

**COBHAM**

# SAILOR 100 GX

Technical manual



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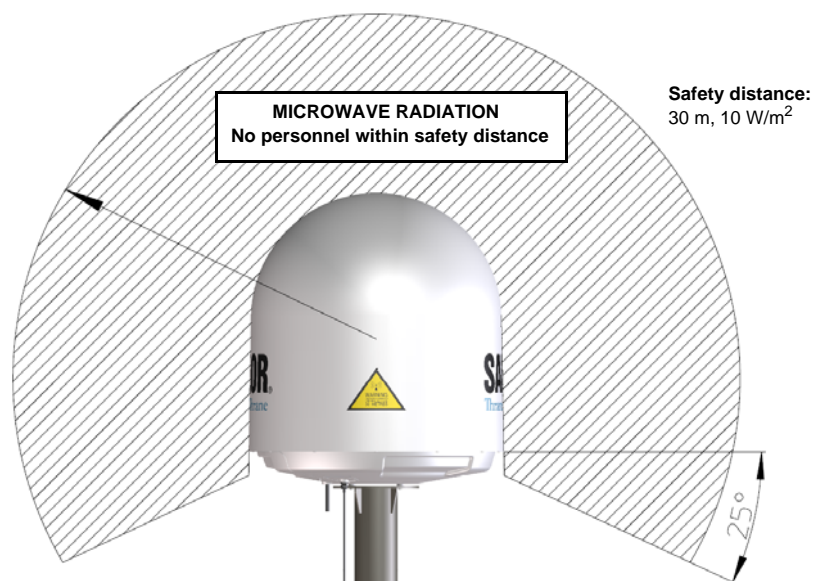
## Safety summary

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

### Microwave radiation hazards

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

The minimum safety distance to the Above Deck Unit reflector on the focal line is 30 m, based on a radiation level of  $10 \text{ W/m}^2$ . No hazard exists  $>25^\circ$  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 and other transmitters* on page 3-13 — it may cause damage to the Above Deck Unit.

**Compass Safe Distance:**

SAILOR 100 GX antenna or ADU (Above Deck Unit): min. 100 cm (ENC 60945).

SAILOR 100 GX ACU (Antenna Control Unit): min. 10 cm (EN 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 100 GX 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**

The voltage range for the SAILOR 100 GX ADU and ACU is 20 – 32 VDC. The Above Deck Unit is powered by the ACU.

If a 24 VDC power bus is not available, an external 115/230 VAC to 28 VDC power supply can be used, for example a SAILOR 6080 Power Supply.

The voltage range for the SAILOR 100 GX GMU is 100 – 240 VAC.

**Do not operate in an explosive atmosphere**

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

**Keep away from live circuits**

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

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

# Record of Revisions

Rev.	Description	Release Date	Initials
A	Original document	26 June 2015	UFO



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# About this manual

## 1.1 Intended readers

This is an installation and service manual for the SAILOR 100 GX 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 & maintenance*

This manual has the following appendices:

- *Technical specifications*
- *Ground and RF protection*
- *System messages*
- *Approvals*

## 1.3 Software version

This manual is intended for SAILOR 100 GX with **software version 1.50 (ADU and ACU)**. The GMU software version is shown in the GMU web interface.

## 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 100 GX system*
- *Part numbers and options*

## 2.1 SAILOR 100 GX system

### 2.1.1 Overview

The SAILOR 100 GX is a unique stabilized maritime GX antenna system operating in the Ka-band (19.2 to 30 GHz). It is used with the Global Xpress service from Inmarsat, delivering consistent high-performance download speeds of up to 50 Mbps and 5 Mbps over the uplink. The following figure shows the coverage map of the GX service at global service introduction.

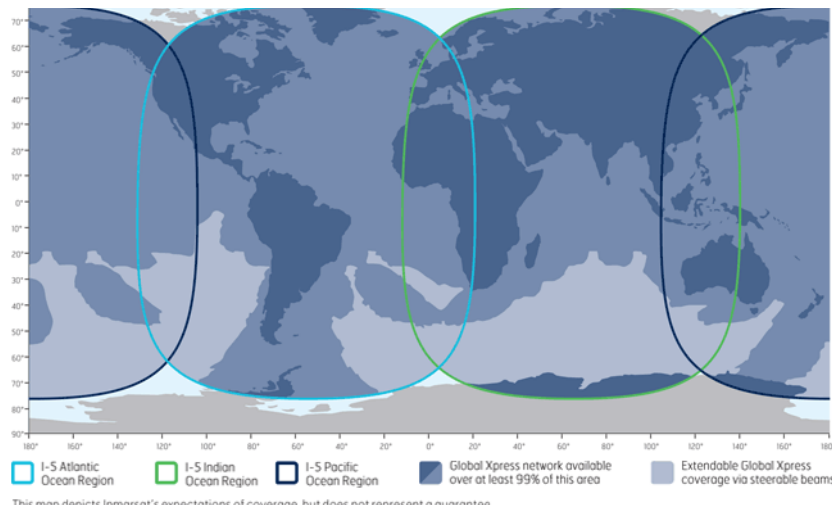


Figure 2-1: GX coverage map

The SAILOR 100 GX system consists of the following units:

- Above Deck Unit (ADU)
- Antenna Control Unit (ACU)
- GX Modem Unit (GMU)
- SAILOR 6080 AC/DC Power Supply Unit (optional)

The system only 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 DC motors act as brakes during transport and when the ADU is not powered. You can access the SAILOR 100 GX remotely and make in-depth performance analysis using the built-in web interface.

The following figure shows the SAILOR 100 GX system.



Figure 2-2: ADU, ACU and GMU

## SAILOR 100 GX features

- Single 50 Ohm coax cable for the ADU.
- One-Touch Commissioning.
- Gyro-free operation.
- SNMP support.
- Secure connection, HTTPS and SSH.
- Remote access using SAILOR FleetBroadband over WAN.
- Remote or local simultaneous software update of ADU, ACU and GMU via PC and Internet browser.
- Global RF configuration.
- Full remote control and troubleshooting with built-in test equipment (BITE).
- ACU with 4 x LAN, NMEA 0183, NMEA 2000, RS-232 and RS-422.
- ACU is DC powered. Start up voltage: 22 VDC guaranteed, operating range: 20 – 32 VDC.
- GMU with 8+2 LAN, RS-232 and RS-422 and I/O connector.
- No scheduled maintenance.



## 2.1.2 Above Deck Unit (ADU)

The SAILOR 100 GX ADU is a 103 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 (plus skew) and can be used in environments with elevations of  $-25^{\circ}$  to  $+125^{\circ}$ . The ADU weighs 126 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 100 GX ADU

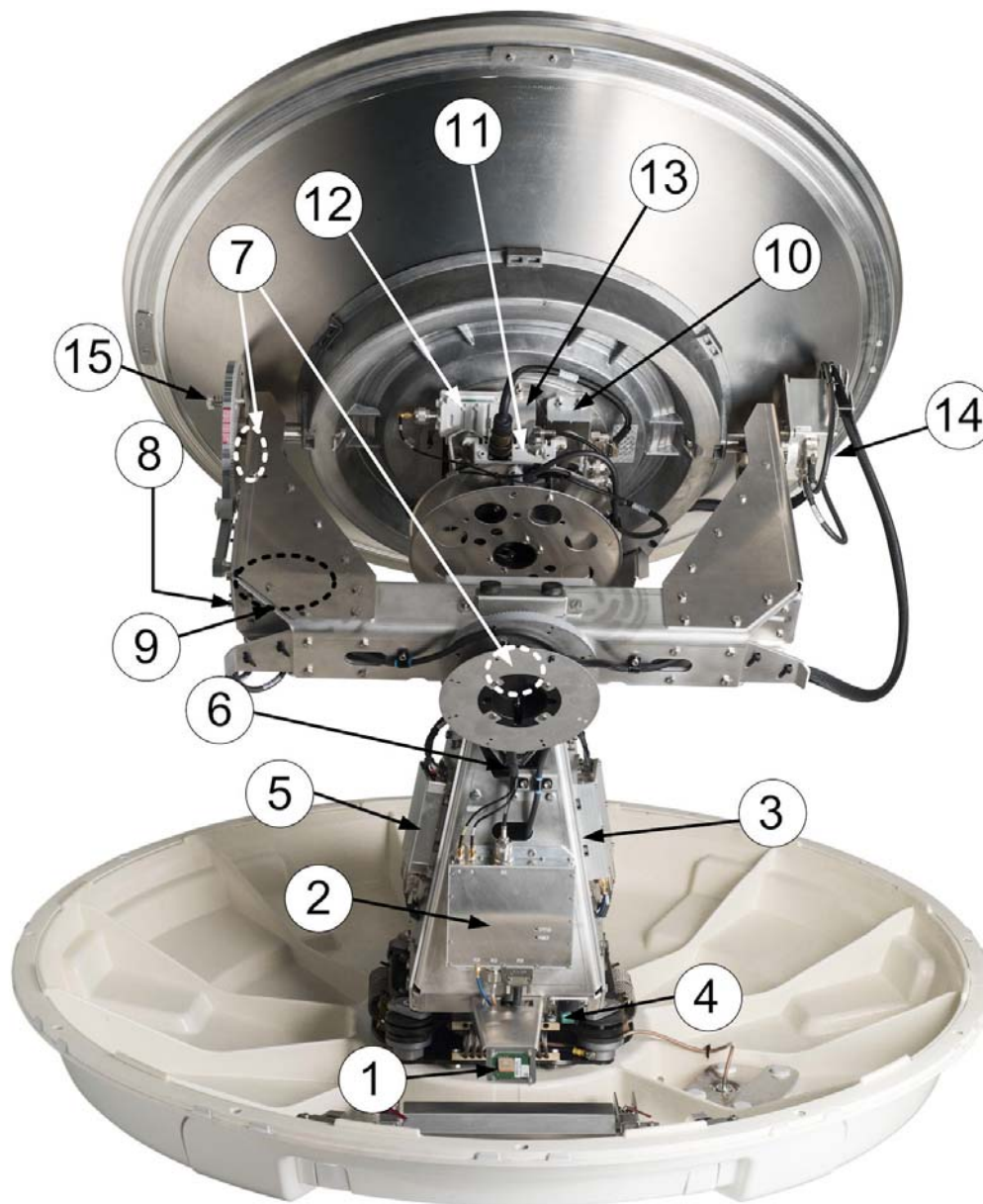


Figure 2-4: Above Deck Unit modules 1/2

1. GPS module.
2. VSAT Interface Module (VIM2).
3. Pedestal Control Module (PCM).
4. Service switch.  
In switch-off position the DC Motor Driver modules and the BUC are turned off for safe conditions during service and repair. The switch must be set to on for normal operation.
5. Motor Driver Module for cross elevation (DDM/SMD).
6. Cross elevation motor and encoder.

7. Zero Reference Module (x3) (ZRM) (not visible on photo). (2 in the figure above, 1 in the figure below)
8. DC-Motor Driver Module for elevation (on the bottom) (DDM).
9. Elevation motor and encoder (not visible).
10. BUC Control Module (BCM).
11. Block Up Converter (BUC).
12. Low Noise Block downconverter (LNB),
13. Polariser.
14. Inertial Sensor Module (ISM).
15. Elevation locking pin to lock the antenna dish in a fixed position.



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

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

Four lifting brackets (included in the delivery) and reuse of packing material help 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. The large service hatch of the radome gives easy access to the ADU on site. The service switch in the ADU stops the DC Motor Driver modules and turns the BUC off. The service tools for replacing modules are placed on a tool holder inside the radome.

All modules have a service and power LED status indicator. Each module is encapsulated in a metal box with self-contained mounting bolts. If necessary, belts and modules can be exchanged through the service hatch on site.

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

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 GMU, 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 GMU.

The ACU provides DC power to the ADU through a single coaxial cable. You can use the SAILOR 6080 AC/DC Power Supply to provide the DC power to the ACU. 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 has the following interfaces and switch:

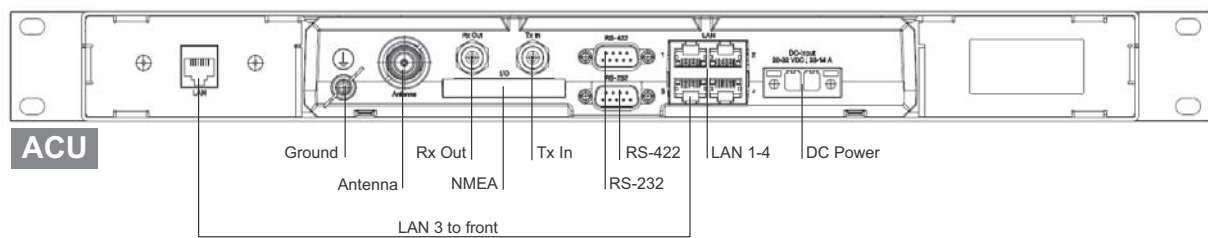


Figure 2-7: ACU (connector panel)

- N-connector for ADU cable (50 Ohm).
- 2 x F connectors for Rx and Tx cables (75 Ohm) to GMU.
- Multi connector for NMEA interfaces (for input from GPS compass or Gyro compass).
- RS-422 interface for modem control.
- RS-232 interface for modem control.
- 4 x LAN ports for 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 GX Modem Unit (GMU)

The GMU is the modem in the system. The GMU comes in a 19" rack version.

The GMU has the following interfaces and switch:

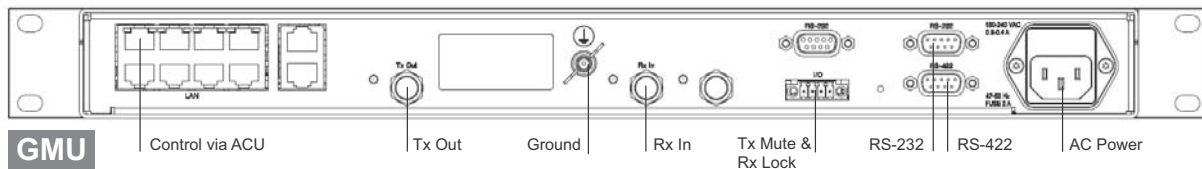


Figure 2-8: GMU (connector panel)

- 8 + 2 ports, one active for modem control and user equipment.
- 3 x F connectors for Rx and Tx cables (75 Ohm) to ACU (Rx2 not active)
- RS-422 interface for modem control.
- 2 x RS-232 interfaces, one for modem control, one not active.
- I/O connector for Tx Mute and Rx Lock.
- Ground wing nut.
- AC Power connector.
- On/Off power switch (at the front).

## 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 100 GX, you need to activate the system for the GX 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 100 GX system:

Part number	Description
407009C-00500	Above Deck Unit (ADU)
407016B-00500	Antenna Control Unit (ACU)
407023A-00500	Global Xpress Modem Unit (GMU)

Table 2-1: Part numbers for the SAILOR 100 GX system

### 2.2.2 Options for SAILOR 100 GX

The following options are available for the SAILOR 100 GX 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 100 GX 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 GMU*
- *To connect the ADU, ACU and GMU*

## 3.1 What's in the box

### 3.1.1 To unpack

Unpack the ADU, ACU and GMU and check that the following items are present:

- SAILOR 7009C ADU with 4 lifting brackets (already mounted)
- Accessory kit for SAILOR 7009C ADU:
  - Package with bolts, washers and cable glands (2 sizes)
- SAILOR 7016B ACU
- Accessory kit for SAILOR 7016B ACU:
  - NMEA multi-connector
  - Connector 2PF pi7.62 straight
  - RJ45 patch cable (0.5 m)
  - Coax cable F-F, low loss, 75 Ohm (2 pcs)
  - RJ45 patch cable (2 m)
- SAILOR 7023A GMU
- Accessory kit for SAILOR 7023 GMU including
  - Wiecon 3.5 mm spacing, 4 pol connector for cable
  - RJ45 patch cable (1 pce)
  - Power cable 230 VAC
  - RS-232/RS-422 cable (2 pcs)
- Installation manual

### 3.1.2 Initial inspection

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



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

After unpacking the system, i.e. removing the top and sides of the wooden box and opening the cartons, inspect it thoroughly for hidden damage and loose components or fittings. If the contents are incomplete, if there is mechanical damage or defect, or if the system does not work properly, notify your dealer.

### 3.1.3 Tools needed

- Unbraco key (4 mm), included, mounted on a tool holder inside the ADU radome.
- Torx TX 20 to open the locks of the service hatch
- Wrench to fasten the mounting bolts for the ADU
- Wrench to fasten the N connector at the ADU
- PC and Internet browser
- Crimping tools

### 3.1.4 Transport of the antenna

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



**CAUTION!**

**Do not lock the antenna dish with the elevation locking pin during transport.**

**Do not strap parts of the antenna.**

**These actions might cause damage to the antenna.**

Damage due to actions listed above will void the warranty.

## 3.2 Site preparation

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

- *General site considerations*
- *Obstructions (ADU shadowing)*
- *Blocking zones 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 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 100 GX 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 100 GX 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. Cobham SATCOM's recommendation is that the radome should NOT be painted because it may impact RF performance and may lead to over-heating, causing the antenna to go in safe mode (switch off).

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

### 3.2.2 Obstructions (ADU shadowing)

The ADU is stabilized in 3-axis (plus skew) and can be used in environments with elevations of  $-25^{\circ}$  to  $+125^{\circ}$  to allow for continuous pointing even in heavy sea conditions. The ADU beam is approximately 1 m in diameter for the first 30 m from the ADU. Beyond 30 m the beam gradually widens so that it is approximately 5 m in diameter at 100 m distance. This beam expansion continues with increasing distance. Any obstructions, such as masts, funnels, bridge house etc. within this field can cause signal degradation or signal loss.

**Note**

Note that due to the short wavelength at 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.

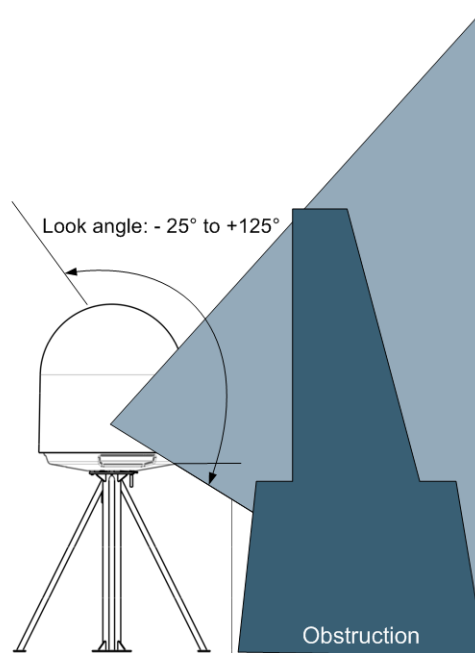


Figure 3-1: Signal degradation because of obstructing objects

### 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 6-22.

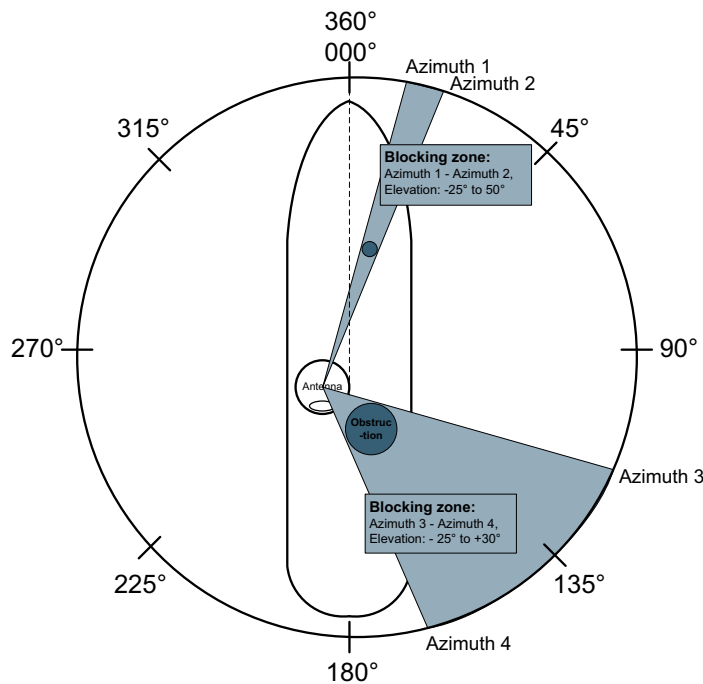


Figure 3-2: 2 blocking zones with no-transmit zones, azimuth (example)

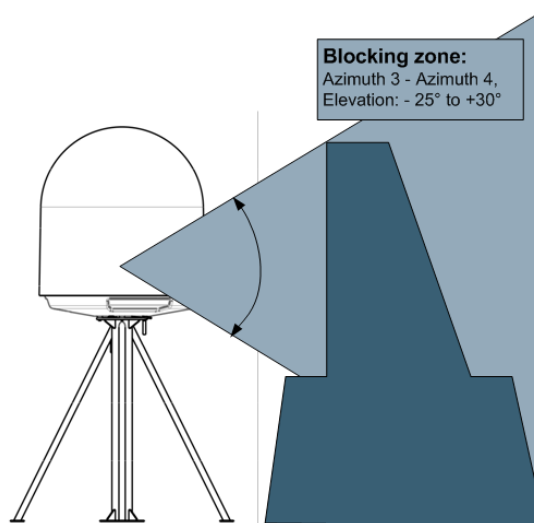


Figure 3-3: Blocking zone with no-transmit zones, elevation angle (example)

### 3.2.4 Safe access to the ADU (radiation hazard)

The ADU radiates up to 54.5 dBW EIRP. 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<sup>2</sup>.



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.

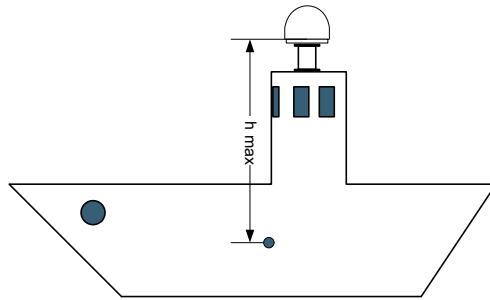


Figure 3-5: Maximum distance from the ship's motion centre (h max)

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 ADU mounting height (h max)	
	Full performance	Potential risk of damage
4 s	12 m	16 m
6 s	27 m	35 m
8 s	48 m	62 m
10 s	75 m	98 m

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

### 3.2.6 Mast foundation and height

The ADU mast must be designed to carry the weight of the ADU (126 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 15 mm.
  - **4 gusset plates:** Minimum 15 mm thick, must be placed close to the holes in the mounting plate and evenly distributed.

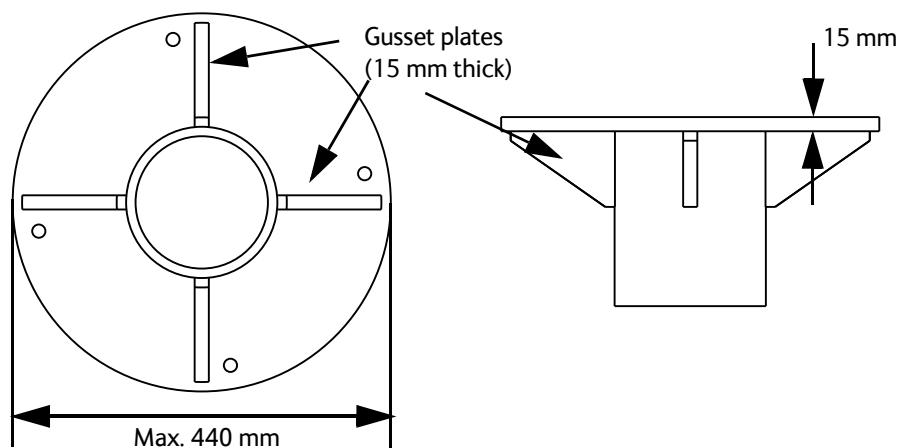


Figure 3-6: ADU mast flange, top and side view

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

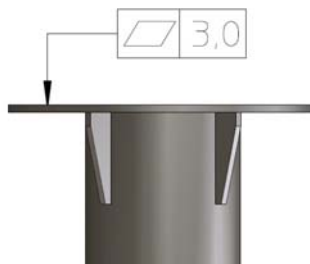


Figure 3-7: ADU mast flange, recommended flatness on the mast mount plateau





**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).

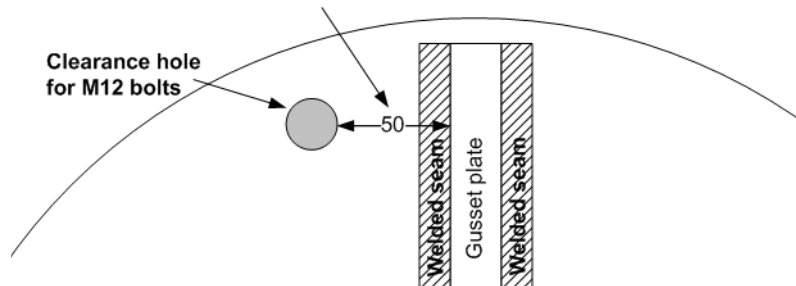


Figure 3-8: ADU mast flange, distance to the welded seam

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

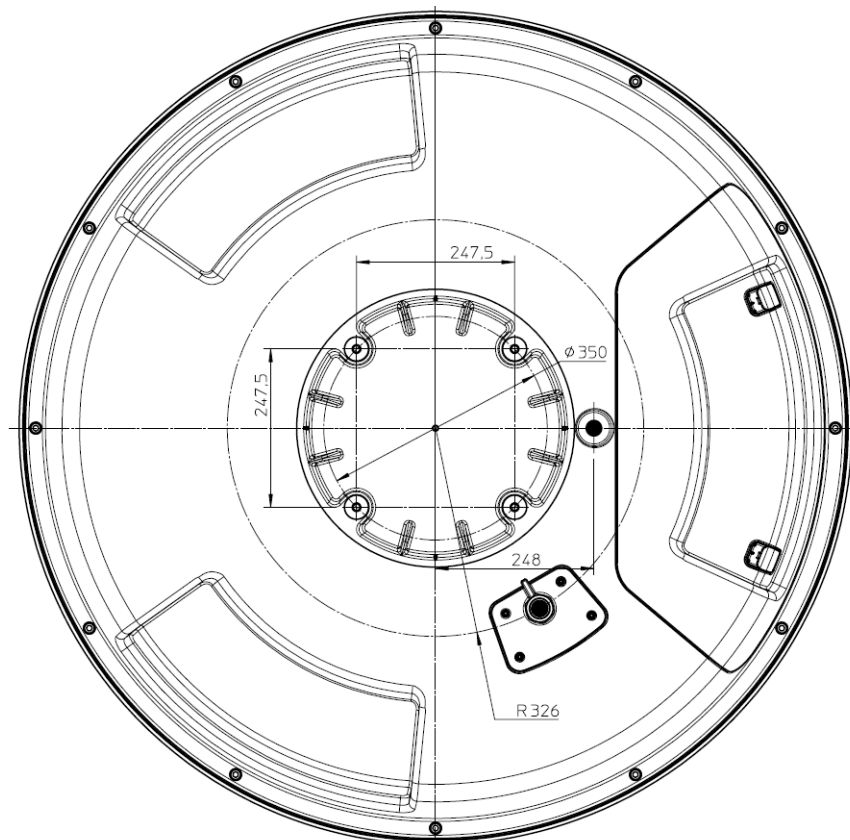


Figure 3-9: ADU, bottom view

## 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-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.

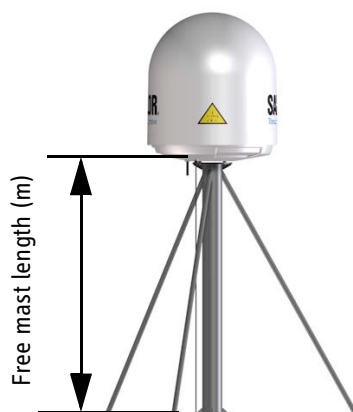


Figure 3-10: Free mast length and bracing for a tall mast

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

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

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

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

The following tables show the minimum dimensions for a ADU mast with and without stays or wires. Note that the values are only guidelines

- always consider the environment and characteristics of the ship before deciding on the mast dimensions.


Mast without braces	Max. free mast length (steel), (m)	Outer Diameter (mm)	Wall Thickness (mm)	Weight (kg/m)
	0.4 <sup>a</sup>	200	5	24.0
	0.6	220	5	26.5
	0.8	250	5	30.2
	1	270	5	32.7

Table 3-2: Mast dimensions without braces

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

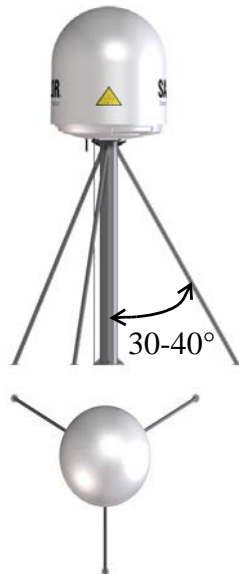
Mast with 3 braces	Max. free mast length (steel), (m)	Outer Diameter (mm)	Wall Thickness (mm)	Outer Diameter for brace (mm)	Thickness for brace (mm)
	1.2	140	10	50	5.0
	1.2	200	5	50	5.0
	1.6	140	10	70	5.0
	1.6	200	5	70	5.0
	2	160	10	70	5.0
	2	220	5	70	5.0
	2.5	180	10	80	5.0
	2.5	220	5	80	5.0

Table 3-3: Mast dimensions with 3 braces


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

Table 3-4: Mast dimensions with 2 braces

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



Figure 3-11: Free space for access to the service hatch

### 3.2.7 Interference from radar, GPS and other transmitters

**Note**

Do not place the ADU close to interfering signal sources or receivers. For allowed distances to other transmitters see Figure 3-13: *Recommended distance to transmitters (m) for frequencies below 1000 MHz* on page 3-15. We recommend testing the total system by operating all equipment simultaneously and verifying that there is no interference.

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 100 GX 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  $\pm 15^\circ$ , you can avoid the worst interference by mounting the ADU at a different level – meaning that the ADU is installed minimum  $15^\circ$  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 100 GX ADU. Therefore it is recommended to ensure as much vertical separation as possible when the SAILOR 100 GX ADU has to be placed close to a radar antenna.

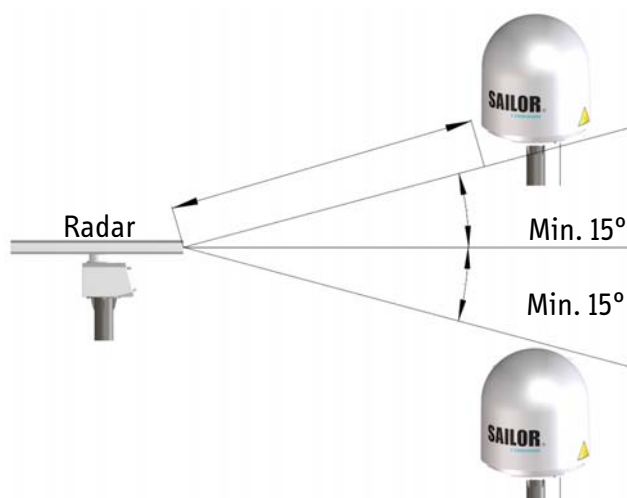


Figure 3-12: Interference with the vessel's radar

## 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 100 GX ADU.

X-band (~ 3 cm / 10 GHz) damage distance		
Radar power	SAILOR 100 GX ADU	
	$d_{\min}$ at 15° vertical separation	$d_{\min}$ at 60° vertical separation
0 – 10 kW	1.0 m	1.0 m
30 kW	2.0 m	1.0 m
50 kW	3.3 m	1.7 m

Table 3-5: Minimum radar separation, X-band

S-band (~ 10 cm / 3 GHz) damage distance		
Radar power	SAILOR 100 GX ADU	
	$d_{\min}$ at 15° vertical separation	$d_{\min}$ at 60° vertical separation
0 – 10 kW	2.0 m	1.0 m
30 kW	3.0 m	1.5 m
50 kW	5.0 m	2.5 m

Table 3-6: Minimum radar separation, S-band

The separation distance for C-band (4-8 GHz) radars should generally be the same as for 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 100 GX 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.

### Other transmitters

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

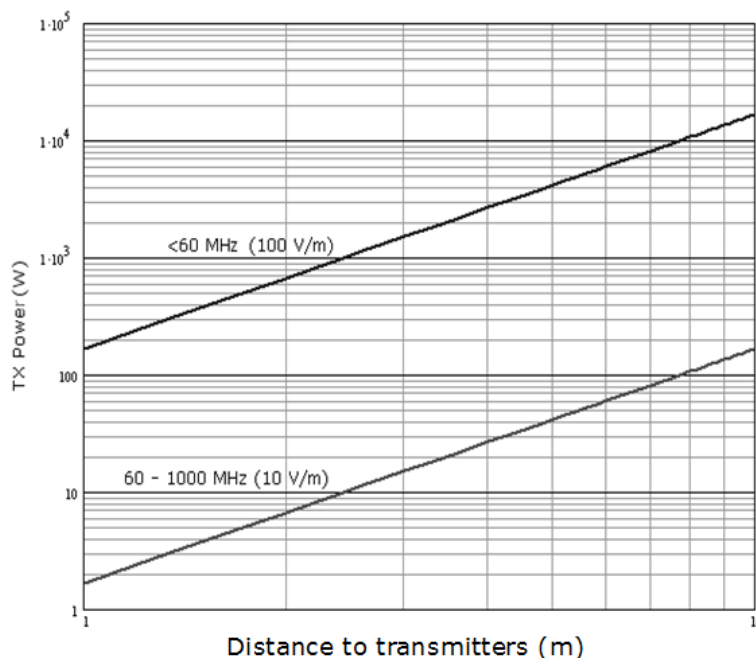


Figure 3-13: Recommended distance to transmitters (m) for frequencies below 1000 MHz

### 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 3-14: 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

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



**WARNING!** Use a strong webbed sling with a belt to lift the ADU without damaging the radome. Make sure that the sling can carry the ADU's weight (126 kg).



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

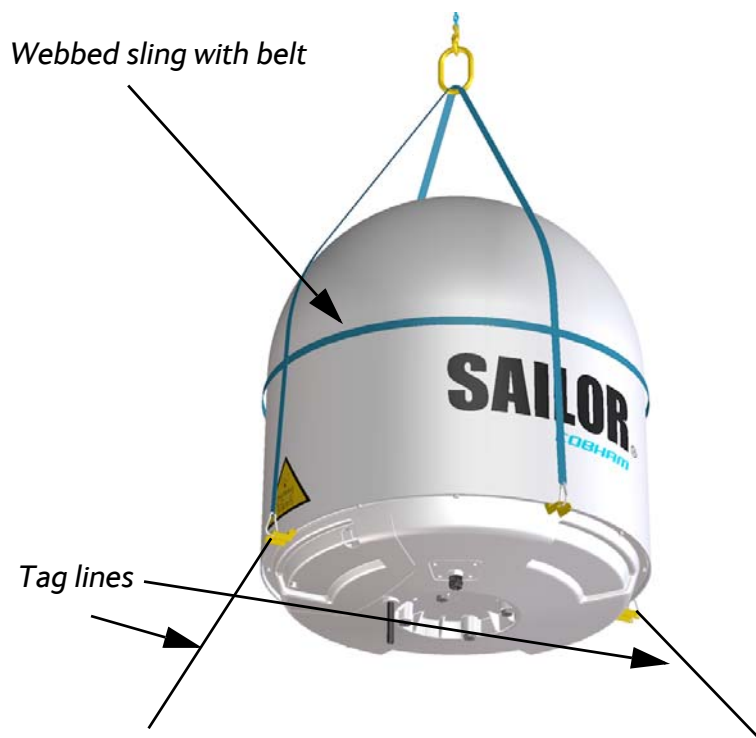


Figure 3-15: Use of strong sling with a belt and tag lines for safe hoisting

Before installing the ADU read the following guidelines.

### 3.3.1 To install the ADU

#### Prerequisites

- Check for potential interference, read more in *Interference from radar, GPS and other transmitters* on page 3-13.
- Install the ADU at a location where **vibrations are limited to a minimum**.
- Maximum allowed cable loss  $\leq 20$  dB at 1950 MHz. This is to ensure optimum performance of the system.

#### Installation procedure

To install the ADU, do as follows:

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



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

5. Attach 2 tag lines of suitable length to 2 lifting brackets and man them.
6. With a crane lift the ADU off the wooden platform and move it on top of the ADU mast. It is important to maintain **vertical orientation of the ADU center line**.

7. Install the ADU on the mast flange with 4 M12 bolts and washers. Read carefully and follow instructions given in *To ground the ADU* on page B-4.  
Tightening torque value: 30 Nm.  
Always use **all 4 bolts** when installing the ADU.
8. Remove the 4 lifting brackets. For safekeeping fasten the lifting brackets inside the bottom of the radome.



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

9. Put the coaxial ADU cable through the protection plate as shown in the following figure and connect the N connector of the ADU cable to the ADU.
10. Select a suitable size for the cable gland: 16—20 mm diameter or 19—23 mm diameter. See also *N-connector interface on the ADU* on

page A-9 for a more detailed drawing how to connect the N-connector on the ADU.

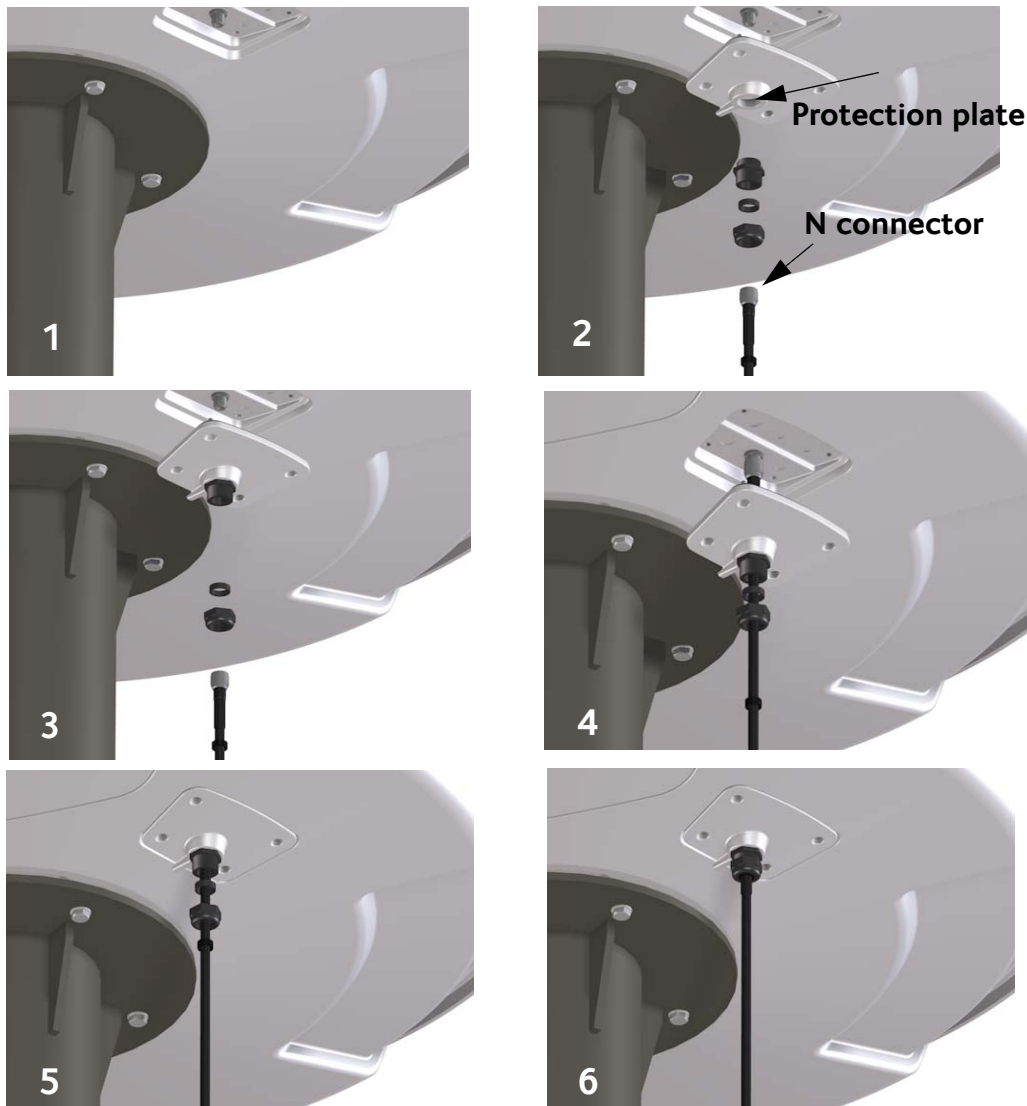


Figure 3-18: Connecting the ADU cable

11. Ensure that the connector assembly is properly protected against seawater and corrosion. As a minimum, wrap it with self-amalgamating rubber.
12. Put the protection plate in place and fasten the 4 bolts (picture 5).
13. Fasten the nut.
14. 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.

### 3.3.2 To open and remove the service hatch

Through the service hatch you can access the antenna modules. You can remove the hatch for better mobility when servicing the antenna.

Do as follows to open and remove the service hatch:

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

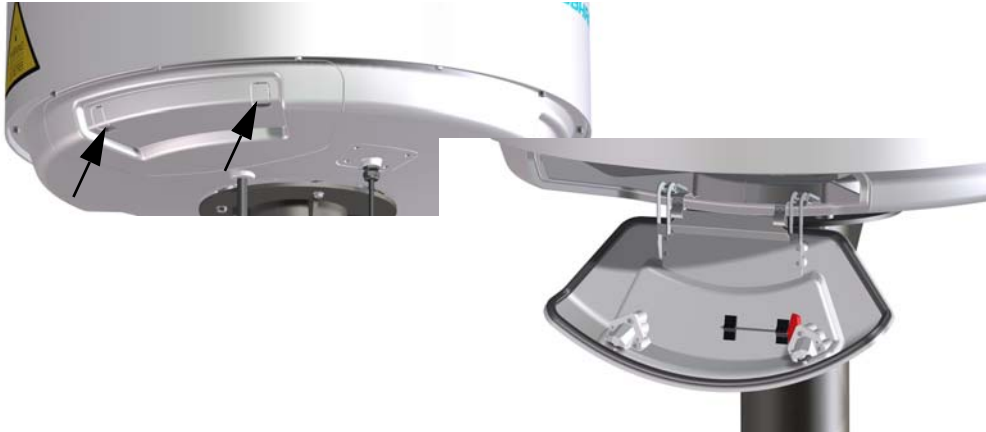


Figure 3-19: To open the service hatch

If necessary, you can remove the service hatch.

3. Free the service hatch from the nylon loops, move them to the side, one by one.

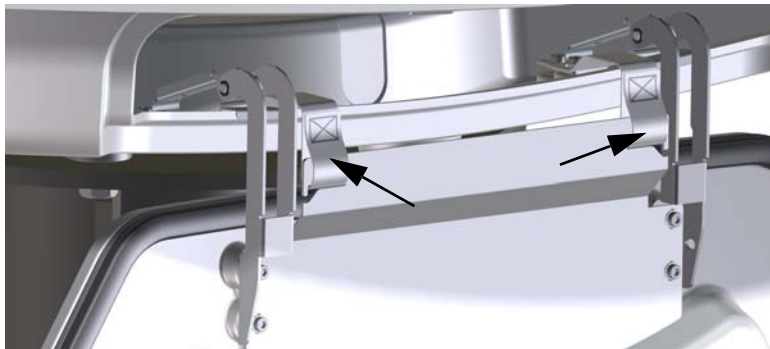


Figure 3-20: To remove the nylon loops

4. Pull the service hatch free. The service hatch weighs approx. 4.5 kg.
5. When inserting the hatch again follow steps above in reverse order. Lock the two latches of the service hatch by fastening the two screws in the latches with a Torx TX20 screw driver to protect the ADU modules against unauthorised access.

### 3.3.3 To ground the ADU

The ADU must be grounded using 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 bolts. Use stainless steel bolts and washers.
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.

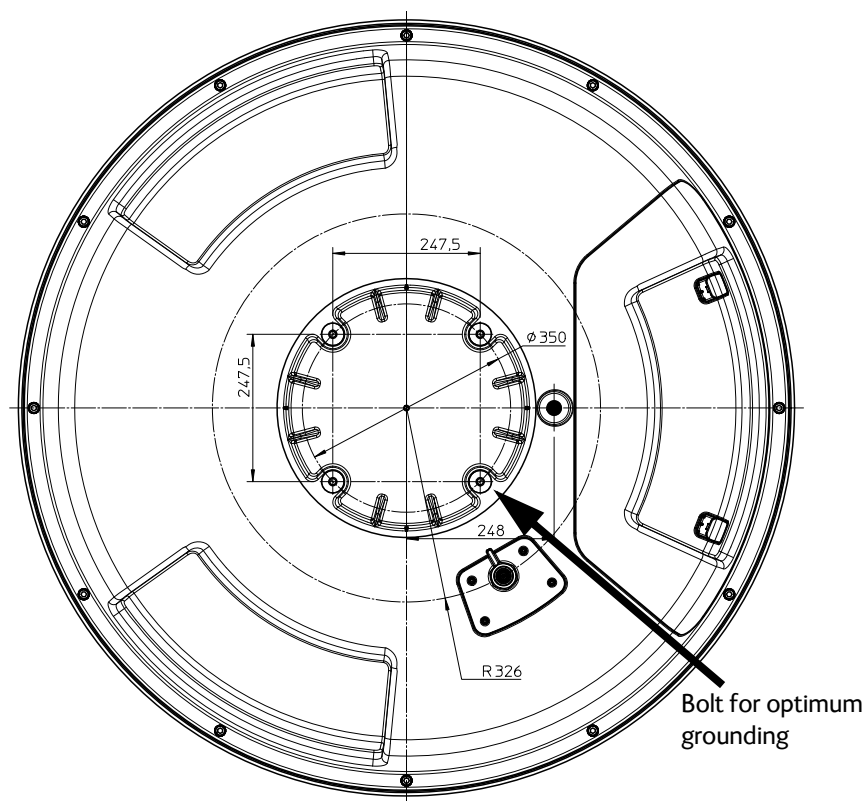


Figure 3-21: ADU, bolt for optimum grounding

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 fibre glass hulls* on page B-9.

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 allowed RF loss in the antenna cable must be maximum 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 6-11 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 3-7: 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

A cable relief bracket is already mounted when receiving the ACU. The cable relief is a simple system to secure cables with cable strips. It offers a number of holders to which you can secure the cables from the ACU.

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

For information about wiring 24 VDC power see *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 ACU. This ground wire must be a heavy wire or braid cable with a larger diameter than the coax cable.

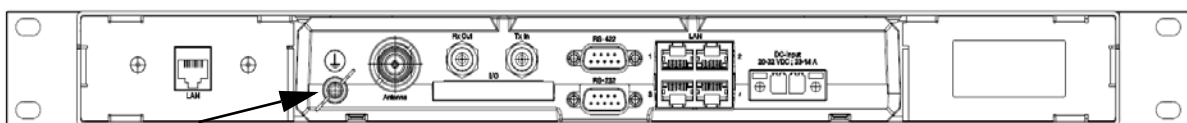


Figure 3-22: Ground stud, ACU



## 3.5 Installation of the GMU

The following sections describe the installation and how to ground the GMU.

### 3.5.1 To install the GMU

To install the GMU, do as follows:

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

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

### 3.5.2 To ground the GMU

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

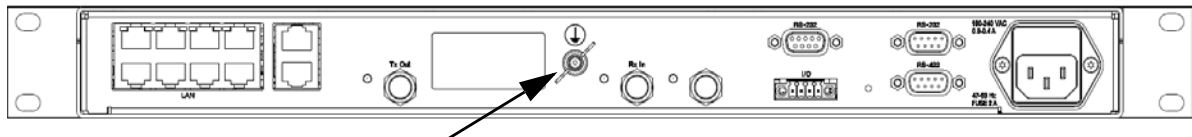


Figure 3-23: Ground stud, GMU

### 3.5.3 Provisioning key and terminal type

You need the Terminal Provisioning Key (TPK) and the Terminal Type (for example TNT-MAR-SCM-1000300) to activate the GMU during commissioning with Inmarsat or other GX service providers. The TPK is printed on the box label and the type label of the GMU. The TPK is unique for each Core Module (GMU). The terminal type describes the terminal and the manufacturer.

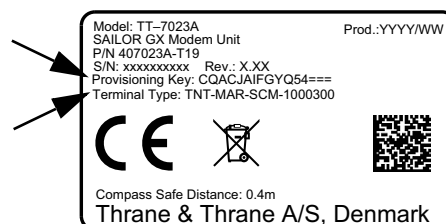


Figure 3-24: Provisioning key and terminal type (example)

### 3.6 To connect the ADU, ACU and GMU

The following figure shows how to connect the ADU, ACU and the GMU.

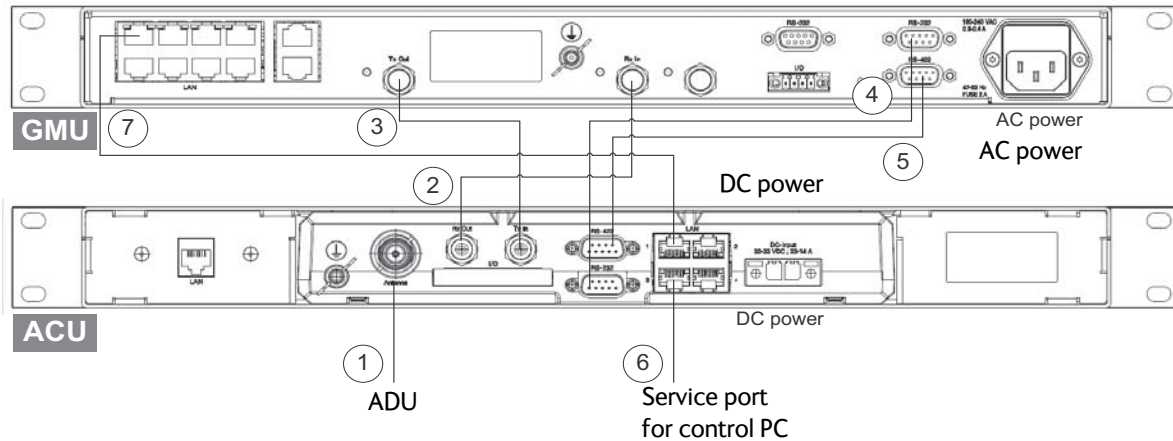


Figure 3-25: Connection between ADU, ACU and GMU

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 GMU with the supplied cable (75 Ohm coax, F-F, 1 m).
3. Connect **Tx In** at the ACU to **Tx Out** at the GMU with the supplied cable (75 Ohm coax, F-F, 1 m).
4. Connect **RS-232** on the ACU to **RS-232** (right) at the GMU.
5. Connect **RS-422** on the ACU to **RS-422** at the GMU.
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 upper left RJ45 connector at the GMU.

# Interfaces

This chapter has in the following sections:

- *Interfaces of the ACU*
- *Interfaces of the GMU*

## 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 6-39.



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

The following figure shows the connector panel of the ACU.

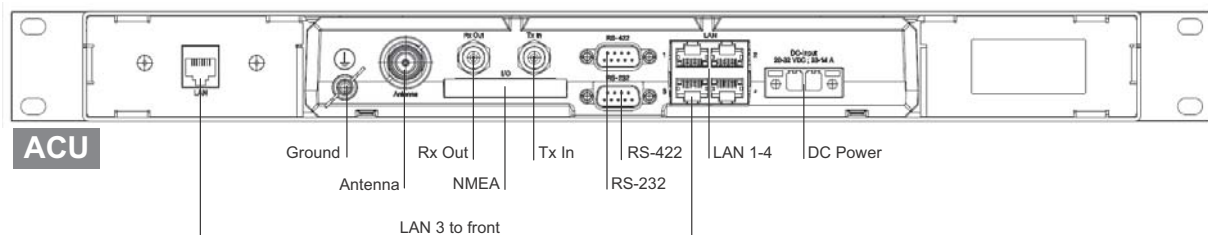


Figure 4-2: ACU (connector panel)

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 rack version.

#### 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 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 mm<sup>2</sup> (included in the delivery).


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

Table 4-1: DC Input plug, outline and pin assignment

1. Insert the power cable as shown below.

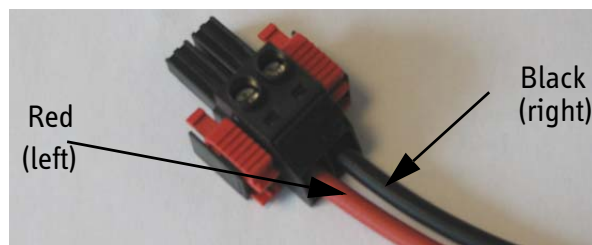


Figure 4-3: DC Input connector with power cable

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.

## 4.1.3 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 GX Rx and Tx signals.

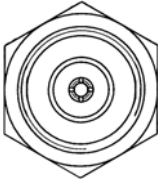
Outline (on the ACU)	Conductor	Pin function
	Inner	DC to ADU reference clock to ADU ACU to ADU internal communication GX Rx/Tx
	Outer	GND (Shield)

Table 4-2: N connector, outline and pin assignment

**Important**

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

#### 4.1.4 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 GMU.


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

Table 4-3: F connector, Rx and Tx, outline and pin assignment

#### 4.1.5 NMEA 0183<sup>1</sup> 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 4-4: NMEA 0183/2000 connector, outline and pin assignment

1. Connect the pins according to the table above.

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

## NMEA 0183

The NMEA 0183 connection supports 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:

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

### 4.1.6 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 GMU.

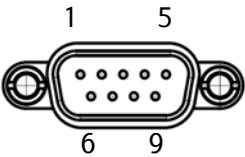
Outline (on the ACU)	Pin	Pin function
	1	Not connected
	2	RXD
	3	TXD
	4	DTR
	5	Ground
	6	DSR
	7	RTS
	8	CTS
	9	Receive Signal Strength Indicator

Table 4-5: RS-232 connector, male, outline and pin assignment, ACU

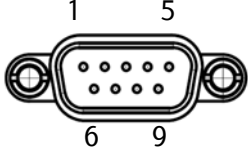
Outline (on the ACU)	Pin	Pin function
	1	Ground
	2	Line A RXD (+)
	3	Line B TXD (-)
	4	Ground
	5	Ground
	6	Not connected
	7	Line A RXD (-)
	8	Line B TXD (+)
	9	Not connected

Table 4-6: RS-422 connector, male, outline and pin assignment, ACU

### 4.1.7 LAN1 – 4 connectors

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

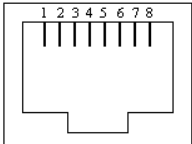
Outline	Pin	Pin function	Wire color
	1	Tx+	White/orange
	2	Tx-	Orange
	3	Rx+	White/green
	4	Not connected	Blue
	5	Not connected	White/blue
	6	Rx-	Green
	7	Not connected	White/brown
	8	Not connected	Brown

Table 4-7: 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 GMU.
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 100 GX to the vessel's LAN

For more details about the LAN networks see *To configure the LAN network* on page 6-24.

## 4.2 Interfaces of the GMU

The following sections describe the connectors of the GMU and how to connect to the ACU, power and other equipment.

### 4.2.1 Connector panel

The following figure shows the connector panel of the GMU.

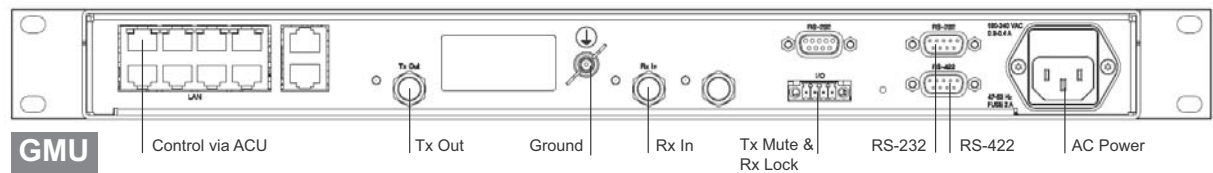


Figure 4-4: Connector panel of the GMU

### 4.2.2 Rx In and Tx Out connectors

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


Outline (on the ACU)	Pin number	Pin function
	1	Inner conductor: 50 MHz clock, Rx/Tx
	2	Outer conductor: GND (Shield)

Table 4-8: F connector, Rx and Tx, outline and pin assignment



4.2.3 RS-232 and RS-422 connectors

The GMU has two RS-232 and one RS-422 connector for control information to and from the ACU. See section *To connect the ADU, ACU and GMU* on page 3-26 for details how to connect the ACU to the GMU.

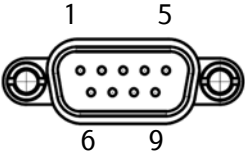
Outline (on the GMU)	Pin	Pin function
	1	Not connected
	2	BUC TXD
	3	BUC RXD
	4	Not connected
	5	GND
	6	Power good
	7	GMU reset
	8	Temperature out of range
	9	Core module RSS

Table 4-9: RS-232 connector, male, outline and pin assignment, GMU

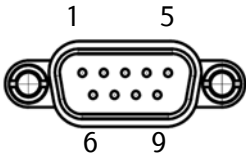
Outline (on the GMU)	Pin	Pin function
	1	GND
	2	Keyline P
	3	Reset P
	4	GND
	5	GND
	6	Not connected
	7	Keyline N
	8	Reset N
	9	Not connected

Table 4-10: RS-422 connector, male, outline and pin assignment, GMU

4.2.4 LAN connectors (8 + 2)

The GMU has 8 Ethernet connectors (type RJ45). Port 1 connects to the ACU and is used for modem control. The other ports are not used. The maximum cable length per connection is 100 m. The Ethernet cable type must be CAT5, shielded. For outline and pin allocation see figure 4-7 on page 5.

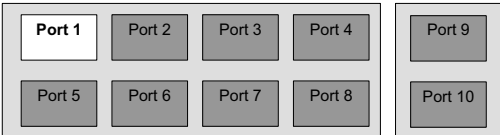


Figure 4-5: LAN connectors at the GMU, Port 1 (modem control) connects to the ACU

4.2.5 I/O connector for Tx Mute and Rx Lock

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

4.2.6 Rx In and Tx Out connectors

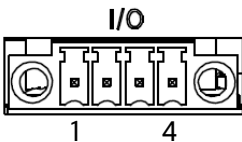
Outline (on the GMU)	Pin	Pin function
	1	GND
	2	Not connected
	3	Rx Lock out
	4	Tx Mute in

Table 4-11: I/O connector, outline and pin assignment, GMU

# Power and startup

This chapter has the following sections:

- *Power source*
- *Power cables*
- *Power up*

## 5.1 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.

The GMU is powered with AC power.

## 5.2 Power cables

### 5.2.1 Power cable selection (ACU)

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:  $50 \text{ mV} / 1 \text{ Amp} = 50 \text{ m}\Omega$ .

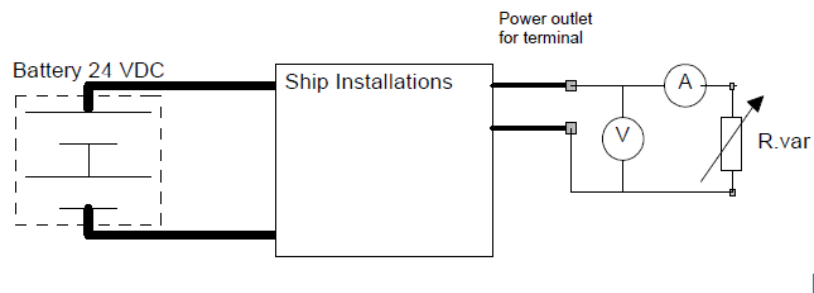


Figure 5-1: Measuring the ship source impedance

### Note

If the total impedance is higher than the limits stated in 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 mm<sup>2</sup>.

- 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 m $\Omega$  ( $R_{\text{max}}$ ), including the source impedance in the ship installation ( $R_{\text{source}}$ ). 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 ( $R_{\text{wire}}$ ) for the cable type you are going to use.  
 4 mm<sup>2</sup>/AWG 11: 4.8 mOhm/m at 55°C  
 6 mm<sup>2</sup>/AWG 10: 3.8 mOhm/m at 55°C  
 Other cable types: see the data sheet for the cable.

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

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  $R_{\text{source}} = 0$  mOhm.

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

$$\text{AWG11}_{\text{max}} = 0.5 \times (60 \text{ mOhm} - 0) / 4.8 \text{ mOhm/m} = 6.2 \text{ m}$$

$$\text{AWG10}_{\text{max}} = 0.5 \times (60 \text{ mOhm} - 0) / 3.8 \text{ mOhm/m} = 7.9 \text{ m}$$

### 5.2.2 Power cable of the GMU

An AC power cable for the GMU is included in the delivery.

## 5.3 Power up

### 5.3.1 To connect the power cable to the ACU and GMU

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

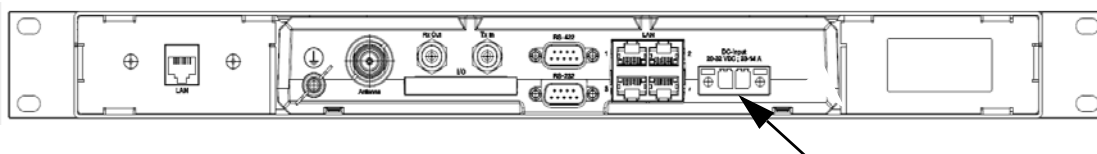


Figure 5-2: ACU - to connect power to DC Input

3. Connect the power cable to the GMU.

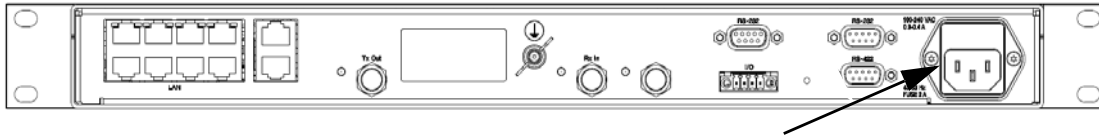


Figure 5-3: GMU - to connect AC power

### 5.3.2 Power-up procedure

4. 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).

5. The SAILOR 100 GX is ready to be calibrated (for first time power up) or receive data from the GMU (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 8-11. 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.
6. Make an azimuth and a cable loss calibration, see *Calibration* on page 6-4.
7. Switch on the GMU.

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

### 5.3.3 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

### 5.3.4 SAILOR 100 GX operational

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

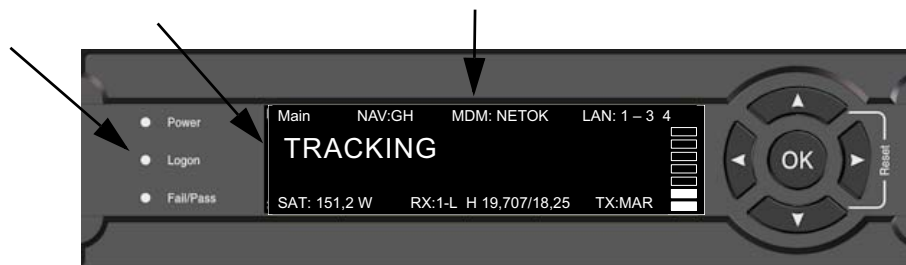


Figure 5-4: ACU display, system operational





# Configuration

This chapter has the following sections:

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

## 6.1 Introduction to the built-in web interface

### 6.1.1 Overview

Use the built-in web interface (installation of software is not necessary) of the SAILOR 100 GX ACU to make a full configuration of the SAILOR 100 GX. You can use a standard Internet browser.

**For quick start instructions see *Calibration* on page 6-4.**

**Important**

The SAILOR 100 GX 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 100 GX are exposed to the Internet you must change the default passwords as anyone with access and malicious intent can render the SAILOR 100 GX 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. 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.
2. Connect a PC to LAN port 3: Service (standard Ethernet) of the ACU or to the front LAN connector of the ACU.

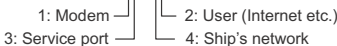


Figure 6-1: LAN 3 connector used for configuring the SAILOR 100 GX

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 6-24 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`. When the login screen is displayed you have verified that the connection to the SAILOR 100 GX can be established. The web interface is ready for use.

Enter user name and password

## Logon

User name:

Password:

[Forgot administrator password?](#)

Figure 6-2: Logon screen

4. Type in the user name **admin** and the password **1234** to access the **Dashboard**.

There is also a guest login (user name: guest, password: guest). With this login you can protect the system from accidental changes of the configuration. A guest can only access the functions that are allowed by an administrator on the page **User permissions**. For more information see *To set up user permissions (guest login)* on page 6-34.

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 8-4 for further information.

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



Figure 6-3: Dashboard

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

## 6.2 Calibration

**Important**

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

Before the SAILOR 100 GX can be used you must select a heading input setting in order to make an azimuth and cable calibration. The azimuth calibration is required in order to determine the offset of the ADU zero direction to the bow-to-stern line of the ship. This procedure is fully automatic. The satellite data for calibration can be entered directly on the calibration page or you can define a Service profile to be used for the azimuth calibration. A cable calibration is required in order to record the cable characteristics of the antenna cable which is used in the SAILOR 100 GX fixed gain feature. See *Fixed TX IF principle* on page 6-15 for more information.

After the calibration you can set up blocking zones for the specific installation.

The following sections describe the steps for a successful calibration:

1. *Service profile for calibration*
2. *Heading input*
3. *Azimuth calibration*
4. *Cable calibration*
5. *Manual One Touch Commissioning (BUC calibration)*

### 6.2.1 Service profile for calibration

You can set up a service profile for calibration. Use this approach if you do not want to enter the satellite parameters directly on the calibration page.

To setup 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. Type in the user name **admin** and the password **1234** to access the **Dashboard**.
4. Select ADMINISTRATION and log on with User name: admin, Password: 1234
5. Select **SETTINGS > Satellite profiles > New entry**. Enter the name of the satellite profile for calibration (a name of your own choice, e.g. IOR Inmarsat GX).
6. Use the VSAT modem profile **Service GX** from the drop-down list.

**SIGNAL:** ■■■■■■

**EDIT SATELLITE PROFILE**

Satellite profile name: IOR Inmarsat GX

VSAT modem profile: Service GX

Satellite position: 62.6 E °

**TRACKING**

RX frequency: ☒ User defined 19.707000 GHz

Satellite identifier: GSC

Apply Cancel

Figure 6-4: Service profile for calibration

- 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)<sup>1</sup>

Satellite	Position	Frequency	Satellite identifier
IOR	62.6 E	19.707 GHz	GSC
POR	144 E	N/A <sup>a</sup>	GSC
AOR	55 W	N/A <sup>a</sup>	GSC

Table 6-1: Inmarsat GSC satellite information

a. Expected to be active in 2016.

- Click **Apply** to save the settings for this satellite profile for calibration. The system is ready for the azimuth and cable 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.

### 6.2.2 Heading input

Access the page for heading and calibration through **SERVICE > Calibration**.

**SIGNAL:** ■■■■■■

**DASHBOARD**

**SETTINGS**

**SERVICE**

**Upload**

**Calibration**

**Modem**

**Line up**

**Dual antenna mode**

**XIM data**

**ADMINISTRATION**

**HELPDESK**

**SITE MAP**

**CALIBRATION**

**Heading**

Input: External

Vessel heading: 0.0°

Apply

**Azimuth calibration result**

Azimuth relative position: 119.9°

Azimuth calibration value: 155.28°

**Azimuth calibration (active satellite profile)**

Enable: ☐

Apply

**Azimuth calibration (user controlled)**

Status: Calibration ready

Result: Calibration successfully done

Satellite: User defined

Longitude: 62.6 E

Tracking frequency: 19.707 GHz

Satellite identifier: GSC

Start Cancel

**Cable Calibration**

Status: Calibration ready

Result: --

Attenuator margin: 20.00 dB

Start Cancel

Figure 6-5: Web interface: SERVICE, Calibration (example)

**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 6.2.1.

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.

1. Select the desired heading input, see the following table.

Heading input	Description
External	Heading input from the vessel's gyro compass (default). If there is no heading input due to failure, alarms are raised and the antenna continues in gyro-free mode. When heading input is available again and a new acquisition is made, alarms are cleared. See also <i>About operation in gyro-free mode</i> on page 6-14.
Fixed	Use this setting for making an azimuth and cable calibration if there is no input from the vessel's gyro compass and for permanent installations like remote areas or oil rigs, or during training and test. <b>Important: Fixed heading is not allowed for sailing vessels!</b> <b>Enter the vessel heading in degrees.</b>
None	<b>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.</b> 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>About operation in gyro-free mode</i> on page 6-14.

Table 6-2: Heading input options

2. Click **Apply**.

**Note**

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

## 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.

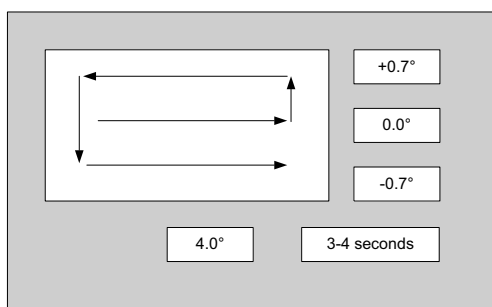


Figure 6-6: Acquisition, search pattern

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.

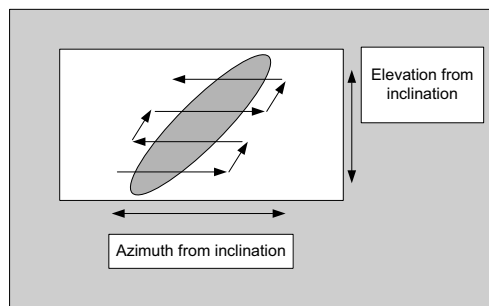


Figure 6-7: Acquisition, search pattern for inclined orbit

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.

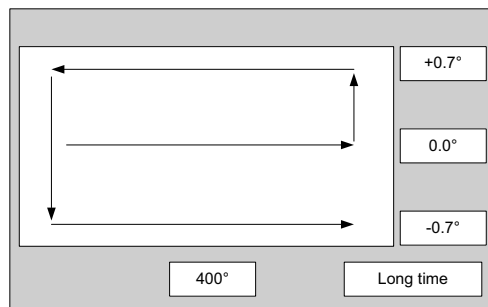


Figure 6-8: Acquisition, search pattern in gyro-free mode



### Acquisition times

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

Table 6-3: Acquisition time

### 6.2.3 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:

- Automatic azimuth calibration
- User-controlled azimuth calibration
- User-controlled azimuth calibration with a service profile

#### Automatic azimuth calibration with an active satellite profile:

If there is no line of sight to an azimuth calibration satellite or GX service satellite from the place of installation you can enable automatic azimuth calibration. When the vessel leaves the harbour and gets line of sight to the GX 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. Click **SERVICE > Calibration**.
2. Select **Enable** in the section **Azimuth calibration (active satellite profile)**. To be able to use this feature you must have made a valid satellite profile and activate it.
3. Click **Apply**.
4. Switch on the GMU.

### User controlled azimuth calibration with user defined input

1. On the page **SERVICE > Calibration**, in the section **Azimuth calibration (user controlled)**, select **User defined** in the **Satellite** drop down list.
2. Type in the longitude of the satellite. See Table 6-1 on page 6-5

**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.
4. Select **Satellite identifier**: GSC, NID, Orbital position (DVB-S, DVB-S2)<sup>1</sup>
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.

### User-controlled azimuth calibration with a service profile

1. Click **SERVICE > Calibration**.
2. Select the service profile in the drop down list **Satellite**. All profiles with the VSAT modem **Service GX** are displayed in the list. If there is no profile in the list see *Service profile for calibration* on page 6-4.
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**.

- 
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 codes during a calibration

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

Table 6-4: Possible error codes during calibration

## 6.2.4 Cable calibration

### Important

Make sure that the GMU is not switched on at this point. The GMU can be switched on after the cable calibration.

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

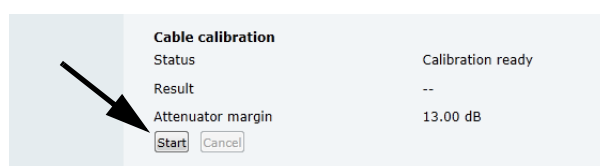


Figure 6-9: Web interface: SERVICE, Calibration, cable attenuator margin

2. Wait for the calibration to finish (typically 2 minutes). 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.
3. After the azimuth and cable calibration switch on the GMU. It will automatically make a BUC calibration and is then ready.

- When commissioning is completed, test all subscribed services.

**Important**

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

## 6.2.5 Manual One Touch Commissioning (BUC calibration)

When the GMU starts up for the first time it will automatically register with the BUC and perform P1dB compression and thereafter register with the Inmarsat network. During the P1dB compression the antenna will point away from the satellite and the ACU will show **BUC calibration** on the **DASHBOARD** and the ACU display.

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

To make a 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**.

- Connect a PC to LAN1.
- Enter the web interface (via Firefox browser) and go to **SERVICE > Modem**.



Figure 6-10: Web interface: SERVICE > Modem, Factory default

- At **Modem access** click the link.

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

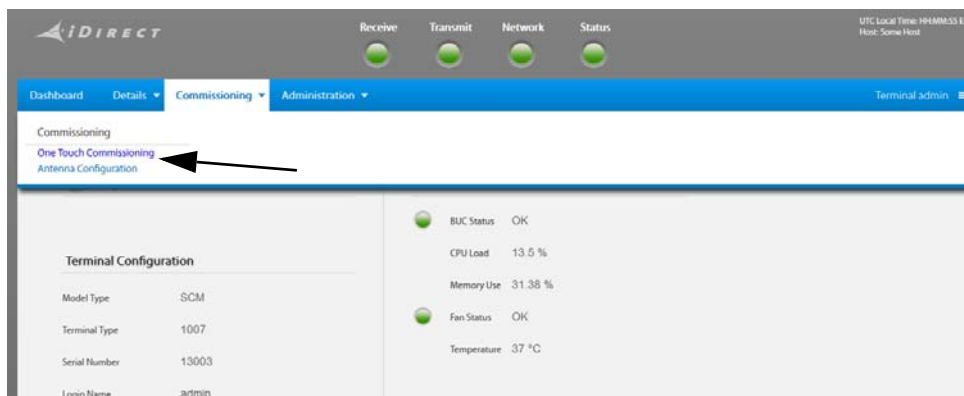


Figure 6-11: Unified web interface of the Core Module

5. In the menu **Commissioning** click **One Touch Commissioning**.
6. Click **Start**. Once commissioning is completed the antenna will search for the I5 satellite with the highest elevation.
7. The antenna will find the satellite and the GMU will perform necessary steps to enter the network (software upgrades, if available).
8. The Unified Web Interface of the Core Module will indicate the modem in the network as well as the modem status in the display in the menu **MODEM**.
9. When commissioning is completed, test all subscribed services.

## 6.2.6 About operation in gyro-free mode

### Heading input: none

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

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

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

### Inclined orbit satellites

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

### Tracking for satellite elevation between 5 and 75 degrees

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

If the satellite is an inclined orbit satellite, the missing heading information introduces a polarization error depending on the satellite elevation and the inclination. Normally it is required that the polarization is controlled within 1 degree towards the satellite. This gives the following limit for use of inclined orbit satellites (a purely physical limit), and all systems without heading input have this limit.

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

Table 6-5: Satellite elevation and max. allowed inclination

### Tracking for satellite elevation above 75 degrees

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

## 6.2.7 Fixed TX IF principle

The SAILOR 100 GX 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 length<sup>1</sup>
- Compatibility with the GX TX Power control feature

When installing the SAILOR 100 GX 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 100 GX system also compensates the RX IF gain.

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1. You find the maximum allowed cable loss at *Prerequisites* on page 3-18.

## 6.3 Configuration with the web interface

### 6.3.1 Overview and dashboard

#### Topics in the web interface

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

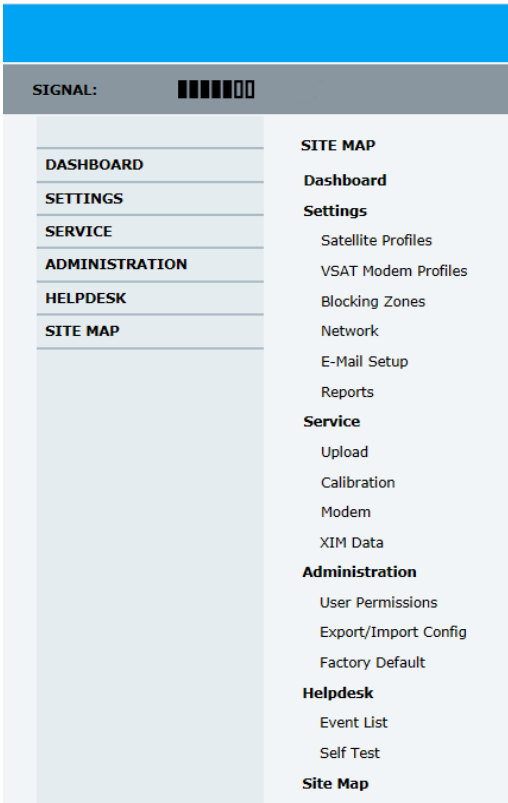


Figure 6-12: Topics in the web interface (SITE MAP)

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

The web interface consists of the following sections:



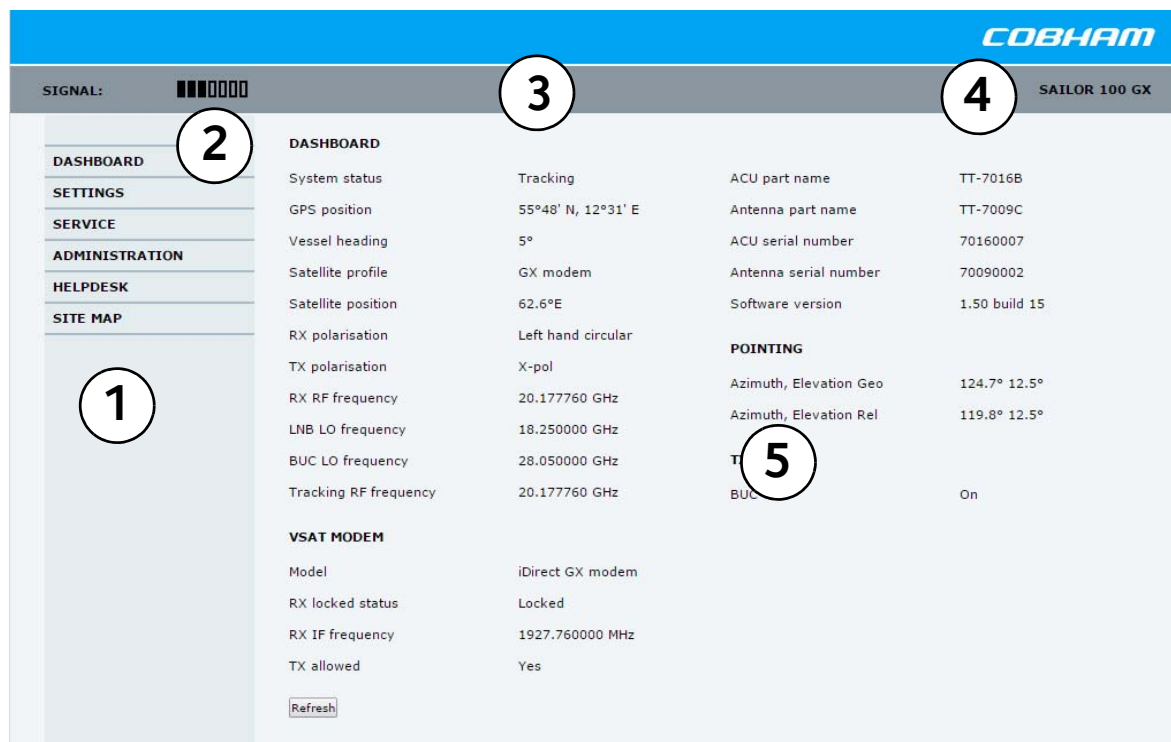


Figure 6-13: Web interface: DASHBOARD

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 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. The signal strength of the modem is shown at VSAT MODEM, Signal level.
3. The icon bar shows icons for active events, when relevant.
4. The host name is shown on every page of the web interface. 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 6-24.
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 *Information fields 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 6-6: 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 (guest login)* on page 6-34.

## 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 6-24 for more information.
2. Open your Internet browser and enter the IP address of the ACU (Default IP address: http://192.168.0.1).

## Information fields on the Dashboard

DASHBOARD	Description
System status	<p>Current status of the SAILOR 100 GX.</p> <p><b>Examples:</b></p> <p><b>Not ready</b> (waiting for input from GNSS, e.g. GPS)</p> <p><b>Ready</b> (waiting for data from the modem or no satellite profile selected)</p> <p><b>Pointing antenna</b> (locating the satellite)</p> <p><b>Acquiring signal</b> (acquiring the satellite signal)</p> <p><b>Tracking</b> (tracks the current satellite)</p> <p><b>Frequency scanning</b> (scanning for transponders)</p> <p><b>No Tx zone</b> (antenna is pointing in a no TX zone; TX is off)</p> <p><b>Blocking zone</b> (antenna is pointing into a blocking zone)</p> <p><b>Service switch</b> (service switch in ADU activated)</p> <p><b>Safe mode</b> (error, followed by an error description)</p>
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, Right-hand.
TX polarisation <sup>a</sup>	Co-pol or X-pol
RX RF frequency <sup>a</sup>	Ka band receiving frequency
LNB Lo frequency <sup>a</sup>	18.25 GHz (system hardware)
BUC Lo frequency	28.05 GHz (system hardware)
ACU part name, ADU part name, ACU serial number, ADU serial number, Software version	Part names, serial numbers for ACU and ADU, software version of the SAILOR 100 GX.

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

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

VSAT MODEM	Description
Model	VSAT modem name, entered in <b>SETTINGS &gt; VSAT modem profiles</b> .
RX locked status	Demodulator lock of the GMU.
RX IF frequency	Read out from the GMU.
TX allowed	Yes or no. Indicates if the GMU 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 6-8: Web interface, DASHBOARD, VSAT MODEM section

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

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

TX	Description
BUC TX	On or Off. Shows if the SAILOR 100 GX 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 6-39.

Table 6-10: Web interface, DASHBOARD, TX section

To use a satellite profile you must activate it, go to **Satellite profiles** and click **Activate** at the desired satellite profile.

**SIGNAL:** [Signal strength bars] [Warning icon]

**DASHBOARD**

**SETTINGS**

**Satellite profiles**

VSAT modem profiles

**Blocking zones**

**Network**

**E-mail setup**

**Reports**

**SERVICE**

**ADMINISTRATION**

**HELPDESK**

**SITE MAP**

**ADD SATELLITE PROFILE**

Satellite profile name: [Text field]

VSAT modem profile: [Generic GX modem]

Satellite position: [0 E] °

Maximum inclination: [0] °

Elevation cutoff: [10] °

RX IF frequency: [Text field] MHz

LNB LO frequency: 18.250000 GHz

RX RF frequency: [Text field] GHz

**TRACKING**

Tracking type: [Narrow band]

RX frequency: ☒ VSAT modem ☐ User defined

[Apply] [Cancel]

Figure 6-14: Satellite profile with generic GX modem

### 6.3.2 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**.

**BLOCKING ZONES**

Active	Azimuth	Elevation	No TX
<input type="checkbox"/>	0° - 0°	0° - 0°	<input checked="" type="checkbox"/>
<input type="checkbox"/>	0° - 0°	0° - 0°	<input checked="" type="checkbox"/>
<input type="checkbox"/>	0° - 0°	0° - 0°	<input checked="" type="checkbox"/>
<input type="checkbox"/>	0° - 0°	0° - 0°	<input checked="" type="checkbox"/>
<input type="checkbox"/>	0° - 0°	0° - 0°	<input checked="" type="checkbox"/>
<input type="checkbox"/>	0° - 0°	0° - 0°	<input checked="" type="checkbox"/>
<input type="checkbox"/>	0° - 0°	0° - 0°	<input checked="" type="checkbox"/>
<input type="checkbox"/>	0° - 0°	0° - 0°	<input checked="" type="checkbox"/>

Apply Cancel

Diagram illustrating the blocking zone configuration. The diagram shows a circular field of view with an antenna at the center. The blocking zone is defined by a vertical oval shape. The azimuth angles are marked around the circle: 360°, 0°, 45°, 90°, 135°, 180°, 225°, 270°, and 315°.

Figure 6-15: 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.

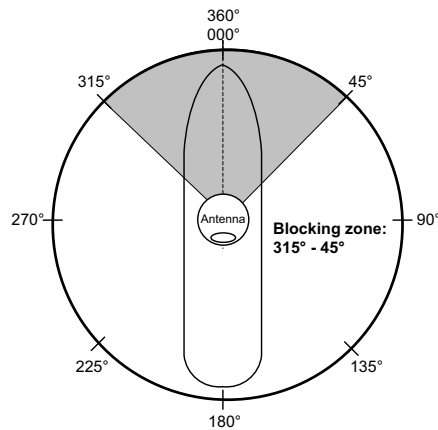


Figure 6-16: Blocking zone, example: 315 - 45 degrees

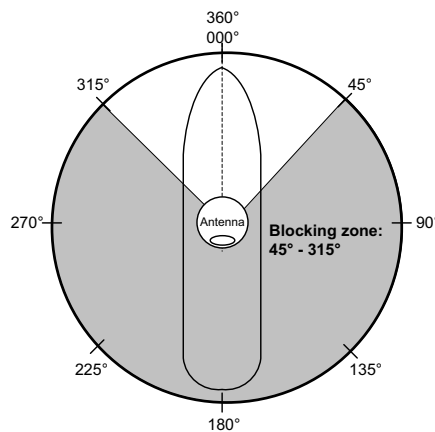


Figure 6-17: Blocking zone, example: 45 - 315 degrees

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 don't want the system to transmit. If 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.
6. Click **Apply** to save the blocking zones.

### 6.3.3 To configure the LAN network

On this page you can enter a host name. The host name helps identifying the SAILOR 100 GX system when sending e-mail reports 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 setup DNS and Gateway.

**Important**

The SAILOR 100 GX 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 100 GX are exposed to the Internet you must change the default passwords as anyone with access and malicious intent can render the SAILOR 100 GX inoperable.

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



**COBHAM**

SIGNAL:

SAILOR 100 GX

**NETWORK**

Host name

**LAN Port 1: iDirect GX Modem**

Mode Static

IP address

Netmask

**LAN Port 2**

Mode Static

IP address

Netmask

**LAN Port 3: Service**

Mode Static

IP address

Netmask

**LAN Port 4: LAN**

Mode DHCP Client

IP address

Netmask

DHCP Server ☒

DHCP Server Start

DHCP Server End

**DNS setup**

DNS source Static

Primary DNS

Secondary DNS

**Gateway setup**

Default gateway source LAN Port 4

Default gateway

**Zeroconf setup**

Zeroconf source LAN Port 4

Figure 6-18: 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 e-mail reports. The default host name is acu. You can change the name. Letters (a-z), digits (0-9) and hyphen (-) are allowed as legal characters. Note: The host name must start with a letter.
LAN Port 1	This network is connected to the GMU. LAN port 1 mode is always Static (static IP address).

Table 6-11: Setup of LAN connectors

Sections	Preferred use
LAN Port 2	LAN port 2 is used for Internet access or Inmarsat Network Service Device (NSD).
LAN Port 3	LAN port 3 is dedicated as the service port. By default this port has the IP address <code>http://192.168.0.1</code> ; the current value can be displayed in the ACU display. In a 19" rack mount it is recommended to connect LAN port 3 to the front port (via rear connector, see the figure <i>ACU (connector panel)</i> on page 4-1), for access to the service port from the rack front. LAN port 3 can be set to the mode <b>Static</b> or <b>Switched with port 1</b> , 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 <b>Static</b> , <b>DHCP client</b> (default) or <b>DHCP server</b> .

Table 6-11: 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 choose to run a DHCP server. Select the check box **DHCP Server**. The DHCP server settings are only displayed and can be selected when the port mode is set to **Static**, 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 6-27. You may statically specify the address of one or two DNS. Select the DNS source as static and fill in IP address or addresses.

Alternatively, if your DHCP server can provide a DNS address and you have selected DHCP client above, then select the same LAN as your DNS source.

## Gateway setup

If the ACU needs to communicate with network units outside the specified sub-nets, you must specify a default gateway (typically a router).

The default gateway can be set as a static IP address. Then set the default gateway source to static and enter the IP address of the default gateway. To remove the default gateway set it to 0.0.0.0.

Alternatively, if your DHCP server is able to provide a default gateway address and you have selected DHCP client above, then select the same LAN as your default gateway source.

### Zeroconf Settings

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

Zeroconf allows devices to connect to a network automatically.

### VLAN port membership table

The VLAN port membership table is configured by the GMU. The table is useful when troubleshooting.

## 6.3.4 E-mail setup

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

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

1. Go to **SETTINGS > E-mail setup**.

Figure 6-19: Web interface: SETTINGS, E-mail setup (example)

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 6-24.

### 6.3.5 To send statistics reports

SAILOR 100 GX can send a statistics report at fixed intervals through an external Internet connection. This report contains historical information from the SAILOR 100 GX up to 1 month. It 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.

Figure 6-20: Web interface: SETTINGS, Reports (example)

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

1. Configure e-mail first, see *E-mail setup* on page 6-27.
2. Go to **SETTINGS > Reports**.
3. In the section **STATISTICS REPORT** enter the following:
  - Email sender.
  - Email recipients (comma separated).
  - Send interval: Select disabled, day (default) with 2-minute samples, week with hourly samples or month with hourly samples. The report contains statistics data for the selected intervals.
4. Click **Apply**.

You can also send the report at any time by clicking **Send now** or at monthly intervals, then click **Send monthly**. Use **Send now** to validate the e-mail setup. See also *To download diagnostic and statistics reports* on page 8-2.

The following parameters are recorded in the statistics report:

Parameter recorded	Description
Host name	Host name, entered in the web interface on the page SETTINGS > Network.
ACU SN	ACU serial number
ADU SN	ADU serial number
SW ver.	Software version
System type	SAILOR 100 GX

Table 6-12: Statistics report, header record

Parameter recorded	Description
UTC. (s) UTC (YYYY-MM-DD hh:mm)	UTC in seconds and date format for the data set.
RSSI.Av RSSI.Max RSSI.Min	Received signal strength (average, maximum and minimum value) for the sampling interval.
POS.Lat (degree) POS.Long (degree) POS.Valid	Latitude value of position. Longitude value of position. Fix = valid position, No Fix = invalid position.
Heading.Samp (degree) Heading.Max (degree) Heading.Min (degree) Heading.Range (+/-degree)	Ship's heading (sample, maximum and minimum value, range) for the sampling interval. See Figure 6-21: <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 6-21: <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.

Table 6-13: Parameters recorded in a statistics report

Parameter recorded	Description
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 GMU, in percent of the sampling interval.
Blocking (%)	Ship in blocking zone, in percent of the sampling interval.

Table 6-13: Parameters recorded in a statistics report (Continued)

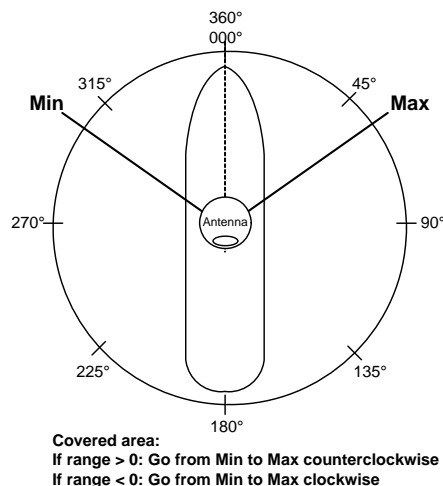


Figure 6-21: Statistics — how to read data for a range

## Processing the statistics report in a spreadsheet application

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

1. Save the zipped file to your computer and extract the text file. The file name contains the identification of the system (example: adu-acu3\_stat\_20111021110901\_day.csv).
2. Open the spreadsheet application, for example Microsoft Excel. On the tab Data click the tab Import from text. Import the unzipped text file and follow the instructions in the wizard. When asked about the delimiter, select 'comma'.

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



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

1. Go to **SETTINGS > Reports**.

- You can generate and send the diagnostic report at any time by clicking **Send now** or at monthly intervals, then click **Send monthly**, or go to the page **HELPDESK** and click **Download** to download it directly to your computer. See also *To download diagnostic and statistics reports* on page 8-2.

### 6.3.7 Upload

For uploading new software to the SAILOR 100 GX see *Software update* on page 8-5.

### 6.3.8 Administration

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

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

You can log on as an administrator or as guest (user name: guest, password: guest). You can allow or deny users that are not administrators (user name: guest, password: guest) access to certain functions and make these pages read-only, see more in *To set up user permissions (guest login)* on page 6-34.

#### To access the administration settings (user name, password)

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

1. Select **ADMINISTRATION** from the left navigation pane.
2. Enter the Administration user name and password.  
The default user name is **admin** and the default password is **1234**.

Figure 6-23: Web interface: Administration

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

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

#### To change the administrator password



Do as follows:

1. After entering the administrator user name and password in the **ADMINISTRATION** page, locate the section **Change administrator logon**.

The screenshot shows the web interface with a blue header bar. Below the header is a grey bar containing a 'SIGNAL:' indicator with five bars and a warning triangle icon. The main content area has a left sidebar with a menu: DASHBOARD, SETTINGS, SERVICE, ADMINISTRATION (highlighted), User permissions, Export/import config, Factory default, HELPDESK, and SITE MAP. The main panel is titled 'ADMINISTRATION' and contains a red warning message 'Remember to log off after use'. Below this is the 'Change Logon' section, which includes input fields for 'User name' (containing 'admin'), 'New password', and 'Retype new password'. There are 'Change' and 'Logoff' buttons at the bottom of this section.

Figure 6-24: Web interface: Administration, change administrator logon and password

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

### To reset the administrator password

If you have forgotten the administrator password, you can reset the password. Do as follows:

1. Contact your service partner for a reset code.
2. Report the serial number of the ACU. You find it in the **Dashboard, ACU serial number**.
3. Click the link **Forgot administrator password?** at the bottom of the **ADMINISTRATOR LOGON** page (see Figure 6-23: *Web interface: Administration*).

The screenshot shows the web interface with the same layout as Figure 6-24. The main panel is titled 'ADMINISTRATION' and contains the same red warning message. Below this is the 'Reset Administrator Password' section, which includes a 'Reset code:' label and an empty input field. At the bottom of this section are 'Reset' and 'Cancel' buttons.

Figure 6-25: Web interface: ADMINISTRATION, Reset administrator password

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

### To log off administration

If you have not entered anything for 30 minutes under **ADMINISTRATION**, you are logged off automatically. You can also log off manually at any time.

To log off manually, do as follows:

1. Select **ADMINISTRATION** from the left navigation pane.
2. Click **Logoff**.

### To set up user permissions (guest login)

You can manage user access to certain functions of the SAILOR 100 GX system. You can allow or deny users that are not administrators (user name: guest, password: guest) access to certain functions and make these pages read-only. This is useful if you want to protect the system against unintended changes or tampering of the system.

#### **Important**

Study this screen thoroughly and decide which areas of the SAILOR 100 GX system you want to give non-administrator users (user name: guest) access to.

To set up the user permissions for guest users, do as follows:

1. From the left navigation pane, select **ADMINISTRATION > User permissions**.

SIGNAL: ■■■■■■

**ADMINISTRATION**

**User permissions**

**USER PERMISSIONS**

Allow users to..

Upload software ☐ Yes ☒ No

Perform self test ☐ Yes ☒ No

Change satellite profiles ☐ Yes ☒ No

Change modem profiles ☐ Yes ☒ No

Change blocking zones ☐ Yes ☒ No

Change network ☐ Yes ☒ No

Change e-mail settings ☐ Yes ☒ No

Change reports settings ☐ Yes ☒ No

Change calibration settings ☐ Yes ☒ No

Modify XIM data ☐ Yes ☒ No

Control Modem ☐ Yes ☒ No

Figure 6-26: Web interface: 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.

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 6-24.
Change email settings	Change e-mail addresses for sending reports. For further information see <i>E-mail setup</i> on page 6-27.
Modify XIM data	Only used during service and maintenance.
Control Modem	Allow to reset or power cycle the GMU.
Require guest login	When set to <b>Yes</b> , a login page is displayed and the user name guest and the password guest must be entered before the Dashboard can be displayed.

Table 6-14: Selected items in the list with user permissions

3. Click **Apply**.

The settings to which access is denied are now greyed out for the guest user or there is a message at the top of the page saying that the page requires administrator login.

## To import and export a system configuration

If you need to reuse a configuration in another SAILOR 100 GX system, you can save the current configuration to a file, which can then be loaded into another SAILOR 100 GX. You can also use this feature as backup. The configuration file contains all the settings you have entered during system setup: satellite profiles, modem profiles, LAN setup, blocking zones, etc.

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

1. Select **ADMINISTRATION > Export/import config**.
2. Click the button **Export**. Follow the download instructions on the screen. You can use this configuration file for upload into another SAILOR 100 GX,

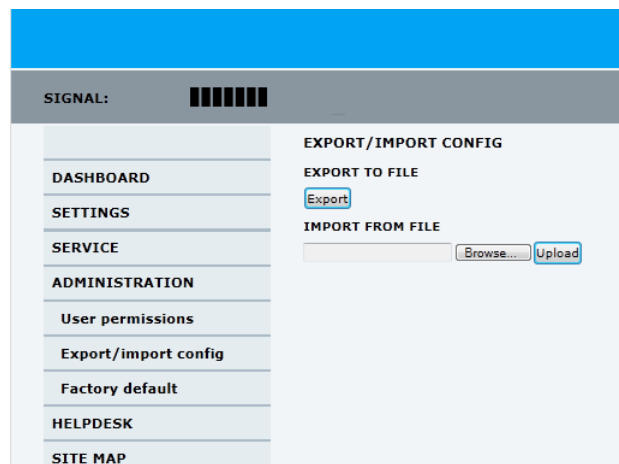


Figure 6-27: Web interface: Administration, Export/import configuration

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

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

**To clone a system configuration, do as follows:**

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

## To reset to factory default - ADU and ACU

When resetting SAILOR 100 GX ACU and ADU 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

To reset to factory default settings, do as follows:

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

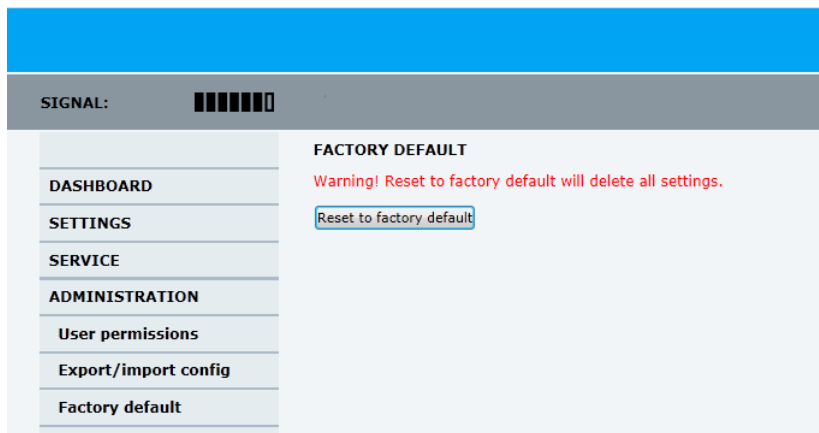


Figure 6-28: Web interface: ADMINISTRATION > Factory default, ADU and ACU

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

**Note**

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

## Reset to factory default - GMU

To reset the GMU to factory default, do as follows:

1. From the left navigation pane, select **SERVICE > Modem**.

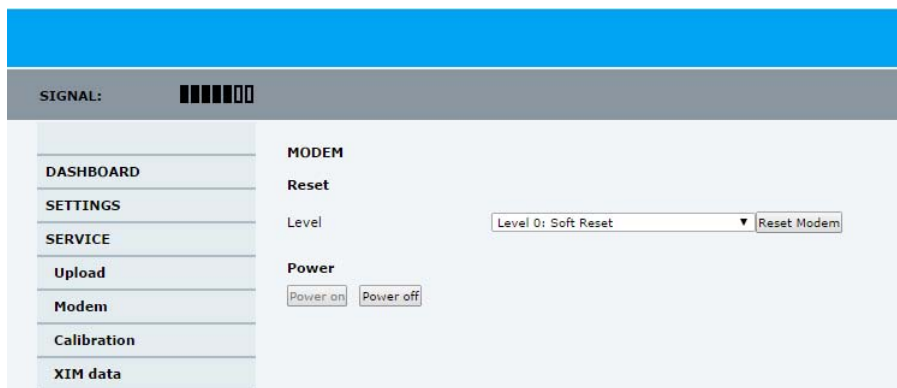


Figure 6-29: Web interface: SERVICE > Modem, Factory default

2. In the drop-down box select one of the three options:
  - Level 0 – Power cycle of the GMU
  - Diagnostic Test Mode – Only connection to the GMU is the serial RS-232 interface, all other connections are shut down.
  - Default Factory Configuration – The GMU stops working. New files must be loaded into the GMU.
3. To power cycle the GMU click the button **Power off** and then **Power on**.

## 6.4 Keypad and menus of the ACU

### 6.4.1 ACU display and keypad

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

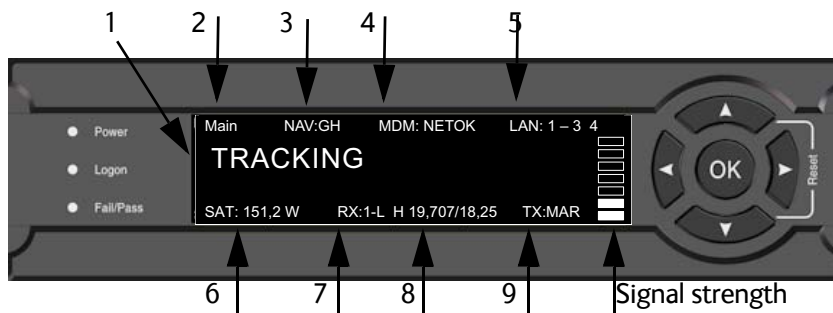


Figure 6-30: Display and keypad of the ACU (example)

1. Current status of the SAILOR 100 GX:
  - NOT READY** (Waiting for input from GNSS, e.g. GPS)
  - READY** (no satellite profile selected)
  - POINTING ANTENNA** (Locating the satellite)
  - ACQUIRING SIGNAL** (Acquiring the satellite signal)
  - TRACKING** (Tracks the current satellite)
  - FREQUENCY SCANNING** (Scanning for transponders)
  - BLOCKING ZONE** (Antenna is pointing into a blocking zone)
2. Current menu, see *The menu tree* on page 6-40.
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 GMU: **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>

&lt;Extern mute&gt; = [X,x]

&lt;Modem TX&gt; = [m,M]

&lt;ADU TX&gt; = [a,A]

&lt;Tx pol&gt;=[-,H,V,L,R]

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

## 6.4.2 Navigating the menus

Use the keypad to navigate the menus.

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



## 6.4.3 The menu tree

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



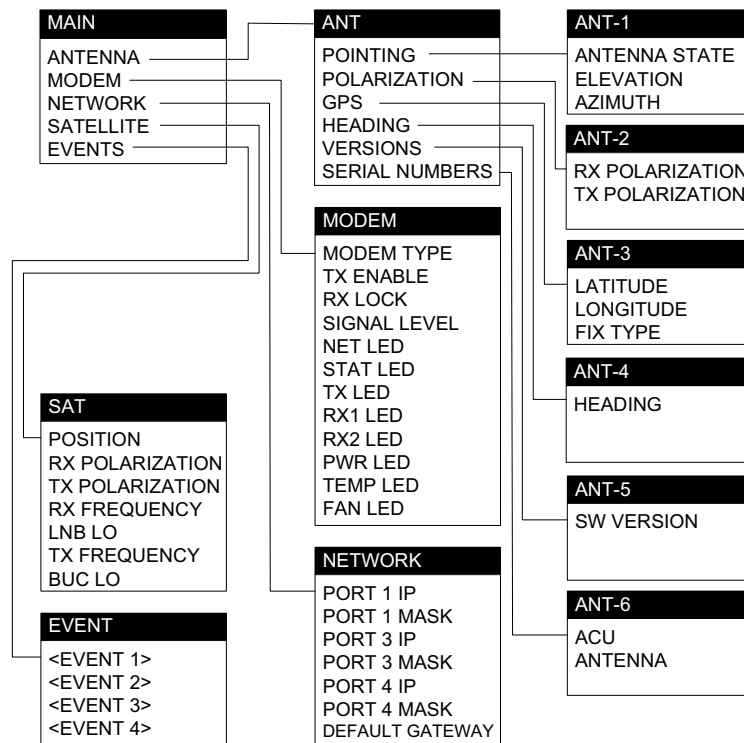


Figure 6-31: Antenna Control Unit, menu tree

## Top-level menu

Top-level menu	Description
MAIN	<p>View with current status of the SAILOR 100 GX. Example when logged on to the satellite:</p> <pre> Main  NAV:GH  MDM: NETOK  LAN: 1 - 3 4 TRACKING SAT: 151.2 W  RX:1-L H 19,707/18,25  TX:MAR </pre> <p>This view is displayed after a time out of 10 minutes. Press any key (except left arrow) to enter the menu at <b>MAIN</b>.</p> <p>New events are shown in this display. If an event is displayed, press <b>OK</b> to jump directly to the menu <b>EVENTS</b> for viewing the currently active events.</p>
ANTENNA	Current ADU parameters, position, software version and serial numbers of the ADU and ACU.
MODEM	Selected GMU type and setup, including signal level.

Table 6-15: Top-level menus of the ACU

Top-level menu	Description
NETWORK	IP addresses and netmasks of the LAN connectors of the ACU and the management mask.
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 <b>MAIN</b> display. Press <b>OK</b> to update the list.

Table 6-15: 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

Table 6-16: ANTENNA menu of the ACU

MODEM menu	Description
MODEM TYPE	Connected modem type
TX ENABLE	On or off, information delivered by the connected GMU
RX LOCK	On or off, information delivered by the connected GMU

Table 6-17: MODEM menu of the ACU

MODEM menu	Description
SIGNAL LEVEL	Current input signal level from the GMU Signal level in dB
NET LED	LED indication from GMU. Steady or flashing green/amber/red, OFF
STAT LED	
TX LED	
RX1 LED	
RX2 LED	
PWR LED	
TEMP LED	
FAN LED	

Table 6-17: MODEM menu of the ACU (Continued)

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 100 GX web interface (default: http://192.168.0.1)
MASK 3	(LAN 3) Current netmask of the SAILOR 100 GX 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 6-18: 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

Table 6-19: SATELLITE menu of the ACU

SATELLITE menu	Description
RX FREQUENCY	Ka band receiving frequency of the active satellite, auto-selected by modem
LNB LO	18.25 GHz, system hardware.
TX FREQUENCY	Transmission frequency, auto-selected by modem
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 6-19: SATELLITE menu of the ACU (Continued)

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 <b>EVENTS</b> menu, a * is shown in the upper left corner of the display, next to the menu name. Press <b>OK</b> to update the EVENTS list, the * will be removed.</p> <p>A &gt; means the event text is longer than the display. Press &gt; to see the remaining text.</p>

Table 6-20: EVENTS menu of the ACU

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

## 6.4.4 Brightness of the display

To adjust the brightness do the following:

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

### 6.4.5 Reset of the ACU and ADU

To reset 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.

### 6.4.6 Reset of the GMU

The GMU can be reset using the web interface. See the section *Reset to factory default - GMU* on page 6-37.

## 6.5 SNMP support

The SAILOR 100 GX 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 100 GX 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 100 GX 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.

You can get the MIB file in two ways:

1. Download the ACU MIB file directly from the ACU from the **HELPDESK** page.

Click the link **Download MIB file** and save the file on your computer.

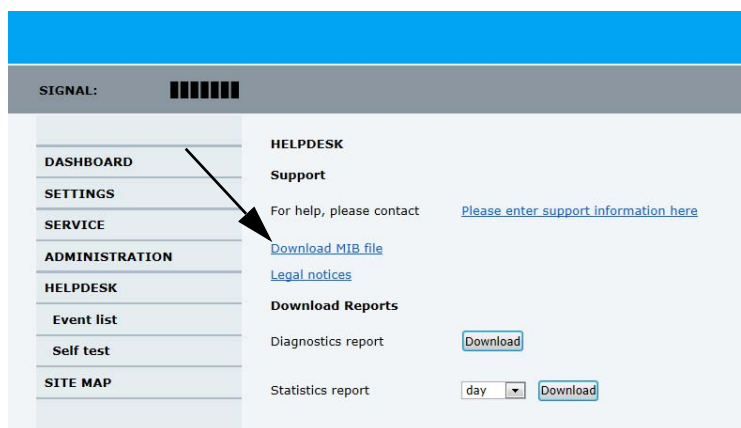


Figure 6-33: Download of MIB file

2. Download the ACU MIB from Cobham eSupport web site.

# 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 GMU, 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 there is sufficient space for access through the service hatch.	See <i>To install the ADU</i> on page 3-18.	
3.	Make sure to maintain the vertical orientation of the ADU center line.		
4.	Check that the ADU is installed where vibrations are limited to a minimum.		
5.	Check that you programmed the blocking zones correctly.	See <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 6-22.	
6.	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.	
7.	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 3-7.	
8.	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.	
9.	Make sure that the distances to radar, Inmarsat systems, GPS receivers and other transmitters are as required.	See <i>Interference from radar, GPS and other transmitters</i> on page 3-13.	
10.	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 3-16.	
11.	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 GMU, 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 GMU is mounted close to the ACU (preferably next to it).	See <i>To install the GMU</i> on page 3-25.	
4.	Check that the ADU antenna N-connector is properly connected with the 50 Ohm RF cable.	Visual inspection of the cover plate at the bottom of the ADU. See the figure <i>Connecting the ADU cable</i> on page 3-20.	
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 <b>Rx Out</b> is connected to the GMU <b>Rx in</b> using the included 1 m F-F 75 ohm cable.	Visual inspection of the connector panel of the ACU and the VSAT modem. See the figure <i>To connect the ADU, ACU and GMU</i> on page 3-26.	
7.	Check that the ACU's <b>Tx In</b> is connected to the GMU <b>Tx out</b> using the included 1 m F-F 75 ohm cable.	Visual inspection of the connector panel of the ACU and the VSAT modem. See the figure <i>To connect the ADU, ACU and GMU</i> on page 3-26.	
8.	Check that the ACU's <b>RS-232</b> is connected to the GMU <b>RS-232</b> using the included serial cable.	Visual inspection of the connector panel of the ACU and the VSAT modem. See the figure <i>To connect the ADU, ACU and GMU</i> on page 3-26.	
9.	Check that the ACU's <b>RS-232</b> is connected to the GMU <b>RS-422</b> using the included serial cable.	Visual inspection of the connector panel of the ACU and the VSAT modem. See the figure <i>To connect the ADU, ACU and GMU</i> on page 3-26.	
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 4-4 on page 4-3.	
11.	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).	Use a volt meter. See Table 4-1: <i>DC Input plug, outline and pin assignment</i> on page 4-2.	
12.	Check that the AC power cable is plugged into the GMU and 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: <b>TRACKING</b> .  In the web interface and in the ACU display check: <b>DASHBOARD:</b> <b>System status: Tracking</b> (see <i>Connecting to the web interface</i> on page 6-1).	
2.	Check that the GMU is in lock and BUC TX on.	In the web interface check: DASHBOARD, <b>RX locked status</b> must show <b>Locked</b> .  The ACU display must show <b>MDM:NETOK</b>	
3.	Connect a user PC LAN (not the service PC) to the Internet LAN connector 2 of the ACU.	The GMU needs no separate setup. See <i>To connect the ADU, ACU and GMU</i> on page 3-26.	
4.	Open a DOS window and type: ping 4.2.2.2.	Check that you get a response.	
5.	Open a web browser and browse to 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 <b>SETTINGS &gt; Network</b> and check the DNS setup (see <i>To configure the LAN network</i> on page 6-24.	

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

# Service & maintenance

This chapter has the following sections:

- *To get support*
- *Software update*
- *Satellite profiles and VSAT modem profiles*
- *Status signalling with LEDs and status messages*
- *Removal and replacement of the ACU*
- *Removal and replacement of ADU modules*
  - *To replace the GPS module*
  - *To replace the VSAT Interface Module (VIM2)*
  - *To replace the DC-Motor Driver Module (DDM)*
  - *To replace the BUC Control Module (BCM)*
  - *To replace the Pedestal Control Module (PCM)*
  - *To replace motor and encoder*
  - *To replace the Drive Belts*
  - *To replace the Zero Reference Module (ZRM)*
  - *To replace the Inertial Sensor Module (ISM)*
  - *To replace the RF Pack*
  - *To replace the BUC*
  - *To replace the LNB*
  - *To replace the rotary joint*
  - *To replace a wire-rope isolator*
- *To update VIM2/PCM calibration data*
- *Inspection of mechanical components*
- *Troubleshooting*
- *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.

### 8.1.1 Help desk and diagnostic report

#### 8.1.1.1 Support at the Help desk

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

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

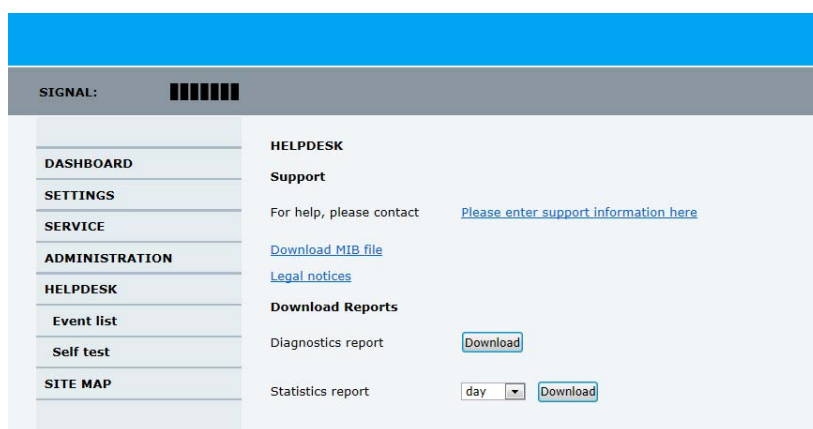


Figure 8-1: Web interface: HELPDESK

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

You can download the MIB file.

At Legal notice you can see the licence text for the source code of the parts of the SAILOR 100 GX software that falls under free and open source software.

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

#### 8.1.1.2 To download diagnostic and statistics reports

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

The main sections are:

- Software
- System
- Hardware


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

To generate a diagnostics report click **HELPDESK > Download** and save the file to your computer.

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

You can also configure the system to send statistics reports at defined time intervals. For further details on this see *To send a diagnostics report* on page 6-31.

### 8..1.1.3 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.

### 8..1.1.4 Self test

You can start a self test of the SAILOR 100 GX ADU and ACU.

1. Click **Self test** in the **HELPDESK** page.

- Click the menu item **Self test**.

**Important**

Warning! The SAILOR 100 GX will reboot to perform the self test. Rebooting the ACU will terminate all existing connections.

### 8.1.1.5 Reset to factory defaults

You can reset the SAILOR 100 GX ADU and ACU to factory defaults. See *To reset to factory default - ADU and ACU* on page 6-36.

**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.

You can reset the SAILOR 100 GX GMU to factory defaults. See *Reset to factory default - GMU* on page 6-37.

### 8.1.1.6 Proxy server settings in your browser

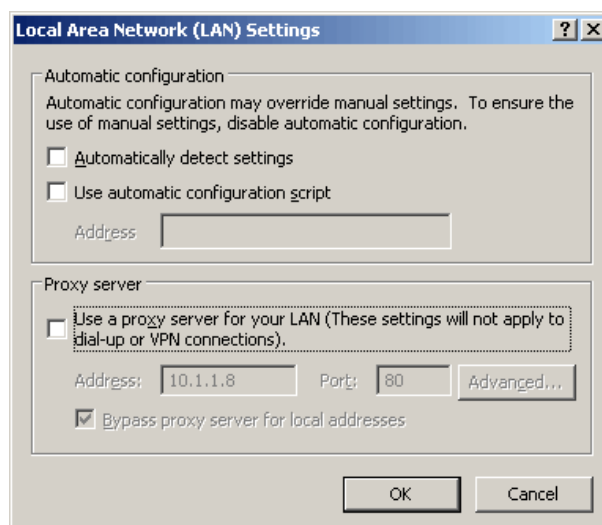
If you are connecting your computer using a LAN or WLAN interface, the **Proxy server** settings in your browser must be disabled before accessing the web interface. Most browsers support disabling of the Proxy server settings for one specific IP address, so you can disable Proxy server settings for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

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



- 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.

## 8.2 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 100 GX system, i.e. switch on the ACU. Wait until the SAILOR logo has disappeared from the ACU display.
2. Connect a PC to LAN interface 3 (Service port, standard Ethernet) of the ACU or to the front LAN connector of the ACU.

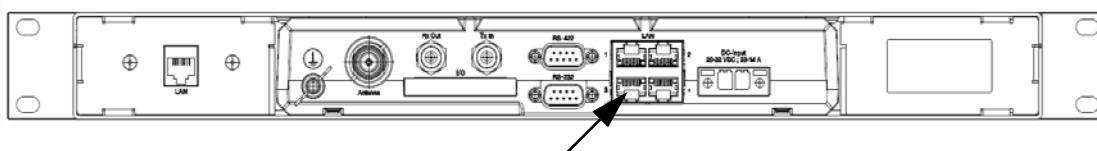


Figure 8-2: LAN 3 connector used for configuring the SAILOR 100 GX

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 6-24 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 password **1234** to access the **Dashboard**.
5. The web interface shows the **DASHBOARD** page.
6. Click **SERVICE** in the navigation pane. The **UPLOAD SOFTWARE TO TERMINAL** page is displayed.

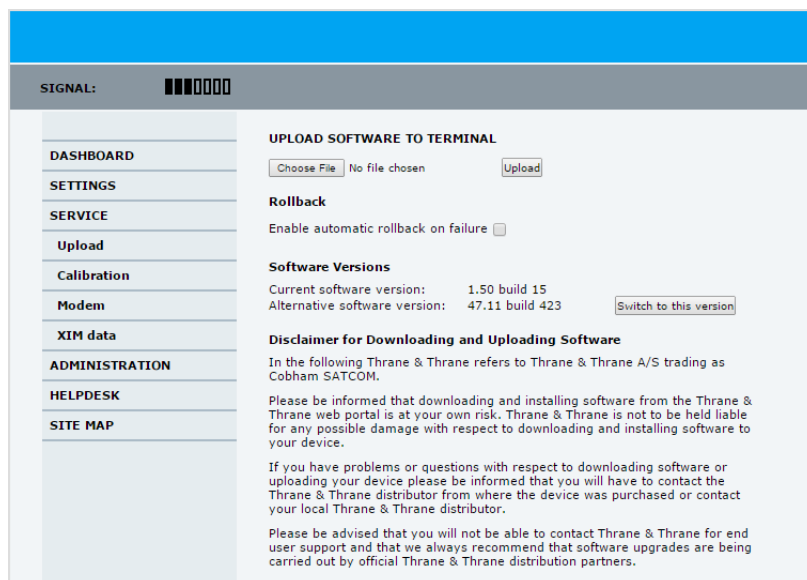


Figure 8-3: Software update with the web interface

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.

### 8.2.2.1 If software upload fails - how to recover

To recover from a failed software upload, do as follows:

1. Turn off the ACU and turn it on again.
2. Repeat the upload procedure as described in *Software update* on page 8-5.



### 8.2.2.2 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 SAILOR 100 GX web interface. The top bar is blue with the COBHAM logo. Below it, a grey bar shows 'SIGNAL: [signal strength bars]' and 'SAILOR 100 GX'. The main content area is divided into a left sidebar with navigation links (DASHBOARD, SETTINGS, SERVICE, ADMINISTRATION, HELPDESK, SITE MAP) and a main panel. The main panel has a 'DASHBOARD' section with a table of system status information. The 'Software version' entry is highlighted with a red circle, showing '1.50 build 15'. Below this is a 'POINTING' section with azimuth and elevation data, and a 'TX' section with BUC TX status. At the bottom, there is a 'VSAT MODEM' section with model and frequency information, and a 'Refresh' button.

DASHBOARD	
System status	Tracking
GPS position	55°48' N, 12°31' E
Vessel heading	5°
Satellite profile	GX modem
Satellite position	62.6°E
RX polarisation	Left hand circular
TX polarisation	X-pol
RX RF frequency	20.177760 GHz
LNB LO frequency	18.250000 GHz
BUC LO frequency	28.050000 GHz
Tracking RF frequency	20.177760 GHz
<b>VSAT MODEM</b>	
Model	iDirect GX modem
RX locked status	Locked
RX IF frequency	1927.760000 MHz
TX allowed	Yes

POINTING	
Azimuth, Elevation Geo	124.7° 12.5°
Azimuth, Elevation Rel	119.8° 12.5°

TX	
BUC TX	On

Figure 8-4: Verifying software update

### 8.2.3 Software update (GMU)

The GMU detects automatically whether a software upgrade is needed. If yes, software upgrade is done automatically via the satellite link. You can see the current software version in the GMU web interface.

## 8.3 Satellite profiles and VSAT modem profiles

### 8.3.1 Satellite profiles

A satellite profile with the GX 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**.

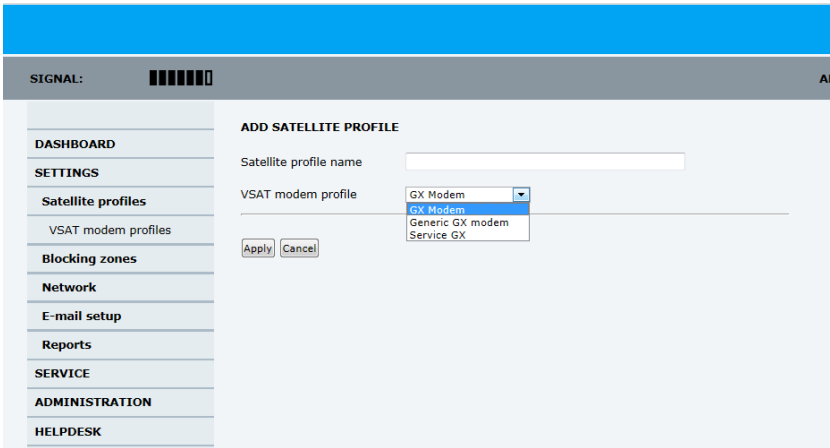
#### 8.3.1.1 Satellite profiles – New entry and Edit



COBHAM		
SIGNAL: [Signal Bar]		ADU-ACU32 - SAILOR 100 GX
<b>DASHBOARD</b> <b>SETTINGS</b> Satellite profiles VSAT modem profiles Blocking zones Network E-mail setup Reports SERVICE ADMINISTRATION HELPPDESK	SATELLITE PROFILES	
	Name ▾	Position ▾
	GX Modem	0 E
	GX Generic WB1	62.6 E
	Service GX	62.6 E
	62.6E Gen	62.6 E
	<a href="#">New entry</a>	
	<a href="#">Edit / Re-activate</a>	
	<a href="#">Edit / Delete / Activate</a>	
	<a href="#">Edit / Delete / Activate</a>	

Figure 8-5: Web interface: SETTINGS - list of satellite profiles (example)

Each satellite profile has one assigned VSAT modem profile.



**DASHBOARD**  
**SETTINGS**  
Satellite profiles  
VSAT modem profiles  
Blocking zones  
Network  
E-mail setup  
Reports  
SERVICE  
ADMINISTRATION  
HELPPDESK

**ADD SATELLITE PROFILE**  
Satellite profile name:   
VSAT modem profile: 

GX Modem

GX Modem  
Generic GX modem  
Service GX

Apply

Cancel

Figure 8-6: Web interface: SETTINGS, Satellite profiles — new entry (example)

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 8-9.
4. Enter the data for the satellite, if any. For satellite data see [www.lyngsat.com](http://www.lyngsat.com).
5. **Only for satellite profiles that use a VSAT modem profile with the Generic GX modem:** At Elevation cutoff enter the minimum elevation angle for the antenna.
  - **FCC (FCC §25.205):** 5 degrees
6. Click **Apply** to save the settings for the satellite profile.

## 8.3.2 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.

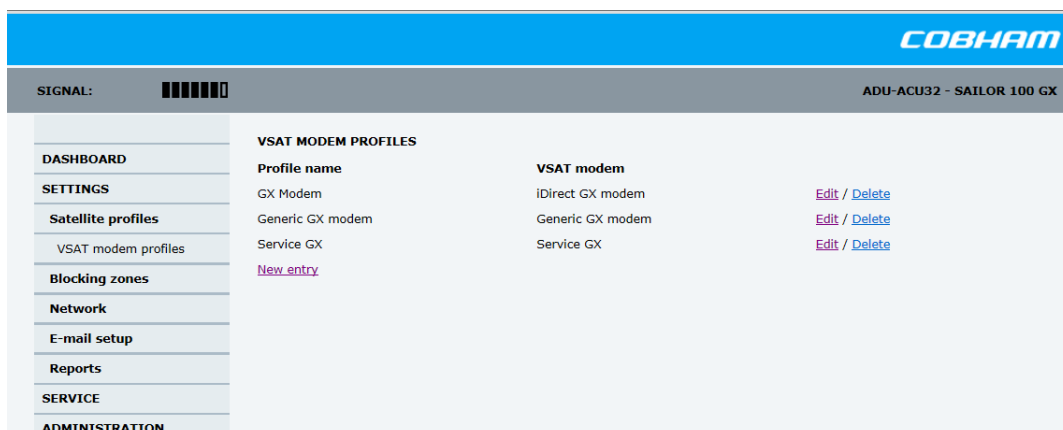


Figure 8-7: Web interface: SETTINGS, VSAT modem profiles (example)

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.

### 8.3.2.1 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**.

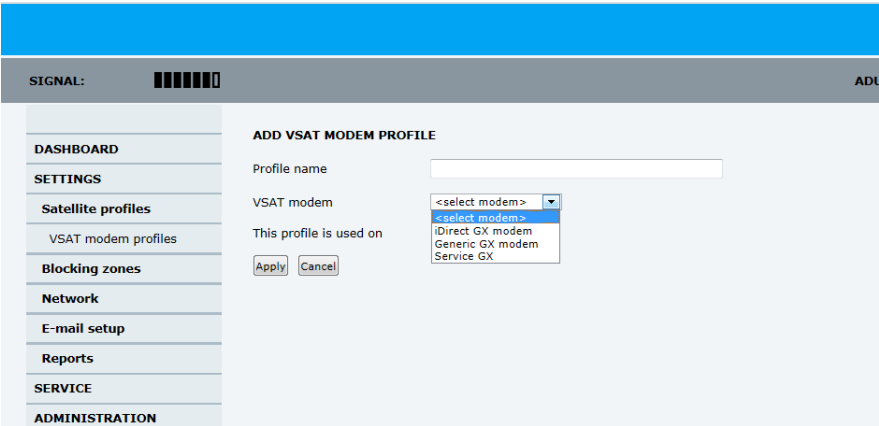


Figure 8-8: Web interface: SETTINGS, VSAT modem profile – supported modems

2. Fill in a VSAT modem profile name of your own choice.
3. Select one of the supported VSAT modems 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 all parameters in the satellite profile.

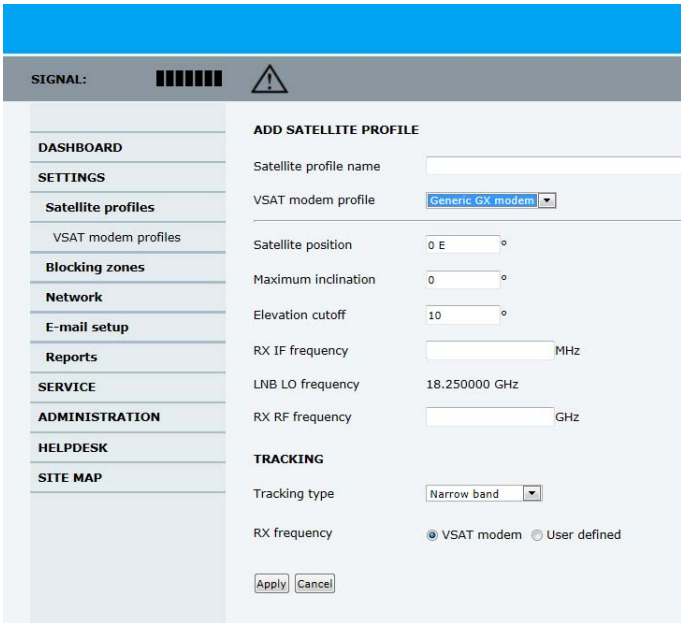


Figure 8-9: Satellite profile with generic GX modem

## 8.4 Status signalling with LEDs and status messages

### 8.4.1 Overview

#### 8.4.1.1 Built-In Test Equipment

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

- Power On Self Test (POST), which is automatically performed each time the system is powered on.
- Person Activated Self Test (PAST), which is initiated by starting a self test in the web interface **HELPDESK > Self test**.

For details on error messages after a POST or a self test see *Event list* on page 8-3.

#### 8.4.1.2 Means of signalling

The SAILOR 100 GX 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).

During service and maintenance, one of the following system status messages may be shown:

- Service switch
- Azimuth calibration
- TX cable calibration
- XIM data error

## 8.4.2 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 8-15.

## 8.4.3 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"><li>• Searching satellite</li><li>• Identifying satellite</li><li>• Carrier lock &amp; TX enabled from modem</li></ul>
	Steady green	Satellite link established
	Off	No satellite link acquired

Table 8-2: LEDs on the ACU

LED	Behaviour	Description
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 (Continued)

#### 8.4.4 LEDs of the GMU

The GMU does not have any LEDs on the front plate. You can check the status of the GMU 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

## **8.5 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.



## 8.6 Removal and replacement of ADU modules

### 8.6.1 Overview

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

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

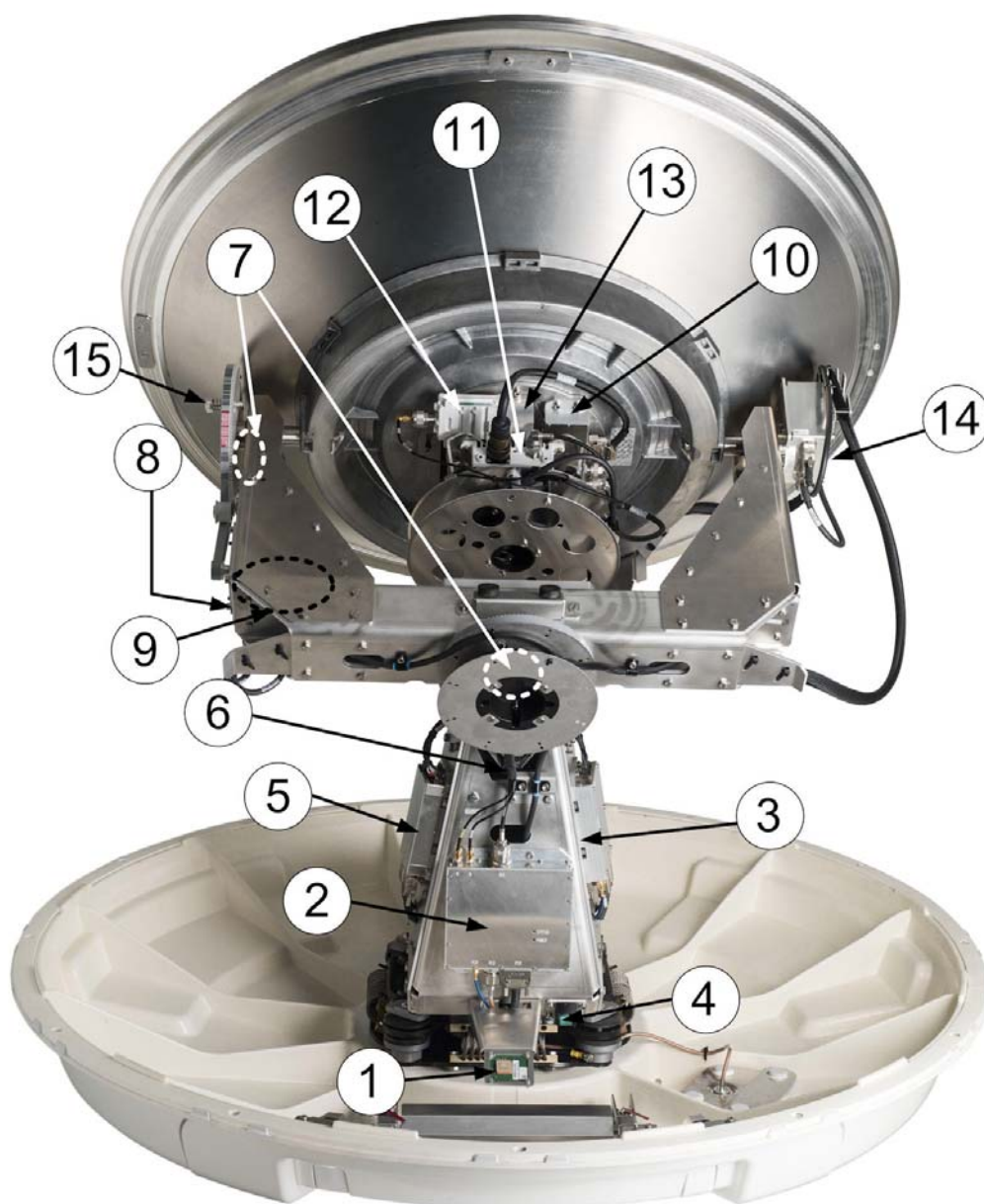


Figure 8-10: Above Deck Unit modules 1/2

1. GPS module.

This module is positioned near the service switch at the bottom of the pedestal. It converts the GPS satellite signals into current position data.

2. VSAT Interface Module (VIM2).

The purpose of the VIM2 is to interface between the ADU coaxial cable carrying several signals (DC, modem, RX IF, L-band TX) and the cable to the LNB/BUC, and the PCM. The VIM takes the received L-band transponder signal from the LNB and converts it to a higher frequency and allows the whole L-band transmitter band to be routed to the BUC.

For narrow band signal or non-DVB tracking the VIM has a power detector as signal strength indicator. It also contains a DVB-S/S2 demodulator.

The VIM consists of the following blocks:

- Power supply block for on board circuits, supply to PCM board and regulated external output to LNB (with band switching) and BUC.
- Narrow band channel detector and a DVB-S/S2 tracking receiver with tuner and demodulator
- LNB Receive signal up-converter with mixer and PLL.
- Cable attenuator section to control the output power variation to the BUC.
- FPGA section to control the functions of the VIM including DVB-S/S2 transport stream decoding.
- Filters for splitting and combining the DC, modem, received up converted IF from the LNB and the transmit signal to the BUC.

### 3. Pedestal Control Module (PCM).

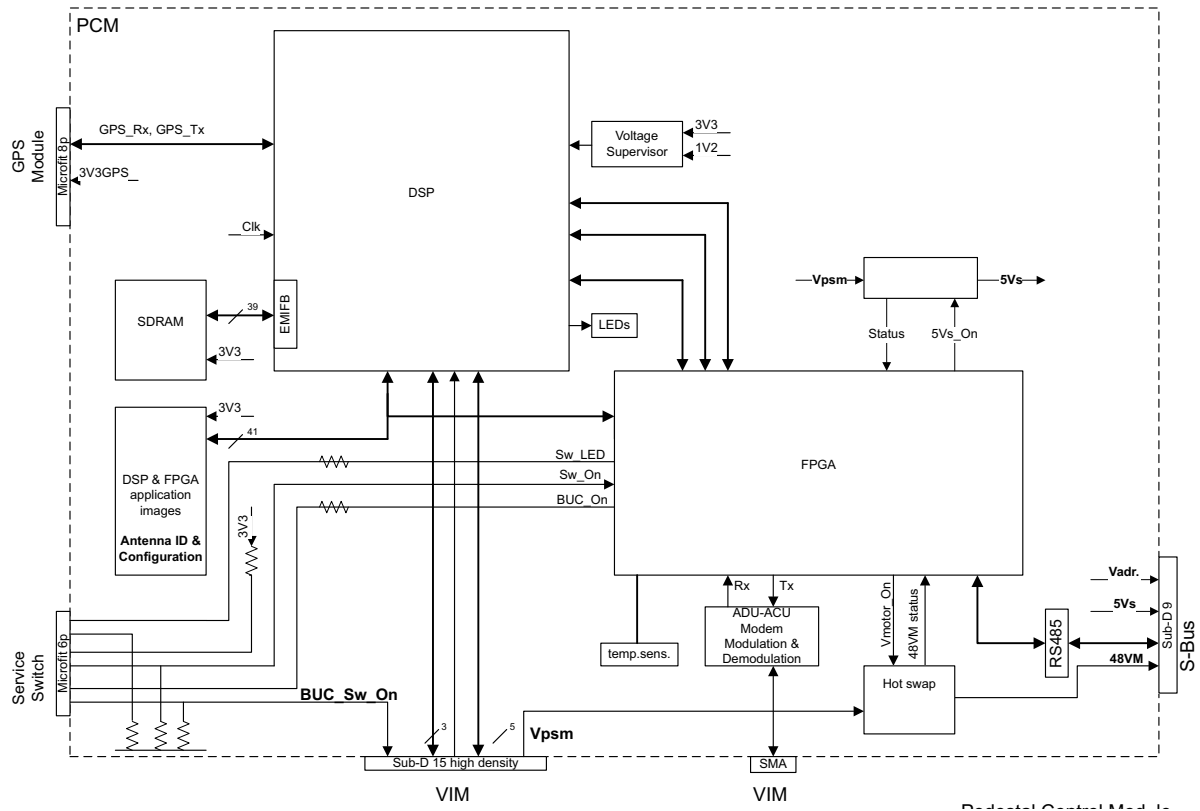


Figure 8-11: PCM – Block diagram

The PCM will - based on several inputs - control the position of the parabolic reflector and the polarization angle of the polarisation mechanism assembly via 3 brush less DC-motors and a stepper motor.

The PCM board is:

- Modem communication with a below deck Antenna Control Unit via a VSAT interface module (VIM).
- Control of the VIM module devices via a parallel interface connector.
- Communication master of the ADU Bus connecting to the DC-motor Driver Modules (DDM), the Polarization Motor Module (PMM), and the Inertial Sensor Module (ISM).
- Communication with the GPS module.
- Provide power to the modules connected via the ADU bus (motor drivers supplies and bus interface circuits' supplies) with over-current protection (hot swap) via the bus cable.
- Modules are by means of shielded DB9 cables connected in a chain in the following order: PCM — DDM (azimuth) — DDM (X-elevation) — DDM (elevation) — ISM — BCM (BUC Control Module). The BCM contains signal terminations.

### 4. Service switch.

In switch-off position the DC Motor Driver modules (DDM), the BCM and the BUC are turned off for safe conditions during service and repair. The switch must be in on position for normal ADU operation. The switch only controls movements and prevents any transmission. In Off position the DDMs, BCM and BUC are turned off for safety during service and repair of the ADU.



Figure 8-12: Service switch

### 5. DC-Motor Driver Module for cross elevation (DDM).

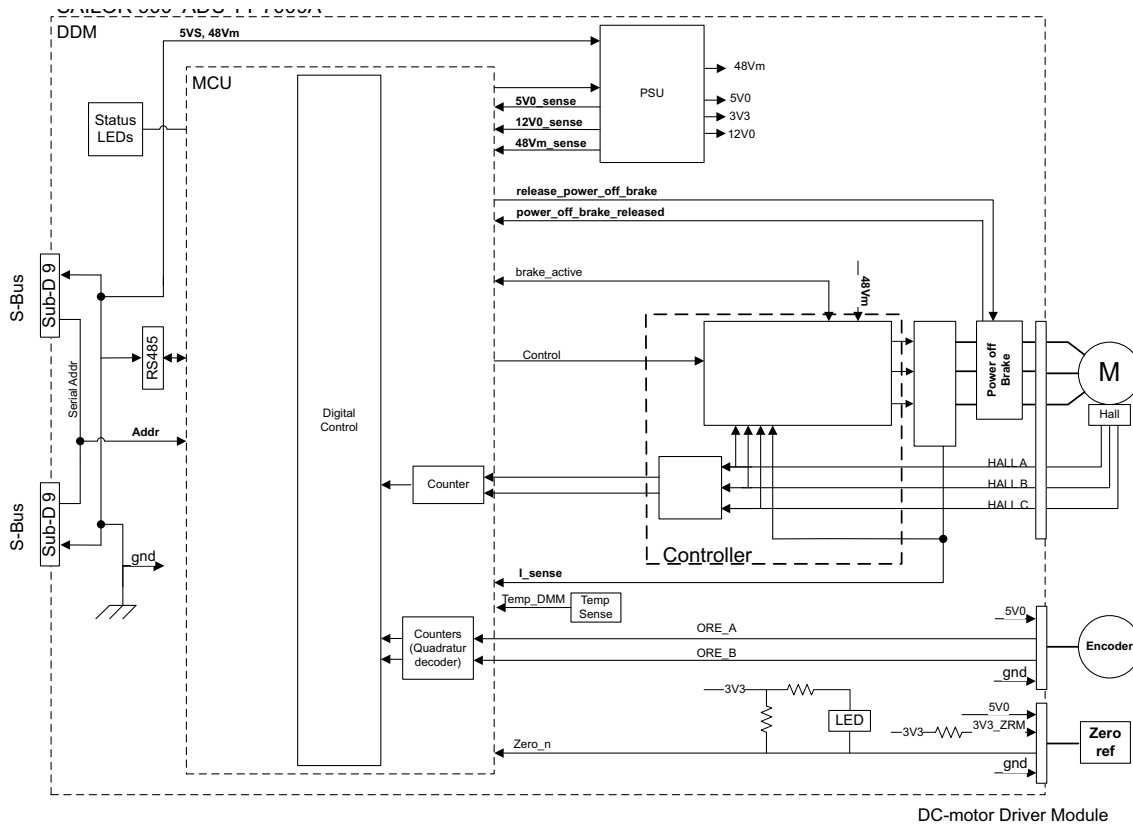


Figure 8-13: DDM – Block diagram

The DDM shall - based on inputs from the PCM - control the torque delivered by the brush-less DC-motors (BLDCM), used to control the position of the parabolic reflector.

The DDM board is:

- Communication slave of the ADU Serial-Bus (S-Bus) connecting the DC-motor Driver Modules (DDM), the BUC Control Module (BCM), the Inertial Sensor Module (ISM) and the Pedestal Control Module (PCM).

- Connection to the BLDCM, and delivering the required phase current to the motor.
  - Decoding the HALL-sensor input from the Zero Reference Module (ZRM).
  - Decoding the input from the Optical Rotary Encoder (ORE).
  - Incorporating a break function when not powered.
6. Cross elevation motor and encoder.
  7. Zero Reference Module (x3) (ZRM) (not visible on photo). (2 in the figure above, i in the figure below).

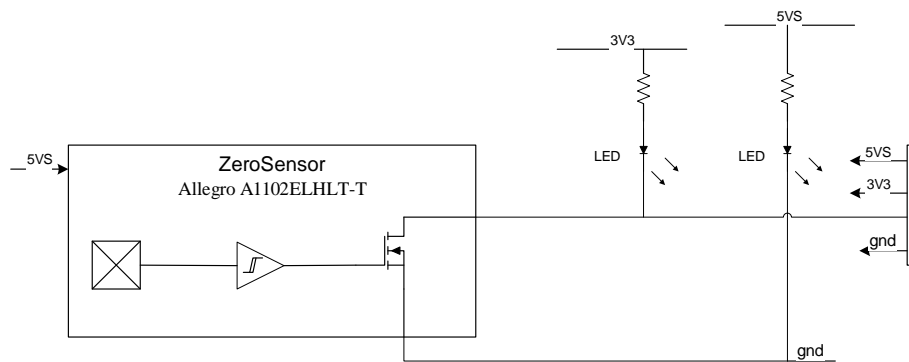


Figure 8-14: ZRM – Block diagram

In order to be able to find the predefined zero point of the antenna direction, HALL sensors and corresponding magnets mount in the gearwheels. Due to the magnetic hysteresis behaviour of the hall sensor, the software will have to make the magnets pass the hall sensor in both directions, and when use the mean value as the zero point.

The ZRM features two LEDs; one for indication of power supply, and one for indication of zero point.

8. DC-Motor Driver Module for elevation (on the bottom side) (DDM).  
As in item 3 above.
9. Elevation motor and encoder (not visible).
10. BUC Control Module (BCM).  
TBD: STA?
11. Block Up Converter (BUC). (behind cable screen, not visible on photo)  
The BUC converts the L-band Intermediate Frequency (IF) up to Ka-band radio signal, and amplifies it to transmit power level. It receives transmit signal and power from VIM2.
12. Low Noise Block down converter (LNB).  
The LNB receives the Ka-band radio signal, amplifies it and converts it down to an L-band Intermediate Frequency (IF). The conversion is controlled by a Local Oscillator (LO) frequency and the LO frequency is locked to an external reference signal. DC power and 50 MHz external reference signal are also supplied over the IF cable. The L-

band IF output is routed to the VSAT Interface Module (VIM2) located on the ADU's azimuth pedestal.

### 13. Polarizer.

The PMM provides power and communicates with the BUC. Control signals forwarded by VIM2 from BDU via coax cable are demodulated and sent to BUC for correct functionality.

The PMM board is:

- Communication slave of the ADU Bus also connecting the DCmotor Driver Modules (DDM), the Inertial Sensor Module (ISM) and the Pedestal Control Module (PCM).
- (Detection of temperature and power level from the Ortho Mode Transducer (OMT) - OPTIONAL)

### 14. Inertial Sensor Module (ISM).

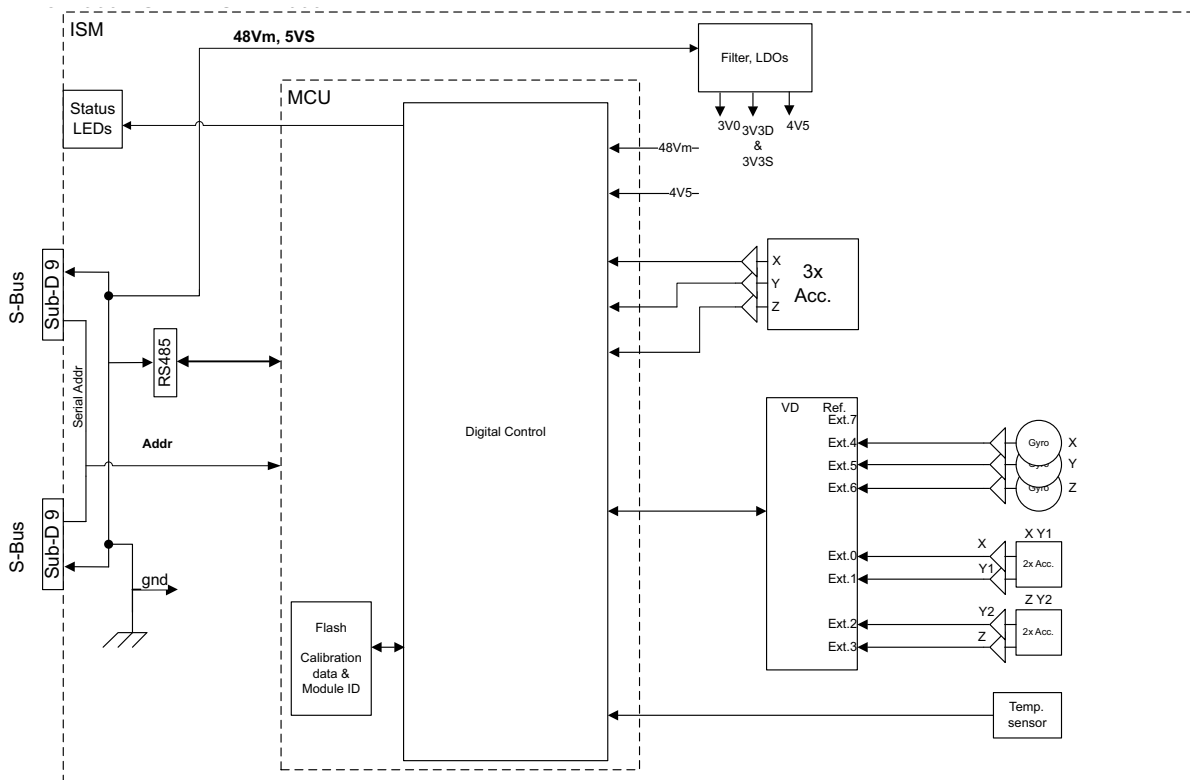


Figure 8-15: ISM – Block diagram

The ISM shall — based on request from the PCM — provide information about movement of the parabolic reflector, in the form of samples from gyro- and acceleration-sensors.

The ISM board is:

- Communication as slave of the ADU Bus connecting the Inertial Sensor Module (ISM), the DC-motor Driver Modules (DDM), the Polarization Motor Module (PMM), and the Pedestal Control Module (PCM).
- Collection of contemporary sample-data sets from all sensors and provide those to the PCM on request. A set of samples should be collected within less than 100 micro seconds.

- High stability and accuracy 3 axis accelerometer and angular rate sensor.
  - Prepared for wide range 3 axis accelerometer.
  - Calibration of sensor offset, gain, and misalignment over temperature (stored in non-volatile memory).
  - Secure fixing to the parabolic reflector.
  - Diagnosis of board supplies, sensor inputs, etc.
15. Elevation locking pin to lock the antenna dish in a fixed position (for safety during service) (not visible on photo).

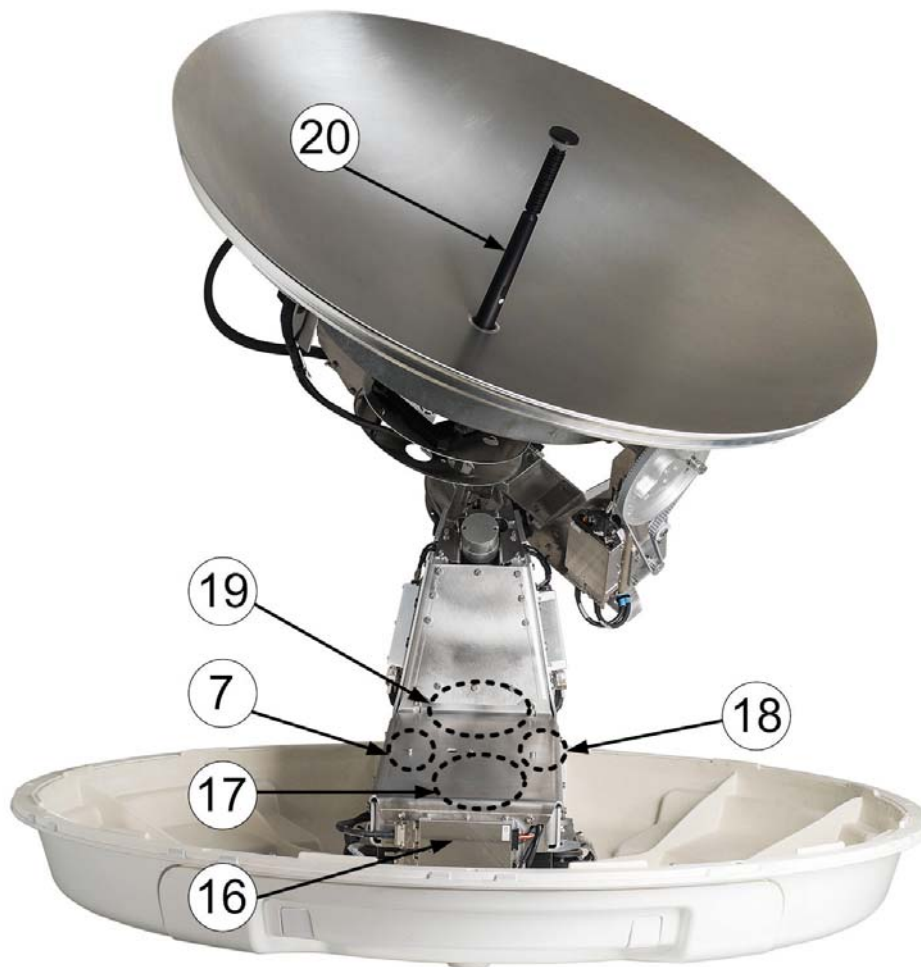


Figure 8-16: Above Deck Unit modules 2/2

16. DC-Motor Driver Module for Azimuth (DDM).  
As in item 3 above.
17. Azimuth motor.
18. Azimuth encoder.
19. Rotary joint.  
The cable signals for the ADU (DC power, internal modem communication, TX IF, RX and L-band TX) to and from the ACU have

to be ported from the stationary platform to the azimuth rotating part of the ADU. This is done via the rotary joint.

20.Feed horn.

The feeder horn carries the mirror centred of the dish and in the correct distance. Thereby the signal from the satellite is reflected by the dish and picked up by the mirror. Then it is transported through the horn to the OMT.

Before contacting your service partner check the LEDs on all modules (VIM, DDMs, PCM, PMM and ISM). See *LEDs of the ADU modules* on page 8-12 and *LEDs in the ACU* on page 8-12.

### 8..6.1.1 S-bus

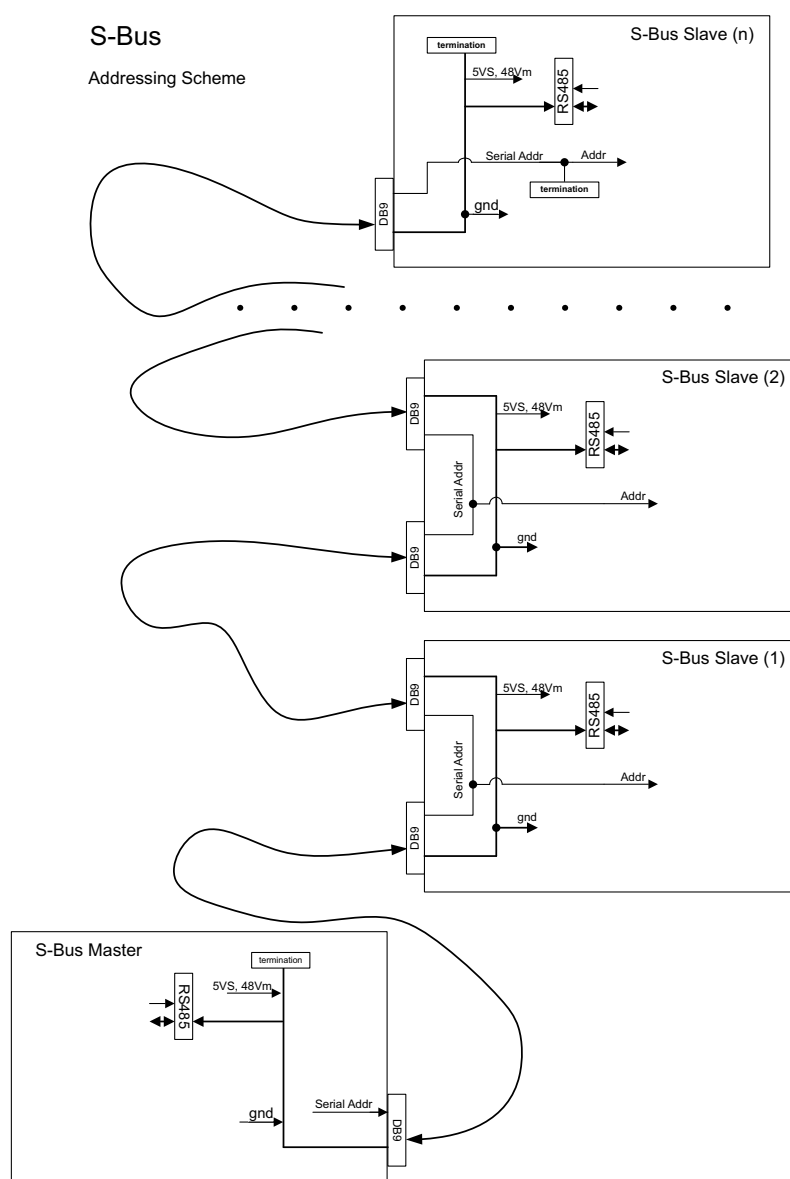


Figure 8-17: Block diagram – S-bus



The S-bus is as a single master/multi slave half-duplex UART link, mastered by the PCM module (5 Mbit/s).

The S-Bus master and slave modules are - by means of shielded DB9 cables - connected in a chain in the following order; PCM - DDM(azimuth) - DDM(x-elevation) - DDM(elevation) - ISM - BCM. End modules contains signal terminations.

#### **8.6.1.2 Tools needed**

Have the following tools ready at hand when starting to replace modules:

- 4x150 mm Allen key (located inside the service door of the ADU)
- Torx 20 screw driver
- Flat head screw driver
- 8 mm open-end spanner
- 11 mm open-end spanner
- 18 mm open-end spanner
- Acoustic frequency meter

## 8.6.2 To replace the GPS module

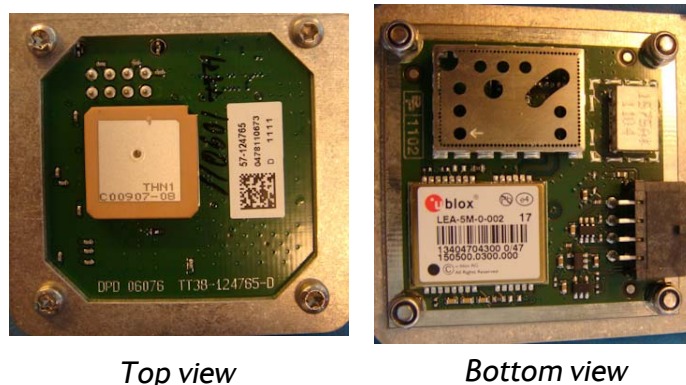


Figure 8-18: GPS module

The GPS Module is equipped with a receiver antenna (on top side) receiving the signals transmitted from the GPS satellites (low orbit), typical 10-12 are visible above the horizon. On the opposite side (bottom side) of the GPS Module the engine is located. It converts the GPS satellite signals into current position data (latitude, longitude and level). A minimum of 4 GPS satellites should be seen by the GPS Module to produce a valid position.

The GPS module is identical to the ones used in Thrane & Thrane SAILOR FleetBroadband products.

To replace the GPS module, do as follows:

### Tools needed:

- TX20
- 4x150 mm Allen key (located inside the service hatch of the ADU).

1. Open the service hatch.
2. Switch off the power to the antenna on the service switch.

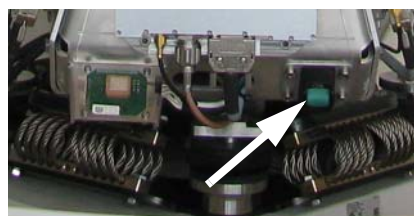
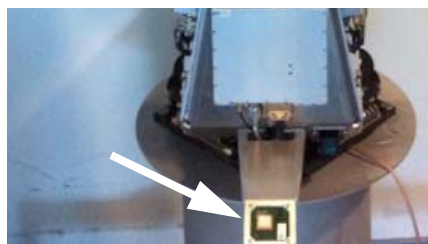


Figure 8-19: Switch off the power to the antenna

3. Rotate the antenna pedestal so that the arm with the GPS module faces the service hatch.

4. Disconnect the connector located on the bottom side of the GPS PCB.



Figure 8-20: Connector for GPS PCB

5. Loosen the 4x4 mm Allen screws (thread size M5).

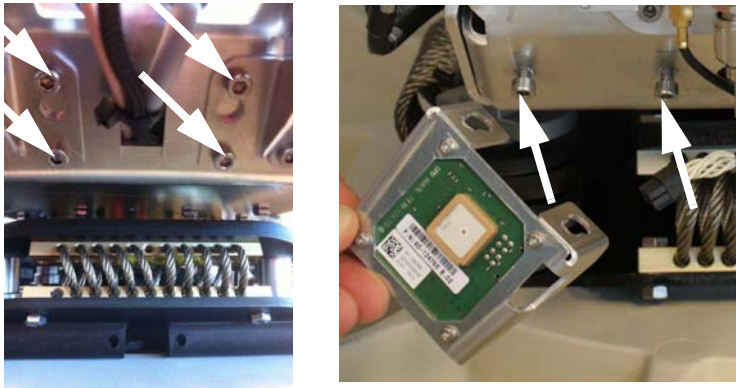


Figure 8-21: Screws on GPS module

6. Lift the complete GPS module free, in the key holes, from the pedestal.

To insert a new GPS module follow the instructions above in reverse order.

### 8.6.3 To replace the VSAT Interface Module (VIM2)

To replace the VIM2, do as follows:

Tools needed:

- 4 x 150 mm Allen key (located inside the service door of the ADU)
- 8 mm open-end spanner
- 11 mm open-end spanner
- 18 mm open-end spanner
- Flat head screw drive

1. Open the service hatch.
2. Switch off the power to the antenna on the service switch.
3. Rotate the antenna pedestal so that the arm of the GPS module faces the service hatch.
4. Rotate the antenna dish to top position.
5. Press in and turn the elevation locking pin to locked position.



Figure 8-22: Elevation locking pin

6. Disconnect the 2 SMA connectors at the top of the VIM2.

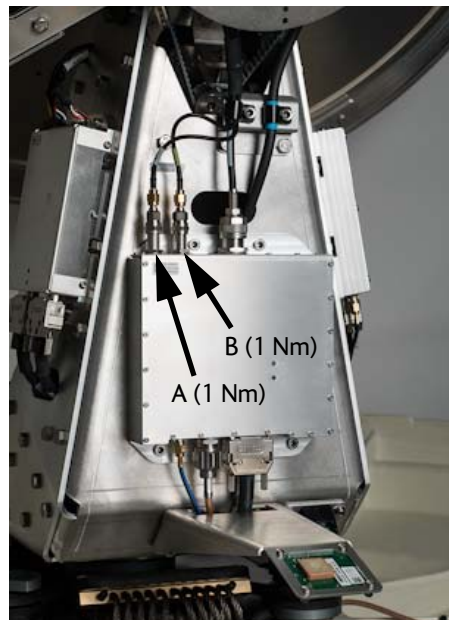


Figure 8-23: Replacement of VIM

7. Disconnect the N-connector at the top (A) and the one at the bottom of the VIM (B), the SUB-D-connector (C), then the SMA connector (D) at the bottom of the VIM2.

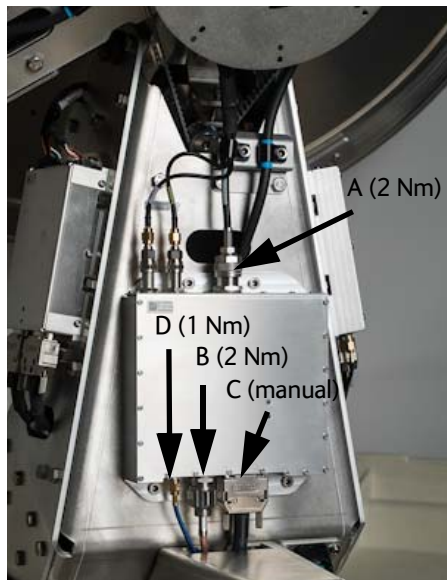


Figure 8-24: Replacement of the VIM (Continued)

8. Loosen the 4x4 mm Allen screws to remove the VIM.

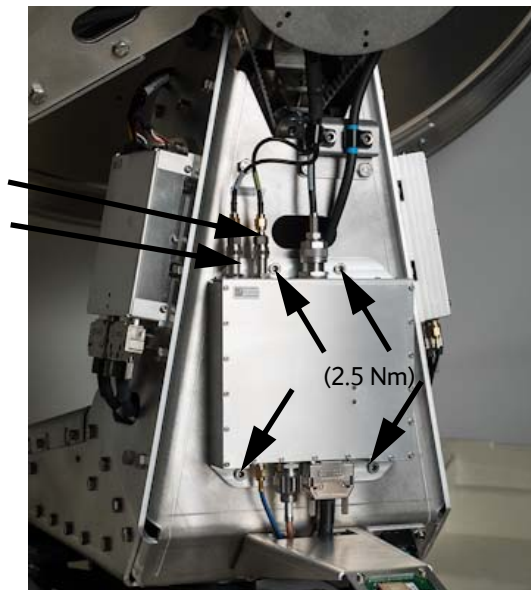


Figure 8-25: Replacing the VIM — remove 4 Allen screws

9. Insert the new VIM2 module, follow the instructions above in reverse order. Use the cable wrench where appropriate.
10. Connect the cable X POL to B and CO POL to A.

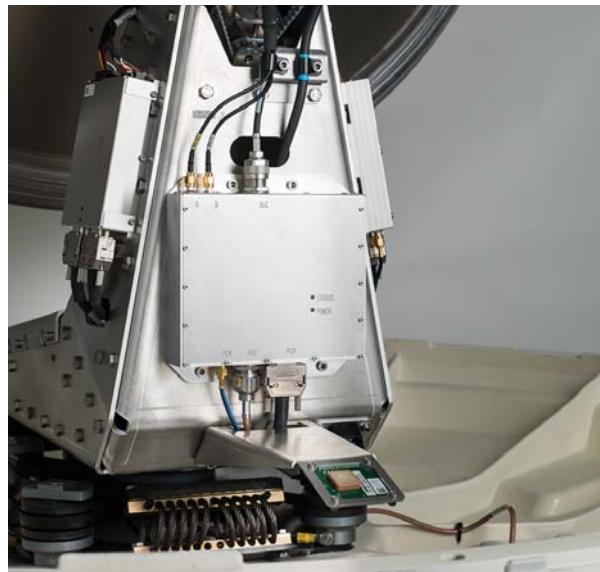


Figure 8-26: VIM2 module for Ka antenna

**Important**

After installing a new VIM you must update the calibration data. For instructions see *To update VIM2/PCM calibration data* on page 8-67.

#### 8.6.4 To replace the DC-Motor Driver Module (DDM)

The ADU is equipped with three (3) DDMs for the axes:

- Cross Elevation DDM
- Elevation DDM
- Azimuth DDM

By the input from the PCM the DDM controls the power delivered to the DC-motors to control the orientation of the ADU.

The DDM has two LEDs for status and troubleshooting:

- Power LED: green or Off
- Service LED: green or red

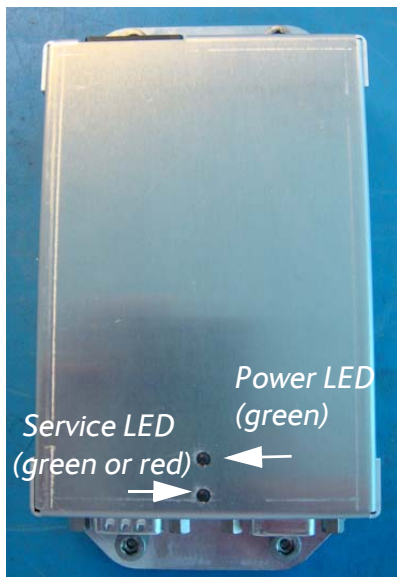


Figure 8-27: DC-Motor Driver Module (DDM) for Cross Elevation

For step-by-step instructions see:

- To replace the Cross Elevation DDM on page 8-29
- To replace the Elevation DDM on page 8-30
- To replace the Azimuth DDM on page 8-31

#### 8..6.4.1 To replace the Cross Elevation DDM

To remove the Cross Elevation DDM, do as follows:

1. Open the service hatch.
2. Switch off the power to the antenna on the service switch.
3. Rotate the antenna pedestal so that the arm with the Cross Elevation DDM module faces the service hatch.
4. Disconnect the 3 connectors at the top of the Cross Elevation DDM, then the 2 SUB-D connectors at the bottom of the DDM.

**Note** | Note that two connectors are identical. Mark them so you know where each connector belongs to (e.g. left, right).

##### Tools needed:

- TX20 (SAILOR 900), TX30 (SAILOR 800)
- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Flat head screw driver





Figure 8-28: Replacing the DDM — remove connectors

5. Remove the 4x4 mm Allen screws (thread size M5) (visible when the connectors are removed) and remove the Cross Elevation DDM.

To insert a new DDM follow the instructions above in reverse order.

#### 8.6.4.2 To replace the Elevation DDM

To remove the Elevation DDM, do as follows:

##### Tools needed:

- TX20 (SAILOR 900), TX30 (SAILOR 800)
- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Flat head screw driver

1. Open the service hatch.
2. Switch off the power to the antenna on the service switch.
3. Rotate the antenna pedestal so that the elevation DDM faces the service hatch.
4. Disconnect the 3 connectors at the front of the Elevation DDM, then the 2 SUB-D connectors at the rear of the Elevation DDM.

##### Note

Note that two connectors are identical. Mark them so you know where each connector belongs to (e.g. left, right).



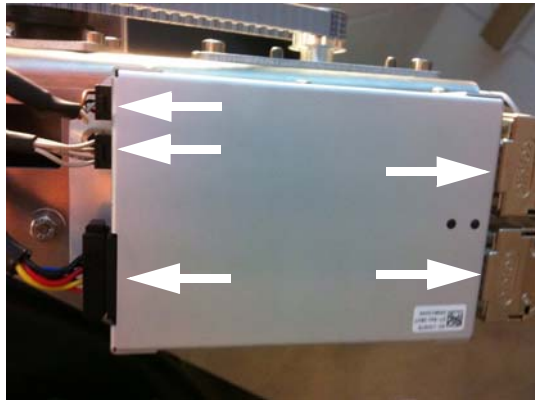


Figure 8-29: Elevation DDM, connectors

5. Remove the 4x4 mm Allen screws (thread size M5) (visible when the connectors are removed) and remove the Elevation DDM.

To insert a new Elevation DDM follow the instructions above in reverse order.

#### 8.6.4.3 To replace the Azimuth DDM

To remove the Azimuth DDM, do as follows:

1. Open the service hatch.
2. Switch off the power to the antenna on the service switch.
3. Rotate the antenna pedestal so that the Azimuth DDM faces the service hatch.
4. Locate the Azimuth DDM at the front of the antenna.

##### Tools needed:

- TX20
- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Flat head screw driver



Figure 8-30: location of the Azimuth DDM (SAILOR 900 picture)

5. Disconnect the 3 connectors at the right of the Azimuth DDM, then the 2 SUB-D connectors at the left of the Azimuth DDM.

**Note**

Note that two connectors are identical. Mark them so you know where each connector belongs to (e.g. left, right).

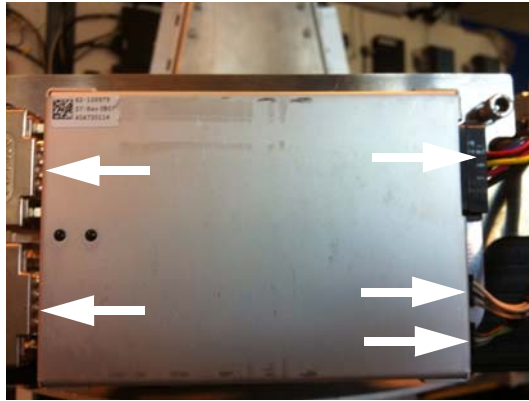


Figure 8-31: Azimuth DDM, connectors

6. Remove the 4x4 mm Allen screws (thread size M5) (visible when the connectors are removed) and remove the Azimuth DDM.

To insert a new Azimuth DDM follow the instructions above in reverse order.

### 8.6.5 To replace the BUC Control Module (BCM)

To remove the BCM, do as follows:

**Tools needed:**

- TX20
- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Flat head screw driver

1. Open the service hatch.
2. Switch off the power to the antenna on the service switch.
3. Rotate the Antenna Dish to top position.
4. Press in and turn the elevation locking pin to locked position.

5. Disconnect the 4 connectors from the BCM (mark them to avoid mistakes).



Figure 8-32: Connectors at the BCM

6. Remove the 4x4 mm Allen screws (thread size M5).



Figure 8-33: Cable connection from the cable wrap

If access for some reason is limited, remove the Ka RF-pack, see section TBD.

To insert a new BCM follow the instructions above in reverse order - while observing the following guidelines:

1. Observe the marking on the BCM:
  - S-BUS IN: SUB-D connector linking BCM to other modules via the S-bus
  - VIM: N-connector, cable connected to VIM2
  - BUC: N-connector connecting BCM to BUC
  - BUC I/O: SUB-D connector, connecting BCM with BUC

See figure Figure 8-32: Connectors at the BCM.

### 8.6.6 To replace the Pedestal Control Module (PCM)

The PCM controls the antenna dish and the polarization mechanism assembly with the three DC motors and a step motor. Communication between the PCM and ACU is done via the VIM2. The VIM2 is also controlled by the PCM via a parallel interface cable.

The PCM is the communication master of the ADU serial-bus connecting the DDM, PMM and ISM. Communication to the GPS Module and power to all modules is via S-bus.

The PCM has two LEDs for status and troubleshooting:

- Power LED: green or Off
- Service LED: green or red

To replace the PCM, do as follows:

#### Tools needed:

- TX20
- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Flat head screw driver
- 8 mm open-end spanner

1. Open the service hatch.
2. Switch off the power to the antenna on the service switch.
3. Rotate the antenna pedestal so that the Pedestal Control Module (PCM) faces the service hatch.
4. Disconnect the 2 connectors at the top, then the 2 SUB-D connectors at the bottom, then the SMA connector at the bottom (left) of the PCM.

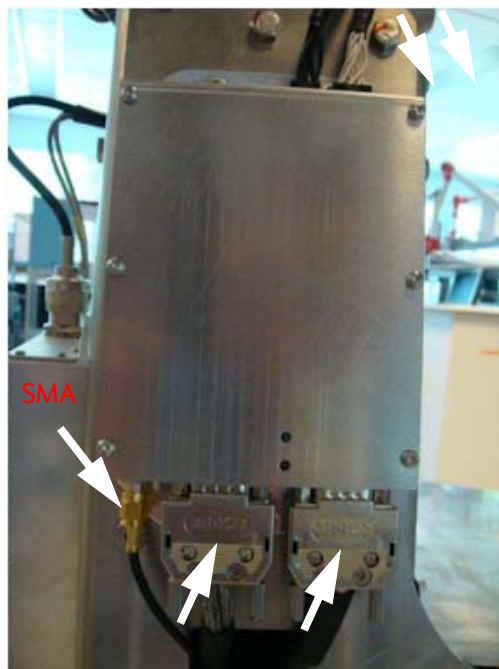


Figure 8-34: Removing the PCM — connectors

5. Remove the 4x4 mm Allen screws (thread size M5) (all become visible when the connectors are removed) and remove the PCM.

To insert a new PCM follow the instructions above in reverse order.

**Important**

After installing a new PCM you must update the calibration data. For instructions see *To update VIM2/PCM calibration data* on page 8-67.

### 8.6.7 To replace motor and encoder

The ADU is equipped with three DC-motors, two of which are identical, and one step motor, for the axes:

- Elevation (DC motor).
- Azimuth (DC motor).
- Cross Elevation (DC motor).

The DC-motors are all brush-less motors, controlled by their individual DDM. To each of the DC-motors a corresponding encoder provides feedback of its position.

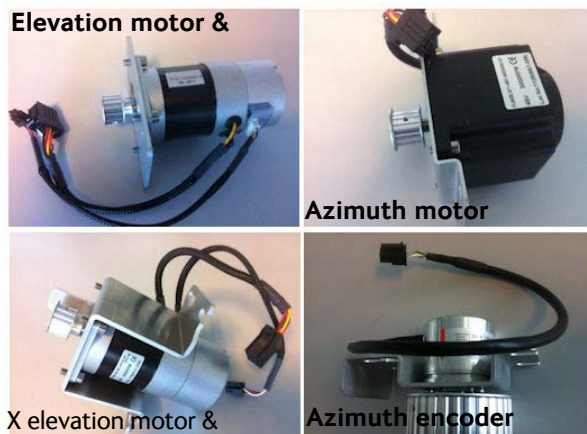


Figure 8-35: Motors and encoders

For step-by-step instructions see:

*To replace the Elevation Motor and Encoder* on page 8-36

*To replace the Azimuth Motor* on page 8-38

*To replace the X Elevation Motor and Encoder* on page 8-45

*To replace the X Elevation Motor and Encoder* on page 8-45

### 8..6.7.1 To replace the Elevation Motor and Encoder

To remove the Elevation Motor and Encoder, do as follows:

Tools needed:

- TX20
- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Acoustic frequency meter

1. Open the service hatch. Switch off the power to the antenna on the service switch.
2. Rotate the Antenna Pedestal so motor assembly and elevation belt faces the service hatch.

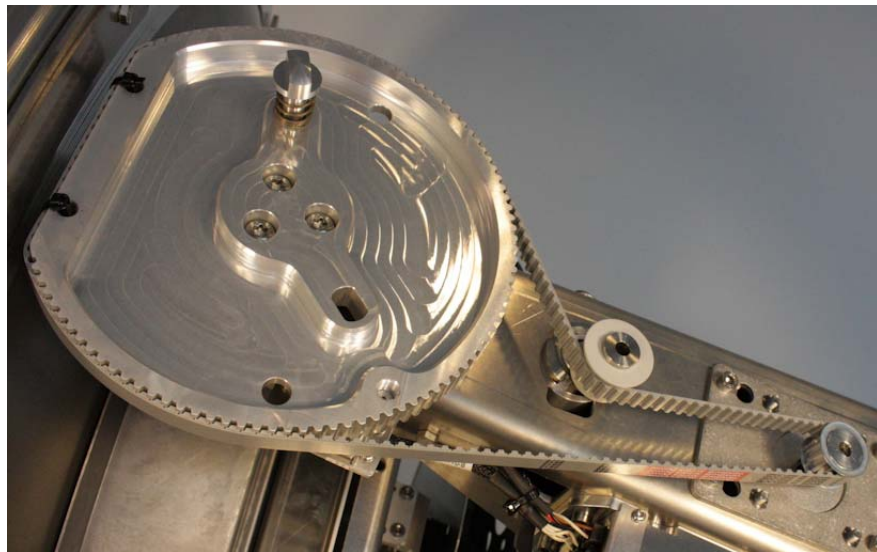


Figure 8-36: Elevation motor and encoder, loosen the belt tensioner



3. Disconnect the 8-pin connector and the 6-pin connector (colored wires) from the Elevation DDM.



Figure 8-37: Elevation DDM, disconnect 2 connectors

4. Loosen the 4x4 mm Allen screws from the motor assembly.

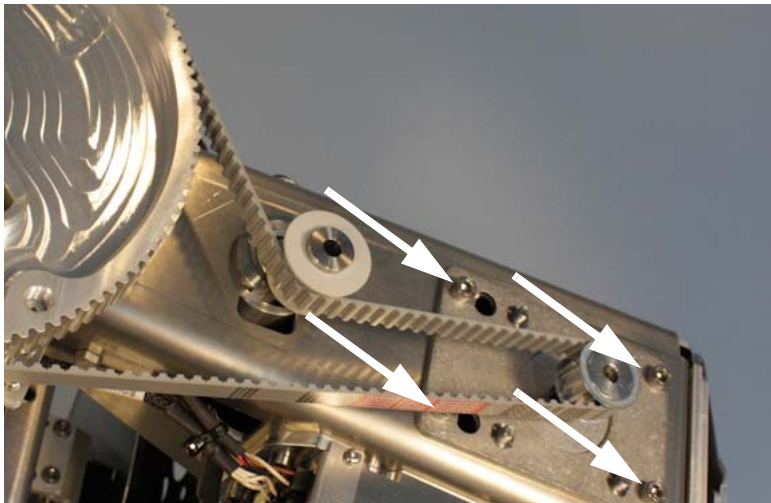


Figure 8-38: Elevation motor and encoder, loosen the screws for the motor assembly

5. Slide free in the key holes of the motor assembly and remove the motor.

**To insert a new Elevation motor and encoder follow the instructions above in reverse order while observing the following guidelines:**

1. String the Elevation belt around the pulley of the motor assembly and below the belt tensioner.

2. Tighten the 4x4 mm Allen screws from the motor assembly.

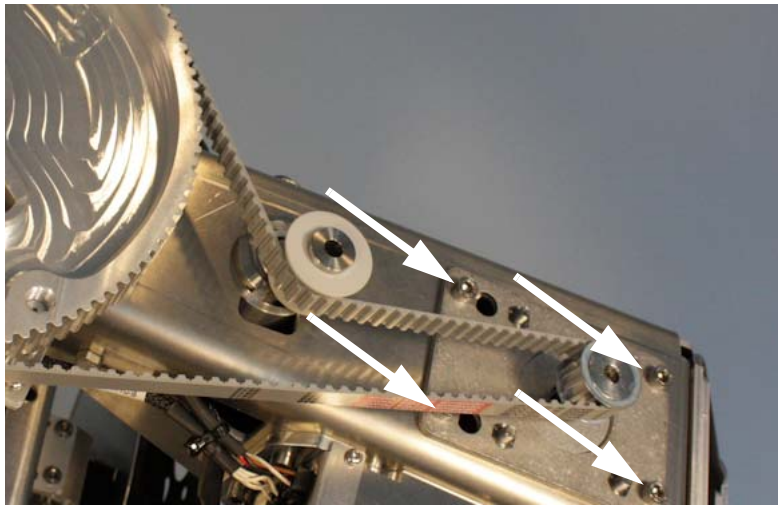


Figure 8-39: Elevation motor and encoder, tighten the screws for the motor assembly

### 8.6.7.2 To replace the Azimuth Motor

To remove the Azimuth Motor, do as follows:

Tools needed:

- TX20
- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Acoustic frequency meter

1. Open the service hatch.
2. Switch off the power to the antenna on the service switch.
3. Rotate the antenna dish to top position.
4. Press in and turn the elevation locking pin to locked position.

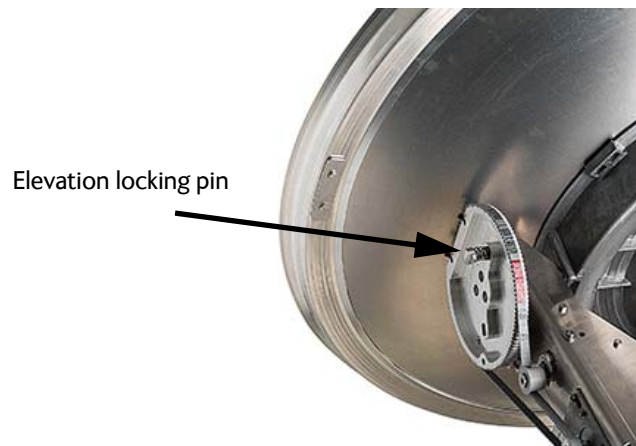


Figure 8-40: Elevation locking pin

5. Rotate the antenna pedestal so that the Azimuth DDM faces from the service hatch.



6. Loosen the 15x4 mm Allen screws (the 3 Allen screws on top are longer than the rest) on the cover over the azimuth drive modules, and remove the cover (lift and slide).

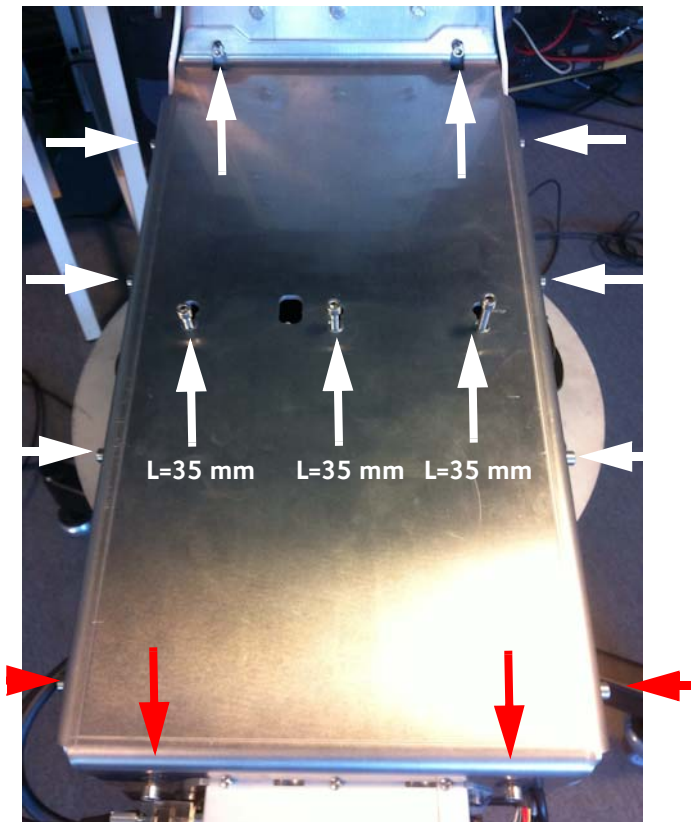


Figure 8-41: Azimuth motor, remove cover

7. Loosen the belt tension device by loosening the 4x4 mm Allen screws (thread size M5).

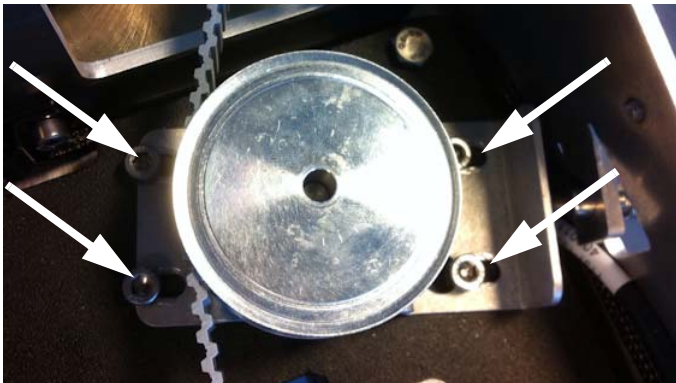


Figure 8-42: Azimuth motor, loosen the belt tensioner

8. Adjust the belt-tension screw to middle position.

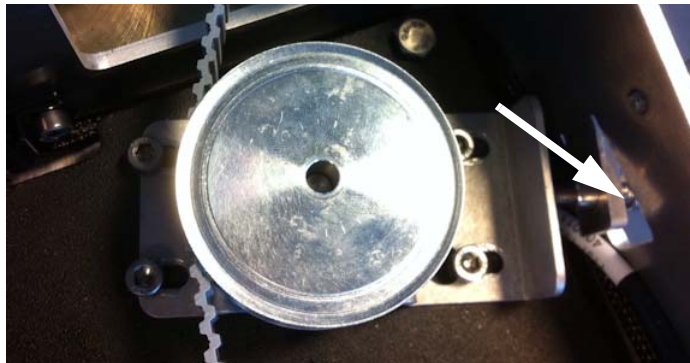


Figure 8-43: Azimuth motor, adjust belt tension

9. Disconnect the 8-pin connector from the Azimuth DDM.



Figure 8-44: Azimuth DDM, disconnect connector

10. Loosen the 4x4 mm Allen screws (thread size M5) from the motor assembly.

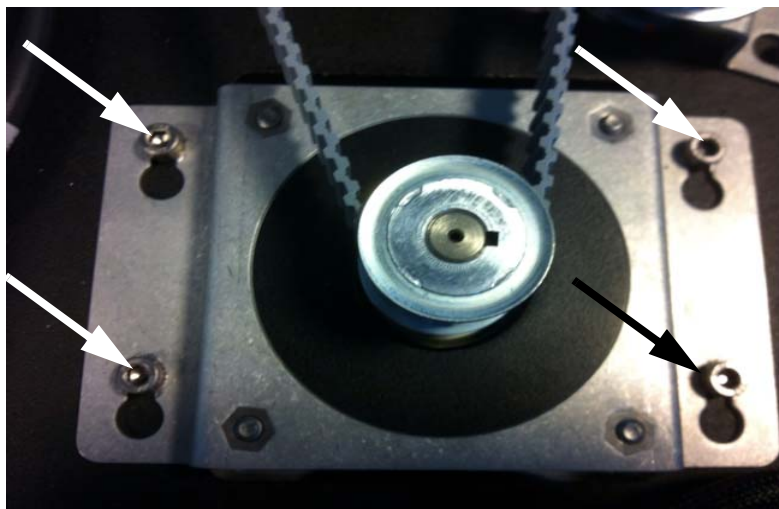


Figure 8-45: Azimuth motor, loosen the screws for the motor assembly

11. Slide free in the key holes of the motor assembly and remove the motor.

To insert a new Azimuth Motor follow the instructions above in reverse order — **while observing the following guidelines:**

1. String the Azimuth belt around the pulley of the motor assembly and around the belt tensioner.
2. Tighten the 4x4 mm Allen screws (thread size M5) from the motor assembly.

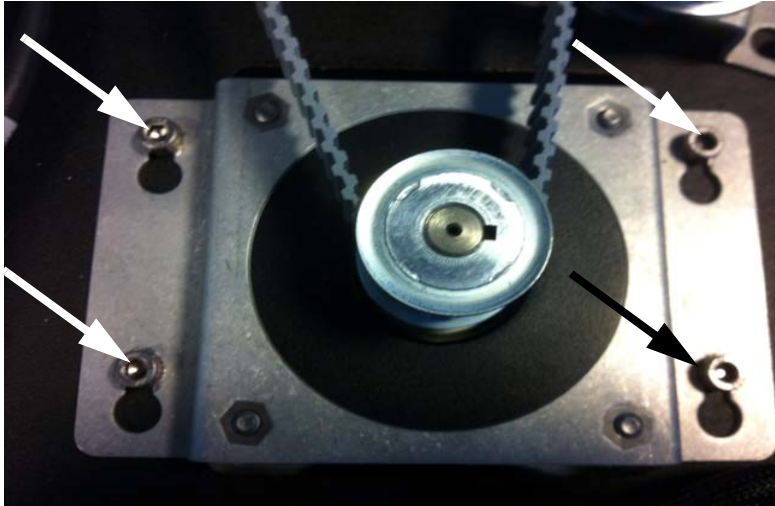


Figure 8-46: Azimuth motor, tighten the screws for the motor assembly

3. Adjust the belt tension using the belt-tension adjustment screw.



Figure 8-47: Azimuth motor, adjust belt tension

The tension of the belt is 90-100 Hz on average (use an Optibel frequency measuring device or alike).

4. Tighten the belt tension device by tightening the 4x4 mm Allen screws (thread size M5).



Figure 8-48: Azimuth motor, tighten the belt tensioner

5. Check the tension of the belt again (90-100 Hz). If needed, repeat the tension adjustment.

### 8.6.7.3 To replace the Azimuth Encoder

To remove the Azimuth Encoder, do as follows:

#### Tools needed:

- TX20
- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Acoustic frequency meter

1. Open the service hatch.
2. Switch off the power to the antenna on the service switch.
3. Rotate the Antenna Dish to top position.
4. Press in and turn the elevation locking pin (available in some antennas) to locked position.
5. Rotate the antenna pedestal so that the Azimuth DDM faces from the service hatch.

6. Loosen the 15x4 mm Allen screws (the 3 Allen screws on top are longer than the rest) on the cover over the azimuth drive modules, and remove the cover (lift and slide).

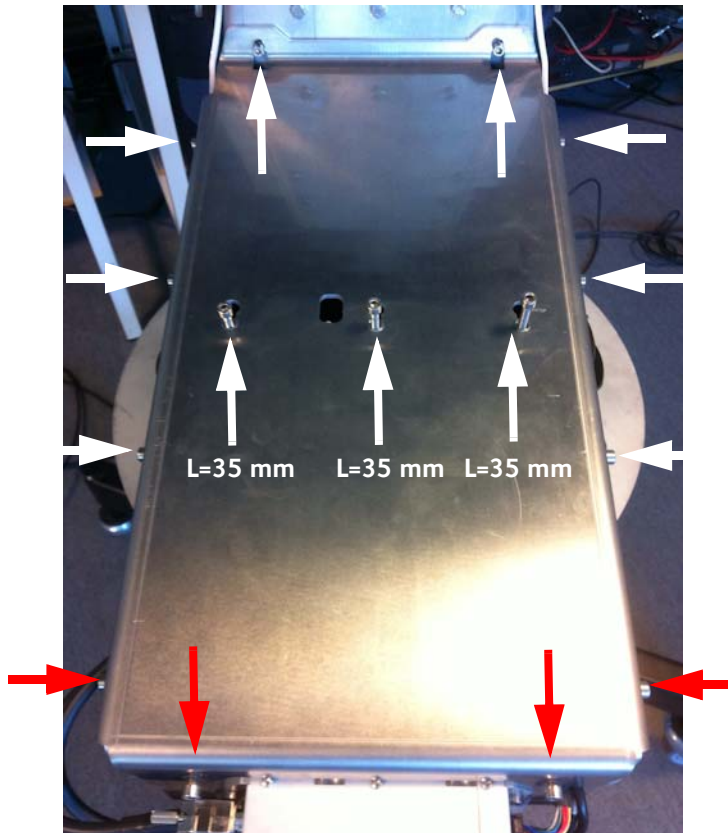


Figure 8-49: Azimuth encoder, remove cover

7. Disconnect the 6-pin connector (colored wires) from the Azimuth DDM.



Figure 8-50: Azimuth DDM, disconnect connector



8. Loosen the belt tension device by loosening the 4x4 mm Allen screws (thread size M5) and slide out the Azimuth Encoder.

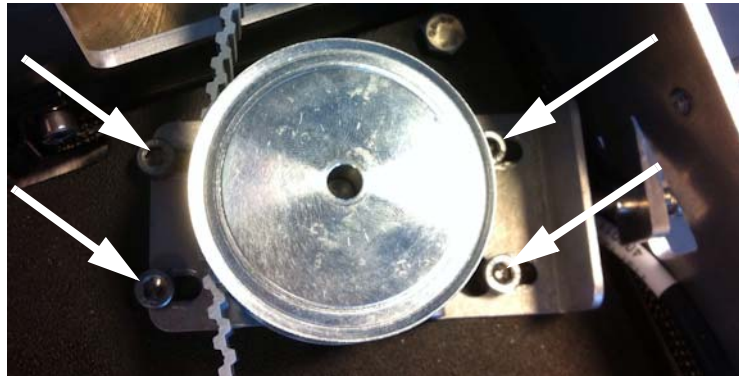


Figure 8-51: Azimuth encoder, remove

9. Adjust the belt-tension screw to middle position.



Figure 8-52: Azimuth encoder, adjust belt tension

To insert a new Azimuth encoder follow the instructions above in reverse order **while observing the following guidelines:**

1. String the Azimuth belt around the pulley of the motor assembly and left around the encoder/belt tensioner.
2. Adjust the belt tension using the belt-tension adjustment screw.



Figure 8-53: Azimuth Encoder, adjust belt tension

The tension of the belt is 90-100 Hz on average (use an Optibel frequency measuring device or alike).

3. Tighten the belt tension device by tightening the 4x4 mm Allen screws (thread size M5).

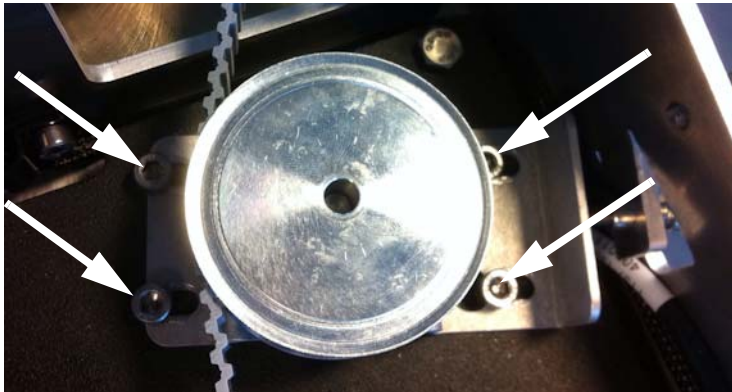


Figure 8-54: Azimuth motor, tighten the belt tensioner

4. Check the tension of the belt again (90-100 Hz). If needed, repeat the tension adjustment.

#### 8.6.7.4 To replace the X Elevation Motor and Encoder

To remove the Cross Elevation Motor and Encoder, do as follows:

1. Open the service hatch.
2. Switch off the power to the antenna on the service switch.
3. Rotate the antenna dish to top position.
4. Rotate the antenna pedestal so that the arm with the X Elevation Motor faces the service hatch.
5. Press in and turn the elevation locking pin (available in some antennas) to locked position.

##### Tools needed:

- TX20
- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Acoustic frequency meter

6. Disconnect the 3 cables at the top of the Cross Elevation DDM.



Figure 8-55: Replacement of X-Elevation Motor & Encoder 1

7. Loosen the Cross-Elevation Drive belt tension/adjustment screw.

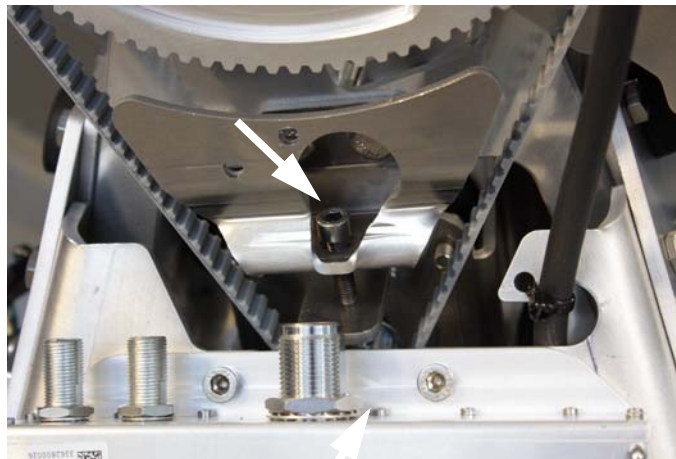


Figure 8-56: X-Elevation Motor & Encoder — belt tension/adjustment screw



8. Loosen the 4x4 mm Allen screws (thread size M5) of the motor assembly.

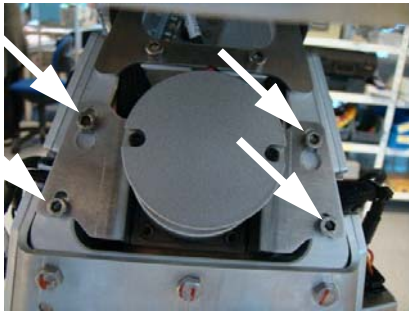


Figure 8-57: X Elevation motor assembly, 4 Allen screws

9. Lift the complete X Elevation Motor & Encoder assembly free, in the key holes, from the pedestal and remove it.

To insert a new X Elevation Motor & Encoder follow the instructions above in reverse order **while observing the following mounting guidelines:**

1. Do not tighten the 4x4 mm Allen screws (thread size M5) of the motor assembly.

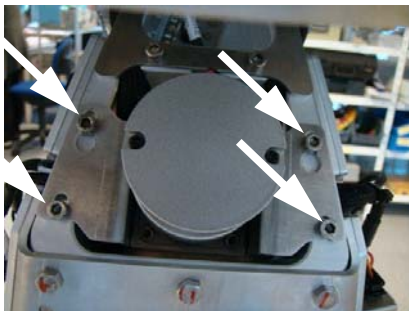


Figure 8-58: Cross Elevation motor assembly, do not tighten screws

2. Adjust the belt tension using the belt tension/adjustment screw.

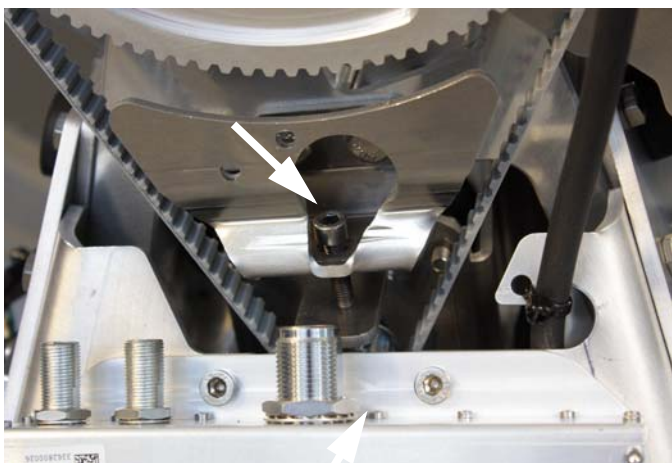


Figure 8-59: X-Elevation Motor & Encoder — adjust belt tension

3. Now tighten the 4x4 Allen screws (thread size M5) of the Cross Elevation Motor & Encoder assembly.

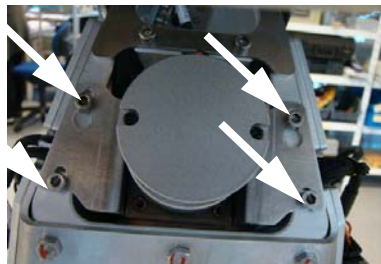


Figure 8-60: X Elevation motor assembly, tighten screws

4. Check the tension of the belt again (80-100 Hz). If needed, repeat the tension adjustment.

### 8.6.8 To replace the Drive Belts

The ADU has the following drive belts:

- X Elevation drive belt
- Elevation drive belt
- Azimuth drive belt

For step-by-step instruction see:

*To replace the X Elevation Drive Belt on page 8-48*

*To replace the Elevation Drive Belt on page 8-50*

*To replace the Azimuth Drive Belt on page 8-50*

#### 8.6.8.1 To replace the X Elevation Drive Belt

To remove the X Elevation Drive Belt, do as follows:

1. Open the service hatch.
2. Switch off the power to the antenna on the service switch.
3. Rotate the Antenna Pedestal so that the cable drum faces the service hatch.
4. Loosen the tension adjustment screw of the Cross Elevation Drive Belt.
5. Loosen the 4x4 mm Allen screws (thread size M5) of the motor assembly.

#### Tools needed:

- TX20
- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Acoustic frequency meter

6. Remove the cable drum by removing the 4x4 mm Allen screws (thread size M5) and leave the cable drum hanging in the cables.



Figure 8-61: Removing the cable drum

7. Remove the Cross Elevation Drive Belt.

To insert a new X Elevation Drive Belt the instructions above in reverse order — **while observing the following mounting guidelines:**

Follow the instructions given in *To replace the X Elevation Motor and Encoder* on page 8-45.

### 8..6.8.2 To replace the Elevation Drive Belt

To remove the Elevation Drive Belt, do as follows:

Tools needed:

- TX20
- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Acoustic frequency meter

1. Open the service hatch.
2. Switch off the power to the antenna on the service switch.
3. Rotate the Antenna Pedestal so the Elevation Drive Belt faces the service hatch.
4. Press in and turn the elevation locking pin to locked position.
5. Cut the two plastic tie wraps on the elevation drive wheel.
6. Remove the Elevation Drive Belt.

To insert a new Elevation Drive Belt follow the instructions above in reverse order while observing the following guidelines:

Follow the instructions in *To replace the X Elevation Motor and Encoder* on page 8-45.

### 8..6.8.3 To replace the Azimuth Drive Belt

To remove the Azimuth Drive Belt, do as follows:

Tools needed:

- TX20
- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Acoustic frequency meter

1. Open the service hatch.
2. Switch off the power to the antenna on the service switch.
3. Rotate the antenna pedestal so that the arm with the GPS module faces the service hatch and
4. Rotate the Antenna Dish to top position.
5. Press in and turn the elevation locking pin (available in some antennas) to locked position.

6. Loosen the 15x4 mm Allen screws (the 3 Allen screws on top are longer than the rest) on the cover over the azimuth drive modules, and remove the cover (lift and slide).

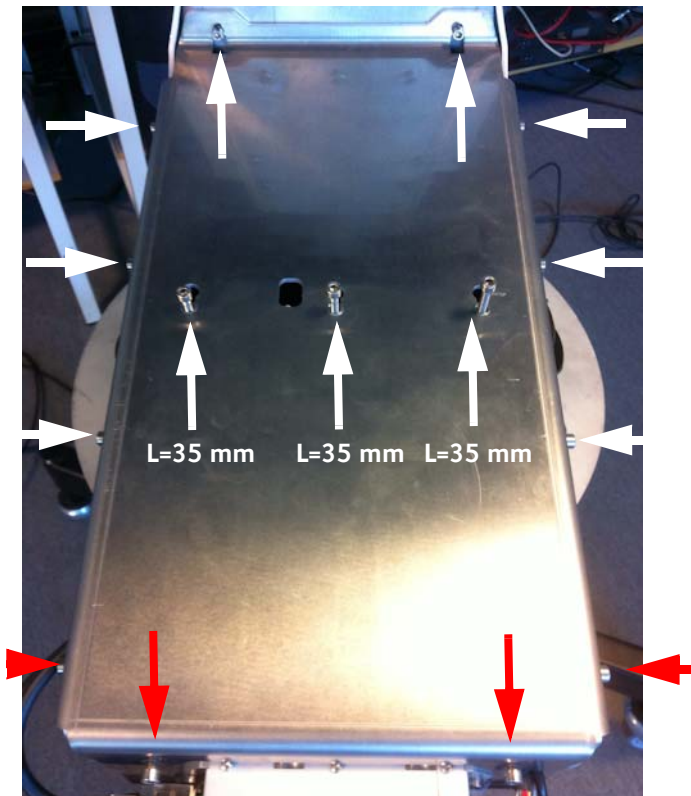


Figure 8-62: Azimuth drive modules, remove cover

7. Loosen the belt tension device by loosening the 4x4 mm Allen screws
8. (thread size M5).

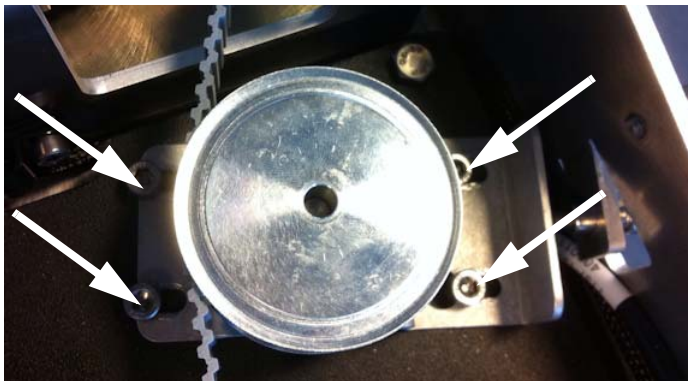


Figure 8-63: Azimuth drive belt, loosen the belt tensioner



9. Adjust the belt-tension screw to middle position.



Figure 8-64: Azimuth drive belt, adjust belt tension

10. Remove the RF connector (N-type, finger nut) from the Rotary Joint.

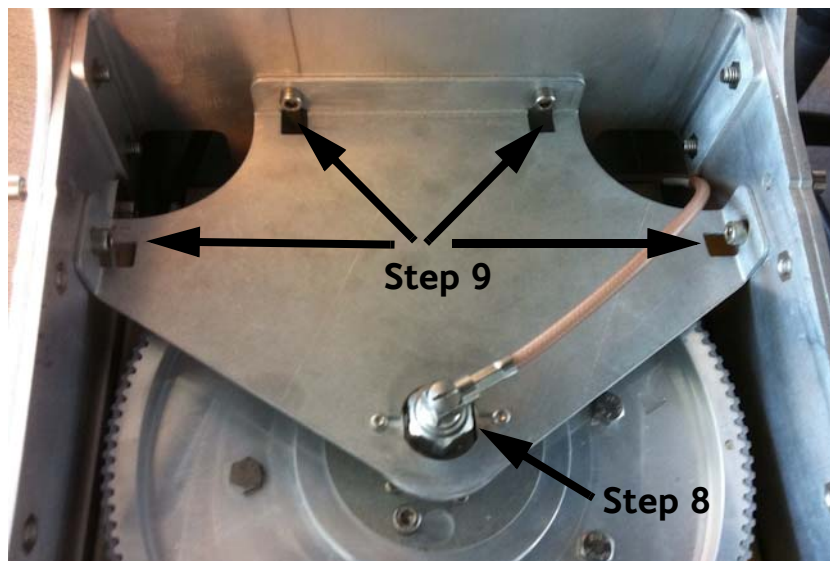


Figure 8-65: Getting access to the azimuth drive wheel

11. Loosen the 4x4 mm Allen screws (thread size M5) from the cover plate over the azimuth drive wheel.
12. Remove the cover plate.

13.Remove the Azimuth Drive Belt.

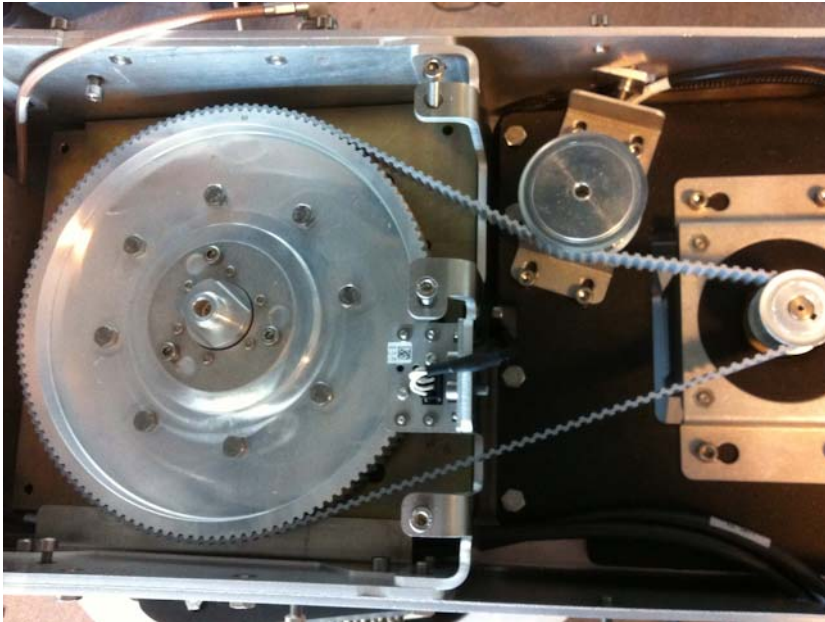


Figure 8-66: Azimuth Drive Belt

To insert a new Azimuth Drive Belt follow the instructions above in reverse order **while observing the following guidelines:**

Follow the instructions in *To replace the Azimuth Motor* on page 8-38.

### 8.6.9 To replace the Zero Reference Module (ZRM)

The ADU has the following identical ZRMs, one for each drive wheel (each axes):

- X Elevation ZRM
- Elevation ZRM
- Azimuth ZRM



Figure 8-67: Location of the Zero Reference Modules (ZRM)

The ZRM has a Hall sensor that detects a zero point (small magnet, mounted on the drive wheel). The zero point signal of the ZRM is sent to the PCM and is used in the orientation of the ADU.

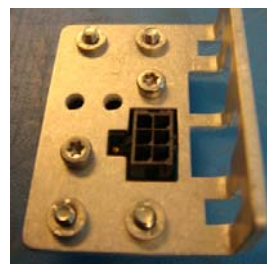


Figure 8-68: Zero Reference Module (ZRM)

For step-by-step instructions see:

*To replace the X Elevation ZRM on page 8-55*

*To replace the Elevation ZRM on page 8-56*

*To replace the Azimuth ZRM on page 8-58*



### 8..6.9.1 To replace the X Elevation ZRM

To remove the X Elevation ZRM, do as follows:

1. Open the service hatch.
2. Switch off the power to the antenna on the service switch.
3. Rotate the antenna pedestal so that the Azimuth DDM faces the service hatch.
4. Rotate the antenna dish to top position.
5. Press in and turn the elevation locking pin to locked position.
6. Disconnect the connector from the ZRM.

Tools needed:

- TX20
- 4 x 150 mm Allen key (located inside the service door of the ADU)



Figure 8-69: X Elevation ZRM, disconnect connector

7. Through the two holes (above the X Elevation DDM) in the pedestal loosen the 2x4 mm Allen screws.

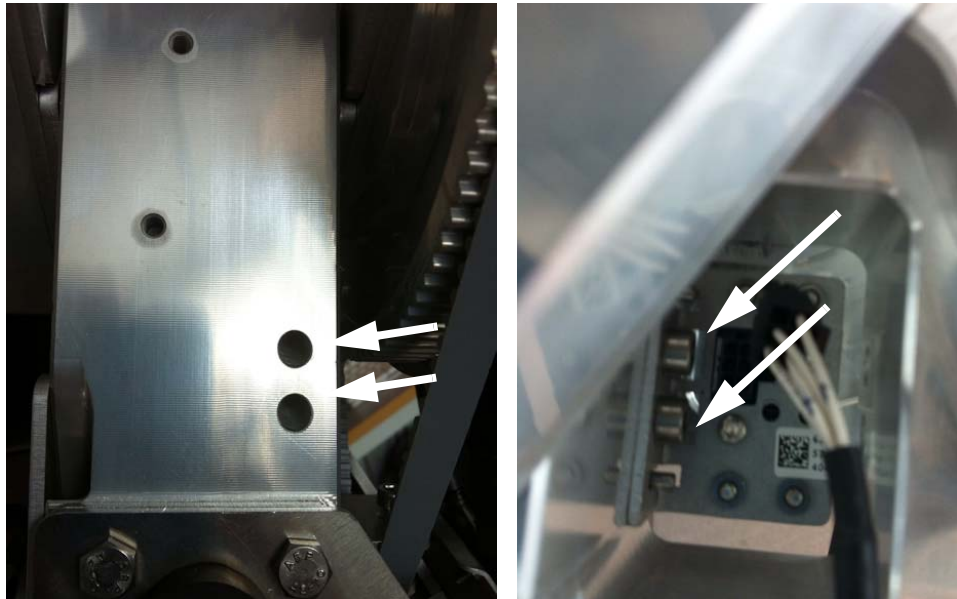


Figure 8-70: X Elevation ZRM, slide out

8. Slide out the X Elevation ZRM.

To insert a new X Elevation ZRM follow the instructions above in reverse order.

**Important** It is very important that you slide the ZRM all the way into the guide pins.

### 8.6.9.2 To replace the Elevation ZRM

To remove the Elevation ZRM, do as follows:

#### Tools needed:

- TX20
- 4 x 150 mm Allen key (located inside the service door of the ADU)

1. Open the service hatch.
2. Switch off the power to the antenna on the service switch.
3. Rotate the antenna pedestal so that the Elevation Drive Belt faces the service hatch.
4. Rotate the antenna dish to top position.
5. Press in and turn the elevation locking pin (if available) to locked position.

6. Disconnect the connector from the Elevation ZRM.

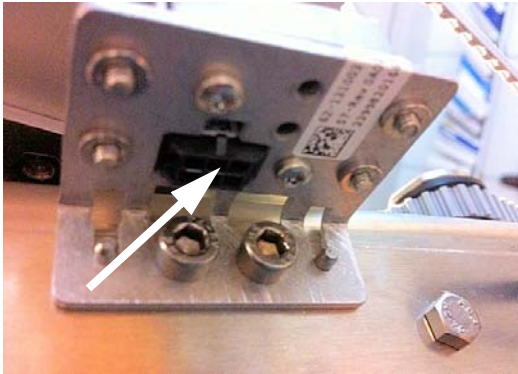


Figure 8-71: Elevation ZRM, disconnect connector

7. Loosen the 2x4 mm Allen screws.

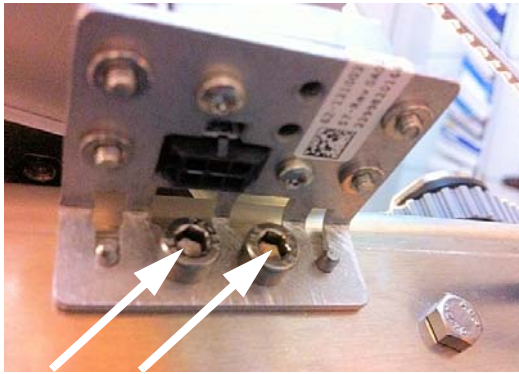


Figure 8-72: Elevation ZRM, remove screws

8. Slide out the Elevation ZRM.

To insert a new Elevation ZRM follow the instructions above in reverse order.

**Important**

It is very important that you slide the ZRM all the way into the guide pins.

### 8.6.9.3 To replace the Azimuth ZRM

To remove the Azimuth ZRM, do as follows:

Tools needed:

- TX20
- 4 x 150 mm Allen key (located inside the service door of the ADU)

1. Open the service hatch.
2. Switch off the power to the antenna on the service switch.
3. Rotate the antenna pedestal so that the Azimuth DDM faces the service hatch.
4. Rotate the antenna dish to top position.
5. Press in and turn the elevation locking pin (available in some antennas) to locked position.
6. Loosen the 15x4 mm Allen screws (the 3 Allen screws on top are longer than the rest) on the cover over the azimuth drive modules, and remove the cover (lift and slide).

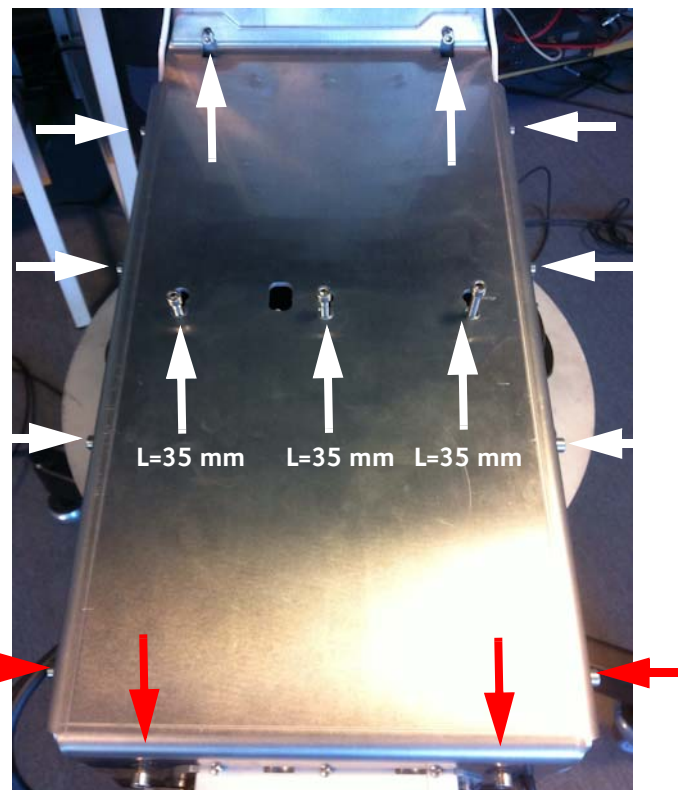


Figure 8-73: Azimuth ZRM, remove cover

7. Disconnect the connector from the Azimuth ZRM.



Figure 8-74: Azimuth ZRM, disconnect connector

8. Loosen the 2x4 mm Allen screws.

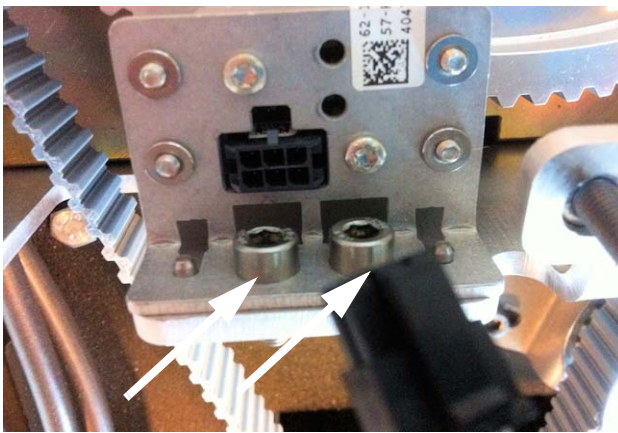


Figure 8-75: Azimuth ZRM, disconnect connector

9. Slide out the Azimuth ZRM.

To insert a new Azimuth ZRM follow the instructions above in reverse order.

**Important**

It is very important that you slide the ZRM all the way into the guide pins.

### 8.6.10 To replace the Inertial Sensor Module (ISM)

Locate the ISM, see *Overview* on page 8-11.

To remove the ISM, do as follows:

### 8.6.11 To replace the RF Pack

To remove the RF Pack do as follows:

Tools needed:

- Wrench
- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Flat head screw driver

1. Open the service hatch by releasing the two latches.
2. Switch off the power to the antenna on the service switch.
3. Turn and tip the antenna so the feed horn faces you.
4. With the wrench remove carefully the Ka feed horn.



Figure 8-76: Removal of the Ka feed horn

5. Rotate the antenna dish to top position.
6. Press in and turn the elevation locking pin to locked position.
7. Disconnect the four cables of the cable wrap; one SMA to LNB, one SMA to blind terminator, one SUB-D to BCM (marked S-BUS IN) and one N-connector to BCM (marked VIM).

Figure 1-17 & 1-18 can be used (Conversion kit manual)



8. Loosen the 4 screws holding the cable wrap in place (torque value: 2.5 Nm).

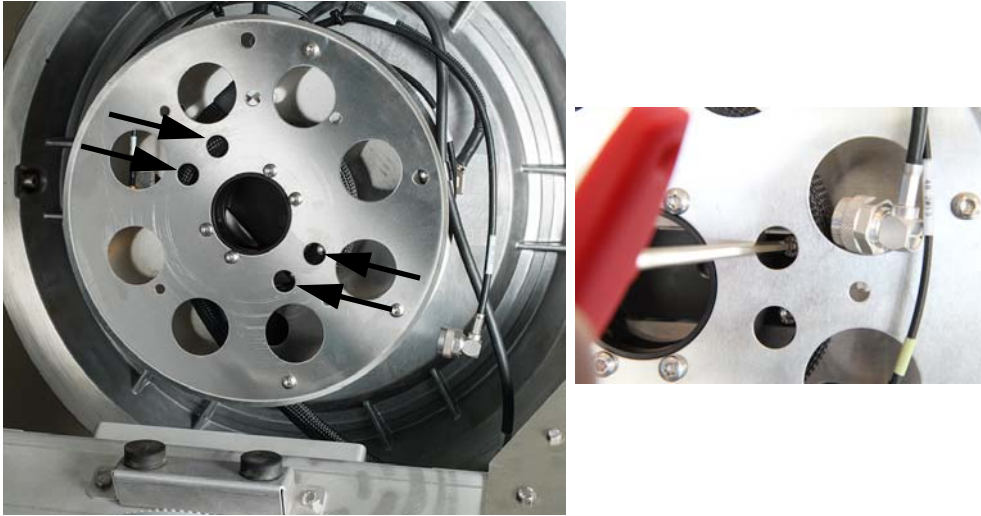


Figure 8-77: Loosening the cable wrap

9. Loosen the four screws holding the Ka RF package. A few millimeters is enough, you do not need to remove them completely.
10. Turn the RF pack counter clockwise and pull it out.
11. Loosen the 4 screws (torque value: 4.5 Nm).

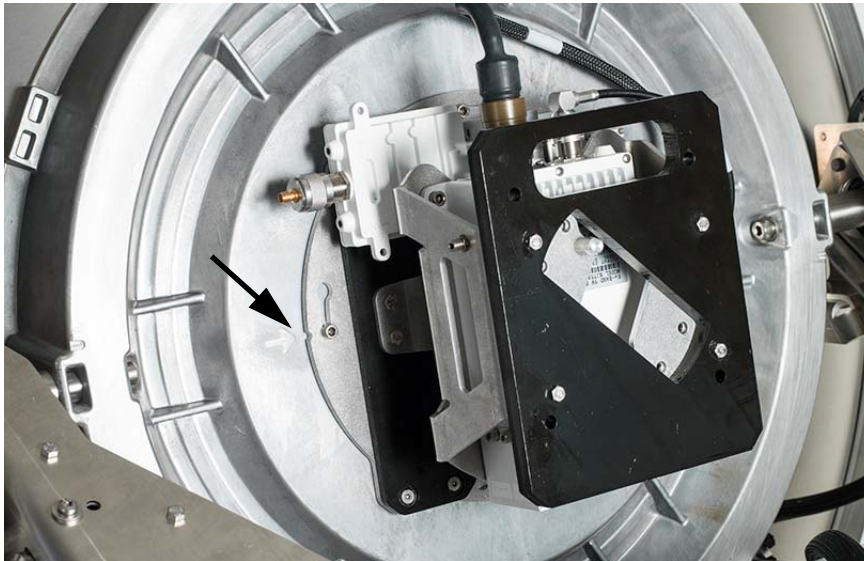


Figure 8-78: Ka RF unit, alignment of notch to arrow

12. Remove the RF unit. Observe the location of the notch on the outer circumference to the arrow as shown in the figure above.

13.TBC: Remove the 4 screws as shown in the following figure.



Figure 8-79: Antenna ready for the Ka RF unit

Assemble in reverse order.

### 8.6.12 To replace the BUC

To remove the BUC, do as follows:

Tools needed:

- 4 x 150 mm Allen key (located inside the service door of the ADU)

1. Follow instructions in *To replace the RF Pack* on page 8-60.
2. Disconnect the BUC from the BCM.

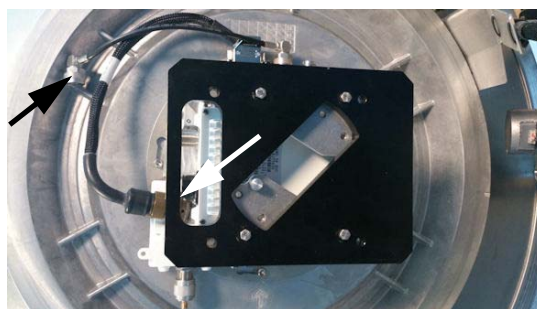


Figure 8-80: Replacement of the BUC

TBD: where? 4 holes for screws

3. Loosen the 4 screws that hold the BUC.



4. Gently pull out the BUC and slide it out of the case.



Figure 8-81: Removal of the BUC

5. Insert the new BUC and assemble in reverse order.

### 8.6.13 To replace the LNB

To remove the LNB, do as follows:

Tools needed:

- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Philips screw driver size 1

1. Follow instructions in *To replace the RF Pack* on page 8-60.
2. Remove the BCM.
3. Loosen the three screws holding the LNB.



Figure 8-82: Removal of the LNB

The mounting plate is held in place by four screws Cross-slot/Phillips size 1.

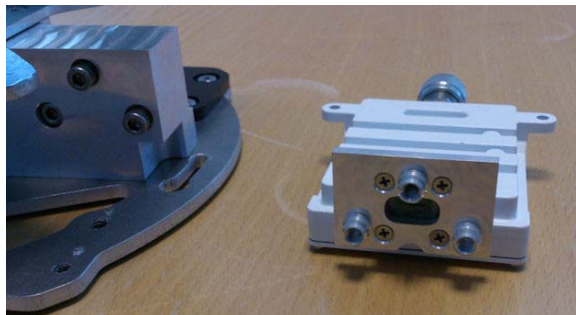


Figure 8-83: Mounting plate of the LNB

### 8.6.14 To replace the rotary joint



Figure 8-84: Rotary joint

To remove the rotary joint do as follows:

1. Open the service hatch.
2. Switch off the power to the antenna on the service switch.

#### Tools needed:

- TX20
- 4 x 150 mm Allen key (located inside the service door of the ADU)

### 8.6.15 To replace a wire-rope isolator

Replacing a wire rope isolator is a critical operation for the ADU. Read the instructions below carefully before starting the procedure. Do not skip any steps.

You may want to read about inspecting the wire-rope isolators, see *Inspection of wire-rope isolators* in the section *Inspection of mechanical components* on page 8-69.



Figure 8-85: Wire-rope isolator in good condition

Tools needed:

- TX20
- 4 x 150 mm Allen key (located inside the service door of the ADU)
- 10 mm wrench
- Loctite 243

1. Open the service hatch.
2. Switch off the power to the antenna on the service switch.
3. Loosen the 4 x M6 hexagonal head screws that connect the wire rope isolator to the antenna.

**Important**

Loosen only one wire rope isolator at a time! Two loose isolators will make the antenna very unstable with a high risk of damage.

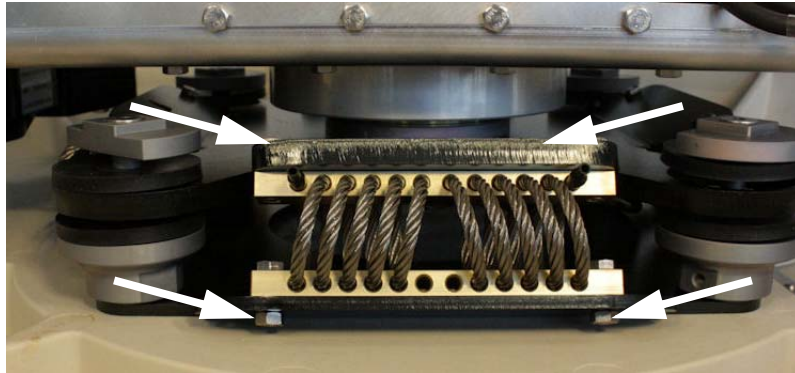


Figure 8-86: Removing a wire-rope isolator

4. Slowly push or pull the x elevation level-beam upwards in order to tilt the antenna and hereby releasing the wire rope isolator from the two plates.
5. Remove the old wire rope isolator and replace it with a new one.

**Important**

Before tilting back the antenna to its original position make sure to keep fingers and tools well away from the contact zones.

6. Apply Loctite 243 to the 4 x M6 hexagonal head screws and fasten the new wire rope isolator to the top and bottom plate.

**Note**

Loctite on the screws is essential in order to secure a rigid connection over time.

7. Repeat the procedure for each wire rope isolator that needs replacing.

# 8.7 To update VIM2/PCM calibration data

After installing a new VIM2 (VSAT Interface Module) or PCM (Pedestal Control Module) you must update the calibration data.

The ACU does not know which of the two modules (PCM or VIM) has been replaced. The ACU needs to know which set of data to keep. You must select the **module that was not exchanged** so the calibration data can be copied to the module that was exchanged during service.

1. Enter the web interface (<http://192.168.0.1>) and click **SERVICE > XIM DATA**. A screen similar to the one in the figure below will appear:

XIM DATA	PCM	VIM
Antenna type	KU 100 cm	KU 100 cm
System type	VSAT	VSAT
Unit-no	Unit-Serial-Number	ADU-100-5
Status	Valid	Valid
	<input type="button" value="Select"/>	<input type="button" value="Select"/>

Warning! Selecting the wrong data will render the system useless. Please consult the manual before making any changes.

Figure 8-87: Updating VIM/PCM calibration data (example)

2. The figure shows at **Unit-no** Unit-Serial-Number for the PCM, because this module was exchanged during service. In this case the user must press the select button below the VIM module in order to copy the current calibration data to the new PCM module.

**Important** Select always the XIM data for the module that was **not** exchanged.

3. Click **Select**, then a warning will appear.



Figure 8-88: XIM data, warning

4. Click **OK** to continue, the data is copied into the replaced module.

XIM DATA	PCM	VIM
XIM data not ready		
<input type="button" value="Refresh"/>		

Figure 8-89: XIM data not ready

5. Click **Refresh**. When the XIM data has been successfully copied from one module to the other, the web interface displays a window

showing the status of both modules as **Valid** (Select boxes are greyed out).

XIM DATA	PCM	VIM
Antenna type	KU 100 cm	KU 100 cm
System type	VSAT	VSAT
Unit-no	ADU-100-5	ADU-100-5
Status	Valid	Valid
	<input type="button" value="Select"/>	<input type="button" value="Select"/>

Figure 8-90: XIM data valid

The XIM data are now updated and the SAILOR 100 GX is operational again.

## 8.8 Inspection of mechanical components

### 8.8.1 Inspection for critical wear

This chapter contains guidelines on how to manually inspect the mechanical components of the ADU for critical wear. Note that this inspection requires a solid understanding of the ADU components and is best done by a certified service partner.

### 8.8.2 Inspection of wire-rope isolators

The ADU has 4 wire-rope isolators. They protect the antenna from vibrations that could either reduce pointing accuracy or even damage some of the electronic hardware. The isolators are designed to last for the entire lifetime of the ADU, but under very severe conditions they might get worn down more quickly. It is therefore important that they are inspected visually by a trained service technician to avoid any problems due to worn-down wire-rope isolators.

The following figure shows where the wire-rope isolators are located. To see them in your antenna you must open the service hatch, see *To open and remove the service hatch* on page 3-21.

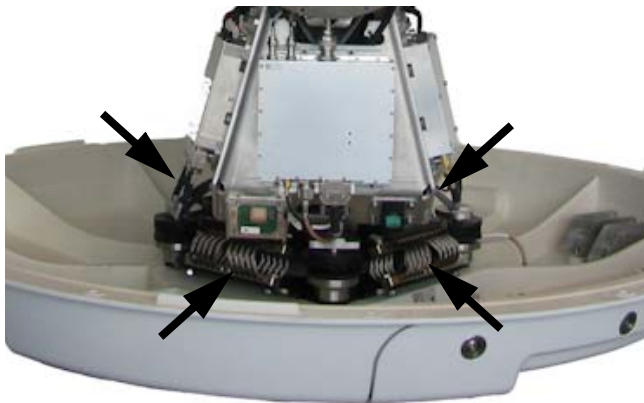


Figure 8-91: Location of the 4 wire-rope isolators



The following figure shows a healthy wire-rope isolator and a critically worn-down isolator. Note the two broken wires on the second picture. They indicate that this wire-rope isolator must be replaced.

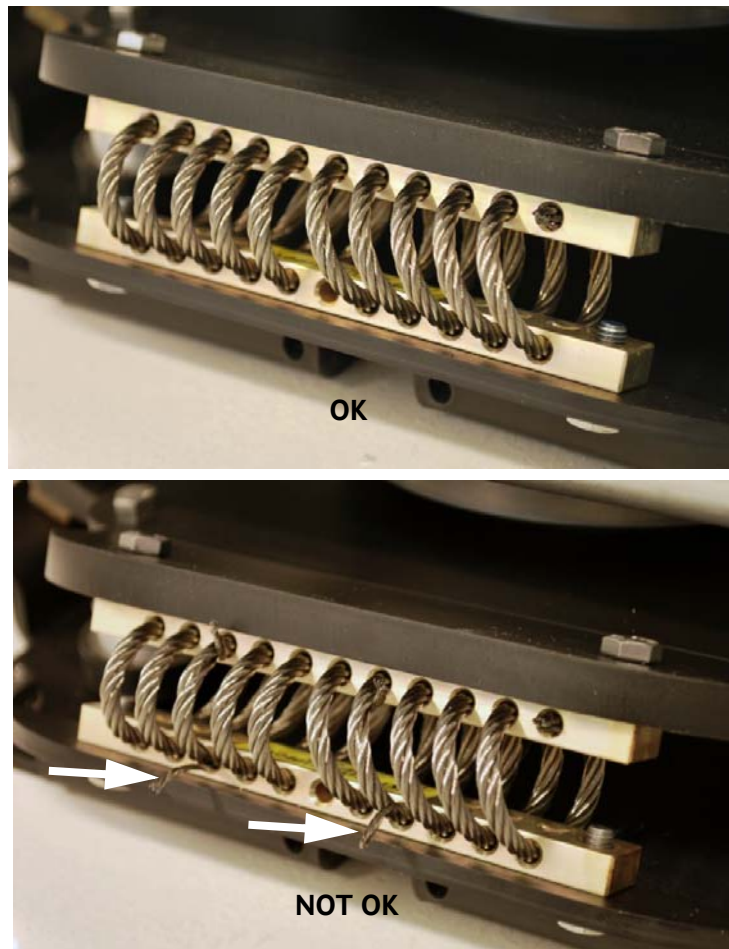


Figure 8-92: Inspection of a wire-rope isolator 1/2

Another sign of excessive wear is illustrated in the following figure. It shows a healthy wire-rope isolator and a critically worn-down isolator.



Note the deformed top bar and bottom bar. They indicate that this wire-rope isolator must be replaced.

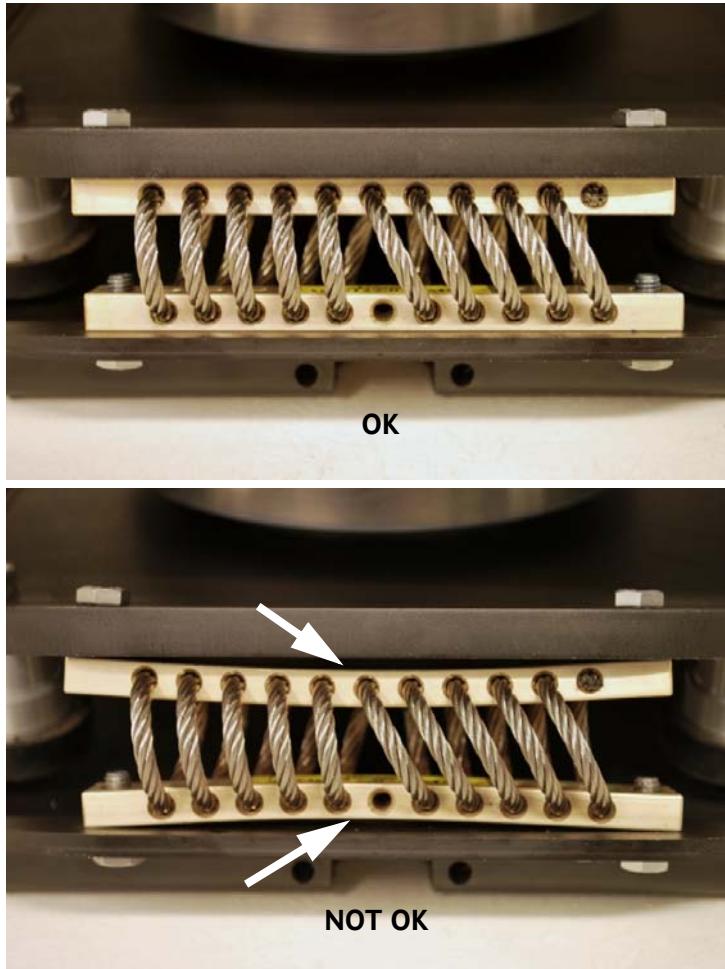


Figure 8-93: Inspection of a wire-rope isolator 2/2

For instructions on how to replace a wire-rope isolator see *To replace a wire-rope isolator* on page 8-65.

## 8.9 Troubleshooting

### 8.9.1 Overview

This section describes an initial check of the primary functions of the SAILOR 100 GX system, and provides some guidelines for troubleshooting.

Generally, if a fault occurs without any obvious reason, it is always recommended to observe the LEDs and the ACU display showing the active events. Possible failure states are shown in the web interface and the display of the ACU:

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

For information on the function of the LEDs, see *Status signalling with LEDs and status messages* on page 8-11.

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

### 8.9.2 Event list for troubleshooting

You can use the event list for troubleshooting. It is described in detail at *Help desk and diagnostic report* on page 8-2.

You can download the event list as part of a diagnostic report.

### 8.9.3 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 send a diagnostics report* on page 6-35.

### 8.9.3.1 How to understand events shown in the Diagnostic report

Below is an example of a system which has failed to power up.

The SAILOR 100 GX will after ended POST go into safe mode, identified by the "ADU\_IF: Error type not eligible for ADU auto recovery (14:20)".

Once in *safe mode* the 48 VDC to the antenna will drop to 20VDC, leaving all axes without power. (All status LED on antenna modules will go RED.) To run a new POST the system must be rebooted.

The POST will hold the outcome of the power up self-test. ANY FAILED POST test will cause the system to go into *safe mode*.

In the below POST the 0x00a023 Ele axis calibration has failed. That will cause the 0x00a025 Antenna calibration to fail as well.

#### POST

Unit	id	description	state	info	time[ms]
pcm_0033	0x00a021	Azi axis calibration	passed	0000000000	169859
pcm_0034	0x00a022	Xel axis calibration	passed	0000000000	169873
pcm_0035	0x00a023	Ele axis calibration	Failed	0000000010	169880
pcm_0036	0x00a024	Pol axis calibration	passed	0000000000	169893
pcm_0037	0x00a025	Antenna calibration	Failed	0000000040	169901
pcm_0040	0x00a028	Demodulator load	passed	0000000000	169913

The events hold and show all events that have been detected during the system lifetime.

Severity levels: (sev)

- **Error** means system = STOP
- **Warn** means system = RUN. BUT needs attention

States: (stat)

- **Set** means that the event is Active
- **Clr** means that the event has been cleared and is no longer active.
- **One** means that the system has detected an event but been able to recover from it.

In the example below the following events are active = SET

pcm_35	0A023	Ele axis calibration	set error	2012-09-20 09:21:44	4	00000010
pcm_37	0A025	Antenna calibration	set error	2012-12-03 06:03:08	4	00000040
pcm_91	0A05B	Ele cal. limits	set warn	2012-09-20 08:34:47	3	00000140

## Events

Unit	id	description	stat	sev	date	count	info
pcm	33 0A021	Azi axis calibration	clr	error	2012-12-03 06:03:08	3	00000000
pcm	35 0A023	Ele axis calibration	set	error	2012-09-20 09:21:44	4	00000010
pcm	37 0A025	Antenna calibration	set	error	2012-12-03 06:03:08	4	00000040
pcm	89 0A059	Azi cal. limits	clr	warn	2012-12-03 06:03:09	3	00004000
pcm	91 0A05B	Ele cal. limits	set	warn	2012-09-20 08:34:47	3	00000140
pcm	75 0A04B	Ele encoder slip	one	warn	2013-03-04 17:40:25	3	0004fffe
pcm	85 0A055	Azi DDM warning	clr	warn	2012-11-12 09:38:45	1	00000000
pcm	86 0A056	Xel DDM warning	clr	warn	2012-11-12 09:38:46	1	00000000
pcm	87 0A057	Ele DDM warning	clr	warn	2012-11-12 09:38:47	1	00000000
pcm	88 0A058	PMM warning	clr	warn	2012-11-12 09:38:48	1	00000000
pcm	89 0A059	Azi cal. limits	clr	warn	2012-11-12 09:38:49	1	00000000
pcm	92 0A05C	Pol cal. limits	clr	warn	2012-11-12 09:38:51	1	00000000
pcm	64 0A040	VIM cable attn	clr	warn	2013-02-25 13:50:59	2	00000000

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

User Event: 040995-0000, 3 ERROR ON Ele axis calibration (00000010)  
 User Event: 040997-0000, 3 ERROR ON Antenna calibration (00000040)  
 User Event: 041051-0000, 3 WARNING ON Ele cal. limits (00000140)

### 8..9.3.2 How to read system messages

In the system messages you can match the ID and Description.

pcm 35 0A023 Ele axis calibration set error 2012-09-20 09:21:44 4 00000010

**0A023:** POST\_ID\_PCM\_ANT\_AZI:

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

pcm 37 0A025 Antenna calibration set error 2012-12-03 06:03:08 4 00000040

**0A025:** POST\_ID\_PCM\_ANT\_CAL:

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: Polarization axis

pcm 91 0A05B Ele cal. limits set warn 2012-09-20 08:34:47 3 00000140

**0A05B:** EV\_PCM\_CM\_AZI\_CAL\_LIMITS: (GOES FOR ELEV AND XELEV AS WELL)

Azimuth axis calibration result check limits 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.

Zero width low/high: Zero reference module placements may be incorrect. "Check that zero ref module and the magnet in in place. Zero ref Module

and magnet located on the back of the elevation drive"

Zero slack high: Mechanical slack may be too high. Check that there is no slack in the elevation drive, by moving the panel manually.

Friction average/peak high: Mechanical friction is higher than expected. Manually move the panel. Check that it moves freely, from end stop to end stop.

Friction asymmetry high: Mechanical imbalance may be too high. Check the panel is in balance.

## 8.9.4 Troubleshooting

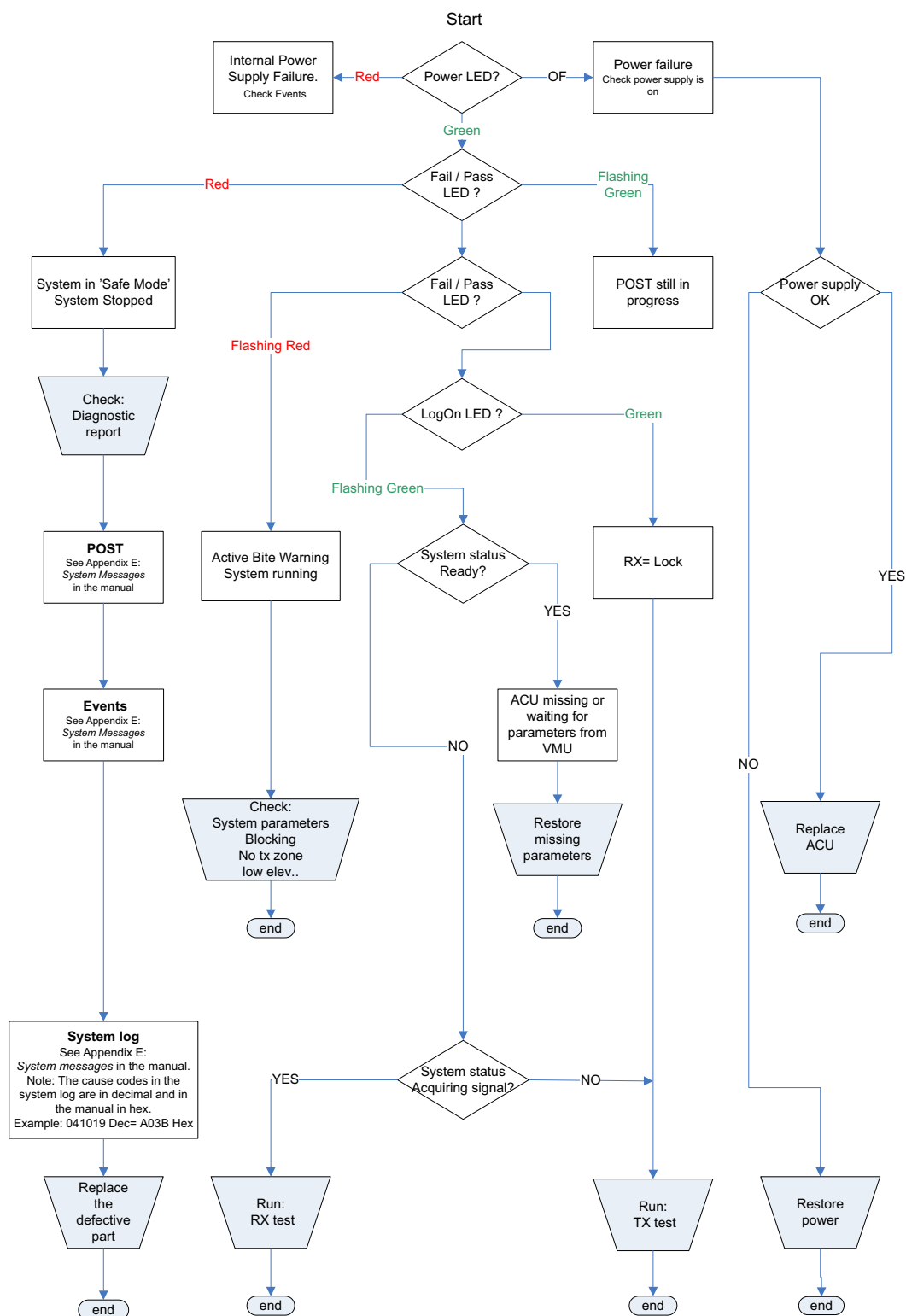


Figure 8-94: Flow chart for troubleshooting

1. Go to **SETTINGS** or **Satellite profiles**.
2. Activate a satellite profile that is used for azimuth calibration. This is a satellite profile that uses the VSAT modem profile **Service & Calibration**.
3. Go to **DASHBOARD** and monitor the field System status. If the field ends up showing **Tracking**, the SAILOR 100 GX can track the satellite and is most likely not the reason why the VSAT modem is not in RX lock.

## 8.9.5 X-elevation bearing test

The system can make a self test to check the state of the X-elevation bearings. The result of this test can be seen in the diagnostics report. This test is relevant in service situations.

1. Go to **HELPDESK > Self test**.
2. At **X-elevation bearing test** click **Start**.
3. When the test is done go to **HELPDESK** and click **Download** to download a diagnostics report.
4. Search for XBT to see the result of the test.
5. Verify that the line contains data like this: "XBT results - pm: 2, ps:1, px:5, sm:103, ss:52, sx:183"

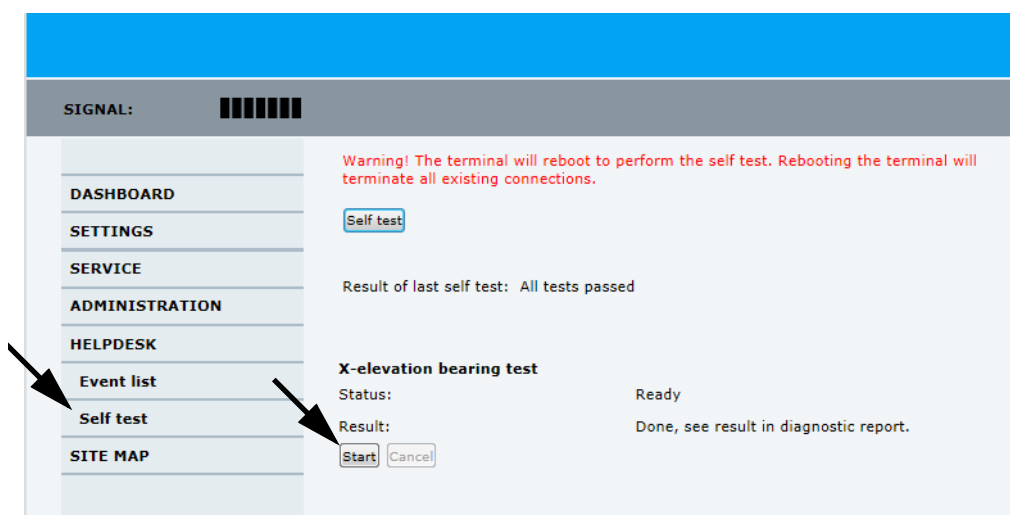


Figure 8-95: X-elevation bearing test (service)

## 8.10 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](http://www.cobham.com/satcom) where you also find the Cobham SATCOM Self Service Center web-portal, which may help you solve the problem. Your dealer, installer or Cobham SATCOM partner will assist you whether the need is user training, technical support, arranging on-site repair or sending the product for repair. Your dealer, installer or Cobham SATCOM partner will also take care of any warranty issue.



# Technical specifications

This appendix has the following sections:

- *SAILOR 100 GX system components*
- *Outline drawings*

## A.1 SAILOR 100 GX system components

### A.1.1 General specifications

Item	Specification
Frequency band	Ka-Band (Inmarsat GX)
Rx	19.2 to 20.2 GHz
Tx	29.0 to 30.0 GHz
Reflector size	103 cm (40.6 inch)
Certification	Compliant with CE (Maritime), ETSI, FCC
System power supply range	ADU+ACU 20–32 VDC GMU 90-264 VAC
ADU cable type (ACU to ADU)	Single 50 Ohm coax cable for Rx, Tx and power
Total system power consumption	410 W peak, 200 W typical (up to 5 W BUC)
Antenna connector at the ADU	Female N-Connector (50 Ohm)
Antenna connector at the ACU	Female N-Connector (50 Ohm)

Table A-1: General specifications

## A.1.2 ADU

Item	Specification
Antenna type, pedestal	3-axis (plus skew) stabilised tracking antenna with integrated GPS
Antenna type, reflector system	Reflector/sub-reflector, ring focus
Transmit Gain	47.5 dBi typ. @ 29.5 GHz (excluding radome)
Receive Gain	44.0 dBi typ. @ 19.7 GHz (excluding radome)
System G/T	20.1 dB/K typ. @ 19.7 GHz, at $\geq 10^\circ$ elevation and clear sky (including radome)
BUC output power	5 W GX BUC
EIRP	$\geq 53.5$ dBW (including radome), max 36.0 dBW/40 kHz
LNB	GX Ka single band LNB
Tracking Receiver	Internal "all band/modulation type" including e.g. power, DVB-S2, GSC and modem RSSI
Polarisation	Circular Cross-Pol (Inmarsat GX, TX:RHCP, RX:LHCP)
Elevation Range	$-25^\circ$ to $+125^\circ$
Azimuth Range	Unlimited (Rotary Joint)
Ship motion, angular	Roll $\pm 30^\circ$ , Pitch $\pm 15^\circ$ , Yaw $\pm 10^\circ$
Ship, turning rate and acceleration	$15^\circ/\text{s}$ and $15^\circ/\text{s}^2$
ADU motion, linear	Linear accelerations $\pm 2.5$ g max., any direction
Satellite acquisition	Automatic - with or without Gyro/GPS compass input
Vibration, operational	Sine: EN 60945 (8.7.2), DNV No.2.4 Class A, MIL-STD-167-1 (5.1.3.3.5) Random: Cobham Maritime Operational
Vibration, survival	Sine: EN 60945 (8.7.2) dwell, MIL-STD-167-1 (5.1.3.3.5) dwell. EN 60721-3-6 class 6M3
Shock	MIL-STD-810F 516.5 (Proc. II). EN 60721-4-6 class 6M3
Temperature (ambient)	Operational: $-25^\circ\text{C}$ to $55^\circ\text{C}$ Storage: $-40^\circ\text{C}$ to $85^\circ\text{C}$
Humidity	100%, condensing
Rain (IP class)	EN 60945 Exposed (IPx6)

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

Item	Specification
Wind resistance	Operational: 80 kt. Survival: 110 kt.
Ice	Survival: 25 mm (1 inch)
Solar radiation	1120 W/m <sup>2</sup> to MIL-STD-810F 505.4
Compass safe distance	100 cm to EN 60945
Maintenance, scheduled	None ( $T_{amb} > 10^{\circ}\text{C}$ )
Maintenance, unscheduled	All electronic, electromechanical modules and belts can be replaced through the service hatch.
Built-in tests	Power On Self Test (POST) Person Activated Self Test (PAST) Continuous Monitoring (CM) with error log
Power OFF	Automatic safe mode
Input power	Powered by ACU
Dimensions (overall)	Diameter x Height: Ø 130 cm (51.3 inch) x H 150 cm (58.9 inch)
Weight, ADU	126 kg (276 lbs)

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

### A.1.3 ACU

Item	Specification
Dimensions, rack mount H x W x D	1 U, 19 inch 4.4 x 48 x 33 cm (1.75 x 19 x 13 inch)
Weight	4.5 kg (10 lbs)
Ambient temperature	Operational: -25°C to +55°C Storage: -40°C to +85°C
Humidity	EN 60945 protected, 95% (non-condensing)
IP class	IP30
Compass safe distance	0.1 m (4 inch) to EN 60945
Interfaces	1 x N-Connector for antenna RF Cable (50 Ohm) with automatic cable loss compensation 2 x F-Connectors (75 Ohm) for Rx/Tx to M 4 x Ethernet 1 x RS-422 data (modem control) 1 x RS-232 data (modem control) 1 x NMEA 0183 (RS-422 or RS-232) and prepared for NMEA 2000 for Gyro/GPS compass input 1 x DC power input 1 x Grounding bolt
Input power	20-32 VDC, 370 W peak, 175 W typical
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
Dual antennas	Dual ACU capability

Table A-3: Technical specifications for the ACU

## A.1.4 GMU

Item	Specification
Dimensions, rack mount H x W x D	1 U, 19 inch 4.4 x 48 x 33 cm (1.75 x 19 x 13 inch)
Weight	4.5 kg (10 lbs)
Ambient temperature	Operational: -25°C to +55°C Storage: -40°C to +85°C
Humidity	IEC 60945 protected, 95% (non-condensing)
IP class	IP30
Compass safe distance	0.1 m (4 inch) to IEC 60945
Modem type	Based on iDirect/Inmarsat GX Core Module
Interfaces	2 x F-Connectors (75 Ohm) for Rx/Tx to ACU 1 x LAN connector for control and user data (routes through ACU) 1 x RS-422 data (Modem control) 1 x RS-232 data (Modem control) 1 x RS-232 modem console 1 x universal AC input 1 x Grounding bolt
Input power	100-240 VAC
Modem interface (control)	iDirect openAMIP protocol, RS-422 & RS-232
Display	Web interface, power LED and ON/OFF switch
Temperature control	Built-in fan and heater

Table A-4: Technical specifications for the GMU

## A.1.5 Patents

Patent application number	Description
11749202.5; 10-2013-7008607; 13/819,621	An assembly comprising a movable and brakable/dampable part and a method for braking a movable part
PCT/EP2012/063849	Combined antennas without switch
Currently applying	Reflector with enforcement ring

Table A-5: Patents

# A.2 Outline drawings

## A.2.1 ADU

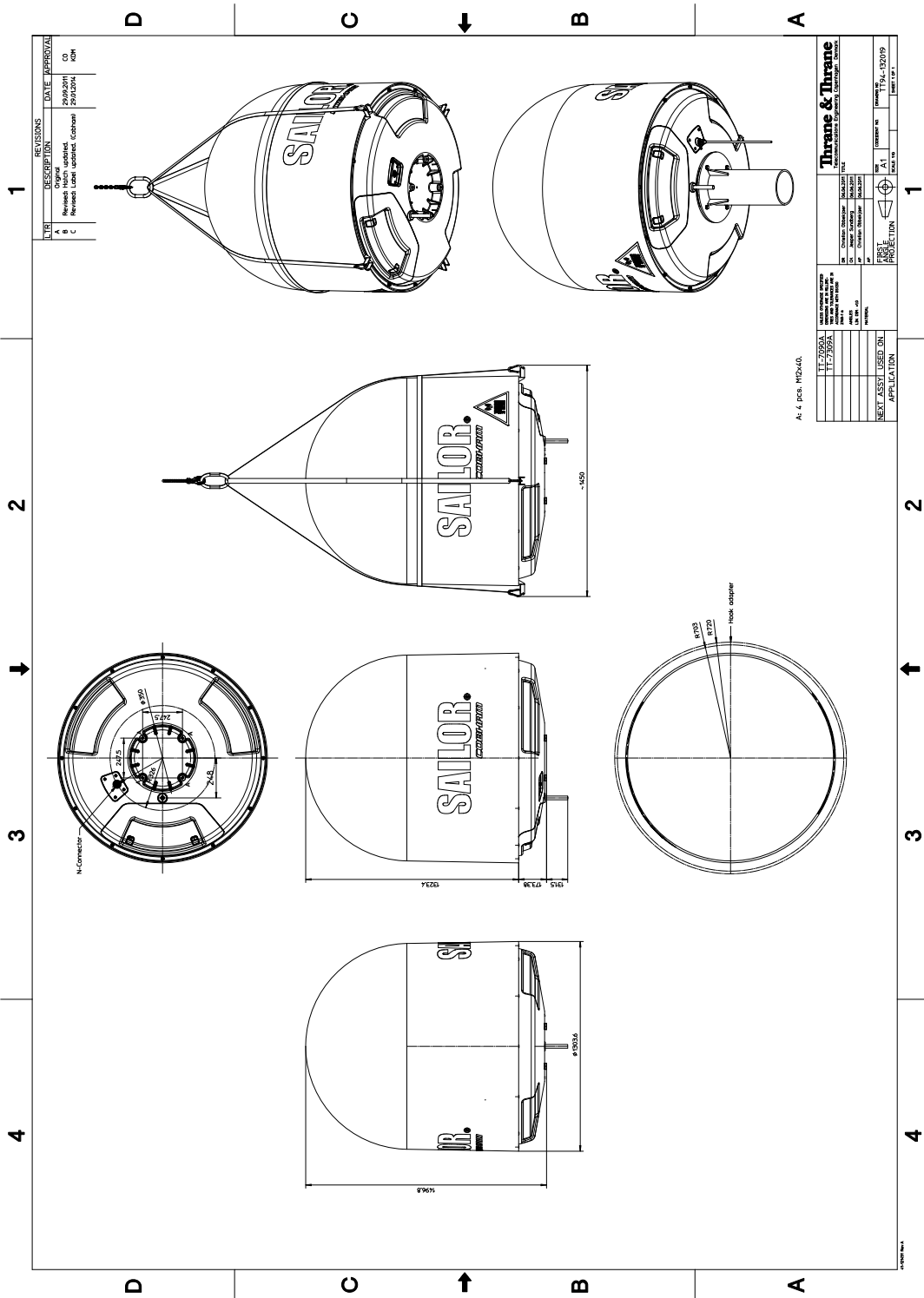
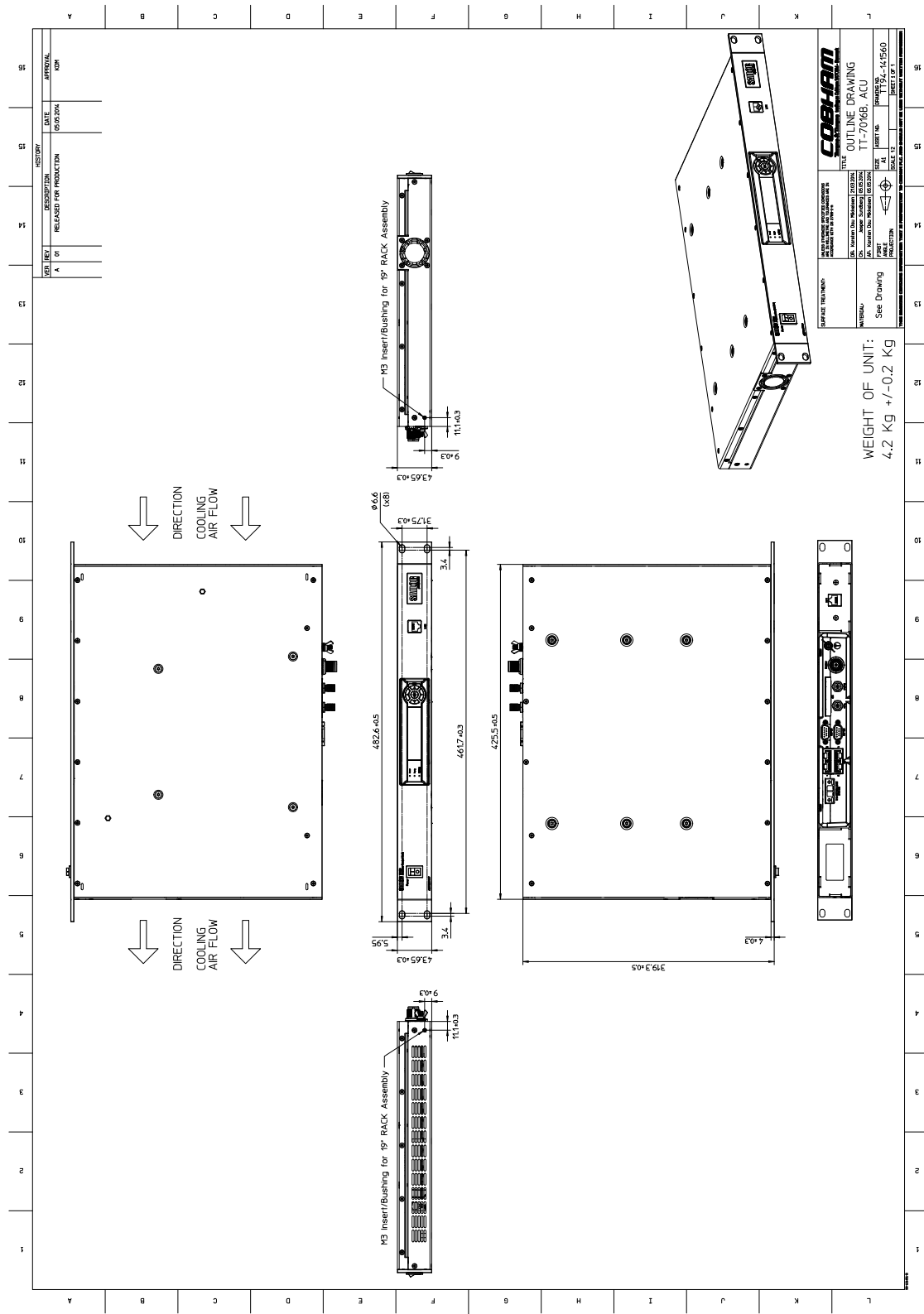


Figure A-1: Outline drawing: ADU

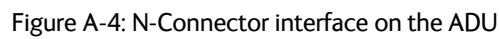
## A-7







## A-9





# 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 fibre glass hulls*
- *Separate ground cable*
- *RF interference*
- *Jumper cable for grounding*

## B.1 Why is a ground connection required?

You must grounding the SAILOR 100 GX 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-14.

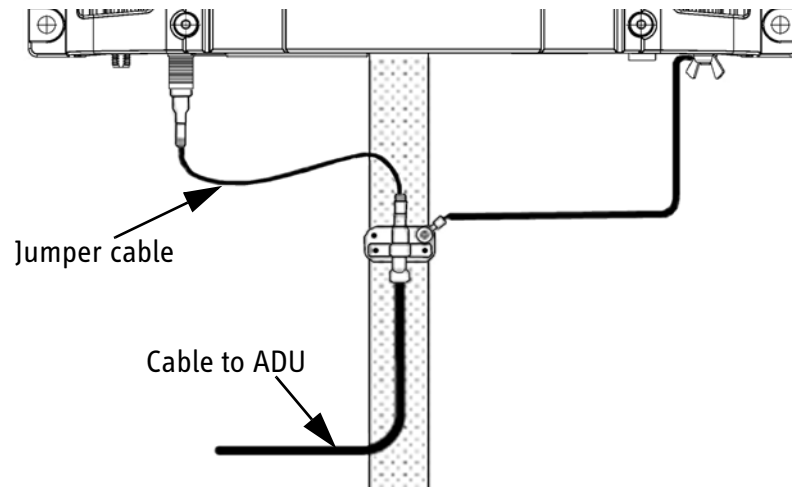


Figure B-1: Extending the ground plane

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.

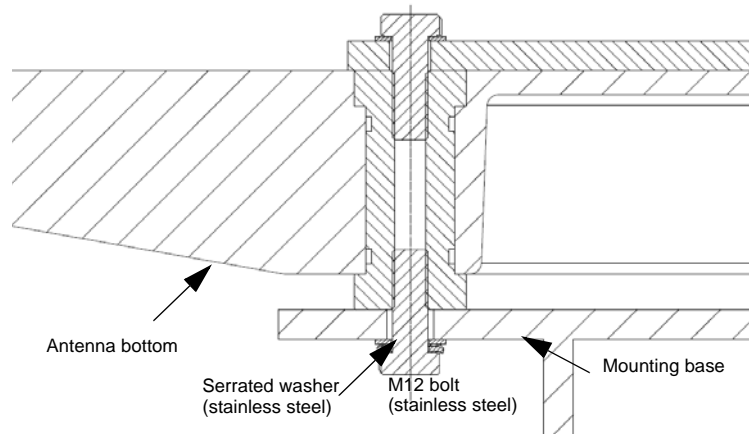


Figure B-2: Grounding the ADU

**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 hull<sup>2</sup>. 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.

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

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-5).

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 mm<sup>2</sup>) 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-12.

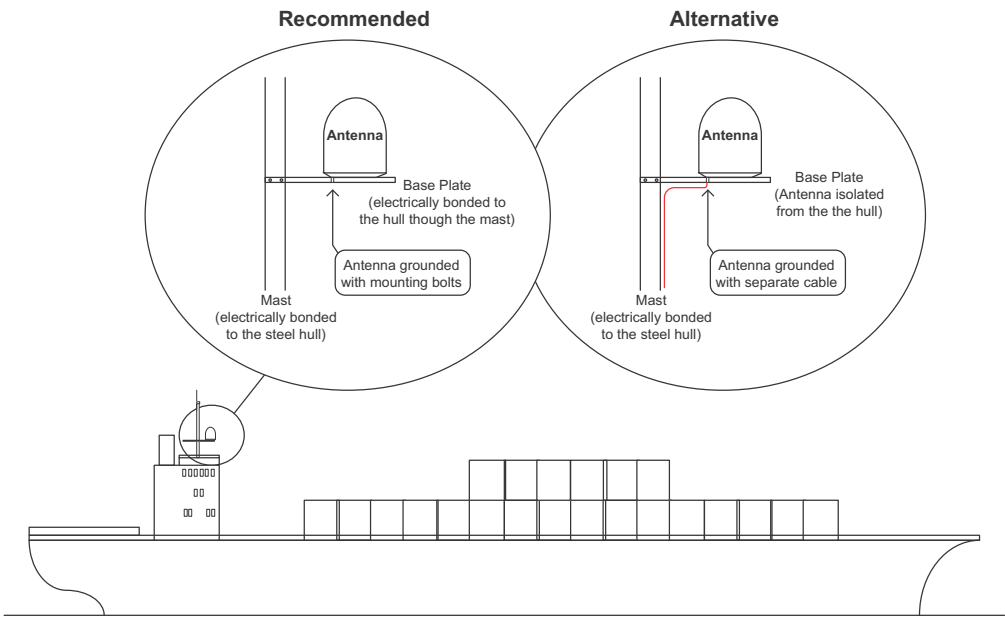


Figure B-3: Grounding at a dedicated RF ground (alternative)



## 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 mm<sup>2</sup>) for this purpose.

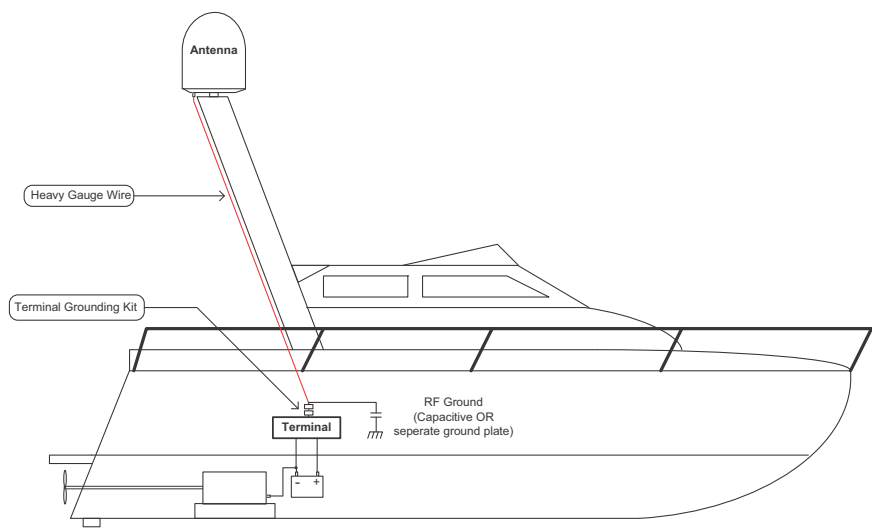


Figure B-4: Alternative grounding for aluminium hulls

## B.5 Alternative ground for fibre 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 mm<sup>2</sup>) for this purpose.

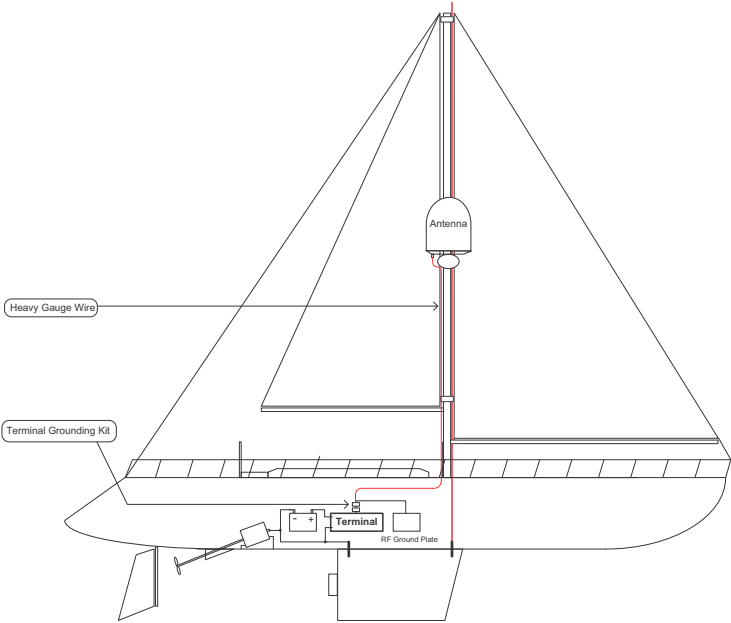


Figure B-5: Alternative grounding for fibreglass hulls

## B.6 Separate ground cable

### B.6.1 To construct 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 constructed using an appropriate cable with a cross section area of at least 6 mm<sup>2</sup> (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.

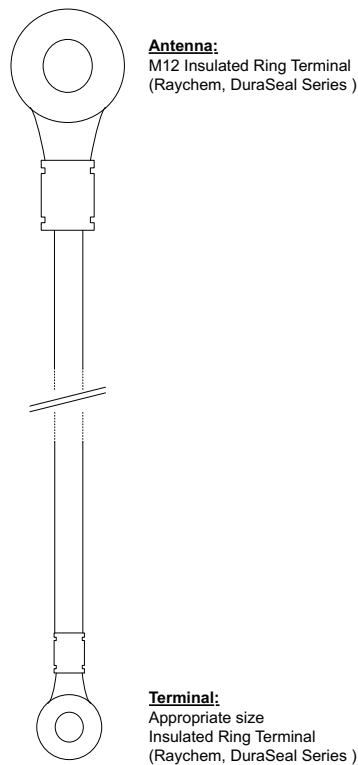


Figure B-6: Separate ground cable

## 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-12.
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).

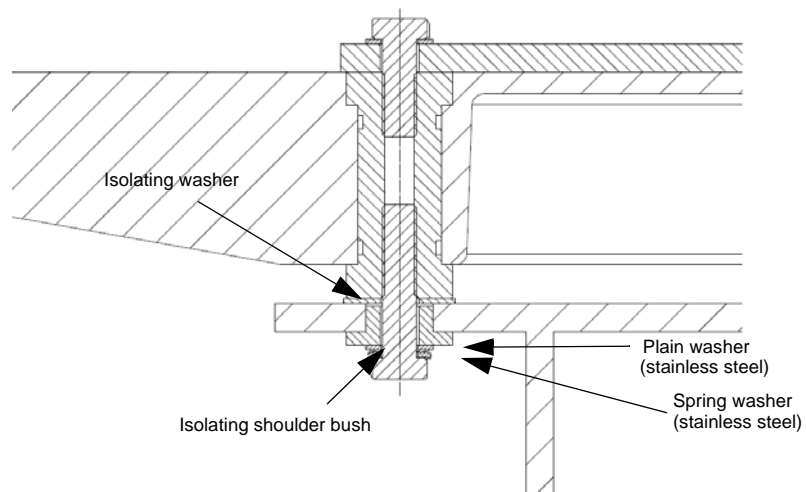


Figure B-7: Isolation of the ADU from the mounting base

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.

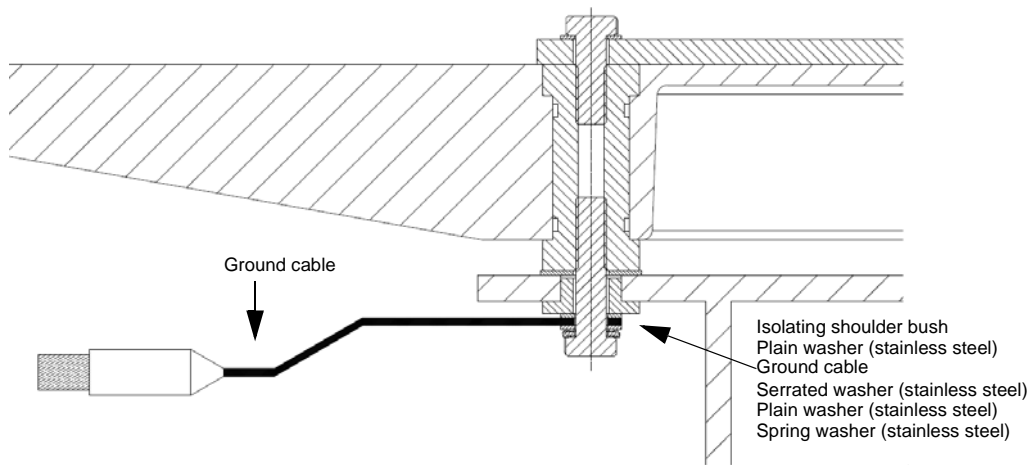


Figure B-8: ADU isolation and grounding cable

## 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 100 GX 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

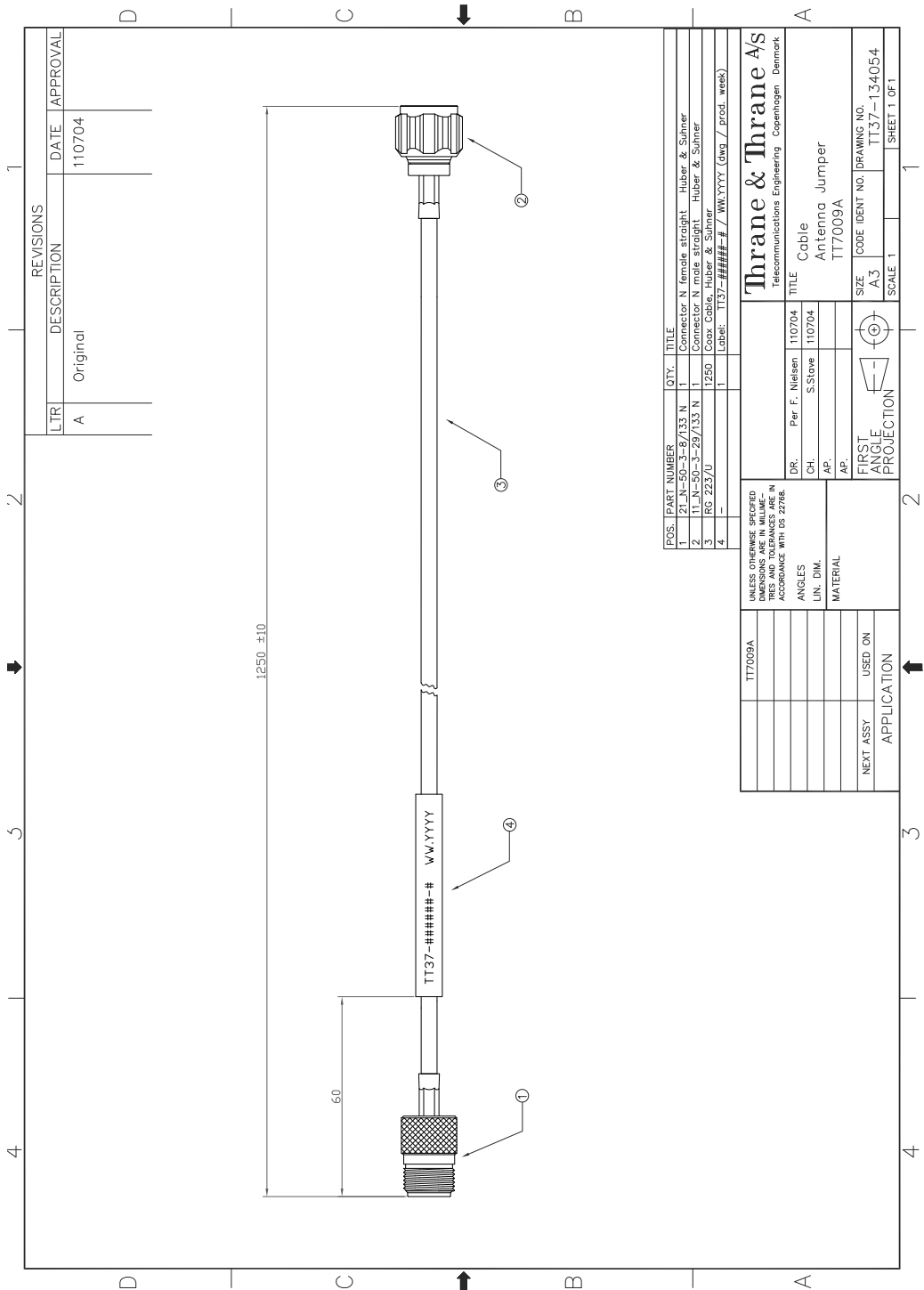


Figure B-9: Jumper cable for grounding (specifications)



# 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 100 GX 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 100 GX 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.

## C.2 List of ADU events

Error code (ID)	Unit	Severity	Description	Explanation
0A001-0	Antenna	ERROR	Production data	Production data is invalid.
0A002-0	Antenna	ERROR	XIM internal	Antenna configuration data stored in the PCM module is invalid.
0A003-0	Antenna	ERROR	XIM external	Antenna configuration data stored in the VIM/TIM module is invalid.
0A004-0	Antenna	ERROR	XIM I/X match	Antenna configuration data stored in the PCM module does not match the configuration data stored in the VIM/TIM module.
0A005-0	Antenna	ERROR	Antenna type	The configured antenna type is not supported or unknown.
0A006-0	Antenna	ERROR	PCM FPGA load	The PCM FPGA cannot be initialised and loaded correctly.
0A007-0	Antenna	ERROR	XIM FPGA load	The VIM/TIM FPGA cannot be initialised and loaded correctly.
0A008-0	Antenna	ERROR	XIM production	Production/calibration data stored in the VIM/TIM module is invalid.
0A00A-0	Antenna	ERROR	GPS initialisation	The GNSS device cannot be initialised. Check cable and GNSS device.
0A014-0	Antenna	ERROR	AMB device discovery	Missing one or more of the following devices: ISM, DDM and PMM. Check cables.
0A015-0	Antenna	ERROR	Azi DDM ABS device	Cannot initialise the azimuth DDM. Info: 0x00000000: Device not found (possible cabling problem) 0x0000bbaa: Device internal error (replace device) aa=status, bb=state.
0A016-0	Antenna	ERROR	Xel DDM ABS device	Cannot initialise the cross-elevation DDM. Info: See 0A015-0.
0A017-0	Antenna	ERROR	Ele DDM ABS device	Cannot initialise the elevation DDM. Info: See 0A015-0.

Table C-1: ADU event messages

Error code (ID)	Unit	Severity	Description	Explanation
0A018-0	Antenna	ERROR	ISM ABS device	Cannot initialise the ISM Info: 0x00000000: Device not found (possible cabling problem) 0x000cbbaa: Device internal error (replace device) aa=status, bb=state, c=calibration data error.
0A019-0	Antenna	ERROR	PMM ABS device	Cannot initialise the PMM. Info: See 0A015-0.
0A01A-0	Antenna	ERROR	BCM ABS device	Cannot initialise the BCM. Info: See 0A015-0.
0A01E-0	Antenna	ERROR	Sensor sanity	Too many invalid values measured by the ISM during initialisation. Check for vibrations or malfunctioning ISM.
0A021-0	Antenna	ERROR	Azi axis calibration	Azimuth axis zero reference not found. Check belt and zero reference module. Info: 0x00000001: Timeout (operation did not complete in time) 0x00000010: Encoder or mechanical problem 0x00000020: Zero reference not found 0x00000040: End stop not found.
0A022-0	Antenna	ERROR	Xel axis calibration	Cross-elevation axis zero reference or end stops not found at expected locations. Check belt, zero reference module, and end stops. Info: See 0A021-0.
0A023-0	Antenna	ERROR	Ele axis calibration	Elevation axis zero reference or end stops not found at expected locations. Check belt, zero reference module, and end stops. Info: See 0A021-0.
0A025-0	Antenna	ERROR	Antenna calibration	One or more errors occurred during antenna start-up Info: 0x00000001: Timeout (calibration did not complete in time) 0x00000010: Azimuth axis 0x00000020: Cross-elevation axis 0x00000040: Elevation axis 0x00000080: Polarisation axis
0A028-0	Antenna	ERROR	Demodulator load	The second receiver demodulator cannot be initialised and loaded correctly.
0A029-0	Antenna	ERROR	XIM PLL lock	The PLL on the VIM/TIM does not lock.

Table C-1: ADU event messages (Continued)

Error code (ID)	Unit	Severity	Description	Explanation
0A02B-0	Antenna	ERROR	ABS software version	The ABS software version in the antenna is too old to match the hardware requirements. Upgrade the software.
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 down.
0A035-0	Antenna	WARNING	ISM data valid	Sensor measurements from the ISM are invalid. This indicates a malfunctioning ISM.
0A036-0	Antenna	WARNING	ISM data range	Sensor measurements from the ISM are out of range.
0A037-0	Antenna	WARNING	GNSS communication	Lost connection to the GNSS device.
0A038-0	Antenna	WARNING	GNSS data range	Received information from the GNSS device which is out of range.
0A039-0	Antenna	WARNING	GNSS device warning	Local GNSS device warning.
0A03A-0	Antenna	WARNING	GNSS device error	Local GNSS device error.
0A03B-0	Antenna	ERROR	Azi DDM shutdown	The azimuth motor control has detected one of the following situations: Extreme temperature, voltage, current or velocity. The motor was then shut down. This is usually a temporary situation and is probably fixed by a restart of the system.
0A03C-0	Antenna	ERROR	Xel DDM shutdown	As Azi DDM shutdown but detected by the cross-elevation motor control.
0A03D-0	Antenna	ERROR	Ele DDM shutdown	As Azi DDM shutdown but detected by the elevation motor control.
0A03E-0	Antenna	ERROR	PMM shutdown	As Azi DDM shutdown but detected by the polarisation motor control.
0A03F-0	Antenna	WARNING	AMB timing	This indicates a busy situation. It may occur during installation procedures. No user interaction is required.
0A040-0	Antenna	WARNING	VIM cable attn	The output power cannot be controlled correctly. Check the Tx chain.

Table C-1: ADU event messages (Continued)

Error code (ID)	Unit	Severity	Description	Explanation
0A043-0	Antenna	WARNING	LNB voltage low	The voltage for the LNB is too low probably caused by a malfunctioning VIM/TIM or LNB.
0A044-0	Antenna	WARNING	LNB voltage high	The voltage for the LNB is too high probably caused by a malfunctioning VIM/TIM.
0A047-0	Antenna	ERROR	VIM PLL lock	The PLL of the VIM/TIM is out of lock. Check the reference reference signal.
0A048-0	Antenna	WARNING	VIM tuner lock	The PLL of the second receiver (DVB) is out of lock. Check the reference signal.
0A049-0	Antenna	WARNING	Azi encoder slip	A slip of the azimuth encoder has been detected. No user interaction is required unless this is a permanent situation. In this case the belt and encoder of the azimuth axis must be checked.
0A04A-0	Antenna	WARNING	Xel encoder slip	A slip of the cross-elevation encoder has been detected. No user interaction is required unless this is a permanent situation. In this case the belt and encoder of the cross-elevation axis must be checked.
0A04B-0	Antenna	WARNING	Ele encoder slip	A slip of the elevation encoder has been detected. No user interaction is required unless this is a permanent situation. In this case the belt and encoder of the elevation axis must be checked.
0A04D-0	Antenna	WARNING	GNSS position	No position available from the GNSS device or position too old.
0A04E-0	Antenna	WARNING	GNSS velocity	No velocity available from the GNSS device.
0A04F-0	Antenna	WARNING	Heading data	Heading information is missing in the antenna.
0A050-0	Antenna	ERROR	Azi DDM communication	Communication error between PCM and azimuth DDM. Check SUB-D connectors and cables.
0A051-0	Antenna	ERROR	Xel DDM communication	Communication error between PCM and cross-elevation DDM. Check SUB-D connectors and cables.
0A052-0	Antenna	ERROR	Ele DDM communication	Communication error between PCM and elevation DDM. Check SUB-D connectors and cables.

Table C-1: ADU event messages (Continued)

Error code (ID)	Unit	Severity	Description	Explanation
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 with regards to 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 with regards to 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 with regards to temperature, voltage, current or velocity. No user interaction required.
0A058-0	Antenna	WARNING	PMM warning	The polarisation motor controller has temporarily observed an unusual situation with regards to temperature, voltage, current or velocity. No user interaction required.
0A059-0	Antenna	WARNING	Azi cal. limits	<p>Azimuth axis calibration result check limits 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 C-1: ADU event messages (Continued)

Error code (ID)	Unit	Severity	Description	Explanation
0A05A-0	Antenna	WARNING	Xel cal. limits	Cross-elevation axis calibration result check limits exceeded. Pointing performance may be degraded. Info: See 0A059-0.
0A05B-0	Antenna	WARNING	Ele cal. limits	Elevation axis calibration result check limits exceeded. Pointing performance may be degraded. Info: See 0A059-0.
0A05D-0	Antenna	WARNING	ISM warning	The ISM has temporarily observed an unusual situation with regards to temperature or voltage. No user interaction required. If repeated after cooldown and reboot, the ISM or cables around it may be 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 headingless mode (gyro-free) because the elevation is too high.

Table C-1: ADU event messages (Continued)

### C.3 List of ACU events

Error code (ID)	ACU PCB	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 10 MHz reference signal.
08065-0	ADM	WARNING	GNSS data	Missing GPS 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. The ACU is not equipped with a fan, so 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 with the sat modem.
0806C-0	ADM	ERROR	VMU frequency setup	There is a mismatch in the frequency setup. Probably the sat 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 VSAT modem.
0806D-0	ADM	ERROR	Antenna power	The antenna supply voltage is outside the allowed limits. This could happen if the PSM fails to provide the requested supply voltage or if the voltage difference across the hotswap is unacceptable high.
0806E-0	ADM	ERROR	VMU 10 MHz reference	The VMU Rx or Tx reference signal is not present. Whether this error Rx or Tx reference, depends on the users selection on the modem profile page. Make sure VMU Rx/Tx cable is connected and that the VMU is configured to output the RX/TX reference signal.

Table C-2: ACU event messages



Error code (ID)	ACU PCB	Severity	Description	Explanation
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 for the procedure.
08078-0	ADM	WARNING	VMU TX frequency invalid	VSAT modem unit provided a TX frequency of zero. This may degrade tx performance. To remove this warning re-configure the modem to provide the correct tx frequency.
08079-0	ADM	WARNING	ACU Fan	Internal Fan is malfunctioning.
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.
08109-0	ADM	ERROR	Antenna XIM data	There is a mismatch with 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.

Table C-2: ACU event messages (Continued)

Error code (ID)	ACU PCB	Severity	Description	Explanation
0810B-0	ADM	ERROR	Antenna software version	Some error occurred during upload of software to the antenna, which means that 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.
0810D-0	ADM	ERROR	Antenna software upload	Some error occurred during upload of software to the ACU, which means that the ACU software version is not as expected. Either the software in the ACU, does not meet the minimum version required by the ACU, the software image in the ACU is corrupted or the upload procedure failed because of a communication error.
0810E-0	ADM	ERROR	RF calibration	The RF calibration is not valid.
08800-0	ADM	ERROR	Internal power supply	An internal power supply voltage is outside its legal 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.
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.

Table C-2: ACU event messages (Continued)

Error code (ID)	ACU PCB	Severity	Description	Explanation
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. It may affect performance, and it will be shut down if the situation gets worse.
08A03-0	ADM	ERROR	GX Core Module	The ACU detected a warning/error in the GX Core Module. Info: 0x00000001: Power supply error 0x00000002: Test error
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. It should be replaced.
0B001-0	PSM	ERROR	NMEA 2000 identifier	Missing or invalid production data in the PSM. It should be replaced.
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.

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 setup VSAT modem parameters.

<pre>H:\&gt;telnet 192.168.0.1 acu login: admin Password:</pre> <p><b>1</b> Connect to SAILOR VSAT using IP address</p>	<pre>UCLI:/\$ config current_list</pre> <p><b>2</b> Read or change settings</p>	<pre>UCLI:/\$ config activate</pre> <p><b>3</b> Write new settings to SAILOR VSAT</p>
---	---	---

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.

Command line interface

### D.1.1 Telnet connection

You can access the command line interface via Telnet.

#### User name and password

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

#### Telnet

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

1. Open a Telnet client of your choice.
2. At the prompt, enter the IP address of the ACU, default login **admin** and default password **1234**.

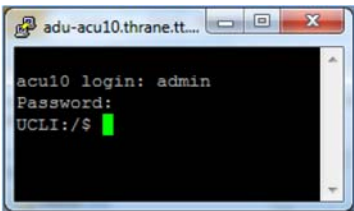


Figure D-2: Command line interface, login

## D.1.2 Help

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

## D.1.3 Conventions

The command description below uses the following special typography:

Convention	Description
Courier font	Information that is displayed on the screen.
<b>Bold Courier font</b>	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
<b>config</b>	Shows the sub commands available, including a short description.
<b>config pending_list</b>	Shows the number of pending changes.
<b>config current_list</b>	Shows the values for the current satellite profile, antenna and some tracking information.
<b>config discard</b>	Discards all pending changes.
<b>config activate</b>	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
<b>demo start</b>	Starts a demo pattern where the antenna will turn azimuth, elevation and cross elevation until it receives the command <b>demo stop</b> .
<b>demo stop</b>	Stops the antenna demo pattern.
<b>demo reset</b>	Resets the antenna to angle 0.

Table D-3: UCLI command: demo

## D.2.3 dual\_antenna

Command	Description
<b>dual_antenna mode</b>	Shows the current dual antenna mode <ul style="list-style-type: none"> <li>• single</li> <li>• master</li> <li>• slave</li> </ul>
<b>dual_antenna status</b>	<ul style="list-style-type: none"> <li>• Shows the current dual-antenna mode status</li> <li>• active</li> <li>• inactive</li> </ul>

Table D-4: UCLI command: dual\_antenna

## D.2.4 exit

Command	Description
<b>exit</b>	Exits the connection to the SAILOR VSAT system.

Table D-5: UCLI command: **exit**

## D.2.5 help

Command	Description
<b>help</b>	Shows a list of commands available, including a short description.
<b>help satellite</b>	Shows the sub commands and description for the command <b>satellite</b> .
<b>help modem</b>	Shows the sub commands and a short description for the command <b>modem</b> .
<b>help track</b>	Shows the sub commands and description for the command <b>track</b> .
<b>help status</b>	Shows the sub commands and description for the command <b>status</b> .
<b>help system</b>	Shows the sub commands and a short description for the command <b>system</b> .
<b>help config</b>	Shows the sub commands, unit and description for the command <b>config</b> .
<b>help zone</b>	Shows the sub commands, unit and description for the command <b>zone</b> .
<b>help demo</b>	
<b>help dual antenna</b>	
<b>help exit</b>	

Table D-6: UCLI command: **help**

## D.2.6 modem

Command	Description
<b>modem</b>	Shows a list of sub commands available, including a short description.
<b>modem name</b>	Shows the VSAT modem name of the currently active satellite profile (entered in the web interface).

Table D-7: UCLI command: **modem**



Command	Description
<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** (Continued)

## 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"> <li>1.0W or 1.0E or -1.0 for west and 1.0 for east</li> </ul>
<code>satellite skew</code> <code>satellite skew 3.7</code>	Shows or sets an additional skew offset of the satellite <sup>a</sup> . Some satellite has additional skew because they have been placed different in the orbit. E.g. Optus satellites in Australia are offset -45 degrees. Most satellites have 0 degree skew offset. <ul style="list-style-type: none"> <li>Skew of the satellite: -90° to +90°.</li> </ul>
<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"> <li>Maximum inclination of satellite 0.0° to 90°</li> </ul>
<code>satellite rx_pol</code> <code>satellite rx_pol v</code>	Shows or sets the current RX polarisation: <ul style="list-style-type: none"> <li>v (vertical)</li> <li>h (horizontal)</li> <li>l (left)</li> <li>r (right)</li> </ul>

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

Command	Description
<code>satellite tx_pol</code>  <code>satellite tx_pol v</code>	<p>Shows or sets the current TX polarisation:</p> <ul style="list-style-type: none"> <li>• v (vertical)</li> <li>• h (horizontal)</li> <li>• l (left)</li> <li>• r (right)</li> </ul>
<code>satellite ele_cut_off</code>  <code>satellite ele_cut_off 5</code>	<p>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.</p> <ul style="list-style-type: none"> <li>• Valid range: 0° to 90°</li> </ul>
<code>satellite rx_lo</code>	<p>Shows the Rx LO / LNB LO. Range: 9.6 GHz to 11.3 GHz. GX: 18.25 GHz</p>
<code>satellite rx_rf_freq</code>  <code>satellite rx_rf_freq</code> <code>12.123456 9.75</code>	<p>Shows or sets the Rx frequency and LNB Lo frequency.</p> <ul style="list-style-type: none"> <li>• 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.</li> <li>• Ka band: RF frequency: 19.2 – 20.2 GHz. LNB Lo frequency: 18.25 GHz.</li> </ul> <p><b>Note:</b> 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><b>Example:</b> 1567.890 MHz = 11.567890 GHz – 10 GHz</p>

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

Command	Description
<b>satellite rx_if_freq</b>  <b>satellite rx_if_freq</b> <b>1200.123 9.75</b>	<p>Shows or sets the IF Rx frequency together with the LNB Lo frequency.</p> <ul style="list-style-type: none"> <li>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.</li> <li>Ka band: IF frequency within 950 MHz – 1950 MHz. LNB Lo frequency: 18.25 GHz.</li> </ul> <p><b>Note:</b> Setting the L-band Rx frequency and LNB Lo automatically configures the Ku-band Rx frequency:  <math>\text{Rx Ku-band frequency} = \text{LNB Lo} + \text{rx\_if\_frequency}</math></p> <p><b>Example:</b> <math>11.567890 \text{ GHz} = 10 \text{ GHz} + 1567.890000 \text{ MHz}</math></p>
<b>satellite tx_lo</b>	<p>Shows the current TX LO frequency, fixed at</p> <p>Ku band: 12.8 GHz  Ka band: 28.05 GHz</p>
<b>satellite tx_rf_freq</b>  <b>satellite tx_rf_freq</b> <b>14.123456</b>	<p>Shows or sets the RF frequency used for tx.</p> <ul style="list-style-type: none"> <li>Valid range: Ku band: 13.75 GHz to 14.5 GHz. Ka band: 29 GHz to 30 GHz.</li> </ul> <p><b>Note:</b> Configuring the Ku-band tx frequency automatically configures the L-band frequency:  <math>\text{L-band frequency} = \text{Ku-band tx frequency} - 12.8 \text{ GHz (BUC Lo)}</math></p> <p><b>Example:</b> <math>1308.300000 \text{ MHz} = 14.108300 \text{ GHz} - 12.8 \text{ GHz}</math></p>
<b>satellite tx_if_freq</b>  <b>satellite tx_if_freq</b> <b>1200.123</b>	<p>Shows or sets the IF frequency for tx.</p> <ul style="list-style-type: none"> <li>Valid range: Ku band: 950 MHz to 1700 MHz. Ka band: 950 MHz to 1950 MHz</li> </ul> <p><b>Note:</b> Configuring the L-band tx frequency automatically configures the Ku-band frequency:  <math>\text{Ku-band frequency} = 12.8 \text{ GHz (BUC Lo)} + \text{L-band frequency}</math></p> <p><b>Example:</b> <math>14.108300 \text{ GHz} = 12.8 \text{ GHz} + 1308.300000 \text{ MHz}</math></p>

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

a. Relevant for Ku band.

## D.2.8 status

Command	Description
<b>status</b>	Shows the sub commands available, including a short description.
<b>status system</b>	Shows the current status of the SAILOR 100 GX.
<b>status track_all</b>	Shows the current values for all tracking parameters: <ul style="list-style-type: none"><li>• vessel heading</li><li>• azimuth relative</li><li>• elevation relative</li><li>• polarisation skew</li><li>• GPS latitude and longitude</li></ul>
<b>status event_list</b>	Shows a list of active events.

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

## D.2.9 system

Command	Description
<b>system</b>	Shows the sub commands available, including a short description.
<b>system restart</b>	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.
<b>system info</b>	Shows the software version, part names and serial numbers of the SAILOR 100 GX.

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

## D.2.10 track

Command	Description
<b>track</b>	Shows the sub commands available, including a short description.
<b>track mode</b>  <b>track mode dvb</b>	Shows or sets the receiver bandwidth or mode, the way the SAILOR 100 GX tracks the satellite: <ul style="list-style-type: none"> <li>• narrow (recommended, uses the built-in 300 kHz filter of the SAILOR 100 GX)</li> <li>• rssi (uses the RSSI signal from the VSAT modem)</li> <li>• wide (uses the wide-band filter to track the satellite)</li> <li>• dvb (uses the built-in DVB-S2 receiver of the SAILOR 100 GX to track the satellite. You must configure dvb_sym and dvb_nid.)</li> <li>• GSC (uses Inmarsat Global Signalling Channel)</li> <li>• GSCpwr (uses power of Inmarsat Global Signalling Channel)</li> </ul>
<b>track dvb_sym</b>  <b>track dvb_sym 22</b>	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"> <li>• Valid range: 0.1 — 99</li> </ul>
<b>track dvb_nid</b>  <b>track dvb_nid 0</b>	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"> <li>• Valid range: 0 — 65535 A NID of '0' disables the NID check. Then the NID will be omitted in the verification of the transponder.</li> </ul>
<b>track rx_rf_freq</b>	The frequency for the receiver to tune to. Verify that the frequency is in the same range as the modem rx_rf_frequency, above or below 11.7 GHz. If rx_rf_freq is set to 0, the tracking frequency is the same as the RX frequency provided by the modem <ul style="list-style-type: none"> <li>• Valid range: Ku band: 10.7 GHz to 12.75 GHz Ka band: 19.2 GHz to 20.2 GHz</li> </ul>

Table D-11: UCLI command: track

## D.2.11 zone

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

Table D-12: UCLI command: `zone`

# Approvals

This appendix lists the approvals for SAILOR 100 GX:

- *CE (R&TTE)*

## E.1 CE (R&TTE)

The SAILOR 100 GX is CE certified (R&TTE directive) as stated in the “Declaration of Conformity with R&TTE Directive”, enclosed in copy on the next page.



## Declaration of Conformity with R&TTE Directive

The undersigned of this letter declares that the following equipment complies with the specifications of EC directive 1999/5/EC concerning Radio & Telecommunications Terminal Equipment.

### Equipment included in this declaration

TT-7090C Sailor 100GX, Maritime Ka-Band Antenna System consisting of:

TT-7016B	Antenna Control Unit (ACU) Ka	PN = 407016B-T19 or
	Antenna Control Unit (ACU) Ka	PN = 407016B-N19

And:

TT-7023A	Global Xpress Modem Unit (GMU)	PN = 407023A-T19 or
	Global Xpress Modem Unit (GMU)	PN = 407023A-N19

And:

TT-7009C	Above Deck Unit (ADU)	PN = 407009C-THR
	Above Deck Unit (ADU)	PN = 407009C-NEU

### Equipment Applicability

TT-7090C SAILOR 100GX System consists of an antenna unit (ADU – Above Deck Unit), an ACU (Antenna Control Unit) and a GMU (Global Xpress Modem Unit). It is a system that provides two-way satellite voice/data broadband communication while in movement on a vessel at sea (stabilized). The system can transmit to and receive from any desired Ka-band satellite, which has adequate signal coverage in the current geographic area.

### Declaration

The requirement with respect to the LVD directive 2006/95/EC is met by conforming to the harmonized EU standard EN 60950. The protection requirement with respect to the EMC directive 2004/108/EC is met by conforming to the harmonized EU standard EN 60945. Effective use of frequency spectrum is met by conforming to harmonized EU standard EN 303978.

### Manufacturer

Thrane & Thrane A/S

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Industrivej 30, DK-9490 Pandrup, Denmark

### Place and Date

Kgs. Lyngby, 10. November 2014

Poul Jona, CEO  
Thrane & Thrane A/S



Doc. no. 99-144294-A

Thrane & Thrane A/S trading as Cobham SATCOM

Registered no.: DK - 65 72 46 18. Registered address: Lundtoftegårdsvej 93 D, 2800 Kgs. Lyngby, Denmark

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**A**

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

**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**

DDM	DC-Motor Driver Module
DHCP	Dynamic Host Configuration Protocol. A protocol for assigning dynamic IP addresses to devices on a network. With dynamic addressing, a device can have a different IP address every time it connects to the network.
DNS	Domain Name System. A system translating server names (URLs) to server addresses.
DVB	Digital Video Broadcasting, a set of standards relating to digital television. ,

**E**

EIRP	Effective Isotropically-Radiated Power. The amount of power that would have to be emitted by an isotropic antenna (that evenly distributes power in all directions) to produce the peak power density observed in the direction of maximum antenna gain.
ESD	ElectroStatic Discharge
ETSI	European Telecommunication Standard Institute

**F**

FPGA            Field Programmable Gate Array ,

**G**

GNSS            Global Navigation Satellite System, e.g. GPS. ,

GPL            General Public License

GPS            Global Positioning System. A system of satellites, computers, and receivers that is able to determine the latitude and longitude of a receiver on Earth by calculating the time difference for signals from different satellites to reach the receiver.

**H**

HDT            HeaDing True, NMEA sentence.

HTTPS          HyperText Transfer Protocol Secure.

**I**

IEC            International Electrotechnical Commission. The international standards and conformity assessment body for all fields of electrotechnology.

IMSO          International Mobile Satellite Organisation. An intergovernmental organisation that oversees certain public satellite safety and security communication services provided via the Inmarsat satellites.

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

PCM Pedestal Control Module

PMM Polarisation Motor Module

POST Power On Self Test. A system test that is activated each time the system is powered on.

PSM Power Supply Module

## R

RF Radio Frequency. Electromagnetic wave frequencies between about 3 kilohertz and about 300 gigahertz including the frequencies used for communications signals (radio, television, cell-phone and satellite transmissions) or radar signals.

RFI Radio Frequency Interference. A non-desired radio signal which creates noise or dropouts in the wireless system or noise in a sound system.

ROSS Roaming Oceanic Satellite Server

RSSI Received Signal Strength Indicator

## S

SMD Single Motor Driver Module

**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.

## U

**UCLI** User Command Line Interface

## V

**VIM** VSAT Interface Module

**VLAN** Virtual Local Area Network

**VMU** VSAT Modem Unit

## W

**WAN** Wide Area Network

## X

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

## Z

**ZRM** Zero Reference Module

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