is necessary to configure the GPIO settings for the SAILOR XTR TVRO to operate in SeaTel compatibility mode when using a dual antenna solution that includes both SAILOR XTR TVRO and SeaTel TVRO systems. This requirement arises because the physical connections for the arbitrator are wired differently when connecting a SeaTel TVRO system.

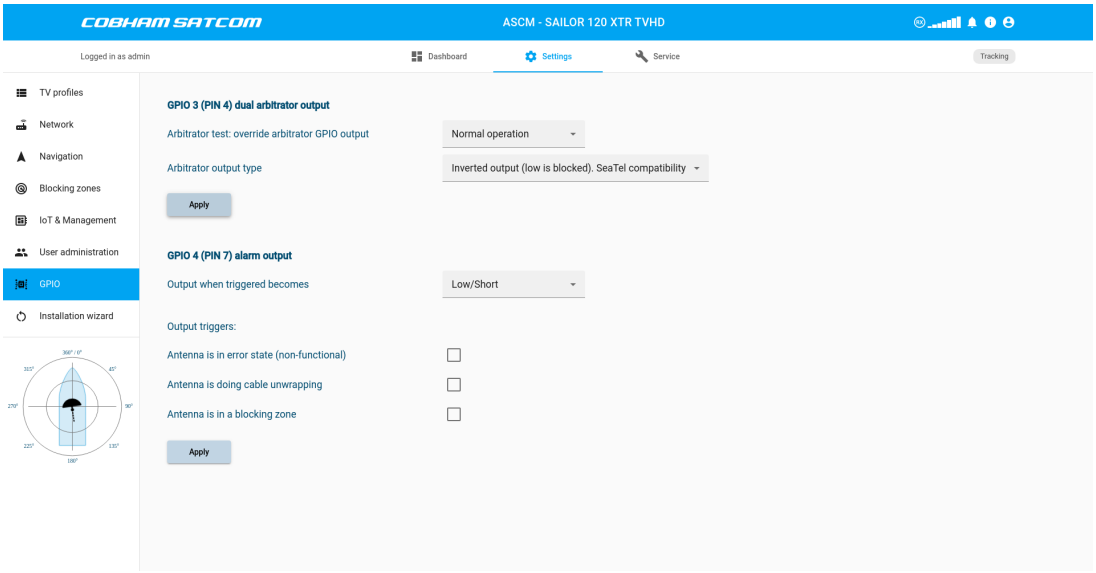


Figure B.5: Configuration of the GPIO settings for the antennas in a SAILOR XTR TVRO and SeaTel TVRO dual antenna configuration.

To configure the GPIO settings for the antennas, do as follows:

1. Open the web interface for the SAILOR XTR TVRO antenna.
2. Go to the page **Settings > GPIO**.
3. At **GPIO 3 (PIN 4) Dual arbitrator output** select the drop-down menu **Arbitrator output type** and select **Inverted output (low is blocked). SeaTel compatibility**.
4. Click **Apply**.

NOTE The physical connections for the arbitrator should be performed as described in documentation for the SeaTel TVRO antenna.

Network Information and Recommendations

In this appendix you find information about:

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

C.1 Network Interfaces and Services exposed via Network Interfaces after Factory default

C.1.1 Network Interfaces

The SAILOR XTR TVRO Network interfaces are as follows:

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

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

C.1.2 IP address configuration after Factory default

The SAILOR XTR TVRO IP addresses are as follows:

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

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

C.1.3 Services running on Interfaces after Factory default

The SAILOR XTR TVRO services running on interface are as follows:

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

Table C.2: Services running after Factory default.

C.2 Public Network Connection

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

C.3 Unsecure protocol usage recommendations

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

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

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

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

Command Line Interface

D.1 Connection Modes

After you have done the initial configuration and connected the SAILOR XTR TVRO to your network, you can use SSH to configure the SAILOR XTR TVRO.

NOTE

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

SSH Connection

You can access the user command line interface (UCLI) via SSH. The UCLI interface is available on the standard SSH port 22. Access to the SAILOR XTR system is protected by the password for the admin account. This is the same password that is used in the web interface. Use any BDU Lite LAN port and corresponding IP address to get access to the UCLI. To start an UCLI session do as follows:

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

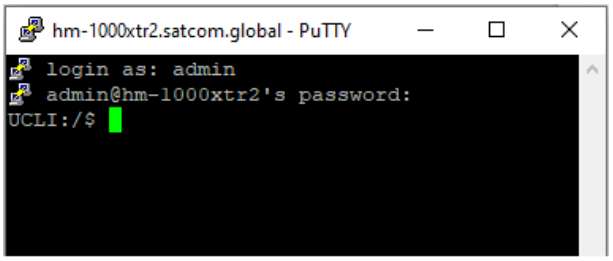


Figure D.1: Command line interface, login.

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*
- *exit*
- *help*
- *navigation*
- *satellite*
- *status*
- *system*
- *test*
- *zone*

D.2.1 antenna_data

Command	Description
`antenna_data`	Shows detailed information on this specific command.

`antenna_data type`	Shows current antenna type.
	Example output:
	`UCLI:/$ antenna_data type`
	`System: 7509D`
	`Type: 2`
	`Oem: generic`
	`sub type: 0`
	`lnb type: 1`
	`buc type: 4`

`antenna_data type [<adu-id> [<sub-type>]]`	Sets the antenna type and the optional sub-type.

Table D.1: 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.

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

D.2.3 config

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

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

D.2.4 demo

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

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

D.2.5 dual_antenna

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

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

D.2.6 exit

Command	Description
`exit`	Exits the connection to the SAILOR XTR TVRO system.

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

D.2.7 help

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

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

D.2.8 navigation

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

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

D.2.9 satellite

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

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

D.2.10 status

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

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

D.2.11 system

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

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

D.2.12 test

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

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

D.2.13 zone

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

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

Grounding and RF Protection

E.1 Introduction

E.1.1 Reasons for Grounding

Grounding the SAILOR XTR TVRO 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 Lite rely on proper grounding of the system in order to work properly. Otherwise sensitive circuits within the BDU Lite 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 XTR TVRO 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 Lite

The BDU Lite should be grounded to the ship/hull. For this purpose you may use a short ADU cable and a grounding kit. Further, the BDU Lite 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 Lite* on page 2-31. 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 Lite 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-10.

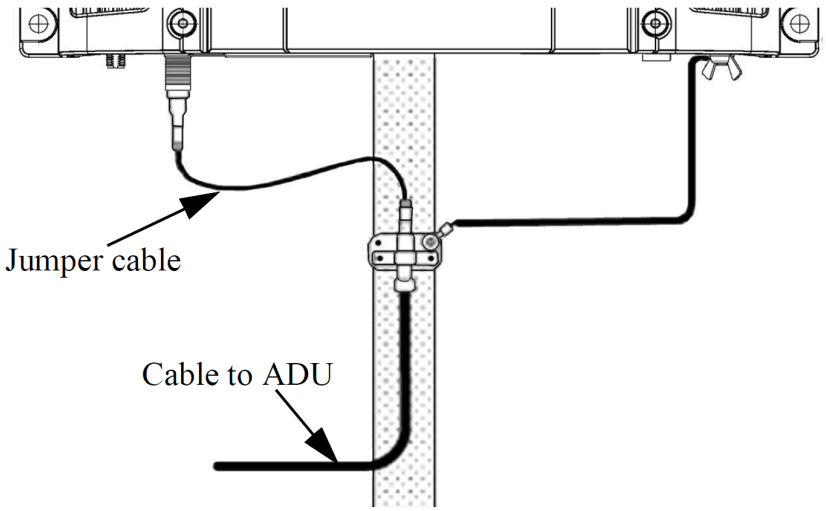


Figure E.1: Extending the Ground Plane.

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.

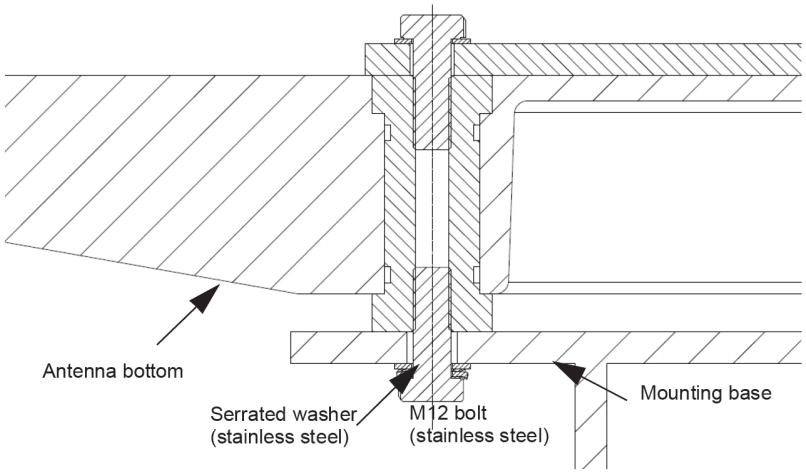


Figure E.2: Grounding the ADU.

NOTE

For optimum grounding use the mounting bolt located clostes to the ADU cable plate, see *To Ground the ADU* on page 2-26

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

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 Lite

The BDU Lite should preferably be grounded to the ship with the short cable. Further, the BDU Lite must be grounded at its grounding stud in order to ensure a proper grounding if the short ADU cable is disconnected.

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

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 Lite** (see *To Ground the ADU*).

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

To Ground the ADU

NOTE

For optimum grounding use the mounting bolt located closest to the ADU cable plate, see *To Ground the ADU* on page 2-26

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 Lite 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-9.

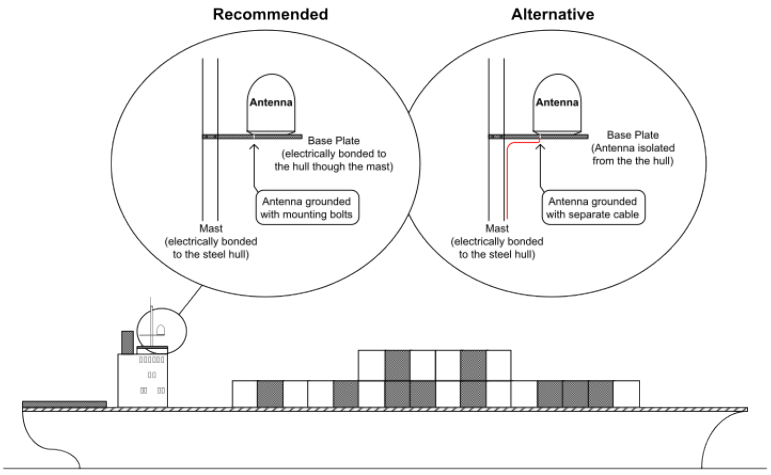


Figure E.3: Grounding at a dedicated RF ground (alternative).

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 Lite

The BDU Lite should preferably be grounded with the short cable. Further, the BDU Lite 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 Lite (see *To Ground the ADU*).

The BDU Lite 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 Lite), the ADU must be isolated at its mounting bolts by means of shoulder bushings and washers, see section *Ground Cable - Connection* and *Isolation of the ADU from the Mounting Base*.

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

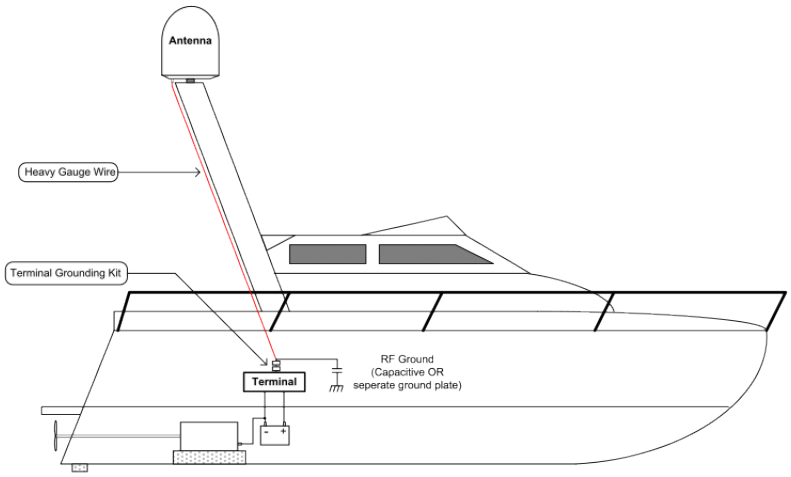


Figure E.4: Alternative grounding for aluminum hulls.

E.2.5 Alternative Grounding for Fiber Glass Hulls

To Ground the BDU Lite

The BDU Lite should preferably be grounded with the short ADU cable and a grounding kit (available from Cobham SATCOM). Further, the BDU Lite 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 Lite (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 Lite (e.g. Lightning Ground), the ADU must be isolated at its mounting bolts by means of shoulder bushings and washers - see section *Separate Ground Cable*.

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

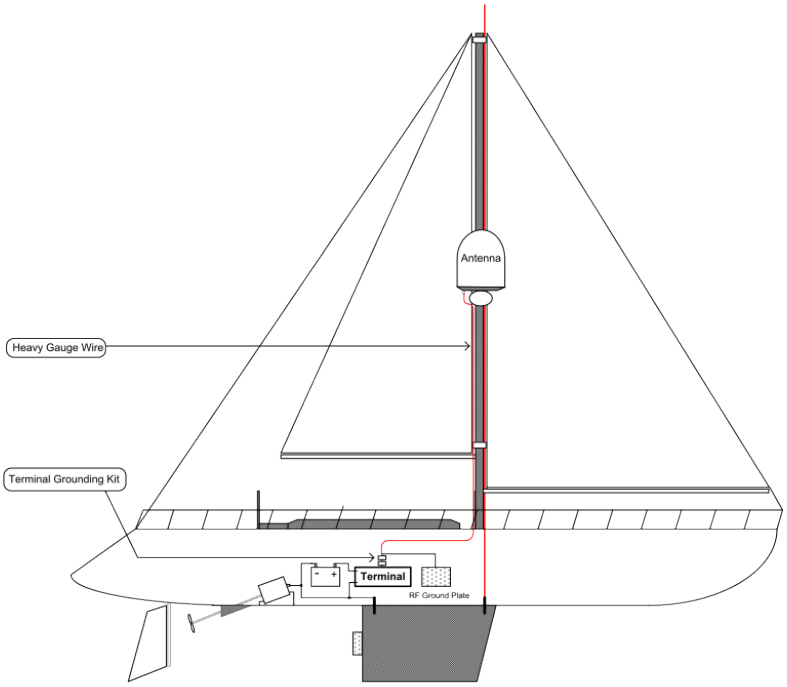


Figure E.5: Alternative grounding for fiber glass hulls.

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 figure E.6. The crimp terminals must be a marine approved type e.g. the DuraSeal series from Raychem.

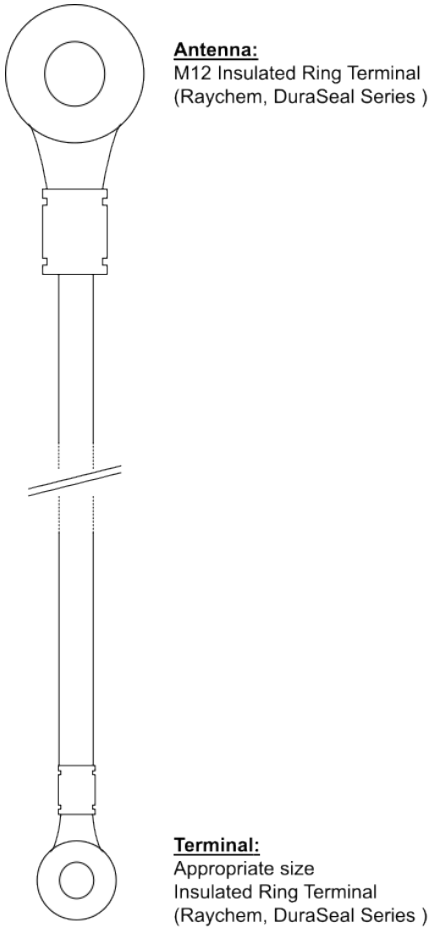


Figure E.6: Separate ground cable.

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-9.
At the other end, connect the ground cable as described in *To Ground the BDU Lite* 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 in figure E.7. Please note that the isolation has to be implemented on all four mounting bolts (including the bolt securing the ground cable).

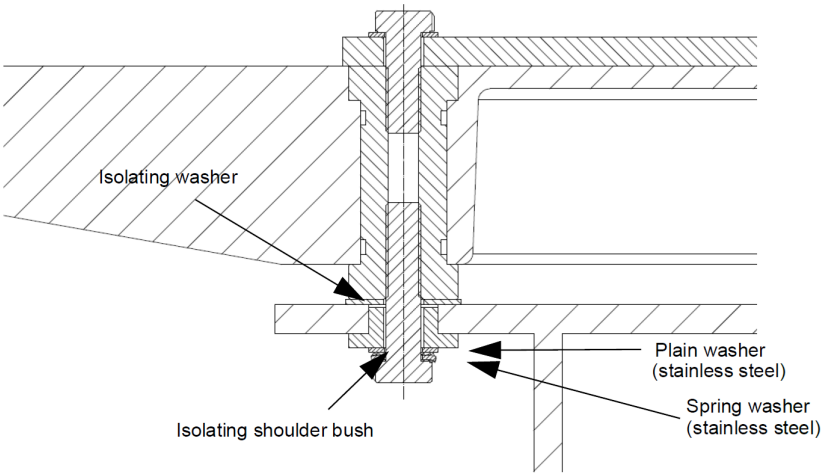


Figure E.7: Isolation of the ADU from the mounting base.

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

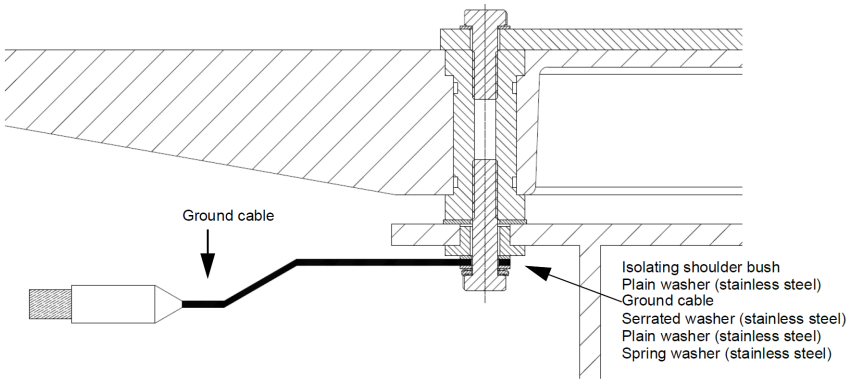


Figure E.8: ADU isolation and grounding cable.

E.3 Jumper Cable for Grounding

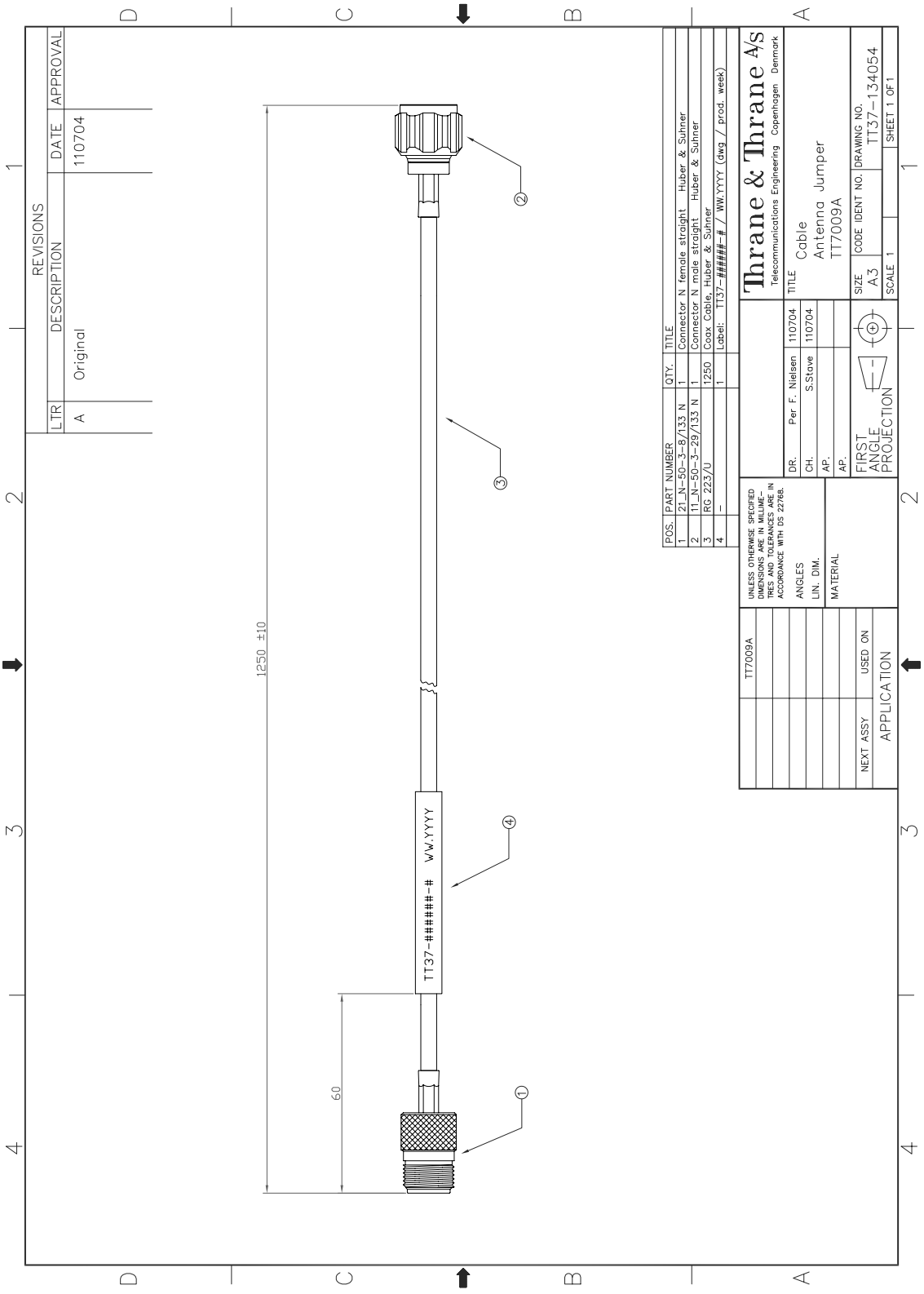


Figure E.9: Jumper cable for grounding (specifications).

Event Messages

F.1 Overview

The SAILOR XTR TVRO 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 TVRO 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 Lite is lit. As long as an event is active, it is shown in the BDU Lite 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

ID	Module	Type	Description	Explanation
08068-0	ADM	WARNING	Blocking zone nearby	The antenna is close to a blocking zone.
08069-0	ADM	WARNING	Blocking Zone	The antenna has entered a blocking zone.
0807F-0	ADM	WARNING	Local administration enabled	Local administration mode is currently enabled. This allows login without providing the admin password. Will be disabled after 5 minutes or next reboot.
08084-0	ADM	WARNING	Radome fan blocked/not rotating	Radome fan is blocked or not rotating even if it should.
08085-0	ADM	INFO	Radome temp too high	The temperature in the radome is too high.
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
08089-0	ADM	INFO	Socat workaround reboot	A reboot was initiated by the socat workaround. Check diagnostics log to verify no false positive.
0808A-0	ADM	INFO	POST recovery initiated	A reboot was initiated by the system to clear an error state.
0808B-0	ADM	INFO	POST recovery failed	The system is staying in SAFE MODE to enable diagnostic and repair.
0808C-0	ADM	INFO	POST test counter	POST test activations.
0808D-0	ADM	WARNING	LNB communication	Communication between ASCM and LNB.
08090-0	ADM	WARNING	Missing feature key for GSO/NGSO tracking	Feature key for tracking this type of satellite using TLE data is not activated (LEO=1,MEO=2,GEO=3,HEO=4)
08091-0	ADM	ERROR	Antenna data invalid	Antenna data is invalid. Check antenna configuration (Either wrong antenna type, BUC type, LNB type or subtype has been selected)
08095-0	ADM	ERROR	Panel connection lost	Lost connection to the antenna panel.
08096-0	ADM	WARNING	Temperature warning	Antenna panel temperature exceeds safe operating range.
08097-0	ADM	ERROR	Panel malfunction detected	The antenna panel has reported a malfunction and is not operational. Check panel connections and hardware for faults.
0810A-0	ADM	ERROR	ASCM production data	Production data has been corrupted.
0810F-0	ADM	ERROR	ASCM Devices	Startup of ascm_devs application failed.
08110-0	ADM	ERROR	ASCM - APSM Communication	Communication between ASPM and ASCM.
08111-0	ADM	ERROR	Presence of EBUS devices	Present EBUS devices matches antenna type. The info code shows the sum of all missing or unexpected modules, see below: 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.

Continued on next page

Table F.1: List of all possible events.

ID	Module	Type	Description	Explanation
08113-0	ADM	ERROR	APSM production data	APSM production data is corrupted.
08114-0	ADM	ERROR	ASCM FS	File system partition corrupt.
08115-0	ADM	ERROR	TVRO LNB initialisation	TVRO LNB initialisation failed.
08116-0	ADM	ERROR	BDU does not support this antenna type	BDU does not support this antenna type
08117-0	ADM	ERROR	FMMI communication	Communication with FMMI failed
08118-0	ADM	ERROR	APSM Operational	APSM didn't reach running state.
08119-0	ADM	ERROR	APSM ADC communication	Communication with A/D converters in power supply. The info code shows the sum of all missing or unexpected ADC's, see below: 0x00000001: U1300 0x00000002: U1302
0850A-0	ADM	ERROR	GNSS Initialization	GNSS initialization failed.
0851E-0	ADM	ERROR	Sensor sanity	Too many invalid values measured by the ISCM during initialisation. Check for vibrations or malfunctioning ISCM.
08521-0	ADM	ERROR	Azi axis calibration	Azimuth axis zero reference not found. Check belt and zero reference module. Info: 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.
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.
08534-0	ADM	WARNING	BDU communication	The communication link between BDU and antenna is not working.
08537-0	ADM	INFO	GNSS communication	Lost connection to the GNSS device.
08538-0	ADM	INFO	GNSS data range	Received information from the GNSS device which is out of range.
08539-0	ADM	WARNING	GNSS device warning	Local GNSS device warning.
0853A-0	ADM	WARNING	GNSS device error	Local GNSS device error.
0853B-0	ADM	WARNING	GNSS Fallback	Position mode fallback to local GNSS, caused by missing NMEA messages.
0854D-0	ADM	WARNING	GNSS position	No position available from the GNSS device or position too old.
0854E-0	ADM	INFO	GNSS velocity	No velocity available from the GNSS device.
0854F-0	ADM	WARNING	Heading data	Heading information is missing in the antenna as no external NMEA signal is detected.
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	Azimuth cable unwrap	The antenna is performing azimuth cable unwrap.
08564-0	ADM	ERROR	Xel/ele axis cables switched	Check cable connections for xel and ele.

Continued on next page

Table F.1: List of all possible events. (Continued)

ID	Module	Type	Description	Explanation
08565-0	ADM	ERROR	Xel/ele axis broken belt	Check motor belt for xel and ele.
08566-0	ADM	INFO	Excessive ADU acceleration	ADU G-force has exceeded 2.5G
08843-0	ADM	WARNING	DVBS demodulator	The DVBS demodulator cannot be initialised and loaded correctly.
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.
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, loop interrupted.
0A081-0	Antenna	ERROR	ISCM error	Communication error with ISCM. Info: 0x00000001: Keyline signal
0A100-0	Antenna	ERROR	ISCM Gyro communication	Internal communication error on ISCM.
0A101-0	Antenna	ERROR	ISCM Accelerometer communication	Internal communication error on ISCM.
0A102-0	Antenna	ERROR	ISCM Magnetometer communication	Internal communication error on ISCM.
0A103-0	Antenna	ERROR	ISCM IMU communication	Internal communication error on ISCM.
0A106-0	Antenna	INFO	ISCM ADC volt	Voltage out of range.
0A107-0	Antenna	WARNING	ISCM Power good	Internal PSU error.
0A108-0	Antenna	ERROR	ISCM Prod data	Internal production data invalid.
0A181-0	Antenna	ERROR	ISCM No response	No communication with ISCM. Check cable.
0A200-0	Antenna	ERROR	Azi Motor prod data	Internal production data invalid.
0A201-0	Antenna	ERROR	Azi Motor ZRM	No zero reference found. Check from motor to ZRM and free movement of the antenna.
0A280-0	Antenna	ERROR	Azi Motor Driver fault	Driver could not move antenna. Check free movement of the antenna.
0A281-0	Antenna	ERROR	Azi Motor Power fault	No power to motor driver. Check input power to system.
0A282-0	Antenna	ERROR	Azi Motor Shutdown	Internal error. Motor is shut down.
0A283-0	Antenna	WARNING	Azi Motor Over temperature warning	Motor temperature too high.
0A284-0	Antenna	ERROR	Azi Motor Over temperature fault	Motor temperature too high. Motor shut down.
0A285-0	Antenna	INFO	Azi Motor Over current fault	Over current protected activated. Check free movement of antenna.
0A286-0	Antenna	ERROR	Azi Motor No response	No communication with motor. Check cable.
0A300-0	Antenna	ERROR	Xel Motor prod data	Internal production data invalid.
0A301-0	Antenna	ERROR	Xel Motor ZRM	No zero reference found. Check from motor to ZRM and free movement of the antenna.
0A380-0	Antenna	ERROR	Xel Motor Driver fault	Driver could not move antenna. Check free movement of the antenna.
0A381-0	Antenna	ERROR	Xel Motor Power fault	No power to motor driver. Check input power to system.

Continued on next page

Table F.1: List of all possible events. (Continued)

ID	Module	Type	Description	Explanation
0A382-0	Antenna	ERROR	Xel Motor Shutdown	Internal error. Motor is shut down.
0A383-0	Antenna	WARNING	Xel Motor Over temperature warning	Motor temperature too high.
0A384-0	Antenna	ERROR	Xel Motor Over temperature fault	Motor temperature too high. Motor shut down.
0A385-0	Antenna	INFO	Xel Motor Over current fault	Over current protected activated. Check free movement of antenna.
0A386-0	Antenna	ERROR	Xel Motor No response	No communication with motor. Check cable.
0A400-0	Antenna	ERROR	Ele Motor prod data	Internal production data invalid.
0A401-0	Antenna	ERROR	Ele Motor ZRM	No zero reference found. Check from motor to ZRM and free movement of the antenna.
0A480-0	Antenna	ERROR	Ele Motor Driver fault	Driver could not move antenna. Check free movement of the antenna.
0A481-0	Antenna	ERROR	Ele Motor Power fault	No power to motor driver. Check input power to system.
0A482-0	Antenna	ERROR	Ele Motor Shutdown	Internal error. Motor is shut down.
0A483-0	Antenna	WARNING	Ele Motor Over temperature warning	Motor temperature too high.
0A484-0	Antenna	ERROR	Ele Motor Over temperature fault	Motor temperature too high. Motor shut down.
0A485-0	Antenna	INFO	Ele Motor Over current fault	Over current protected activated. Check free movement of antenna.
0A486-0	Antenna	ERROR	Ele Motor No response	No communication with motor. Check cable.
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	WARNING	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	INFO	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.
0A600-0	Antenna	ERROR	Azi motor initialisation	Azi motor initialisation failed.
0A601-0	Antenna	ERROR	Xel motor initialisation	Xel motor initialisation failed.
0A602-0	Antenna	ERROR	Ele motor initialisation	Ele motor initialisation failed.
0A603-0	Antenna	ERROR	Pol motor initialisation	Pol motor initialisation failed.
0A680-0	Antenna	ERROR	Azi motor initialisation	Azi motor initialisation failed.
0A681-0	Antenna	ERROR	Xel motor initialisation	Xel motor initialisation failed.
0A682-0	Antenna	ERROR	Ele motor initialisation	Ele motor initialisation failed.
0A683-0	Antenna	ERROR	Pol motor initialisation	Pol motor initialisation failed.
0B060-0	APSM	INFO	NMEA 0183 parse error	No valid NMEA input. Check NMEA 0183 cable.
0B061-0	APSM	WARNING	Heading data	No valid heading input received. Check NMEA 0183 cable.
0B062-0	APSM	WARNING	APSM AUX temperature warning	Temperature too high.

Continued on next page

Table F.1: List of all possible events. (Continued)

ID	Module	Type	Description	Explanation
0B063-0	APSM	ERROR	APSM AUX temperature failure	Temperature too high. AUX shut down.
0B064-0	APSM	WARNING	APSM EBUS temperature warning	Temperature too high.
0B065-0	APSM	ERROR	APSM EBUS temperature failure	Temperature too high. EBUS shut down.
0B066-0	APSM	WARNING	APSM LNB temperature warning	Temperature too high.
0B067-0	APSM	ERROR	APSM LNB temperature failure	Temperature too high. LNB shut down.
0B068-0	APSM	WARNING	APSM Main temperature warning	Temperature too high.
0B069-0	APSM	ERROR	APSM Main temperature failure	Temperature too high. APSM shut down.
0B070-0	APSM	INFO	APSM AUX Under voltage lockout	Voltage too low.
0B072-0	APSM	INFO	APSM EBUS Under voltage lockout	Voltage too low.
0B073-0	APSM	INFO	APSM LNB Under voltage lockout	Voltage too low.
0B074-0	APSM	INFO	APSM Main Under voltage lockout	Voltage too low.
0B080-0	APSM	INFO	APSM AUX Over current protection	Too high current. AUX shut down.
0B082-0	APSM	INFO	APSM EBUS Over current protection	Too high current. EBUS shut down.
0B083-0	APSM	INFO	APSM LNB Over current protection	Too high current. LNB shut down.
0B084-0	APSM	INFO	APSM Main Over current protection	Too high current. APSM shut down.
0B090-0	APSM	INFO	APSM AUX Over voltage protection	Voltage too high.
0B092-0	APSM	INFO	APSM EBUS Over voltage protection	Voltage too high.
0B093-0	APSM	INFO	APSM LNB Over voltage protection	Voltage too high.
0B094-0	APSM	INFO	APSM Main Over voltage protection	Voltage too high.
0B0A0-0	APSM	ERROR	APSM Communication error	No communication with APSM. Check internal connections in ACM.
0B0A1-0	APSM	ERROR	BDCM Communication error	No communication with BDCM. Check main antenna cable.
0D000-0	BDCM	WARNING	BDU PSU temperature too high	BDU PSU temperature too high.
0D001-0	BDCM	WARNING	BDU PSU fan does not work	BDU PSU fan does not work.
0D002-0	BDCM	ERROR	BDU PSU will shutdown	BDU PSU will shutdown.
0D003-0	BDCM	ERROR	BDCM prod data	BDCM prod data is invalid.

Table F.1: List of all possible events.

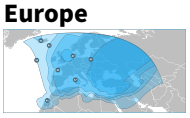
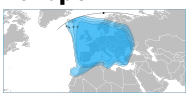
DVB-S Satellites

This appendix contains examples of satellite data for azimuth calibration.

VSAT Coverage	Satellite Name	Satellite Position	RX Polarization	RX Frequency	Symbol Rate	NID
Americas 	**EchoStar9b/ 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** Transponder (South East) Backup (North East)	95°E	Horizontal Horizontal	11.635 GHz 12.729 GHz	27.500 MS/s 26.400 MS/s	8192 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

Continued on next page

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	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** Transponder Backup	134°E	Vertical Vertical	12.435 GHz 12.675 GHz	27.500 MS/s 27.500 MS/s	65 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
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

Continued on next page

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
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	26.500 MS/s	57

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

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.

Approvals

This appendix contains approvals for the SAILOR XTR TVRO systems. Additional approvals can be provided by contacting Cobham SATCOM. The appendix has the following sections:

- *CE (RED and RoHS) SAILOR 100 XTR TV*
- *CE (RED and RoHS) SAILOR 100 XTR TVHD*
- *CE (RED and RoHS) SAILOR 120 XTR TV*
- *CE (RED and RoHS) SAILOR 120 XTR TVHD*
- *Supplier Declaration of Conformity and Material Declaration*
- *Chinese MITT Order 32 (China-RoHS 2)*

H.1 CE (RED and RoHS) SAILOR 100 XTR TV

COBHAM SATCOM
Connecting the future

EU Declaration of Conformity

Hereby **Thrane & Thrane A/S trading as Cobham SATCOM** declares under sole responsibility, that the following

equipment included in this declaration

Model	Description	Part no.
7510A	**SAILOR 100 XTR TV system**	**4075100A**
Consists of		
7510A	SAILOR 100 XTR TV ADU	407510A-xxx
7516B	SAILOR XTR Below Deck Unit Lite	407516B-xxx
SW version	3.14, build 17	-

"xxx" is 3 characters determining the product branding, where only labels, logos and user interface varies.

complies with the specifications of:

- **RoHS directive 2011/65/EU** concerning Restriction of hazardous Substances including **delegated directive (EU) 2015/863** as described in the standard:

Restricted substances, Article 4(1) (ANNEX II)	EN 63000:2018

- **RED directive 2014/53/EU** concerning Radio Equipment as described in harmonized EU standards:

Health and safety, Article 3.1.a	EN 62368-1:2014 EN 60950-22:2016 + A1:2009 + A2:2013
EMC, Article 3.1.b	EN 301 489-1 V2.2.3 EN 301 489-12 V3.2.1 EN 301 489-19 V2.2.1 EN 301 489-20 V2.2.1 EN 301 843-1 :2018 EN 301 843-6 V2.2.1 EN60945:2003
Spectrum, Article 3.2	EN 301 428 V2.1.2
Cyber Security, Article 3.3.d/e	EN 18031-1:2024 EN 18031-2:2024

Description of series/system

75100A SAILOR 100 XTR TV antenna system consists of an ADU (Above Deck Unit) and a BDU (Below Deck Unit Lite). The system provides one way satellite TV/data featuring stabilization to minimize impact from the vessel. The system assumes use of a 3rd Party Ku-band modem unit. The system can receive only from any desired Ku-band satellite, which has adequate signal coverage in the current geographic area.

Manufacturer

Thrane & Thrane A/S trading as Cobham SATCOM
Lundtoftegårdsvej 93D, DK-2800 Kgs. Lyngby, Denmark

Location and date

Kgs. Lyngby, 7 July 2025

Director R&D Antennas

Ian Rowe

CE

MANAGEMENT SYSTEM CERTIFICATION DNV·GL ISO 9001 ISO 14001

Document . no: 99-185234-B
Thrane & Thrane A/S trading as Cobham Satcom
Registered no.: DK - 65 72 46 18. Registered address: Lundtoftegaardsvej 93 D, 2800 Kgs. Lyngby, Denmark

www.cobhamsatcom.com

H.2 CE (RED and RoHS) SAILOR 100 XTR TVHD

COBHAM SATCOM
Connecting the future

EU Declaration of Conformity

Hereby **Thrane & Thrane A/S trading as Cobham SATCOM** declares under sole responsibility, that the following

equipment included in this declaration

Model	Description	Part no.
7510B	**SAILOR 100 XTR TVHD system**	**4075100B**
Consists of		
7510B	SAILOR 100 XTR TVHD ADU	407510B-xxx
7516B	SAILOR XTR Below Deck Unit Lite	407516B-xxx
SW version	3.14, build 17	-

"xxx" is 3 characters determining the product branding, where only labels, logos and user interface varies.

complies with the specifications of:

- **RoHS directive 2011/65/EU** concerning Restriction of hazardous Substances including **delegated directive (EU) 2015/863** as described in the standard:

Restricted substances, Article 4(1) (ANNEX II)	EN 63000:2018

- **RED directive 2014/53/EU** concerning Radio Equipment as described in harmonized EU standards:

Health and safety, Article 3.1.a	EN 62368-1:2014 EN 60950-22:2016 + A1:2009 + A2:2013
EMC, Article 3.1.b	EN 301 489-1 V2.2.3 EN 301 489-12 V3.2.1 EN 301 489-19 V2.2.1 EN 301 489-20 V2.2.1 EN 301 843-1 :2018 EN 301 843-6 V2.2.1 EN60945:2003
Spectrum, Article 3.2	EN 301 428 V2.1.2
Cyber Security, Article 3.3. d/e	EN 18031-1:2024 EN 18031-2:2024

Description of series/system

75100B SAILOR 100 XTR TVHD antenna system consists of an ADU (Above Deck Unit) and a BDU (Below Deck Unit Lite). The system provides one way satellite TV/data featuring stabilization to minimize impact from the vessel. The system assumes use of a 3rd Party Ku-band modem unit. The system can receive only from any desired Ku-band satellite, which has adequate signal coverage in the current geographic area.

Manufacturer

Thrane & Thrane A/S trading as Cobham SATCOM
Lundtoftegårdsvej 93D, DK-2800 Kgs. Lyngby, Denmark

Location and date

Kgs. Lyngby, 8 July 2025

Director R&D Antennas

Ian Rowe

CE

MANAGEMENT SYSTEM CERTIFICATION DNV·GL ISO 9001 = ISO 14001

Document . no: 99-185377-B
Thrane & Thrane A/S trading as Cobham Satcom
Registered no.: DK - 65 72 46 18. Registered address: Lundtoftegaardsvej 93 D, 2800 Kgs. Lyngby, Denmark

www.cobhamsatcom.com

H.3 CE (RED and RoHS) SAILOR 120 XTR TV

COBHAM SATCOM
Connecting the future

EU Declaration of Conformity

Hereby **Thrane & Thrane A/S trading as Cobham SATCOM** declares under sole responsibility, that the following

equipment included in this declaration

Model	Description	Part no.
7512A	**SAILOR 120 XTR TV system**	**4075120A**
Consists of		
7512A	SAILOR 120 XTR TV ADU	407512A-xxx
7516B	SAILOR XTR Below Deck Unit Lite	407516B-xxx
SW version	3.14, build 17	-

"xxx" is 3 characters determining the product branding, where only labels, logos and user interface varies.

complies with the specifications of:

- **RoHS directive 2011/65/EU** concerning Restriction of hazardous Substances including **delegated directive (EU) 2015/863** as described in the standard:

Restricted substances, Article 4(1) (ANNEX II)	EN 63000:2018

- **RED directive 2014/53/EU** concerning Radio Equipment as described in harmonized EU standards:

Health and safety, Article 3.1.a	EN 62368-1:2014 EN 60950-22:2016 + A1:2009 + A2:2013
EMC, Article 3.1.b	EN 301 489-1 V2.2.3 EN 301 489-12 V3.2.1 EN 301 489-19 V2.2.1 EN 301 489-20 V2.2.1 EN 301 843-1 :2018 EN 301 843-6 V2.2.1 EN60945:2003
Spectrum, Article 3.2	EN 301 428 V2.1.2
Cyber Security, Article 3.3.d/e	EN 18031-1:2024 EN 18031-2:2024

Description of series/system

75120A SAILOR 120 XTR TV antenna system consists of an ADU (Above Deck Unit) and a BDU (Below Deck Unit Lite). The system provides one way satellite TV/data featuring stabilization to minimize impact from the vessel. The system assumes use of a 3rd Party Ku-band modem unit. The system can receive only from any desired Ku-band satellite, which has adequate signal coverage in the current geographic area.

Manufacturer

Thrane & Thrane A/S trading as Cobham SATCOM
Lundtoftegårdsvej 93D, DK-2800 Kgs. Lyngby, Denmark

Location and date

Kgs. Lyngby, 8 July 2025

Director R&D Antennas

Ian Rowe

CE

MANAGEMENT SYSTEM CERTIFICATION DNV·GL ISO 9001 ISO 14001

Document . no: 99-185378-C
Thrane & Thrane A/S trading as Cobham Satcom
Registered no.: DK - 65 72 46 18. Registered address: Lundtoftegaardsvej 93 D, 2800 Kgs. Lyngby, Denmark

www.cobhamsatcom.com

H.4 CE (RED and RoHS) SAILOR 120 XTR TVHD

COBHAM SATCOM
Connecting the future

EU Declaration of Conformity

Hereby **Thrane & Thrane A/S trading as Cobham SATCOM** declares under sole responsibility, that the following

equipment included in this declaration

Model	Description	Part no.
7512B	**SAILOR 120 XTR TVHD system**	**4075120B**
Consists of		
7512B	SAILOR 120 XTR TVHD ADU	407512B-xxx
7516B	SAILOR XTR Below Deck Unit Lite	407516B-xxx
SW version	3.14, build 17	-

"xxx" is 3 characters determining the product branding, where only labels, logos and user interface varies.

complies with the specifications of:

- **RoHS directive 2011/65/EU** concerning Restriction of hazardous Substances including **delegated directive (EU) 2015/863** as described in the standard:

Restricted substances, Article 4(1) (ANNEX II)	EN 63000:2018

- **RED directive 2014/53/EU** concerning Radio Equipment as described in harmonized EU standards:

Health and safety, Article 3.1.a	EN 62368-1:2014 EN 60950-22:2016 + A1:2009 + A2:2013
EMC, Article 3.1.b	EN 301 489-1 V2.2.3 EN 301 489-12 V3.2.1 EN 301 489-19 V2.2.1 EN 301 489-20 V2.2.1 EN 301 843-1 :2018 EN 301 843-6 V2.2.1 EN60945:2003
Spectrum, Article 3.2	EN 301 428 V2.1.2
Cyber Security, Article 3.3.d/e	EN 18031-1:2024 EN 18031-2:2024

Description of series/system

75120B SAILOR 120 XTR TVHD antenna system consists of an ADU (Above Deck Unit) and a BDU (Below Deck Unit Lite). The system provides one way satellite TV/data featuring stabilization to minimize impact from the vessel. The system assumes use of a 3rd Party Ku-band modem unit. The system can receive only from any desired Ku-band satellite, which has adequate signal coverage in the current geographic area.

Manufacturer

Thrane & Thrane A/S trading as Cobham SATCOM
Lundtoftegårdsvej 93D, DK-2800 Kgs. Lyngby, Denmark

Location and date

Kgs. Lyngby, 8 July 2025

Director R&D Antennas

Ian Rowe

CE

MANAGEMENT SYSTEM CERTIFICATION DNV·GL ISO 9001 = ISO 14001

H.5 Supplier Declaration of Conformity and Material Declaration

Supplier Declaration of Conformity and Material Declaration

Declaration ID No.: **99-186466-B**
Equipment Type and Name: **SAILOR 100/120 XTR TV/TVHD (4075100A, 4075100B, 4075120A, 4075120B)**

Thrane & Thrane A/S trading as Cobham Satcom hereby declares conformity with
- **IMO RESOLUTION MEPC 379(80) section 6.2** and compliance with the
- **RoHS** (**2011/65/EU** and **2015/863/EU)** and
- **REACH** (**EC 1907/2006**) directives

Material declaration below shows the amount of hazardous materials contained in 1 item of the product:

Table	Material name		Threshold level	Above thres-hold level	If yes, material mass		If yes, Information on where it is used
				Yes/no	Mass	Unit	
Table A (Materials listed in appendix 1 of the annex to the Convention)	Asbestos	Asbestos	0.1% [4]	No			
	Polychlorinated Biphenyls (PCB)	Polychlorinated Biphenyls (PCB)	50 mg/kg	No			
	Ozone Depleting Substance	Chlorofluorocaobons (CFS)	No level	No			
		Halons		No			
		Other fully halogenated CFC		No			
		Carbon tetrachloride		No			
		1,1,1-Trichloreothane		No			
		Hydrochlorofluorocarobons		No			
		Hydrobromofluorocarobons		No			
		Methyl bromide		No			
		Bromochloromethane		No			
	Anti-fouling systems containing organotin compounds as a biocide		2,500mg total tin/kg	No			
	Anti-fouling systems containing cybutryne		1,000 mg/kg[6]	No			
Table	Material name		Threshold level	Above thres-hold level	If yes, material mass		If yes, Information on where it is used
				Yes/no	Mass	Unit	
Table B (Materials listed in appendix 2 of the annex to the Convention)	Cadmium and cadmium compounds (Cd)[2]		100 mg/kg	No			
	Hexavalent chromium and hexavalent chromium compounds (Cr VI)[2]		1000 mg/kg	No			
	Lead and lead compounds (Pb)[2]		1000 mg/kg	No			
	Mercury and mercury compounds (Hg)[2]		1000 mg/kg	No			
	Polybrominated Biphenyl (PBB)[2]		50 mg/kg	No			
	Polybrominated Diphenyl Ethers (PBDE)[2]		1000 mg/kg	No			
	Polychloronaphthalenes (Cl>3)		50 mg/kg	No			
	Radioactive substances		No level	No			
	Certain shortchain chlorinated paraffins		1%	No			
Annex II [1] (Additional materials)	Perfluorooctane sulfonic acid (PFOS)		10 mg/kg [5]	No			
	Brominated Flame Retardant (HBCDD)		100 mg/kg	No			
RoHS 3 (2015/863)	Bis(2-Ethylhexyl) phthalate (DEHP)		1000 mg/kg	No			
	Benzyl butyl phthalate (BBP)		1000 mg/kg	No			
	Dibutyl phthalate (DBP)		1000 mg/kg	Nov			
	Diisobutyl phthalate (DIBP)		1000 mg/kg	No			

RoHS compliance Yes/No: Yes	REACH[3] compliance Yes/No: Yes

[1] Regulation EU No. 1257/2013 of the European Parliament and of the Council of 20 November 2013 on Ship Recycling and amending Regulation EC No. 1013/2006 and Directive 2009/16/EC including EMSA's Best Practice Guidance on the Inventory of Hazardous Materials, dated 2016-10-28.
[2] These substances also listed in Directive 2011/65/EU.
[3] Thrane & Thrane products and any involved manufacturing processes are within the Regulation (EC) no. 1907/2006 (REACH) and the associated Candidate List at any time.
[4] Please see footnote 18 on the "Form of Material Declaration" in the IMO Guidelines Resolution MEPC.269(68).
[5] Concentrations of PFOS above 10 mg/kg (0.001% by weight) when it occurs in substances or in preparations or concentrations of PFOS in semi-finished products or articles, or parts thereof equal to or above than 0.1% by weight calculated with reference to the mass of structurally or micro-structurally distinct parts that contain PFOS or for textiles or other coated materials, if the amount of PFOS is equal to or above than 1 µg/m² of the coated material.
[6] Regulatory amendments from MEPC 379(80) details the restriction on substances like Cybutryne and Tributyltin (TBT) effective from January 1, 2023.

Manufacturer: Thrane & Thrane A/S trading as Cobham Satcom

Name: Ian Rowe
Position: R&D Director

Signature: _____ Date: 07-11-2024

Template. No. 99-137297-N Declaration of Conformity and Material Declaration
Thrane & Thrane A/S trading as Cobham Satcom · Lundtoftegaardsvej 93 D · 2800 Kgs. Lyngby · Denmark
T +45 39 55 88 00 · F +45 39 55 88 88 · **www.cobham-satcom.com**
Bank: Danske Bank · Comp.reg.: 65 72 46 18 · VAT: DK-20 64 64 46

H.6 Chinese MITT Order 32 (China-RoHS 2)

Cobham Satcom
Lundtoftegaardsvej 93 D
2800 Kgs. Lyngby
Denmark

T: +45 39 55 88 00
F: +45 39 55 88 88

Chinese MIIT Order 32 (China-RoHS 2)

The declared devices meet the Measures for Restriction of the Use of Hazardous Substances in Electrical & Electronic Products Order No. 32 (China-RoHS II) of the Chinese Ministry of Industry and Information Technology (MIIT).
Hazardous Substance Control Table in compliance with Chinese SJ/T11364-2014 of 21 January 2016 for the declared devices.

部件名称 Part Name	部件号 Part Number	有毒有害物质或元素 Toxic or hazardous Substances and Elements					
		铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr (VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
SAILOR 100 XTR TV	407510A-THR	X	O	O	O	O	O
SAILOR 100 XTR TVHD	407510B-THR	X	O	O	O	O	O
SAILOR 120 XTR TV	407512A-THR	X	O	O	O	O	O
SAILOR 120 XTR TVHD	407512B-THR	X	O	O	O	O	O
O: 表示该有毒有害物质在该部件所有均质材料中的含量均在GB/T 26572规定的限量要求以下 O: Indicates the toxic or hazardous substance contained in all the homogeneous materials for this part is within the limit requirement in GB/T 26572.							
X: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出GB/T 26572规定的限量要求。 X: Indicates the toxic or hazardous substance contained in at least one of the homogeneous materials used for this part is outside the limit requirement in GB/T 26572							
环保期限（EFUP）的产品及其部件是每个列出的符号，除非另有标明。使用期限只适用于产品在产品手册中规定的条件下工作 The Environmentally Friendly Period (EFUP) for the product and its parts are per the symbol listed, unless otherwise marked. The Period of use is valid only when the product is operated within the conditions defined in the product manual.							

Table 1: Hazardous Substance Control Table

The EFUP of the declared devices is 10 years.

The units are marked with following EFUP symbol with the year of production:

Doc. No. 99-186630-A

Glossary

A

- ACU: Antenna Control Unit. Legacy version of the BDU used for older systems.
- ADM: ACU Digital Module. A main processor board in the ACU.
- ADS: Antenna Diversity Solution.
- ADU: Above Deck Unit.
- AIMO: Antenna Interface Module.
- APSM: Antenna Power Supply Module.

B

- BDCM: BDU Control Module.
- BDU: Below Deck Unit.
- BEIDOU: Chinese satellite navigation system.
- BITE: Built-In Test Equipment.

C

- CM: Continuous Monitoring.

D

- DHCP: Dynamic Host Configuration Protocol. A protocol for assigning dynamic IP addresses to devices on a network.
- DNS: Domain Name Server.

E

- EPP: Expanded PolyPropylene.
- ESD: ElectroStatic Discharge.

F

- FCC: Federal Communications Commission.

G

- GEO: Geosynchronous Equatorial Orbit.
- GLONASS: GLObal'naya NAvigatsionnaya Sputnikovaya Sistema. Global Navigation Satellite System in English.
- GMU: Global Xpress Modem Unit.
- GPIO: General Purpose Input/Output.
- GPL: General Public License.
- GPS: Global Positioning System.

H

- HDT: HeaDing True, NMEA sentence.

I

- IEC: International Electrotechnical Commission.
- IoT: Internet of Things.
- IP: Internet Protocol.
- ISCM: Inertial Sensor and Controller Module.

K

- KDM: Keyboard and Display Module of the BDU.

L

- L.O.: Local Oscillator. L.O. Frequency used by BUC and LNB.
- LAN: Local Area Network.
- LED: Light Emitting Diode.
- LGPL: Lesser General Public License.
- LHC: Left Hand Circular.
- LNB: Low Noise Block.

M

- MIB: Management Information Base.

N

- NID: Network IDentification.
- NMEA: National Marine Electronics Association (standard).

O

- OID: Object IDentifier.

P

- POST: Power On Self Test.

R

- RF: Radio Frequency.
- RFI: Radio Frequency Interference.
- ROSS: Roaming Oceanic Satellite Server.
- RSSI: Received Signal Strength Index.

S

- SNMP: Simple Network Management Protocol.
- SWM: Single Wire Multi-switch.

T

- TVRO: TeleVision Receive Only.

U

- UCLI: Unified Command Line Interface.

V

- VLAN: Virtual LAN.
- VSAT: Very Small Aperture Terminal.

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