COBHAM

SAILOR 900 VSAT High Power

Installation manual

SAILOR 900 VSAT High Power

Quick guide

Introduction

This quick guide aims at experienced service personnel who have installed the SAILOR 900 VSAT High Power system and connected power. It lists the minimum configuration tasks you have to make before the system. can be used on-air on a satellite.

Prerequisites

1. Connect a PC to the front LAN connector or the LAN3 connector at the rear of the Antenna Control Unit.
2. Open an Internet Browser and type the default IP address of the SAILOR 900 VSAT High Power: http://192.168.0.1 to access the web interface.

Configuration tasks (minimum)

Configuration task	What to do and where to find more information
Heading input	Configure the heading mode to **External** under **SETTINGS > Navigation**. For more information see Table 6-2 on page 6-4. Connect the ship's heading (RS-422, NMEA0183) to the NMEA 0183 multi-connector. Pin 8 Ship Ground/Shield (connect only one end), Pin 9 Line B +, and Pin 10 Line A-. For more information see *NMEA 0183 connector* on page 4-3.
Azimuth calibration	Make an azimuth calibration under **SERVICE > Calibration** to ensure that the SAILOR VSAT can point and receive satellite signal. For more information see *Azimuth calibration* on page 6-7.
TX cable calibration	Make a Tx cable calibration under **SERVICE > Calibration** to ensure that Tx power is calibrated at all frequencies. For more information see *Cable calibration* on page 6-11. See Appendix E or http://www.lyngsat.com for DVB-S transponder information.
Modem connection	Connect cables between the modem and the ACU. For more information see *VMU settings* on page C-1.
Modem profile	Configure the modem profile under **SETTINGS > Modem profiles**. For more information see *Modem profiles* on page 6-23
Network settings	Configure the network settings under **SETTINGS > Network** if the modem communicates with IP to the ACU. For more information see *To configure the LAN network* on page 6-30.
Satellite profile	Configure the satellite profile under **SETTINGS > Satellite profiles** and then activate the satellite profile and wait for the system to acquire the satellite and start tracking. For more information see *Satellite profiles* on page 6-26 and *Satellite profiles* on page 6-26.

You find a flow chart for the calibration procedure on page 6-14.

SAILOR 900 VSAT High Power

Installation manual

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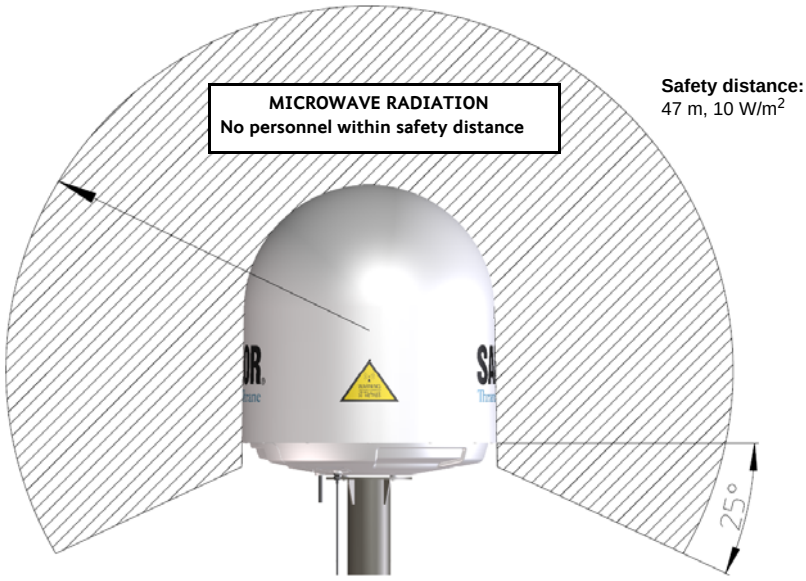
Safety summary

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

Microwave radiation hazards

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

The minimum safety distance to the Above Deck Unit reflector on the focal line is 47 m, based on a radiation level of 10 W/m^2. No hazard exists >25° below the Above Deck Unit's mounting plane. Refer to the drawing below.



Distance to other equipment

Do not move the Above Deck Unit closer to radars than the minimum safe distance specified in section *Interference* on page 3-12 — it may cause damage to the Above Deck Unit.

Compass Safe Distance:

SAILOR 900 VSAT High Power antenna or ADU (Above Deck Unit): min. 170 cm (IEC 60945).
SAILOR 900 VSAT High Power ACU (Antenna Control Unit): min. 10 cm (IEC 60945).

Service

User access to the interior of the ACU is prohibited. Only a technician authorized by Cobham SATCOM may perform service - failure to comply with this rule will void the warranty. Access to

the interior of the Above Deck Unit is allowed. Replacement of certain modules and general service may only be performed by a technician authorized by Cobham SATCOM.

Grounding, cables and connections
To minimize shock hazard and to protect against lightning, the equipment chassis and cabinet must be connected to an electrical ground. The ACU must be grounded to the ship. For further grounding information refer to the Installation manual.

Do not extend the cables beyond the lengths specified for the equipment. The cable between the ACU and Above Deck Unit can be extended if it complies with the specified data concerning cable losses etc.

Rx cables for the SAILOR 900 VSAT High Power 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
The voltage range for the SAILOR 900 VSAT High Power is 100 – 240 VAC. Note that the Above Deck Unit is powered by the ACU.

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!

CAUTION! Do not manually turn the Polarisation Unit of the antenna, it may cause damage to the antenna.

If needed to turn the Polarisation Unit manually, remove the connector (1) marked M of the Polarisation Motor Module (2).

VSAT restrictions

Note

There are restrictions in use of the frequency band 13.75 to 14 GHz in the following countries:

- Belgium
- Hungary
- Latvia
- Malta
- Slovakia

Contact the VSAT modem provider for local setups.

Record of Revisions

Rev.	Description	Release Date	Initials
A	Original document.	20 May 2016	UFO
A02	P. H-2 EU Declaration of Conformity added	19 July 2016	UFO

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About this manual

1.1 Intended readers

This is an installation manual for the SAILOR 900 VSAT High Power system, 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.

1.2 Manual overview

This manual has the following chapters:

- *Introduction*
- *Installation*
- *Interfaces*
- *Connecting power*
- *Configuration*
- *Installation check*
- *Service & maintenance*

This manual has the following appendices:

- *Technical specifications*
- *VMU cables*
- *VMU settings*
- *Command line interface*
- *DVB-S satellites*
- *Grounding and RF protection*
- *System messages*
- *Approvals*

1.3 Software version

This manual is intended for SAILOR 900 VSAT High Power with **software version 1.55**.

1.4 Typography

In this manual, typography is used as indicated below:

Bold is used for the following purposes:

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

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

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

1.5 Precautions

1.5.1 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.

1.5.2 General precautions

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

WARNING! Before using any material, refer to the manufacturers' material safety data sheets for safety information. Some materials can be dangerous.

CAUTION! Do not use materials that are not equivalent to materials specified by Thrane & Thrane. 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.

Introduction

This chapter is organised in the following sections:

- *SAILOR 900 VSAT High Power system*
- *Part numbers and options*

2.1 SAILOR 900 VSAT High Power system

The SAILOR 900 VSAT High Power is a unique stabilized maritime VSAT antenna system operating in the Ku-band (10.7 to 14.5 GHz). It provides bi-directional IP data connections both on regional satellite beams and quasi-global Ku-band satellite networks. The system only requires a single 50 Ohm cable to provide the Above Deck Unit with both DC power, data and control information. The radome does not have to be removed neither before nor after the installation. To protect the Above Deck Unit the built-in DC motors act as brakes during transport and when the Above Deck Unit is not powered. The ADU system can be accessed remotely and in-depth performance analysis can be done using the built-in web interface.

The SAILOR 900 VSAT High Power system consists of the following units:

- Above Deck Unit (ADU)
- Antenna Control Unit (ACU)

The following figure shows the SAILOR 900 VSAT High Power system.

Figure 2-1: Above Deck Unit and Antenna Control Unit (ACU)

SAILOR 900 VSAT High Power features

- Single 50 Ohm coax cable for the ADU.
- Support of several VSAT modems.

- 20W High Power BUC.
- Gyro-free operation.
- Dual antenna mode.
- SNMP support.
- Service communication using SAILOR FleetBroadband over WAN.
- Remote or local simultaneous software update of ADU and ACU via PC and Internet browser.
- Global RF configuration.
- Full remote control and troubleshooting with built-in test equipment (BITE).
- ACU with 4 x LAN, NMEA 0183, NMEA 2000, RS-232 and RS-422.
- All interfaces at the ACU, no additional units required.
- AC powered.
- No scheduled maintenance.

2.1.1 Above Deck Unit (ADU)

The SAILOR 900 VSAT High Power ADU is a cm stabilised tracking antenna, consisting of a suspended antenna with a standard global RF configuration. The ADU's weight is 126,5 kg. It is stabilized by heavy duty vibration dampers in 3-axis (plus skew) and can be used in environments with elevations of -25° to + 125°. The ADU is powered by the ACU and protected by a radome.

Figure 2-2: Above Deck Unit (ADU)

Modules in the SAILOR 900 VSAT High Power ADU

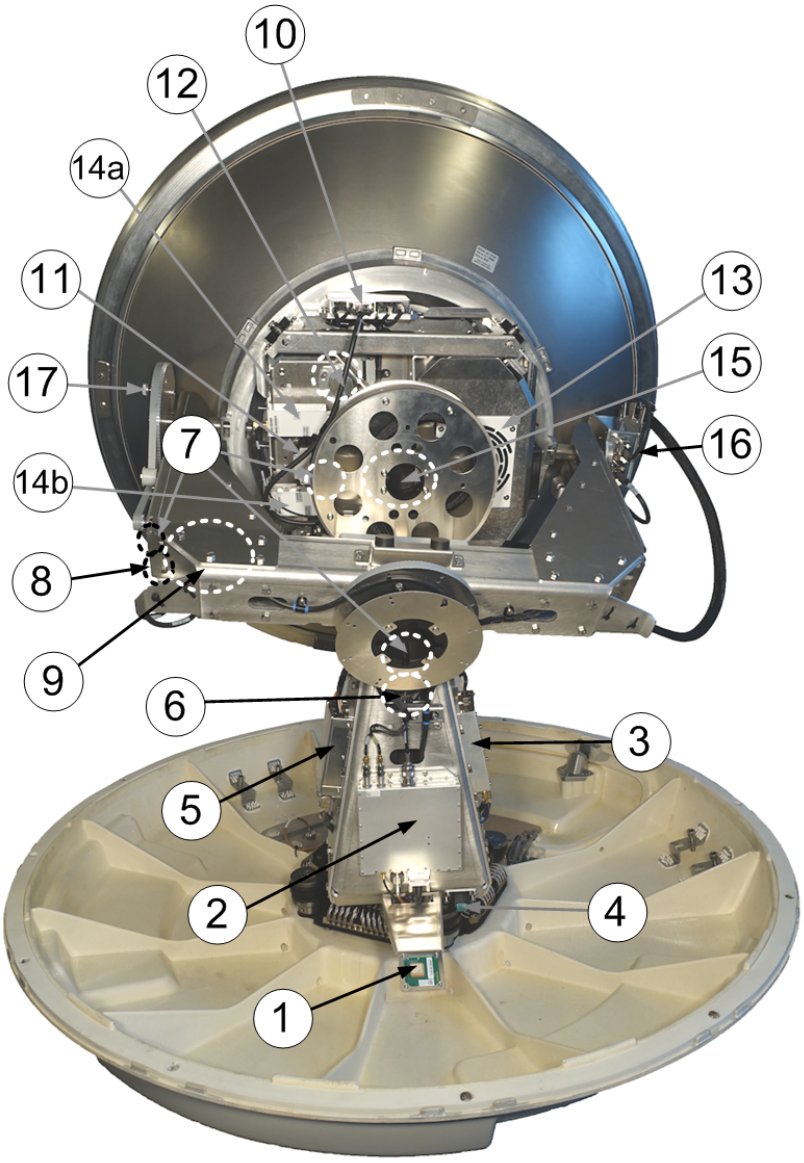


Figure 2-3: Above Deck Unit modules 1/2

1. GNSS module (GPS, GLONASS, BEIDOU).
2. VSAT Interface Module (VIM).
3. Pedestal Control Module (PCM).
4. Service switch.
5. DC-Motor Driver Module for cross elevation (DDM).
6. Cross elevation motor and encoder.
7. Zero Reference Module (x4) (ZRM) (not visible on photo). (3 on this figure)
8. DC-Motor Driver Module for elevation (on the bottom) (DDM).
9. Elevation motor and encoder (not visible).

10. Polarisation Motor Module (PMM).
11. Polarisation motor.
12. Polarisation encoder.
13. Block Up Converter (BUC).
14. Low Noise Block downconverter (x2),
15. Ortho Mode Transducer (OMT) (not visible on photo).
16. Inertial Sensor Module (ISM).
17. Elevation locking pin to lock the antenna dish in a fixed position.

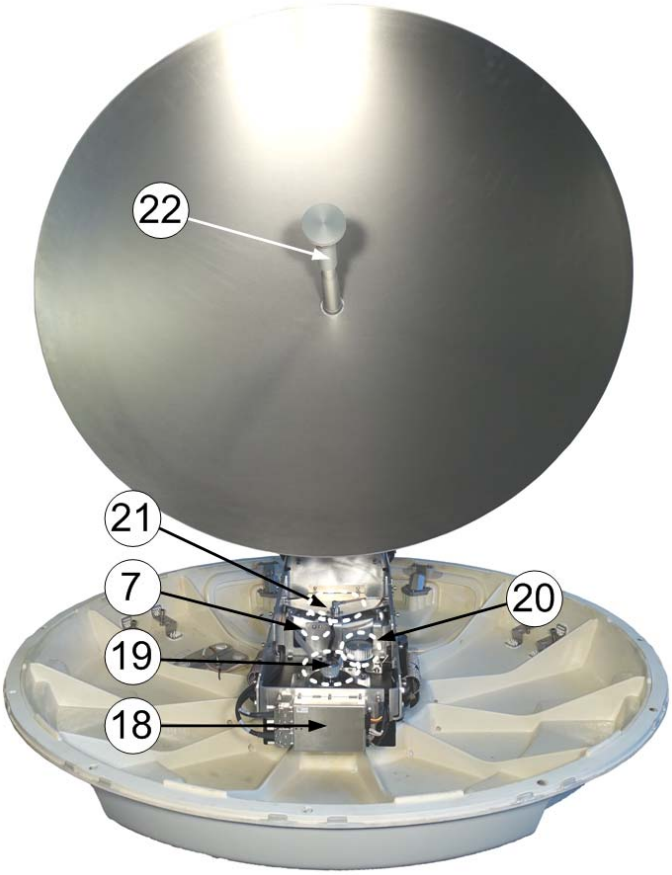


Figure 2-4: Above Deck Unit modules 2/2

18. DC-Motor Driver Module for Azimuth (DDM).
19. Azimuth motor.
20. Azimuth encoder.
21. Rotary joint.
22. Feed horn.

SAILOR 900 VSAT High Power ADU interface

All communication between the ADU and the ACU passes through a single standard 50 Ohm cable (with N connector) through the rotary joint. No cable work is required inside the radome.

Installation friendly

Four lifting brackets (included in the delivery) and reuse of packing material help getting the ADU safely into place. Satellite profile parameters are entered using the built-in web server of the ACU, using a PC.

Service friendly

The system configuration is saved in two modules, there is no loss of data at repair. The large service hatch of the radome gives easy access to the ADU on site. The service switch in the ADU stops the DC Motor Driver modules The service tools for replacing modules are placed on a tool holder inside the radome.

All modules have a service and power 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 with the ADU. Its built-in test equipment checks constantly the ADU's modules for proper functioning, it monitors and logs information for all modules. The ADU performs a POST (Power On Self Test) and you can request a self test (PAST, Person Activated Self Test) and Continuous Monitoring (CM). Error codes can be read out in the web interface and in the display of the ACU.

ADU software is updated automatically when making a software update of the ACU.

2.1.2 Antenna Control Unit (ACU)

The ACU is the central unit in the system. It contains all user interfaces and manages all communication between the ADU and the connected VMU, a connected PC and an optional FleetBroadband service communication line. The ACU has a display, status LEDs and a keypad. It provides a DHCP client. During configuration you can configure heading offset, save satellite and VMU setups and enter *No Transmit Zones* (blocking zones in which the ADU does not transmit).

The ACU provides DC power to the ADU through a single coaxial cable.

ACU interfaces

The ACU has the following interfaces and switch:

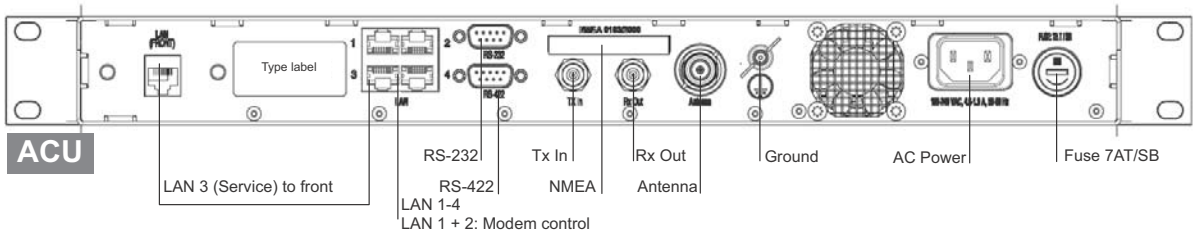


Figure 2-5: SAILOR 900 VSAT High Power ACU, connector overview

- N-connector for ADU cable (50 Ohm).
- 2 x F connectors for Rx and Tx cables (75 Ohm) to VSAT modem.
- Multi connector for NMEA interfaces (for input from GPS compass or Gyro compass).
- RS-422 interface for modem control.
- RS-232 interface for modem control.
- 4 x LAN ports for VSAT modem control and user equipment (i.e. for SAILOR FleetBroadband service communication line or WAN port for VSAT Internet).
- AC input.
- On/Off power switch

The ACU has additionally a LAN connector at the front for accessing the service port from the ACU front panel.

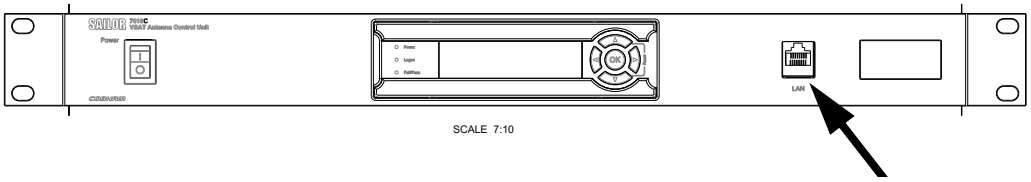


Figure 2-6: SAILOR 900 VSAT High Power ACU

Installation friendly

The ACU comes in a 19" rack version.

Service friendly

You can do remote diagnostics and service with the ACU. Its built-in test equipment checks constantly the device for proper functioning. It performs POST (Power On Self Test) and you can request a PAST (Person Activated Self Test). Continuous Monitoring (CM) is also available. BITE error codes can be read out in the web interface and in the display of the ACU.

Software update is done via a connected PC and the built-in web interface of the ACU.

2.1.3 VSAT Modem Unit (VMU)

SAILOR 900 VSAT High Power is designed to be operated with third-party VSAT modems. For a list of supported VSAT modems see the SAILOR 900 VSAT High Power data sheet at www.cobham.com/satcom.

2.1.4 Satellite type approvals

For a list of satellite type approvals see the SAILOR 900 VSAT High Power data sheet at www.cobham.com/satcom.

2.1.5 Service activation

Before you can start using the SAILOR 900 VSAT High Power, you need to activate the system for VSAT service. Contact your service provider for activation.

2.2 Part numbers and options

2.2.1 Applicable model and part numbers

The following model and part numbers are available for the SAILOR 900 VSAT High Power system:

Part number	Model number	Description
407009E-00500	7009E	SAILOR 900 VSAT HP Antenna
407016C-00500	7016C	SAILOR Antenna Control Unit

Table 2-1: Model and part numbers for the SAILOR 900 VSAT High Power system

2.2.2 Options for SAILOR 900 VSAT High Power

The following options are available for the SAILOR 900 VSAT High Power system:

Part number	Description
407090A-950	Antenna cable 50 m
407090A-925	Pigtail Cable 1.25 m, N-Conn, female/male
407090-010	Accessory kit for dual antenna mode

Table 2-2: Model and part numbers for options of the SAILOR 900 VSAT High Power system

Installation

This chapter is organised in the following sections:

- *Unpacking*
- *Site preparation*
- *Installation of the ADU*
- *Installation of the ACU*
- *Installation of the VMU*

3.1 Unpacking

3.1.1 What's in the box

ADU

Unpack your SAILOR 900 VSAT High Power ADU and check that the following items are present:

- ADU with 4 lifting brackets (already mounted)
- Package with bolts, washers and cable glands (2 sizes)

ACU

Unpack your SAILOR ACU VSAT KU a and check that the following items are present:

- 1 x Ethernet cable (2 m)
- 1 x Ethernet cable (short)
- Power cable (230 VAC)
- 2 x 75 Ohm coax cables F-F (1m), for Rx and Tx
- NMEA multi-connector
- Installation manual

3.1.2 Initial inspection

Inspect the shipping cartons and wooden box 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, i.e. removing the top and sides of the wooden box and opening the cartons, inspect it 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.

3.1.3 Tools needed

- Allen key (4 mm), included, mounted on a tool holder inside the radome.

Other tools that may be needed during the installation:

- Torx TX20 to open the service hatch
- Wrench to fasten the mounting bolts for the ADU
- Wrench to fasten the N connector at the ADU
- PC and Internet browser
- Crimping tools

3.1.4 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 lock the antenna dish with the elevation locking pin during transport.

Do not strap parts of the antenna.

These actions might cause damage to the antenna.

Damage due to actions listed above will void the warranty.

3.2 Site preparation

The following topics have to be considered when installing the ADU:

- *General site considerations*
- *Obstructions (ADU shadowing)*
- *Blocking zones – azimuth and elevation*
- *Safe access to the ADU: Radiation hazard*
- *Ship motion and offset from the ship's motion centre*
- *ADU mast design: Foundation and height*
- *Interference*
- *Other precautions*

3.2.1 General site considerations

For optimum system performance, some guidelines on where to install or mount the different components of the SAILOR 900 VSAT High Power System must be followed.

It is recommended to mount the ADU in a location with as much **360° free line of sight to the satellite** as possible while making sure that the support structure fulfills the requirements for the mast foundation. The ADU must be mounted 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 colour. Cobham SATCOM's recommendation is that the radome should NOT be painted because it may impact RF performance and may lead to over-heating, causing the antenna to go in safe mode (switch off).

However, painting the radome will not void the general warranty regarding material and workmanship etc. It is only the performance that cannot be guaranteed. Any paint used must be non-metallic based.

3.2.2 Obstructions (ADU shadowing)

Place the ADU so that it has as much free line-of-sight as possible without any structures in the beam through one full 360 degrees turn of the vessel. Do not place the ADU close to large objects that may block the signal. To avoid obstruction elevate the ADU by mounting it on a mast or on a mounting pedestal on a deck or deck house top.

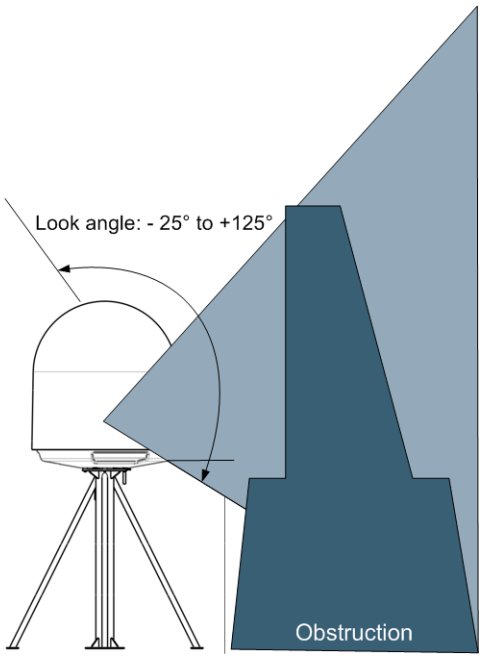


Figure 3-1: Signal degradation because of obstructing objects

The ADU is stabilized in 3-axis (plus skew) and can be used in environments with elevations of -25° to + 125° to allow for continuous pointing even in heavy sea conditions.

The ADU beam is approximately 1 m in diameter for the first 30 m from the ADU. Beyond 30 m the beam gradually widens so that it is approximately 5 m in diameter at 100 m distance. This beam expansion continues with increasing distance.

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

Note Note that due to the short wavelength at Ku band and the narrow beam width of the ADU even a **6 mm steel wire placed within 50 m** inside the beam can causes signal degradation.

3.2.3 Blocking zones – azimuth and elevation

Your installation may require that you set up blocking zones for the ADU, i.e. areas where the ADU will not transmit and areas where transmit power is potentially dangerous for persons frequently being in these zones. You can set up 8 blocking zones. Each blocking zone is set up with azimuth start and stop, and elevation angle.

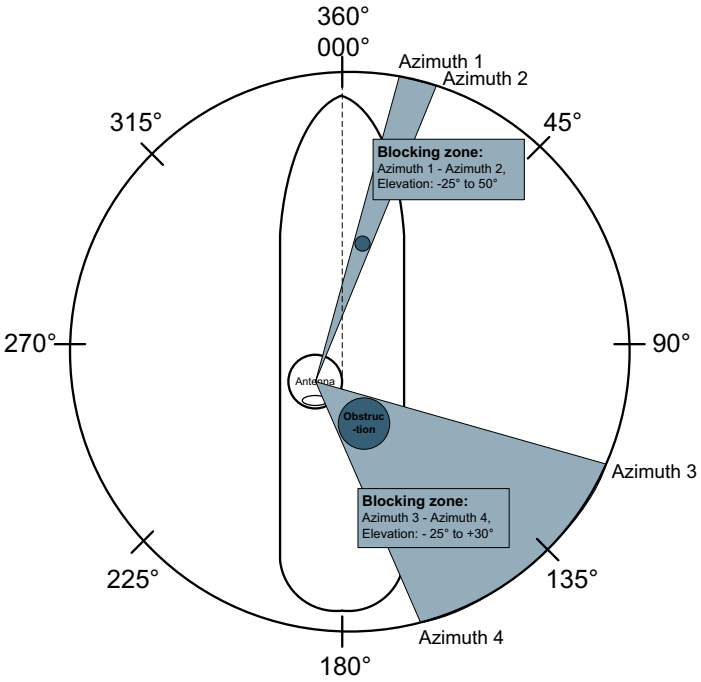


Figure 3-2: 2 blocking zones w, azimuth (example)

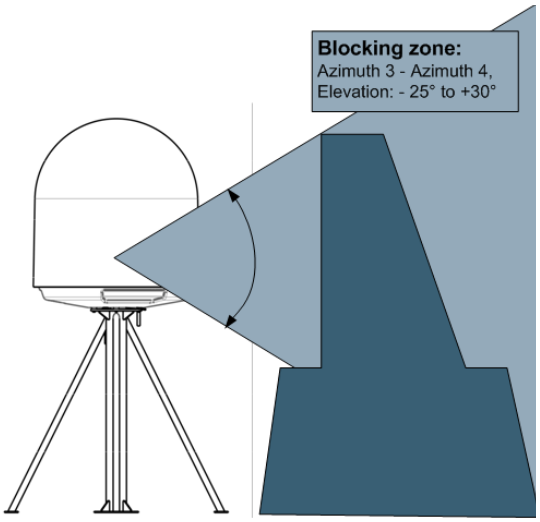


Figure 3-3: Blocking zone w, elevation angle (example)

The blocking zones are set up in the built-in web interface of the ACU. For further information see *To set up blocking zones (RX and TX)* on page 6-28.

3.2.4 Safe access to the ADU: Radiation hazard

The SAILOR 900 VSAT ADU radiates up to 54.3 dBW EIRP. This translates to a minimum safety distance of 47 m from the ADU while it is transmitting, based on a radiation level of 10 W/m^2.

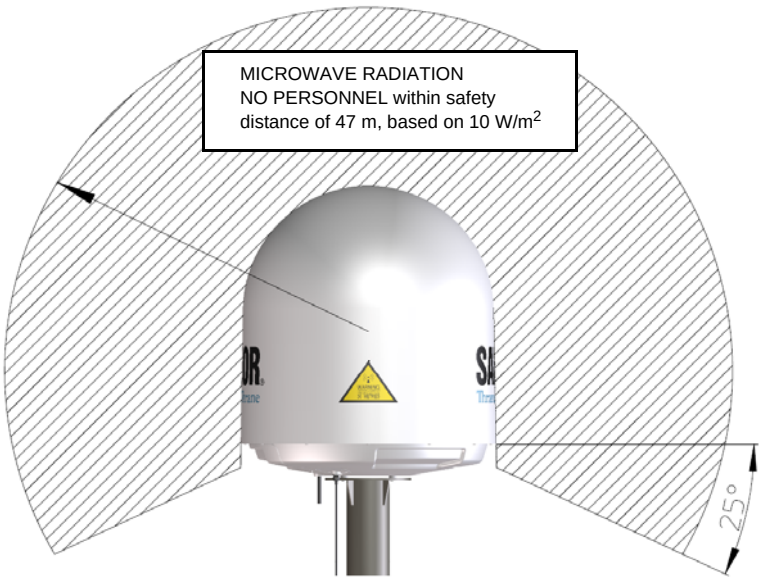


Figure 3-4: SAILOR 900: Radiation hazard, safety distance 47 m

3.2.5 Ship motion and offset from the ship's motion centre

Even though it is recommended to mount the ADU high, keep the distance between the ADU and the ship's motion centre as short as possible. 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 3-1. If the g force applied is too high, performance and ADU signal stabilization may be reduced and eventually the ADU may be damaged. Refer to the following table for allowed mounting heights above the ship's motion centre.

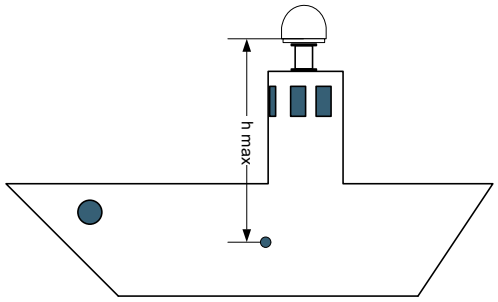


Figure 3-5: Maximum distance from the ship's motion centre (h max)

Min. roll period	Max. 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 3-1: Maximum distance from the ship's motion center versus ship's roll period

3.2.6 ADU mast design: Foundation and height

The ADU mast must be designed to carry the weight of the ADU unit, which is 126,5 kg (+ the weight of the mast flange). The mast must also be able to withstand on-board vibrations and wind speeds up to 110 knots on the radome, even in icing conditions.

ADU mast flange

Fit the top of the ADU mast with a flange with clearance holes matching the bushings in the radome and with minimum 4 gusset plates. No center hole is necessary in the flange.

- **Flange thickness**: Minimum 15 mm.
- **4 gusset plates**: Minimum 15 mm thick, must be placed close to the holes in the mounting plate and evenly distributed.

Recommended flatness on the mast mount plateau is below 3,0 mm.

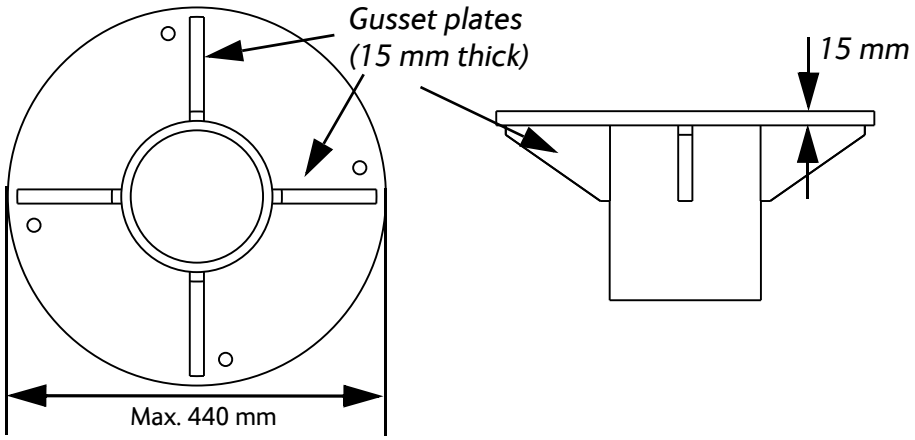


Figure 3-6: SAILOR 900: ADU mast flange, top and side view

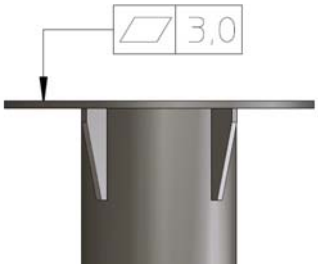


Figure 3-7: ADU mast flange, recommended flatness on the mast mount plateau

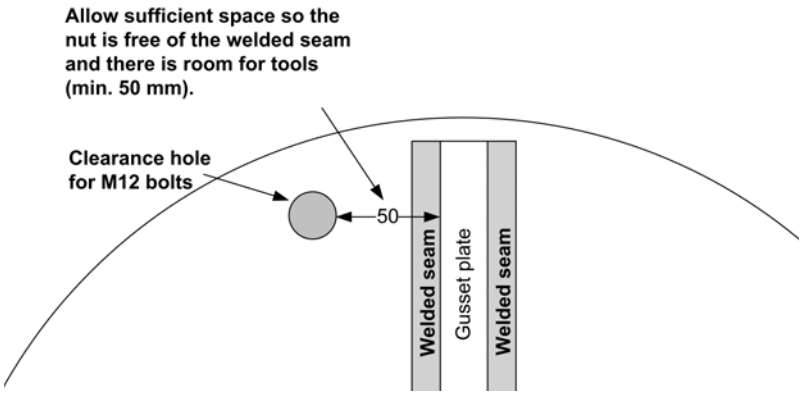


Figure 3-8: ADU mast flange, distance to the welded seam

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.

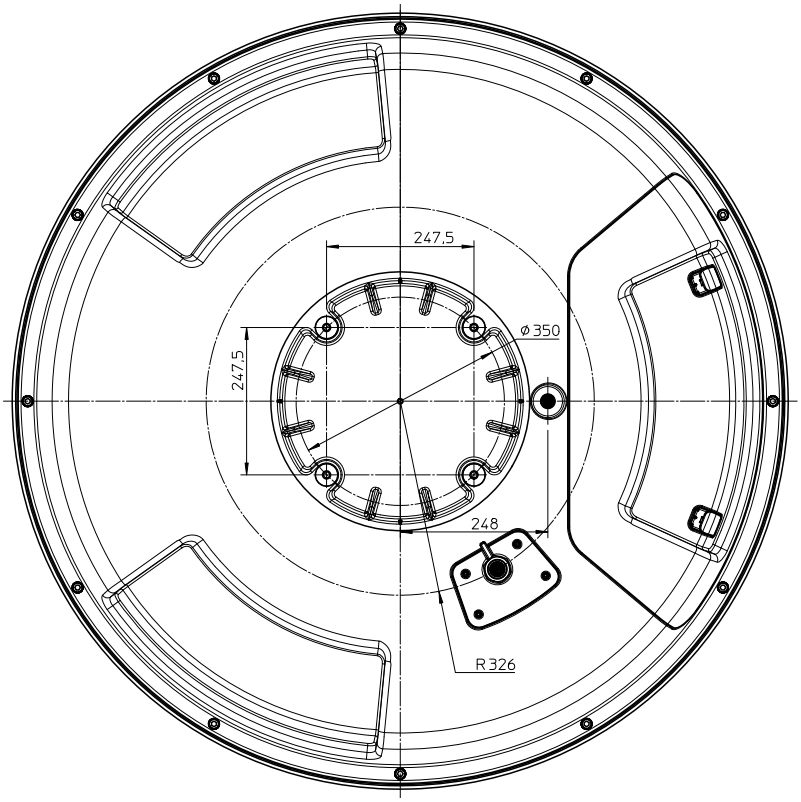


Figure 3-9: SAILOR 900: ADU, bottom view

Mast length and diameter

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 shall 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 stabilise the mast with bracing. Note that the design values given below depend on rigid ADU-ship interfaces. The cross-sectional properties and the corresponding maximum free length give a natural frequency close to 30 Hz. It is recommended to shorten the mast length as much as possible to obtain higher frequencies. Preferably, mount stays or wires to stabilize the mast further.

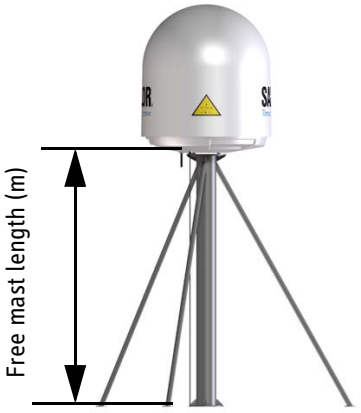


Figure 3-10: Free mast length and bracing for a tall mast

Note Make sure that there is free space below the drain tube. Read also *Condensation and water intrusion* on page 3-16.

The tables in the next sections give some suggested design values for the free mast length.

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

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

SAILOR 900 VSAT High Power ADU mast length

The below tables show the minimum dimensions for a SAILOR 900 VSAT High Power ADU mast with and without stays or wires. Note that the values are only guidelines - always consider the environment and characteristics of the ship before deciding on the mast dimensions.

Mast without braces	Max. free mast length (steel), (m)	Outer diameter (mm)	Wall thickness (mm)	Weight (kg/m)
	0.4[a]	200	5	24.0
	0.6	220	5	26.5
	0.8	250	5	30.2
	1	270	5	32.7

Table 3-2: Mast dimensions without braces

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

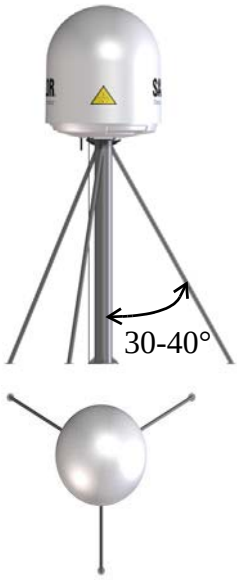
Mast with 3 braces	Max. free mast length (steel), (m)	Outer Diameter (mm)	Wall Thickness (mm)	Outer Diameter for brace (mm)	Thickness for brace (mm)
	1.2	140	10	50	5.0
	1.2	200	5	50	5.0
	1.6	140	10	70	5.0
	1.6	200	5	70	5.0
	2	160	10	70	5.0
	2	220	5	70	5.0
	2.5	180	10	80	5.0
	2.5	220	5	80	5.0

Table 3-3: Mast dimensions with 3 braces

Mast with 2 braces	Max. free mast length (steel), (m)	Outer Diameter (mm)	Wall Thickness (mm)	Outer Diameter for brace (mm)	Thickness for brace (mm)
	1.2	160	10	80	5.0
	1.2	200	5	80	5.0
	1.6	180	10	80	5.0
	1.6	220	5	80	5.0
	2	180	10	80	5.0
	2	240	5	80	5.0
	2.5	200	10	80	5.0
	2.5	260	5	80	5.0

Table 3-4: Mast dimensions with 2 braces

3.2.7 Interference

Note Do not place the ADU close to interfering signal sources or receivers. For allowed distances to other transmitters see Figure 3-12: *Recommended distance to transmitters (m) for frequencies below 1000 MHz* on page 3-15. We recommend testing the total system by operating all equipment simultaneously and verifying that there is no interference.

The ADU must be mounted as far away as possible from the ship's radar and high power radio transmitters, because they may compromise the ADU performance. RF emission from radars might actually damage the ADU. The SAILOR 900 VSAT High Power ADU itself may also interfere with other radio systems.

Radar

It is difficult to give exact guidelines for the minimum distance between a radar and the ADU because radar power, radiation pattern, frequency and pulse length/shape vary from radar to radar. Further, the ADU is typically placed in the near field of the radar ADU and reflections from masts, decks and other items in the vicinity of the radar are different from ship to ship.

However, 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 between radar antenna and the SAILOR 900 VSAT High Power ADU. Therefore it is recommended to ensure as much vertical separation as possible when the SAILOR 900 VSAT High Power ADU has to be placed close to a radar antenna.

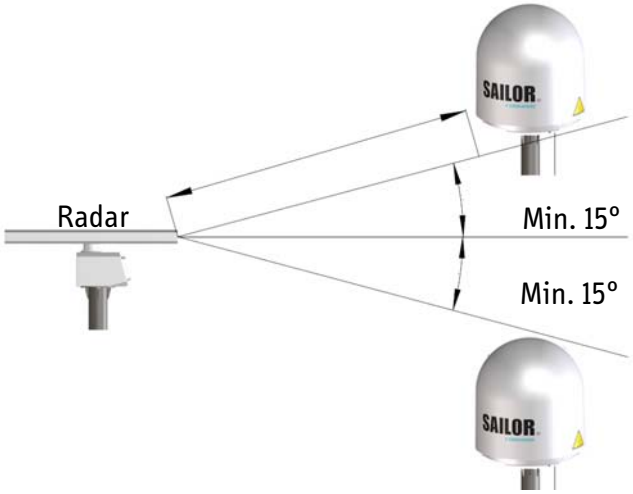


Figure 3-11: Interference with the vessel's radar

Radar distance

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.

"d min." is defined as the shortest distance between the radar antenna (in any position) and the surface of the SAILOR 900 VSAT High Power ADU.

X-band (~ 3 cm / 10 GHz) damage distance		
Radar power	SAILOR 900 VSAT High Power 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 3-5: Minimum radar separation, X-band

S-band (~ 10 cm / 3 GHz) damage distance		
Radar power	SAILOR 900 VSAT High Power 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 3-6: Minimum radar separation, S-band

The separation distance for C-band (4-8 GHz) radars should generally be the same as for S-band radars.

Radar interference

Even at distances greater than "d min." in the previous section the radar might still be able to degrade the performance of the SAILOR 900 VSAT High Power 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 favourable, this limited degradation is without importance. 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 experimentally before the installation is finalized.

CAUTION! The ADU must never be installed 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.

GPS receivers

Good quality GPS receivers will work properly very close to the ADU - typically down to one meter outside the main beam.

Other transmitters

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

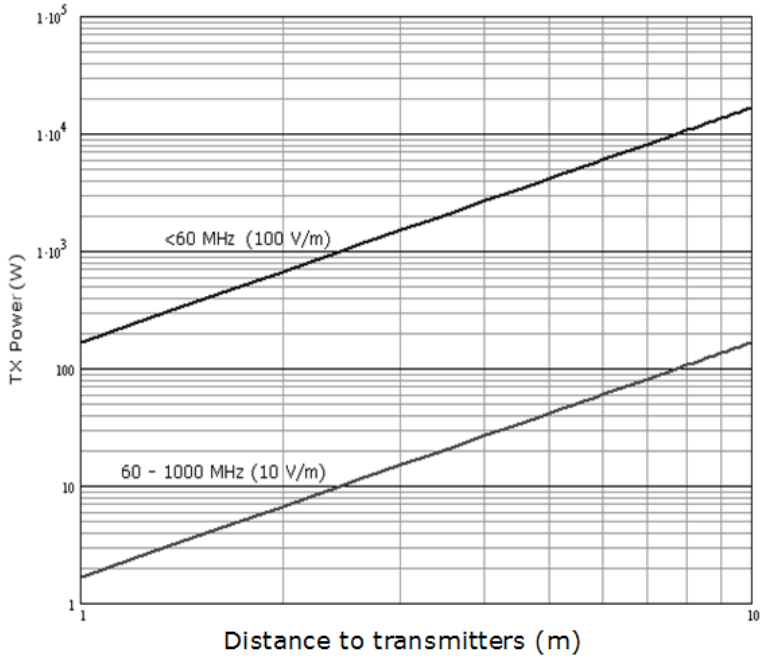


Figure 3-12: Recommended distance to transmitters (m) for frequencies below 1000 MHz

3.2.8 Other precautions

Condensation and water intrusion

If possible, install the radome such that direct spray of seawater is avoided. In some weather conditions there may occur condensation inside the radome. The drain tube is designed to lead any water away from inside the radome. Make sure the ADU's drain tube is open and that there it free space between the drain tube and the mounting surface so water can escape and there is ventilation for the ADU.

It is recommended not to use pneumatic tools for cleaning the radome, especially at a short distance and directly at the split between top and bottom.

Figure 3-13: SAILOR 900: Drain pipe with free space

Deposits

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

3.3 Installation of the ADU

The ADU is shipped fully assembled. You have to 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 ADU's weight 126,5 kg.

WARNING! The ADU may be subject to swaying motions in windy conditions. Always use tag lines to stabilise the ADU during hoisting.

Figure 3-14: Use of strong sling with a belt and tag lines for safe hoisting

Before installing the ADU read the following guidelines.

3.3.1 To install the ADU

Make sure that there is sufficient space underneath the ADU to open the service hatch. Through this hatch you access the ADU modules for service and maintenance.

Figure 3-15: Free space for access to the service hatch

The ADU does not have to be aligned with the bow-to-stern line of the ship. When configuring the SAILOR 900 VSAT High Power you make an azimuth calibration to obtain the correct azimuth of the ADU.

- It is important to maintain **vertical orientation of the ADU center line**.
- Consider the aspect of interference, read more about this in *Interference* on page 3-12.
- Install the ADU where **vibrations are limited to a minimum**.
- Always use **all 4 bolts** when installing the ADU.

To install the ADU, do as follows:

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

Figure 3-16: ADU installation, webbed sling attached to the 4 lifting brackets

5. Attach 2 tag lines of suitable length to 2 lifting brackets and man them.
6. With a crane lift the ADU off the wooden platform and move it on top of the ADU mast.
7. Install the ADU on the mast flange with 4 M12 bolts and washers. Read carefully and follow instructions given in *To ground the ADU* on page F-2.
   Tightening torque value: 30 Nm.
8. Remove the 4 lifting brackets. For safekeeping fasten the lifting brackets inside the bottom of the radome.

Figure 3-17: Mounting the ADU on the mast flange

Put the coaxial ADU cable through the protection plate as shown in the following figure and select a suitable size for the cable gland: 16—20 mm diameter or 19–23 mm

diameter. See also *N-connector interface on the ADU* on page A-7 for a more detailed drawing how to connect the N-connector on the ADU.

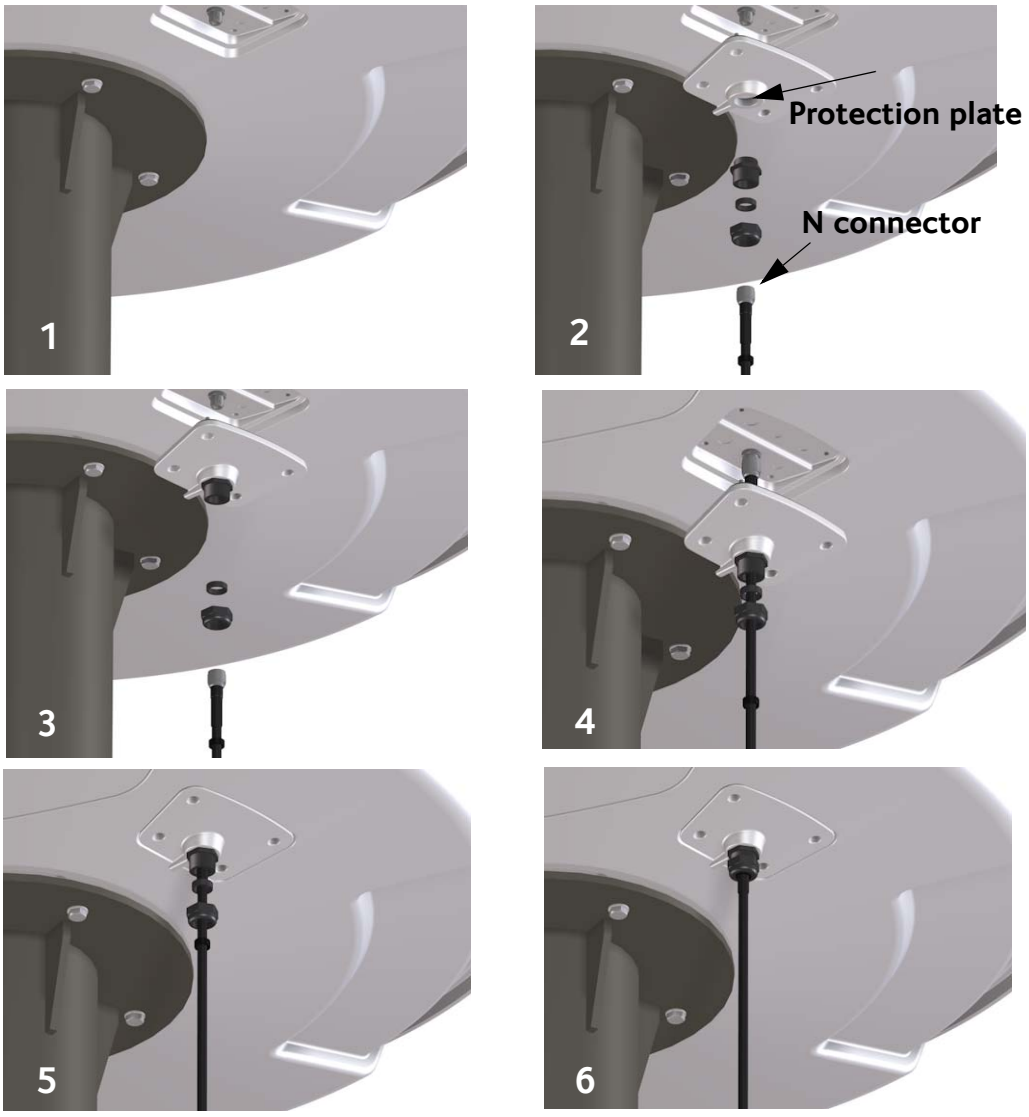


Figure 3-18: SAILOR 900: Connecting the ADU cable

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

9. Put the protection plate in place and fasten the 4 bolts (picture 5).
10. Fasten the nut.

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

Maximum allowed RF loss in the ADU cable

Maximum allowed cable loss is ≤ 20 dB at 1700 MHz. This is to ensure optimum performance of the system.

3.3.2 To open and remove the service hatch

Open the hatch to access the antenna modules. The two latches of the service hatch must be locked by fastening the two screws in the latches with a Torx TX20 screw driver to protect the ADU modules against unauthorised access.

You can remove the hatch for better mobility when servicing the antenna. Do as follows to open and remove the service hatch:

1. With a Torx TX20 screw driver, remove the two screws locking the latches.
2. Pull open the two latches and let the lid fall open.

Figure 3-19: Opening the service hatch

3. Remove the 2 split pins and park them.

Figure 3-20: Removing the 2 split pins

4. Pull the service hatch free.

3.3.3 To ground the ADU

The ADU must be grounded using the mounting bolts. If the ADU cannot or should not be electrically connected directly to the mounting surface, you can use a separate grounding cable to make the connection between the ADU and the common ground to which the ACU is also connected. If grounding to the ship ground is impossible, for example if you have a fibre glass hull, see *Alternative grounding for fibre glass hulls* on page F-6.

To obtain a good ground connection, the metal underneath the head of **at least** one bolt must be clean of insulating protective coating and a serrated washer should be used. After tightening the bolts we recommend that you seal the area suitably in order to avoid corrosion of the grounding point. Use stainless steel bolts and washers.

Optimum grounding is achieved by connecting the ground wire to the bolt marked in the figure below.

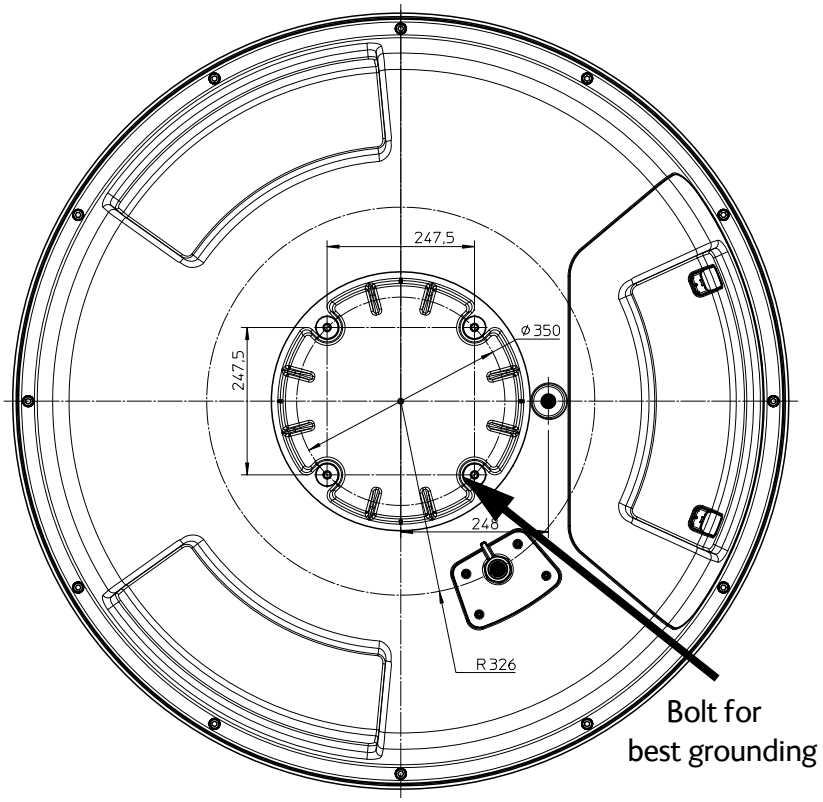


Figure 3-21: ADU, bolt for optimum grounding

For further information on grounding and RF protection see *Grounding and RF protection* on page F-1.

3.3.4 Alternative ADU cable

The allowed RF loss in the antenna cable is determined by the attenuators of the PSM and VIM modules. The electronic design guarantees that minimum 20 dB RF loss @ 1700 MHz in the antenna cable will work, but typically an RF loss of about 25 dB will be within the limits of the cable calibration. You can verify the cable attenuation margin with the cable calibration. See *Cable calibration* on page 6-11 for more details.

The DC-resistance loop of the antenna cable must be maximum 0.7 Ohm at 55˚C. This is to ensure the power requirements from ACU to the antenna and to ensure the performance of the system. Preferably choose one of the cable types listed in the table below.

Cable Type	Absolute maximum length (m)	Absolute maximum length (ft)
RG223-D	25 m	82 ft
RG214/U	50 m	164 ft
S 07272B-05	70 m	230 ft
LMR-600-50	105 m	344 ft
LDF4.5-50 Andrew	290 m	951 ft

Table 3-7: ADU cable types and maximum lengths

Check the data sheet from the cable supplier that both the RF- attenuation and the DC-resistance are kept within the maximum specified values:

- ADU cable RF-attenuation at 4450 MHz: max. 35 dB including connector.
- ADU cable modem-attenuation at 10 MHz: Max. 2 dB
  ADU cable modem-attenuation at 36 and 54 MHz: Max. 4 dB
- ADU cable loop DC-resistance max: 0.7 Ohm.

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

3.4 Installation of the ACU

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

3.4.1 To install the ACU

A cable relief bracket is already mounted when receiving the ACU. The cable relief is a simple system to secure cables with cable strips. It offers a number of holders to which you can secure the cables from the ACU. To install the 19" rack version of the ACU, do as follows:

1. Slide the ACU into a 1U space in a 19" rack.
2. Make sure that the air intakes on the side of the unit are not blocked.
3. Mount the screws in each side through the holes in the front and fasten the screws to the rack. Make sure that the unit is mounted securely according to the requirements for your 19" rack.
4. Connect all cables. See *Interfaces of the SAILOR 900 VSAT High Power ACU* on page 4-1 for a description of the ACU connectors.

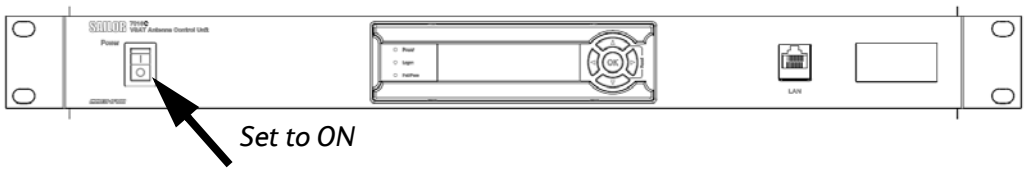


Figure 3-22: ACU, On/off switch

5. Set the On/Off switch at the front panel to On.

For a description of the connectors see *Connector panel — overview* on page 4-1. TheACU has additionally a LAN connector at the front for accessing the service port from the ACU front panel.

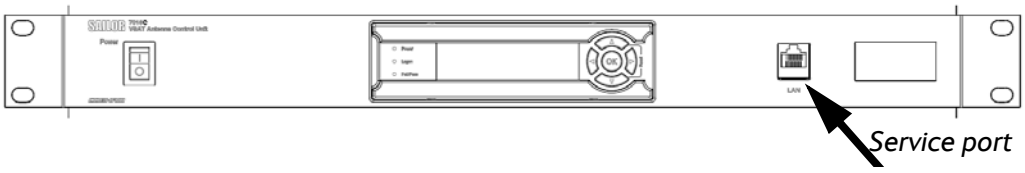


Figure 3-23: ACU, LAN connector at the front: Service port

3.4.2 To ground the ACU

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

ADU cable

The ADU is connected to the ACU with the ADU cable (coax cable) with an N connector at both ends. For information on ADU grounding, see *To ground the ADU* on page 3-22.

At the ACU end, it is strongly recommended to ground the ADU cable. Use a short cable from the ACU to a grounding point in the rack and connect the short cable to the ADU cable at this grounding point, making sure the shield of the connector is properly connected to the rack.

Ground stud at the ACU

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

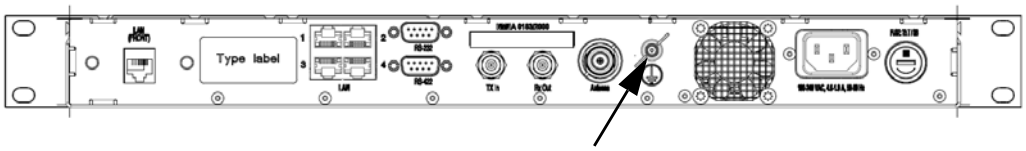


Figure 3-24: ACU, ground stud

3.5 Installation of the VMU

For a list of supported VSAT modems see the SAILOR 900 VSAT High Power data sheet or Figure 6-17: *Web interface: SETTINGS, Modem profile – supported modems*.

3.5.1 General mounting considerations — VMU

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

Connectors and pin-out of the VMU

For connectors and pin-out see the user documentation of the VMU and *Interfaces of the VMU* on page 4-5.

Wiring Power

Provide power to the VMU, see the user documentation of the unit.

3.6 To install the dual-antenna mode (optional)

You can use the SAILOR 900 VSAT High Power in dual antenna mode with 2 ADUs, 2 ACUs and the dual-antenna accessories kit. The kit consists of two 75 Ohm RF cables, an RF splitter and an RF combiner. In case one antenna enters a blocking zone, the other antenna of the dual-antenna system takes over and the system continues working.

There is a Master ACU and a Slave ACU. The VSAT modem is connected to and configured in the Master ACU. The Slave ACU is configured as a slave unit. It is connected with an Ethernet cable to the Master ACU from which it gets all satellite information. You can use any LAN port as long as the Master and the Slave are in the same subnet.

For remote access connect Master LAN 2 to Slave LAN 2. This leaves LAN 1 on the Master for the VSAT modem control and LAN 1 on the Slave free. An alternative is to connect the VSAT Modem, Master LAN 1, and Slave LAN 1 via an external switch.

The switching from one antenna to the other is done based on the programmed blocking zones in the two antennas and takes effect whenever signal blockages occur from cranes etc.

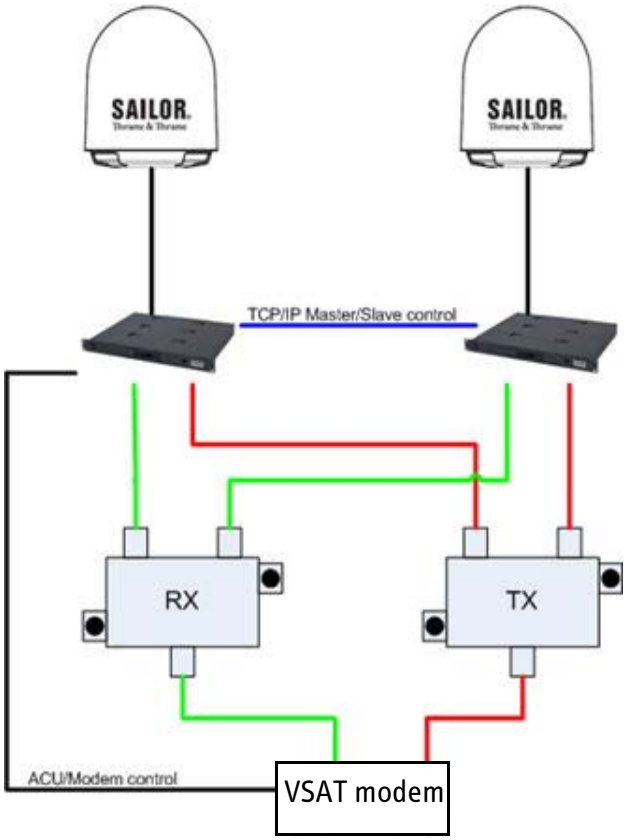


Figure 3-25: Dual mode antenna, overview

To install the dual antennas, do as follows:

1. Install the master ADU, ACU, the RX combiner and the VSAT modem as shown in figure 3-25.
2. Install the slave ADU, ACU, the TX splitter as shown below.

3. Provide vessel heading input to the master ACU and slave ACU, see *NMEA 0183 connector* on page 4-3.
4. Connect the cables as shown below and in the table below.

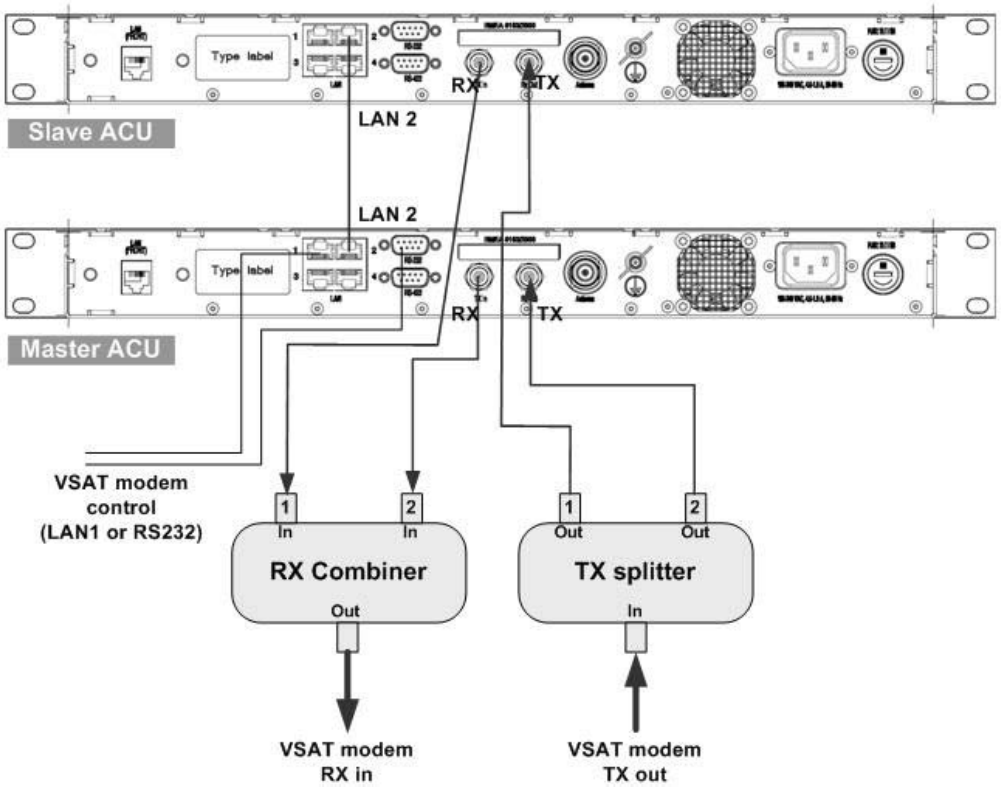


Figure 3-26: Dual mode antenna, connecting cables (example)

Connect cables	Purpose
Master ACU LAN to Slave ACU LAN	Master/Slave control
Master ACU LAN port 1 or RS 232 to VSAT modem control	VSAT modem control
Master ACU Rx Out to the Rx combiner input 1	Rx when Master active
Slave ACU Rx Out to the Rx combiner input 2	Rx when Slave active
Rx combiner output to VSAT modem Rx	Rx to VSAT modem
Master ACU Tx In to the Tx splitter output 1	Enabled when Master active
Slave ACU Tx In to the Tx splitter output 2	Enabled when Slave active
Tx splitter input to VSAT modem Tx	Tx from VSAT modem

Table 3-8: Dual mode antenna, cabling

Interfaces

This chapter is organised in the following sections:

- *Interfaces of the SAILOR 900 VSAT High Power ACU*
- *Interfaces of the VMU*

4.1 Interfaces of the SAILOR 900 VSAT High Power ACU

4.1.1 LEDs, display and keypad

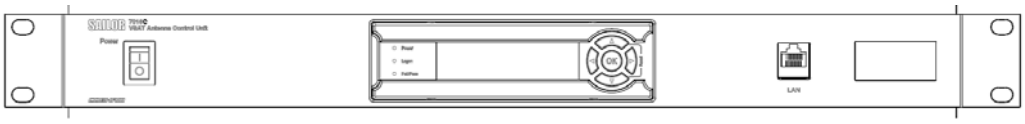


Figure 4-1: ACU — LEDs, display and keypad

Figure 4-2: ACU: LEDs, display and keypad (detailed)

Connector panel — overview

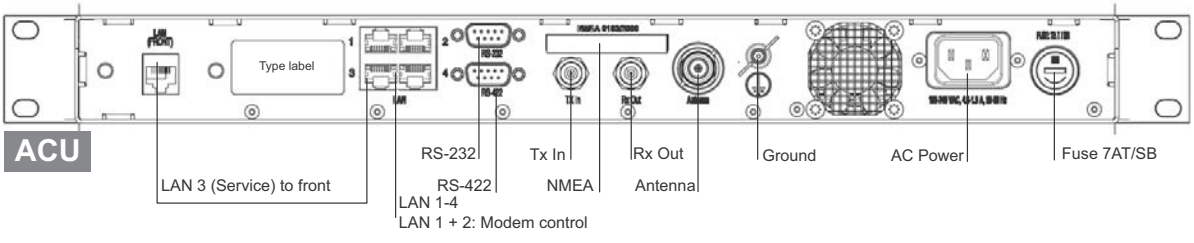


Figure 4-3: ACU, connector panel overview

The connector LAN on the front panel is typically connected to the service port at LAN3 at the rear panel with a straight Ethernet cable. Then you can access the service port from the front of the ACU.

4.1.2 ADU connector

There is just one cable from the ACU to the ADU. This is used to power the ADU, supply 10 MHz clock, handle all communication between ACU and ADU, and deliver the VSAT Rx and Tx signals.

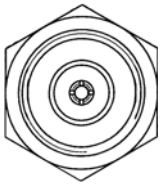
Outline (on the ACU)	Conductor	Pin function
	Inner	DC to ADU 10 MHz clock to ADU ACU to ADU internal communication VSAT Rx/Tx
	Outer	GND (Shield)

Table 4-1: 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.

4.1.3 Rx/Tx connectors for VMU

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

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

Table 4-2: F connector, Rx and Tx, outline and pin assignment

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

4.1.4 NMEA 0183 connector

Connect the ship's gyro to this connector.

Outline (on the ACU)	Pin	Pin function	Wire color
	1	Not connected	–
	2	NET-H (NMEA 2000)	White
	3	NET-L (NMEA 2000)	Blue
	4	NET-S (NMEA 2000)	Red
	5	NET-C (NMEA 2000)	Black
	6	Not connected	–
	7	Not connected / RS-232 RX NMEA 0183	–
	8	RS-232 GND RS-422 shield, connect only one end.	
	9	RS-422 Line B (+) NMEA 0183	
	10	RS-422 Line A (-) NMEA 0183	
	11	Not connected	–

Table 4-3: NMEA 0183/2000 connector, outline and pin assignment

(Hardware prepared for NMEA 2000, for future use)
NMEA 2000 power: 9-16 VDC. NMEA 2000 LEN (Load Equivalency Number): 2 (100mA)

NMEA 0183

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

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

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

Supported NMEA string:

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

Recommended NMEA 0183 cable:

Two-wire constructed with one enclosed shield

Network signal pair:

- Size: No. 24 AWG (0.24 sq. mm) or heavier
- Characteristic impedance: 95 - 140 Ohm
- Propagation delay: 5 nanoseconds per meter, maximum
- 15 Twists (minimum) per meter

4.1.5 RS-232 and RS-422 connectors

Use these connectors to connect the ACU to the VSAT modems with serial interfaces. See *Interfaces of the VMU* on page 4-5 for further details about the RS-232 or RS-422 connector.

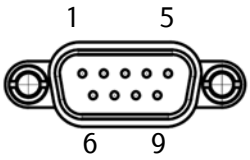
Outline (on the ACU)	Pin	Pin function
	1	Not connected
	2	RXD
	3	TXD
	4	DTR
	5	Ground
	6	DSR
	7	RTS
	8	CTS
	9	Receive Signal Strength Indicator

Table 4-4: RS-232 connector, male, outline and pin assignment

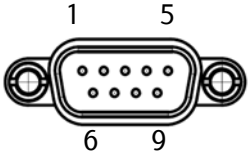
Outline (on the ACU)	Pin	Pin function
	1	Ground
	2	Line A RXD (+)
	3	Line B TXD (+)
	4	Ground
	5	Ground
	6	Not connected
	7	Line A RXD (-)
	8	Line B TXD (-)
	9	Not connected

Table 4-5: RS-422 connector, male, outline and pin assignment

4.1.6 LAN1, LAN2, LAN3 and LAN4 connectors

Four Ethernet connectors (type RJ45) for PC/lap tops, routers, wireless access points. The maximum cable length per connection is 100 m. Depending on the VMU connected, a LAN connector may be used for modem control.

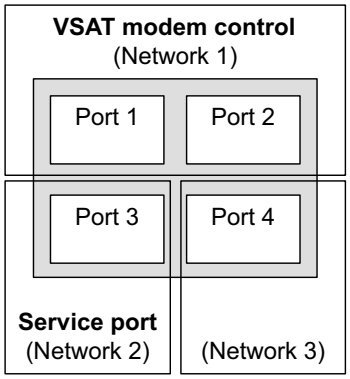


Figure 4-4: LAN connectors

Cable type: CAT5, shielded.
For information how to configure the LAN network see *To configure the LAN network* on page 6-30.

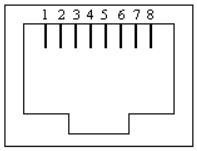
Outline	Pin	Pin function	Wire color
	1	Tx+	White/orange
	2	Tx-	Orange
	3	Rx+	White/green
	4	Not connected	Blue
	5	Not connected	White/blue
	6	Rx-	Green
	7	Not connected	White/brown
	8	Not connected	Brown

Table 4-6: Ethernet connector, outline and pin assignment

4.2 Interfaces of the VMU

For interfaces of the VMU and how to connect a VMU correctly to the ACU the user documentation of the VMU. For step-by-step guidelines how to set up the VSAT modem see Appendix C, *VMU settings*.

Connecting power

This chapter is organised in the following section:

- *Power up*

5.1 Power up

5.1.1 Procedure

1. Connect power to the VMU.
2. Switch on the ACU. The unit starts up and goes through an initialization procedure:
   - ACU POST
   - ADU Initializing
   - ADU POST
   - READY

   This may take some time (up to a couple of minutes).
3. The SAILOR 900 VSAT High Power is ready to be calibrated (for first time power up) or receive data from the VSAT modem (when in normal operation). The ACU display shows the following message:
   The LEDs **Power** and **Fail/Pass** are **steady green**, the is off. For further information on status indicators see *Status signalling with LEDs and status messages* on page 8-9.
   Make sure there are no hardware failures or error codes present, check the display of the ACU for events. For more information on error codes and events see *Troubleshooting* on page 8-78 and *System messages* on page G-1.
4. Continue to get the SAILOR 900 VSAT High Power system operational, do the following:
   - Make an azimuth calibration.
   - Create one or more satellite profiles.

For step-by-step instructions, see *Introduction to the built-in web interface* on page 6-1.
For installation check lists see, *Installation check* on page 7-1.

5.1.2 Initialisation steps in daily use

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

- ACU POST
- ADU Initializing
- ADU SW upload (If the software versions in the ADU and ACU are not the same, a software update is done during startup.)
- ADU POST
- READY

- POINTING ANTENNA
- ACQUIRING SIGNAL
- TRACKING

5.1.3 SAILOR 900 VSAT High Power operational

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

Configuration

This chapter is organised in the following sections:

- *Introduction to the built-in web interface*
- *Calibration*
- *Configuration with the web interface*
- *Keypad and menus of the ACU*
- *SNMP support*

6.1 Introduction to the built-in web interface

6.1.1 Overview

Use the built-in web interface (installation of software is not necessary) of the SAILOR 900 VSAT High Power ACU to make a full configuration of the SAILOR 900 VSAT High Power with the correct VMU, the satellite positions you intend to use and other parameters. You can use a standard Internet browser.

For quick start instructions see *Calibration* on page 6-3.

Important

The SAILOR 900 VSAT High Power 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 900 VSAT High Power are exposed to the Internet you must change the default passwords as anyone with access and malicious intent can render the SAILOR 900 VSAT High Power inoperable.

6.1.2 Connecting to the web interface

To connect to the web interface of the ACU do as follows:

1. Power up the SAILOR 900 VSAT High Power system, i.e. switch on the ACU. Wait until the LEDs on the front plate of the ACU show that the system is ready to be configured.
   - Power LED: Green
   - Logon LED: Off
   - Fail/Pass LED: Flashing green, during power-on self test, after that steady green.

Connect a PC to LAN interface 3 (Service port, standard Ethernet) at the rear panel of the ACU or to the front LAN connector of the ACU.

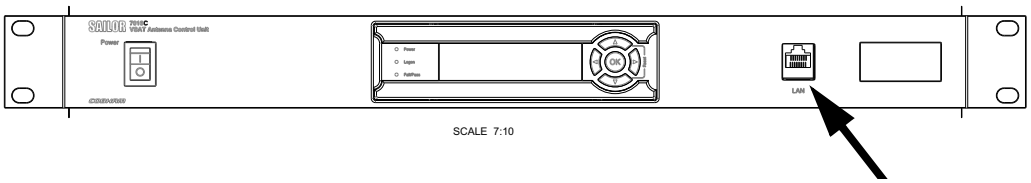


Figure 6-1: SAILOR 900 VSAT High Power ACU

2. Open your Internet browser and enter the IP address of the ACU. The default IP address is **http://192.168.0.1**.
3. The web interface shows the **DASHBOARD** page.

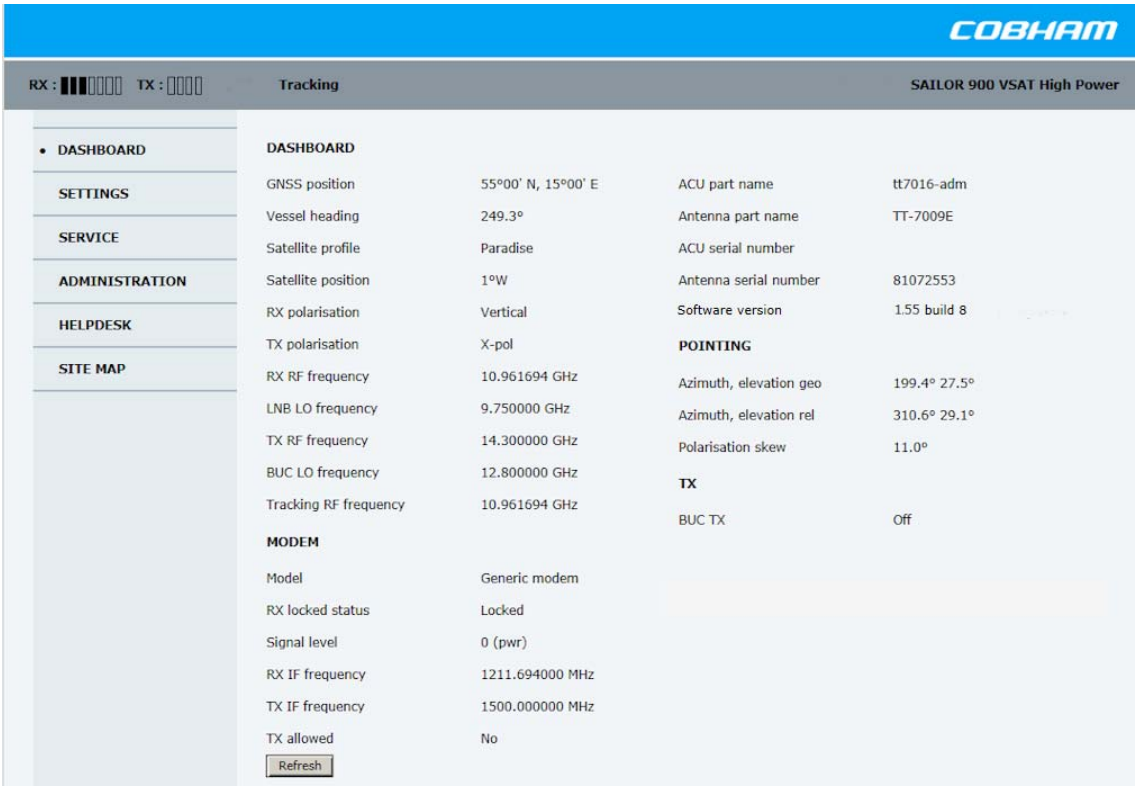


Figure 6-2: Dashboard

When the Dashboard is displayed you have verified that the connection to the SAILOR 900 VSAT High Power can be established. The web interface is ready for use. You can continue to configure the system.

If you cannot establish a connection there might be problems with the Proxy server settings of your PC. See *Proxy server settings in your browser* on page 6-20 for further information. For a detailed introduction to the web interface see *Overview and dashboard* on page 6-18. If you want to use another LAN port you must configure it according to your network requirements. For information how to configure the LAN connectors see *To configure the LAN network* on page 6-30.

For a detailed introduction to the web interface see *Overview and dashboard* on page 6-18.

6.2 Calibration

Before the SAILOR 900 VSAT High Power can be used you must select a heading input setting in order to make an azimuth and cable calibration. The azimuth calibration is required in order to determine the offset of the ADU zero direction to the bow-to-stern line of the ship. This procedure is fully automatic. The satellite data for calibration can be entered directly on the calibration page or you can define a Service profile to be used for the azimuth calibration. A cable calibration is required in order to record the cable characteristics of the antenna cable which is used in the SAILOR 900 VSAT High Power fixed gain feature. See *Fixed TX gain principle* on page 6-17 for more information. After the calibration you create the satellite and VSAT modem profiles you want to use during normal operation, and you can set up blocking zones for the specific installation.

Important You must log on as an administrator to do a calibration. See *Administration* on page 6-41.

The following sections describe the steps for a successful calibration:

- *Heading mode and position mode*
- *Azimuth calibration*
- *To set up a service profile for calibration*
- *Cable calibration*
- *Operation in gyro-free mode*
- *Flow chart for calibration (user controlled)*
- *To make a line up procedure*
- *Fixed TX gain principle*

6.2.1 Heading mode and position mode

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

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

1. Go to the page **SETTINGS > Navigation**.

2. Select the desired heading input.

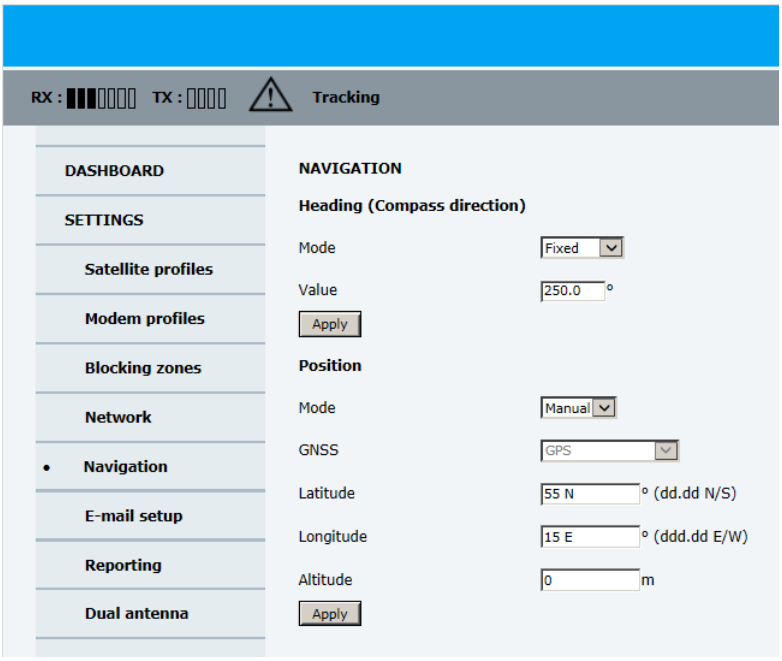


Figure 6-3: Web interface: SETTINGS, Navigation (Heading and Position) (example)

Heading mode	Description
External	Heading input from the vessel's gyro compass (default). If there is no heading input due to failure, alarms are raised and the antenna continues in gyro-free mode. When heading input is available again and a new acquisition is made, alarms are cleared. See also *Operation in gyro-free mode* on page 6-12.
Fixed	Use this setting for making 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 **Important: Fixed heading is not allowed for sailing vessels!**
None	**Important: You must make an azimuth and cable calibration with Fixed before you can use this setting. This is required in order to be able to use blocking zones. After a successful azimuth and cable calibration you must change the heading input setting from Fixed to None.** Select this setting after a successful azimuth calibration with Fixed heading if the system does not have input from the vessel's gyro compass. See also *Operation in gyro-free mode* on page 6-12.

Table 6-1: Heading mode options

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

Position mode	Description
Mode	Select one of the following: • GNSS (default) • Manual
GNSS[a]	Select one of the following: • GPS (default) • BEIDOU • GPS + BEIDOU • GLONASS • GPS + GLONASS
Latitude, Longitude, Altitude	Enter the values if you have set the **Position Mode** to **Manual**.

Table 6-2: Position mode options

a. This is only available if the antenna's GNSS module supports GLONASS and BeiDou.

5. Click **Apply**.

Acquisition process and search pattern

With heading input or fixed heading

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

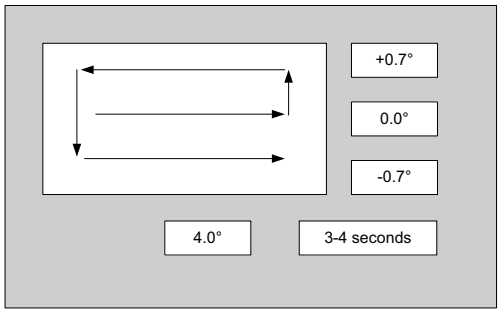


Figure 6-4: Acquisition, search pattern

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

With heading input or fixed heading, Inclined Orbit Satellite

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

2. If no RX lock is detected, a box search pattern is started and the positions where RF power can be received are stored.

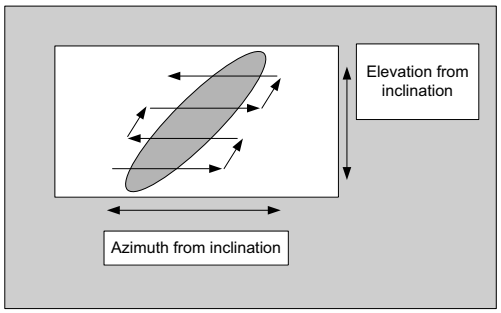


Figure 6-5: Acquisition, search pattern for inclined orbit

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

Without heading input and not fixed heading (Gyro-free)

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

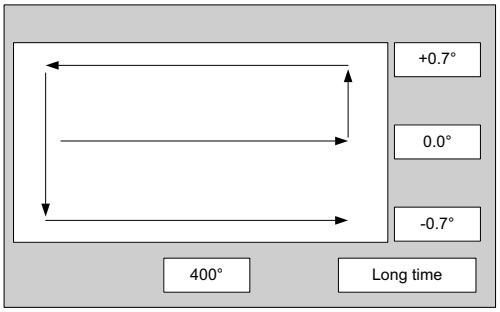


Figure 6-6: Acquisition, search pattern in gyro-free mode

Acquisition times

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

Table 6-3: Acquisition time

6.2.2 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 installation. The satellite and transponder properties for the calibration can be selected from a list of service profiles or supplied manually.

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

You can make an azimuth calibration in the following ways:

- *Automatic azimuth calibration with an active satellite profile*
- *Azimuth calibration (user controlled)*
- *Azimuth calibration with a service profile*

Automatic azimuth calibration with an active satellite 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 be able to use this feature you must have made a valid satellite profile and have activated it. When the vessel leaves the harbour 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 ACU will automatically disable the setting **Azimuth calibration (active satellite profile)** on the page **SERVICE > Calibration**.

To enable automatic azimuth calibration, do as follows:

1. Create a modem profile, see *Modem profiles* on page 6-23.
2. Create a satellite profile, see *Satellite profiles* on page 6-26.
3. Click **SETTINGS** and **Activate** the satellite profile.

4. Click **SERVICE > Calibration**.

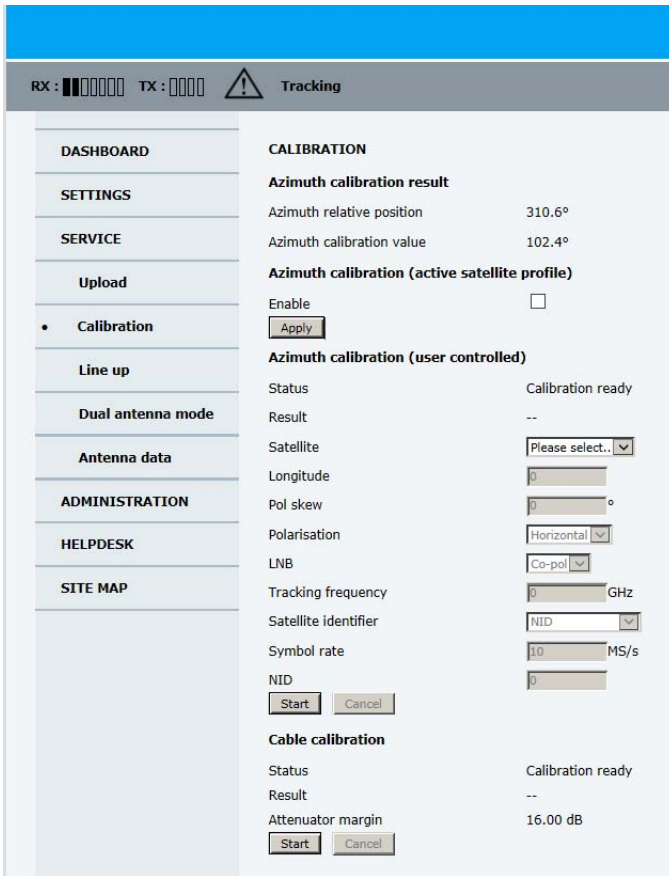


Figure 6-7: Web interface: SERVICE, Calibration

5. Select **Enable** in the section **Azimuth calibration (active satellite profile)**.
6. Click **Apply**.
7. Switch on the modem.

Azimuth calibration (user controlled)

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

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

Note Check that the satellite transponder is visible from the location of the installation and that it is at an elevation angle between 10 and 70 degrees.

2. Type in the longitude and polarisation skew of the satellite. The polarisation skew is provided by the satellite operator, it is typically 0 degrees. For satellite data see *DVB-S satellites* on page E-1, www.lyngsat.com.

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

3. Select the polarisation of a transponder and type in its frequency and symbol rate.

4. Select which satellite identifier to use for identification of the signal.

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

Table 6-4: Satellite identifier and NID values

5. Click **Start** and wait typically 5 minutes for the calibration to finish. A progress bar is shown during calibration and 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 6-5: Possible error codes during calibration

Azimuth calibration with a service profile

1. Click **SERVICE > Calibration**.
2. Select the service profile in the drop down list **Satellite**. All profiles with the VSAT modem **Service & Calibration** are displayed in the list. If there is no profile in the list see *To set up a service profile for calibration* on page 6-10.

3. Click **Start** in the section **Azimuth calibration** and wait typically 5 minutes for the calibration to finish. After finished calibration a message with the result of the calibration is displayed.

6.2.3 To set up a service profile for calibration

If you do not want to use the automatic azimuth calibration or if you want to enter the satellite parameters directly on the calibration page, use this calibration method. To prepare for calibration you can set up a service profile for calibration.

To setup a service profile do as follows:

1. Open your Internet browser and enter the IP address of the ACU. The default IP address is **http://192.168.0.1**.
2. Select **SETTINGS > Satellite profiles** > **New entry**. Enter the name of the satellite profile for calibration (a name of your own choice).
3. Select the modem profile **Service & Calibration** from the drop-down list.

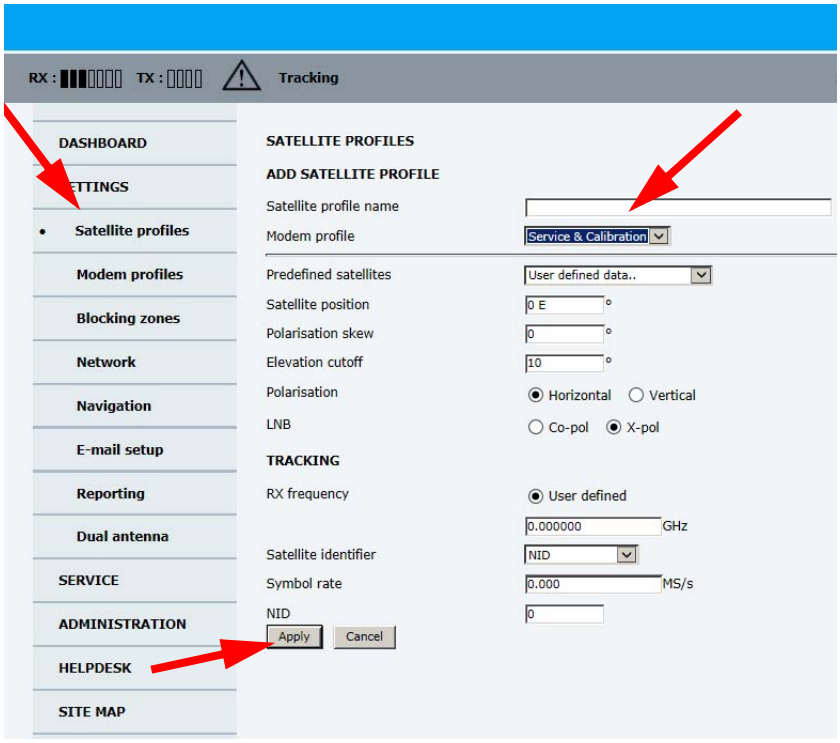


Figure 6-8: Service profile for calibration

4. Enter the data for the satellite that you want to use as a calibration reference. You can enter the satellite data manually or select a satellite from the list of predefined satellites (Eutelsat). For satellite information see *DVB-S satellites* on page E-1 or www.lyngsat.com.
   Note the following calibration requirements:

Satellite requirements for successful calibration	
Elevation	Elevation angle: 5 – 70 degrees Not allowed for calibration: Inclined orbit.
System encryption	DVB-S or DVB-S2
Polarisation	Horizontal or vertical polarisation. Not allowed: Left-hand circular (L) or right-hand circular (R).
Symbol rate	The DVB symbol rate must be >5 Ms/s.
NID	Preferably a unique NID (ONID). An azimuth calibration without NID can be useful in regions where the satellite operators do not broadcast NID (US, China, Australia etc.). For NID=0 the NID is not used when checking the satellite link.

Table 6-6: Satellite requirements for elevation and carrier

Elevation cutoff: Not relevant for calibration.

LNB: Co-pol or X-pol, use this for test if both the LNBs and RX cables function properly in case of issues with the reception of a signal. The polarisation must remain the same as stated for the transponder used for the azimuth calibration. The antenna will just turn the polarisation motor 90 degrees to use the other LNB to receive the same signal.

5. Click **Apply** to save the settings for the service profile for calibration. The system is ready for the azimuth and cable calibration.

6.2.4 Cable calibration

You must make a cable calibration.

1. On the page **SERVICE > Calibration** click **Start** in the section **Cable calibration**.

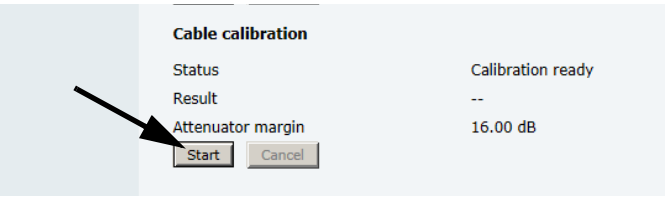


Figure 6-9: Web interface: SERVICE, Calibration, cable attenuator margin

2. Wait typically for 2 minutes for the calibration to finish. A message is displayed when the calibration has been completed successfully.This screen shows how much attenuation margin is left for the antenna cable. This indicates whether the antenna cable and connectors are in good condition and well crimped.

It is recommended to make a cable calibration when servicing the system to check if the antenna cable is still in good order. If the attenuator margin changes by 2 dB or more after a cable calibration, it is recommended to do a P1dB compression measurement to verify that the VSAT modem configuration is correct.

The SAILOR 900 VSAT High Power is calibrated now. If the calibration failed there will be a message on the calibration screen.

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

6.2.5 Operation in gyro-free mode

Heading input: none

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

When the antenna does not have ship heading input from the vessel's gyro compass, the azimuth direction of the satellite is not known. In this case the antenna will start a 360 degrees sky scan and scan until it finds a satellite. The satellite search time to find the satellite and start tracking is therefore raised considerably. If the ship is on a steady course and sails at a speed over ground above 5 kn, the system can use an estimated heading from the current GPS position. This will reduce the search time, but it will still be a longer search time than with heading input.

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

If a system loses the signal from the satellite, i.e. due to blockage, and the duration of signal loss is longer than approximately 1 minute, a system without heading input must do a new sky scan to find the satellite when the antenna is out of blockage.

Inclined orbit satellites

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

Tracking for satellite elevation between 5 and 75 degrees

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

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

the following limit for use of inclined orbit satellites (a purely physical limit), and all systems without heading input have this limit.

Satellite elevation	Max allowed inclination
<20	2.5
<50	0.7
<70	0.3
≤75	0

Table 6-7: Satellite elevation and max. allowed inclination

Tracking for satellite elevation above 75 degrees

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

6.2.6 Flow chart for calibration (user controlled)

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

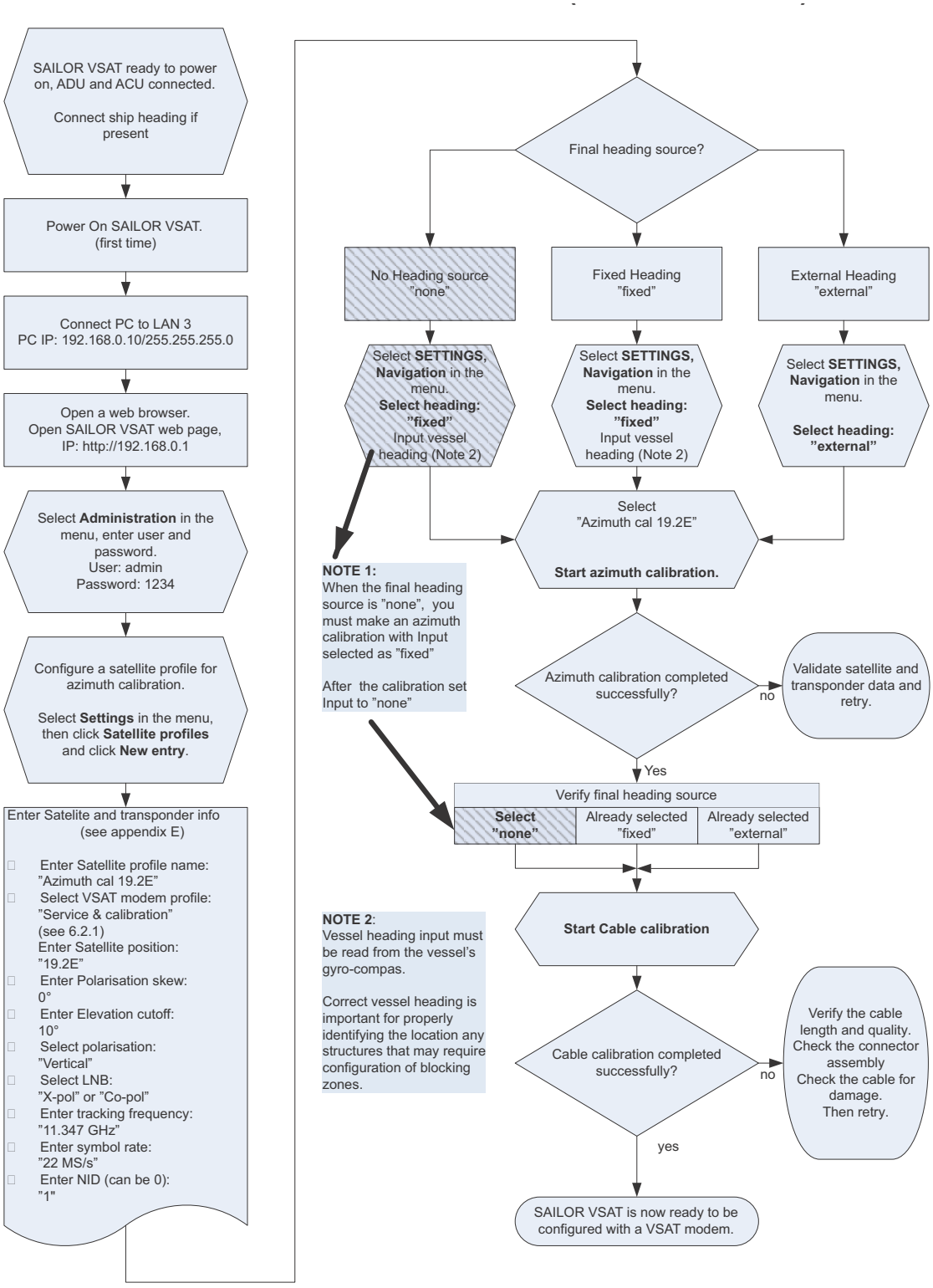


Figure 6-10: Example for a calibration (user controlled) – step by step

6.2.7 To make a line up procedure

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

The SAILOR 900 VSAT High Power has been tested at the factory and online on a live satellite link to calibrate the TX polarisation unit. You can fine-tune the TX polarization by doing a line up as described below. To do the line up, do as follows:

1. Open your Internet browser and enter the IP address of the ACU. The default IP address is **http://192.168.0.1**.
2. Create a VSAT modem profile and a satellite profile using the previously created VSAT modem profile (See *To set up a service profile for calibration* on page 6-10).
3. Go to the page **SERVICE > Line up**. As soon as the antenna is in tracking mode and points to the satellite, the text next to **Status** shows: **Please wait. Improving tracking**. This may take up to 2 minutes.
4. Wait until the text shows: **Ready for activation**.

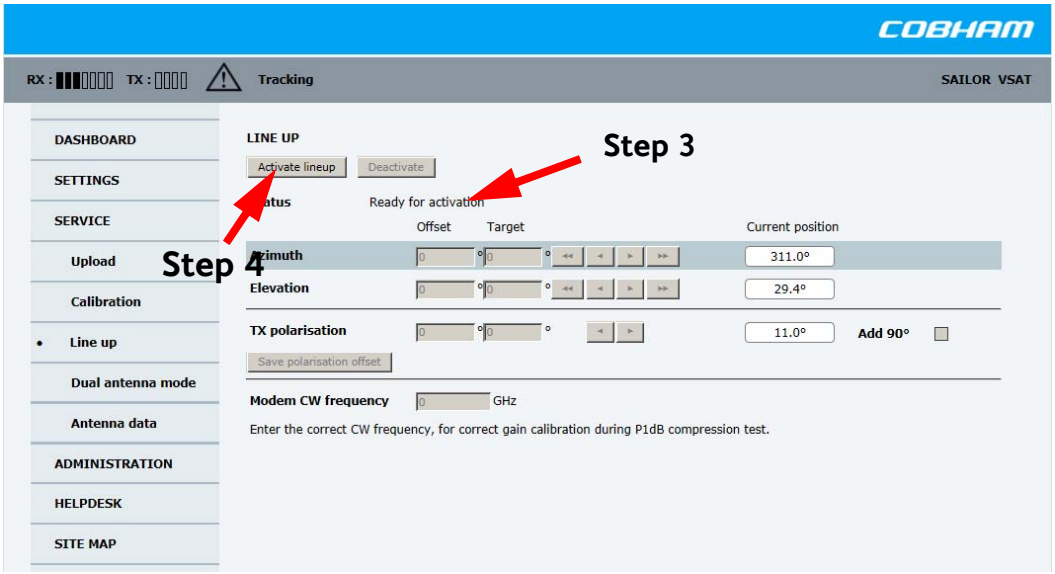


Figure 6-11: Web interface: SERVICE, Line up: Ready for activation

5. Click the button **Activate lineup** and wait until the status field shows **Antenna ready**. Follow the instructions from your service provider.

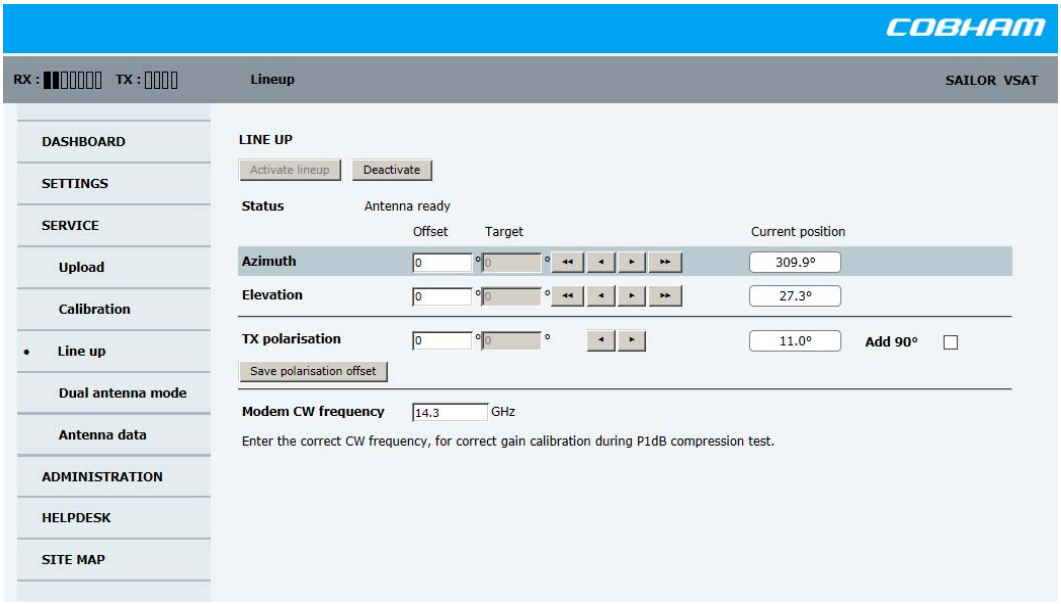


Figure 6-12: Web interface: SERVICE, Line up: Antenna ready

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

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

6.2.8 Fixed TX gain principle

The SAILOR 900 VSAT High Power uses a new transmitter chain concept. After calibration it provides a fixed gain of 48 dB from the Tx-port of the ACU to the output of the BUC. The advantages of the fixed TX gain principle are:

- Fixed TX gain over frequency and cable length
- TX gain independent of antenna cable length
- Utilization of the full 20 W BUC power over frequency
- P1dB compression point the same over frequency

When installing the SAILOR 900 VSAT High Power you make a cable calibration. At that point every installation finds the same P1dB compression setting regardless of cable length. The P1dB compression point is approximately -5 dBm at the ACU Tx-port. Additionally the SAILOR 900 VSAT High Power system monitors the TX gain in real time.

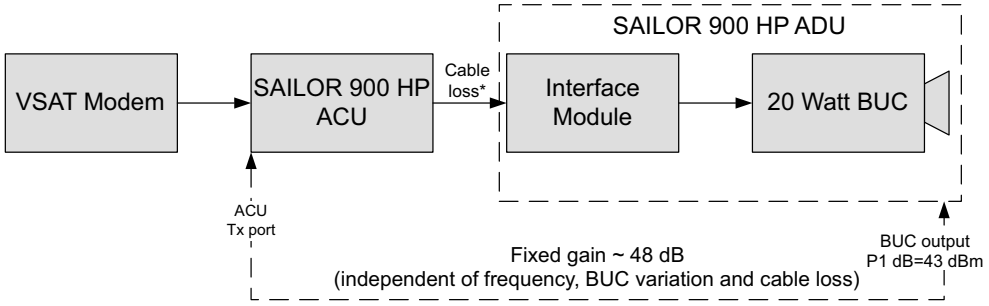


Figure 6-13: Fixed TX gain principle

* You find the maximum cable loss at *Maximum allowed RF loss in the ADU cable* on page 3-20.

Example: ACU Tx-port power: -5 dBm > BUC output = +43 dBm (compression)

6.3 Configuration with the web interface

The following sections give detailed description of various parts of the web interface.

6.3.1 Overview and dashboard

Topics in the web interface

Use the site map to get an overview over the existing menus, submenus and topics. You can click on each menu in the site map to go directly to the page or display the respective submenu.

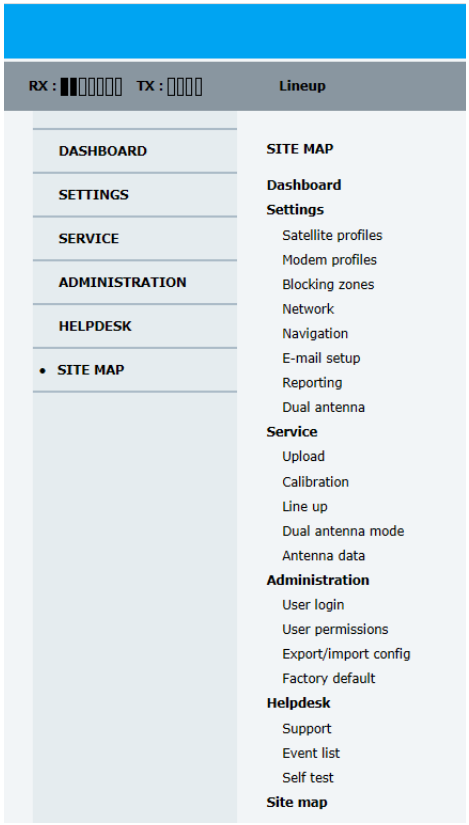


Figure 6-14: Topics in the web interface (SITE MAP)

Software version 1.55 is the version described in this chapter.

Dashboard and navigation

The Dashboard is the first screen that is displayed when the user or administrator enters the IP address of the web interface of the ACU. The Dashboard is used for viewing properties and status of the ACU and ADU. The Dashboard has the following sections:

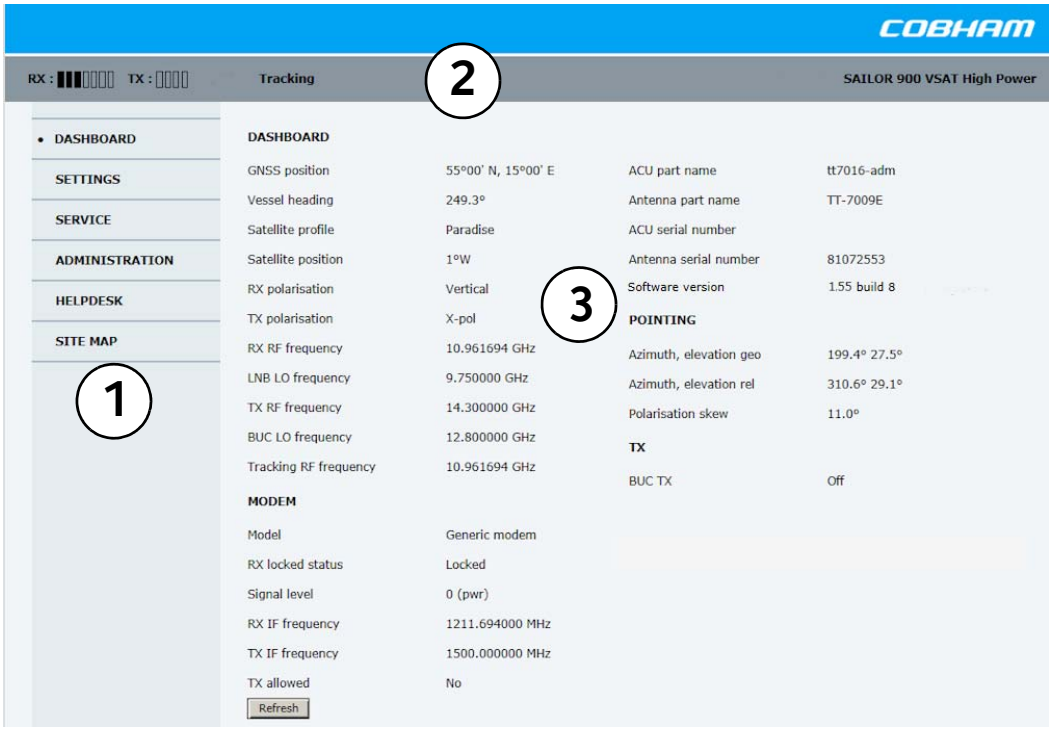


Figure 6-15: Web interface: DASHBOARD

1. The navigation pane contains the menus. You can click an item in the menu to open the list of submenus or a new page in the contents section. The currently displayed menu is marked by a bullet.
2. The top bar shows the following:
   - RX signal strength bars: This shows the tracking signal strength of the antenna. The signal strength can vary during operation, depending on the current position relative to the satellite. The signal strength of the VSAT modem (if available) is shown on the **DASHBOARD** in the section **MODEM**, at **Signal level**.
   - BUC output power bars (TX): This indicates if the BUC is transmitting or not. This is a unique feature of the SAILOR 900 VSAT High Power antenna. A built-in power detector in the OMT developed by Cobham SATCOM makes it possible to measure the power within a time window to be able to catch short TX bursts. The power within the window is averaged and shown in the BUC output power bar graph on the DASHBOARD. Note that this indicator is an averaged signal, it is not a real-time indicator. After measuring a signal burst the bar graph falls slowly in order for the user to be able to see short TX bursts.
     The BUC output power indicator is very useful during installation as the service engineer knows whether the antenna is transmitting or not and that the hub should be able to monitor the transmission. It is also very useful when doing line up with the hub as the service engineer can monitor the TX BUC output power level on the

DASHBOARD and watch when the output power approaches the P1dB compression point which is at 4 bars.

- Current status of the antenna, see *Status field in the top bar* on page 6-21.
- An icon for active events is displayed, if there are any.

Icon	Explanation
⚠	An event is active. Click the icon to see a list of active events. The event time is UTC time. For explanations of the event messages, see *Event list* on page 8-3 and *Event messages – overview* on page G-1. Note that this icon will remain in the icon bar as long as the event is active.

Table 6-8: Web interface: Event icon

- Host name: This is shown on every page. It is useful to identify the system at remote login and in reports from the system. The host name is recommended to contain the name of the vessel. To change the host name see *To configure the LAN network* on page 6-30.

3. The contents section shows the page selected in the navigation pane. This section is used for viewing or changing settings, or for performing actions.
   For a description of the individual items in the contents section see *Sections on the Dashboard* on page 6-22.

To navigate the web interface

- **To expand a menu**, click the menu in the navigation pane.
- **To access status and settings**, click the relevant subject in the navigation pane or click the relevant icon in the icon bar. The status or settings are displayed in the contents section.
- **To get an overview over the submenus available**, click **SITE MAP** in the navigation pane. Click on items in the site map to go directly to the relevant location.

Note You can give access to some configuration settings for users that are not administrators. For information see *To set up user permissions* on page 6-43.

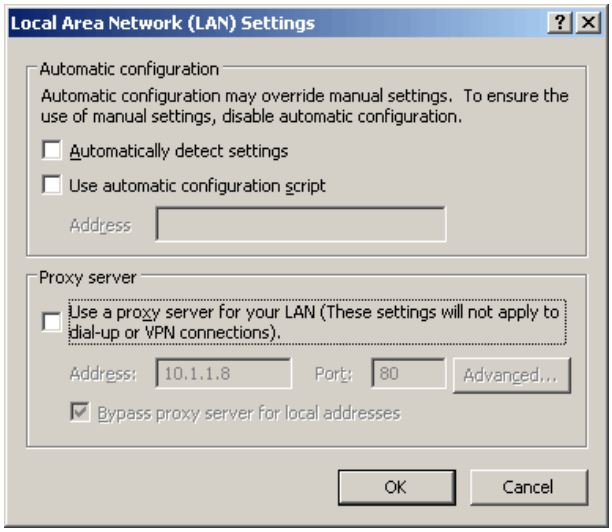
Proxy server settings in your browser

If you are connecting your computer using a LAN or WLAN interface, the **Proxy server** settings in your browser must be disabled before accessing the web interface. Most browsers support disabling of the Proxy server settings for one specific IP address, so you can disable Proxy server settings for the web interface only, if you wish. Consult your browser help for information.

To disable the use of a Proxy server completely, do as follows:

Note The following description is for **Microsoft Internet Explorer**. If you are using a different browser, the procedure may be different.

1. In Microsoft Internet Explorer, select **Tools > Internet Options > Connections > LAN Settings**.



2. Clear the box labeled **Use a proxy server for your LAN**.
3. Click **OK**.

When the proxy server settings are disabled, close and restart your browser. You may need to change this setting back on return to your Internet connection.

To connect a PC

To connect your PC to the ACU do as follows:

1. Connect a PC to LAN interface 3 (Service port, standard Ethernet) of the ACU or to the front LAN connector of the ACU. If you want to use another LAN port than LAN 3 you must configure it according to your network requirements. For information how to configure the LAN connectors see *To configure the LAN network* on page 6-30.
2. Open your Internet browser and enter the IP address of the ACU. The default IP address is **http://192.168.0.1**.

Status field in the top bar

The top bar shows the current status of the antenna. Examples are:

- **Not ready** (waiting for input from GNSS, e.g. GPS)
- **Antenna initializing**
- **Antenna SW upload**
- **Antenna POST error**
- **XIM data error**
- **Unrecoverable XIM data error**
- **System upgrade**
- **Antenna POST pending**
- **Antenna POST**
- **Safe Mode** (error, followed by an error description)
- **Service switch** (service switch in ADU activated)
- **Ready** (waiting for data from the modem or no satellite profile selected)

- **Pointing antenna** (locating the satellite)
- **Acquiring signal** (acquiring the satellite signal)
- **Tracking** (tracks the current satellite)
- **Lineup** (line up is activated)
- **Azimuth calibration**
- **TX cable calibration**
- **Test**
- **Not ready** (waiting for input from GNSS, e.g. GPS)
- **Not ready**: **Initializing**
- **Not ready**: **Need pos**
- **Blocking zone** (antenna is pointing into a blocking zone)
- **No TX zone** (antenna is pointing into a no TX zone; TX is off)

Sections on the Dashboard

DASHBOARD	Description
GPS position	Current position of the vessel, reported by the GPS module
Vessel heading	Ship's heading in degrees with reference to North, provided by the ship's gyro.
Satellite profile	Name of the currently active satellite profile.
Satellite position	Position of the satellite selected in Satellite profile.
RX polarisation	Horizontal or vertical.
TX polarisation[a]	Co-pol or X-pol, auto-selected by VSAT modem
RX RF frequency[a]	Ku band receiving frequency, auto-selected by VSAT modem
LNB Lo frequency[a]	Auto-selected by VSAT modem
TX RF frequency[a]	Auto-selected by VSAT modem
BUC Lo frequency	12.8 GHz (system parameter)
Tracking RF frequency	Current RF tracking frequency.
ACU part name, Antenna part name, ACU serial number, Antenna serial number, Software version	Part names, serial numbers for ACU and ADU, software version of the SAILOR 900 VSAT High Power.

Table 6-9: Web interface, DASHBOARD, SAILOR 900 VSAT High Power parameters

a. Can be changed when using a generic modem profile.

POINTING	Description
Azimuth relative	Current value for azimuth, relative to the vessel heading.
Elevation relative	Current value for elevation, relative to the vessel.
Polarisation skew	Current value for polarisation skew.

Table 6-10: Web interface, DASHBOARD, POINTING parameter

TX	Description
BUC TX	On or Off. Shows if the SAILOR 900 VSAT High Power has enabled the BUC or not. It is the same TX ON/TX OFF as shown in the display of the ACU, see *ACU display and keypad* on page 6-46.

Table 6-11: Web interface, DASHBOARD, TX parameter

BUC TX information

The BUC TX information is displayed on the **DASHBOARD** in the section **TX**. **BUC TX** indicates if the SAILOR 900 VSAT High Power VSAT has enabled the BUC or not. It can show **On** or **Off**. This information is also shown in the display of the ACU as TX ON or TX OFF. **BUC TX On** is shown when the following conditions are met:

- The SAILOR 900 VSAT High Power must sense the 10 MHz Tx reference signal from the connected VSAT modem.
- The VSAT modem must have Rx lock.
- The antenna must point correctly to the satellite.
- The antenna must be in tracking mode.

6.3.2 Modem profiles and satellite profiles

Modem profiles

On the page **Modem profiles** you create, edit or delete VSAT modem profiles. The supported modem profiles are listed in the drop-down list **Modem**. A modem profile contains all modem settings that are necessary for a successful connection to the satellite. The data you have to fill in are provided by your VSAT service and modem provider. You must add at least one modem profile.

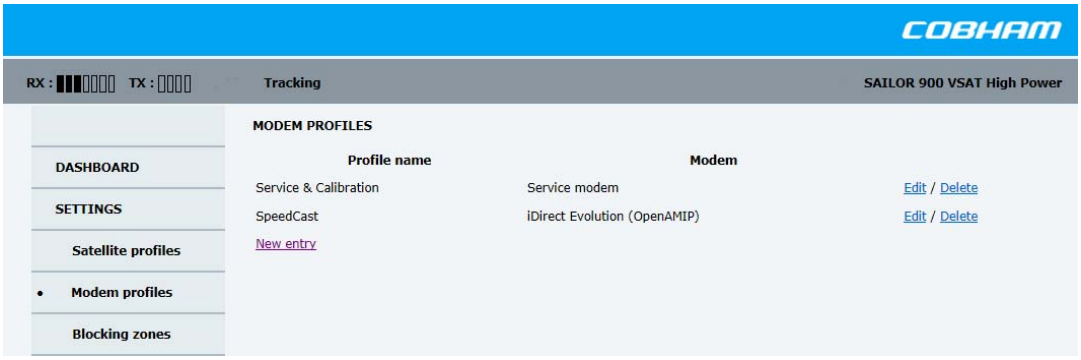


Figure 6-16: Web interface: SETTINGS, VSAT modem profiles — list (example)

To add or edit a modem profile, do as follows:

1. Go to **SETTINGS** > **Modem profiles** and click **New entry** or **Edit**. The supported modem profiles are listed in the drop-down list **VSAT modem profile**.

Figure 6-17: Web interface: SETTINGS, Modem profile – supported modems

2. Fill in a VSAT modem profile name of your own choice.
3. Select one of the supported modems from the drop down list. Once you have selected a modem, entry fields required for this modem are displayed.
   Generic modem: If you have a modem that is not included in the list, select the generic modem.
4. Fill in or edit the data provided by your VSAT service provider.
   The following configuration data may be needed by the modem:

Parameter	Description
IP address	Enter the IP address for the dual antenna master.
Port	Enter the modem IP port number.
VSAT modem root password	iDirect serial login. Default: P@55w0rd!
VSAT modem user password	iDirect serial login. Default: iDirect
Baud rate	Select the baud rate for the modem communication or modem GPS input.
GPS output	Disable GPS output or select the appropriate baud rate.

Table 6-12: Modem configuration data

Parameter	Description
10 MHz reference	Select the 10 MHz reference source for the BUC/LNBs. Recommended settings: **VMU-TX**: STM Satlink 2900, Gilat SkyEdge II, COMTECH, iDirect modems, **ACU Internal**: service modem, InmarsatG5
RSSI lock type	Select None (no RX lock), High (positive voltage) or Low (negative voltage)
RSSI lock level	Enter the voltage level for the modem RX lock signal. Range: 0 - 14000 mV (-14 VDC to+ 14 VDC)

Table 6-12: Modem configuration data (Continued)

Important The SAILOR 900 VSAT High Power can work either using the Rx or Tx 10 MHz reference signals provided by the modem or using its own built-in 10 MHz reference signal. It is recommended to use the Tx 10 MHz reference signal from the modem.

For modems communicating via Ethernet: Make sure that you have entered the correct IP address also for the LAN connector that is used for the modem, see *To configure the LAN network* on page 6-30.

5. Click **Apply** to add the new profile to the list of VSAT modem profiles or to accept the edits.

For a generic modem you enter all parameters in the satellite profile that has the modem profile with the generic modem.

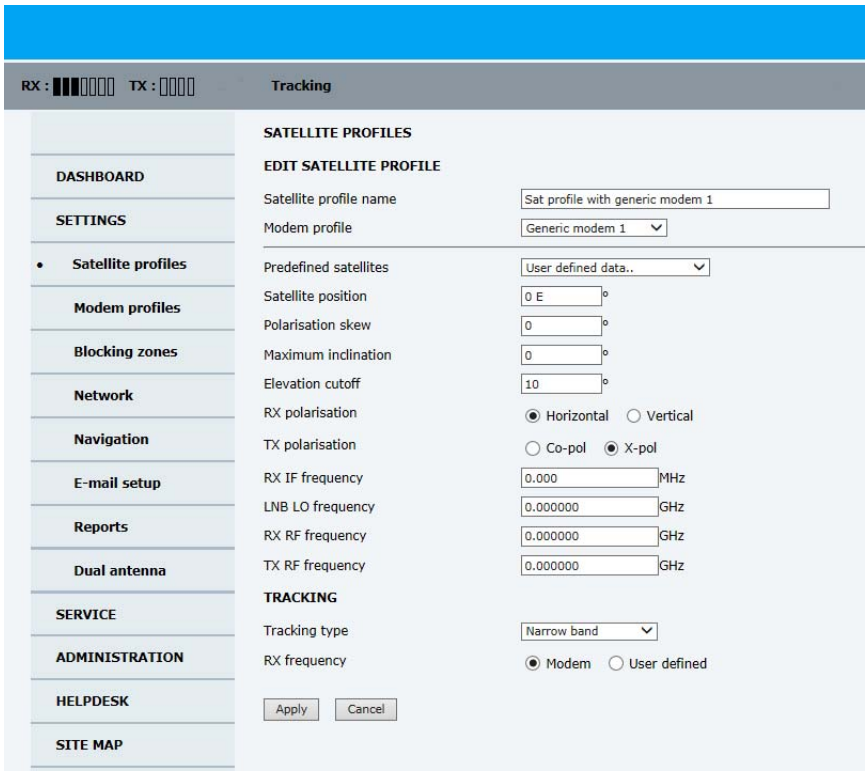


Figure 6-18: Satellite profile with generic modem

Satellite profiles

On the page **Satellite profiles** you add, edit and delete satellite profiles. A satellite profile contains all settings that are necessary for a successful connection to the satellite, including a VSAT modem profile. Most of the data you have to fill in are provided by your VSAT service provider. Each satellite profile has one assigned modem profile. You must activate one satellite profile.

Note You must add at least one modem profile before you can add a satellite profile. See *Modem profiles* on page 6-23.

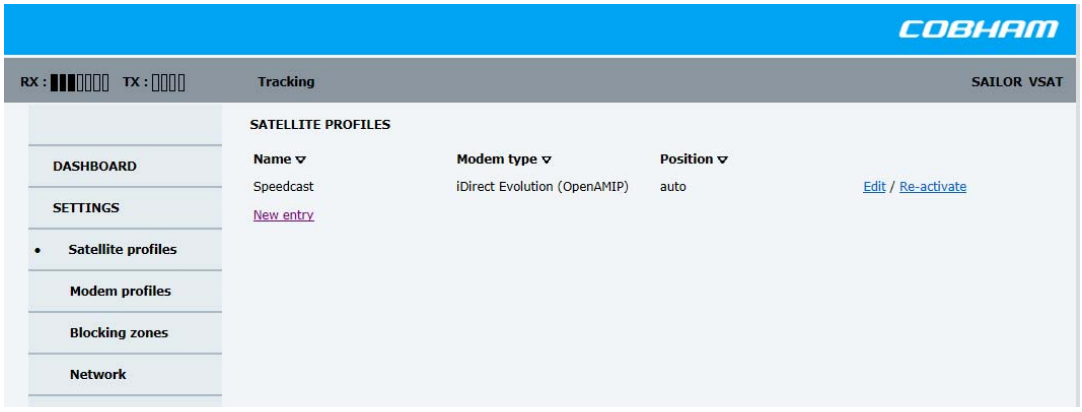


Figure 6-19: Web interface: SETTINGS - list of satellite profiles (example)

To add or edit a satellite profile, do as follows:

1. Go to **SETTINGS or Satellite profiles** and click **Edit** or **New entry**.

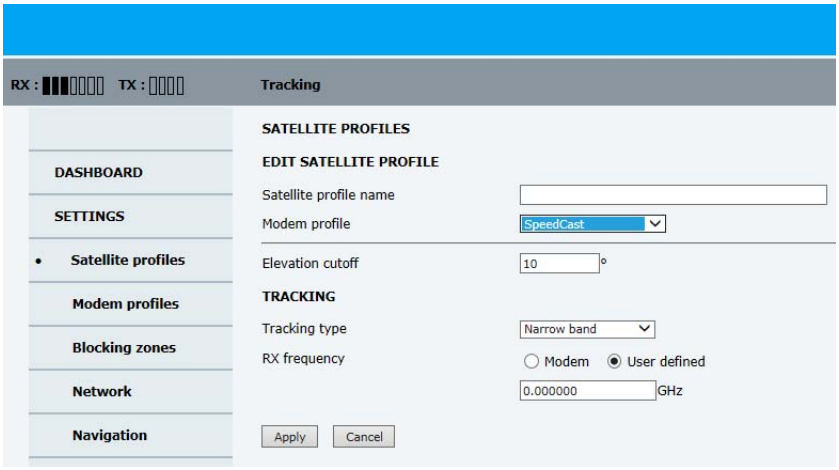


Figure 6-20: Web interface: SETTINGS, Satellite profiles — new entry (example)

2. Enter or edit the Satellite profile name.

Note Tip: Assign a name containing the location where the Satellite profile is to be used (e.g. *Gulf of Mexico* or *North Sea*) and, if possible, the provider.

3. Select a modem profile. The page automatically displays the parameters available for the selected modem profile.
   For instruction how to add a VSAT modem profile see *Modem profiles* on page 6-23.
4. Enter the data for the satellite that you want to use. For satellite data see *DVB-S satellites* on page E-1 or www.lyngsat.com.
5. Polarisation skew: See documents from VSAT provider.
6. At Elevation cutoff enter the minimum elevation angle for the antenna to function in accordance with ETSI (ETSI EN 302 340) and FCC (FCC §25.205) regulations.
   - **ETSI (ETSI EN 302 340)**: The minimum elevation angle depends on the Tx bandwidth and the nominal power of the VSAT modem, see the table below.

Bandwidth	Nominal modem power								
Modem Power [dBm]	-16	-14	-12	-10	-8	-6	-4	-2	0
Eirp@14.25 GHz [dBm][a]	69.1	71.1	73.1	75.1	77.1	79.1	81.1	83.1	85.1
Bw 64kHz-1MHz	6°	7°	8°	9°	11°	13°	16°	19°	22°
Bw 2MHz	4°	5°	6°	7°	8°	10°	12°	14°	17°
Bw 4 MHz	3°	4°	5°	6°	7°	8°	9°	11°	13°
Bw 8 MHz	3°	3°	4°	4°	5°	6°	7°	8°	10°
Bw 16MHz	2°	2°	3°	3°	4°	5°	6°	7°	8°
Bw 32MHz	2°	2°	2°	3°	3°	4°	4°	5°	6°

Table 6-13: Elevation cutoff (in degrees) versus VSAT modem bandwidth and power

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

- **FCC (FCC §25.205)**: 5 degrees

7. Click **Apply** to save the settings for the satellite profile.

6.3.3 To set up blocking zones (RX and TX)

On this page you define blocking zones, i.e. NO TX and RX zones, enter azimuth values and elevation angles for each blocking zone. You must select **Active** to enable a blocking zone.

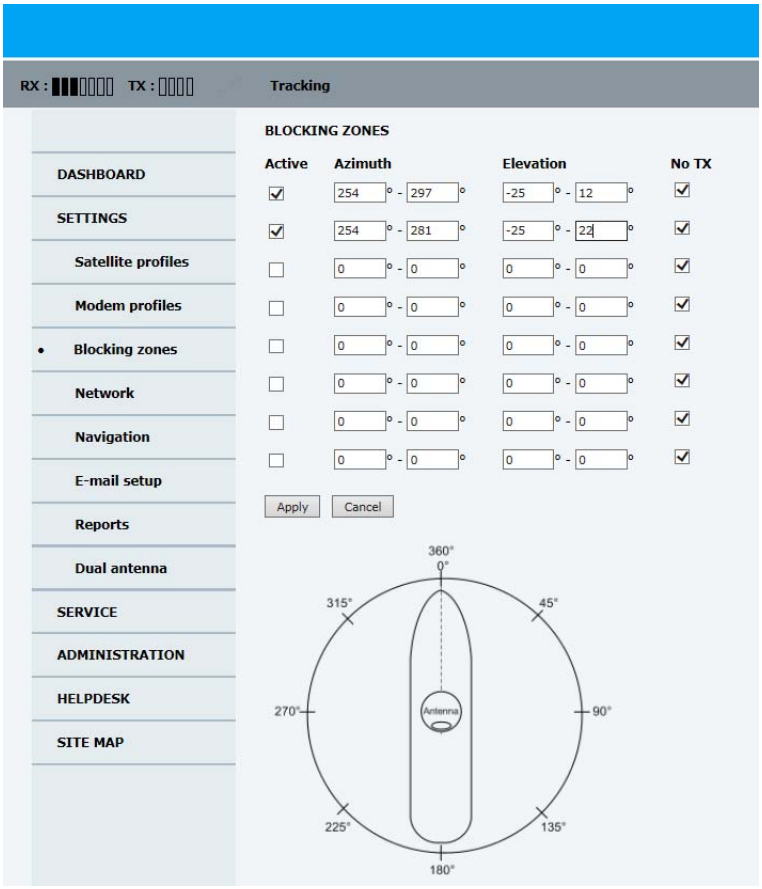


Figure 6-21: Web interface: SETTINGS, Blocking zones — azimuth and elevation

To set up a blocking zone, do as follows:

1. Select **SETTINGS > Blocking zones**.
2. Select **Active** to enable the blocking zone.

3. **Azimuth**: Enter start and stop azimuth value in degrees for the blocking zone. Values allowed: 0 to 360 degrees. Enter clockwise.

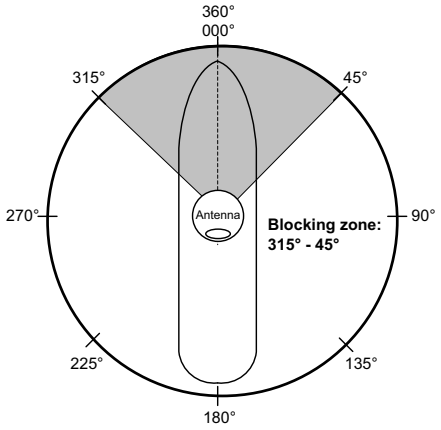


Figure 6-22: Blocking zone, example: 315 - 45 degrees

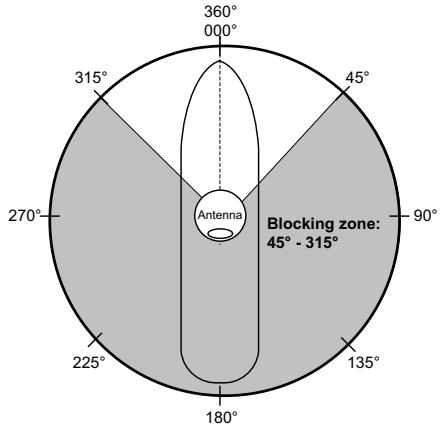


Figure 6-23: Blocking zone, example: 45 - 315 degrees

4. **Elevation**: Enter the start and stop elevation angle for the blocking zone. If you enter nothing, there will be no blocking zone. Values allowed: -30 to 90 degrees.

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

5. Select **No TX** for zones if you don't want the system to transmit.
   If not selected, the system also transmits when pointing through areas with blocking objects. The VSAT modem will shut off for TX if no signal is received.
6. Click **Apply** to save the blocking zones.

6.3.4 To configure the LAN network

You can enter a host name. The host name helps identifying the SAILOR 900 VSAT High Power system when sending e-mail reports. The ACU has four 10/100 Mbit Ethernet ports labelled LAN port 1, 2, 3 and 4. The ports are divided in three groups, each group operating in its own network. You can setup DNS and Gateway.

To configure the LAN network go to **SETTINGS > Network**.

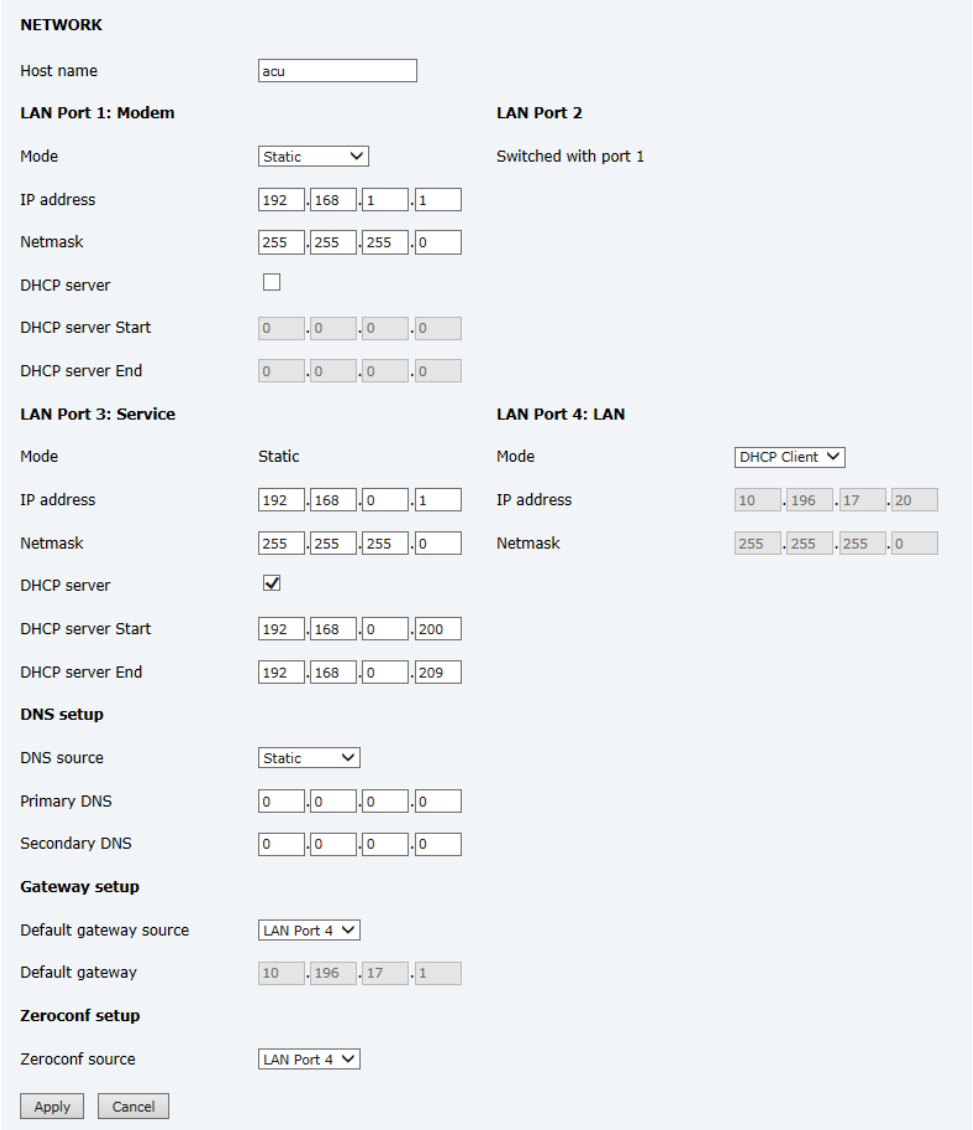


Figure 6-24: Web interface: SETTINGS, Network (default settings)

Important Make sure that the 3 networks do not use IP address ranges that overlap.

Sections	Preferred use
NETWORK Host name	The host name is used for identifying the ACU in local networks and in e-mail reports. The default host name is acu. You can change the name. Letters (a-z), digits (0-9) and hyphen (-) are allowed as legal characters. Note: The host name must start with a letter.
LAN Port 1 + 2	LAN port 1 and 2 are switched, i.e. they share the same IP address and operate on the same network. This network is usually connected to the VSAT Modem Unit. LAN port 1 can be set to static IP (default), DHCP client or DHCP server.
LAN Port 3	LAN port 3 is dedicated as the service port. By default this port has the IP address 192.168.0.1; the current value can be displayed in the ACU display. It is recommended to connect LAN port 3 to the front port (via rear connector, see the figure *ACU, connector panel overview* on page 4-1), for access to the service port from the rack front. LAN port 3 can be set to static IP, DHCP client or DHCP server (default).
LAN Port 4	LAN port 4 can be used for connection to the LAN of the vessel or other general purpose. LAN port 4 can be set to static IP, DHCP client (default) or DHCP server.

Table 6-14: Setup of LAN connectors

Static IP or 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 LAN ports 1,3 and 4 you can choose to run a DHCP server. Select the check box **DHCP Server**. The DHCP server settings are only displayed and can be selected when the port mode is set to **Static IP**, otherwise the DHCP server settings are not shown.

The DHCP start and end addresses must be on the same network as the port's static IP.

DNS setup

If you have access to a Domain Name Server (DNS) you can specify the address of the e-mail server by using the server name instead of its IP address. This can be used in **Outgoing mail server** in *E-mail setup* on page 6-32.

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 ACU 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.

Zeroconf Settings

On LAN ports 1,3 and 4 you can choose to add a zeroconf address in the network (169.254.0.0).This zeroconf address will be in addition to the existing static or DHCP IP address. One port at a time can be enabled.

Zeroconf allows devices to connect to a network automatically.

6.3.5 E-mail setup

To be able to send diagnostics and statistics reports using e-mail you must set up a couple of parameters. Contact your IT department for the specific data.

To configure the e-mail setup, do the following:

1. Go to **SETTINGS > E-mail setup**.
2. Enter the data for Outgoing mail server (SMTP), SMTP port number, SMTP

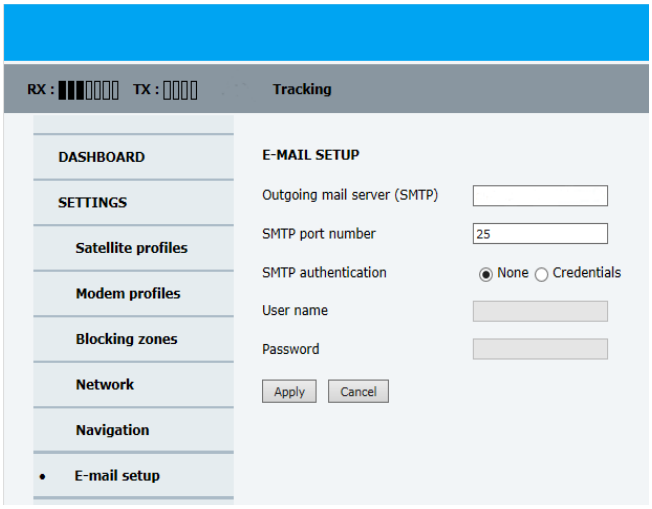


Figure 6-25: Web interface: SETTINGS, E-mail setup (example)

authentication, 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 *To configure the LAN network* on page 6-30.

6.3.6 Reports, syslog and SNMP traps

The antenna can send the following reports and messages:

- *Diagnostics report*
- *Statistics report*
- *Remote syslog*
- *SNMP traps*

Diagnostics report

You can send automatically generated diagnostic reports at fixed intervals. The diagnostic report contains information from the ADU and ACU that are relevant for the service personnel during troubleshooting. The report contains data for the selected download intervals.

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

1. Select **SETTINGS > Reporting**.
2. In the section **DIAGNOSTICS REPORT** enter the following:
   - E-mail sender.
   - E-mail recipients (comma separated).
   - Send interval: Select **e-mail disabled**, **day** (default, 2-minute samples), **week** (hourly samples) or **month** (hourly samples).
3. Click **Apply**.

You can generate and send the diagnostic report at any time by clicking **Send now**. You can also download a diagnostics report directly to your computer, go to the page **HELPDESK** and click **Download**. For more details see *To download diagnostic and statistics reports* on page 8-2.

Statistics report

SAILOR 900 VSAT High Power can send a statistics report at fixed intervals. This report contains historical information from the SAILOR 900 VSAT High Power of up to 1 month. It is sent as a zipped attachment to an e-mail. The file format is a comma separated value file (csv). The report can then be processed in spreadsheet applications, e.g. Microsoft Excel.

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

1. Configure e-mail first, see *E-mail setup* on page 6-32.
2. Go to **SETTINGS > Reports**.
3. In the section **STATISTICS REPORT** enter the following:
   - Email sender.
   - Email recipients (comma separated).
   - Send interval: Select disabled, day (default) with 2-minute samples, week with hourly samples or month with hourly samples. The report contains statistics data for the selected intervals.
4. Click **Apply**.

You can also send the report at any time by clicking **Send now**. Use **Send now** to validate the e-mail setup. See also *Download of a diagnostic report or a statistics report* on page 8-2.

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**.
ACU SN	ACU serial number
ADU SN	ADU serial number
SW ver.	Software version
System type	SAILOR 900 VSAT High Power

Table 6-15: Statistics report, header record

Parameter recorded	Description
UTC. (s) UTC (YYYY-MM-DD hh:mm)	UTC in seconds and date format for the data set.
RSSI.Av RSSI.Max RSSI.Min	Received signal strength (average, maximum and minimum value) for the sampling interval.
POS.Lat (degree) POS.Long (degree) POS.Valid	Latitude value of position. Longitude value of position. Fix = valid position, No Fix = invalid position.
Heading.Samp (degree) Heading.Max (degree) Heading.Min (degree) Heading.Range (+/-degree)	Ship's heading (sample, maximum and minimum value, range) for the sampling interval. See Figure 6-26: *Statistics — how to read data for a range*.
Antenna.Azi (degree) Antenna.Azi Max (degree) Antenna.Azi Min (degree) Antenna.Azi Range (+/-degree)	Current antenna azimuth (sample, maximum and minimum value, range) for the sampling interval. See Figure 6-26: *Statistics — how to read data for a range*.
Antenna.Ele (+/-degree) Antenna.Ele Max (+/-degree) Antenna.Ele Min (+/-degree)	Current antenna elevation (sample, maximum and minimum value) for the sampling interval.
Vsat.rx_lo_freq (GHz) Vsat.tx_lo_freq (GHz)	Rx frequency of VSAT modem for this record. Tx frequency of VSAT modem for this record.
Tracking.rf freq (GHz) Tracking.type	Tracking RF frequency for this record. Narrow filter, DVB-S2 decoder.
Sat.long (degree)	Longitude position of the satellite.
Carrier rf.rx (GHz) Carrier rf.tx (GHz)	Rx frequency of carrier for this record. Tx frequency of carrier for this record.

Table 6-16: Parameters recorded in a statistics report

Parameter recorded	Description
Pol.rx Pol.tx	Current Rx and Tx polarisation modes
Rx Lock (%) Logon (%)	Rx locked and logon time, in percent, for the sampling interval.
Pos Ok (%)	Valid position, in percent of the sampling interval.
VMU Connection (%)	Link with VSAT modem, in percent of the sampling interval.
Blocking (%)	Ship in blocking zone, in percent of the sampling interval.
DualAntenna.mode DualAntenna.logon_remote (%) DualAntenna.active (%)	Shows the current mode and the time active and remote logon.

Table 6-16: Parameters recorded in a statistics report (Continued)

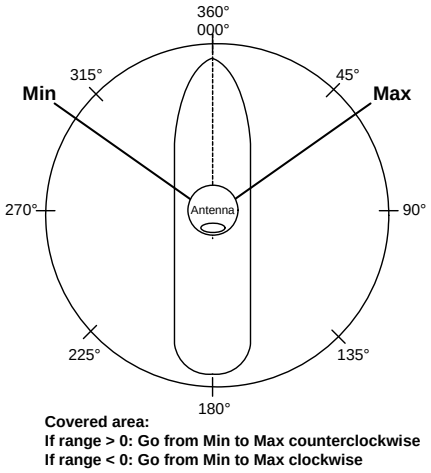


Figure 6-26: Statistics — how to read data for a range

Processing the statistics report in a spreadsheet application

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

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

The following figure shows an example of a statistics report in MS Excel 2007.

Remote syslog

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

To set up sending syslog messages to a syslog server, do as follows:

1. Select **SETTINGS > Reporting**.
2. In the section **Remote syslog** select **On** to enable remote syslog (default: **Off**).
3. Enter the IP address of the syslog server to which the syslog messages will be sent.
4. Click **Apply**.

SNMP traps

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.

To set up reporting SNMP traps to an SNMP server, do as follows:

1. Select **SETTINGS > Reporting**.
2. In the section **SNMP traps** select **On** to enable sending of SNMP traps (default: **Off**).
3. Enter the IP address of the SNMP trap receiver/manager to which the SNMP traps will be sent.
4. Enter the Community name. This is the name of the SNMP trap receiver/manager. This is needed for authentication of the SNMP trap request.
5. Click **Apply**.

6.3.7 Dual antenna mode (optional)

The following tasks must be taken care of when setting up a dual-antenna system:

- *To configure the Master ACU*
- *To configure the Slave ACU*
- *Blocking zone setup for dual antenna setup*
- *Line up and commissioning for dual antenna setup*

At the bottom of the DASHBOARD of the web interface there is a section where you can switch over to the other ACU dashboard. Next to **Status** you can see whether the current ACU is active or not.

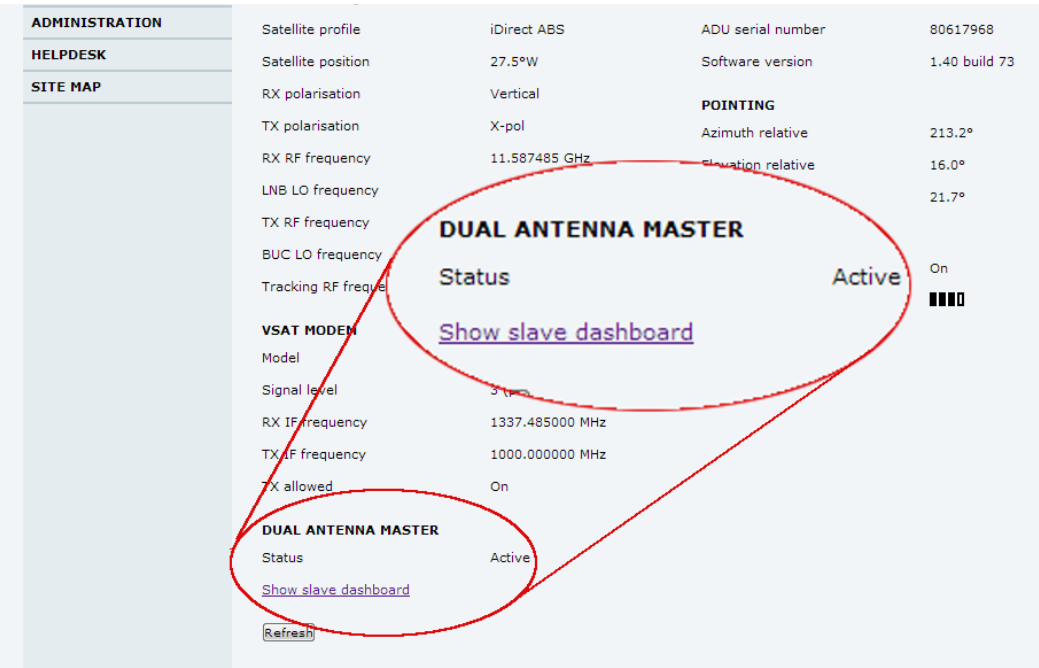


Figure 6-27: Dual-antenna mode, link on DASHBOARD

The dual-antenna system switches between the 2 antennas in the following scenarios:

- When in a programmed blocking zone.
- When the signal is blocked for more than 2 minutes.
- ADU is malfunctioning.

In the statistics report you can get more detailed information on the dual-antenna mode, see also Table 6-6-16 on page 6-34.

To configure the Master ACU

The Master ACU is configured exactly the same way as a stand-alone SAILOR 900 VSAT High Power system with satellite profiles and VSAT modem profiles. Do as follows:

1. Go to **SETTINGS > Dual antenna**.

2. Select **Enable** and click **Apply**.

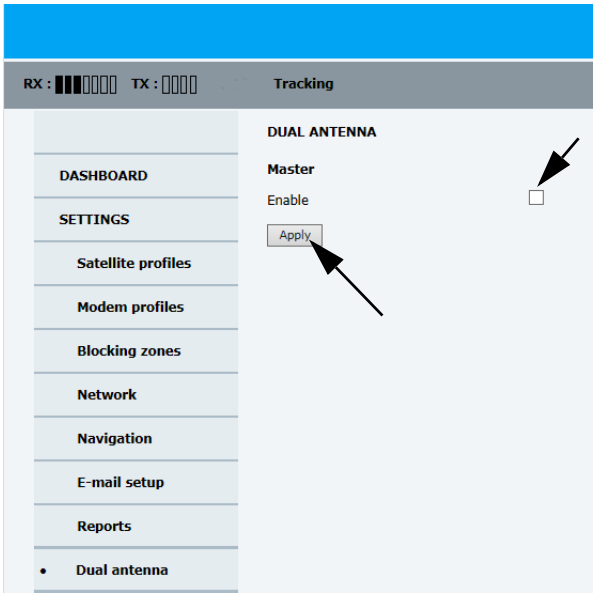


Figure 6-28: Enabling dual-antenna mode in Master ACU

The SAILOR 900 VSAT High Power is now ready to act as Master ACU.

To configure the Slave ACU

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

1. Add a specific VSAT modem profile for dual-antenna mode, go to **SETTINGS > Satellite profiles > VSAT modem profiles > New entry**.

Figure 6-29: Dual-antenna mode, add modem profile for slave ACU (example)

2. Enter the profile name, for example Dual Antenna Master.
3. As modem select **Dual Antenna Master**.
4. IP address: this is the IP address of the LAN connector at the Master ACU. See *To configure the LAN network* on page 6-30.
5. Click **Apply**.

6. Add a satellite profile that uses the modem profile **Dual Antenna Master**, go to **SETTINGS > Satellite profiles > New entry**.

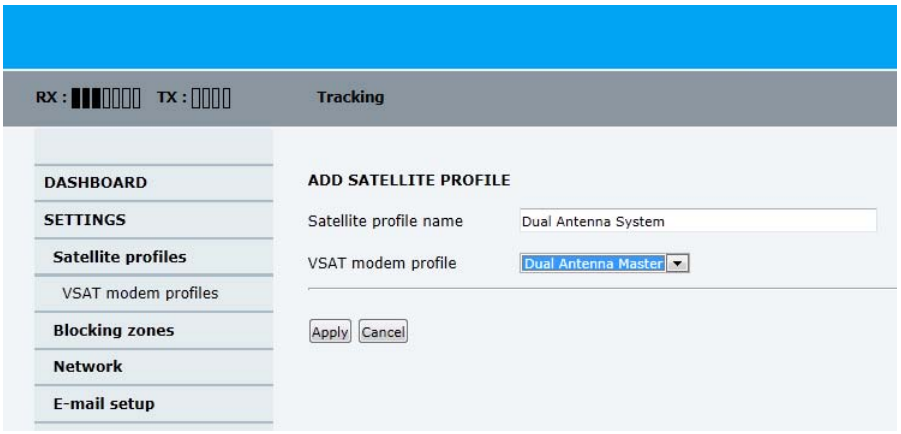


Figure 6-30: Dual-antenna mode, add Slave satellite profile

7. Enter the satellite profile name, for example: **Dual Antenna Master**.
8. As modem profile select **Dual Antenna Master**.
9. Click **Apply**.
10. Go to **SETTINGS > Satellite profiles**.

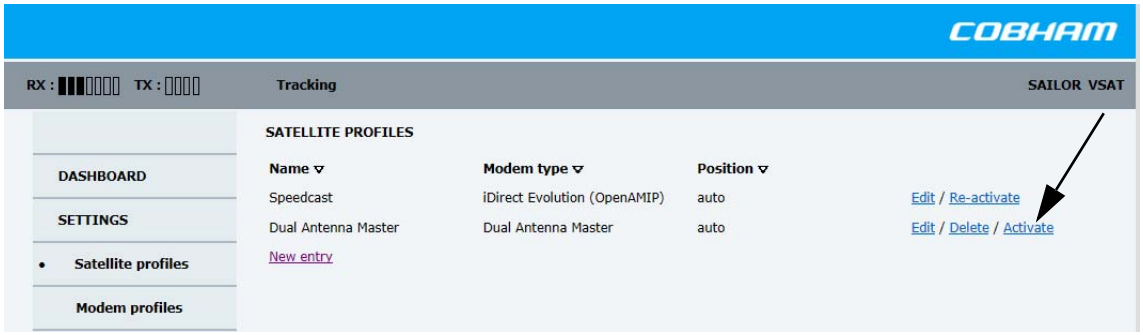


Figure 6-31: Dual-antenna mode, Activate

11. Click **Activate** to activate the satellite profile **Dual Antenna Master**

Blocking zone setup for dual antenna setup

It is recommended to define the following 3 blocking zones in each SAILOR 900 VSAT High Power system:

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

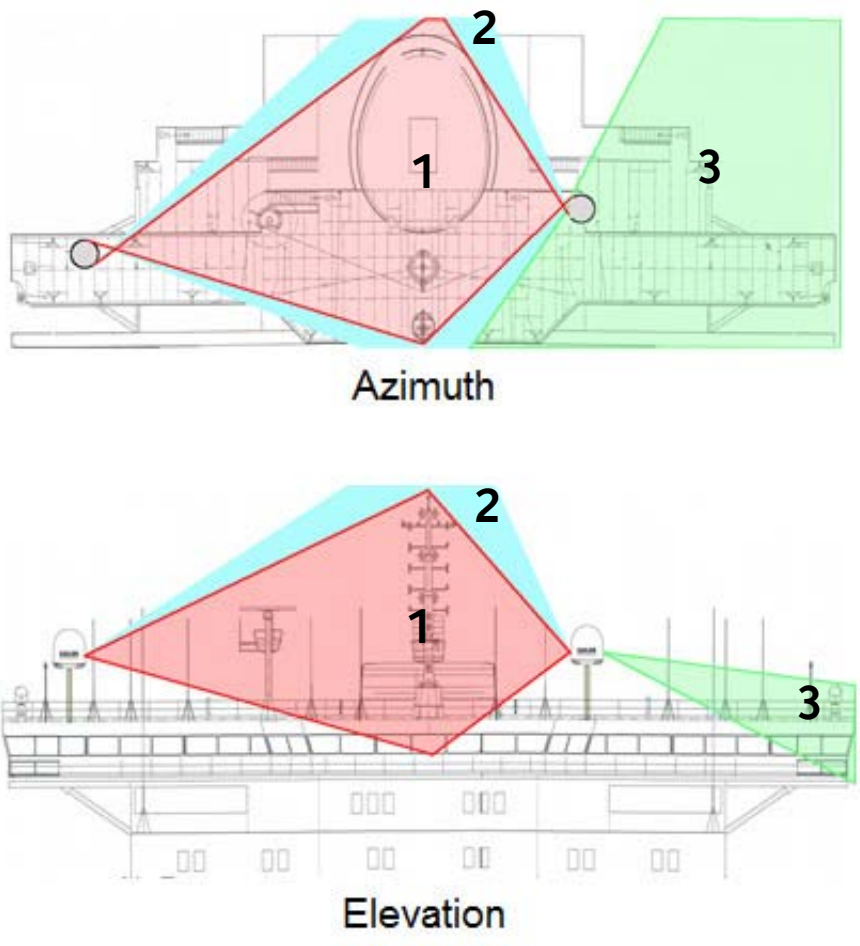


Figure 6-32: Dual-antenna mode, blocking zones — azimuth and elevation

For instructions how to set up blocking zones see *To set up blocking zones (RX and TX)* on page 6-28.

Line up and commissioning for dual antenna setup

The SAILOR 900 VSAT High Power antenna systems must be lined up and commissioned one by one. The line-up procedure is done for each antenna as it would have been done for a single antenna system. In order to be able to do the line-up for each antenna you must force the dual system to use one or the other antenna at a time. Do as follows:

1. Enter the web interface of the Master ACU, go to the page **SERVICE > Dual antenna mode**.

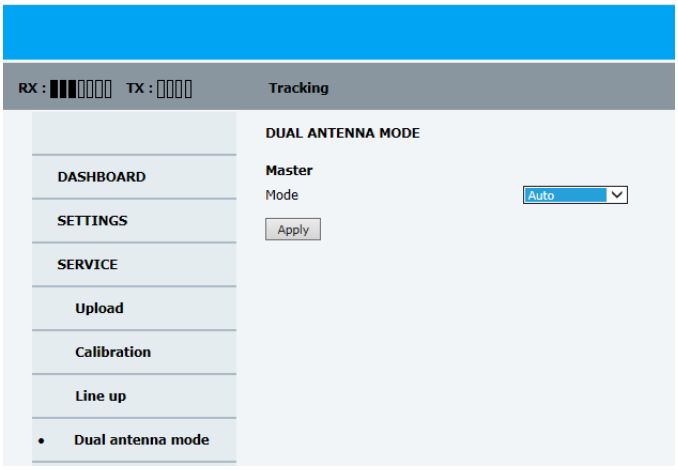


Figure 6-33: Dual-antenna mode, line up

2. Set the mode to either **Master active** or **Slave active** to force the system to use that antenna until it is changed again or the Master system is rebooted. After reboot the dual antenna mode will be set to **Auto** (default).

6.3.8 Upload of new software

For uploading new software to the SAILOR 900 VSAT High Power see *Software update* on page 8-5.

6.3.9 Administration

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

- *To access the administration settings (user name, password)*
- *To set up user permissions*
- *To import and export a system configuration*
- *To reset to factory default*

To access the administration settings (user name, password)

The ADMINISTRATION settings require an administration user name and password. To log on as administrator, do as follows:

1. Select **ADMINISTRATION** from the left navigation pane.
2. Enter the Administration user name and password.

The user name is **admin** and the default password is **1234**.

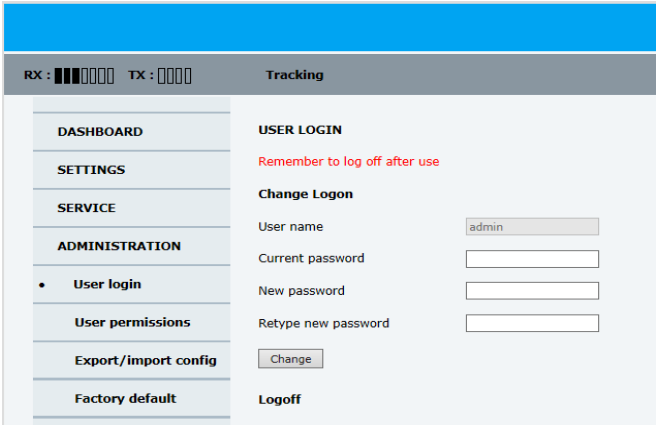


Figure 6-34: Web interface: Administration

If you have forgotten the administrator password, you can reset the password. For further information, see the next section.

3. Click **Logon**.
   The Administration page is now updated to let you change the user name and password or log off Administration.

To change the password for administrator or guest users, do as follows:

1. After entering the user name and password in the **User login** page, locate the section **Change Logon**.

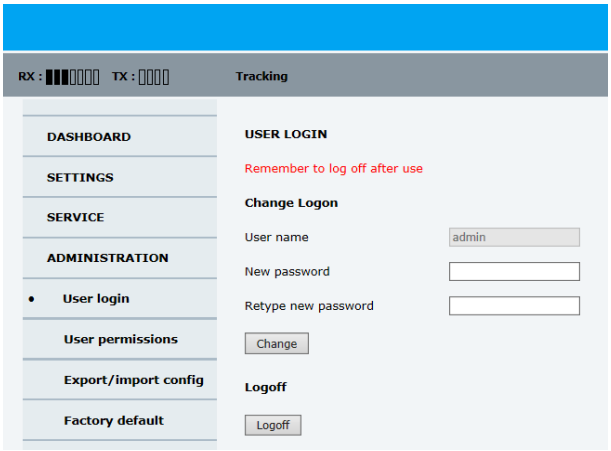


Figure 6-35: Web interface: Administration, change password

2. Type in the new password and retype it on the next line.
3. Click **Change**. At the next logon the new password is required.

To reset the administrator password, do as follows:

1. Contact your service partner for a reset code. Report the serial number of the ACU. You find it in the **Dashboard**, **ACU serial number**.

2. Click the link **Forgot administrator password?** at the bottom of the **ADMINISTRATOR LOGON** page (see Figure 6-34: *Web interface: Administration*).

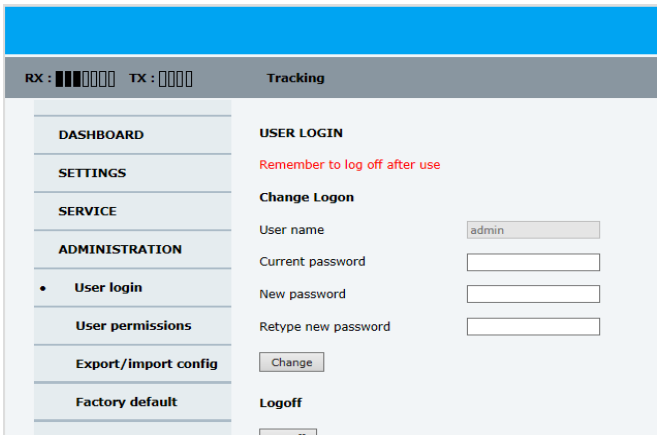


Figure 6-36: Web interface: ADMINISTRATION, Reset administrator password

3. Type in the reset code obtained from your service partner and click **Reset**.
4. Type in the user name **admin**, the default password **1234** and click **Logon**.

To log off administration

If you have not entered anything for 30 minutes under **ADMINISTRATION**, you are logged off automatically. To log off manually, click **Logoff** under administrator logoff in the **ADMINISTRATION** page.

To set up user permissions

You can manage user access to certain functions of the SAILOR 900 VSAT High Power system. You can allow or deny users that are not administrators access to certain functions and make these pages read-only. This is useful if you want to protect the system against unintended changes or tampering of the system.

Important Study this screen thoroughly and decide which areas of the SAILOR 900 VSAT High Power system you want to give non-administrator users access to.

To set up the user permissions, do as follows:

1. From the left navigation pane, select **ADMINISTRATION > User permissions**.
2. For each item under **ALLOW USERS TO**: select
   - **Yes** to allow access
   - **No** to block access to the settings. Then the pages are read-only, changes cannot be made by non-administrator users.

   Change network: Change IP configuration of the LAN connectors. For further information see *To configure the LAN network* on page 6-30.
   Change email settings: Change e-mail addresses for sending reports. For further information see *E-mail setup* on page 6-32.
   Modify antenna data: Only used during service and maintenance.

Require guest login: You must enter user name **guest** and password to enter the web interface. Use user name **guest** and the password **guest** (default) or the user name **admin** and the password **1234** (default).

3. Click **Apply**.

The settings to which access is denied are now greyed out for the non-administrator user.

To import and export a system configuration

If you need to reuse a configuration in another SAILOR 900 VSAT High Power system, you can save the current configuration to a file, which can then be loaded into another SAILOR 900 VSAT High Power. You can also use this feature for backup purposes.

The configuration file contains all the settings you have entered during system setup: satellite profiles, LAN setup, blocking zones, etc.

To save a configuration to a file, do as follows:

1. Select **ADMINISTRATION > Export/import config**.
2. Click the button **Export**. Follow the download instructions on the screen. You can use this configuration file for upload into another SAILOR 900 VSAT High Power,

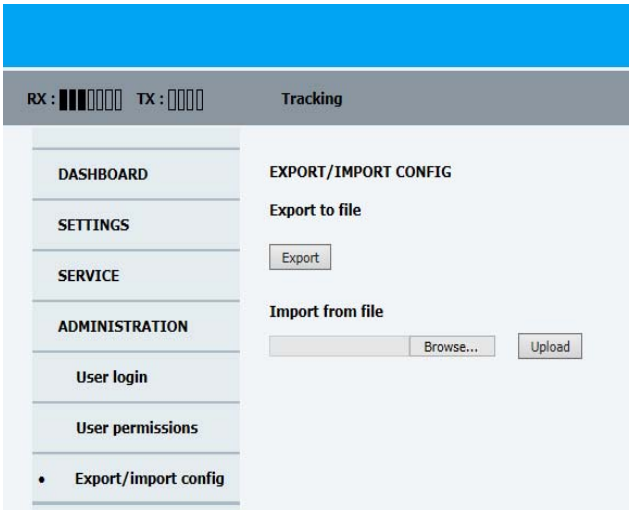


Figure 6-37: Web interface: Administration, Export/import configuration

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

1. Select **ADMINISTRATION > Export/import config**.
2. Click the button **Browse** and locate the configuration file (.cfg file) you want to upload. Then click the button **Open**.
3. In the web interface click the button **Upload**.

To clone a system configuration, do as follows:

1. Reset to factory default, see the following section for details.
2. Import a configuration from file, see section above.

To reset to factory default

When resetting SAILOR 900 VSAT High Power to factory default, the following settings are deleted:

- All satellite profiles
- All modem profiles
- Blocking zones
- Heading settings
- Network setup
- User permissions
- ACU display: brightness setting

To reset to factory default settings, do as follows:

1. From the left navigation pane, select **ADMINISTRATION > Factory default**.

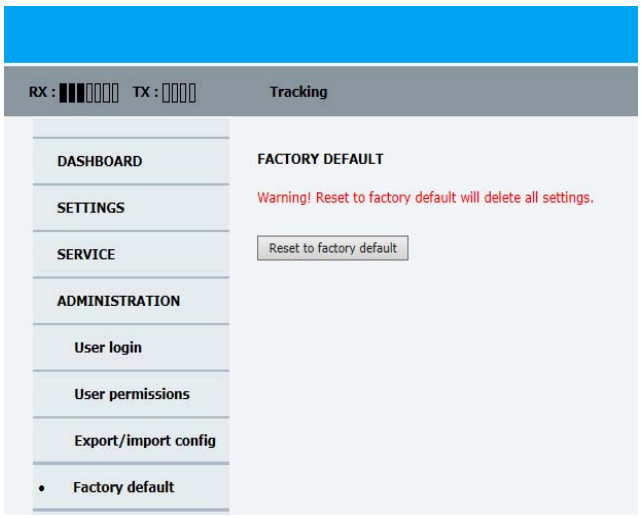


Figure 6-38: Web interface: ADMINISTRATION, Factory default

2. Click **Reset to factory default**.

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

6.4 Keypad and menus of the ACU

6.4.1 ACU display and keypad

In the ACU 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.

1. Current status of the SAILOR 900 VSAT High Power:

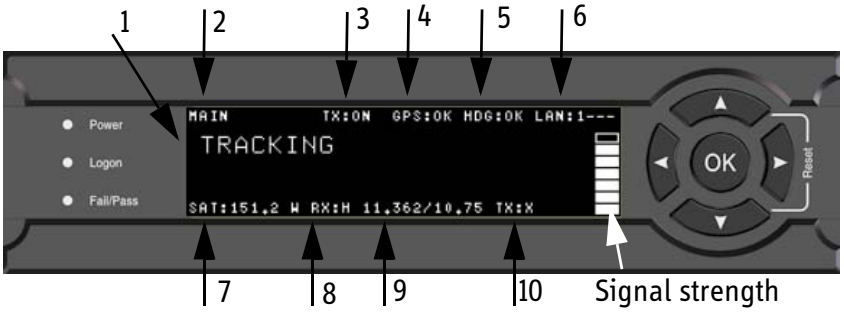


Figure 6-39: Display (example) and keypad of the ACU

NOT READY (waiting for input from GNSS, e.g. GPS)
ANTENNA INITIALIZING
ANTENNA SW UPLOAD
ANTENNA POST ERROR
XIM DATA ERROR
UNRECOVERABLE XIM DATA ERROR
SYSTEM UPGRADE
ANTENNA POST PENDING
ANTENNA POST
SAFE MODE (error, followed by an error description)
SERVICE SWITCH (service switch in ADU activated)
Ready (waiting for data from the modem or no satellite profile selected)
POINTING ANTENNA (locating the satellite)
ACQUIRING SIGNAL (acquiring the satellite signal)
TRACKING (tracks the current satellite)
LINEUP (line up is activated)
AZIMUTH CALIBRATION
TX CABLE CALIBRATION
TEST
NOT READY (waiting for input from GNSS, e.g. GPS)
NOT READY: **INITIALIZING**
NOT READY: **NEED POS**
BLOCKING ZONE (antenna is pointing into a blocking zone)
NO TX ZONE (antenna is pointing into a no TX zone; TX is off)

2. Current menu.
3. TX: Current transmission state, ON or OFF (off when in blocking zone).
4. GPS: GPS signal is received from the GPS module, OK or —.

5. HDG: Ship heading data received from the ship's gyro, OK or —.
6. LAN: LAN connectors used, 1, 2, 3, 4, —.
7. SAT: Satellite position of currently active satellite profile.
8. RX: RX polarisation of currently active satellite profile. H (horizontal), V (vertical), L (left-hand) R (right-hand).
9. RF tracking frequency in GHz and LNB LO Frequency.
10. TX:X TX polarisation of currently active satellite profile. X (Cross polarisation) or Co (Co-pol).

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

6.4.2 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 or enter a number, digit by digit.
- Use the arrow keys ◀ and ▶ to go through the settings and move from one digit to the next.
- Press **OK** to select a setting.
- Press ◀ again to move one level up. If applicable, confirm to store the new setting by pressing **OK**.

6.4.3 The menu tree

In the menu tree you can see how the system has been configured. To enter satellite information directly, use a connected PC and the web interface.

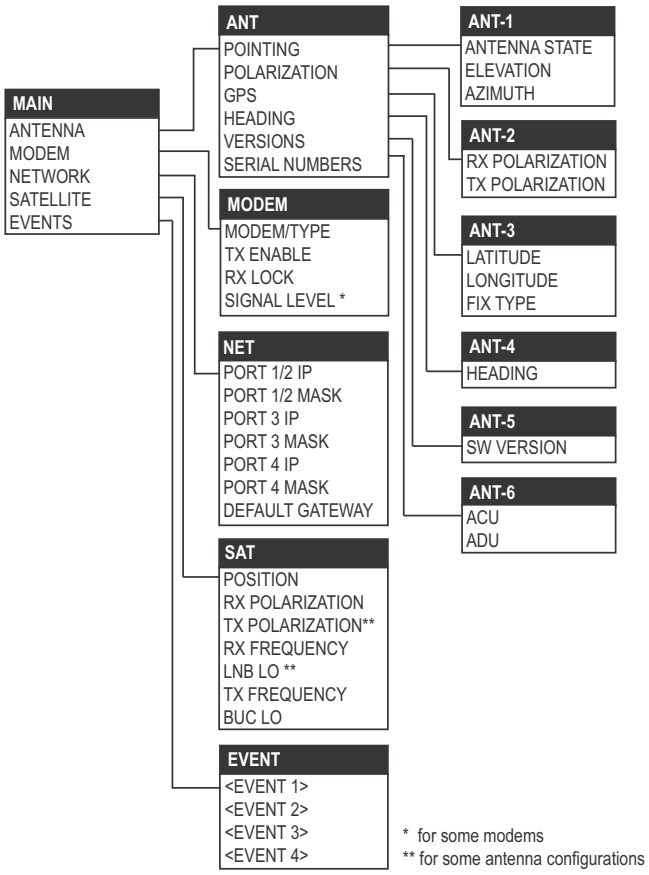


Figure 6-40: Antenna Control Unit, menu tree

Top-level menu

Top-level menu	Description
MAIN	View with current status of the SAILOR 900 VSAT High Power. This view is displayed after a time out of 10 minutes. Press any key (except left arrow) to enter the menu at **MAIN**. New events are shown in this display. If an event is displayed, press **OK** to jump directly to the menu **EVENTS** for viewing the currently active events.
ANTENNA	Shows the current ADU parameters, position, software version and serial numbers of the ADU and ACU.
MODEM	Selected VMU type and setup, including signal level.
NETWORK	Shows the IP addresses and netmasks of the LAN connectors of the ACUand the management mask.

Table 6-17: Top-level menus of the ACU

Top-level menu	Description
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 6-17: Top-level menus of the ACU (Continued)

Menu descriptions

ANTENNA menu	Description
POINTING	ANTENNA STATE: Current state of the antenna, e.g. TRACKING ELEVATION: Current elevation angle of the antenna AZIMUTH: Current azimuth of the antenna, with reference to North
POLARISATION	RX POLARISATION: HORIZONTAL or VERTICAL, read from connected VSAT modem. TX POLARIZATION: X-POL or Co-POL, read from connected VSAT modem.
GPS	LATITUDE: current latitude, read from GPS module. LONGITUDE: current longitude, read from GPS module. FIX TYPE: 2D or 3D
HEADING	Ship's heading in degrees with reference to North, provided by the ship's gyro.
VERSIONS	Current software version.
SERIAL NUMBERS	ACU: ACU serial number; ADU: Serial number of the antenna

Table 6-18: ANTENNA menu of the ACU

MODEM menu	Description
MODEM TYPE	Connected modem type.
TX ENABLE	On or off, information delivered by the connected VSAT modem.
RX LOCK	On or off, information delivered by the connected VSAT modem.
SIGNAL LEVEL	Current input signal level from VSAT modem. iDirect openAMIP modem: (PWR) 0-500, delivered by the connected modem. For values <250 the antenna searches after a new signal. Other modem: Signal level in dB.

Table 6-19: MODEM menu of the ACU

NETWORK menu	Description
PORT 1/2 IP	Current IP address for LAN 1 and LAN 2.
MASK 1/2	Current netmask for LAN 1 and LAN 2.
PORT 3 IP	(LAN 3) Current IP address of the SAILOR 900 VSAT High Power web interface (default: 192.168.0.1).
MASK 3	(LAN 3) Current netmask of the SAILOR 900 VSAT High Power web interface (default: 255.255.255.0).
PORT 4 IP	Current IP address for LAN 4.
MASK 4	Current netmask for LAN 4.
DEFAULT GATEWAY	Current default gateway.

Table 6-20: NETWORK menu of the ACU

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

Table 6-21: SATELLITE menu of the ACU

EVENT menu	Description
<EVENT>	In this menu all active events are listed. Use ▼ and ▲ to go through the active events. Events can be of the type WARNING or ERROR. The event time is UTC time. 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. Press to **>** to see the remaining text.

Table 6-22: EVENTS menu of the ACU

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.

6.4.4 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.

6.4.5 Power cycle of the ACU and ADU

To power cycle the ACU and ADU do as follows:

1. Press and hold ▲ and ▼ until the ACU display shuts down and the ACU reboots.
2. Wait until the system has rebooted and is operational again. The last active satellite profile will be used.

6.5 SNMP support

The SAILOR 900 VSAT High Power supports SNMP v2 requests to retrieve configuration and present settings. SNMP is always enabled on all Ethernet interfaces. The SNMP community string is **public**. The SAILOR 900 VSAT High Power 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 SAILOR 900 VSAT High Power MIB file.

The MIB entries are grouped as shown below:

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

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

You can download the ACU MIB file directly from the ACU:

1. Go to the **HELPDESK** page.
2. Click the link **Download MIB file**.

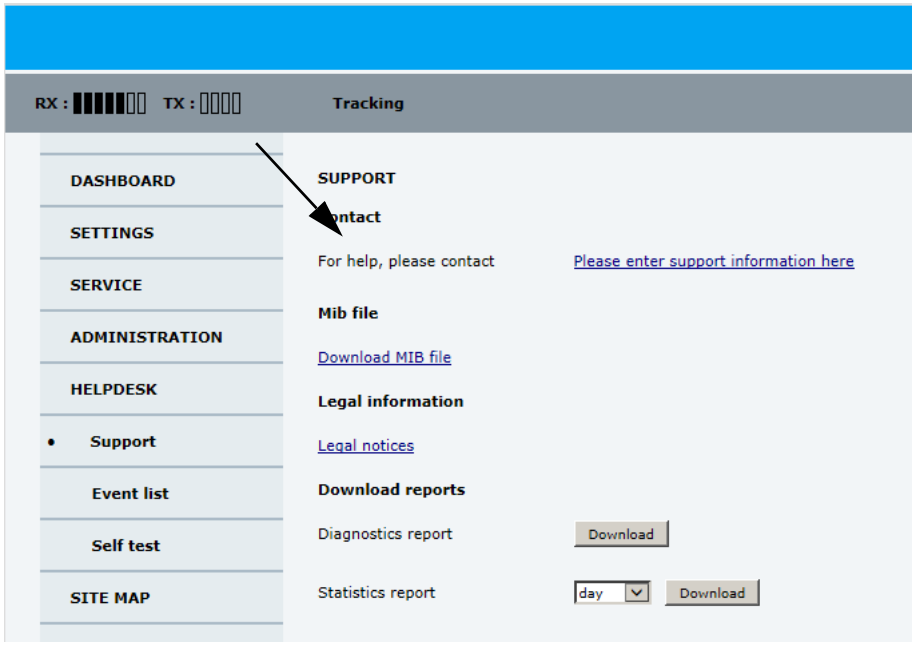


Figure 6-41: Download of the MIB file

3. Save the file on your computer.

You can also download the ACU MIB from Cobham eSupport web site.

You can set up SNMP traps, see *Reports, syslog and SNMP traps* on page 6-33.

Installation check

Now that you have installed the system, you can test it to verify it is ready for customer delivery. Follow the check lists below to test the system for proper operation.

- *Installation check list: Antenna*
- *Installation check list: ACU, connectors and wiring*
- *Installation check list: Functional test in harbor*

7.1 Installation check list: Antenna

Step	Task	Further information	Done
1.	Check that the antenna is free of obstructions.	See *Obstructions (ADU shadowing)* on page 3-4.	
2.	Make sure there is sufficient space for access through the service hatch.	See *To install the ADU* on page 3-18.	
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 3-5 and *To set up blocking zones (RX and TX)* on page 6-28.	
6.	Make sure that the safety distance for radiation hazard is 47 metres.	See *Safe access to the ADU: Radiation hazard* on page 3-6.	
7.	Check that the mounting height of the antenna is in accordance with the ship's min. roll period.	See *Ship motion and offset from the ship's motion centre* on page 3-7.	

Table 7-1: Installation check list: Antenna

Step	Task	Further information	Done
8.	Make sure that the requirements for mast foundation and height, including flatness, gusset plates and distance from welding seams are met.	See *ADU mast design: Foundation and height* on page 3-8.	
9.	Make sure that the distances to radar, Inmarsat systems, GPS receivers and other transmitters are as required.	See *Interference* on page 3-12.	
10.	Make sure that the drain tube is open and risk for water intrusion is at a minimum.	See *Other precautions* on page 3-16.	
11.	Check that the ADU is grounded correctly, using the mounting bolts.	See *To ground the ADU* on page 3-22 and *Grounding and RF protection* on page F-1.	

Table 7-1: Installation check list: Antenna (Continued)

7.2 Installation check list: ACU, connectors and wiring

Step	Task	Verification and further information	Done
1.	Check that the ACU is grounded correctly, using the mounting bolts and washers.	See *To ground the ACU* on page 3-25 and *Grounding and RF protection* on page F-1.	
2.	Make sure you strain relieved the cables.	See *To install the ACU* on page 3-24.	
3.	Make sure that the VSAT modem is mounted close to the ACU.	See *General mounting considerations — VMU* on page 3-25.	
4.	Check that the ADU antenna N-connector is properly connected with the 50 Ohm RF cable.	Visual inspection of the cover plate at the bottom of the ADU.	
5.	Check that the ACU antenna N-connector is properly connected with the 50 ohm RF cable.	Visual inspection of the connector panel of the ACU.	
6.	Check that the ACU's **Rx Out** is connected to the VSAT modem's Rx in using the included 1 m F-F 75 ohm cable.	Visual inspection of the connector panel of the ACU and the VSAT modem.	
7.	Check that the ACU's **Tx In** is connected to the VSAT modem's Tx out using the included 1 m F-F 75 ohm cable.	Visual inspection of the connector panel of the ACU and the VSAT modem.	

Table 7-2: Installation check list: ACU, connectors and wiring

Step	Task	Verification and further information	Done
8.	Check connection of the VSAT modem: **COMTECH only!**: Check that the ACU RS-232 port is connected to the Remote Control port and Alarm port of the VMU using the serial cable (specifications in *Modem Cable COMTECH Serial & RSSI TT7016A* on page B-2). **iDirect iNFINITI Series/ Evolution only!**: Check that the ACU RS-232 port is connected to the Console port of the VMU using the included serial cable. **iDirect iNFINITI Series only!**: Check that the ACU LAN port 1 is connected to the LAN B of the VMU using the included CAT5 Ethernet cable. **iDirect Evolution only!**: Check that the ACU LAN port 1 is connected to the LAN of the VMU using the included CAT5 Ethernet cable. **STM SatLink 2900**: Check that the ACU LAN port 1 is connected to the LAN of the VMU using the included CAT5 Ethernet cable. **Gilat SkyEdge II VSAT modem**: Check that the ACU RS-232 port is connected to the SERIAL port of the VMU using the included serial cable.	Visual inspection of the connector panel of the ACU and the VSAT modem. See also: *COMTECH 570L and ROSS box* on page C-17 *OpenAMIP setup for iDirect iNFINITI & Evolution* on page C-3 *OpenAMIP setup for iDirect iNFINITI & Evolution* on page C-3 *STM SatLink 2900 VSAT modem* on page C-22 *Gilat SkyEdge II VSAT modem* on page C-26	
9.	Check that the ADU's NMEA 0183 connector is connected to the NMEA 0183 bus of the vessel using the included multi-connector	Visual inspection of the connector panel of the ACU connector.	

Table 7-2: Installation check list: ACU, connectors and wiring (Continued)

7.3 Installation check list: Functional test in harbor

Step	Task	Further information	Done
1.	Check that the antenna is tracking the satellite	The logon LED in the ACU display must be steady green and the display shows: **TRACKING**. In the web interface check: **DASHBOARD**: **System status**: **Tracking**	
2.	Check that the VMU is in lock and ready for Tx.	In the web interface check: DASHBOARD > VSAT MODEM > Signal level and RX frequency show values.	
3.	Connect a user PC LAN (not the service PC) to the Internet LAN connector, either on the LAN port 2 of the ACU (only X5 VSAT modem) or to the User LAN connector on the VMU.	Check the VSAT modem documentation for details.	
4.	Open a DOS window and type: ping 4.2.2.2.	Check that you get a response.	
5.	Open a web browser and browse to www.google.com.	Check that the web page is downloaded.	
6.	If step 4 is successful and step 5 is not then it seems like the DNS is not configured correctly.	Check the VSAT modem documentation how to set up the DNS server, “Obtain DNS server address automatically” or enter specific DNS server addresses.	

Table 7-3: Installation check list: Functional test in harbour

Service

This chapter is organised in the following sections:

- *Getting support: Helpdesk*
- *Software update*
- *Status signalling with LEDs and status messages*
- *Removal and replacement of the ACU*
- *Removal and replacement of ADU modules*
- *Troubleshooting*

8.1 Getting support: Helpdesk

If this manual does not provide the remedies to solve your problem, contact your service provider.

8.1.1 Help desk and diagnostic report

During the installation you can enter the support contact for this installation.

To access the Help desk, select **HELPDESK** from the left navigation pane.

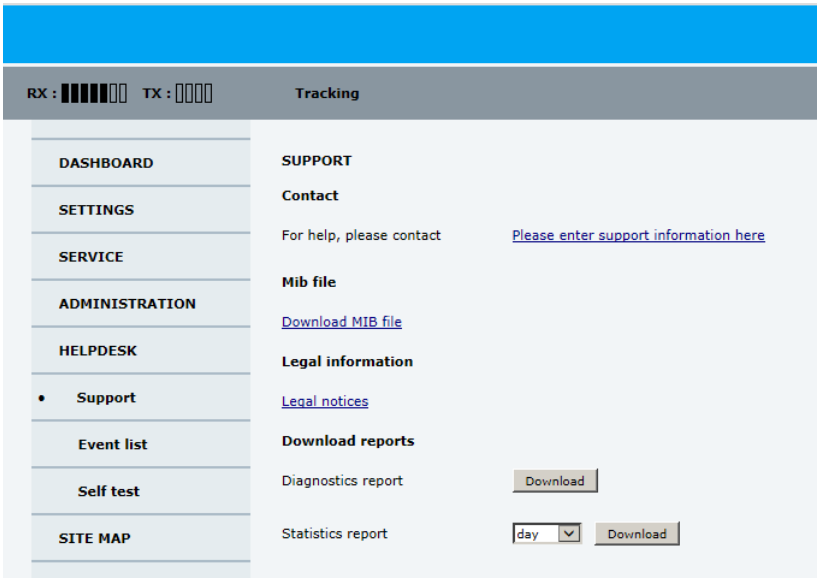


Figure 8-1: Web interface: HELPDESK

Click the link, enter support contact information and click **Apply**.

You can download the MIB file.

At Legal notice the licence text for the source code of the parts of the SAILOR 900 VSAT High Power software that falls under free and open source software can be displayed.

If you need help **with ACU or ADU related issues** call your service provider.

To download diagnostic and statistics reports

You can download a diagnostic report. The Diagnostics report contains information relevant for the service personnel during troubleshooting. It is also useful documentation of the current setup. It contains all parameters set during configuration:

The main sections are:

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

To generate a diagnostics report do as follows:

1. Click **HELPDESK > Download**
2. Save the file to your computer.

You can download a statistics report. This report contains information relevant for the service personnel during troubleshooting. To generate a statistics report select the period for the statistics from the drop down list and click **Download**.

You can also configure the system to send statistics reports at defined time intervals. For further details on this see *Reports, syslog and SNMP traps* on page 6-33.

Event list

When an event is registered, the web interface shows an event icon ⚠ in the icon bar as long as the event is active. The ACU display shows also active events. 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 **HELPDESK > Event list** from the left navigation pane.

The **Event list** 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. Active events are cleared from the event list when the error is cleared. They are moved to the section **Notifications** and are displayed for 24 hours. All entries in the section **Notifications** are cleared automatically after 24 hours and after restart of the system.

For a list of all events with description, error code (ID), explanation and remedy see *List of events with explanation and remedy* on page C-1.

Self test

You can start a self test of the SAILOR 900 VSAT High Power. The self test checks all vital parts of the antenna and ACU. If a malfunction is detected, the unit provides system messages with a description of the failing test. This is indicated by in the icon bar and in the ACU display. All system messages are listed in *System messages* on page G-1.

You can start a self test of the SAILOR 900 VSAT High Power ADU and ACU.

1. Click **Self test** in the **HELPDESK** page.
2. Click the menu item **Self test**.

Important Warning! The SAILOR 900 VSAT High Power will reboot to perform the self test. Rebooting the ACU will terminate all existing connections.

Reset to factory defaults

You can reset the SAILOR 900 VSAT High Power ADU and ACU to factory defaults. See *To reset to factory default* on page 6-45.

Important Warning! Reset to factory default will delete all settings, including satellite and modem profiles, blocking zones, network setup, user permissions and ACU display brightness settings.

8.2 Software update

8.2.1 Hardware and software requirements

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

- One computer with a standard Ethernet port available.
- A standard Internet browser.
- 1024×768 pixels or higher display resolution. The program is best viewed using small fonts.
- One straight LAN cable.
- The file with the new software.

8.2.2 Software update (ADU and ACU)

Note Only qualified service personnel.should make a software update.

Software update using the web interface of the ACU

1. Power up the SAILOR 900 VSAT High Power system, i.e. switch on the ACU. Wait until the SAILOR logo has disappeared from the ACU display.
2. Connect a PC to LAN interface 3 (Service port, standard Ethernet) or the front LAN connector of the ACU.
3. Open your Internet browser and enter the IP address of the ACU. The IP address is **http://192.168.0.1** (default). For further details on network setup see *To configure the LAN network* on page 6-30.
4. If needed, type in the user name **admin** and the password **1234**.
5. The web interface opens directly with the **DASHBOARD** page.
6. Click **SERVICE** from the left navigation pane. The **UPLOAD SOFTWARE TO TERMINAL** page is displayed.
7. Click **Browse...** and locate the new software file.
8. Click **Upload**.
   Note that the upload procedure takes a couple of minutes. When done, the ACU 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.

   The start-up procedure after a software upload takes longer than the usual start-up time, as the software in the ADU must also be updated. The ACU display shows: **ADU SW UPLOAD**.
9. Click **Switch to this version** if you want to force the system to use the alternative software version stated in the display.

Software recovery procedure (SAFE MODE)

To recover from a failed software upload, turn off the ACU and turn it on again. Then repeat the upload procedure as described in *Software update* on page 8-4. If this does not help use the following recovery procedure:

1. Switch off the ACU.
2. Press and hold down the arrow keys ◀ and ▶ on the keypad.
3. Switch the ACU on and wait for the display to show with a small font size **SAFE MODE** in the top left corner.

Figure 8-2: Recovery procedure after failed software upload

4. Release the arrow keys ◀ and ▶.
5. Connect a PC to LAN port 3 of the ACU.
6. Set the IP address of the PC to static: IP:192.168.0.2, Subnet: 255.255.255.0
7. Open an Internet browser and type http://192.168.0.1 (Default IP address of the ACU).

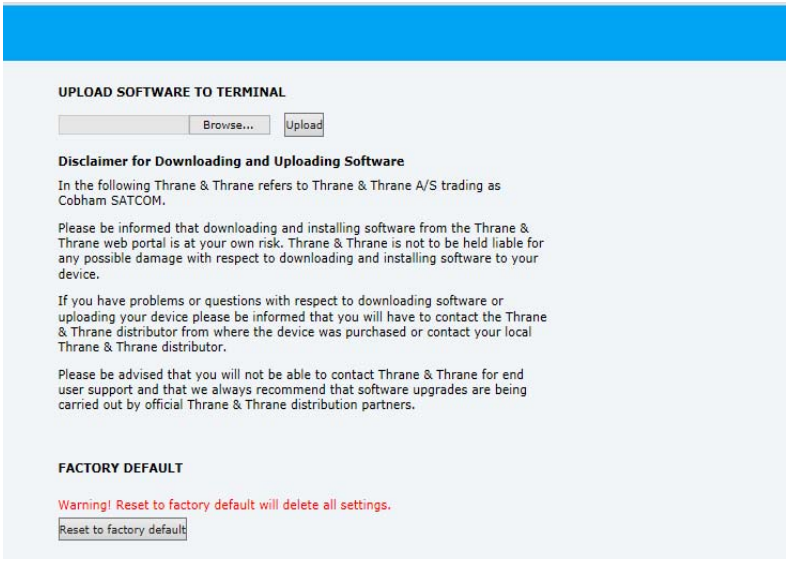


Figure 8-3: Upload software to terminal

8. Click **Browse...** and locate the software file.
9. Click **Upload**.

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

8.2.3 To verify the software update

1. The software version can be viewed in the **DASHBOARD** window of the web interface.
2. After completing the software update procedure, the ACU will perform a POST (Power On Self Test).
3. When the POST has finished, the green Pass/Fail LED on the front of the ACU must become steadily green. Verify that the Pass/Fail LED is not red nor flashing orange once every 2 seconds. Wait until the Pass/Fail LED is green.
4. Verify that the software update has been completed successfully. You find the software version number in the **DASHBOARD** window of the web interface.

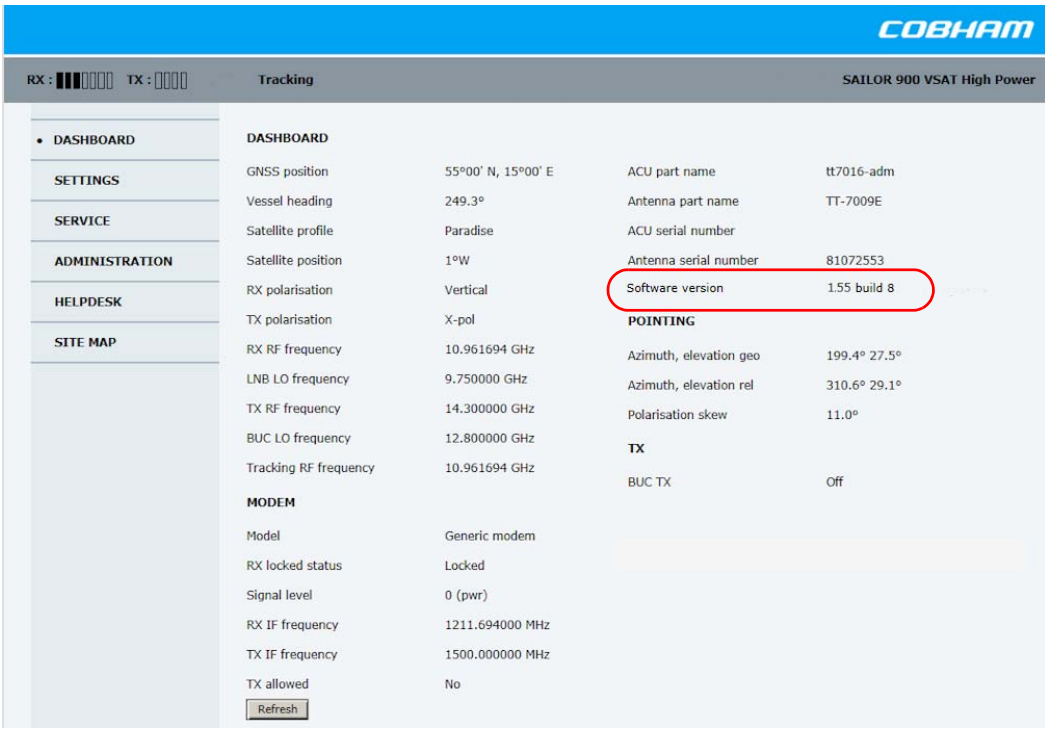


Figure 8-4: Verifying software update

8.3 Status signalling with LEDs and status messages

Built-In Test Equipment

The ADU and the ACU 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.
- Person Activated Self Test (PAST), which is initiated by starting a self test in the web interface **HELPDESK > Self test**.

For details on error messages after a POST or a self test see *Event list* on page 8-2.

Means of signalling

The SAILOR 900 VSAT High Power provides various methods for signalling the system status. **LEDs** on the front panel of the ACU are used to signal:

- Power on/off
-
- Fail/Pass

The built-in web interface of the ACU shows any events (BITE error codes) with a short message describing each error. This is also displayed in the ACU.

In an error situation, one of the following system status messages may be shown:

- ACU POST error
- ADU POST error
- SAFE MODE (plus information about the specific error, see *System messages* on page G-1).

8.3.1 LEDs of the ADU modules

Each ADU module has a Power and a Service LED.

LED	Behaviour	Description
Power	Steady green	Power supply OK
	Off	No power
Service	Steady green	Module ok, application running.
	Flashing green	Waiting for upload
	Flashing red/green	Uploading application
	Steady red	Module error or loading error

Table 8-1: LEDs of the ADU modules

For a list of modules see *Removal and replacement of ADU modules* on page 8-10.

8.3.2 LEDs in the ACU

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

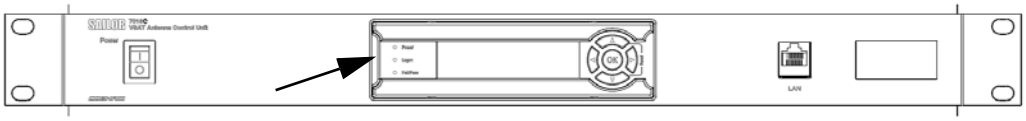


Figure 8-5: ACU — LEDs

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

Table 8-2: LEDs on the ACU

8.4 Removal and replacement of the ACU

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

8.5 Removal and replacement of ADU modules

All replacement of modules must be carried out by a Cobham SATCOM service partner. The figure below shows the modules and their position. Some modules are equipped with LEDs for status information and troubleshooting.

For instructions on how to open and remove the service hatch see *To open and remove the service hatch* on page 3-21.

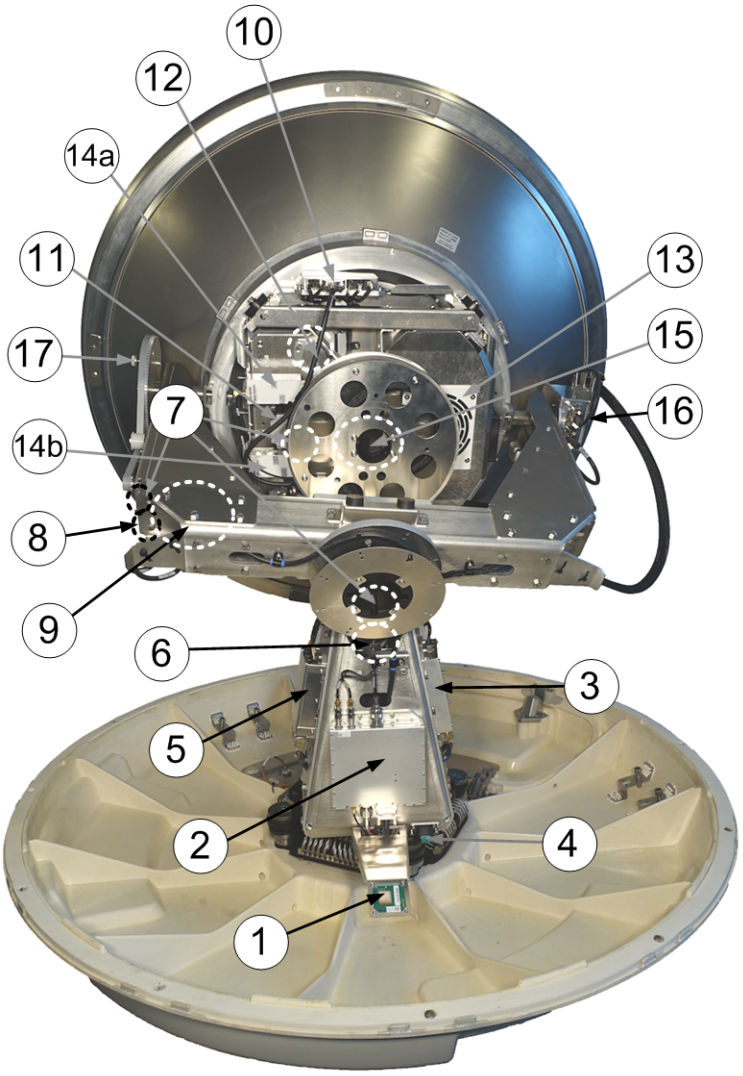


Figure 8-6: ADU modules and service switch

1. GNSS module (GPS, GLONASS, BEIDOU).
2. VSAT Interface Module (VIM).
3. Pedestal Control Module (PCM).
4. Service switch.

In switch-off position the DC Motor Driver modules (DDM) the Polarisation Motor Module (PMM) and the BUC are turned off for safe conditions during service and repair. The switch must be in on position for normal ADU operation.

5. DC-Motor Driver Module for cross elevation (DDM).
6. Cross elevation motor and encoder.
7. Zero Reference Module (x4, 3 in the previous figure, 1 in the next figure) (ZRM) (not visible on photo).
8. DC-Motor Driver Module for elevation (on the bottom side) (DDM).
9. Elevation motor and encoder (not visible on photo).
10. Polarisation Motor Module (PMM).
11. Polarisation motor.
12. Polarisation encoder (not visible on photo).
13. Block Up Converter (BUC). (behind cable screen)
14. Low Noise Block down converter (x2) (LNB)
15. Ortho Mode Transducer (OMT) (behind cable screen, not visible on photo).
16. Inertial Sensor Module (ISM).
17. Elevation locking pin to lock the antenna dish in a fixed position (for safety during service) (not visible on photo).

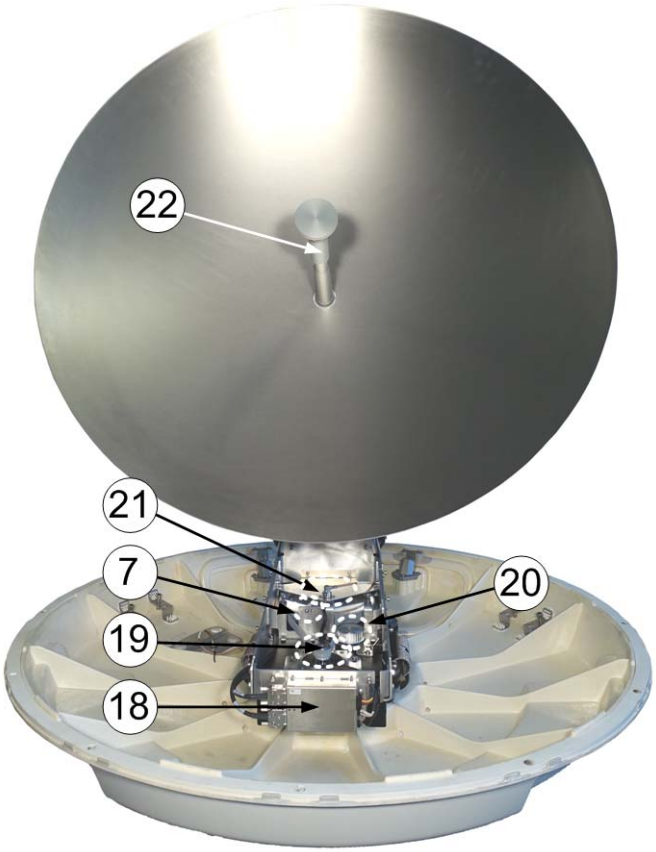


Figure 8-7: Above Deck Unit modules (continued)

18. DC-Motor Driver Module for Azimuth (DDM).
19. Azimuth motor.
20. Azimuth encoder.
21. Rotary joint.
22. Feed horn.

Before contacting your service partner check the LEDs on all modules (VIM, DDMs, PCM, PMM and ISM). See *LEDs of the ADU modules* on page 8-7 and *LEDs in the ACU* on page 8-8.

8.6 Troubleshooting

8.6.1 Overview

This section describes an initial check of the primary functions of the SAILOR 900 VSAT High Power 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 ACU display showing the active events. Possible failure states are shown in the web interface and the display of the ACU:

- SAFE MODE (e.g. hardware error, missing communication link between the ADU and ACU, excessive ship motion)
- XIM error (after exchange of modules)
- ADU POST error (hardware error)
- ACU POST error (hardware error)

For information on the function of the LEDs, see *Status signalling with LEDs and status messages* on page 8-7.

For a list of all the error messages and warnings, see *Event messages – overview* on page G-1.

8.6.2 Event list for troubleshooting

You can use the event list for troubleshooting. It is described in detail at *Help desk and diagnostic report* on page 8-1. You can download the event list as part of a diagnostic report.

8.6.3 Diagnostics report for troubleshooting

You can generate a diagnostic report containing results from the POST, all events and system log information since the last reset to factory default. For more information see *Reports, syslog and SNMP traps* on page 6-33.

8.6.4 To verify that the antenna can go into tracking mode

In case there is no RX lock on the connected VSAT modem you can activate a service profile to verify that the transponder data used during calibration are received correctly. If the SAILOR 900 VSAT High Power can go into tracking mode it is most likely not defective.

1. Go to **SETTINGS** or **Satellite profiles**.
2. Activate a satellite profile that is used for azimuth calibration. This is a satellite profile that uses the VSAT modem profile **Service & Calibration**.
3. Go to DASHBOARD and monitor the field System status. If the field ends up showing Tracking, the SAILOR 900 VSAT High Power can track the satellite and is most likely not the reason why the VSAT modem is not in RX lock.

8.7 Returning units for repair

Should your Cobham SATCOM product fail, please contact your dealer or installer, or the nearest Cobham SATCOM partner. You will find the partner details on www.cobham.com/satcom/service-and-support/cobham-satcom-service-and-support where you also find the Cobham SATCOM Self Service Center web-portal, which may help you solve the problem. Your dealer, installer or Cobham SATCOM partner will assist you whether the need is user training, technical support, arranging on-site repair or sending the product for repair. Your dealer, installer or Cobham SATCOM partner will also take care of any warranty issue.

Appendices

Technical specifications

A.1 SAILOR 900 VSAT High Power system components

A.1.1 General specifications

Item	Specification
Frequency band Rx	Ku/Ka (VSAT) 10.70 to 12.75 GHz13.75 to 14.50 GHz (extended)
Reflector size	103 cm (40 inch)
Certification	CE (Maritime), ETSI EN 302 340,CEI/IEC 60950-1, CEI/IEC 60945, CEI/IEC 60950-22
System power supply range	90-264 VAC
ADU cable type (ACU to ADU)	Single 50 Ohm coax cable for Rx, ACU-ADU modem and power
Total system power consumption	320 W typical, 480 W peak
ACU to ADU cable	Single 50 Ohm Coax for Rx, Tx, ACU–ADU modem, 10 MHz reference and DC power
Antenna connector at the ADU	Female N-Connector (50 Ohm)
Antenna connector at the ACU	Female N-Connector (50 Ohm)

Table A-1: General specifications

A.1.2 ADU

Item	Specification
Antenna type, pedestal	3-axis (plus skew) stabilised tracking ADU with integrated GNSS (GPS, GLONASS, Beidou)
Antenna type, reflector system	Reflector/sub-reflector, ring focus
Transmit gain	41.6 dBi typ. @ 14.25 GHz (excluding radome)
Receive gain	40.6 dBi typ. @ 11.70 GHz (excluding radome)
System G/T	19.9 dB/K typ. @ 12.75 GHz, at ≥30° elevation and clear sky (including radome)
BUC output power	20 W

Table A-2: Technical specifications for the Above Deck Unit

Item	Specification
EIRP	≥ 54.3 dBW (including radome)
LNB	2 units multi-band LNBs (band selection by ACU)
Tracking Receiver	Internal "all band/modulation type" DVB-S2, 300 kHz narrowband receiver and modem RSSI
Polarisation	Linear Cross or Co-Pol (selected by ACU)
Elevation Range	-25˚ to +125˚
Azimuth Range	Unlimited (Rotary Joint)
Ship motion, angular	Roll ±30˚, Pitch ±15˚, Yaw ±10˚
Ship, turning rate and acceleration	15˚/s and 15˚/s^2
ADU motion, linear	Linear accelerations ±2.5 g max any direction
Satellite acquisition	Automatic - with Gyro/GPS compass input Prepared for gyro-free operation support
Vibration, operational	Sine: IEC 60945 (8.7.2), DNV No.2.4 Class A, MIL-STD-167-1 (5.1.3.3.5) Random: Cobham Maritime Operational
Vibration, survival	Sine: IEC 60945 (8.7.2) dwell, MIL-STD-167-1 (5.1.3.3.5) dwell, IEC 60721-4-6 class 6M3
Shock	MIL-STD-810F 516.5 (Proc. II). IEC 60721-4-6 class 6M3
Temperature (ambient)	Operational: -25˚ C to 55˚ C Storage: -40˚C to 85˚C
Humidity	100%, condensing
Rain (IP class)	IEC 60945 Exposed (IPx6)
Wind resistance	Operational: 80 kt. Survival: 110 kt.
Ice	Survival: 25 mm (1 inch)
Solar radiation	1120 W/m2 to MIL-STD-810F 505.4
Compass safe distance	170 cm to IEC 60945
Maintenance, scheduled	None
Maintenance, unscheduled	All electronic, electromechanical modules and belts can be replaced through the service hatch.
Built-in tests	Power On Self Test (POST) Person Activated Self Test (PAST) Continuous Monitoring (CM) with error log
Power OFF	Automatic safe mode

Table A-2: Technical specifications for the Above Deck Unit (Continued)

Item	Specification
Input power	Powered by ACU
Dimensions (overall)	Diameter x Height: Ø 130 cm (51.3 inch) x H 150 cm (58.9 inch)
Weight, ADU	126.5 kg (279 lbs)

Table A-2: Technical specifications for the Above Deck Unit (Continued)

A.1.3 ACU

Item	Specification
Dimensions, rack mount H x W x D	1 U, 19 inch 4.4 x 48 x 33 cm (1.75 x 19 x 13 inch)
Weight	4.5 kg (10 lbs)
Ambient temperature	Operational: -25˚C to +55˚C Storage: -40˚C to +85˚C
Humidity	IEC 60945 protected, 95% (non-condensing)
IP class	IP30
Compass safe distance	10 cm (4 inch) to IEC 60945
Interfaces	1 x N-Connector for antenna RF Cable (50 Ohm) 2 x F-Connectors (75 Ohm) for Rx/Tx to VSAT modem 4 x Ethernet 1 x RS-422 data (VSAT modem control) 1 x RS-232 data (VSAT modem control) 1 x NMEA 0183 and prepared for NMEA 2000 for Gyro/GPS compass input 1 x AC power input 1 x Grounding bolt
Input power	See *System power supply range* and *Total system power consumption* on page A-1.
Modem interface (control)	iDirect openAMIP protocol & custom protocol Comtech ROSS Open Antenna Management (ROAM) ESS Satroaming STM SatLink
Display	OLED (red) display, 5 push buttons, 3 discrete indicator LEDs and ON/OFF switch
No transmit zones	Programmable, 8 zones with azimuth and elevation

Table A-3: Technical specifications for the ACU

A.1.4 Supported VSAT modems

Item	Specification
VSAT modems supported	iDirect iNFINITI 5000 (Serial)
	iDirect iNFINITI 5000 (OpenAMIP)
	iDirect Evolution (Serial)
	iDirect Evolution (OpenAMIP)
	COMTECH CDM 570L
	COMTECH CDM 625
	COMTECH 570L with ROSS (ROAM)
	Generic modem[a]
	STM SatLink 2900
	Gilat SkyEdge II
	Inmarsat G5
	Service modem
	Generic OpenAMIP
	Dual Antenna Master
	ViaSat Linkway S2
	For a list of supported VSAT modems see also the SAILOR 900 VSAT High Power product sheet.

Table A-4: Supported VSAT modems

a. Modems not listed here can be configured using the Generic modem.

A.1.5 Patents

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
Currently applying	Reflector with enforcement ring

Table A-5: Patents

A.2 Outline drawings

A.2.1 ADU

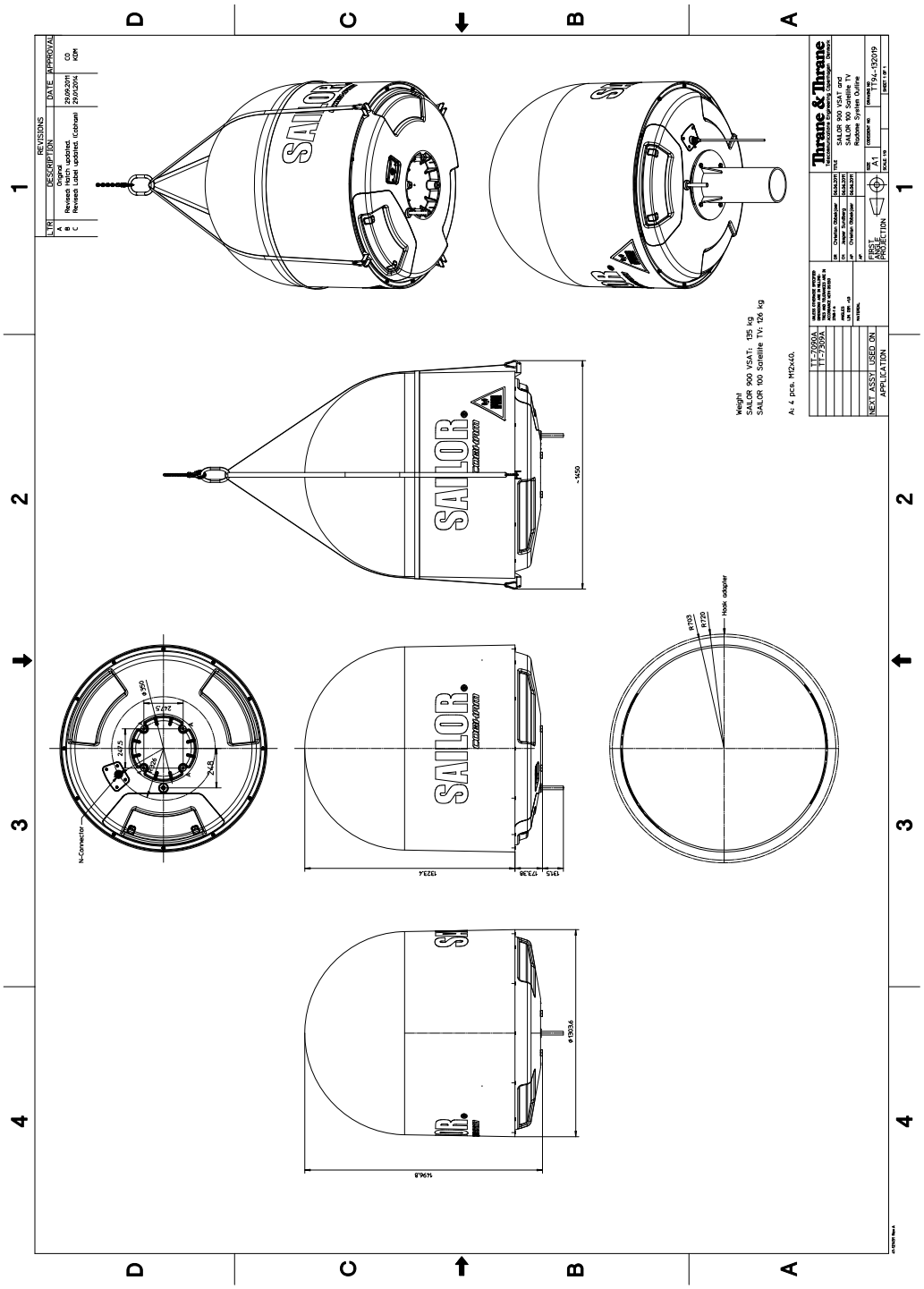


Figure A-1: Outline drawing: ADU

A.2.2 ACU

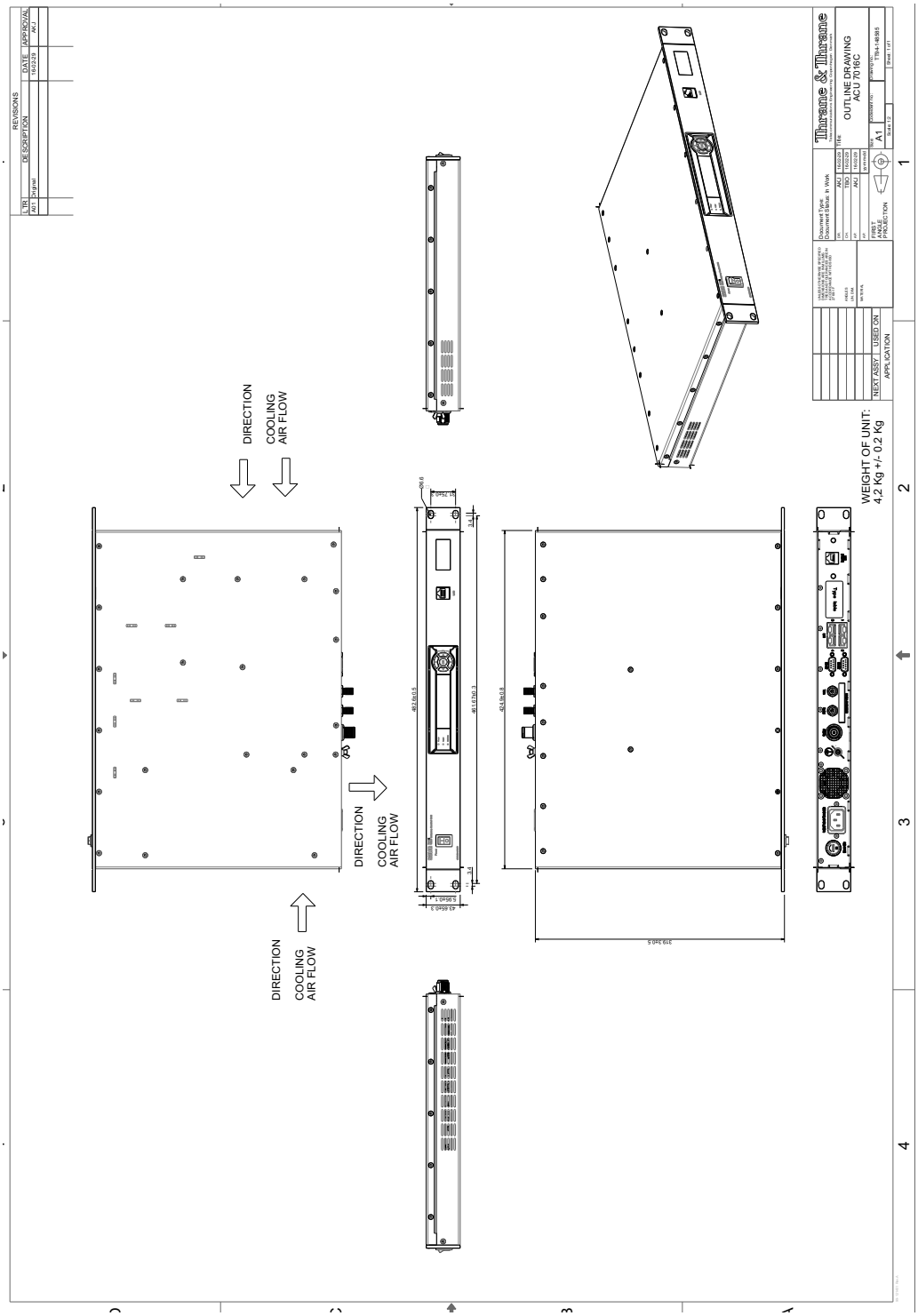


Figure A-2: Outline drawing: ACU

A.2.3 N-connector interface on the ADU

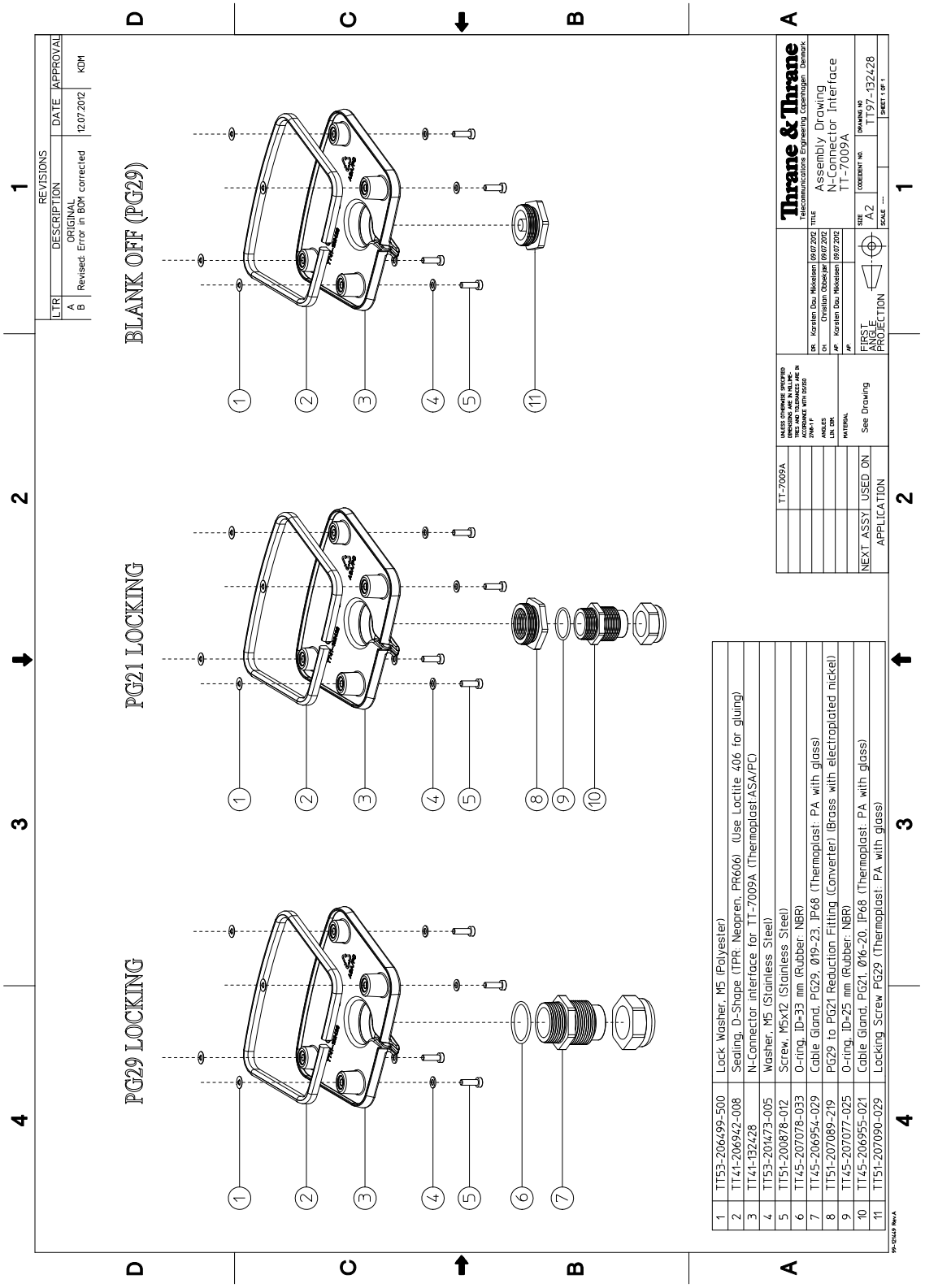


Figure A-3: N-Connector interface on the ADU

A.3 VSAT LNB Data Sheet (physical LNB)

The following table shows the data of the LNBs which are fitted in the ADU. The SAILOR 900 VSAT High Power is designed to make any Ku Band frequency in the range of 10.7 GHz to 12.75 GHz available to a VSAT modem by allowing the user to select the LNB LO of his choice – without having to exchange the physical LNBs in the ADU. This is achieved by the sophisticated single-cable solution of the SAILOR 900 VSAT High Power.

See A.3.1 for configuration information.

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

Table A-6: Technical specifications for VSAT LNB 1/2

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

Table A-7: Technical specifications for VSAT LNB 2/2

A.3.1 VSAT LNB user installation and configuration information

The SAILOR 900 VSAT High Power can interpret 4-band LNB switching signals and exact LO information acquired directly from the attached VSAT modem by means of a data connection. When using a VSAT modem which is integrated to use LO information transferred via a data connection, the LO must be in the range of 9.6 GHz to 11.3 GHz (Optimum values are 9.75 GHz and 10.75 GHz as these match the physical LNB values). All VSAT modems that can be used with SAILOR 900 VSAT High Power use this approach for selecting the LO frequency, except a COMTECH modem with ROSS server. A COMTECH modem with ROSS server reads switching signals by means of a data connection instead of using voltage and tone signals.

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

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

Since the LO frequency of 10.1 GHz is in the range of 9.6 GHz to 11.3 GHz, this is a valid set of data. The SAILOR 900 VSAT High Power will tune to 11.7389 GHz and provide the carrier on the L-Band frequency 1638.9 MHz.

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

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

Since the LO frequency of 11.3 GHz is in the range of 9.6 GHz to 11.3 GHz, this is a valid set of data. The SAILOR 900 VSAT High Power will tune to 12.750 GHz and provide the carrier on the L-Band frequency 1450 MHz.

4-band switching

When using 4-band switching and a VSAT modem which is integrated with SAILOR 900 VSAT High Power to use voltage and tone for switching, the switching is done according to the following table:

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

Table A-8: 4-band switching

Currently none of the VSAT modems which are integrated with the SAILOR 900 VSAT High Power use voltage and tone switching.

A.4 VSAT 20W BUC Data Sheet (Extended)

Interface	Model	Spec.
Input, IF	-	N (50 Ohm)
Output, Ku-band	20 W	WR75 waveguide (43.0 dBm min. $T_{amb} \leq 55^{\circ}C$)
Spectrum	-	Non inverting
Stability	-	Stable with any passive load on input and output
LO type	-	Locked to 10 MHz external reference over IF interface
LO frequency	Extended	12.80 GHz
TX ON/OFF	-	10 MHz reference ON/OFF
Cooling	-	Internal temperature controlled fan (S)
Protection	-	TX shutdown at over-temperature not required (>70˚C ambient air)

Table A-9: Technical specifications for VSAT 20 W BUC 1/3

Parameter	Condition/remark	Unit	Min.	Typical	Max.
Output frequency range	VSAT Ext. TX	GHz	13.75		14.50
Input (IF) frequency range	Extended	MHz	950		1700
VSWR	Input (10, 950 - 1700 MHz)	-			2.0 : 1
	Output (13.75 - 14.50 GHz)	-			2.0 : 1
Output power at P1dB	Worst case, $T_{amb} \leq 55^{\circ}C$	dBm	43.0		
	Worst case, $T_{amb} > 55^{\circ}C$	dBm	42.5		
Output power 10 MHz ref OFF	TX band, at -35 dBm ref.	dBm			-60
Gain (absolute linear)	Over output freq. range, Min.	dB	64	68	
	Over output freq. range, Max.	dB		68	72
Gain (relative)	Over 500 MHz BW	dB	-2.5	0,0	2.5
Gain (relative)	Over 36 MHz BW	dB	-1.0	0,0	1.0

Table A-10: Technical specifications for VSAT 20 W BUC 2/3

Parameter	Condition/remark	Unit	Min.	Typical	Max.
Spurious/harmonics out	RX band 10.70 - 12.75 GHz	dBm			-56
	13.50 - 13.75 GHz band	dBm			-15
	TX band 13.75 - 14.50 GHz	dBm			-15
	14.50 - 14.80 GHz band	dBm			-17
	Carrier ±10 MHz to 9.99 MHz	dBm			-30
	Carrier ±10 MHz to 50 MHz	dBm			-30
	Out of band[a] 1)	dBm			-26
ACPR at Pout 43.0 dBm, 5 Msym/s	8PSK, α=0.2, Δf=6Mz, $\leq$ 55˚C	dBc			-24
	8PSK, α=0.2, Δf=6Mz, < 55˚C	dBc			-24
External ref. freq. (input)	Nominal	MHz		10	
External reference freq. (input)	Deviation	Hz	-100	0	100
LO phase noise (output), SSB	10 Hz	dBc/Hz			-50
	100 Hz	dBc/Hz			-60
	1 kHz	dBc/Hz			-70
	10 kHz	dBc/Hz			-80
	199 kHz	dBc/Hz			-90
	≥1 MHz	dBc/Hz			-110

Table A-10: Technical specifications for VSAT 20 W BUC 2/3 (Continued)

a. 0.10 - 10.70 GHz & 12.75 - 13.50 GHz & 14.80 - 26.00 GHz

Parameter	Condition/remark	Unit	Min.	Typical	Max.
Power supply voltage	DC	V	39.0		50
Supply power	DC	W			185
Temperature range	Operation w. internal forced cooling (no sun)	˚C	-30		+70
	Storage	˚C	-40		85
Dimensions (incl. connector) overall, fan included (waveguide port on WxH side)	L	mm			190
	W	mm			125
	H	mm			110
Weight, fan included	Total	g	2500		2900

Table A-11: Technical specifications for VSAT 20 W BUC 3/3

VMU cables

This appendix contains cable specifications for cables between the ACU and a VSAT modem.

- *Modem Cable COMTECH Serial & RSSI TT7016A*
- *Modem Cable iDirect Serial and RSSI*

B.1 Modem Cable COMTECH Serial & RSSI TT7016A

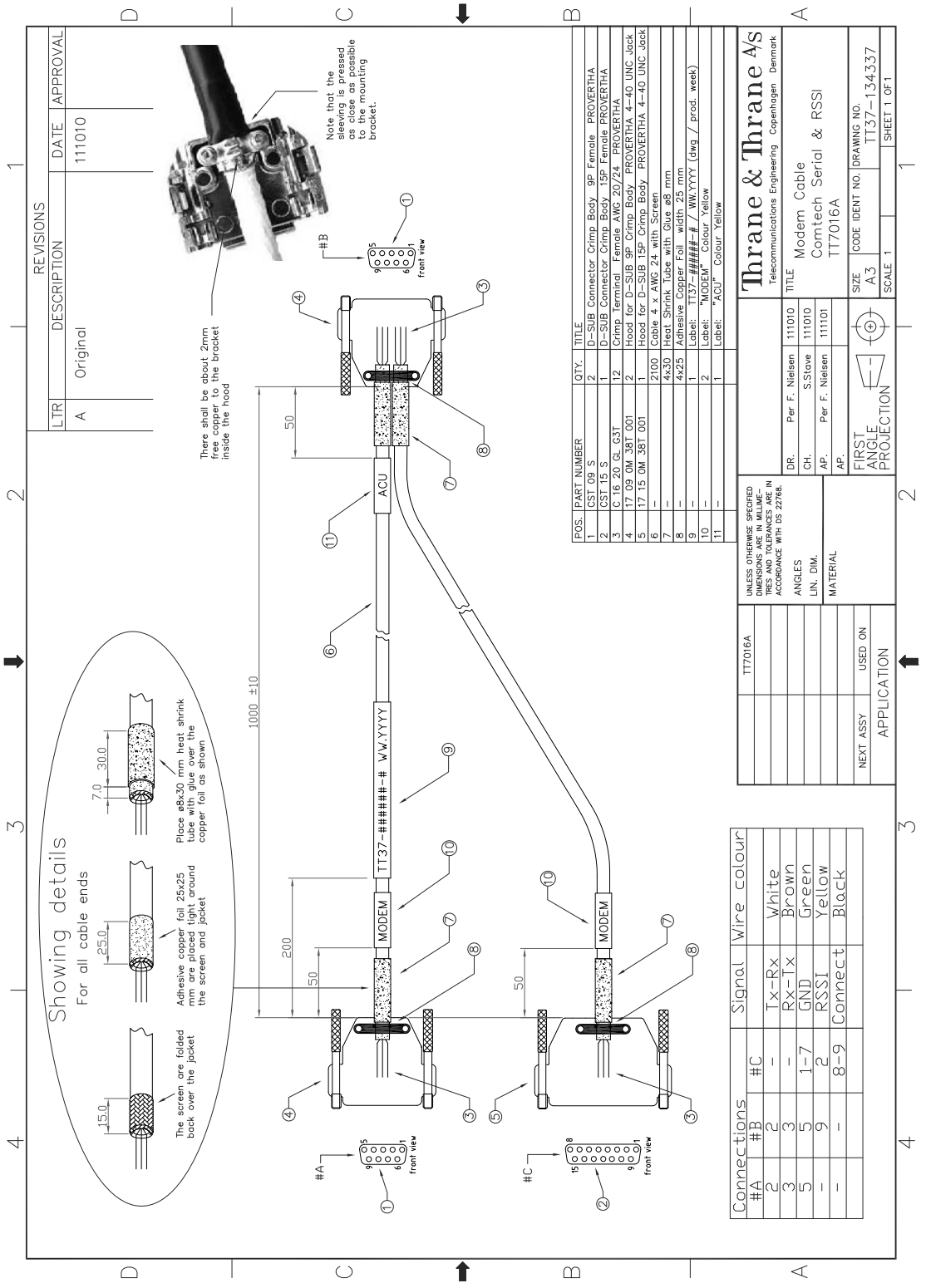


Figure B-1: Modem Cable COMTECH Serial & RSSI TT7016A

B.2 Modem Cable iDirect Serial and RSSI

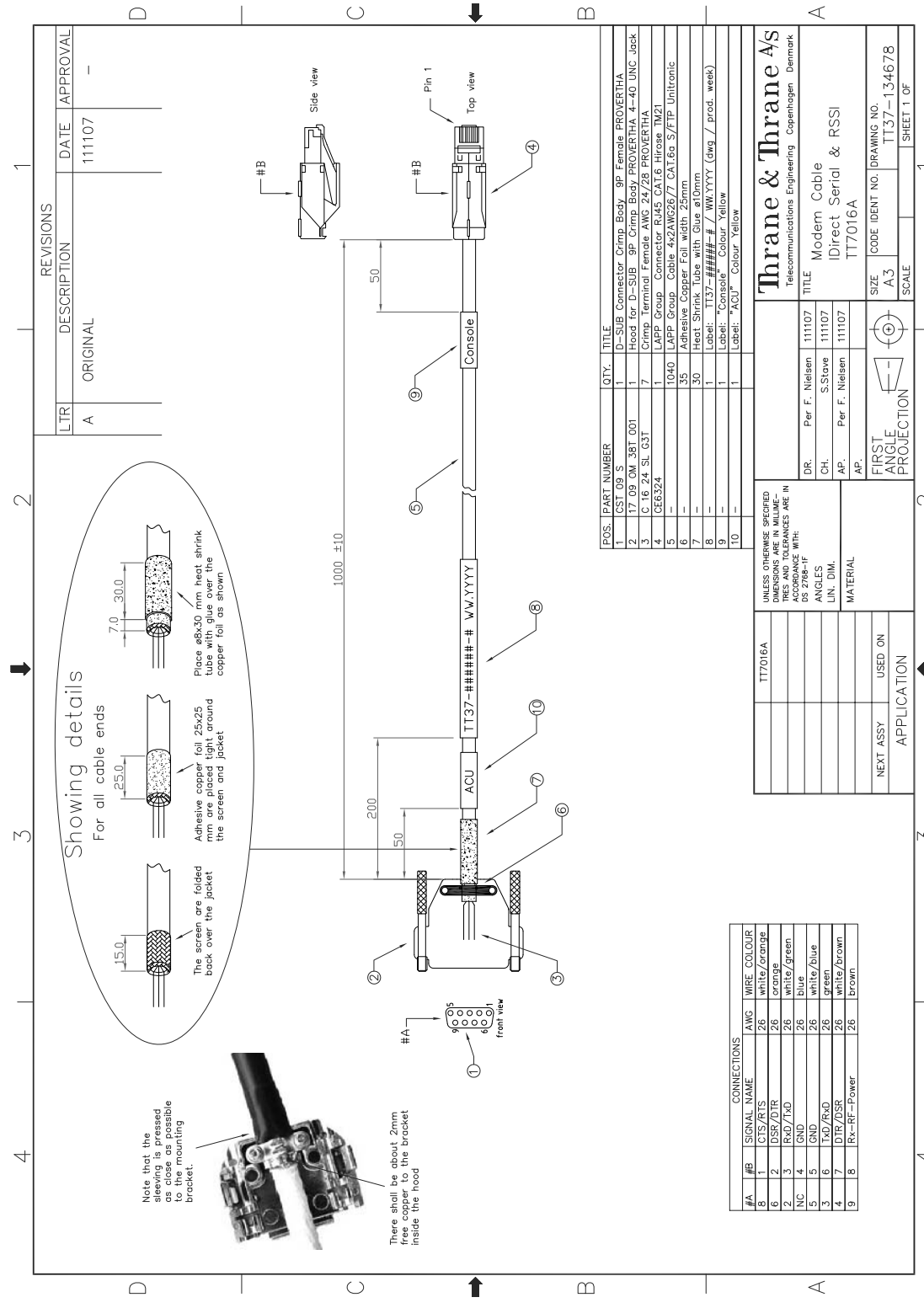


Figure B-2: Modem Cable iDirect Serial and RSSI

VMU settings

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

- *Performance optimization for blockage*
- *OpenAMIP setup for iDirect iNFINITI & Evolution*
- *Serial setup for iDirect iNFINITI & Evolution*
- *COMTECH 570L and ROSS box*
- *COMTECH 570L*
- *STM SatLink 2900 VSAT modem*
- *Gilat SkyEdge II VSAT modem*
- *Inmarsat G5 modem*
- *Linkway S2 modem*

C.1 Performance optimization for blockage

C.1.1 Performance of VSAT systems encountering blockage, configured with multiple satellites.

Definition of blockage

In most VSAT installations the VSAT antenna is installed in a position with areas of blockage. Blockage is often caused by the vessel's masts, stacks and other equipment installed on board. During installation the blockage areas should be entered in the web interface, see *To set up blocking zones (RX and TX)* on page 6-28.

When blockage occurs, the ACU can inform the VSAT modem (if the blocking zones have been typed correctly into the ACU web interface). It is often seen that by not informing the VSAT modem of blockage the VSAT system gains a higher uptime, although the quality of the extra gained uptime is not good enough to give the user a stable data connection. Therefore it is not of any value to the user. Another disadvantage of not informing the VSAT modem of blockage is that the VSAT modem does not have the option to switch to a different satellite to avoid the blockage.

VSAT modems can typically[1] only receive one signal from the ACU, which is "TX-mute" / "modem must not transmit", they are therefore not able to perform fast switching, but are limited to use a simple time-out, which is configured as a fixed value in the modem configuration.

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

The simple time-out means that there is a fixed delay, plus the time needed to acquire another satellite, before there is a chance of regaining good link performance.

If the signal is not sent to the modem, the system can in some cases remain linked and have a higher uptime, but not provide a stable data connection. Such a link is of no value to the subscriber. Not sending the blockage (TX-Mute) signal also extends the period of the poor-quality link, as the VSAT modem is still relying on a time-out before switching to another satellite, and the time-out may be constantly reset by the link coming and going.

Better blockage communication

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

Minimum elevation angle

One safe way of getting optimum performance under the current conditions is to switch to a satellite in view as fast as possible. This is done by having well defined satellite parameters in the VSAT modem configuration. It is the VSAT modem that has the task of selecting the correct satellite, and since the VSAT modem is only concerned about the satellite visibility at the current geographic position, it is very important to enter the minimum elevation of a satellite at which a stable link can be established.

It is often seen that the minimum elevation is set to 0 (zero). A setting of 0 is not only in many cases below the usable limit of the satellite, but also a violation against ETSI EN 302 340, where a calculated minimum elevation ranges from 12˚ to 3˚ depending on power and bandwidth must be ensured or FCC §25.205 which states the minimum elevation to be 5˚. See also the table in the section *Satellite profiles* on page 6-26.

Unless the vessel is operating in international waters with no other options, a minimum elevation of 10˚ or higher is recommended.

Conclusion

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

C.2 OpenAMIP setup for iDirect iNFINITI & Evolution

C.2.1 Protocol and interfaces

Introduction

The following sections describe the protocol and interface between the SAILOR 900 VSAT High Power ACU and an iDirect OpenAMIP VSAT modem. OpenAMIP operation is normally used by service providers offering global VSAT service as the protocol supports roaming between satellites (Automatic Beam Switching).

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

Connections

Connect the ACU and iDirect modem with the following cables:

- Ethernet cable for TCP/IP data communication
- RS-232 console cable for signal strength indication (part number: 407090A-020)

Important It is important to connect this cable to achieve satisfactory acquisition of the satellite. This is due to missing information in the iDirect OpenAMIP software before version 3.1.1.2/13.0.1.2. RSSI information on the dashboard will only be available with this cable connected.

- 75 Ohm RF cables F-F connectors for rx and tx frequencies.

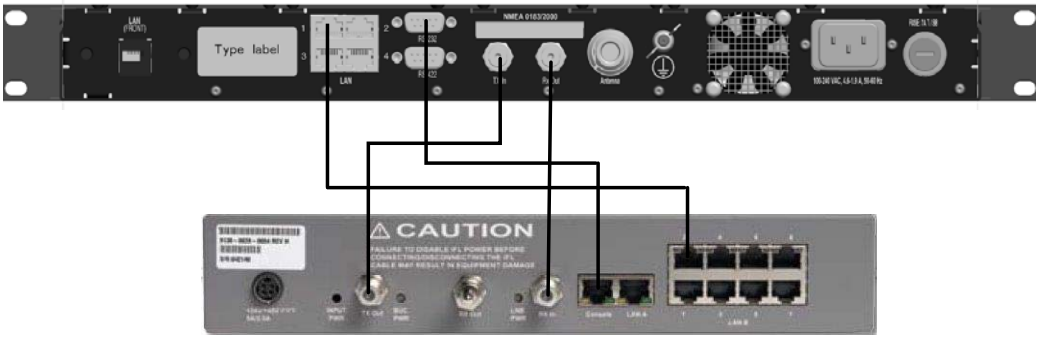


Figure C-1: Connecting iDirect iNFINITI 5000 series to the ACU (OpenAMIP)

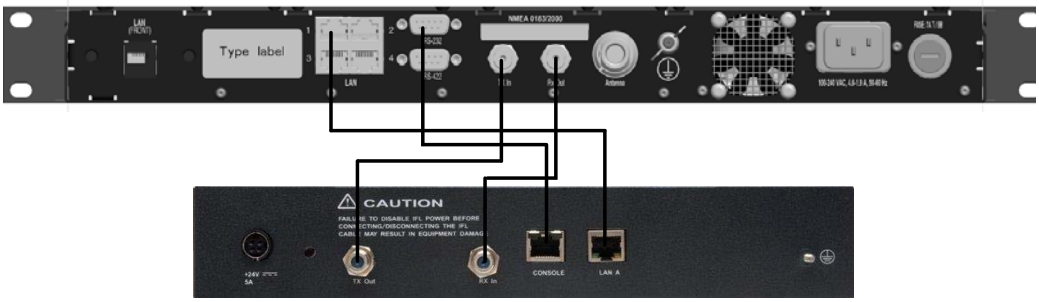


Figure C-2: Connecting iDirect Evolution X5 to the ACU (OpenAMIP)

The pin allocation for the RS-232 Console cable is shown below. See also Appendix B on page C-1 for a cable drawing.

Console port (DTE)	RJ-45 pin	Color code	RJ-45 to DB-9 adapter pin	Console device
RTS	1	Blue	8	CTS
DTR	2	Orange	6	DSR
TxD	3	Black	2	RxD
GND	4	Red	NC	GND
GND	5	Green	5	GND
RxD	6	Yellow	3	TxD
DSC	7	Brown	4	DTR
Rx-RF Power	8	White/Grey	9	--

Table C-1: RS-232 Console cable for iDirect VSAT modem

Protocol

The SAILOR 900 VSAT High Power ACU supports all OpenAMIP commands except the X command which is optional. All the supported OpenAMIP commands are shown in the following figure.

	Messages Sent from Remote				Messages Sent from Antenna	
iDS/iDX Release	Message	# Para-meters	Mapped to Options File Keys	Options File Group	Message	# Para-meters
iDX 2.0.x	A		keepalive_interval Default value of 15 seconds. Will not appear in Options file unless overwritten.	[ANTENNA]	a	
	B	2	rx_lcl_osc, tx_lcl_osc	[SATELLITE]		
	H	2	hunt_frequency, hunt_bandwidth	[SATELLITE]		
	K	1	max_skew Maximum skew of the beam short axis to the geosynchronous arc.	[SATELLITE]		
	P	2	polarity, tx_polarity	[SATELLITE]		
	S	3	longitude, max_lat, pol_skew	[SATELLITE]	s	2
	T	2	tx_frequency, tx_bandwidth	[SATELLITE]		
	W	1	latlong_interval Message contains single value in seconds. Does not generate Options file key.	[MOBILE]	w	4

Figure C-3: Supported OpenAMIP commands

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

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

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

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

Note The iDirect modems only sends the satellite information once when booting. If the ACU has not received the information for some reason, the system cannot point. In that case the modem will automatically boot after 5 minutes and send the satellite information again.

The signal strength from the modem is measured on RS-232 pin 9. It is a DC voltage in the range of 0 - 5 VDC.

Ranges for signal strength	
VDC	Antenna status
0-2.5	RF energy is detected, but from the wrong satellite.
2.6-5.0	Carrier lock, correct satellite.

Table C-4: Ranges for signal strength for iDirect OpenAMIP VSAT modem

The signal strength displayed web interface on the Dashboard as 0 – 500. The minimum value for an Internet connection is 250 - 260.

C.2.2 Sample options file

This section presents a portion of a sample options file with OpenAMIP parameters that must be defined for SAILOR VSAT. Each parameter is in bold and commented.

```
[ANTENNA]
    addr = 10.1.6.2                    #!!(ACU LAN1 IP setting)!!
    connect_timeout = 30
    dedicated_interface = ixp0
    manufacturer = OpenAMIP
    max_skew = 90.000000
    model = OpenAMIP
    port = 2000                        #!!(ACU Modem Profile setting)!!
[ETH0_1]
    address = 10.1.6.1
    netmask = 255.255.255.128          #!!(ACU LAN1 subnet setting)!!
    rip_enabled = 0
    web_server_enabled = 0
```

```
[FREQ_TRANS]
    down_translation = 11300.000000
    up_translation = 12800.000000          #!!(SAILOR VSAT, BUC LO)!!
[MOBILE]
    gps_input = 2                          #!!(2 = GPS via OpenAMIP)!!
    gps_validation_active = 1
    init_tx_power_offset = -10.000000      #!!(SAILOR VSAT)!!
    is_mobile = 1                          #!!(1 = Maritime)!!
    latlong_acq_interval = 300
    latlong_fail_interval = 10
    latlong_interval = 300
    tx_handshake_enabled = 0               #!!(SAILOR VSAT)!!
[ODU]
    lnb_dc_voltage = 18
    lnb_tone_enable = 0
    music_present = 0
    odu_disable_tx_pwm = 0
    odu_rx_10_mhz = 0
    odu_rx_dc_power = 0
    odu_tx_10_mhz = 1                      #!!(SAILOR VSAT)!!
    odu_tx_dc_power = 0
[SATELLITE]
    channelname = E36B - Maritime
    hunt_bandwidth = 0.000000
    hunt_frequency = 1233.660000
    longitude = 35.900000
    max_lat = 0.000000
    max_skew = 90.000000
    min_look_angle = 0.000000
    name = E36B
    noise_reference_frequency = 0.000000
    pol_skew = 0.000000
    polarity = V
    rx_lcl_osc = 11300.000000
    skew_margin = 90.000000
    tx_bandwidth = 0.000000
    tx_frequency = 1234.560000             #!!(Tx freq. for best performance)!!
    tx_lcl_osc = 12800.000000              #!!(SAILOR VSAT, 12.8 GHz BUC LO)!!
    tx_polarity = X
[UCP]
    max_power_level_in_db = -5.000000  #!!(S900 VSAT P1dB = -5.0 dBm)
                                       #!!(S800 VSAT 6W P1dB = -6.2 dBm)
    power_uplink_control_processing = 1
```

The option file must use following information:

Section	Requirements
[SATELLITE]	The modem provides RX and TX frequency information via a data connection to the SAILOR 900 VSAT High Power. The single-cable solution makes it possible to configure the VSAT modem to use any LO frequency in the range from 9.6 GHz to 11.3 GHz. The SAILOR 900 VSAT High Power will tune to the correct Ku-Band frequency and provide the correct L-Band frequency to the VSAT modem. Example: “rx_lcl_osc = 11250.000000” SAILOR 900 VSAT High Power has an extended Watt BUC with LO up conversion frequency of 12.8 GHz. — Example: “tx_lcl_osc = 12800.000000” **Note:** SAILOR 900 VSAT High Power supports any LNB frequency due to the 1-cable design.
[MOBILE]	The iDirect modem must be set to mobile unit and receive the GPS information from the ACU with the command “w <Valid> <Lat> <Lon> <Time>”. **Example**: “is_mobile = 1” Tx handshake must not be enabled in the iDirect modem. **Example**: “tx_handshake_enabled = 0”
[ODU]	The SAILOR 900 VSAT High Power can work either using the Rx or Tx 10 MHz reference signals provided by the modem or using its own built-in 10 MHz reference signal. It is recommended to use the Tx 10 MHz reference signal from the modem. See also *Modem profiles* on page 6-23. **Example**: “odu_rx_10_mhz = 1” The SAILOR 900 VSAT High Power needs the Tx 10 MHz reference signal in order to allow TX ON. **Example**: “odu_tx_10_mhz = 1”

Table C-5: Information in the VSAT modem option file

C.2.3 Configuration example (OpenAMIP)

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

Figure C-4: VSAT modem profile, OpenAMIP (example)

Add a satellite profile (**SETTINGS > Satellite profiles**) as shown below.

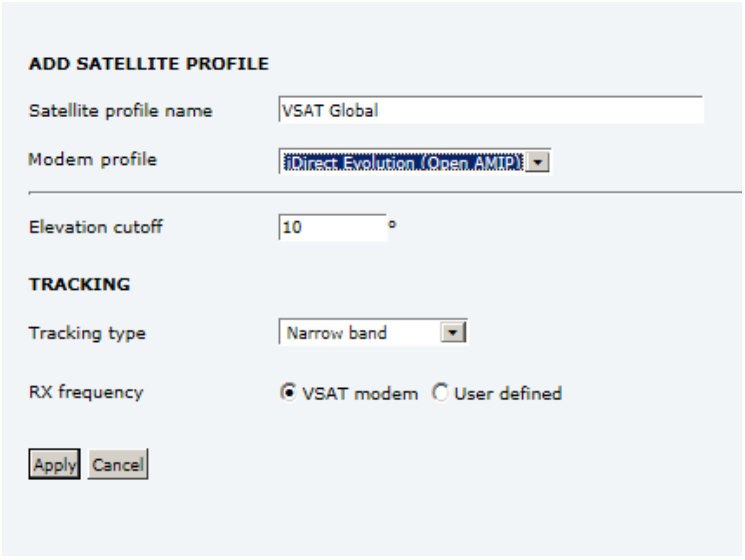


Figure C-5: Satellite profile, OpenAMIP (example)

Simple OpenAMIP protocol in iDS 8.0.2.7 is **NOT** supported by the SAILOR 900 VSAT High Power.

Full OpenAMIP protocol from iDX 2.0 and up is supported by the SAILOR 900 VSAT High Power.

C.2.4 Troubleshooting

It is expected that the modem has been connected with cables to the ACU and that an iDirect OpenAMIP modem profile and satellite profile have been configured in the web server of the SAILOR 900 VSAT High Power and has been activated. For further details see *Configuration example (OpenAMIP)* on page C-9.

It is recommended to connect the service PC to LAN port 2 of the ACU in order to have access to the web server of the SAILOR 900 VSAT High Power and IP connection to the attached iDirect OpenAMIP modem.

A telnet or ssh client and Internet browser is needed in order to go through the troubleshooting guidelines. It is recommended to use the telnet/ssh client program called PuTTy, which is available for free on the Internet (http://www.putty.org/).

1. Default login to iDirect modems are: User name: admin, Password: P@55w0rd!
2. Every time a setting is changed in the iDirect modem, it must be stored in flash using the following command line command:
   `options flash`
3. After changing a setting and storing the new setting the modem has to boot its application in order to read and use the new setting. This is done with the command line command:
   `reset application`

The iDirect options file is divided into sections; the section name is always CAPITAL letters. Each section has several parameters, and each parameter has a value. See the following example:

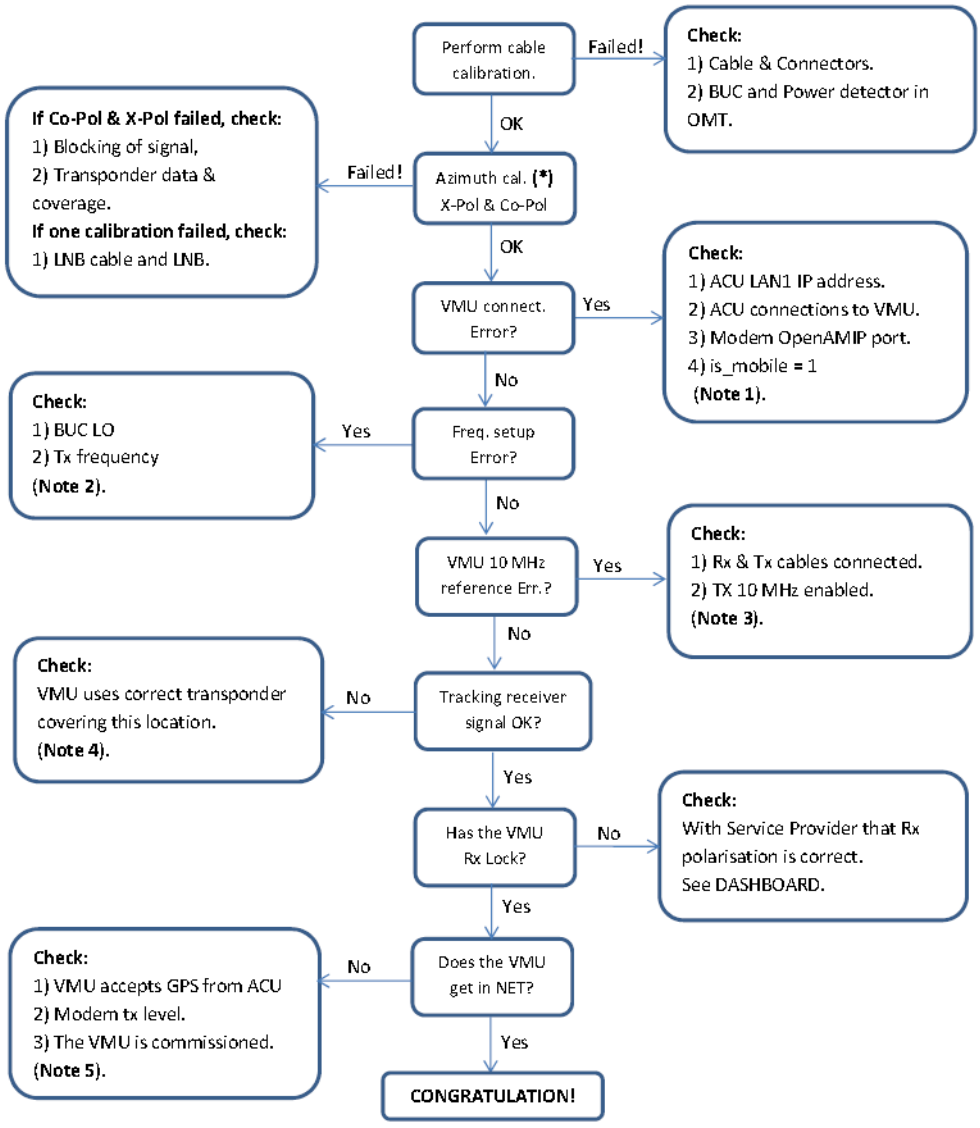
```
[MOBILE]
        gps_input = 2
        init_tx_power_offset = 0.000000
        is_mobile = 1
        latlong_interval = 60
        tx_handshake_enabled = 0
```

To change a setting in the MOBILE section use the `options set` command. See example of command here:

```
options set MOBILE gps_input 2
```

Note that setting the `gps_input` parameter to value 2 is written without an equal sign but only with a space character between parameter name and the value.

You can use the following flow chart and the instructions in the notes later in this appendix.



* Use same transponder polarity with both calibrations.

Figure C-6: iDirect OpenAMIP troubleshooting

Note 1: Connect to modem with Telnet or serial and issue following commands:

```
options show ANTENNA
```

Check: IP address, port # and manufacturer = OpenAMIP.

```
options show MOBILE
```

Check: is_mobile = 1

Note 2: Connect to modem with telnet and issue command:

```
options show SATELLITE
```

Check: tx_lcl_osc = 12800.000000,
Check: tx_frequency is between: 950.000000 to 1700.000000
Check: rx_lcl_osc + hunt_frequency is between: 10.7 GHz to 12.75 GHz

Note 3: Connect to the modem with Telnet and issue commands:

```
options show ODU
```
Check: odu_tx_10_mhz = 1
```
options show MOBILE
```
Check: tx_handshake_enabled = 0

Note 4: Connect to the modem with Telnet and issue command:

```
beamselector list
```
Write down the transponder number for one of the beams that has line of sight.
Use the command: beamselector switch <number> -f to force the VMU to use this transponder. E.g:
```
beamselector switch 323 -f
```
Use the command: beamselector lock to lock the VMU to this transponder and stay there (until power cycle or reset application).

Note 5: Connect to the modem with Telnet and issue commands:

```
options show MOBILE
```
Check: gps_input = 2
```
tx power
```
Try to increase the tx power step by step up to max. -5 dBm, which is around SAILOR 900 VSAT High Power P1dB level. E.g. tx power -10

Examples of commands

```
options set SATELLITE tx_frequency 1450
options set MOBILE gps_input 2
options set MOBILE is_mobile 1
options set MOBILE tx_handshake_enabled 0
options set ODU odu_tx_10_mhz 1
options flash
```
If this fails then the options file is write protected!
Change disable_options_flash_command = 0 first!
```
options set OPTIONS_FILE disable_options_flash_command 0
reset application
```
Starts the VMU application (soft boot)

- Notice that changing options file locally can help determine wrong settings. The settings will probably be changed back to original settings when the VMU get synchronized with the hub.
- Tell the NOC about the faulty settings so they can correct configuration.

C.3 Serial setup for iDirect iNFINITI & Evolution

C.3.1 Protocol and interfaces

Introduction

The following sections describe the protocol and interface between the ACU and an iDirect Serial modem. Serial operation is normally used by service providers offering regional VSAT service.

Connections

Connect the ACU and iDirect modem with the following cables:

- RS-232 console cable for control communication
- 75 Ohm RF cables F-F connectors for rx and tx frequencies.

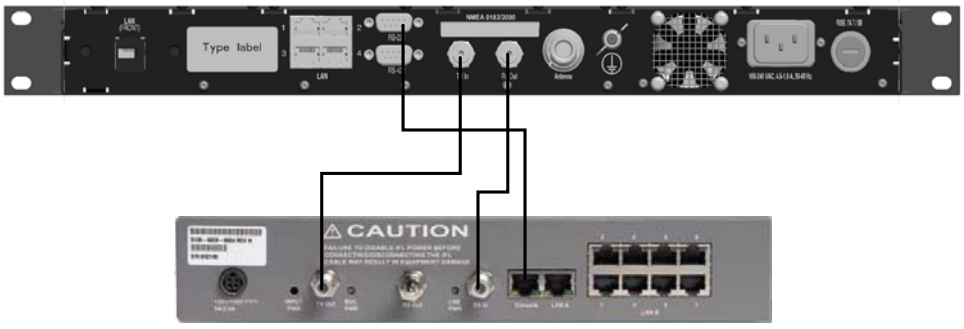


Figure C-7: Connecting iDirect iNFINITI 5000 series to the ACU (Serial)

Figure C-8: Connecting iDirect Evolution X5 to the ACU (Serial)

The pin allocation for the RS-232 Console cable is shown in Table C-C-1 on page C-4. See also Appendix B on page C-1 for a cable drawing.

C.3.2 Console port settings

The iDirect modem must be configured to use following console port settings:

- Baud rate: 4800 or 9600
- Data bits: 8
- Parity: None

- Stop bit: 1

Passwords

The SAILOR 900 VSAT High Power ACU will log in to the modem using root and user passwords. The default passwords are:

- Root: P@55w0rd!
- User: iDirect

Supported commands

After login to the modem the ACU will issue commands to the modem every second. The following commands are supported by the SAILOR 900 VSAT High Power ACU:

- rx snr
- options show FREQ_TRANS
- rx freq
- tx freq
- latlong <lat> <long>

The signal strength command: rx snr is issued every 2 seconds. The rest of the commands are issued one by one every 2 seconds between each signal strength command. Meaning each of the other commands is issued every 8 seconds.

The signal strength in the ACU display and web interface is shown as dB., e.g: 8.5 dB. The minimum value for Internet connection is around 2-3 dB.

VSAT modem option file

The option file of the VSAT modem must also include the following information:

Section	Description
Satellite information	Receive frequency of the transponder. Used with “rx freq” command Transmit frequency if known otherwise just a dummy tx frequency (e.g. 1.450 MHz). Used with “tx freq” command.
SAILOR 900 VSAT High Power information	The modem provides RX and TX frequency information via a data connection to the SAILOR 900 VSAT High Power. The single-cable solution makes it possible to configure the VSAT modem to use any LO frequency in the range from 9.6 GHz to 11.3 GHz. The SAILOR 900 VSAT High Power will tune to the correct Ku-Band frequency and provide the correct L-Band frequency to the VSAT modem. The SAILOR 900 VSAT High Power has an extended 8 Watt BUC with LO up conversion frequency of 12.8 GHz.
GPS	The iDirect modem must be set to mobile unit and receive the GPS information from the ACU with the command “latlong <lat> <long>”. Tx handshake must be disabled in the iDirect modem.

Table C-6: Requirements for VSAT modem option file, Serial

Section	Description
Rx 10 MHz	The SAILOR 900 VSAT High Power can work either using the Rx or Tx 10 MHz reference signals provided by the modem or using its own built-in 10 MHz reference signal. It is recommended to use the Tx 10 MHz reference signal from the modem. See also *Modem profiles* on page 6-23.
Tx 10 MHz	The SAILOR 900 VSAT High Power needs the Tx 10 MHz reference signal in order to allow TX ON.

Table C-6: Requirements for VSAT modem option file, Serial (Continued)

C.3.3 Configuration example (Serial)

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

Figure C-9: Modem profile, Serial (example)

Add a satellite profile (**SETTINGS > Satellite profiles**) as shown below.

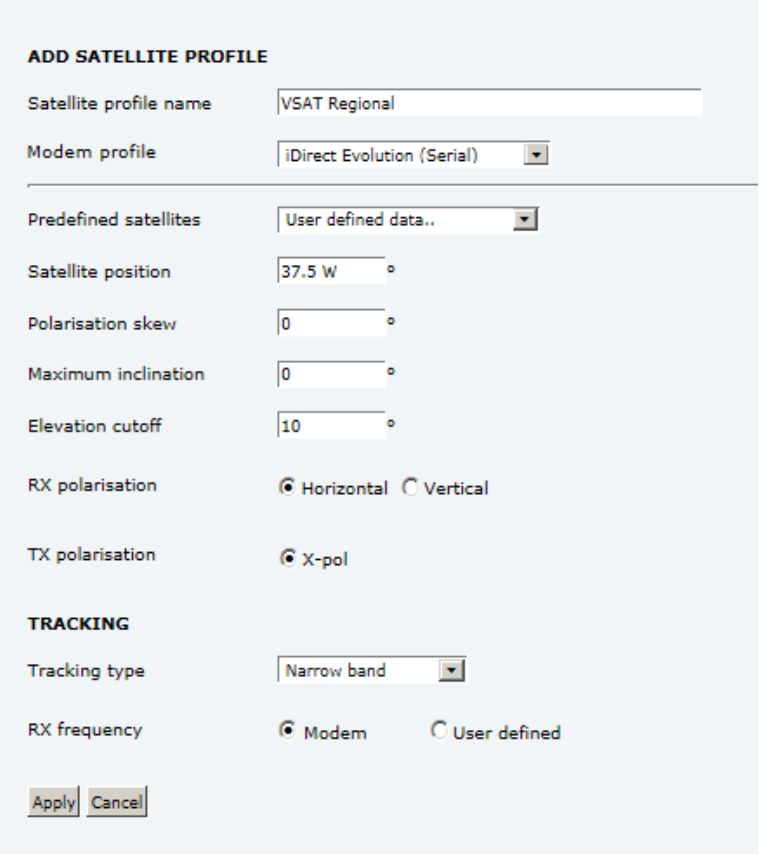


Figure C-10: Satellite profile, Serial (example)

C.4 COMTECH 570L and ROSS box

C.4.1 Protocols and interfaces

The following sections describe how to connect an ACU, a COMTECH570L VSAT modem, a ROSS box and an Ethernet switch.

From software version 1.30 or higher the SAILOR 900 VSAT High Power supports COMTECH ROSS ROAM protocol 1+ which includes the satellite longitude in the responses from the ACU to the ROSS box. 1.30 also supports setting inclined orbit by entering user defined data.

Connections

Connect the ACU and COMTECH 570L, ROSS box and Ethernet switch with the following cables:

- Ethernet cables for TCP/IP data communication (x3)
- RS-232 console cable
- 75 Ohm RF cables F-F connectors for rx and tx frequencies.

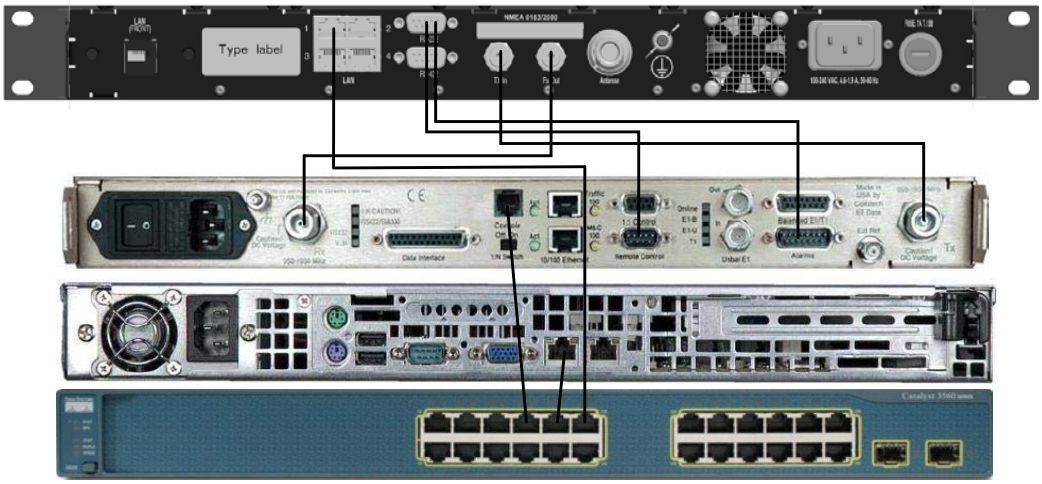


Figure C-11: Connecting COMTECH 570L and ROSS box to the ACU (example)

See also cable specifications at *Modem Cable COMTECH Serial & RSSI TT7016A* on page B-2.

C.4.2 Configuration example (COMTECH 570L and ROSS)

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

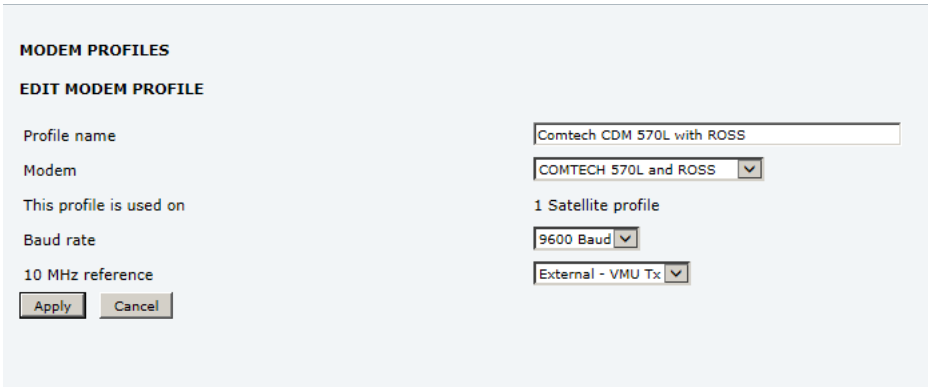


Figure C-12: Modem profile, COMTECH 570L and ROSS (example)

Add a satellite profile (**SETTINGS > Satellite profiles**) as shown below.

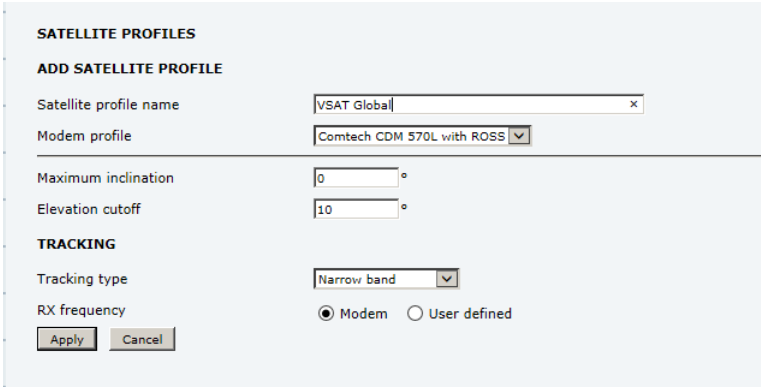


Figure C-13: Satellite profile, COMTECH 570L and ROSS (example)

C.5 COMTECH 570L

C.5.1 Protocol and interfaces

The following sections describe how to connect the ACU to a COMTECH 570L VSAT modem.

Protocol

The ACU supports 4800 or 9600 baud on the serial port. You can set the baud rate of the COMTECH 570L at its front MMI.

The ACU issues the following commands on the serial interface to the COMTECH 570L modem:

- 0000/EBN?
- 0000/TFQ?
- 0000/LLO?
- 0000/BLO?
- 0000/RFQ?

An example of the serial communication between the ACU and the COMTECH 570L modem is shown below:

```
0000/EBN?
0000EBN=11.8
0000/TFQ?
0000/TFQ=1310.7956
0000/EBN?
0000/EBN=11.8
0000/LLO?
0000/LLO=10000+
0000/EBN?
0000/EBN=11.9
0000/BLO?
0000/BLO=12800-
0000/EBN?
0000/EBN=11.8
0000/RFQ?
0000/RFQ=1367.5500
```

Command	Description
EBN?	This command is used to show the signal strength in the web interface and on the display of the SAILOR 900 VSAT High Power to determine if the COMTECH 570L modem is in Rx Lock. The signal strength goes from 0dB - 16dB, +16dB indicates a signal greater than 16dB, 99.9dB indicates no Rx Lock.
TFQ?	TFQ (Transmit Frequency) is used to calibrate the Tx chain in real time, in order to have same output power independent of frequency, temperature and antenna cable length.
LLO?	LLO (LNB LO) is used to set up the LNB LO frequency for the system. **All LNB LO frequencies are supported by** SAILOR 900 VSAT High Power.
BLO?	BLO (BUC LO) is used to read the BUC LO. This makes the ADU compatible with future SAILOR VSAT products using a different BUC LO.
RFQ?	RFQ (Receive Frequency) is used as tracking frequency for SAILOR VSAT.

Table C-7: Communication, COMTECH 570L

Note The BUC LO (BLO) must always be 12800 MHz for SAILOR 800 & 900 VSAT.

Connections

Connect the ACU and the COMTECH 570L with the following cables:

- Standard RS-232 serial cable (using 300KHz Narrow Band tracking receiver)
- Or COMTECH Serial & RSSI cable (using Modem RSSI tracking)
- 2 pcs. 75 Ohm RF cables F-F connectors for rx and tx frequencies.

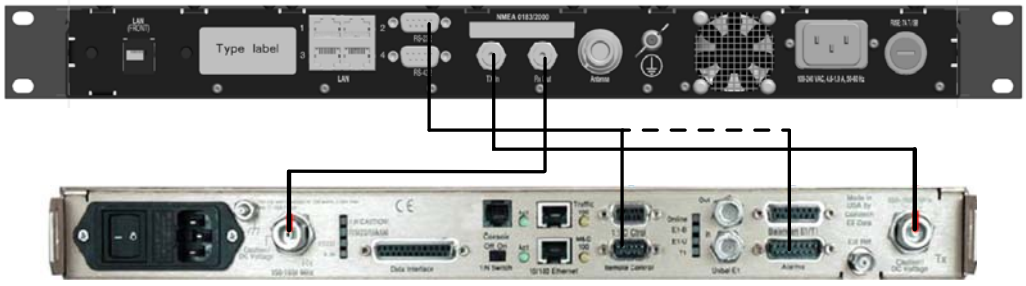


Figure C-14: Connecting COMECH 570L to the ACU (example)

In most cases it is recommended to use the antenna that is built-in in the 300 KHz narrow band tracking receiver to track the satellite, and you can connect the ACU to the VSAT modem with a standard RS-232 serial cable.

For Modem RSSI tracking use a cable according to the specifications at *Modem Cable COMTECH Serial & RSSI TT7016A* on page B-2 (Cobham part number: 407090A-021).

C.5.2 Configuration example (COMTECH 570L)

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

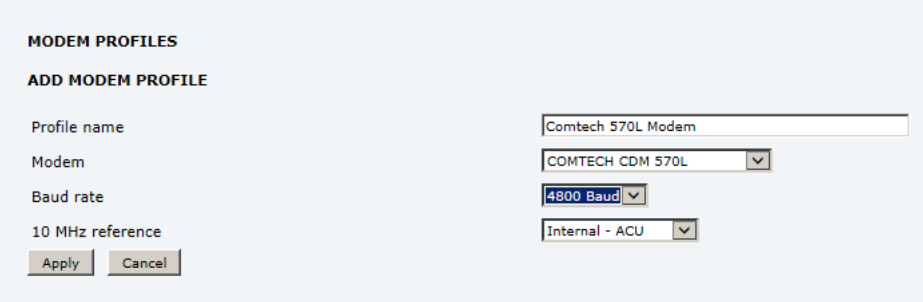


Figure C-15: VSAT modem profile, COMTECH 570L (example)

Add a satellite profile (**SETTINGS > Satellite profiles**) as shown below.

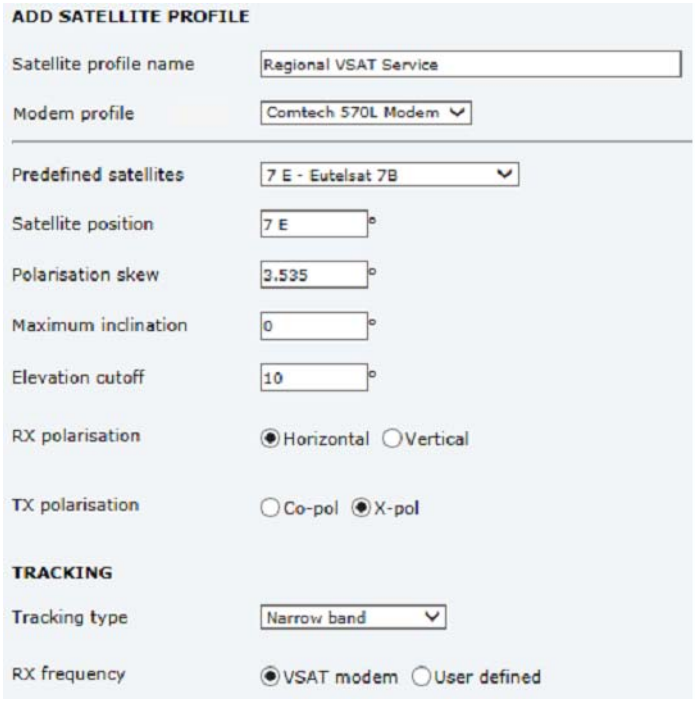


Figure C-16: Satellite profile, COMTECH 570L (example)

C.6 STM SatLink 2900 VSAT modem

C.6.1 Interfaces and VSAT modem configuration

The following sections describe how to connect an ACU to an STM SatLink 2900 VSAT modem. The STM SatLink 2900 and the SAILOR 900 VSAT High Power are fully integrated and require almost no user setup.

STM SatLink 2900 software version required: 14.2.0 or higher.

Connections and login

1. Connect the ACU and STM SatLink 2900 with the following cables:

- Ethernet cable for TCP/IP data communication. Connect LAN A on the VSAT modem to LAN 1 on the ACU.
- 75 Ohm RF cables F-F connectors for RX and TX frequencies

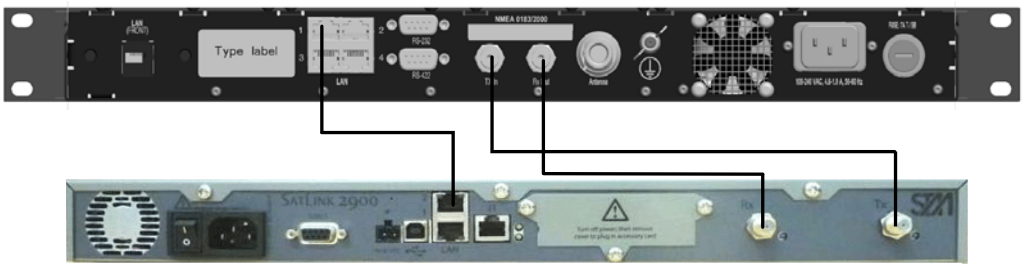


Figure C-17: Connecting STM SatLink 2900 VSAT modem to the ACU

2. Connect a PC to the modem via serial (setting: 38400, 8, N, 1) or telnet.
3. Login to the modem with the user name and password received from the VSAT service provider.

   Example: Login: root
   Password: *******
   SatLink 2900
   - Main board ID 120265, Revision R4.0
   - SW ID 120208, Revision 16.0.0 Build 46

4. Check that the modem has software version 14.2.0 or higher. Earlier modem software versions are not supported.

Modem configuration requirements

Type the following command in a modem console to set up the STM Satlink 2900 modem to use the SAILOR 900 VSAT High Power:

Command	Description
`odu antctrl waitstablize 300`	This configures the antenna stability tries which is the amount of times the modem should try to logon before it tries the next beam in its transponder list.
`odu antctrl periodictime 5`	This configures the polling frequency in seconds between the modem and ACU.
`odu antctrl port 0 (zero)`	This configures the IP communication port to default (5990). Use the command `odu antenna` to configure the modem with either SAILOR 800 VSAT or SAILOR 900 VSAT
`odu antenna 30`	This configures the antenna type to a Thrane & Thrane / Cobham SATCOM antenna. NOTE: `odu antenna 52` is supported from modem software 16.0.0 or higher. Use the command `odu txtype` to set the BUC for either SAILOR 800 VSAT or SAILOR 900 VSAT.
`odu txtype 62`	This configures the BUC type to a SAILOR VSAT BUC NOTE: `odu txtype 63` is supported from modem software 16.0.0 or higher. Use the command `odu lnb` to set the LNB for either SAILOR 800 VSAT or SAILOR 900 VSAT.
`odu lnb 62`	This configures the LNB type to SAILOR VSAT LNB NOTE: `lnb 63` is supported from modem software 16.0.0. or higher.
`odu antctrl enable all`	This will enable the communication between the modem and ACU including GPS input.
`dvb rx autostart on`	This will enable modem rx.
`dvb tx autostart on`	This will enable modem tx. Save the new ODU Configuration:

Table C-8: Configuration of the STM SatLink 2900 VSAT modem

Command	Description
`save config`	This will save the above settings to flash in the modem. And restart the modem:
`restart`	

Table C-8: Configuration of the STM SatLink 2900 VSAT modem (Continued)

Example:

```
odu antctrl show
Antenna Controller Configuration
--------------------------------
Type                      : Thrane & Thrane SAILOR 00
Enabled                   : All
IP address                : 10.110.2.226
Polling frequency         : 5 sec
Antenna Stability Tries   : 300

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

C.6.2 ACU configuration

To set up the ACU to work with an STM Satlink 2900 VSAT modem, do as follows:

1. Add a modem profile with the STM Satlink 2900 modem. See *Modem profiles* on page 6-23.
2. Add a satellite profile using the STM Satlink modem profile just created. See *Satellite profiles* on page 6-26.
3. Edit the network settings and input the IP information supplied with the modem. See *To configure the LAN network* on page 6-30.
4. Activate the satellite profile.

C.6.3 Configuration example (STM Satlink 2900)

Examples of modem profile and satellite configuration from the ACU web interface are shown in the figures below.

Figure C-18: VSAT modem profile, STM SatLink 2900 (example)

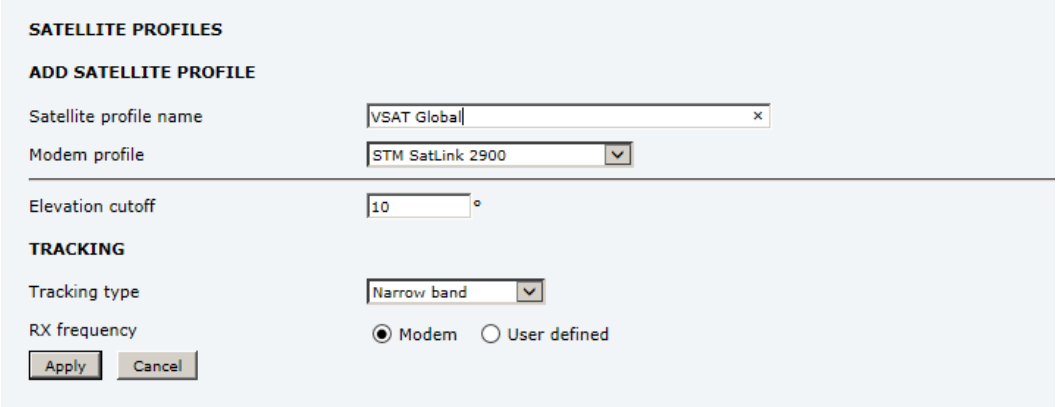


Figure C-19: Satellite profile, STM SatLink 2900 (example)

C.7 Gilat SkyEdge II VSAT modem

C.7.1 Interfaces and VSAT modem configuration

The following sections describe how to connect an ACU to a Gilat SkyEdgeII VSAT modem. The Gilat SkyEdge II and the SAILOR 900 VSAT High Power are fully integrated and require only little user setup.

Connections

Connect the ACU and Gilat SkyEdge II with the following cables:

- 75 Ohm RF cables F-F connectors for RX and TX frequencies
- Serial cable for communication with the modem. Connect SERIAL on the VSAT modem to RS-232 on the ACU. You can use the cable described in *Modem Cable iDirect Serial and RSSI* on page B-3.

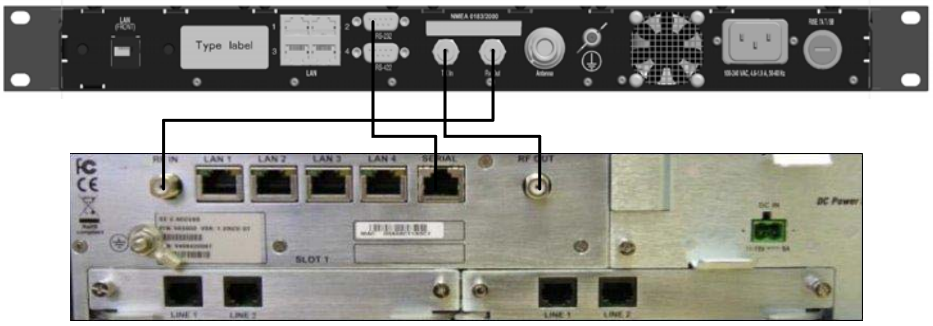


Figure C-20: Connecting Gilat SkyEdge II VSAT modem to the ACU

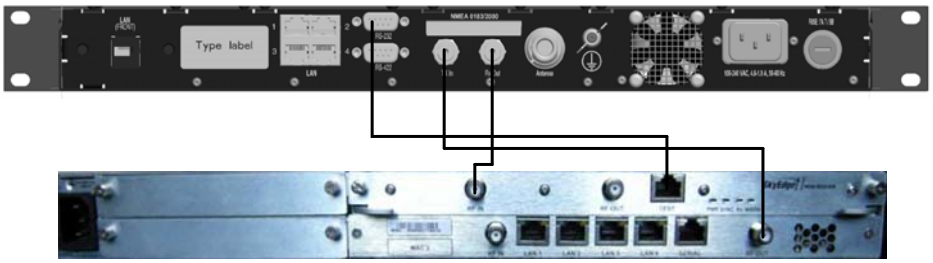


Figure C-21: Connecting Gilat SkyEdge II VSAT modem (rack) to the ACU

Modem configuration requirements

1. Connect a PC with an Ethernet cable to LAN port 1 of the VSAT modem.
2. Set the PC to static IP address: 192.168.1.2
3. Start an Internet browser (e.g. Internet Explorer) and go to URL://192.168.1.1 in order to get access to the web server of the VSAT modem.
4. Login with: User name: inst and Password: $Sat2598$

5. Go to the menu **Installer**.

Parameter	Settings
RF Downlink frequency	In the section **General** the RF Downlink frequency is shown. Write it down as it is going to be used for the selection of LNB LO. Further down on the page you find the BUC and LNB LO frequencies.
LNB LO	Depending on the RF Downlink frequency select an appropriate LNB LO of 9.75, 10.25, 10.75 or 11.25 GHz which will result in an L-band frequency between 950 and 1650 MHz which is the operating frequency band of the SkyEdge II Access modem.
BUC LO	Select the BUC to be 12.8 GHz as this is the BUC LO of the SAILOR 900 VSAT High Power. Remember to inform the hub operator about this when doing line up and commissioning.
BUC 10MHz Reference Signal	The BUC 10MHz Reference Signal must be configured to ON, otherwise the SAILOR 900 VSAT High Power will never allow TX. Scroll further down to enable GPS for the Location Coordinates. This enables the serial protocol of the modem so it can communicate with the ACU.

Table C-9: Configuration of Gilat SkyEdge II VSAT modem

6. Go to the top of the page and press the **Submit** button and **OK** to save the new settings.

The VSAT modem is now configured to be used with the SAILOR 900 VSAT High Power.

C.7.2 ACU configuration

To set-up the ACU to work with a Gilat SkyEdge II VSAT modem, do as follows:

1. Add a modem profile with the Gilat SkyEdge II modem. See *Modem profiles* on page 6-23.
2. Add a satellite profile using the Gilat SkyEdge II modem profile just created. See *Satellite profiles* on page 6-26.
3. Edit the network settings and input the IP information supplied with the modem. See *To configure the LAN network* on page 6-30.
4. Activate the satellite profile.

See also the configuration example in the following section.

C.7.3 Configuration example (Gilat SkyEdge II)

Examples of modem profile and satellite configuration from the ACU web MMI are shown in the figures below.

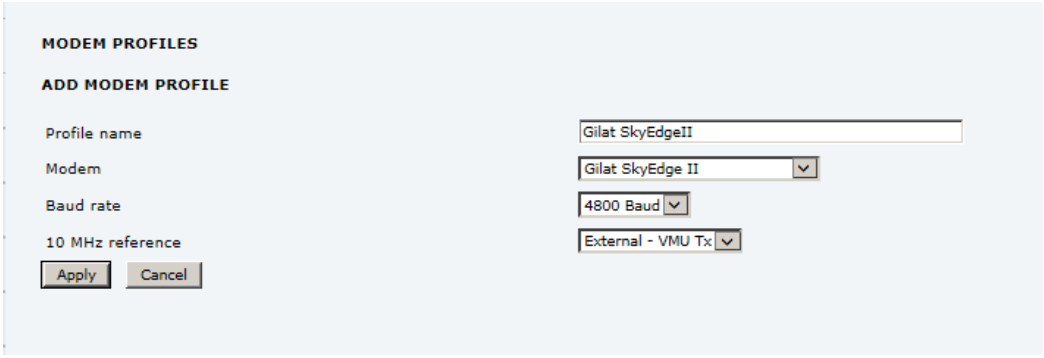


Figure C-22: VSAT modem profile, Gilat Sky Edge II (example)

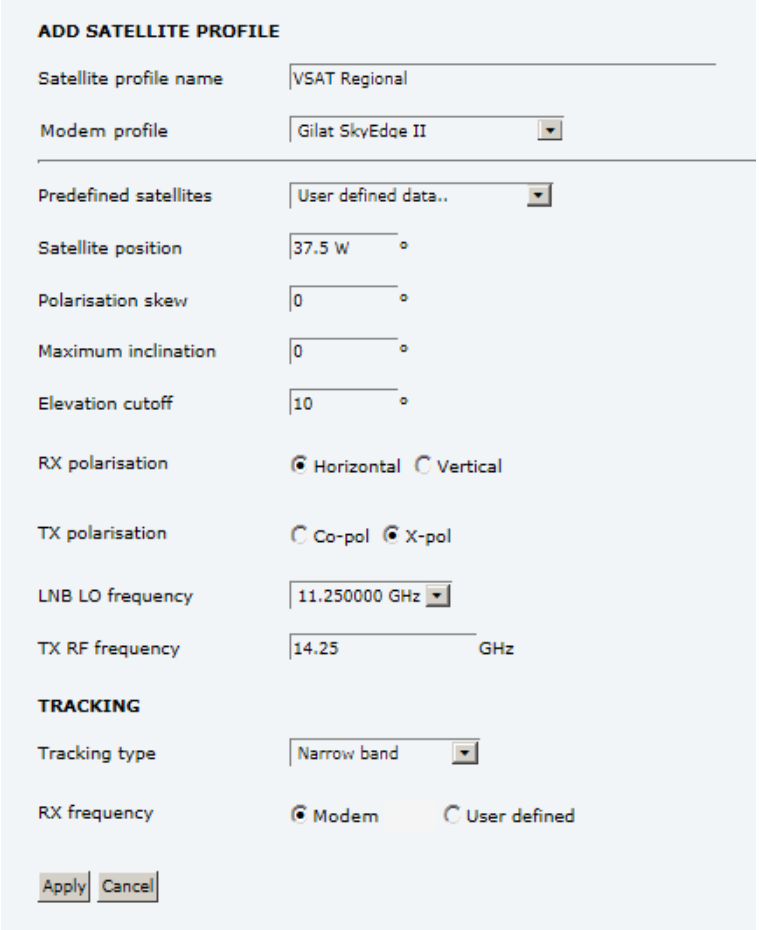


Figure C-23: Satellite profile, Gilat Sky Edge II (example)

C.8 Inmarsat G5 modem

C.8.1 Interfaces and VSAT modem configuration

Inmarsat G5 is delivered in a pre-wired and fully configured 19" rack by Inmarsat.

C.8.2 Connecting a Inmarsat G5 modem

Inmarsat G5 is delivered in a pre-wired and fully configured 19" rack by Inmarsat.

C.8.3 Inmarsat G5 Driver

The Inmarsat G5 driver uses two interfaces on the SAILOR ACU VSAT KU: RS-232 and LAN1.

RS-232

The RS-232 serial port outputs NMEA GPS strings that can be used by the Inmarsat G5 system to feed GPS to the VSAT modem. The baud rate is fixed at 4800 baud and the NMEA string is GPGGA and is output every 15th seconds.

Example of a GPGGA string:

`$GPGGA,065401,5500.000,N,01200.000,E,1,08,,0.0,M,,,,*32`

The RS-232 serial port also supports serial commands to configure and verify the LAN1 IP settings.

The following serial commands are supported:

[Set] and [Get] commands	
Set up of LAN1 IP address	`$SC:ACUNS:IP#203.88.69.106`
Set IP Mask	`$SC:ACUNS:MASK#255.255.255.0`
Set DNS	`$SC:ACUNS:DNS#4.2.2.2`
Set Gateway	`$SC:ACUNS:GW#10.196.17.1`
Get IP settings	`$GC:ACUNS`

Table C-10: RS-232 [Set] and [Get] commands

ACU Response:

`ACUNS:IP#203.88.69.103:MASK#255.255.255.0:GW#10.196.17.1:DNS#4.2.2.2`

LAN1

The ACU LAN1 is used to communicate with the Inmarsat G5 system. This interface supports following commands:

[Get] commands		ACU Response
G5: Get Current ACU Status	$CACUS	CACUS:ANTS#TRK:AGCL#68:TXL#1:HDG#YES:BLOK#NO
G5: Get Current ACU Values	$CACUV	CACUV:AZIM#181.2:ELEV#26.8:RAZM#180.8:POLN#0.7
G5:Request Current Error Status	$RCES	RCES:COMME#NOERROR:AZME#NOERROR:ELME#NOERROR:CLME#NOERROR:POLNME#NOERROR:GPSE#NOERROR:PWRE#NOERROR:BUCE#NOERROR:LNBE#NOERROR
G5:Request Current Values Status	$RCVS	RXPOL#V:SKEW#0.0:MLOCK#ON:MAXINCL#0.0:TXFREQ#955000:TXLO#12800 RCVS:LALO#N55.00-E012.00:HEAD#1.7:SATP#11.0E:FREQ#1466900:BAND#1:LNB#XPOL:TXPOL#H:
G5: Get Command	$GC:ACUNS	ACUNS:IP#192.168.1.1:MASK#255.255.255.0:GW#0.0.0.0:DNS#0.0.0.0

Table C-11: LAN1 - [Get] commands

[Set] commands	
G5: Set Command Modem Lock	$SC:MLOCK#ON
G5: Set Command Modem No Lock	$SC:MLOCK#OFF
G5: Send Values	$SV:FREQ#1466900:SATP#42.0E:BAND#1:TXPOL#H:RXPOL#V:LNB#XPOL:TXFREQ#955000:TXLO#12800:SKEW#0.0:MAXINCL#0.0

Table C-12: LAN1 - [Set] commands

C.8.4 ACU configuration

To set-up the ACU to work with an Inmarsat G5 modem, do as follows:

1. Add a modem profile with the Inmarsat G5 modem. See *Modem profiles* on page 6-23.
2. Add a satellite profile using the Inmarsat G5 modem profile just created. See *Satellite profiles* on page 6-26.
3. Activate the satellite profile.

See also the configuration example in the following section.

C.8.5 Configuration example (Inmarsat G5)

Examples of modem profile and satellite configuration from the ACU web MMI are shown in the figures below.

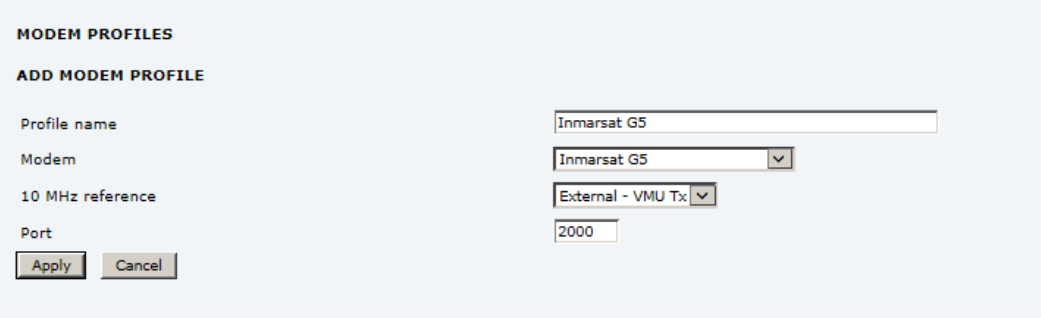


Figure C-24: VSAT modem profile, Inmarsat G5 (example)

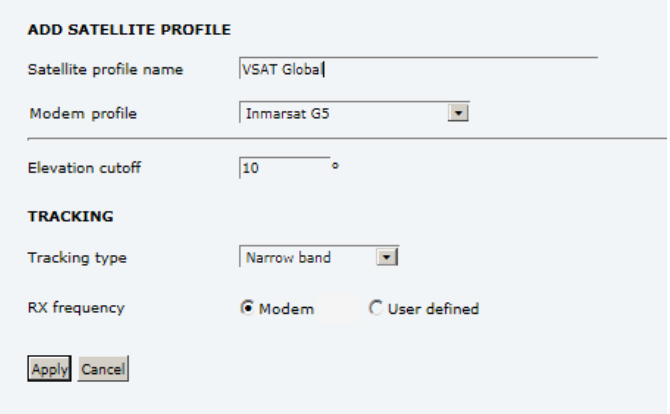


Figure C-25: Satellite profile, Inmarsat G5 (example)

C.8.6 LAN setup requirements for G5 system

Make sure that the following requirements are taken care of when configuring the LAN:

- LAN1: Static IP
- LAN1: DHCP Server disabled
- DNS setup: Static IP
- GW setup: Static IP
- LAN3: IP <> LAN1
- LAN4: IP <> LAN1

See also *To configure the LAN network* on page 6-30.

C.9 Linkway S2 modem

C.9.1 Protocols and interfaces

The following sections describe the protocol and interface between the ACU and a LinkWay S2 modem.

Connections

Connect the ACU and Linkway S2 modem with the following cables:

- RS-232 console cable for control communication
- 75 Ohm RF cables F-F connectors for rx and tx frequencies.

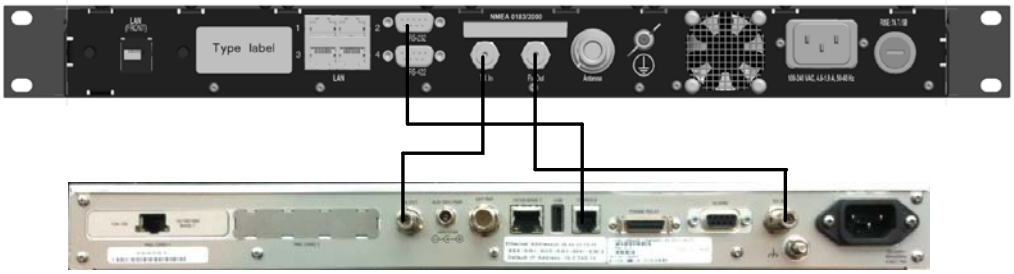


Figure C-26: Connecting LinkWay S2 modem to the ACU

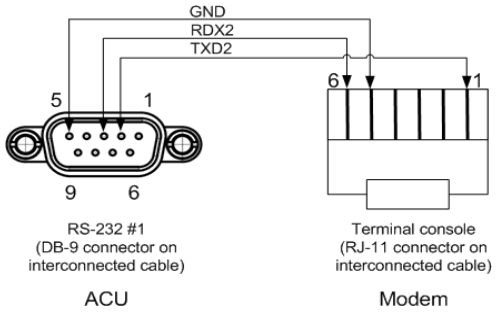


Figure C-27: Serial cable between the modem and the ACU

Modem signal

The $TTD command is sent by the modem to the ACU every second. The format is as follows:

```
$TTD, Eb/No, RB_Detected, RB_Detected_With_No_CRC,
Rx_Synced, Tx_Synced, RB_Power,0*
```

Command items	Description
$TTD	Literal string that prefixes the message
Eb/No	Eb/No measured since the last message transmission

Table C-13: Linkway S2 modem command $TTD

Command items	Description
RB_Detected	'L' if RBs were detected since the last message transmission or 'N'
RB_Detected_With_No_CRC	'D' if RBs were detected without CRC since the last message transmission or 'N'
Rx_Synced	'L' if terminal is Rx synced at the time of transmission of this message or 'N'
Tx_Synced	'T' if terminal is Tx synced at the time of transmission of this message or 'N'
RB_Power	Measured RB Power since the last message transmission
Checksum	

Table C-13: Linkway S2 modem command $TTD (Continued)

The ACU uses the Eb/No to show modem signal strength on the DASHBOARD of the web interface of the ACU. The Rx_Synced is used to determine if the modem is in Rx Lock with the satellite signal and is used to search for the satellite signal if Rx Lock is lost.

IP address

The $TIPCD command is sent by the modem to the ACU once every 10th seconds. The format is as follows:

```
$TIPCD, MAC_ADDR_OF_TERMINAL,
IP_ADDR_OF_TERMINAL,IP_MASK_OF_TERMINAL,0*
```

Command item	Description
$TIPCD	Literal string that prefixes the message
MAC_ADDR_OF_TERMINAL	Ethernet address of the modem in aa:bb:cc:dd:ee:ff form.
IP_ADDR_OF_TERMINAL	IP address assigned to the modem at the time of message transmission in dotted decimal notation.
IP_MASK_OF_TERMINAL	IP subnet mask assigned to the modem at the time of message transmission, in dotted decimal notation.
Checksum	

Table C-14: LinkWay S2 modem command $TIPCD

This $TIPCD is not used by the ACU.

GPS

The $GPGGA command is sent by the ACU to the modem once every 15th seconds. The format is as follows:

`$GPGGA,055751,3732.1619,N,12659.0507,E,0,00,,,M,,M,,*5F`

- UTC of Position 055751
- Latitude 3732.1619
- N or S
- Longitude 12659.0507
- E or W
- GPS quality indicator (0=invalid; 1=GPS fix; 2=Diff. GPS fix)
- Number of satellites in use [not those in view]
- Horizontal dilution of position
- Antenna altitude above/below mean sea level (geoid)
- Meters (Antenna height unit)
- Geoidal separation (Diff. between WGS-84 earth ellipsoid and mean sea level. -=geoid is below WGS-84 ellipsoid)
- Meters (Units of geoidal separation)
- Age in seconds since last update from diff. reference station
- Diff. reference station ID#
- Checksum

C.9.2 ACU configuration

To set-up the ACU to work with an Linkway S2 modem, do as follows:

1. Add a modem profile with the Linkway S2 modem. See *Modem profiles* on page 6-23. Enter the information from you service provider.
2. Add a satellite profile using the Linkway S2 modem profile just created. See *Satellite profiles* on page 6-26.
3. Activate the satellite profile.

See also the configuration example in the following section.

C.9.3 Configuration example (Linkway S2)

Examples of modem profile and satellite configuration from the ACU web MMI are shown in the figures below

Figure C-28: Modem profile for Linkway S2

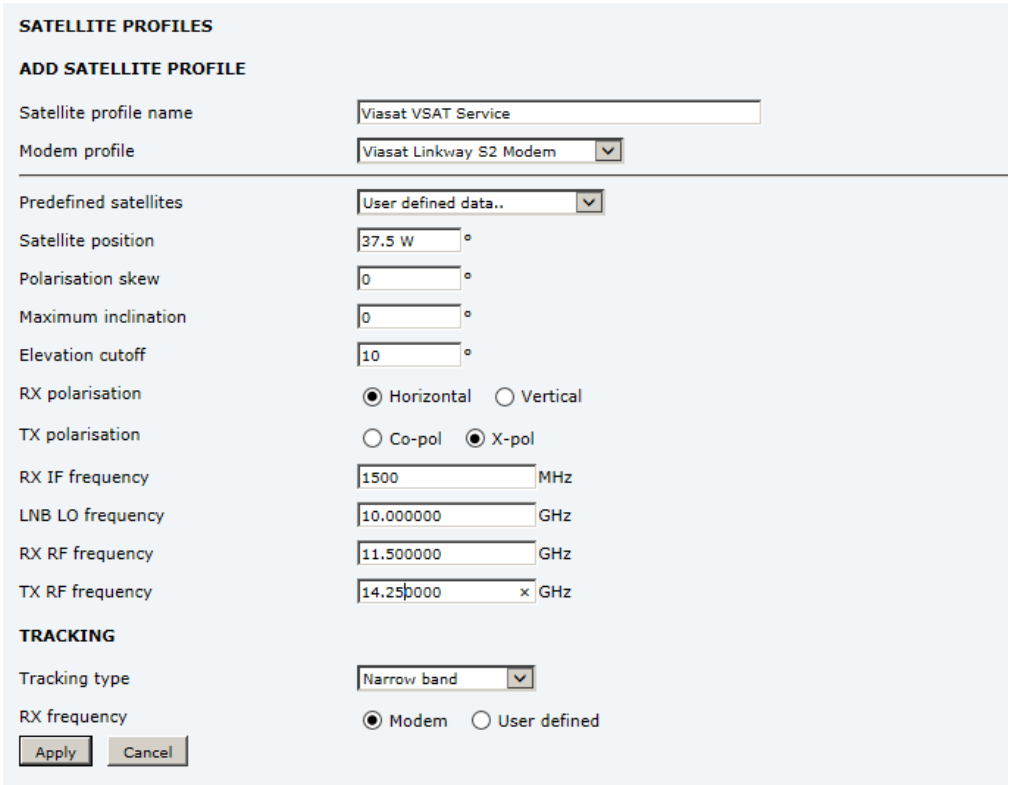


Figure C-29: Satellite profile with Linkway S2 modem profile

Command line interface

D.1 Introduction

After you have done the initial configuration and connected the SAILOR VSAT system to your network, you can use Telnet to configure the SAILOR VSAT system. You can also setup VSAT modem parameters. Note that the following sections cover the command line interface for all SAILOR VSAT antennas. Some of the commands may not be relevant for the antenna described in this manual.

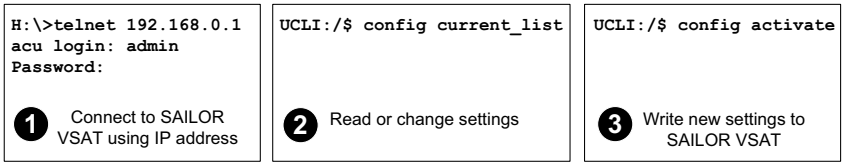


Figure D-1: How to use the command line interface (example for telnet)

After successful login you can read and change settings. Use the command **`config activate`** to activate the new settings in the ACU. You will need to refresh the browser window before the changed settings become visible.

Note Every change is performed on the active satellite profile or the active VSAT modem profile. Parameter identifiers are case sensitive.

D.1.1 Telnet connection

You can access the command line interface via Telnet.

User name and password

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

Telnet

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

1. Open a Telnet client of your choice.
2. At the prompt, enter the IP address of the ACU, default login **admin** and default password **1234**.

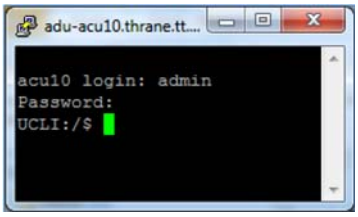


Figure D-2: Command line interface, login

D.1.2 Help

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

D.1.3 Conventions

The command description below uses the following special typography:

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

Table D-1: Command typography

Example:
```
satellite lon [longitude]
zone <id> active <yes | no>
```

D.2 Supported commands

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

- *config*
- *demo*
- *dual_antenna*
- *exit*
- *help*
- *modem*
- *satellite*
- *status*
- *system*
- *track*
- *zone*

D.2.1 config

Command	Description
config	Shows the sub commands available, including a short description.
config pending_list	Shows the number of pending changes.
config current_list	Shows the values for the current satellite profile, antenna and some tracking information.
config discard	Discards all pending changes.
config activate	Use this command to save and activate the pending changes in the SAILOR VSAT system.

Table D-2: UCLI command: config

D.2.2 demo

Command	Description
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-3: UCLI command: demo

D.2.3 dual_antenna

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

Table D-4: UCLI command: dual_antenna

D.2.4 exit

Command	Description
exit	Exits the connection to the SAILOR VSAT system.

Table D-5: UCLI command: exit

D.2.5 help

Command	Description
help	Shows a list of commands available, including a short description.
help satellite	Shows the sub commands and description for the command satellite.
help modem	Shows the sub commands and a short description for the command modem.
help track	Shows the sub commands and description for the command track.
help status	Shows the sub commands and description for the command status.
help system	Shows the sub commands and a short description for the command system.
help config	Shows the sub commands, unit and description for the command config.
help zone	Shows the sub commands, unit and description for the command zone.
help demo	
help dual antenna	
help exit	

Table D-6: UCLI command: **help**

D.2.6 modem

Command	Description
modem	Shows a list of sub commands available, including a short description.
modem name	Shows the VSAT modem name of the currently active satellite profile (entered in the web interface).
modem model	Shows the currently active VSAT modem model (selected in the web interface).
modem gps_fix	Shows the current GPS position
modem gps_lat	Shows the latitude value of the current position.
modem gps_lon	Shows the longitude value of the current position.

Table D-7: UCLI command: **modem**

D.2.7 satellite

Command	Description
satellite name	Shows the name of the currently active satellite profile.
satellite lon **satellite lon 1W**	Shows or sets the longitude position of the satellite, in degrees. • 1.0W or 1.0E or -1.0 for west and 1.0 for east
satellite skew **satellite skew 3.7**	Shows or sets an additional skew offset of the satellite[a]. Some satellite has additional skew because they have been placed different in the orbit. E.g. Optus satellites in Australia are offset -45 degrees. Most satellites have 0 degree skew offset. • Skew of the satellite: –90˚ to +90˚.
satellite max_inc **satellite max_inc 2.5**	Shows or sets the maximum inclination of the used satellite. Some satellites are old and are therefore moving in larger circles in space. Setting the maximum inclination will add this to the SAILOR VSAT system acquisition window size used to find the satellite. • Maximum inclination of satellite 0.0˚ to 90˚
satellite rx_pol **satellite rx_pol v**	Shows or sets the current RX polarisation: • v (vertical) • h (horizontal) • l (left) • r (right)
satellite tx_pol **satellite tx_pol v**	Shows or sets the current TX polarisation: • v (vertical) • h (horizontal) • l (left) • r (right)
satellite ele_cut_off **satellite ele_cut_off 5**	Shows or sets the elevation referenced to earth where the SAILOR VSAT system must shut off for transmission. This is an FCC requirement. The elevation cut off depends on how much power is transmitted and which coding is used. • Valid range: 0˚ to 90˚
satellite rx_lo	Shows the Rx LO / LNB LO. Range: 9.6 GHz to 11.3 GHz. GX: 18.25 GHz

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

Command	Description
satellite rx_rf_freq **satellite rx_rf_freq 12.123456 9.75**	Shows or sets the Rx frequency and LNB Lo frequency. • Ku band: RF frequency: 10.7 – 12.75 GHz. LNB Lo frequency: 9.6 GHz – 11.3 GHz. The SAILOR VSAT system supports any LNB Lo. • Ka band: RF frequency: 19.2 – 20.2 GHz. LNB Lo frequency: 18.25 GHz. **Note**: Setting the Ku-band Rx frequency and LNB Lo automatically configures the L-band rx frequency: Rx L-band freq = rx_rf_freq – LNB Lo **Example**: 1567.890 MHz = 11.567890 GHz – 10 GHz
satellite rx_if_freq **satellite rx_if_freq 1200.123 9.75**	Shows or sets the IF Rx frequency together with the LNB Lo frequency. • Ku band: IF frequency within 950 MHz – 2150 MHz. LNB Lo frequency within 9.6 GHz – 11.3 GHz. The SAILOR VSAT system supports any LNB Lo. • Ka band: IF frequency within 950 MHz – 1950 MHz. LNB Lo frequency: 18.25 GHz. **Note**: Setting the L-band Rx frequency and LNB Lo automatically configures the Ku-band Rx frequency: Rx Ku-band frequency = LNB Lo + rx_if_frequency **Example**: 11.567890 GHz = 10 GHz + 1567.890000 MHz
satellite tx_lo	Shows the current TX LO frequency, fixed at Ku band:12.8 GHz Ka band: 28.05 GHz

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

Command	Description
satellite tx_rf_freq **satellite tx_rf_freq 14.123456**	Shows or sets the RF frequency used for tx. • Valid range: Ku band: 13.75 GHz to 14.5 GHz. Ka band: 29 GHz to 30 GHz. **Note**: Configuring the Ku-band tx frequency automatically configures the L-band frequency: L-band frequency = Ku-band tx frequency – 12.8 GHz (BUC Lo) **Example**: 1308.300000 MHz = 14.108300 GHz – 12.8 GHz
satellite tx_if_freq **satellite tx_if_freq 1200.123**	Shows or sets the IF frequency for tx. • Valid range: Ku band: 950 MHz to 1700 MHz. Ka band: 950 MHz to 1950 MHz **Note**: Configuring the L-band tx frequency automatically configures the Ku-band frequency: Ku-band frequency = 12.8 GHz (BUC Lo) + L-band frequency **Example**: 14.108300 GHz = 12.8 GHz + 1308.300000 MHz

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

a. Relevant for Ku band.

D.2.8 status

Command	Description
status	Shows the sub commands available, including a short description.
status system	Shows the current status of the SAILOR 900 VSAT High Power.
status track_all	Shows the current values for all tracking parameters: • vessel heading • azimuth relative • elevation relative • polarisation skew • GPS latitude and longitude
status event_list	Shows a list of active events.

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

D.2.9 system

Command	Description
system	Shows the sub commands available, including a short description.
system restart	Sends a command to the ACU to restart the system instantaneously. It makes a power-on self test and then points to the last used satellite.
system info	Shows the software version, part names and serial numbers of the SAILOR 900 VSAT High Power.

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

D.2.10 track

Command	Description
track	Shows the sub commands available, including a short description.
track mode **track mode dvb**	Shows or sets the receiver bandwidth or mode, the way the SAILOR 900 VSAT High Power tracks the satellite: • narrow (recommended, uses the built-in 300 kHz filter of the SAILOR 900 VSAT High Power) • rssi (uses the RSSI signal from the VSAT modem) • wide (uses the wide-band filter to track the satellite) • dvb (uses the built-in DVB-S2 receiver of the SAILOR 900 VSAT High Power to track the satellite. You must configure `dvb_sym` and `dvb_nid`.) • GSC (uses Inmarsat Global Signalling Channel • GSCpwr (uses power of Inmarsat Global Signalling Channel)
track dvb_sym **track dvb_sym 22**	Shows or sets the current mega symbols rate for the DVB-S2 receiver when in dvb mode. The symbol rate used to verify and track a transponder. • Valid range: 0.1 — 99

Table D-11: UCLI command: `track`

Command	Description
track dvb_nid **track dvb_nid 0**	Shows or sets the DVB NID to be verified by the built-in DVB-S2 tracking receiver, when using tracking mode DVB. It configures the NID used to verify and track a transponder. • Valid range: 0 — 65535 A NID of '0' disables the NID check. Then the NID will be omitted in the verification of the transponder.
track rx_rf_freq	The frequency for the receiver to tune to. Verify that the frequency is in the same range as the modem rx_rf_frequency, above or below 11.7 GHz. I.f rx_rf_freq is set to 0, the tracking frequency is the same as the RX frequency provided by the modem • Valid range: Ku band: 10.7 GHz to 12.75 GHz Ka band: 19.2 GHz to 20.2 GHz

Table D-11: UCLI command: `track`

D.2.11 zone

Command	Description
zone	Shows the sub commands, unit and description for the command `zone`.
zone <id> azimuth <start angle> <end angle>	Sets the azimuth angles of the blocking zone for one zone. • Valid zones: 0 to 7 • Valid angles: 0 to 360
zone <id> elevation <start angle> <end angle>	Sets the elevation angles for a blocking zone. • Valid zones: 0 to 7 • Valid angles: 0 to 360
zone <id> tx_off <yes | no>	Enables or disables TX inside the blocking zone.
zone <id> active <yes | no>	Enables or disables the blocking zone.
zone <id>	Shows the setting for the blocking zone.

Table D-12: UCLI command: `zone`

DVB-S satellites

This appendix contains examples of DVB-S satellite data for azimuth calibration.

VSAT coverage	Satellite name	Satellite position	RX polarisation	RX frequency	Symbol rate	NID
Americas 	EchoStar9/ Galaxy23	121°W	Vertical	12.016 GHz	20.000 MS/s	0
Europe & Americas	**Hispasat**	30°W	Vertical	12.052 GHz	27.500 MS/s	51
East Asia 	**NSS6** 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	12.673 GHz	20.25 MS/s	65535
Europe 	**THOR 6 BEAM K2**	0.8°W	Horizontal	11.747 GHz	28.000 MS/s	4369
Europe 	**THOR 5 BEAM T2** Backup	0.8°W	 Vertical	 12.418 GHz	 28.000 MS/s	 70

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

VSAT coverage	Satellite name	Satellite position	RX polarisation	RX frequency	Symbol rate	NID
Europe KU 	**Astra2** Backup	28.2˚E 3.535˚skew	Horizontal	12.032 GHz	27.500 MS/s	32
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

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

VSAT coverage	Satellite name	Satellite position	RX polarisation	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	25.6 Ms/s	57

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

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

Example:

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

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

The above transponder has following parameters:

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

Grounding and RF protection

F.1 Why is grounding required?

F.1.1 Reasons for grounding

Grounding the SAILOR 900 VSAT High Power system is required for at least two reasons:

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

F.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.

F.1.3 ESD Protection

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

F.2 Grounding Recommendations

F.2.1 To ground the ACU

The ACU should be grounded to the ship/hull. For this purpose you may use a short ADU cable and a grounding kit. Further, the ACU must be grounded at its grounding stud in order to ensure proper grounding if the short ADU cable is disconnected. For further information, see *Grounding the terminal* on page 2-33.

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 ACU 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 F-9.

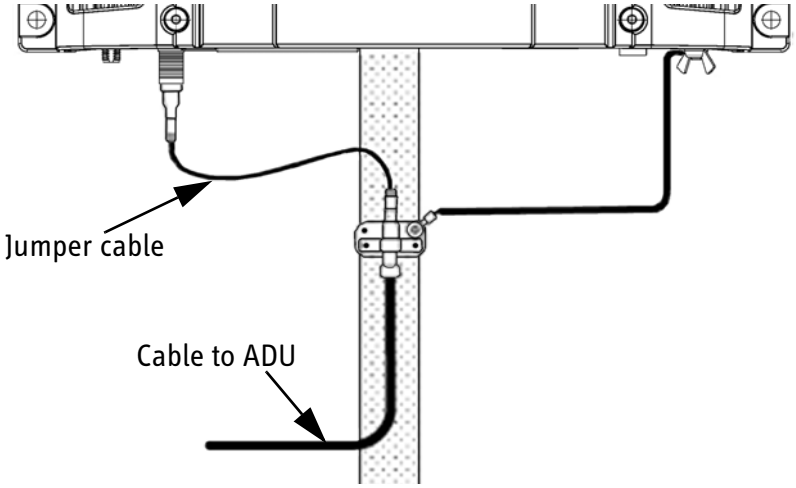


Figure F-1: Extending the ground plane

F.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.

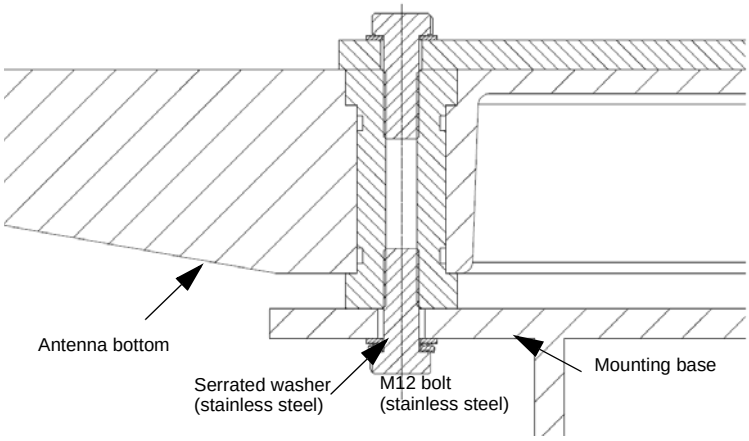


Figure F-2: Grounding the ADU

Note For optimum grounding use the mounting bolt located closest to the ADU cable plate, see *To ground the ADU* on page 3-22.

It is always recommended to establish the shortest possible grounding path e.g. on steel hulls the ADU should be grounded directly to the hull [2]. However, due to the fact that this is not possible on e.g. fibreglass hulls (nor is it preferable on aluminium hulls) a number of alternative grounding methods are suggested in the following paragraphs.

F.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.

F.3.1 To ground the ACU

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

The ground connection can be established either at the hull (recommended) or at a dedicated RF ground if available (alternative).

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

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

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

F.3.2 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 3-22.

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 ACU 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 F-8.

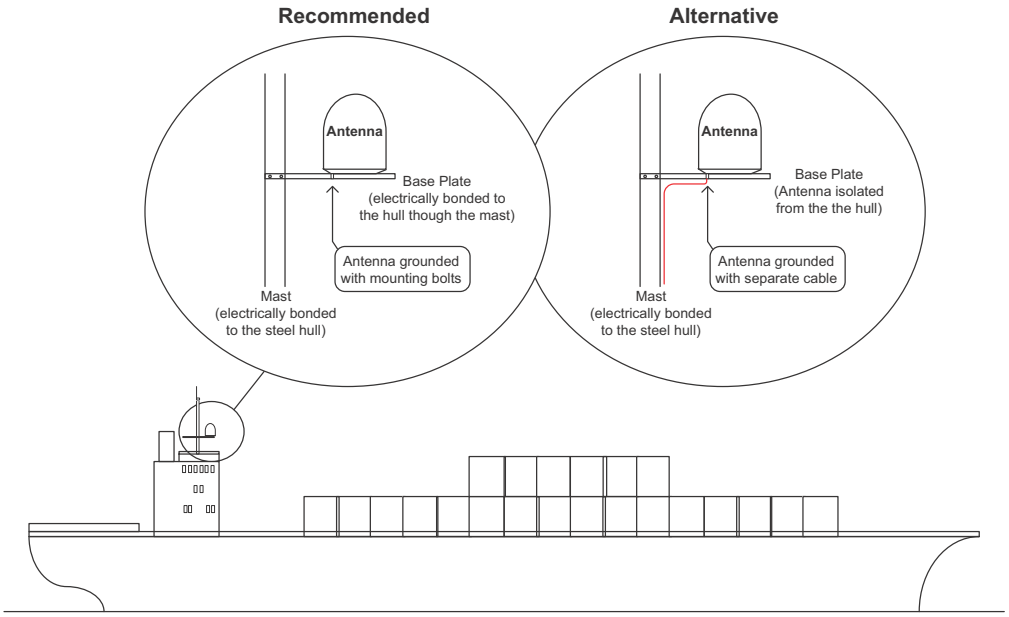


Figure F-3: Grounding at a dedicated RF ground (alternative)

F.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.

F.4.1 To ground the ACU

The ACU should preferably be grounded with the short cable. Further, the ACU 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).

Importan Remember to make the ADU ground connection at the **same electrical ground potential** as the ACU (see *To ground the ADU*).

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

F.4.2 To ground the ADU

If the mounting base of the ADU is electrically connected to the hull (or any other ground potential than the ACU), the ADU must be isolated at its mounting bolts by means of shoulder bushings and washers, see F.6.3. 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 ACU Grounding kit. A heavy gauge wire with tinned strands (min. 6 mm^2) can be used for this purpose.

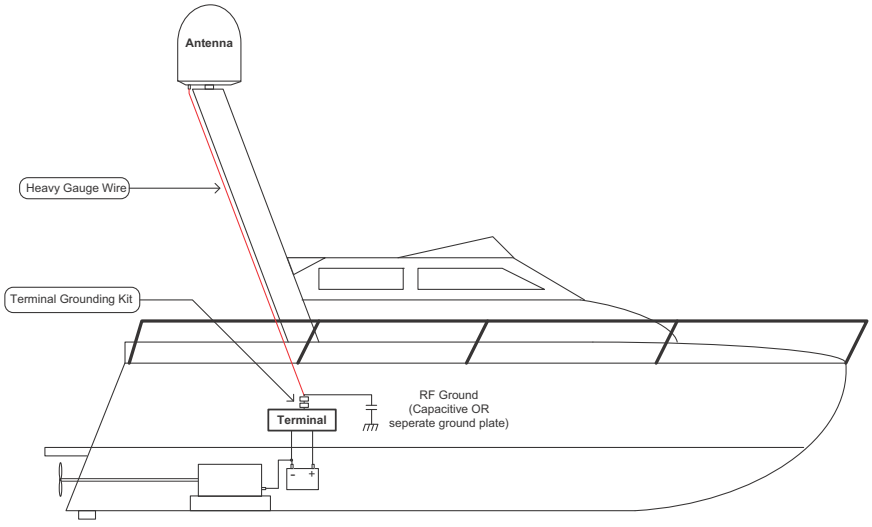


Figure F-4: Alternative grounding for aluminium hulls

F.5 Alternative grounding for fibre glass hulls

F.5.1 To ground the ACU

The ACU should preferably be grounded with the short ADU cable and a grounding kit (available from Thrane & Thrane). Further, the ACU 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 ACU (see *To ground the ADU*).

F.5.2 To ground the ADU

If the mounting base of the ADU is electrically connected to any other ground potential than the ACU (e.g. Lightning Ground), the ADU must be isolated at its mounting bolts by means of shoulder bushings and washers - see section F.6.3.

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 ACU Grounding kit. A heavy gauge wire with tinned strands (min. 6 mm^2) can be used for this purpose.

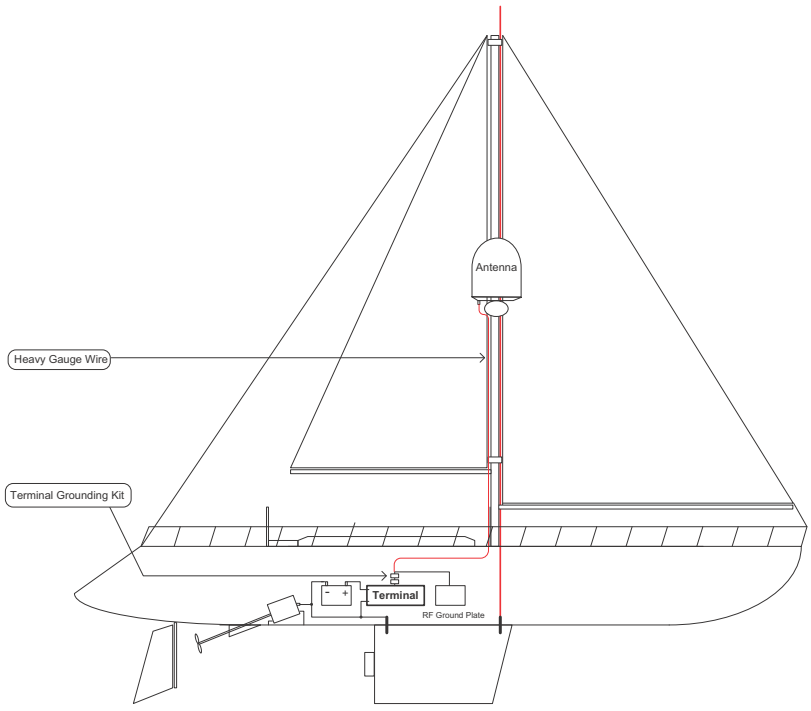


Figure F-5: Alternative grounding for fibreglass hulls

F.6 Separate ground cable

F.6.1 Ground cable - construction

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

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

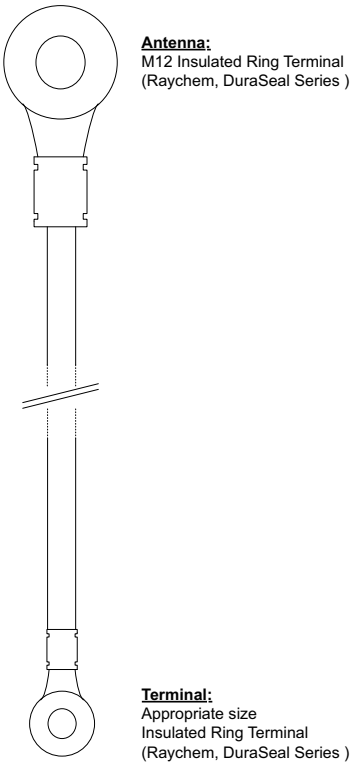


Figure F-6: Separate ground cable

F.6.2 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 F-7, *Isolation of the ADU from the mounting base* on page F-8.

At the other end, connect the ground cable as described in *To ground the ACU* on page F-2.

F.6.3 Isolation of the ADU from the mounting base

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

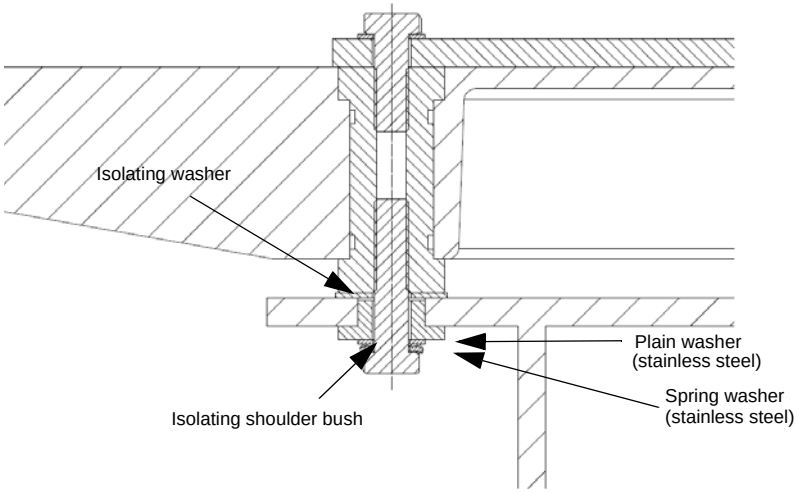


Figure F-7: Isolation of the ADU from the mounting base

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

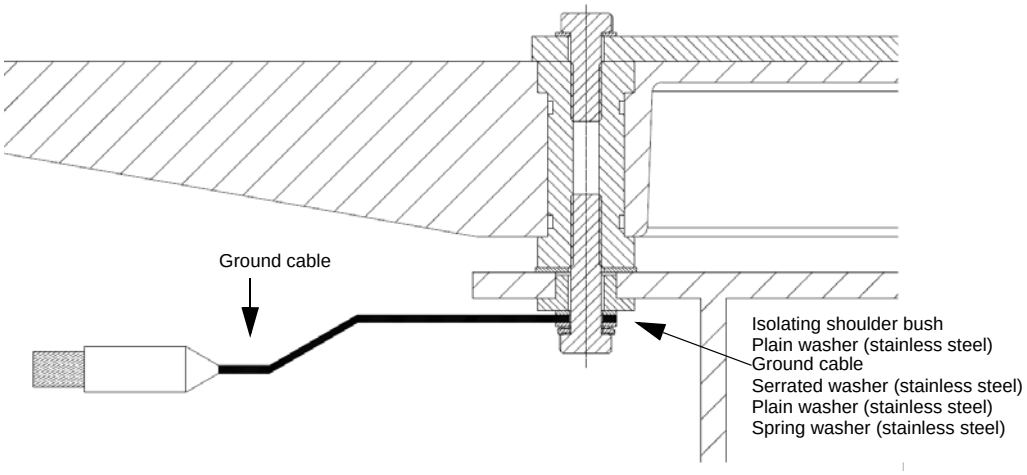


Figure F-8: ADU isolation and grounding cable

F.7 Jumper cable for grounding

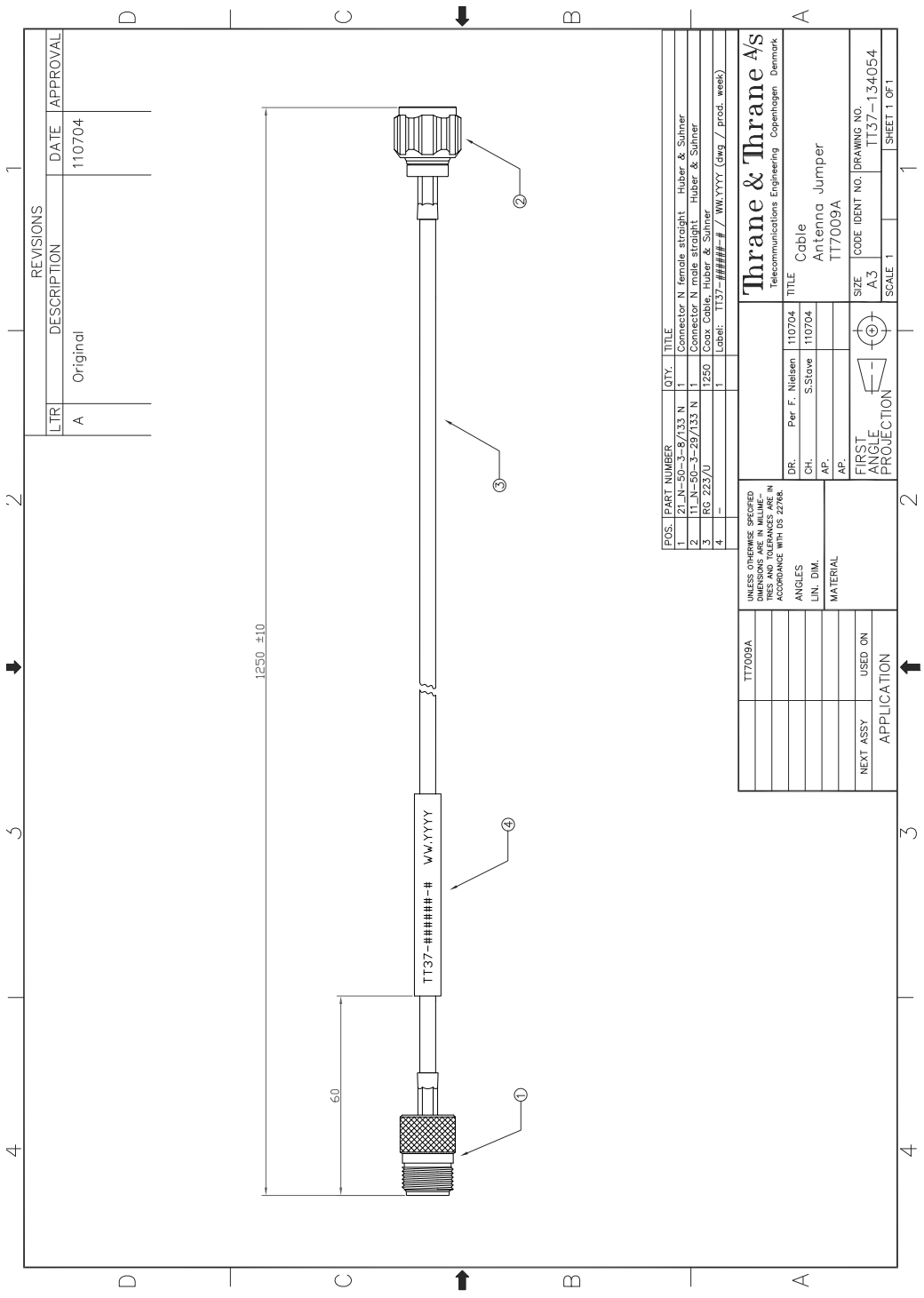


Figure F-9: Jumper cable for grounding (specifications)

F.8 RF interference

Interference induced from nearby high-power RF transmitters might cause system failures and in extreme cases permanent damage to the SAILOR 900 VSAT High Power 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.

F.8.1 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.

System messages

G.1 Event messages – overview

The SAILOR 900 VSAT High Power detects events during

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

When the SAILOR 900 VSAT High Power detects an event that requires your action, it issues an event message and the red Fail/Pass LED in the LED panel of the ACU is lit. As long as an event is active, it is shown in the ACU display and the web interface (in HELPDESK > Event list or click the event icon on the DASHBOARD).

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 Notifications section. Notifications are cleared after 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.

G.2 List of ADU events

Error code (ID)	Unit	Severity	Description	Explanation
0A001-0	Antenna	ERROR	Production data	Production data is invalid.
0A002-0	Antenna	ERROR	XIM internal	Antenna configuration data stored in the PCM module is invalid.
0A003-0	Antenna	ERROR	XIM external	Antenna configuration data stored in the VIM/TIM module is invalid.
0A004-0	Antenna	ERROR	XIM I/X match	Antenna configuration data stored in the PCM module does not match the configuration data stored in the VIM/TIM module.
0A005-0	Antenna	ERROR	Antenna type	The configured antenna type is not supported or unknown.
0A006-0	Antenna	ERROR	PCM FPGA load	The PCM FPGA cannot be initialised and loaded correctly.
0A007-0	Antenna	ERROR	XIM FPGA load	The VIM/TIM FPGA cannot be initialised and loaded correctly.
0A008-0	Antenna	ERROR	XIM production	Production/calibration data stored in the VIM/TIM module is invalid.
0A00A-0	Antenna	ERROR	GNSS initialisation	The GNSS device cannot be initialised. Check cable and GNSS device.
0A014-0	Antenna	ERROR	AMB device discovery	Missing one or more of the following devices: ISM, DDM and PMM. Check cables.
0A015-0	Antenna	ERROR	Azi DDM ABS device	Cannot initialise the azimuth DDM. Info: 0x00000000: Device not found (possible cabling problem) 0x0000bbaa: Device internal error (replace device) aa=status, bb=state.
0A016-0	Antenna	ERROR	Xel DDM ABS device	Cannot initialise the cross-elevation DDM. Info: See 0A015-0.
0A017-0	Antenna	ERROR	Ele DDM ABS device	Cannot initialise the elevation DDM. Info: See 0A015-0.

Table G-1: ADU event messages

Error code (ID)	Unit	Severity	Description	Explanation
0A018-0	Antenna	ERROR	ISM ABS device	Cannot initialise the ISM Info: 0x00000000: Device not found (possible cabling problem) 0x000cbbaa: Device internal error (replace device) aa=status, bb=state, c=calibration data error.
0A019-0	Antenna	ERROR	PMM ABS device	Cannot initialise the PMM. Info: See 0A015-0.
0A01A-0	Antenna	ERROR	BCM ABS device	Cannot initialise the BCM. Info: See 0A015-0.
0A01E-0	Antenna	ERROR	Sensor sanity	Too many invalid values measured by the ISM during initialisation. Check for vibrations or malfunctioning ISM.
0A021-0	Antenna	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.
0A022-0	Antenna	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 0A021-0.
0A023-0	Antenna	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 0A021-0.
0A024-0	Antenna	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 0A021-0.

Table G-1: ADU event messages (Continued)

Error code (ID)	Unit	Severity	Description	Explanation
0A025-0	Antenna	ERROR	Antenna calibration	One or more errors occurred during antenna start-up Info: 0x00000001: Timeout (calibration did not complete in time) 0x00000010: Azimuth axis 0x00000020: Cross-elevation axis 0x00000040: Elevation axis 0x00000080: Polarisation axis
0A028-0	Antenna	ERROR	Demodulator load	The second receiver demodulator cannot be initialised and loaded correctly.
0A029-0	Antenna	ERROR	XIM PLL lock	The PLL on the VIM/TIM does not lock.
0A02B-0	Antenna	ERROR	ABS software version	The ABS software version in the antenna is too old to match the hardware requirements. Upload new software via the web interface.
0A034-0	Antenna	WARNING	ACU communication	The communication link between ACU and antenna is not working.
0A035-0	Antenna	WARNING	ISM data valid	Sensor measurements from the ISM are invalid. This indicates a malfunctioning ISM.
0A036-0	Antenna	WARNING	ISM data range	Sensor measurements from the ISM are out of range.
0A037-0	Antenna	WARNING	GNSS communication	Lost connection to the GNSS device.
0A038-0	Antenna	WARNING	GNSS data range	Received information from the GNSS device which is out of range.
0A039-0	Antenna	WARNING	GNSS device warning	Local GNSS device warning.
0A03A-0	Antenna	WARNING	GNSS device error	Local GNSS device error.
0A03B-0	Antenna	ERROR	Azi DDM shutdown	The azimuth motor control has detected one of the following situations: Extreme temperature, voltage, current or velocity. The motor was then shut down. This is usually a temporary situation and is probably fixed by a restart of the system.
0A03C-0	Antenna	ERROR	Xel DDM shutdown	As Azi DDM shutdown but detected by the cross-elevation motor control.

Table G-1: ADU event messages (Continued)

Error code (ID)	Unit	Severity	Description	Explanation
0A03D-0	Antenna	ERROR	Ele DDM shutdown	As Azi DDM shutdown but detected by the elevation motor control.
0A03E-0	Antenna	ERROR	PMM shutdown	As Azi DDM shutdown but detected by the polarisation motor control.
0A03F-0	Antenna	WARNING	AMB timing	This indicates a busy situation. It may occur during installation procedures. No user interaction is required unless it occurs repeatedly.
0A040-0	Antenna	WARNING	VIM cable attn	The output power cannot be controlled correctly. Check the Tx chain.
0A041-0	Antenna	WARNING	BUC voltage low	The voltage for the BUC is too low, probably caused by a malfunctioning VIM or BUC.
0A042-0	Antenna	WARNING	BUC voltage high	The voltage for the BUC is too high probably caused by a malfunctioning VIM.
0A043-0	Antenna	WARNING	LNB voltage low	The voltage for the LNB is too low probably caused by a malfunctioning VIM/TIM or LNB.
0A044-0	Antenna	WARNING	LNB voltage high	The voltage for the LNB is too high probably caused by a malfunctioning VIM/TIM.
0A045-0	Antenna	WARNING	PMM fan	The fan is not working or the tacho input from the fan is not connected. Check fan cable and fan.
0A046-0	Antenna	WARNING	Antenna temperature	The temperature of the antenna is too high. Check if the fan is working.
0A047-0	Antenna	ERROR	VIM PLL lock	The PLL of the VIM/TIM is out of lock. Check the 10 MHz reference signal.
0A048-0	Antenna	WARNING	VIM tuner lock	The PLL of the second receiver (DVB) is out of lock. Check the 10 MHz reference signal.
0A049-0	Antenna	WARNING	Azi encoder slip	A slip of the azimuth encoder has been detected. If this event is not resolved by itself after some time, check the belt and encoder of the azimuth axis.

Table G-1: ADU event messages (Continued)

Error code (ID)	Unit	Severity	Description	Explanation
0A04A-0	Antenna	WARNING	Xel encoder slip	A slip of the cross-elevation encoder has been detected. If this event is not resolved by itself after some time, check the belt and encoder of the cross-elevation axis.
0A04B-0	Antenna	WARNING	Ele encoder slip	A slip of the elevation encoder has been detected. If this event is not resolved by itself after some time, check the belt and encoder of the elevation axis.
0A04C-0	Antenna	WARNING	Pol encoder slip	A slip of the polarisation encoder has been detected. If this event is not resolved by itself after some time, check the belt and encoder of the polarisation axis.
0A04D-0	Antenna	WARNING	GNSS position	No position available from the GNSS device or position too old.
0A04E-0	Antenna	WARNING	GNSS velocity	No velocity available from the GNSS device.
0A04F-0	Antenna	WARNING	Heading data	Heading information is missing in the antenna.
0A050-0	Antenna	ERROR	Azi DDM communication	Communication error between PCM and azimuth DDM. Check SUB-D connectors and cables.
0A051-0	Antenna	ERROR	Xel DDM communication	Communication error between PCM and cross-elevation DDM. Check SUB-D connectors and cables.
0A052-0	Antenna	ERROR	Ele DDM communication	Communication error between PCM and elevation DDM. Check SUB-D connectors and cables
0A053-0	Antenna	ERROR	ISM communication	Communication error between PCM and ISM. Check SUB-D connectors and cables.
0A054-0	Antenna	ERROR	PMM communication	Communication error between PCM and PMM. Check SUB-D connectors and cables.
0A055-0	Antenna	WARNING	Azi DDM warning	The azimuth motor controller has temporarily observed an unusual situation for temperature, voltage, current or velocity. No user interaction required.

Table G-1: ADU event messages (Continued)

Error code (ID)	Unit	Severity	Description	Explanation
0A056-0	Antenna	WARNING	Xel DDM warning	The cross-elevation motor controller has temporarily observed an unusual situation for temperature, voltage, current or velocity. No user interaction required.
0A057-0	Antenna	WARNING	Ele DDM warning	The elevation motor controller has temporarily observed an unusual situation for temperature, voltage, current or velocity. No user interaction required.
0A058-0	Antenna	WARNING	PMM warning	The polarisation motor controller has temporarily observed an unusual situation with regards to temperature, voltage, current or velocity. No user interaction required.
0A059-0	Antenna	WARNING	Azi cal. limits	Check limits of the calibration result for the azimuth axis are exceeded. Pointing performance may be degraded. Info: 0x00000040: End stop detected before expected limit 0x00000100: Zero width is low 0x00000200: Zero width is high 0x00000400: Zero slack is high 0x00001000: Friction average is high 0x00002000: Friction peak is high 0x00004000: Friction asymmetry is high Zero width low/high: Zero reference module placement may be incorrect. Zero slack high: Mechanical slack may be too high. Friction average/peak high: Mechanical friction is higher than expected. Friction asymmetry high: Mechanical imbalance may be too high.
0A05A-0	Antenna	WARNING	Xel cal. limits	Check limits of the calibration result for the cross-elevation axis are exceeded. Pointing performance may be degraded. Info: See 0A059-0.
0A05B-0	Antenna	WARNING	Ele cal. limits	Check limits of the calibration result for the elevation axis are exceeded. Pointing performance may be degraded. Info: See 0A059-0.
0A05C-0	Antenna	WARNING	Pol cal. limits	Check limits of the calibration result for the polarisation axis are exceeded. Pointing performance may be degraded. Info: See 0A059-0.

Table G-1: ADU event messages (Continued)

Error code (ID)	Unit	Severity	Description	Explanation
0A05D-0	Antenna	WARNING	ISM warning	The ISM has temporarily observed an unusual situation for temperature or voltage. No user interaction required. If repeated after cooldown and reboot, check if the ISM or cables around it are defective.
0A05E-0	Antenna	WARNING	Low elevation	The antenna is not allowed to transmit because the elevation is too low.
0A05F-0	Antenna	WARNING	Heading range	Heading data range error. External heading unit supplies unreliable data.
0A062-0	Antenna	WARNING	High elevation	The antenna cannot perform acquisition in gyro-free mode because the elevation is too high.
0A065-0	Antenna	ERROR	Deploy/Stow	Deploy/stow error. The antenna did not properly unlock (deploy), or the stow switch never closed (stow).
0A066-0	Antenna	ERROR	OMT error	Problem with OMT. Temperature may be too high. OMT cable may be broken.

Table G-1: ADU event messages (Continued)

G.3 List of ACU events

Error code (ID)	Unit	Severity	Description	Explanation
08060-0	ADM	WARNING	Antenna modem	ACU/Antenna communication error detected (framing and parity). If the situation is persistent, check if cable specifications comply (length and attenuation).
08061-0	ADM	WARNING	VMU linux shell password	The specified password (root) for the satellite modem is not accepted by the modem.
08062-0	ADM	WARNING	VMU debug shell password	The specified password (user) for the satellite modem is not accepted by the modem.
08063-0	ADM	ERROR	Antenna connection	The ACU has lost connection with the antenna.
08064-0	ADM	ERROR	ADM PLL lock	The intermediate frequency PLL is not in lock. Check the 10 MHz reference signal.
08065-0	ADM	WARNING	GNSS data	Missing GNSS data (fix).
08066-0	ADM	WARNING	Heading data	Missing heading information. Check cable and heading provider device.
08067-0	ADM	ERROR	PCB temperature	ADM temperature too high. Make sure there is compliance with the environmental specifications.
08068-0	ADM	ERROR	PSM power	The PSM fails to provide the requested supply voltage.
08069-0	ADM	WARNING	Blocking Zone	The antenna has entered a blocking zone.
0806A-0	ADM	WARNING	VMU connection	The ACU has lost connection to the satellite modem.
0806B-0	ADM	WARNING	ROSS connection	The ACU has lost connection with the ROSS device.
0806C-0	ADM	ERROR	VMU frequency setup	There is a mismatch in the frequency setup. Probably the satellite modem is not configured correctly to match the requirements of the ACU and antenna. A common mismatch is the absence of Rx or Tx LO parameter in the satellite modem.
0806D-0	ADM	ERROR	Antenna power	The antenna supply voltage is outside the allowed limits. This may happen if the PSM fails to provide the requested supply voltage.

Table G-2: ACU event messages

Error code (ID)	Unit	Severity	Description	Explanation
0806E-0	ADM	ERROR	VMU reference signal	There is no VMU Rx or Tx reference signal. Whether this is Rx or Tx reference depends on the user's selection on the modem profile page in the web interface. Make sure the VMU Rx/Tx cable is connected and that the VMU is configured to output the RX/TX reference signal.
0806F-0	ADM	WARNING	ROSS synchronization	The ACU has become out of sync with the ROSS device, most likely because the ACU has been replaced, or the ROSS satellite profile is new. A manual (forced) handoff sequence must be initiated from the ROSS, refer to the ROSS manual.
08073-0	ADM	WARNING	Slave connection	The system is configured as a dual antenna master, but no dual antenna slave is connected to it. Either disable the dual antenna master in the web interface or configure a another system as a dual antenna slave.
08074-0	ADM	WARNING	Master connection	The system is configured as a dual antenna slave, but it was not possible to connect to the dual antenna master. Check that the IP address entered in the modem profile is correct and check that the master and slave systems are physically connected as described in the manual.
08076-0	ADM	WARNING	Incompatible message version	The system is configured as a dual antenna system, but the software versions on master and slave system are different. Ensure that both master and slave have identical software.
08078-0	ADM	WARNING	VMU TX frequency invalid	The satellite modem provided a TX frequency of zero. This may degrade tx performance. To remove this warning re-configure the modem to provide the correct tx frequency.
0807A-0	ADM	WARNING	Automatic azimuth calibration pending	Automatic azimuth calibration mode is enabled. The system tries to perform an azimuth calibration using the target satellite whenever satellite data is received from the modem. After successful calibration the feature is automatically disabled and the system returns to normal operation. WARNING: If a system has not completed azimuth calibration after the installation, the blocking zones may appear to be at wrong angles.
0807C-0	ADM	ERROR	System configuration	Invalid ACU / antenna combination.

Table G-2: ACU event messages (Continued)

Error code (ID)	Unit	Severity	Description	Explanation
08100-0	ADM	ERROR	PSM low voltage (22 V)	The ADM measures a different antenna voltage than expected. If the problem is not solved by a restart, and the PSM is not reporting any errors, the ADM is probably defective.
08101-0	ADM	ERROR	PSM high voltage (48 V)	The ADM measures a different antenna voltage than expected. Check for short circuit of the antenna coax connector. If the problem is not solved by a restart, and the PSM is not reporting any errors, the ADM is probably defective.
08102-0	ADM	ERROR	PSM 5 V power	Internal voltage supply error of the ADM.
08103-0	ADM	ERROR	ADM hotswap	The ACU is not able to supply the correct voltage to the antenna. Check for short circuits in coax cable and the antenna
08104-0	ADM	ERROR	Antenna communication	The ACU cannot communicate with the antenna. Check cable and antenna.
08107-0	ADM	ERROR	ADM FPGA load	The ADM FPGA cannot be initialised and loaded.
08108-0	ADM	ERROR	TX Power Detector calibration	The power detector calibration is not valid.
08109-0	ADM	ERROR	Antenna XIM data	There is a mismatch in the antenna configuration data. Either the PCM or the VIM in the antenna are malfunctioning or one of them has been replaced. In the latter case, select which is the original device in the web interface and restart the system.
0810A-0	ADM	ERROR	ADM production data	Production data has been corrupted.
0810B-0	ADM	ERROR	Antenna software version	An error has occurred during upload of software to the antenna, the antenna software version is not as expected. Either the software in the ACU does not meet the minimum version required by the antenna, the software image in the ACU is corrupted or the upload procedure failed because of a communication error.
0810C-0	ADM	ERROR	File system integrity	One or more file system partitions are corrupt. You may have lost your settings and collected statistics. If restarting the system does not help, contact your service partner.

Table G-2: ACU event messages (Continued)

Error code (ID)	Unit	Severity	Description	Explanation
08840-0	ADM	WARNING	Master PLL lock	The master PLL has lost lock. Check the input reference signal.
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.
0B000-0	PSM	ERROR	PSM production data	Missing or invalid production data in the PSM. Replace it.
0B001-0	PSM	ERROR	NMEA 2000 identifier	Missing or invalid production data in the PSM. Replace it.
0B010-0	PSM	ERROR	PSM link/SW version	Link to the PSM module could not be established. Either the PSM board is malfunctioning, or - if the system software has just been updated - the software is too old and is not compatible with the PSM hardware.
0B060-0	PSM	WARNING	NMEA 0183 parse error	Parse errors detected on the NMEA 0183 interface. Check NMEA 0183 cable, signal levels etc.
0B061-0	PSM	WARNING	Power supply temperature	ACU Power supply temperature is high. Improve ventilation or move to a cooler area. Info: 00000000 = Temperature warning, system still operational, but will shut down eventually if temperature keeps rising. 00000001 = Temperature critical, system has shut down to protect the hardware from overheating.

Table G-2: ACU event messages (Continued)

Approvals

H.1 Overview

This appendix lists the approvals for SAILOR 900 VSAT High Power:

- *CE (R&TTE)*

H.2 CE (R&TTE)

The SAILOR 900 VSAT High Power is CE certified (R&TTE directive) as stated in the "Declaration of Conformity with R&TTE Directive", it is available at www.cobam.com/SATCOM.

EU Declaration of Conformity

COBHAM

Hereby declares **Thrane & Thrane A/S** by this letter that the following equipment complies with the specifications of:

- **R&TTE directive 1999/5/EC** concerning Radio & Telecommunications Terminal Equipment as described in harmonized EU standards EN 301 428 V1.3.1; EN 302 340 V1.1.1.
- **LVD directive 2006/95/EC** concerning Low Voltage equipment as described in harmonized EU standard EN 60950-1:2006 + A11:2009 + A1:2010 + A12:2011; EN60950-22:2006 + A11:2008.
- **EMC directive 2004/108/EC** concerning EMC disturbances is met by conforming to the harmonized EU standards EN301 489-1 V1.9.2; EN 301 489-12 V2.2.2; EN 55022:2010/AC:2011; EN60945:2002 and EN55024:1998 + A1:2002 + A2:2003.
- **Federal Communication Commission**, FCC as described in 47CFR Part 25 (Title 47 of the Code of Federal Regulations; Chapter 1; Part 25 – Satellite Communications
- **Industry Canada** as described in IC SRSP-101, Technical Requirements for Fixed Earth Stations Operating Above 1 GHz in Space Radiocommunication Services and Earth Stations On Board Vessels (ESVs) Operating in the Fixed- Satellite Service.

Equipment included in this declaration

7090E	SAILOR 900 VSAT High Power (S900E) consisting of:	
7009E	SAILOR 900 VSAT HP Antenna (ADU)	PN = 407009E
7016C	SAILOR Antenna Control Unit (ACU)	PN = 407016C

Equipment Applicability

7090E SAILOR 900 VSAT High Power system consists of an ADU (Above Deck Unit) and an ACU (Antenna Control Unit).It is a system that provides two-way satellite voice/data broadband communication featuring stabilization to minimize impact from the vessel. The system assumes use of a 3rd Party Ku-band modem unit. The system can transmit to and receive from any desired Ku-band satellite, which has adequate signal coverage.

Manufacturer

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

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CE

DNV·GL

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A

ABS	ADU Bus Slave
ACU	Antenna Control Unit
ADM	ACU Digital Module. A main processor board in the ACU.
AMB	Antenna Module Bus

C

CE	Conformité Européenne. This term signifies that a CE certified product conforms to European health, environmental, and safety regulations. In short, it makes the product legal to be sold in the European Union.
CM	Continuous Monitoring

D

DDM	DC-Motor Driver Module
DHCP	Dynamic Host Configuration Protocol. A protocol for assigning dynamic IP addresses to devices on a network. With dynamic addressing, a device can have a different IP address every time it connects to the network.
DNS	Domain Name System. A system translating server names (URLs) to server addresses.
DVB	Digital Video Broadcasting, a set of standards relating to digital television.

E

EIRP	Effective Isotropically-Radiated Power. The amount of power that would have to be emitted by an isotropic antenna (that evenly distributes power in all directions) to produce the peak power density observed in the direction of maximum antenna gain.
ESD	ElectroStatic Discharge
ETSI	European Telecommunication Standard Institute

F

FPGA	Field Programmable Gate Array

G

GNSS	Global Navigation Satellite System, e.g. GPS.
GPL	General Public License
GPS	Global Positioning System. A system of satellites, computers, and receivers that is able to determine the latitude and longitude of a receiver on Earth by calculating the time difference for signals from different satellites to reach the receiver.

H

HDT	HeaDing True, NMEA sentence.

I

IEC	International Electrotechnical Commission. The international standards and conformity assessment body for all fields of electrotechnology.
ISM	Inertial Sensor Module

K

KDM	Keyboard and Display Module of the ACU

L

LAN	Local Area Network
LEN	Load Equivalent Number
LGPL	Lesser General Public License
LNB	Low Noise Block. A device used to amplify or boost the weak received signal without amplifying the noise signals (hence the “low noise” part of LNB) and to convert the high frequencies of the signal into lower frequencies, a process called down converting, for conveyance to the indoor equipment (demodulator) for processing.
LO	Local Oscillator. LO frequency used by BUC and LNB.

M

MIB	Management Information Base

N

NID	Network IDentification

NMEA — National Marine Electronics Association (standard). A combined electrical and data specification for communication between marine electronic devices such as echo sounder, sonars, anemometer (wind speed and direction), gyrocompass, autopilot, GPS receivers and many other types of instruments. It has been defined by, and is controlled by, the U.S.-based National Marine Electronics Association.

O

OID — Object Identifier, in the context of the Simple Network Management Protocol (SNMP), consists of the object identifier for an object in a Management Information Base (MIB).

OMT — Ortho Mode Transducer

openAMIP — Open Antenna-Modem Interface Protocol, facilitates the exchange of information between an ACU and a satellite router. It allows the router to command the antenna and enables automatic beam switching (ABS).

P

PAST — Person Activated Self Test

PCM — Pedestal Control Module

PMM — Polarisation Motor Module

POST — Power On Self Test. A system test that is activated each time the system is powered on.

PSM — Power Supply Module

R

RF — Radio Frequency. Electromagnetic wave frequencies between about 3 kilohertz and about 300 gigahertz including the frequencies used for communications signals (radio, television, cell-phone and satellite transmissions) or radar signals.

RFI — Radio Frequency Interference. A non-desired radio signal which creates noise or dropouts in the wireless system or noise in a sound system.

RSSI — Received Signal Strength Indicator

S

SNMP — Simple Network Management Protocol. An Internet-standard protocol for managing devices on IP networks. It is used mostly in network management systems to monitor network-attached devices for conditions that warrant administrative attention.

U

UCLI	User Command Line Interface

V

VIM	VSAT Interface Module
VMU	VSAT Modem Unit
VSAT	Very Small Aperture Terminal, a two-way satellite ground station or a stabilized maritime VSAT antenna with a dish antenna that is smaller than 3 metres.

W

WAN	Wide Area Network

X

XIM	Xim Interface Module, term for the module that connects the PCM and the ACU. X stands for one of various interface modules.

Z

ZRM	Zero Reference Module

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