

COBHAM

SAILOR 600 VSAT Ka

Technical manual



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Technical manual

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Manufacturer address

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

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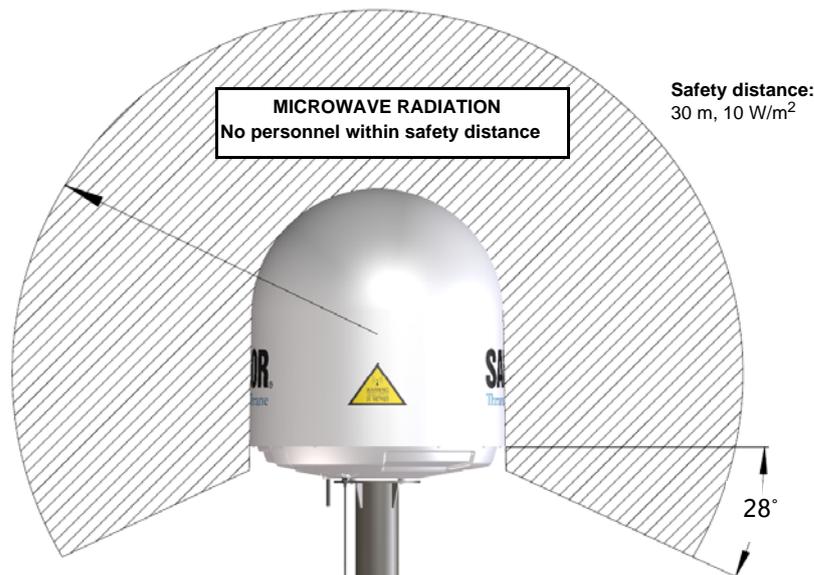
Safety summary

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

Microwave radiation hazards

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

The minimum safety distance to the Above Deck Unit reflector on the focal line is 30 m, based on a radiation level of 10 W/m^2 . No hazard exists $>28^\circ$ below the Above Deck Unit's mounting plane. Refer to the drawing below.



No-transmit zones

In order to protect personnel no-transmit zones can be programmed. For further information see *Blocking zones with azimuth and elevation* on page 3-5.

Distance to other equipment

Do not move the Above Deck Unit closer to radars than the minimum safe distance specified in section *Interference from radar, GPS, L-band and other transmitters* on page 3-14 – it may cause damage to the Above Deck Unit.

Compass Safe Distance:

SAILOR 60 GX/600 VSAT Ka antenna or ADU (Above Deck Unit): min. 140 cm (IEC 60945).

SAILOR 7016C Antenna Control Unit: min. 30 cm (IEC 60945).

SAILOR 7016B Antenna Control Unit: min. 10 cm (IEC 60945).

Service

User access to the interior of the ACU is not allowed. 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, you must connect the equipment chassis and cabinet to an electrical ground. Ground the ACU to the ship. For further details see Appendix B, *Ground and RF protection*.

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 and Tx cables for the SAILOR 600 VSAT Ka 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 this might cause malfunction of the equipment.

Power supply

SAILOR 7016C Antenna Control Unit: voltage range 100-240 VAC.

SAILOR 7016B Antenna Control Unit: voltage range 20-32 VDC.

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!

After installation make this manual available to the user for further reference.

Record of Revisions

Rev.	Description	Release Date	Initials
A	Original document	March 2018	UFO

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About this manual

1.1 Intended readers

This is an installation and service manual for the SAILOR 600 VSAT Ka 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*
- *Power and startup*
- *Configuration*
- *Installation check*
- *Service*

This manual has the following appendices:

- *Technical specifications*
- *Installation of the Antenna Diversity Solution*
- *Ground and RF protection*
- *System messages*
- *Command line interface*
- *Approvals*

1.3 Software version

This manual is intended for SAILOR 600 VSAT Ka with **software version 1.60 (ADU and ACU)**.

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 *To connect cables* on page...”.

1.5 Precautions

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.

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 has the following sections:

- *SAILOR 600 VSAT Ka system*
- *Part numbers and options*

2.1 SAILOR 600 VSAT Ka system

2.1.1 Overview

The SAILOR 600 VSAT Ka is a unique stabilized maritime VSAT antenna system operating in the Ka-band (19.2 to 30 GHz). It provides bi-directional IP data connections both on regional satellite beams and quasi-global Ka-band satellite networks. The following figure shows a coverage map of the Ka service.

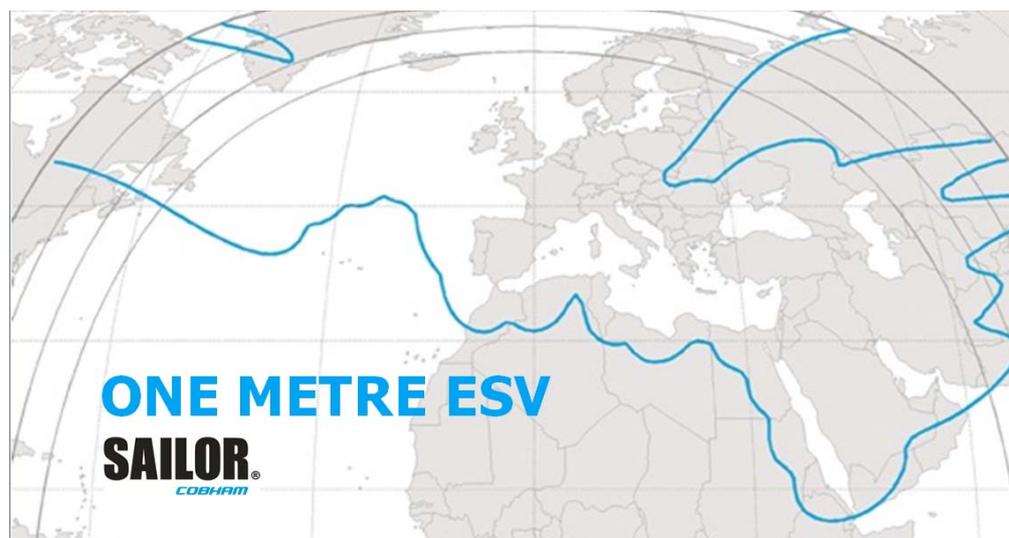


Figure 2-1: Coverage map for a Ka service (example)

The SAILOR 600 VSAT Ka system consists of the following units:

- SAILOR 7006B Above Deck Unit (ADU)
- SAILOR 7016C¹ Antenna Control Unit (ACU)

The system requires a single 50 Ohm cable to provide the Above Deck Unit (ADU) with both DC power, data and control information. The radome does not have to be removed neither before nor after the installation. To protect the ADU the built-in motors act as brakes during transport and when the ADU is not powered. You can access the SAILOR 600 VSAT Ka remotely and make in-depth performance analysis using the built-in web interface.

The following figure shows the SAILOR 600 VSAT Ka system.

1. Some antennas may have the SAILOR 7016B ACU (DC powered).



Figure 2-2: ADU and ACU

SAILOR 600 VSAT Ka features

- Single 50 Ohm coax cable for the ADU.
- One-Touch Commissioning.
- Gyro-free operation.
- SNMP traps and syslog support.
- Secure connection, HTTPS and SSH.
- Remote access using SAILOR FleetBroadband over WAN.
- Remote or local simultaneous software update of the ADU and ACU via PC and Internet browser.
- Full remote control and troubleshooting with built-in test equipment (BITE).
- ACU with 4 x LAN, NMEA 0183, RS-232 and RS-422.
- No scheduled maintenance.

2.1.2 Above Deck Unit (ADU)

The SAILOR 600 VSAT Ka ADU is a 65 cm stabilized tracking antenna, consisting of a suspended antenna with a standard global RF configuration. It is stabilized by heavy duty vibration dampers in 3-axis and can be used in environments with elevations of -28° to $+120^{\circ}$. The ADU weighs 37 kg and is powered by the ACU. The ADU is protected by a radome.

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.



Figure 2-3: Above Deck Unit (ADU)

Modules in the SAILOR 600 VSAT Ka ADU

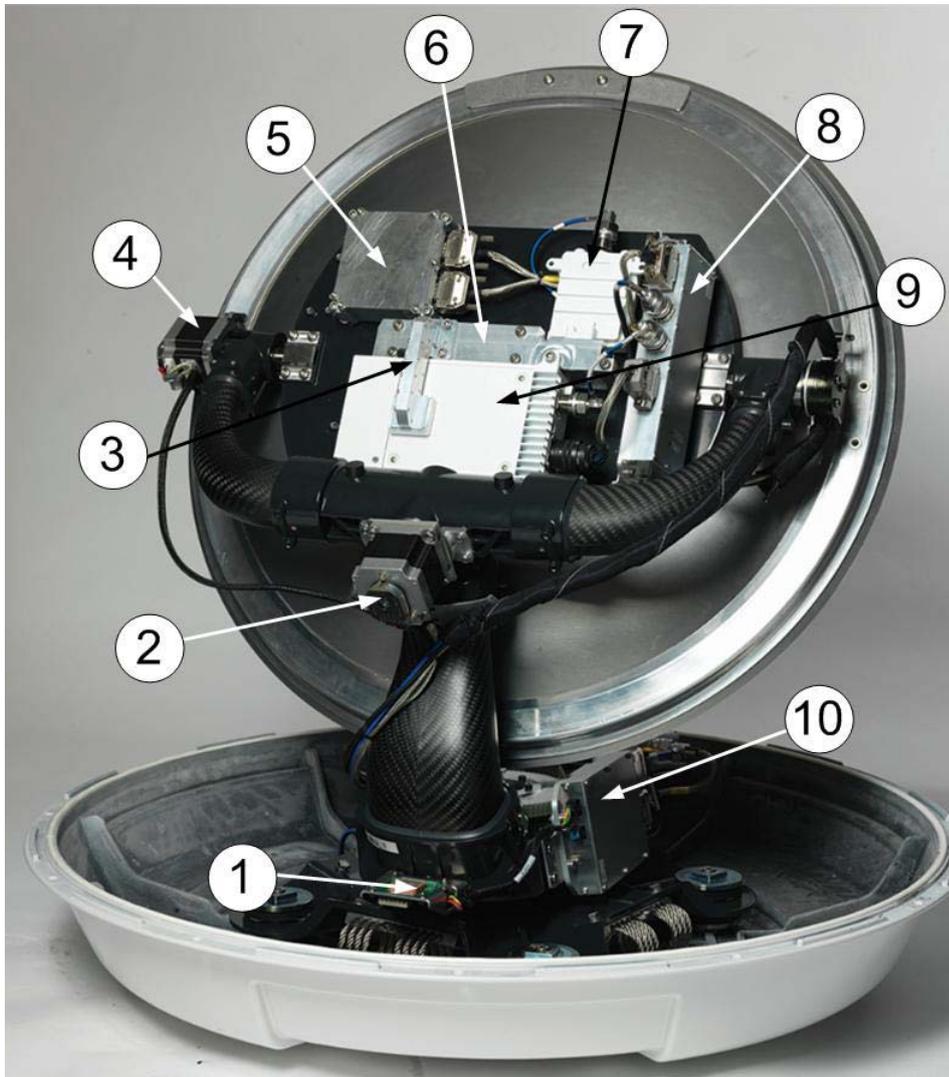


Figure 2-4: Above Deck Unit modules 1/2

1. GNSS module.
2. X-elevation motor and encoder.
3. Wave guide.
4. Elevation motor and encoder
5. Inertial Sensor Module (ISM2).
6. Polariser.
7. Low Noise Block downconverter (LNB),
8. BUC Control Module (BCM).
9. Block Up Converter (BUC).
10. Pedestal Control Module (PCM2).

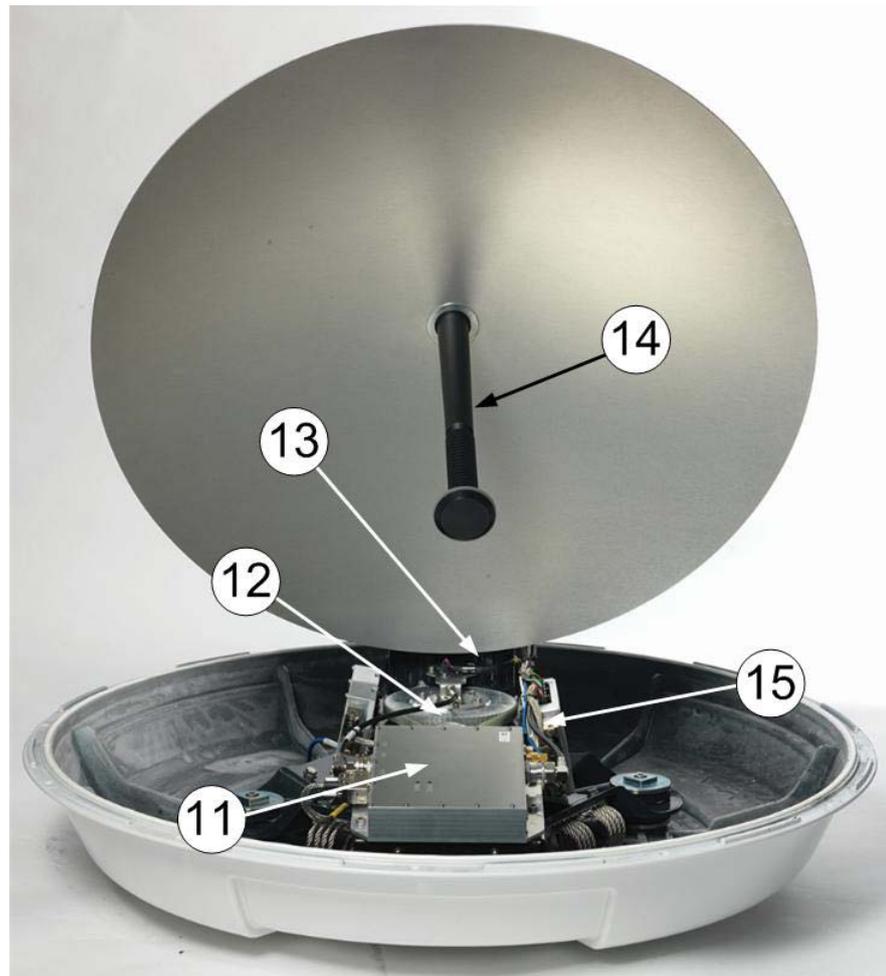


Figure 2-5: Above Deck Unit modules 2/2

11. VSAT Interface Module (VIM2).
12. Azimuth motor and encoder.
13. Zero Reference Module (ZRM)
14. Feed horn.
15. Field Vector Driver Module (FDM).

A lifting harness (included in the delivery) helps getting the ADU safely into place. Satellite profile parameters are entered in the built-in web server of the ACU, using a PC. The system configuration is saved in two modules, there is no loss of data at repair. 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 on site.

The ADU software is updated automatically when you make a software update of the ACU.

2.1.3 Antenna Control Unit (ACU)

The ACU is the central control unit in the system. It contains all user interfaces and manages all communication between the ADU and the connected modem, 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 setups and enter *No Transmit Zones* (blocking zones in which the ADU does not transmit).

The user PC (user WAN) for Internet access etc. is connected to the ACU, not the modem.

The ACU provides DC power to the ADU through a single coaxial cable. The ACU comes in a 19" rack version.



Figure 2-6: Antenna Control Unit

You can do remote diagnostics and service with the ACU. Its built-in test equipment constantly checks 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. You can make a software update with a connected PC and the built-in web interface of the ACU.

The ACU is available for DC power (SAILOR 7016B) and AC power (SAILOR 7016C).

ACU interfaces (AC powered)

The ACU (SAILOR 7016C) has the following interfaces:

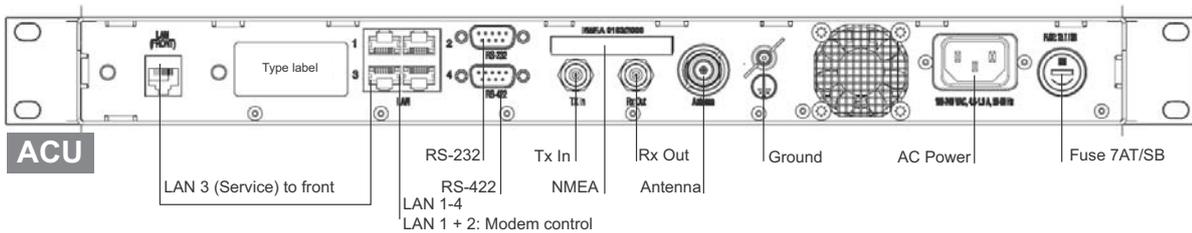


Figure 2-7: ACU (connector panel)

- N-connector for ADU cable (50 Ohm).

- 2 x F connectors for Rx and Tx cables (75 Ohm) to modem.
- Multi connector for NMEA interfaces (for input from GPS compass or Gyro compass).
- RS-422 interface for BUC I/O
- RS-232 interface for modem control.
- 4 x LAN ports for modem control and user equipment.
- Ground wing nut.
- AC power connector.
- On/Off power switch (at the front).

The ACU also has a LAN connector at the front to access the service port from the ACU front panel.

ACU interfaces (DC powered)

The ACU (SAILOR 7016B) has the following interfaces and switch:

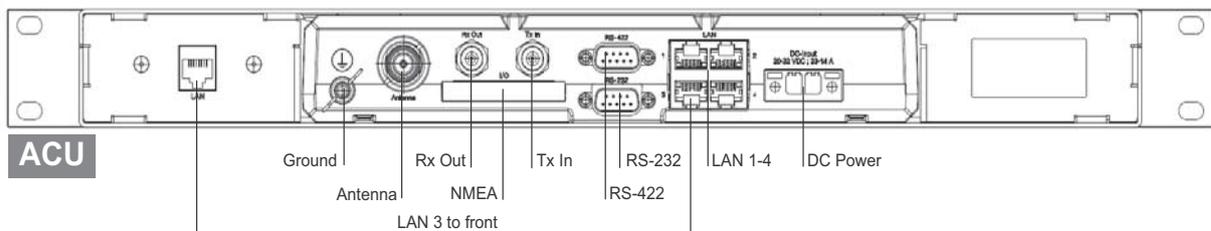


Figure 2-8: ACU (connector panel)

- N-connector for ADU cable (50 Ohm).
- 2 x F connectors for Rx and Tx cables (75 Ohm).
- Multi connector for NMEA interfaces (for input from GPS compass or Gyro compass).
- RS-422 interface for BUC I/O
- RS-232 interface for modem control.
- 4 x LAN ports for modem control and user equipment.
- Ground wing nut.
- Power connector.
- On/Off power switch (at the front).

The ACU also has a LAN connector at the front to access the service port from the ACU front panel.

2.1.4 iDirect X7 Modem

The iDirect X7 Modem is the modem in the system. The modem is not supplied by Cobham SATCOM. The modem has the following interfaces and connectors:

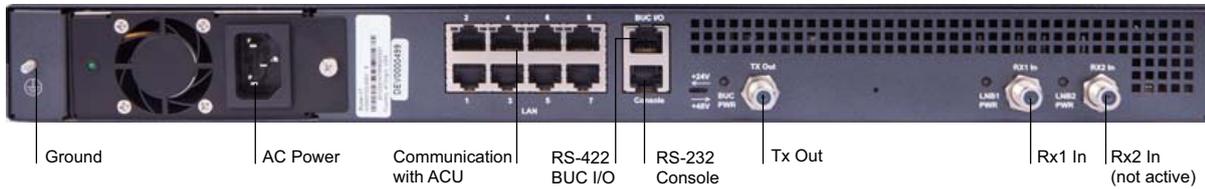


Figure 2-9: Connector panel of the iDirect X7 modem

- GND
- 100-240 VAC power connector
- 8 LAN ports, one to ACU
- RS-422 interface BUC I/O
- RS-232 Console for modem control
- Tx Out (F-connector)
- RX1 and RX2 (RX 2 not used) (F connector)

2.1.5 Satellite type approvals

For a list of satellite type approvals see Appendix E, *Approvals*.

2.1.6 Service activation

Before you can start using the SAILOR 600 VSAT Ka, you need to activate the system for the Ka 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 600 VSAT Ka system:

Part number	Description
407006B-00500	Above Deck Unit (ADU) for DC powered ACU
407006B-00501	Above Deck Unit (ADU) for AC powered ACU
407016B-00530	Antenna Control Unit (ACU) (DC powered)
407016C-00503	Antenna Control Unit (ACU) (AC powered)

Table 2-1: Part numbers for the SAILOR 600 VSAT Ka system

2.2.2 Options for SAILOR 600 VSAT Ka

The following options are available for the SAILOR 600 VSAT Ka system:

Part number	Description
406080A-00500	SAILOR 6080 AC/DC Power Supply
407090A-950	Antenna cable 50 m N-Conn (not mounted), male/male
407090A-925	Pigtail Cable 1.25 m, N-Conn, female/male
406080A-005	19" Rack mount kit for SAILOR 6080 AC/DC Power Supply

Table 2-2: Part numbers for options of the SAILOR 600 VSAT Ka system

Installation

This chapter has the following sections:

- *What's in the box*
- *Site preparation*
- *Installation of the ADU*
- *Installation of the ACU*
- *Installation of the modem*
- *To connect the ADU, ACU and modem*

3.1 What's in the box

3.1.1 To unpack

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

- SAILOR 7006B ADU
- Accessory kit for SAILOR 7006B ADU:
 - Package with bolts and washers
 - Lifting harness
- SAILOR 7016C ACU
- Accessory kit for SAILOR 7016C ACU:
 - NMEA multi-connector
 - RJ45 patch cable (0.5 m)
 - Coax cable F-F, low loss, 75 Ohm (2 pcs)
 - RJ45 patch cable (2 m)
 - Power cable (230 VAC)

Note For 7016B (DC power) a DC connector is included (Connector 2PF pi7.62 straight)

- X7 Modem BUC & Console to ACU cable
- Installation manual

3.1.2 Initial inspection

Inspect the shipping cartons 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. 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. 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

- Torque wrench to fasten the mounting bolts for the ADU
- Torque wrench to fasten the N connector at the ADU
- PC and Internet browser
- Crimping tools

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 strap parts of the antenna.

This 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 with azimuth and elevation*
- *Safe access to the ADU (radiation hazard)*
- *Ship motion and offset from the ship's motion centre*
- *Mast foundation and height*
- *Interference from radar, GPS, L-band and other transmitters*
- *Condensation, water intrusion and deposits*

3.2.1 General site considerations

For optimum system performance, you must follow some guidelines on where to install or mount the different components of the SAILOR 600 VSAT Ka System.

Important

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.

1. Mount the ADU on stiffened structures with a minimum of exposure to vibrations.

You do not have to align the ADU with the bow-to-stern line of the ship. When configuring the SAILOR 600 VSAT Ka system, the azimuth calibration provides the correct azimuth of the ADU.

Painting the radome

Customers may wish to paint the radome in order to match the vessel's colour. Any paint used must be non-metallic based. Painting the radome may impact RF performance and may lead to over-heating, causing the antenna to go in safe mode (switch off).

Cobham SATCOM recommends that the radome should NOT be painted. Painting the radome will not void the general warranty regarding material and workmanship etc. It is only the performance that cannot be guaranteed.

Modifying the radome or using another radome

The SAILOR 600 VSAT Ka antenna comes with a type-approved radome fitted from the factory. This radome is specifically designed for a minimal loss of RF performance for this specific antenna. Insertion loss reduces the available signal and decreases the effective radiated power and G/T (the ability to receive a weak signal). Modifying the radome or using another radome may increase the antenna side lobes, resulting in interference with other communication systems and thereby void satellite operator approvals. Other electrical effects on antenna performance of another radome, or of modifying the radome, include a change in the antenna beam width and shifting of the antenna bore sight.

Cobham SATCOM recommends that the radome should NOT be modified or changed to another type. Exchanging or modifying the radome will not void the general warranty for

material and workmanship etc. but the performance cannot be guaranteed, and the satellite operator approvals will not be valid.

3.2.2 Obstructions (ADU shadowing)

The ADU is stabilized in 3-axis (plus skew) and can be used in environments with elevations of -28° to $+120^{\circ}$ to allow for continuous pointing even in heavy sea conditions. The ADU beam is approximately 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 Ka band and the narrow beam width of the ADU even a **6 mm steel wire placed within 50 m** inside the beam can cause signal degradation.

For optimum performance adhere to the following guidelines:

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

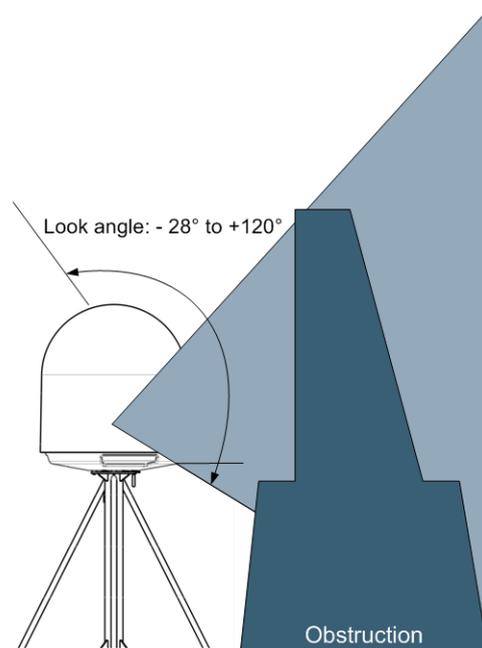


Figure 3-1: Signal degradation because of obstructing objects

3.2.3 Blocking zones with 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. The blocking zones are set up in the built-in web interface of the ACU during configuration. For further information see *To set up blocking zones (RX and TX)* on page 6-23.

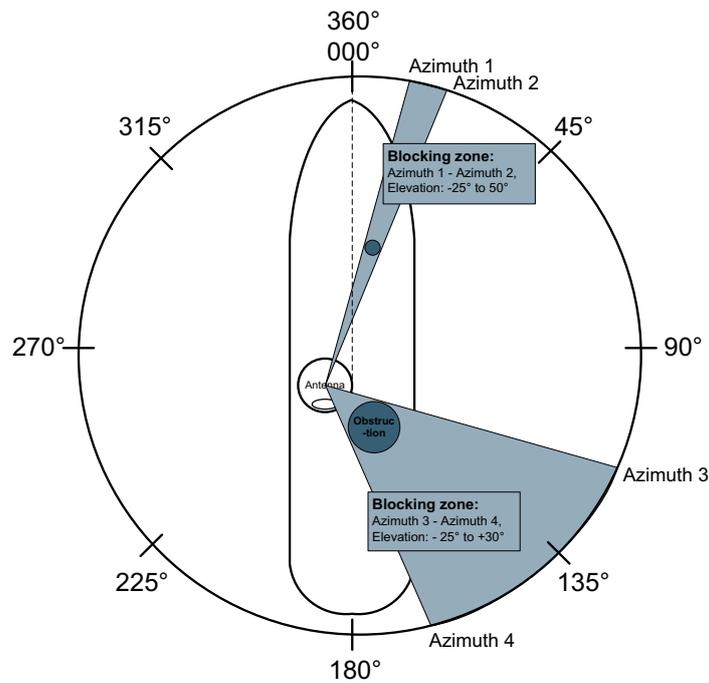


Figure 3-2: 2 blocking zones with no-transmit zones, azimuth (example)

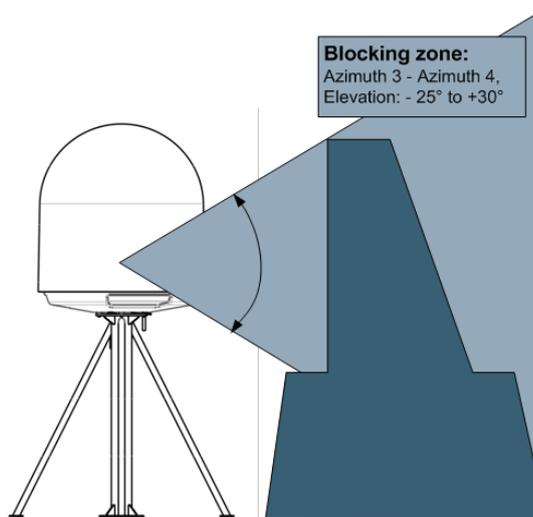


Figure 3-3: Blocking zone with no-transmit zones, elevation angle (example)

3.2.4 Safe access to the ADU (radiation hazard)

The ADU radiates up to 50.4 dBW EIRP at 29.5 GHz. This translates to a minimum safety distance of 30 m from the ADU while it is transmitting, based on a radiation level of 10 W/m^2 .



Figure 3-4: Radiation hazard, safety distance 30 m

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

When installing the ADU you must consider the mounting height carefully. The higher up the ADU is mounted, the higher is the linear g force applied to the ADU. The g force also depends on the roll period of the ship, see Table 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. See the following table for allowed mounting heights above the ship's motion centre.

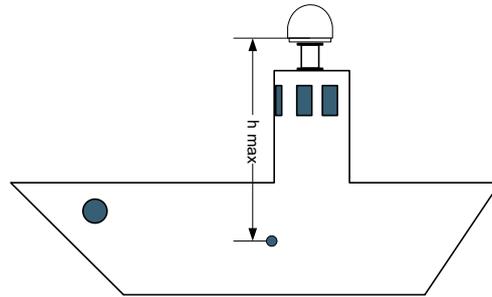


Figure 3-5: Maximum distance from the ship's motion centre (h max)

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.

Min. roll period	Maximum antenna 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 Mast foundation and height

The ADU mast must be designed to carry the weight of the ADU (37 kg), plus 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.

Follow the guidelines in the sections:

- *ADU mast flange*
- *Mast length and diameter*

ADU mast flange

To prepare the mast flange do as follows:

1. 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 5 mm.
 - **4 gusset plates:** Minimum 5 mm thick, must be placed close to the holes in the mounting plate and evenly distributed.

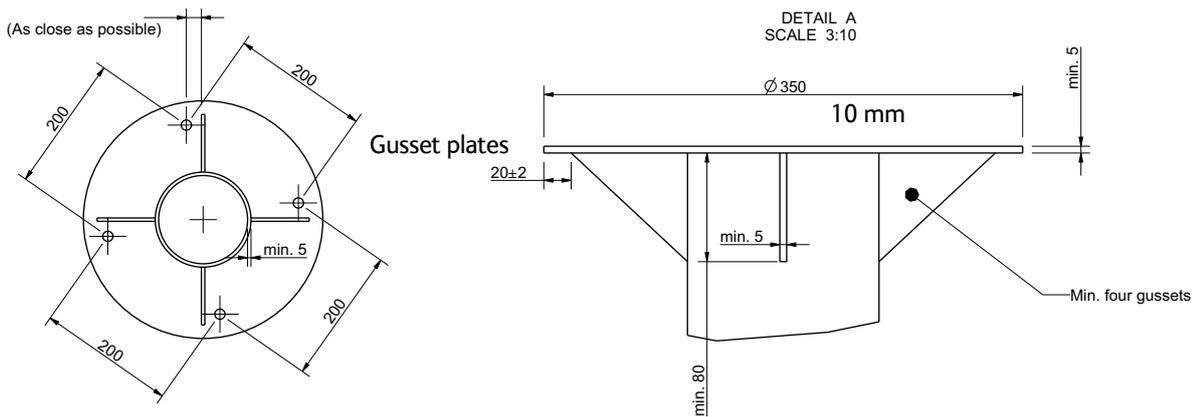


Figure 3-6: ADU mast flange, top and side view

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



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



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.

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

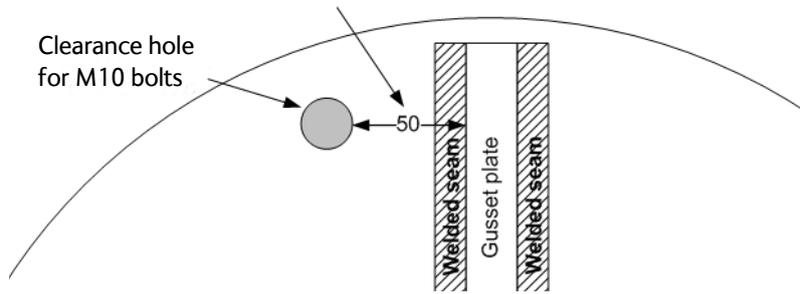


Figure 3-8: ADU mast flange, distance to the welded seam

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

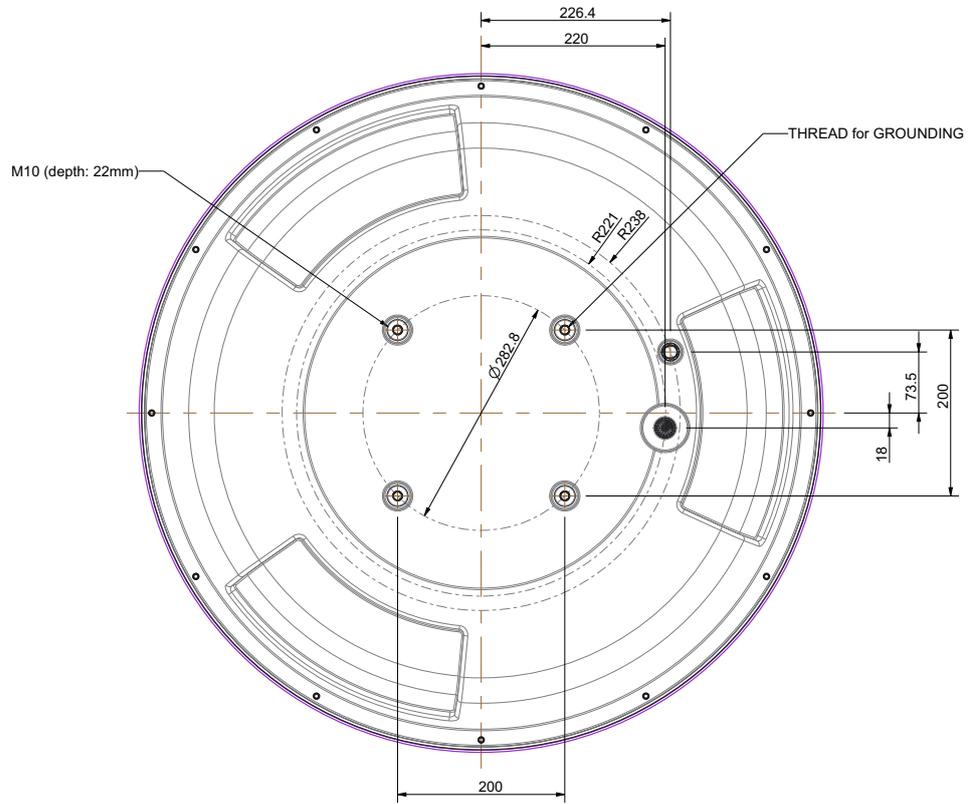


Figure 3-9: ADU, bottom view

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-to-ship interfaces. The cross-sectional properties and the corresponding maximum free length give a natural frequency close to 30 Hz. Shorten the mast length as much as possible to obtain higher frequencies. Preferably, mount stays or wires to stabilize the mast further.

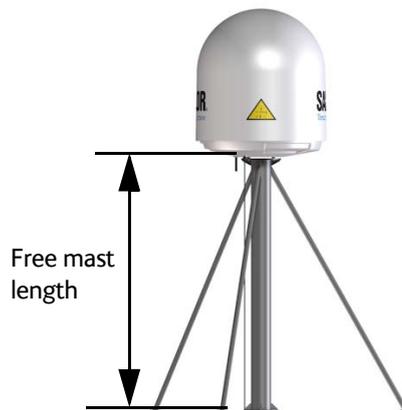


Figure 3-10: Free mast length and example bracing for a tall mast

- Note** Make sure that there is free space below the drain tube. See also *Condensation, water intrusion and deposits* on page 3-17.
- Note** Bracing and rigid masts can still not prevent vertical vibration if the mast is attached to a deck plate that is not rigid. Make every effort to mount the mast on a surface that is well supported by ribs. If this is not possible, provide extra deck plate propping.

Mast without braces

The following figure shows the maximum mast length over the outer mast diameter.

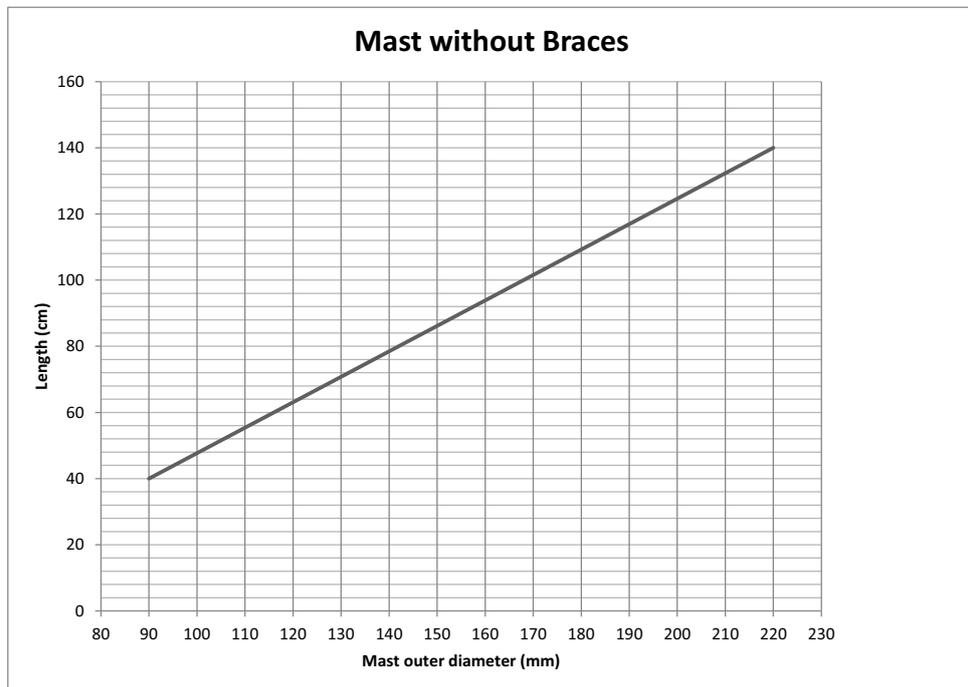


Figure 3-11: Maximum mast length for a mast without braces

Example: The mast outer diameter is 150 mm. Then the mast length must be shorter than 82 cm.

Mast with three braces

For a mast with three braces consider the following dimensions when you design the mast and braces:

- Mast length
- Mast outer diameter
- Connection point where the brace join the mast.
- Brace outer diameter

The shorter the braces become the more support they add to the mast. The 30 - 40 degrees between the braces and the mast should be respected.

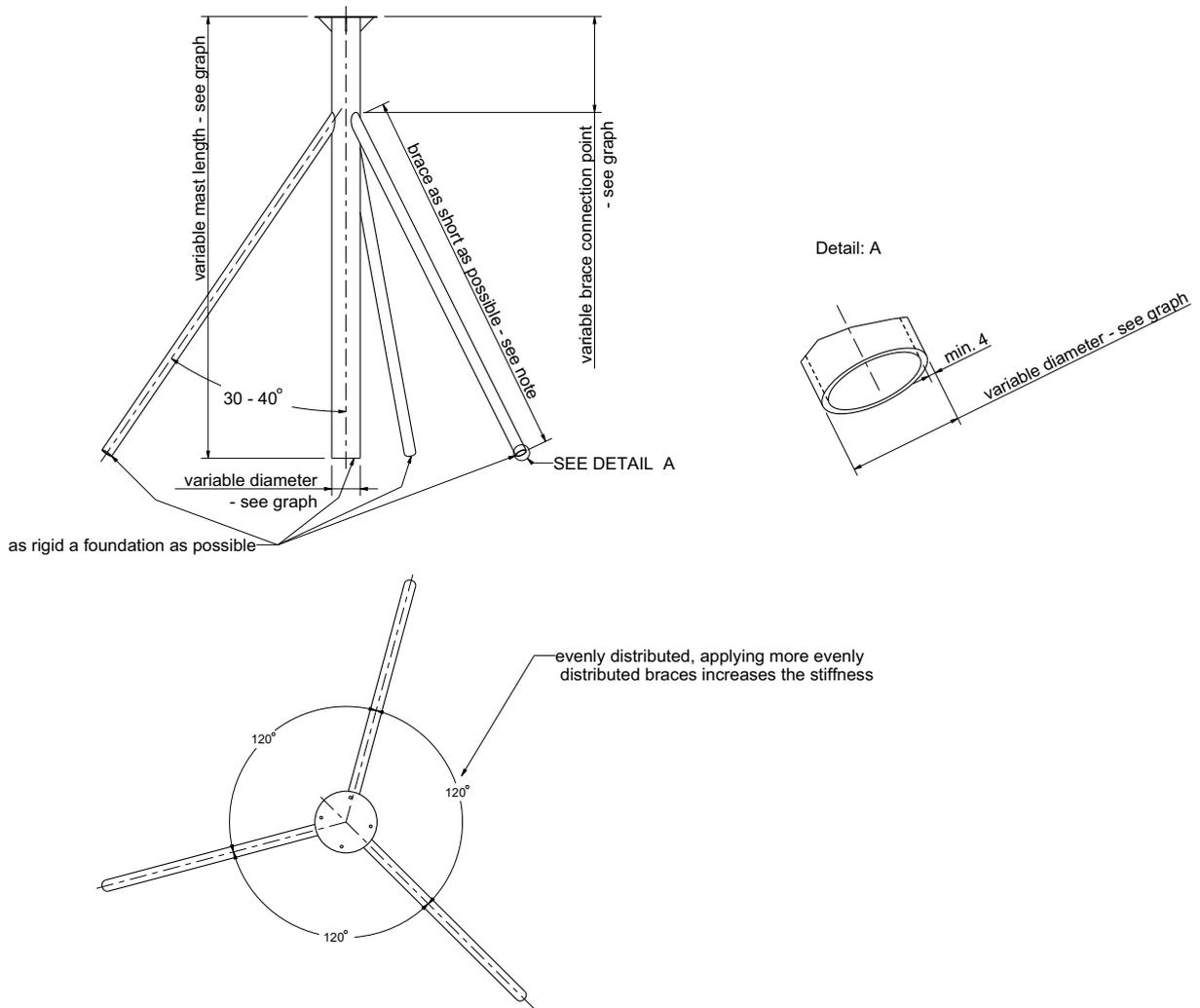


Figure 3-12: Mast with three braces

The following figure shows the maximum mast length and the mast/brace connection point over the outer mast diameter.

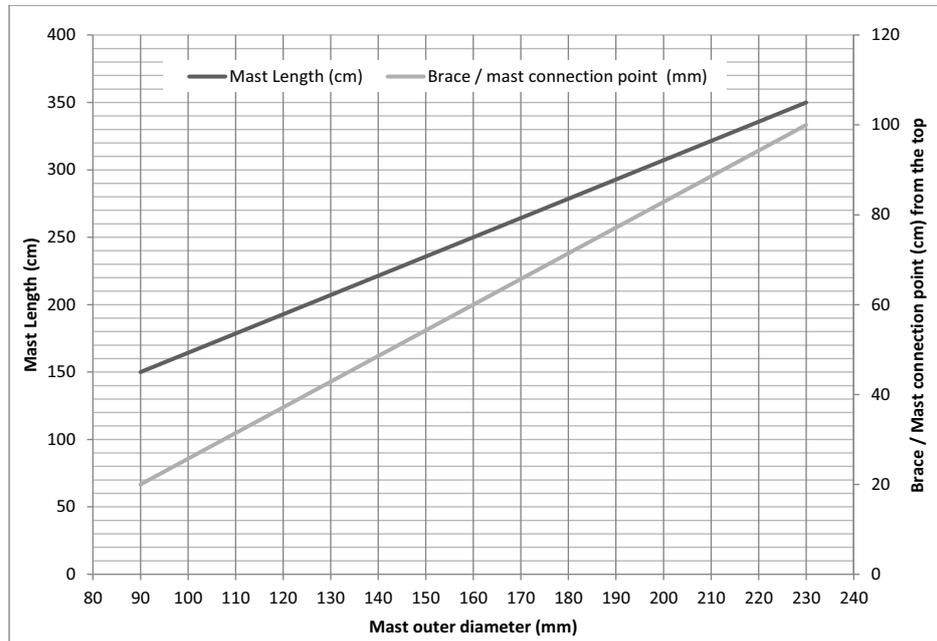


Figure 3-13: Maximum mast length and connection point for a mast with three braces

Example: The mast outer diameter is 150 mm. Then the mast length must be shorter than 240 cm and the brace/mast connection point is 56 cm from the top of the mast.

Make sure that the brace outer diameter is big enough for the selected mast length.

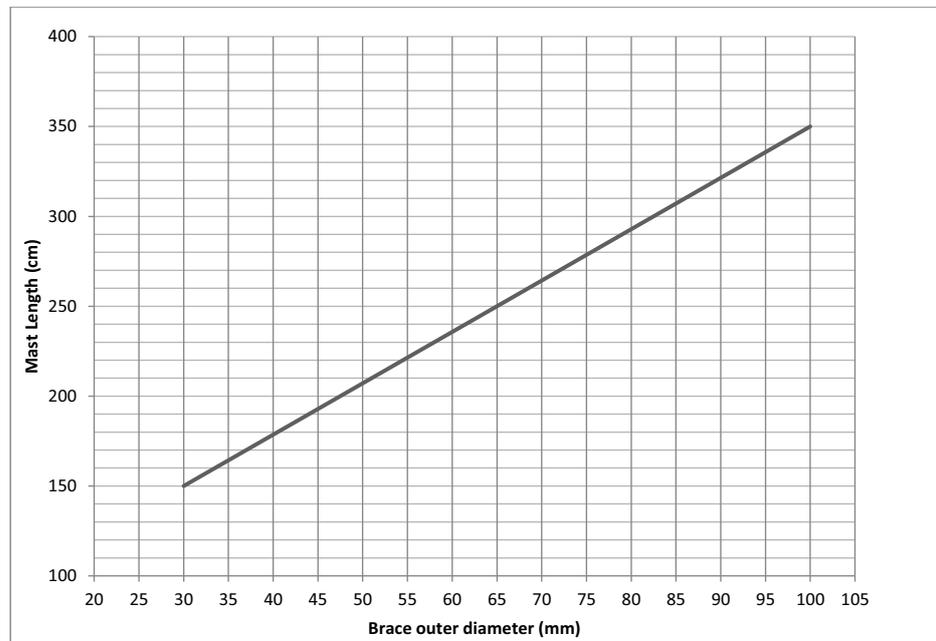


Figure 3-14: Minimum brace outer diameter

Example: For a mast length of 250 cm, the brace outer diameter must be minimum 65 mm.

3.2.7 Interference from radar, GPS, L-band and other transmitters

Note Do not place the ADU close to interfering signal sources or receivers. We recommend to test the total system by operating all equipment simultaneously and verifying that there is no interference.

Mount the ADU 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 600 VSAT Ka 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 near the radar vary 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°, you can avoid the worst interference by mounting the ADU at a different level – meaning that the ADU is installed minimum 15° above or below the radar antenna. Due to near field effects the benefit of this vertical separation could be reduced at short distances (below approximately 10 m) between radar antenna and the SAILOR 600 VSAT Ka ADU. Therefore it is recommended to ensure as much vertical separation as possible when the SAILOR 600 VSAT Ka ADU has to be placed close to a radar antenna.

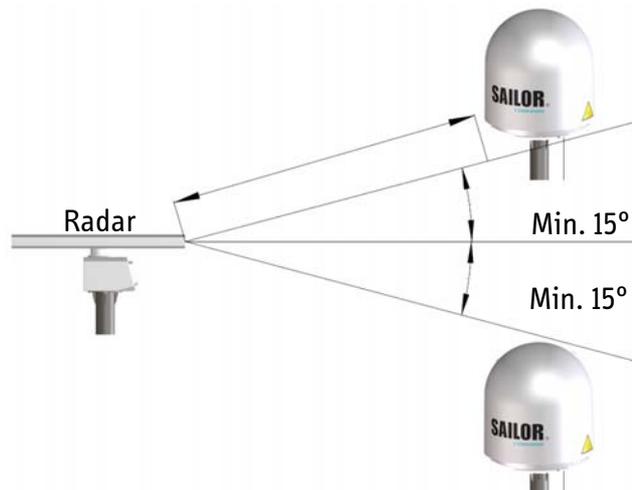


Figure 3-15: Interference with the vessel's radar

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 600 VSAT Ka ADU.

X-band (~ 3 cm / 10 GHz) damage distance		
Radar power	SAILOR 600 VSAT Ka 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 3-2: Minimum radar separation, X-band

S-band (~ 10 cm / 3 GHz) damage distance		
Radar power	SAILOR 600 VSAT Ka 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 3-3: Minimum radar separation, S-band

The separation distance for C-band (4-8 GHz) radars should generally be the same as for SX-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 600 VSAT Ka system. The presence of one or more S or X-band radars within a radius up to 100 m may cause a minor degradation of the Ka-band connection. The degradation will be most significant at high radar pulse repetition rates. As long as receiving conditions are favourable, this limited degradation is not important. However, if receiving conditions are poor – e.g. due to objects blocking the signal path, heavy rainfall or icing, low satellite elevation and violent ship movements – the small extra degradation due to the radar(s) could cause poor connection quality.

The presence of S-band radar(s) is unlikely to cause any performance degradation – as long as the minimum distances (d min.) listed in the previous section are applied.

It is strongly recommended that interference-free operation is verified experimentally before the installation is finalized. If radar interference is suspected, or the antenna is placed inside the radar beam, configure the radar to have a blanking zone to avoid transmission towards the antenna.



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 work properly very close to the ADU - typically down to one meter outside the main beam.

L-band antennas

If L-band antennas are installed on the same vessel, keep a minimum distance of 3 meters from the SAILOR 600 VSAT Ka ADU to the L-band antenna.

Other transmitters

See the following figure for minimum recommended distance to transmitters in the frequency range below 1000 MHz.

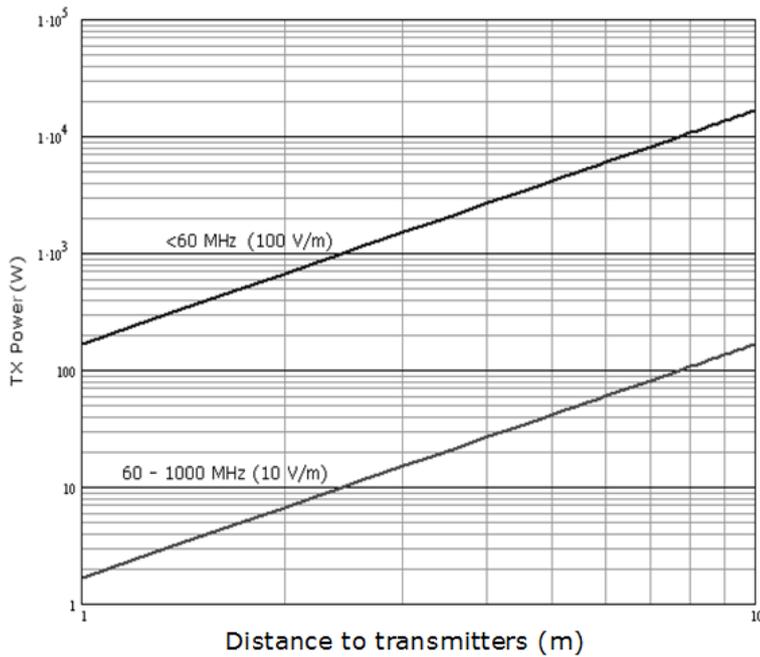


Figure 3-16: Recommended distance to transmitters (m) for frequencies below 1000 MHz

3.2.8 Condensation, water intrusion and deposits

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.

Observe the following guidelines for condensation and water intrusion:

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



Figure 3-17: Drain pipe with free space

3. Do not use pneumatic tools for cleaning the radome, especially at a short distance and directly at the split between top and bottom.
4. Do not place the ADU close to a funnel, as smoke deposits are corrosive. Furthermore, deposits on the radome can degrade performance.

3.3 Installation of the ADU

3.3.1 Overview

The following sections describe the installation and grounding of the antenna. The ADU is shipped fully assembled. You have to install it on the mast and attach the ADU cable.



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



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

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



Figure 3-18: Use of the lifting harness and tag lines for safe hoisting



WARNING! Use the lifting harness only to lift the antenna. Do not lift other objects or persons with the harness.

Lifting Harness – Declaration of Conformity

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

The Working Load Limit (WLL) is defined as 40 kg. The harness may only be used for lifting the ADU.

3.3.2 To install the ADU

Prerequisites

- Check for potential interference, read more in *Interference from radar, GPS, L-band and other transmitters* on page 3-14.
- Install the ADU at a location where **vibrations are limited to a minimum**.
- Maximum allowed cable loss ≤ 20 dB at 1950 MHz. This is to ensure optimum performance of the system.
- Ensure that the crane hook has a closing mechanism to prevent accidental slippage of the lifting straps.

Installation procedure

To install the ADU, do as follows:

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



Figure 3-19: ADU installation, 4 lifting straps on crane hook

5. Attach two tag lines of suitable length to the harness and man them.
6. With a crane lift the ADU off the packaging and move it on top of the mast. Maintain **vertical orientation of the ADU center line.**
7. Install the ADU on the mast flange with 4 M10 bolts and washers.
Tightening torque value: 30 Nm.
Always use **all 4 bolts** when installing the ADU.
8. Read carefully and follow instructions given in the next section on grounding.

9. **Only for a**Remove the harness as shown in the following figure:

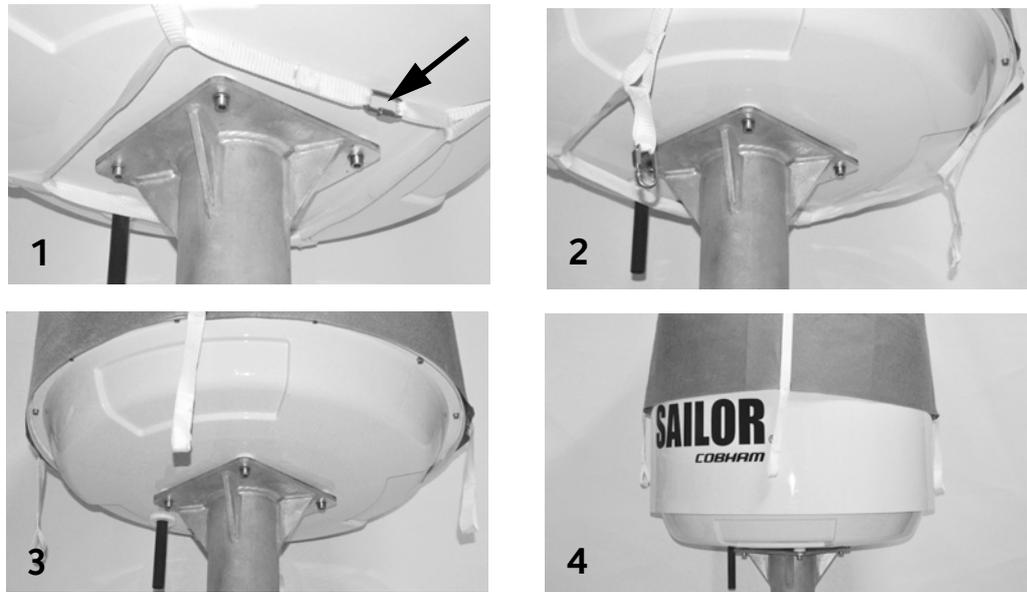


Figure 3-20: Removal of the harness

10. Locate the quick link (1) and open it (2).
11. Pull the strap with the quick link through the harness to remove it (3).
12. Slide the harness over the top of the ADU (4).
13. Dispose of the harness in a responsible manner.
14. Attach the N connector of the ADU cable to the ADU.

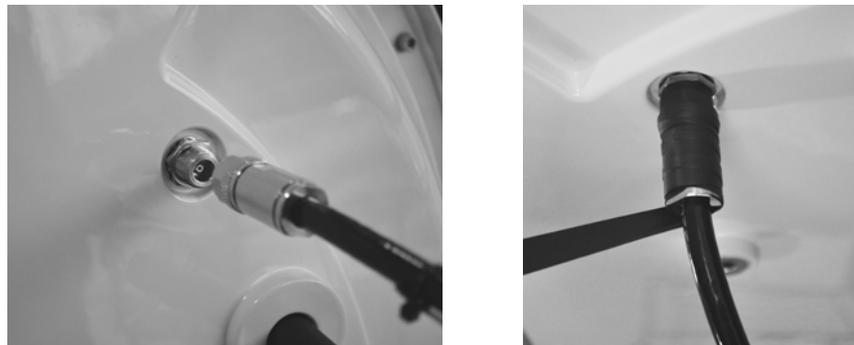


Figure 3-21: Attaching the N connector

15. Ensure that the connector is properly protected against seawater and corrosion. As a minimum, wrap it with self-amalgamating rubber.
16. 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.

3.3.3 To ground the ADU

The ADU must be grounded using one of the mounting bolts.

To ground the ADU do as follows:

1. Clean the metal underneath the head of **at least** one bolt of insulating protective coating and use a serrated washer to obtain a good ground connection
2. Tighten the bolt. Use stainless steel bolts and washers.
Tightening torque value: 30 Nm.
3. Seal the area suitably to avoid corrosion of the grounding point (recommended).
For optimum grounding connect the ground wire to the bolt marked in the figure below.

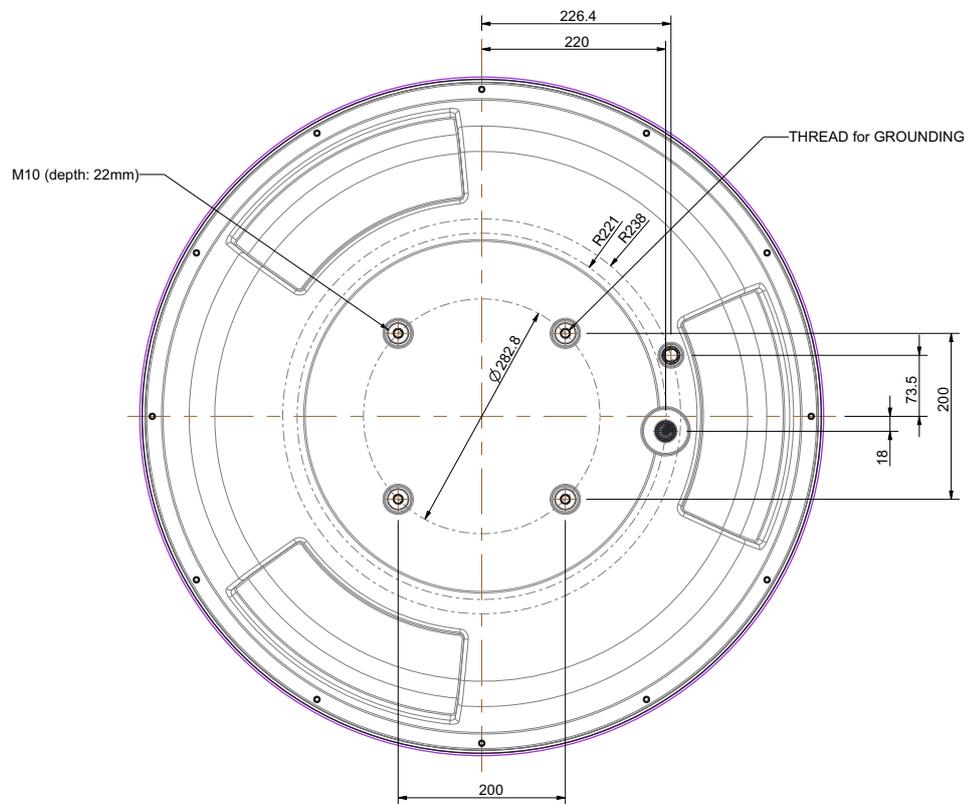


Figure 3-22: ADU, thread for optimum grounding

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 ground for fiber glass hulls* on page B-7.

For further information on grounding and RF protection see the appendix *Ground and RF protection* on page B-1.

3.3.4 Alternative ADU cable

The maximum allowed RF loss in the antenna cable is 20 dB RF loss @ 1950 MHz and maximum 35 dB RF loss @ 4450 MHz. You can verify the cable attenuation margin with the cable calibration, see *Cable calibration* on page 6-12 for more details.

The DC-resistance loop of the antenna cable must be maximum 0.9 Ohm. 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	Thickness	Absolute maximum length (m)	Absolute maximum length (ft)
RG214	3/8"	50 m	160 ft
LMR-400-DB	0.405"	85 m	280 ft
LMR-600-50	1/2"	150 m	490 ft
LDF4.5-50 Andrew	5/8"	270 m	810 ft

Table 3-4: ADU cable types and maximum lengths

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

1. Check the data sheet from the cable supplier to verify the values:
The RF-attenuation and the DC-resistance are below the maximum values specified below:
 - ADU cable RF-attenuation at 1950 MHz: Max. 20 dB including connector.
 - ADU cable RF-attenuation at 4450 MHz: Max. 35 dB including connector.
 - ADU cable modem-attenuation at 10 MHz: Max. 2 dB
 - ADU cable modem-attenuation at 36 and 54 MHz: Max. 4 dB
 - ADU cable loop DC-resistance max: 0.9 Ohm.
2. Respect the specified minimum bending radius, see the documentation from the cable supplier. If this is not the case, the loss in the cable will increase.

3.4 Installation of the ACU

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

3.4.1 To install the ACU

To install the ACU, do as follows:

1. Slide the ACU into a 1U space in a 19" rack.
2. Mount the screws in each side through the holes in the front and fasten the screws to the rack. Make sure that the unit is mounted securely according to the requirements for your 19" rack.

Important

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

3. Connect all cables. See *Interfaces of the ACU* on page 4-1 for a description of the ACU connectors.

For information about wiring DC power see *Only for ACU with DC power: DC input connector* on page 4-2.

For information about power source and power cable requirements see *Power and startup* on page 5-1.

3.4.2 To ground the ACU

To ground the ACU do as follows:

1. Make sure that the grounding requirements are met. See the appendix *Ground and RF protection* on page B-1 for details about grounding.
2. You must ground the ADU cable (coax cable, with an N connector at both ends) at the ACU end. 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.
3. Make sure that the shield of the connector is properly connected to the rack.
4. 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 ACU¹. This ground wire must be a heavy wire or braid cable with a larger diameter than the coax cable.

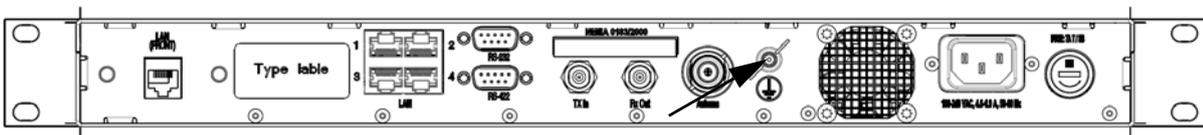


Figure 3-23: Ground stud, ACU

1. Antenna Control Units that are DC powered (SAILOR 7016B): The ground stud is located to the left.

3.5 Installation of the modem

See the documentation of the iDirect X7 Modem.

3.6 To connect the ADU, ACU and modem

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

3.6.1 ACU with AC power (SAILOR 7016C)

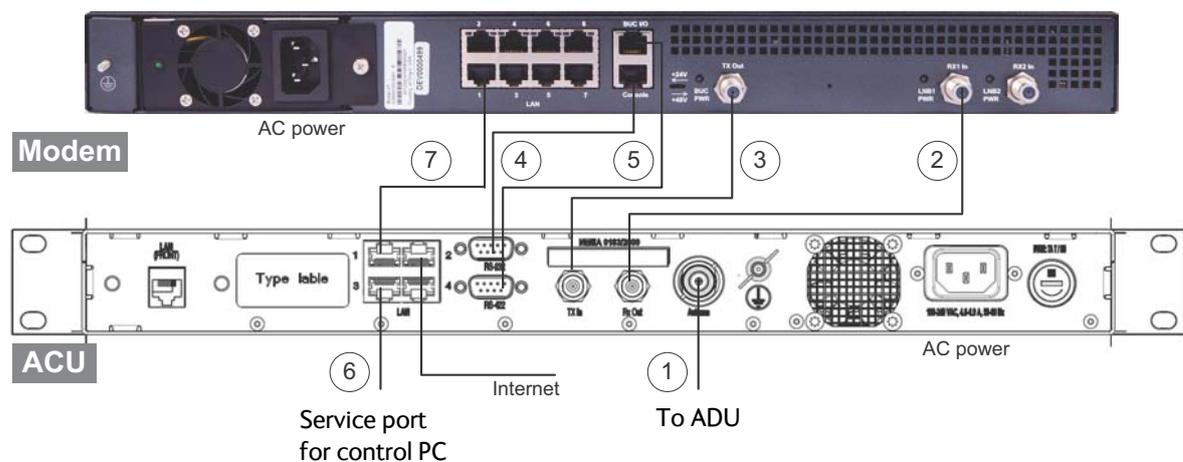


Figure 3-24: Connection between ADU, ACU and modem

1. Connect the antenna cable to **Antenna** at the ACU and the antenna.
2. Connect **Rx Out** at the ACU to **Rx In** at the modem with the supplied cable (75 Ohm coax, F-F, 1 m).
3. Connect **Tx In** at the ACU to **Tx Out** at the modem with the supplied cable (75 Ohm coax, F-F, 1 m).
4. Connect **RS-232** on the ACU to **Console (RS-232)** at the modem. Use the supplied X7 Modem BUC & Console to ACU cable.
5. Connect **RS-422** on the ACU to **BUC I/O (RS-422)** at the modem. Use the supplied X7 Modem BUC & Console to ACU cable.
6. Connect a PC at the **LAN3** interface (Service port) of the ACU for access to the web interface for configuration.
7. Connect **LAN1** at the ACU to the RJ45 connector 1 at the modem.

3.6.2 ACU with DC power (SAILOR 7016B)

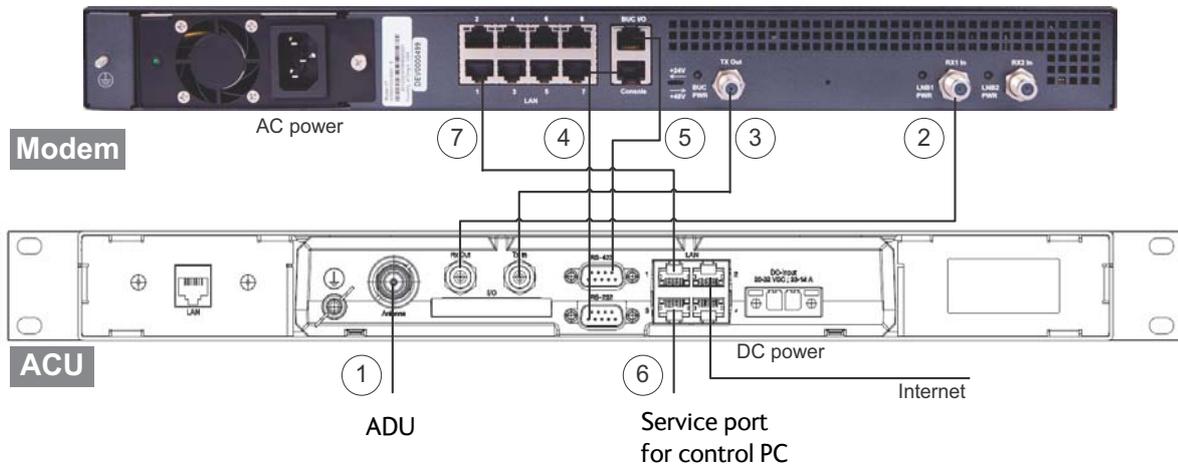


Figure 3-25: Connection between ADU, ACU and modem

1. Connect the antenna cable to **Antenna** at the ACU and the antenna.
2. Connect **Rx Out** at the ACU to **Rx In** at the modem with the supplied cable (75 Ohm coax, F-F, 1 m).
3. Connect **Tx In** at the ACU to **Tx Out** at the modem with the supplied cable (75 Ohm coax, F-F, 1 m).
4. Connect **RS-232** on the ACU to **Console (RS-232)** at the modem. Use the supplied X7 Modem BUC & Console to ACU cable.
5. Connect **RS-422** on the ACU to **BUC I/O (RS-422)** at the modem. Use the supplied X7 Modem BUC & Console to ACU cable.
6. Connect a PC at the **LAN3** interface (Service port) of the ACU for access to the web interface for configuration.
7. Connect **LAN1** at the ACU to the RJ45 connector 1 at the modem.

Interfaces

This chapter has the following section:

- *Interfaces of the ACU*

4.1 Interfaces of the ACU

4.1.1 LEDs, display, keypad and connectors

The following figure shows the LEDs, display and the keypad of the ACU. For an explanation of the texts in the display see *ACU display and keypad* on page 6-38.



Figure 4-1: ACU: LEDs, display and keypad (detailed, example)

The following figure shows the connector panel of the ACU.

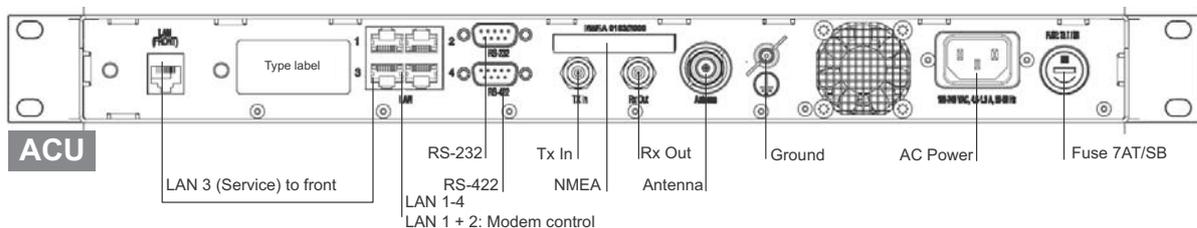


Figure 4-2: ACU (connector panel) with AC power

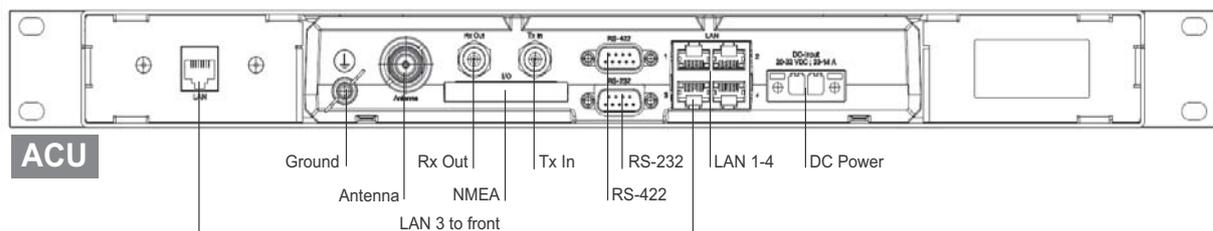


Figure 4-3: ACU (connector panel) with DC power

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

Important

Connect the Ethernet cable between LAN 3 and LAN to provide connection to the service port (LAN connector) at the front of the ACU.

4.1.2 AC input connector

Connect the power cable to the AC power connector.

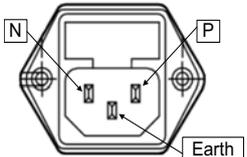
Outline (on the ACU)	Voltage range
	100–240 VAC

Table 4-1: AC power connector

4.1.3 Only for ACU with DC power: DC input connector

The ACU must be provided with DC power, for example by using the SAILOR 6080 AC/DC Power Supply or 24 VDC from the vessel's power supply.

DC input: Female plug (Weidmuller, Part number 1930050000) for wires up to AWG10/6 mm² (included in the delivery).

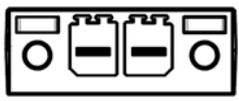
Outline (on the ACU)	Pin	Pin function	Wire color
 V_{in+} V_{in-}	Left	Vin+	Red
	Right	Vin-	Black

Table 4-2: DC Input plug, outline and pin assignment

1. Insert the power cable as shown below.

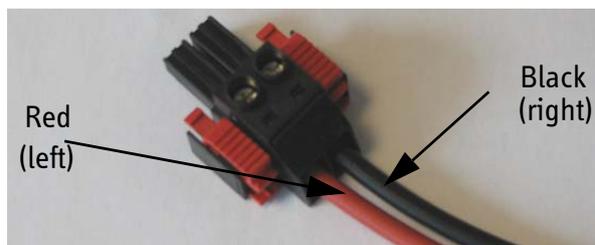


Figure 4-4: DC Input connector with power cable

2. Plug in the connector.
3. Fasten the connector with the two red clamps.

For more information about power supply and power requirements see the chapter *Power and startup* on page 5-1.

4.1.4 ADU connector

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

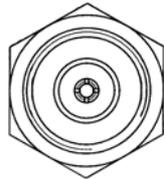
Outline (on the ACU)	Conductor	Pin function
	Inner	DC to ADU reference clock to ADU ACU to ADU internal communication Rx/Tx
	Outer	GND (Shield)

Table 4-3: N connector, outline and pin assignment

Important

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

4.1.5 Rx In and Tx Out connectors

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

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

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

4.1.6 NMEA 0183¹ connector

The ACU has an NMEA 0183 connector for the ship's gyro.

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 4-5: NMEA 0183/2000 connector, outline and pin assignment

1. Connect the pins according to the table above.

NMEA 0183

The NMEA 0183 connection supports EN 61162-1 (baud rate 4800, format 8N1) and EN 61162-2 (baud rate 38400, format 8N1). The ACU detects the baud rate automatically, you cannot configure this interface.

Supported NMEA sentences:

- HEHDT (North seeking Gyro compass)
- GPHDT (GPS compass)
- HNHDT (Non-North seeking gyro compass)
- IIHDT (Integrated Instrument)
- HCHDT (Magnetic compass)

Recommended NMEA 0183 cable: Two-wire constructed with one enclosed shield

Network signal pair:

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

- 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

4.1.7 RS-232 and RS-422 connectors

The ACU has an RS-232 and RS-422 connector for modem control. Use these connectors to connect the ACU to the modem.

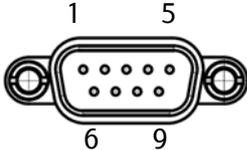
Outline (on the ACU)	Pin	Pin function
	1	Not connected
	2	RXD
	3	TXD
	4	DTR
	5	Ground
	6	DSR
	7	RTS
	8	CTS
	9	Receive Signal Strength Indicator

Table 4-6: RS-232 connector, male, outline and pin assignment, ACU

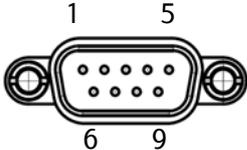
Outline (on the ACU)	Pin	Pin function
	1	Ground
	2	Line A RXD (+)
	3	Line B TXD (+)
	4	Ground
	5	Ground
	6	Not connected
	7	Line A RXD (-)
	8	Line B TXD (-)
	9	Not connected

Table 4-7: RS-422 connector, male, outline and pin assignment, ACU

4.1.8 LAN1 – 4 connectors

The ACU has four Ethernet connectors (type RJ45) for connecting to the modem, PC/laptops, routers, wireless access points. The maximum cable length per connection is 100 m. The Ethernet cable type must be CAT5, shielded.

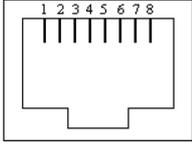
Outline	Pin	Pin function	Wire color
	1	Tx+	White/orange
	2	Tx-	Orange
	3	Rx+	White/green
	4	Not connected	Blue
	5	Not connected	White/blue
	6	Rx-	Green
	7	Not connected	White/brown
	8	Not connected	Brown

Table 4-8: Ethernet connector, outline and pin assignment

1. Connect an Ethernet cable to Port 1 at the ACU and to the upper leftmost LAN connector at the modem.
2. Use Port 2 for user WAN (Internet etc.).
3. Connect an Ethernet cable to Port 3 and to the LAN connector on the left side of the rear panel if you want to use the front LAN connector of the ACU for system control.
4. Use Port 4 (network 3) to connect the SAILOR 600 VSAT Ka to the vessel's LAN

For more details about the LAN networks see *To configure the LAN network* on page 6-25.

Power and startup

This chapter has the following sections:

- *Only DC powered ACU: Power source*
- *Only DC powered ACU: Power cable*
- *Only DC powered ACU: Power up*
- *Power-up procedure*

5.1 Only DC powered ACU: Power source

The ACU is powered with DC power. There are different options for the power supply:

- The 24 VDC ship supply provides power for the ACU.
- An AC line provides power through an AC/DC power supply. The SAILOR 6080 AC/DC Power Supply is recommended.

Note | Be aware of high start-up peak current: 35 A at 24 VDC, 5 ms.

In order to protect against short circuit in the power cable/connector, the ship's DC outlet must be protected by a 30 A fuse or circuit breaker.

5.2 Only DC powered ACU: Power cable

The following sections provide information about the source impedance of the DC power installation in the ship, how to measure it and power cable recommendations.

Source impedance

The maximum length of the power cable depends on the type of cable used and the source impedance of the DC power installation in the ship. The maximum allowed source impedance depends on the usage of the power range of the terminal DC input (Start up voltage: 22 VDC guaranteed, operating range: 20 – 32 VDC; 23 A – 14 A).

See also *Power cable recommendations* on page 5-2.

To measure the ship's source impedance

To measure the ship's source impedance do as follows:

1. Select a power outlet from the ship's 24 VDC system.
2. Measure the voltage without load (R.var disconnected).
3. Set the current to e.g. 1 A by adjusting R.var.
4. Measure the corresponding voltage change.

Example: 1 A and 50 mV. Source impedance: $50 \text{ mV}/1 \text{ Amp} = 50 \text{ m}\Omega$.

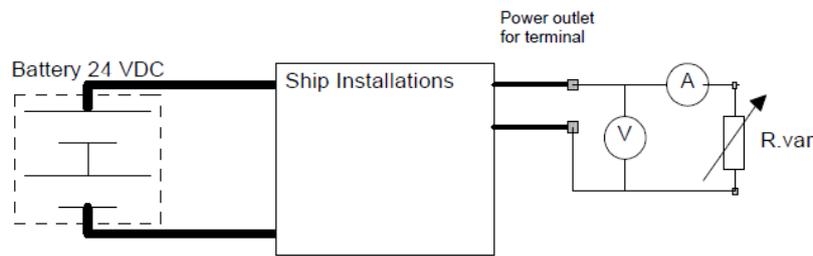


Figure 5-1: Measuring the ship source impedance

Note

If the total impedance is higher than the maximum stated further below in this section, the terminal may become unstable and start to on/off oscillate.

The total impedance is the sum of the source impedance of the ship power supply plus the impedance of connected cables including connectors and joints where cables are extended.

Power cable recommendations

The ACU is delivered with a power connector (PCB plug-in connector, female plug, Weidmuller, Part number 1930050000), which accepts wires up to AWG10/6 mm².

- When installing the power cable, install positive and negative supply wires closely together side by side to keep cable inductance low.
- Ensure that cable inductance for the selected cable at the desired length is less than 50 uH. Approximately 50 m maximum length.

Calculating the maximum power cable length

For 24 VDC operation, the total impedance must be max. 60 mOhm (R_{max}), including the source impedance in the ship installation (R_{source}). The total impedance is the sum of the following:

- Source impedance in the ship installation
- Impedance of the selected power cable

To calculate the maximum cable extension, do as follows:

1. Measure the source impedance in the ship installation as shown in Figure 5-1.
2. Find the resistance per meter (R_{wire}) for the cable type you are going to use.
 4 mm²/AWG 11: 4.8 mOhm/m at 55°C
 6 mm²/AWG 10: 3.8 mOhm/m at 55°C
 Other cable types: see the data sheet for the cable.

$$Maximum\ length = 0,5 \times (R_{max} - R_{source}) / (R_{wire})$$

The length is multiplied by 0.5 because there are two conductors in the cable.
 If the SAILOR 6080 AC/DC Power Supply is used, use $R_{source} = 0$ mOhm.

Examples for using the SAILOR 6080 AC/DC Power Supply:

$$AWG11_{\max} = 0.5 \times (60 \text{ mOhm} - 0) / 4.8 \text{ mOhm/m} = 6.2 \text{ m}$$

$$AWG10_{\max} = 0.5 \times (60 \text{ mOhm} - 0) / 3.8 \text{ mOhm/m} = 7.9 \text{ m}$$

5.3 Only DC powered ACU: Power up

5.3.1 To connect the power cable to the ACU

1. Connect the positive and negative input terminals to the ship's DC supply according to *Only for ACU with DC power: DC input connector* on page 4-2.
2. Connect the power plug to DC Input.

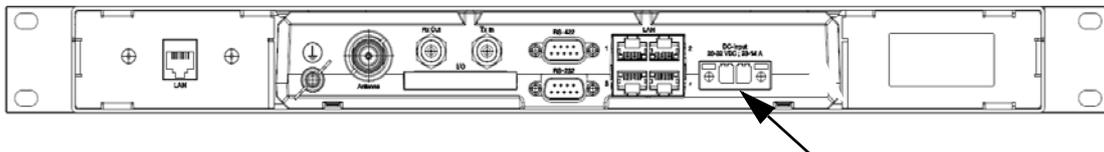


Figure 5-2: ACU - to connect power to DC Input

5.4 Power-up procedure

1. Connect power to the ACU.
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 600 VSAT Ka is ready to be calibrated (for first time power up) or receive data from the modem (when in normal operation).

The LEDs **Power** and **Fail/Pass** are **steady green**, the LED **Logon** is off. For further information on status indicators see *Status signalling with LEDs and status messages* on page 8-13.

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 *System messages* on page C-1.

4. Make an azimuth and a cable loss calibration, see *Heading input and position system* on page 6-4.
5. Create one or more VSAT modem profiles. See *VSAT modem profiles* on page 6-21.
6. Create one or more satellite profiles. See *Satellite profiles* on page 6-21.

For more detailed step-by-step instructions, see the chapter *Configuration* on page 6-1.

5.4.1 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

5.4.2 SAILOR 600 VSAT Ka operational

When the display shows **TRACKING. MDM: NETOK** and the LED **Logon** is steady green the system is operational.

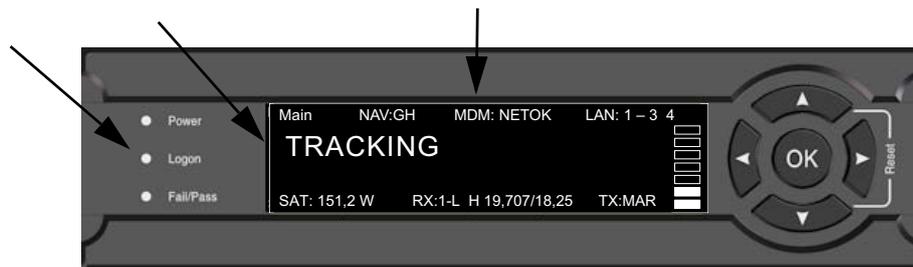


Figure 5-3: ACU display, system operational

Configuration

This chapter has the following sections:

- *Introduction to the built-in web interface*
- *Heading input and position system*
- *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

With the built-in web interface of the SAILOR 600 VSAT Ka ACU you make a full configuration of the SAILOR 600 VSAT Ka. You can use a standard Internet browser. Installation of software is not necessary.

For quick start instructions see *Heading input and position system* on page 6-4.

Important

The SAILOR 600 VSAT Ka system is not designed to be connected directly to the Internet. It must be located behind a dedicated network security device such as a fire wall.

If any ports of the SAILOR 600 VSAT Ka are exposed to the Internet you must change the default passwords as anyone with access and malicious intent can render the SAILOR 600 VSAT Ka inoperable.

6.1.2 Connecting to the web interface

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

1. Switch on the ACU.
2. 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.
3. Connect a PC to LAN port 3: Service (standard Ethernet) of the ACU or to the front LAN connector of the ACU.

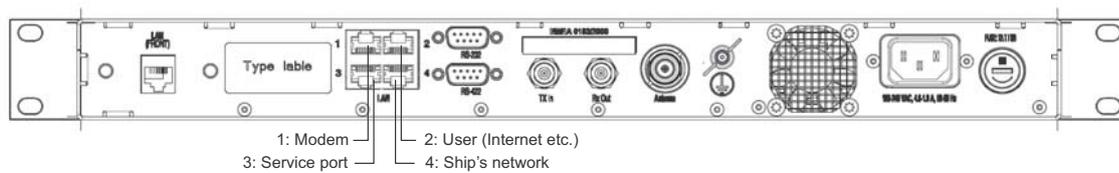


Figure 6-1: LAN 3 connector used for configuration of the SAILOR 600 VSAT Ka

If you want to use another LAN port to access the web interface you must configure it as described in *To configure the LAN network* on page 6-25.

4. Open your Internet browser and enter the default IP address of the ACU
<http://192.168.0.1>.

When the login screen is displayed you have verified that the connection to the **SAILOR 600 VSAT Ka** can be established. The web interface is ready for use. **First time login as administrator**

For a new installation you will set the ACU into local administration and set the admin password. This is also the case after a factory default.

Do as follows:

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

Note

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

5. To enter or change the password select **ADMINISTRATION > User login** and locate the section **Change Login**.
6. If needed, type in the new password (minimum 8 characters) and click **Change**. No old password is required.

After the 1 hour window or a restart the administrator password is required.

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 8-5 for further information.

The web interface shows the **DASHBOARD** page.

RX : Tracking SAILOR 600 KA

• DASHBOARD **DASHBOARD**

<ul style="list-style-type: none"> SETTINGS SERVICE ADMINISTRATION HELPDESK SITE MAP 	<table border="0"> <tr> <td>GNSS position</td> <td>55°47' N, 12°31' E</td> <td>ACU part name</td> <td>TT-7016B</td> </tr> <tr> <td>Vessel heading</td> <td>4.8°</td> <td>Antenna part name</td> <td>TT-7006A</td> </tr> <tr> <td>Satellite profile</td> <td>X7 Profile</td> <td>ACU serial number</td> <td>81047461</td> </tr> <tr> <td>Satellite position</td> <td>0.7°W</td> <td>Antenna serial number</td> <td>74618104</td> </tr> <tr> <td>RX polarisation</td> <td>Left hand circular</td> <td>Software version</td> <td>1.51 build 09</td> </tr> <tr> <td>TX polarisation</td> <td>X-pol</td> <td>POINTING</td> <td></td> </tr> <tr> <td>RX RF frequency</td> <td>19.827000 GHz</td> <td>Azimuth, elevation geo</td> <td>195.8° 24.9°</td> </tr> <tr> <td>LNB LO frequency</td> <td>18.250000 GHz</td> <td>Azimuth, elevation rel</td> <td>190.8° 24.9°</td> </tr> <tr> <td>BUC LO frequency</td> <td>28.050000 GHz</td> <td>TX</td> <td></td> </tr> <tr> <td>Tracking RF frequency</td> <td>19.827000 GHz</td> <td>BUC TX</td> <td>On</td> </tr> <tr> <td colspan="4">MODEM</td> </tr> <tr> <td>Model</td> <td>iDirect X7 (OpenAMIP)</td> <td></td> <td></td> </tr> <tr> <td>RX locked status</td> <td>Locked</td> <td></td> <td></td> </tr> <tr> <td>RX IF frequency</td> <td>1577.000000 MHz</td> <td></td> <td></td> </tr> <tr> <td>TX allowed</td> <td>Yes</td> <td></td> <td></td> </tr> </table> <p style="text-align: center;"><input type="button" value="Refresh"/></p>	GNSS position	55°47' N, 12°31' E	ACU part name	TT-7016B	Vessel heading	4.8°	Antenna part name	TT-7006A	Satellite profile	X7 Profile	ACU serial number	81047461	Satellite position	0.7°W	Antenna serial number	74618104	RX polarisation	Left hand circular	Software version	1.51 build 09	TX polarisation	X-pol	POINTING		RX RF frequency	19.827000 GHz	Azimuth, elevation geo	195.8° 24.9°	LNB LO frequency	18.250000 GHz	Azimuth, elevation rel	190.8° 24.9°	BUC LO frequency	28.050000 GHz	TX		Tracking RF frequency	19.827000 GHz	BUC TX	On	MODEM				Model	iDirect X7 (OpenAMIP)			RX locked status	Locked			RX IF frequency	1577.000000 MHz			TX allowed	Yes		
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RX polarisation	Left hand circular	Software version	1.51 build 09																																																										
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Tracking RF frequency	19.827000 GHz	BUC TX	On																																																										
MODEM																																																													
Model	iDirect X7 (OpenAMIP)																																																												
RX locked status	Locked																																																												
RX IF frequency	1577.000000 MHz																																																												
TX allowed	Yes																																																												

Figure 6-2: Dashboard

For a detailed introduction to the web interface see *Overview and dashboard* on page 6-16.

6.2 Heading input and position system

Important | Make sure that the modem is switched off at this point. Switch on the modem after the cable calibration.

Before the SAILOR 600 VSAT Ka can be used you must select the heading input and the positioning system.

Important | You must be logged on as an administrator. See *Administration* on page 6-34.

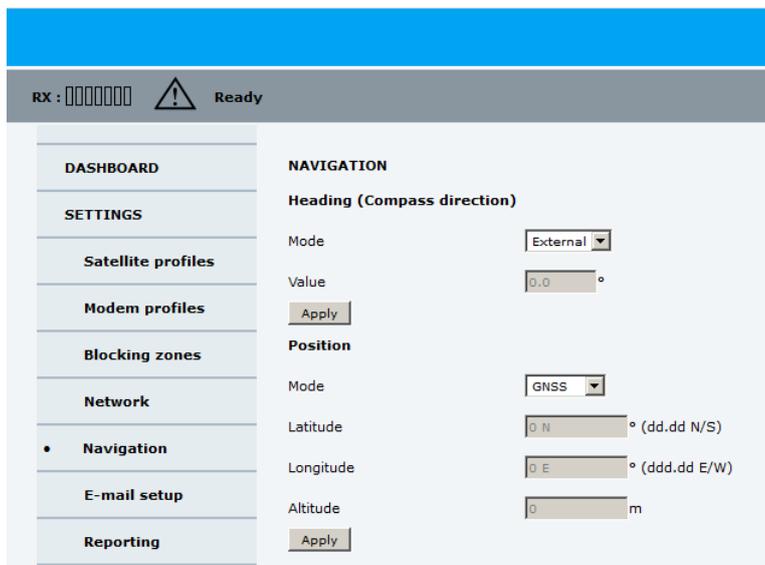


Figure 6-3: Web interface: SETTINGS, Navigation (example)

To set the heading input and the position system, do as follows:

1. Go to the page **SETTINGS > Navigation**.
2. Select the desired heading input, see the following table.

Heading input	Description
External	<p>Heading input from the vessel's gyro compass (default).</p> <p>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 <i>Operation in gyro-free mode</i> on page 6-14.</p>
Fixed	<p>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.</p> <p>Important: Fixed heading is not allowed for sailing vessels!</p> <p>Enter the vessel heading in degrees.</p>
None	<p>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.</p> <p>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 <i>Operation in gyro-free mode</i> on page 6-14.</p>

Table 6-1: Heading input options

3. Click **Apply**.

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

4. In the section **Position, Mode** select **GNSS System** or **Manual**. The **Manual** mode is used for fixed installations (fixed heading).

5. For **GNSS System**, select from **GPS, Beidou, GPS and Beidou, GPS and GLONASS**. The SAILOR 600 VSAT Ka uses GPS by default

6. For **Manual** enter the latitude, longitude and altitude.

7. Click **Apply**.

Note | If you move outside coverage of the selected system, you will eventually lose connection to the satellite network. The **Position** field in the **Dashboard** of the web interface will show **Acquiring**.

Background information on the acquisition process and search pattern

With heading input or fixed heading

1. The antenna starts the acquisition and 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.

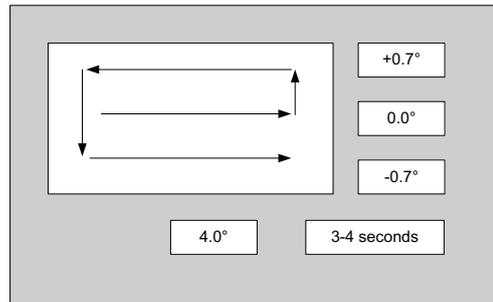


Figure 6-4: Acquisition, search pattern

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 and Inclined Orbit Satellite

1. The antenna starts the acquisition and 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.

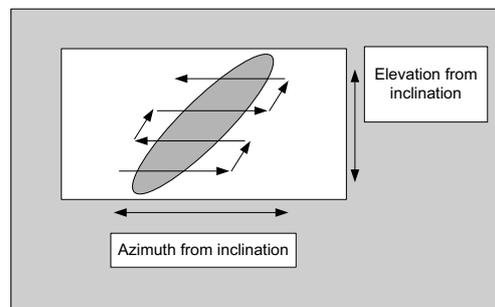


Figure 6-5: Acquisition, search pattern for inclined orbit

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.

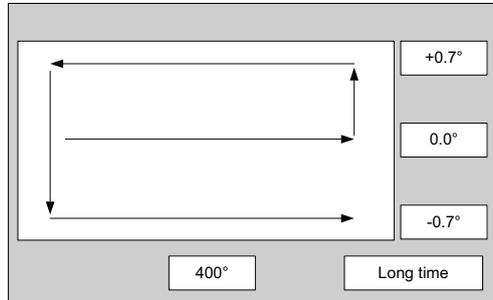


Figure 6-6: Acquisition, search pattern in gyro-free mode

Acquisition times

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

Table 6-2: Acquisition time

6.3 Calibration

Important Make sure that the modem is switched off at this point. Switch on the modem after the cable calibration.

Before the SAILOR 600 VSAT Ka can be used you must 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 600 VSAT Ka fixed gain feature. See *Fixed TX IF principle* on page 6-14 for more information. After the calibration 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 6-34.

The following sections describe the steps for a successful calibration:

1. *Calibration*
2. *Service profile for calibration*
3. *Cable calibration*
4. *Manual One Touch Commissioning (BUC calibration)*

6.3.1 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.

You can make an azimuth calibration in the following ways:

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

Azimuth calibration (user controlled)

1. On the page **SERVICE > Calibration**, in the section **Azimuth calibration (user controlled)**, select **User defined** in the **Satellite** drop down list.

Note If you do not want to enter the satellite data on the calibration page you can select a dedicated satellite service profile for calibration and select it. For information how to set up a service profile see 6.3.2.

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

2. Type in the longitude of the satellite.

Satellite	Position	Frequency	Satellite identifier
I5F1	62.6 E	19.707 GHz	GSC
I5F2	180 W	19.707 GHz	GSC
I5F3	55 W	19.707 GHz	GSC

Table 6-3: GSC satellite information

Important

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

3. Type in its tracking frequency, 19.707 GHz.
4. Select **Satellite identifier**: GSC, NID, Orbital position (DVB-S, DVB-S2)¹.
5. Click **Start** and wait typically 5 minutes for the azimuth calibration to finish. A 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 TX frequency.

Table 6-4: Possible error codes during calibration

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

Error code	Explanation
8	Invalid satellite, e.g. satellite not visible.
9	Unknown error

Table 6-4: Possible error codes during calibration (Continued)

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 the place of installation. To be able to use this feature you must have made a valid satellite profile and activate it. When the vessel leaves the harbour and gets line of sight to the calibration 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 **Azimuth calibration (active satellite profile)** on the page **SERVICE > Calibration**.

1. Create a modem profile, see *VSAT modem profiles* on page 6-21.
2. Create a satellite profile, see *Satellite profiles* on page 6-21.
3. Click **SETTINGS** and **Activate** the satellite profile.
4. Click **SERVICE > Calibration**.

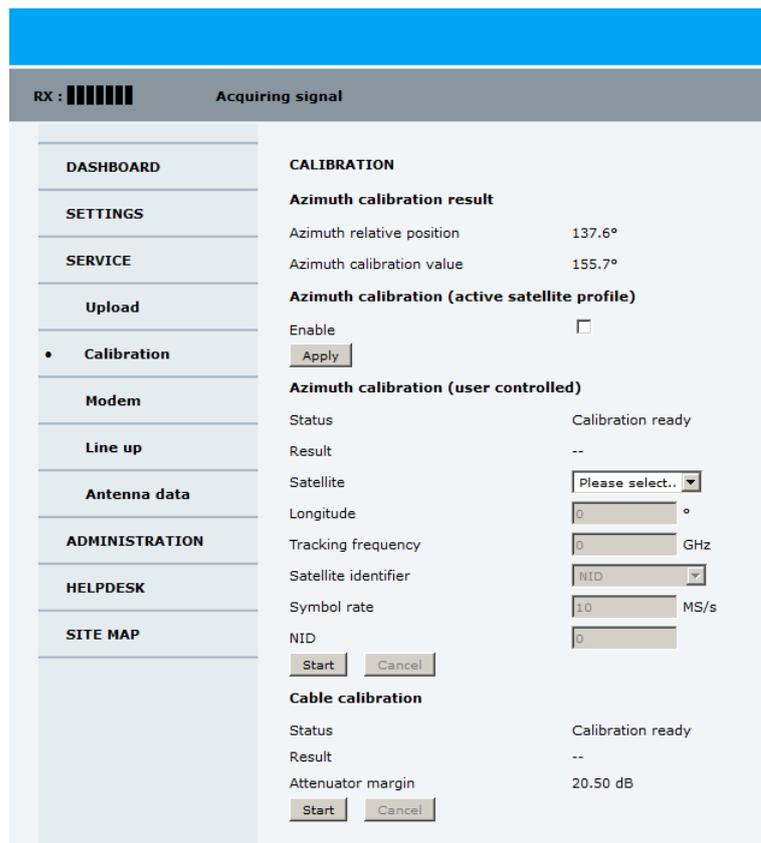


Figure 6-7: Web interface: SERVICE, Calibration (example)

5. Select **Enable** in the section **Azimuth calibration (active satellite profile)**. To be able to use this feature there must be a valid satellite profile and you must activate it in **SETTINGS > Satellite profiles**.

6. Click **Apply**.
7. Switch on the modem.

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 modem **Service & calibration** are displayed in the list. If there is no profile in the list, you must set up one, see *Service profile for calibration* on page 6-11.
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 in the field **Result**.

6.3.2 Service profile for calibration

Use the 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. To prepare for calibration you can set up a service profile for calibration. To set up a service profile do as follows:

1. Connect a PC to LAN connector 3 (Service port, standard Ethernet) of the ACU or to the front LAN connector of the ACU.
2. Open an Internet browser and enter the IP address of the ACU (Default: <http://192.168.0.1>).
3. Select ADMINISTRATION and log on with User name: admin, Password: 1234
4. Select **SETTINGS > Satellite profiles > New entry**. Enter the name of the satellite profile for calibration (a name of your own choice).
5. Select the modem profile **Service & calibration** from the drop-down list.

The screenshot displays the 'ADD SATELLITE PROFILE' configuration page. On the left is a navigation menu with 'SETTINGS' highlighted. The main content area contains the following fields:

- Satellite profile name:** Service profile
- VSAT modem profile:** Service & Calibration
- Satellite position:** 62.6 E
- TRACKING:**
 - RX frequency:** 19.707 GHz
 - Satellite identifier:** GSC

At the bottom of the form are 'Apply' and 'Cancel' buttons. Red arrows in the image highlight the 'SETTINGS' menu item, the 'ADD SATELLITE PROFILE' title, the 'Satellite profile name' field, the 'Satellite position' field, the 'RX frequency' field, and the 'Satellite identifier' dropdown menu.

Figure 6-8: Service profile for calibration

6. Enter the data for the satellite that you want to use as a calibration reference. Note the following calibration requirements:
 Elevation angle: 5 – 70 degrees.
 Not allowed for calibration: Inclined orbit.
 Satellite identifier: GSC, NID, Orbital position (DVB-S, DVB-S2)¹. See also Table 6-3 on page 6-9.
7. Click **Apply** to save the settings for this satellite profile for calibration. The system is ready for the azimuth calibration.
8. Click **Start** to start the azimuth calibration.

6.3.3 Cable calibration

Important Make sure that the modem is not switched on at this point. The modem can be switched on after the cable calibration.
 Make sure that **Heading Mode** on the page **SETTINGS > Navigation** is set to **Fixed** or **External**.
 Make sure to disable all no-tx zones if defined at this point. Otherwise the cable calibration may fail.

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

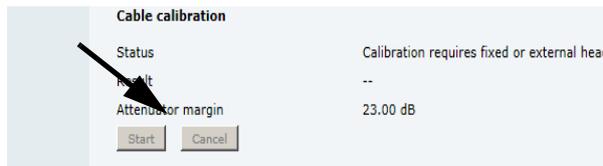


Figure 6-9: Web interface: SERVICE, Calibration, cable attenuator margin

2. Wait for the calibration to finish. After finished calibration a message with the result of the calibration is displayed in the field **Result**. 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.

Note Each time a cable calibration is made, the ACU displays the warning **BUC calibration outdated**. To clear the warning make a manual One Touch Commissioning.

3. After the azimuth and cable calibration switch on the modem. The modem will automatically make a BUC calibration if switched on for the first time and is then ready.

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

4. When commissioning is completed, test all subscribed services, see *Installation check list: Functional test in harbor* on page 7-4.
5. Enable the no-tx zones after cable calibration, if you have disabled them.

Important

If there is no input from the vessel's gyro compass: Change the heading input setting from **Fixed** to **None** at **Heading – Input**.
Fixed heading is not allowed for sailing vessels!

6.3.4 Manual One Touch Commissioning (BUC calibration)

When the modem starts up for the first time it will automatically register with the BUC and perform P1dB compression on multiple frequencies and thereafter register with the network. During the P1dB compression the antenna will point away from the satellite and transmit on 950 MHz to 1950 MHz in 50 MHz steps. The ACU will show **BUC calibration** on the **DASHBOARD** and the ACU display. This may take up to 10 minutes.

If a new cable calibration is made, the ACU displays the warning **BUC calibration outdated**. Then you must make a manual One Touch Commissioning.

To make a manual One Touch Commissioning (OTC) for the modem, do as follows:



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

Important

You must use the Internet browser **Firefox**.

1. Connect a PC to LAN1.
2. Enter the web interface (via Firefox browser) and go to **SERVICE > Modem**.
3. At **Modem access** click the link.

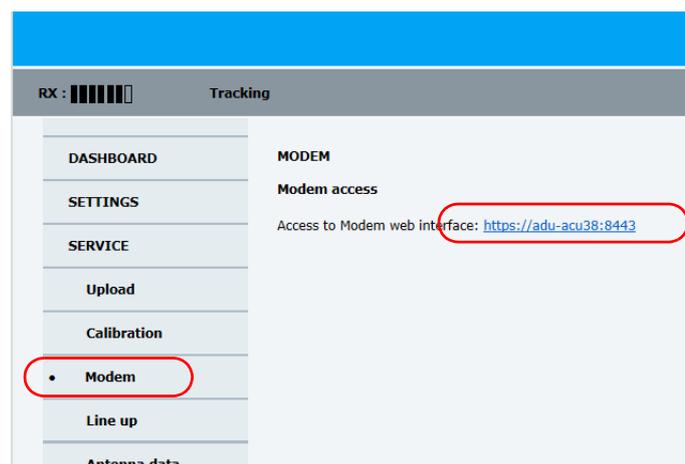


Figure 6-10: Web interface: SERVICE > Modem, access to modem web interface

4. Type the user name **admin** (default) and the password **iDirect** (default).

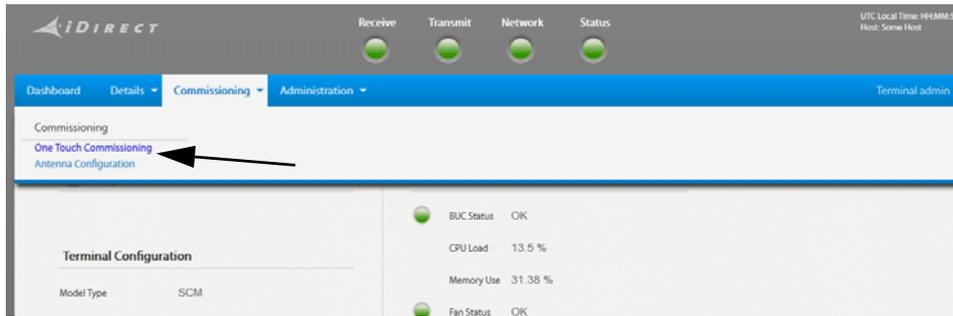


Figure 6-11: Unified web interface of the Core Module

5. In the menu **Commissioning** click **One Touch Commissioning**.
6. Click **Start**. One Touch Commissioning takes place. When commissioning is completed the antenna will search for the I5 satellite with the highest elevation.
7. The antenna will find the satellite and the modem will perform the necessary steps to enter the network (software upgrades, if available).
8. The web interface of the iDirect core module will indicate the modem in the network and the modem status is shown in the display in the menu **MODEM** of the SAILOR 600 VSAT Ka web interface.
9. When commissioning is completed, test all subscribed services.

6.3.5 Operation in gyro-free mode

If input from a gyro compass is not available (Heading input: none), information from the GPS position is used when searching for a satellite. If 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 search time to find the satellite and start tracking is therefore increased 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 present.

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

6.3.6 Fixed TX IF principle

The SAILOR 600 VSAT Ka uses a TX IF gain concept. After calibration it provides a fixed average gain from the TX-port of the ACU to the input of the BUC. Advantages of the fixed TX IF gain principle are:

- Average TX IF gain independent of antenna cable length¹
- Compatibility with the TX Power control feature

¹ You find the maximum allowed cable loss at *Prerequisites* on page 3-19.

When installing the SAILOR 600 VSAT Ka you make a cable calibration. At that point every installation adjusts to the same average TX IF gain regardless of the ADU cable length. Additionally the SAILOR 600 VSAT Ka system also compensates for variations of the cable characteristics or loss over frequency.

6.4 Configuration with the web interface

6.4.1 Overview and dashboard

Topics in the web interface

The site map gives 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.

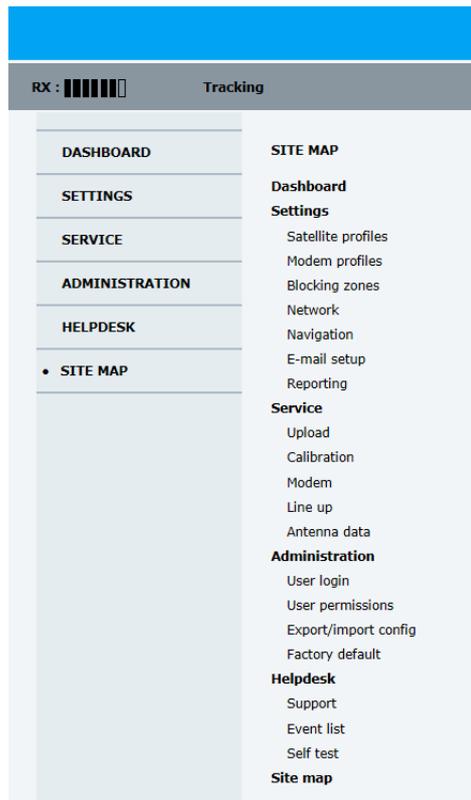


Figure 6-12: Topics in the web interface (SITE MAP)

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 and the user name and password. The Dashboard is used for viewing properties and status of the ACU and ADU.

The web interface has the following sections:

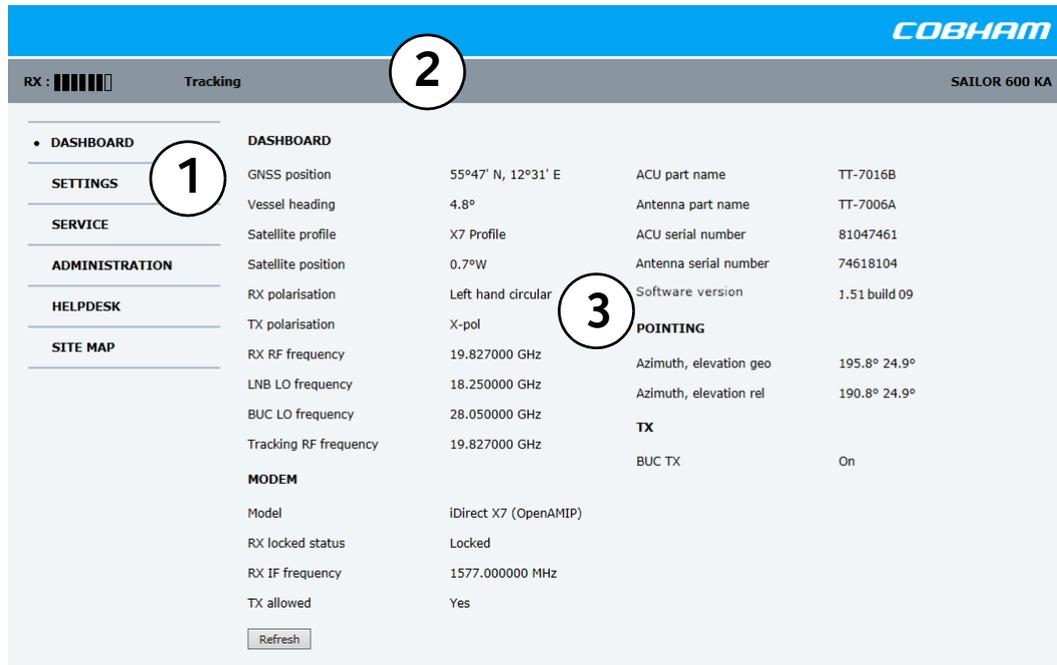


Figure 6-13: Web interface: DASHBOARD of SAILOR 600 VSAT Ka

1. The navigation pane holds the main menu. Clicking an item in the menu opens a submenu in the navigation pane or a new page in the contents section.
2. The top bar shows the signal strength, current status and icons for events, if any, and the host name.
The signal status field shows the tracking signal strength of the antenna. The signal strength can vary during operation, depending on the current position relative to the satellite.
3. The icon bar shows icons for active events, when relevant. The host name is shown on every page of the web interface.
4. The host name is useful for identifying the system at remote login and when requesting 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 6-25.
5. 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 6-19.

The following icon may appear in the icon bar in the web interface:

Icon	Explanation
	An event is active. Click the icon to see a list of active events. For explanations of the event messages, see <i>Event messages – overview</i> on page C-1. Note that this icon will remain in the icon bar as long as the event is active.

Table 6-5: Web interface: Event icon

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 for guest login* on page 6-35.

To connect a PC

To connect a 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 to access the web interface you must configure it according to your network requirements. See *To configure the LAN network* on page 6-25 for more information.
2. Open your Internet browser and enter the IP address of the ACU (Default IP address: `http://192.168.0.1`).

Status field in the icon bar

The top bar shows the current status of the antenna.

- **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)
- **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**

- **BUC 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 in 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	Circular polarisation: Left-hand.
TX polarisation	X-pol
RX RF frequency ^a	Ka band receiving frequency
LNB Lo frequency	18.25 GHz (system hardware)
BUC Lo frequency	28.05 GHz (system hardware)
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 600 VSAT Ka.

Table 6-6: Web interface, DASHBOARD, first section

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

MODEM ^a	Description
Model	Modem name, entered in SETTINGS > Modem profiles .
RX locked status	Demodulator lock of the modem.
RX IF frequency	Read out from the modem.
TX allowed	Yes or no. Indicates if the modem supplies the 50 MHz reference signal on its TX connector (On) and if an iDirect OpenAMIP modem indicates modem Locked and Tx ON in the OpenAMIP message L (L 1 1).

Table 6-7: Web interface, DASHBOARD, MODEM section

- a. Items shown in this list may vary, they depend on the current modem.

POINTING	Description
Azimuth, elevation geo	Current value for azimuth, elevation, relative to the vessel heading.
Azimuth, elevation rel.	Current value for azimuth, elevation, relative to the vessel.

Table 6-8: Web interface, DASHBOARD, POINTING section

TX	Description
BUC TX	On or Off. Shows if the SAILOR 600 VSAT Ka has enabled the BUC or not. It is the same TX ON/TX OFF as shown in the display of the ACU, see <i>ACU display and keypad</i> on page 6-38.

Table 6-9: Web interface, DASHBOARD, TX section

6.5 Satellite profiles and VSAT modem profiles

6.5.1 Satellite profiles

A satellite profile with the modem is already set up at the factory. You may add a satellite profile with the generic modem for troubleshooting purposes. This is done on the page **Satellite profiles**. Logon as an administrator (page **ADMINISTRATION**, user name: admin password: 1234).

To use a satellite profile you must activate it.

1. Go to **Satellite profiles**.
2. Click **Activate** at the desired satellite profile.

Satellite profiles – New entry and Edit



SATELLITE PROFILES			
Name ▲	Modem type ▲	Position ▲	
X7 Profile	iDirect X7 (OpenAMIP)	auto	Edit / Re-activate
Generic GSC	Generic modem	62.6 E	Edit / Delete / Activate

Figure 6-14: Web interface: SETTINGS - list of satellite profiles (example)

Each satellite profile has one assigned VSAT modem profile. A VSAT modem profile must be set up. Before making a satellite profile you must make a modem profile.

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

1. Go to **SETTINGS** or **Satellite profiles** and click **Edit** or **New entry**.
2. Enter or edit the Satellite profile name.

Note It is helpful to assign a name containing the location where the Satellite profile is to be used (e.g. *Gulf of Mexico* or *North Sea*) and possibly the provider.

3. Select a VSAT modem profile. The page automatically displays the parameters available for the selected VSAT modem profile. For instructions how to add a VSAT modem profile see *VSAT modem profile – New entry and Edit* on page 6-22.
4. Enter the data for the satellite, if any. For satellite data see www.lyngsat.com.
5. Click **Apply** to save the settings for the satellite profile.

6.5.2 VSAT modem profiles

On the page **VSAT modem profiles** you create, edit or delete VSAT modem profiles. You must add at least one VSAT modem profile.

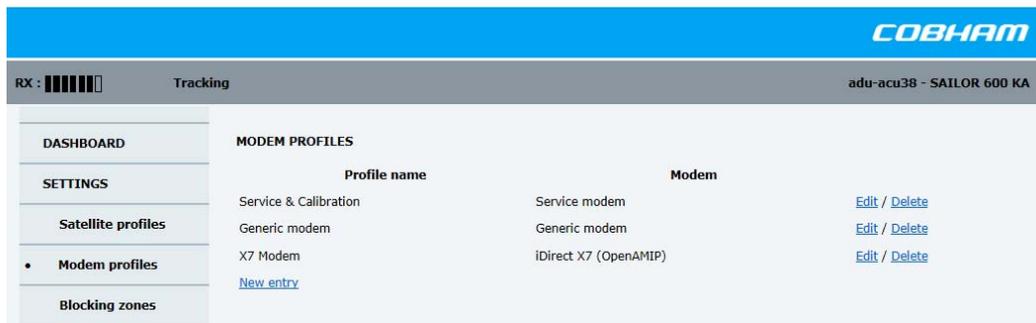


Figure 6-15: Web interface: SETTINGS, VSAT modem profiles (example)

A VSAT modem profile contains all VSAT 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.

VSAT modem profile – New entry and Edit

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

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



Figure 6-16: Web interface: SETTINGS, VSAT modem profile – supported modems

2. Fill in a VSAT modem profile name of your own choice.
3. Select a VSAT modem from the drop down list.
Generic modem: If you have a modem that is not included in the list, select the generic modem. This is mainly used for troubleshooting purposes.
4. 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 the parameters in the satellite profile that uses the generic modem profile.

RX : [Progress Bar] Tracking

SATELLITE PROFILES

ADD SATELLITE PROFILE

Satellite profile name: [Text Field]

Modem profile: [Generic modem]

Satellite position: [0 E]°

Maximum inclination: [0]°

Elevation cutoff: [10]°

RX IF frequency: [0.000] MHz

LNB LO frequency: [18.25] GHz

RX RF frequency: [0.000000] GHz

TRACKING

Tracking type: [Narrow band]

RX frequency: Modem User defined

[Apply] [Cancel]

Figure 6-17: Satellite profile with generic modem

6.5.3 To set up blocking zones (RX and TX)

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

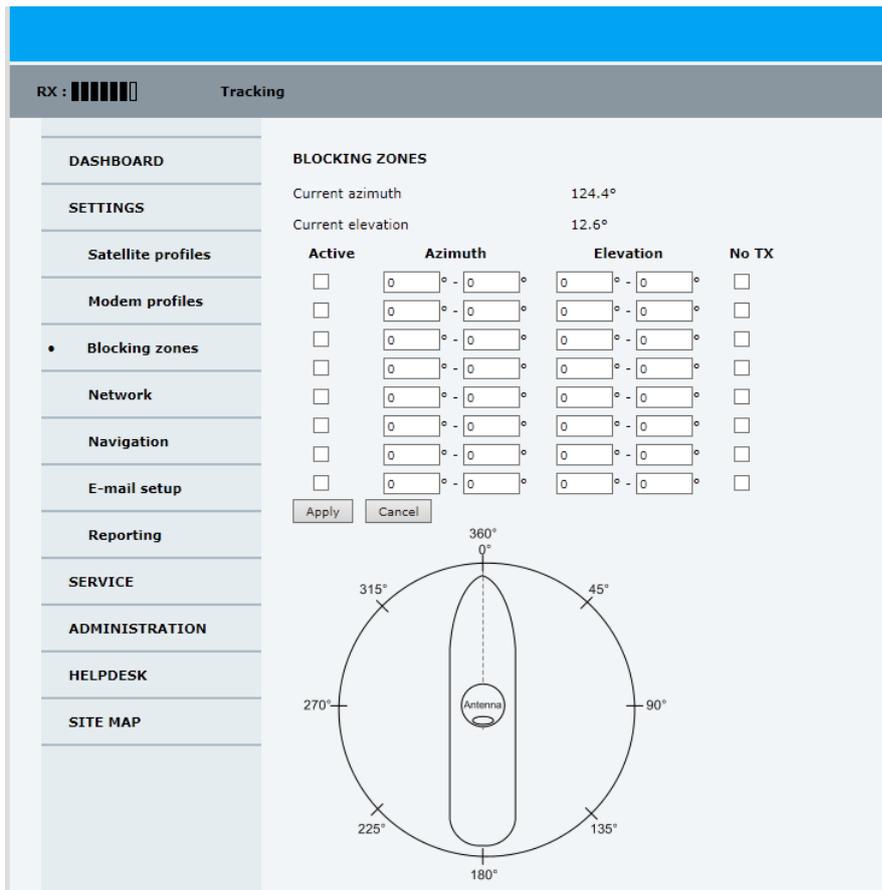


Figure 6-18: Web interface: SETTINGS, Blocking zones – azimuth and elevation

To define and set a blocking zone, do as follows:

1. Select **SETTINGS > Blocking zones**.
2. Select **Active** to enable the blocking zone.
3. Enter start and stop azimuth value in degrees for the blocking zone. Values allowed: 0 to 360 degrees. Enter clockwise.

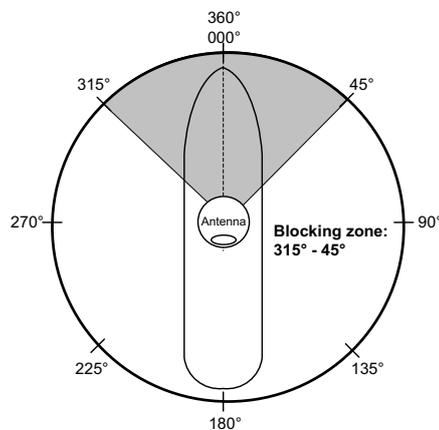


Figure 6-19: Blocking zone, example: 315 - 45 degrees

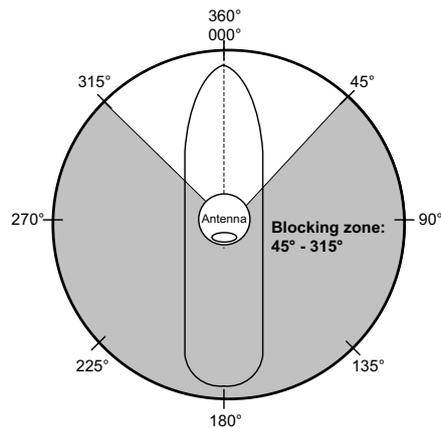


Figure 6-20: Blocking zone, example: 45 - 315 degrees

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

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

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

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

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

6.5.4 To configure the LAN network

On this page you can enter a host name. The host name helps identifying the SAILOR 600 VSAT Ka system when sending e-mail reports and remotely connecting through an external Internet connection. The ACU has four 10/100 Mbit/s 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 set up DNS and Gateway.

Important The SAILOR 600 VSAT Ka system is not designed to be connected directly to the Internet. It must be located behind a dedicated network security device such as a fire wall. If any ports of the SAILOR 600 VSAT Ka are exposed to the Internet you must change the default passwords as anyone with access and malicious intent can render the SAILOR 600 VSAT Ka inoperable.

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

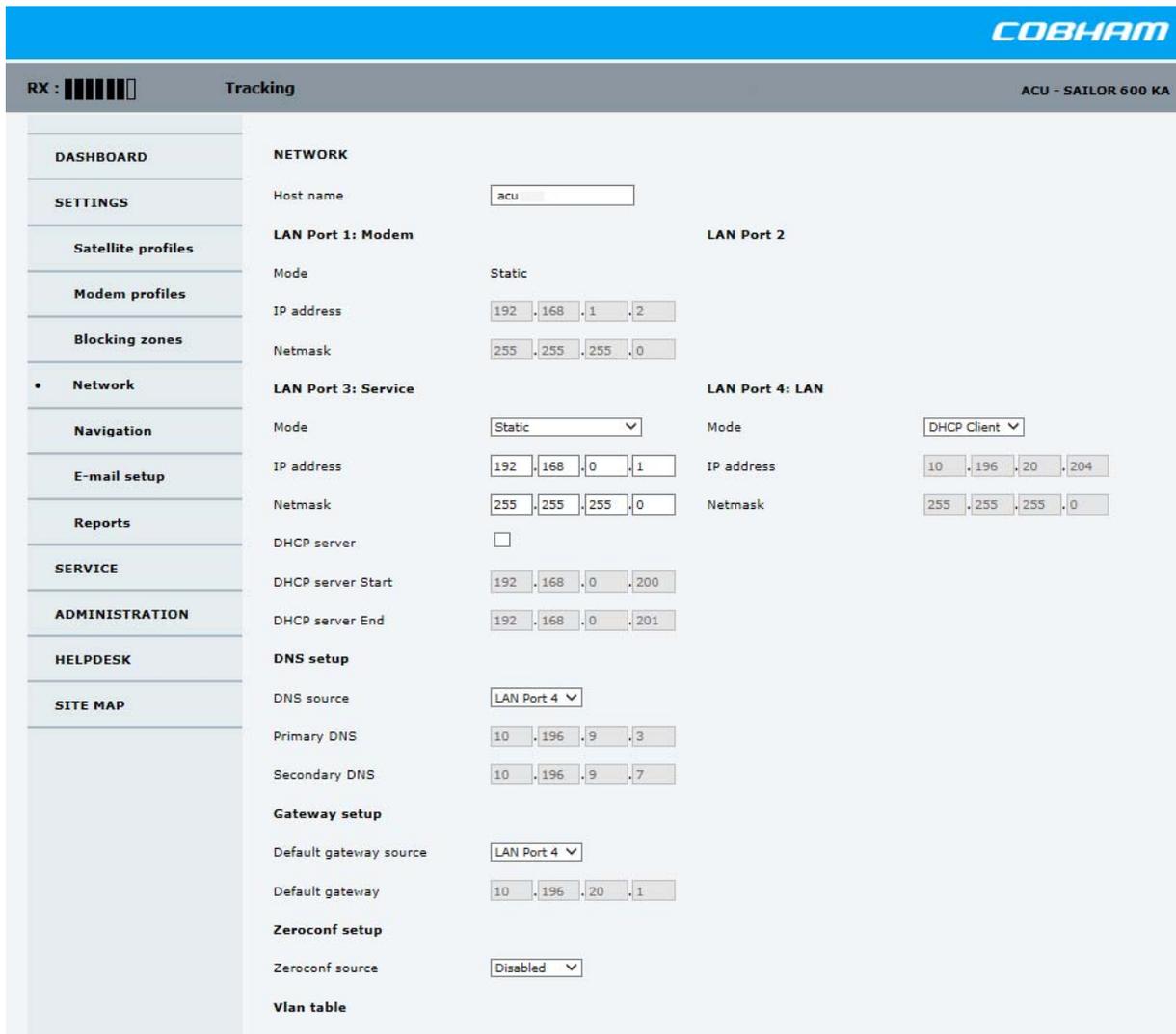


Figure 6-21: Web interface: SETTINGS, Network (default settings)

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

Make the necessary changes on this page and click **Apply**.

Sections	Preferred use
NETWORK Host name	The host name is used for identifying the ACU in local networks and in reports. The default host name is acu. You can change the name. Letters (a-z), digits (0-9) and hyphen (-) are allowed. Note: The host name must start with a letter.
LAN Port 1	This network is connected to the modem. LAN port 1 mode is always Static (static IP address).
LAN Port 2	LAN port 2 is used for Internet access .

Table 6-10: Setup of LAN connectors

Sections	Preferred use
LAN Port 3	LAN port 3 is the service port. The default IP address is http://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 <i>ACU (connector panel) with AC power</i> on page 4-1), for access to the service port from the rack front. LAN port 3 can be set to the mode Static or Switched with port 1 , DHCP server can be selected (default) or DHCP client.
LAN Port 4	LAN port 4 can be used to connect to the vessel's LAN. LAN port 4 mode can be set to Static , DHCP client (default) or DHCP server .

Table 6-10: Setup of LAN connectors (Continued)

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 3 and 4 you can select 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**, 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 6-28. 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 the 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 the 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.

VLAN port membership table

The VLAN port membership table is configured by the modem as configured by the service provider. The table is useful when troubleshooting.

6.5.5 E-mail setup

If you want to send diagnostics and statistics reports through an external Internet connection using e-mail you must set up a couple of parameters.

Figure 6-22: Web interface: SETTINGS, E-mail setup

To configure the e-mail setup, do as follows:

1. Go to **SETTINGS > E-mail setup**.
2. Enter the data for Outgoing mail server (SMTP), SMTP port number, SMTP 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 6-25.

3. Select the SMTP type, for secure e-mail select SMTPS or STARTTLS.
 - SMTPS: SMPT Secure usually uses port 465, SMTPS is 'deprecated' data between client and server, encrypted with SSL or TLS, this is decided beforehand.
 - STARTTLS can upgrade the connection to SSL or TLS, it is not dependent on a port as SMTPS. SSL and TLS connections are encrypted, just as HTTPS, the data of the connection cannot be (easily) read.
4. Select SMTP authentication, if needed. Credentials means that a user name and password are needed to be allowed to use the given mail server (SMTP).

6.5.6 Setup of reports, syslog and SNMP traps

The antenna can send the following reports and messages:

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

The screenshot shows the 'Reporting' configuration page in a web interface. The page has a blue header with 'RX : [signal strength]' and 'Tracking'. A left sidebar contains a navigation menu with 'Reporting' selected. The main content area is titled 'REPORTING' and includes a red warning: 'Please configure e-mail first.' Below this are four sections: 'Diagnostics report', 'Statistics report', 'Remote syslog', and 'SNMP traps'. Each section contains input fields and buttons for configuration.

Figure 6-23: Web interface: SETTINGS, Reporting

Diagnostics report

The antenna 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**. See *To download diagnostics and statistics reports* on page 8-3.

Statistics report

SAILOR 600 VSAT Ka can send a statistics report at fixed intervals through an external Internet connection. This report contains historical information from the SAILOR 600 VSAT Ka up to 1 month. It contains statistics data for the selected intervals. The report is sent as a zipped attachment to an e-mail address. 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 6-28.
2. Go to **SETTINGS > Reporting**.
3. In the section **STATISTICS 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).
 - To send the report at weekly intervals click **Send Weekly**, or at monthly intervals click **Send Monthly**.
4. Click **Apply**.

The following parameters are recorded in the statistics report. Some of the parameters may not be relevant for the antenna described in this manual.

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 600 VSAT Ka

Table 6-1 1: 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.
NAV.Speed (m/s)	Speed over ground
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 6-24: <i>Statistics — how to read data for a range.</i>
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 6-24: <i>Statistics — how to read data for a range.</i>
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 LO frequency of modem for this record. Tx LO frequency of modem for this record.
Tracking.rf_freq (GHz) Tracking.type	Tracking RF frequency for this record. Narrow filter, DVB-S2 decoder and modem RSSI and GSC.
Sat.long (degree)	Longitude position of the satellite.
Carrier.rf.rx (GHz) Carrier.rf.tx (GHz)	Rx frequency of carrier for this record. Tx frequency of carrier for this record.
Pol.rx Pol.tx	Current Rx and Tx 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 modem, in percent of the sampling interval.
Blocking (%)	Ship in blocking zone, in percent of the sampling interval.
DualAntenna.mode DualAntenna.active DualAntenna.logon_remote	Shows the current mode, the time active and remote logon.

Table 6-12: Parameters recorded in a statistics report

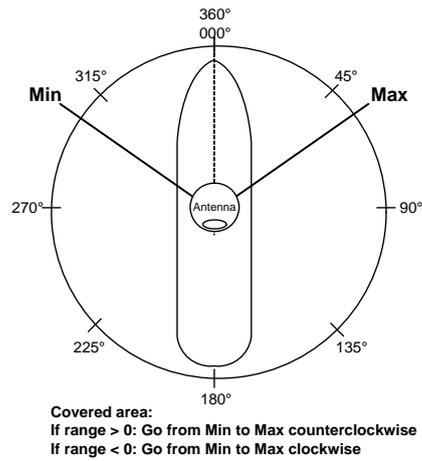


Figure 6-24: Statistics — how to read data for a range

To import the statistics report into spreadsheet applications, e.g. Microsoft Excel, do as follows:

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.
3. On the tab Data click the tab Import from text. import the unzipped text file and follow the instructions in the wizard.
4. When asked about the delimiter, select 'comma'.

The following figure shows an example of a statistics report.

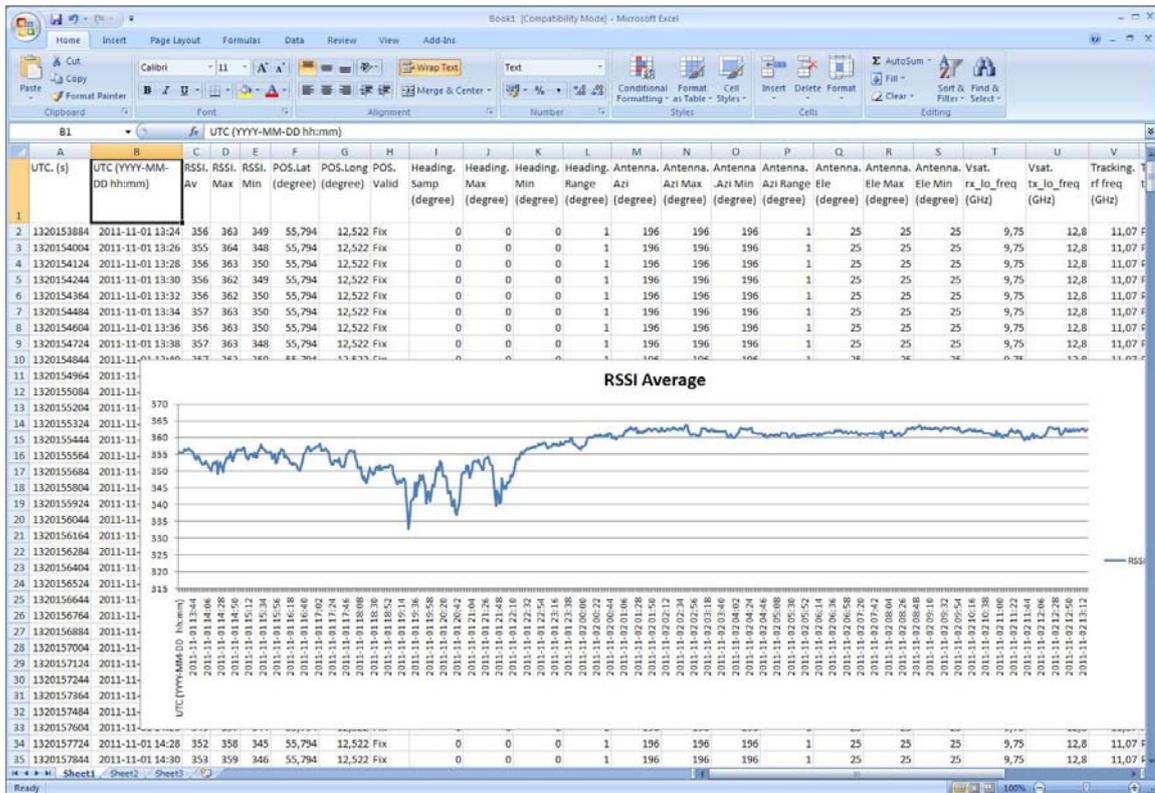


Figure 6-25: Statistics report (example, MS Excel 2007)

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). 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**.

6.5.7 Administration

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

- To change the password and log off
- To set up user permissions for guest login
- To import and export a system configuration

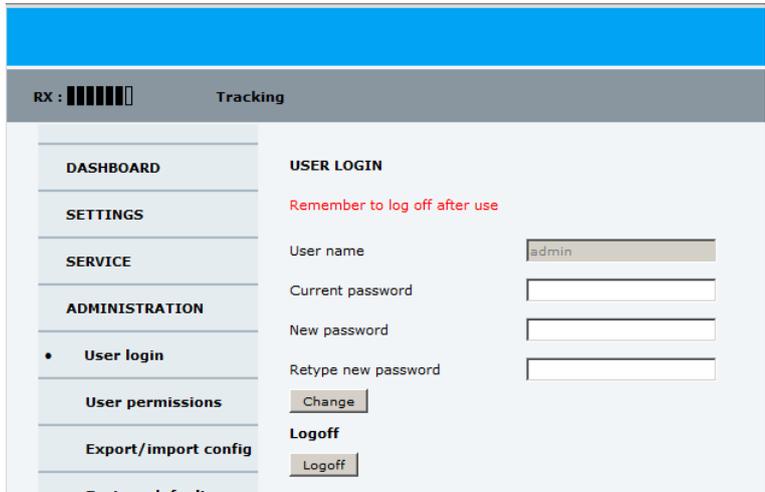


Figure 6-26: Web interface: Administration

To change the password and log off

On the page **ADMINISTRATION** and **User login** you can change the password for the currently logged in user (admin or guest) or you can log off.

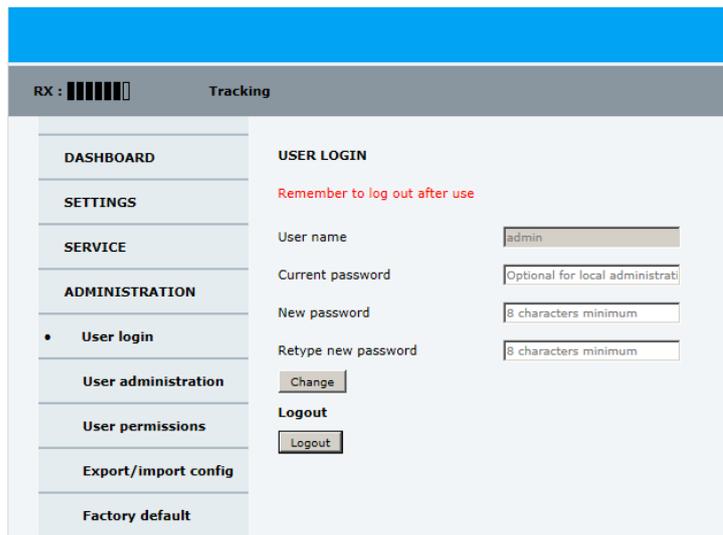


Figure 6-27: Web interface: ADMINISTRATION, change administrator logon and password

To change the current password, do as follows:

1. Enter the current password.
2. Enter the new password (minimum 8 characters) and retype it on the next line.
3. Click **Change**. At the next logon the new password is required.
4. Click **Logoff** to log off the system. If you have not entered anything for 30 minutes, you are logged off automatically.

If you have forgotten the administrator password, do as follows:¹

1. On the ACU keypad, push and hold the left arrow key for 5 seconds.
2. Wait for the very short display of **Local administration**, followed by the event text: **0807F-0 WARNING Local administration enabled**. This will give you temporary administrator access **for 1 hour or until next restart**.

3. Open your browser and access the web interface.
4. Enter user name: **admin** (no password is required). The **DASHBOARD** is displayed.

Note

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

5. To enter or change the password select **ADMINISTRATION > User login** and locate the section **Change Login**.
6. If needed, type in the new password (minimum 8 characters) and click **Change**. No old password is required.

After the 1 hour window or a restart the administrator password is required.

To set up user permissions for guest login

You can manage user access to certain functions of the SAILOR 600 VSAT Ka. You can allow or deny users that are not administrators (to access certain functions and make these pages read-only). This is useful to protect the system against unintended changes or tampering of the system.

Item	Description
Change network	Change IP configuration of the LAN connectors of the ACU. For further information see <i>To configure the LAN network</i> on page 6-25.
Change e-mail settings	Change e-mail addresses for sending reports. For further information see <i>E-mail setup</i> on page 6-28.
Modify antenna data	Only used during service and maintenance when you exchange modules in the antenna.

Table 6-13: Selected items in the list with user permissions

1. If you have an earlier software version than 1.60, the default admin password is 1234. If you have forgotten the password, contact your service partner for a reset code.

Item	Description
Control modem	Allow to reset or power cycle the modem.
Require guest login	When set to Yes , a login page is displayed and the user name guest and the password guest must be entered before the Dashboard can be displayed.

Table 6-13: Selected items in the list with user permissions

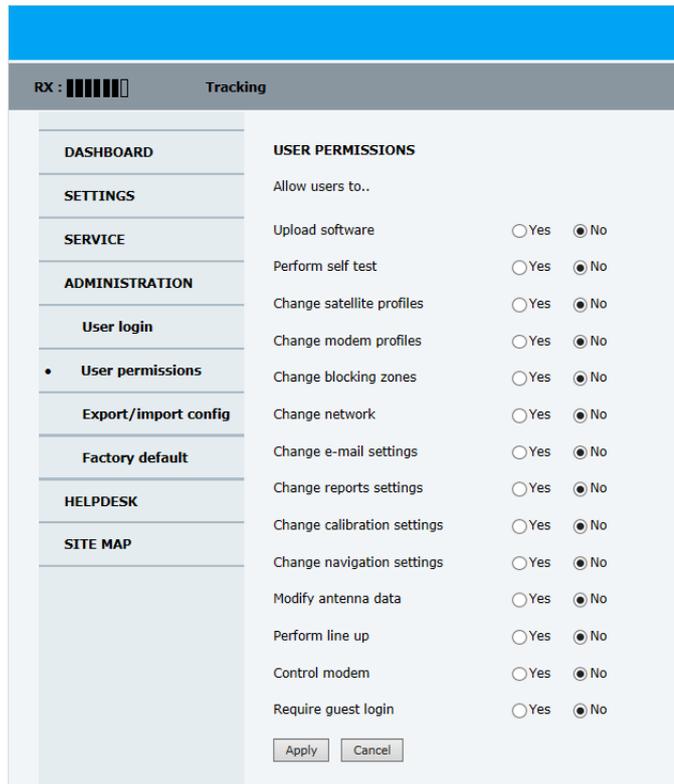


Figure 6-28: Web interface: ADMINISTRATION, User permissions

Important

Study this screen thoroughly and decide which areas of the SAILOR 600 VSAT Ka system non-administrator users can access.

To set up the user permissions for guest users, 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.

Most of the items in the list are self-explaining, the others are explained in the following table.

3. Click **Apply**.

A message at the top of the page saying that the page requires administrator rights informs the guest user that access is denied.

To import and export a system configuration

If you need to reuse a configuration in another SAILOR 600 VSAT Ka system, you can save the current configuration to a configuration file. This file can then be loaded into another SAILOR 600 VSAT Ka or be used as backup. The configuration file contains all the settings you have entered during system setup: satellite profiles, modem profiles, LAN setup, blocking zones, etc.

Note | The antennas involved must have the same software version.

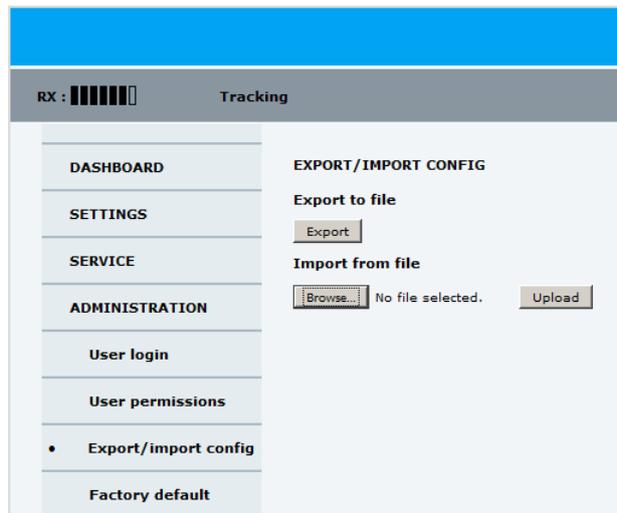


Figure 6-29: Web interface: ADMINISTRATION, Export/import configuration

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.

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
3. Click the button **Open**.
4. Click the button **Upload**.

To clone a system configuration, do as follows:

1. Reset to factory default, see *Reset to factory default* on page 8-6.
2. Import a configuration from file, see section above.

6.6 Keypad and menus of the ACU

6.6.1 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.

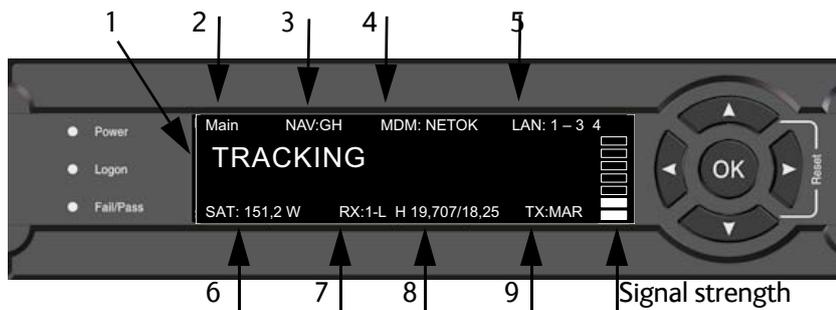


Figure 6-30: Display and keypad of the ACU (example)

- Current status of the SAILOR 600 VSAT Ka:
 - NOT READY** (waiting for input from GNSS, e.g. GPS)
 - ANTENNA INITIALIZING**
 - ANTENNA SW UPLOAD**
 - ANTENNA POST ERROR**
 - XIM DATA ERROR** (PCM or VIM were serviced and may need further configuration)
 - UNRECOVERABLE XIM DATA ERROR**
 - SYSTEM UPGRADE**
 - ANTENNA POST PENDING**
 - ANTENNA POST**
 - SAFE MODE** (error, followed by an error description)
 - 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)
 - LINE UP** (line up is activated)
 - AZIMUTH CALIBRATION**
 - TX CABLE CALIBRATION**
 - BUC 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 in a no TX zone; TX is off)
- Current menu, see *The menu tree* on page 6-39.

3. **NAV:** Navigational information
First letter: **G** (Valid GPS signal received from the GPS module) or **g** (No valid GPS fix)
Second letter: **H** (Valid ship heading data received from the ship's gyro) or **h** (No valid heading data).
4. **MDM:** Current status of the modem: **TEST, ERROR, READY, INIT, RXOK, ACQ, NETOK, RESET, OFF**
5. **LAN:** LAN connectors used, **1, 2, 3, 4, –**.
6. **SAT:** Longitude, satellite position of the currently active satellite profile.
7. **RX:**
1 (Rx1 Lock, - or **1**),
- (Rx2 Lock, - or **2**),
L (RX polarisation of currently active satellite profile: **H** (horizontal), **V** (vertical), **L** (left-hand) **R** (right-hand)).
8. RF tracking frequency in GHz and LNB LO Frequency.
9. **TX:** <Extern mute> <Modem TX> <ADU TX> <TX pol>
Read the TX status as follows: Upper case: Ok, lower case: Not ok, -: unknown
<Extern mute> = [U,u]
<Modem TX> = [m,M]
<ADU TX> = [a,A]
<Tx pol>=[-,X,C,L,R]

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

6.6.2 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**.



6.6.3 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.

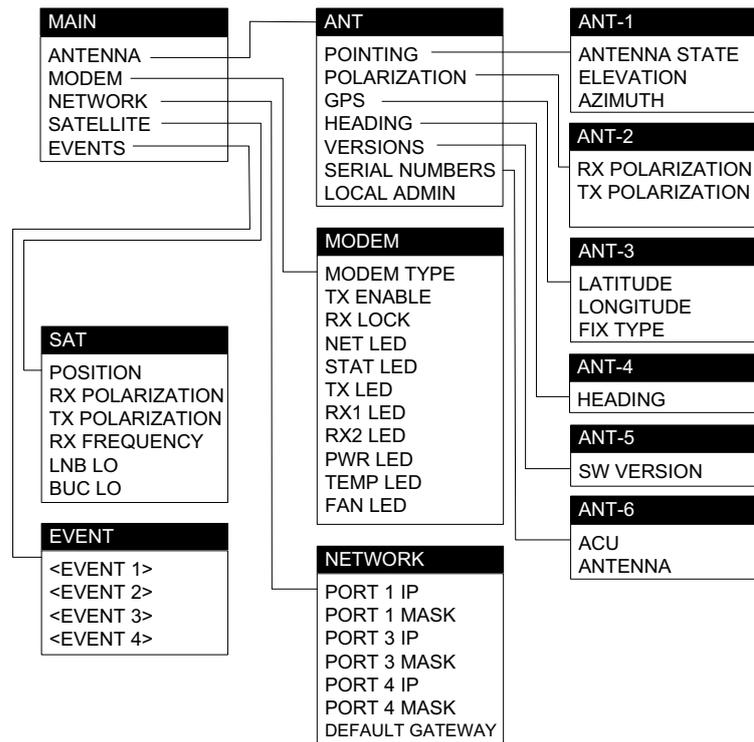


Figure 6-31: Antenna Control Unit, menu tree

Top-level menu

Top-level menu	Description
MAIN	<p>View with current status of the SAILOR 600 VSAT Ka. Example when logged on to the satellite:</p>  <p>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.</p>
ANTENNA	Current ADU parameters, position, software version and serial numbers of the ADU and ACU.
MODEM	Selected modem type and setup, including signal level.
NETWORK	IP addresses and netmasks of the LAN connectors of the ACU and the management mask.

Table 6-14: Top-level menus of the ACU

Top-level menu	Description
SATELLITE	Current satellite information. This information is selected using the web interface.
EVENTS	System events. Active events are shown as: X ACTIVE EVENTS in the MAIN display. Press OK to update the list.

Table 6-14: 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: LHC or RHC. TX POLARIZATION: X-POL or Co-POL.
GPS	LATITUDE: current latitude, read from GPS module. LONGITUDE: current longitude, read from GPS module. FIX TYPE: 2D or 3D or NONE
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
LOCAL ADMIN	Shows that the ACU is set into local administration mode. Only user name admin is needed and the ACU is in admin mode for 1 hour.

Table 6-15: ANTENNA menu of the ACU

MODEM menu	Description
MODEM TYPE	Connected modem type
TX ENABLE	On or off, information delivered by the connected modem
RX LOCK	On or off, information delivered by the connected modem
NET LED	LED indication from modem. Steady or flashing green/amber/red, OFF
STAT LED	
TX LED	
RX1 LED	
RX2 LED	
PWR LED	
TEMP LED	
FAN LED	

Table 6-16: MODEM menu of the ACU

NETWORK menu	Description
PORT 1 IP	Current IP address for LAN 1
MASK 1	Current netmask for LAN 1
PORT 3 IP	(LAN 3) Current IP address of the SAILOR 600 VSAT Ka web interface (default: http://192.168.0.1)
MASK 3	(LAN 3) Current netmask of the SAILOR 600 VSAT Ka 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 6-17: NETWORK menu of the ACU

SATELLITE menu	Description
POSITION	Position of the current satellite
RX POLARISATION	LHC or RHC
TX POLARIZATION	X-POL or CO-POL
RX FREQUENCY	Ka band receiving frequency of the active satellite, auto-selected by modem
LNB LO	18.25 GHz, system hardware.
BUC LO	28.05 GHz, system hardware
LNB LO HIGH	Current LNB Local Oscillator frequency, high band (GHz), selected in the satellite profile
LNB LO LOW	Current LNB Local Oscillator frequency, low band (GHz), selected in the satellite profile

Table 6-18: SATELLITE menu of the ACU

EVENT menu	Description
<EVENT>	<p>In this menu all active events are listed. Use ▼ and ▲ to go through the active events.</p> <p>Events can be of the type WARNING or ERROR.</p> <p>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.</p> <p>A > means the event text is longer than the display. Press > to see the remaining text.</p>

Table 6-19: 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.

6.6.4 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.

6.6.5 Power-cycle of the ACU and ADU

To power cycle the ACU and ADU do the following:

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



Figure 6-32: Reset the system

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

6.7 SNMP support

The SAILOR 600 VSAT Ka 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 600 VSAT Ka 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 600 VSAT Ka MIB file.

The MIB entries are grouped in the following sections:

- 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.

To get the MIB file, do as follows:

1. Select **HELPDESK**.
2. Click the link **Download MIB file**.
3. Save the file on your computer.

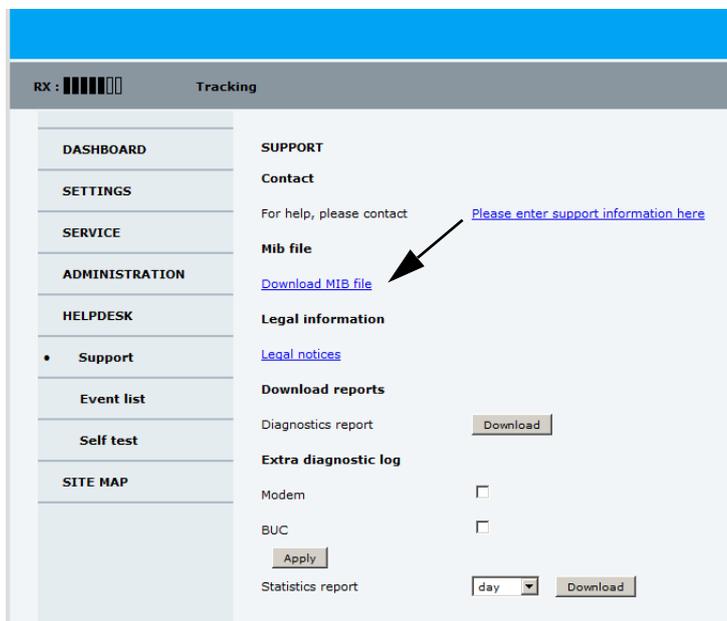


Figure 6-33: Download of MIB file

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 and modem, 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 <i>Obstructions (ADU shadowing)</i> on page 3-4.	
2.	Make sure to maintain the vertical orientation of the ADU center line.	See <i>To install the ADU</i> on page 3-19.	
3.	Check that the ADU is installed where vibrations are limited to a minimum.	See <i>To install the ADU</i> on page 3-19.	
4.	Check that you programmed the blocking zones correctly.	See <i>Blocking zones with azimuth and elevation</i> on page 3-5 and <i>To set up blocking zones (RX and TX)</i> on page 6-23.	
5.	Make sure that the safety distance for radiation hazard of 30 metres is kept.	See <i>Safe access to the ADU (radiation hazard)</i> on page 3-6.	
6.	Check that the mounting height of the antenna is in accordance with the ship's min. roll period.	See <i>Ship motion and offset from the ship's motion centre</i> on page 3-6.	
7.	Make sure that the requirements for mast foundation and height, including flatness, gusset plates and distance from welding seams are met.	See <i>Mast foundation and height</i> on page 3-8.	
8.	Make sure that the distances to radar, Inmarsat systems, GPS receivers and other transmitters are as required.	See <i>Interference from radar, GPS, L-band and other transmitters</i> on page 3-14.	
9.	Make sure that the drain tube is open and risk for water intrusion is at a minimum.	See <i>Condensation, water intrusion and deposits</i> on page 3-17.	
10.	Check that the ADU is grounded correctly, using the mounting bolts.	See <i>To ground the ADU</i> on page 3-22 and <i>Ground and RF protection</i> on page B-1.	

Table 7-1: Installation check list: Antenna

7.2 Installation check list: ACU and modem, 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 <i>To ground the ACU</i> on page 3-24 and <i>Ground and RF protection</i> on page B-1.	
2.	Make sure you strain relieved the cables at the ACU.	See <i>To install the ACU</i> on page 3-24.	
3.	Make sure that the modem is mounted close to the ACU (preferably next to it).	Visual inspections.	
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. See section <i>Installation procedure</i> on page 3-19.	
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 modem Rx in using the included 1 m F-F 75 ohm cable.	Visual inspection of the connector panel of the ACU and the modem. See the figure <i>To connect the ADU, ACU and modem</i> on page 3-25.	
7.	Check that the ACU's Tx In is connected to the modem Tx out using the included 1 m F-F 75 ohm cable.	Visual inspection of the connector panel of the ACU and the modem. See the figure <i>To connect the ADU, ACU and modem</i> on page 3-25.	
8.	Check that the ACU's RS-232 is connected to the modem using the included serial cable.	Visual inspection of the connector panel of the ACU and the modem. See the figure <i>To connect the ADU, ACU and modem</i> on page 3-25.	
9.	Check that the ACU's RS-232 is connected to the modem's using the included serial cable.	Visual inspection of the connector panel of the ACU and the modem. See the figure <i>To connect the ADU, ACU and modem</i> on page 3-25.	
10.	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. See Table 4-5 on page 4-4.	
11.	ACU with DC power: Measure that the power for the ACU has the correct polarity in the power connector, before connecting it to the ACU power input. (V_{in+} : left, V_{in-} : right). ACU with AC power: Check that the power cable is plugged into the ACU and that AC power is available.	Use a volt meter. See Table 4-2: <i>DC Input plug, outline and pin assignment</i> on page 4-2. Visual inspection.	
12.	Check that the AC power cable is plugged into the modem. Check that AC power is available.	Visual inspection.	

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

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 must show: TRACKING . Check in the web interface: DASHBOARD : System status: Tracking (see <i>Connecting to the web interface</i> on page 6-1).	
2.	Check that the modem is in lock and BUC TX on.	In the web interface check: DASHBOARD, RX locked status must show Locked . The ACU display must show MDM:NETOK	
3.	Connect a user PC LAN (not the service PC) to the Internet LAN connector 2 of the ACU.	The modem needs no separate setup. See <i>To connect the ADU, ACU and modem</i> on page 3-25.	
4.	Open a command line window and type: ping 4.2.2.2.	Check that you get a response.	
5.	Open a web browser and browse to e.g. www.google.com.	Check that the web page is downloaded.	
6.	If step 4 is successful and step 5 is not then it seems that the DNS is not configured correctly.	See the page SETTINGS > Network and check the DNS setup (see <i>To configure the LAN network</i> on page 6-25).	

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

Service

This chapter has the following sections:

- *To get support*
- *Software update*
- *Status signalling with LEDs and status messages*
- *Removal and replacement of the ACU*
- *Removal and replacement of ADU modules*
 - *Replacing the GNSS module*
 - *Replacing the azimuth motor*
 - *Replacing the elevation motor*
 - *Replacing the rotary joint*
 - *Replacing the X-elevation motor*
 - *Replacing the BUC*
 - *Replacing the LNB*
 - *Replacing the azimuth drive belt*
 - *Replacing the Field Vector Drive Module (FDM)*
 - *Replacing the Inertial Sensor Module ISM2*
 - *Replacing the Pedestal Control Module (PCM)*
 - *Replacing the VIM2/3*
 - *Replacing the Azimuth Zero Reference Module (ZRM)*
 - *Replacing the BCM*
- *Troubleshooting basics*
- *To return units for repair*

8.1 To get support

If this manual does not provide the remedies to solve your problem, contact your service provider. If you need help **with ACU or ADU related issues** call your service provider.

The section has the following subsections:

- *Options for support*
- *Reset to factory default*
- *Reset to factory default - GMU*
- *Line up procedure*

8.1.1 Options for support

In this section you can enter the support contact for this installation, download the MIB file and reports.

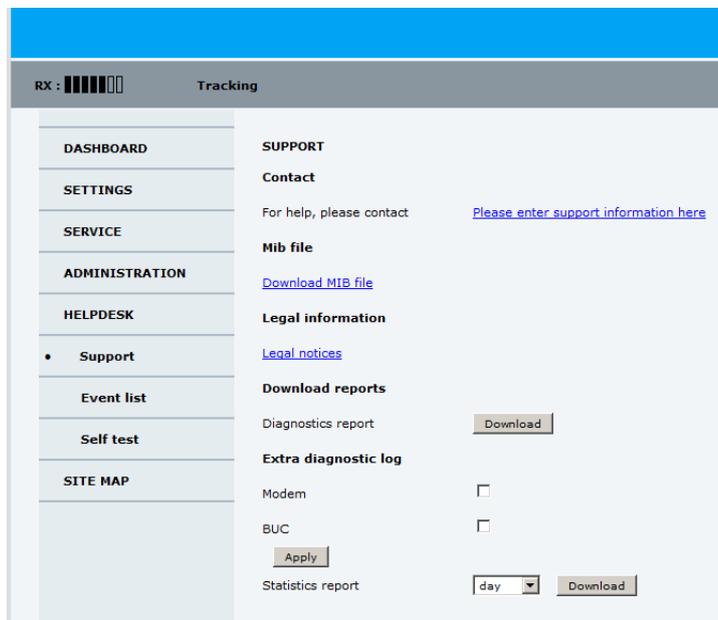


Figure 8-1: Web interface: HELPDESK

To enter contact information, download the MIB file and view legal notices

1. Select **HELPDESK** from the left navigation pane.
2. Click the link to enter support contact information and click **Apply**.
3. To download the MIB file click the link.
4. Click the link **Legal notices** to see the licence text for the source code of the parts of the SAILOR 600 VSAT Ka software that falls under free and open source software.

To download diagnostics 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. You can add diagnostic log information from the modem and the BUC.

The main sections of the diagnostics report are:

- Software
- System
- Hardware
- Identifiers
- Setup - System data
- Calibration - Calibration Data
- Blocking zones - Blocking zone configuration
- Network - LAN Configuration
- Modems
- 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
- Statistics - including navigation data and logging of temperatures for the ACU and ADU. The temperature is measured every 5 minutes within an hour and is then averaged and incidents are logged in the diagnostic file.
- System log

You can download a statistics report. This report contains information relevant for the service personnel during troubleshooting. You can also configure the system to send statistics reports at defined time intervals. For further details on this see *Diagnostics report* on page 6-29.

To generate a report do as follows:

1. Select **HELPDESK** from the left navigation pane.
2. Select **Modem** and/or **BUC** to include modem and BUC information in the diagnostics report.
3. Click **Apply**.
4. Click **Download** next to the text **Diagnostics report**.
5. Save the diagnostics report to your computer.
6. Next to the text **Statistics report** select the interval for the statistics report.

7. Click **Download** next to the text **Statistics report**.
8. Save the statistics report to your computer.

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 ADU events* on page C-2 and *List of ACU events* on page C-8. You can clear the event history in the diagnostic report, this will not change the configuration.

To clear the event history do as follows:

1. Click **Factory default** in the **ADMINISTRATION** page.
2. Click the button **Clear event history**.



Figure 8-2: Web interface: Clear event history

Self test

You can start a self test of the SAILOR 600 VSAT Ka ADU and ACU.

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

Important

Warning! The SAILOR 600 VSAT Ka will reboot to perform the self test. Rebooting the ACU will terminate all existing connections.

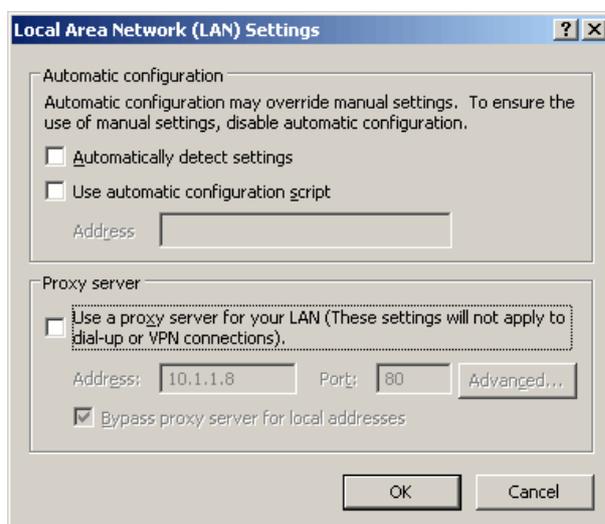
Proxy server settings in your browser

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 labelled **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.

8.1.2 Reset to factory default

You can reset the SAILOR 600 VSAT Ka ADU and ACU to factory default.

Important

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

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

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

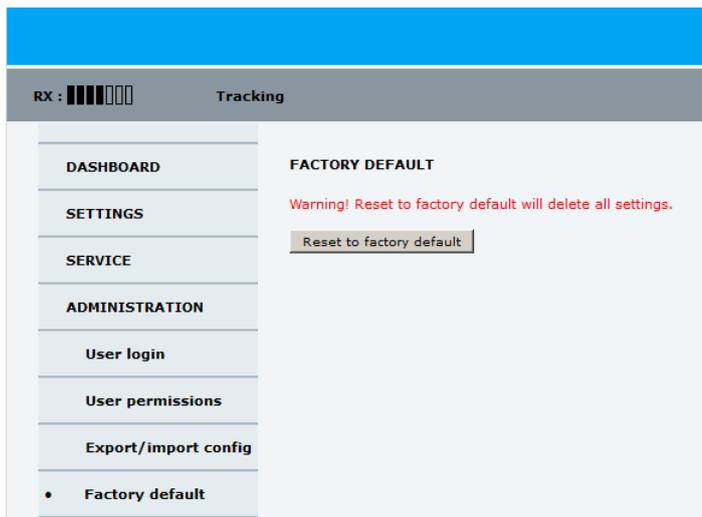


Figure 8-3: Web interface: ADMINISTRATION > Factory default, ADU and ACU

To reset to factory default settings, do as follows:

1. From the left navigation pane, select **ADMINISTRATION > Factory default**.
2. Click **Reset to factory default**.

Note

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

3. Click **Reset Modem**.

8.1.3 Line up procedure

The SAILOR 600 VSAT Ka has a line-up utility for testing the modem connection.

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

The SAILOR 600 VSAT Ka has been tested at the factory and online on a live satellite link. You can also make a line up and adjust the azimuth and elevation manually. 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 modem profile and a satellite profile using the previously created modem profile (See *Service profile for calibration* on page 6-11).
3. Go to the page **SERVICE > Line up**.
4. Wait until the text next to **Status** shows: **Ready for activation**.

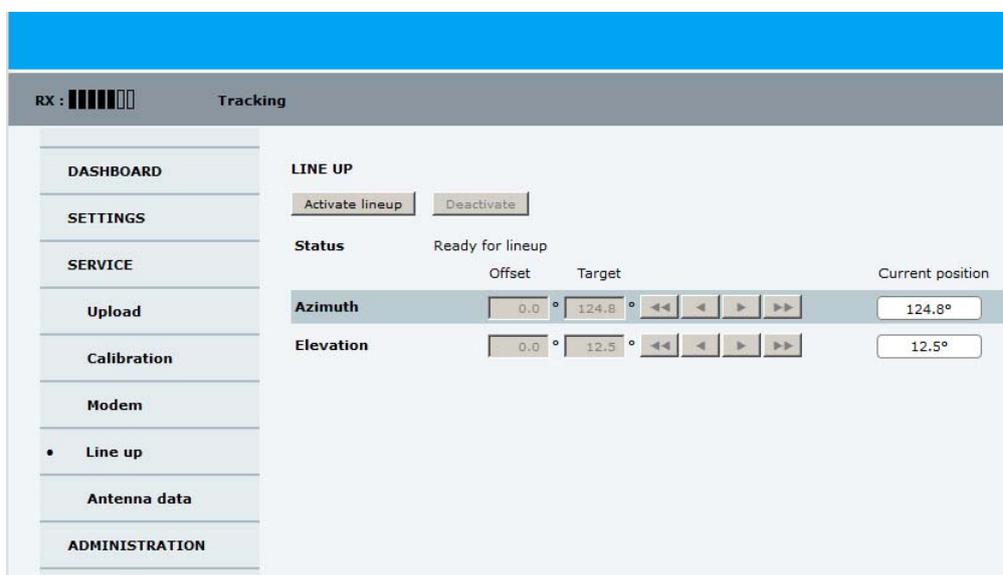


Figure 8-4: Web interface: SERVICE, Line up: Ready for activation

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

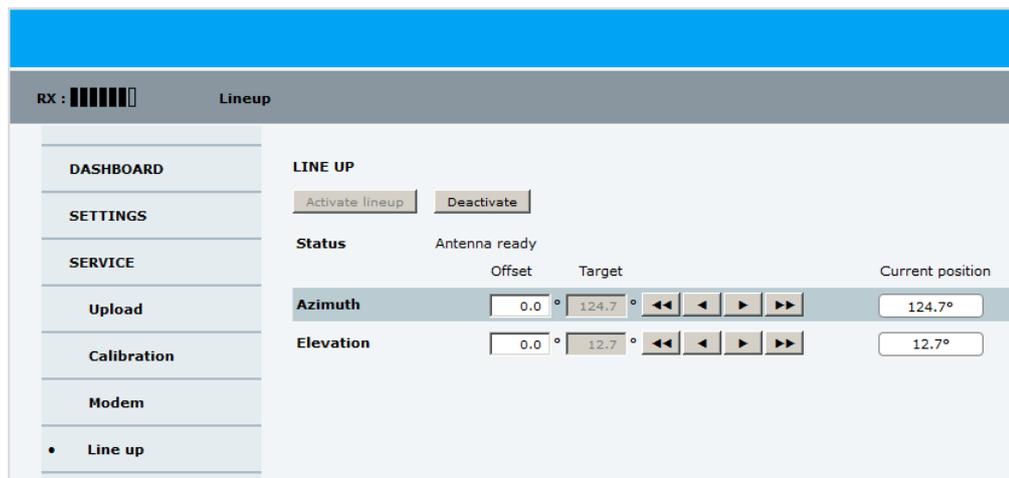


Figure 8-5: Web interface: SERVICE, Line up: Antenna ready

6. Set the values **Azimuth** and **Elevation** as advised by the service provider.
7. Follow the instructions from the service provider to make a P1 dB compression test (modem).
8. Click the button **Deactivate** to leave the line up procedure and to go back in tracking mode.

8.2 Software update

8.2.1 Prerequisites

The following items are required to make a software update:

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

8.2.2 Software update (ADU, ACU)

Note Software update should only be done by qualified service personnel.

The upload procedure takes a couple of minutes. When done, the ACU automatically restarts with the new software version. 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. This is shown in the ACU display as **ADU SW UPLOAD**.

To make a software update, do as follows:

1. Power up the SAILOR 600 VSAT Ka system, i.e. switch on the ACU. Wait until the ACU has finished initializing.
2. Connect a PC to LAN interface 3 (Service port, standard Ethernet) of the ACU or to the front LAN connector of the ACU.

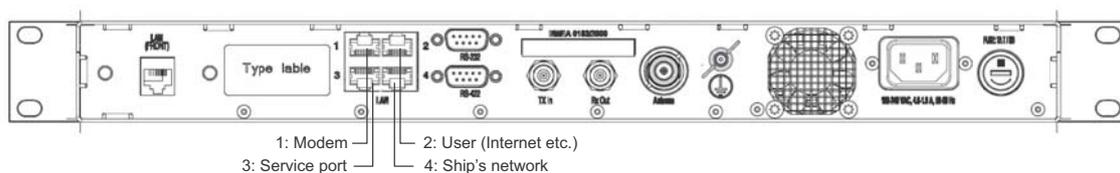


Figure 8-6: LAN 3 connector used for configuration of the SAILOR 600 VSAT Ka (AC powered)

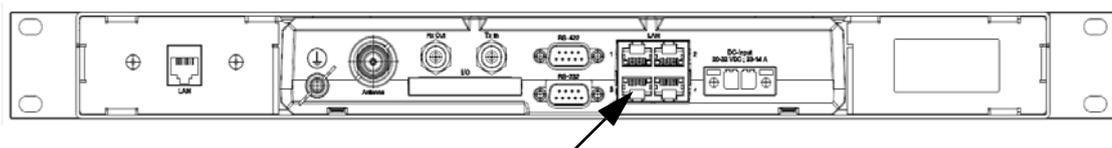


Figure 8-7: LAN 3 connector used for configuring the SAILOR 600 VSAT Ka (DC powered)

If you want to use another LAN port to access the web interface you must configure it according to your network requirements. See *To configure the LAN network* on page 6-25 for more information.

3. Open your Internet browser and enter the IP address of the ACU. The default IP address is <http://192.168.0.1>.

4. Type in the user name **admin** and the administrator password to access the **Dashboard**.
5. The web interface shows the **DASHBOARD** page.
6. Click **SERVICE** in the navigation pane. The **UPLOAD** page is displayed.

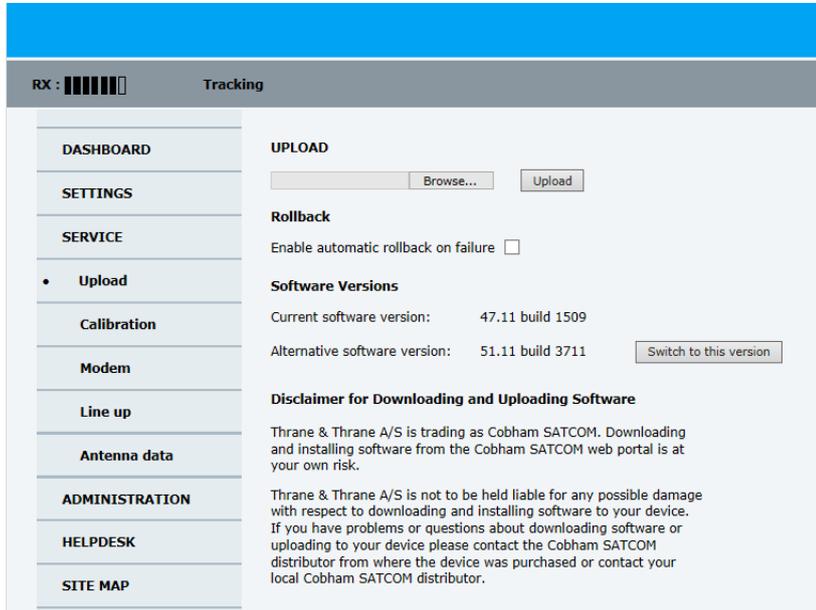


Figure 8-8: Software update with the web interface

7. Click **Browse...** and locate the new software file.
8. Click **Upload**.

Important

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

9. You can select **Enable automatic rollback on failure**, then the system returns to the previous software if an error occurs during the POST.
10. 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 8-9. 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.

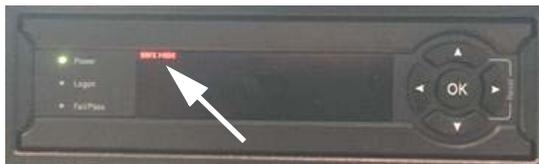


Figure 8-9: Recovery procedure after failed software upload

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).

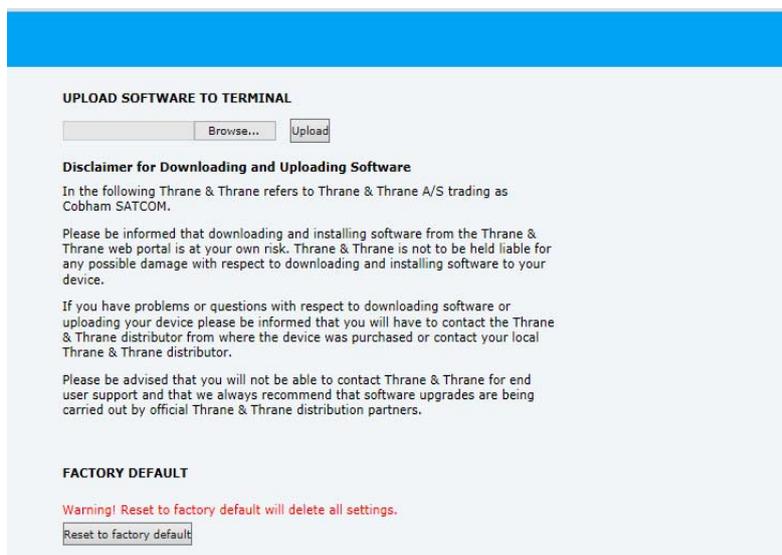


Figure 8-10: Upload software to terminal (Safe mode)

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.

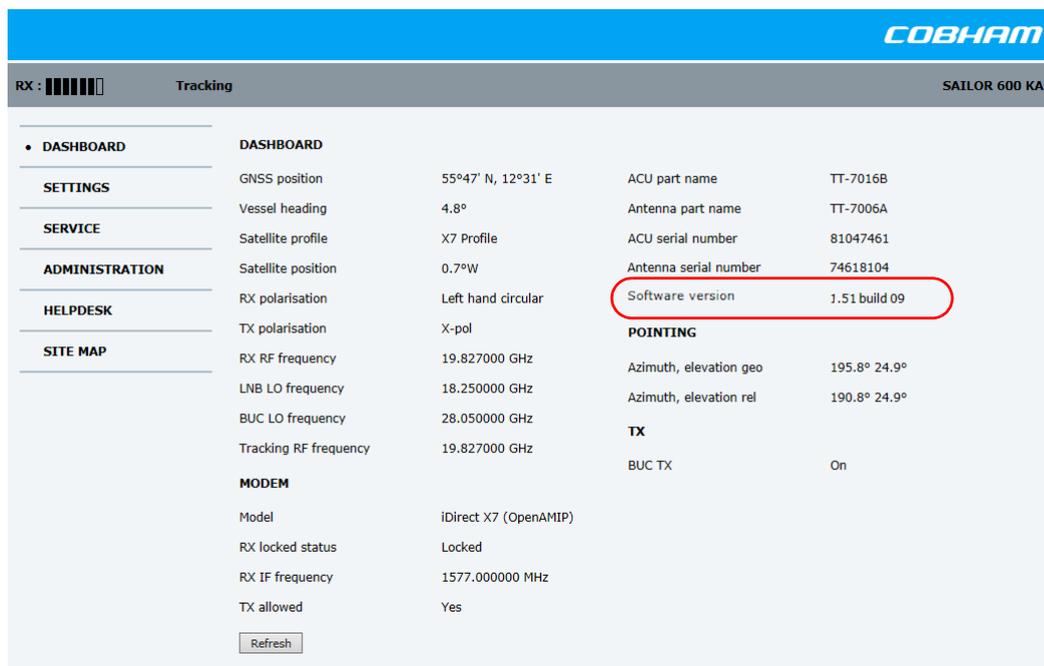
Important

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

To verify the software update (ADU and ACU)

The software version can be viewed in the **DASHBOARD** window of the web interface. After completing the software update procedure, the ACU will perform a POST (Power On Self Test). When the POST has finished, the green Pass/Fail LED on the front of the ACU must become steadily green.

1. Verify that the Pass/Fail LED is not red nor flashing orange once every 2 seconds.
2. Wait until the Pass/Fail LED is green.
3. Verify that the software update has been completed successfully. You find the software version number in the **DASHBOARD** window of the web interface.



The screenshot shows the COBHAM web interface for a Tracking station (SAILOR 600 KA). The interface is divided into several sections: DASHBOARD, SETTINGS, SERVICE, ADMINISTRATION, HELPDESK, and SITE MAP. The DASHBOARD section displays various parameters for the ACU, including GNSS position, Vessel heading, Satellite profile, Satellite position, RX polarisation, TX polarisation, RX RF frequency, LNB LO frequency, BUC LO frequency, Tracking RF frequency, ACU part name, Antenna part name, ACU serial number, Antenna serial number, Software version (highlighted in a red circle), POINTING (Azimuth, elevation geo and rel), TX (BUC TX), and MODEM (Model, RX locked status, RX IF frequency, TX allowed). A Refresh button is located at the bottom of the DASHBOARD section.

Section	Parameter	Value
DASHBOARD	GNSS position	55°47' N, 12°31' E
	Vessel heading	4.8°
	Satellite profile	X7 Profile
	Satellite position	0.7°W
	RX polarisation	Left hand circular
	TX polarisation	X-pol
	RX RF frequency	19.827000 GHz
	LNB LO frequency	18.250000 GHz
	BUC LO frequency	28.050000 GHz
	Tracking RF frequency	19.827000 GHz
ACU	ACU part name	TT-7016B
	Antenna part name	TT-7006A
	ACU serial number	81047461
Antenna	Antenna serial number	74618104
	Software version	1.51 build 09
POINTING	Azimuth, elevation geo	195.8° 24.9°
	Azimuth, elevation rel	190.8° 24.9°
TX	BUC TX	On
MODEM	Model	iDirect X7 (OpenAMIP)
	RX locked status	Locked
	RX IF frequency	1577.000000 MHz
	TX allowed	Yes

Figure 8-11: 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 installation and service. 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 8-4.

Means of signalling

The SAILOR 600 VSAT Ka provides various methods for signalling the system status. **LEDs** on the front panel of the ACU are used to signal:

- Power on/off
- Logon
- 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 C-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 software
	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 8-16.

8.3.2 LEDs in the ACU

The ACU has 3 LEDs: on the front panel: Power, Logon and Fail/Pass LED.

LED	Behaviour	Description
Power	Steady green	Power supply OK
	Steady red	Power supply failure
	Off	No power
Logon	Flashing green	Current status is displayed: <ul style="list-style-type: none"> • 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, MODEM).
	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

8.3.3 LEDs of the modem

The modem does not have any LEDs on the front plate. You can check the status of the modem in the display of the ACU, in the menu **Modem**. The current status is communicated by a text string. Each LED can have the status steady green, red or amber, or flashing green, red or amber.

- NET LED
- STAT LED
- TX LED
- RX1 LED
- RX2 LED
- PWR LED
- TEMP LED
- FAN LED

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.

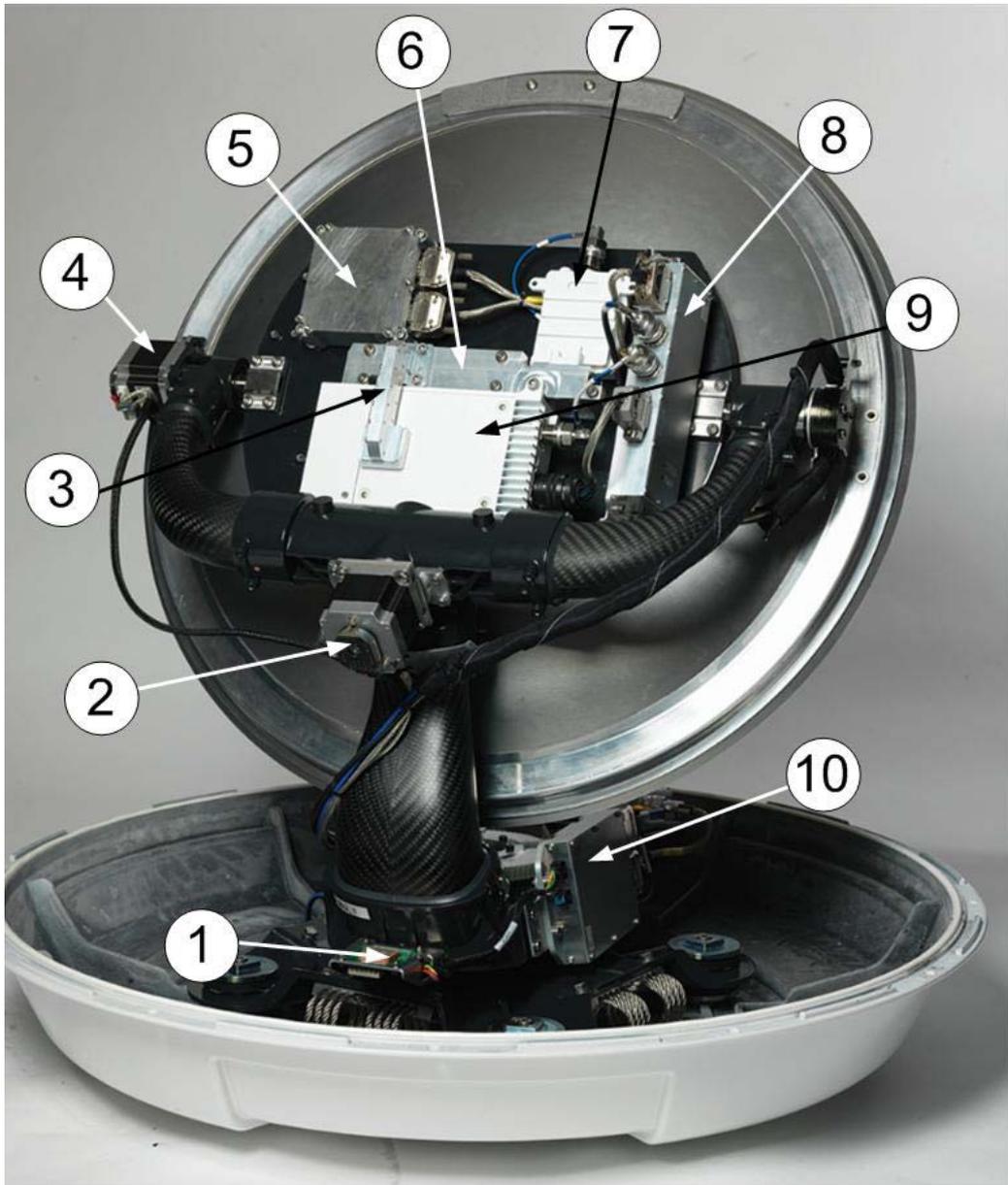


Figure 8-12: Above Deck Unit modules 1/2

1. GNSS module.
2. X-elevation motor and encoder.
3. Wave guide.
4. Elevation motor and encoder
5. Inertial Sensor Module (ISM2).
6. Polariser.

7. Low Noise Block downconverter (LNB),
8. BUC Control Module (BCM).
9. Block Up Converter (BUC).
10. Pedestal Control Module (PCM2).

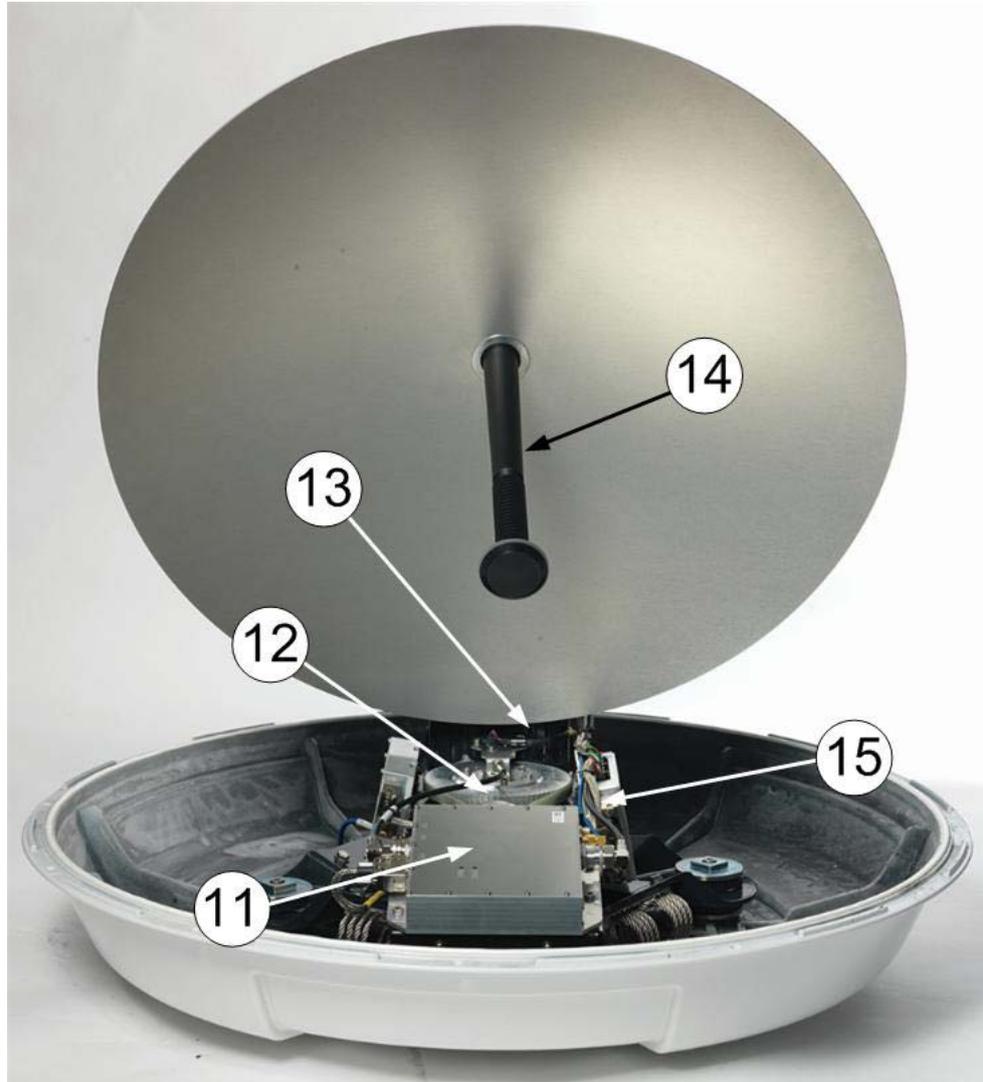


Figure 8-13: Above Deck Unit modules 2/2

11. VSAT Interface Module (VIM2).
12. Azimuth motor and encoder.
13. Zero Reference Module (ZRM).
14. Feed horn.
15. Field Vector Driver Module (FDM).

Before contacting your service partner check the LEDs on all modules (VIM, FDM, PCM, PMM and ISM). See *LEDs of the ADU modules* on page 8-13 and *LEDs in the ACU* on page 8-14.

8.5.1 Replacing the GNSS module

Brief summary

Field replacement instructions for replacing the GNSS module.

Tools needed

Tools needed	
Torque wrench (1.0 - 7.0 Nm)	
5mm Hex bit, M6. for the radome	
4mm Hex bit, M5. for the motor	

Table 8-3: Tools needed for replacing the GNSS module

Spare part

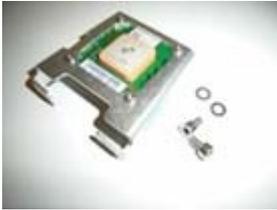
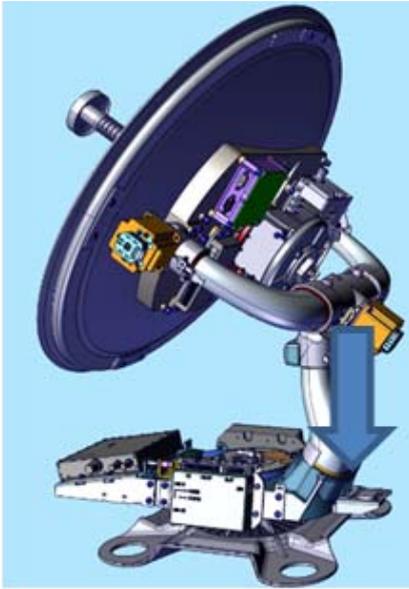
Spare part and location	
<p>S-62-149820. GNSS Module kit (GPS) F/SAILOR 600 & 60 GX</p> 	

Table 8-4: Spare part and location: GNSS module

Replacing the part

Task	
1. Power off the SAILOR VSAT (Switch Off the ACU) and power off the VSAT Modem.	

Table 8-5: Replacing the GNSS module

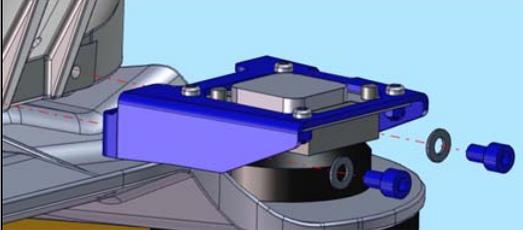
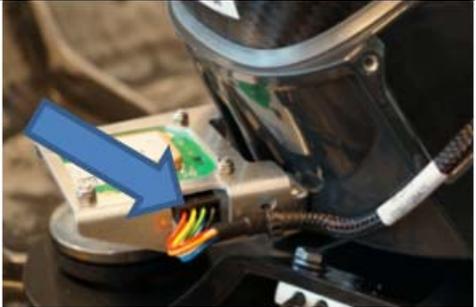
Task	
2. Remove the twelve M6 hex screws and washers. Lift off the radome. Be careful not to damage the feed horn.	
3. Disconnect the GNSS plug.	
4. Remove the two M5 Hex screws holding the GNSS module Note. the screws are not secured by "a stay".	
5. Install the new GNSS module and the two M5 Hex screws. 4.5 Nm.	
6. Reconnect the GNSS plug.	

Table 8-5: Replacing the GNSS module (Continued)

Task	
<p>7. Put the radome back on. Be careful not to damage the feed horn. Place the warning label above the drain tube. Install the twelve M6 screws and washers. 6 Nm</p>	

Table 8-5: Replacing the GNSS module (Continued)

Verify the initialization of the SAILOR VSAT ADU

Having replaced the defective component re-initialize the pedestal and verify its operation.

1. Power On the VSAT modem
2. Make an extended POST.
3. Verify that the VSAT POST is completed without any errors / warnings.
4. Verify that the system is online and full functionality is restored.

8.5.2 Replacing the azimuth motor

Brief summary

Field replacement instructions for replacing the azimuth motor.

Tools needed

Tools needed	
Torque wrench (1.0 - 5.0 Nm)	
5mm Hex bit, M6. for the radome	
4mm Hex bit, M5. for the motor	
4mm Hex key M5. Angled. For belt tension	
Optibelt frequency measuring device	

Table 8-6: Tools needed for replacing the azimuth motor

Spare part

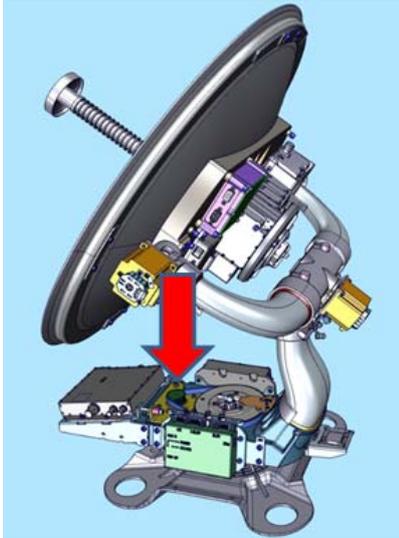
Spare part and location	
<p>S-62-149822 Azimuth Motor Assembly F/SAILOR 600 & 60 GX</p> 	

Table 8-7: Spare part and location: Azimuth motor

Replacing the part

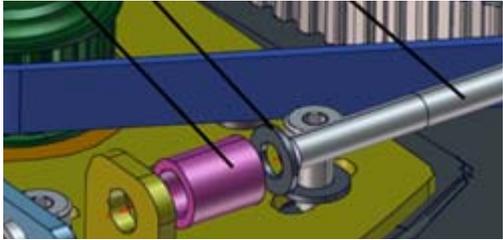
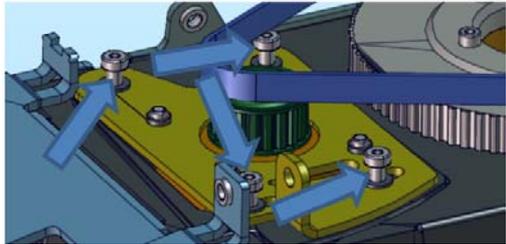
Task	
<p>1. Power off the SAILOR VSAT (Switch Off the ACU) and power off the VSAT Modem.</p>	
<p>2. Remove the twelve M6 hex screws and washers. Lift off the radome. Be careful not to damage the feed horn.</p>	
<p>3. Remove the belt tension, spring, and washer bolt by turning it counterclockwise.</p>	
<p>4. Remove the four M5 screws holding the azimuth motor.</p>	

Table 8-8: Replacing the azimuth motor

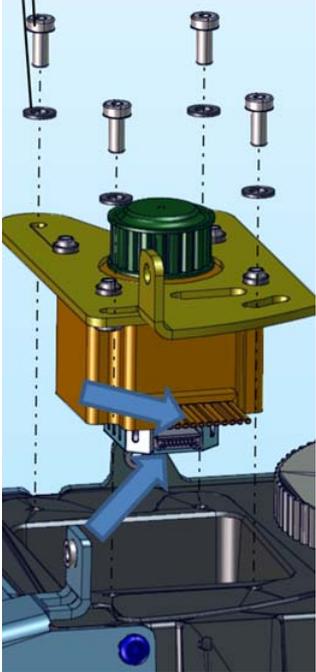
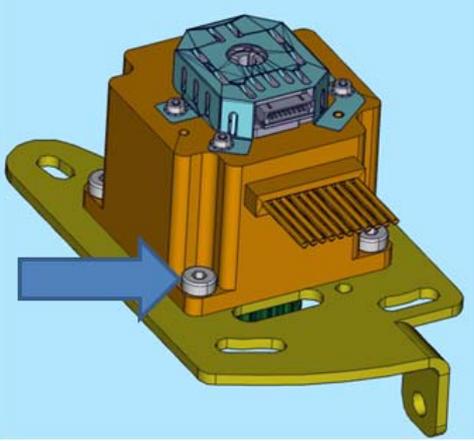
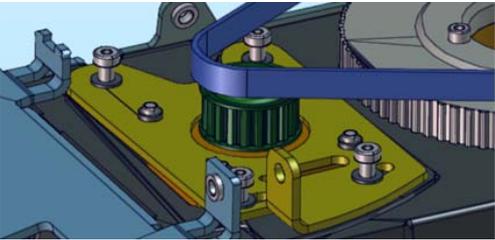
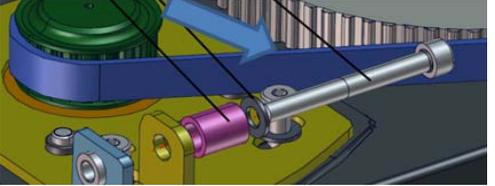
Task	
<p>5. Remove the azimuth motor. Unplug the motor and the encoder cable</p>	
<p>6. Remove the motor from the bracket, by removing the four M5 screws. 7. Install the new motor on the bracket. 4.5 Nm.</p>	
<p>8. Reconnect the motor and encoder cable on the new motor. Install the new motor. Install the four M4 screws. Install the azimuth cable. Do not tighten yet.</p>	
<p>9. Install the belt tension, spring, and washer bolt by turning it clockwise.</p>	

Table 8-8: Replacing the azimuth motor (Continued)

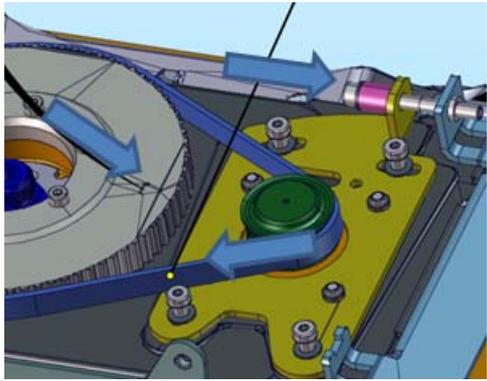
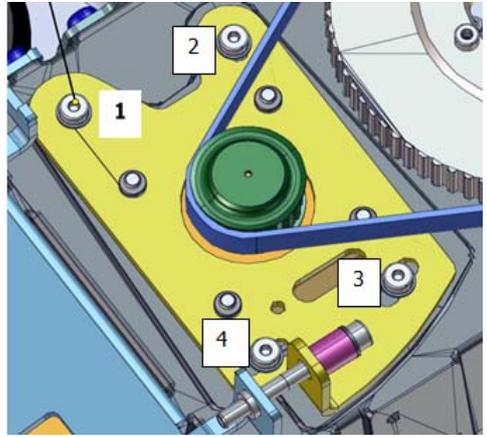
Task	
<p>10. Increase the azimuth drive belt tension slightly by turning the belt tension bolt clockwise.</p> <p>Turn the azimuth axis two times 360 degrees.</p> <p>With the triangular marking on the azimuth drive gear facing the motor pulley, check the tension on the right hand side. Adjust the azimuth drive belt tension to 220 Hz +/- 10Hz using a 'Optibelt Frequency measuring device' (S-88-207045-000).</p> <p>Repeat the above three times.</p>	
<p>11. Tighten the four M5 screws, securing the azimuth motor, in the order 1-2-3-4 4.5 Nm</p> <p>Check the belt tension again</p> <p>Turn the azimuth axis two times 360 degrees.</p> <p>With the triangular marking on the azimuth drive gear facing the motor pulley, check the tension on the right hand side. Adjust the azimuth drive belt tension to 220 Hz +/- 10Hz using a 'Optibelt Frequency measuring device' (S-88-207045-000).</p>	
<p>12. Put the radome back on. Be careful not to damage the feed horn.</p> <p>Place the warning label above the drain tube.</p> <p>Install the twelve M6 screws and washers. 6 Nm</p>	

Table 8-8: Replacing the azimuth motor (Continued)

Verify the initialization of the SAILOR VSAT ADU

Having replaced the defective component re-initialize the pedestal and verify its operation.

1. Power On the VSAT modem
2. Make an extended POST.
3. Verify that the VSAT POST is completed without any errors / warnings.
4. Verify that the system is online and full functionality is restored.

8.5.3 Replacing the elevation motor

Brief Summary

Field replacement instructions for replacing the elevation motor and perform the necessary zero point calibration.

Tools needed

Tools needed	
Torque wrench (0.4 - 5.0 Nm)	
Long TorX 8 bit, for the motor shaft and the grounding.	
Long 4 mm Hex bit, M5	
Flat headed screwdriver.	

Table 8-9: Tools needed for replacing the elevation motor

Spare part

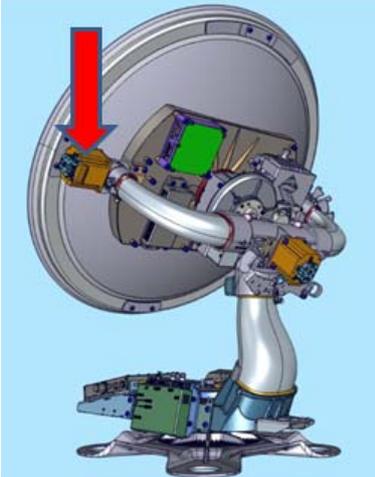
Spare part and location	
<p>S-62-146657: Elevation Motor kit</p> 	

Table 8-10: Spare part and location: Elevation motor

Replacing the part

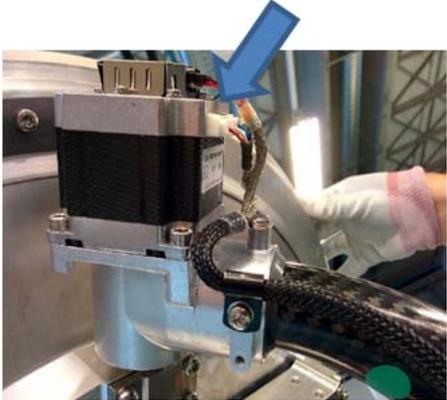
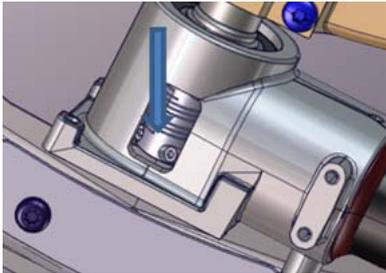
Task	
1. Power Off the SAILOR VSAT (Switch Off the ACU) and power off the VSAT Modem	
2. Remove the twelve M6 hex screws and washers. Lift off the radome. Be careful not the damage the feed horn.	
3. Disconnect the motor connector (white), the encoder connector (black) and the grounding wire Torx 8.	
4. Loosen the two TorX 8 screws on the coupling, closest to the motor. Be careful not to damage the screw head.	

Table 8-11: Replacing the elevation motor

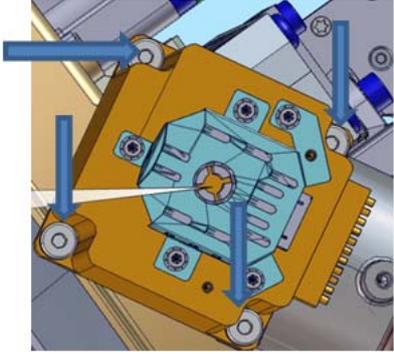
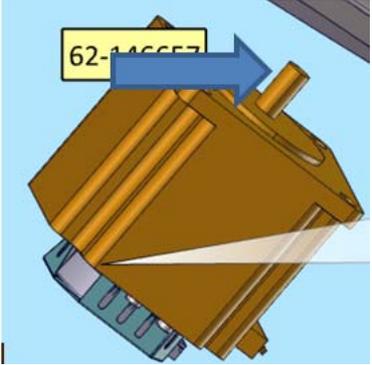
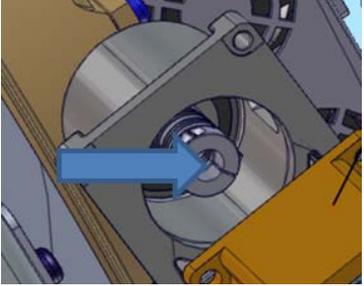
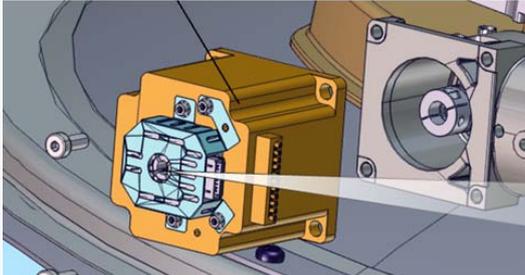
Task	
5. Remove the four Hex M5 screws, holding the motor, and remove the motor.	
6. Clean the new motor shaft with Isopropyl alcohol using a cotton swab.	
7. Clean the inside of the coupling with Isopropyl alcohol using a cotton swab.	
8. Install the new motor. a) Install the four M5 hex screws. 4.5 Nm. b) Install the motor connector (white) and encoder connector (black). c) Install grounding wire, Torx 8. 0.5 Nm. d) Do not tighten the coupling screws yet.	

Table 8-11: Replacing the elevation motor (Continued)

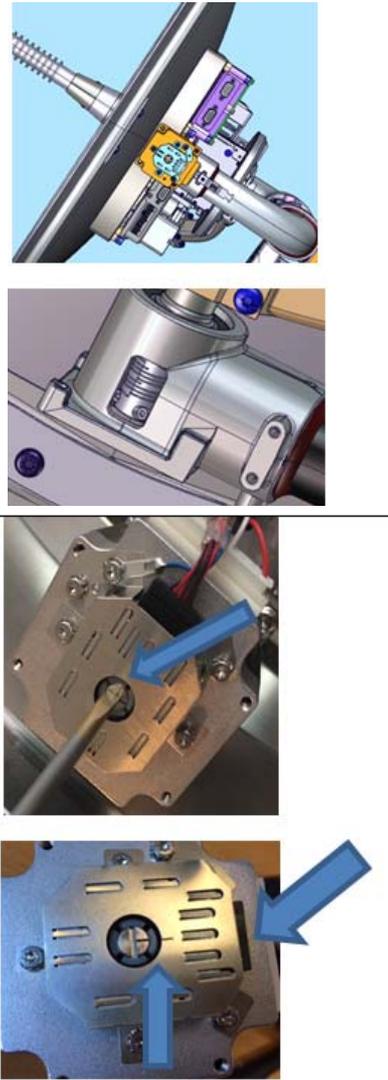
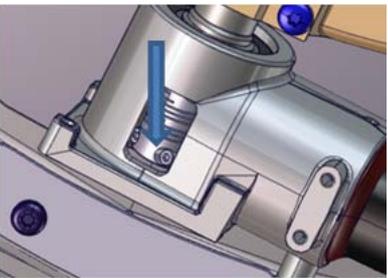
Task	
<p>9. Align the motor shaft.</p> <p>Place the antenna panel in approximate 35 degrees with the coupler screws visible.</p> <p>Use a flat screwdriver to adjust the motor shaft.</p> <p>The marking must face the encoder plug. This alignment is very important. The Zero ref point (the zero ref. sensor is a part of the encoder) must be detected during POST otherwise the POST will fail. The elevation motor turns approximately 150 degrees during POST and if the motor is not aligned correctly, the zero ref. sensor might not be detected, which will cause the POST to fail.</p>	
<p>10. Before you tighten the two Torx 8 screws, check that the screw head has not been damaged. If damaged use the spare screws from the kit. Tighten the two Torx 8 screws, securing the motor shaft in the coupling. 1.0 Nm. Start with the upper screw, then the lower screw. Repeat three times.</p>	

Table 8-11: Replacing the elevation motor (Continued)

Task	
<p>11. Put the radome back on. Be careful not to damage the feed horn. Place the warning label above the drain tube. Install the twelve M6 screws and washers. 6 Nm</p>	
<p>12. The last step is to calibrate the Motor / encoder. Power On the SAILOR VSAT (Switch On the ACU)</p>	
<p>13. Connect a PC to the service port. Setup a telnet connection to 192.168.0.1 User name: admin Password: 1234 During the calibration the Dashboard status will be: Calibration/Test. The test result will show the result of the calibration. If the test fails, go back to step 8. and check the alignment. Realign if necessary, see step 9.</p>	<p>Run the following CMD. <code>calib zrm</code></p> <pre>UCLI:/\$ calib zrm UCLI:/\$ ZRM calib started ZRM cal done (-4.31, 8.10)</pre>

Table 8-11: Replacing the elevation motor (Continued)

Verify the Initialization of the SAILOR VSAT ADU:

Having replaced the defective component re-initialize the pedestal and verify its operation.

1. Power On the VSAT modem
2. Verify that the VSAT POST is completed without any errors / warnings.
3. Verify that the system is online and full functionality is restored.

8.5.4 Replacing the rotary joint

Brief Summary

Field replacement instructions for replacing the rotary joint.

Tools needed

Tools needed	
Torque wrench (1.0 - 5.0 Nm)	
Long TorX bit T15	
Long 4 mm Hex bit, M5	
19 mm torque wrench. 2.5 Nm (For the N connector)	

Table 8-12: Tools needed for replacing the rotary joint

Spare part

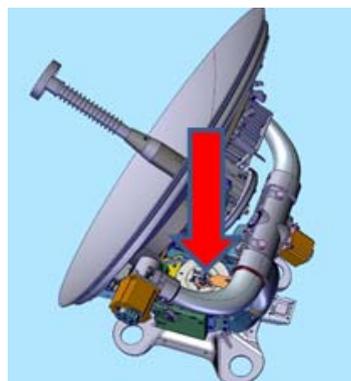
Spare part and location	
<p>S-62-147214 - Rotary Joint</p> 	

Table 8-13: Spare part and location: Rotary joint

Replacing the part

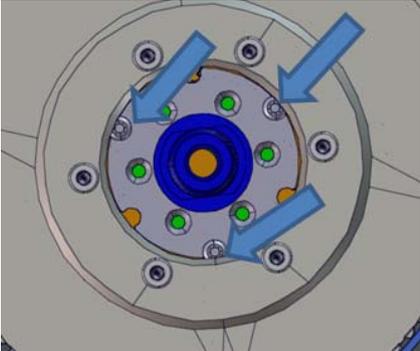
Task	
1. Power off the SAILOR VSAT (Switch Off the ACU) and power off the VSAT Modem.	
2. Remove the twelve M6 hex screws and washers. Lift off the radome. Be careful not to damage the feed horn.	
3. Disconnect the main coax cable from the top of the rotary joint.	
4. Remove the three Torx T15 screws holding the rotary joint.	

Table 8-14: Replacing the rotary joint

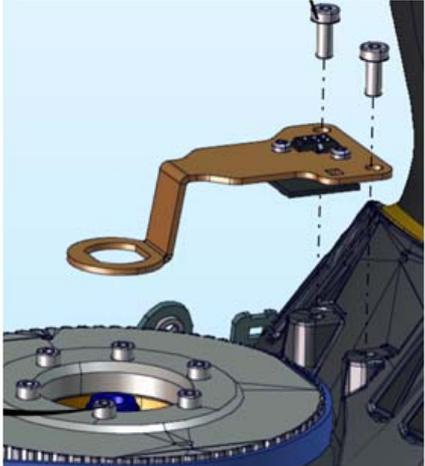
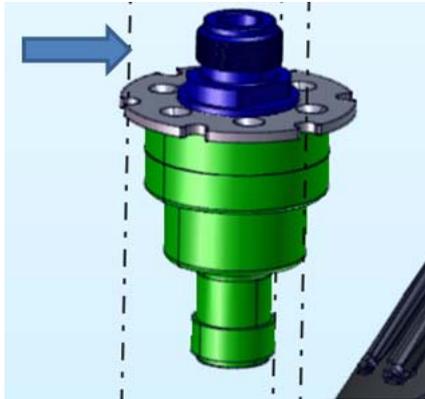
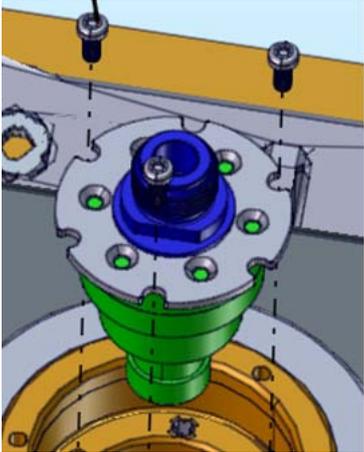
Task	
5. Remove the azimuth zero reference bracket by removing the two M5 screws	
6. Pull out the Rotary joint, and remove the main coax cable.	
7. Reconnect the main coax cable to the new rotary joint and insert the new rotary joint.	

Table 8-14: Replacing the rotary joint (Continued)

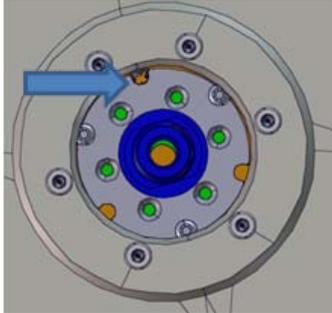
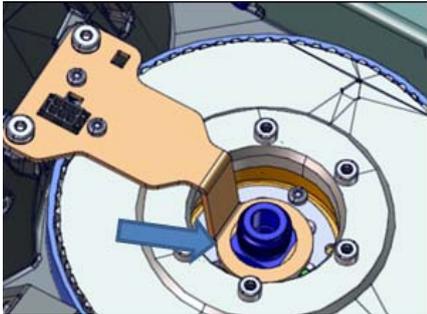
Task	
<p>8. Make sure that the drain hole is not blocked. Secure the rotary joint using the three Torx 15 screws. 2.5 Nm</p>	
<p>9. Reinstall the azimuth zero ref. bracket by installing the two M5 screws 4.5 Nm. Make sure that it locks down the rotary joint preventing it from turning</p>	
<p>10. Reinstall the main coax cable. 2.5 Nm</p>	
<p>11. Put the radome back on. Be careful not to damage the feed horn. Place the warning label above the drain tube. Install the twelve M6 screws and washers. 6 Nm</p>	

Table 8-14: Replacing the rotary joint (Continued)

Verify the initialization of the SAILOR VSAT ADU

Having replaced the defective component re-initialize the pedestal and verify its operation.

1. Reboot the SAILOR VSAT, switch Off / On the ACU.
2. Power On the VSAT modem
3. Verify that the VSAT POST is completed without any errors / warnings.
4. Verify that the system is online and full functionality is restored.

8.5.5 Replacing the X-elevation motor

Brief Summary

Field replacement instructions for replacing the X-elevation motor, and perform the necessary zero point calibration.

Tools needed

Tools needed	
Torque wrench (1.0 - 10.0 Nm)	
Long 3mm Hex bit, M4	
Long 4 mm Hex bit, M5	
Long Torx 8 bit	

Table 8-15: Tools needed for replacing the X-elevation motor

Spare part

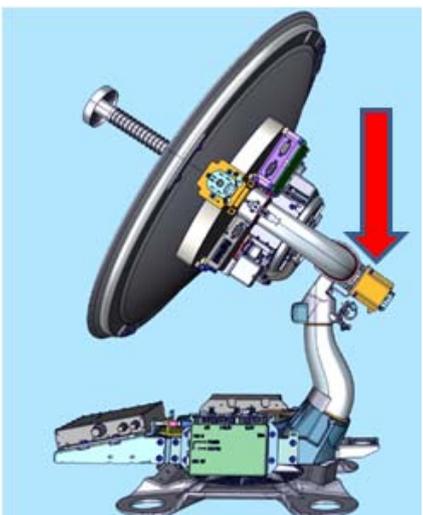
Spare part and location	
<p>S-62-149824: X-Elevation Motor kit</p> 	

Table 8-16: Spare part: and location, X-elevation motor

Replacing the part

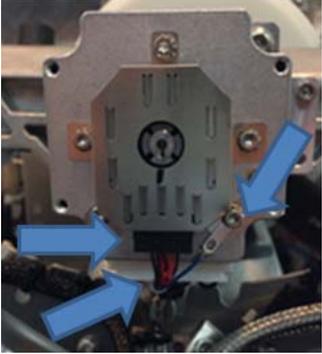
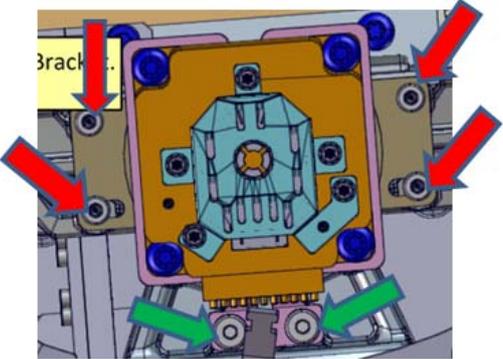
Task	
1. Power off the SAILOR VSAT (Switch Off the ACU) and power off the VSAT Modem.	
2. Remove the twelve M6 hex screws and washers. Lift off the radome. Be careful not to damage the feed horn.	
3. Disconnect the motor connector (white), the encoder connector (black), and the grounding, Torx 8.	
4. Remove the two M5 hex screws (green), and the four M4 hex screws (red). 5. Remove the old motor.	

Table 8-17: Replacing the X-elevation motor

Task	
<p>6. Install the new motor. Install the two M5 hex screws. 4.5 Nm. (green). Install the four M4 hex screws. 2.5 Nm (red).</p>	
<p>7. Install the motor connector (white), the encoder connector (black) and the grounding, Torx 8, 0.6 Nm</p>	
<p>8. Put the radome back on. Be careful not to damage the feed horn. Place the warning label above the drain tube. Install the twelve M6 screws and washers. 6 Nm</p>	
<p>9. The last step is to calibrate the Motor / encoder. Power On the SAILOR VSAT (Switch On the ACU).</p>	
<p>10. Connect a PC to the service port. Setup a telnet connection to 192.168.0.1 User name: admin Password: 1234 During the calibration the Dashboard status will be: Calibration/Test. The test result will show the result of the calibration.</p>	<p>Run the following CMD. <code>calib zrm</code></p> <pre>UCLI:/\$ calib zrm UCLI:/\$ ZRM calib started ZRM cal done (-4.31, 8.10)</pre>

Table 8-17: Replacing the X-elevation motor (Continued)

Verify the initialization of the SAILOR VSAT ADU

Having replaced the defective component re-initialize the pedestal and verify its operation.

1. Power On the VSAT modem
2. Verify that the VSAT POST is completed without any errors / warnings.
3. Verify that the system is online and full functionality is restored.

8.5.6 Replacing the BUC

Brief Summary

Field replacement instructions for replacing the BUC (S-62-140903).

Theory of Operation: The BUC converts the L-band Intermediate Frequency (IF) up to Ka-band radio signal, and amplifies it to transmit power level. It receives the transmit signal and power from the BCM.

Tools needed

Tools needed	
Torque wrench (1.0 - 5.0 Nm)	
4 mm Hex bit, M5	
5 mm Hex bit, M6	
19 mm open-ended spanner/wrench - Torque 2.5 Nm for the N connector	

Table 8-18: Tools needed for replacing the BUC

Spare part

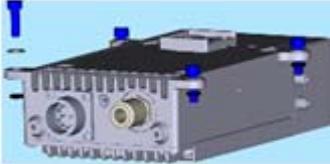
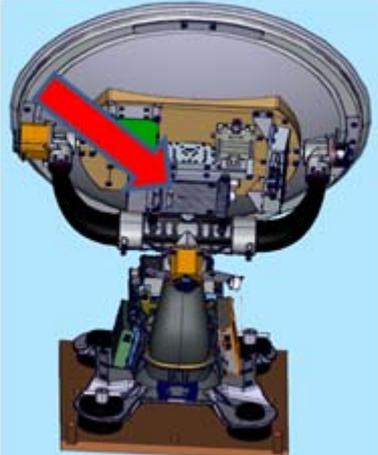
Spare part and location	
S-62-140903: 5W Ka BUV SAILOR 600Ka / 60 Gx 	

Table 8-19: Spare part: and location, BUC

Replacing the part

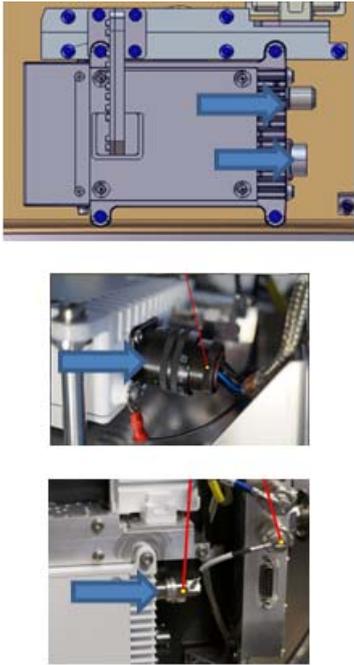
Task	
<ol style="list-style-type: none"> 1. Power off the SAILOR VSAT (Switch Off the ACU). 2. Power off the GMU/VSAT Modem. 	
<ol style="list-style-type: none"> 3. Remove the twelve M6 hex screws and washers. Lift off the radome. Be careful not the damage the feed horn. 	
<ol style="list-style-type: none"> 4. Disconnect the BUC control cable and the coax cable.. 	

Table 8-20: Replacing the BUC

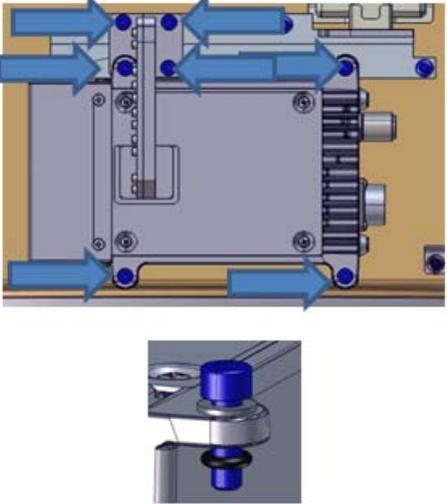
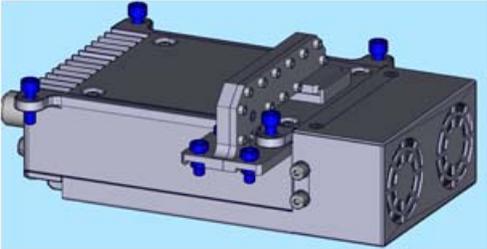
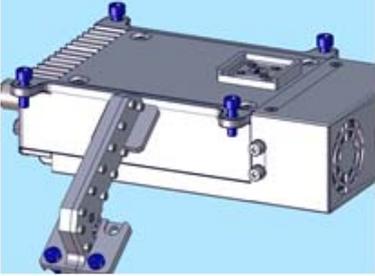
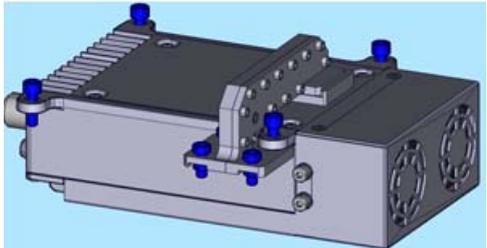
Task	
<p>5. Loosen the seven M5 screws.</p> <p>Do not remove the screws as they are secured with "a stay" on the back.</p>	
<p>6. Remove the BUC.</p>	
<p>7. Remove the wave guide.</p>	
<p>8. Install the wave guide on the new BUC.</p>	

Table 8-20: Replacing the BUC (Continued)

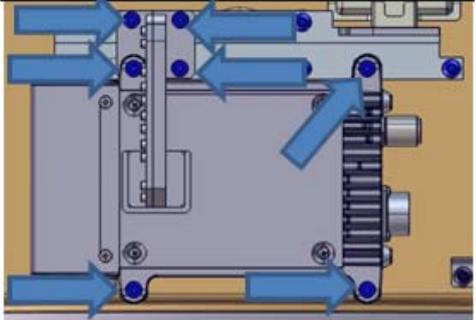
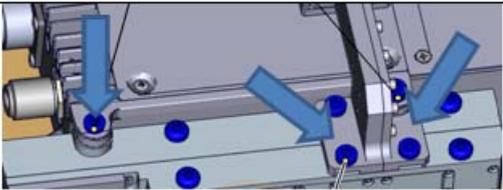
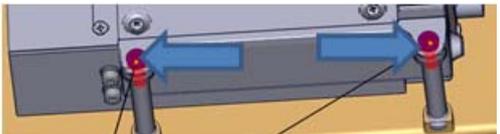
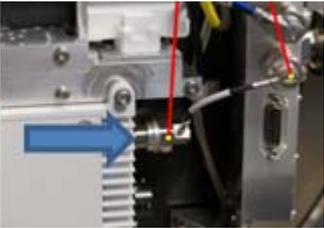
Task	
<p>9. Install the new BUC and wave guide. Install the seven M5 screws. Do not tighten yet!</p>	
<p>10. Firstly, tighten the five screws on the polarizer. 4.5 Nm</p>	
<p>11. Tighten the two remaining M5 screws. 4.5 Nm</p>	
<p>12. Reconnect the BUC control cable. Turn clockwise until it locks with a 'click'.</p>	
<p>13. Reconnect the coax cable. 2.5 Nm</p>	
<p>14. Power On the SAILOR VSAT (Switch ON the ACU) and verify that the VSAT POST is completed without any errors or warnings.</p>	

Table 8-20: Replacing the BUC (Continued)

Task	
<p>15. Put the radome back on. Be careful not to damage the feed horn. Place the warning label above the drain tube. Install the twelve M6 screws and washers. 6 Nm</p>	
<p>16. Enter the ACU web interface and make a cable calibration.</p>	
<p>17. Power on the GMU/VSAT modem. The GMU/VSAT modem will normally automatically enter the OTC (One Touch Commissioning). If not: Enter the modem's web interface.</p>	
<p>18. Log in with the user name admin and password iDirect123!</p>	
<p>19. Go to Commissioning and start an OTC.</p>	

Table 8-20: Replacing the BUC (Continued)

Verify the initialization of the SAILOR VSAT ADU

Having replaced the defective component re-initialize the pedestal and verify its operation.

1. Verify that the VSAT POST is completed without any errors / warnings.
2. Verify that the system is online and full functionality is restored.

8.5.7 Replacing the LNB

Brief Summary

Field replacement instructions for replacing the LNB (S-62-140904).

Theory of Operation: The LNB converts the Ka-band radio signal to L-band Intermediate Frequency (IF). It provides the L-band (IF) to the VIM and gets power and ref. from the VIM.

Tools needed

Tools needed	
Torque wrench (1.0 - 5.0 Nm)	
4 mm Hex bit, M5	
3 mm Hex bit, M4	
9 mm open-ended spanner/wrench - Torque 2.5 Nm for the N connector	

Table 8-21: Tools needed for replacing the LNB

Spare part

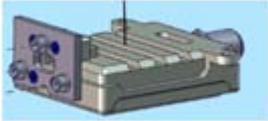
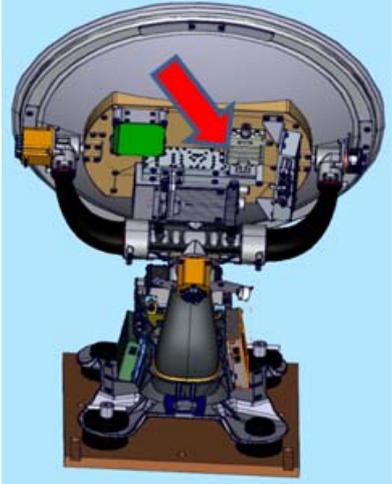
Spare part and location	
<p>S-62-140904: Ka LNB SAILOR 600 Ka/60 Gx</p> 	

Table 8-22: Spare part: and loculation

Replacing the part

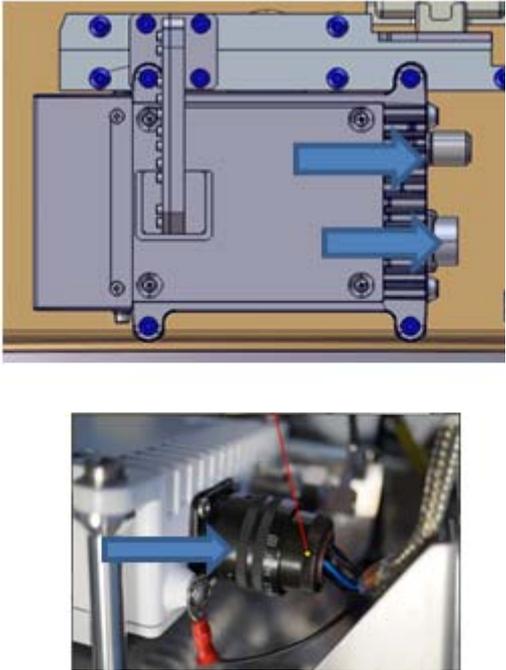
Task	
<ol style="list-style-type: none"> 1. Power off the SAILOR VSAT (Switch Off the ACU). 2. Power off the GMU/VSAT Modem. 	
<ol style="list-style-type: none"> 3. Remove the twelve M6 hex screws and washers. Lift off the radome. Be careful not the damage the feed horn. 	
<ol style="list-style-type: none"> 4. To have access to the 3 Hex M4 screws holding the LNB you must remove the BUC. 	
<ol style="list-style-type: none"> 5. Diconnect the BUC control cable. 	

Table 8-23: Replacing the LNB

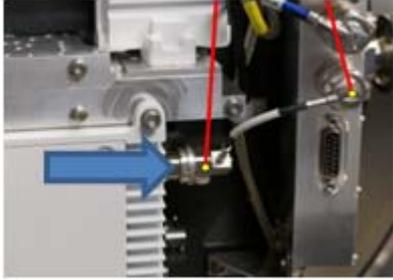
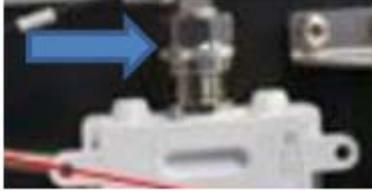
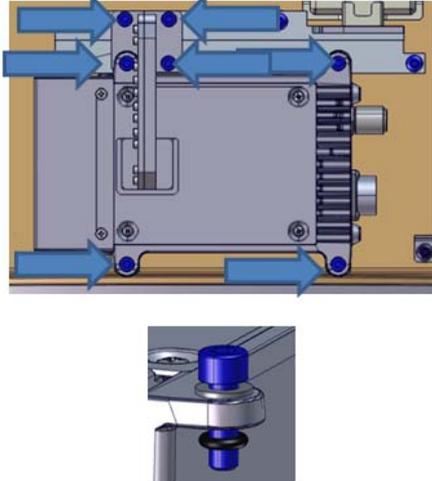
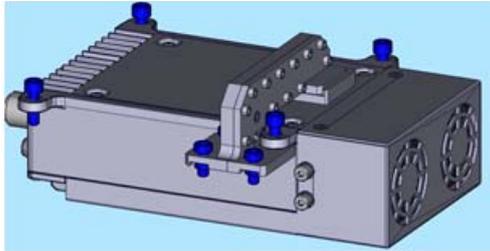
Task	
<p>6. Disconnect the coax cable.</p>	
<p>7. Disconnect the coax from the LNB.</p>	
<p>8. Loosen the seven Hex M5 screws holding the BUC. Do not remove the screws! They are secured with "a stay" on the back.</p>	
<p>9. Remove the BUC and the wave guide.</p>	

Table 8-23: Replacing the LNB (Continued)

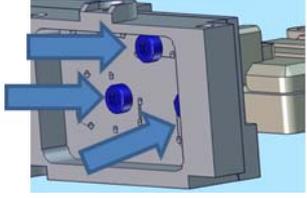
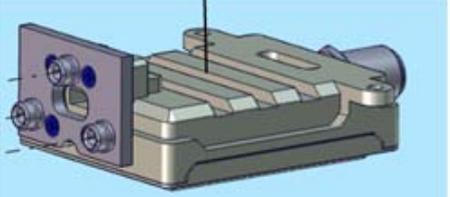
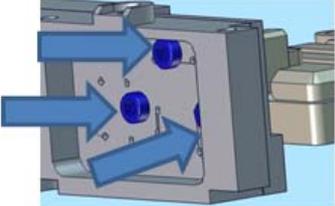
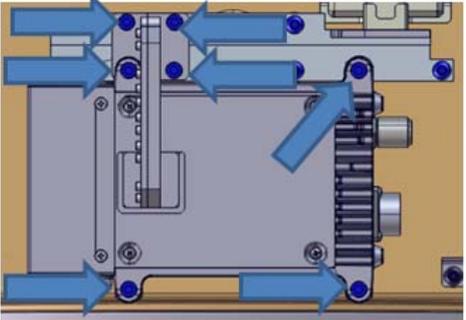
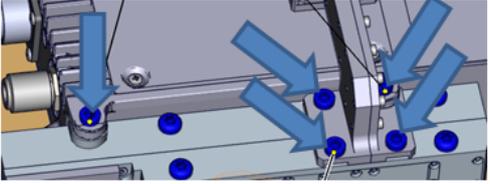
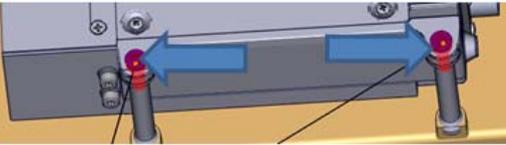
Task	
10. Remove the three Hex M4 screws holding the LNB.	
11. Install the new LNB.	
12. Install the three Hex M4 screws. Tighten 2.5 Nm.	
13. Install the BUC and wave guide. Install the seven Hex M5 screws. Do not tighten yet!	
14. Firstly, tighten the five screws on the polarizer. 4.5 Nm	
15. Tighten the two remaining M5 screws. 4.5 Nm	

Table 8-23: Replacing the LNB (Continued)

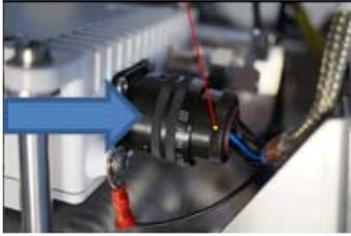
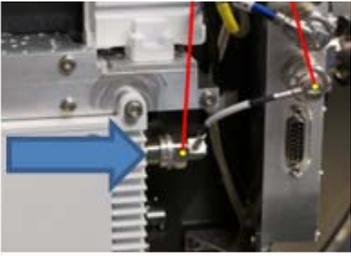
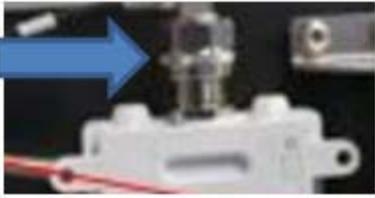
Task	
16.Reconnect the BUC control cable. Turn clockwise until it locks with a 'click'.	
17.Reconnect the BUC coax cable. 2.5 Nm	
18.Reconnect the LNB coax cable. 2.5 Nm	
19.Put the radome back on. Be careful not to damage the feed horn. Place the warning label above the drain tube. Install the twelve M6 screws and washers. 6 Nm	

Table 8-23: Replacing the LNB (Continued)

Verify the initialization of the SAILOR VSAT ADU

Having replaced the defective component re-initialize the pedestal and verify its operation.

1. Power on the SAILOR VSAT, switch on the ACU.
2. Power On the GMU/VSAT modem
3. Make an extended POST.
4. Verify that the VSAT POST is completed without any errors / warnings.
5. Verify that the system is online and full functionality is restored.

8.5.8 Replacing the azimuth drive belt

Brief Summary

Field replacement instructions for replacing the azimuth drive belt.

Tools needed

Tools needed	
Torque wrench (1.0 - 7.0 Nm)	
4 mm Hex bit, M5	
5 mm Hex bit, M6	
4mm Hex key M5. Angled. For belt tension	
Optibelt frequency measuring device	

Table 8-24: Tools needed for replacing the azimuth drive belt

Spare part

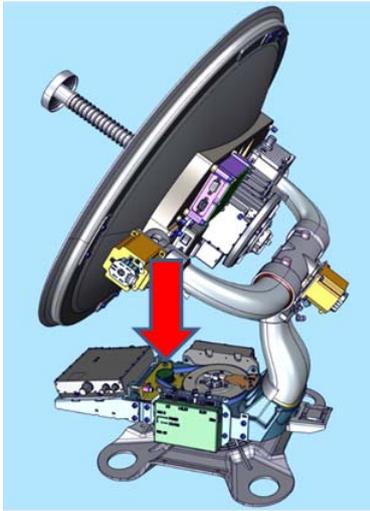
Spare part and location	
<p>S-410207264-480 Azimuth Timing Belt 10TS/480 F/ S600/60 GX</p> 	

Table 8-25: Spare part: and location, azimuth drive belt

Replacing the part

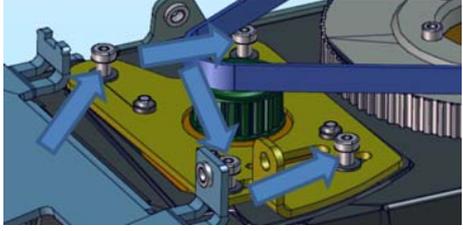
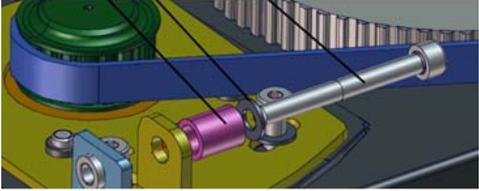
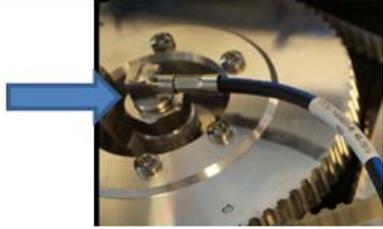
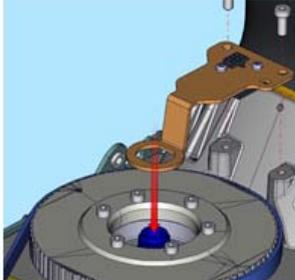
Task	
<p>1. Power off the SAILOR VSAT (Switch Off the ACU) and power off the VSAT Modem.</p>	
<p>2. Remove the twelve M6 hex screws and washers. Lift off the radome. Be careful not to damage the feed horn.</p>	
<p>3. Loosen the four M5 screws holding the azimuth motor.</p>	
<p>4. Loosen the belt tension. Turn counter clockwise.</p>	
<p>5. Disconnect the N-connector from the top of the rotary joint.</p>	
<p>6. Remove 6 pin plug Remove the Two M5 hex screws, and remove the ZRM.</p>	

Table 8-26: Replacing the azimuth drive belt

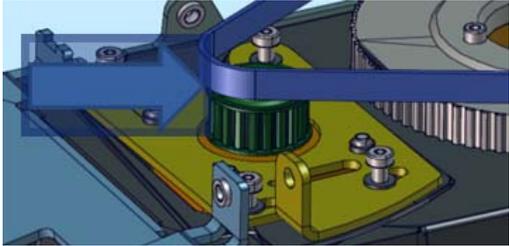
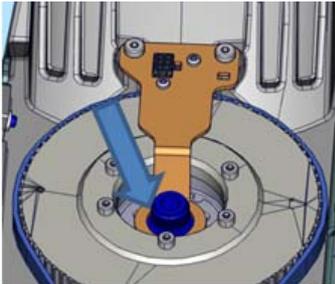
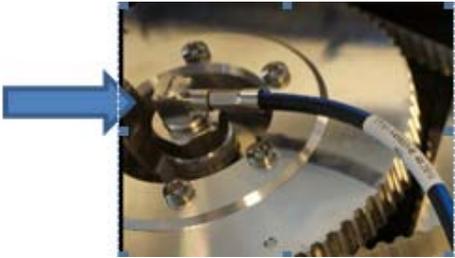
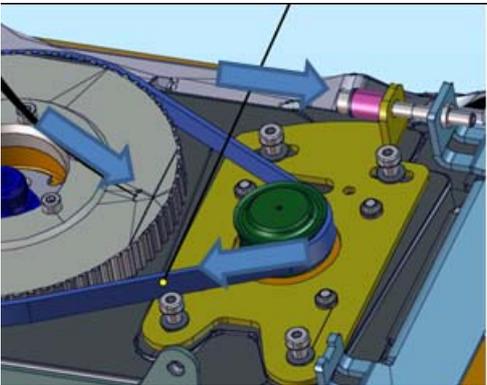
Task	
7. Remove the Azimuth drive belt	
8. Install the new Azimuth drive belt 9. Install the two M5 hex screws and the new ZRM. 2.5 Nm Make sure that it fits on the top of the rotary joint. Connect the 6 pin plug	
10. Disconnect the N-connector from the top of the rotary joint.	
11. Increase the azimuth drive belt tension slightly by turning the belt tension bolt clockwise Turn the azimuth axis two times 360. With the triangular marking on the azimuth drive gear facing the motor pulley, check the tension on the right hand side. Adjust the azimuth drive belt tension to 220 Hz + 10 Hz using a 'Optibelt Frequency measuring device' (S-88-207045-000). Repeat the above three times.	

Table 8-26: Replacing the azimuth drive belt (Continued)

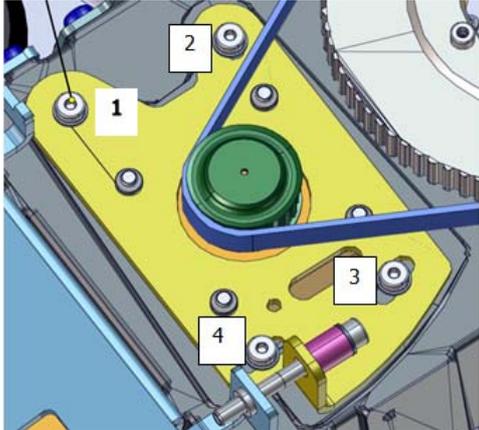
Task	
<p>12. Tighten the four M5 screws, securing the azimuth motor, in the order 1-2-3-4 4.5 Nm. Check the belt tension again. Turn the azimuth axis two times 360. With the triangular marking on the azimuth drive gear facing the motor pulley, check the tension on the right hand side. Adjust the azimuth drive belt tension to 220 Hz \pm 10Hz using a 'Optibelt Frequency measuring device' (S-88-207045-000).</p>	
<p>13. Put the radome back on. Be careful not to damage the feed horn. Place the warning label above the drain tube. Install the twelve M6 screws and washers. 6 Nm</p>	

Table 8-26: Replacing the azimuth drive belt (Continued)

Verify the initialization of the SAILOR VSAT ADU

Having replaced the defective component re-initialize the pedestal and verify its operation.

1. Power On the VSAT modem
2. Make an extended POST.
3. Verify that the VSAT POST is completed without any errors / warnings.
4. Verify that the system is online and full functionality is restored.

8.5.9 Replacing the Field Vector Drive Module (FDM)

Brief Summary

Field replacement instructions for the FDM kit (S-62-144290).

Theory of Operation: The FDM is the driver module for azi, ele, xele motors / encoders / azi ZRM.

Tools needed

Tools needed	
Torque wrench (1.0 - 5.0 Nm)	
5 mm Hex bit, M6	
4 mm Hex bit, M5	
Flat Head Bit (for the DB connectors)	

Table 8-27: Tools needed for replacing the FDM

Spare part

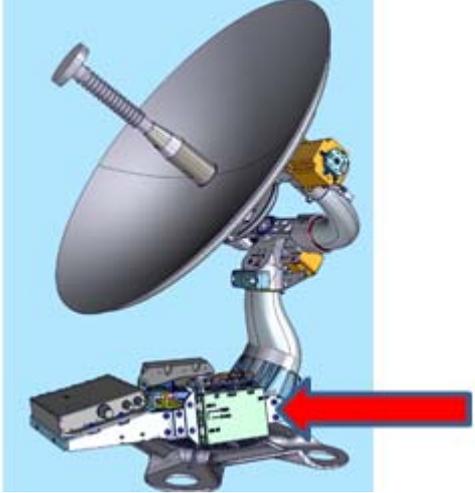
Spare part and location	
Field Vector Motor drive- F/ S600 & 60 	

Table 8-28: Spare part: and location, FDM

Replacing the part

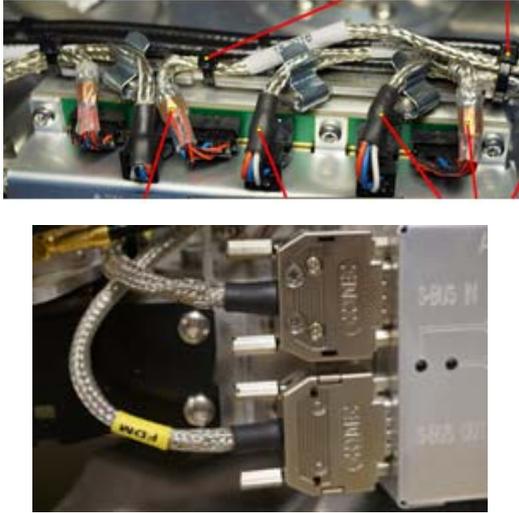
Task	
<p>1. Power off the SAILOR VSAT (Switch Off the ACU) and power off the VSAT Modem.</p>	
<p>2. Remove the twelve M6 hex screws and washers. Lift off the radome. Be careful not to damage the feed horn.</p>	
<p>3. Disconnect the motor/encoder cables. 4. Remove the plug to the ZRM. 5. Disconnect the S-bus cables.</p>	
<p>6. Loosen the four Hex M5 screws and remove the FDM Note. the screws are secured by "a stay"</p>	

Table 8-29: Replacing the FDM

Task	
7. Install the new FDM. 4.5 Nm 8. Connect the Azi, ele, xele motor/encoders 9. Connect the ZRM 10. Connect the S-Bus. 0.4 NM	
11. Put the radome back on. Be careful not to damage the feed horn. Place the warning label above the drain tube. Install the twelve M6 screws and washers. 6 Nm	

Table 8-29: Replacing the FDM (Continued)

Verify the initialization of the SAILOR VSAT ADU

Having replaced the defective component re-initialize the pedestal and verify its operation.

1. Power on the SAILOR VSAT, switch on the ACU.
2. Power On the VSAT modem
3. Make an extended POST.
4. Verify that the VSAT POST is completed without any errors / warnings.
5. Verify that the system is online and full functionality is restored.

8.5.10 Replacing the Inertial Sensor Module ISM2

Brief Summary

Field replacement instructions for the ISM2 kit (S-62-140736).

Theory of Operation: The ISM is the sensor unit.

Tools needed

Tools needed	
Torque wrench (1.0 - 5.0 Nm)	
5 mm Hex bit, M6	
4 mm Hex bit, M5	
Flat Head Bit (for the DB connectors)	

Table 8-30: Tools needed for replacing the ISM2

Spare part

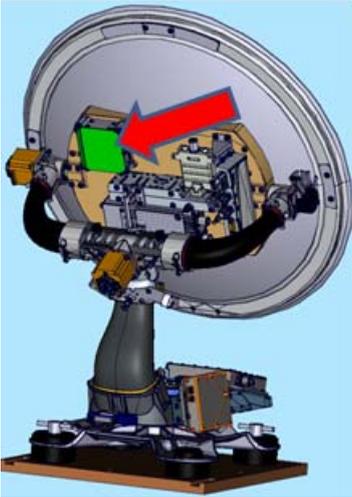
Spare part and location	
S- 62-140736. Inertial Sensor Module, ISM2, SAILOR 600Ka/Ku & 60 GX	

Table 8-31: Spare part: and location, ISM2

Replacing the part

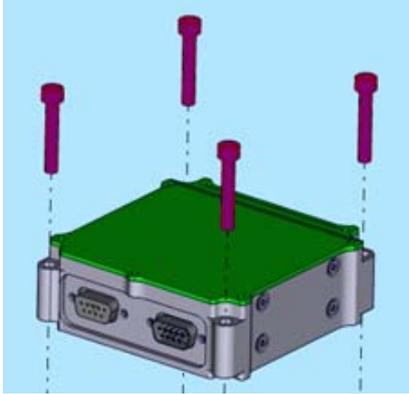
Task	
1. Power off the SAILOR VSAT (Switch Off the ACU) and power off the VSAT Modem.	
2. Remove the twelve M6 hex screws and washers. Lift off the radome. Be careful not to damage the feed horn.	
3. Disconnect the S-Bus cables.	
4. Loosen the four Hex M5 screws and remove the ISM Note: The screws are secured by "a stay".	
5. Install the new ISM. 4.5Nm.	
6. Connect the S-Bus. 0.4 Nm.	

Table 8-32: Replacing the ISM2

Task	
<p>7. Put the radome back on. Be careful not to damage the feed horn. Place the warning label above the drain tube. Install the twelve M6 screws and washers. 6 Nm</p>	

Table 8-32: Replacing the ISM2 (Continued)

Verify the initialization of the SAILOR VSAT ADU

Having replaced the defective component re-initialize the pedestal and verify its operation.

1. Power on the SAILOR VSAT, switch on the ACU.
2. Power On the VSAT modem
3. Make an extended POST.
4. Verify that the VSAT POST is completed without any errors / warnings.
5. Verify that the system is online and full functionality is restored.

8.5.11 Replacing the Pedestal Control Module (PCM)

Brief Summary

Field replacement instructions for the PCM.

The PCM is the 'computer' in the ADU, controlling the S-bus modules (ABS's).

Tools needed

Tools needed	
Torque wrench (1.0 - 7.0 Nm)	
5 mm Hex bit, M6	
4 mm Hex bit, M5	
Flat Head Bit (for the DB connectors)	
8 mm open-ended spanner/wrench - Torque 0.5 -3.0 Nm for the SMA and N connector	

Table 8-33: Tools needed for replacing the PCM

Spare part

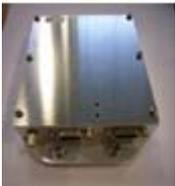
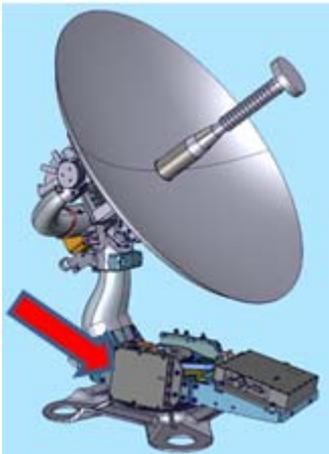
Spare part and location	
S-62-136569. Pedestal Control Module 	

Table 8-34: Spare part: and location, PCM

Replacing the part

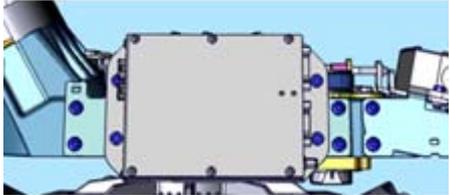
Task	
<p>1. Power off the SAILOR VSAT (Switch Off the ACU) and power off the VSAT Modem.</p>	
<p>2. Remove the twelve M6 hex screws and washers. Lift off the radome. Be careful not to damage the feed horn.</p>	
<p>3. Disconnect the: SMA connector. (comms from the VIM). 1 Nm DB15 connector. (connection to the VIM) 0.4Nm 6 pin plug from GPS 6 pin "service switch dummy"</p>	
<p>4. Disconnect the: 6 pin plug from GPS 6 pin "service switch dummy plug"</p>	
<p>5. Loosen the four Hex M5 screws and remove the PCM. Note. the screws are secured by "a stay".</p>	

Table 8-35: Replacing the PCM

Task	
6. Install the new VIM2/3. 4.5Nm	
7. Connect the: SMA connector. (comms from the VIM). 1NM DB15 connector. (connection to the VIM) 0.4 Nm 6 pin plug from GPS 6 pin "service switch dummy"	
8. Install the new ISM. 4.5Nm.	
9. Connect the S-Bus. 0.4 Nm.	
10. Put the radome back on. Be careful not to damage the feed horn. Place the warning label above the drain tube. Install the twelve M6 screws and washers. 6 Nm	

Table 8-35: Replacing the PCM (Continued)

Verify the initialization of the SAILOR VSAT ADU

Having replaced the defective component re-initialize the pedestal and verify its operation.

1. Power on the SAILOR VSAT, switch on the ACU.
2. Power On the VSAT modem
3. Make an extended POST.
4. Verify that the VSAT POST is completed without any errors / warnings.
5. Verify that the system is online and full functionality is restored.

8.5.12 Replacing the VIM2/3

Brief Summary

Field replacement instructions for the VIM2/3 (S-62-136435 / S-62-148091)

The VIM interfaces the ACU to the ADU, and handle the RXIF from LNB and provide TXIF BUC.

Tools needed

Tools needed	
Torque wrench (1.0 - 7.0 Nm)	
5 mm Hex bit, M6	
4 mm Hex bit, M5	
Flat Head Bit (for the DB connectors)	
8 mm + 19 mm open-ended spanner/wrench - Torque 0.5 -3.0 Nm for the SMA and N connector	

Table 8-36: Tools needed for replacing the VIM2/3

Spare part

Spare part and location	
	

Table 8-37: Spare part: and location, VIM2/3

Replacing the part

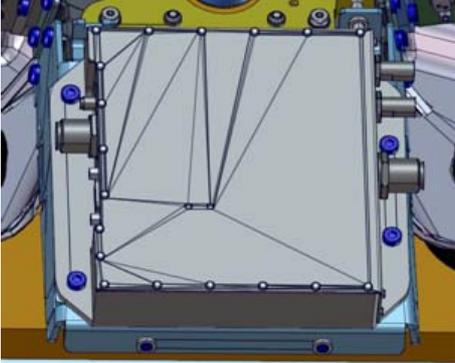
Task	
1. Power off the SAILOR VSAT (Switch Off the ACU) and power off the VSAT Modem.	
2. Remove the twelve M6 hex screws and washers. Lift off the radome. Be careful not to damage the feed horn.	
3. Disconnect the: SMA connector. (comms to the PCM) N-connector. (Connection from rotary joint) DB15 connector. (connection to the PCM)	
4. Disconnect the: N-connector. (connection to BUC/BCM) SMA connectors. (Connection from LNBS)	
5. Loosen the four Hex M5 screws and remove the VIM2/3 Note: the screws are secured by "a stay"	
6. Install the new VIM2/3. 4.5 Nm	

Table 8-38: Replacing the VIM2/3

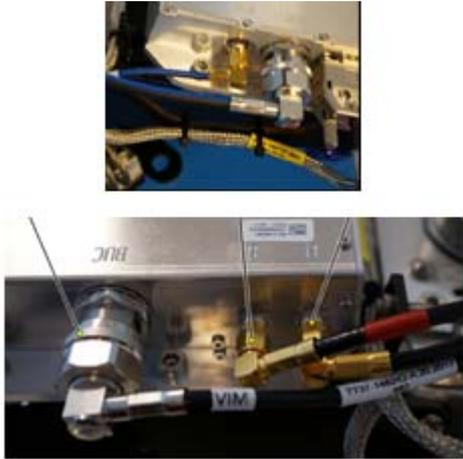
Task	
<p>7. Connect the:</p> <ul style="list-style-type: none"> SMA connector. (comms to the PCM). 1 Nm N-connector. (Connection from rotary joint) 2.5 Nm DB15 connector. (connection to the PCM) 0.4 Nm N-connector. (connection to BUC/BCM) 2.5 Nm SMA connectors. (Connection from LNBS) 1 Nm 	
<p>8. Put the radome back on. Be careful not to damage the feed horn. Place the warning label above the drain tube. Install the twelve M6 screws and washers. 6 Nm</p>	

Table 8-38: Replacing the VIM2/3 (Continued)

Verify the initialization of the SAILOR VSAT ADU

Having replaced the defective component re-initialize the pedestal and verify its operation.

1. Power on the SAILOR VSAT, switch on the ACU.
2. Power On the VSAT modem
3. Make an extended POST.
4. Verify that the VSAT POST is completed without any errors / warnings.
5. Verify that the system is online and full functionality is restored.

8.5.13 Replacing the Azimuth Zero Reference Module (ZRM)

Brief Summary

Field replacement instructions for the azimuth ZRM.

Tools needed

Tools needed	
Torque wrench (1.0 - 5.0 Nm)	
4 mm Hex bit, M5 for the radome	
Torx T10 bit	
19 mm open-ended spanner/wrench - Torque 2.5 Nm for N connector	

Table 8-39: Tools needed for replacing the azimuth ZRM

Spare part

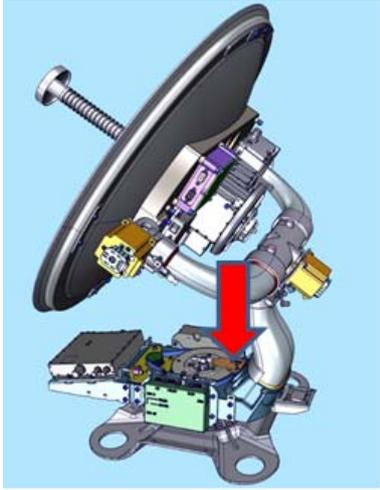
Spare part and location	
<p>S-62-149821 ZRM F/SAILOR 600 & 60 GX</p> 	

Table 8-40: Spare part: and location, azimuth ZRM

Replacing the part

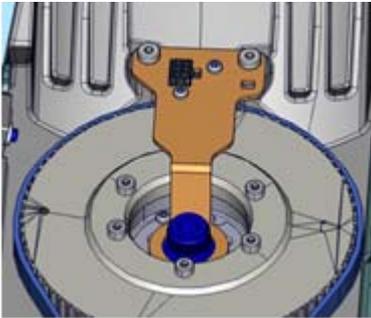
Task	
1. Power off the SAILOR VSAT (Switch Off the ACU) and power off the GMU/VSAT Modem.	
2. Remove the twelve M6 hex screws and washers. Lift off the radome. Be careful not to damage the feed horn.	
3. Remove the N-connector from the top of the rotary joint.	
4. Remove 6 pin plug. Remove the two M5 hex screws, and remove the ZRM.	
5. Install the two M5 hex screws and the new ZRM. 4.5 Nm Make sure that it fits on the top of the rotary joint. Connect the 6 pin plug.	

Table 8-41: Replacing the azimuth ZRM

Task	
6. Connect the N-connector to the Rotary joint. 2.5 Nm	
7. Put the radome back on. Be careful not to damage the feed horn. Place the warning label above the drain tube. Install the twelve M6 screws and washers. 6 Nm	

Table 8-41: Replacing the azimuth ZRM (Continued)

Verify the initialization of the SAILOR VSAT ADU

Having replaced the defective component re-initialize the pedestal and verify its operation.

1. Power On the VSAT modem
2. Make an extended POST.
3. Verify that the VSAT POST is completed without any errors / warnings.
4. Verify that the system is online and full functionality is restored.

8.5.14 Replacing the BCM

Brief Summary

Field replacement instructions for the BCM kit (S-67-157402).

Theory of Operation: The BCM provides power to the BUC and handles internal communication with the BUC.

Tools needed

Tools needed	
Torque wrench (1.0 - 5.0 Nm)	
4 mm Hex bit, M5	
Flat Head Bit (for the DB connectors)	
19 mm open-ended spanner/wrench - Torque 2.5 Nm for the N connector	

Table 8-42: Tools needed for replacing the BCM

Spare part

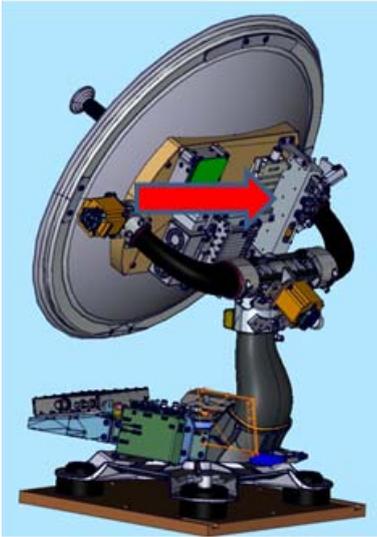
Spare part and location	
<p>S-67-157402: BCM kit. BUC Control Module & cable</p> 	

Table 8-43: Spare part: and location, BCM

Replacing the part

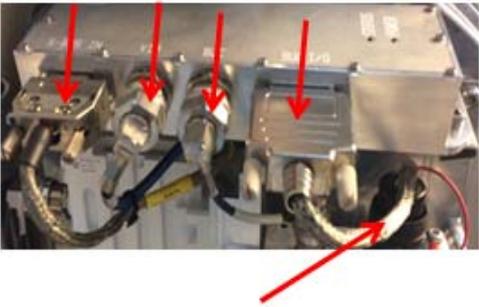
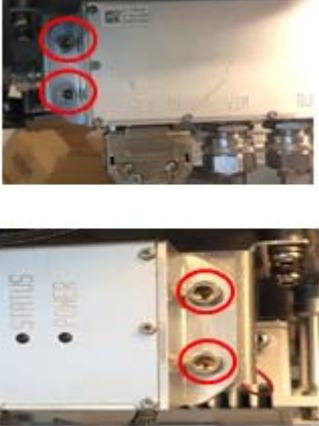
Task	
1. Power off the SAILOR VSAT (Switch Off the ACU) and power off the GMU/VSAT Modem.	
2. Remove the twelve M6 hex screws and washers. Lift off the radome. Be careful not to damage the feed horn.	
3. Disconnect the 4 connectors from the BCM (mark them to avoid errors). 4. Remove the BCM to BUC control cable from the BUC.	
5. Loosen the four screws holding the BCM in place. 6. Remove the BCM. 7. Remove the BCM to BUC control cable.	

Table 8-44: Replacing the BCM

Task	
<p>8. To install the new BCM and the new BCM to BUC control cable, following the instructions above in reverse order:</p> <p>The four M5 screws: 4.5 Nm The two coax: 2.5 Nm The two N-connectors: 2.5 Nm The S-Bus and the BUC control cable: 0.4 Nm</p> <p>9.</p>	
<p>10. Put the radome back on. Be careful not to damage the feed horn. Place the warning label above the drain tube. Install the twelve M6 screws and washers. 6 Nm</p>	
<p>11. Enter the ACU web interface and make a cable calibration.</p>	
<p>12. Power on the GMU/VSAT modem. The GMU/VSAT modem will normally automatically enter the OTC (One Touch Commissioning).</p> <p>If not: Enter the modem's web interface.</p>	

Table 8-44: Replacing the BCM (Continued)

Task	
13. Log in with the user name admin and password iDirect123!	
14. Go to Commissioning and start an OTC.	

Table 8-44: Replacing the BCM (Continued)

Verify the initialization of the SAILOR VSAT ADU

Having replaced the defective component re-initialize the pedestal and verify its operation.

1. Verify that the VSAT POST is completed without any errors / warnings.
2. Verify that the system is online and full functionality is restored.

8.6 Troubleshooting basics

8.6.1 Overview

This section describes an initial check of the primary functions of the SAILOR 600 VSAT Ka 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) (see also *Software recovery procedure (SAFE MODE)* on page 8-11)
- Antenna data error (after exchange of modules, XIM)
- 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 8-13. 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 *Options for support* on page 8-2. 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 *To download diagnostics and statistics reports* on page 8-3.

8.7 To return 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, **Technical Service Partner List**. You can also access the Partner Portal at www.cobham.com/satcom, **Cobham SYNC Partner Portal**, which may help you solve the problem. Your dealer, installer or Cobham SATCOM partner will assist you whether the need is user training, technical support, arranging on-site repair or sending the product for repair. Your dealer, installer or Cobham SATCOM partner will also take care of any warranty issue.

Troubleshooting

This chapter has the following sections:

- *Flow chart*
- *System log*
- *Log line format*

9.1 Flow chart

9.1.1 Flow chart for fault finding

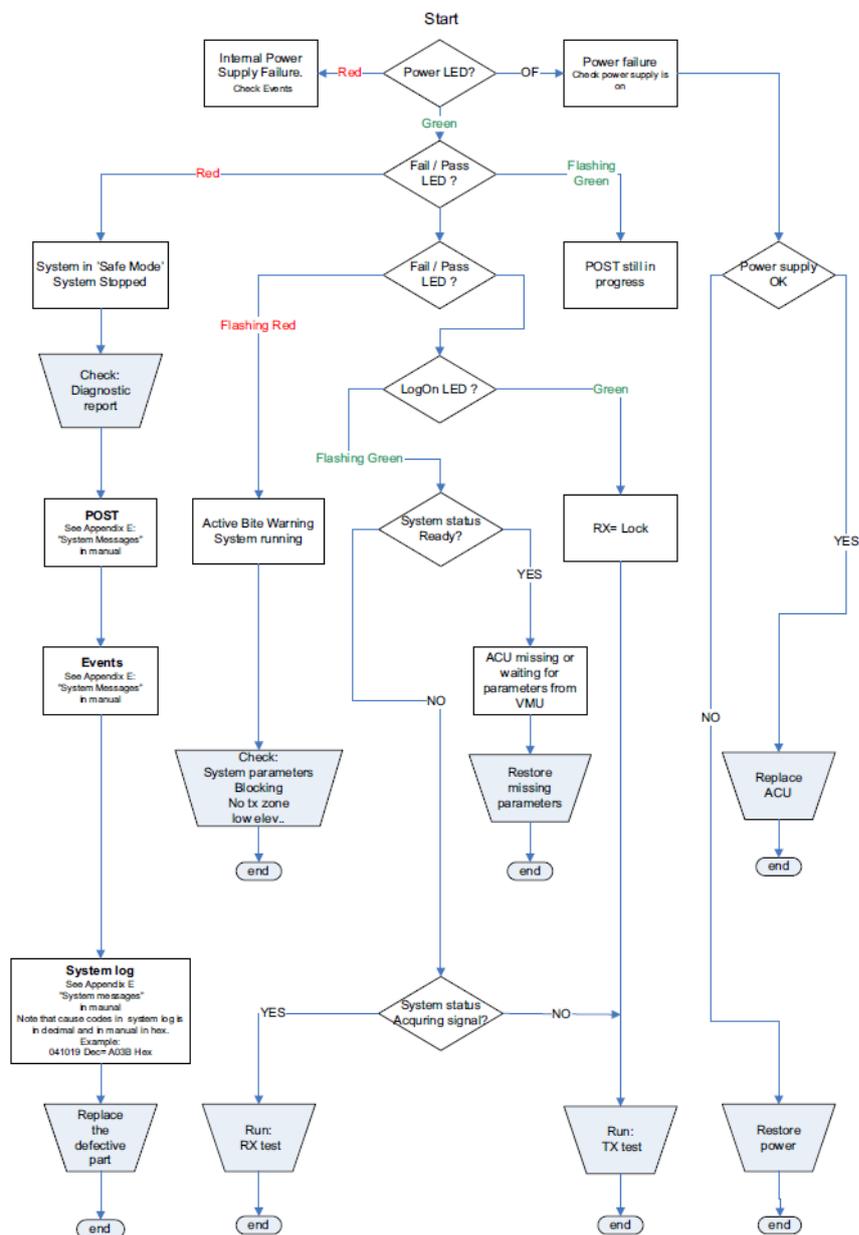


Figure 9-1: Flow chart for fault finding

9.2 System log

9.2.1 Overview

The system log holds minute by minute status readout from the system. The below system log holds three active (ON) events.

User Event: **0A023** , 3 ERROR ON Ele axis calibration (00000010)
 User Event: **0A025** , 3 ERROR ON Antenna calibration (00000040)
 User Event: **0A05B** , 3 WARNING ON Ele cal. limits (00000140)

The SAILOR VSAT system will after ended POST go into safe mode, identified by the event: **“ADU_IF: Error type not eligible for ADU auto recovery (14:20)”**

Once in “safe mode” the 48 VDC to the antenna drops to 20 VDC, leaving all axes without power. All status LEDs on antenna modules will light RED.

To make a new POST, you must reboot the system. Normally the SAILOR VSAT system will try to reboot after a period of time.

9.2.2 System log, example

The following figure shows an example of a system log.

```

System log:
-----
2013-02-02T09:03:54.319653+00:00 acu : user.notice : ADU_IF: Powering up ADU
2013-02-02T09:20:09.001047+00:00 acu : user.info : ADU_IF: System time has been reset - fast forward 939 s (0x510cd69e to 0x510cda49)
2013-02-02T09:21:45.935128+00:00 acu : user.err : User Event: 0A023 , 3 ERROR ON Ele axis calibration (00000010)
2013-02-02T09:21:46.000776+00:00 acu : user.err : User Event: 0A025 , 3 ERROR ON Antenna calibration (00000040)
2013-02-02T09:21:46.080124+00:00 acu : user.err : ADU_IF: adu_if entered error state because of EV_POST_DONE_CALLBACK_FAIL in ST_RUN_POST (Power OK)
2013-02-02T09:21:46.088260+00:00 acu : user.info : ADU_IF: Error type not eligible for ADU auto recovery (14:20)
2013-02-02T09:21:47.068187+00:00 acu : user.warn : User Event: 0A05B , 3 WARNING ON Ele cal. limits (00000140)
    
```

Figure 9-2: System log, example

9.2.3 User event message, how to interpret

The last line of the system log in figure 9-2 says to look into the user event 0A05B-0:

Error ID	Unit	Severity	Name	Description
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.

Table 9-1: Examples of ADU events 1/2

This event then leads you to the event 0A059-0:

Error ID	Unit	Severity	Name	Description
0A059-0	Antenna	WARNING	Azi cal. limits	<p>Check limits of the calibration result for the azimuth axis are exceeded. Pointing performance may be degraded. Info:</p> <p>0x00000040: End stop detected before expected limit</p> <p>0x00000100: Zero width is low</p> <p>0x00000200: Zero width is high</p> <p>0x00000400: Zero slack is high</p> <p>0x00001000: Friction average is high</p> <p>0x00002000: Friction peak is high</p> <p>0x00004000: Friction asymmetry is high</p> <p>Zero width low/high: Zero reference module placement may be incorrect.</p> <p>Zero slack high: Mechanical slack may be too high.</p> <p>Friction average/peak high: Mechanical friction is higher than expected.</p> <p>Friction asymmetry high: Mechanical imbalance may be too high.</p>

Table 9-2: Examples of ADU events 2/2

You find a list of system messages in Appendix C.

9.3 Log line format

9.3.1 General log line format

Important | The following sections are only for internal use. There can be differences and missing parts as the log evolves along with the software

Header

The part up to message is a general log line prefix and is omitted in the examples below. The time is UTC.

YYYY-MM-DDTHH:MM:SS.UUUUUU+ZZ:ZZ hostname: facility.priority : message

Example: 2015-03-09T10:33:04.498277+00:00 acu : user.info acu_ctl: ADU_IF: XST:

Heading mode:

Example: acu_ctl: ADU_IF: HDG: Mode Ext angle 0.000

Breakdown: Mode: Ext, Fixed, None
Angle: current angle value in the calibration menu (used when fixed heading is selected)

GNSS - Position, velocity:

Current position/velocity information (received from ADU GNSS module). This information is logged for every PRQ.

Example: ADU_IF: GNSS: Fix 3 LLA lat lon alt VT vel trk

Breakdown: Fix= Fix type, 1: No fix, 2: 2D fix, 3: 3D fix
LLA= Position

lat: Latitude [Deg] [-90; 90]

lon: Longitude [Deg] [-180; 180]

alt: Altitude [m]

VT= Velocity

vel: Horizontal velocity (abs value) [m/s]

trk: Track angle (velocity direction in horizontal plane) [Deg] [-180; 180]

System time

Example: ADU_IF: 96984: System time reset - fast forward 19 s (1425891934 to 1425891953)

TXSU - Tx setup

Message sent from CU to ADU when Tx setup parameters change.

Example: ADU_IF: TXSU: s=x f=frq T=s att=bb/aa

Breakdown: ADU_IF: ADU interface, Tx setup
 s= Tx gain control mode
 f= Tx frequency [GHz]
 T= Power measurement time constant [s]
 att= Tx attenuator settings

bb: ACU attenuator [dB]

aa: ADU attenuator [dB]

Old format (pre-1.48)

ADU_IF: TXSU: s=4 f=14.215 T=60000 att=1000/1000 (DB / 100)

VMU (VSAT Modem Unit) handler:

Message sent from VMU (VSAT Modem Unit) handler to ADU handler when conditions change.

Example: DEMOD: VMU: RxLock=0 TxOn=0 BucOn=1

Breakdown: RxLock=rx rx: VMU has Rx lock
 TxOn=tx tx: VMU has asserted TxOn
 BucOn=buc buc: VMU has asserted BucOn

Old format (pre-1.49)

ADU_IF: VMU: RxLock=0 TxOn=1

PRQ - Pointing request

Message sent from ACU to ADU instructing it to enter a new operational mode.

Pointing request:

Example: ADU_IF: PRQ: 9 m=Acquisition sat=-37.5/0.0/1.5/2.0 acq=O/R sig=H/V/12.523
 trk=N/H/12.523/0.0 sid=V/0/0 lo=0.000 ofs=0.0/0.0/0.0

Breakdown: ADU_IF: ADU interface, pointing request, sequence number = nn
 m= Mode. Command

Satellite parameters:

Example: ADU_IF: PRQ: 9 m=Acquisition sat=pp/ss/ii/cc acq=O/R sig=H/V/12.523
 trk=N/H/12.523/0.0 sid=V/0/0 lo=0.000 ofs=0.0/0.0/0.0

Breakdown: sat= Satellite parameters
 pp: Position (longitude) [Deg]
 ss: Skew (satellite intrinsic) [Deg]

ii: Max inclination [Deg]
cc: Elevation cut-off [Deg]

Acquisition mode:

Example: ADU_IF: PRQ: 9 m=Acquisition sat=-37.5/0.0/1.5/2.0 acq=mode/oo
sig=H/V/12.523 trk=N/H/12.523/0.0 sid=V/0/0 lo=0.000 ofs=0.0/0.0/0.0

Breakdown: acq= Acquisition mode. R: Retry, O: Once
oo: Azimuth correction mode. R: Reset, U: Update, K: Keep

Signal (payload):

Example: ADU_IF: PRQ: 9 m=Acquisition sat=-37.5/0.0/1.5/2.0 acq=O/R sig=rr/tt/ff
trk=N/H/12.523/0.0 sid=V/0/0 lo=0.000 ofs=0.0/0.0/0.0

Breakdown: sig= Signal (payload)
rr: Rx polarization. H: Hor, V: Ver, L: LHC, R: RHC
tt: Tx polarization. Notation as for Rx polarization
ff: Rx frequency [GHz]

Signal (tracking):

Example: ADU_IF: PRQ: 9 m=Acquisition sat=-37.5/0.0/1.5/2.0 acq=O/R sig=H/V/12.523
trk=ss/rr/ff/bb sid=V/0/0 lo=0.000 ofs=0.0/0.0/0.0

Breakdown: trk= Signal (tracking)
ss: Tracking signal source. V: VMU analog, N: Narrowband, P: DVB power,
D: DVB SNR, G: GSC
rr: Tracking polarization. Notation as for Rx polarization
ff: Tracking frequency [GHz]
bb: Tracking symbol rate/bandwidth [Msps/MHz]

Signal identification:

Example: ADU_IF: PRQ: 9 m=Acquisition sat=-37.5/0.0/1.5/2.0 acq=O/R sig=H/V/12.523
trk=N/H/12.523/0.0 sid=mm/nn/tt lo=0.000 ofs=0.0/0.0/0.0

Breakdown: sid= Signal identification
mm: Mode. A: Any (Generic), V: VMU Rx lock, N: Narrowband, P: DVB
power, D: DVB lock, G: GSC
nn: DVB Network ID
tt: Timeout [s]

Rx LO:

Example: ADU_IF: PRQ: 9 m=Acquisition sat=-37.5/0.0/1.5/2.0 acq=O/R sig=H/V/12.523
trk=N/H/12.523/0.0 sid=V/0/0 lo=0.000 ofs=0.0/0.0/0.0

Breakdown: lo= Rx LO (ONLY USED if LNB has programmable LO(s) [GHz]

Lineup mode pointing offsets:

Example: ADU_IF: PRQ: 9 m=Acquisition sat=-37.5/0.0/1.5/2.0 acq=O/R sig=H/V/12.523
trk=N/H/12.523/0.0 sid=V/0/0 lo=0.000 ofs=0.0/0.0/0.0

Breakdown: ofs= Lineup mode pointing offsets. aa/ee/pp: Cross elevation/elevation/polarization [Deg]

XST - Extended status

The extended status message is requested / received once per second in the ACU. It is attempted to log only when something interesting happens, not to spam the log, and provides a log line at least once per hour.

State:

Example: ADU_IF: XST: 65 st=Norm:Trk(0) z=- nav=AIPT/AIPTC/DPX TxA/E=Y/Y 28.22
dBm hdg=-102.7 az/el=-160.6/51.4 ssi=11.10 chyz=0.00/0.12/0.06

Breakdown: st= ADU state, main state mm, substate ss, (further details below).

ADU state:

Main state	Substate	Information
Init	-	Initialising
POST	-	Power On Self Test
Rdy	-	Ready
Err	-	Error
Svc	-	Service switch

Table 9-3: ADU states

Main state	Substate	Information
Norm		Normal operation
	Idle	Idle
	Init	Initialising (e.g. moving antenna)
	Acq	Acquiring signal
	Trk	Tracking signal
	Man	Manual pointing (lineup)
	Fix	Fixed pointing (frequency scan)
	Bts	Bearing test
	Dpl	Deploy/Stow/Stop
	Abort	Error code Operation has been aborted
Caz		Azimuth calibration
	Run	progress (%) Running
	Done	Finished ok
	Err	Error code Finished with error
Cca	-	Cable calibration
Prod	-	Production mode (calibration)
Nrddy	-	Not ready (e.g. no GPS or heading)

Table 9-3: ADU states (Continued)

Error codes:

- 1 Low elevation
- 2 High elevation
- 3 Not tracking
- 4 XIM write fail
- 5 Rx not ok
- 6 No signal
- 7 RF setup invalid
- 8 Invalid satellite setup (inclined orbit sat used in azimuth adjust)
- 9 Invalid satellite setup (invalid ID mode in azimuth calibration)

Blocking zone status:

Example: ADU_IF: XST: 65 st=Norm:Trk(0) z=- nav=AIPT/AIPTC/DPX TxA/E=Y/Y 28.22 dBm hdg=-102.7 az/el=-160.6/51.4 ssi=11.10 chyz=0.00/0.12/0.06

Breakdown: z= Zone status. -: Not in blocking zone, B: In blocking zone, T: In no Tx zone.

NAV subsystem status:

Example: ADU_IF: XST: 65 st=Norm:Trk(0) z=- nav=AIPT/AIPTC/DPX TxA/E=Y/Y 28.22 dBm hdg=-102.7 az/el=-160.6/51.4 ssi=11.10 chyz=0.00/0.12/0.06

Breakdown:

Item	Not ok / OK	Subsystem	
Rx	a / A	Antenna control	"ADU in INU mode, Azimuth angle error low"
i / I	INU (Inertial navigation unit)	" INU functional"	
	p / P	Position	"Have GPS - Have a target satellite -"
	t / T	Tracking	"no pointing or pol errors"
Tx	a / A	Antenna control	"Rx antenna control = Ok"
	i / I	INU	"Rx INU = OK"
	p / P	Position	"Not low elevation"
	t / T	Tracking	"No pointing or Pol errors"
	c / C	Control	"No 'No TX' zones"
Trk.info	d / D	Direction accuracy for Tx	
	p / P	Polarization accuracy for Tx	
	x / X	Tracking converged (only used during Line Up)	

Table 9-4: Nav subsystem status

Old format (pre-1.49)

Example: ADU_IF: XST: 65 st=Norm:Trk(0) z=- pok=Y trk=Y TxA/E=Y/Y 28.22 dBm hdg=-102.7 az/el=-160.6/51.4 ssi=11.10 chyz=0.00/0.12/0.06
pok= Pointing ok for Rx. N: No, Y: Yes.
trk= Signal tracking active. N: No, Y: Yes.

TxA/E - Tx Allow/Enable:

Tx Allow: Indicates whether or not the ADU will allow Tx.

Requires: Normal mode Antenna pointing accuracy is within requirements (direction and polarization)

Tx Enable: Indicates whether or not Tx is enabled (BUC activated) Tx Allow + VMU TxOn

Example: ADU_IF: XST: 65 st=Norm:Trk(0) z=- nav=AIPT/AIPTC/DPX TxA/E=Y/Y 28.22 dBm hdg=-102.7 az/el=-160.6/51.4 ssi=11.10 chyz=0.00/0.12/0.06

Breakdown: TxA/E= Tx status. aa: Tx allowed, N: No, Y: Yes. ee: Tx enabled, N: No, Y: Yes pp dBm: Measured OMT power level.

Heading info:

Example: ADU_IF: XST: 65 st=Norm:Trk(0) z=- nav=AIPT/AIPTC/DPX TxA/E=Y/Y 28.22 dBm hdg=-102.7 az/el=-160.6/51.4 ssi=11.10 chyz=0.00/0.12/0.06

Breakdown: hdg= Heading (ship) [Deg] [-180:180].

Pointing relative:

Example: ADU_IF: XST: 65 st=Norm:Trk(0) z=- nav=AIPT/AIPTC/DPX TxA/E=Y/Y 28.22 dBm hdg=-102.7 az/el=-160.6/51.4 ssi=11.10 chyz=0.00/0.12/0.06

Breakdown: az/el= Azimuth/elevation to satellite (relative to north/horizontal) [Deg]

Signal strength: From DVB receiver in VIM

Example: ADU_IF: XST: 65 st=Norm:Trk(0) z=- nav=AIPT/AIPTC/DPX TxA/E=Y/Y 28.22 dBm hdg=-102.7 az/el=-160.6/51.4 ssi=11.10 chyz=0.00/0.12/0.06

Breakdown: ssi= Signal strength used for tracking. The value and its normalization depend on the current tracking signal source.

Current tracking corrections: Difference between actual and calculated pointing

Example: ADU_IF: XST: 65 st=Norm:Trk(0) z=- nav=AIPT/AIPTC/DPX TxA/E=Y/Y 28.22 dBm hdg=-102.7 az/el=-160.6/51.4 ssi=11.10 chyz=0.00/0.12/0.06

Breakdown: chyz= Current tracking corrections. hh: Heading, yy: Elevation, zz: Cross-elevation. (Only when elev >70deg)

Technical specifications

This appendix has the following sections:

- *SAILOR 600 VSAT Ka system components*
- *Outline drawings*
- *X7 Modem BUC & Console to ACU cable*

A.1 SAILOR 600 VSAT Ka system components

A.1.1 General specifications

Item	Specification
Frequency band	Ka-Band (e.g. THOR 7)
Rx	19.2 to 20.2 GHz
Tx	29.0 to 30.0 GHz
Reflector size	65 cm (25.5 inch)
Certification	Compliant with CE (Maritime), ETSI, RoHS, REACH
System power supply range	100-240 VAC ^a
Total system power consumption	240 W peak, 135 W typical DC (VSAT modem not included)
ADU cable type (ACU to ADU)	Single 50 Ohm coax cable for Rx, Tx, ACU-ADU modem and power
ACU to ADU cable, requirements	RF loss at 1950 MHz < 20 dB, 4450 MHz < 35 dB. DC Resistance: < 0.9 Ohm.
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. ACU with DC power (SAILOR 7016B): 20-32 VDC, start up voltage: 22 VDC guaranteed.

A.1.2 ADU

Item	Specification
Antenna type, pedestal	3-axis stabilised tracking antenna with integrated GNSS (GPS, GLONASS, Beidou)
Antenna type, reflector system	Reflector/sub-reflector, ring focus
Transmit gain (BUC flange)	43.4 dBi typ. @ 29.5 GHz (including radome)
Receive gain (LNB flange)	40.4 dBi typ. @ 19.7 GHz (including radome)
System G/T	17.2 dB/K typ. @ 19.7 GHz, at $\geq 10^\circ$ elevation and clear sky
BUC output power	5 W Ka BUC w. comm.
EIRP	50.4 dBW typical @ 29,5 GHz
LNB	Ka LNB, NF = 1.3 dB typical
Tracking receiver	Internal GSC, DVB-S2 and power
Polarisation	Circular Cross-Pol (TX:RHCP, RX:LHCP)
Satellite elevation range	5° to 90°
Azimuth, mechanical freedom	Unlimited (Rotary joint)
Elevation, mechanical freedom	-28° to $+120^\circ$
Cross elevation, mechanical freedom	$\pm 43^\circ$ (cross elevation axis tilt 35°)
Drive system	3 stepper motors w. FV direct drive. Electrodynamic braking at power off.
Ship motion, combined angular min.	Roll $\pm 25^\circ$ (in 6 s), Pitch $\pm 15^\circ$ (in 5 s), Yaw $\pm 10^\circ$ (in 8 s) ^a
Ship, turning rate and acceleration	$15^\circ/\text{s}$ and $15^\circ/\text{s}^2$
ADU motion, linear	Linear accelerations ± 2.5 g max., any direction, allows min 12 m mounting height offset
Pointing loss	≤ 0.2 dB RX (+/- 0.2°) 95% confidence
Satellite acquisition	Automatic - with or without Gyro/GPS compass input
Vibration, operational	Sine: Certified for EN60945 (8.7.2), DNV2.4-A and 1.1 g Cobham Maritime. Designed for MIL-STD-167-1 (5.1.3.3.5)

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

Item	Specification
Vibration, survival	Sine: Certified for EN60945 (8.7.2) dwell and EN60721-3-6 class 6M3 mod. by EN60721-4-6 Designed for MIL-STD-167-1 (5.1.3.3.5) dwell (no test required)
Shock	EN60721-3-6 class 6M3 mod. by EN60721-4-6
Temperature (ambient)	Operational: -25° C to 55° C Storage: -40°C to 85°C
Humidity	100%, condensing
Rain (IP class)	EN 60945 Exposed (IPx6)
Wind resistance	Operational: 80 kt. Survival: 110 kt.
Ice, survival	25 mm (1 inch)
Solar radiation	1120 W/m ² to MIL-STD-810F 505.4
Compass safe distance	1.4 m (55.1 inches) to EN 60945
Maintenance, scheduled	None (first 10 years)
Maintenance, unscheduled	All electronic, electromechanical modules and belts can be replaced.
Built-in tests	Power On Self Test (POST), Person Activated Self Test (PAST), Continuous Monitoring (CM) with error log
Radiation safety distance	30 m
Power OFF	Automatic safe mode
Input power	Powered by ACU
Dimensions (overall)	Diameter x Height: Ø 82 cm (32 inch) x H 91 cm (36 inch)
Weight, ADU	37 kg (82 lbs)

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

- a. For a satellite elevation range of 6° to 86° up to +/-30° roll, in combination with +/-15° pitch, can be accommodated.

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)
Connections ACU-VSAT modem	Delivered with cable for iDirect X7 modem
Ambient temperature	Operational: -25°C to +55°C Storage: -40°C to +85°C
Humidity	EN 60945 protected, 95% (non-condensing)
IP class	IP30
Compass safe distance	AC input (7016C): 0.3 m (12 inch) to EN 60945 DC input (7016B): 0.1 m (4 inch) to EN 60945
Interfaces	1 x N-Connector for antenna RF Cable (50 Ohm) with automatic cable loss compensation 1 x NMEA 0183 for Gyro/GPS compass input (prepared for NMEA 2000) 2 x F-Connectors (75 Ohm) for modem Rx and Tx 1 x Ethernet (User) 1 x Ethernet (Management) 1 x Ethernet (Modem) 1 x Ethernet (ThraneLink, service, setup etc.) 1 x RS-232 data (modem control) 1 x RS-422 data (modem control) 1 x DC power input 1 x Grounding bolt
Input power	See <i>System power supply range</i> and <i>Total system power consumption</i> in Table A-1 on page A-1.
Modem interface (control)	Generic, iDirect openAMIP protocol & custom protocol
Display and controls	Web interface, 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 Patents

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

Table A-4: Patents

ACU with DC power (SAILOR 7016B)

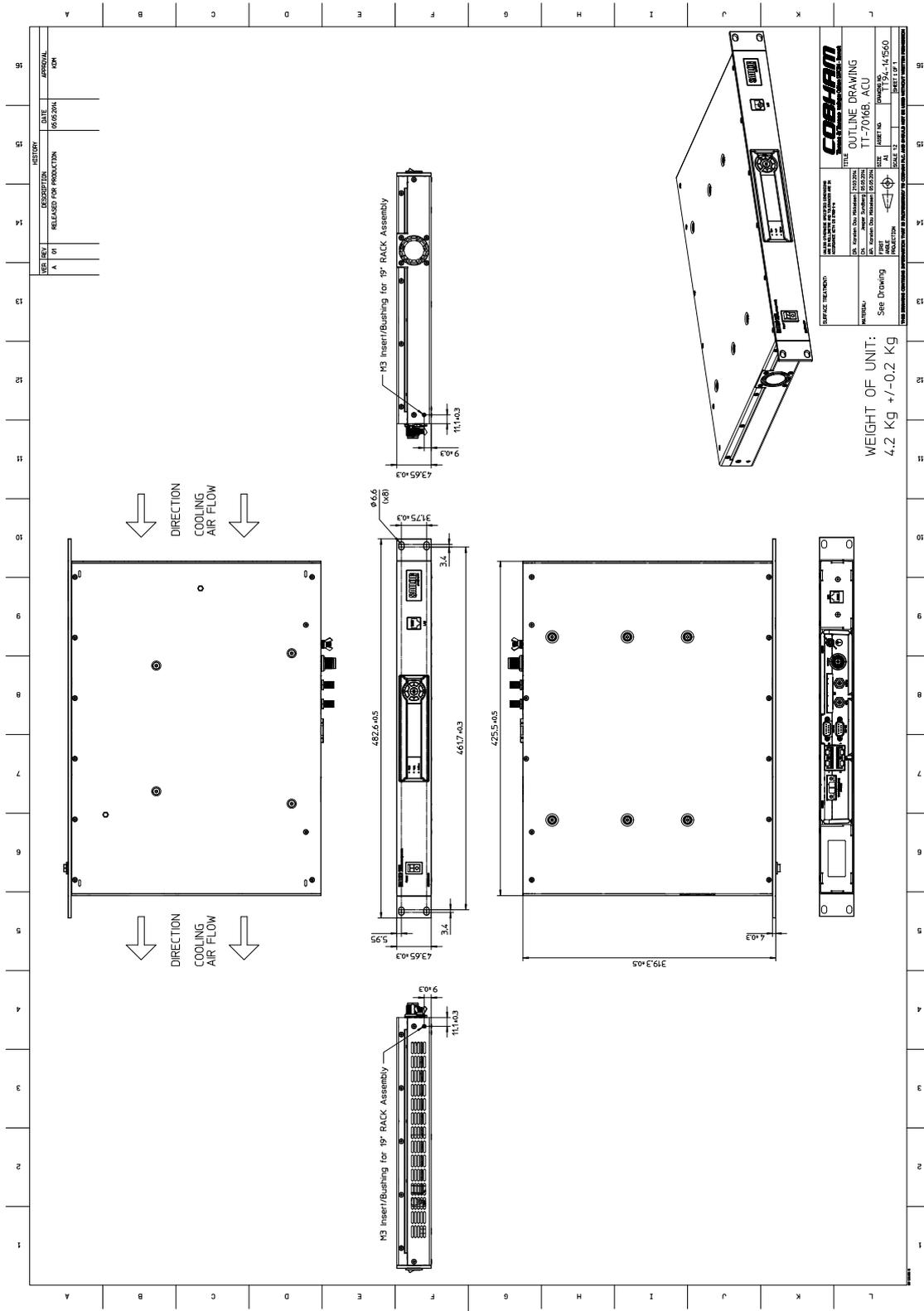


Figure A-3: Outline drawing: ACU, DC powered (SAILOR 7016B)

A.3 X7 Modem BUC & Console to ACU cable

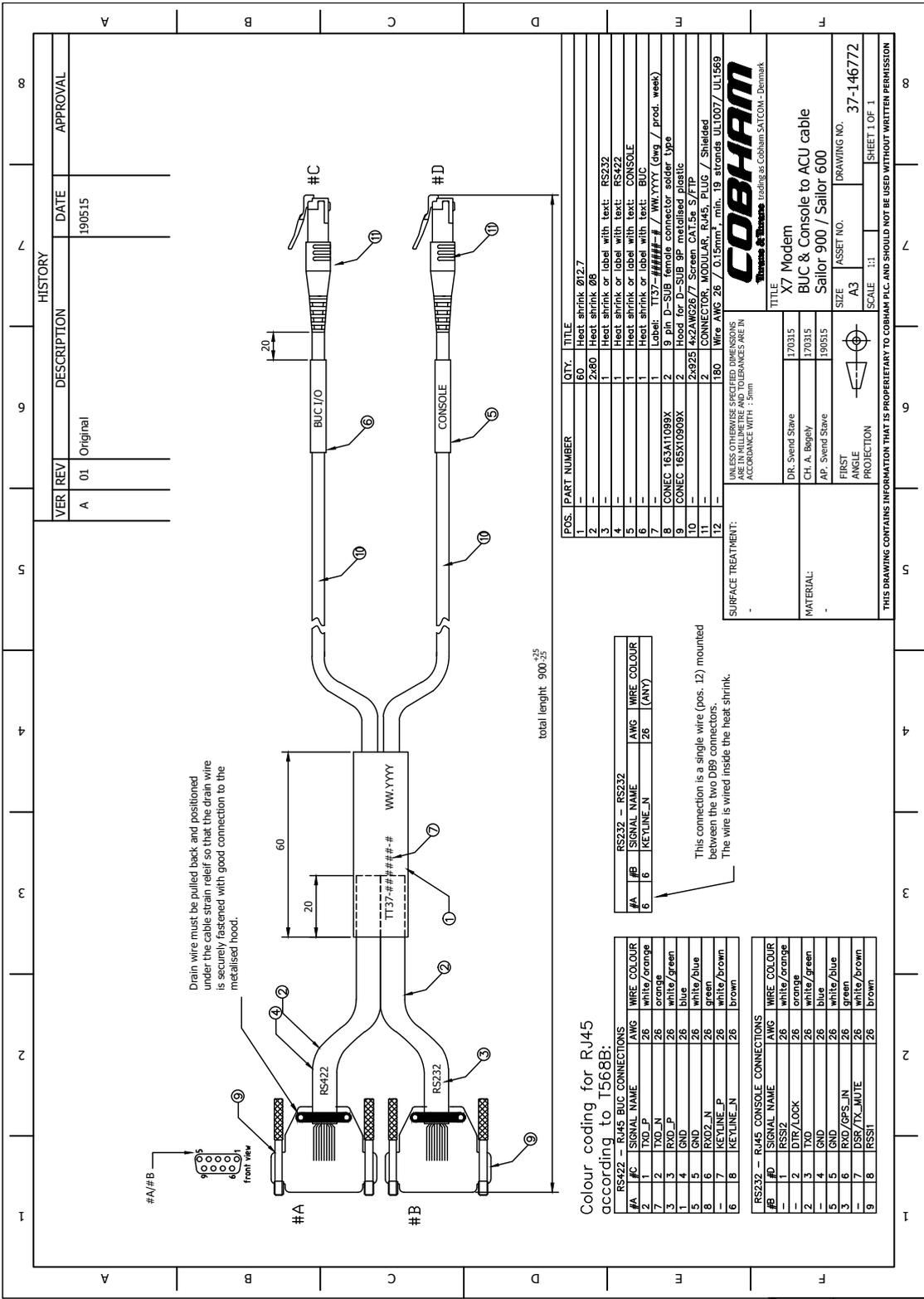


Figure A-4: X7 Modem BUC & Console to ACU cable

Ground and RF protection

This appendix has the following sections:

- *Why is a ground connection required?*
- *Recommendations*
- *Alternative ground for steel hulls*
- *Alternative ground for aluminum hulls*
- *Alternative ground for fiber glass hulls*
- *Separate ground cable*
- *RF interference*
- *Jumper cable for grounding*

B.1 Why is a ground connection required?

You must ground the SAILOR 600 VSAT Ka system for at least two reasons:

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

B.1.1 Safety

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

B.1.2 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.

B.2 Recommendations

B.2.1 To ground the ACU

To ground the ACU do as follows:

1. Ground the ACU to the ship/hull. For this purpose you may use a short ADU cable and a grounding kit.
2. 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 *To ground the ACU* on page 3-24.

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 ensure 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.

Do as follows:

1. Connect the foil to the hull by plenty of screws or hard-soldering.
2. 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 B-11.

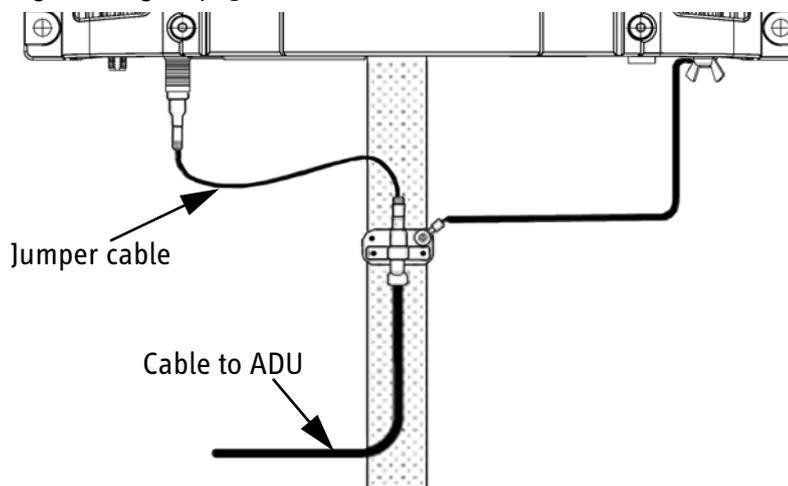


Figure B-1: Extending the ground plane

Per used jumper cable the maximum cable length of the cable to the antenna is reduced by:

- Enviroflex 400: 1.25 m
- SPUMA 400-FR: 6 m
- SUCOFEED 1/2" FR: 10 m

B.2.2 To ground the ADU

To ground the ADU do as follows:

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

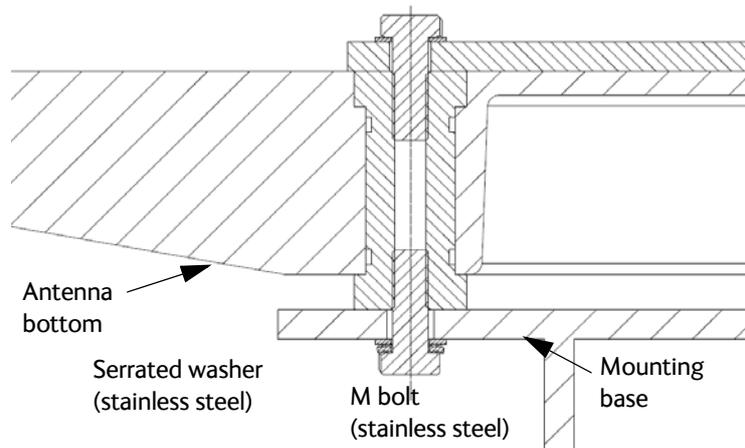


Figure B-2: Grounding the ADU

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 hull². 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.

2. Note that the ADU ground connection is made at the same electrical ground potential as the ACU.

B.3 Alternative ground 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.

B.3.1 To ground the ACU

To ground the ACU do as follows:

1. Ground the ACU preferably to the ship with the short cable.
2. Further, ground the ACU at its grounding stud in order to ensure a proper grounding if the short ADU cable is disconnected.
3. Establish the ground connection either at the hull (recommended) or at a dedicated RF ground if available (alternative).

Important

However, bear in mind that the ADU ground connection must be made at the **same electrical ground potential as the ACU** (see *To ground the ADU* on page B-4).

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.

B.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.

1. Make sure to remove painting, dirt, grease etc. at the mounting holes in order to make good electrical contact to the hull.
2. 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.

1. Route the ground cable parallel and close to the shielded coax cable connecting the ADU to the ACU grounding kit.
2. You can use a heavy gauge wire with tinned strands (min. 6 mm²) 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 B-9.

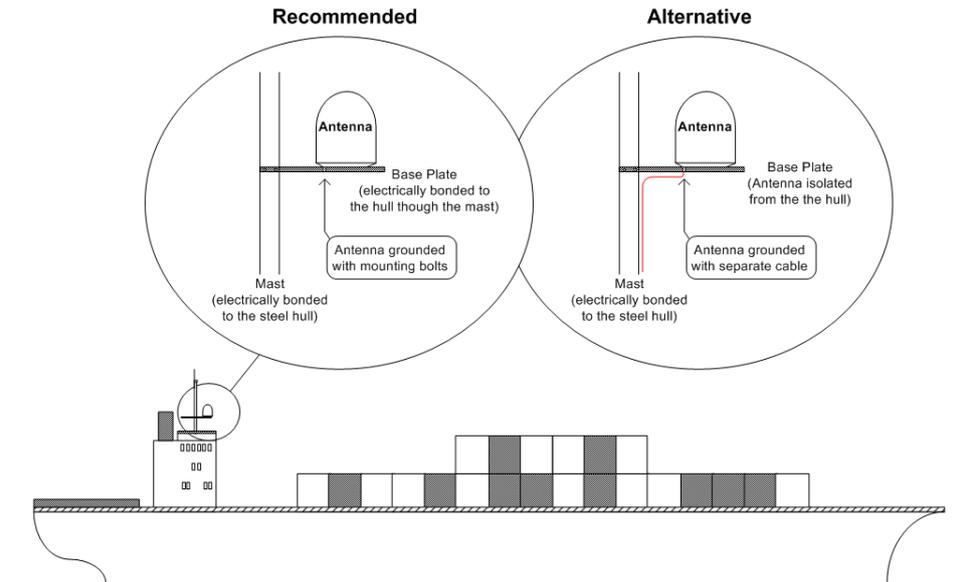


Figure B-3: Grounding at a dedicated RF ground (alternative)

B.4 Alternative ground 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.

B.4.1 To ground the ACU

To ground the ACU do as follows:

1. Ground the ACU preferably with the short cable.
2. Ground the ACU at its grounding stud to ensure a proper grounding if the short ADU cable is disconnected.
3. Establish the ground connection at a dedicated RF ground (either capacitively or electrically coupled).

Important

Remember to make the ADU ground connection at the **same electrical ground potential** as the 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.

B.4.2 To ground the ADU

To ground the ADU do as follows:

1. If the mounting base of the ADU is electrically connected to the hull (or any other ground potential than the ACU), isolate the ADU at its mounting bolts by means of shoulder bushings and washers, see B.6.3. This is done in order to prevent DC currents flowing in the hull thus causing electrolytic corrosion.
2. However, you must establish a ground connection via one of the mounting bolts and a separate ground cable.
3. Route the ground cable parallel and in close proximity to the shielded coax cable hence connecting the ADU to the ACU Grounding kit. Use a heavy gauge wire with tinned strands (min. 6 mm²) for this purpose.

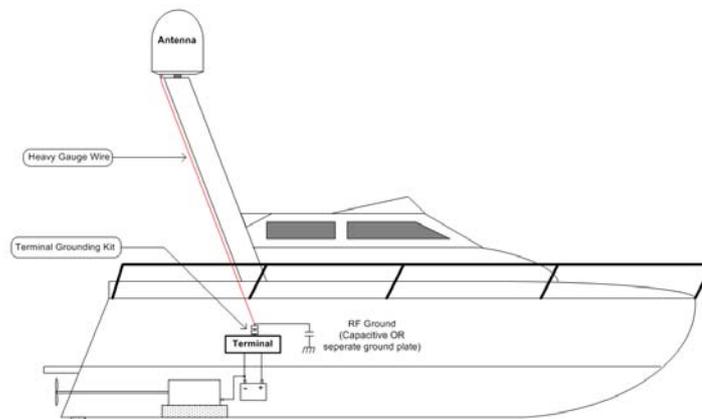


Figure B-4: Alternative grounding for aluminium hulls

B.5 Alternative ground for fiber glass hulls

B.5.1 To ground the ACU

To ground the ACU do as follows:

1. Preferably ground the ACU with the short ADU cable and a grounding kit (available from Thrane & Thrane A/S).
2. Ground the ACU at its grounding stud in order to ensure a proper grounding if the short ADU cable is disconnected.
3. You must establish the ground connection 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*).

B.5.2 To ground the ADU

To ground the ADU do as follows:

1. If the mounting base of the ADU is electrically connected to any other ground potential than the ACU (e.g. Lightning Ground), you must isolate the ADU at its mounting bolts with shoulder bushings and washers - see section B.6.3.
2. However, you must establish a ground connection via one of the mounting bolts with a separate ground cable.
3. You must route the ground cable in parallel and in close proximity to the shielded coax cable hence connecting the ADU to the ACU Grounding kit. Use a heavy gauge wire with tinned strands (min. 6 mm²) for this purpose.

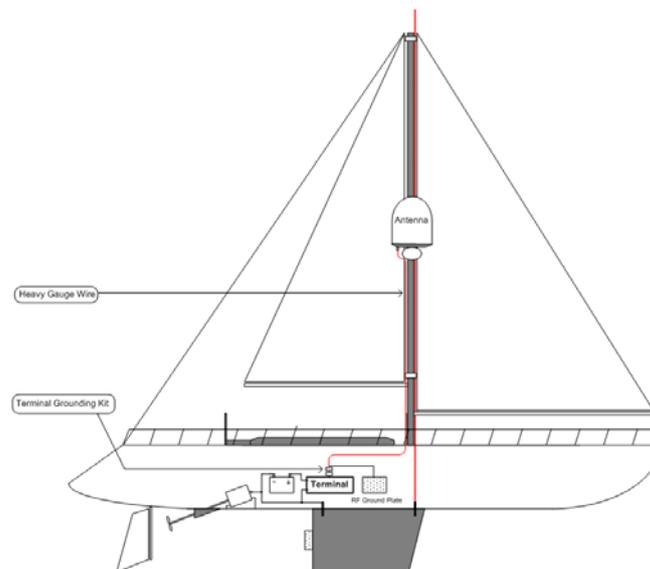


Figure B-5: Alternative grounding for fibreglass hulls

B.6 Separate ground cable

B.6.1 To make a ground cable

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 made using an appropriate cable with a cross section area of at least 6 mm² (AWG10) and terminated with insulated ring crimp terminals, see the illustration below. The crimp terminals must be a marine approved type e.g. the DuraSeal series from Raychem.

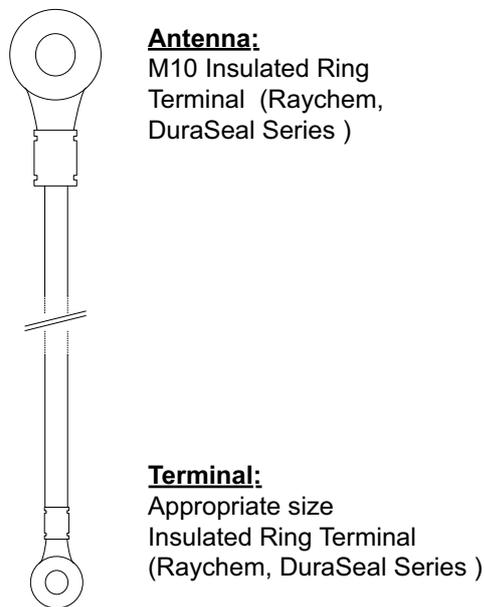


Figure B-6: Separate ground cable

B.6.2 Ground cable - connection

To mount the ground cable do as follows:

1. 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).
2. Connect the ground cable at one of the mounting/grounding bolts on the ADU.
3. Use bolts and washers of stainless steel and seal the joint with protective coating to avoid corrosion.
4. If the ADU is to be isolated from the mounting base, use shoulder bushings and washer, see figure B-7, *Isolation of the ADU from the mounting base* on page B-9.
5. At the other end, connect the ground cable as described in *To ground the ACU* on page B-2.

B.6.3 Isolation of the ADU from the mounting base

In cases where the ADU is to be isolated from the mounting base, do as follows:

1. Use shoulder bushings and washers (accessories) as illustrated below. Note that the isolation must be implemented on all four mounting bolts (including the bolt securing the ground cable).

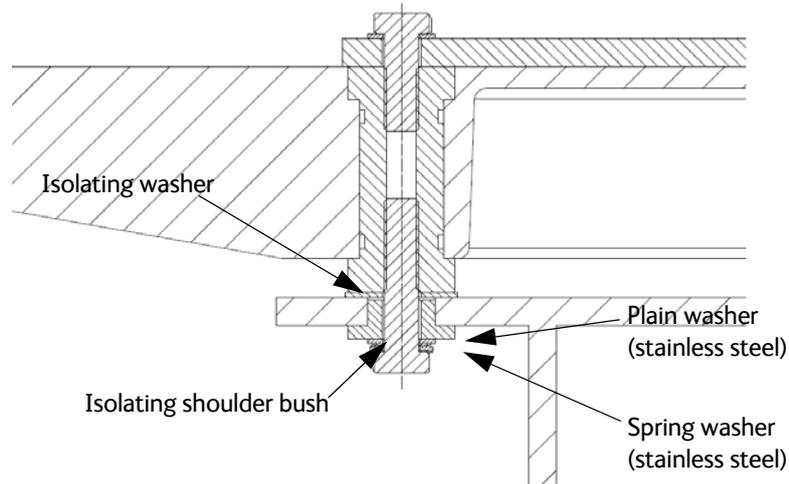


Figure B-7: Isolation of the ADU from the mounting base

2. Connect the ground cable at one of the mounting/grounding bolts on the ADU as illustrated below.
3. Seal the joint with protective coating to avoid corrosion.

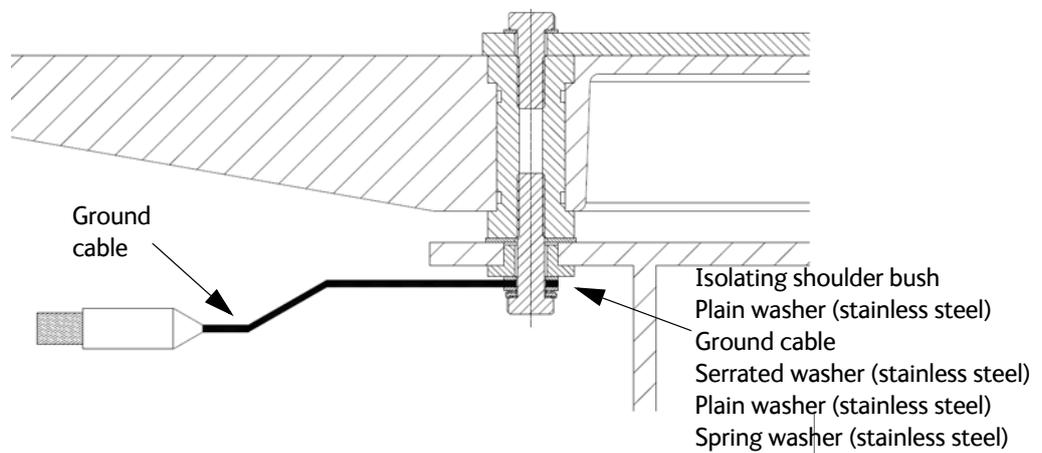


Figure B-8: ADU isolation and grounding cable

B.7 RF interference

Interference induced from nearby high-power RF transmitters might cause system failures and in extreme cases permanent damage to the SAILOR 600 VSAT Ka equipment.

If there are problems with interference from HF transmitters, do as follows:

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

B.8 Jumper cable for grounding

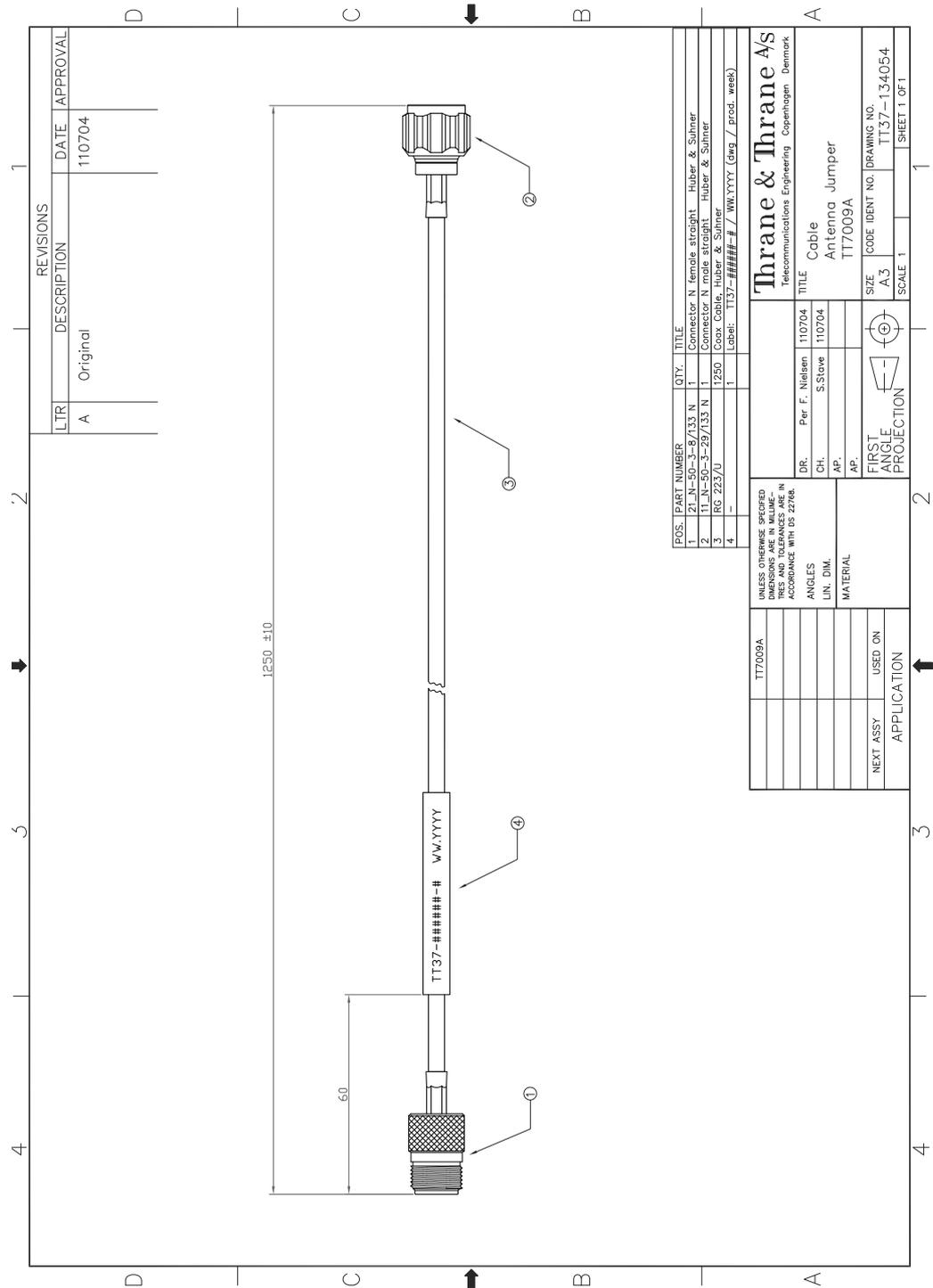


Figure B-9: Jumper cable for grounding (specifications)

System messages

This appendix has the following sections:

- *Event messages – overview*
- *List of ADU events*
- *List of ACU events*

C.1 Event messages – overview

The SAILOR 600 VSAT Ka 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 600 VSAT Ka 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, the Control Panel 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.

Note that the following sections cover the system messages for all SAILOR VSAT antennas. Some of the events may not be relevant for the antenna described in this manual.

C.2 List of ADU events

as of 2.2.2018

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 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 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 FPGA cannot be initialised and loaded correctly.
0A008-0	Antenna	ERROR	XIM production	Production/calibration data stored in the VIM 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/DMD/FDM and PMM. Check cables.
0A015-0	Antenna	ERROR	Azi DDM ABS device	Cannot initialise the azimuth DDM/DMD/FDM. 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/DMD/FDM. Info: See 0A015-0.
0A017-0	Antenna	ERROR	Ele DDM ABS device	Cannot initialise the elevation DDM/DMD/FDM. Info: See 0A015-0.
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.

Table C-1: ADU event messages

Error code (ID)	Unit	Severity	Description	Explanation
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.
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 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.
0A02D-0	Antenna	ERROR	BUC reference switch	The BUC reference switches do not work. Check PCM-VIM cable and replace cable, VIM or PCM.
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.

Table C-1: ADU event messages (Continued)

Error code (ID)	Unit	Severity	Description	Explanation
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/DMD/FDM shutdown but detected by the cross-elevation motor control.
0A03D-0	Antenna	ERROR	Ele DDM shutdown	As Azi DDM/DMD/FDM shutdown but detected by the elevation motor control.
0A03E-0	Antenna	ERROR	PMM shutdown	As Azi DDM/DMD/FDM 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.
0A043-0	Antenna	WARNING	LNB voltage low	The voltage for the LNB is too low probably caused by a malfunctioning VIM or LNB.
0A044-0	Antenna	WARNING	LNB voltage high	The voltage for the LNB is too high probably caused by a malfunctioning VIM.
0A047-0	Antenna	ERROR	VIM PLL lock	The PLL of the VIM 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.
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.
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.

Table C-1: ADU event messages (Continued)

Error code (ID)	Unit	Severity	Description	Explanation
0A050-0	Antenna	ERROR	Azi DDM communication	Communication error between PCM and azimuth DDM/DMD/FDM. Check SUB-D connectors and cables.
0A051-0	Antenna	ERROR	Xel DDM communication	Communication error between PCM and cross-elevation DDM/DMD/FDM. Check SUB-D connectors and cables.
0A052-0	Antenna	ERROR	Ele DDM communication	Communication error between PCM and elevation DDM/DMD/FDM. 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.
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.

Table C-1: ADU event messages (Continued)

Error code (ID)	Unit	Severity	Description	Explanation
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.
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.
0A063-0	Antenna	WARNING	BCM warning	The BCM has observed an unusual situation with regards to the PLL. If the situation persists, check the BCM.
0A064-0	Antenna	ERROR	BCM communication	Communication error between PCM and BCM. Check SUB-D connectors and cables.
0A065-0	Antenna	ERROR	Deploy/Stow	Deploy/stow error. The antenna did not properly unlock (deploy), or the stow switch never closed (stow).

Table C-1: ADU event messages (Continued)

Error code (ID)	Unit	Severity	Description	Explanation
0A066-0	Antenna	ERROR	OMT error	Problem with OMT. Temperature out of range or OMT cable may be broken.
0A067-0	Antenna	WARNING	Automatic stow	The antenna automatically stowed because it detected significant movement.
0A068-0	Antenna	WARNING	Polarisation tuning	Polarisation tuning was not successful. Polarisation may be incorrect.
0A069-0	Antenna	ERROR	BCM error	The BCM PLL failed to initialize.

Table C-1: ADU event messages (Continued)

C.3 List of ACU events

as of 2.2.2018

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).
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 external 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.
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.
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.

Table C-2: ACU event messages

Error code (ID)	Unit	Severity	Description	Explanation
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.
08075-0	ADM	WARNING	Rx cable calibration	The calibration of the ACU-antenna cable failed. The cable could be defective, too long, of too poor quality, not properly connected, or the VIM or ACU hardware could be defective.
08076-0	ADM	WARNING	Dual mode configuration	The system is configured as a dual antenna system, but the system setup is invalid. The dual mode function may not work properly or performance could be degraded. Info code: xxxxxxx1 = Antenna types are different, they must be identical xxxxxxx2 = Master or Slave hardware does not support dual mode operation. xxxxxxx3 = Software version on master and slave are different, they must be identical.
08078-0	ADM	WARNING	VMU TX frequency invalid	The satellite modem did not provide a Tx frequency, or it is invalid. A default Tx frequency is assumed, but this may degrade Tx performance. To remove this warning re-configure the modem to provide the correct Tx frequency.
08079-0	ADM	WARNING	ACU Fan	Internal fan is malfunctioning.
0807A-0	ADM	WARNING	Automatic azimuth calibration pending	Automatic azimuth calibration mode is enabled. The system tries to perform an azimuth calibration using the target satellite whenever satellite data is received from the modem. After successful calibration the feature is automatically disabled and the system returns to normal operation. WARNING: If a system has not completed azimuth calibration after the installation, the blocking zones may appear to be at wrong angles.
0807B-0	ADM	WARNING	OTC required (Calibration outdated)	BUC calibration is outdated. Rerun it from the Core Module by using the One Touch Commissioning in the web interface.
0807C-0	ADM	ERROR	System configuration	Invalid ACU / antenna combination.
0807E-0	ADM	WARNING	Keyline signal	The keyline signal on the dual antenna master does not match the keyline signal on the slave. Check the keyline splitter cable. When fixed, the ACU needs to be rebooted to clear the event.

Table C-2: ACU event messages (Continued)

Error code (ID)	Unit	Severity	Description	Explanation
0807F-0	ADM	WARNING	Local administration enabled	Local administration mode is currently enabled. This allows login without providing the admin password. Will be disabled after 1 hour or next reboot.
08080-0	ADM	WARNING	Satellite info mismatch	Current chosen manual satellite information does not match information from the modem. Please select another satellite for manual pointing.
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.
0810E-0	ADM	ERROR	RF calibration	The RF calibration is not valid.

Table C-2: ACU event messages (Continued)

Error code (ID)	Unit	Severity	Description	Explanation
08800-0	ADM	ERROR	Internal power supply	An internal power supply voltage is outside its allowed range.
08840-0	ADM	WARNING	Master PLL lock	The master PLL has lost lock. Check the input reference signal.
08841-0	ADM	ERROR	Tuner lock	The internal tuner PLL was unable to lock.
08842-0	ADM	WARNING	GSC demodulator	The GSC demodulator has reported an error.
08843-0	ADM	WARNING	DVBS demodulator	The DVBS demodulator cannot be initialised and loaded correctly.
08844-0	ADM	WARNING	BUC voltage	The BUC voltage is out of range.
08845-0	ADM	WARNING	LNB voltage	The LNB voltage is out of range. The LNB might be switched off to protect the power supply circuitry. Reactivate satellite profile to try again, check LNB cable and surroundings if the problem persists.
08880-0	ADM	ERROR	WLAN configuration error	Configuration of WLAN module failed.
08A00-0	ADM	WARNING	GX Core Module fan	There is a problem with the Core Module fan. Check/clean and replace if necessary.
08A01-0	ADM	WARNING	GX Core Module heater	There is a problem with the Core Module heater. Check and replace if necessary.
08A02-0	ADM	WARNING	GX Core Module temperature	The Core Module temperature is out of range. This may affect performance, and the Core Module will be shut down if the situation gets worse. If the "GX core module heating" event is also present, the internal heater is currently warming up the unit to its operational temperature.
08A03-0	ADM	ERROR	GX Core Module power	The Power Good signal from the Core Module is low. The issue can either be: - Internal Core Module or internal cable failure - Temperature of Core Module is too high and it has been turned off (*) - GMU has been manually switched off on the front panel (*) (*) = Only on systems with GMU.
08A04-0	ADM	WARNING	iDirect modem	The ACU detected a warning/error in the iDirect modem. Log into the modem for more information. Info: 0x00000001: Temperature error 0x00000002: Test error 0x00000004: Fan error
08A05-0	ADM	WARNING	GX Core Module heating	The GX core module heater is active. It will automatically be cleared when the core module reaches the operational temperature level.

Table C-2: ACU event messages (Continued)

Error code (ID)	Unit	Severity	Description	Explanation
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 C-2: ACU event messages (Continued)

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 set up VSAT modem parameters. Note that the following sections cover the command line interface for all SAILOR VSAT antennas.

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

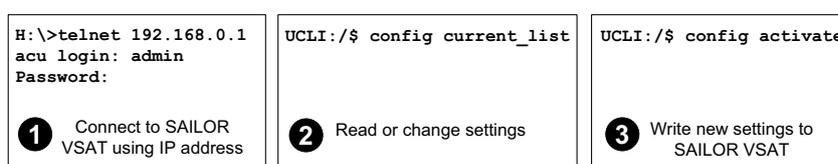


Figure D-1: How to use the command line interface (example for telnet)

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.

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

The interface is on the standard Telnet port 23 or SSH port 22. Use any LAN port and corresponding IP address of the 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, login **admin** and password.

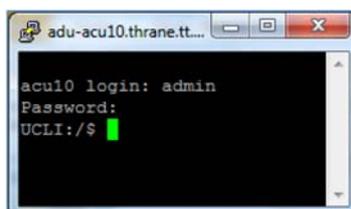


Figure D-2: Command line interface, login

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 <ul style="list-style-type: none"> • single • master • slave
dual_antenna status	<ul style="list-style-type: none"> • 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
<code>help</code>	Shows a list of commands available, including a short description.
<code>help satellite</code>	Shows the sub commands and description for the command <code>satellite</code> .
<code>help modem</code>	Shows the sub commands and a short description for the command <code>modem</code> .
<code>help track</code>	Shows the sub commands and description for the command <code>track</code> .
<code>help status</code>	Shows the sub commands and description for the command <code>status</code> .
<code>help system</code>	Shows the sub commands and a short description for the command <code>system</code> .
<code>help config</code>	Shows the sub commands, unit and description for the command <code>config</code> .
<code>help zone</code>	Shows the sub commands, unit and description for the command <code>zone</code> .
<code>help demo</code>	
<code>help dual antenna</code>	
<code>help exit</code>	

Table D-6: UCLI command: `help`

D.2.6 modem

Command	Description
<code>modem</code>	Shows a list of sub commands available, including a short description.
<code>modem name</code>	Shows the VSAT modem name of the currently active satellite profile (entered in the web interface).
<code>modem model</code>	Shows the currently active VSAT modem model (selected in the web interface).
<code>modem gps_fix</code>	Shows the current GPS position
<code>modem gps_lat</code>	Shows the latitude value of the current position.
<code>modem gps_lon</code>	Shows the longitude value of the current position.

Table D-7: UCLI command: `modem`

D.2.7 satellite

Command	Description
<code>satellite name</code>	Shows the name of the currently active satellite profile.
<code>satellite lon</code> <code>satellite lon 1W</code>	Shows or sets the longitude position of the satellite, in degrees. <ul style="list-style-type: none"> 1.0W or 1.0E or -1.0 for west and 1.0 for east
<code>satellite skew</code> <code>satellite skew 3.7</code>	Shows or sets an additional skew offset of the satellite ^a . Some satellites have 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. <ul style="list-style-type: none"> Skew of the satellite: -90° to +90°.
<code>satellite max_inc</code> <code>satellite max_inc 2.5</code>	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. <ul style="list-style-type: none"> Maximum inclination of satellite 0.0° to 90°
<code>satellite rx_pol</code> <code>satellite rx_pol v</code>	Shows or sets the current RX polarisation: <ul style="list-style-type: none"> v (vertical) h (horizontal) l (left) r (right)
<code>satellite tx_pol</code> <code>satellite tx_pol v</code>	Shows or sets the current TX polarisation: <ul style="list-style-type: none"> v (vertical) h (horizontal) l (left) r (right)
<code>satellite ele_cut_off</code> <code>satellite ele_cut_off 5</code>	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. <ul style="list-style-type: none"> Valid range: 0° to 90°
<code>satellite rx_lo</code>	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
<pre>satellite rx_rf_freq satellite rx_rf_freq 12.123456 9.75</pre>	<p>Shows or sets the Rx frequency and LNB Lo frequency.</p> <ul style="list-style-type: none"> • 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. <p>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</p> <p>Example: 1567.890 MHz = 11.567890 GHz – 10 GHz</p>
<pre>satellite rx_if_freq satellite rx_if_freq 1200.123 9.75</pre>	<p>Shows or sets the IF Rx frequency together with the LNB Lo frequency.</p> <ul style="list-style-type: none"> • 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. <p>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</p> <p>Example: 11.567890 GHz = 10 GHz + 1567.890000 MHz</p>
<pre>satellite tx_lo</pre>	<p>Shows the current TX LO frequency, fixed at Ku band: 12.8 GHz Ka band: 28.05 GHz</p>

Table D-8: UCLI command: `satellite` (Continued)

Command	Description
<pre>satellite tx_rf_freq satellite tx_rf_freq 14.123456</pre>	<p>Shows or sets the RF frequency used for tx.</p> <ul style="list-style-type: none"> Valid range: <ul style="list-style-type: none"> Ku band: 13.75 GHz to 14.5 GHz. Ka band: 29 GHz to 30 GHz. <p>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)</p> <p>Example: 1308.300000 MHz = 14.108300 GHz – 12.8 GHz</p>
<pre>satellite tx_if_freq satellite tx_if_freq 1200.123</pre>	<p>Shows or sets the IF frequency for tx.</p> <ul style="list-style-type: none"> Valid range: <ul style="list-style-type: none"> Ku band: 950 MHz to 1700 MHz. Ka band: 950 MHz to 1950 MHz <p>Note: Configuring the L-band tx frequency automatically configures the Ku-band frequency: Ku-band frequency = 12.8 GHz (BUC Lo) + L-band frequency</p> <p>Example: 14.108300 GHz = 12.8 GHz + 1308.300000 MHz</p>

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 600 VSAT Ka.
status track_all	Shows the current values for all tracking parameters: <ul style="list-style-type: none"> 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
<code>system</code>	Shows the sub commands available, including a short description.
<code>system restart</code>	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.
<code>system info</code>	Shows the software version, part names and serial numbers of the SAILOR 600 VSAT Ka.

Table D-10: UCLI command: `system`

D.2.10 track

Command	Description
<code>track</code>	Shows the sub commands available, including a short description.
<code>track mode</code> <code>track mode dvb</code>	Shows or sets the receiver bandwidth or mode, the way the SAILOR 600 VSAT Ka tracks the satellite: <ul style="list-style-type: none"> • narrow (recommended, uses the built-in 300 kHz filter of the SAILOR 600 VSAT Ka) • 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 600 VSAT Ka to track the satellite. You must configure <code>dvb_sym</code> and <code>dvb_nid</code>.) • GSC (uses Inmarsat Global Signalling Channel) • GSCpwr (uses power of Inmarsat Global Signalling Channel)
<code>track dvb_sym</code> <code>track dvb_sym 22</code>	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. <ul style="list-style-type: none"> • Valid range: 0.1 — 99

Table D-11: UCLI command: `track`

Command	Description
<code>track dvb_nid</code> <code>track dvb_nid 0</code>	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. <ul style="list-style-type: none"> Valid range: 0 — 65535 A NID of '0' disables the NID check. Then the NID will be omitted in the verification of the transponder.
<code>track rx_rf_freq</code>	The frequency for the receiver to tune to. Verify that the frequency is in the same range as the modem <code>rx_rf_frequency</code> , above or below 11.7 GHz. If <code>rx_rf_freq</code> is set to 0, the tracking frequency is the same as the RX frequency provided by the modem <ul style="list-style-type: none"> 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` (Continued)

D.2.11 zone

Command	Description
<code>zone</code>	Shows the sub commands, unit and description for the command <code>zone</code> .
<code>zone <id> azimuth <start angle> <end angle></code>	Sets the azimuth angles of the blocking zone for one zone. <ul style="list-style-type: none"> Valid zones: 0 to 7 Valid angles: 0 to 360
<code>zone <id> elevation <start angle> <end angle></code>	Sets the elevation angles for a blocking zone. <ul style="list-style-type: none"> Valid zones: 0 to 7 Valid angles: 0 to 360
<code>zone <id> tx_off <yes no></code>	Enables or disables TX inside the blocking zone.
<code>zone <id> active <yes no></code>	Enables or disables the blocking zone.
<code>zone <id></code>	Shows the setting for the blocking zone.

Table D-12: UCLI command: `zone`

Approvals

This appendix lists the approvals for SAILOR 600 VSAT Ka:

- *CE (RED)*
- *Telenor antenna approval*
- *Telenor antenna approval*

E.1 CE (RED)

The SAILOR 600 VSAT Ka is CE certified (RED directive) as stated in the “Declaration of Conformity with RED Directive”, enclosed in copy on the next page.



EU Declaration of Conformity

Hereby **Thrane & Thrane A/S trading as Cobham SATCOM** declares that the following equipment complies with the specifications of:

RED directive 2014/53/EU concerning Radio Equipment

Equipment included in this declaration

Ku Models	Description	Part no.
7080A 7090B 7090E Consists of	SAILOR 800 VSAT Ku SAILOR 900 VSAT Ku SAILOR 900 VSAT High Power	
7008A	SAILOR 800 VSAT Above Deck Unit (ADU)	407008A-xxx-01
7009B	SAILOR 900 VSAT Above Deck Unit (ADU)	407009B-xxx-01
7009E	SAILOR 900 VSAT HP Above Deck Unit (ADU)	407009E-xxx
7016C	SAILOR Antenna Control Unit (ACU)	407016C-xxx

GX Models	Description	Part no.
7090C 7060A Consists of	SAILOR 100 GX SAILOR 60 GX	
7009C	SAILOR Above Deck Unit GX (ADU)	407009C-xxx-01
7006A	SAILOR 60 GX Antenna (ADU)	407006A-xxx-01
7016C	SAILOR Antenna Control Unit (ACU)	407016C-xxx
7023A	SAILOR GX Modem Unit	407023A-xxx

Ka Models	Description	Part no.
7090D 7060B Consists of	SAILOR 900 VSAT Ka SAILOR 600 VSAT Ka	
7009D	SAILOR Above Deck Unit Ka (ADU)	407009D-xxx-01
7006B	SAILOR 600 Ka Antenna (ADU)	407006B-xxx-01
7016C	SAILOR Antenna Control Unit (ACU)	407016C-xxx

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

The full text of the EU declaration of conformity is available at the following internet address:

<http://sync.cobham.com/satcom/support/downloads>

Document no.: 99-157422-A

E.2 Telenor antenna approval



Antenna Approval

TSBc (Telenor Satellite Broadcasting AS) hereby approves the antenna mentioned below with the restrictions listed for the use on the TSBc space segment. The restrictions are based on that the antenna must be compliant with “*VSAT Type Approval Procedures for Earth Station on Vessels (ESVs) accessing Telenor Space Segment*”.

Antenna manufacturer:	<u>Thrane</u> & Thrane A/S trading as Cobham SATCOM Lundtoftegaardsvej 93D, KD-2800 Kgs. Lyngby, DENMARK Tel: +45 39 55 88 00, Fax: +45 39 55 88 88, info@thrane.com
Antenna Model:	SAILOR 600 VSAT Ka
Antenna:	65 cm, Stabilized maritime Ka-band antenna, 3 axis
Transmit Gain:	43.7 dBi at 29.75 GHz
Tx axial ratio:	1.06 (on axis), 1.1 (within -1 dB contour) at 29.5 GHz
Polarisation:	Circular (THOR 7, Tx: RHCP/ Rx: LHCP)
Transmit Frequency:	29.5 – 30.0 GHz
Receive Frequency:	19.7 – 20.2 GHz
Maximum allowed EIRP:	35 dBW/40 kHz

Stabilized platform movements and pointing accuracy

The manufacturer confirms that the Sailor 600 Ka Maritime VSAT Antenna, when being operated within the specified ship motion limits, is able to maintain RMS pointing accuracy towards the satellite to within $\pm 0.2^\circ$. The specified ship motion limits are:

Roll= 30° in aperiod of 6 sec

Pitch= 15° in aperiod of 5 sec

Yaw= 10° in aperiod of 8 sec

If the ship motion in terms of vibration and shock should exceed the specified limits, an additional safety mechanism is built in to protect neighboring satellite systems and will, via control signals to the BUC, disable signal transmission if the pointing error towards the satellite exceeds $\pm 0.5^\circ$.

Antenna testing and reproduction

The antenna approval is based on test data provided by the manufacturer during an antenna system testing at Politecnico di Torino Antenna Laboratory (LACE), Italy, October 2015. The manufacturer is responsible for quality reproduction in the factory. Any major changes in the construction of the antenna or RF system are subject to revision, and will be considered on case-by-case basis.

Environmental standards

The antenna complies with, inter alia, the following environmental standards including EMI/EMC/ERM: EN 60945, EN 60950, R&TTE Directives 1999/5/EC (essential requirements), ETSI EN 301 489-12; V1.2.1 (2003-05).

Telenor Satellite Broadcasting AS - © October 2015

A

ABS	ADU Bus Slave
ACU	Antenna Control Unit
ADM	ACU Digital Module. A main processor board in the ACU.
AMB	Antenna Module Bus

B

BUC	Block Up Converter - The BUC can be thought of the “transmitter”, and its actions are effectively the direct opposite to the LNB. The BUC consists of the Up Converter and HPA.
-----	---

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

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

- FBB FleetBroadband
- 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.
- GSC Global Signaling Channel.

H

- HDT HeaDing True, NMEA sentence.
- HTTPS HyperText Transfer Protocol Secure.

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.

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

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

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

REACH A regulation of the European Union, adopted to improve the protection of human health and the environment from the risks that can be posed by chemicals, while enhancing the competitiveness of the EU chemicals industry.

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.

RoHS Restriction of Hazardous Substances

ROSS Roaming Oceanic Satellite Server

S

SMTPS	Simple Mail Transfer Protocol Secure
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.
SSH	Secure Shell. A network protocol for secure data communication, remote shell services or command execution and other secure network services between two networked computers that it connects via a secure channel over an insecure network. ,
STARTTLS	Start TLS begins a process where the email program and server turn an unencrypted connection into a connection that is secured and encrypted with either SSL or TLS.

T

TLS	Transport Layer Security
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U

UCLI	User Command Line Interface
------	-----------------------------

V

VLAN	Virtual Local Area Network
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W

WAN	Wide Area Network
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X

XIM	Xim Interface Module, term for the module that connects the PCM and the ACU. X stands for one of various interface modules.
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