

**COBHAM**

# SAILOR 800 & 900 VSAT

Technical manual





# SAILOR 800/900 VSAT

## Technical manual

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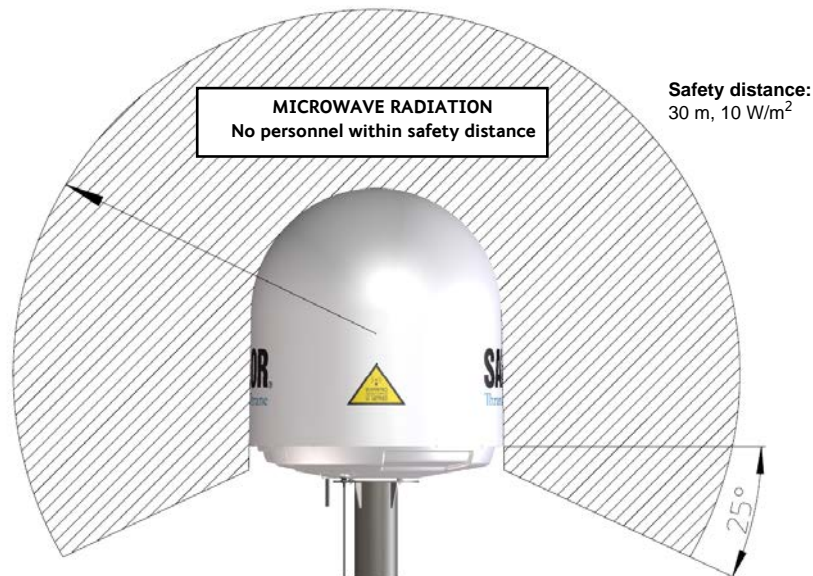
## Safety summary

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. Cobham SATCOM 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 (SAILOR 900 VSAT) / 24 m (SAILOR 800 VSAT), 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 – 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* on page 3-17 — it may cause damage to the Above Deck Unit.

### Compass Safe Distance:

SAILOR 800/900 VSAT antenna or ADU (Above Deck Unit): min. 130 cm (SAILOR 900 Var. A),

170 cm (SAILOR 900 Var. B), min. 100 cm (SAILOR 800) (IEC 945).  
SAILOR 800/900 VSAT ACU (Antenna Control Unit): min. 10 cm (IEC 945)

### **Service**

User access to the interior of the ACU is prohibited. Only a technician authorized by Cobham SATCOM may perform service - failure to comply with this rule will void the warranty. Access to the interior of the Above Deck Unit is allowed. Replacement of certain modules - as described in *Service* on page 8-1 and general service may only be performed by a technician authorized by Cobham SATCOM.

### **Do not service or adjust alone**

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

### **Grounding, cables and connections**

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

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

Rx and Tx cables for the SAILOR 800/900 VSAT system are shielded and should not be affected by magnetic fields. However, try to avoid running cables parallel to high power and AC/RF wiring as it might cause malfunction of the equipment.

### **Power supply**

The voltage range for the SAILOR 800/900 VSAT is 20 – 32 VDC. Note that 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.

### **Do not operate in an explosive atmosphere**

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

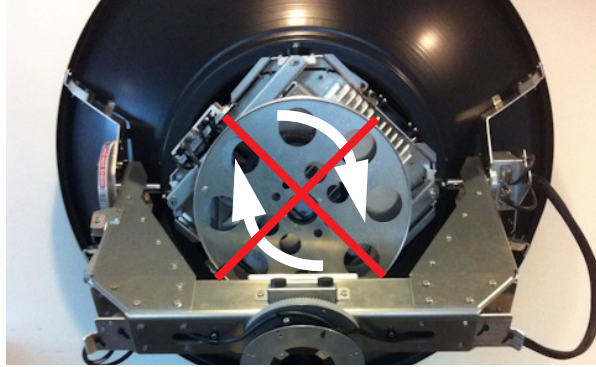
### **Keep away from live circuits**

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

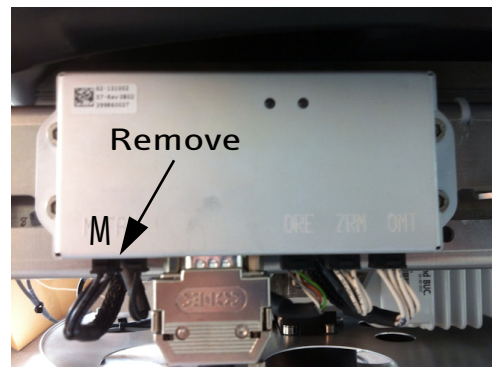
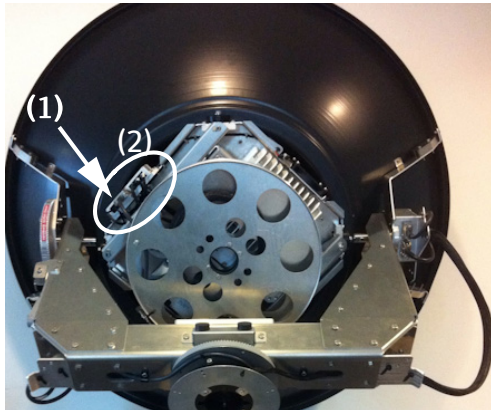
**Failure to comply with the rules above will void the warranty!**



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



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



### VSAT restrictions

**Note**

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

- Belgium
- Hungary
- Latvia
- Malta
- Slovakia

Contact VSAT modem provider for local setups.





# Table of contents

---

|                  |  |      |
|------------------|--|------|
| <b>Chapter 1</b> | <b>About this manual</b>   |      |
|                  | 1.1 Intended readers .....                                       | 1-1  |
|                  | 1.2 Manual overview .....  | 1-1  |
|                  | 1.3 Software version .....                                       | 1-1  |
|                  | 1.4 Typography .....   | 1-2  |
|                  | 1.5 Precautions .....  | 1-2  |
|                  | 1.5.1 Warnings, Cautions and Notes .....                         | 1-2  |
|                  | 1.5.2 General precautions .....                                  | 1-2  |
| <br>             |  |      |
| <b>Chapter 2</b> | <b>Introduction</b>  |      |
|                  | 2.1 SAILOR 800/900 VSAT system .....                             | 2-1  |
|                  | 2.1.1 Overview .....   | 2-1  |
|                  | 2.1.2 Above Deck Unit (ADU) .....                                | 2-3  |
|                  | 2.1.3 Antenna Control Unit (ACU) .....                           | 2-8  |
|                  | 2.1.4 VSAT Modem Unit (VMU) .....                                | 2-10 |
|                  | 2.1.5 Satellite type approvals .....                             | 2-10 |
|                  | 2.1.6 Power supply (optional) .....                              | 2-10 |
|                  | 2.1.7 Service activation .....                                   | 2-10 |
|                  | 2.2 Part numbers and options .....                               | 2-11 |
|                  | 2.2.1 Applicable Thrane & Thrane model and part numbers .....    | 2-11 |
|                  | 2.2.2 Options for SAILOR 800/900 VSAT .....                      | 2-11 |
| <br>             |  |      |
| <b>Chapter 3</b> | <b>Installation</b>  |      |
|                  | 3.1 Unpacking .....  | 3-1  |
|                  | 3.1.1 What's in the box .....                                    | 3-1  |
|                  | 3.1.2 Initial inspection .....                                   | 3-2  |
|                  | 3.1.3 Tools needed .....   | 3-2  |
|                  | 3.2 Site preparation .....                                       | 3-3  |
|                  | 3.2.1 General site considerations .....                          | 3-3  |
|                  | 3.2.2 Obstructions (ADU shadowing) .....                         | 3-4  |
|                  | 3.2.3 Blocking zones – azimuth and elevation .....               | 3-5  |
|                  | 3.2.4 Safe access to the ADU: Radiation hazard .....             | 3-6  |
|                  | 3.2.5 Ship motion and offset from the ship's motion centre ..... | 3-8  |
|                  | 3.2.6 ADU mast design: Foundation and height .....               | 3-9  |
|                  | 3.2.7 Interference .....   | 3-17 |
|                  | 3.2.8 Other precautions .....                                    | 3-20 |

|  |      |
|--|------|
| <b>3.3 Installation of the ADU</b> .....                     | 3-22 |
| 3.3.1 To install the ADU .....                               | 3-24 |
| 3.3.2 To open and remove the service hatch .....             | 3-30 |
| 3.3.3 To ground the ADU .....                                | 3-32 |
| 3.3.4 Alternative ADU cable .....                            | 3-34 |
| <b>3.4 Installation of the ACU</b> .....                     | 3-35 |
| 3.4.1 To install the ACU .....                               | 3-35 |
| 3.4.2 To ground the ACU .....                                | 3-36 |
| <b>3.5 Installation of the VMU</b> .....                     | 3-36 |
| 3.5.1 General mounting considerations — VMU .....            | 3-36 |
| <b>3.6 To install the dual-antenna mode (optional)</b> ..... | 3-37 |

## Chapter 4

### Interfaces

|  |     |
|--|-----|
| <b>4.1 Interfaces of the SAILOR 800/900 VSAT ACU</b> ..... | 4-1 |
| 4.1.1 LEDs, display and keypad .....                       | 4-1 |
| 4.1.2 ACU connector panel — overview .....                 | 4-1 |
| 4.1.3 DC Input connector .....                             | 4-2 |
| 4.1.4 ADU connector .....                                  | 4-3 |
| 4.1.5 Rx/Tx connectors for VMU .....                       | 4-3 |
| 4.1.6 NMEA 0183 connector .....                            | 4-4 |
| 4.1.7 RS-232 and RS-422 connectors .....                   | 4-5 |
| 4.1.8 LAN1, LAN2, LAN3 and LAN4 connectors .....           | 4-6 |
| <b>4.2 Interfaces of the VMU</b> .....                     | 4-7 |

## Chapter 5

### Connecting power

|   |     |
|---|-----|
| <b>5.1 Power source</b> .....                   | 5-1 |
| <b>5.2 Power cable selection</b> .....          | 5-1 |
| 5.2.1 Source impedance .....                    | 5-1 |
| 5.2.2 Measuring the ship source impedance ..... | 5-2 |
| 5.2.3 Power cable recommendations .....         | 5-2 |
| <b>5.3 Connecting power</b> .....               | 5-3 |
| <b>5.4 Power up</b> .....                       | 5-3 |
| 5.4.1 Procedure .....                           | 5-3 |
| 5.4.2 Initialisation steps in daily use .....   | 5-4 |
| 5.4.3 SAILOR 800/900 VSAT operational .....     | 5-4 |

## Chapter 6

### Configuration

|   |     |
|---|-----|
| <b>6.1 Introduction to the built-in web interface</b> ..... | 6-1 |
| 6.1.1 Overview .....  | 6-1 |
| 6.1.2 Connecting to the web interface .....                 | 6-1 |

|                  |  |      |
|------------------|--|------|
| <b>6.2</b>       | <b>Calibration</b> .....   | 6-4  |
| 6.2.1            | To set up a service profile for calibration .....                | 6-4  |
| 6.2.2            | Heading input .....  | 6-6  |
| 6.2.3            | Cable calibration .....  | 6-11 |
| 6.2.4            | <b>Operation in gyro-free mode</b> .....                         | 6-12 |
| 6.2.5            | Flow chart for calibration .....                                 | 6-14 |
| 6.2.6            | To make a line up procedure .....                                | 6-15 |
| 6.2.7            | SAILOR 800/900 VSAT fixed TX gain principle .....                | 6-17 |
| <b>6.3</b>       | <b>Configuration with the web interface</b> .....                | 6-18 |
| 6.3.1            | Overview and dashboard .....                                     | 6-18 |
| 6.3.2            | Satellite profiles and VSAT modem profiles .....                 | 6-25 |
| 6.3.3            | To set up blocking zones (RX and TX) .....                       | 6-32 |
| 6.3.4            | To configure the LAN network .....                               | 6-34 |
| 6.3.5            | E-mail setup .....   | 6-36 |
| 6.3.6            | To send statistics reports .....                                 | 6-38 |
| 6.3.7            | To send a diagnostics report .....                               | 6-41 |
| 6.3.8            | Dual antenna mode (optional) .....                               | 6-42 |
| 6.3.9            | Upload .....   | 6-46 |
| 6.3.10           | Administration .....   | 6-46 |
| <b>6.4</b>       | <b>Keypad and menus of the ACU</b> .....                         | 6-52 |
| 6.4.1            | ACU display and keypad .....                                     | 6-52 |
| 6.4.2            | Navigating the menus .....                                       | 6-53 |
| 6.4.3            | The menu tree .....  | 6-53 |
| 6.4.4            | Adjusting brightness of the display .....                        | 6-57 |
| 6.4.5            | Resetting the system .....                                       | 6-57 |
| <b>6.5</b>       | <b>SNMP support</b> .....  | 6-58 |
| <br>             |  |      |
| <b>Chapter 7</b> | <b>Installation check</b>  |      |
| 7.1              | <b>Installation check list: Antenna</b> .....                    | 7-1  |
| 7.2              | <b>Installation check list: ACU, connectors and wiring</b> ..... | 7-3  |
| 7.3              | <b>Installation check list: Functional test in harbor</b> .....  | 7-5  |
| <br>             |  |      |
| <b>Chapter 8</b> | <b>Service &amp; maintenance</b>                                 |      |
| 8.1              | <b>Getting support: Helpdesk</b> .....                           | 8-2  |
| 8.1.1            | Help desk and diagnostic report .....                            | 8-2  |
| 8.2              | <b>Software update</b> .....                                     | 8-4  |
| 8.2.1            | Hardware and software requirements .....                         | 8-4  |
| 8.2.2            | Software update (ADU and ACU) .....                              | 8-4  |
| 8.2.3            | To verify the software update .....                              | 8-8  |

|            |   |       |
|------------|---|-------|
| <b>8.3</b> | <b>Status signalling with LEDs and status messages</b>    | 8-10  |
| 8.3.1      | Overview  | 8-10  |
| 8.3.2      | LEDs of the ADU modules                                   | 8-11  |
| 8.3.3      | LEDs in the ACU   | 8-11  |
| <b>8.4</b> | <b>Removal and replacement of the ACU</b>                 | 8-13  |
| <b>8.5</b> | <b>Removal and replacement of ADU modules</b>             | 8-15  |
| 8.5.1      | Overview  | 8-15  |
| 8.5.2      | System block diagram of the ADU.                          | 8-17  |
| 8.5.3      | Replacing the GPS module                                  | 8-28  |
| 8.5.4      | Replacing the VSAT Interface Module (VIM)                 | 8-31  |
| 8.5.5      | Replacing the DC-Motor Driver Module (DDM)                | 8-32  |
| 8.5.6      | Replacing the Polarisation Motor Module (PMM)             | 8-37  |
| 8.5.7      | Replacing the Pedestal Control Module (PCM)               | 8-40  |
| 8.5.8      | Replacing motor and encoder                               | 8-41  |
| 8.5.9      | Replacing the Drive Belts                                 | 8-57  |
| 8.5.10     | Replacing the Zero Reference Module (ZRM)                 | 8-63  |
| 8.5.11     | Replacing the Inertial Sensor Module (ISM)                | 8-69  |
| 8.5.12     | Replacing the Polarisation Unit                           | 8-72  |
| 8.5.13     | Replacing the BUC Fan                                     | 8-75  |
| 8.5.14     | Replacing the Block Up Converter (BUC)                    | 8-76  |
| 8.5.15     | Replacing the Low Noise Block down converter (LNB)        | 8-78  |
| 8.5.16     | Replacing the Ortho Mode Transducer (OMT)                 | 8-80  |
| 8.5.17     | Replacing the rotary joint                                | 8-83  |
| 8.5.18     | Replacing a wire-rope isolator                            | 8-86  |
| <b>8.6</b> | <b>Updating VIM/PCM calibration data</b>                  | 8-88  |
| <b>8.7</b> | <b>Inspection of mechanical components</b>                | 8-90  |
| 8.7.1      | Inspection for critical wear                              | 8-90  |
| 8.7.2      | Inspection of wire-rope isolators                         | 8-90  |
| <b>8.8</b> | <b>Troubleshooting</b>                                    | 8-93  |
| 8.8.1      | Overview  | 8-93  |
| 8.8.2      | Event list for troubleshooting                            | 8-93  |
| 8.8.3      | Diagnostics report for troubleshooting                    | 8-93  |
| 8.8.4      | Troubleshooting – VSAT                                    | 8-96  |
| 8.8.5      | Troubleshooting – BUC                                     | 8-98  |
| 8.8.6      | Troubleshooting – LNB                                     | 8-99  |
| 8.8.7      | LNB test  | 8-100 |
| 8.8.8      | To verify that the VSAT antenna can go into tracking mode | 8-104 |
| 8.8.9      | X-elevation bearing test                                  | 8-104 |
| <b>8.9</b> | <b>Returning units for repair</b>                         | 8-105 |

---

|                   |   |      |
|-------------------|---|------|
| <b>Appendix A</b> | <b>Technical specifications</b>   |      |
|                   | <b>A.1 SAILOR 800/900 VSAT system components</b>  | A-1  |
|                   | A.1.1 General specifications  | A-1  |
|                   | A.1.2 ADU   | A-2  |
|                   | A.1.3 ACU   | A-4  |
|                   | A.1.4 Supported VSAT modems   | A-5  |
|                   | A.1.5 Patents   | A-5  |
|                   | <b>A.2 Outline drawings</b>   | A-6  |
|                   | A.2.1 ADU   | A-6  |
|                   | A.2.2 ACU   | A-8  |
|                   | A.2.3 N-connector interface on the ADU  | A-9  |
|                   | <b>A.3 VSAT LNB Data Sheet (physical LNB)</b>   | A-10 |
|                   | A.3.1 VSAT LNB user installation and configuration information                                | A-11 |
|                   | <b>A.4 VSAT 8/6 W BUC Data Sheet (Extended)</b>   | A-12 |
| <b>Appendix B</b> | <b>VMU cables</b>   |      |
|                   | <b>B.1 Modem Cable COMTECH Serial &amp; RSSI TT7016A</b>                                      | B-2  |
|                   | <b>B.2 Modem Cable iNFINITI iDirect VSAT modem</b>  | B-3  |
| <b>Appendix C</b> | <b>VMU settings</b>   |      |
|                   | <b>C.1 Performance optimization for blockage</b>  | C-1  |
|                   | C.1.1 Performance of VSAT systems encountering blockage, configured with multiple satellites. | C-1  |
|                   | <b>C.2 OpenAMIP setup for iDirect iNFINITI &amp; Evolution</b>                                | C-4  |
|                   | C.2.1 Protocol and interfaces   | C-4  |
|                   | C.2.2 Sample options file   | C-7  |
|                   | C.2.3 Configuration example (OpenAMIP)  | C-10 |
|                   | C.2.4 Troubleshooting   | C-11 |
|                   | <b>C.3 Serial setup for iDirect iNFINITI &amp; Evolution</b>                                  | C-14 |
|                   | C.3.1 Protocol and interfaces   | C-14 |
|                   | C.3.2 Console port settings   | C-14 |
|                   | C.3.3 Configuration example (Serial)  | C-16 |
|                   | <b>C.4 COMTECH 570L and ROSS box</b>  | C-18 |
|                   | C.4.1 Protocols and interfaces  | C-18 |
|                   | C.4.2 Configuration example (COMTECH 570L and ROSS)   | C-19 |
|                   | <b>C.5 COMTECH 570L</b>   | C-20 |
|                   | C.5.1 Protocol and interfaces   | C-20 |
|                   | C.5.2 Configuration example (COMTECH 570L)  | C-22 |

- C.6 STM SatLink 2900 VSAT modem** .....C-23
- C.6.1 Interfaces and VSAT modem configuration .....C-23
- C.6.2 ACU configuration .....C-24
- C.6.3 Configuration example (STM Satlink 2900) .....C-25
- C.7 Gilat SkyEdge II VSAT modem** .....C-26
- C.7.1 Interfaces and VSAT modem configuration .....C-26
- C.7.2 ACU configuration .....C-27
- C.7.3 Configuration example (Gilat SkyEdge II) .....C-28
- C.8 Inmarsat G5 modem** .....C-29
- C.8.1 Interfaces and VSAT modem configuration .....C-29
- C.8.2 Connecting a Inmarsat G5 modem .....C-29
- C.8.3 Configuration example (Inmarsat G5) .....C-29

**Appendix D Command line interface**

- D.1 Introduction** .....D-1
- D.1.1 Telnet connection .....D-2
- D.1.2 Help .....D-2
- D.1.3 Conventions .....D-2
- D.2 Supported commands** .....D-3
- D.2.1 config .....D-3
- D.2.2 demo .....D-3
- D.2.3 dual\_antenna .....D-4
- D.2.4 exit .....D-4
- D.2.5 help .....D-4
- D.2.6 modem .....D-5
- D.2.7 satellite .....D-5
- D.2.8 status .....D-7
- D.2.9 system .....D-8
- D.2.10 track .....D-8
- D.2.11 zone .....D-9

**Appendix E DVB-S satellites**

|                   |  |            |
|-------------------|--|------------|
| <b>Appendix F</b> | <b>Grounding and RF protection</b>                     |            |
|                   | <b>F.1 Why is grounding required?</b>                  | F-1        |
|                   | F.1.1 Reasons for grounding                            | F-1        |
|                   | F.1.2 Safety   | F-1        |
|                   | F.1.3 ESD Protection                                   | F-1        |
|                   | <b>F.2 Grounding Recommendations</b>                   | F-2        |
|                   | F.2.1 To ground the ACU                                | F-2        |
|                   | F.2.2 To ground the ADU                                | F-3        |
|                   | <b>F.3 Alternative grounding for steel hulls</b>       | F-3        |
|                   | F.3.1 To ground the ACU                                | F-3        |
|                   | F.3.2 To ground the ADU                                | F-4        |
|                   | <b>F.4 Alternative grounding for aluminum hulls</b>    | F-6        |
|                   | F.4.1 To ground the ACU                                | F-6        |
|                   | F.4.2 To ground the ADU                                | F-6        |
|                   | <b>F.5 Alternative grounding for fibre glass hulls</b> | F-7        |
|                   | F.5.1 To ground the ACU                                | F-7        |
|                   | F.5.2 To ground the ADU                                | F-7        |
|                   | <b>F.6 Separate ground cable</b>                       | F-8        |
|                   | F.6.1 Ground cable - construction                      | F-8        |
|                   | F.6.2 Ground cable - connection                        | F-9        |
|                   | F.6.3 Isolation of the ADU from the mounting base      | F-9        |
|                   | <b>F.7 Jumper cable for grounding</b>                  | F-11       |
|                   | <b>F.8 RF interference</b>                             | F-12       |
|                   | F.8.1 Recommendations                                  | F-12       |
| <b>Appendix G</b> | <b>System messages</b>                                 |            |
|                   | <b>G.1 Event messages – overview</b>                   | G-1        |
|                   | <b>G.2 List of ADU events</b>                          | G-2        |
|                   | <b>G.3 List of ACU events</b>                          | G-8        |
| <b>Appendix H</b> | <b>Approvals</b>                                       |            |
|                   | <b>H.1 Overview</b>                                    | H-1        |
|                   | <b>H.2 CE (R&amp;TTE)</b>                              | H-1        |
|                   | <b>H.3 Eutelsat S.A – ESV Summary Sheet</b>            | H-4        |
|                   | <b>H.4 Russian Maritime Register of Shipping</b>       | H-6        |
|                   | <b>H.5 ANATEL Certificado de Homologação</b>           | H-9        |
| <b>Glossary</b>   |  | Glossary-1 |
| <b>Index</b>      |  | Index-1    |





# List of figures

---

## Chapter 1 About this manual

## Chapter 2 Introduction

|              |   |      |
|--------------|---|------|
| Figure 2-1:  | Above Deck Unit and Antenna Control Unit (ACU)..... | 2-1  |
| Figure 2-2:  | SAILOR 900: Above Deck Unit (ADU).....              | 2-3  |
| Figure 2-3:  | SAILOR 800: Above Deck Unit (ADU).....              | 2-3  |
| Figure 2-4:  | SAILOR 900: Above Deck Unit modules 1/2.....        | 2-4  |
| Figure 2-5:  | SAILOR 800: Above Deck Unit modules 1/2.....        | 2-5  |
| Figure 2-6:  | SAILOR 900: Above Deck Unit modules 2/2.....        | 2-6  |
| Figure 2-7:  | SAILOR 800 Above Deck Unit modules 2/2.....         | 2-7  |
| Figure 2-8:  | SAILOR 800/900 VSAT ACU, connector overview.....    | 2-9  |
| Figure 2-9:  | SAILOR 800/900 VSAT ACU, 19" rack version.....      | 2-9  |
| Figure 2-10: | Antenna Control Unit for 19" rack installation..... | 2-10 |

## Chapter 3 Installation

|              |  |      |
|--------------|--|------|
| Figure 3-1:  | Signal degradation because of obstructing objects.....                             | 3-4  |
| Figure 3-2:  | 2 blocking zones with no-transmit zones, azimuth (example).....                    | 3-5  |
| Figure 3-3:  | Blocking zone with no-transmit zones, elevation angle (example).....               | 3-5  |
| Figure 3-4:  | SAILOR 900: Radiation hazard, safety distance 30 m.....                            | 3-6  |
| Figure 3-5:  | SAILOR 800: Radiation hazard, safety distance 24 m.....                            | 3-7  |
| Figure 3-6:  | Maximum distance from the ship's motion centre (h max).....                        | 3-8  |
| Figure 3-7:  | SAILOR 900: ADU mast flange, top and side view.....                                | 3-9  |
| Figure 3-8:  | SAILOR 800: ADU mast flange, top and side view.....                                | 3-10 |
| Figure 3-9:  | ADU mast flange, recommended flatness on the mast mount plateau.....               | 3-10 |
| Figure 3-10: | ADU mast flange, distance to the welded seam.....                                  | 3-11 |
| Figure 3-11: | SAILOR 900: ADU, bottom view.....  | 3-11 |
| Figure 3-12: | SAILOR 800: ADU, bottom view.....  | 3-12 |
| Figure 3-13: | Free mast length and bracing for a tall mast.....                                  | 3-13 |
| Figure 3-14: | Interference with the vessel's radar.....  | 3-18 |
| Figure 3-15: | Recommended distance to transmitters (m) for frequencies below 1000 MHz.....       | 3-20 |
| Figure 3-16: | SAILOR 900: Drain pipe with free space.....  | 3-21 |
| Figure 3-17: | SAILOR 800: Drain pipe with free space.....  | 3-21 |
| Figure 3-18: | SAILOR 900: Use of strong sling with a belt and tag lines for safe hoisting.....   | 3-22 |
| Figure 3-19: | SAILOR 800: Use of strong sling with a belt and tag lines for safe hoisting.....   | 3-23 |
| Figure 3-20: | SAILOR 900: Free space for access to the service hatch.....                        | 3-24 |
| Figure 3-21: | SAILOR 800: Free space for access to the service hatch.....                        | 3-25 |
| Figure 3-22: | SAILOR 900: ADU installation, webbed sling attached to the 4 lifting brackets..... | 3-26 |
| Figure 3-23: | SAILOR 800: ADU installation, webbed sling attached to the 4 lifting brackets..... | 3-26 |
| Figure 3-24: | SAILOR 800: ADU installation, align flange with service hatch.....                 | 3-27 |

---

|                  |  |      |
|------------------|--|------|
| Figure 3-25:     | Mounting the ADU on the mast flange .....                                    | 3-27 |
| Figure 3-26:     | SAILOR 900: Connecting the ADU cable .....                                   | 3-28 |
| Figure 3-27:     | SAILOR 800: Connecting the ADU cable .....                                   | 3-29 |
| Figure 3-28:     | SAILOR 900: Opening the service hatch .....                                  | 3-30 |
| Figure 3-29:     | Removing the 2 split pins .....  | 3-30 |
| Figure 3-30:     | SAILOR 800: Removing the service hatch .....                                 | 3-31 |
| Figure 3-31:     | SAILOR 900: ADU, bolt for optimum grounding .....                            | 3-32 |
| Figure 3-32:     | SAILOR 800: ADU, bolt for optimum grounding .....                            | 3-33 |
| Figure 3-33:     | ACU, On/off switch at the back .....   | 3-35 |
| Figure 3-34:     | ACU, LAN connector at the front: Service port .....                          | 3-35 |
| Figure 3-35:     | ACU, 19" rack version, ground stud .....                                     | 3-36 |
| Figure 3-36:     | Dual mode antenna, overview .....  | 3-37 |
| Figure 3-37:     | Dual mode antenna, connecting cables (example) .....                         | 3-38 |
| <br>             |  |      |
| <b>Chapter 4</b> | <b>Interfaces</b>  |      |
| Figure 4-1:      | ACU — LEDs, display and keypad .....   | 4-1  |
| Figure 4-2:      | ACU: LEDs, display and keypad (detailed) .....                               | 4-1  |
| Figure 4-3:      | ACU rack version, connector panel overview .....                             | 4-1  |
| Figure 4-4:      | DC Input connector with power cable .....                                    | 4-2  |
| Figure 4-5:      | LAN connectors .....   | 4-6  |
| <br>             |  |      |
| <b>Chapter 5</b> | <b>Connecting power</b>  |      |
| Figure 5-1:      | Measuring the ship source impedance .....                                    | 5-2  |
| Figure 5-2:      | Connecting power to DC Input .....   | 5-3  |
| Figure 5-3:      | ACU display after first power on (example with LAN ports 1 and 4 used) ..... | 5-4  |
| <br>             |  |      |
| <b>Chapter 6</b> | <b>Configuration</b>   |      |
| Figure 6-1:      | LAN connector used for configuring the SAILOR 800/900 VSAT .....             | 6-1  |
| Figure 6-2:      | SAILOR 900 Dashboard .....   | 6-2  |
| Figure 6-3:      | SAILOR 800 Dashboard .....   | 6-3  |
| Figure 6-4:      | Service profile for calibration .....  | 6-5  |
| Figure 6-5:      | Web interface: SERVICE, Calibration .....                                    | 6-6  |
| Figure 6-6:      | Acquisition, search pattern .....  | 6-8  |
| Figure 6-7:      | Acquisition, search pattern for inclined orbit .....                         | 6-8  |
| Figure 6-8:      | Acquisition, search pattern in gyro-free mode .....                          | 6-9  |
| Figure 6-9:      | Web interface: SERVICE, Calibration, cable attenuator margin .....           | 6-11 |
| Figure 6-10:     | Example for a calibration – step by step .....                               | 6-14 |
| Figure 6-11:     | Web interface: SERVICE, Line up: Ready for activation .....                  | 6-15 |
| Figure 6-12:     | Web interface: SERVICE, Line up: Antenna ready .....                         | 6-16 |
| Figure 6-13:     | Fixed TX gain principle (SAILOR 900 VSAT) .....                              | 6-17 |
| Figure 6-14:     | Fixed TX gain principle (SAILOR 800 VSAT) .....                              | 6-17 |
| Figure 6-15:     | Topics in the web interface (SITE MAP) .....                                 | 6-18 |

|              |  |      |
|--------------|--|------|
| Figure 6-16: | Web interface: DASHBOARD of SAILOR 900 VSAT .....                            | 6-19 |
| Figure 6-17: | Web interface: DASHBOARD of SAILOR 800 VSAT .....                            | 6-20 |
| Figure 6-18: | Web interface: DASHBOARD, TX - BUC output power (example) .....              | 6-25 |
| Figure 6-19: | Web interface: SETTINGS - list of satellite profiles (example) .....         | 6-26 |
| Figure 6-20: | Web interface: SETTINGS, Satellite profiles — new entry (example) .....      | 6-26 |
| Figure 6-21: | Web interface: SETTINGS, VSAT modem profiles — list (example) .....          | 6-29 |
| Figure 6-22: | Web interface: SETTINGS, VSAT modem profile – supported modems .....         | 6-29 |
| Figure 6-23: | Satellite profile for generic modem .....                                    | 6-31 |
| Figure 6-24: | Web interface: SETTINGS, Blocking zones — azimuth and elevation .....        | 6-32 |
| Figure 6-25: | Blocking zone, example: 315 - 45 degrees .....                               | 6-33 |
| Figure 6-26: | Blocking zone, example: 45 - 315 degrees .....                               | 6-33 |
| Figure 6-27: | Web interface: SETTINGS, Network (default settings) .....                    | 6-34 |
| Figure 6-28: | Web interface: SETTINGS, E-mail setup (example) .....                        | 6-37 |
| Figure 6-29: | Web interface: SETTINGS, Reports (example) .....                             | 6-38 |
| Figure 6-30: | Statistics — how to read data for a range .....                              | 6-40 |
| Figure 6-31: | Statistics report (example) .....  | 6-41 |
| Figure 6-32: | Dual-antenna mode, link on DASHBOARD .....                                   | 6-42 |
| Figure 6-33: | Enabling dual-antenna mode in Master ACU .....                               | 6-43 |
| Figure 6-34: | Dual-antenna mode, add Slave modem profile .....                             | 6-43 |
| Figure 6-35: | Dual-antenna mode, add Slave satellite profile .....                         | 6-44 |
| Figure 6-36: | Dual-antenna mode, Activate .....  | 6-44 |
| Figure 6-37: | Dual-antenna mode, blocking zones — azimuth and elevation .....              | 6-45 |
| Figure 6-38: | Dual-antenna mode, line up .....   | 6-46 |
| Figure 6-39: | Web interface: Administration .....  | 6-47 |
| Figure 6-40: | Web interface: Administration, change administrator logon and password ..... | 6-48 |
| Figure 6-41: | Web interface: ADMINISTRATION, Reset administrator password .....            | 6-48 |
| Figure 6-42: | Web interface: ADMINISTRATION, User permissions .....                        | 6-49 |
| Figure 6-43: | Web interface: Administration, Export/import configuration .....             | 6-50 |
| Figure 6-44: | Web interface: ADMINISTRATION, Factory default .....                         | 6-51 |
| Figure 6-45: | Display (example) and keypad of the ACU .....                                | 6-52 |
| Figure 6-46: | Antenna Control Unit, menu tree .....  | 6-53 |
| Figure 6-47: | Reset the system .....   | 6-57 |
| Figure 6-48: | Download of MIB file .....   | 6-58 |

## Chapter 7 Installation check

## Chapter 8 Service & maintenance

|             |   |     |
|-------------|---|-----|
| Figure 8-1: | Web interface: HELPDESK .....                                     | 8-2 |
| Figure 8-2: | Web interface: HELPDESK, Event list .....                         | 8-3 |
| Figure 8-3: | LAN connector used for software update (TMA) .....                | 8-5 |
| Figure 8-4: | SAILOR 800/900 VSAT connected: Software update with the TMA ..... | 8-5 |
| Figure 8-5: | SAILOR 800/900 VSAT connected: Software update with the TMA ..... | 8-6 |

---

|              |  |      |
|--------------|--|------|
| Figure 8-6:  | LAN connector used for software update (web interface).....                            | 8-7  |
| Figure 8-7:  | Software update with the web interface.....  | 8-7  |
| Figure 8-8:  | Verifying software update, SAILOR 900 VSAT.....  | 8-8  |
| Figure 8-9:  | Verifying software update, SAILOR 800 VSAT.....  | 8-9  |
| Figure 8-10: | LEDs on the ACU.....   | 8-11 |
| Figure 8-11: | Removal and replacement of the ACU.....  | 8-13 |
| Figure 8-12: | ACU – Block diagram 1/2.....   | 8-13 |
| Figure 8-13: | ACU – Digital and RF module.....   | 8-14 |
| Figure 8-14: | SAILOR 900: ADU modules and motor stop switch.....                                     | 8-15 |
| Figure 8-15: | SAILOR 800: ADU modules and motor stop switch.....                                     | 8-16 |
| Figure 8-16: | VIM – Block diagram.....   | 8-18 |
| Figure 8-17: | PCM – Block diagram.....   | 8-19 |
| Figure 8-18: | Service switch.....  | 8-20 |
| Figure 8-19: | DDM – Block diagram.....   | 8-20 |
| Figure 8-20: | ZRM – Block diagram.....   | 8-21 |
| Figure 8-21: | PMM – Block diagram.....   | 8-22 |
| Figure 8-22: | OMT – Block diagram.....   | 8-23 |
| Figure 8-23: | ISM – Block diagram.....   | 8-24 |
| Figure 8-24: | SAILOR 900: Above Deck Unit modules (continued).....                                   | 8-25 |
| Figure 8-25: | SAILOR 800: Above Deck Unit modules (continued).....                                   | 8-26 |
| Figure 8-26: | Block diagram – S-bus.....   | 8-27 |
| Figure 8-27: | GPS module.....  | 8-28 |
| Figure 8-28: | Switch off the power to the antenna.....   | 8-29 |
| Figure 8-29: | GPS module facing the service hatch.....   | 8-29 |
| Figure 8-30: | Connector for GPS PCB.....   | 8-30 |
| Figure 8-31: | Screws on GPS module.....  | 8-30 |
| Figure 8-32: | VSAT Interface Module (VIM).....   | 8-31 |
| Figure 8-33: | Replacing the VIM — remove 2 F-connectors (SAILOR 800 picture).....                    | 8-31 |
| Figure 8-34: | Replacing the VIM — remove 2 N, 2 F, 1 SMA and 1 SUB-D connectors (SAILOR 800 picture) | 8-32 |
| Figure 8-35: | Replacing the VIM — remove 4 Allen screws (SAILOR 800 picture).....                    | 8-32 |
| Figure 8-36: | DC-Motor Driver Module (DDM) for Cross Elevation.....                                  | 8-33 |
| Figure 8-37: | Replacing the DDM — remove connectors.....   | 8-34 |
| Figure 8-38: | Elevation DDM, connectors.....   | 8-35 |
| Figure 8-39: | location of the Azimuth DDM (SAILOR 900 picture).....                                  | 8-36 |
| Figure 8-40: | Azimuth DDM, connectors.....   | 8-36 |
| Figure 8-41: | Polarisation Motor Module, remove connectors.....                                      | 8-37 |
| Figure 8-42: | Polarisation Motor Module, remove screws.....  | 8-38 |
| Figure 8-43: | Polarisation Motor Module, inserting.....  | 8-39 |
| Figure 8-44: | Removing the PCM — connectors.....   | 8-40 |
| Figure 8-45: | Motors and encoders.....   | 8-41 |
| Figure 8-46: | Elevation motor and encoder, loosen the belt tensioner.....                            | 8-42 |

---

|              |   |      |
|--------------|---|------|
| Figure 8-47: | Elevation DDM, disconnect 2 connectors.....                                 | 8-43 |
| Figure 8-48: | Elevation motor and encoder, loosen the screws for the motor assembly.....  | 8-43 |
| Figure 8-49: | Elevation motor and encoder, tighten the screws for the motor assembly..... | 8-44 |
| Figure 8-50: | Azimuth motor, remove cover.....  | 8-45 |
| Figure 8-51: | Azimuth motor, loosen the belt tensioner.....                               | 8-45 |
| Figure 8-52: | Azimuth motor, adjust belt tension.....                                     | 8-46 |
| Figure 8-53: | Azimuth DDM, disconnect connector.....                                      | 8-46 |
| Figure 8-54: | Azimuth motor, loosen the screws for the motor assembly.....                | 8-46 |
| Figure 8-55: | Azimuth motor, tighten the screws for the motor assembly.....               | 8-47 |
| Figure 8-56: | Azimuth motor, adjust belt tension.....                                     | 8-47 |
| Figure 8-57: | Azimuth motor, tighten the belt tensioner.....                              | 8-48 |
| Figure 8-58: | Azimuth encoder, remove cover.....  | 8-49 |
| Figure 8-59: | Azimuth DDM, disconnect connector.....                                      | 8-49 |
| Figure 8-60: | Azimuth encoder, remove.....  | 8-50 |
| Figure 8-61: | Azimuth encoder, adjust belt tension.....                                   | 8-50 |
| Figure 8-62: | Azimuth Encoder, adjust belt tension.....                                   | 8-50 |
| Figure 8-63: | Azimuth motor, tighten the belt tensioner.....                              | 8-51 |
| Figure 8-64: | Replacement of X-Elevation Motor & Encoder 1.....                           | 8-52 |
| Figure 8-65: | X-Elevation Motor & Encoder — belt tension/adjustment screw.....            | 8-52 |
| Figure 8-66: | Cross Elevation motor assembly, 4 Allen screws.....                         | 8-53 |
| Figure 8-67: | Cross Elevation motor assembly, do not tighten screws.....                  | 8-53 |
| Figure 8-68: | X-Elevation Motor & Encoder — adjust belt tension.....                      | 8-53 |
| Figure 8-69: | Belt tension in 3 positions (SAILOR 800 picture).....                       | 8-54 |
| Figure 8-70: | Cross Elevation motor assembly, tighten screws.....                         | 8-54 |
| Figure 8-71: | Polarisation Motor, disconnecting power.....                                | 8-55 |
| Figure 8-72: | Polarisation Motor, removing 4x4 mm Allen screws.....                       | 8-55 |
| Figure 8-73: | Removing the sub-D connector of the PMM.....                                | 8-56 |
| Figure 8-74: | Polarisation Encoder, removing.....   | 8-56 |
| Figure 8-75: | Removing the cable drum.....  | 8-58 |
| Figure 8-76: | Elevation Drive Belt.....   | 8-59 |
| Figure 8-77: | Azimuth drive modules, remove cover.....                                    | 8-60 |
| Figure 8-78: | Azimuth drive belt, loosen the belt tensioner.....                          | 8-61 |
| Figure 8-79: | Azimuth drive belt, adjust belt tension.....                                | 8-61 |
| Figure 8-80: | Getting access to the azimuth drive wheel.....                              | 8-61 |
| Figure 8-81: | Azimuth Drive Belt.....   | 8-62 |
| Figure 8-82: | Zero Reference Modules (ZRM), location (SAILOR 900 picture).....            | 8-63 |
| Figure 8-83: | Zero Reference Module (ZRM).....  | 8-63 |
| Figure 8-84: | X Elevation ZRM, disconnect connector.....                                  | 8-64 |
| Figure 8-85: | X Elevation ZRM, slide out.....   | 8-65 |
| Figure 8-86: | Elevation ZRM, disconnect connector.....                                    | 8-66 |
| Figure 8-87: | Elevation ZRM, remove screws.....   | 8-66 |

---

|               |   |      |
|---------------|---|------|
| Figure 8-88:  | Azimuth ZRM, remove cover .....   | 8-67 |
| Figure 8-89:  | Azimuth ZRM, disconnect connector .....   | 8-68 |
| Figure 8-90:  | Azimuth ZRM, disconnect connector .....   | 8-68 |
| Figure 8-91:  | Polarisation ZRM, disconnecting .....   | 8-69 |
| Figure 8-92:  | Polarisation ZRM, loosen 2x4 mm Allen screws .....                                  | 8-69 |
| Figure 8-93:  | Inertial Sensor Module (ISM) .....  | 8-70 |
| Figure 8-94:  | Removing the ISM .....  | 8-71 |
| Figure 8-95:  | Removing the ISM Sub D connectors .....   | 8-71 |
| Figure 8-96:  | Removing the sub-D connector of the PMM .....                                       | 8-73 |
| Figure 8-97:  | Disconnecting the LNBS .....  | 8-73 |
| Figure 8-98:  | Removing the cable spool .....  | 8-74 |
| Figure 8-99:  | Disconnecting the OMT connector .....   | 8-74 |
| Figure 8-100: | Disconnecting the OMT connector .....   | 8-75 |
| Figure 8-101: | Removing the BUC fan .....  | 8-76 |
| Figure 8-102: | Block Up Converter (BUC) (SAILOR 800 picture) .....                                 | 8-76 |
| Figure 8-103: | BUC, removing .....   | 8-77 |
| Figure 8-104: | BUC, removing (continued) .....   | 8-77 |
| Figure 8-105: | Low Noise Block (LNB) (SAILOR 900 var. A) .....                                     | 8-78 |
| Figure 8-106: | LNB, removing (SAILOR 800/900 VSAT variant A) .....                                 | 8-79 |
| Figure 8-107: | LNB, removing (continued) .....   | 8-79 |
| Figure 8-108: | Ortho Mode Transducer (OMT) .....   | 8-80 |
| Figure 8-109: | OMT, removing 2xTorx20 screws on top .....  | 8-81 |
| Figure 8-110: | OMT, removing 4xTorx20 screws on the left-hand rail of the Polarisation Unit .....  | 8-81 |
| Figure 8-111: | OMT, removing 4xTorx20 screws on the right-hand rail of the Polarisation Unit ..... | 8-82 |
| Figure 8-112: | OMT, removing .....   | 8-82 |
| Figure 8-113: | OMT, removing the waveguide .....   | 8-83 |
| Figure 8-114: | Rotary joint .....  | 8-83 |
| Figure 8-115: | Azimuth motor, remove cover .....   | 8-84 |
| Figure 8-116: | Getting access to the azimuth drive wheel .....                                     | 8-84 |
| Figure 8-117: | Rotary joint (in place) .....   | 8-85 |
| Figure 8-118: | Rotary joint (removed) .....  | 8-85 |
| Figure 8-119: | Wire-rope isolator in good condition .....  | 8-86 |
| Figure 8-120: | Removing a wire-rope isolator .....   | 8-87 |
| Figure 8-121: | Updating VIM/PCM calibration data (example) .....                                   | 8-88 |
| Figure 8-122: | XIM data, warning .....   | 8-88 |
| Figure 8-123: | XIM data not ready .....  | 8-88 |
| Figure 8-124: | XIM data valid .....  | 8-89 |
| Figure 8-125: | Location of the 4 wire-rope isolators (SAILOR 900 picture) .....                    | 8-90 |
| Figure 8-126: | Inspection of a wire-rope isolator 1/2 .....  | 8-91 |
| Figure 8-127: | Inspection of a wire-rope isolator 2/2 .....  | 8-92 |
| Figure 8-128: | Troubleshooting – VSAT .....  | 8-97 |

|               |  |       |
|---------------|--|-------|
| Figure 8-129: | Troubleshooting – BUC .....                    | 8-98  |
| Figure 8-130: | Troubleshooting – LNB .....                    | 8-99  |
| Figure 8-131: | First signal test: Co-Pol LNB / low band.....  | 8-100 |
| Figure 8-132: | Second signal test: X-pol LNB / low band.....  | 8-101 |
| Figure 8-133: | Third signal test: Co-Pol LNB / high band..... | 8-102 |
| Figure 8-134: | Fourth signal test: X-Pol LNB / high band..... | 8-103 |
| Figure 8-135: | X-elevation bearing test (service) .....       | 8-104 |

## **App. A      Technical specifications**

|             |   |     |
|-------------|---|-----|
| Figure A-1: | SAILOR 900: Outline drawing: ADU.....   | A-6 |
| Figure A-2: | SAILOR 800: Outline drawing: ADU.....   | A-7 |
| Figure A-3: | Outline drawing: ACU, 19 inch rack..... | A-8 |
| Figure A-4: | N-Connector interface on the ADU.....   | A-9 |

## **App. B      VMU cables**

|             |  |     |
|-------------|--|-----|
| Figure B-1: | Modem Cable COMTECH Serial & RSSI TT7016A..... | B-2 |
| Figure B-2: | Modem Cable iNFINITI iDirect VSAT modem.....   | B-3 |

## **App. C      VMU settings**

|              |   |      |
|--------------|---|------|
| Figure C-1:  | Connecting iDirect iNFINITI 5000 series to the ACU (OpenAMIP) ..... | C-5  |
| Figure C-2:  | Connecting iDirect Evolution X5 to the ACU (OpenAMIP).....          | C-5  |
| Figure C-3:  | Supported OpenAMIP commands .....                                   | C-6  |
| Figure C-4:  | VSAT modem profile, OpenAMIP (example) .....                        | C-10 |
| Figure C-5:  | Satellite profile, OpenAMIP (example).....                          | C-10 |
| Figure C-6:  | iDirect OpenAMIP troubleshooting.....                               | C-12 |
| Figure C-7:  | Connecting iDirect iNFINITI 5000 series to the ACU (Serial) .....   | C-14 |
| Figure C-8:  | Connecting iDirect Evolution X5 to the ACU (Serial).....            | C-14 |
| Figure C-9:  | VSAT modem profile, Serial (example) .....                          | C-16 |
| Figure C-10: | Satellite profile, Serial (example) .....                           | C-17 |
| Figure C-11: | Connecting COMTECH 570L and ROSS box to the ACU (example).....      | C-18 |
| Figure C-12: | VSAT modem profile, COMTECH 570L and ROSS (example) .....           | C-19 |
| Figure C-13: | Satellite profile, COMTECH 570L and ROSS (example).....             | C-19 |
| Figure C-14: | Connecting COMTECH 570L to the ACU (example).....                   | C-21 |
| Figure C-15: | VSAT modem profile, COMTECH 570L (example).....                     | C-22 |
| Figure C-16: | Satellite profile, COMTECH 570L (example) .....                     | C-22 |
| Figure C-17: | Connecting STM SatLink 2900 VSAT modem to the ACU .....             | C-23 |
| Figure C-18: | VSAT modem profile, STM SatLink 2900 (example).....                 | C-25 |
| Figure C-19: | Satellite profile, STM SatLink 2900 (example) .....                 | C-25 |
| Figure C-20: | Connecting Gilat SkyEdge II VSAT modem to the ACU .....             | C-26 |
| Figure C-21: | Connecting Gilat SkyEdge II VSAT modem (rack) to the ACU .....      | C-26 |
| Figure C-22: | VSAT modem profile, Gilat Sky Edge II (example).....                | C-28 |
| Figure C-23: | Satellite profile, Gilat Sky Edge II (example) .....                | C-28 |

|               |  |      |
|---------------|--|------|
| Figure C-24:  | VSAT modem profile, Inmarsat G5 (example) .....                  | C-29 |
| Figure C-25:  | Satellite profile, Inmarsat G5 (example).....                    | C-29 |
| <b>App. D</b> | <b>Command line interface</b>                                    |      |
| Figure D-1:   | How to use the command line interface (example for telnet) ..... | D-1  |
| Figure D-2:   | Command line interface, login.....                               | D-2  |
| <b>App. E</b> | <b>DVB-S satellites</b>  |      |
| Figure E-1:   | Satellite data, example from www.lyngsat.com .....               | E-2  |
| <b>App. F</b> | <b>Grounding and RF protection</b>                               |      |
| Figure F-1:   | Extending the ground plane.....                                  | F-2  |
| Figure F-2:   | Grounding the ADU .....  | F-3  |
| Figure F-3:   | Grounding at a dedicated RF ground (alternative).....            | F-5  |
| Figure F-4:   | Alternative grounding for aluminium hulls.....                   | F-6  |
| Figure F-5:   | Alternative grounding for fibreglass hulls.....                  | F-7  |
| Figure F-6:   | Separate ground cable .....                                      | F-8  |
| Figure F-7:   | Isolation of the ADU from the mounting base.....                 | F-9  |
| Figure F-8:   | ADU isolation and grounding cable.....                           | F-10 |
| Figure F-9:   | Jumper cable for grounding (specifications).....                 | F-11 |
| <b>App. G</b> | <b>System messages</b>   |      |
| <b>App. H</b> | <b>Approvals</b>   |      |



# List of tables

---

## Chapter 1 About this manual

## Chapter 2 Introduction

|            |  |      |
|------------|--|------|
| Table 2-1: | Model and part numbers for the SAILOR 800/900 VSAT system .....            | 2-11 |
| Table 2-2: | Model and part numbers for options of the SAILOR 800/900 VSAT system ..... | 2-11 |

## Chapter 3 Installation

|             |   |      |
|-------------|---|------|
| Table 3-1:  | Maximum distance from the ship's motion center versus ship's roll period..... | 3-8  |
| Table 3-2:  | SAILOR 900: Mast dimensions without braces.....                               | 3-14 |
| Table 3-3:  | SAILOR 900: Mast dimensions with 3 braces .....                               | 3-14 |
| Table 3-4:  | SAILOR 900: Mast dimensions with 2 braces .....                               | 3-15 |
| Table 3-5:  | SAILOR 800: Mast dimensions without braces.....                               | 3-15 |
| Table 3-6:  | SAILOR 800: Mast dimensions with 3 braces .....                               | 3-16 |
| Table 3-7:  | SAILOR 800: Mast dimensions with 2 braces .....                               | 3-16 |
| Table 3-8:  | Minimum radar separation, X-band .....  | 3-18 |
| Table 3-9:  | Minimum radar separation, S-band .....  | 3-19 |
| Table 3-10: | ADU cable types and maximum lengths.....                                      | 3-34 |
| Table 3-11: | Dual mode antenna, cabling.....   | 3-38 |

## Chapter 4 Interfaces

|            |   |     |
|------------|---|-----|
| Table 4-1: | DC Input plug, outline and pin assignment.....            | 4-2 |
| Table 4-2: | N connector, outline and pin assignment.....              | 4-3 |
| Table 4-3: | F connector, Rx and Tx, outline and pin assignment .....  | 4-3 |
| Table 4-4: | NMEA 0183/2000 connector, outline and pin assignment..... | 4-4 |
| Table 4-5: | RS-232 connector, male, outline and pin assignment.....   | 4-5 |
| Table 4-6: | RS-422 connector, male, outline and pin assignment.....   | 4-6 |
| Table 4-7: | Ethernet connector, outline and pin assignment.....       | 4-7 |

## Chapter 5 Connecting power

## Chapter 6 Configuration

|            |  |      |
|------------|--|------|
| Table 6-1: | Satellite requirements for elevation and carrier ..... | 6-5  |
| Table 6-2: | Heading input options.....                             | 6-7  |
| Table 6-3: | SAILOR VSAT acquisition time .....                     | 6-9  |
| Table 6-4: | Satellite identifier and NID values.....               | 6-10 |
| Table 6-5: | Possible error codes during calibration .....          | 6-11 |
| Table 6-6: | Satellite elevation and max. allowed inclination ..... | 6-13 |
| Table 6-7: | Web interface: Event icon.....                         | 6-21 |

|             |   |      |
|-------------|---|------|
| Table 6-8:  | Web interface, DASHBOARD, SAILOR 800/900 VSAT parameters.....                     | 6-23 |
| Table 6-9:  | Web interface, DASHBOARD, VSAT MODEM parameter.....                               | 6-24 |
| Table 6-10: | Web interface, DASHBOARD, POINTING parameter.....                                 | 6-24 |
| Table 6-11: | Web interface, DASHBOARD, TX parameter.....                                       | 6-24 |
| Table 6-12: | SAILOR 900: Elevation cutoff (in degrees) versus VSAT modem bandwidth and power.. | 6-27 |
| Table 6-13: | SAILOR 800: Elevation cutoff (in degrees) versus VSAT modem bandwidth and power.. | 6-28 |
| Table 6-14: | Setup of LAN connectors.....  | 6-35 |
| Table 6-15: | Statistics report, header record.....   | 6-39 |
| Table 6-16: | Parameters recorded in a statistics report.....                                   | 6-39 |
| Table 6-17: | Top-level menus of the ACU.....   | 6-54 |
| Table 6-18: | ANTENNA menu of the ACU.....  | 6-54 |
| Table 6-19: | MODEM menu of the ACU.....  | 6-55 |
| Table 6-20: | NETWORK menu of the ACU.....  | 6-55 |
| Table 6-21: | SATELLITE menu of the ACU.....  | 6-56 |
| Table 6-22: | EVENTS menu of the ACU.....   | 6-56 |

## Chapter 7 Installation check

|            |  |     |
|------------|--|-----|
| Table 7-1: | Installation check list: Antenna.....                    | 7-1 |
| Table 7-2: | Installation check list: ACU, connectors and wiring..... | 7-3 |
| Table 7-3: | Installation check list: Functional test in harbour..... | 7-5 |

## Chapter 8 Service & maintenance

|            |                              |      |
|------------|------------------------------|------|
| Table 8-1: | LEDs of the ADU modules..... | 8-11 |
| Table 8-2: | LEDs on the ACU.....         | 8-11 |

## App. A Technical specifications

|             |   |      |
|-------------|---|------|
| Table A-1:  | General specifications.....                           | A-1  |
| Table A-2:  | Technical specifications for the Above Deck Unit..... | A-2  |
| Table A-3:  | Technical specifications for the ACU.....             | A-4  |
| Table A-4:  | Supported VSAT modems.....                            | A-5  |
| Table A-5:  | Patents.....  | A-5  |
| Table A-6:  | Technical specifications for VSAT LNB 1/2.....        | A-10 |
| Table A-7:  | Technical specifications for VSAT LNB 2/2.....        | A-10 |
| Table A-8:  | 4-band switching.....                                 | A-12 |
| Table A-9:  | Technical specifications for VSAT 86 W BUC 1/3.....   | A-12 |
| Table A-10: | Technical specifications for VSAT 86 W BUC 2/3.....   | A-12 |
| Table A-11: | Technical specifications for VSAT 86 W BUC 3/3.....   | A-15 |

|               |   |      |
|---------------|---|------|
| <b>App. B</b> | <b>VMU cables</b>   |      |
| <b>App. C</b> | <b>VMU settings</b>   |      |
| Table C-1:    | RS-232 Console cable for iDirect VSAT modem.....                | C-5  |
| Table C-2:    | Messages sent from the VSAT modem to the ACU (examples).....    | C-6  |
| Table C-3:    | Messages sent from the ACU to the VSAT modem (examples).....    | C-7  |
| Table C-4:    | Ranges for signal strength for iDirect OpenAMIP VSAT modem..... | C-7  |
| Table C-5:    | Information in the VSAT modem option file.....                  | C-9  |
| Table C-6:    | Requirements for VSAT modem option file, Serial .....           | C-15 |
| Table C-7:    | .....   | C-21 |
| Table C-8:    | Configuration of Gilat SkyEdge II VSAT modem.....               | C-27 |
| <b>App. D</b> | <b>Command line interface</b>                                   |      |
| Table D-1:    | Command typography.....   | D-2  |
| Table D-2:    | UCLI command: <code>config</code> .....                         | D-3  |
| Table D-3:    | UCLI command: <code>demo</code> .....                           | D-3  |
| Table D-4:    | UCLI command: <code>dual_antenna</code> .....                   | D-4  |
| Table D-5:    | UCLI command: <code>exit</code> .....                           | D-4  |
| Table D-6:    | UCLI command: <code>help</code> .....                           | D-4  |
| Table D-7:    | UCLI command: <code>modem</code> .....                          | D-5  |
| Table D-8:    | UCLI command: <code>satellite</code> .....                      | D-5  |
| Table D-9:    | UCLI command: <code>status</code> .....                         | D-7  |
| Table D-10:   | UCLI command: <code>system</code> .....                         | D-8  |
| Table D-11:   | UCLI command: <code>track</code> .....                          | D-8  |
| Table D-12:   | UCLI command: <code>zone</code> .....                           | D-9  |
| <b>App. E</b> | <b>DVB-S satellites</b>   |      |
| Table E-1:    | Examples of DVB-S satellites for azimuth calibration.....       | E-1  |
| <b>App. F</b> | <b>Grounding and RF protection</b>                              |      |
| <b>App. G</b> | <b>System messages</b>  |      |
| Table G-1:    | ADU event messages.....   | G-2  |
| Table G-2:    | ACU event messages.....   | G-8  |
| <b>App. H</b> | <b>Approvals</b>  |      |



# About this manual

## 1.1 Intended readers

This is an installation and service manual for the SAILOR 800/900 VSAT system, intended for installers of the system and service personnel. Personnel installing or servicing the system must be properly trained and authorized by Cobham SATCOM. It is important that you observe all safety requirements listed in the beginning of this manual, and install the system according to the guidelines in this manual.

## 1.2 Manual overview

This manual has the following chapters:

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

This manual has the following appendices:

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

## 1.3 Software version

This manual is intended for SAILOR 800/900 VSAT with **software version 1.48**.

## 1.4 Typography

In this manual, typography is used as indicated below:

**Bold** is used for the following purposes:

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

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

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

## 1.5 Precautions

### 1.5.1 Warnings, Cautions and Notes

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

- **Warning:** A Warning is an operation or maintenance procedure that, if not obeyed, can cause injury or death.
- **Caution:** A Caution is an operation or maintenance procedure that, if not obeyed, can cause damage to the equipment.
- **Note:** A Note gives information to help the reader.
- **Important:** A text marked Important gives information that is important to the user, e.g. to make the system work properly. This text does not concern damage on equipment or personal safety.

### 1.5.2 General precautions

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



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



**CAUTION!** Do not use materials that are not equivalent to materials specified by Thrane & Thrane. Materials that are not equivalent can cause damage to the equipment.



**CAUTION!** The system contains items that are electrostatic discharge sensitive. Use approved industry precautions to keep the risk of damage to a minimum when you touch, remove or insert parts or assemblies.

# Introduction

This chapter is organised in the following sections:

- *SAILOR 800/900 VSAT system*
- *Part numbers and options*

## 2.1 SAILOR 800/900 VSAT system

### 2.1.1 Overview

The SAILOR 800/900 VSAT is a unique stabilized maritime VSAT antenna system operating in the Ku-band (10.7 to 14.5 GHz). It provides bi-directional IP data connections both on regional satellite beams and quasi-global Ku-band satellite networks. The system only requires a single 50 Ohm cable to provide the Above Deck Unit with both DC power, data and control information. The radome does not have to be removed neither before nor after the installation. To protect the Above Deck Unit the built-in DC motors act as brakes during transport and when the Above Deck Unit is not powered. The ADU system can be accessed remotely and in-depth performance analysis can be done using the built-in web interface.

The SAILOR 800/900 VSAT system consists of the following units:

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

The following figure shows the SAILOR 800/900 VSAT system.



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

### 2..1.1.1 SAILOR 800/900 VSAT features

- Single 50 Ohm coax cable for the ADU.
- Support of several VSAT modems.
- Gyro-free operation.
- Dual antenna mode.
- SNMP support.
- Service communication using SAILOR FleetBroadband over WAN.
- Remote or local simultaneous software update of ADU and ACU via PC and Internet browser.
- Global RF configuration.
- Full remote control and troubleshooting with built-in test equipment (BITE).
- ACU with 4 x LAN, NMEA 0183, NMEA 2000, RS-232 and RS-422.
- All interfaces at the ACU, no additional units required.
- DC powered. Start up voltage: 22 VDC guaranteed, operating range: 20 – 32 VDC.
- No scheduled maintenance.



## 2.1.2 Above Deck Unit (ADU)

The SAILOR 800/900 VSAT ADU is a 83 (SAILOR 800)/103 cm VSAT stabilised tracking antenna, consisting of a suspended antenna with a standard global RF configuration. The ADU's weight is 130 kg (SAILOR 900 Var. A) or 125 (SAILOR 800)/126,5 kg (SAILOR 900 Var. B). 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 is powered by the ACU and protected by a radome.



Figure 2-2: SAILOR 900: Above Deck Unit (ADU)



Figure 2-3: SAILOR 800: Above Deck Unit (ADU)

### 2.1.2.1 Modules in the SAILOR 800/900 VSAT ADU

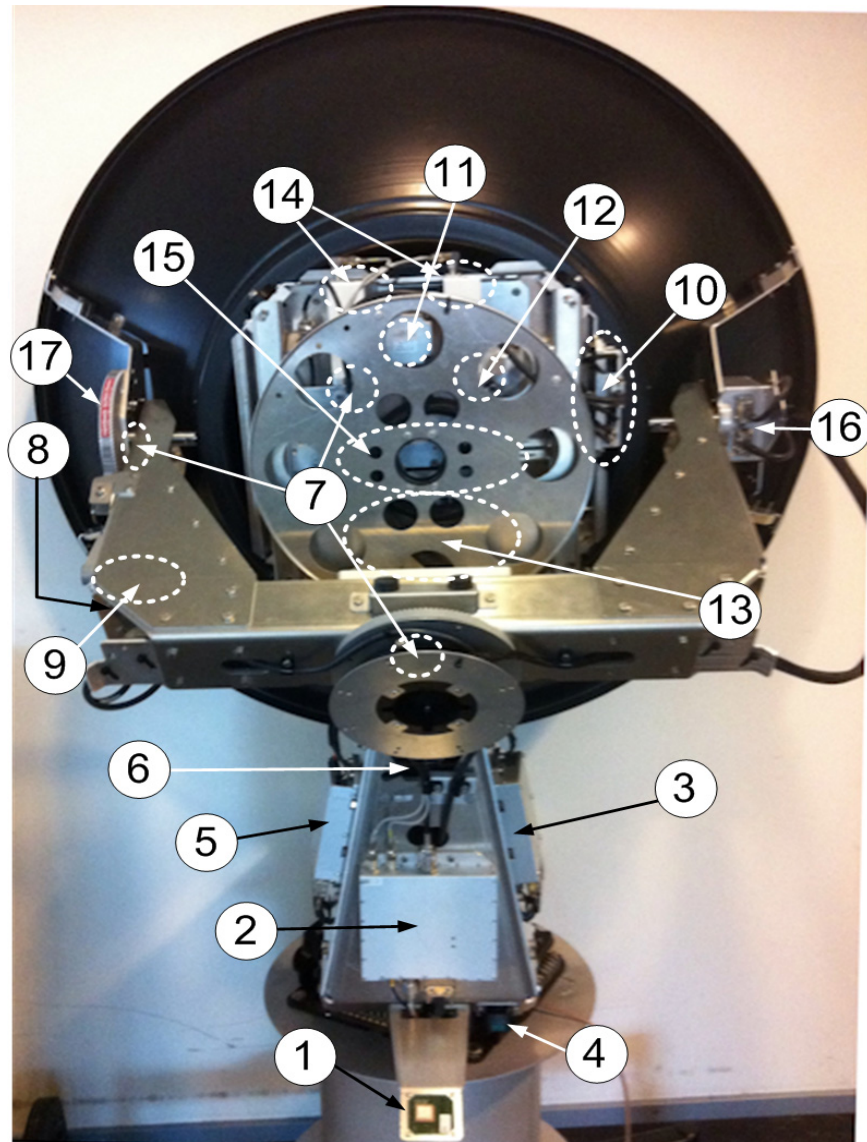


Figure 2-4: SAILOR 900: Above Deck Unit modules 1/2

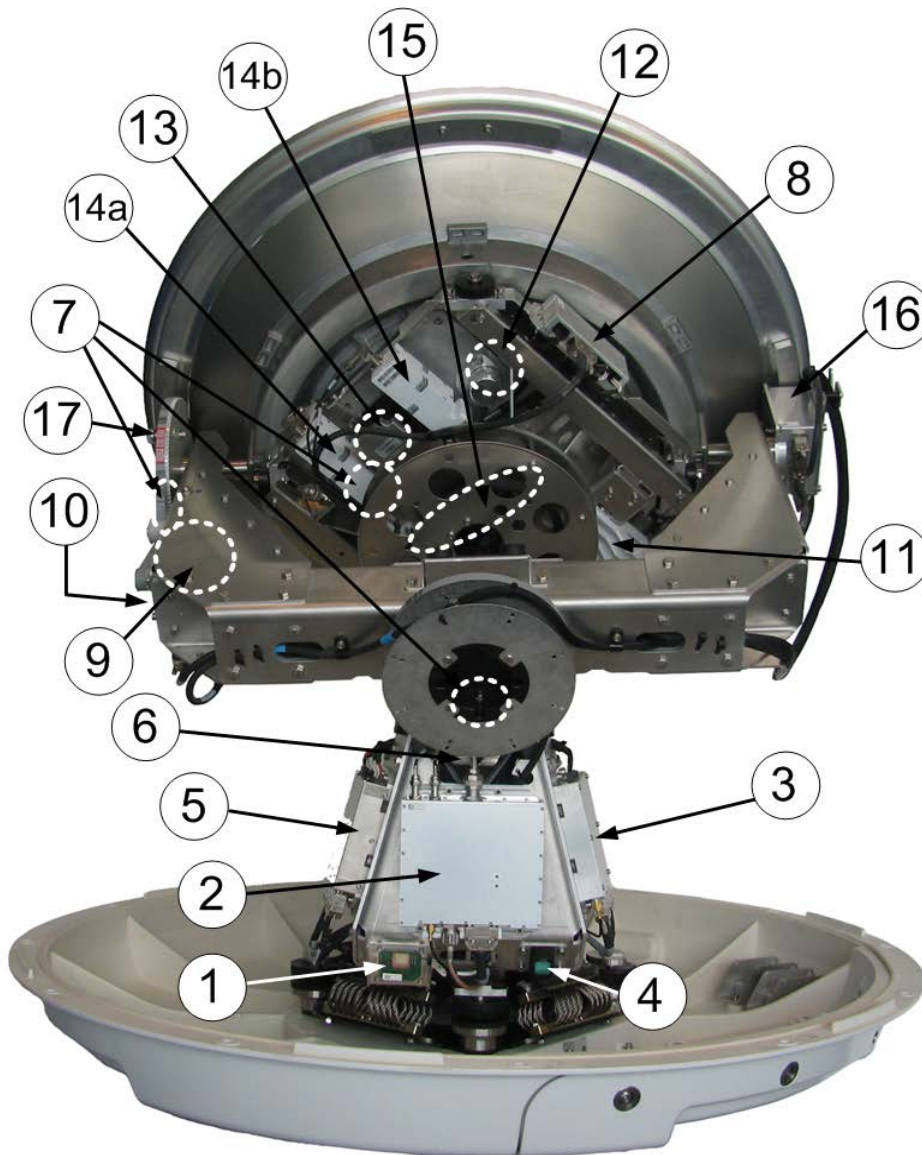


Figure 2-5: SAILOR 800: Above Deck Unit modules 1/2

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

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

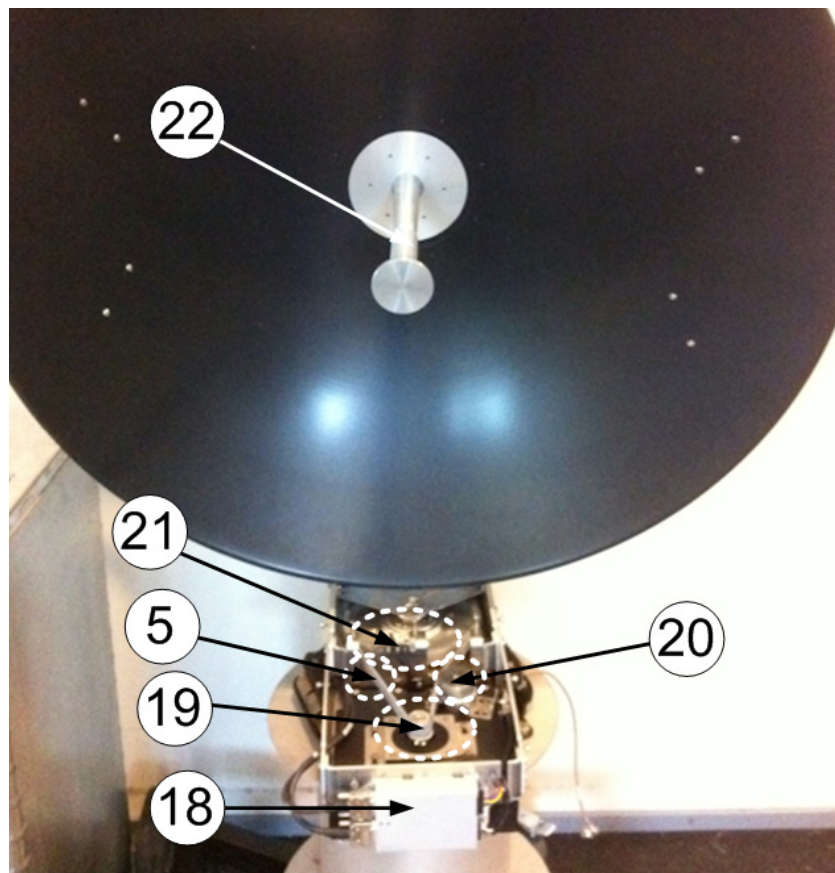


Figure 2-6: SAILOR 900: Above Deck Unit modules 2/2

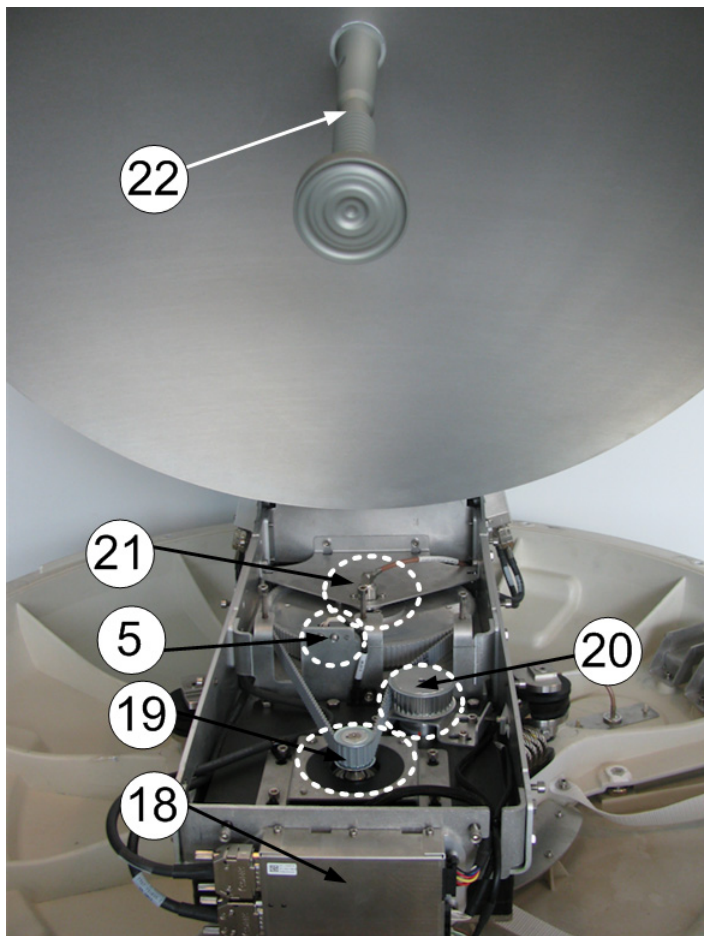


Figure 2-7: SAILOR 800 Above Deck Unit modules 2/2

18.DC-Motor Driver Module for Azimuth (DDM).

19.Azimuth motor.

20.Azimuth encoder.

21.Rotary joint.

22.Feed horn.

See *Overview* on page 8-15 in the chapter *Service* for a more detailed description of the modules.

### 2..1.2.2 SAILOR 800/900 VSAT ADU interface

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

### 2..1.2.3 Installation friendly

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

#### **2.1.2.4 Service friendly**

The system configuration is saved in two modules, there is no loss of data at repair. The large service hatch of the radome gives easy access to the ADU on site. The service switch in the ADU stops the DC Motor Driver modules 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 checks constantly the ADU's modules for proper functioning, it monitors and logs information for all modules. The ADU performs a POST (Power On Self Test) and you can request a self test (PAST, Person Activated Self Test) and Continuous Monitoring (CM). Error codes can be read out in the web interface and in the display of the ACU.

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

### **2.1.3 Antenna Control Unit (ACU)**

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

The ACU provides DC power to the ADU through a single coaxial cable. You can use the SAILOR 6080 Power Supply to provide the DC power for the ACU.

### 2..1.3.1 ACU interfaces

The ACU has the following interfaces and switch:

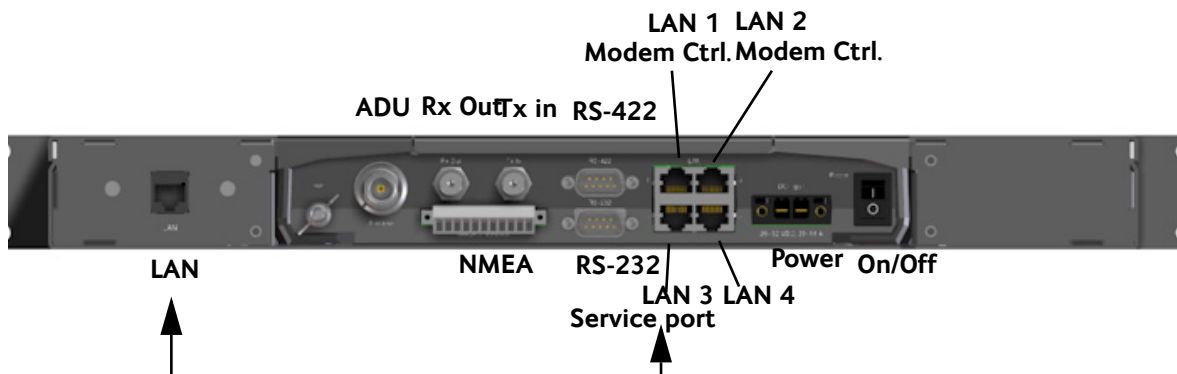


Figure 2-8: SAILOR 800/900 VSAT ACU, connector overview

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

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



Figure 2-9: SAILOR 800/900 VSAT ACU, 19" rack version

### 2..1.3.2 Installation friendly

The ACU comes in a 19" rack version.



Figure 2-10: Antenna Control Unit for 19" rack installation

### **2.1.3.3 Service friendly**

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

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

### **2.1.4 VSAT Modem Unit (VMU)**

SAILOR 800/900 VSAT is designed to be operated with third-party VSAT modems. For a list of supported VSAT modems see the SAILOR 800/900 VSAT data sheet at [cobham.com/satcom](http://cobham.com/satcom).

### **2.1.5 Satellite type approvals**

For a list of satellite type approvals see the SAILOR 800/900 VSAT data sheet at [cobham.com/satcom](http://cobham.com/satcom).

### **2.1.6 Power supply (optional)**

Use the SAILOR 6080 AC/DC Power Supply to provide DC power to the SAILOR 800/900 VSAT.

### **2.1.7 Service activation**

Before you can start using the SAILOR 800/900 VSAT, you need to activate the system for VSAT service. Contact your service provider for activation.



## 2.2 Part numbers and options

### 2.2.1 Applicable Thrane & Thrane model and part numbers

The following model and part numbers are available for the SAILOR 800/900 VSAT system:

| Part number   | Model number | Description  |
|---------------|--------------|--|
| 407009A-00500 | TT-7009A-THR | SAILOR 900 VSAT Above Deck Unit (ADU) Variant A        |
| 407009B-00500 | TT-7009B-THR | SAILOR 900 VSAT Above Deck Unit (ADU) Variant B        |
| 407080A-00500 | TT-7008A-THR | SAILOR 800 VSAT Above Deck Unit (ADU)                  |
| 407016A-00500 | TT-7016A-T19 | SAILOR ACU VSAT KU Antenna Control Unit (19 inch rack) |

Table 2-1: Model and part numbers for the SAILOR 800/900 VSAT system

### 2.2.2 Options for SAILOR 800/900 VSAT

The following options are available for the SAILOR 800/900 VSAT 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          |
| 407090-010    | Accessory kit for dual antenna mode                |

Table 2-2: Model and part numbers for options of the SAILOR 800/900 VSAT system



# Installation

This chapter is organised in the following sections:

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

## 3.1 Unpacking

### 3.1.1 What's in the box

#### 3.1.1.1 ADU

Unpack your SAILOR 800/900 VSAT ADU and check that the following items are present:

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

#### 3.1.1.2 ACU

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

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

### 3.1.2 Initial inspection

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



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

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

### 3.1.3 Tools needed

- Unbraco key (5 mm), included, mounted on a tool holder inside the radome.

Other tools that may be needed during the installation:

- Torx TX 20 (SAILOR 900) or TX 30 (SAILOR 800) 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

For tools needed when replacing modules you find a list of tools needed for each module in the chapter *Service*.

## 3.2 Site preparation

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

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

### 3.2.1 General site considerations

For optimum system performance, some guidelines on where to install or mount the different components of the SAILOR 800/900 VSAT System must be followed.

It is recommended to mount the ADU in a location with as much **360° free line of sight to the satellite** as possible while making sure that the support structure fulfills the requirements for the mast foundation. The ADU must be mounted on stiffened structures with a minimum of exposure to vibrations.

### 3.2.2 Obstructions (ADU shadowing)

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

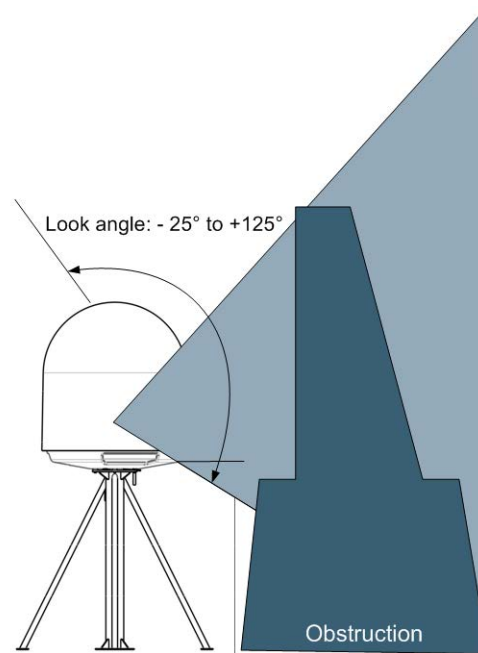


Figure 3-1: Signal degradation because of obstructing objects

The ADU is stabilized in 3-axis (plus skew) and can be used in environments with elevations of  $-25^{\circ}$  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** Please note that due to the short wavelength at Ku band and the narrow beam width of the ADU even a **6 mm steel wire placed within 50 m** inside the beam can cause signal degradation.

### 3.2.3 Blocking zones – azimuth and elevation

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

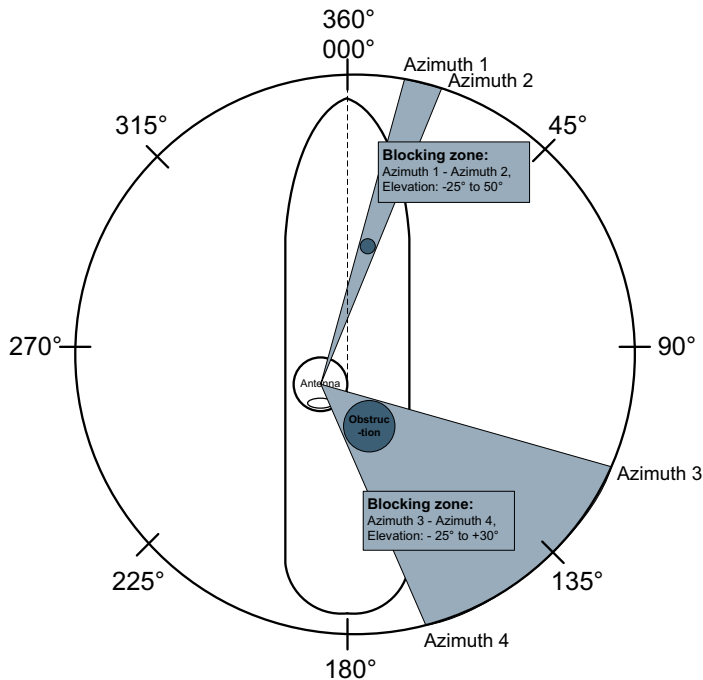


Figure 3-2: 2 blocking zones with no-transmit zones, azimuth (example)

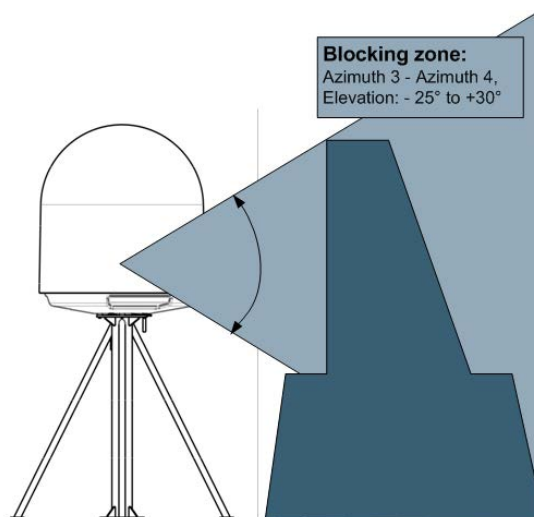


Figure 3-3: Blocking zone with no-transmit zones, elevation angle (example)

The blocking zones are set up in the built-in web interface of the ACU. For further information see *To set up blocking zones (RX and TX)* on page 6-32.

### 3.2.4 Safe access to the ADU: Radiation hazard

The SAILOR 900 VSAT ADU radiates up to 49 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: SAILOR 900: Radiation hazard, safety distance 30 m



The SAILOR 800 VSAT ADU radiates up to 47.9 dBW EIRP including radome. This translates to a minimum safety distance of 24 m from the ADU while it is transmitting, based on a radiation level of  $10 \text{ W/m}^2$ .

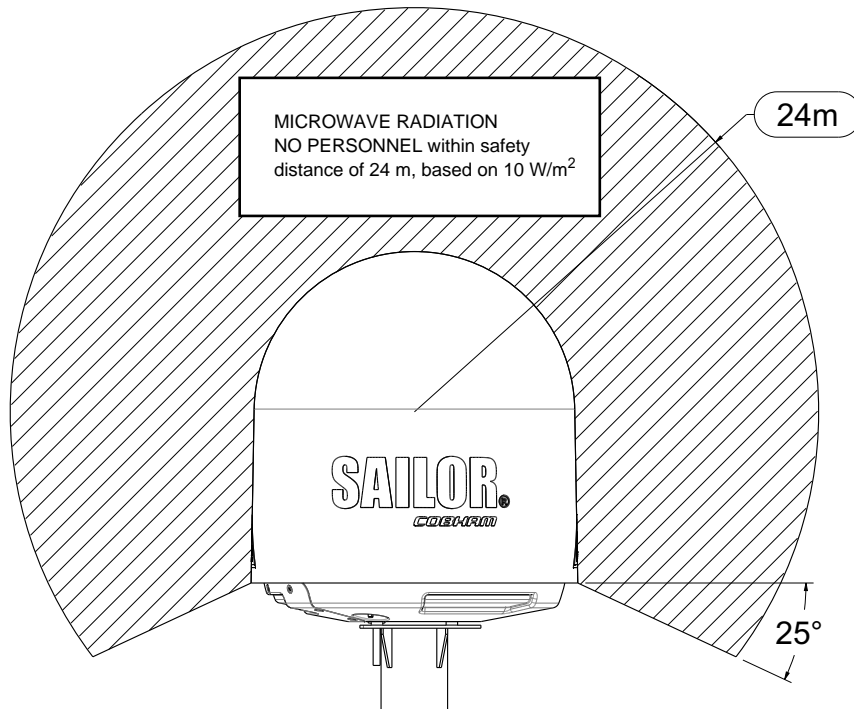


Figure 3-5: SAILOR 800: Radiation hazard, safety distance 24 m

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

Even though it is recommended to mount the ADU high, keep the distance between the ADU and the ship's motion centre as short as possible. The higher up the ADU is mounted, the higher is the linear g force applied to the ADU. The g force also depends on the roll period of the ship, see Table 3-1. If the g force applied is too high, performance and ADU signal stabilization may be reduced and eventually the ADU may be damaged. Refer to the following table for allowed mounting heights above the ship's motion centre.

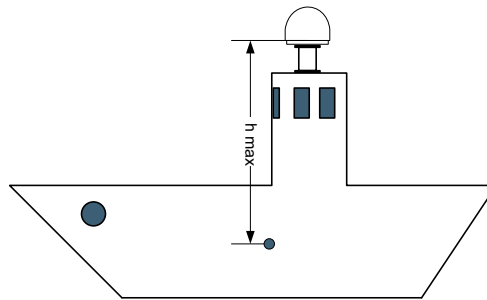


Figure 3-6: Maximum distance from the ship's motion centre (h max)

| Min. roll period | Max. ADU mounting height (h max) |                          |
|------------------|----------------------------------|--------------------------|
|                  | Full performance                 | Potential risk of damage |
| 4 s              | 12 m                             | 16 m                     |
| 6 s              | 27 m                             | 35 m                     |
| 8 s              | 48 m                             | 62 m                     |
| 10 s             | 75 m                             | 98 m                     |

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

### 3.2.6 ADU mast design: Foundation and height

The ADU mast must be designed to carry the weight of the ADU unit, which is 130 kg (SAILOR 900 Var. A), or 125 kg (SAILOR 800) (+ 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.

#### 3.2.6.1 ADU mast flange

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

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

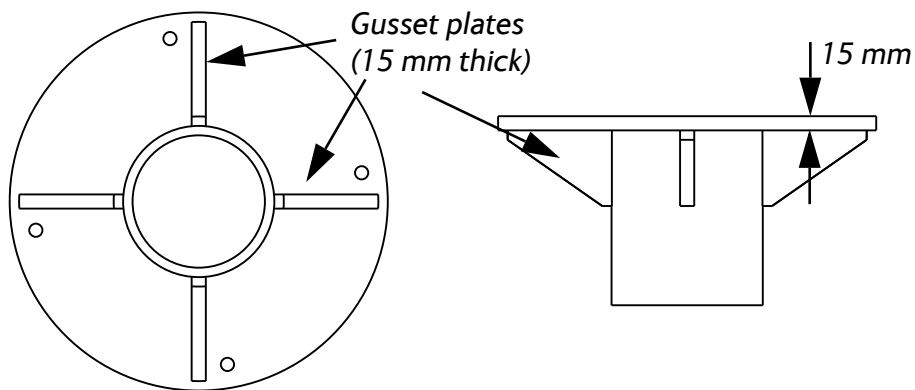


Figure 3-7: SAILOR 900: ADU mast flange, top and side view

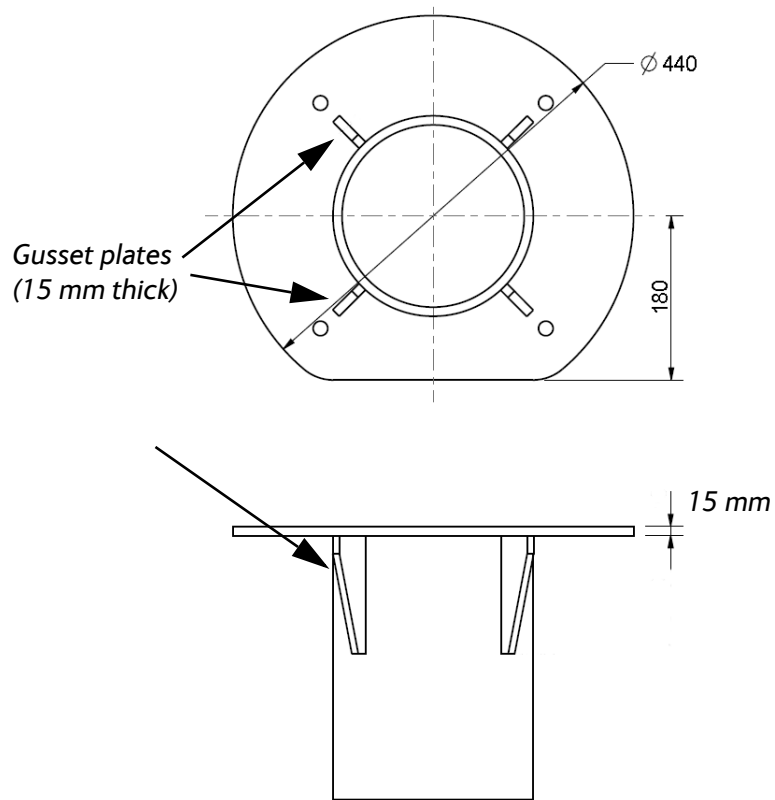


Figure 3-8: SAILOR 800: ADU mast flange, top and side view  
Recommended flatness on the mast mount plateau is below 3,0 mm.

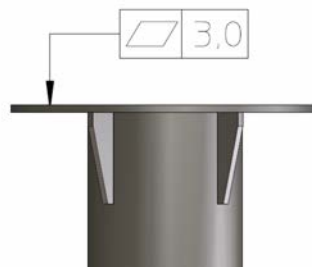


Figure 3-9: ADU mast flange, recommended flatness on the mast mount plateau

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

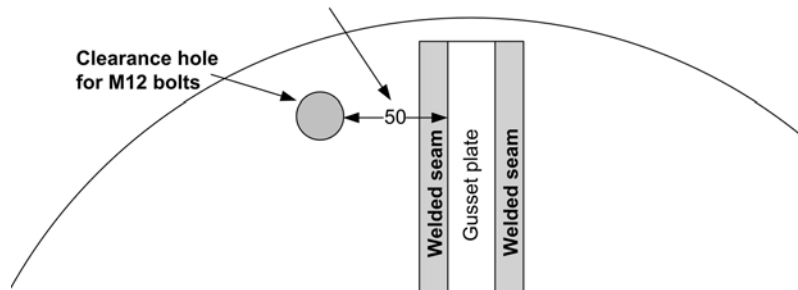


Figure 3-10: ADU mast flange, distance to the welded seam



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

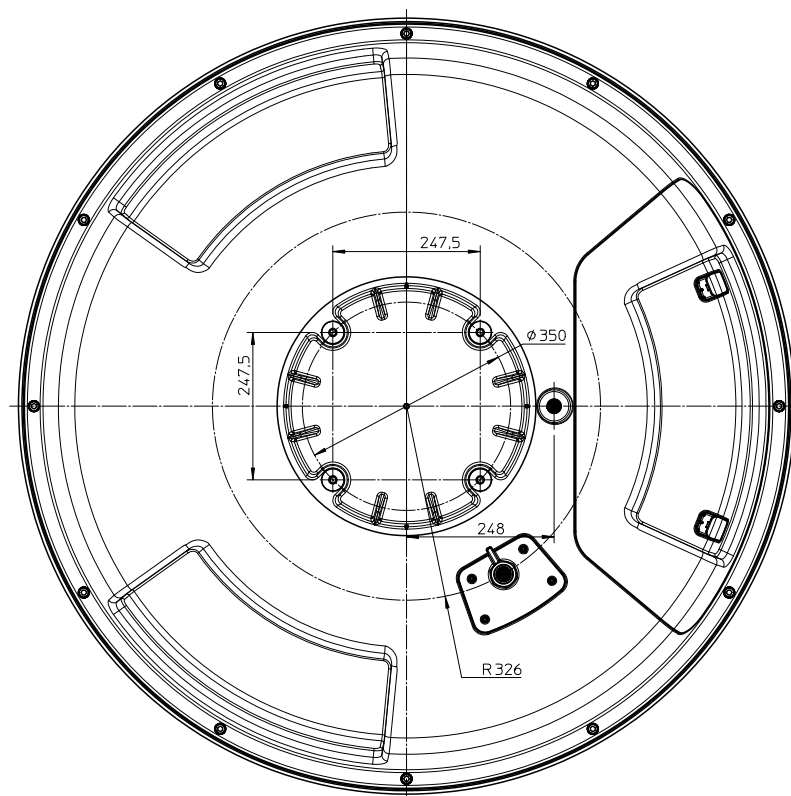


Figure 3-11: SAILOR 900: ADU, bottom view

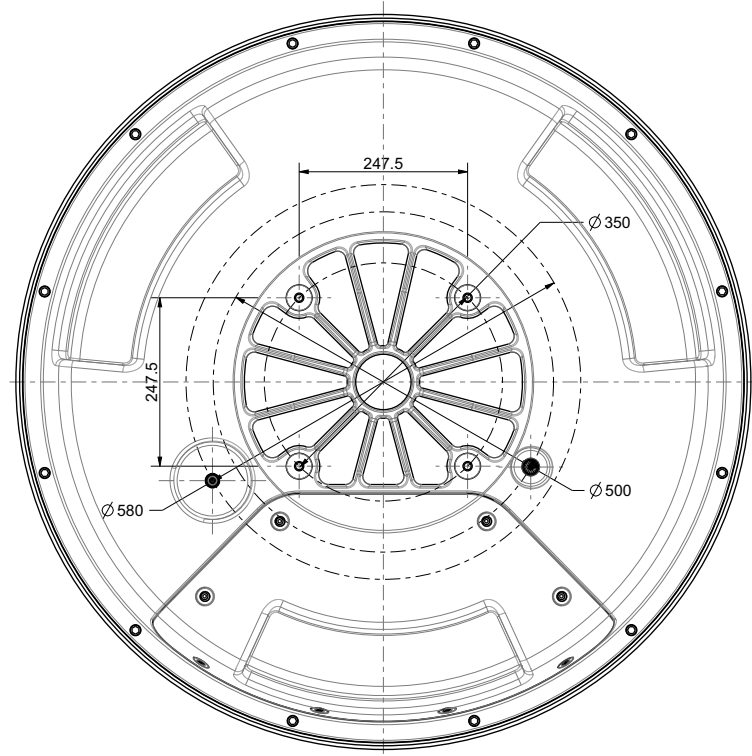


Figure 3-12: SAILOR 800: ADU, bottom view

### 3.2.6.2 Mast length and diameter

The placement of the ADU must ensure a rigid structural connection to the hull or structure of the ship. Parts of the ship with heavy resonant vibrations are not suitable places for the ADU. A small platform or short mast shall provide rigid support for the ADU fastening bolts and a rigid interface to the ship.

If it is necessary to use a tall mast, you must stabilise the mast with bracing. Note that the design values given below depend on rigid ADU-ship interfaces. The cross-sectional properties and the corresponding maximum free length give a natural frequency close to 30 Hz. It is recommended to shorten the mast length as much as possible to obtain

higher frequencies. Preferably, mount stays or wires to stabilize the mast further.

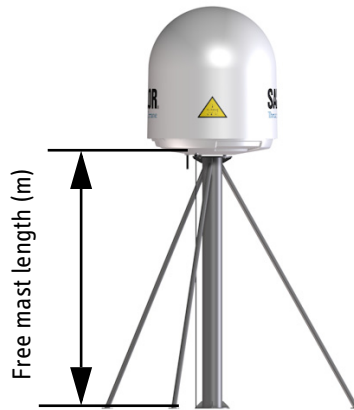


Figure 3-13: Free mast length and bracing for a tall mast

**Note** Make sure that there is free space below the drain tube. Read also *Condensation and water intrusion* on page 3-20.

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

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

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

### 3.2.6.3 SAILOR 800/900 VSAT ADU mast length

The below tables show the minimum dimensions for a SAILOR 800/900 VSAT 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: SAILOR 900: 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.

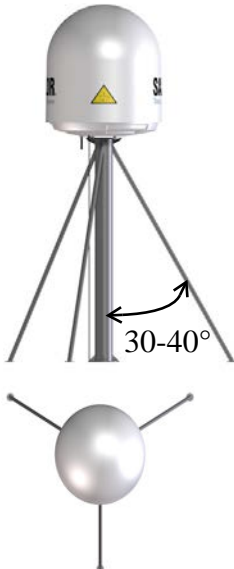
| Mast with 3 braces  | Max. free mast length (steel), (m) | Outer Diameter (mm) | Wall Thickness (mm) | Outer Diameter for brace (mm) | Thickness for brace (mm) |
|---|------------------------------------|---------------------|---------------------|-------------------------------|--------------------------|
|  | 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: SAILOR 900: 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: SAILOR 900: Mast dimensions with 2 braces


| Mast without braces   | Max. free mast length (steel), (m) | Outer Diameter (mm) | Wall Thickness (mm) | Weight (kg/m) |
|---|------------------------------------|---------------------|---------------------|---------------|
|  | 0.4 <sup>a</sup>                   | 180                 | 5                   | 21.6          |
|   | 0.6                                | 200                 | 5                   | 24.0          |
|   | 0.8                                | 220                 | 5                   | 26.5          |
|   | 1                                  | 250                 | 5                   | 30.2          |

Table 3-5: SAILOR 800: 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.

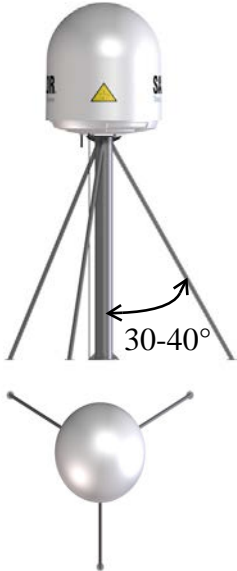
| Mast with 3 braces  | Max. free mast length (steel), (m) | Outer Diameter (mm) | Wall Thickness (mm) | Outer Diameter for brace (mm) | Thickness for brace (mm) |
|---|------------------------------------|---------------------|---------------------|-------------------------------|--------------------------|
|  | 1.2                                | 120                 | 10                  | 50                            | 5.0                      |
|   | 1.2                                | 160                 | 5                   | 50                            | 5.0                      |
|   | 1.6                                | 120                 | 10                  | 70                            | 5.0                      |
|   | 1.6                                | 160                 | 5                   | 70                            | 5.0                      |
|   | 2.0                                | 140                 | 10                  | 70                            | 5.0                      |
|   | 2.0                                | 180                 | 5                   | 70                            | 5.0                      |
|   | 2.5                                | 160                 | 10                  | 80                            | 5.0                      |
|   | 2.5                                | 180                 | 5                   | 80                            | 5.0                      |

Table 3-6: SAILOR 800: 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                                | 140                 | 10                  | 70                            | 5.0                      |
|   | 1.2                                | 160                 | 5                   | 70                            | 5.0                      |
|   | 1.6                                | 160                 | 10                  | 70                            | 5.0                      |
|   | 1.6                                | 180                 | 5                   | 70                            | 5.0                      |
|   | 2.0                                | 160                 | 10                  | 70                            | 5.0                      |
|   | 2.0                                | 200                 | 5                   | 70                            | 5.0                      |
|   | 2.5                                | 180                 | 10                  | 80                            | 5.0                      |
|   | 2.5                                | 220                 | 5                   | 80                            | 5.0                      |

Table 3-7: SAILOR 800: Mast dimensions with 2 braces

## 3.2.7 Interference

**Note**

Do not place the ADU close to interfering signal sources or receivers. For allowed distances to other transmitters see Figure 3-15: *Recommended distance to transmitters (m) for frequencies below 1000 MHz* on page 3-20. We recommend testing the total system by operating all equipment simultaneously and verifying that there is no interference.

The ADU must be mounted as far away as possible from the ship's radar and high power radio transmitters, because they may compromise the ADU performance. RF emission from radars might actually damage the ADU.

The SAILOR 800/900 VSAT ADU itself may also interfere with other radio systems.

### 3.2.7.1 Radar

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

However, it is possible to give a few guidelines. Since a radar radiates a fan beam with a horizontal beam width of a few degrees and a vertical beam width of up to  $\pm 15^\circ$ , the worst interference can be avoided 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 800/900 VSAT ADU. Therefore it is recommended to ensure as much vertical separation as possible when the SAILOR 800/900 VSAT ADU has to be placed close to a radar antenna.

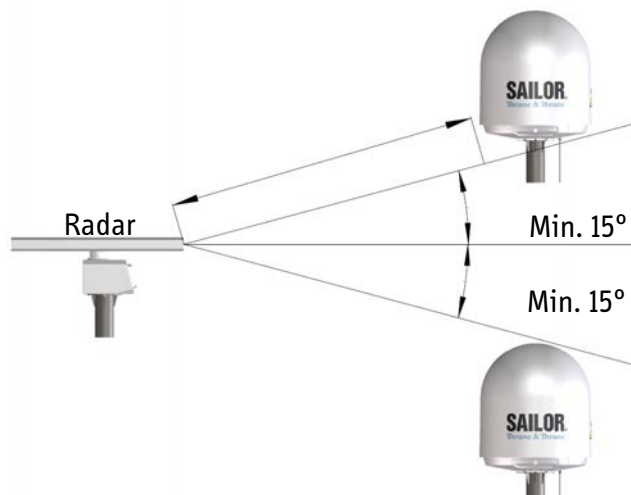


Figure 3-14: Interference with the vessel's radar

### 3.2.7.2 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 800/900 VSAT ADU.

| X-band (~ 3 cm / 10 GHz) damage distance |  |  |
|--|--|--|
| Radar power                              | SAILOR 800/900 VSAT ADU                  |  |
|  | <i>d min.</i> at 15° vertical separation | <i>d min.</i> 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 3-8: Minimum radar separation, X-band

| S-band (~ 10 cm / 3 GHz) damage distance |                                   |                                   |
|--|-----------------------------------|-----------------------------------|
| Radar power                              | SAILOR 800/900 VSAT 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 3-9: 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.

### 3..2.7.3 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 800/900 VSAT system.

The presence of one or more S or X-band radars within a radius up to 100 m may cause a minor degradation of the Ku-band connection. The degradation will be most significant at high radar pulse repetition rates.

As long as receiving conditions are favourable, this limited degradation is without importance. However, if receiving conditions are poor – e.g. due to objects blocking the signal path, heavy rainfall or icing, low satellite elevation and violent ship movements – the small extra degradation due to the radar(s) could cause poor connection quality.

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

It is strongly recommended that interference free operation is verified experimentally before the installation is finalized.



**CAUTION!** The ADU must never be installed closer to a radar than “d min.” - even if experiments show that interference free operation can be obtained at shorter distances than “d min.” in the previous section.

### 3..2.7.4 GPS receivers

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

### 3.2.7.5 Other transmitters

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

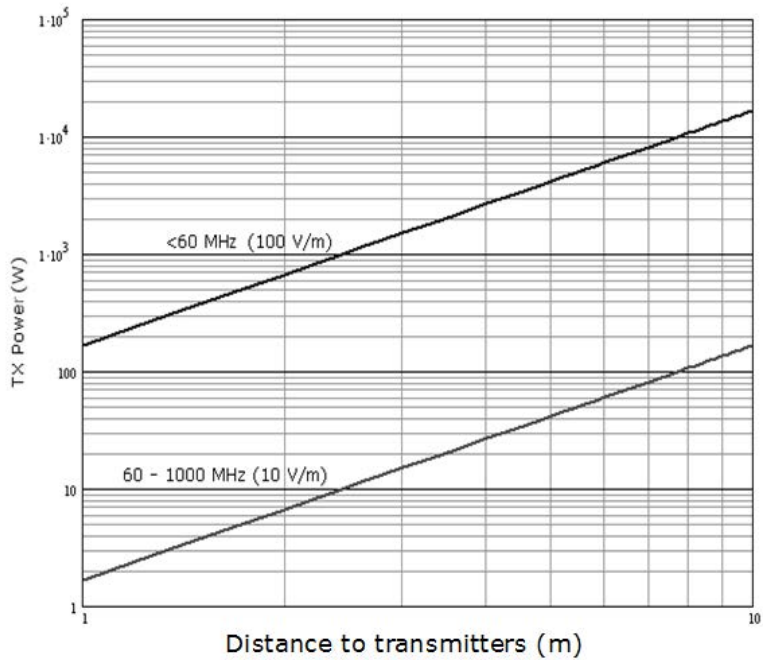


Figure 3-15: Recommended distance to transmitters (m) for frequencies below 1000 MHz

## 3.2.8 Other precautions

### 3.2.8.1 Condensation and water intrusion

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



Figure 3-16: SAILOR 900: Drain pipe with free space



Figure 3-17: SAILOR 800: Drain pipe with free space

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

### 3.2.8.2 Deposits

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

### 3.3 Installation of the ADU

The ADU is shipped fully assembled. You have to install it on the mast and attach the ADU cable.



**WARNING!** Use a strong webbed sling with a belt to lift the ADU without damaging the radome. Make sure that the sling can carry the ADU's weight 130 kg (SAILOR 900 Var. A), or 125 kg (SAILOR 800).



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

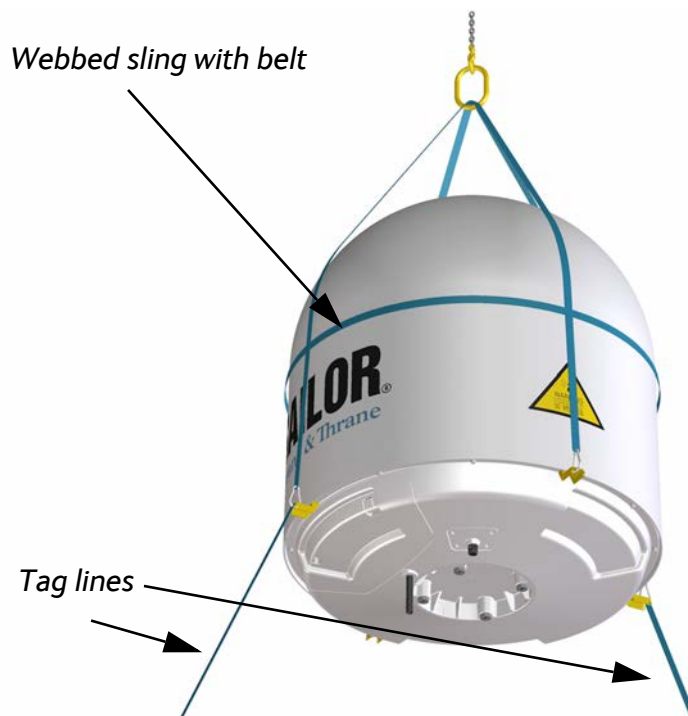


Figure 3-18: SAILOR 900: Use of strong sling with a belt and tag lines for safe hoisting



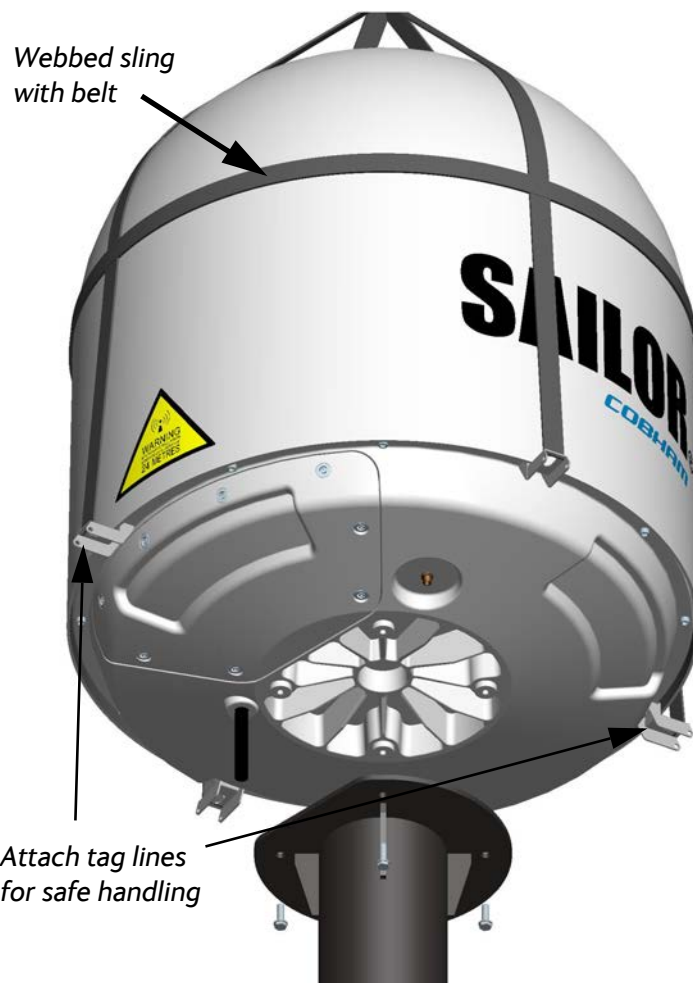


Figure 3-19: SAILOR 800: Use of strong sling with a belt and tag lines for safe hoisting  
Before installing the ADU read the following guidelines.

### 3.3.1 To install the ADU

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



Figure 3-20: SAILOR 900: Free space for access to the service hatch



Figure 3-21: SAILOR 800: Free space for access to the service hatch

The ADU does not have to be aligned with the bow-to-stern line of the ship. When configuring the SAILOR 800/900 VSAT you make an azimuth calibration to obtain the correct azimuth of the ADU.

- It is important to maintain **vertical orientation of the ADU center line.**
- Consider the aspect of interference, read more about this in *Interference* on page 3-17.
- Install the ADU where **vibrations are limited to a minimum.**
- Always use **all 4 bolts** when installing the ADU.

To install the ADU, do as follows:

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



Figure 3-22: SAILOR 900: ADU installation, webbed sling attached to the 4 lifting brackets

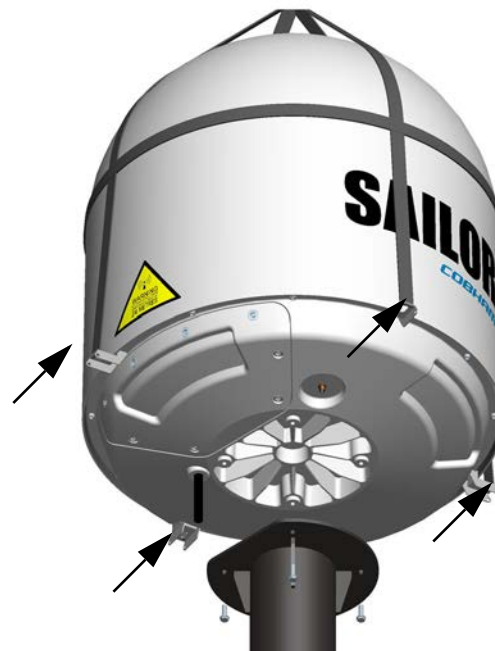


Figure 3-23: SAILOR 800: ADU installation, webbed sling attached to the 4 lifting brackets

5. Attach 2 tag lines of suitable length to 2 lifting brackets and man them.
6. With a crane lift the ADU off the wooden platform and move it on top of the ADU mast.

7. Install the ADU on the mast flange with 4 M12 bolts and washers. Read carefully and follow instructions given in *To ground the ADU* on page F-3.

**Important**

SAILOR 800: The cut-off edge of the mast flange must be under the service hatch to provide space when opening the service hatch.

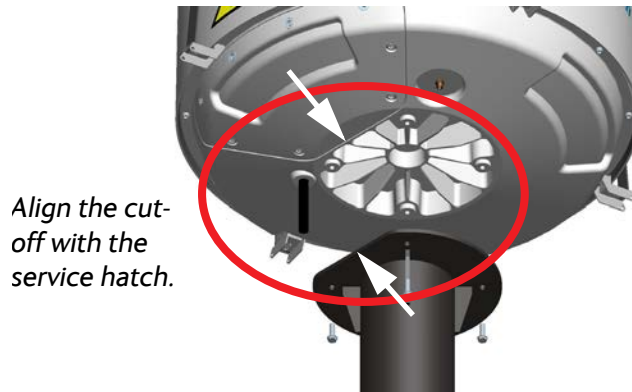


Figure 3-24: SAILOR 800: ADU installation, align flange with service hatch

Tightening torque value: 30 Nm.

8. Remove the 4 lifting brackets. For safekeeping fasten the lifting brackets inside the bottom of the radome.



Figure 3-25: Mounting the ADU on the mast flange

9. Put the coaxial ADU cable through the protection plate as shown in the following figure (SAILOR 900), and connect the N connector of the ADU cable to the ADU.

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.

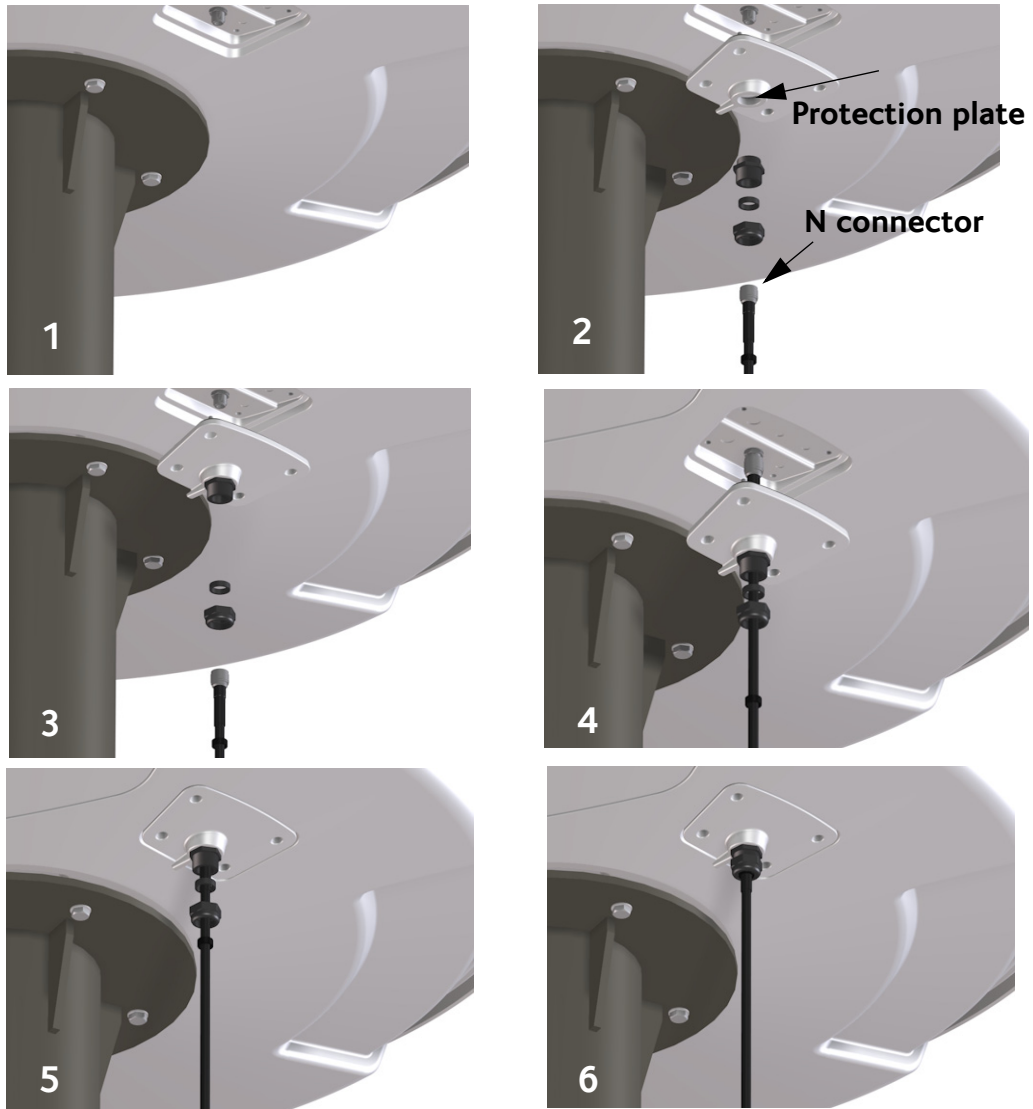


Figure 3-26: SAILOR 900: Connecting the ADU cable

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

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

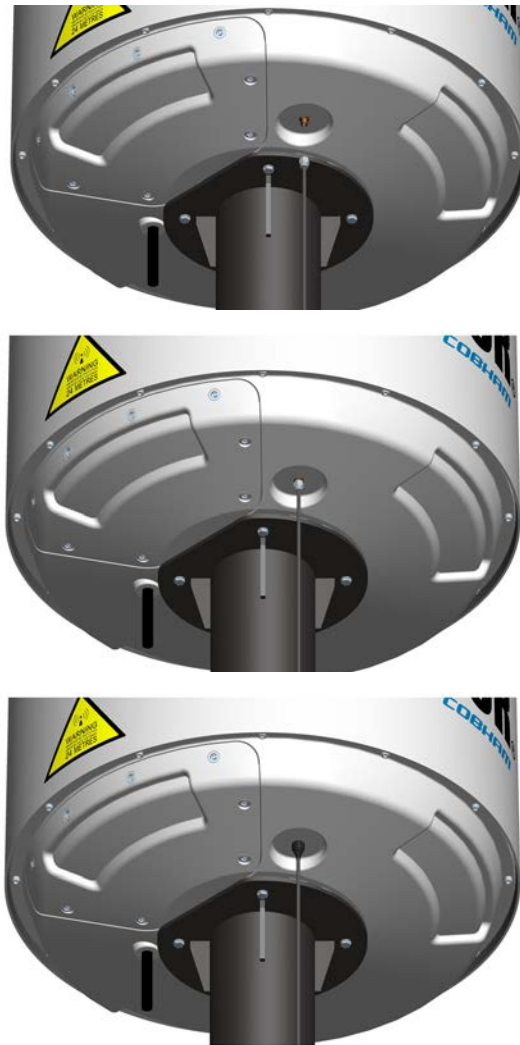


Figure 3-27: SAILOR 800: Connecting the ADU cable

11. Fasten the nut.

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

### 3.3.1.1 Maximum allowed RF loss in the ADU cable

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

### 3.3.2 To open and remove the service hatch

#### 3.3.2.1 SAILOR 900 VSAT service hatch

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

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

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



Figure 3-28: SAILOR 900: Opening the service hatch

3. Remove the 2 split pins and park them.



Figure 3-29: Removing the 2 split pins

4. Pull the service hatch free.



### 3.3.2.2 SAILOR 800 VSAT service hatch

To open the service hatch in order to access the antenna modules do as follows:

1. With a Torx TX30 screw driver, loosen the 8 screws holding the service hatch in place.
2. Pull and lower the hatch to remove the service hatch from the radome.
3. Lower the service hatch and let it hang in the 2 strips.



Figure 3-30: SAILOR 800: Removing the service hatch

### 3.3.3 To ground the ADU

The ADU must be grounded using the mounting bolts. If the ADU cannot or should not be electrically connected directly to the mounting surface, you can use a separate grounding cable to make the connection between the ADU and the common ground to which the ACU is also connected. If grounding to the ship ground is impossible, for example if you have a fibre glass hull, see *Alternative grounding for fibre glass hulls* on page F-7.

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

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

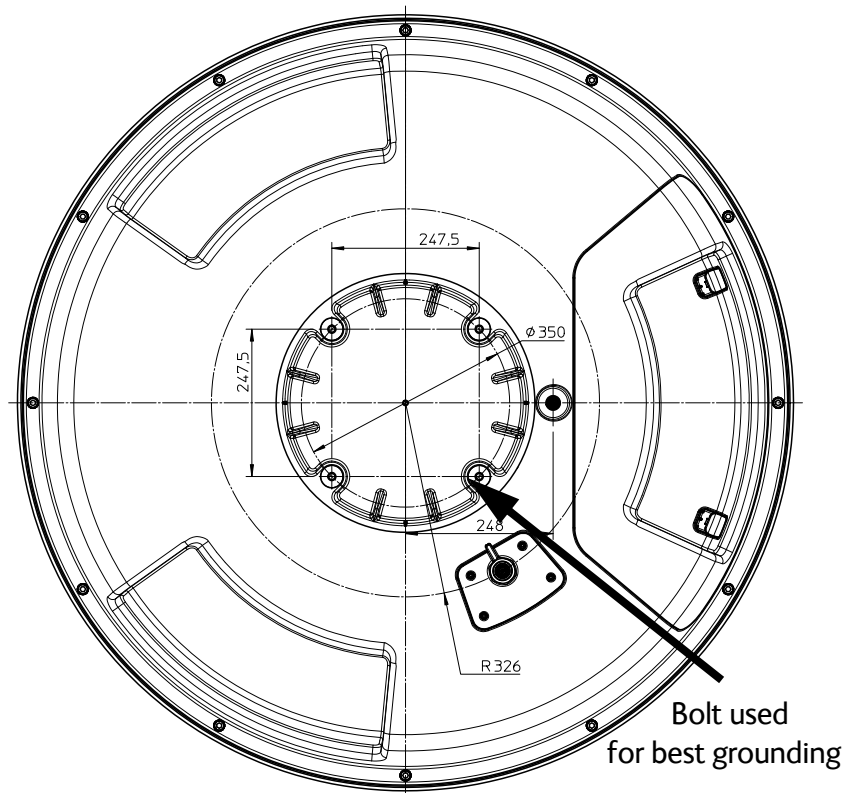


Figure 3-31: SAILOR 900: ADU, bolt for optimum grounding

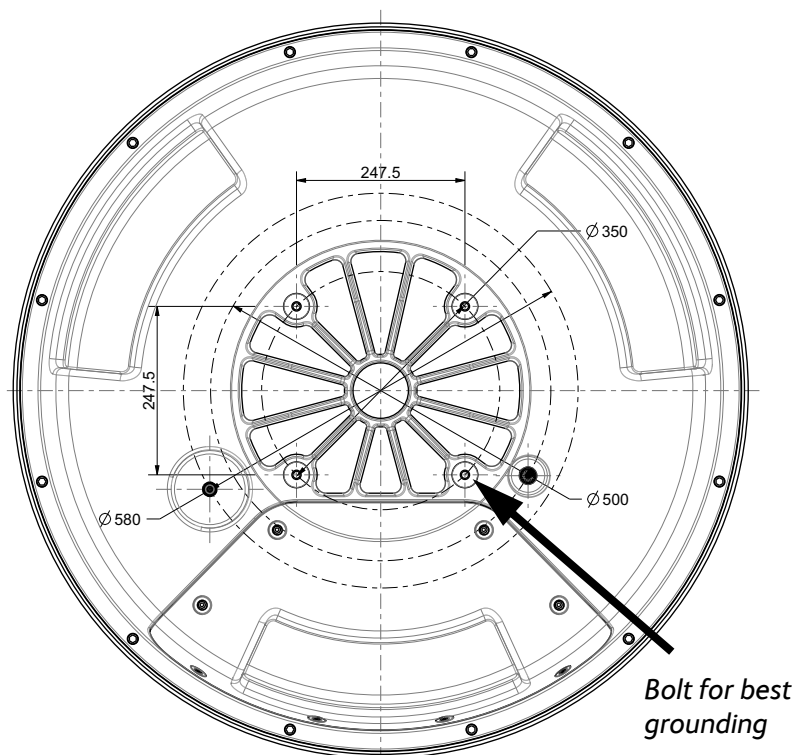


Figure 3-32: SAILOR 800: ADU, bolt for optimum grounding

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

### 3.3.4 Alternative ADU cable

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

The DC-resistance loop of the antenna cable must be maximum 0.9 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       | Absolute maximum length (m) | Absolute maximum length (ft) |
|------------------|-----------------------------|------------------------------|
| RG223-D          | 25 m                        | 80 ft                        |
| RG214/U          | 50 m                        | 160 ft                       |
| S 07272B-05      | 95 m                        | 310 ft                       |
| LMR-600-50       | 135 m                       | 440 ft                       |
| LDF4.5-50 Andrew | 300 m                       | 980 ft                       |

Table 3-10: ADU cable types and maximum lengths

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

- ADU cable RF-attenuation at 1700 MHz: max. 20-25 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.

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

## 3.4 Installation of the ACU

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

### 3.4.1 To install the ACU

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

1. Slide the ACU into a 1U space in a 19" rack.
2. 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 SAILOR 800/900 VSAT ACU* on page 4-1 for a description of the ACU connectors.



Figure 3-33: ACU, On/off switch at the back

4. Set the On/Off switch at the back of the ACU to On. Then you can use the On/Off switch at the front panel.

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



Figure 3-34: ACU, LAN connector at the front: Service port

For information on wiring 24 VDC power see *DC Input connector* on page 4-2.

For information about power supply and power requirements see *Connecting power* on page 5-1.

### 3.4.2 To ground the ACU

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

#### 3.4.2.1 ADU cable

The ADU is connected to the ACU with the ADU cable (coax cable) with an N connector at both ends. For information on ADU grounding, see *To ground the ADU* on page 3-32.

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

#### 3.4.2.2 Ground stud at the ACU

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



Figure 3-35: ACU, 19" rack version, ground stud

## 3.5 Installation of the VMU

For a list of supported VSAT modems see the SAILOR 800/900 VSAT data sheet or Figure 6-22: *Web interface: SETTINGS, VSAT modem profile – supported modems*.

### 3.5.1 General mounting considerations — VMU

1. Mount the VMU close to the ACU, preferably at a distance < 1 m.
2. Connect all cables. See *Interfaces of the VMU* on page 4-7 for a description of the connectors for supported VSAT modems. For cable specifications see *VMU cables* on page B-1.

#### 3.5.1.1 Connectors and pin-out of the VMU

For connectors and pin-out see the user documentation of the VMU and *Interfaces of the VMU* on page 4-7.

#### 3.5.1.2 Wiring Power

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

## 3.6 To install the dual-antenna mode (optional)

You can use the SAILOR 800/900 VSAT in dual antenna mode with 2 ADUs, 2 ACUs and the dual-antenna accessories kit. The kit consists of two 75 Ohm RF cables, an RF splitter and an RF combiner. In case one antenna enters a blocking zone, the other antenna of the dual-antenna system takes over and the system continues working.

There is a Master ACU and a Slave ACU. The VSAT modem is connected to and configured in the Master ACU. The Slave ACU is configured as a slave unit. It is connected with an Ethernet cable to the Master ACU from which it gets all satellite information.

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

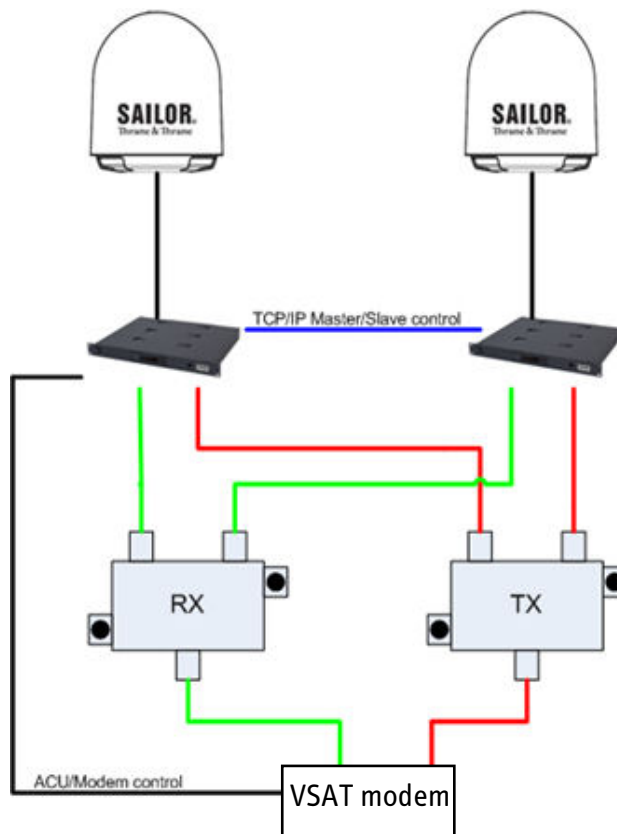


Figure 3-36: Dual mode antenna, overview

To install the dual antennas, do as follows:

1. Install the master ADU, ACU, the RX combiner and the VSAT modem as shown in figure 3-36.
2. Install the slave ADU, ACU, the TX splitter as shown below.

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

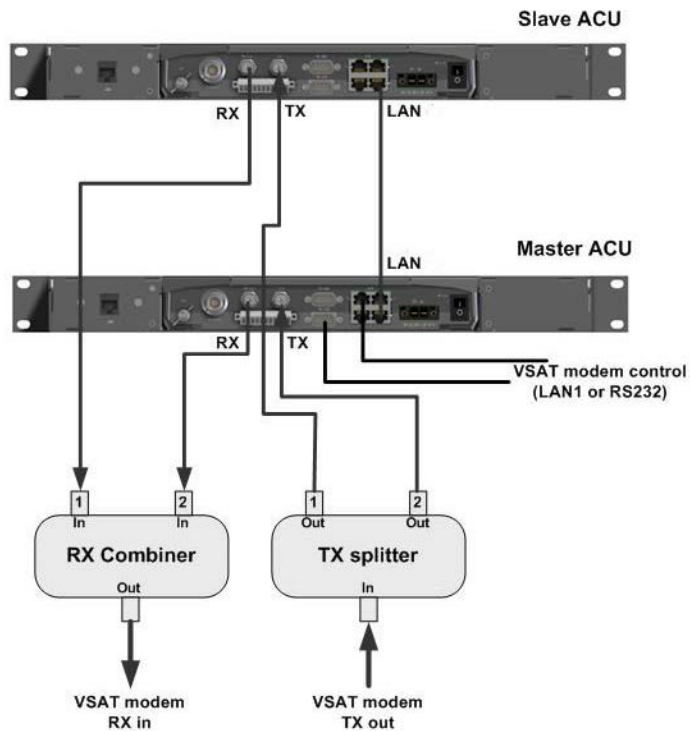


Figure 3-37: Dual mode antenna, connecting cables (example)

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

Table 3-11: Dual mode antenna, cabling



# Interfaces

This chapter is organised in the following sections:

- *Interfaces of the SAILOR 800/900 VSAT ACU*
- *Interfaces of the VMU*

## 4.1 Interfaces of the SAILOR 800/900 VSAT ACU

### 4.1.1 LEDs, display and keypad



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



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

### 4.1.2 ACU connector panel — overview

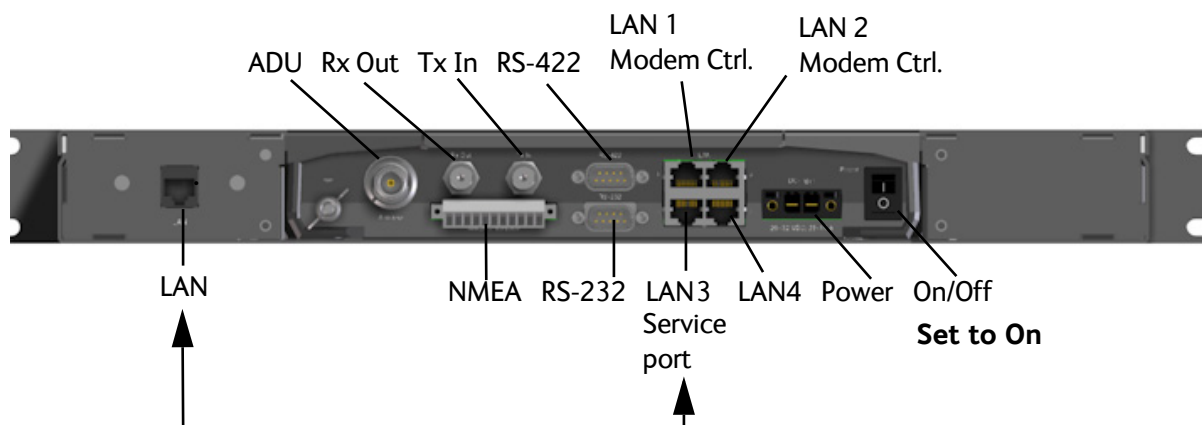


Figure 4-3: ACU rack version, connector panel overview

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**

Set the On/Off switch at the back of the ACU to On. Then you can use the On/Off switch at the front panel of the ACU.

Connect the Ethernet cable to provide connection to the service port on the front of the ACU.

### 4.1.3 DC Input connector

Provide DC power to the ACU, for example by using the TT-6080A Power Supply or 24 VDC from the vessel's power supply. The connector for DC input is included in the delivery.

**DC input:** Female plug (Weidmuller, Part number 1930050000) for wires up to AWG10/6 mm<sup>2</sup>.

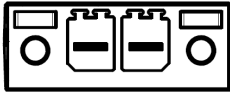
| Outline (on the ACU)  | Pin   | Pin function | Wire color |
|---|-------|--------------|------------|
| <br>$V_{in+}$ $V_{in-}$ | Left  | Vin+         | Red        |
|   | Right | Vin-         | Black      |

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

1. Insert the power cable as shown below.

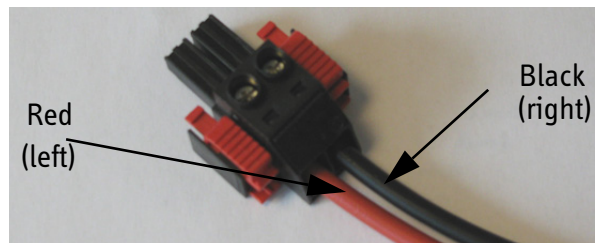


Figure 4-4: DC Input connector with power cable

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

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

### 4.1.4 ADU connector

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

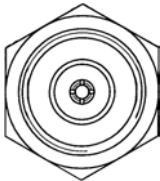
| Outline (on the ACU)  | Conductor | Pin function  |
|---|-----------|---|
|  | Inner     | DC to ADU<br>10 MHz clock to ADU<br>ACU to ADU internal communication<br>VSAT Rx/Tx |
|   | Outer     | GND (Shield)  |

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

**Important**

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

### 4.1.5 Rx/Tx connectors for VMU

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


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

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

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

### 4.1.6 NMEA 0183 connector

Connect the ship's gyro to this connector.


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

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

- a. The Power Supply Module (PSM) module must be hardware ID 2 or higher. To check your system download a diagnostics report and search for PSM.  
 Example for version 2 PSM: psm 2 0A.02 0406210014 1.47-0096 1.00-0001  
 Example for version 1 PSM: psm 1 0B.01 0389420009 1.47-0096 1.00-0001.

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

#### 4.1.6.1 NMEA 0183

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

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

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

**Supported NMEA string:**

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

**Recommended NMEA 0183 cable:**

Two-wire constructed with one enclosed shield

Network signal pair:

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

**4.1.7 RS-232 and RS-422 connectors**

Use these connectors to connect the ACU to the VSAT modems with serial interfaces. See *Interfaces of the VMU* on page 4-7 for further details about the RS-232 or RS-422 connector.

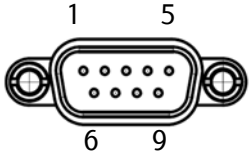
| Outline (on the ACU)  | Pin | Pin function                      |
|---|-----|-----------------------------------|
|  | 1   | Not connected                     |
|   | 2   | RXD                               |
|   | 3   | TXD                               |
|   | 4   | DTR                          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

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

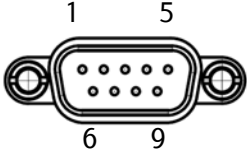
| Outline (on the ACU)  | Pin | Pin function   |
|---|-----|----------------|
|  | 1   | Ground         |
|   | 2   | Line A RXD (+) |
|   | 3   | Line B TXD (-) |
|   | 4   | Ground         |
|   | 5   | Ground         |
|   | 6   | Not connected  |
|   | 7   | Line A RXD (-) |
|   | 8   | Line B TXD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

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

### 4.1.8 LAN1, LAN2, LAN3 and LAN4 connectors

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

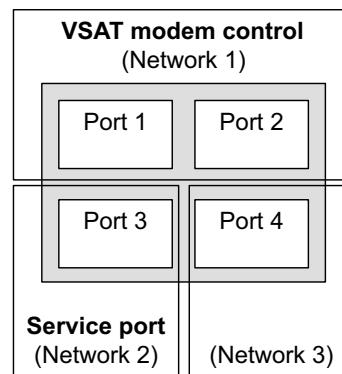


Figure 4-5: LAN connectors

Cable type: CAT5, shielded.

For information how to configure the LAN network see *To configure the LAN network* on page 6-34.

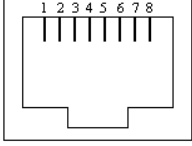
| Outline   | Pin | Pin function  | Wire color   |
|---|-----|---------------|--------------|
|  | 1   | Tx+           | White/orange |
|   | 2   | Tx-           | Orange       |
|   | 3   | Rx+           | White/green  |
|   | 4   | Not connected | Blue         |
|   | 5   | Not connected | White/blue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

Table 4-7: Ethernet connector, outline and pin assignment

## 4.2 Interfaces of the VMU

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





# Connecting power

This chapter is organised in the following sections:

- *Power source*
- *Power cable selection*
- *Connecting power*
- *Power up*

## 5.1 Power source

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 TT-6080A Power Supply is recommended.

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

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

## 5.2 Power cable selection

### 5.2.1 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).

Select a power outlet from the DC system and measure the source impedance of the ship installation as described in the next section.

**Note** If the total impedance is higher than the limits stated in section 5.2.3, the terminal may become unstable and start to on/off oscillate.

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

For further recommendations on power cable selection, see *Power cable recommendations* on page 5-2.

## 5.2.2 Measuring the ship source impedance

Select a power outlet from the ship 24 VDC system and measure the source impedance of the ship installation as described below.

1. Measure the voltage without load (R.var disconnected).
2. Set the current to e.g. 1 A by adjusting R.var.
3. Measure the corresponding voltage change.

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

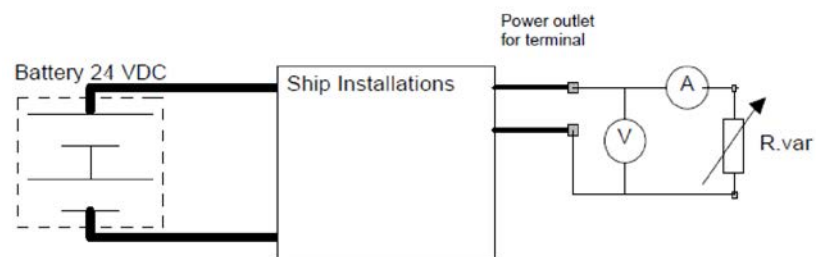


Figure 5-1: Measuring the ship source impedance

## 5.2.3 Power cable recommendations

### 5.2.3.1 Overview

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  $\mu\text{H}$ . Approximately 50 m maximum length.

### 5.2.3.2 Calculating the maximum power cable length

For 24 VDC operation, the total impedance must be max. 60 mOhm ( $R_{\text{max}}$ ), including the source impedance in the ship installation ( $R_{\text{source}}$ ).

The total impedance is made up 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. First measure the source impedance in the ship installation as shown in *Measuring the ship source impedance* on page 5-2.

- Find the resistance per meter ( $R_{\text{wire}}$ ) for the cable type you are going to use.  
For 4 mm<sup>2</sup>/AWG 11, the value is 4.8 mOhm/m at 55°C  
For 6 mm<sup>2</sup>/AWG 10, the value is 3.8 mOhm/m at 55°C  
For other cable types, refer to 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 above because there are two conductors in the cable.  
If the TT-6080A Power Supply is used, use  $R_{\text{source}} = 0$  mOhm.

### 5.2.3.3 Examples for using the TT-6080A Power Supply:

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

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

## 5.3 Connecting power

### 5.3.0.1 To connect the power cable to the ACU

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



Figure 5-2: Connecting power to DC Input

## 5.4 Power up

### 5.4.1 Procedure

- Connect power to the VMU.
- 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).
- The SAILOR 800/900 VSAT is ready to be calibrated (for first time power up) or receive data from the VSAT modem (when in normal operation). The ACU display shows the following message:



Figure 5-3: ACU display after first power on (example with LAN ports 1 and 4 used)

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 8-8.

Make sure there are no hardware failures or error codes present, check the display of the ACU for events. For more information on error codes and events see *Troubleshooting* on page 8-14 and *System messages* on page G-1.

4. Continue to get the SAILOR 800/900 VSAT system operational, do the following:
  - Make a cable loss and an azimuth calibration.
  - Create VSAT modem profiles.
  - Create one or more satellite profiles.

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

## 5.4.2 Initialisation steps in daily use

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

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

## 5.4.3 SAILOR 800/900 VSAT operational

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

# Configuration

This chapter is organised in the following sections:

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

## 6.1 Introduction to the built-in web interface

### 6.1.1 Overview

Use the built-in web interface (installation of software is not necessary) of the SAILOR 800/900 VSAT ACU to make a full configuration of the SAILOR 800/900 VSAT with the correct VMU, the satellite positions you intend to use and other parameters. You can use a standard Internet browser.

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

### 6.1.2 Connecting to the web interface

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

1. Power up the SAILOR 800/900 VSAT system, i.e. switch on the ACU. Wait until the LEDs on the front plate of the ACU show that the system is ready to be configured.
  - Power LED: Green
  - Logon LED: Off
  - Fail/Pass LED: Flashing green, during power-on self test, after that steady green.
2. Connect a PC to LAN interface 3 (Service port, standard Ethernet) of the ACU or to the front LAN connector of the ACU.

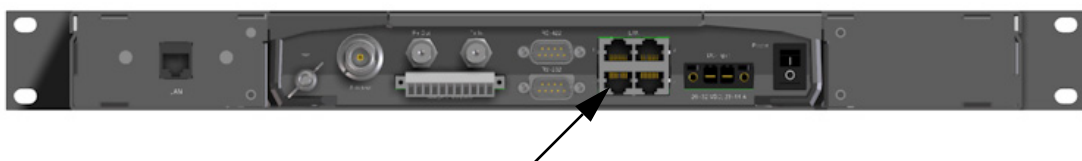


Figure 6-1: LAN connector used for configuring the SAILOR 800/900 VSAT

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

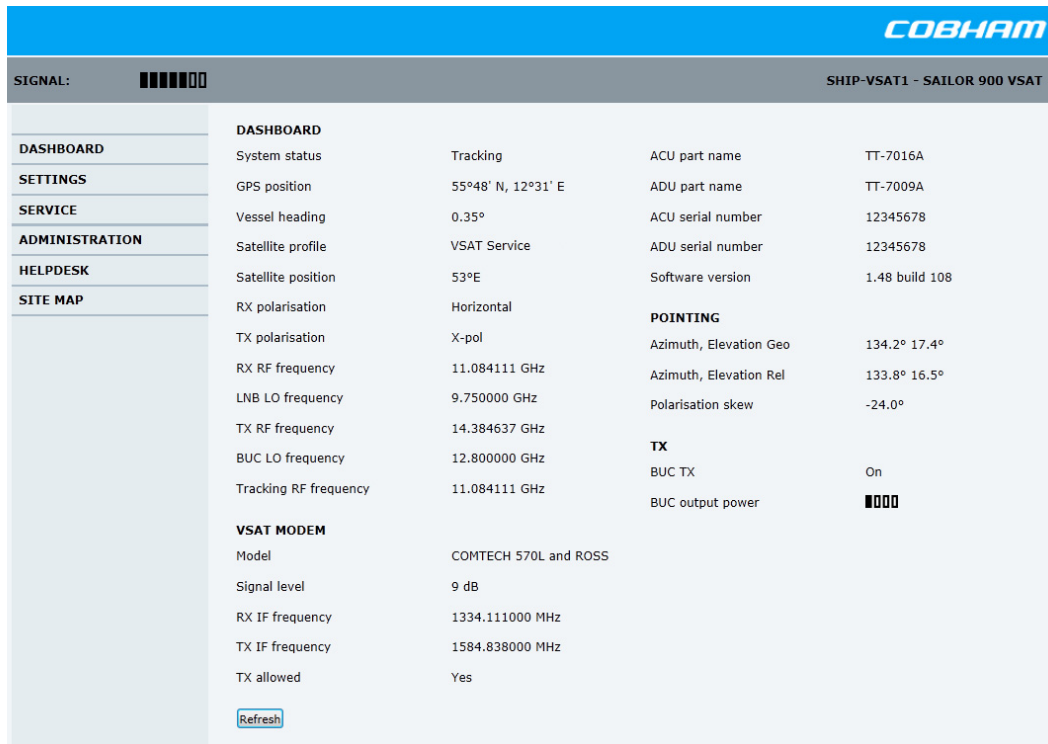


Figure 6-2: SAILOR 900 Dashboard



Figure 6-3: SAILOR 800 Dashboard

When the Dashboard is displayed you have verified that the connection to the SAILOR 800/900 VSAT can be established. The web interface is ready for use. You can continue to configure the system.

If you cannot establish a connection there might be problems with the Proxy server settings of your PC. See *Proxy server settings in your browser* on page 6-22 for further information. For a detailed introduction to the web interface see *Overview and dashboard* on page 6-18. If you want to use another LAN port you must configure it according to your network requirements. For information how to configure the LAN connectors see *To configure the LAN network* on page 6-34.

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

## 6.2 Calibration

Before the SAILOR 800/900 VSAT 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 for the SAILOR VSAT 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 800/900 VSAT fixed gain feature. See *SAILOR 800/900 VSAT fixed TX gain principle* on page 6-17 for more information.

After the calibration you create the satellite and VSAT modem profiles you want to use during normal operation, and you can set up blocking zones for the specific installation.

**Important**

You must logon as an administrator to do a calibration. See *Administration* on page 6-46.

The following sections describe the steps for a successful calibration:

- *To set up a service profile for calibration*
- *Heading input*
- *Azimuth calibration*
- *Cable calibration*
- *Operation in gyro-free mode*
- *Flow chart for calibration*
- *To make a line up procedure*
- *SAILOR 800/900 VSAT fixed TX gain principle*

### 6.2.1 To set up a service profile for calibration

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



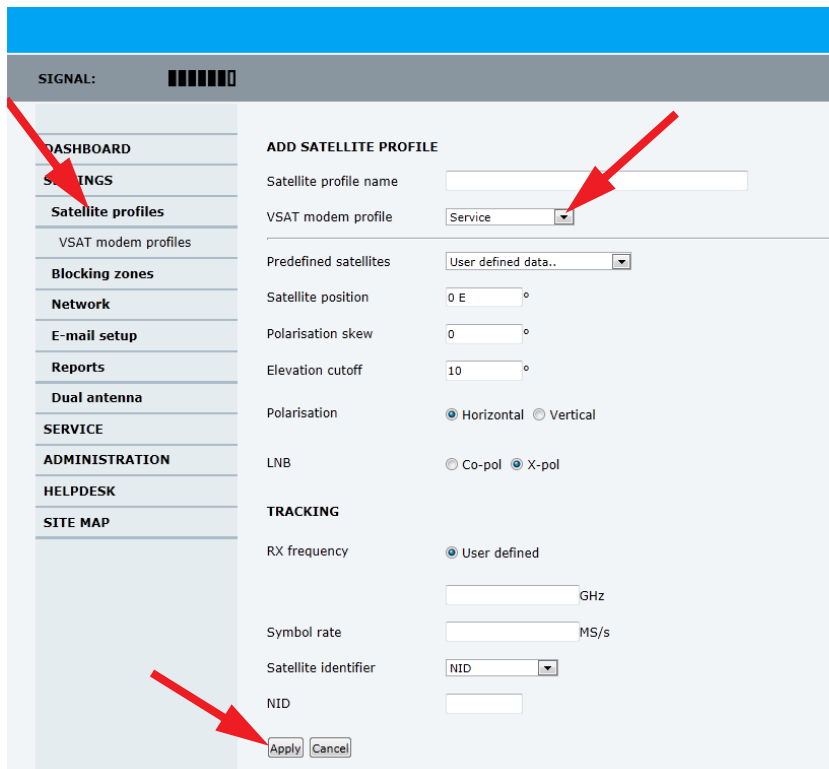


Figure 6-4: Service profile for calibration

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

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

Table 6-1: Satellite requirements for elevation and carrier

Elevation cutoff: Not relevant for calibration.

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

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

## 6.2.2 Heading input

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

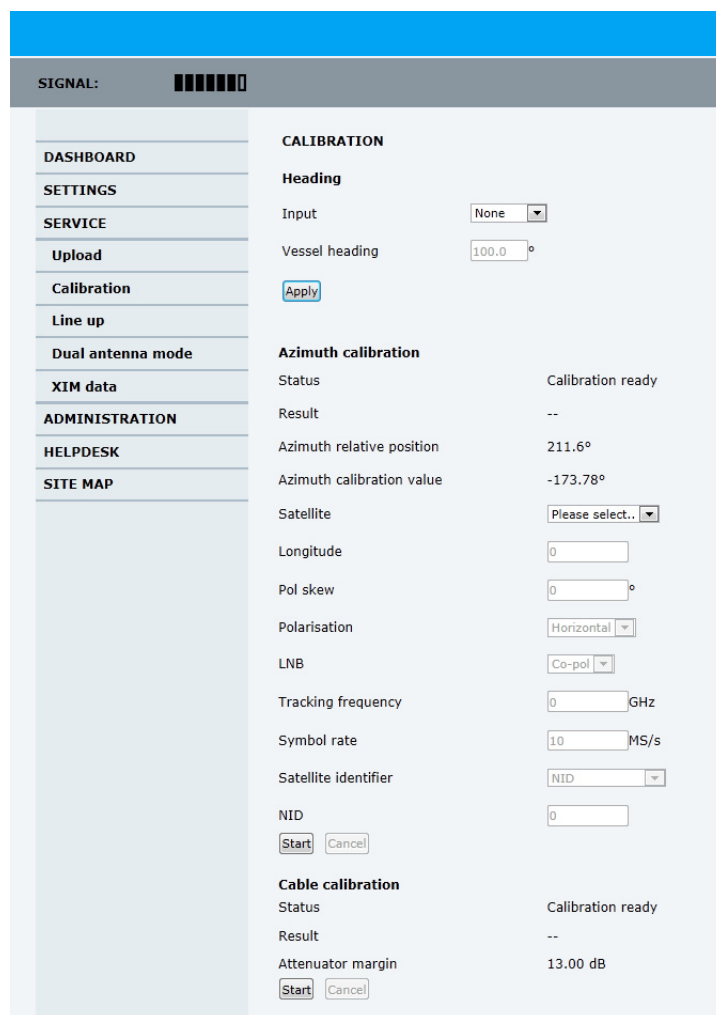


Figure 6-5: Web interface: SERVICE, Calibration

**Note**

If you do not want to enter the satellite data on the calibration page you can set up a dedicated service profile for calibration, 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 10 and 70 degrees.

1. Select the desired heading input, see table below.
2. For **Fixed**, enter the vessel heading in degrees.
3. Click **Apply**.

**Note**

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

| Heading input | Description   |
|---------------|---|
| External      | Heading input from the vessel's gyro compass (default).<br>If there is no heading input due to failure, alarms are raised and the antenna continues in gyro-free mode. When heading input is available again and a new acquisition is made, alarms are cleared. See also <i>Operation in gyro-free mode</i> on page 6-12.   |
| Fixed         | Use this setting for making an azimuth and cable calibration if there is no input from the vessel's gyro compass and for permanent installations like remote areas or oil rigs, or during training and test.<br><b><u>Important: Fixed heading is not allowed for sailing vessels!</u></b>  |
| None          | <b><u>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.</u></b><br>Select this setting after a successful azimuth calibration with Fixed heading if the system does not have input from the vessel's gyro compass. See also <i>Operation in gyro-free mode</i> on page 6-12. |

Table 6-2: Heading input options

### 6.2.2.1 Acquisition process and search pattern

#### With heading input or fixed heading

1. The SAILOR VSAT starts the acquisition, searches for 10 seconds at the expected position. If RX lock is detected the SAILOR VSAT 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.

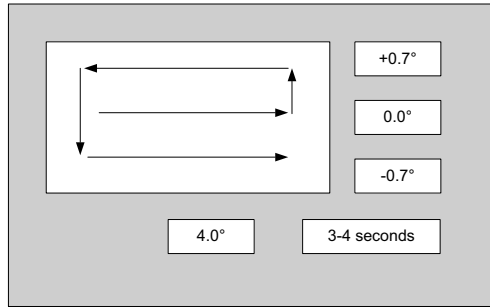


Figure 6-6: Acquisition, search pattern

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

#### With heading input or fixed heading, Inclined Orbit Satellite

1. The SAILOR VSAT starts the acquisition, searches for 10 seconds at the expected position. If RX lock is detected the SAILOR VSAT 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.

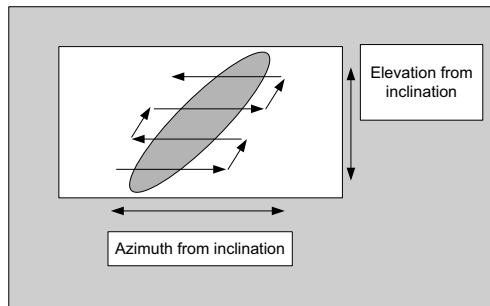


Figure 6-7: Acquisition, search pattern for inclined orbit

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

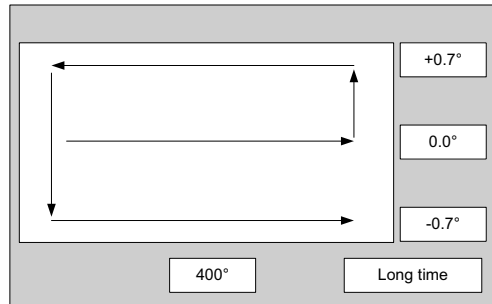


Figure 6-8: Acquisition, search pattern in gyro-free mode

**SAILOR VSAT acquisition times**

| Activity                          | Inclination 0° | Inclination 1° | Inclination 2° | Inclination 3° | Inclination 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: SAILOR VSAT acquisition time

**6.2.2.2 Azimuth calibration**

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

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.

There are two ways to make an azimuth calibration:

- *Azimuth calibration with a service profile*
- *Azimuth calibration with user defined input*

**6.2.2.3 Azimuth calibration with a service profile**

1. Click **SERVICE > Calibration**.
2. Select the service profile in the drop down list **Satellite**. All profiles with the VSAT modem **Service & Calibration** are displayed in the

list. If there is no profile in the list see *To set up a service profile for calibration* on page 6-4.

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.

#### 6.2.2.4 Azimuth calibration with user defined input

1. On the page **SERVICE > Calibration**, select **User defined** in the Satellite drop down list.
2. Type in the longitude and polarisation skew of the satellite. The polarisation skew is provided by the satellite operator, it is typically 0 degrees. For satellite data see *DVB-S satellites* on page E-1, [www.lyngsat.com](http://www.lyngsat.com).

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

3. Select the polarisation of a transponder and type in its frequency and symbol rate.
4. Select which satellite identifier to use for identification of the signal.

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

Table 6-4: Satellite identifier and NID values

5. Click **Start** and wait typically 5 minutes for the calibration to finish. A progress bar is shown during calibration and a message is displayed when the calibration has completed. In case of failure, see the table in the following section for a description of error codes during calibration.

**Important** It is strongly recommended to verify the result of a calibration performed with user defined data. This can be done by making a new calibration on a different satellite and verify that the resulting Azimuth calibration value differs less than one degree.

The following table shows the error codes that might be displayed during a calibration.

| Error code | Explanation   |
|------------|---|
| 1          | The elevation of the selected satellite is too low. Select another satellite.   |
| 2          | The elevation of the selected satellite is too high. Select another satellite.  |
| 4          | The calibration values could not be saved. Possibly due to defective hardware.  |
| 5          | The antenna could not point with sufficient precision. Check that the antenna is mounted in a stable way. Other possible causes might be electrical or mechanical faults. |
| 6          | No signal received. Check that there is free line of sight. Try again or try with another satellite.  |
| 7          | RF setup error, e.g. missing or invalid TX frequency.   |
| 8          | Invalid satellite, e.g. satellite not visible.  |

Table 6-5: Possible error codes during calibration

### 6.2.3 Cable calibration

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

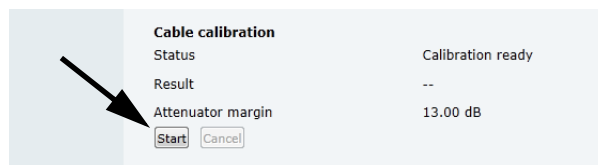


Figure 6-9: Web interface: SERVICE, Calibration, cable attenuator margin

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

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

The SAILOR 800/900 VSAT is calibrated now. If the calibration failed there will be a message on the calibration screen.

**Important**

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

## 6.2.4 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 VSAT 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 VSAT 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 VSAT 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 VSAT 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 6-6: 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.

### 6.2.5 Flow chart for calibration

The following flow chart gives an example of the steps in a calibration.

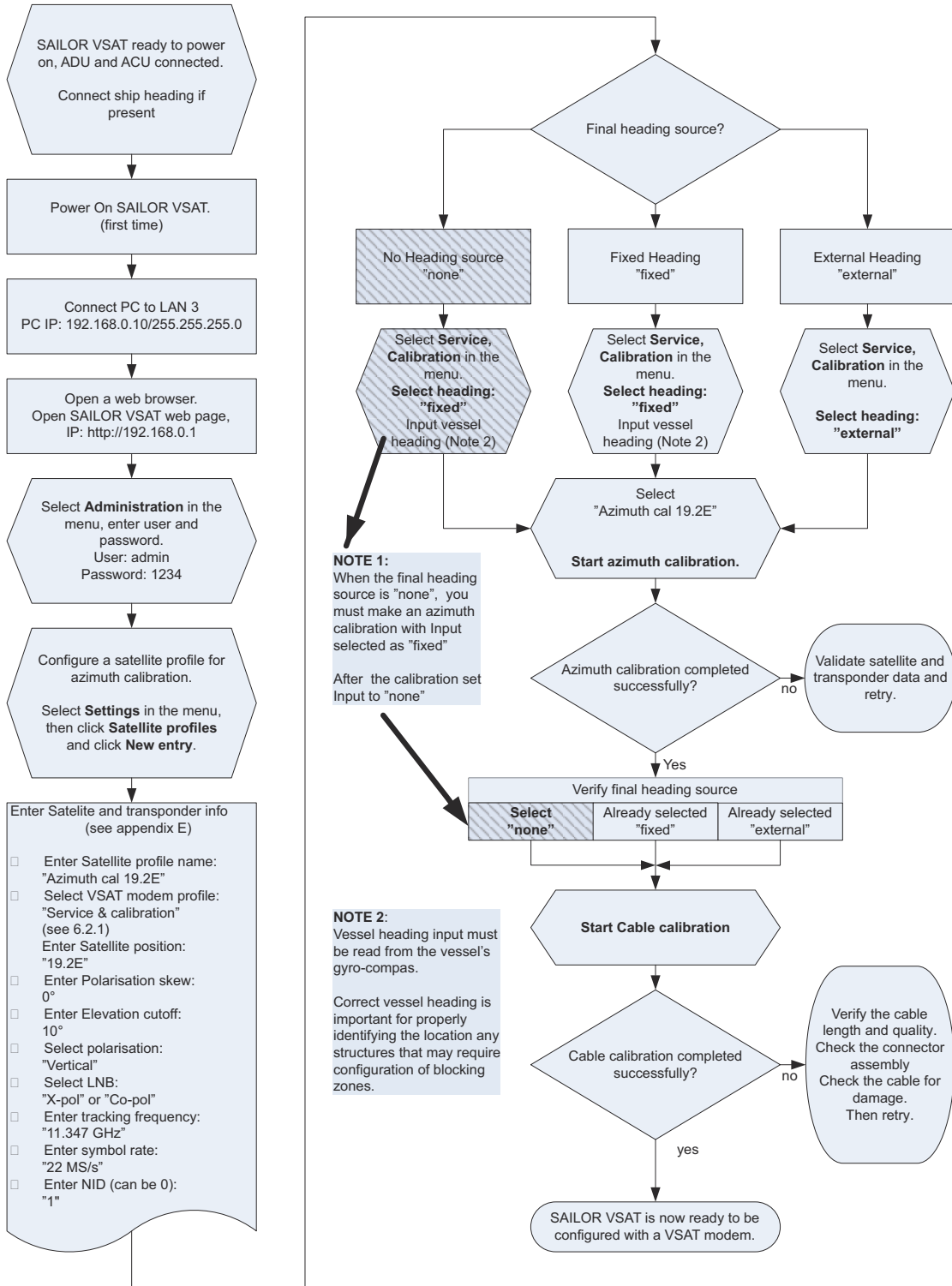


Figure 6-10: Example for a calibration – step by step

## 6.2.6 To make a line up procedure

**Note** | The ship must not move during the calibration procedure.

The SAILOR 800/900 VSAT has been tested at the factory and online on a live satellite link to calibrate the TX polarisation unit. You can fine-tune the TX polarization by doing a line up as described below. To do the line up, do as follows:

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

**Please wait. Improving tracking.**

This may take up to 2 minutes. Wait until the text shows:

**Ready for activation.**

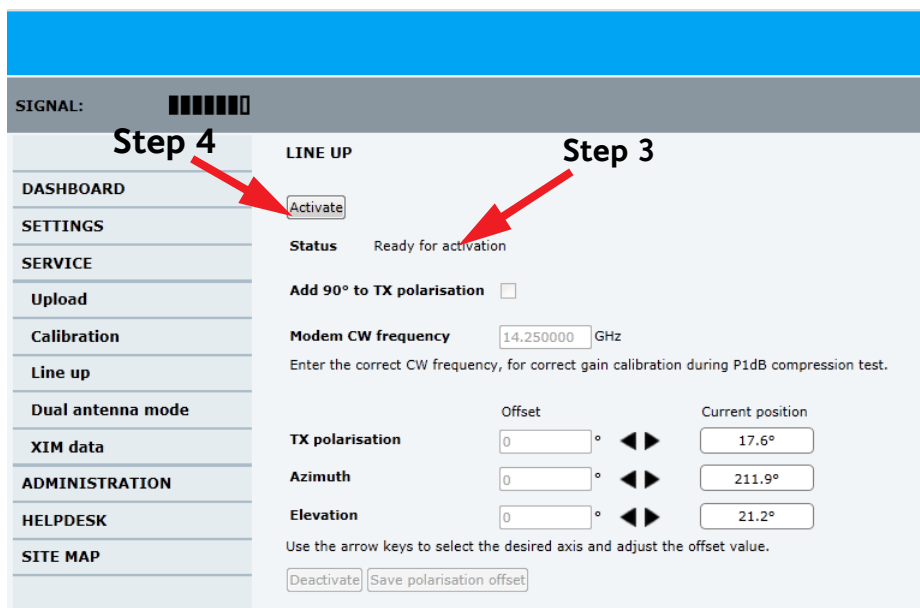


Figure 6-11: Web interface: SERVICE, Line up: Ready for activation

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

The screenshot shows a web interface for configuring a satellite service. On the left is a navigation menu with options: DASHBOARD, SETTINGS, SERVICE, Upload, Calibration, Line up (selected), Dual antenna mode, XIM data, ADMINISTRATION, HELPDESK, and SITE MAP. The main content area is titled 'LINE UP' and features an 'Activate' button. Below this, the status is 'Antenna ready'. There is a checked checkbox for 'Add 90° to TX polarisation'. The 'Modem CW frequency' is set to '14.250000 GHz' with a note: 'Enter the correct CW frequency, for correct gain calibration during P1dB compression test.' Underneath are three rows of controls for 'TX polarisation', 'Azimuth', and 'Elevation'. Each row has an 'Offset' input (all set to 0) and a 'Current position' input (set to -72.4°, 211.0°, and 20.3° respectively). A note says: 'Use the arrow keys to select the desired axis and adjust the offset value.' At the bottom are 'Deactivate' and 'Save polarisation offset' buttons.

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

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

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

## 6.2.7 SAILOR 800/900 VSAT fixed TX gain principle

The SAILOR 800/900 VSAT uses a new transmitter chain concept. After calibration it provides a fixed gain of 44 dB from the Tx-port of the ACU to the output of the BUC. Advantages of the fixed TX gain principle are:

- Fixed TX gain over frequency and cable length
- TX gain independent of antenna cable length
- Utilization of the full 86W BUC power over frequency
- P1dB compression point the same over frequency

When installing the SAILOR 800/900 VSAT you make a cable calibration. At that point every installation finds the same P1dB compression setting regardless of cable length. The P1dB compression point is approximately -56.2 dBm at the ACU Tx-port. Additionally the SAILOR 800/900 VSAT system monitors the TX gain in real time.

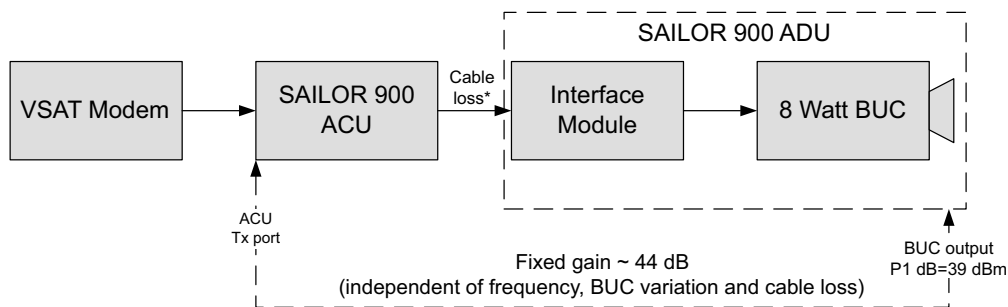


Figure 6-13: Fixed TX gain principle (SAILOR 900 VSAT)

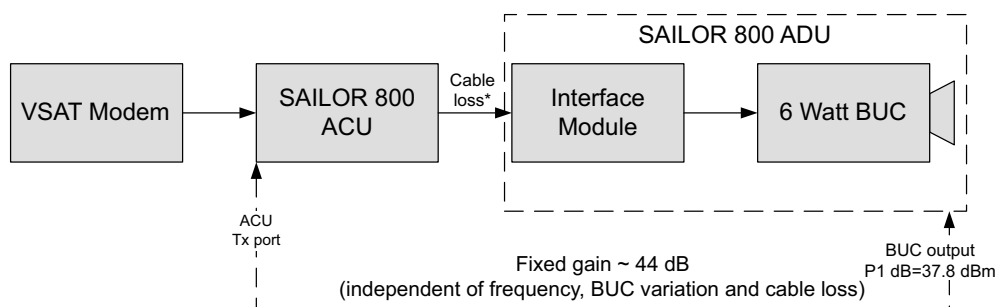


Figure 6-14: Fixed TX gain principle (SAILOR 800 VSAT)

- \* You find the maximum cable loss at *Maximum allowed RF loss in the ADU cable* on page 3-29.

**Example:** ACU Tx-port power: -56.2 dBm > BUC output = +3937.8 dBm (compression)

## 6.3 Configuration with the web interface

### 6.3.1 Overview and dashboard

#### 6.3.1.1 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.

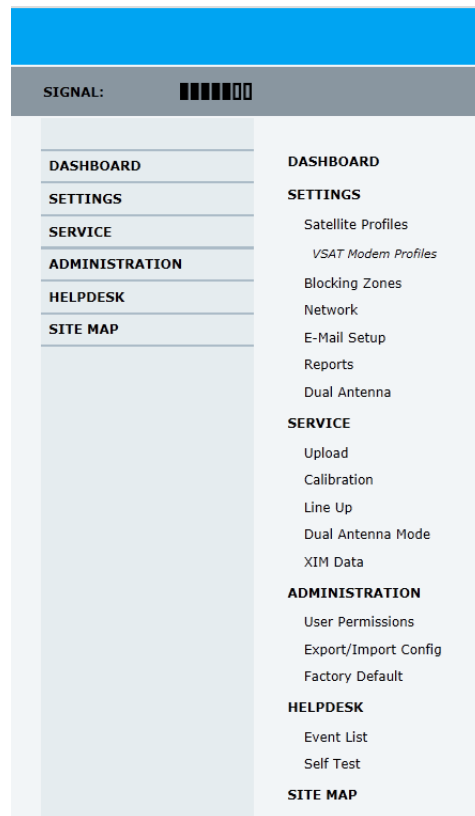


Figure 6-15: Topics in the web interface (SITE MAP)

Software version 1.30 is the version described in this chapter.

### 6.3.1.2 Dashboard and navigation

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

The web interface consists of the following sections:

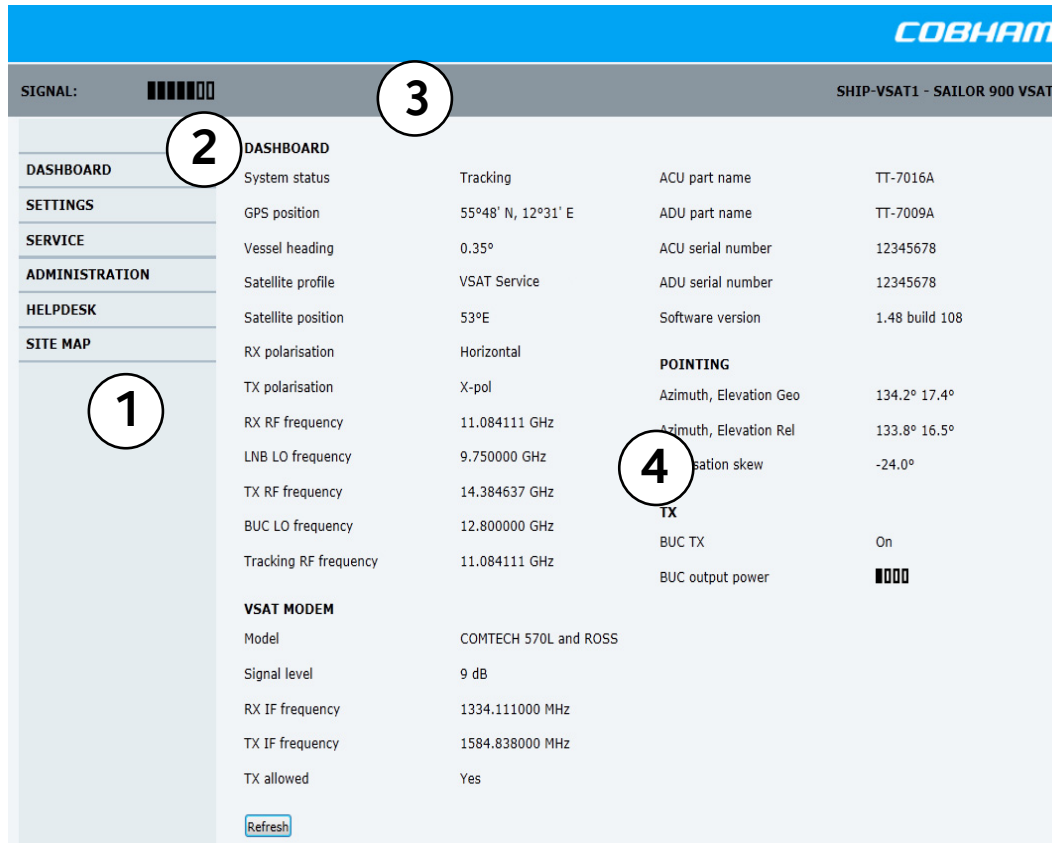


Figure 6-16: Web interface: DASHBOARD of SAILOR 900 VSAT

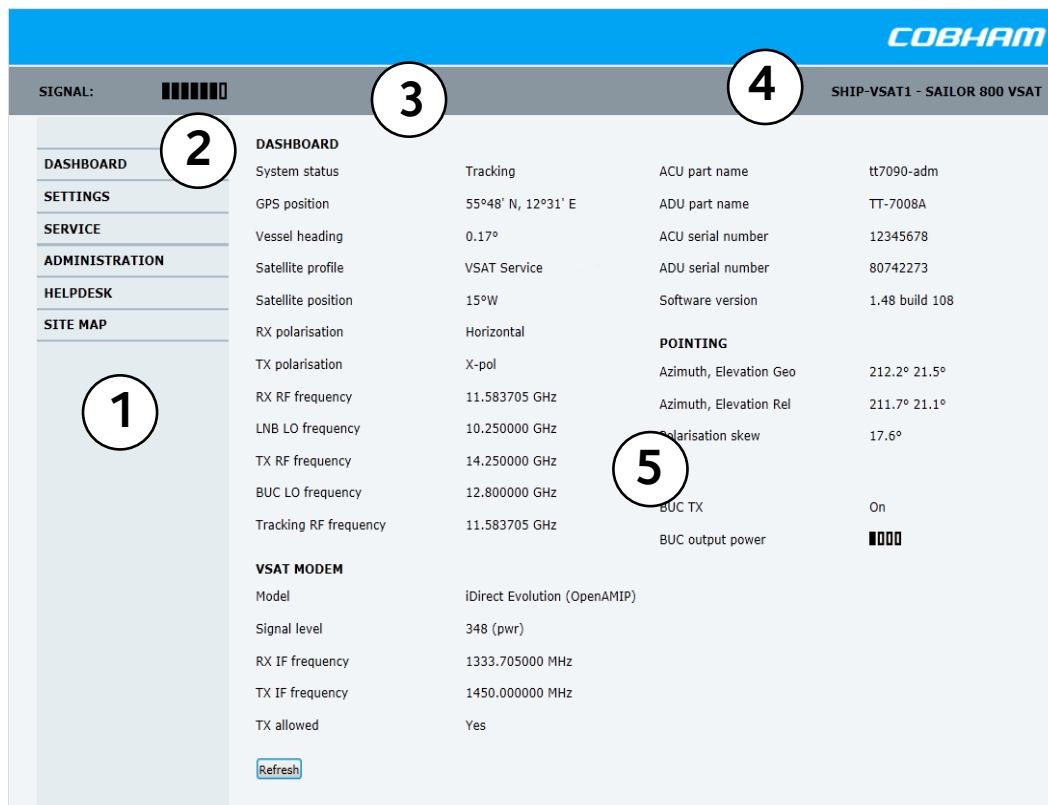


Figure 6-17: Web interface: DASHBOARD of SAILOR 800 VSAT

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 VSAT 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 6-34
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 6-23.

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




| Icon  | Explanation   |
|---|---|
|  | <p>An event is active. Click the icon to see a list of active events. For explanations of the event messages, see <i>Event list</i> on page 8-2 and <i>Event messages – overview</i> on page G-1. Note that this icon will remain in the icon bar as long as the event is active.</p> |

Table 6-7: Web interface: Event icon

### 6.3.1.3 To navigate the web interface

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

**Note** You can give access to some configuration settings for users that are not administrators. For information see *To set up user permissions* on page 6-49.

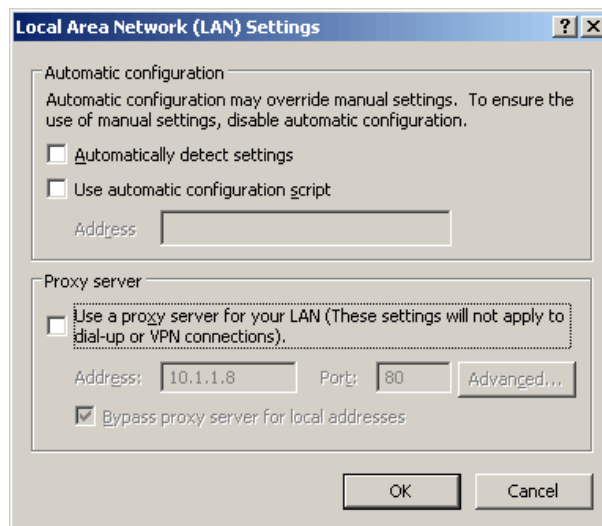
### 6.3.1.4 Proxy server settings in your browser

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

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

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

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



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

When the proxy server settings are disabled, close and restart your browser.

You may need to change this setting back on return to your Internet connection.

### 6.3.1.5 To connect a PC

To connect your PC to the ACU do as follows:

1. Connect a PC to LAN interface 3 (Service port, standard Ethernet) of the ACU or to the front LAN connector of the ACU.  
If you want to use another LAN port than LAN 3 you must configure it according to your network requirements. For information how to configure the LAN connectors see *To configure the LAN network* on page 6-34.
2. Open your Internet browser and enter the IP address of the ACU.  
The default IP address is **http://192.168.0.1**.

### 6.3.1.6 Information fields on the Dashboard

| SAILOR 800/900 VSAT parameter  | Description  |
|--|--|
| System status  | Current status of the SAILOR 800/900 VSAT.<br><b>Examples:</b><br><b>Not ready</b> (waiting for input from GNSS, e.g. GPS)<br><b>Ready</b> (waiting for data from the VSAT modem or no satellite profile selected)<br><b>Pointing antenna</b> (locating the satellite)<br><b>Acquiring signal</b> (acquiring the satellite signal)<br><b>Tracking</b> (tracks the current satellite)<br><b>No Tx zone</b> (antenna is pointing in a no TX zone; TX is off)<br><b>Blocking zone</b> (antenna is pointing into a blocking zone)<br><b>Service switch</b> (service switch in ADU activated)<br><b>Safe mode</b> (error, followed by an error description) |
| GPS position   | Current position of the vessel, reported by the GPS module   |
| Vessel heading   | Ship's heading in degrees with reference to North, provided by the ship's gyro.  |
| Satellite profile  | Name of the currently active satellite profile.  |
| Satellite position   | Position of the satellite selected in Satellite profile.   |
| RX polarisation  | Horizontal or vertical.  |
| TX polarisation <sup>a</sup>   | Co-pol or X-pol, auto-selected by VSAT modem   |
| RX RF frequency <sup>a</sup>   | Ku band receiving frequency, auto-selected by VSAT modem   |
| LNB Lo frequency <sup>a</sup>  | Auto-selected by VSAT modem  |
| TX RF frequency <sup>a</sup>   | Auto-selected by VSAT modem  |
| BUC Lo frequency   | 12.8 GHz (system parameter)  |
| Tracking RF frequency  | Current RF tracking frequency.   |
| 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 800/900 VSAT.   |

Table 6-8: Web interface, DASHBOARD, SAILOR 800/900 VSAT parameters

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

| VSAT MODEM parameter | Description  |
|----------------------|--|
| Model                | VSAT modem name, entered in <b>SETTINGS &gt; VSAT modem profiles</b> .   |
| Signal level         | Current input signal level from VSAT modem.<br>iDirect openAMIP modem: (PWR) 0-500, delivered by the connected modem. For values <250 the antenna searches after a new signal.<br>Other modem: Signal level in dB. |
| RX IF frequency      | Read out from VMU.   |
| TX IF frequency      | Read out from VMU.   |
| TX allowed           | On or Off. Indicates if the VSAT modem supplies the 10 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 6-9: Web interface, DASHBOARD, VSAT MODEM parameter

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

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

| TX parameter     | Description   |
|------------------|---|
| BUC TX           | On or Off. Shows if the SAILOR 800/900 VSAT 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 6-52. |
| BUC output power | See sections below this table.  |

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

### 6.3.1.7 TX BUC output power information

The BUC TX information is displayed on the DASHBOARD. The BUC TX indicates if the SAILOR 800/900 VSAT VSAT has enabled the BUC or not. It can show BUC Tx On or Off. This information is also shown in the display of the ACU as TX ON or TX OFF.

The SAILOR 800/900 VSAT shows BUC TX On when the following conditions are met:

- The SAILOR 800/900 VSAT must sense the 10 MHz Tx reference signal from the connected VSAT modem.
- The VSAT modem must have Rx lock.
- The antenna must point correctly to the satellite.
- The antenna must be in tracking mode.

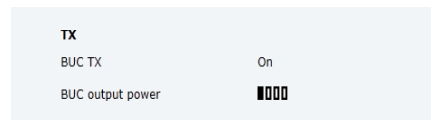


Figure 6-18: Web interface: DASHBOARD, TX - BUC output power (example)

The BUC output power indicates if the BUC is transmitting or not. This is a unique feature of the SAILOR 800/900 VSAT antenna. A built-in power detector in the OMT developed by Cobham SATCOM makes it possible to measure the power within a time window to be able to catch short TX bursts. The power within the window is averaged and shown in the BUC output power bar graph on the DASHBOARD. Not that this indicator is an averaged signal, it is not a real-time indicator. After measuring a signal burst the bar graph falls slowly in order for the user to be able to see short TX bursts.

The BUC output power indicator is very useful during installation as the service engineer knows whether the antenna is transmitting or not and that the hub should be able to monitor the transmission. It is also very useful when doing line up with the hub as the service engineer can monitor the TX BUC output power level on the DASHBOARD and watch when the output power approaches the P1dB compression point which is at 4 bars.

## 6.3.2 Satellite profiles and VSAT modem profiles

### 6.3.2.1 Satellite profiles

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

You must activate one satellite profile.

#### Note

You must add at least one VSAT modem profile before you can add a satellite profile. See *VSAT modem profile – New entry and Edit* on page 6-29.

### 6.3.2.2 Satellite profiles – New entry and Edit



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

Each satellite profile has one assigned VSAT modem profile.

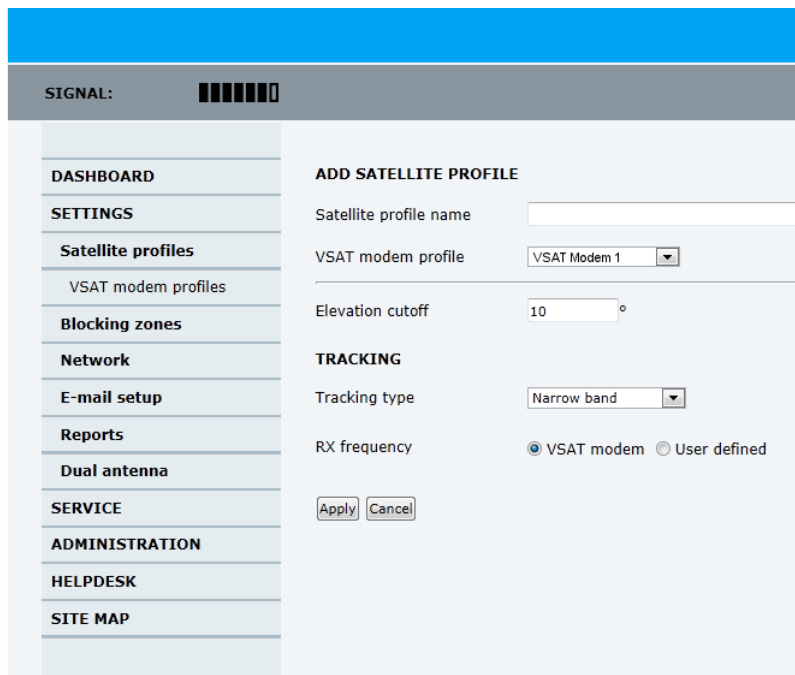


Figure 6-20: Web interface: SETTINGS, Satellite profiles — new entry (example)

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 instruction how to add a VSAT modem profile see *VSAT modem profile – New entry and Edit* on page 6-29.

4. Enter the data for the satellite that you want to use. For satellite data see *DVB-S satellites* on page E-1 or [www.lyngsat.com](http://www.lyngsat.com).

5. Polarisation skew: See documents from VSAT provider.

6. At Elevation cutoff enter the minimum elevation angle for the antenna to function in accordance with ETSI (ETSI EN 302 340) and FCC (FCC §25.205) regulations.

- **ETSI (ETSI EN 302 340):** The minimum elevation angle depends on the Tx bandwidth and the nominal power of the VSAT modem, see the table below.

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

Table 6-12: SAILOR 900: Elevation cutoff (in degrees) versus VSAT modem bandwidth and power

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

| Bandwidth                   | Nominal VSAT modem power |          |          |          |          |          |          |          |          |
|-----------------------------|--------------------------|----------|----------|----------|----------|----------|----------|----------|----------|
|                             | -22 dBm                  | -20 dBm  | -18 dBm  | -16 dBm  | -14 dBm  | -12 dBm  | -10 dBm  | -8 dBm   | -6 dBm   |
| Eirp@14.25 GHz <sup>a</sup> | 63.4 dBm                 | 65.4 dBm | 67.4 dBm | 69.4 dBm | 71.4 dBm | 73.4 dBm | 75.4 dBm | 77.4 dBm | 79.4 dBm |
| 64 kHz                      | 3°                       | 4°       | 4°       | 4°       | 6°       | 7°       | 7°       | 7°       | 7°       |
| 128 kHz                     | 3°                       | 4°       | 4°       | 4°       | 6°       | 7°       | 7°       | 7°       | 7°       |
| 256 kHz                     | 3°                       | 4°       | 4°       | 4°       | 6°       | 7°       | 7°       | 7°       | 7°       |
| 512 kHz                     | 3°                       | 4°       | 4°       | 4°       | 6°       | 7°       | 7°       | 7°       | 7°       |
| 1024 kHz                    | 3°                       | 4°       | 4°       | 4°       | 6°       | 7°       | 7°       | 7°       | 7°       |
| 2048 kHz                    | 2°                       | 3°       | 3°       | 4°       | 4°       | 4°       | 6°       | 6°       | 7°       |
| 4096 kHz                    | 2°                       | 2°       | 3°       | 3°       | 4°       | 4°       | 4°       | 4°       | 7°       |
| 8192 kHz                    | 2°                       | 2°       | 2°       | 2°       | 3°       | 3°       | 4°       | 4°       | 4°       |
| 16384 kHz                   | 2°                       | 2°       | 2°       | 2°       | 2°       | 3°       | 3°       | 3°       | 4°       |
| 32768 kHz                   | 2°                       | 2°       | 2°       | 2°       | 2°       | 2°       | 2°       | 2°       | 3°       |

Table 6-13: SAILOR 800: Elevation cutoff (in degrees) versus VSAT modem bandwidth and power

a. Eirp = Fixed system gain 44 dB + antenna gain @ 14.25 GHz 40.0 dB + modem power

- **FCC (FCC §25.205):** 5 degrees

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



### 6.3.2.3 VSAT modem profiles

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. You must add at least one VSAT modem profile.

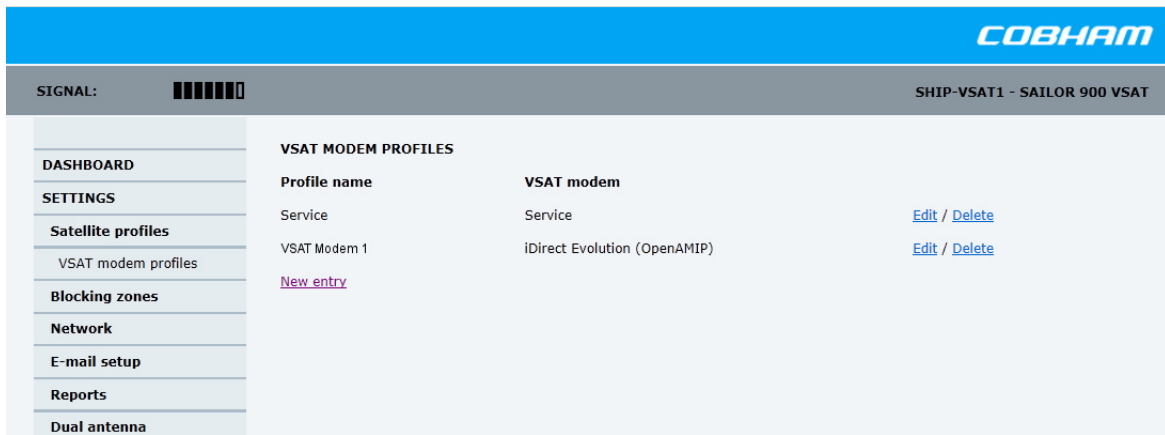


Figure 6-21: Web interface: SETTINGS, VSAT modem profiles — list (example)

To create a new VSAT modem satellite profile, click **New entry**. To edit or delete a VSAT modem profile, click **Edit** or **Delete**.

### 6.3.2.4 VSAT modem profile – New entry and Edit

On the page **VSAT modem profiles** you create, edit or delete VSAT modem profiles. The supported VSAT modem profiles are listed in the drop-down list **VSAT modem profile**.

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

1. Go to **SETTINGS > VSAT modem profiles** and click **New entry** or **Edit**.

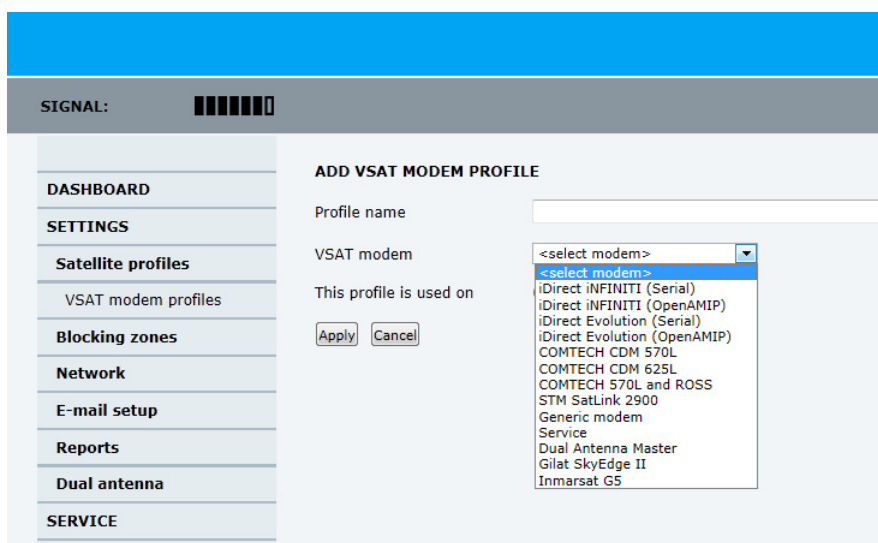


Figure 6-22: Web interface: SETTINGS, VSAT modem profile – supported modems

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. Once you have selected a VSAT modem, entry fields required for this VSAT modem are displayed.  
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. Fill in or edit the data provided by your VSAT service provider. Enter the passwords, if needed.  
Select the VSAT modem baud rate and whether you want to use the 10 MHz reference from the ACU or the VSAT modem.

**Important**

The SAILOR 800/900 VSAT can work either using the Rx or Tx 10 MHz reference signals provided by the modem or using its own built-in 10 MHz reference signal. It is recommended to use the Tx 10 MHz reference signal from the modem.

**For OpenAMIP IP address:** Make sure that you have entered this IP address also for the LAN connector that is used for the OpenAMIP modem, see *To configure the LAN network* on page 6-34.

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

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

**ADD SATELLITE PROFILE**

Satellite profile name

VSAT modem profile

---

Satellite position  °

Polarisation skew  °

Maximum inclination  °

RX polarisation  Horizontal  Vertical

TX polarisation  Co-pol  X-pol

RX IF frequency  MHz

LNB LO frequency

RX RF frequency  GHz

TX RF frequency  GHz

**Tracking**

RX frequency  VSAT modem  User defined

GHz

DVB-S / DVB-S2

Symbol rate  MS/s

NID

DVB power

Narrow band

VSAT modem RSSI

Figure 6-23: Satellite profile for generic modem

### 6.3.3 To set up blocking zones (RX and TX)

On this page you define blocking zones, i.e. NO TX and RX zones, enter azimuth values and elevation angles for each blocking zone.

You must select **Active** to enable a blocking zone.

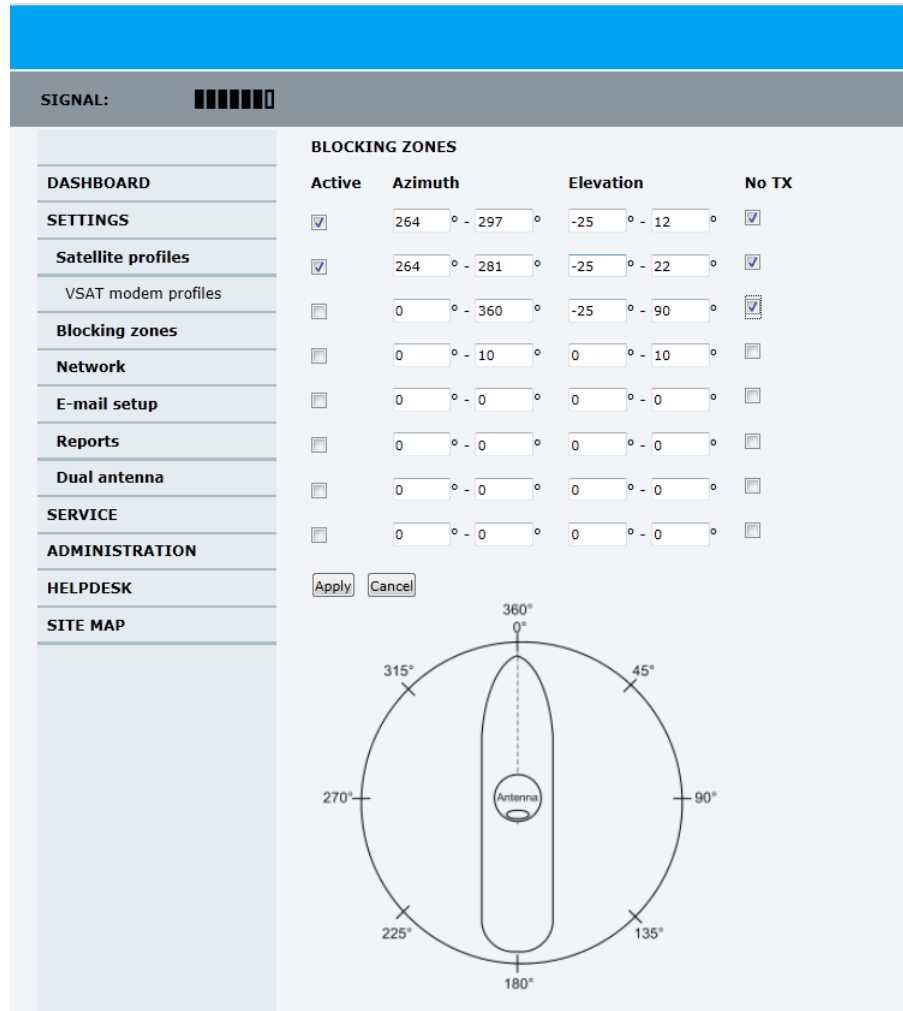


Figure 6-24: Web interface: SETTINGS, Blocking zones — azimuth and elevation

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

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

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

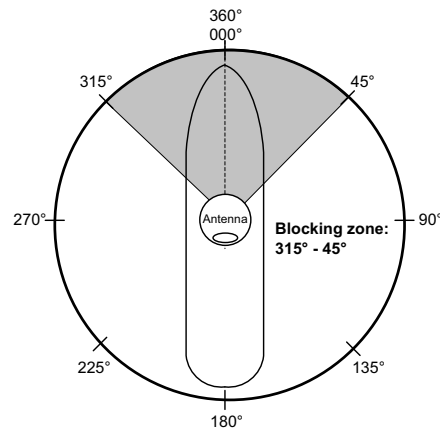


Figure 6-25: Blocking zone, example: 315 - 45 degrees

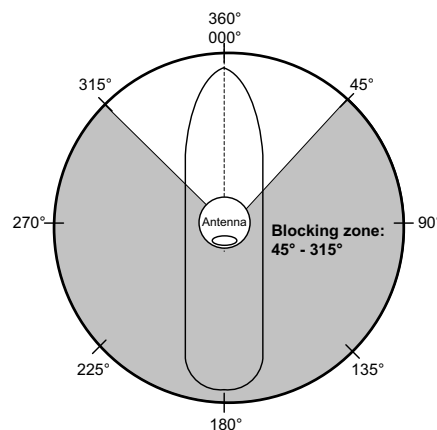


Figure 6-26: Blocking zone, example: 45 - 315 degrees

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

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

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

### 6.3.4 To configure the LAN network

You can enter a host name. The host name helps identifying the SAILOR 800/900 VSAT system when sending e-mail reports. The ACU has four 10/100 Mbit Ethernet ports labelled LAN port 1, 2, 3 and 4. The ports are divided in three groups, each group operating in its own network. You can setup DNS and Gateway.

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

**NETWORK**

Host name

---

**LAN Port 1: VSAT Modem Unit**

Mode  Static IP  DHCP client

IP address

Netmask

DHCP Server

DHCP Server Start

DHCP Server End

**LAN Port 2: LAN**

Switched with Port 1

---

**LAN Port 3: Service**

Mode  Static IP  DHCP client

IP address

Netmask

DHCP Server

DHCP Server Start

DHCP Server End

**LAN Port 4: LAN**

Mode  Static IP  DHCP client

IP address

Netmask

---

**DNS setup**

DNS source

Primary DNS

Secondary DNS

**Gateway setup**

Default gateway source

Default gateway

**Zeroconf setup**

Zeroconf source

Figure 6-27: Web interface: SETTINGS, Network (default settings)

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

| Sections             | Preferred use   |
|----------------------|---|
| NETWORK<br>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.<br><br>Note: The host name must start with a letter.  |
| LAN Port 1 + 2       | LAN port 1 and 2 are switched, i.e. they share the same IP address and operate on the same network. This network is usually connected to the VSAT Modem Unit.<br><br>LAN port 1 can be set to static IP (default), DHCP client or DHCP server.  |
| LAN Port 3           | LAN port 3 is dedicated as the service port. By default this port has the IP address 192.168.0.1; the current value can be displayed in the ACU display. 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 rack version, connector panel overview</i> on page 4-1), for access to the service port from the rack front.<br><br>LAN port 3 can be set to static IP, DHCP client or DHCP server (default). |
| LAN Port 4           | LAN port 4 can be used for connection to the LAN of the vessel or other general purpose.<br><br>LAN port 4 can be set to static IP, DHCP client (default) or DHCP server.   |

Table 6-14: Setup of LAN connectors

#### 6.3.4.1 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.

#### 6.3.4.2 DHCP Server Settings.

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

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

### 6.3.4.3 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 6-36.

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.

### 6.3.4.4 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.

### 6.3.4.5 Zeroconf Settings

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

Zeroconf allows devices to connect to a network automatically.

## 6.3.5 E-mail setup

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



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

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

Figure 6-28: 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 6-34.

### 6.3.6 To send statistics reports

SAILOR 800/900 VSAT can send a statistics report at fixed intervals. This report contains historical information from the SAILOR 800/900 VSAT of up to 1 month. It is sent as a zipped attachment to an e-mail. The file format is a comma separated value file (csv). The report can then be processed in spreadsheet applications, e.g. Microsoft Excel.

The screenshot shows the 'SETTINGS' page with a sidebar on the left containing navigation links: DASHBOARD, SETTINGS, Satellite profiles, VSAT modem profiles, Blocking zones, Network, E-mail setup, Reports, Dual antenna, SERVICE, ADMINISTRATION, HELPDESK, and SITE MAP. The 'Reports' section is active, displaying two configuration panels. The 'DIAGNOSTICS REPORT' panel includes fields for 'E-mail sender' (SHIP-VSAT1@cobham.), 'E-mail recipients' (no-one@cobham.com), and 'Send interval' (month), with 'Apply', 'Cancel', and 'Send Now' buttons. The 'STATISTICS REPORT' panel includes fields for 'E-mail sender' (SHIP-VSAT1@cobham.), 'E-mail recipients' (no-one@cobham.com), and 'Send interval' (week), with 'Apply', 'Cancel', 'Send Weekly', and 'Send Monthly' buttons.

Figure 6-29: 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 6-36.
2. Go to **SETTINGS > Reports**.
3. In the section **STATISTICS REPORT** enter the following:
  - Email sender.
  - Email recipients (comma separated).
  - Send interval: Select disabled, day (default) with 2-minute samples, week with hourly samples or month with hourly samples. The report contains statistics data for the selected intervals.
4. Click **Apply**.

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

The following parameters are recorded in the statistics report:

| Parameter recorded | Description   |
|--------------------|---|
| Hostname           | 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 800/900 VSAT   |

Table 6-15: Statistics report, header record

| Parameter recorded  | Description  |
|---|--|
| UTC. (s)<br>UTC (YYYY-MM-DD hh:mm)  | UTC in seconds and date format for the data set.   |
| RSSI.Av<br>RSSI.Max<br>RSSI.Min   | Received signal strength (average, maximum and minimum value) for the sampling interval.   |
| POS.Lat (degree)<br>POS.Long (degree)<br>POS.Valid  | Latitude value of position.<br>Longitude value of position.<br>Fix = valid position, No Fix = invalid position.  |
| Heading.Samp (degree)<br>Heading.Max (degree)<br>Heading.Min (degree)<br>Heading.Range (+/-degree)            | Ship's heading (sample, maximum and minimum value, range) for the sampling interval. See Figure 6-30: <i>Statistics — how to read data for a range.</i>          |
| Antenna.Azi (degree)<br>Antenna.Azi Max (degree)<br>Antenna.Azi Min (degree)<br>Antenna.Azi Range (+/-degree) | Current antenna azimuth (sample, maximum and minimum value, range) for the sampling interval. See Figure 6-30: <i>Statistics — how to read data for a range.</i> |
| Antenna.Ele (+/-degree)<br>Antenna.Ele Max (+/-degree)<br>Antenna.Ele Min (+/-degree)                         | Current antenna elevation (sample, maximum and minimum value) for the sampling interval.   |
| Vsat.rx_lo_freq (GHz)<br>Vsat.tx_lo_freq (GHz)  | Rx frequency of VSAT modem for this record.<br>Tx frequency of VSAT modem for this record.   |
| Tracking.rf_freq (GHz)<br>Tracking.type   | Tracking RF frequency for this record.<br>Narrow filter, DVB-S2 decoder and VSAT modem RSSI.   |
| Sat.long (degree)   | Longitude position of the satellite.   |

Table 6-16: Parameters recorded in a statistics report

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

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

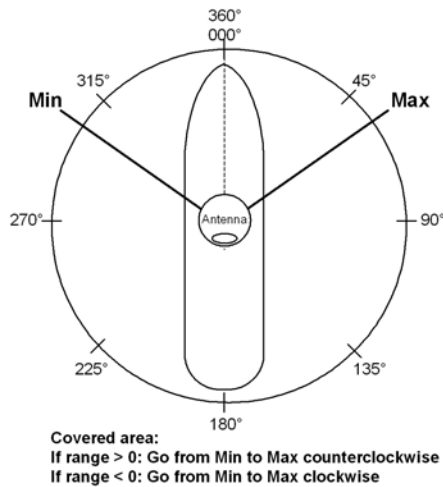


Figure 6-30: Statistics — how to read data for a range

### 6.3.6.1 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.

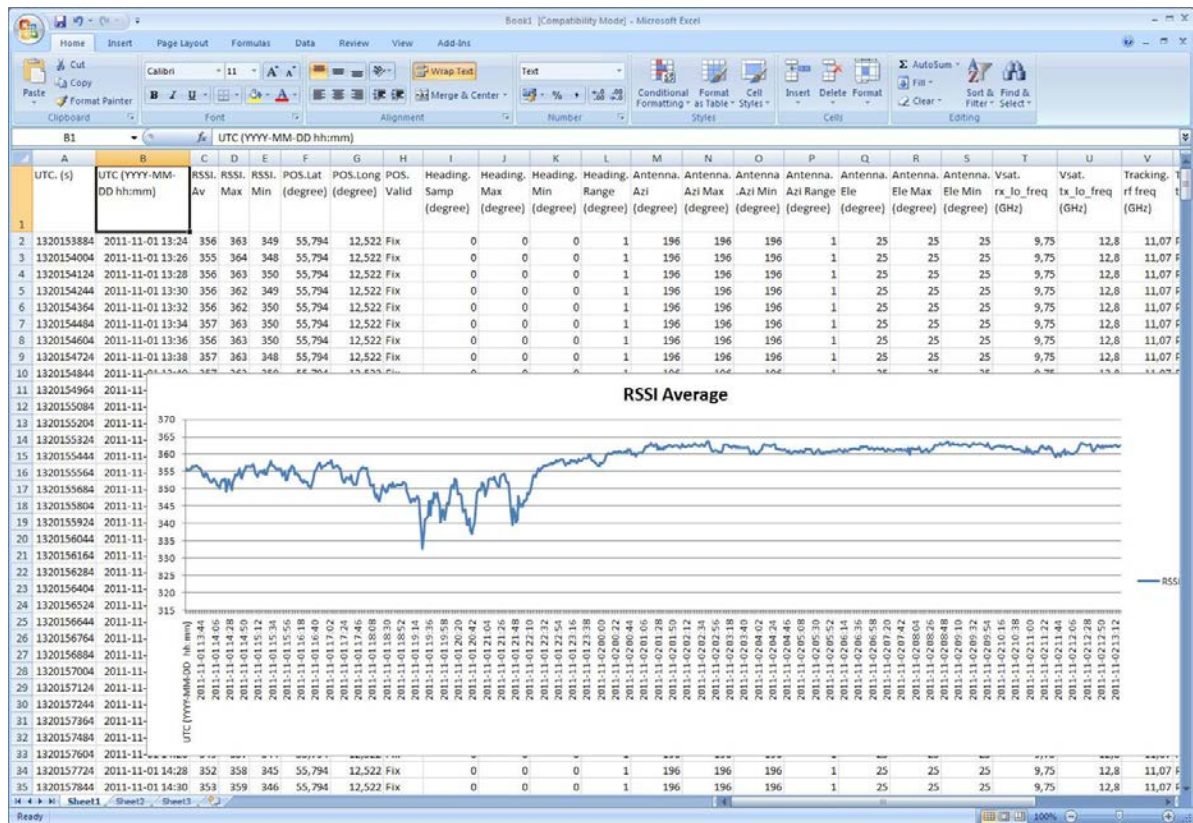


Figure 6-31: Statistics report (example)

### 6.3.7 To send a diagnostics report

You can send automatically generated diagnostic reports at fixed intervals. The diagnostic report contains information relevant for the service personnel during troubleshooting.

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

1. Go to **SETTINGS > Reports**.
2. In the section **DIAGNOSTICS 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.
3. Click **Apply**.

To generate a diagnostic report, click **Send now** or go to the page **HELPDESK** and click **Download** to download it directly to your computer. See also *Download of a diagnostic report or a statistics report* on page 8-2.

### 6.3.8 Dual antenna mode (optional)

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

- To configure the Master ACU
- To configure the Slave ACU
- Blocking zone setup
- Line up and commissioning

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

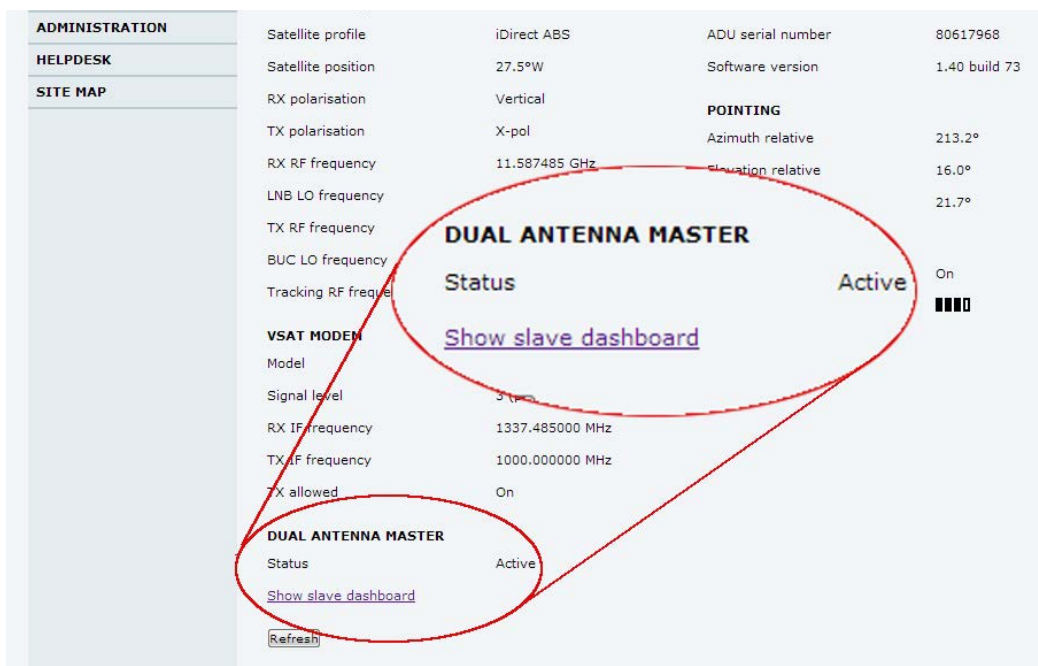


Figure 6-32: Dual-antenna mode, link on DASHBOARD

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

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

In the statistics report you can get more detailed information on the dual-antenna mode, see also Table 6-16 on page 6-39.

#### 6.3.8.1 To configure the Master ACU

The Master ACU is configured exactly the same way as a stand-alone SAILOR 800/900 VSAT system with satellite profiles and VSAT modem profiles. Do as follows:

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

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

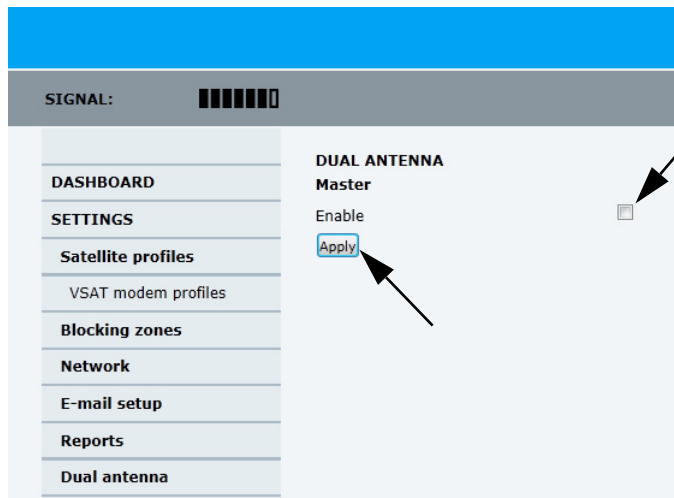


Figure 6-33: Enabling dual-antenna mode in Master ACU

The SAILOR 800/900 VSAT is now ready to act as Master ACU.

### 6.3.8.2 To configure the Slave ACU

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

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

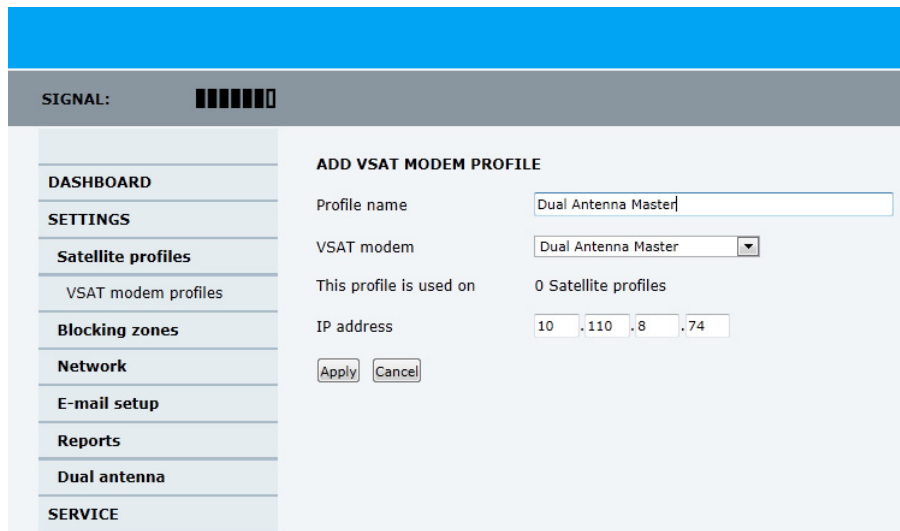


Figure 6-34: Dual-antenna mode, add Slave modem profile

2. Enter the profile name, for example **Dual Antenna Master**.
3. As VSAT modem select **Dual Antenna Master**.
4. IP address: this is the IP address of the LAN connector at the Master ACU. See *To configure the LAN network* on page 6-34.

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

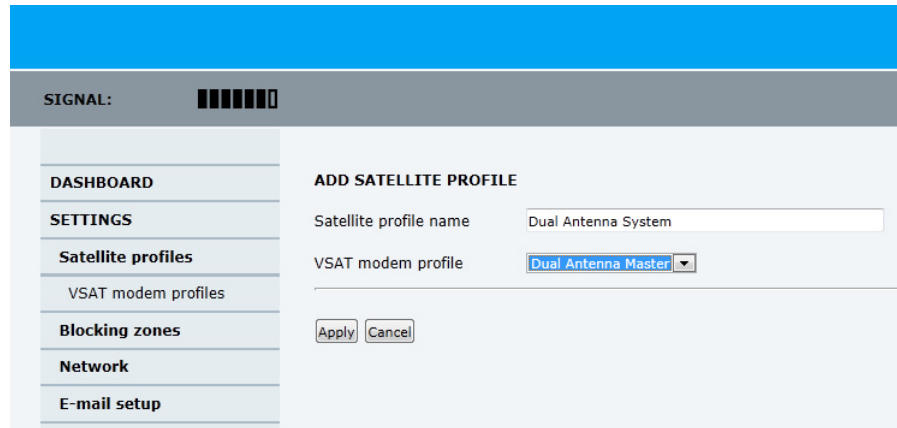


Figure 6-35: Dual-antenna mode, add Slave satellite profile

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

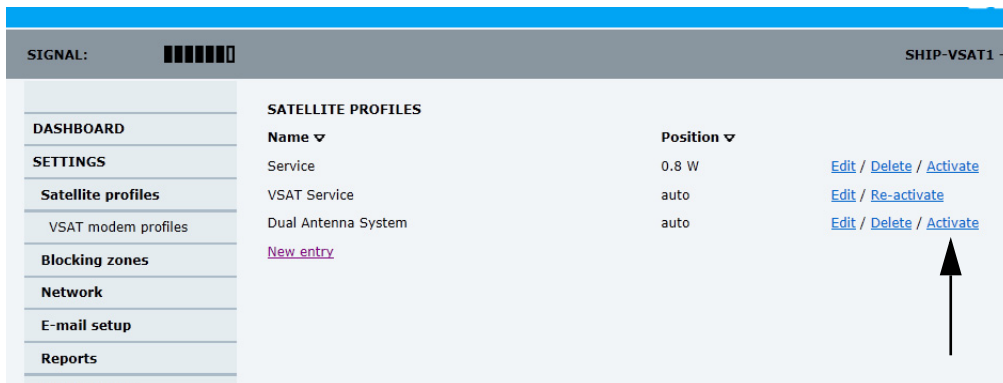


Figure 6-36: Dual-antenna mode, Activate



### 6.3.8.3 Blocking zone setup

It is recommended to define the following 3 blocking zones in each SAILOR 800/900 VSAT system:

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

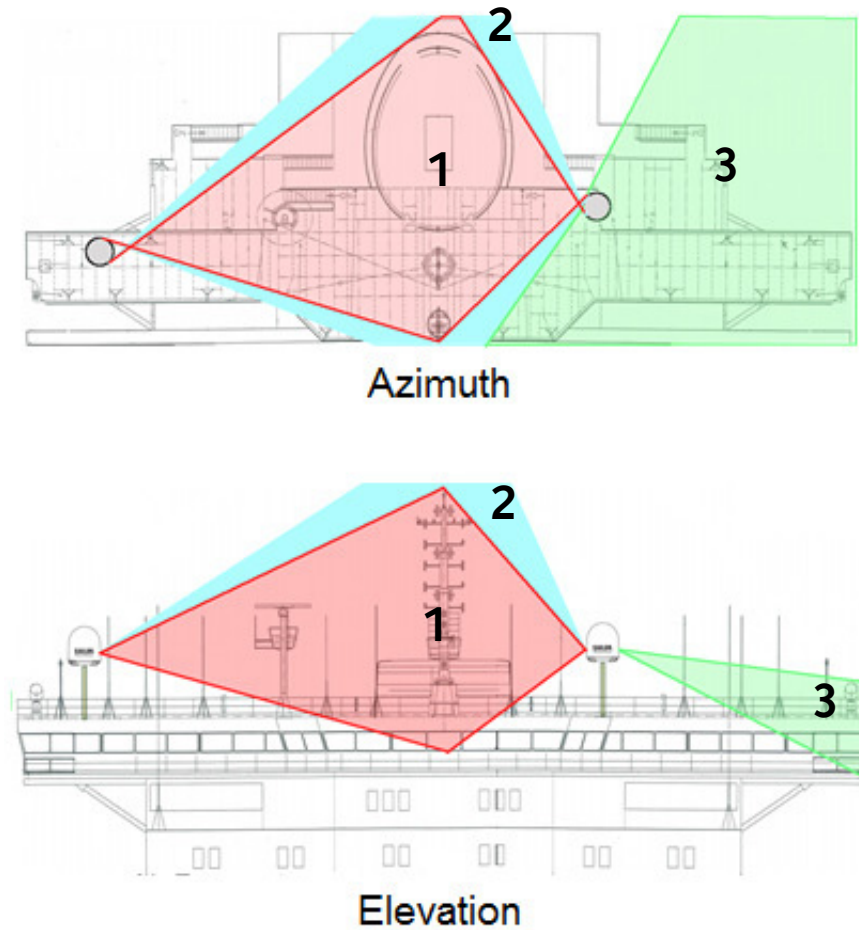


Figure 6-37: Dual-antenna mode, blocking zones — azimuth and elevation

For instructions how to set up blocking zones see *To set up blocking zones (RX and TX)* on page 6-32.

### 6.3.8.4 Line up and commissioning

The SAILOR 800/900 VSAT antenna systems must be lined up and commissioned one by one. The lineup procedure is done for each antenna as it would have been done for a single antenna system. In order to be able to do the lineup for each antenna you must force the dual system to use one or the other antenna at a time. Do as follows:

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

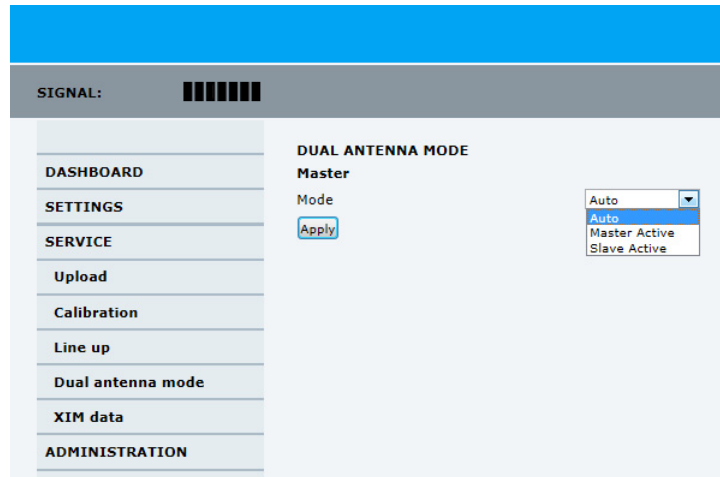


Figure 6-38: Dual-antenna mode, line up

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

### 6.3.9 Upload

For uploading new software to the SAILOR 800/900 VSAT see *Software update* on page 8-4.

### 6.3.10 Administration

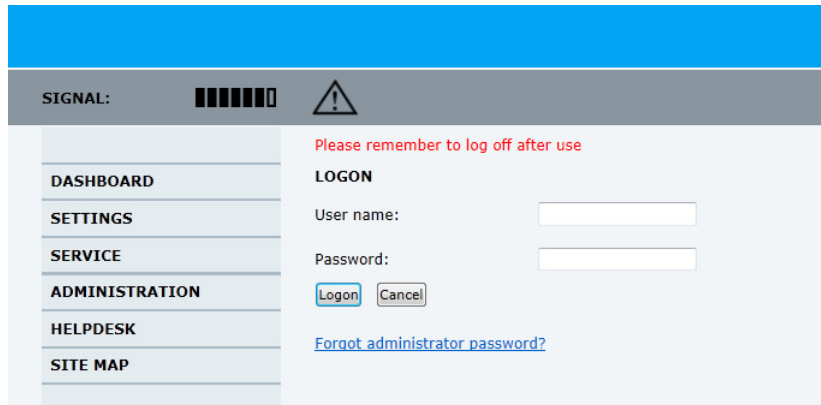
In this section of the web interface you can configure the following administrative settings:

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

### 6.3.10.1 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**.



The screenshot shows the Administration page of a web interface. At the top, there is a blue header bar. Below it, a grey bar contains a 'SIGNAL:' indicator with five bars and a warning triangle icon. The main content area is divided into two columns. The left column is a navigation menu with the following items: DASHBOARD, SETTINGS, SERVICE, ADMINISTRATION (highlighted), HELPDESK, and SITE MAP. The right column contains a red warning message: 'Please remember to log off after use'. Below this is the 'LOGON' section, which includes 'User name:' and 'Password:' labels, each followed by a text input field. There are 'Logon' and 'Cancel' buttons below the password field. At the bottom of the logon section is a blue link: 'Forgot administrator password?'.

Figure 6-39: Web interface: Administration

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

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

**To change the administrator password, do as follows:**

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

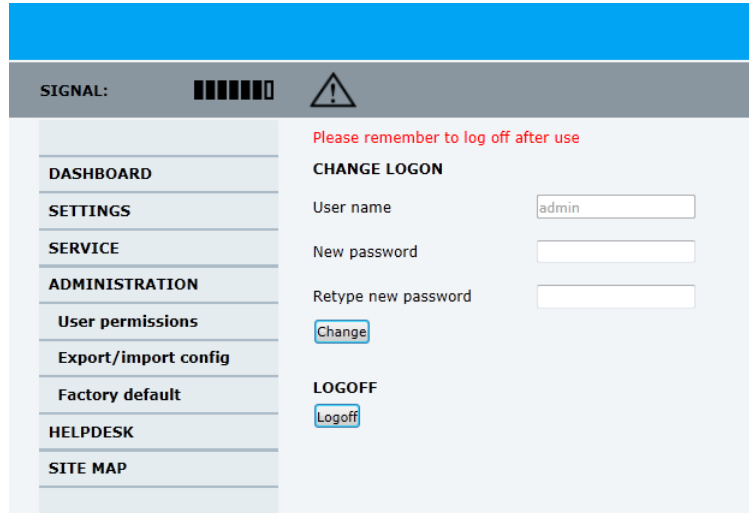


Figure 6-40: Web interface: Administration, change administrator logon and password

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, do as follows:**

1. Contact your service partner for a reset code. Report the serial number of the ACU. You find it in the **Dashboard, ACU serial number**.
2. Click the link **Forgot administrator password?** at the bottom of the **ADMINISTRATOR LOGON** page (see Figure 6-39: *Web interface: Administration*).

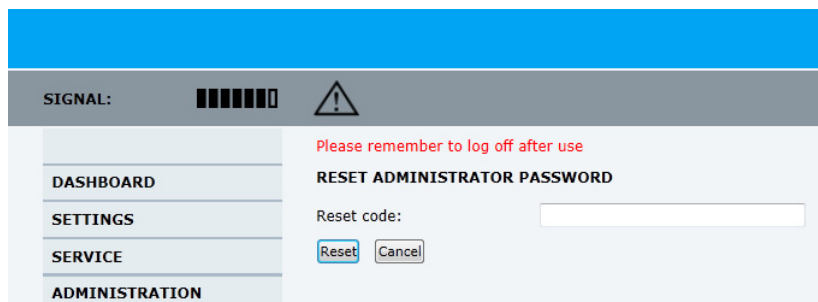


Figure 6-41: Web interface: ADMINISTRATION, Reset administrator password

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

### 6.3.10.2 To log off administration

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

### 6.3.10.3 To set up user permissions

You can manage user access to certain functions of the SAILOR 800/900 VSAT system. You can allow or deny users that are not administrators access to certain functions and make these pages read-only. This is useful if you want to protect the system against unintended changes or tampering of the system.

#### Important

Study this screen thoroughly and decide which areas of the SAILOR 800/900 VSAT system you want to give non-administrator users access to.

To set up the user permissions, do as follows:

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

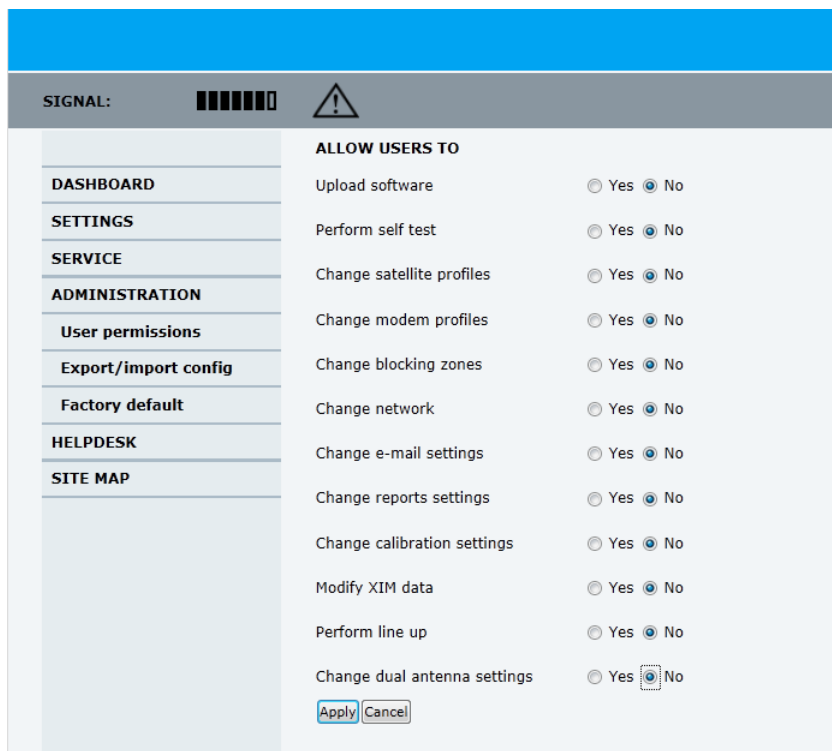


Figure 6-42: Web interface: ADMINISTRATION, User permissions

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.

**Change network:** Change IP configuration of the LAN connectors. For further information see *To configure the LAN network* on page 6-34.

**Change email settings:** Change e-mail addresses for sending reports. For further information see *E-mail setup* on page 6-36.

**Modify XIM data:** Only used during service and maintenance. For further information see *Updating VIM/PCM calibration data* on page 8-88.

3. Click **Apply**.

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

#### 6.3.10.4 To import and export a system configuration

If you need to reuse a configuration in another SAILOR 800/900 VSAT system, you can save the current configuration to a file, which can then be loaded into another SAILOR 800/900 VSAT. You can also use this feature for backup purposes.

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 800/900 VSAT,

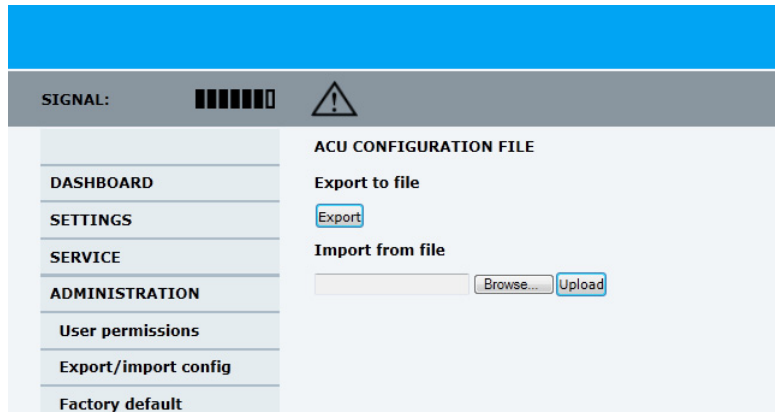


Figure 6-43: Web interface: Administration, Export/import configuration

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

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

To clone a system configuration, do as follows:

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

### 6.3.10.5 To reset to factory default

When resetting SAILOR 800/900 VSAT to factory default, the following settings are deleted:

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

To reset to factory default settings, do as follows:

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

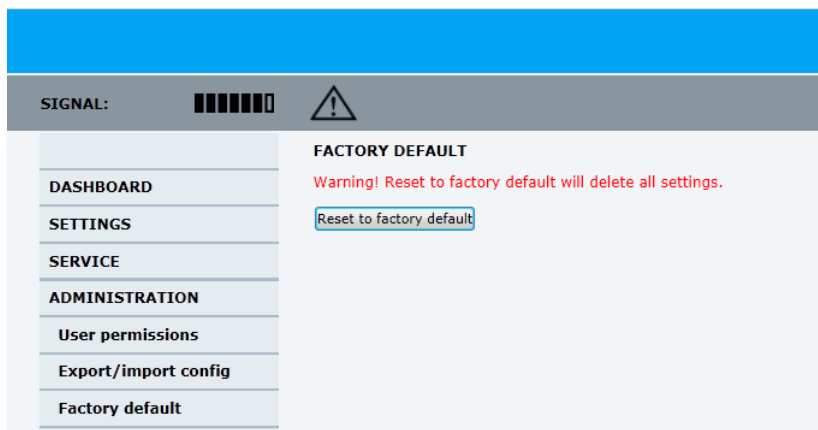


Figure 6-44: Web interface: ADMINISTRATION, Factory default

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

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

## 6.4 Keypad and menus of the ACU

### 6.4.1 ACU display and keypad

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

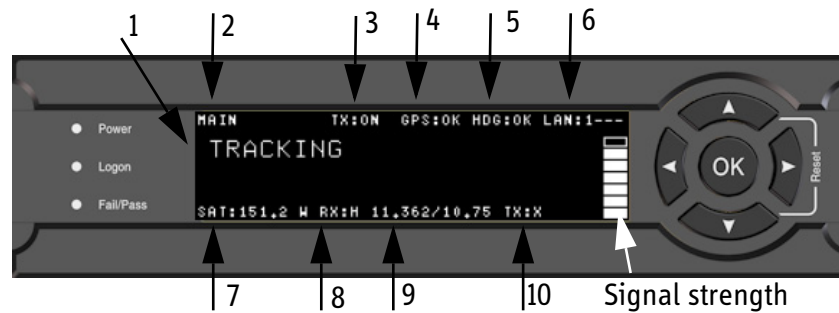


Figure 6-45: Display (example) and keypad of the ACU

1. Current status of the SAILOR 800/900 VSAT:  
**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)  
**BLOCKING ZONE** (Antenna is pointing into a blocking zone)
2. Current menu.
3. TX: Current transmission state, ON or OFF (off when in blocking zone).
4. GPS: GPS signal is received from the GPS module, OK or —.
5. HDG: Ship heading data received from the ship's gyro, OK or —.
6. LAN: LAN connectors used, 1, 2, 3, 4, —.
7. SAT: Satellite position of currently active satellite profile.
8. RX: RX polarisation of currently active satellite profile. H (horizontal), V (vertical), L (left-hand) R (right-hand).
9. RF tracking frequency in GHz and LNB LO Frequency.
10. TX:X TX polarisation of currently active satellite profile. X (Cross polarisation) or Co (Co-pol).

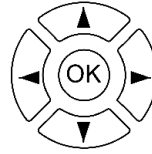
After 1 hour the display is dimmed to lowest intensity. Press any key to light up the display.



## 6.4.2 Navigating the menus

Use the keypad to navigate the menus.

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



## 6.4.3 The menu tree

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

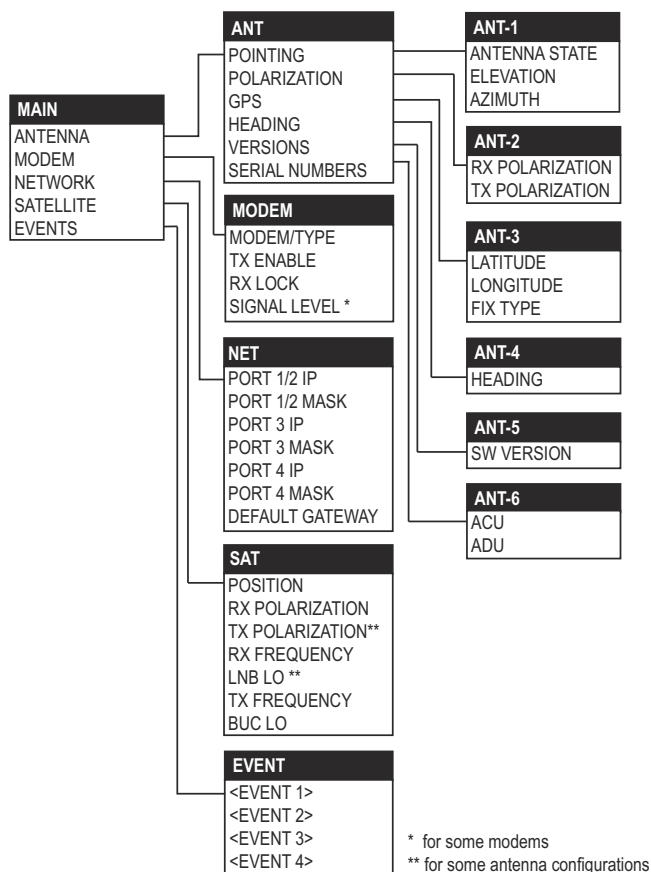


Figure 6-46: Antenna Control Unit, menu tree

### 6.4.3.1 Top-level menu

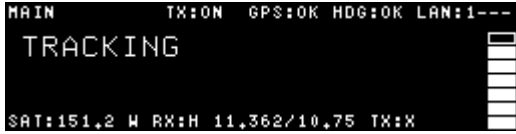
| Top-level menu | Description   |
|----------------|---|
| MAIN           | <p>View with current status of the SAILOR 800/900 VSAT. Example when logged on to the satellite:</p>  <p>MAIN TX:ON GPS:OK HDG:OK LAN:1---</p> <p>TRACKING</p> <p>SAT:151.2 W RX:H 11.362/10.75 TX:X</p> <p>This view is displayed 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        | Shows the current ADU parameters, position, software version and serial numbers of the ADU and ACU.   |
| MODEM          | Selected VMU type and setup, including signal level.  |
| NETWORK        | Shows the IP addresses and netmasks of the LAN connectors of the ACU and the management mask.   |
| SATELLITE      | Current satellite information. This information is entered using the web interface.   |
| EVENTS         | View system events. Active events are shown as: X ACTIVE EVENTS in the <b>MAIN</b> display. Press <b>OK</b> to update the list.   |

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

### 6.4.3.2 Menu descriptions

| ANTENNA menu | Description  |
|--------------|--|
| POINTING     | <p>ANTENNA STATE: Current state of the antenna, e.g. TRACKING</p> <p>ELEVATION: Current elevation angle of the antenna</p> <p>AZIMUTH: Current azimuth of the antenna, with reference to North</p> |
| POLARISATION | <p>RX POLARISATION: HORIZONTAL or VERTICAL, read from connected VSAT modem.</p> <p>TX POLARIZATION: X-POL or Co-POL, read from connected VSAT modem.</p>   |

Table 6-18: ANTENNA menu of the ACU

| ANTENNA menu   | Description  |
|----------------|--|
| GPS            | LATITUDE: current latitude, read from GPS module.<br>LONGITUDE: current longitude, read from GPS module.<br>FIX TYPE: 2D or 3D |
| HEADING        | Ship's heading in degrees with reference to North, provided by the ship's gyro.  |
| VERSIONS       | Current software version.  |
| SERIAL NUMBERS | ACU: ACU serial number;<br>ADU: Serial number of the antenna   |

Table 6-18: ANTENNA menu of the ACU (Continued)

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

Table 6-19: MODEM menu of the ACU

| NETWORK menu | Description   |
|--------------|---|
| PORT 1/2 IP  | Current IP address for LAN 1 and LAN 2.   |
| MASK 1/2     | Current netmask for LAN 1 and LAN 2.  |
| PORT 3 IP    | (LAN 3) Current IP address of the SAILOR 800/900 VSAT web interface (default: 192.168.0.1). |
| MASK 3       | (LAN 3) Current netmask of the SAILOR 800/900 VSAT web interface (default: 255.255.255.0).  |
| PORT 4 IP    | Current IP address for LAN 4.   |
| MASK 4       | Current netmask for LAN 4.  |

Table 6-20: NETWORK menu of the ACU

| NETWORK menu    | Description              |
|-----------------|--------------------------|
| DEFAULT GATEWAY | Current default gateway. |

Table 6-20: NETWORK menu of the ACU (Continued)

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

Table 6-21: SATELLITE menu of the ACU

| EVENT menu | Description   |
|------------|---|
| <EVENT>    | <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 to &gt; to see the remaining text.</p> |

Table 6-22: EVENTS menu of the ACU

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

## 6.4.4 Adjusting brightness of the display

To adjust the brightness do the following:

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

## 6.4.5 Resetting the system

To reset the system do the following:

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



Figure 6-47: Reset the system

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

## 6.5 SNMP support

The SAILOR 800/900 VSAT 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 800/900 VSAT 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 800/900 VSAT MIB file.

The MIB entries are grouped as shown below:

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

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

You can acquire 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

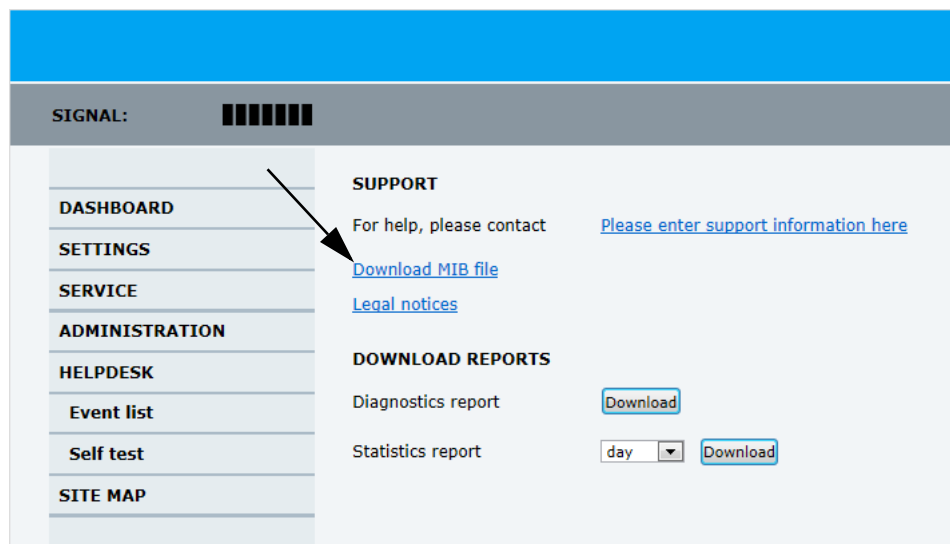


Figure 6-48: Download of MIB file

computer.

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, 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 3-24.   |      |
| 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 – azimuth and elevation</i> on page 3-5<br>and<br><i>To set up blocking zones (RX and TX)</i> on page 6-32. |      |
| 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 3-8.  |      |

Table 7-1: Installation check list: Antenna

| Step | Task   | Further information   | Done |
|------|--|---|------|
| 8.   | Make sure that the requirements for mast foundation and height, including flatness, gusset plates and distance from welding seams are met. | See <i>ADU mast design: Foundation and height</i> on page 3-9.                                      |      |
| 9.   | Make sure that the distances to radar, Inmarsat systems, GPS receivers and other transmitters are as required.                             | See <i>Interference</i> on page 3-17.   |      |
| 10.  | Make sure that the drain tube is open and risk for water intrusion is at a minimum.  | See <i>Other precautions</i> on page 3-20.  |      |
| 11.  | Check that the ADU is grounded correctly, using the mounting bolts.  | See <i>To ground the ADU</i> on page 3-32<br>and<br><i>Grounding and RF protection</i> on page F-1. |      |

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



## 7.2 Installation check list: ACU, connectors and wiring

| Step | Task   | Verification and further information  | Done |
|------|--|---|------|
| 1.   | Check that the ACU is grounded correctly, using the mounting bolts and washers.                                    | See <i>To ground the ACU</i> on page 3-36<br>and<br><i>Grounding and RF protection</i> on page F-1. |      |
| 2.   | Make sure you strain relieved the cables.  | See <i>To install the ACU</i> on page 3-35.   |      |
| 3.   | Make sure that the VSAT modem is mounted close to the ACU.   | See <i>General mounting considerations — VMU</i> on page 3-36.                                      |      |
| 4.   | Check that the ADU antenna N-connector is properly connected with the 50 Ohm RF cable.                             | Visual inspection of the cover plate at the bottom of the ADU.                                      |      |
| 5.   | Check that the ACU antenna N-connector is properly connected with the 50 ohm RF cable.                             | Visual inspection of the connector panel of the ACU.  |      |
| 6.   | Check that the ACU's <b>Rx Out</b> is connected to the VSAT modem's Rx in using the included 1 m F-F 75 ohm cable. | Visual inspection of the connector panel of the ACU and the VSAT modem.                             |      |
| 7.   | Check that the ACU's <b>Tx In</b> is connected to the VSAT modem's Tx out using the included 1 m F-F 75 ohm cable. | Visual inspection of the connector panel of the ACU and the VSAT modem.                             |      |

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

| Step | Task   | Verification and further information  | Done |
|------|--|---|------|
| 8.   | <p>Check connection of the VSAT modem:</p> <p><b>COMTECH only!</b> Check that the ACU RS-232 port is connected to the Remote Control port and Alarm port of the VMU using the serial cable (specifications in <i>Modem Cable COMTECH Serial &amp; RSSI TT7016A</i> on page B-2).</p> <p><b>iDirect iFINITI Series/ Evolution only!</b> Check that the ACU RS-232 port is connected to the Console port of the VMU using the included serial cable.</p> <p><b>iDirect iFINITY Series only!</b> Check that the ACU LAN port 1 is connected to the LAN B of the VMU using the included CAT5 Ethernet cable.</p> <p><b>iDirect Evolution only!</b> Check that the ACU LAN port 1 is connected to the LAN of the VMU using the included CAT5 Ethernet cable.</p> <p><b>STM SatLink 2900:</b> Check that the ACU LAN port 1 is connected to the LAN of the VMU using the included CAT5 Ethernet cable.</p> <p><b>Gilat SkyEdge II VSAT modem:</b> Check that the ACU RS-232 port is connected to the SERIAL port of the VMU using the included serial cable.</p> | <p>Visual inspection of the connector panel of the ACU and the VSAT modem. See also:</p> <p><i>COMTECH 570L and ROSS box</i> on page C-18</p> <p><i>OpenAMIP setup for iDirect iFINITI &amp; Evolution</i> on page C-4</p> <p><i>OpenAMIP setup for iDirect iFINITY &amp; Evolution</i> on page C-4</p> <p><i>STM SatLink 2900 VSAT modem</i> on page C-23</p> <p><i>Gilat SkyEdge II VSAT modem</i> on page C-26</p> |      |
| 9.   | <p>Check that the ADU's NMEA 0183 connector is connected to the NMEA 0183 bus of the vessel using the included multi-connector</p>   | <p>Visual inspection of the connector panel of the ACU connector.</p>   |      |
| 10.  | <p>Measure that the power has the correct polarity in the power connector, before connecting it to the ACU power input. (<math>V_{in+}</math>: left, <math>V_{in-}</math>: right).</p>   | <p>Use a volt meter. See Table 4-1: <i>DC Input plug, outline and pin assignment</i> on page 4-2.</p>   |      |

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

## 7.3 Installation check list: Functional test in harbor

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

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



# Service & maintenance

In this chapter you find the following sections:

- *Getting support: Helpdesk*
- *Software update*
- *Status signalling with LEDs and status messages*
- *Removal and replacement of the ACU*
- *Removal and replacement of ADU modules*
  - *Replacing the GPS module*
  - *Replacing the VSAT Interface Module (VIM)*
  - *Replacing the DC-Motor Driver Module (DDM)*
  - *Replacing the Polarisation Motor Module (PMM)*
  - *Replacing the Pedestal Control Module (PCM)*
  - *Replacing motor and encoder*
  - *Replacing the Drive Belts*
  - *Replacing the Zero Reference Module (ZRM)*
  - *Replacing the Inertial Sensor Module (ISM)*
  - *Replacing the Polarisation Unit*
  - *Replacing the BUC Fan*
  - *Replacing the Block Up Converter (BUC)*
  - *Replacing the Low Noise Block down converter (LNB)*
  - *Replacing the Ortho Mode Transducer (OMT)*
  - *Replacing the rotary joint*
  - *Replacing a wire-rope isolator*
- *Inspection of mechanical components*
- *Troubleshooting*
- *Returning units for repair*

## 8.1 Getting support: Helpdesk

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

### 8.1.1 Help desk and diagnostic report

#### 8.1.1.1 Support at the Help desk

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

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

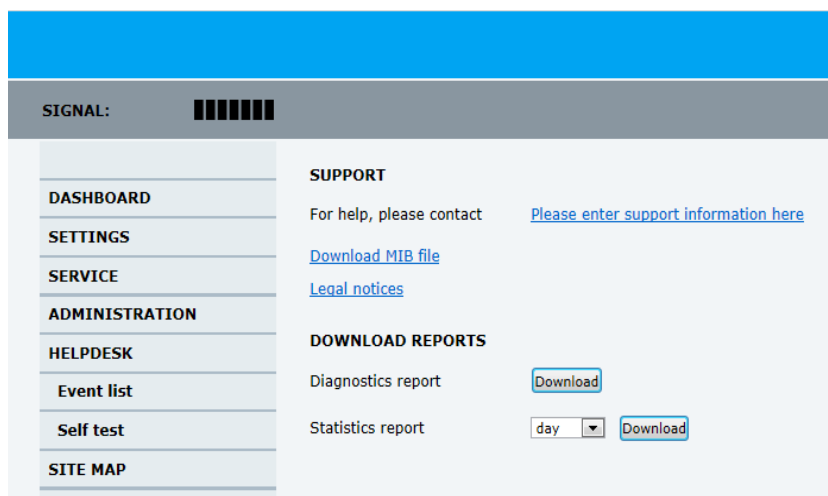


Figure 8-1: Web interface: HELPDESK

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

You can download the MIB file.

At Legal notice the licence text for the source code of the parts of the SAILOR 800/900 VSAT software that falls under free and open source software can be displayed.

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

#### 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
- Modems - Modem profiles
- Satellites - Satellite profiles
- Operation - Current modem and navigation parameters.
- POST - results of the Power-On-Self-Test
- Active Events - lists the currently active events
- Events - List of all cleared events.
- System log

To generate a diagnostics report 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 6-41.

### 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.

| DASHBOARD      | ACTIVE EVENTS           |         |          |          |  |
|----------------|-------------------------|---------|----------|----------|--|
| SETTINGS       | Time UTC                | ID      | Unit     | Severity | Text                                     |
| SERVICE        | 13:06:32 10 Sep 2012    | 09010-0 | Terminal | ERROR    | KDM link/SW version (00000003)           |
| ADMINISTRATION | 13:06:27 10 Sep 2012    | 08108-0 | Terminal | ERROR    | TX Power Detector calibration (00000000) |
| HELPDESK       | NOTIFICATIONS           |         |          |          |  |
| Event list     | Notification list empty |         |          |          |  |
| Self test      |                         |         |          |          |  |
| SITE MAP       |                         |         |          |          |  |

Figure 8-2: Web interface: HELPDESK, Event list

The **Event list** page shows a detailed list of active events and notifications including the time of the first occurrence, ID and severity of the event message, and a short text describing the error. Active events are cleared from the event list when the error is cleared. They are

moved to the section **Notifications** and are displayed for 24 hours. All entries in the section **Notifications** are cleared automatically after 24 hours and after restart of the system.

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

#### 8..1.1.4 Self test

You can start a self test of the SAILOR 800/900 VSAT ADU and ACU.

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

##### **Important**

Warning! The SAILOR 800/900 VSAT 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 800/900 VSAT ADU and ACU to factory defaults. See *To reset to factory default* on page 6-51.

##### **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.

## 8.2 Software update

### 8.2.1 Hardware and software requirements

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

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

### 8.2.2 Software update (ADU and ACU)

##### **Note**

Software update should only be done by qualified service personnel.

You can update the software in two ways:

- *Software update using the TMA (Thrane Management Application)*



- Software update using the web interface of the ACU

### 8.2.2.1 Software update using the TMA (Thrane Management Application)

1. Download the TMA from Cobham eSupport web site (Self-Service Center, SSC. You find the SSC in the Service and Support section, 24-7 Service). Make sure to use version 1.03 or higher.
2. Make sure that your PC is on the same network as the SAILOR 800/900 VSAT.
3. Power up the SAILOR 800/900 VSAT system, i.e. switch on the ACU. Wait until the SAILOR logo has disappeared from the ACU display.
4. Connect a PC to LAN interface 3 (Service port, standard Ethernet) or the front LAN connector of the ACU.

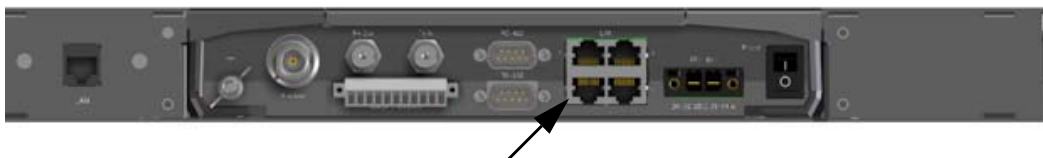


Figure 8-3: LAN connector used for software update (TMA)

5. Start the TMA. The SAILOR 800/900 VSAT is automatically detected. Click the icon for the SAILOR 800/900 VSAT to display the following screen:

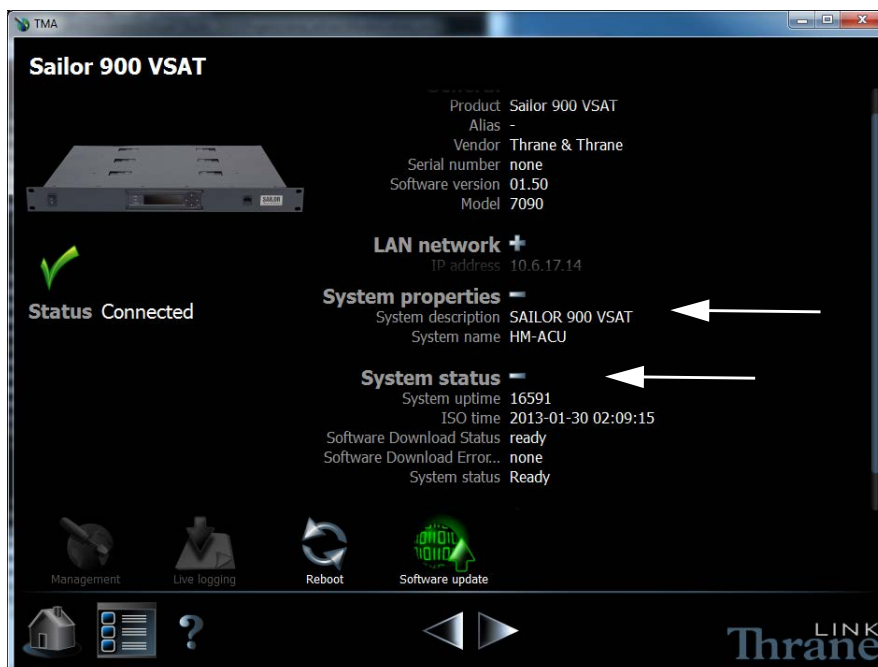


Figure 8-4: SAILOR 800/900 VSAT connected: Software update with the TMA



Figure 8-5: SAILOR 800/900 VSAT connected: Software update with the TMA

The **Software Download Status** must show **Ready**.

6. The icon **Software update** pulsates yellow when a new software version is detected for the SAILOR 800/900 VSAT.  
The TMA searches all devices connected via USB for new software. You can add an additional search path. To do so press the icon **Option** on the software update screen and select **Search for software**. A dialog box is displayed and you can select a directory.
7. To start the software update click the icon **Software update** and select **Update**. The current and the new software version numbers are displayed.  
You can also select a specific software version. To do so press the icon **Option** on the software update screen and select **Select software**. A list of available software versions is displayed. Select one and click the button **Update**.

### 8.2.2.2 Software update using the web interface of the ACU

1. Power up the SAILOR 800/900 VSAT system, i.e. switch on the ACU. Wait until the SAILOR logo has disappeared from the ACU display.
2. Connect a PC to LAN interface 3 (Service port, standard Ethernet) or the front LAN connector of the ACU.

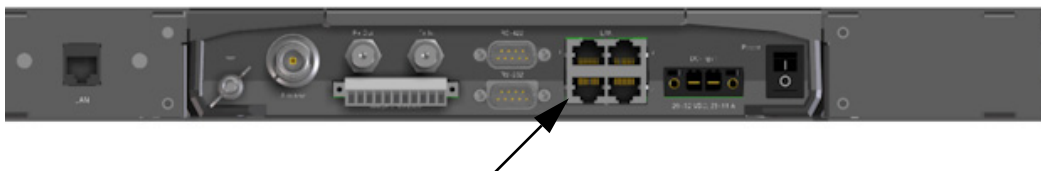


Figure 8-6: LAN connector used for software update (web interface)

3. Open your Internet browser and enter the IP address of the ACU. The IP address is **http://192.168.0.1** (default). For further details on network setup see *To configure the LAN network* on page 6-34.
4. The web interface opens directly with the **DASHBOARD** page.
5. Click **SERVICE** from the left navigation pane. The **Upload** page is displayed.

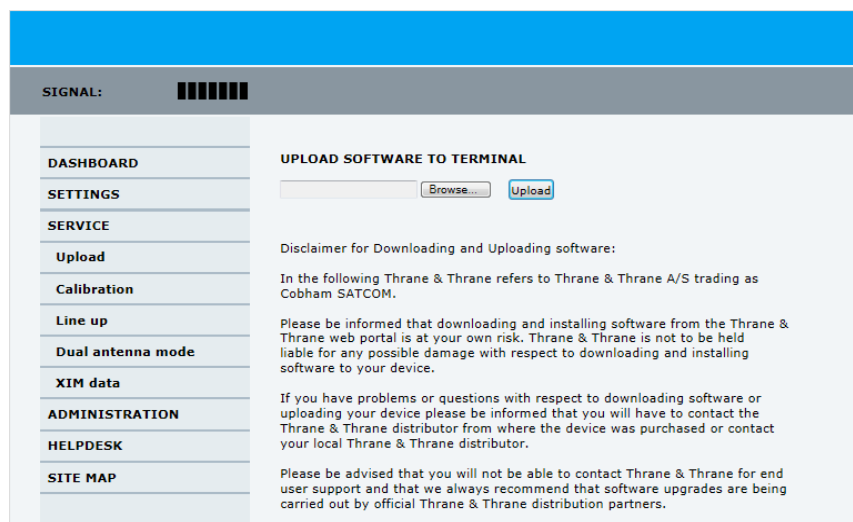


Figure 8-7: Software update with the web interface

6. Click **Browse...** and locate the new software file.
7. Click **Upload**.  
Note that the upload procedure takes a couple of minutes. When done, the ACU automatically restarts with the new software version.

#### Important

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

The start-up procedure after a software upload takes longer than the usual start-up time, as the software in the ADU must also be updated. The ACU display shows: **ADU SW UPLOAD**.

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

To recover from a failed software upload, turn off the ACU and turn it on again. Then repeat the upload procedure as described in *Software update* on page 8-4.

## 8.2.3 To verify the software update

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

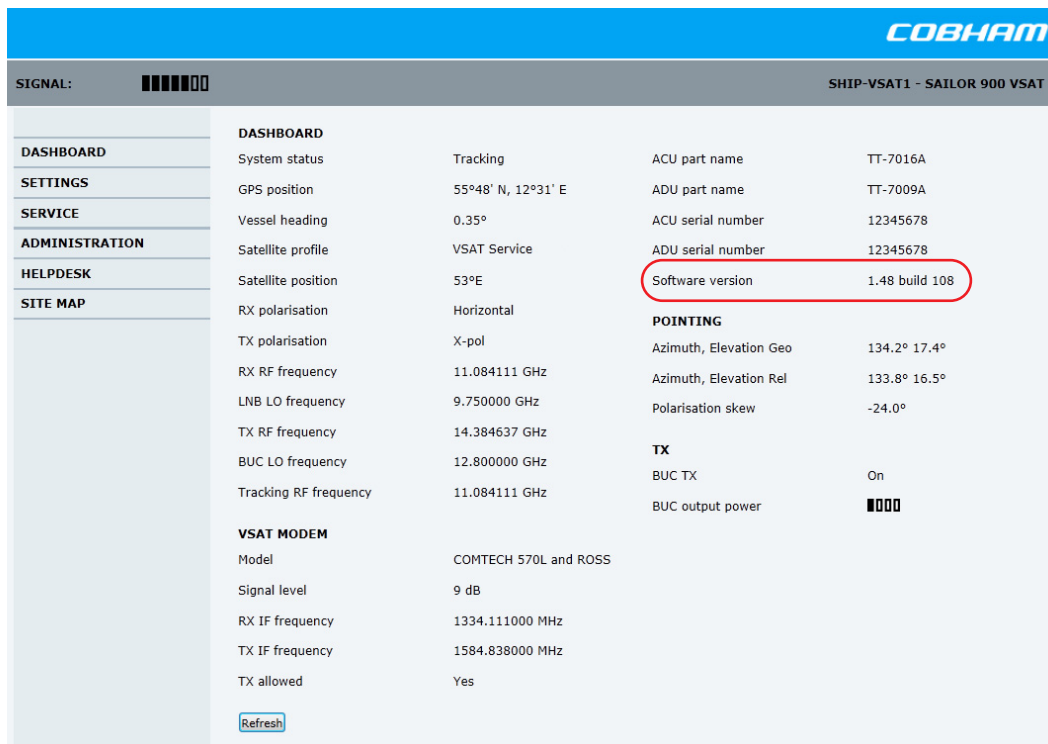


Figure 8-8: Verifying software update, SAILOR 900 VSAT

The screenshot displays the COBHAM SAILOR 800 VSAT dashboard. The top navigation bar includes a signal strength indicator and the text 'SHIP-VSAT1 - SAILOR 800 VSAT'. A left-hand menu lists various sections: DASHBOARD, SETTINGS, SERVICE, ADMINISTRATION, HELPDESK, and SITE MAP. The main content area is divided into several sections:

- DASHBOARD:** A table showing system status, GPS position (55°48' N, 12°31' E), vessel heading (0.17°), satellite profile (VSAT Service), and satellite position (15°W).
- VSAT MODEM:** A table listing modem details such as model (iDirect Evolution (OpenAMIP)), signal level (348 (pwr)), and frequencies.
- POINTING:** A table showing azimuth and elevation for both Geo and Rel, along with polarisation skew.
- TX:** A table indicating BUC TX status (On) and BUC output power.

The 'Software version' field, located under the 'POINTING' section, is circled in red and displays the value '1.48 build 108'. A 'Refresh' button is visible at the bottom of the dashboard area.

Figure 8-9: Verifying software update, SAILOR 800 VSAT

## 8.3 Status signalling with LEDs and status messages

### 8.3.1 Overview

#### 8.3.1.1 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.

#### 8.3.1.2 Means of signalling

The SAILOR 800/900 VSAT 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 G-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

### 8.3.2 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 application           |
|         | Steady red         | Module error or loading error   |

Table 8-1: LEDs of the ADU modules

For a list of modules see *Removal and replacement of ADU modules* on page 8-15.

### 8.3.3 LEDs in the ACU

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



Figure 8-10: LEDs on the ACU

| 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 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.



Figure 8-11: Removal and replacement of the ACU

The ACU consists of three major parts; see the following block diagram.

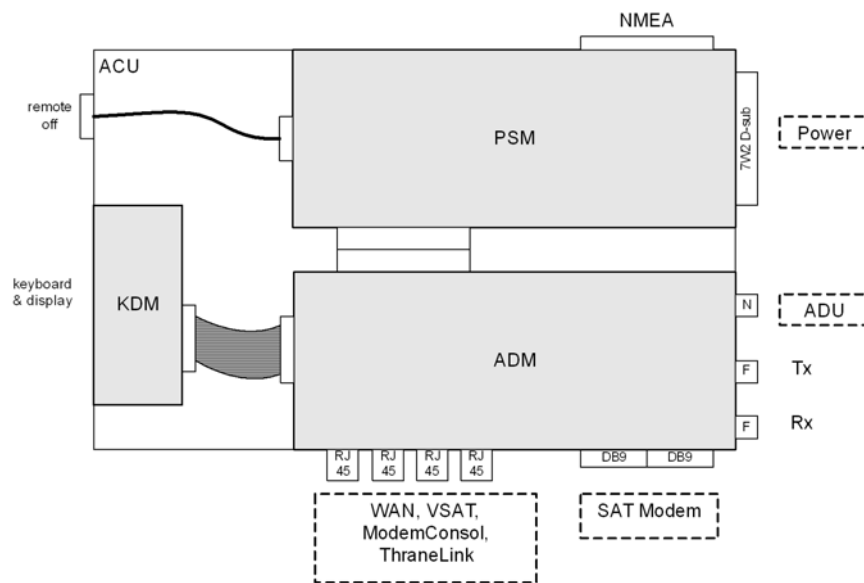


Figure 8-12: ACU – Block diagram 1/2

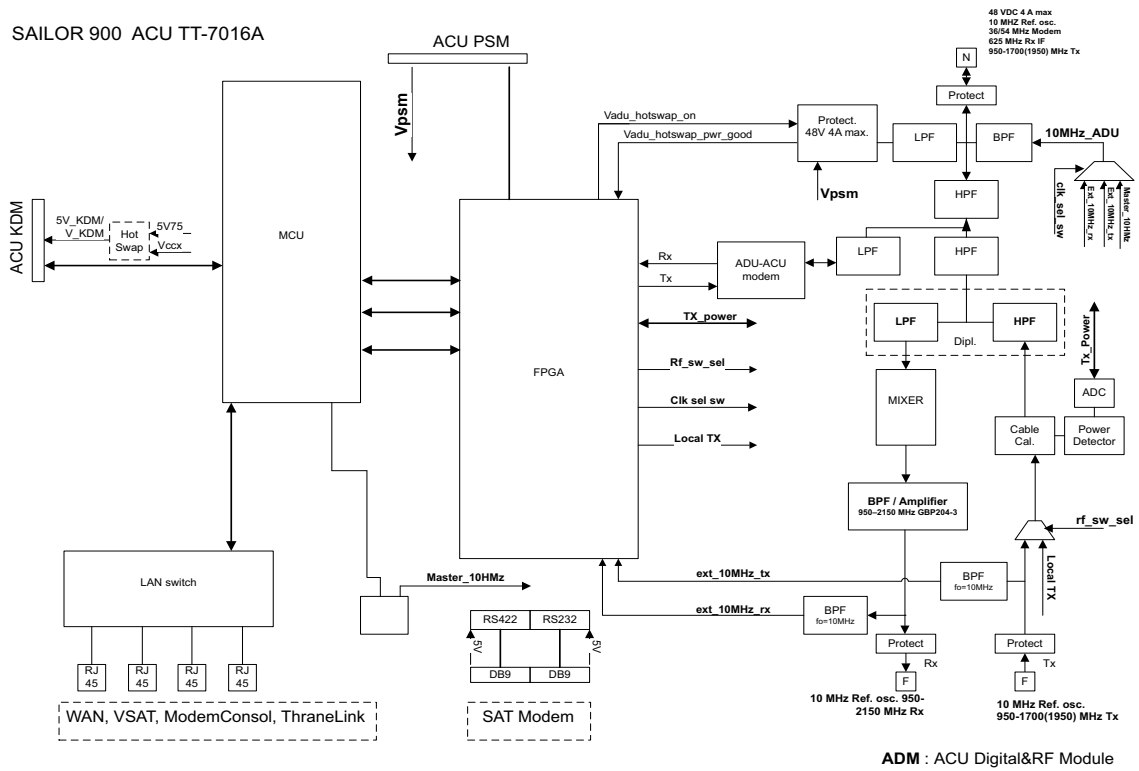


Figure 8-13: ACU – Digital and RF module

- Digital & RF Module (ADM), with processor and external interfaces. RF circuit, including 10 MHz circuits, PLL, mixer (RX signal up converter 625 Mhz to L-band), duplexer, modem and DC feed for the ADU. Local power supply. Modem driver for communication between ACU and ADU. (Speed 115.2 kb/s)
- Keyboard / Display Module (KDM) for front mounting (LEDs included).
- Power supply (DC/DC) with isolation. 18 - 32 VDC input.

## 8.5 Removal and replacement of ADU modules

### 8.5.1 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 on how to open and remove the service hatch see *To open and remove the service hatch* on page 3-30.

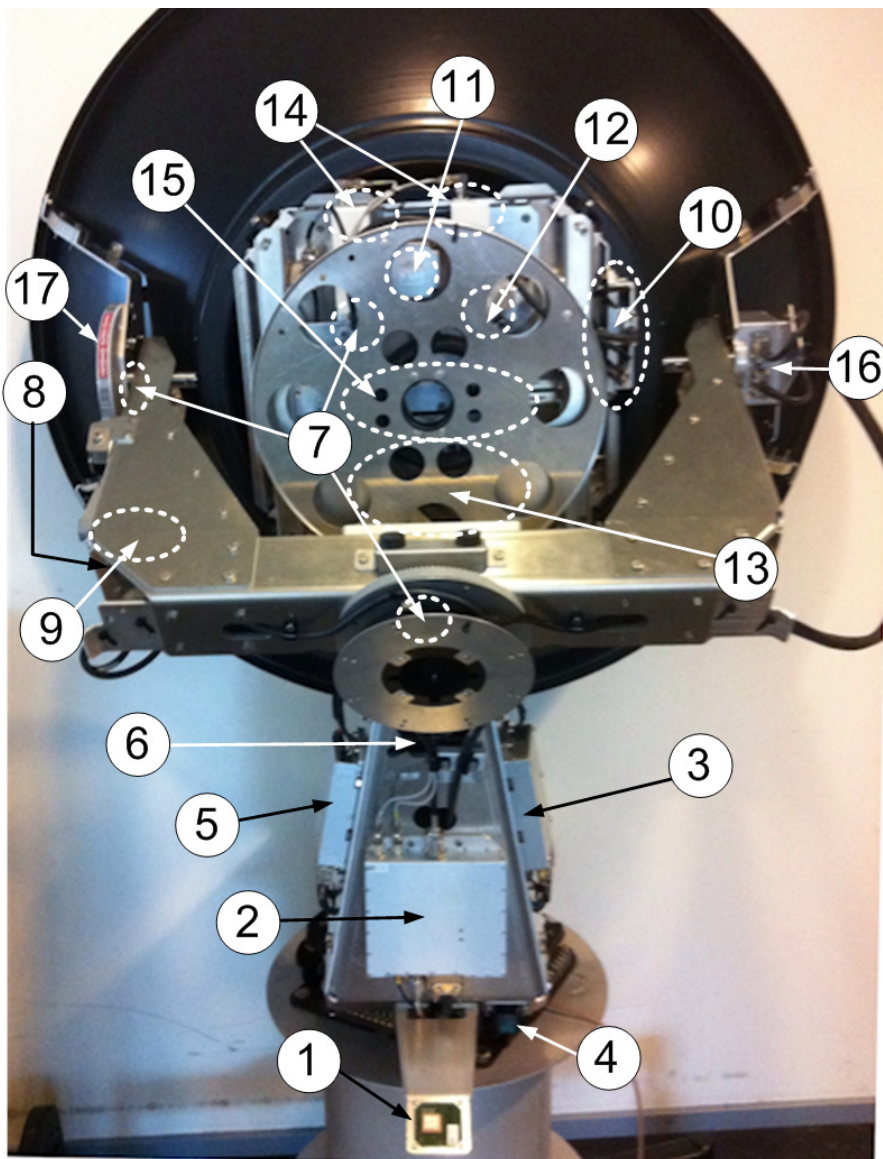


Figure 8-14: SAILOR 900: ADU modules and motor stop switch

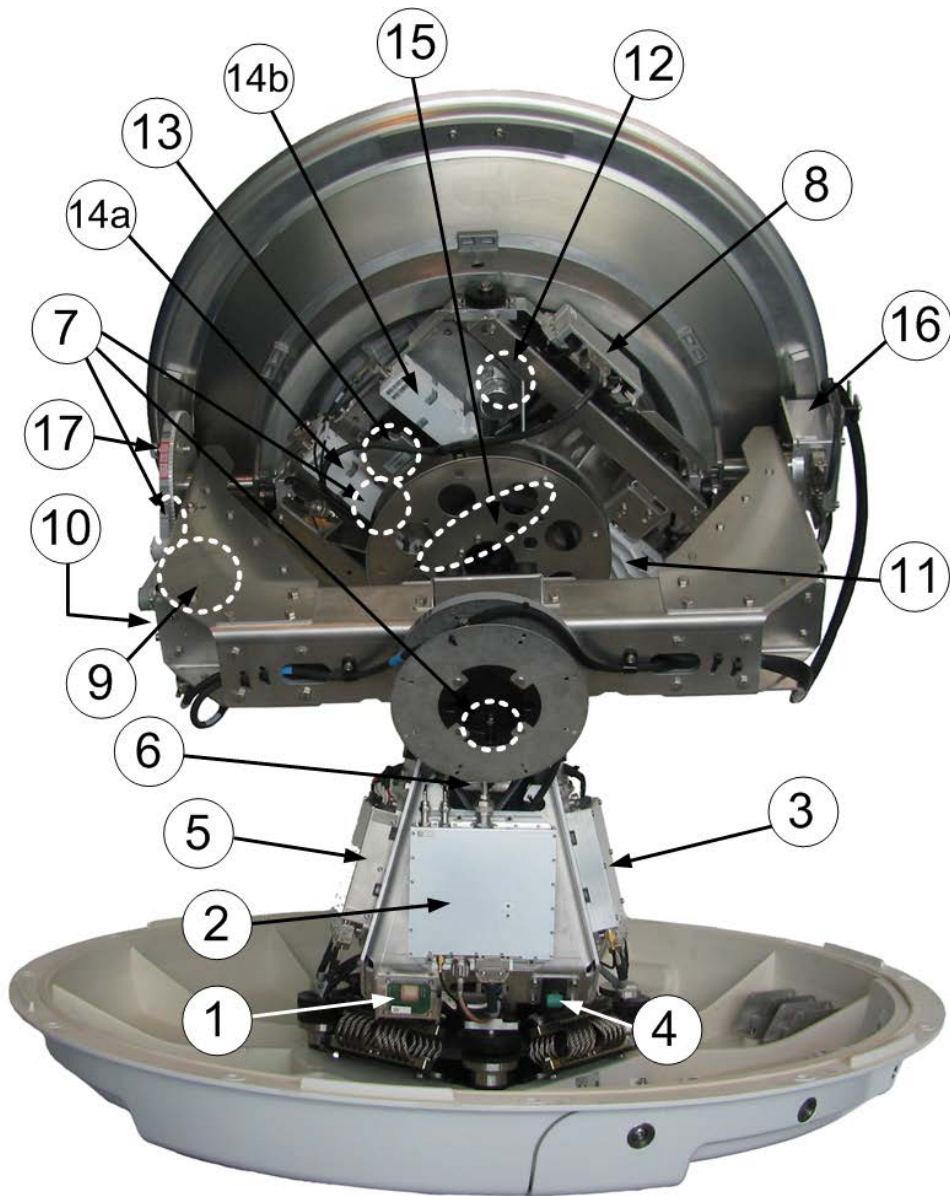
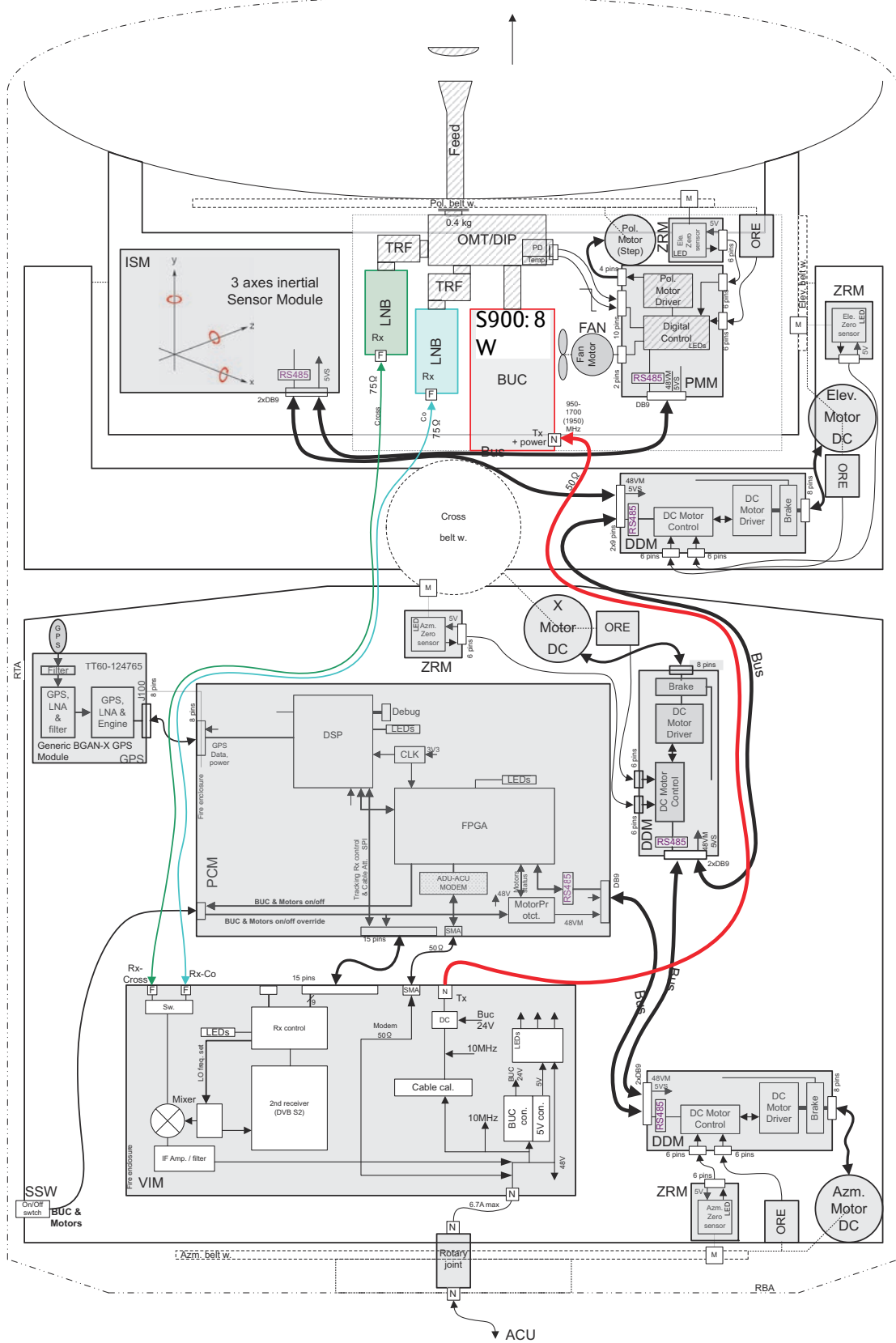


Figure 8-15: SAILOR 800: ADU modules and motor stop switch

### 8.5.2 System block diagram of the ADU.



Service & maintenance

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 (VIM).

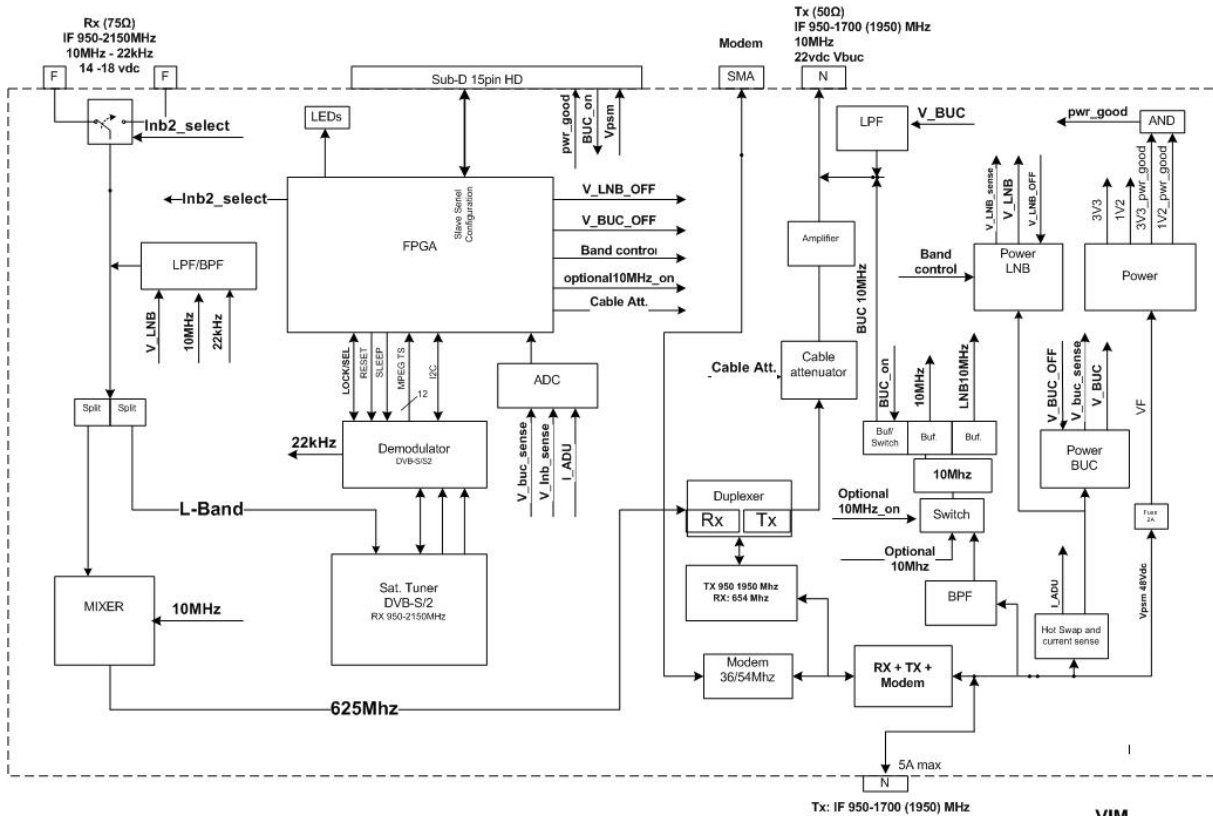


Figure 8-16: VIM – Block diagram

The purpose of the VIM 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 lower frequency and allows the whole L-band transmitter band to be routed to the BUC.

For tracking purpose the VIM has a DVB-S/S2 demodulator for tracking at the TV-satellites. For narrow band signal or non-DVB tracking the VIM also has a power detector as signal strength indicator. The VIM also has PSU for the external LNB and BUC.

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.
- DVB-S/S2 tracking receiver with tuner and demodulator including wide band signal detector and narrow band channel detector.
- LNB Receive signal down 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 transport stream decoding.
- Filters for splitting and combining the DC, modem, received down converted IF from the LNB and the transmit signal to the BUC.

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

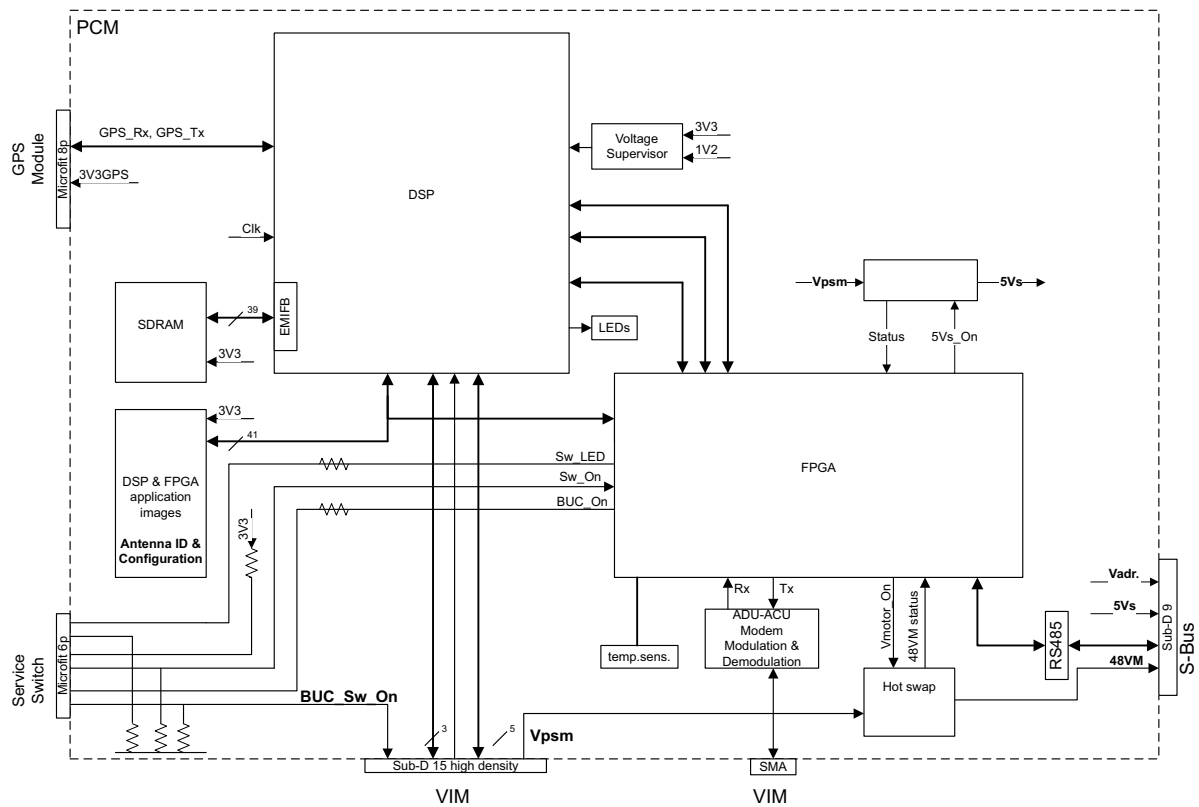


Figure 8-17: PCM – Block diagram

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 — PMM. PMM module contains signal terminations.

4. Service switch.

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



Figure 8-18: Service switch

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

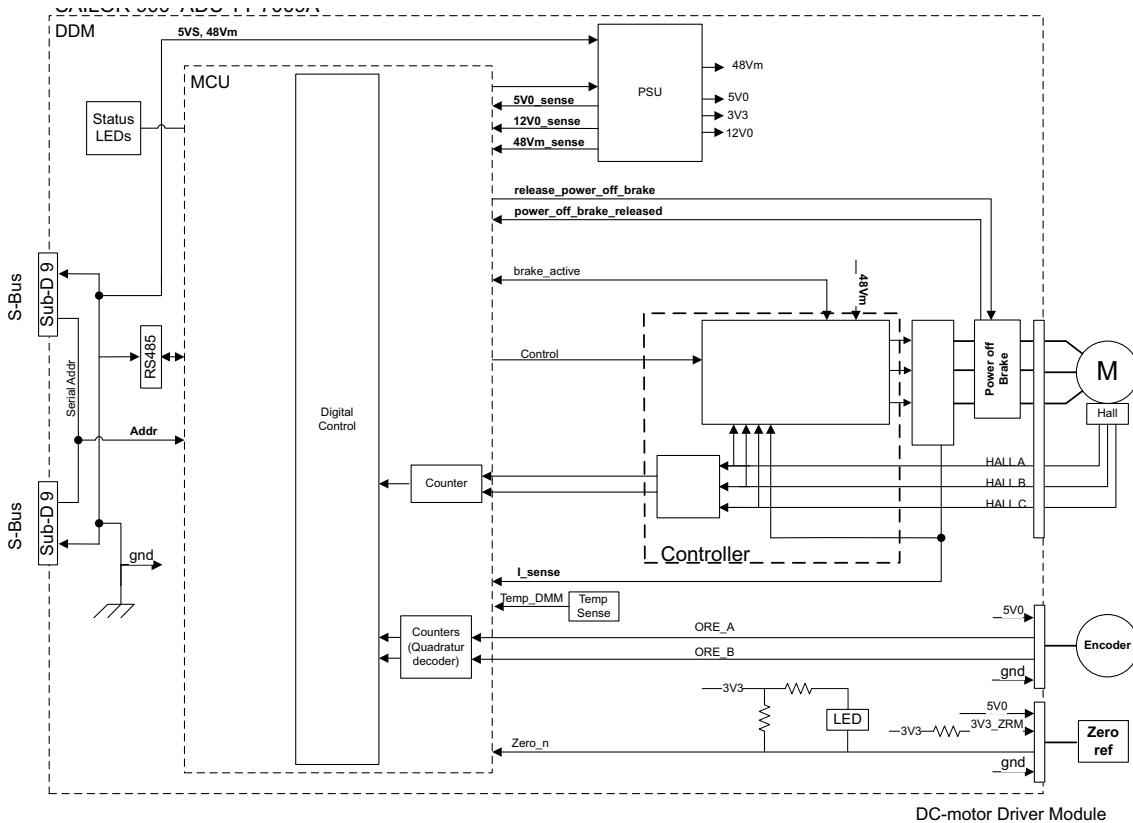


Figure 8-19: DDM – Block diagram



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 Polarization Motor Module (PMM), 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 (x4, 3 in the previous figure, 1 in the next figure) (ZRM) (not visible on photo).

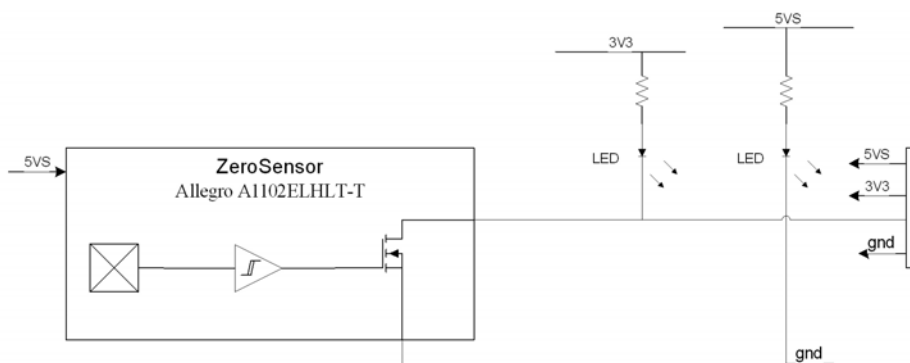


Figure 8-20: ZRM – Block diagram

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 on photo).
10. Polarisation Motor Module (PMM).

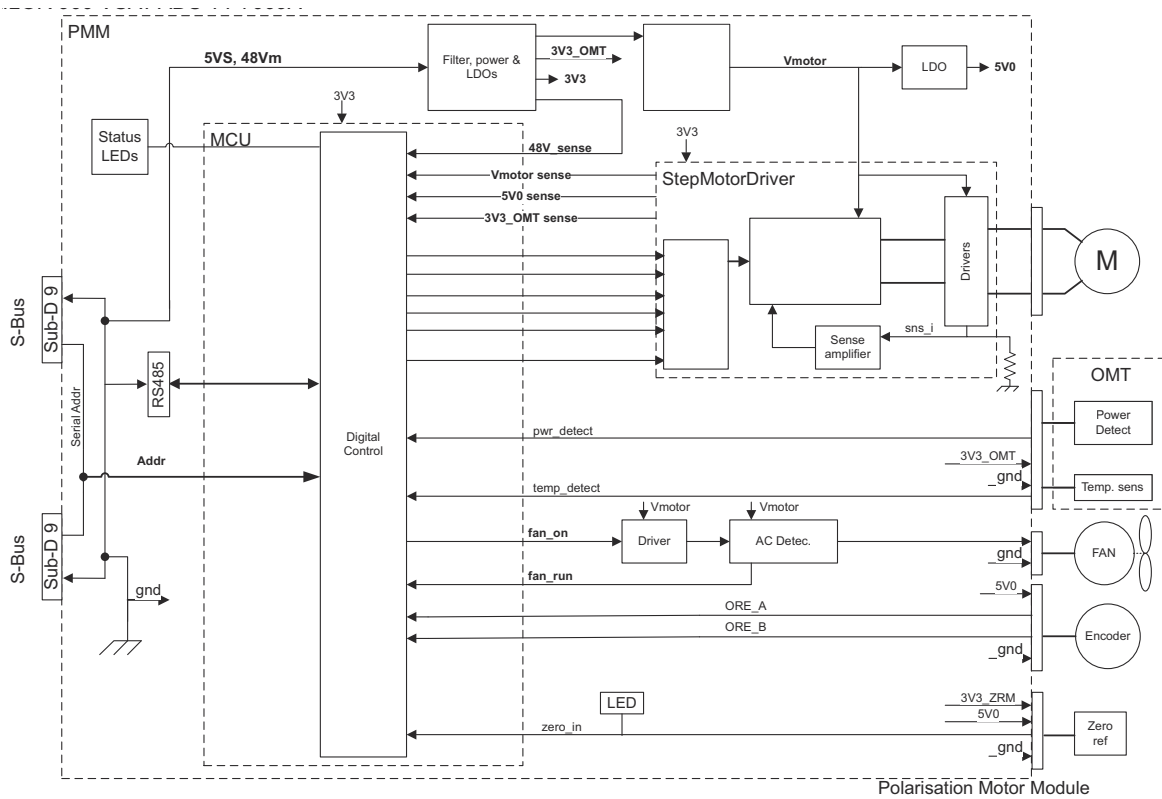


Figure 8-21: PMM – Block diagram

The PMM shall - based on inputs from the PCM - control the angle position of the Polarization Mechanism Assembly (PMA).

The PMM board is:

- Communication slave of the ADU Bus also connecting the DC-motor Driver Modules (DDM), the Inertial Sensor Module (ISM) and the Pedestal Control Module (PCM).
- Driving a stepper motor, with micro stepping capability.
- Motor Filter which filters electrical noise and minimizes acoustic noise.
- Detection of temperature and power level from the Ortho Mode Transducer (OMT).
- Decoding the HALL-sensor input from the Zero Reference Module (ZRM).
- Decoding the input from the Optical Rotation Encoder (ORE).

11.Polarisation motor.

12.Polarisation encoder (not visible on photo).

13.Block Up Converter (BUC). (behind cable screen, not visible on photo)

The BUC converts the L-band (950 to 1700 MHz) Intermediate Frequency (IF) up to Ku-band (13.75-14.50 GHz (extended)) radio signal, and amplifies it to transmit power level. It receives transmit signal and power from VIM.

#### 14. Low Noise Block down converter (x2) (LNB), 14a LNB CO, 14b LNB X.

The LNB receives the Ku-band (10.70-12.75 GHz) radio signal, amplifies it and converts it down to a L-band (950 or 2150 MHz) Intermediate Frequency (IF). The conversion is controlled by 2 Local Oscillator (LO) frequencies and the LO frequency is locked to an external reference signal.

The Ku-band interface is WR75 waveguide and the IF interface is for  
 – variant A: 75 Ohm F-connector  
 – variant B: 50 Ohm SMA connector.

DC power and 10 MHz external reference signal are also supplied over the IF cable. The L-band IF output is routed to the VSAT Interface Module (VIM) located on the ADU's azimuth pedestal.

#### 15. Ortho Mode Transducer (OMT) (behind cable screen, not visible on photo).

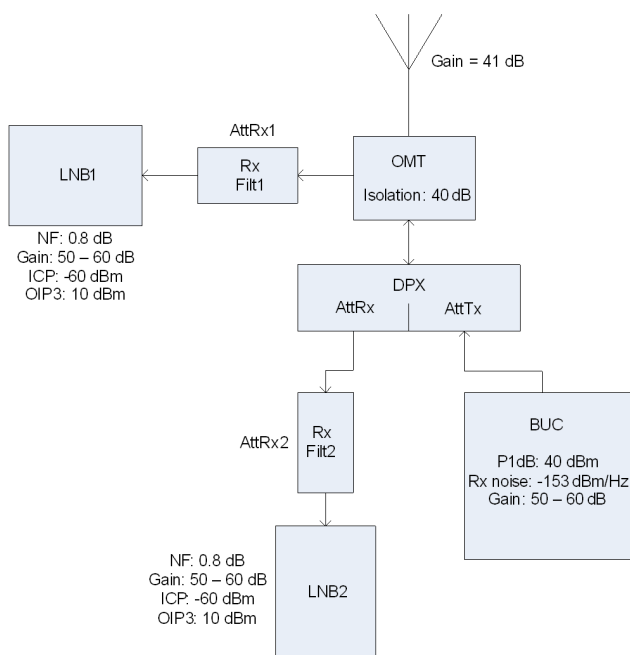


Figure 8-22: OMT – Block diagram

The OMT provides a low-loss waveguide interface between the dual polarised ADU feed-horn and the BUC/LNB. The main purpose of the OMT is to separate transmitter and receiver signals and to provide sufficient isolation between BUC and LNB. The OMT uses the orthogonality of the signals to split and provide isolation. The OMT also detects the BUC output power and temperature.

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

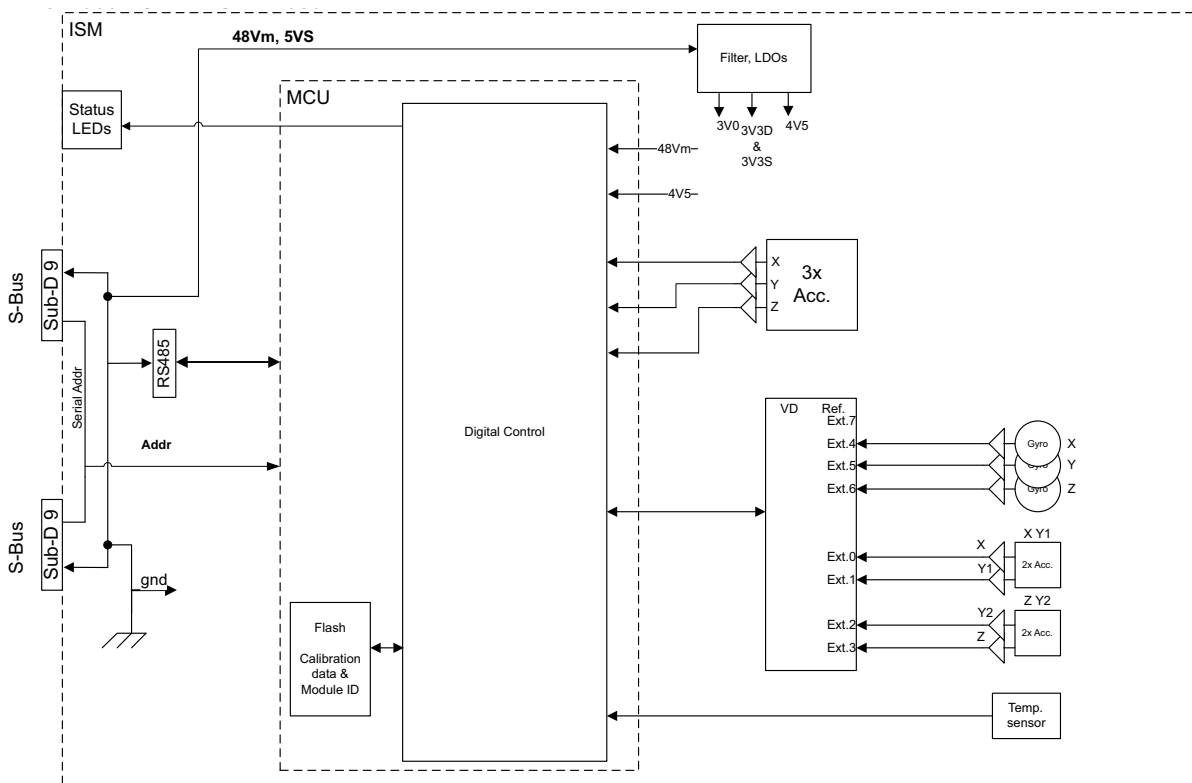


Figure 8-23: ISM – Block diagram

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.

17. Elevation locking pin to lock the antenna dish in a fixed position (for safety during service) (not visible on photo).

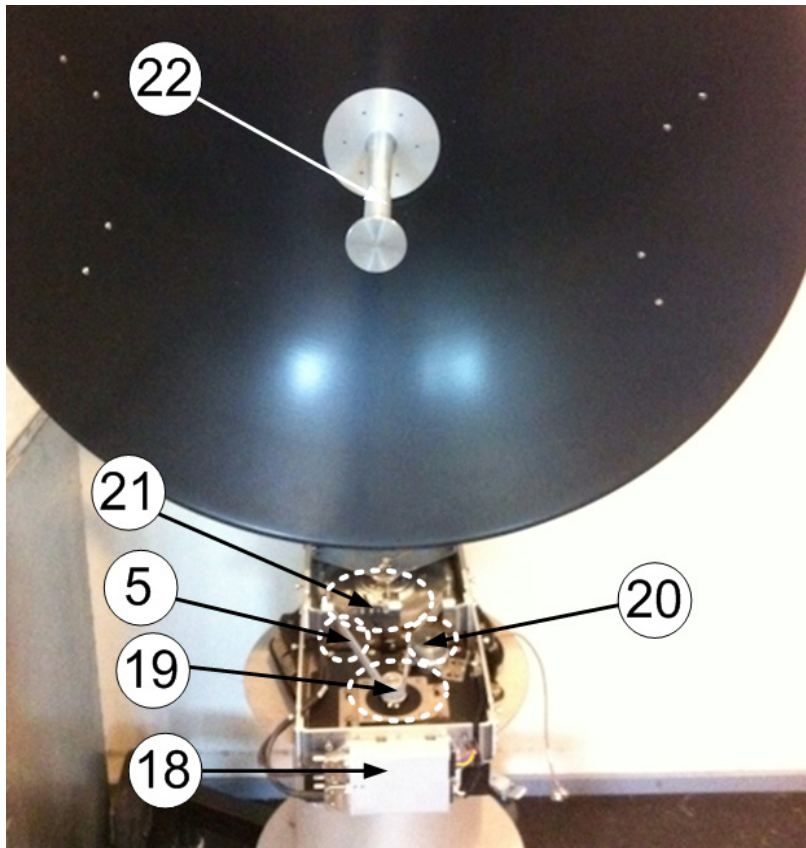


Figure 8-24: SAILOR 900: Above Deck Unit modules (continued)

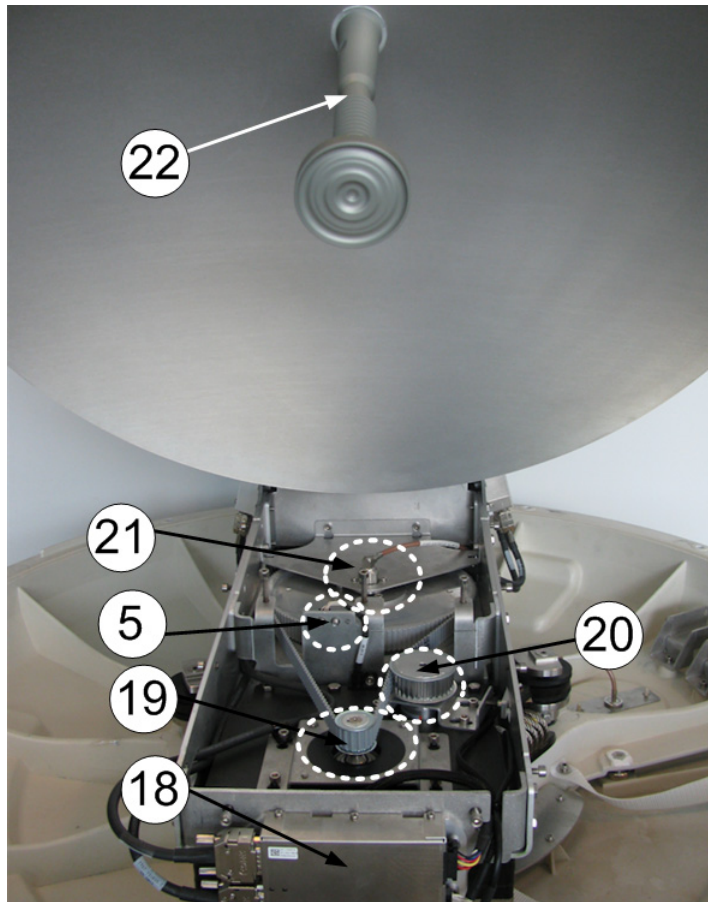


Figure 8-25: SAILOR 800: Above Deck Unit modules (continued)

18.DC-Motor Driver Module for Azimuth (DDM).

As in item 3 above.

19.Azimuth motor.

20.Azimuth encoder.

21.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.

22.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 8-11 and *LEDs in the ACU* on page 8-11.

### 8.5.2.1 S-bus

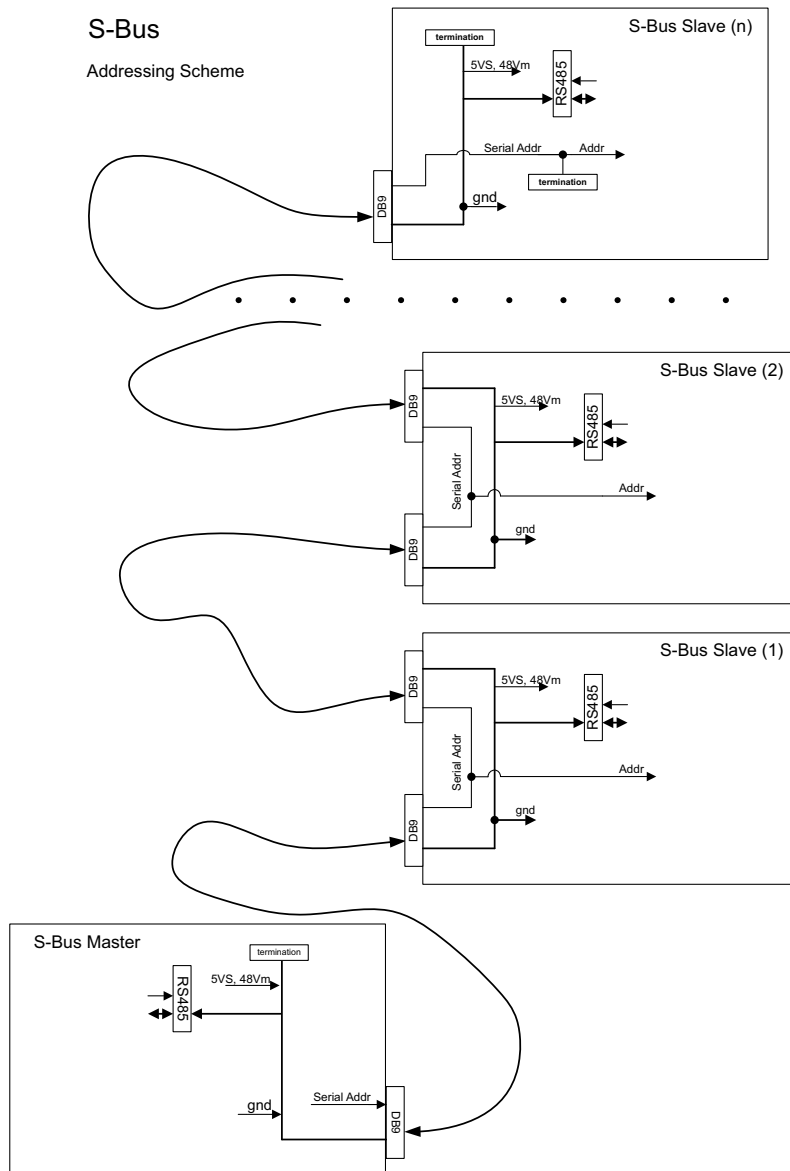


Figure 8-26: Block diagram – S-bus

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 - PPM. End modules contains signal terminations.

### 8.5.2.2 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

### 8.5.3 Replacing the GPS module

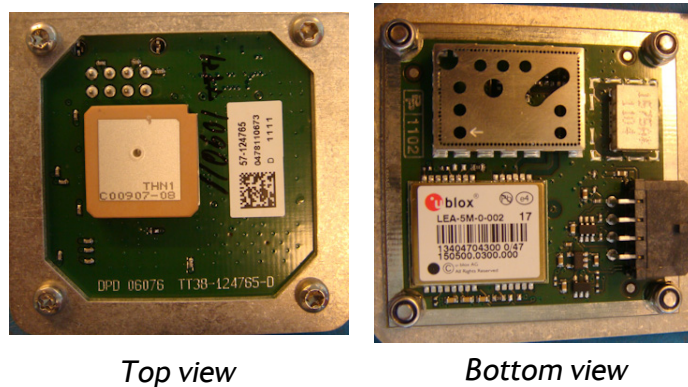


Figure 8-27: GPS module

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:

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

**Tools needed:**

- TX20 (SAILOR 900), TX30 (SAILOR 800)
- 4x150 mm Allen key (located inside the service hatch of the ADU).



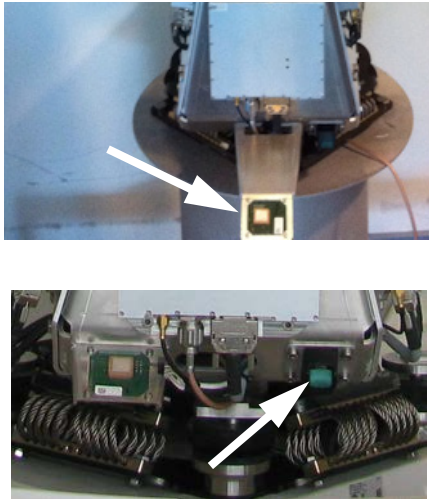


Figure 8-28: Switch off the power to the antenna

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

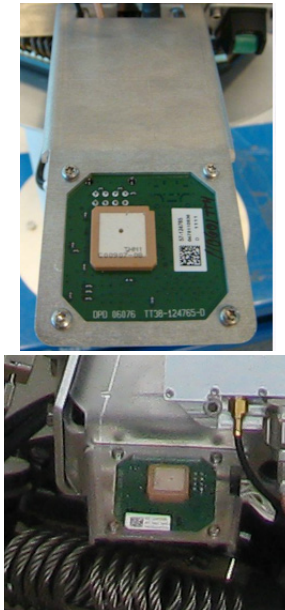


Figure 8-29: GPS module facing the service hatch

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



Figure 8-30: Connector for GPS PCB

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

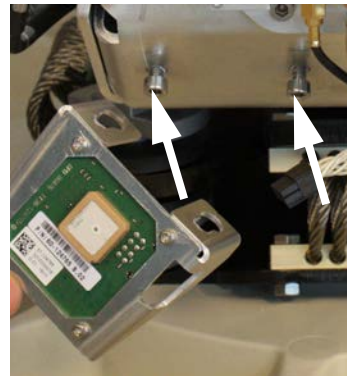
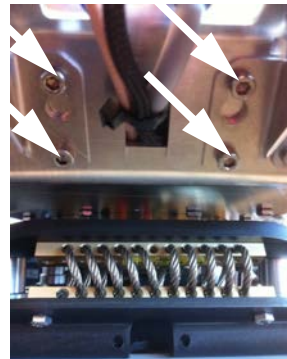


Figure 8-31: Screws on GPS module

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.

## 8.5.4 Replacing the VSAT Interface Module (VIM)

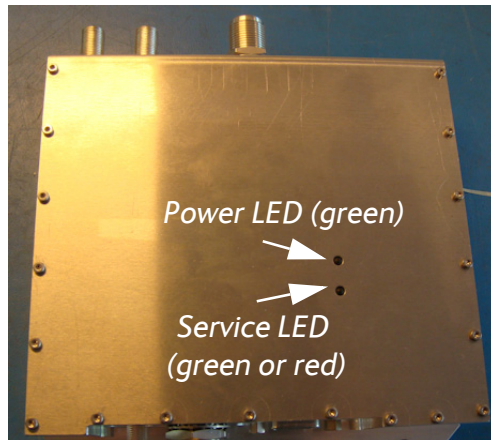


Figure 8-32: VSAT Interface Module (VIM)

The VIM is the interface between the antenna cable signals (power, internal modem communication, RX IF and L-band TX) and to the cable to the LNB /BUC and PCM. The VIM also provides power to the LNB and BUC and all other modules in the ADU.

The VIM has two LEDs for status and troubleshooting:

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

To replace the VIM, do as follows:

1. Open the service hatch by releasing the two latches.
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. Disconnect the 2 F-connectors at the top of the VIM.

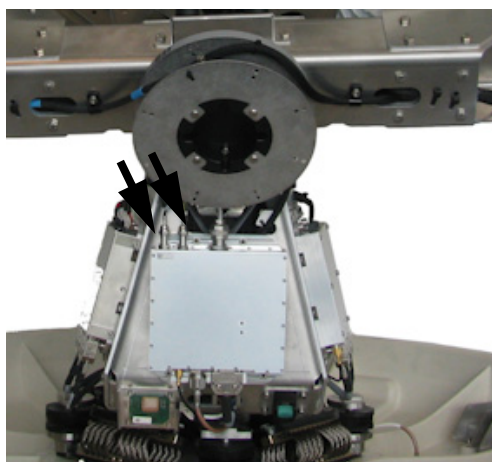


Figure 8-33: Replacing the VIM — remove 2 F-connectors (SAILOR 800 picture)

### 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 driver

5. Disconnect the 2 N-connectors, one at the top and one at the bottom of the VIM, the 2 F-connectors (note the connections) on top of the VIM, the SUB-D-connector, then the small cable (SMA connector) at the bottom of the VIM.

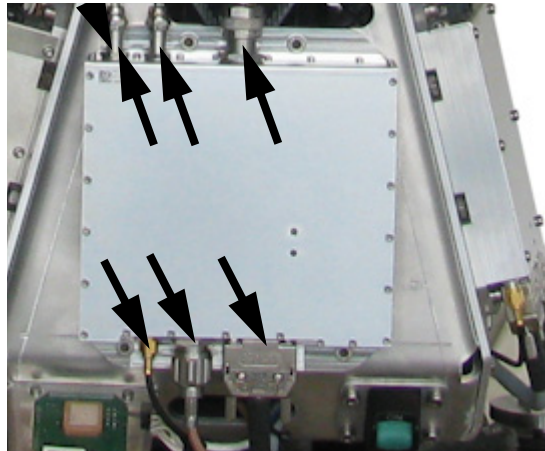


Figure 8-34: Replacing the VIM — remove 2 N, 2 F, 1 SMA and 1 SUB-D connectors (SAILOR 800 picture)

6. Remove the 4x4 mm Allen screws and remove the VIM.

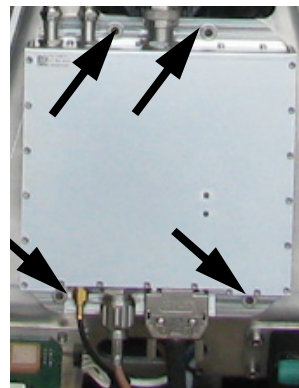


Figure 8-35: Replacing the VIM — remove 4 Allen screws (SAILOR 800 picture)

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

**Important** After installing a new VIM you must update the calibration data. For instructions see *Updating VIM/PCM calibration data* on page 8-88.

### 8.5.5 Replacing 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

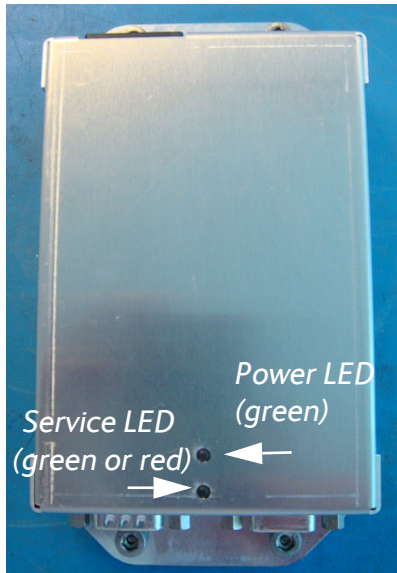


Figure 8-36: DC-Motor Driver Module (DDM) for Cross Elevation

For step-by-step instructions see:

- *Removing the Azimuth DDM* on page 8-35
- *Inserting a new Azimuth DDM* on page 8-36
- *Removing the Azimuth DDM* on page 8-35
- *Inserting a new Azimuth DDM* on page 8-36
- *Removing the Azimuth DDM* on page 8-35
- *Inserting a new Azimuth DDM* on page 8-36

### 8..5.5.1 Removing the Cross Elevation DDM

To replace 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.

#### 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

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.

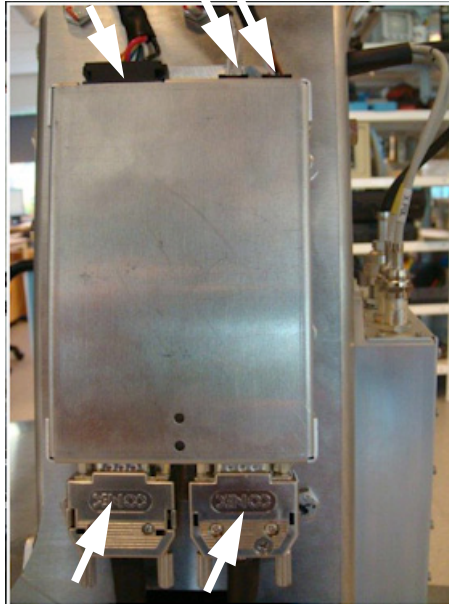


Figure 8-37: Replacing the DDM — remove connectors

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

#### 8..5.5.2 Inserting a new Cross Elevation DDM

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

#### 8..5.5.3 Removing the Elevation DDM

To replace 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.

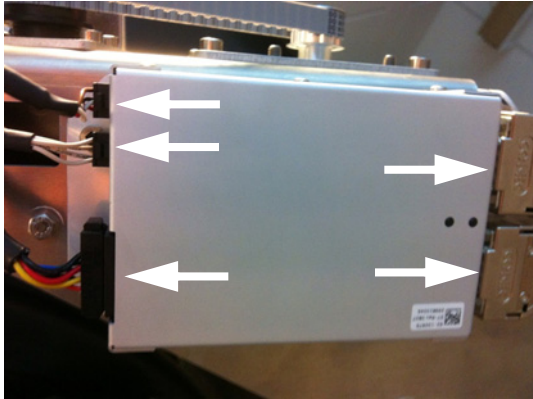


Figure 8-38: Elevation DDM, connectors

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

#### 8..5.5.4 Inserting a new Elevation DDM

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

#### 8..5.5.5 Removing the Azimuth DDM

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



Figure 8-39: 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.

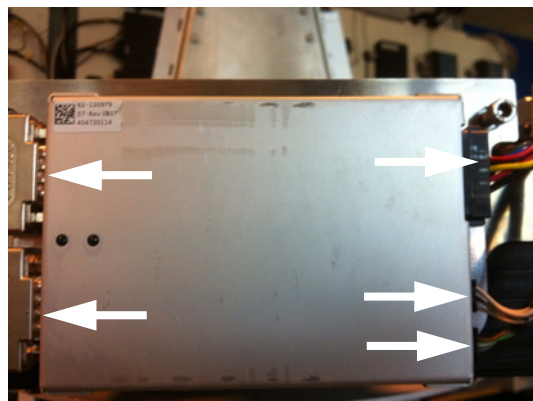


Figure 8-40: Azimuth DDM, connectors

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

#### 8..5.5.6 Inserting a new Azimuth DDM

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



## 8.5.6 Replacing the Polarisation Motor Module (PMM)

### 8.5.6.1 Removing the Polarisation Motor Module (PMM)

To remove the Polarisation Motor Module, 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 PMM 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. Rotate the Polarisation Unit so that the Polarisation Motor Module (PMM) can be reached.
7. Disconnect the 6 connectors from the PMM.

#### 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 8-41: Polarisation Motor Module, remove connectors

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

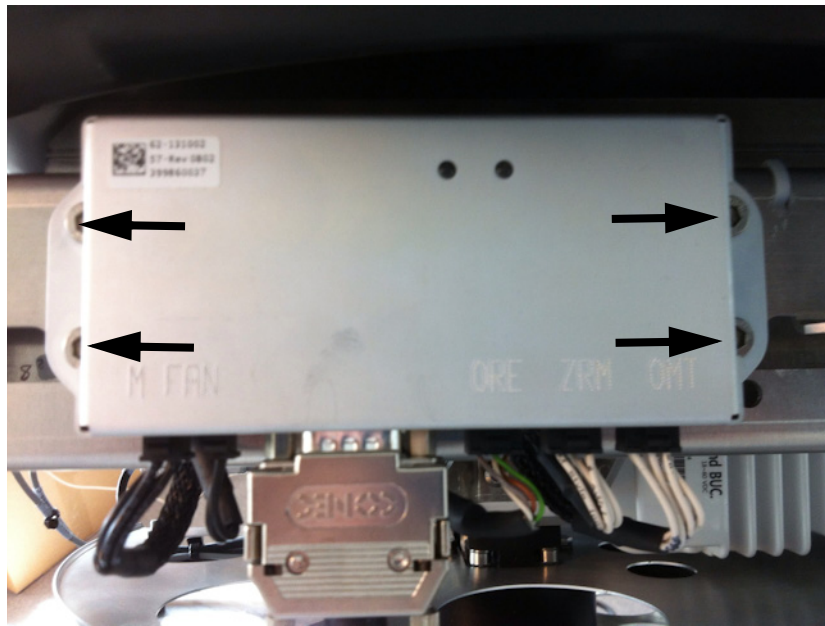


Figure 8-42: Polarisaton Motor Module, remove screws

9. Remove the PMM.

#### 8.5.6.2 Inserting a new Polarization Motor Module.

To insert a new Polarization Motor Module (PMM) follow the instructions above in reverse order — **while observing the following guidelines:**

1. Connect the **6-pin connector with the colored wires** (Polarization Encoder) to the plug marked **ORE** on the PMM.
2. Connect the **6-pin connector with white wires, only 4 wires available**, (Zero Reference Module) to the plug marked **ZRM** on the PMM.

3. Connect the **6-pin connector with white wires, all 6 wires available**, (Ortho Mode Transducer) to the plug marked **OMT** on the PMM.



Figure 8-43: Polarisation Motor Module, inserting

### 8.5.7 Replacing 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 VIM. The VIM 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:

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.

**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
- 8 mm open-end spanner

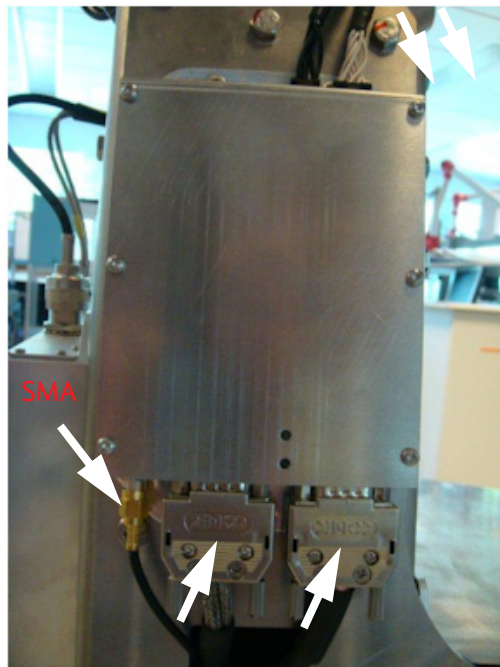


Figure 8-44: Removing the PCM — connectors

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 *Updating VIM/PCM calibration data* on page 8-88.

## 8.5.8 Replacing motor and encoder

The ADU is equipped with three (3) DC-motors, two of which are identical, and one (1) step motor, for the axes:

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

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

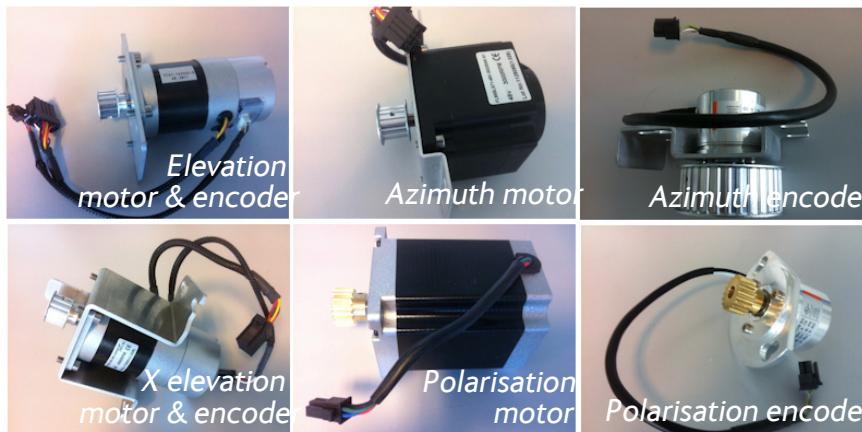


Figure 8-45: Motors and encoders

For step-by-step instructions see:

*Removing the Elevation Motor and Encoder* on page 8-42

*Inserting a new Elevation Motor and Encoder* on page 8-43

*Removing the Azimuth Motor* on page 8-44

*Inserting a new Azimuth Motor* on page 8-47

*Removing the Azimuth Encoder* on page 8-48

*Inserting a new Azimuth Encoder* on page 8-50

*Removing the X Elevation Motor and Encoder* on page 8-51

*Inserting a new X Elevation Motor and Encoder* on page 8-53

*Removing the Polarisation Motor* on page 8-54

*Inserting a new Polarisation Motor* on page 8-55

*Removing the Polarisation Encoder on page 8-56*

*Inserting a new Polarisation Encoder on page 8-56*

### **8..5.8.1 Removing the Elevation Motor and Encoder**

To remove the Elevation Motor and Encoder, 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)
- 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 motor assembly and elevation belt faces the service hatch.

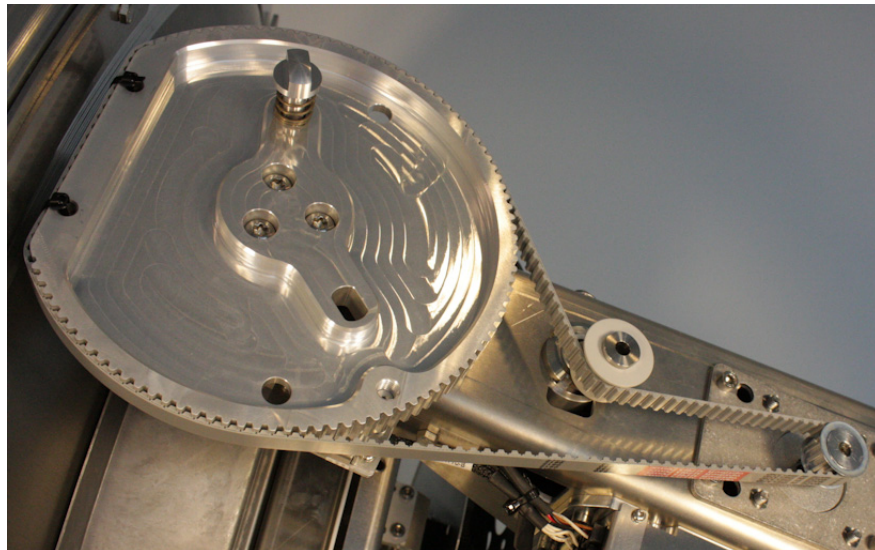


Figure 8-46: Elevation motor and encoder, loosen the belt tensioner

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



Figure 8-47: Elevation DDM, disconnect 2 connectors

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

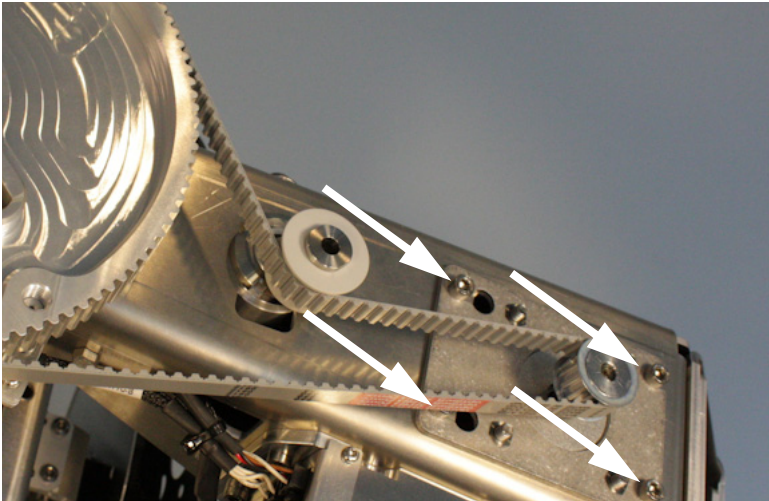


Figure 8-48: Elevation motor and encoder, loosen the screws for the motor assembly

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

### 8..5.8.2 Inserting a new Elevation Motor and Encoder

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.

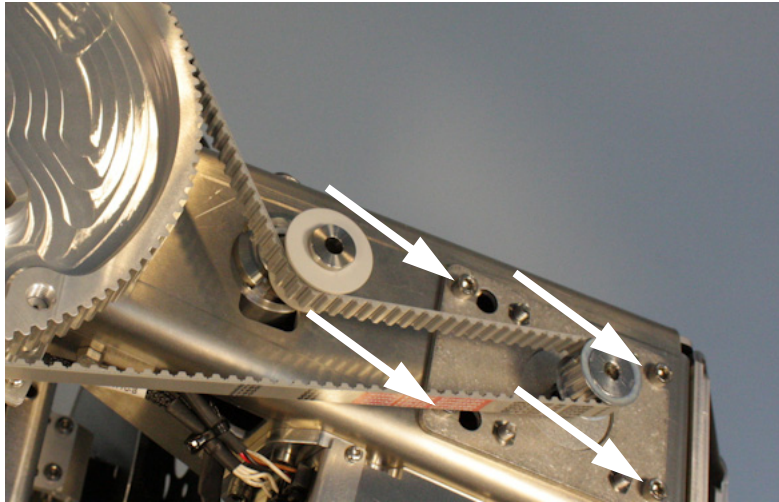


Figure 8-49: Elevation motor and encoder, tighten the screws for the motor assembly

### 8.5.8.3 Removing the Azimuth Motor

To remove the Azimuth Motor, 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)
- 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.



- 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).

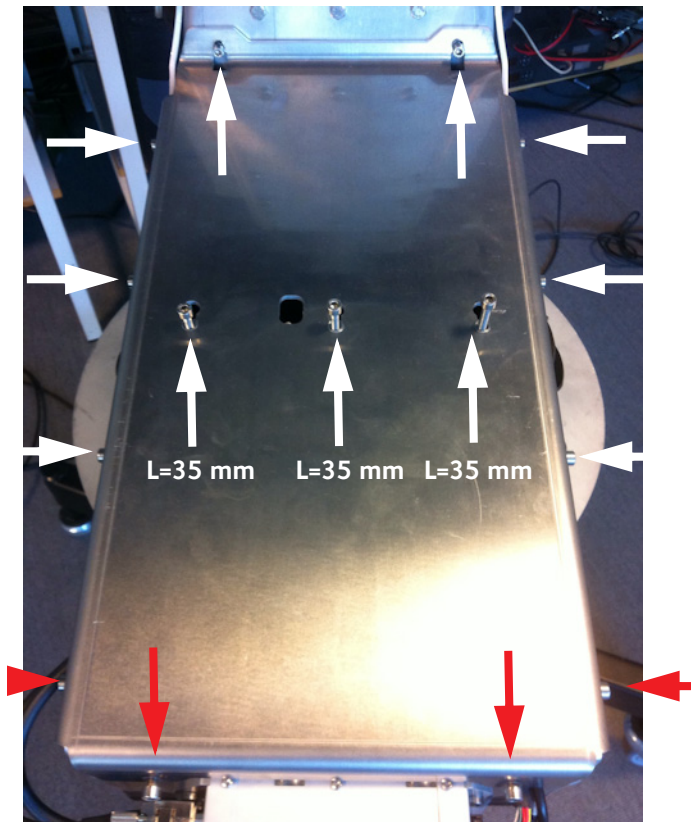


Figure 8-50: Azimuth motor, remove cover

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

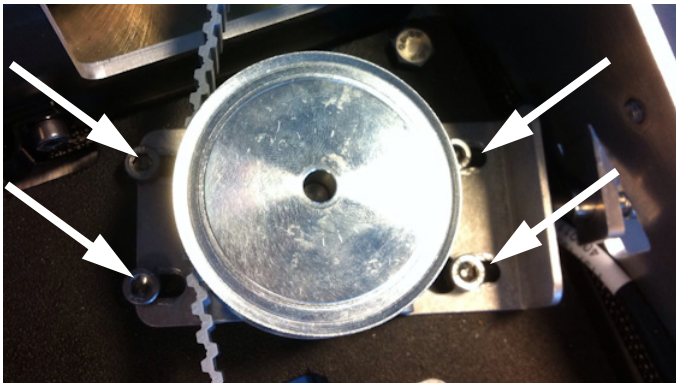


Figure 8-51: Azimuth motor, loosen the belt tensioner

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

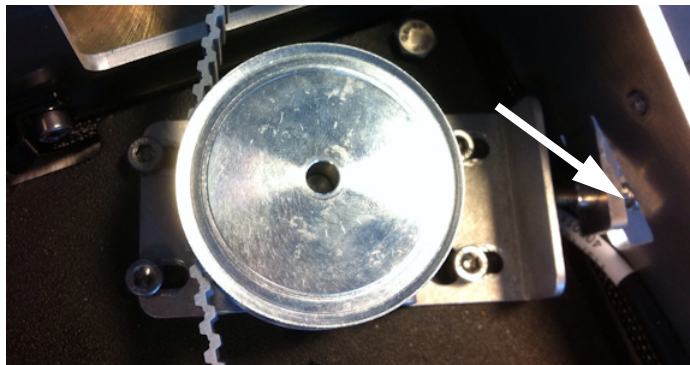


Figure 8-52: Azimuth motor, adjust belt tension

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



Figure 8-53: Azimuth DDM, disconnect connector

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

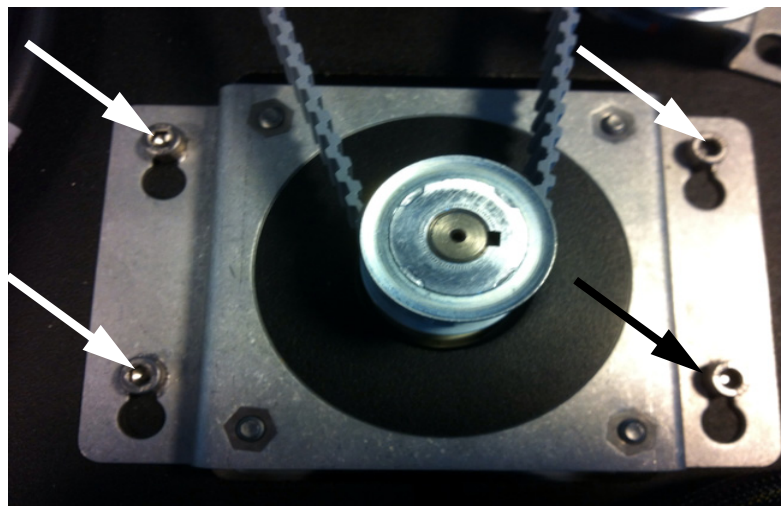


Figure 8-54: Azimuth motor, loosen the screws for the motor assembly

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

#### 8..5.8.4 Inserting a new Azimuth 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.

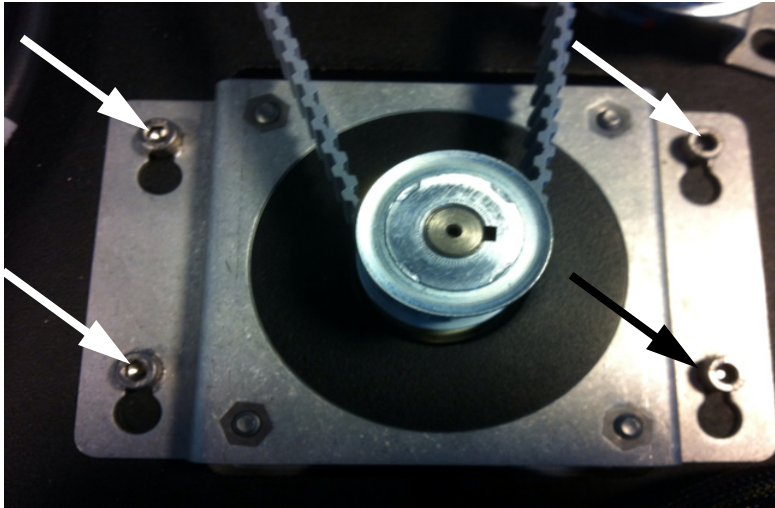


Figure 8-55: Azimuth motor, tighten the screws for the motor assembly

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

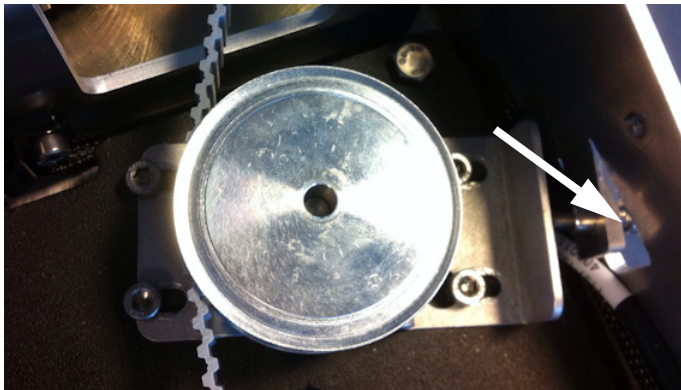


Figure 8-56: Azimuth motor, adjust belt tension

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).

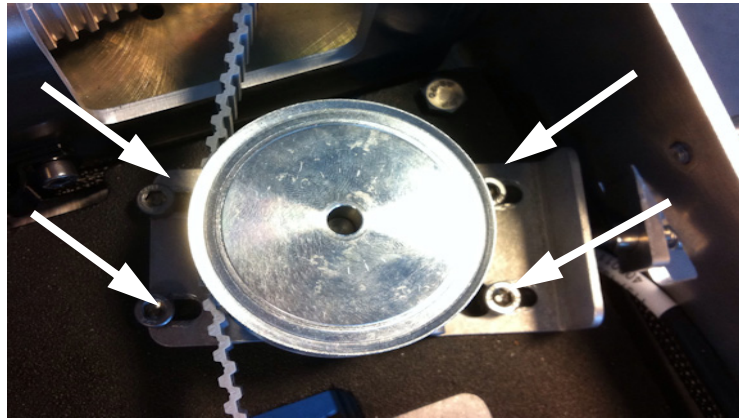


Figure 8-57: Azimuth motor, tighten the belt tensioner

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

#### 8.5.8.5 Removing the Azimuth Encoder

To remove the Azimuth Encoder, 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)
- 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.

- 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).

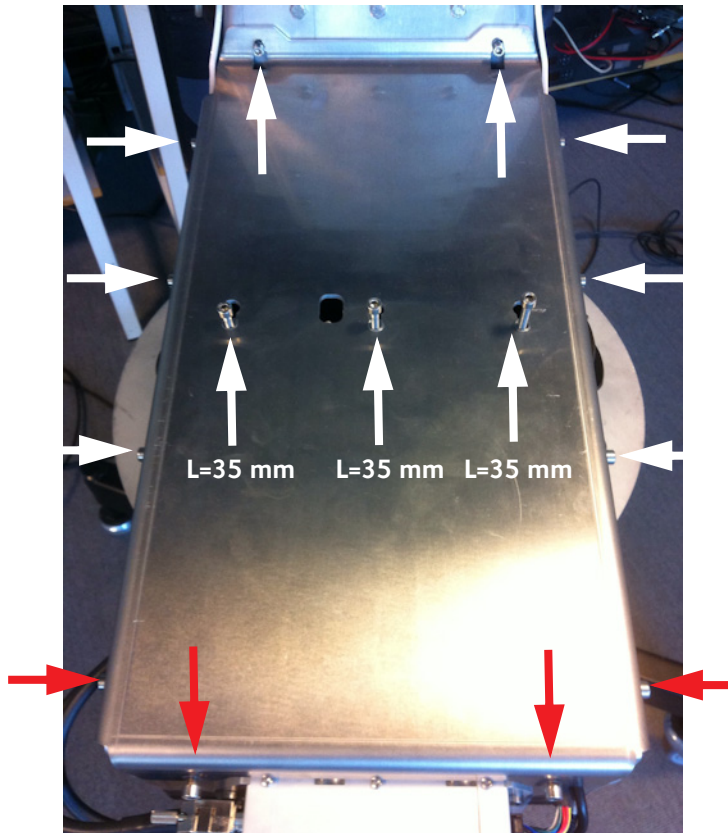


Figure 8-58: Azimuth encoder, remove cover

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



Figure 8-59: 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.

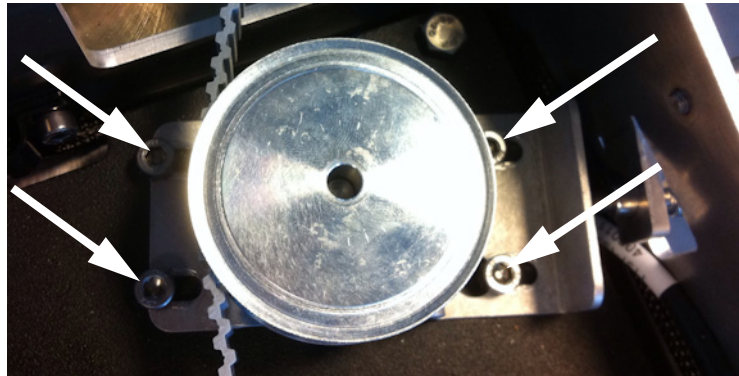


Figure 8-60: Azimuth encoder, remove

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



Figure 8-61: Azimuth encoder, adjust belt tension

#### 8.5.8.6 Inserting a new Azimuth Encoder

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.

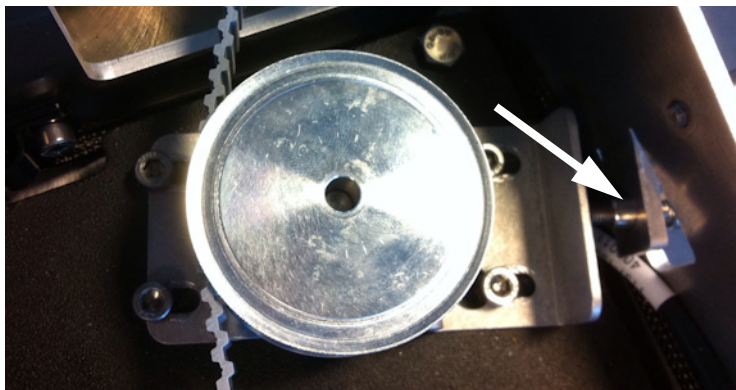


Figure 8-62: Azimuth Encoder, adjust belt tension

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).

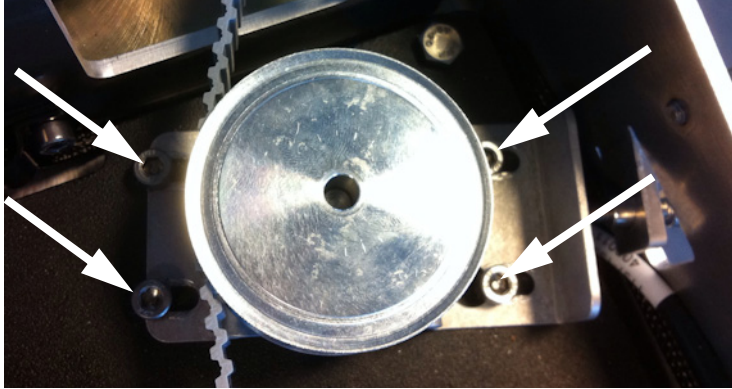


Figure 8-63: Azimuth motor, tighten the belt tensioner

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

### 8.5.8.7 Removing 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 (SAILOR 900), TX30 (SAILOR 800)
- 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.

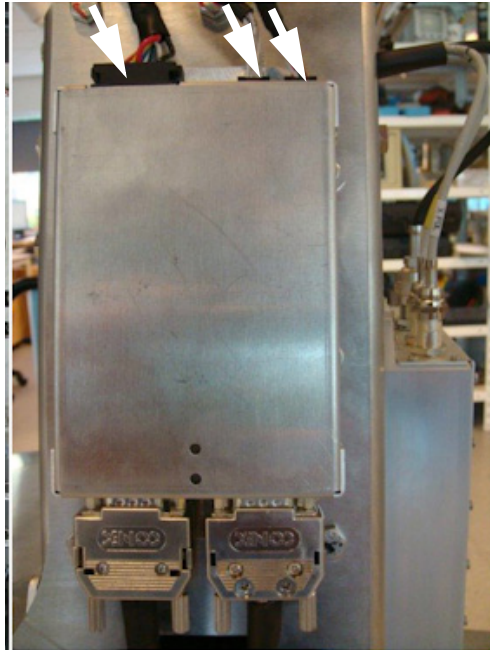


Figure 8-64: Replacement of X-Elevation Motor & Encoder 1

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

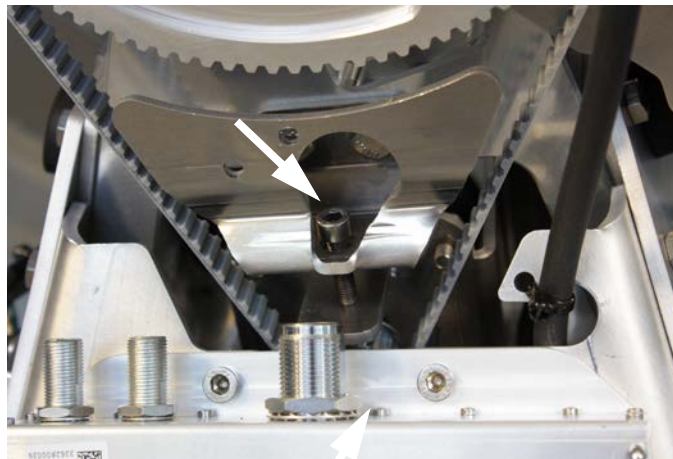


Figure 8-65: X-Elevation Motor & Encoder — belt tension/adjustment screw



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

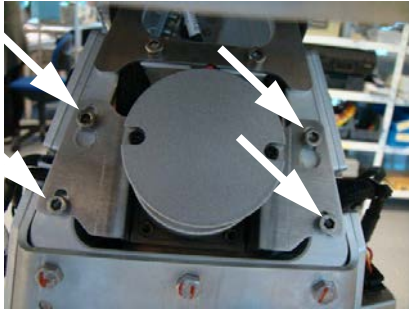


Figure 8-66: Cross Elevation motor assembly, 4 Allen screws

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

### 8.5.8.8 Inserting a new X Elevation Motor and Encoder

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

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

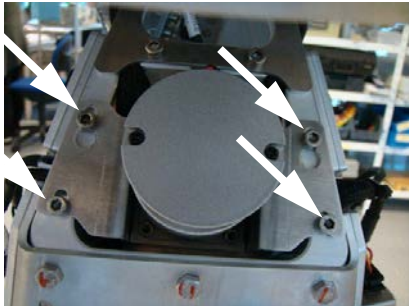


Figure 8-67: Cross Elevation motor assembly, do not tighten screws

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

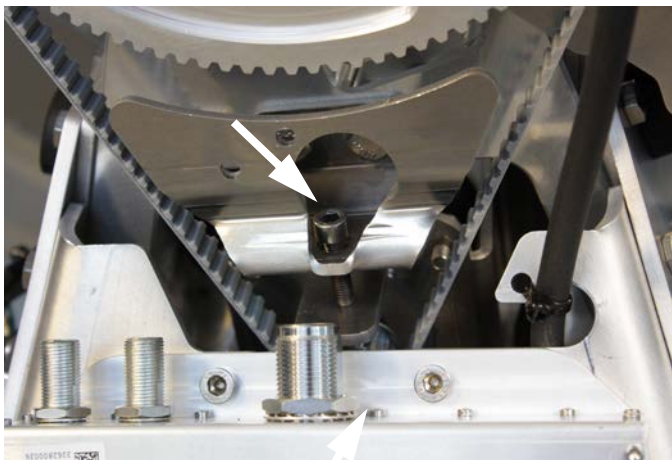


Figure 8-68: X-Elevation Motor & Encoder — adjust belt tension

The tension of the belt is 80—100 Hz on average, with the cross elevation beam in 3 positions.

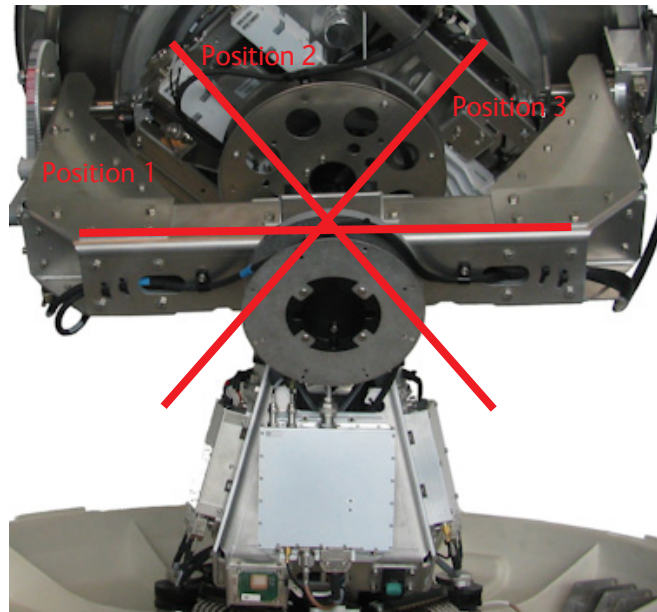


Figure 8-69: Belt tension in 3 positions (SAILOR 800 picture)

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

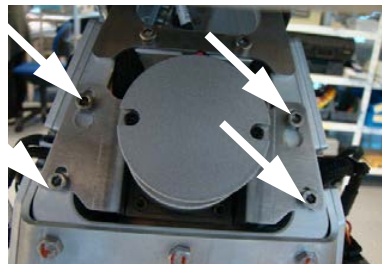


Figure 8-70: Cross Elevation motor assembly, tighten screws

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

### 8.5.8.9 Removing the Polarisation Motor

To remove the Polarisation Motor, 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. Follow the instructions in *Removing the Polarisation Unit* on page 8-72.
2. Disconnect the power connector of the Polarisation Motor.

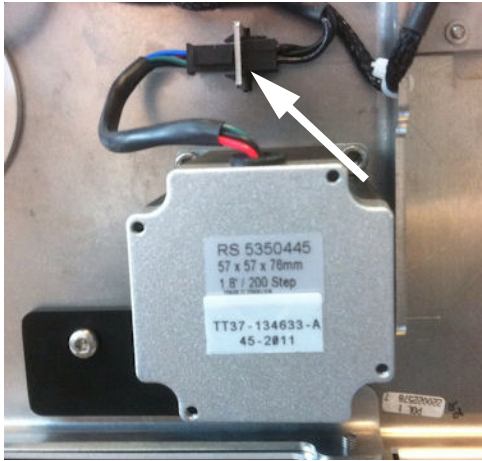


Figure 8-71: Polarisation Motor, disconnecting power

3. Remove the 4x4 mm Allen screws (thread size M5) that hold the motor.

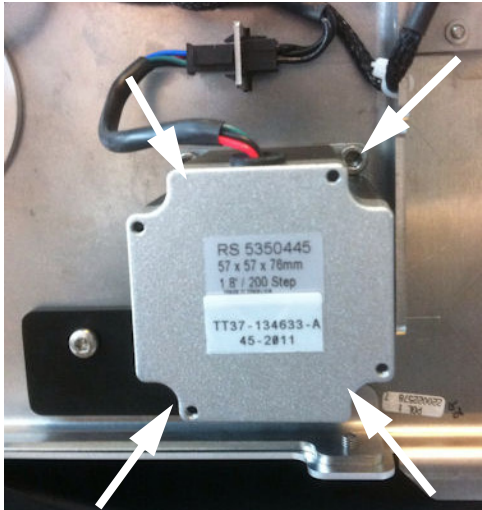


Figure 8-72: Polarisation Motor, removing 4x4 mm Allen screws

4. Remove the Polarisation Motor.

#### 8..5.8.10 Inserting a new Polarisation Motor

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

### 8..5.8.11 Removing the Polarisation Encoder

To remove the Polarisation Encoder, 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. Follow the instructions in *Removing the Polarisation Unit* on page 8-72.
2. Disconnect the 6-pin connector (with the colored wires) from the PMM, marked **ORE**, and free the cable to the Polarisation Encoder.

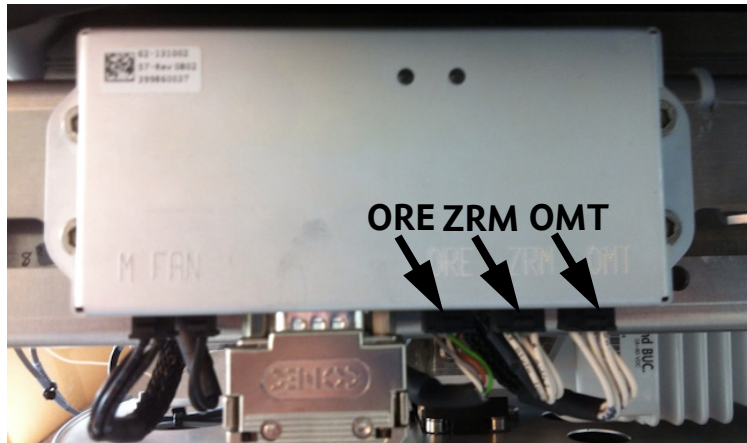


Figure 8-73: Removing the sub-D connector of the PMM

3. Loosen the 2x4 mm Allen screws and rotate the Polarisation Encoder in the key holes.

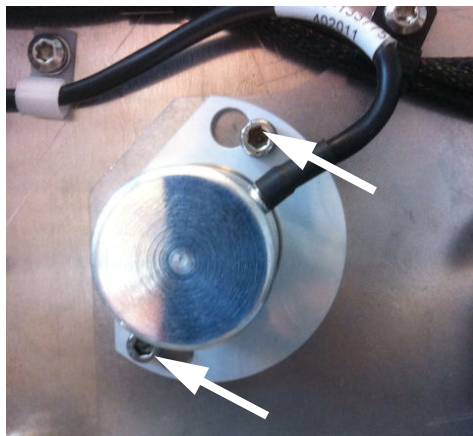


Figure 8-74: Polarisation Encoder, removing

4. Free the Polarisation Encoder from the cable holders.
5. Remove the Polarisation Encoder.

### 8..5.8.12 Inserting a new Polarisation Encoder

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

## 8.5.9 Replacing the Drive Belts

The ADU has 3 drive belts:

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

For step-by-step instructions see:

*Removing the X Elevation Drive Belt on page 8-57*

*Inserting a new X Elevation Drive Belt on page 8-58*

*Removing the Elevation Drive Belt on page 8-59*

*Inserting a new Elevation Drive Belt on page 8-59*

*Removing the Azimuth Drive Belt on page 8-60*

*Inserting a new Azimuth Drive Belt on page 8-62*

### 8.5.9.1 Removing 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 Cross Elevation Drive Belt tension adjustment screw.
5. Loosen the 4x4 mm Allen screws (thread size M5) of the motor assembly.

#### Tools needed:

- TX20 (SAILOR 900), TX30 (SAILOR 800)
- 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.

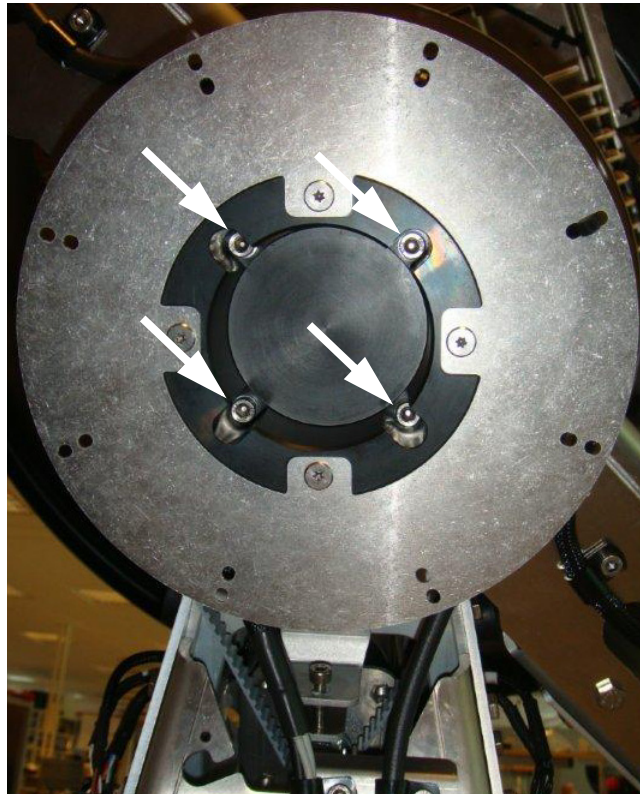


Figure 8-75: Removing the cable drum

7. Remove the Cross Elevation Drive Belt.

#### 8..5.9.2 Inserting a new X 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 *Inserting a new X Elevation Motor and Encoder* on page 8-53.

### 8..5.9.3 Removing the Elevation Drive Belt

To remove the 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 the Elevation Drive Belt faces the service hatch.
4. Press in and turn the elevation locking pin (if available) to locked position.
5. Cut the two plastic tie-wraps on the elevation drive wheel.

#### Tools needed:

- TX20 (SAILOR 900), TX30 (SAILOR 800)
- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Acoustic frequency meter

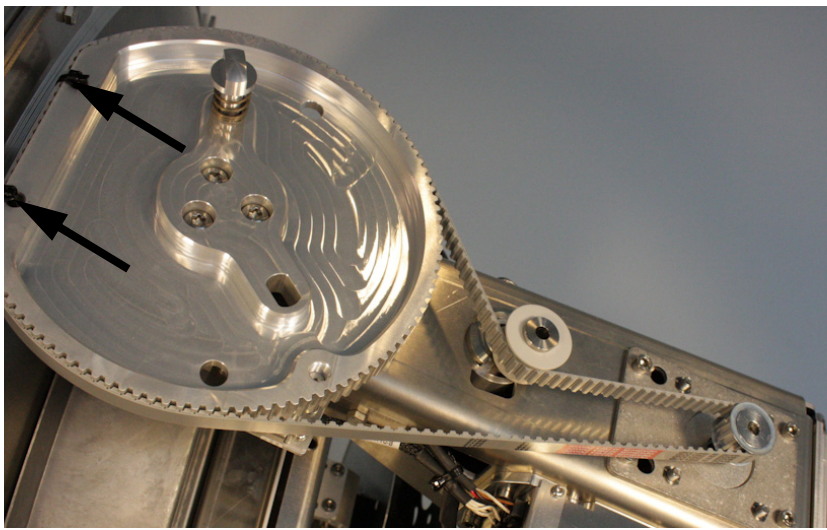


Figure 8-76: Elevation Drive Belt

6. Remove the Elevation Drive Belt.

### 8..5.9.4 Inserting a new Elevation Drive Belt

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

Follow the instructions in *Inserting a new Elevation Motor and Encoder* on page 8-43.

### 8.5.9.5 Removing the Azimuth Drive Belt

Tools needed:

- TX20 (SAILOR 900), TX30 (SAILOR 800)
- 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).

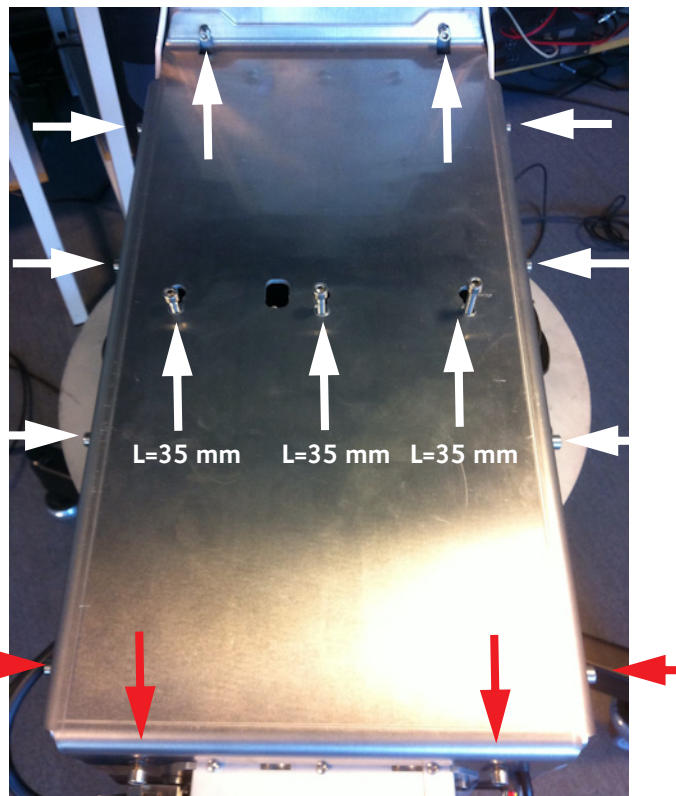


Figure 8-77: Azimuth drive modules, remove cover



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

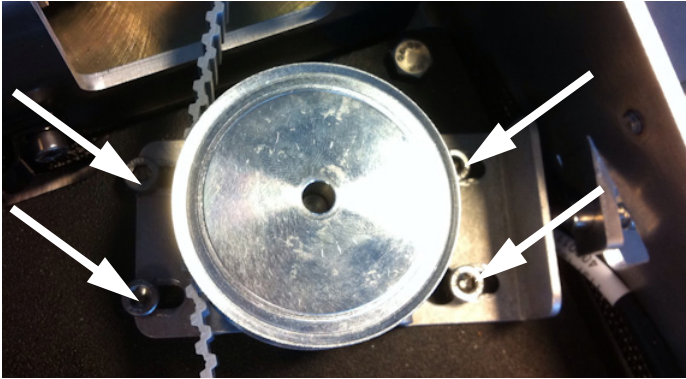


Figure 8-78: Azimuth drive belt, loosen the belt tensioner

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



Figure 8-79: Azimuth drive belt, adjust belt tension

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

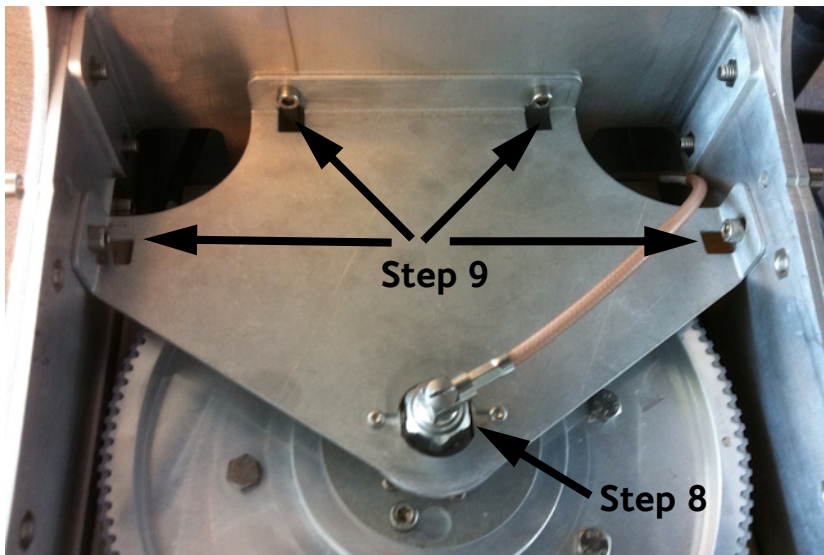


Figure 8-80: Getting access to the azimuth drive wheel

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

11. Remove the cover plate.
12. Remove the Azimuth Drive Belt.

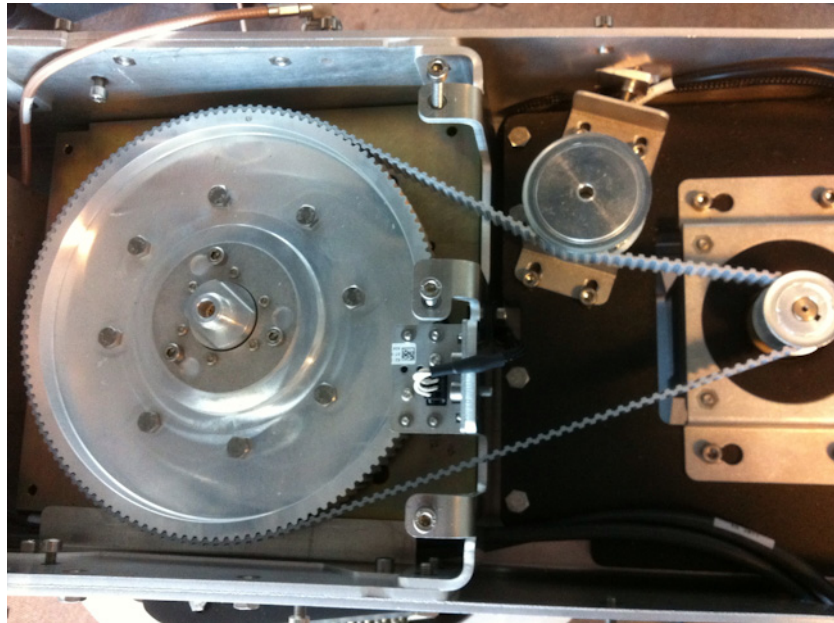


Figure 8-81: Azimuth Drive Belt

#### **8..5.9.6 Inserting a new 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 *Inserting a new Azimuth Motor* on page 8-47.

## 8.5.10 Replacing 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
- Polarization ZRM

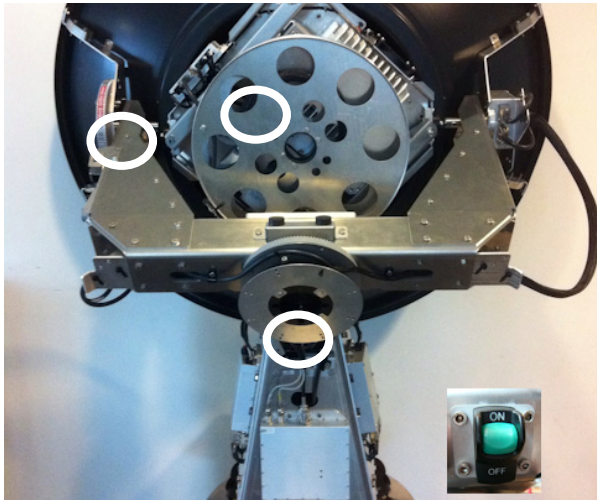


Figure 8-82: Zero Reference Modules (ZRM), location (SAILOR 900 picture)

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

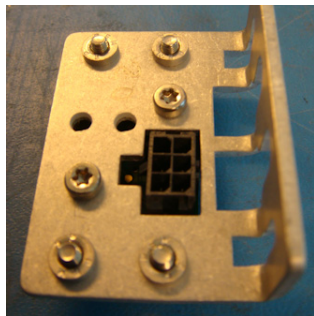


Figure 8-83: Zero Reference Module (ZRM)

For step-by-step instructions see:

*Removing the X Elevation ZRM* on page 8-64

*Inserting a new X Elevation ZRM* on page 8-65

*Removing the Elevation ZRM* on page 8-65

*Inserting a new Elevation ZRM* on page 8-66

*Removing the Azimuth ZRM* on page 8-67

*Inserting a new Azimuth ZRM on page 8-68*

*Removing the Polarisation ZRM on page 8-69*

*Inserting a new Polarisation ZRM on page 8-69*

### **8..5.10.1 Removing the X Elevation ZRM**

**Tools needed:**

- TX20 (SAILOR 900), TX30 (SAILOR 800)
- 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. Disconnect the connector from the Zero Reference Module.

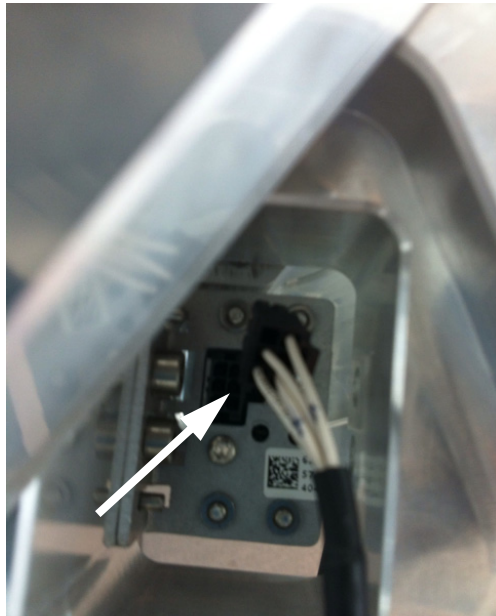


Figure 8-84: X Elevation ZRM, disconnect connector

- Through the 2 holes (above the Cross Elevation DDM) in the pedestal loosen the 2x4 mm Allen screws.

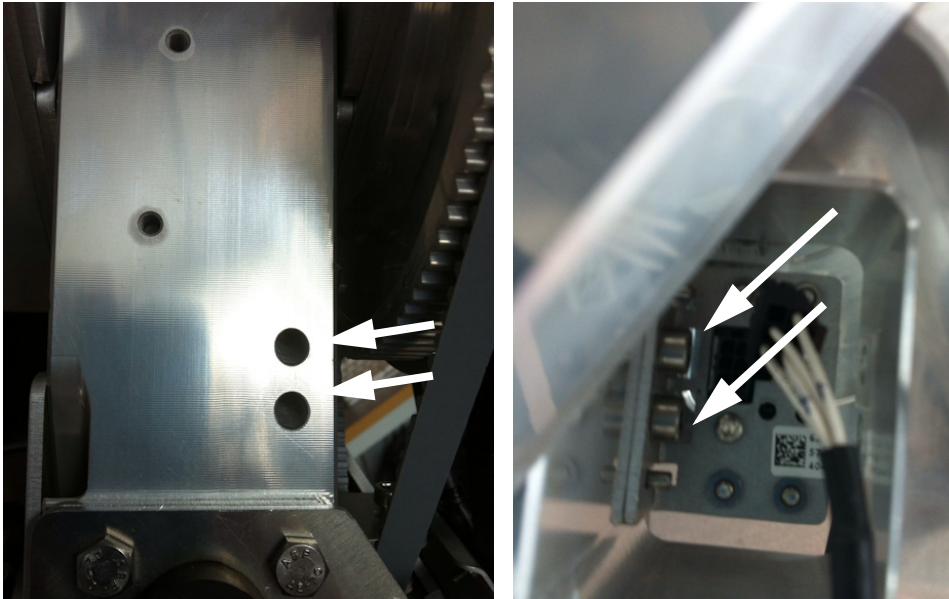


Figure 8-85: X Elevation ZRM, slide out

- Slide out the X Elevation ZRM.

### 8.5.10.2 Inserting a new 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.

### 8.5.10.3 Removing the Elevation ZRM

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

#### Tools needed:

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

6. Disconnect the connector from the Elevation ZRM.

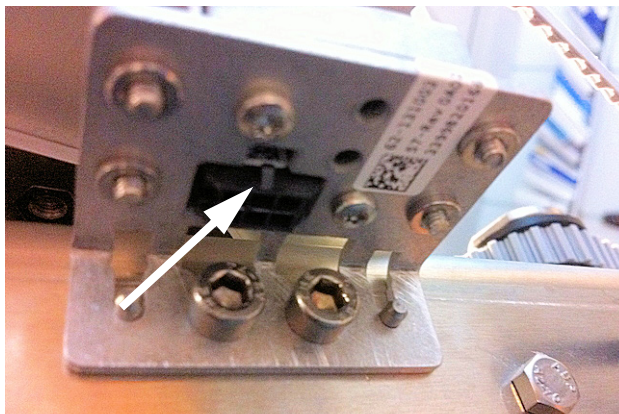


Figure 8-86: Elevation ZRM, disconnect connector

7. Loosen the 2x4 mm Allen screws.

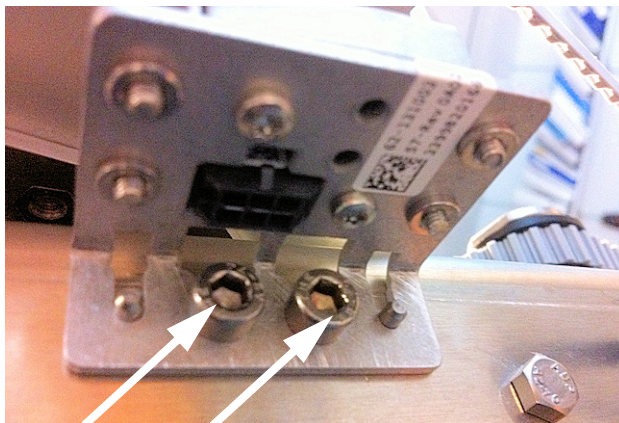


Figure 8-87: Elevation ZRM, remove screws

8. Slide out the Elevation ZRM.

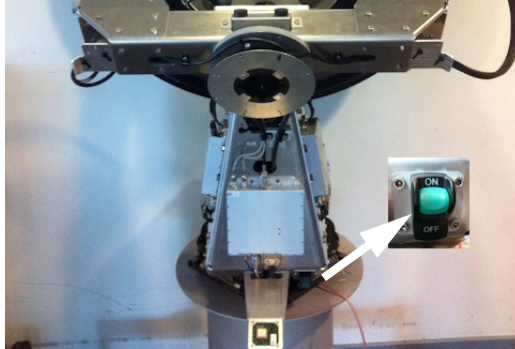
#### 8.5.10.4 Inserting a new Elevation ZRM

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.

### 8.5.10.5 Removing the Azimuth ZRM

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



#### Tools needed:

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

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).

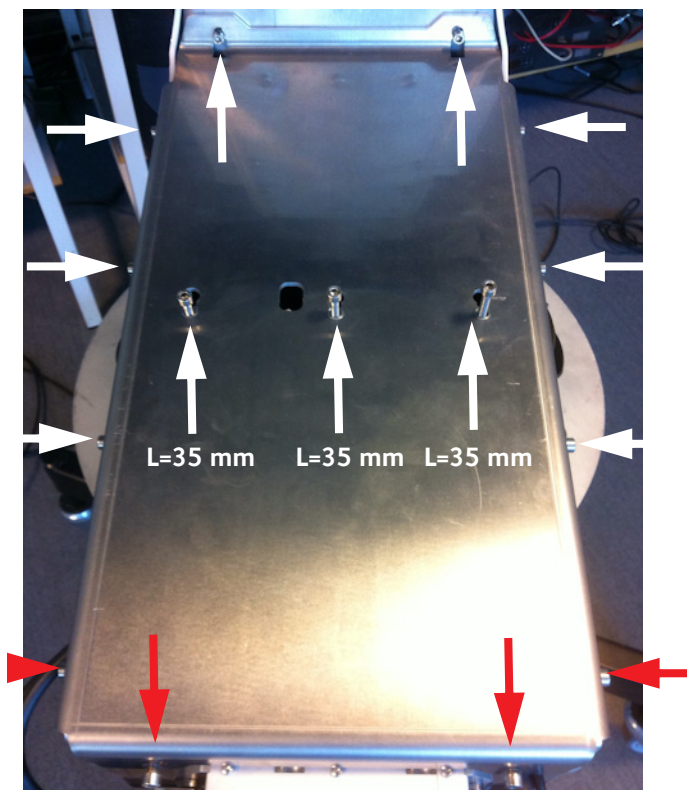


Figure 8-88: Azimuth ZRM, remove cover

7. Disconnect the connector from the Azimuth ZRM.

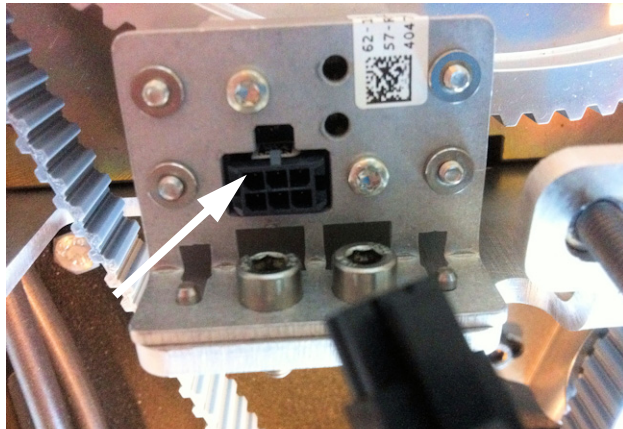


Figure 8-89: Azimuth ZRM, disconnect connector

8. Loosen the 2x4 mm Allen screws.

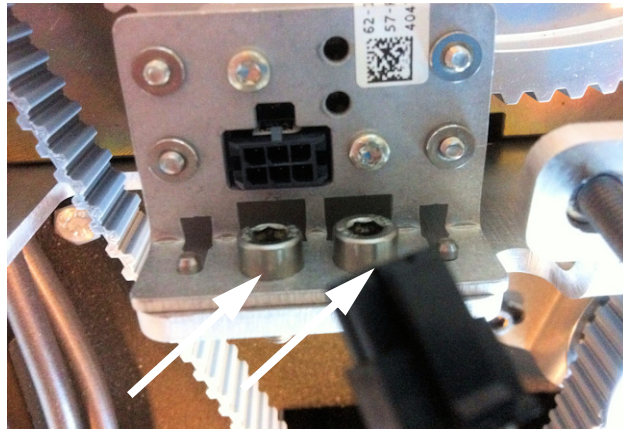


Figure 8-90: Azimuth ZRM, disconnect connector

9. Slide out the Azimuth ZRM.

#### 8..5.10.6 Inserting a new Azimuth ZRM

To insert a new Cross 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.



### 8.5.10.7 Removing the Polarisation ZRM

1. Follow the instructions in *Removing the Polarisation Unit* on page 8-72.
2. Disconnect the connector from the Polarisation ZRM.

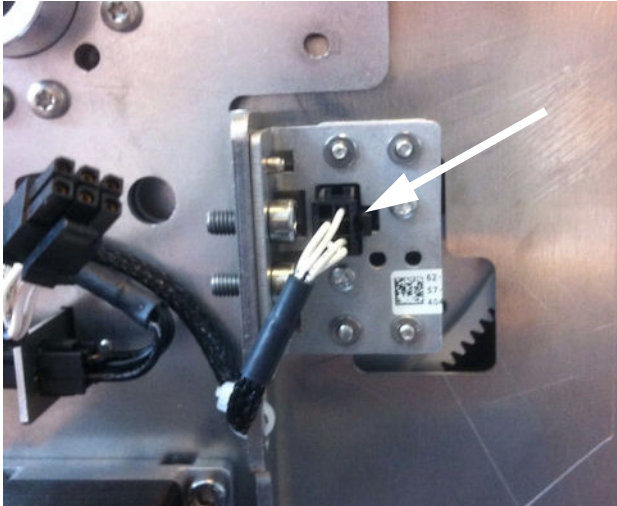


Figure 8-91: Polarisation ZRM, disconnecting

3. Loosen the 2x4 mm Allen screws.

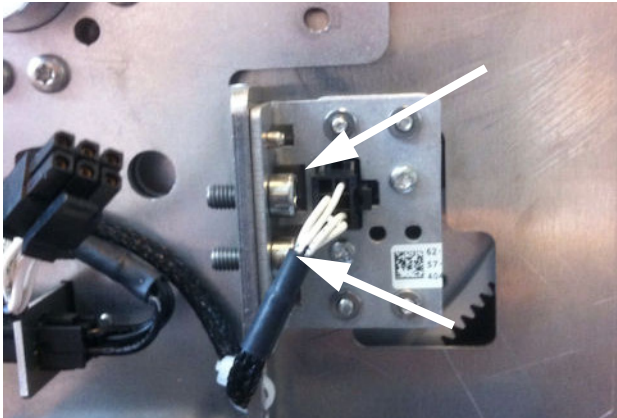


Figure 8-92: Polarisation ZRM, loosen 2x4 mm Allen screws

4. Slide out the Polarisation ZRM.

### 8.5.10.8 Inserting a new Polarisation ZRM

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

### 8.5.11 Replacing the Inertial Sensor Module (ISM)

Locate the ISM, see *Overview* on page 8-10.

#### 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

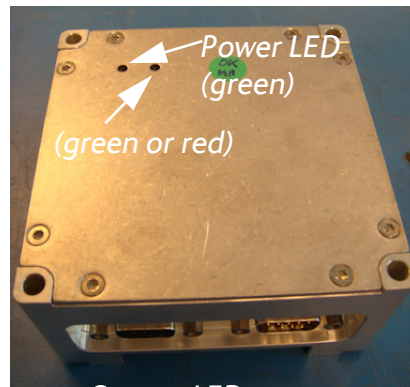


Figure 8-93: Inertial Sensor Module (ISM)

When the antenna dish is moved by the motors and ships motions, in all its plans the ISM provides the information regarding these movements.

This information is based on rate gyro and accelerometers mounted in the ISM.

The information is passed on to the PCM.

The ISM has two LEDs for status and troubleshooting:

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

#### 8.5.11.1 Removing the ISM

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. Press in and turn the elevation locking pin (if available) to locked position.
4. Rotate the antenna so that you can reach the ISM.
5. Loosen the 4x4 mm Allen screws (thread size M5).

- Slide the cable support free in the key holes, and leave it hanging in the cables.

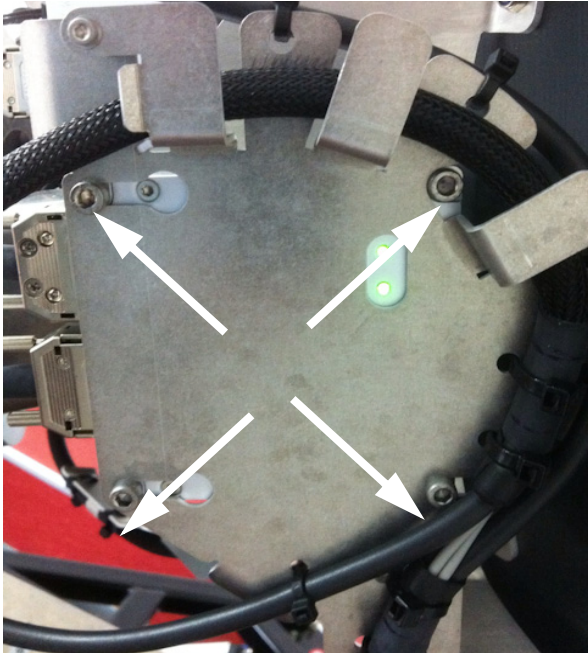


Figure 8-94: Removing the ISM

- Disconnect the two SUB-D connectors using a small flat screw driver.

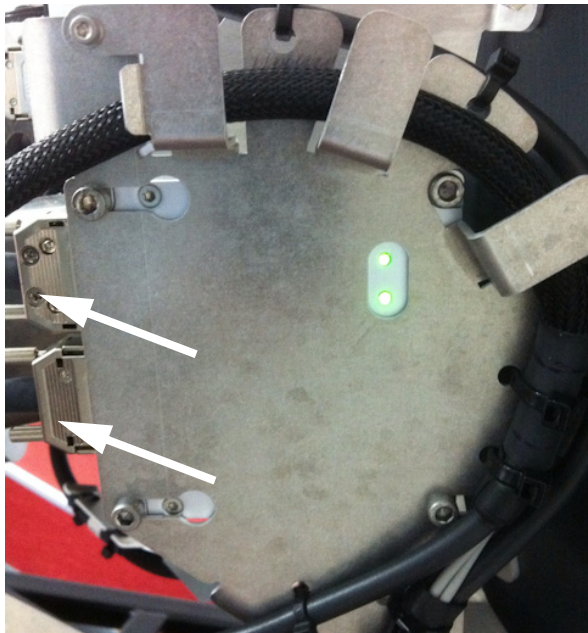


Figure 8-95: Removing the ISM Sub D connectors

- Remove the 4x4 mm Allen screws (thread size M5), loosened in step 5.
- Remove the ISM.

### 8.5.11.2 Inserting a new ISM

To insert a new Inertial Sensor Module follow the instructions above in reverse order.

## 8.5.12 Replacing the Polarisation Unit

### 8.5.12.1 Removing the Polarisation Unit

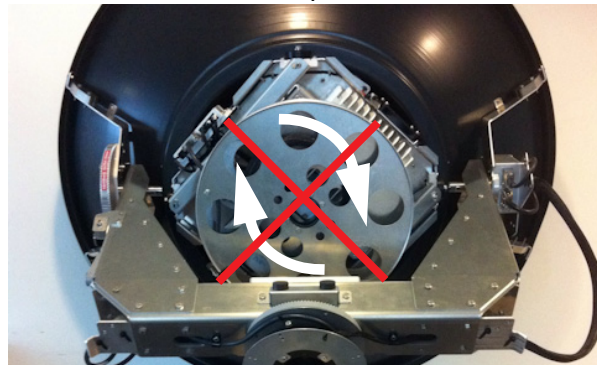
Tools needed:

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

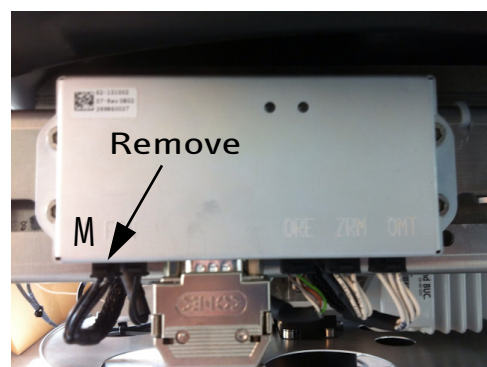
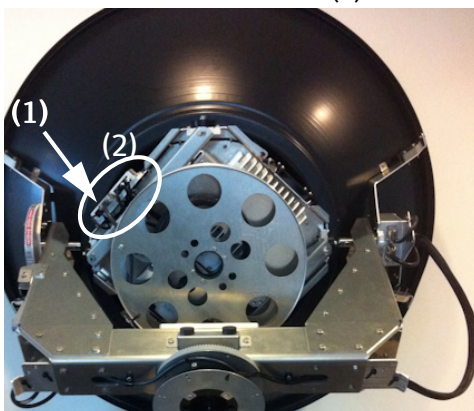
1. Open the service hatch by releasing the two latches.
2. Switch off the power to the antenna on the service switch.
3. Rotate the antenna pedestal so that the Azimuth DDM faces the service hatch.
4. Press in and turn the elevation locking pin (if available) to locked position.



**CAUTION!** Do not manually turn the Polarisation Unit of the antenna, it may cause damage to the antenna (SAILOR 900 pictures).



Before turning the Polarisation Unit manually, remove the connector (1) marked M of the Polarisation Motor Module (2).



5. Disconnect the SUB-D connector from the PMM.



Figure 8-96: Removing the sub-D connector of the PMM

6. Disconnect the two RF F-connectors from the two LNBS. Mark the LNBS after the label on the wires: **Co-pol (left)** and **X-pol (right)**. Remove also the RF N-connector.



Figure 8-97: Disconnecting the LNBS

7. Remove the 4x4 Allen screws to free the cable spool attached to the PMM. Let the cable spool hang freely in the cables.

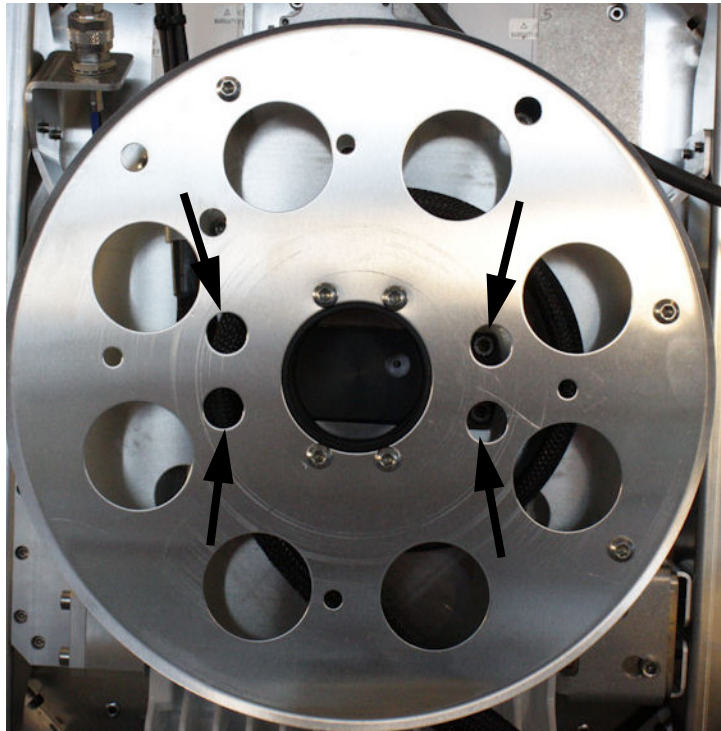


Figure 8-98: Removing the cable spool

8. Disconnect the connector on the OMT.

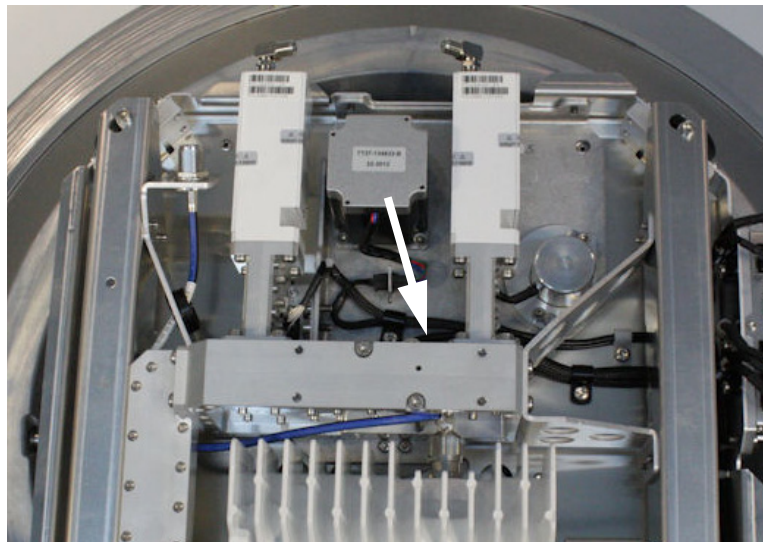


Figure 8-99: Disconnecting the OMT connector

- Remove the 2x4 mm Allen screws at the OMT and loosen the 4x4 mm Allen screws on the Polarisation Unit.

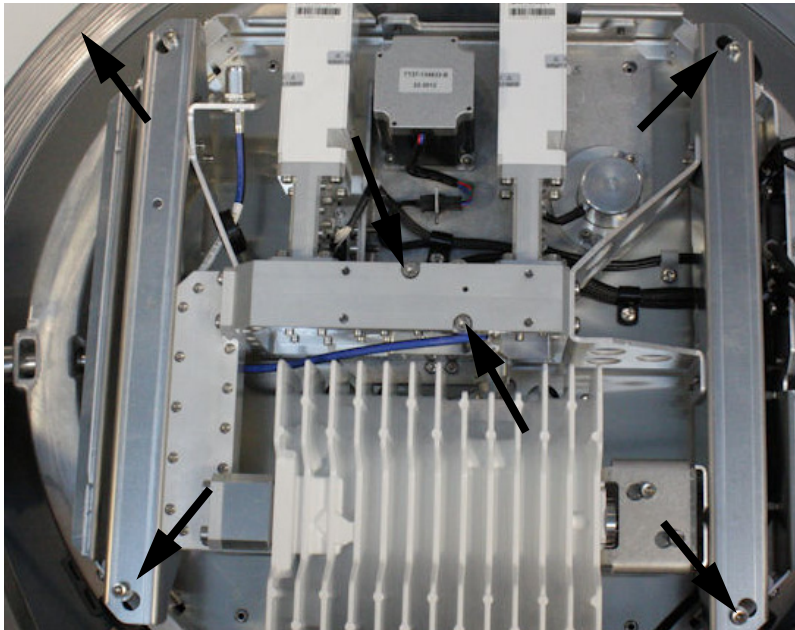


Figure 8-100: Disconnecting the OMT connector

- Rotate the Polarisation Unit in clockwise direction until end stop.
- Rotate the Polarisation Unit further in the key holes and remove it.

**Note** The Polarisation Unit is attached to the OMT collar to the feeder horn tube on the rear side of the unit.

### 8.5.12.2 Inserting a new Polarisation Unit

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

## 8.5.13 Replacing the BUC Fan

### 8.5.13.1 Removing the BUC Fan

- Open the service hatch.
- Switch off the power to the antenna on the service switch.
- Rotate the antenna pedestal so that the Azimuth DDM faces the service hatch.
- Press in and turn the elevation locking pin (if available) to locked position.
- Rotate the Polarisation Unit so that you can reach the BUC fan.
- Disconnect the fan connector.

#### Tools needed:

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

7. Remove the 2x4 mm Allen screws.

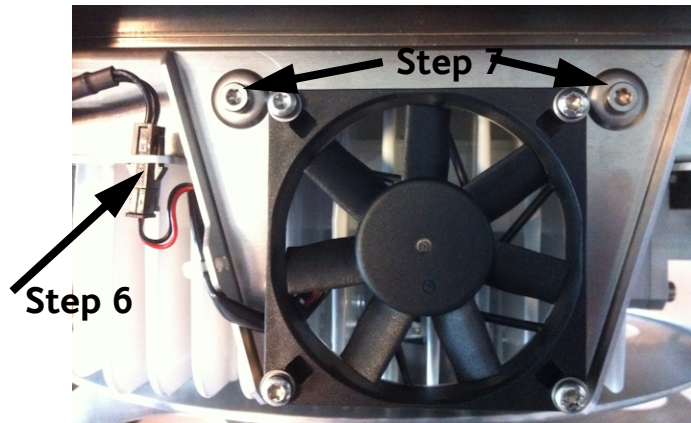


Figure 8-101: Removing the BUC fan

8. Remove the BUC fan.

### 8..5.13.2 Inserting a new BUC Fan

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

## 8.5.14 Replacing the Block Up Converter (BUC)



Figure 8-102: Block Up Converter (BUC) (SAILOR 800 picture)

The BUC converts the L-band IF (950 – 1700 MHz) up to Ku-band radio signal (13.75-14.50 GHz (extended)) and amplifies the TX power level. The BUC receives the TX signal and power from the VIM.

SAILOR 900: 8 W BUC

SAILOR 800: 6 W BUC

### 8..5.14.1 Removing the BUC

1. Locate the BUC, see *Overview* on page 8-10.



2. Follow the instructions in *Removing the Polarisation Unit* on page 8-72.
3. Remove the 4x4 mm Allen screws from the waveguide flange at the side of the BUC.

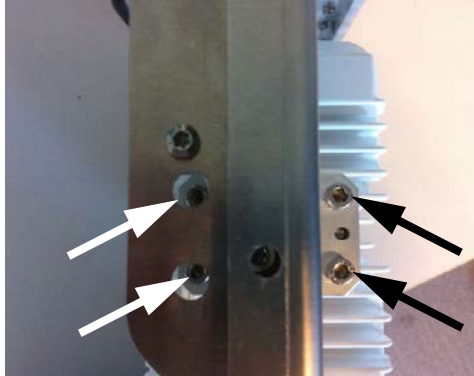


Figure 8-103: BUC, removing

## Tools needed:

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

4. Loosen the 2x4 mm Allen screws from the bracket at the side of the BUC.

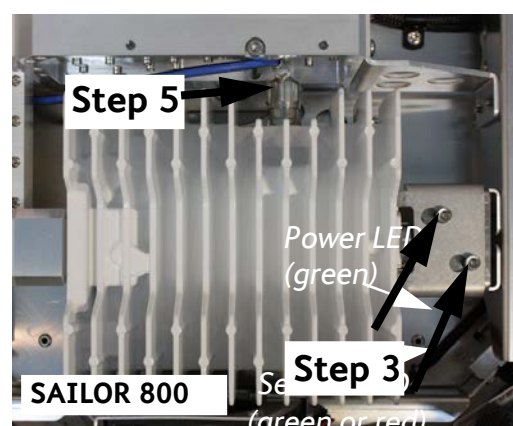
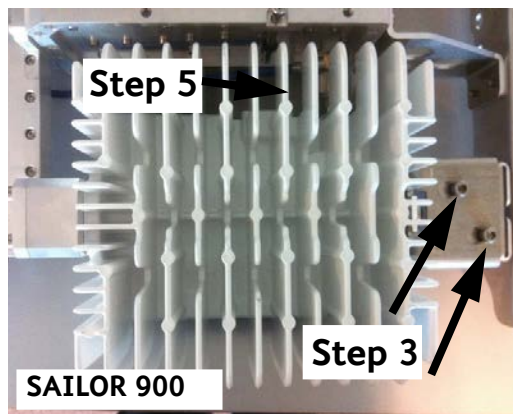


Figure 8-104: BUC, removing (continued)

5. Slide the BUC to the right to free it from the Polarisation Unit.
6. Disconnect the finger nut N-connector from the BUC.

### 8.5.14.2 Inserting a new BUC

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

### 8.5.15 Replacing the Low Noise Block down converter (LNB)

**Important**

LNB for SAILOR 900 variant A (7009A):  
75 Ohm F connector

LNB for SAILOR 900 variant B (7009B) and SAILOR  
800: 50 Ohm SMA connector



Figure 8-105: Low Noise Block (LNB) (SAILOR 900 var. A)

The LNB down-converter receives the Ku-band radio signal (10.70-12.75 GHz), which will be amplified and converted down to a L-band IF (950 – 2150 MHz). The conversion is controlled by two or four LO's, locked to an external reference signal.

The Ku-band interface is a WR75 waveguide and the IF interface is for  
– variant A: 75 Ohm F-connector  
– variant B: 50 Ohm SMA connector.

It has DC-power, 10 MHz external ref. Signal and a 22 kHz control signal is delivered via the IF cable. The L-band output is delivered to the VIM.

The removal and insertion procedures of the Co-pol LNB and the X-pol LNB are identical.

### 8..5.15.1 Removing the LNB

1. Follow the instructions in *Removing the Polarisation Unit* on page 8-72.
2. Remove the 4x4 mm Allen screws that fix the LNB to the OMT.



Figure 8-106: LNB, removing (SAILOR 800/900 VSAT variant A)

#### Tools needed:

- TX20 (SAILOR 900), TX30 (SAILOR 800)
- 4 x 150 mm Allen key (located inside the service door of the ADU)
- Torx20 screw driver

3. Remove the 4xTorx20 screws and separate the LNB from the filter. (Reuse the filter.)

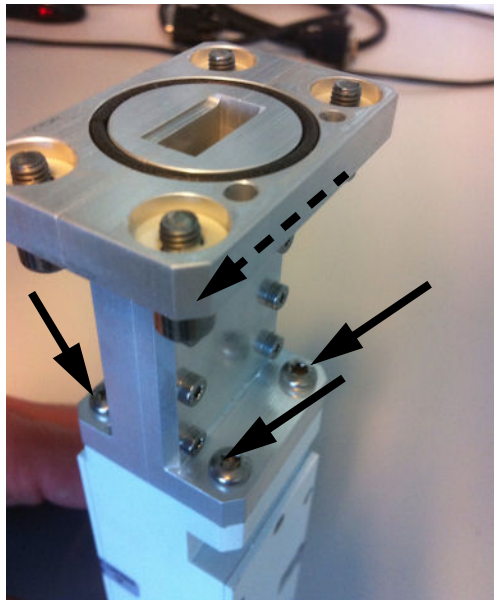


Figure 8-107: LNB, removing (continued)

### 8..5.15.2 Inserting a new LNB

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

## 8.5.16 Replacing the Ortho Mode Transducer (OMT)



Figure 8-108: Ortho Mode Transducer (OMT)

The OMT interfaces a low-loss waveguide from the dual-polarized feed-horn to the BUC/LNB. The purpose of the OMT is to separate the TX and RX signals and provide isolation between BUC and LNB. DC power, 10 MHz external reference signal and a 22 kHz control signal is delivered via the IF cable. The OMT uses the independency of the signals to split and provide isolation. The OMT also detects the output power and temperature of the BUC.

### 8.5.16.1 Removing the OMT

#### Tools needed:

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

1. Follow the instructions in *Removing the Polarisation Unit* on page 8-72.
2. Follow the instruction in *Removing the LNB* on page 8-79 and remove both Co-pol LNB (to the left) and X-pol LNB (to the right).

3. Remove the 2xTorx20 screws on top of the OMT.

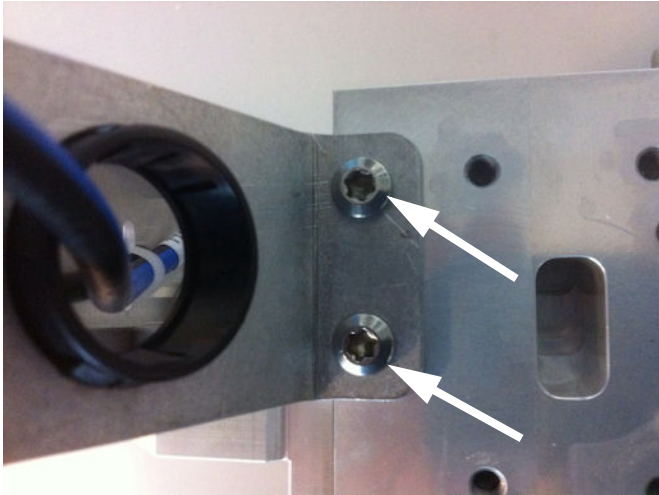


Figure 8-109: OMT, removing 2xTorx20 screws on top

4. Remove the 4xTorx 20 screws on the left-hand rail of the Polarisation Unit fixing the rail to the waveguide between the BUC and OMT.

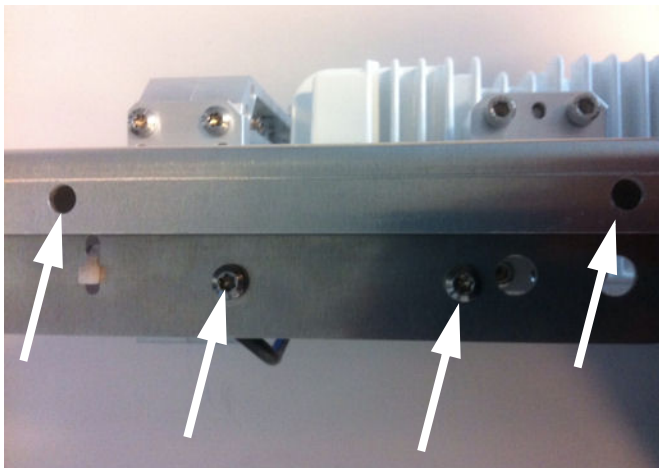


Figure 8-110: OMT, removing 4xTorx20 screws on the left-hand rail of the Polarisation Unit

5. Remove the 4xTorx 20 screws on the right-hand rail of the Polarisation Unit fixing the rail to the OMT.

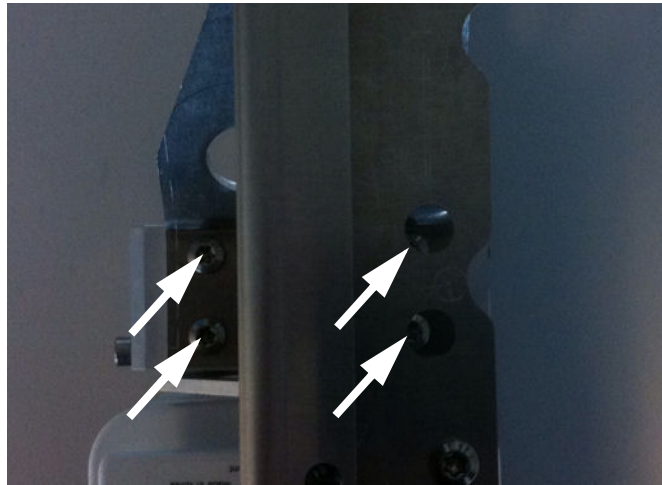


Figure 8-111: OMT, removing 4xTorx20 screws on the right-hand rail of the Polarisation Unit

6. Remove the 4x4 mm Allen screws from the waveguide flange at the side of the BUC.

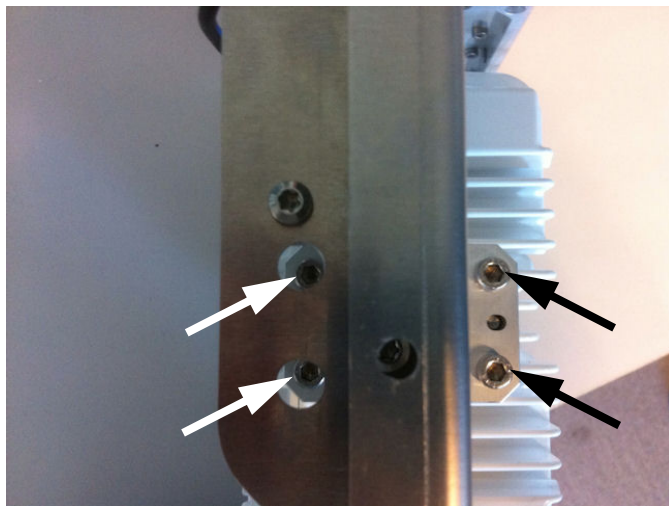


Figure 8-112: OMT, removing

7. The OMT and waveguide are now free to be removed from the Polarisation Unit.

8. Remove the 4xTorx 20 screws and remove the waveguide from the OMT.

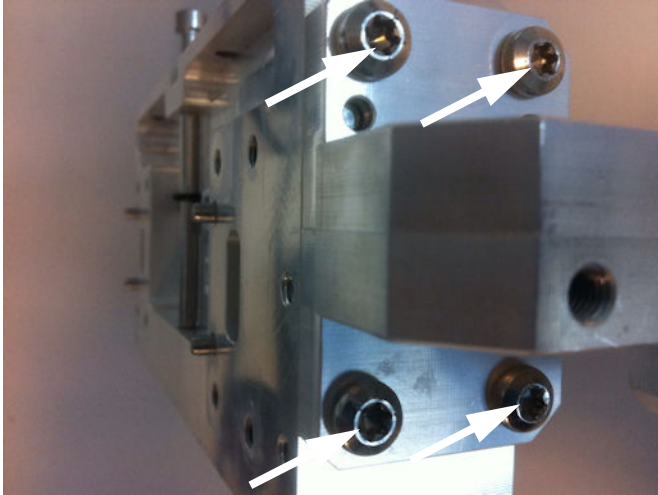


Figure 8-113: OMT, removing the waveguide

### 8.5.16.2 Inserting a new OMT

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

## 8.5.17 Replacing the rotary joint



Figure 8-114: Rotary joint

### 8.5.17.1 Removing the rotary joint

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.

#### Tools needed:

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

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).

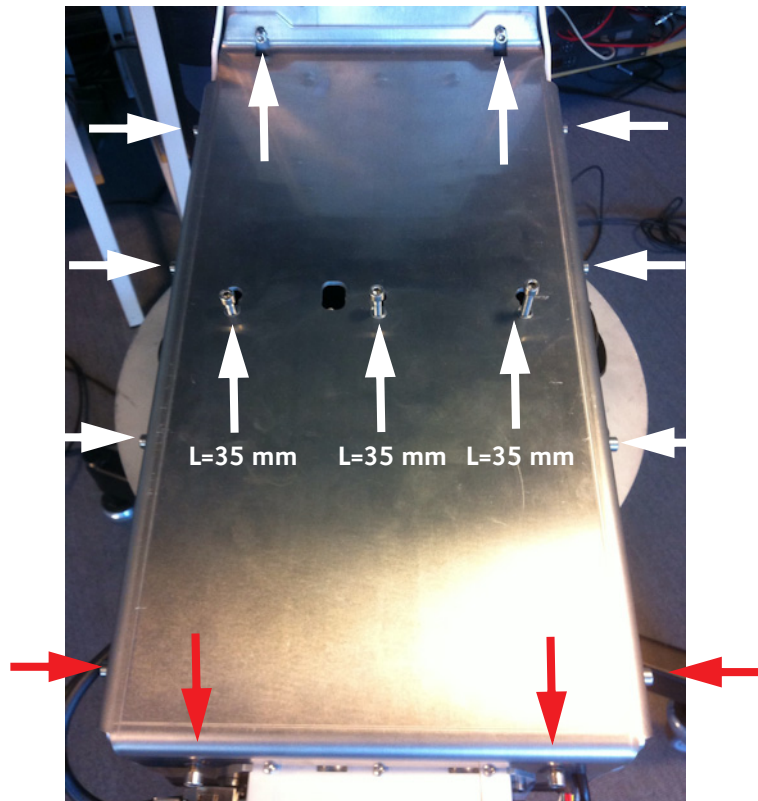


Figure 8-115: Azimuth motor, remove cover

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

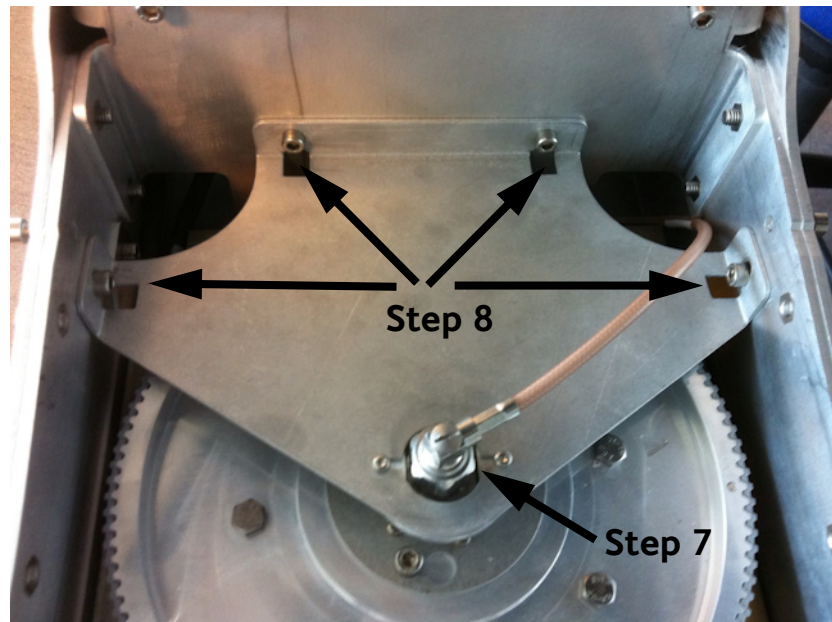


Figure 8-116: Getting access to the azimuth drive wheel



8. Loosen the 4x4 mm Allen screws (thread size M5) from the cover plate over the azimuth drive wheel.
9. Remove the cover plate.
10. Loosen the 3x4 mm Allen screws.

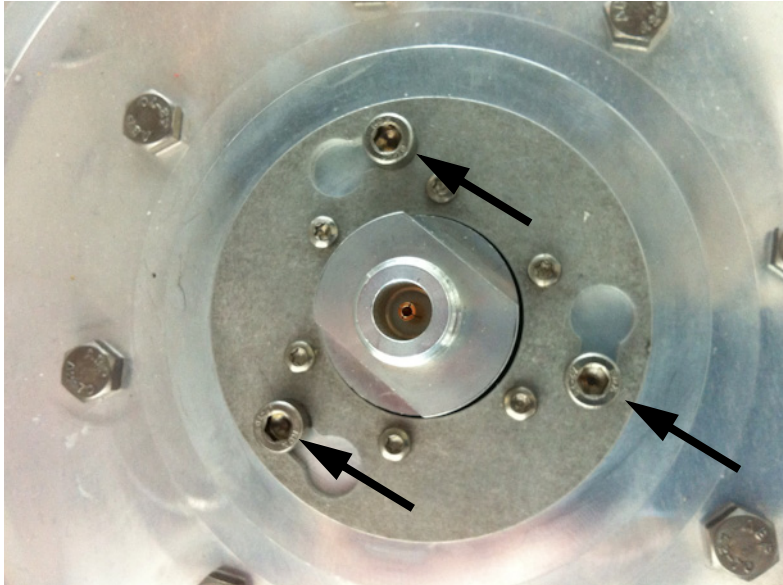


Figure 8-117: Rotary joint (in place)

11. Rotate the rotary joint on the key holes and lift it carefully up.
12. Disconnect the RF connector (N-type, finger nut) from the bottom end of the rotary joint.

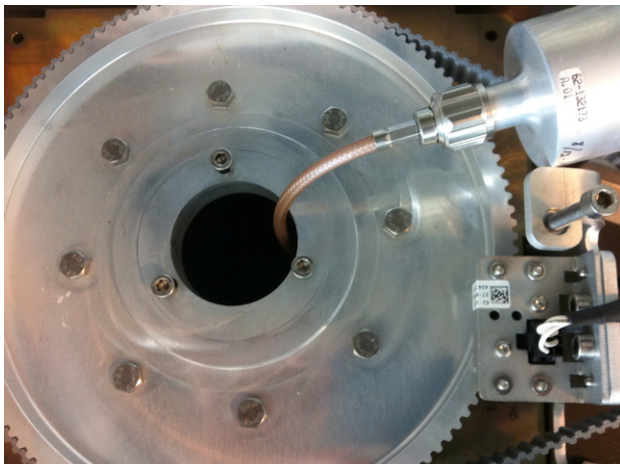


Figure 8-118: Rotary joint (removed)

13. Remove the rotary joint.

### 8.5.17.2 Insert a new Rotary Joint.

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

### 8.5.18 Replacing 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 8-90.



Figure 8-119: Wire-rope isolator in good condition

Tools needed:

- TX20 (SAILOR 900), TX30 (SAILOR 800)
- 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.

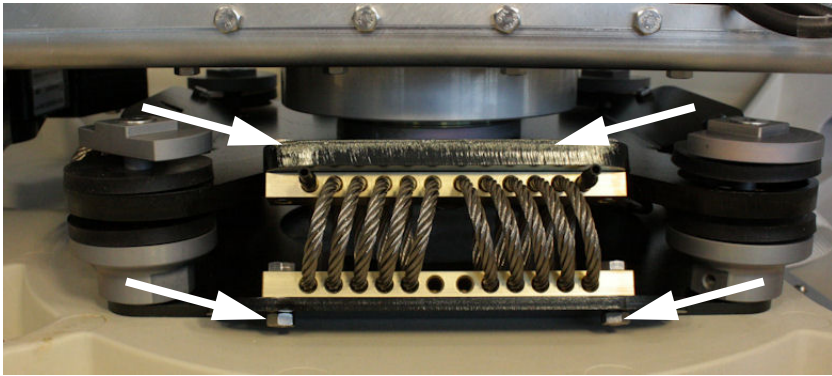


Figure 8-120: Removing a wire-rope isolator

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.

## 8.6 Updating VIM/PCM calibration data

After installing a new VIM (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:

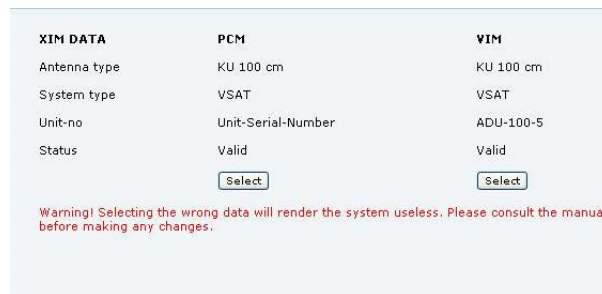


Figure 8-121: Updating VIM/PCM calibration data (example)

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 8-122: XIM data, warning

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



Figure 8-123: 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).

| <b>XIM DATA</b> | <b>PCM</b>                            | <b>VIM</b>                            |
|-----------------|---------------------------------------|---------------------------------------|
| 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 8-124: XIM data valid

The XIM data are now updated and the **SAILOR 800/900 VSAT** is operational again.

## 8.7 Inspection of mechanical components

### 8.7.1 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.

### 8.7.2 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 3-30.

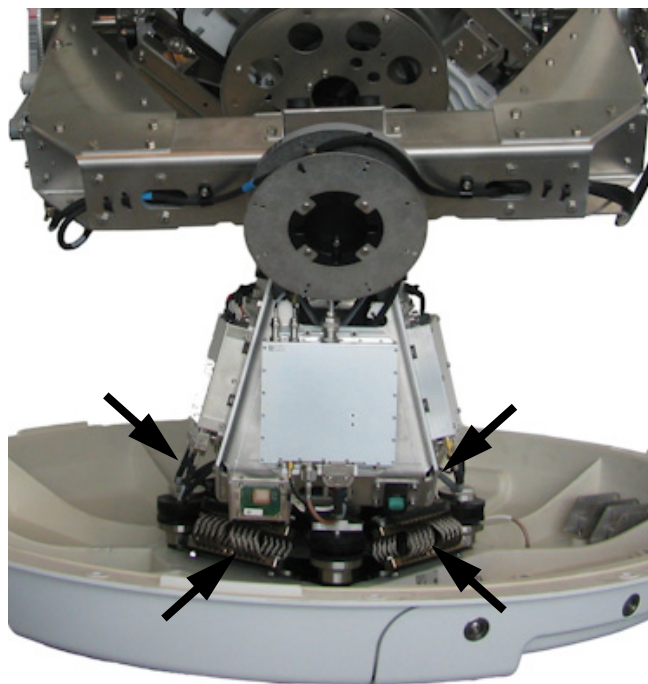


Figure 8-125: Location of the 4 wire-rope isolators (SAILOR 900 picture)

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.

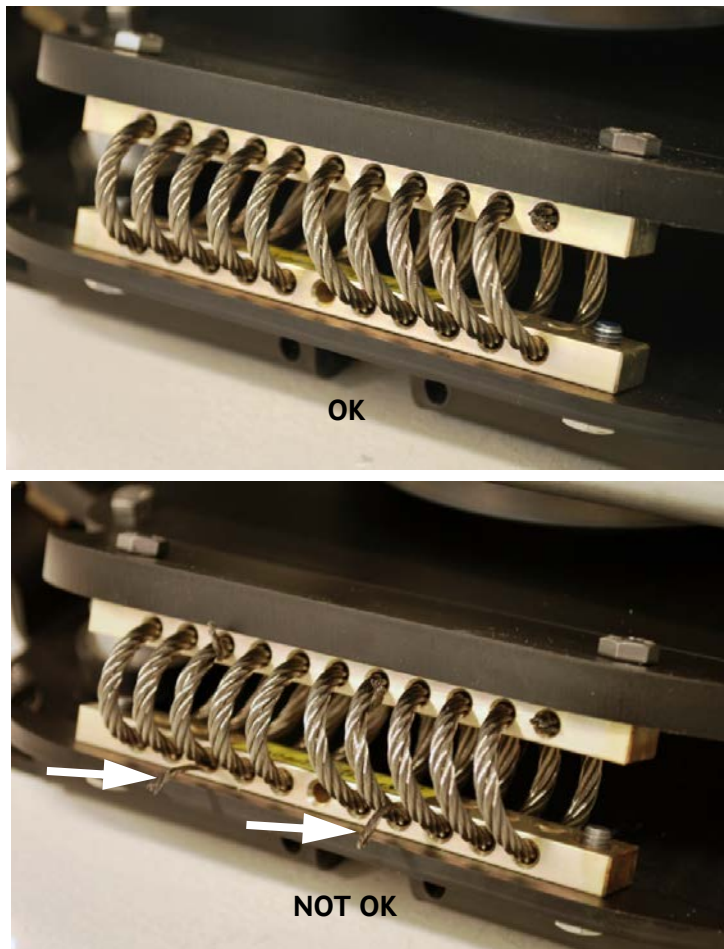


Figure 8-126: Inspection of a wire-rope isolator 1/2

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.

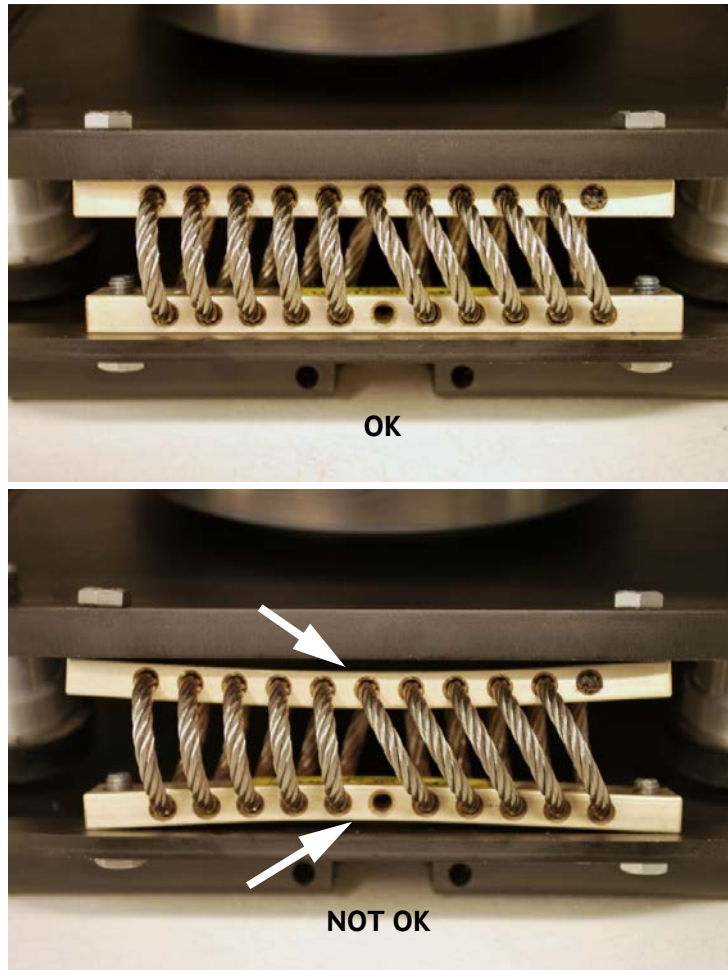


Figure 8-127: Inspection of a wire-rope isolator 2/2

For instructions on how to replace a wire-rope isolator see *Replacing a wire-rope isolator* on page 8-86.



## 8.8 Troubleshooting

### 8.8.1 Overview

This section describes an initial check of the primary functions of the SAILOR 800/900 VSAT 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 8-10.

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

### 8.8.2 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.

### 8.8.3 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 6-41.

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

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

The SAILOR 800/900 VSAT 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 0x00the exa024 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)
```

### System log:

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

### 8.8.3.2 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.]

### 8.8.4 Troubleshooting – VSAT

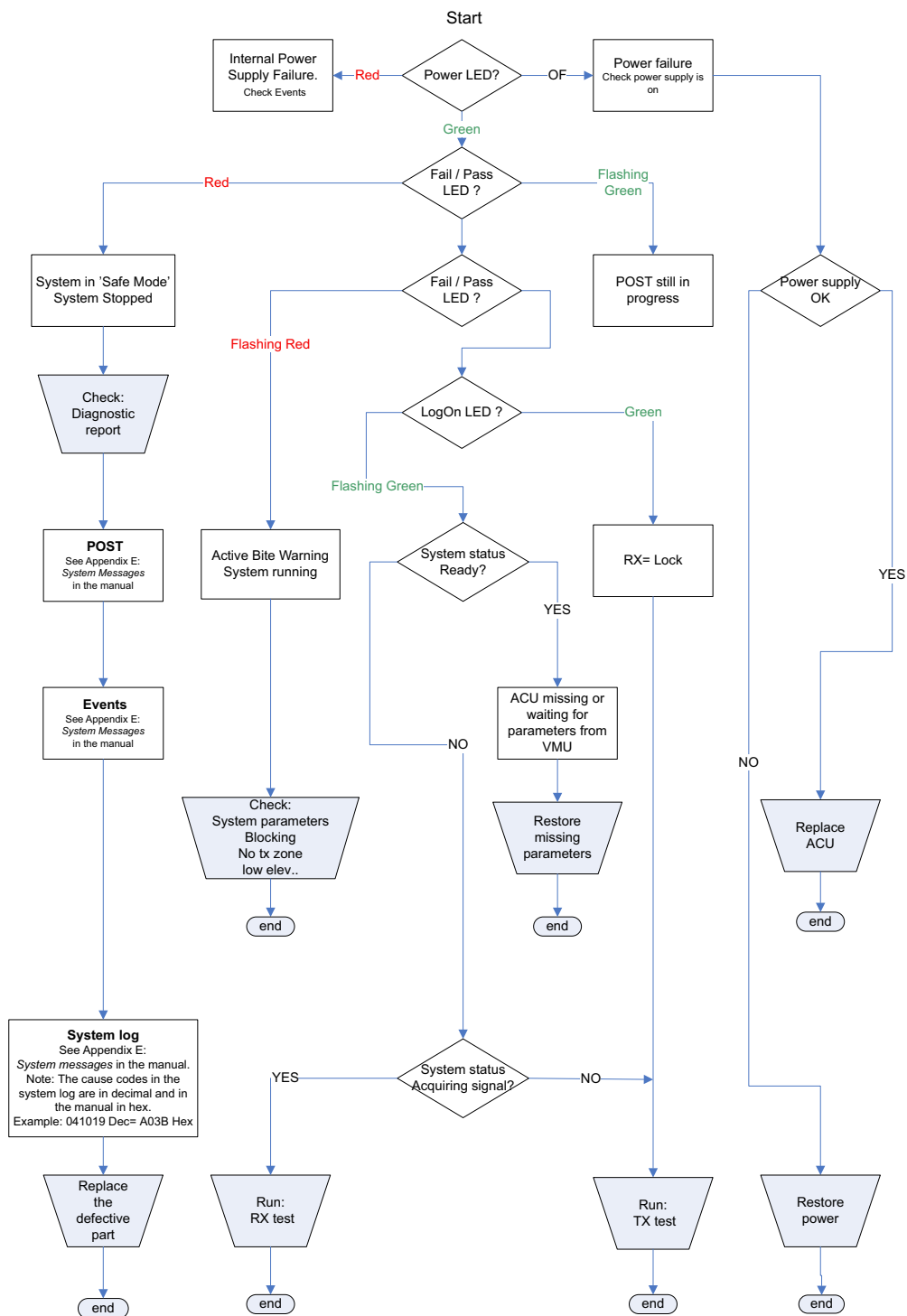


Figure 8-128: Troubleshooting – VSAT

### 8.8.5 Troubleshooting – BUC

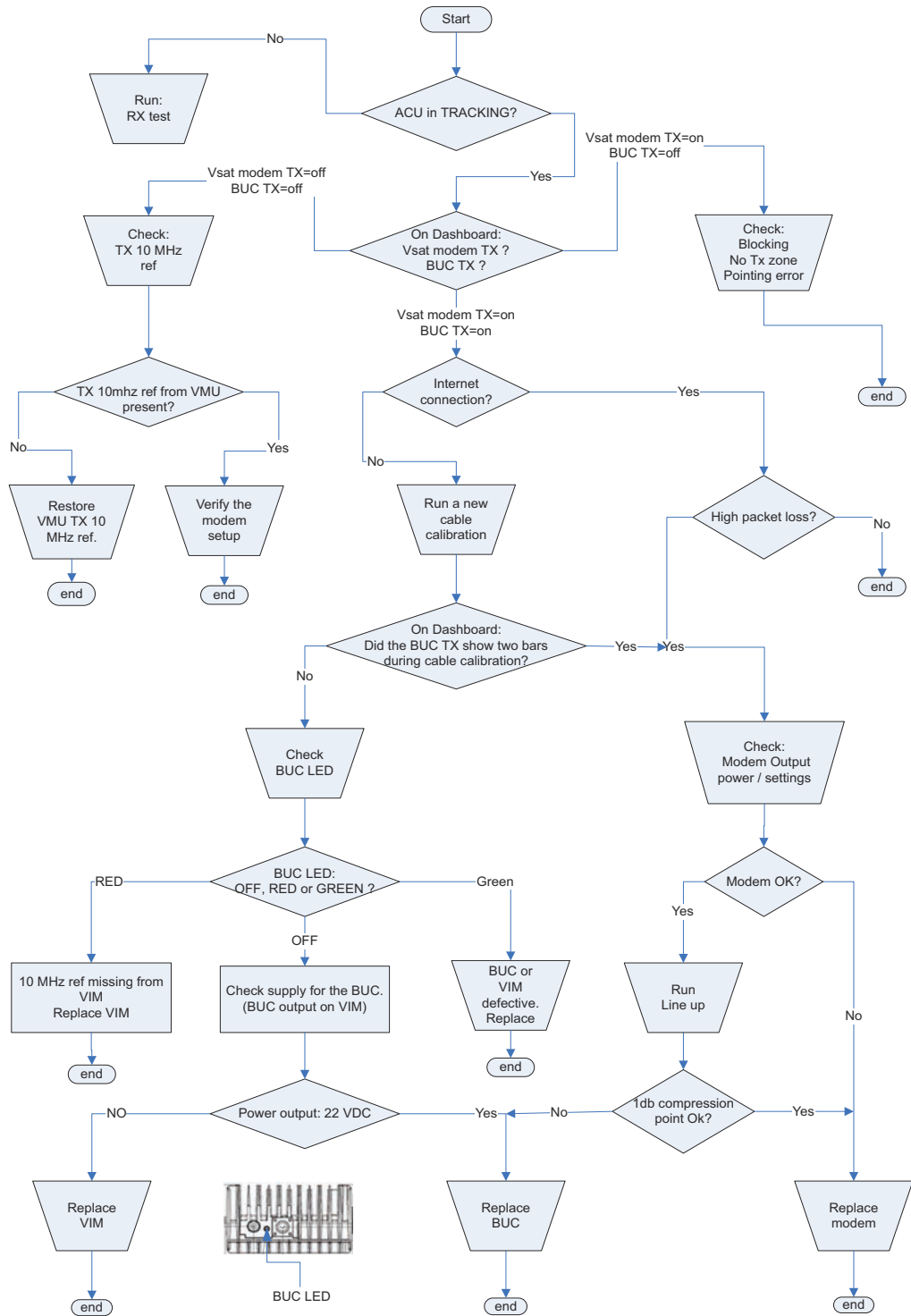


Figure 8-129: Troubleshooting – BUC

### 8.8.6 Troubleshooting – LNB

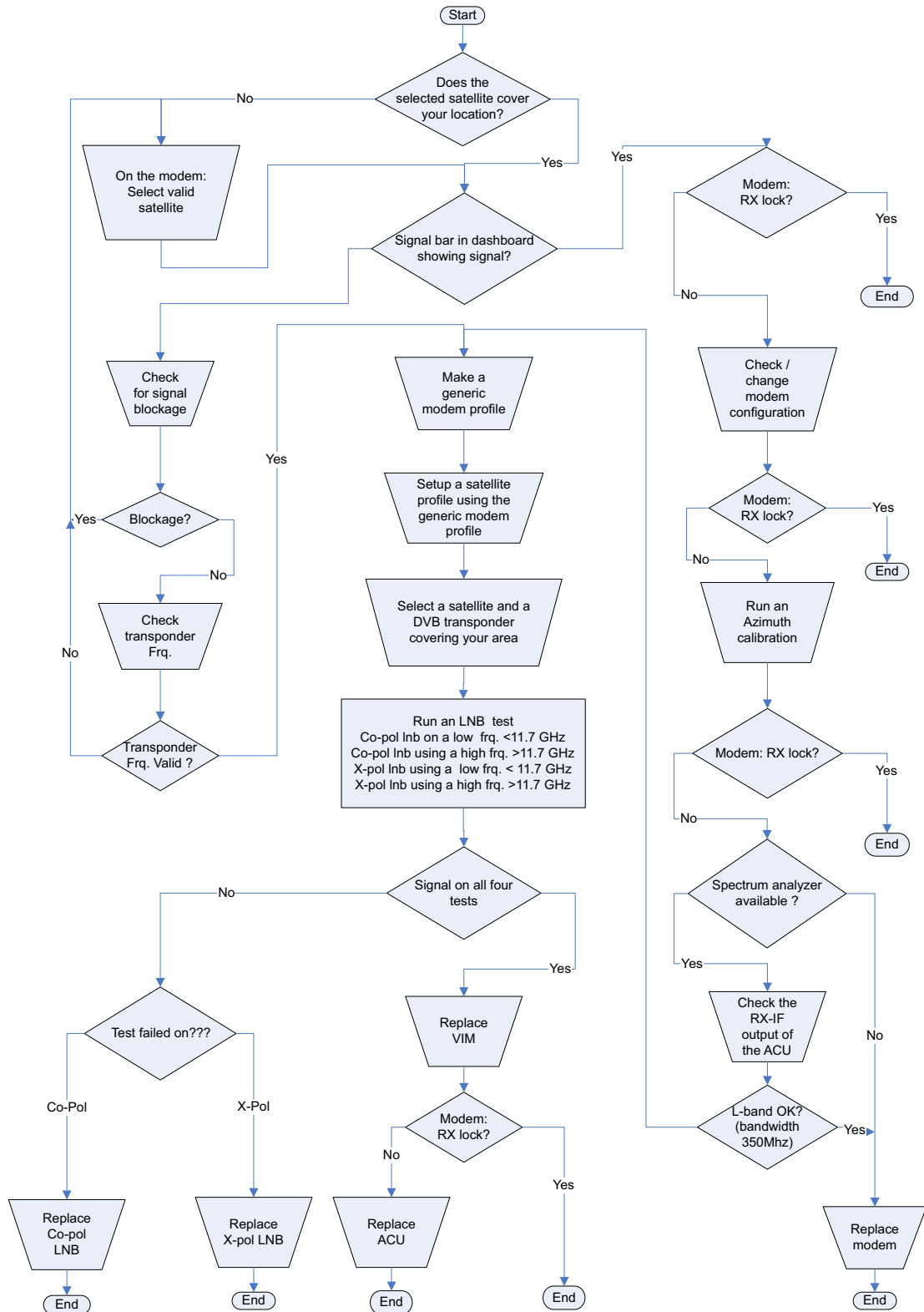


Figure 8-130: Troubleshooting – LNB

## 8.8.7 LNB test

To check the two LNBs, run four different signal level tests:

1. First test to test the Co-pol LNB, on an RX frequency in the low band (<11.700 GHz)
2. Second test to test X-pol LNB on a frequency in the low band (<11.700 GHz)
3. Third test to test the Co-pol LNB, on an RX frequency in the high band (>11.700 GHz)
4. Fourth test to test X-pol LNB on a frequency in the high band (>11.700 GHz)

Find a satellite that covers the area that you are located in. Use for example LyngSat. (Use a DVB transponder with a good solid signal.)

### 8.8.7.1 First signal test: Co-Pol LNB / low band

1. Set up the satellite profile as follows.  
 RX: RF < 11.700 GHz, HOR, RX LO = 9.75 GHz (in the below example 0.8 W and 10.747 is used)  
 TX: RF 13.800z , Co-pol, LO = 12.800GHz  
**This tests the Co-Pol LNB in the low band.**
2. Activate the profile.  
 See that there is full or near full bar readings in the signal bar on the Dashboard.

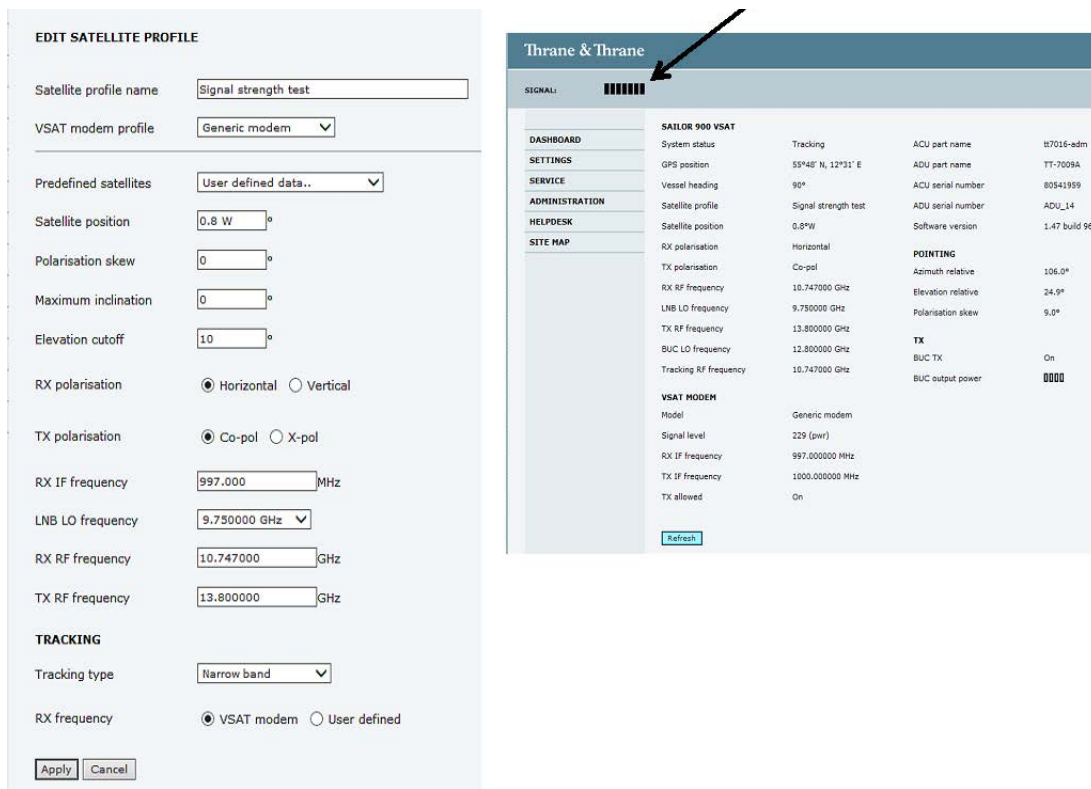


Figure 8-131: First signal test: Co-Pol LNB / low band



### 8.8.7.2 Second signal test: X-pol LNB / low band

1. Change the setup as follows:  
 RX: RF < 11.700 GHz, HOR, RX LO = 9.75 GHz (in the below example 0.8 W and 10.747 is used)  
 TX: RF 13.800 GHz, X-pol, LO = 12.800 GHz  
**This tests the X-pol LNB in the low band.**
2. Activate the profile.  
 See that there is full or near full bar readings in the signal bar on the Dashboard.

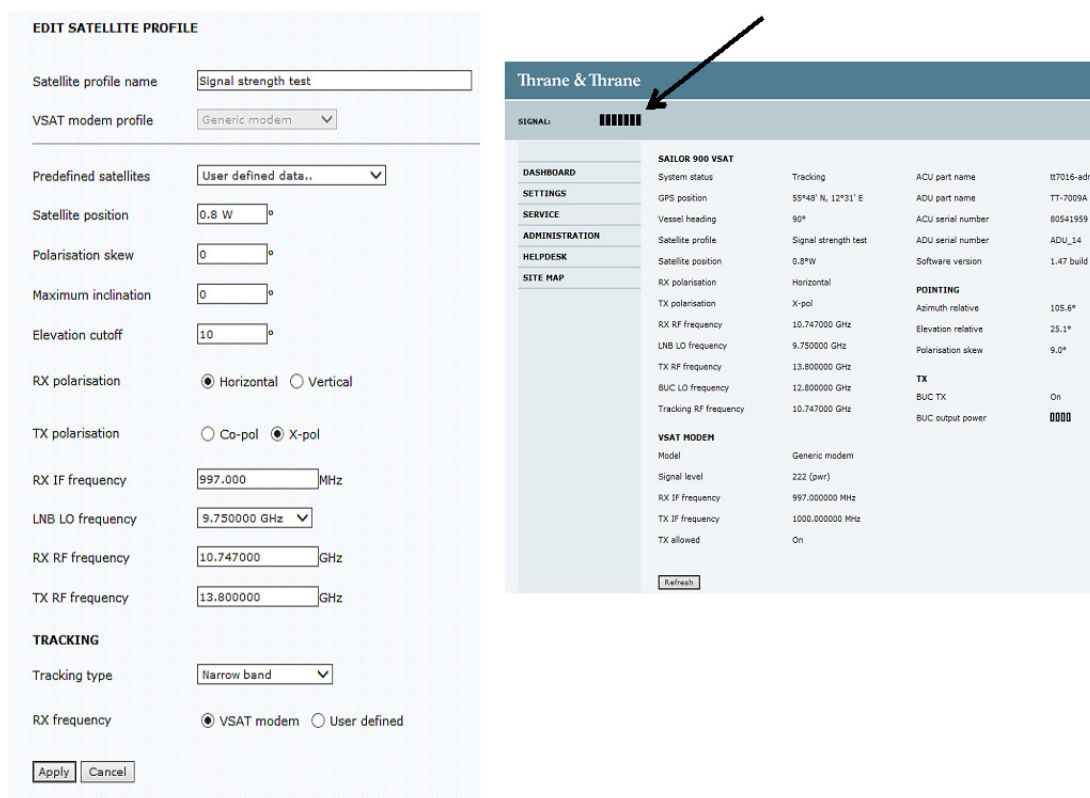


Figure 8-132: Second signal test: X-pol LNB / low band

### 8.8.7.3 Third signal test: Co-Pol LNB / high band

1. Change the setup as follows:  
RX: RF > 11.700 GHz, HOR, RX LO = 10.75 GHz (in the below example 0.8 W and 12.015 GHz is used)  
TX: RF 13.800 GHz , Co-pol, LO = 12.800 GHz  
**This tests the Co-Pol LNB in the high band.**
2. Activate the profile.  
See that there is full or near full bar readings in the signal bar on the Dashboard.

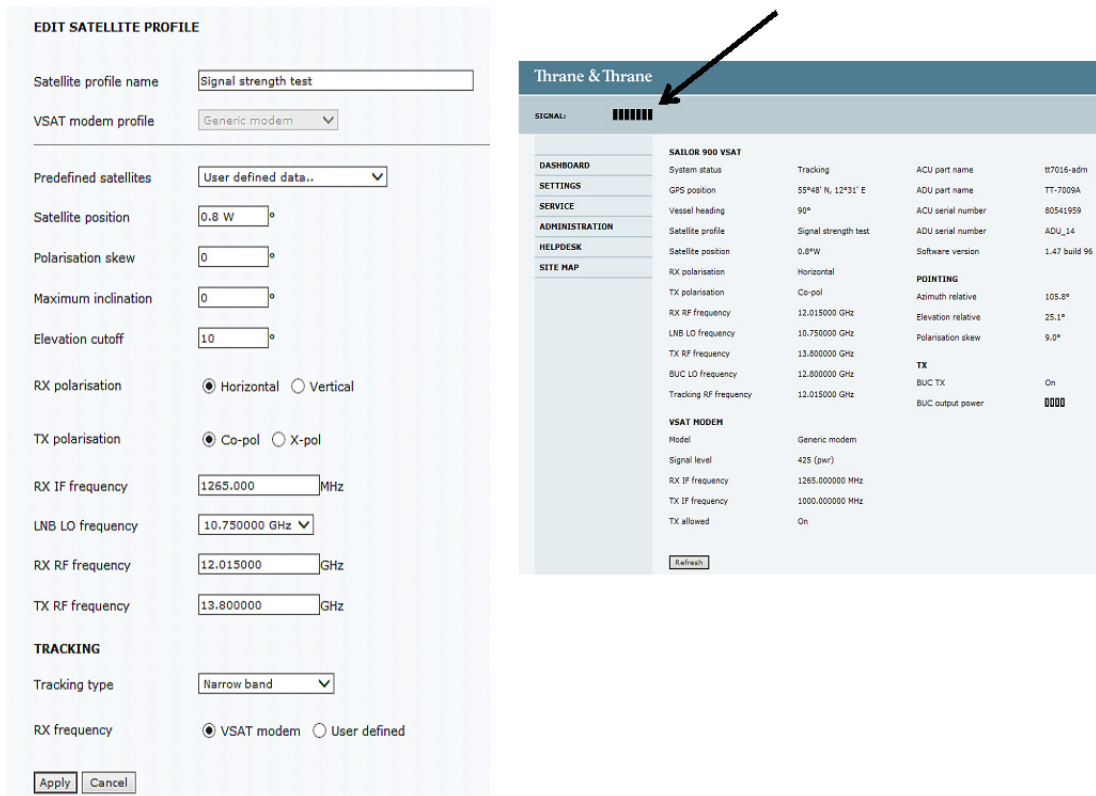


Figure 8-133: Third signal test: Co-Pol LNB / high band

### 8.8.7.4 Fourth signal test: X-Pol LNB / high band

1. Change the setup as follows:  
 RX: RF > 11.700 GHz, HOR, RX LO = 10.75 GHz (in the below example 0.8 W and 12.015 GHz is used)  
 TX: RF 13.800 GHz, X-pol, LO = 12.800 GHz  
**This tests the X-Pol LNB in the high band.**
2. Activate the profile.  
 See that there is full or near full bar readings in the signal bar on the Dashboard.

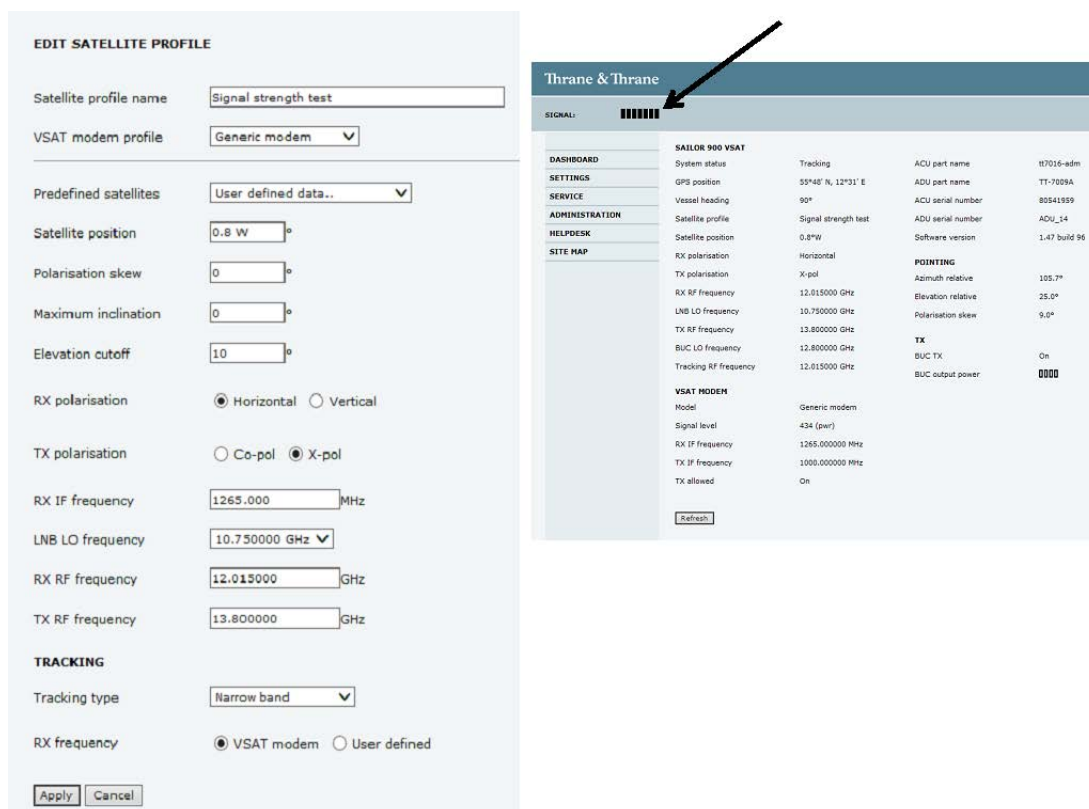


Figure 8-134: Fourth signal test: X-Pol LNB / high band

### 8.8.8 To verify that the VSAT antenna can go into tracking mode

In case there is no RX lock on the connected VSAT modem you can activate a service profile to verify that the transponder data used during calibration are received correctly. If the SAILOR 800/900 VSAT can go into tracking mode it not likely that it is defective.

1. Go to **SETTINGS** or **Satellite profiles**.
2. Activate a satellite profile that is used for azimuth calibration. This is a satellite profile that uses the VSAT modem profile **Service & Calibration**.
3. Go to **DASHBOARD** and monitor the field System status. If the field ends up showing Tracking, the SAILOR 800/900 VSAT can track the satellite and is most likely not the reason why the VSAT modem is not in RX lock.

### 8.8.9 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"

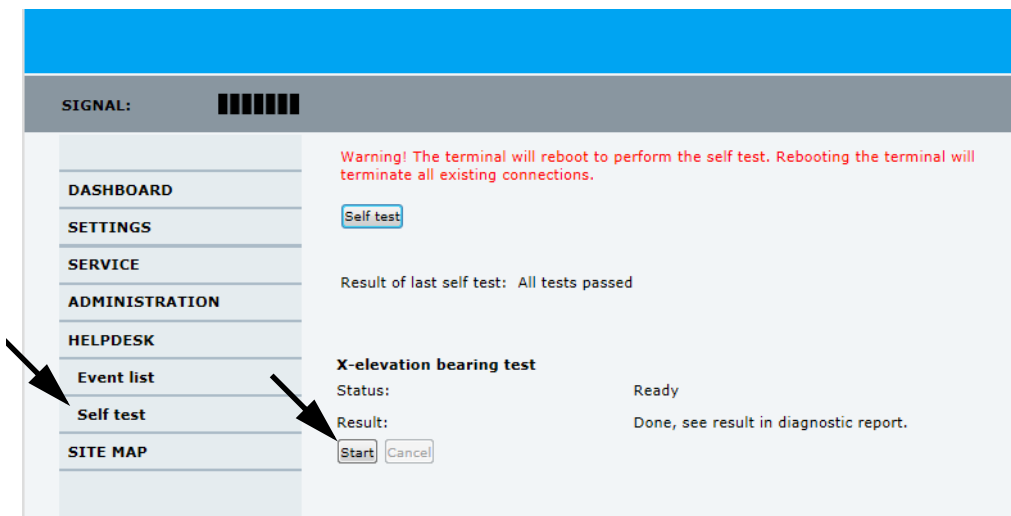


Figure 8-135: X-elevation bearing test (service)

## 8.9 Returning units for repair

Should your Cobham SATCOM product fail, please contact your dealer or installer, or the nearest Cobham SATCOM partner. You will find the partner details on [www.cobham.com/satcom](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.



# Appendices





# Technical specifications

## A.1 SAILOR 800/900 VSAT system components

### A.1.1 General specifications

| Item                           | Specification   |
|--------------------------------|---|
| Frequency band                 | Ku (VSAT)   |
| Rx                             | 10.70 to 12.75 GHz  |
| Tx                             | 13.75 to 14.50 GHz (extended)   |
| Reflector size                 | SAILOR 900: 103 cm (40 inch),<br>SAILOR 800: 83 cm (32.7 inch)  |
| Certification                  | CE (Maritime), ETSI EN 302 340, CEI/IEC 60950-1, CEI/IEC 60945, CEI/IEC 60950-22 Eutelsat                       |
| System power supply range      | 20–32 VDC<br>(Start up voltage: 22 VDC guaranteed)  |
| ADU cable type (ACU to ADU)    | Single 50 Ohm coax cable for Rx, Tx, ACU-ADU modem and power  |
| Total system power consumption | SAILOR 900: 370 W peak, 175 W typical (up to 8 W BUC),<br>SAILOR 800: 330 W peak, 140 W typical (up to 6 W BUC) |
| ACU to ADU cable               | Single 50 Ohm Coax for Rx, Tx, ACU-ADU modem, 10 MHz reference and DC power                                     |
| Antenna connector at the ADU   | Female N-Connector (50 Ohm)   |
| Antenna connector at the ACU   | Female N-Connector (50 Ohm)   |

Table A-1: General specifications

## A.1.2 ADU

| Item                                | Specification   |
|-------------------------------------|---|
| Antenna type, pedestal              | 3-axis (plus skew) stabilised tracking ADU with integrated GPS  |
| Antenna type, reflector system      | Reflector/sub-reflector, ring focus   |
| Transmit Gain                       | SAILOR 900: 41.6, SAILOR 800: 40.6 dBi typ. @ 14.25 GHz (excluding radome)  |
| Receive Gain                        | SAILOR 900: 40.6, SAILOR 800: 38.8 dBi typ. @ 11.70 GHz (excluding radome)  |
| System G/T                          | SAILOR 900: 19.9, SAILOR 800: 18.2 dB/K typ. @ 12.75 GHz, at $\geq 30^\circ$ elevation and clear sky (including radome) |
| BUC output power                    | SAILOR 900: 8, SAILOR 800: 6 W  |
| EIRP                                | SAILOR 900: $\geq 50.1$ , SAILOR 800: $\geq 48.1$ dBW (including radome)  |
| LNB                                 | 2 units multi-band LNBs (band selection by ACU)   |
| Tracking Receiver                   | Internal "all band/modulation type" DVB-S2, 300 kHz narrowband receiver and modem RSSI                                  |
| Polarisation                        | Linear Cross or Co-Pol (selected by ACU)  |
| Elevation Range                     | $-25^\circ$ 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 | $15^\circ/s$ and $15^\circ/s^2$   |
| ADU motion, linear                  | Linear accelerations $\pm 2.5$ g max any direction  |
| Satellite acquisition               | Automatic - with Gyro/GPS compass input<br>Prepared for gyro-free operation support                                     |
| Vibration, operational              | Sine: IEC 60945 (8.7.2), DNV No.2.4 Class A, MIL-STD-167-1 (5.1.3.3.5)<br>Random: Cobham Maritime Operational           |
| Vibration, survival                 | Sine: IEC 60945 (8.7.2) dwell, MIL-STD-167-1 (5.1.3.3.5) dwell. IEC 60721-4-6 class 6M3                                 |
| Shock                               | MIL-STD-810F 516.5 (Proc. II), IEC60721-4-6 class 6M3   |

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

| Item                         | Specification  |
|------------------------------|--|
| Temperature (ambient)        | Operational: -25° C to 55° C<br>Storage: -40°C to 85°C   |
| Humidity                     | 100%, condensing   |
| Rain (IP class)              | IEC 60945 Exposed (IPx6)   |
| Wind resistance              | Operational: 80 kt.<br>Survival: 110 kt.   |
| Ice                          | Survival: 25 mm (1 inch)   |
| Solar radiation              | 1120 W/m2 to MIL-STD-810F 505.4  |
| Compass safe distance        | SAILOR 900: 130 cm for Var. A, 170 cm for Var. B, SAILOR 800: 100 cm (40 inch) to IEC 60945                                  |
| Maintenance, scheduled       | None ( $T_{amb} > 10^{\circ}C$ )   |
| Maintenance, unscheduled     | All electronic, electromechanical modules and belts can be replaced through the service hatch.                               |
| Built-in tests               | Power On Self Test (POST)<br>Person Activated Self Test (PAST)<br>Continuous Monitoring (CM) with error log                  |
| Power OFF                    | Automatic safe mode  |
| Input power                  | Powered by ACU   |
| Dimensions (overall)         | Diameter x Height: Ø SAILOR 900:130 cm (51.3 inch) x H 150 cm (58.9 inch), SAILOR 800: 108 cm (42.5) x H123.5 cm (48.6 inch) |
| Weight, ADU                  | SAILOR 900: 130 kg (287 lbs) (Var. A) or 126.5 kg (279 lbs) (Var. B), SAILOR 800:125 kg (275 lbs)                            |
| Dimensions, packing material | 1230 x 1230 x 1370 mm  |
| Weight, packing material     | 65 kg (143 lbs)  |

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

### A.1.3 ACU

| Item                                | Specification  |
|-------------------------------------|--|
| Dimensions, rack mount<br>H x W x D | 1 U, 19 inch<br>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<br>Storage: -40°C to +85°C   |
| Humidity                            | IEC 60945 protected, 95% (non-condensing)  |
| IP class                            | IP20   |
| Compass safe distance               | 10 cm (4 inch) to IEC 60945  |
| Interfaces                          | 1 x N-Connector for antenna RF Cable (50 Ohm) with automatic cable loss compensation<br>2 x F-Connectors (75 Ohm) for Rx/Tx to VSAT modem<br>4 x Ethernet<br>1 x RS-422 data (VSAT modem control)<br>1 x RS-232 data (VSAT modem control)<br>1 x NMEA 0183 and prepared for NMEA 2000 for Gyro/GPS compass input<br>1 x DC power input<br>1 x Grounding bolt |
| Input power                         | See <i>System power supply range</i> and <i>Total system power consumption</i> on page A-1.  |
| Modem interface (control)           | iDirect openAMIP protocol & custom protocol<br>Comtech ROSS Open Antenna Management (ROAM)<br>ESS Satroaming<br>STM SatLink  |
| Display                             | OLED (red) display, 5 push buttons,<br>3 discrete indicator LEDs and ON/OFF switch   |
| No transmit zones                   | Programmable, 8 zones with azimuth and elevation   |

Table A-3: Technical specifications for the ACU

## A.1.4 Supported VSAT modems

| Item                  | Specification  |
|-----------------------|--|
| VSAT modems supported | iDirect iINFINITI 5000 (Serial)<br>iDirect iINFINITI 5000 (OpenAMIP)<br>iDirect Evolution (Serial)<br>iDirect Evolution (OpenAMIP)<br>COMTECH CDM 570L<br>COMTECH CDM 625<br>COMTECH 570L with ROSS (ROAM)<br>Generic VSAT modem<br>STM SatLink 2900<br>Gilat SkyEdge II<br>Inmarsat G5<br>For a list of supported VSAT modems see also the SAILOR 800/900 VSAT product sheet. |

Table A-4: Supported VSAT modems

## A.1.5 Patents

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

Table A-5: Patents

# A.2 Outline drawings

## A.2.1 ADU

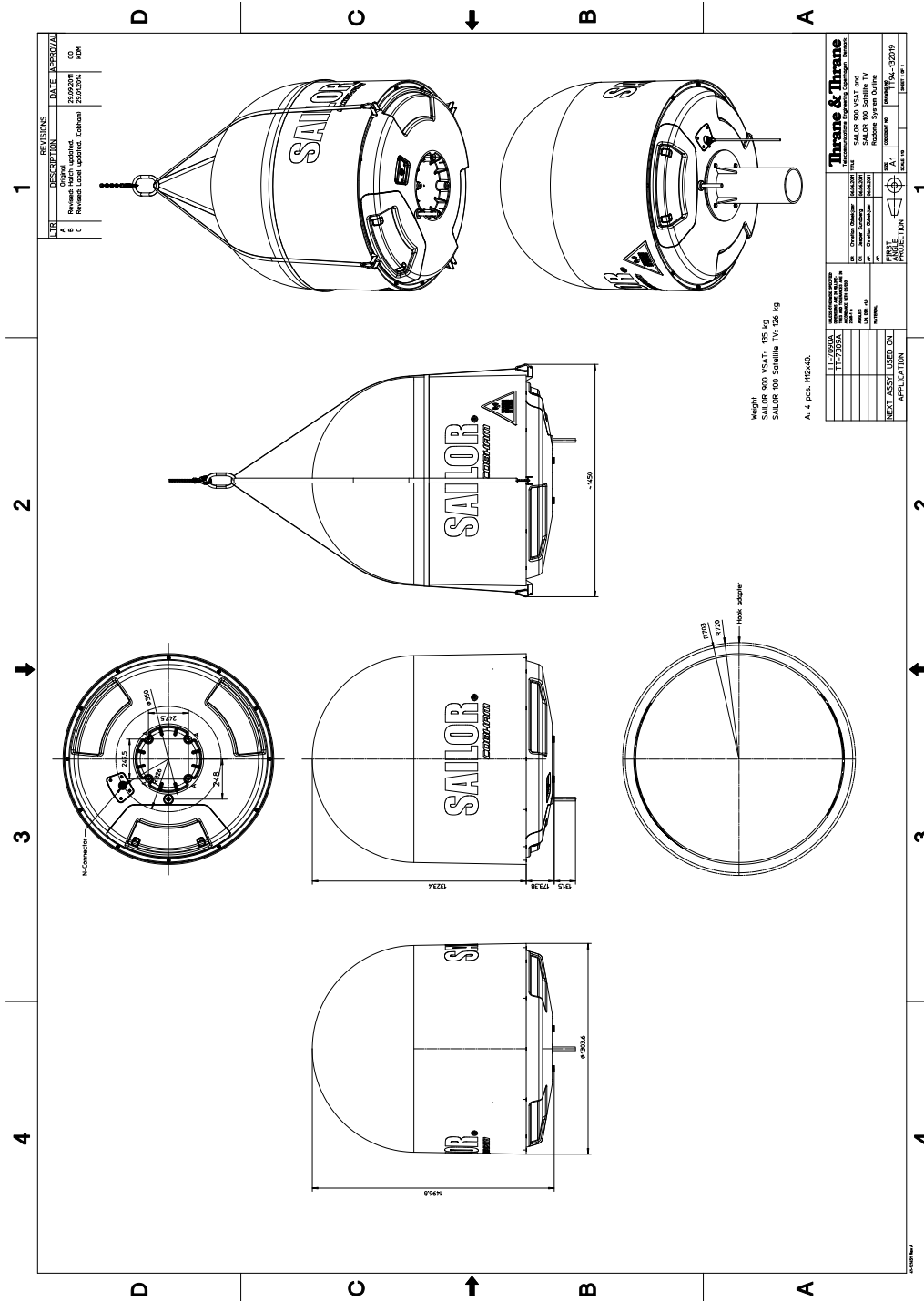


Figure A-1: SAILOR 900: Outline drawing: ADU

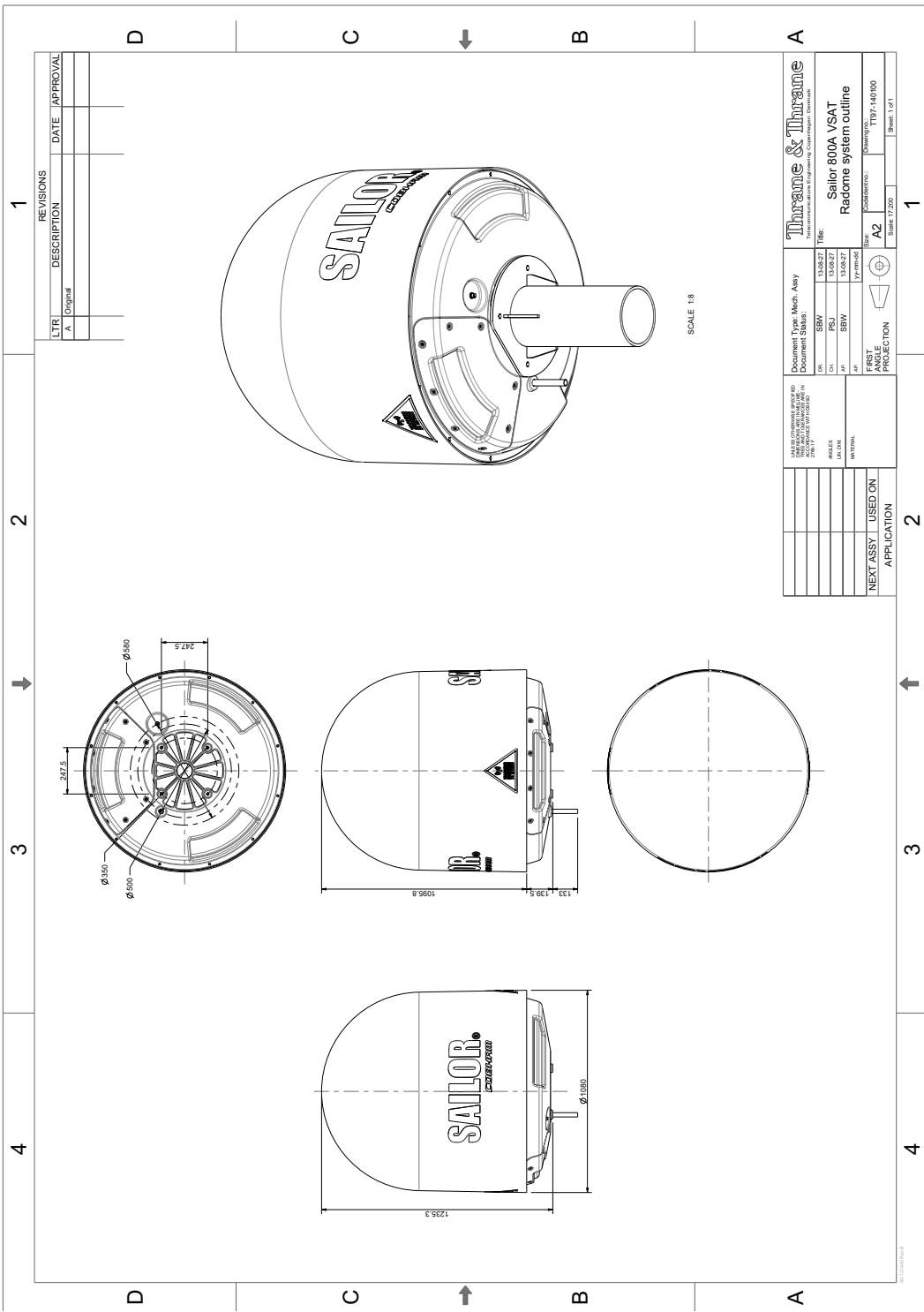


Figure A-2: SAILOR 800: Outline drawing: ADU

## A.2.2 ACU

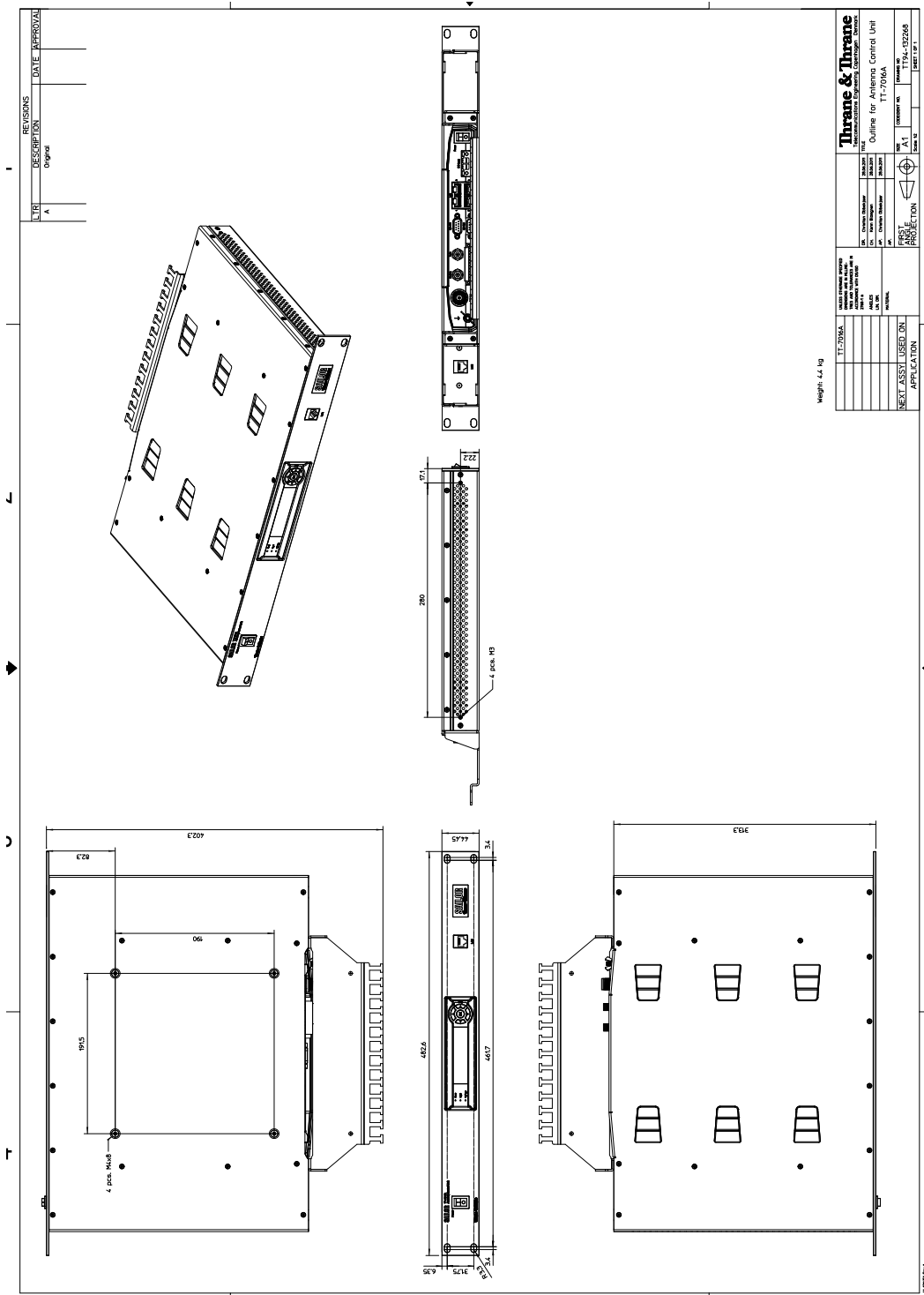


Figure A-3: Outline drawing: ACU, 19 inch rack



### A.2.3 N-connector interface on the ADU

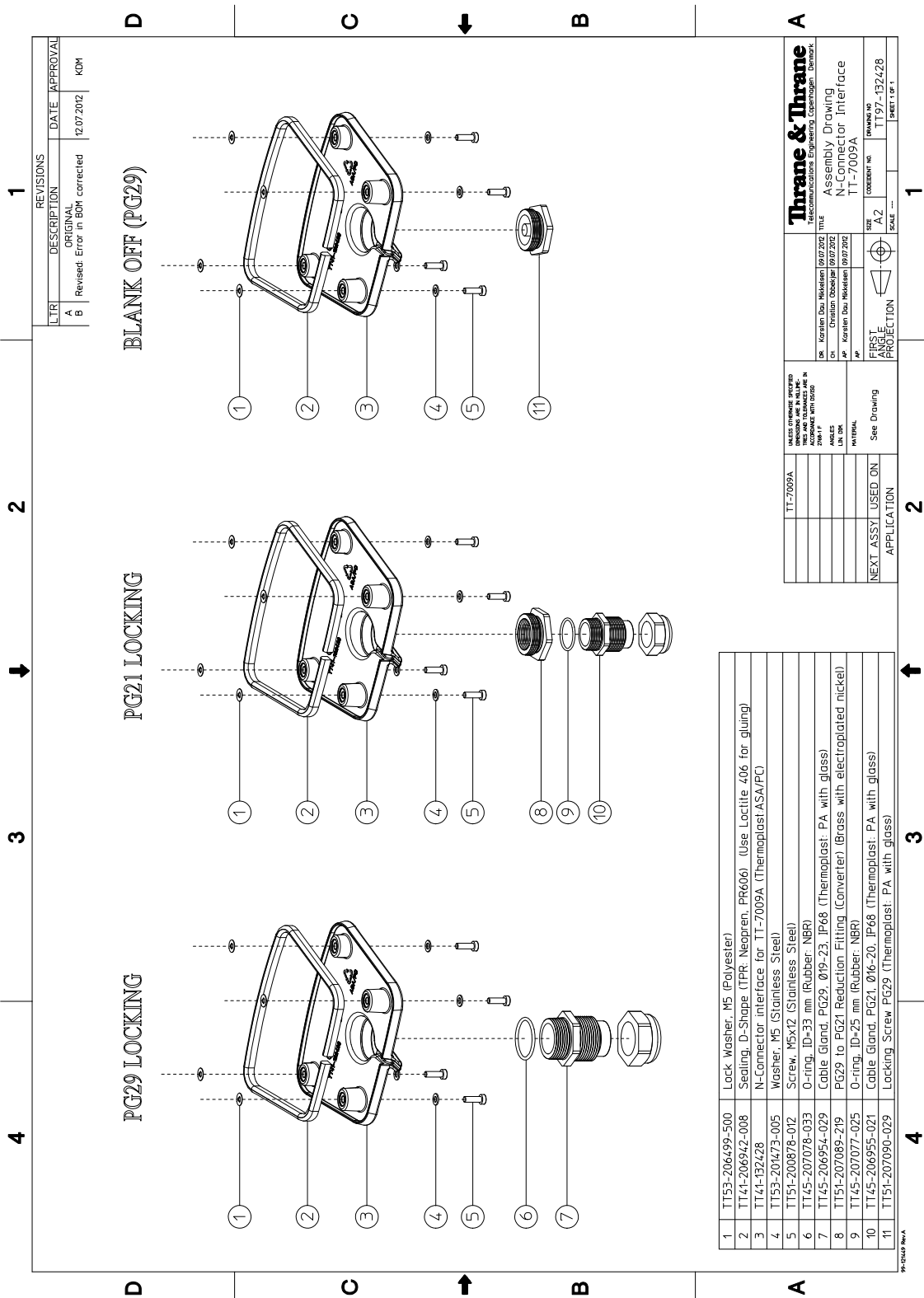


Figure A-4: N-Connector interface on the ADU

## A.3 VSAT LNB Data Sheet (physical LNB)

The following table shows the data of the LNBs which are fitted in the ADU.

The SAILOR 800/900 VSAT is designed to make any Ku Band frequency in the range of 10.7 GHz to 12.75 GHz available to a VSAT modem by allowing the user to select the LNB LO of his choice – without having to exchange the physical LNBs in the ADU. This is achieved by the sophisticated single-cable solution of the SAILOR 800/900 VSAT.

Please see A.3.1 for configuration information.

| Interface      | Model  | Spec.   |
|----------------|--------|---|
| Input, Ku-band | 2-band | WR75 waveguide  |
| Output, IF     | 2-band | F (SAILOR 900: 50, SAILOR 800: 75 Ohm <sup>a</sup> )                  |
| LO type        | 2-band | Locked to 10 MHz external reference over IF interface or ACU internal |
| LO frequencies | 2-band | 9.75, 10.75 GHz   |

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

a. 75 Ohm for TT-7009A.

| Parameter                   | Condition/remark          | Unit | Min. | Typical | Max.    |
|-----------------------------|---------------------------|------|------|---------|---------|
| Input frequency range       | VSAT                      | GHz  | 10.7 |         | 12,75   |
| Output (IF) frequency range | 2-band                    | MHz  | 950  |         | 2150    |
| VSWR                        | Input                     | -    |      |         | 2.0 : 1 |
|                             | Output                    | -    |      |         | 1.7 : 1 |
| Noise Figure                | At 25 °C                  | dB   |      | 0,8     |         |
| LO stability                | Over temp. range          | kHz  | -10  | 0       | 10      |
| Gain                        |                           | dB   |      | 60      |         |
| Gain (relative)             | Over 500 MHz BW           | dB   | -2.0 | 0       | 2.0     |
| Gain (relative)             | Over 36 MHz BW            | dB   | -0.5 | 0       | 0.5     |
| External ref. freq. (input) | Nominal                   | MHz  |      | 10      |         |
| Power supply voltage        | DC                        | V    | 11.0 |         | 19.0    |
| Supply current              | DC                        | mA   |      |         | 350     |
| LO selection voltage        | Voltage, low (L) (input)  | V    | 11.0 |         | 14.0    |
|                             | Voltage, high (H) (input) | V    | 16.0 |         | 19.0    |

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

| Parameter                             | Condition/remark | Unit | Min. | Typical | Max. |
|---------------------------------------|------------------|------|------|---------|------|
| Temperature range (ambient)           | Operation        | °C   | -30  |         | 75   |
|                                       | Storage          | °C   | -40  |         | 85   |
| Dimensions (incl. connector) over all | L                | mm   |      |         | 140  |
|                                       | W                | mm   |      |         | 58   |
|                                       | H                | mm   |      |         | 50   |
| Weight                                | Total            | g    |      |         | 350  |

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

### A.3.1 VSAT LNB user installation and configuration information

The SAILOR 800/900 VSAT can interpret 4-band LNB switching signals as well as exact LO information acquired directly from the attached VSAT modem by means of a data connection.

When using a VSAT modem which is integrated to use LO information transferred via a data connection, the LO must be in the range of 9.6 GHz to 11.3 GHz (Optimum values are 9.75 GHz and 10.75 GHz as these match the physical LNB values).

All VSAT modems that can be used with SAILOR 800/900 VSAT use this approach for selecting the LO frequency, except a COMTECH modem with ROSS server. A COMTECH modem with ROSS server reads switching signals by means of a data connection instead of using voltage and tone signals.

#### A.3.1.1 Example configuration for an iDirect i5100 (L-Band range 950 - 1700 MHz)

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

Since the LO frequency of 10.1 GHz is in the range of 9.6 GHz to 11.3 GHz, this is a valid set of data. The SAILOR 800/900 VSAT will tune to 11.7389 GHz and provide the carrier on the L-Band frequency 1638.9 MHz.

#### A.3.1.2 Example configuration for a special VSAT modem (L-Band range 950 - 1450 MHz)

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

Since the LO frequency of 11.3 GHz is in the range of 9.6 GHz to 11.3 GHz, this is a valid set of data. The SAILOR 800/900 VSAT will tune to 12.750 GHz and provide the carrier on the L-Band frequency 1450 MHz.

### A.3.1.3 4-band switching

When using 4-band switching and a VSAT modem which is integrated with SAILOR 800/900 VSAT to use voltage and tone for switching, the switching is done according to the following table:

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

Table A-8: 4-band switching

Currently none of the VSAT modems which are integrated with the SAILOR 800/900 VSAT use voltage and tone switching.

## A.4 VSAT 8/6 W BUC Data Sheet (Extended)

| Interface        | Model    | Spec.   |
|------------------|----------|---|
| Input, IF        | -        | N (50 Ohm)  |
| Output, Ku-band  | 86 W     | WR75 waveguide (SAILOR 900: 39.0, SAILOR 800: 37.8 dBm min.)          |
| Spectrum         | -        | Non inverting   |
| S800: Stability  | -        | Stable with any passive load on input and output                      |
| LO type          | -        | Locked to 10 MHz external reference over IF interface or ACU internal |
| LO frequency     | Extended | 12.80 GHz   |
| TX ON/OFF        | -        | 10 MHz reference ON/OFF   |
| Cooling          | -        | External temperature controlled fan - does not need to be incl. BUC   |
| S800: Protection | -        | TX shutdown at over-temperature not required                          |

Table A-9: Technical specifications for VSAT 86 W BUC 1/3

| Parameter                  | Condition/remark | Unit | Min.  | Typical | Max.  |
|----------------------------|------------------|------|-------|---------|-------|
| Output frequency range     | VSAT Ext. TX     | GHz  | 13.75 |         | 14.50 |
| Input (IF) frequency range | Extended         | MHz  | 950   |         | 1700  |

Table A-10: Technical specifications for VSAT 86 W BUC 2/3

| Parameter                    | Condition/remark                         | Unit   | Min.                         | Typical            | Max.                 |
|------------------------------|--|--------|------------------------------|--------------------|----------------------|
| VSWR                         | Input (10, 950 - 1700 MHz)               | -      |                              |                    | 2.0 : 1              |
|                              | Output (13.75 - 14.50 GHz)               | -      |                              |                    | 2.0 : 1              |
| S800: Input (IF) level       | Non destructive                          | dBm    | 13                           |                    |                      |
| Output power at P1dB         | Worst case                               | dBm    | S900:<br>39.0,<br>S800: 37.8 |                    |                      |
| Output power 10 MHz ref OFF  | TX band, at -35 dBm ref.                 | dBm    |                              |                    | -60                  |
| S800: Noise density (RX)     | 10.70-12.75 GHz                          | dBm/Hz |                              |                    | -153                 |
| Gain (absolute linear)       | Over output freq. range                  | dB     | S900:61<br>S800:56           | S900:65<br>S800:60 | S900:69<br>S800:64   |
| Gain (relative)              | Over 500 MHz BW                          | dB     | -2.5                         | 0,0                | 2.5                  |
| Gain (relative)              | Over 36 MHz BW                           | dB     | -1.0                         | 0,0                | 1.0                  |
| S800: Group delay (relative) | Over 10 MHz BW                           | ps p-p |                              | 400                | 800                  |
| S800: LO leakage             | At output (TX), only LO                  | dBm    |                              |                    | -40                  |
| S900: Spurious               | RX band                                  | dBc    |                              |                    | -60                  |
|                              | TX band                                  | dBc    |                              |                    | -15                  |
| S900: Phase noise            | 10 Hz                                    | dBc/Hz |                              |                    | -50                  |
|                              | 100 Hz                                   | dBc/Hz |                              |                    | -60                  |
|                              | 1 kHz                                    | dBc/Hz |                              |                    | -70                  |
|                              | 10 kHz                                   | dBc/Hz |                              |                    | -80                  |
|                              | 100 kHz                                  | dBc/Hz |                              |                    | -90                  |
|                              | 1 MHz                                    | dBc/Hz |                              |                    | -110                 |
| S800: Spurious/harmonics out | RX band 10.70 - 12.75 GHz                | dBm    |                              |                    | -60                  |
|                              | 13.50 - 13.75 GHz band                   | dBm    |                              |                    | -15                  |
|                              | TX band 13.75 - 14.50 GHz                | dBm    |                              |                    | -15                  |
|                              | 14.50 - 14.80 GHz band                   | dBm    |                              |                    | -20                  |
|                              | Out of band <sup>a</sup> 1)              | dBm    |                              |                    | -30                  |
| IMD3                         | At 2 x +S900: 33/S800: 31.8 dBm carriers | dBc    |                              |                    | S900:-26<br>S800:-24 |

Table A-10: Technical specifications for VSAT 86 W BUC 2/3 (Continued)

| Parameter                               | Condition/remark         | Unit   | Min.                   | Typical   | Max.                   |
|---|--------------------------|--------|------------------------|-----------|------------------------|
| S800: AM/PM conversion                  | At +37.8 dBm carriers    | °/dB   |                        |           | 3.5                    |
| External ref. freq. (input)             | Nominal                  | MHz    |                        | 10,000000 |                        |
| External reference freq. (input)        | Deviation                | Hz     | -100                   | 0         | 100                    |
| S800: External ref. level (input)       | ON                       | dBm    | -7,0                   | 0,0       | 5,0                    |
| S800: External ref. level (input)       | OFF                      | dBm    |                        |           | -35                    |
| S800: External ref. phase noise (input) | 10 Hz                    | dBc/Hz |                        |           | -105                   |
|   | 100 Hz                   | dBc/Hz |                        |           | -125                   |
|   | 1 kHz                    | dBc/Hz |                        |           | -135                   |
|   | ≥10 kHz                  | dBc/Hz |                        |           | -140                   |
| S800: LO phase noise (output), SSB      | 10 Hz                    | dBc/Hz |                        |           | -50                    |
|   | 100 Hz                   | dBc/Hz |                        |           | -60                    |
|   | 1 kHz                    | dBc/Hz |                        |           | -70                    |
|   | 10 kHz                   | dBc/Hz |                        |           | -80                    |
|   | 199 kHz                  | dBc/Hz |                        |           | -90                    |
|   | ≥1 MHz                   | dBc/Hz |                        |           | -110                   |
| S800: TX turn ON (36.8 dBm) delay       | From ref. level ≥-7 dBm  | ms     |                        |           | 100                    |
| S800: TX turn OFF (-59 dBm) delay       | From ref. level ≥-35 dBm | ms     |                        |           | 100                    |
| S800: TX turn ON transition time        | -59 to 36.8 dBm          | ms     |                        |           | 100                    |
| S800: TX turn OFF transition time       | 36.8 to -59 dBm          | ms     |                        |           | 100                    |
| Power supply voltage                    | DC abs. min./max.        | V      | S900:20.0<br>S800:15.0 |           | S900:50.0<br>S800:26.0 |
| Supply power                            | DC                       | W      |                        |           | S900: 85<br>S800: 50   |

Table A-10: Technical specifications for VSAT 86 W BUC 2/3 (Continued)

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

| Parameter   | Condition/remark  | Unit    | Min.       | Typical | Max.                     |
|---|---|---------|------------|---------|--------------------------|
| Temperature range                                     | Operation w. external forced cooling                        | °C      | -30        |         | 75                       |
|   | Storage   | °C      | -40        |         | 85                       |
| S800: Vibration. Note: Including mounting provisions. | Operation, 1 g <sub>p</sub> sine                            | Hz      | 5          |         | 500                      |
|   | Survival time per axis at 2.4 g <sub>rms</sub> random 5-500 | h       | 2          |         |                          |
| S800: ESD   | EN61000-4-2, cont. & air                                    | kV & kV | 6 & 8      |         |                          |
| S800: Dust and water proofing                         | IP class, mounted   | -       | 54         |         |                          |
| S800: Salt mist                                       | IEC 68-2-52, mounted,                                       | days    | 4 x 7      |         |                          |
| S800: MTBF  | At 45°C ambient   | h       | 10000<br>0 |         |                          |
|   | At 75°C ambient   | h       | 8000       |         |                          |
| Dimensions  | L   | mm      |            |         | 176                      |
|   | W   | mm      |            |         | S900: 170<br>S800: 162   |
|   | H   | mm      |            |         | S900: 102<br>S800: 65    |
| Weight, fan not included (S800)                       | Total   | g       |            |         | S900: 2790<br>S800: 1800 |

Table A-11: Technical specifications for VSAT 86 W BUC 3/3





# VMU cables

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

- *Modem Cable COMTECH Serial & RSSI TT7016A*
- *Modem Cable iNFINITI iDirect VSAT modem*

## B.1 Modem Cable COMTECH Serial & RSSI TT7016A

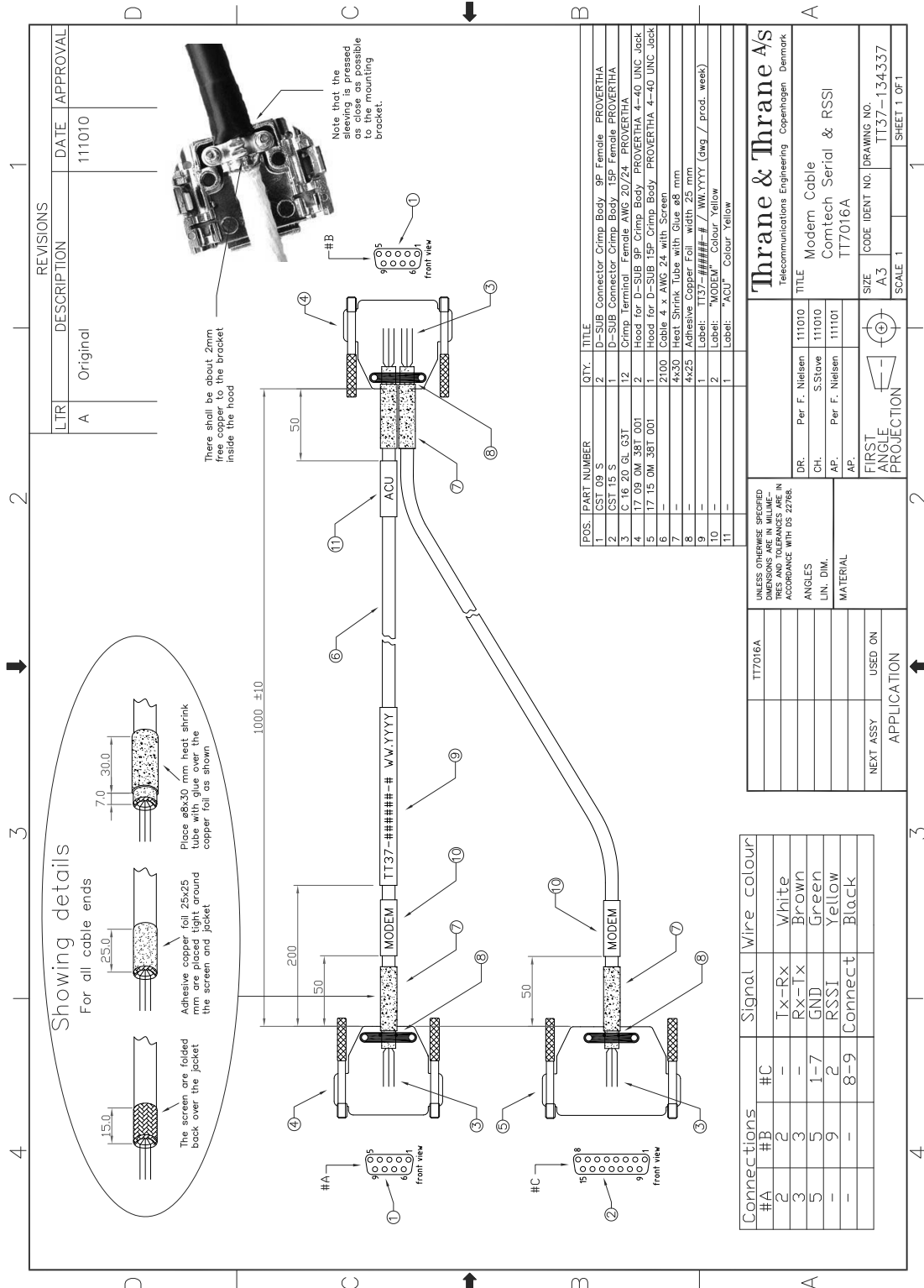


Figure B-1: Modem Cable COMTECH Serial & RSSI TT7016A

## B.2 Modem Cable iNFINITI iDirect VSAT modem

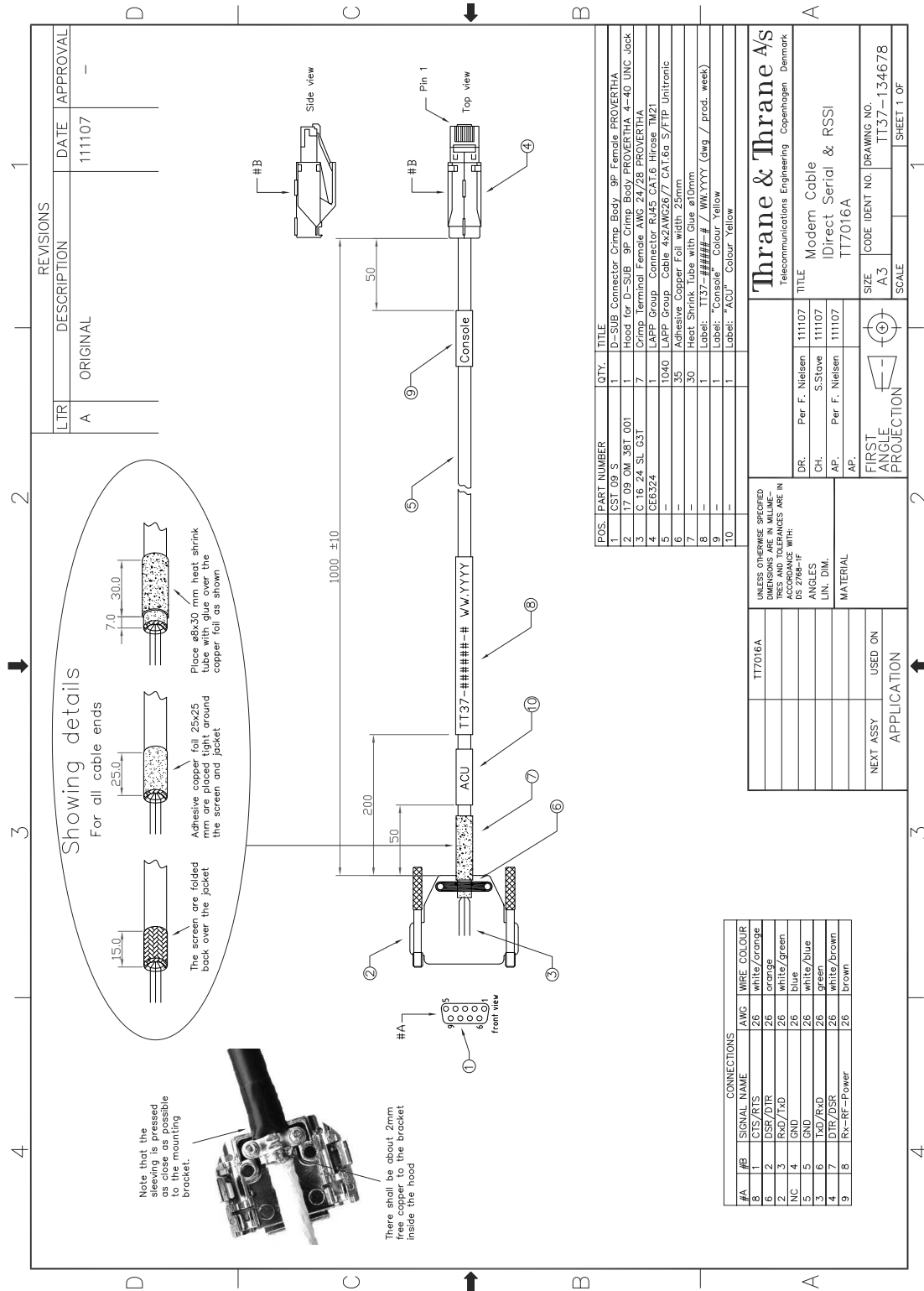


Figure B-2: Modem Cable iNFINITI iDirect VSAT modem



# VMU settings

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

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

## C.1 Performance optimization for blockage

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

#### C..1.1.1 Blockage definition

In most VSAT installations the VSAT antenna is installed in a position with areas of blockage. Blockage is often caused by the vessel's masts, stacks and other equipment installed on board. During installation the blockage areas should be entered in the web interface, see *To set up blocking zones (RX and TX)* on page 6-32.

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

VSAT modems can typically<sup>1</sup> only receive one signal from the ACU, which is "TX-mute" / "modem must not transmit", they are therefore not

able to perform fast switching, but are limited to use a simple time-out, which is configured as a fixed value in the modem configuration.

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

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

### **C..1.1.2 Better blockage communication**

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

### **C..1.1.3 Minimum elevation angle**

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

It is often seen that the minimum elevation is set to 0 (zero). A setting of 0 is not only in many cases below the usable limit of the satellite, but also a violation against ETSI EN 302 340, where a calculated minimum elevation ranges from 12° to 3° depending on power and bandwidth must be ensured or FCC §25.205 which states the minimum elevation to be 5°. See also Table 6-12 on page 6-27.

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

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

#### **C..1.1.4 Conclusion**

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

## C.2 OpenAMIP setup for iDirect iNFINITI & Evolution

### C.2.1 Protocol and interfaces

#### C..2.1.1 Introduction

The following sections describe the protocol and interface between the SAILOR 800/900 VSAT ACU and an iDirect OpenAMIP VSAT modem. OpenAMIP operation is normally used by service providers offering global VSAT service as the protocol supports roaming between satellites (Automatic Beam Switching).

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

Thrane & Thrane A/S received OpenAMIP certification for SAILOR 800/900 VSAT from VT iDirect Inc. on 22 September 2011.

#### C..2.1.2 Connections

Connect the ACU and iDirect modem with the following cables:

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

**Important**

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

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



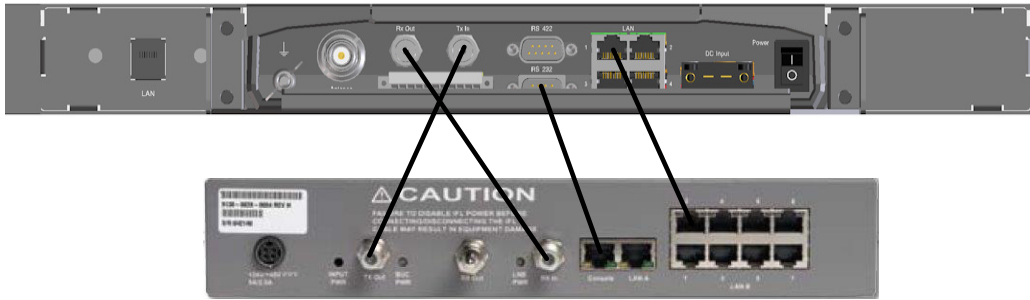


Figure C-1: Connecting iDirect iNFINITI 5000 series to the ACU (OpenAMIP)

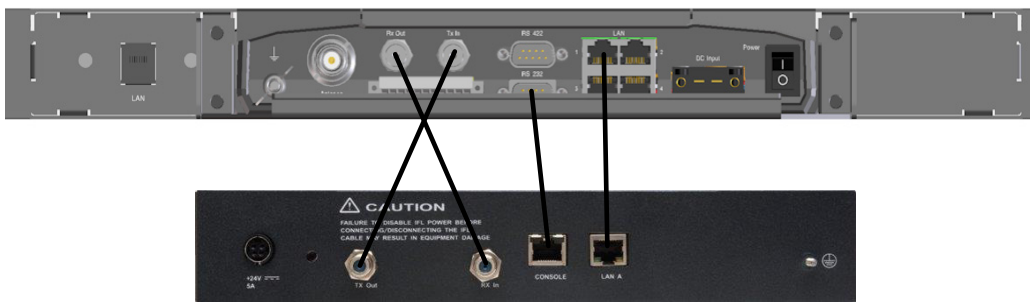


Figure C-2: Connecting iDirect Evolution X5 to the ACU (OpenAMIP)

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

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

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

### C.2.1.3 Protocol

The SAILOR 800/900 VSAT ACU supports all OpenAMIP commands except the X command which is optional. All the supported OpenAMIP commands are shown in the following figure.

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

Figure C-3: Supported OpenAMIP commands

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

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

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

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

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

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

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

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

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

## C.2.2 Sample options file

The following section presents a portion of a sample iDX 2.0.x Options file with OpenAMIP messages and parameters defined. OpenAMIP keys appear highlighted in bold.

```
[OPTIONS_FILE]
product_mode = idirect_scpc
modem_sn = 40170
generated_by = NMS-10.0.0
did = 12885226
modem_type = Remote
modem_hardware = 5000
is_mesh = 0
disable_options_flash_command = 0
carrier_type = 0
...
[MOBILE]
is_mobile = 1
tx_handshake_enabled = 0
gps_input = 2
```

```
latlong_interval = 300
latlong_fail_interval = 10
init_tx_power_offset = 0.000000
[MAPSERVER_0]
hostname = 172.20.130.3
port = 5003
[BEAMS]
beam_21 = PPS_Perf_Eval
maxbeam = 21
[ANTENNA]
manufacturer = OpenAMIP
model = OpenAMIP
addr = 172.26.81.34
port = 2000
connect_timeout = 30
dedicated_interface = ixp1
[SATELLITE]
min_look_angle = 0.000000
tx_frequency = 1300.000000
tx_bandwidth = 36.000000
hunt_bandwidth = 36.000000
rx_lcl_osc = 11250.000000
tx_lcl_osc = 12800.000000
max_skew = 90.000000
name = T12
channelname = T12_EMEA
longitude = -15.000000
max_lat = 0.000000
pol_skew = 0.000000
hunt_frequency = 1075.000000
polarity = H
tx_polarity = X
noise_reference_frequency = 0.000000
```

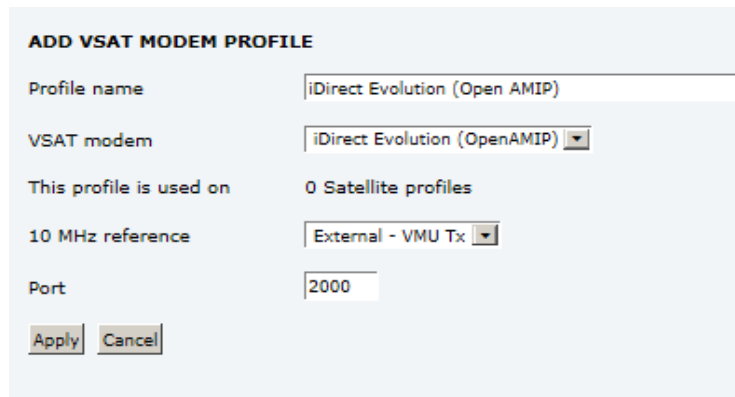
The option file must use following information:

| Section in the option file | Requirements   |
|----------------------------|--|
| [SATELLITE]                | <p>The modem provides RX and TX frequency information via a data connection to the SAILOR 800/900 VSAT.</p> <p>The single-cable solution makes it possible to configure the VSAT modem to use any LO frequency in the range from 9.6 GHz to 11.3 GHz. The SAILOR 800/900 VSAT will tune to the correct Ku-Band frequency and provide the correct L-Band frequency to the VSAT modem.</p> <p>Example: “rx_lcl_osc = 11250.000000”</p> <p>SAILOR 800/900 VSAT has an extended 86 Watt BUC with LO up conversion frequency of 12.8 GHz.</p> <p>— Example: “tx_lcl_osc = 12800.000000”</p> <p><b>Note:</b> SAILOR 800/900 VSAT supports any LNB frequency due to the 1-cable design.</p> |
| [MOBILE]                   | <p>The iDirect modem must be set to mobile unit and receive the GPS information from the ACU with the command “w &lt;Valid&gt; &lt;Lat&gt; &lt;Lon&gt; &lt;Time&gt;”.</p> <p><b>Example:</b> “is_mobile = 1”</p> <p>Tx handshake must not be enabled in the iDirect modem.</p> <p><b>Example:</b> “tx_handshake_enabled = 0”</p>   |
| [ODU]                      | <p>The SAILOR 800/900 VSAT can work either using the Rx or Tx 10 MHz reference signals provided by the modem or using its own built-in 10 MHz reference signal. It is recommended to use the Tx 10 MHz reference signal from the modem. See also <i>VSAT modem profile – New entry and Edit</i> on page 6-29.</p> <p><b>Example:</b> “odu_rx_10_mhz = 1”</p> <p>The SAILOR 800/900 VSAT needs the Tx 10 MHz reference signal in order to allow TX ON.</p> <p><b>Example:</b> “odu_tx_10_mhz = 1”</p>   |

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

### C.2.3 Configuration example (OpenAMIP)

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

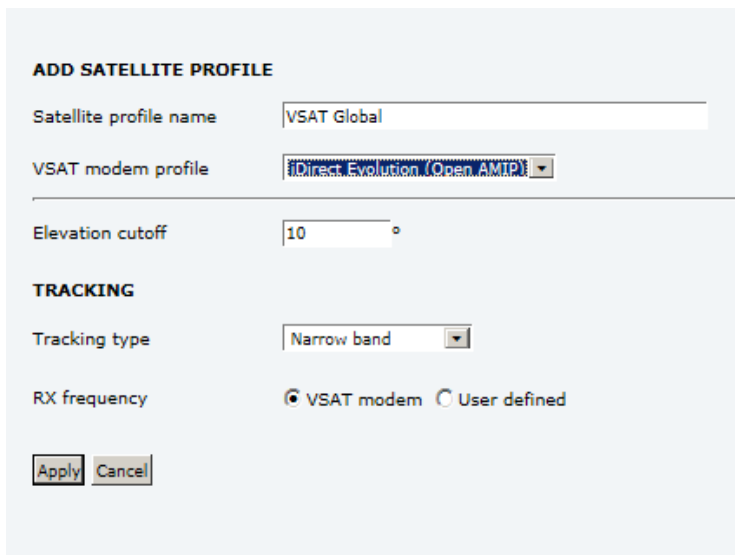


The screenshot shows the 'ADD VSAT MODEM PROFILE' configuration form. The fields are as follows:

| Field                   | Value                         |
|-------------------------|-------------------------------|
| Profile name            | iDirect Evolution (Open AMIP) |
| VSAT modem              | iDirect Evolution (OpenAMIP)  |
| This profile is used on | 0 Satellite profiles          |
| 10 MHz reference        | External - VMU Tx             |
| Port                    | 2000                          |

Buttons: Apply, Cancel

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



The screenshot shows the 'ADD SATELLITE PROFILE' configuration form. The fields are as follows:

| Field                  | Value  |
|------------------------|--|
| Satellite profile name | VSAT Global  |
| VSAT modem profile     | iDirect Evolution (OpenAMIP)   |
| Elevation cutoff       | 10 °   |
| TRACKING               |  |
| Tracking type          | Narrow band  |
| RX frequency           | <input checked="" type="radio"/> VSAT modem <input type="radio"/> User defined |

Buttons: Apply, Cancel

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

Simple OpenAMIP protocol in iDS 8.0.2.7 is **NOT** supported by the SAILOR 800/900 VSAT.

Full OpenAMIP protocol from iDX 2.0 and up is supported by the SAILOR 800/900 VSAT.

## C.2.4 Troubleshooting

It is expected that the modem has been connected with cables to the ACU and that an iDirect OpenAMIP modem profile and satellite profile have been configured in the web server of the SAILOR 800/900 VSAT and has been activated. For further details see *Configuration example (OpenAMIP)* on page C-10.

It is recommended to connect the service PC to LAN port 2 of the ACU in order to have access to the web server of the SAILOR 800/900 VSAT and IP connection to the attached iDirect OpenAMIP modem.

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

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

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

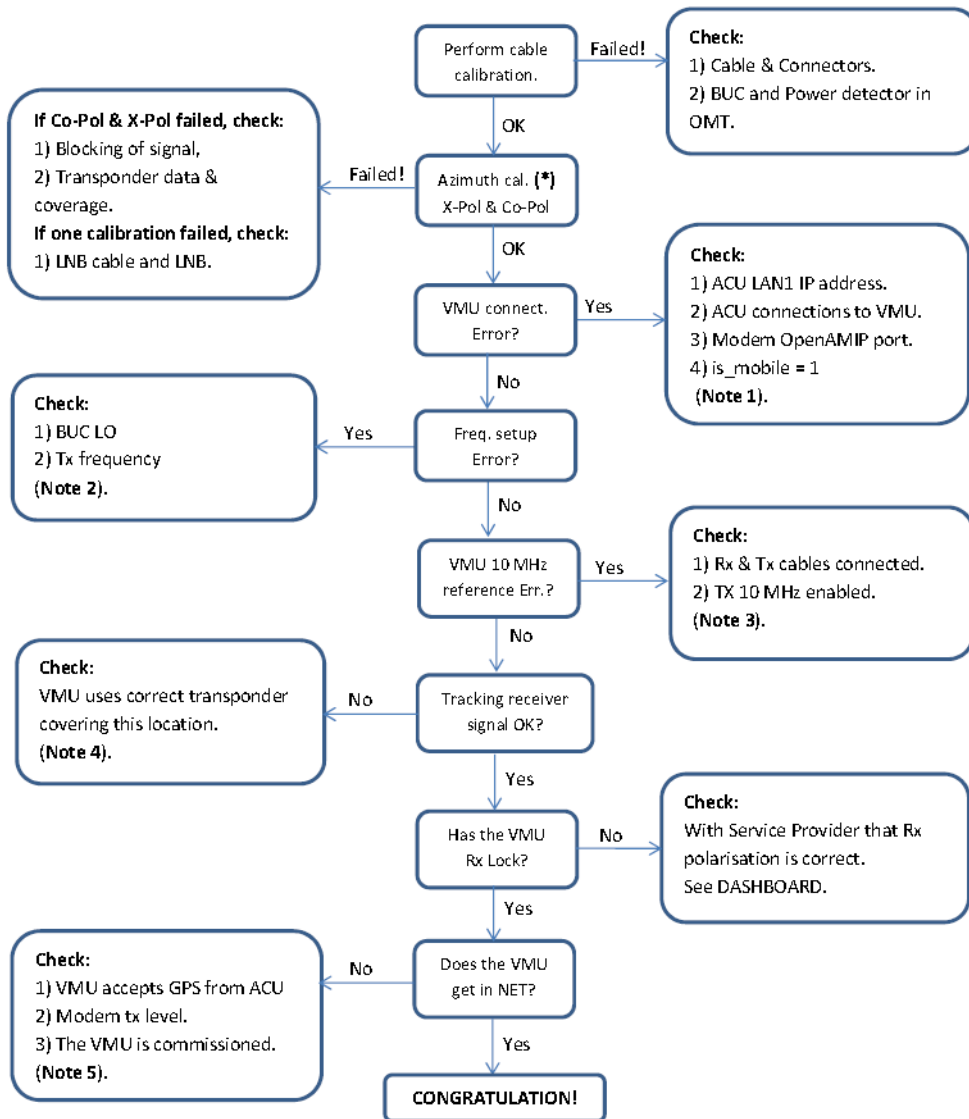
```
[MOBILE]
  gps_input = 2
  init_tx_power_offset = 0.000000
  is_mobile = 1
  latlong_interval = 60
  tx_handshake_enabled = 0
```

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

```
options set MOBILE gps_input 2
```

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

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



\* Use same transponder polarity with both calibrations.

Figure C-6: iDirect OpenAMIP troubleshooting

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

```

options show ANTENNA
Check: IP address, port # and manufacturer = OpenAMIP.
options show MOBILE
Check: is_mobile = 1
  
```

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

```

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



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

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

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

```
beamselector list
```

Write down the transponder number for one of the beams that has line of sight.  
Use the command: beamselector switch <number> -f to force the VMU to use this transponder. E.g:

```
beamselector switch 323 -f
```

Use the command: beamselector lock to lock the VMU to this transponder and stay there (until power cycle or reset application).

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

```
options show MOBILE
Check: gps_input = 2
tx power
```

Try to increase the tx power step by step up to max. -5 dBm, which is around SAILOR 800/900 VSAT P1dB level. E.g. tx power -10

### C..2.4.1 Examples of commands

```
options set SATELLITE tx_frequency 1450
options set MOBILE gps_input 2
options set MOBILE is_mobile 1
options set MOBILE tx_handshake_enabled 0
options set ODU odu_tx_10_mhz 1
options flash
```

If this fails then the options file is write protected!  
Change disable\_options\_flash\_command = 0 first!

```
options set OPTIONS_FILE
disable_options_flash_command 0
reset application
```

Starts the VMU application (soft boot)

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

## C.3 Serial setup for iDirect iNFINITI & Evolution

### C.3.1 Protocol and interfaces

#### C.3.1.1 Introduction

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

#### C.3.1.2 Connections

Connect the ACU and iDirect modem with the following cables:

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

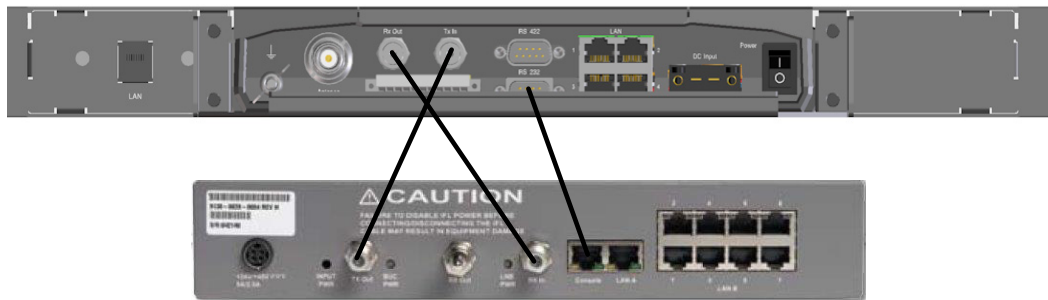


Figure C-7: Connecting iDirect iNFINITI 5000 series to the ACU (Serial)



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

The pin allocation for the RS-232 Console cable is shown in Table C-1 on page C-5. See also Appendix B on page 1 for a cable drawing.

### C.3.2 Console port settings

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

- Baud rate: 4800 or 9600
- Data bits: 8
- Parity: None
- Stop bit: 1

### C..3.2.1 Passwords

The SAILOR 800/900 VSAT ACU will log in to the modem using root and user passwords. The default passwords are:

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

### C..3.2.2 Supported commands

After login to the modem the ACU will issue commands to the modem every second. The following commands are supported by the SAILOR 800/900 VSAT ACU:

- rx snr
- options show FREQ\_TRANS
- rx freq
- tx freq
- latlong <lat> <long>

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

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

### C..3.2.3 VSAT modem option file

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

| Section in option file | Description   |
|------------------------|---|
| Satellite information  | Receive frequency of the transponder. Used with "rx freq" command<br>Transmit frequency if known otherwise just a dummy tx frequency (e.g. 1.450 MHz). Used with "tx freq" command. |

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

| Section in option file          | Description   |
|---------------------------------|---|
| SAILOR 800/900 VSAT information | <p>The modem provides RX and TX frequency information via a data connection to the SAILOR 800/900 VSAT.</p> <p>The single-cable solution makes it possible to configure the VSAT modem to use any LO frequency in the range from 9.6 GHz to 11.3 GHz. The SAILOR 800/900 VSAT will tune to the correct Ku-Band frequency and provide the correct L-Band frequency to the VSAT modem.</p> <p>The SAILOR 800/900 VSAT has an extended 8 Watt BUC with LO up conversion frequency of 12.8 GHz.</p> |
| GPS                             | <p>The iDirect modem must be set to mobile unit and receive the GPS information from the ACU with the command “latlong &lt;lat&gt; &lt;long&gt;”.</p> <p>Tx handshake must be disabled in the iDirect modem.</p>  |
| Rx 10 MHz                       | <p>The SAILOR 800/900 VSAT can work either using the Rx or Tx 10 MHz reference signals provided by the modem or using its own built-in 10 MHz reference signal. It is recommended to use the Tx 10 MHz reference signal from the modem. See also <i>VSAT modem profile – New entry and Edit</i> on page 6-29.</p>   |
| Tx 10 MHz                       | <p>The SAILOR 800/900 VSAT needs the Tx 10 MHz reference signal in order to allow TX ON.</p>  |

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

### C.3.3 Configuration example (Serial)

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

**ADD VSAT MODEM PROFILE**

Profile name: iDirect Evolution (Serial)

VSAT modem: iDirect Evolution (Serial)

This profile is used on: 0 Satellite profiles

VSAT modem root password: P@55w0rd!

VSAT modem user password: iDirect

Baud rate: 4800 baud

10 MHz reference: External - VMU Tx

Apply Cancel

Figure C-9: VSAT modem profile, Serial (example)

**ADD SATELLITE PROFILE**

Satellite profile name

VSAT modem profile

---

Predefined satellites

Satellite position

Polarisation skew

Maximum inclination

Elevation cutoff

RX polarisation  Horizontal  Vertical

TX polarisation  Co-pol  X-pol

**TRACKING**

Tracking type

RX frequency  VSAT modem  User defined

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

## C.4 COMTECH 570L and ROSS box

### C.4.1 Protocols and interfaces

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

From software version 1.30 or higher the SAILOR 800/900 VSAT supports COMTECH ROSS ROAM protocol 1+ which includes the satellite longitude in the responses from the ACU to the ROSS box. 1.30 also supports setting inclined orbit by entering user defined data.

#### C.4.1.1 Connections

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

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

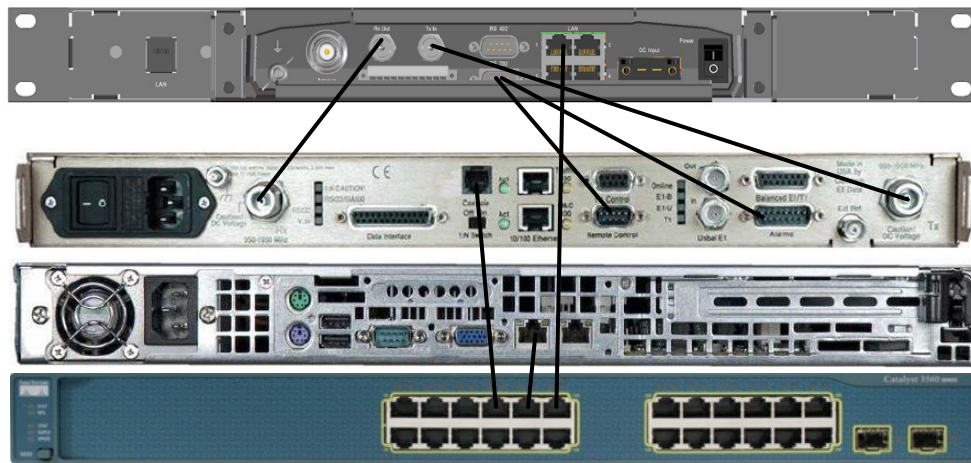


Figure C-11: Connecting COMTECH 570L and ROSS box to the ACU (example)

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

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

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

**EDIT VSAT MODEM PROFILE**

Profile name

VSAT modem

This profile is used on 0 Satellite profiles

Baud rate

10 MHz reference

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

**ADD SATELLITE PROFILE**

Satellite profile name

VSAT modem profile

---

Maximum inclination  °

Elevation cutoff  °

**TRACKING**

Tracking type

RX frequency  VSAT modem  User defined

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

## C.5 COMTECH 570L

### C.5.1 Protocol and interfaces

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

#### C.5.1.1 Protocol

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

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

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

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

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



| Command | Description   |
|---------|---|
| EBN?    | This command is used to show the signal strength in the web interface and on the display of the SAILOR 800/900 VSAT to determine if the COMTECH 570L modem is in Rx Lock.<br><br>The signal strength goes from 0dB - 16dB, +16dB indicates a signal greater than 16dB, 99.9dB indicates no Rx Lock. |
| TFQ?    | TFQ (Transmit Frequency) is used to calibrate the Tx chain in real time, in order to have same output power independent of frequency, temperature and antenna cable length.   |
| LLO?    | LLO (LNB LO) is used to set up the LNB LO frequency for the system.<br><br><b>All LNB LO frequencies are supported by SAILOR 800/900 VSAT.</b>  |
| BLO?    | BLO (BUC LO) is used to read the BUC LO. This makes the ADU compatible with future SAILOR VSAT products using a different BUC LO.   |
| RFQ?    | RFQ (Receive Frequency) is used as tracking frequency for SAILOR VSAT.  |

Table C-7:

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

### C..5.1.2 Connections

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

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

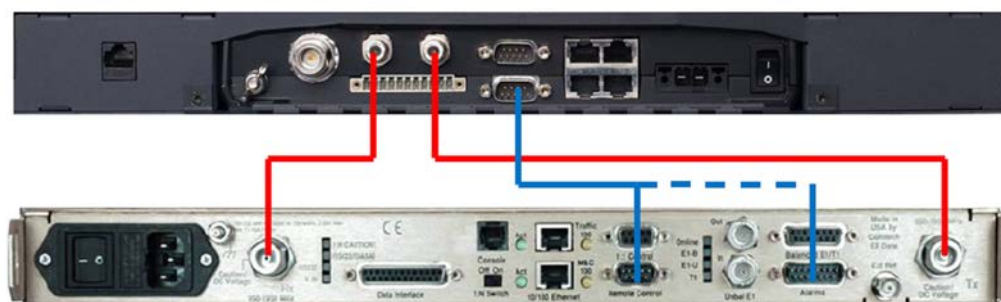


Figure C-14: Connecting COMTECH 570L to the ACU (example)

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

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

## C.5.2 Configuration example (COMTECH 570L)

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

The screenshot shows a web form titled "ADD VSAT MODEM PROFILE". It contains the following fields and values:

- Profile name: Comtech 570L Modem
- VSAT modem: COMTECH CDM 570L
- This profile is used on: 0 Satellite profiles
- Baud rate: 4800 baud
- 10 MHz reference: External - VMU Tx

At the bottom of the form are two buttons: "Apply" and "Cancel".

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

The screenshot shows a web form titled "ADD SATELLITE PROFILE". It contains the following fields and values:

- Satellite profile name: Regional VSAT Service
- VSAT modem profile: Comtech 570L Modem
- Predefined satellites: 7 E - Eutelsat 7B
- Satellite position: 7 E
- Polarisation skew: 3.535
- Maximum inclination: 0
- Elevation cutoff: 10
- RX polarisation:  Horizontal  Vertical
- TX polarisation:  Co-pol  X-pol

Under the heading "TRACKING", there are two fields:

- Tracking type: Narrow band
- RX frequency:  VSAT modem  User defined

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

## C.6 STM SatLink 2900 VSAT modem

### C.6.1 Interfaces and VSAT modem configuration

The following sections describe how to connect an ACU to an STM SatLink 2900 VSAT modem. The STM SatLink 2900 and the SAILOR 800/900 VSAT are fully integrated and require almost no user setup.

STM SatLink 2900 software version required: 14.2.0 or higher.

#### C.6.1.1 Connections

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

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

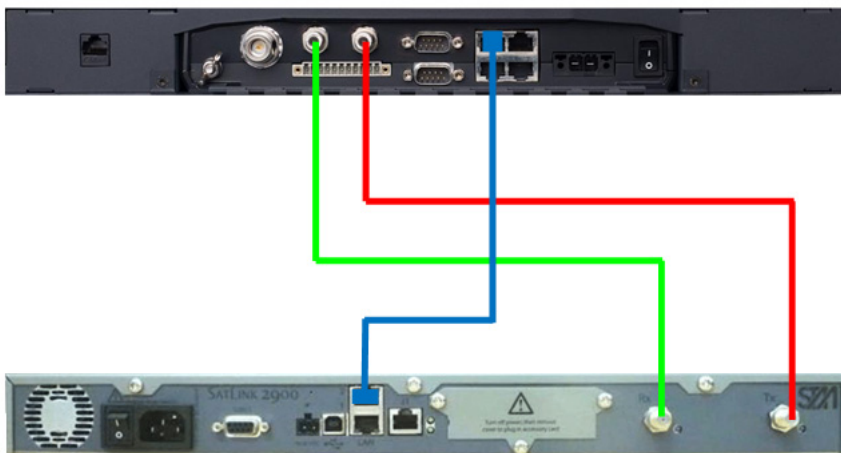


Figure C-17: Connecting STM SatLink 2900 VSAT modem to the ACU

#### C.6.1.2 Modem configuration requirements

Type the following command in a modem console to set up the STM SatLink 2900 modem to use the SAILOR 800/900 VSAT:

```
odu antenna 30
odu txtype 62
odu lnb 62
```

To display the antenna setup for the STM Satlink 2900 modem, type:

```
odu antctrl show
```

**Example:**

```
odu antctrl show
Antenna Controller Configuration
-----
Type                          : Thrane & Thrane SAILOR
9800
Enabled                        : All
IP address                     : 10.110.2.226
Polling frequency             : 5 sec
Antenna Stability Tries       : 300

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

## C.6.2 ACU configuration

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

1. Add a modem profile with the STM Satlink 2900 modem. See *VSAT modem profile – New entry and Edit* on page 6-29.
2. Add a satellite profile using the STM Satlink modem profile just created. See *Satellite profiles – New entry and Edit* on page 6-26.
3. Edit the network settings and input the IP information supplied with the modem. See *To configure the LAN network* on page 6-34.
4. Activate the satellite profile.

### C.6.3 Configuration example (STM Satlink 2900)

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

**EDIT VSAT MODEM PROFILE**

Profile name

VSAT modem

This profile is used on

10 MHz reference

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

**ADD SATELLITE PROFILE**

Satellite profile name

VSAT modem profile

Elevation cutoff  °

**TRACKING**

Tracking type

RX frequency  VSAT modem  User defined

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

## C.7 Gilat SkyEdge II VSAT modem

### C.7.1 Interfaces and VSAT modem configuration

The following sections describe how to connect an ACU to a Gilat SkyEdgeII VSAT modem. The Gilat SkyEdge II and the SAILOR 800/900 VSAT are fully integrated and require only little user setup.

#### C..7.1.1 Connections

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

- 75 Ohm RF cables F-F connectors for RX and TX frequencies
- Serial cable for communication with the modem. Connect SERIAL on the VSAT modem to RS-232 on the ACU.

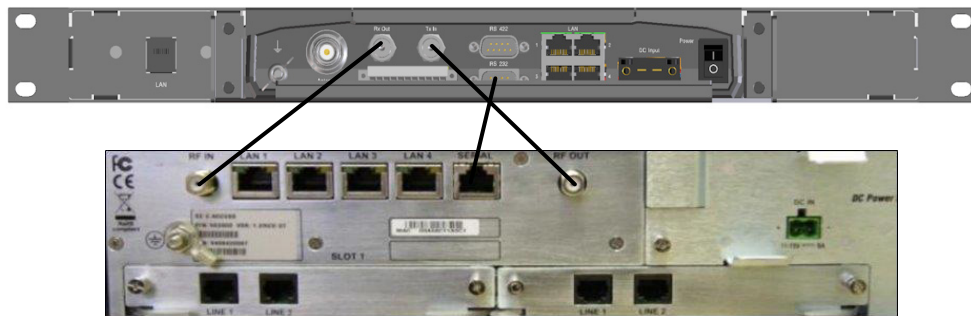


Figure C-20: Connecting Gilat SkyEdge II VSAT modem to the ACU

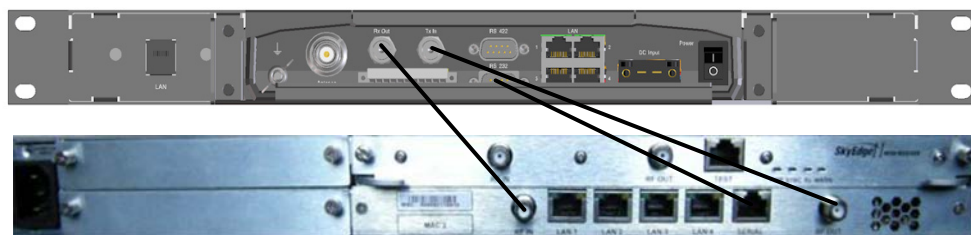


Figure C-21: Connecting Gilat SkyEdge II VSAT modem (rack) to the ACU

#### C..7.1.2 Modem configuration requirements

1. Connect a PC with an Ethernet cable to LAN port 1 of the VSAT modem.
2. Set the PC to static IP address: 192.168.1.2

3. Start an Internet browser (e.g. Internet Explorer) and go to URL://192.168.1.1 in order to get access to the web server of the VSAT modem.
4. Login with: User name: inst and Password: \$Sat2598\$
5. Go to the menu **Installer**.

| Parameter                  | Settings  |
|----------------------------|---|
| RF Downlink frequency      | In the section <b>General</b> the RF Downlink frequency is shown. Write it down as it is going to be used for the selection of LNB LO.<br><br>Further down on the page you find the BUC and LNB LO frequencies.   |
| LNB LO                     | Depending on the RF Downlink frequency select an appropriate LNB LO of 9.75, 10.25, 10.75 or 11.25 GHz which will result in an L-band frequency between 950 and 1650 MHz which is the operating frequency band of the SkyEdge II Access modem.                    |
| BUC LO                     | Select the BUC to be 12.8 GHz as this is the BUC LO of the SAILOR 800/900 VSAT. Remember to inform the hub operator about this when doing line up and commissioning.  |
| BUC 10MHz Reference Signal | The BUC 10MHz Reference Signal must be configured to ON, otherwise the SAILOR 800/900 VSAT will never allow TX. Scroll further down to enable GPS for the Location Coordinates. This enables the serial protocol of the modem so it can communicate with the ACU. |

Table C-8: Configuration of Gilat SkyEdge II VSAT modem

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

The VSAT modem is now configured to be used with the SAILOR 800/900 VSAT.

## C.7.2 ACU configuration

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

1. Add a modem profile with the Gilat SkyEdge II modem. See *VSAT modem profile – New entry and Edit* on page 6-29.
2. Add a satellite profile using the Gilat SkyEdge II modem profile just created. See *Satellite profiles – New entry and Edit* on page 6-26.
3. Edit the network settings and input the IP information supplied with the modem. See *To configure the LAN network* on page 6-34.
4. Activate the satellite profile.

See also the configuration example in the following section.

### C.7.3 Configuration example (Gilat SkyEdge II)

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

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

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



## C.8 Inmarsat G5 modem

### C.8.1 Interfaces and VSAT modem configuration

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

### C.8.2 Connecting a Inmarsat G5 modem

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

### C.8.3 Configuration example (Inmarsat G5)

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

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

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



# Command line interface

## D.1 Introduction

After you have done the initial configuration and connected the SAILOR 800/900 VSAT to your network, you can use Telnet to configure the SAILOR 800/900 VSAT. You can also setup VSAT modem parameters.

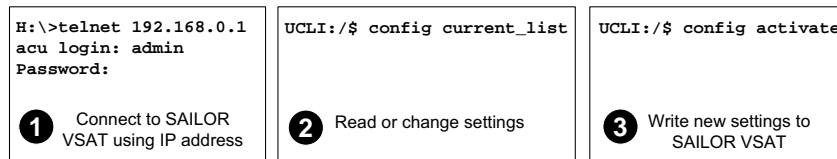


Figure D-1: How to use the command line interface (example for telnet)

After successful login you can read and change settings. Use the command **config activate** to activate the new settings in the ACU.

You will need to refresh the browser window before the changed settings become visible.

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

## D.1.1 Telnet connection

You can access the command line interface via Telnet.

### D..1.1.1 User name and password

Access to the SAILOR 800/900 VSAT 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**, for further details see *To access the administration settings (user name, password)* on page 6-47.

### D..1.1.2 Telnet

The interface is on the standard Telnet port 23. Use any LAN port and corresponding IP address of the 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, user name (admin) and password (1234).

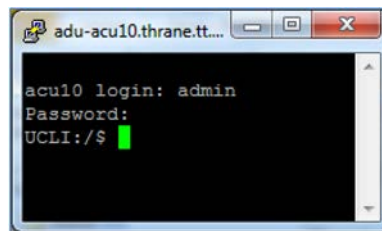


Figure D-2: Command line interface, login

## 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 activate</b>     | Use this command to save and activate the pending changes in the SAILOR 800/900 VSAT.      |

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 800/900 VSAT. |

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 <code>satellite</code> .      |
| <b>help modem</b>     | Shows the sub commands and a short description for the command <code>modem</code> .  |
| <b>help track</b>     | Shows the sub commands and description for the command <code>track</code> .          |
| <b>help status</b>    | Shows the sub commands and description for the command <code>status</code> .         |
| <b>help system</b>    | Shows the sub commands and a short description for the command <code>system</code> . |
| <b>help config</b>    | Shows the sub commands, unit and description for the command <code>config</code> .   |
| <b>help zone</b>      | Shows the sub commands, unit and description for the command <code>zone</code> .     |

Table D-6: UCLI command: `help`

## D.2.6 modem

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

Table D-7: UCLI command: `modem`

## D.2.7 satellite

| Command  | Description   |
|--|---|
| <code>satellite name</code>  | Shows the name of the currently active satellite profile.   |
| <code>satellite lon</code><br><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><br><code>satellite skew 3.7</code>       | Shows or sets an additional skew offset of the satellite. 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: <math>-90^{\circ}</math> to <math>+90^{\circ}</math>.</li> </ul>                       |
| <code>satellite max_inc</code><br><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 800/900 VSAT acquisition window size used to find the satellite. <ul style="list-style-type: none"> <li>• Maximum inclination of satellite <math>0.0^{\circ}</math> to <math>90^{\circ}</math></li> </ul> |
| <code>satellite rx_pol</code><br><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> </ul>   |

Table D-8: UCLI command: `satellite`

| Command   | Description  |
|---|--|
| <pre>satellite tx_pol satellite tx_pol v</pre>                      | <p>Shows or sets the current RX polarisation:</p> <ul style="list-style-type: none"> <li>v (vertical)</li> <li>h (horizontal)</li> </ul>   |
| <pre>satellite ele_cut_off satellite ele_cut_off 5</pre>            | <p>Shows or sets the elevation referenced to earth where the SAILOR 800/900 VSAT 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> <p>For further information see Table 6-12 on page 6-27 (S900) and Table 6-13 on page 6-28 (S800).</p>   |
| <pre>satellite rx_lo</pre>  | <p>Shows the Rx LO / LNB LO. Range: 9.6 GHz to 11.3 GHz.</p>   |
| <pre>satellite rx_rf_freq satellite rx_rf_freq 12.123456 9.75</pre> | <p>Shows or sets the Ku-band rx frequency and LNB Lo frequency.</p> <ul style="list-style-type: none"> <li>RF frequency: 10.7 — 12.75 GHz.</li> <li>LNB Lo frequency: 9.6 GHz — 11.3 GHz.</li> </ul> <p>The SAILOR 800/900 VSAT supports any LNB Lo!</p> <p><b>Note:</b> Setting the Ku-band rx frequency and LNB Lo automatically configures the L-band rx frequency:<br/> <math>\text{Rx L-band freq} = \text{rx\_rf\_freq} - \text{LNB Lo}</math></p> <p><b>Example:</b> 1567.890 MHz = 11.567890 GHz – 10 GHz</p>                                      |
| <pre>satellite rx_if_freq satellite rx_if_freq 1200.123 9.75</pre>  | <p>Shows or sets the IF rx frequency together with the LNB Lo frequency.</p> <ul style="list-style-type: none"> <li>IF frequency within 950 MHz – 2150 MHz.</li> <li>LNB Lo frequency within 9.6 GHz – 11.3 GHz.</li> </ul> <p>The SAILOR 800/900 VSAT supports any LNB Lo!</p> <p><b>Note:</b> Setting the L-band rx frequency and LNB Lo automatically configures the Ku-band rx frequency:<br/> <math>\text{Rx Ku-band frequency} = \text{LNB Lo} + \text{rx\_if\_frequency}</math></p> <p><b>Example:</b> 11.567890 GHz = 10 GHz + 1567.890000 MHz</p> |

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



| Command  | Description   |
|--|---|
| <code>satellite tx_lo</code>   | Shows the current TX LO frequency, fixed at 12.8 GHz.   |
| <code>satellite tx_rf_freq</code><br><br><code>satellite tx_rf_freq 14.123456</code> | Shows or sets the Set the RF frequency used for tx. <ul style="list-style-type: none"> <li>Valid range: 13.75 GHz to 14.5 GHz.</li> </ul> <p><b>Note:</b> Configuring the Ku-band tx frequency automatically configures the L-band frequency: L-band frequency = Ku-band tx frequency – 12.8 GHz (BUC Lo)</p> <p><b>Example:</b> 1308.300000 MHz = 14.108300 GHz – 12.8 GHz</p> |
| <code>satellite tx_if_freq</code><br><br><code>satellite tx_if_freq 1200.123</code>  | Shows or sets the Set the IF frequency for tx. <ul style="list-style-type: none"> <li>Valid range: 950 MHz to 1700 MHz.</li> </ul> <p><b>Note:</b> Configuring the L-band tx frequency automatically configures the Ku-band frequency: Ku-band frequency = 12.8 GHz (BUC Lo) + L-band frequency</p> <p><b>Example:</b> 14.108300 GHz = 12.8 GHz + 1308.300000 MHz</p>           |

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

## D.2.8 status

| Command                        | Description   |
|--------------------------------|---|
| <code>status</code>            | Shows the sub commands available, including a short description.  |
| <code>status system</code>     | Shows the current status of the SAILOR 800/900 VSAT. For further information on status values see <i>Information fields on the Dashboard</i> on page 6-23.  |
| <code>status track_all</code>  | 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> |
| <code>status event_list</code> | Shows a list of active events. For further information on events see <i>System messages</i> on page G-1.  |

Table D-9: UCLI command: `status`

## D.2.9 system

| Command                     | Description   |
|-----------------------------|---|
| <code>system</code>         | Shows the sub commands available, including a short description.  |
| <code>system restart</code> | Sends a command to the ACU to restart the system instantaneously. It makes a power-on self test and then points to the last used satellite. |
| <code>system info</code>    | Shows the software version, part names and serial numbers of the SAILOR 800/900 VSAT.   |

Table D-10: UCLI command: `system`

## D.2.10 track

| Command   | Description   |
|---|---|
| <code>track</code>  | Shows the sub commands available, including a short description.  |
| <code>track mode</code><br><code>track mode dvb</code>      | Shows or sets the receiver bandwidth or mode, the way the SAILOR 800/900 VSAT tracks the satellite: <ul style="list-style-type: none"> <li>• narrow (recommended, uses the built-in 300 kHz filter of the SAILOR 800/900 VSAT)</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 800/900 VSAT to track the satellite. You must configure <code>dvb_sym</code> and <code>dvb_nid</code>.)</li> </ul> |
| <code>track dvb_sym</code><br><code>track dvb_sym 22</code> | Shows or sets the current mega symbols rate for the DVB-S2 receiver when in dvb mode. The symbol rate used to verify and track a transponder. <ul style="list-style-type: none"> <li>• Valid range: 0.1 — 99</li> </ul>   |
| <code>track dvb_nid</code><br><code>track dvb_nid 0</code>  | Shows or sets the DVB NID to be verified by the built-in DVB-S2 tracking receiver, when using tracking mode DVB. It configures the NID used to verify and track a transponder. <ul style="list-style-type: none"> <li>• Valid range: 0 — 65535<br/>A NID of '0' disables the NID check. Then the NID will be omitted in the verification of the transponder.</li> </ul>   |

Table D-11: UCLI command: `track`

| Command                       | Description   |
|-------------------------------|---|
| <code>track rx_rf_freq</code> | <p>The frequency for the receiver to tune to. Verify that the frequency is in the same range as the modem <code>rx_rf_frequency</code>, above or below 11.7 GHz. If <code>rx_rf_freq</code> is set to 0, the tracking frequency is the same as the RX frequency provided by the modem</p> <ul style="list-style-type: none"> <li>Valid range: 10.7 GHz to 12.75 GHz.</li> </ul> |

Table D-11: UCLI command: `track`

## D.2.11 zone

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

Table D-12: UCLI command: `zone`



# DVB-S satellites

This appendix contains examples of DVB-S satellite data for azimuth calibration of the SAILOR 800/900 VSAT.







| VSAT coverage   | Satellite name                            | Satellite position | RX polarisation          | RX frequency             | Symbol rate                | NID          |
|---|---|--------------------|--------------------------|--------------------------|----------------------------|--------------|
| <b>Americas</b><br>          | <b>SatMex6</b><br>Transponder<br>Backup   | 113°W              | Horizontal<br>—          | 12.080 GHz<br>—          | 25.635 MS/s<br>—           | 0<br>—       |
| <b>USA</b><br>              | <b>Echostar9</b><br>Transponder<br>Backup | 121°W              | Horizontal<br>Vertical   | 11.943 GHz<br>12.016 GHz | 20.000 MS/s<br>20.000 MS/s | 0<br>0       |
| <b>South East Asia</b><br> | <b>NSS6</b><br>Transponder<br>Backup      | 95°E               | Horizontal<br>Horizontal | 11.676 GHz<br>12.729 GHz | 27.500 MS/s<br>26.400 MS/s | 65535<br>100 |
| <b>Europe</b><br>          | <b>Thor 5 T2</b><br>Transponder<br>Backup | 0.8°W              | Horizontal<br>Vertical   | 11.785 GHz<br>12.418 GHz | 30.000 MS/s<br>28.000 MS/s | 70<br>70     |
| <b>Europe</b><br>          | <b>Astra2</b><br>Transponder<br>Backup    | 28.2°E             | Horizontal<br>Horizontal | 11.623 GHz<br>12.032 GHz | 27.500 MS/s<br>27.500 MS/s | 32<br>2      |
| <b>China</b><br>           | <b>Apstar6</b><br>Transponder<br>Backup   | 134°E              | Horizontal<br>Vertical   | 12.435 GHz<br>12.675 GHz | 27.500 MS/s<br>27.500 MS/s | 65<br>65     |

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



| VSAT coverage  | Satellite name                           | Satellite position | RX polarisation | RX frequency | Symbol rate | NID |
|--|--|--------------------|-----------------|--------------|-------------|-----|
| <b>Australia</b><br>    | <b>Optus D1</b><br>Transponder<br>Backup | 160°E              |                 |              |             |     |
|  |  | -45°skew           | Horizontal      | 12.391 GHz   | 12.600 MS/s | 0   |
|  |  |                    | Horizontal      | 12.407 GHz   | 12.600 MS/s | 0   |
| <b>Singapore</b>   | <b>Thaicom 5</b>                         | 78.5°E             | Horizontal      | 12.272 GHz   | 30.000 MS/s | 88  |
|  |  |                    | Vertical        | 12.313 GHz   | 30.000 MS/s | 1   |
| <b>Singapore</b>   | <b>Apstar 2R (Telstar 10) / Apstar 7</b> | 76.5°E             | Vertical        | 11.167 GHz   | 45.000 MS/s | 0   |
| <b>Osaka, Japan</b><br> | KT 5                                     | 113°E              | Vertical        | 12.430 GHz   | 25.6 Ms/s   | 0   |

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

For satellite data of other regions or transponders see [www.lyngsat.com](http://www.lyngsat.com).

**Example:**



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

Figure E-1: Satellite data, example from [www.lyngsat.com](http://www.lyngsat.com)

The above transponder has following parameters:

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

# Grounding and RF protection

## F.1 Why is grounding required?

### F.1.1 Reasons for grounding

Grounding the SAILOR 800/900 VSAT system is required for at least two reasons:

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

### F.1.2 Safety

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

### F.1.3 ESD Protection

The ESD protection circuits in the ACU rely on proper grounding of the system in order to work properly. Otherwise sensitive circuits within the ACU might be damaged due to ESD when you are handling the equipment.

## F.2 Grounding Recommendations

### F.2.1 To ground the ACU

The ACU should be grounded to the ship/hull. For this purpose you may use a short ADU cable and a grounding kit. Further, the ACU must be grounded at its grounding stud in order to ensure proper grounding if the short ADU cable is disconnected. For further information, see *Grounding the terminal* on page 2-33.

If you use the Extended cable support, make the ground connections through the cable support. You may need to extend the ground plane using copper foil, see the following section.

#### F.2.1.1 To extend the ground plane

In some cases it may not be possible to access the hull and at the same time place the ACU in a suitable place. A way to insure good grounding and at the same time make it possible to ground the coax cable - is to extend the ship ground plane by means of copper foil. The maximum length of the foil is determined by the width of the foil:

- Copper foil 5 cm wide: Max 50 cm
- Copper foil 10 cm wide: Max 100 cm
- Copper foil 20 cm wide: Max 200 cm

**Note** | The foil must be at least 0.1 mm thick.

Connect the foil to the hull by plenty of screws or hard-soldering. Run the foil past the place where the short ADU cable is to be grounded and mount a grounding kit on top of the foil. For details on the jumper cable see *Jumper cable for grounding* on page F-11.

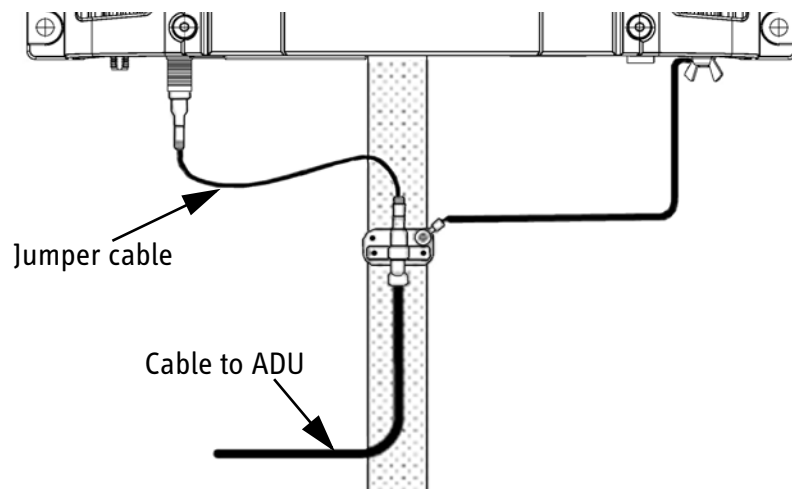


Figure F-1: Extending the ground plane



## F.2.2 To ground the ADU

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

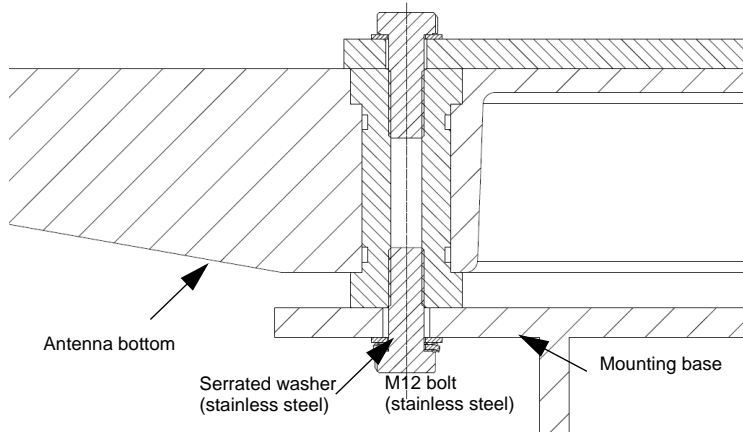


Figure F-2: Grounding the ADU

### Note

For optimum grounding use the mounting bolt located closest to the ADU cable plate, see *To ground the ADU* on page 3-32.

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.

## F.3 Alternative grounding for steel hulls

The following guidelines assume a two-wire, isolated grounding arrangement; that is no part of the circuit, in particular the battery negative, is connected to any ground potential or equipment.

### F.3.1 To ground the ACU

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

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

The ground connection can be established either at the hull (recommended) or at a dedicated RF ground if available (alternative).

**Important**

However, bear in mind that the ADU ground connection is to be made at the **same electrical ground potential as the ACU** (see *To ground the ADU*).

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

## F.3.2 To ground the ADU

**Note**

For optimum grounding use the mounting bolt located closest to the ADU cable plate, see *To ground the ADU* on page 3-32.

### F..3.2.1 Terminal grounded at the hull (recommended)

In this case the ADU is grounded to the ship via one (or more) of its mounting bolts. Make sure to remove painting, dirt, grease etc. at the mounting holes in order to make good electrical contact to the hull. Use serrated washers when securing the mounting bolts and seal the joint with protective coating to avoid corrosion.

### F..3.2.2 Terminal grounded at a dedicated RF ground (alternative)

In this case the ADU is grounded with a separate ground cable. The ground cable must be routed parallel and close to the shielded coax cable connecting the ADU to the ACU grounding kit. A heavy gauge wire with tinned strands (min. 6 mm<sup>2</sup>) can be used for this purpose.

**Note**

The ADU must be electrically isolated at its mounting bolts by means of shoulder bushings and washers ensuring the isolated RF ground - see *Isolation of the ADU from the mounting base* on page F-9.

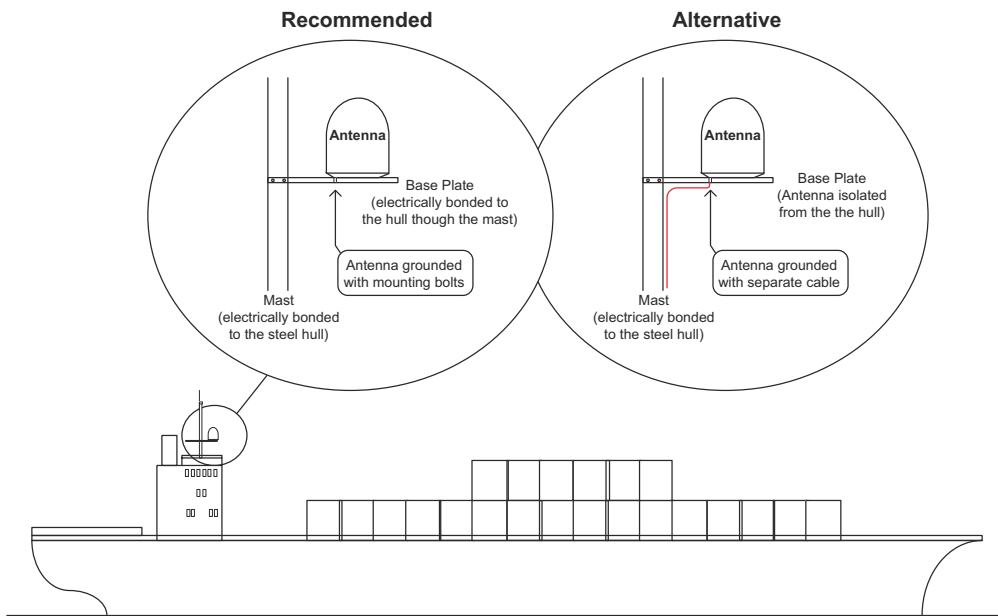


Figure F-3: Grounding at a dedicated RF ground (alternative)

## F.4 Alternative grounding for aluminum hulls

The following guidelines assume a two-wire, isolated grounding arrangement; that is no part of the circuit, in particular the battery negative, is connected to any ground potential or equipment.

### F.4.1 To ground the ACU

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

The ground connection must be established at a dedicated RF ground (either capacitively or electrically coupled).

**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.

### F.4.2 To ground the ADU

If the mounting base of the ADU is electrically connected to the hull (or any other ground potential than the ACU), the ADU must be isolated at its mounting bolts by means of shoulder bushings and washers, see F.6.3. This is done in order to prevent DC currents flowing in the hull thus causing electrolytic corrosion.

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

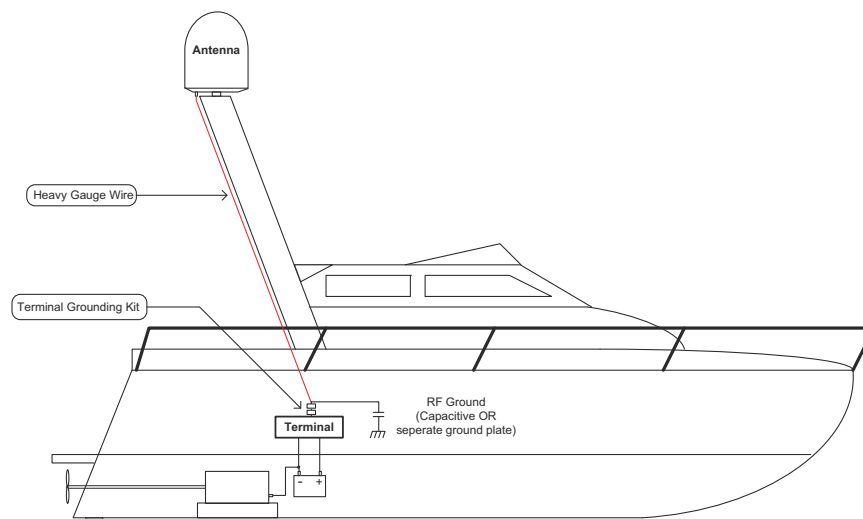


Figure F-4: Alternative grounding for aluminium hulls

## F.5 Alternative grounding for fibre glass hulls

### F.5.1 To ground the ACU

The ACU should preferably be grounded with the short ADU cable and a grounding kit (available from Thrane & Thrane). Further, the ACU must be grounded at its grounding stud in order to ensure a proper grounding if the short ADU cable is disconnected.

The ground connection must be established at a dedicated RF ground (either capacitive or electrical coupled).

#### Important

Bear in mind that the ADU ground connection is to be made at the **same electrical ground potential** as the ACU (see *To ground the ADU*).

### F.5.2 To ground the ADU

If the mounting base of the ADU is electrically connected to any other ground potential than the ACU (e.g. Lightning Ground), the ADU must be isolated at its mounting bolts by means of shoulder bushings and washers - see section F.6.3.

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

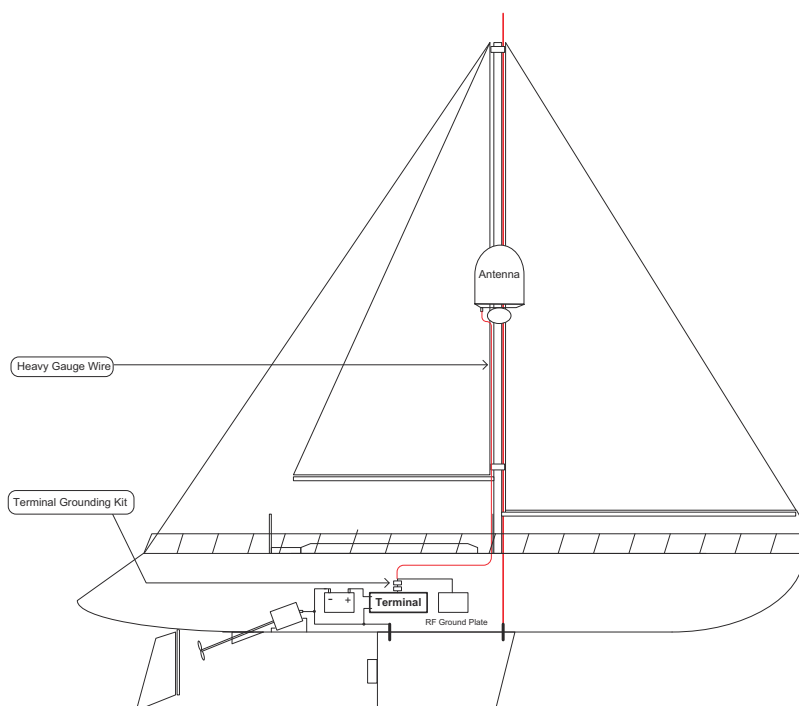


Figure F-5: Alternative grounding for fibreglass hulls

## F.6 Separate ground cable

### F.6.1 Ground cable - construction

When dealing with electrical installations in a marine environment, all wiring must be done with double insulated, tinned strands, high quality and if exposed also UV resistant cables. This shall also apply to the separate ground cable mentioned in the previous paragraphs.

The ground cable is constructed using an appropriate cable with a cross section area of at least 6 mm<sup>2</sup> (AWG10) and terminated with insulated ring crimp terminals – see illustration below. The crimp terminals must be a marine approved type e.g. the DuraSeal series from Raychem.

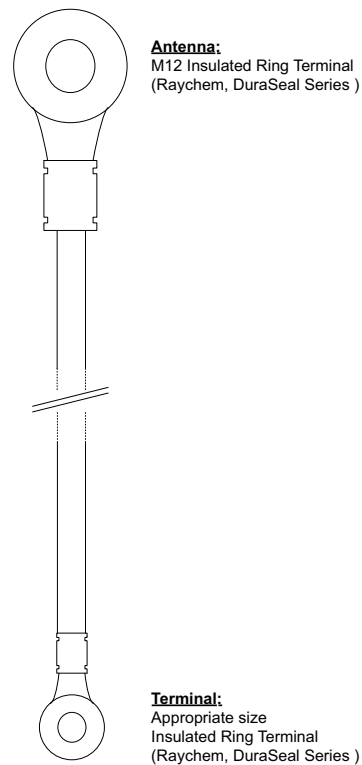


Figure F-6: Separate ground cable

## F.6.2 Ground cable - connection

Mount the ground cable close to and parallel to the shielded coax cable thus minimizing ground loop problems. If possible, route the coax cable and the ground cable in metal conduits bonded to the hull or within a mast (depending on the actual installation).

The ground cable must be connected at one of the mounting/grounding bolts on the ADU. Use bolts and washers of stainless steel and seal the joint with protective coating to avoid corrosion. If the ADU is to be isolated from the mounting base, shoulder bushings and washers must be used — see figure F-7, *Isolation of the ADU from the mounting base* on page F-9.

At the other end, connect the ground cable as described in *To ground the ACU* on page F-2.

## F.6.3 Isolation of the ADU from the mounting base

In cases where the ADU is to be isolated from the mounting base, shoulder bushings and washers (accessories) must be used as illustrated below. Please note that the isolation has to be implemented on all four mounting bolts (including the bolt securing the ground cable).

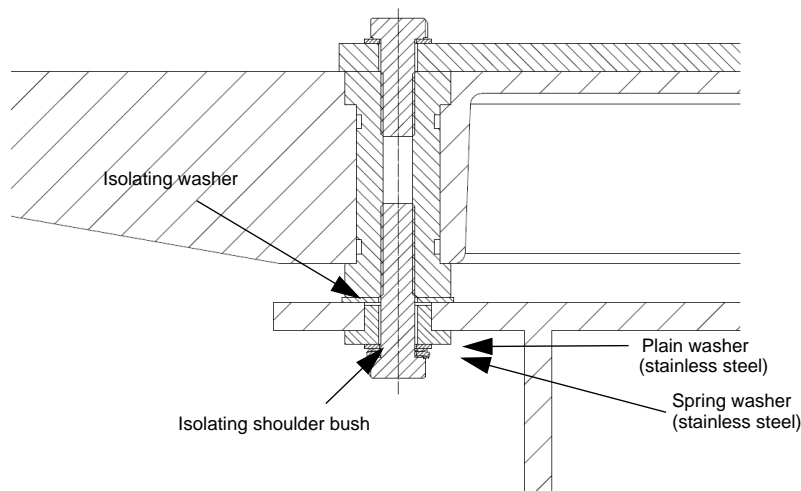


Figure F-7: Isolation of the ADU from the mounting base

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

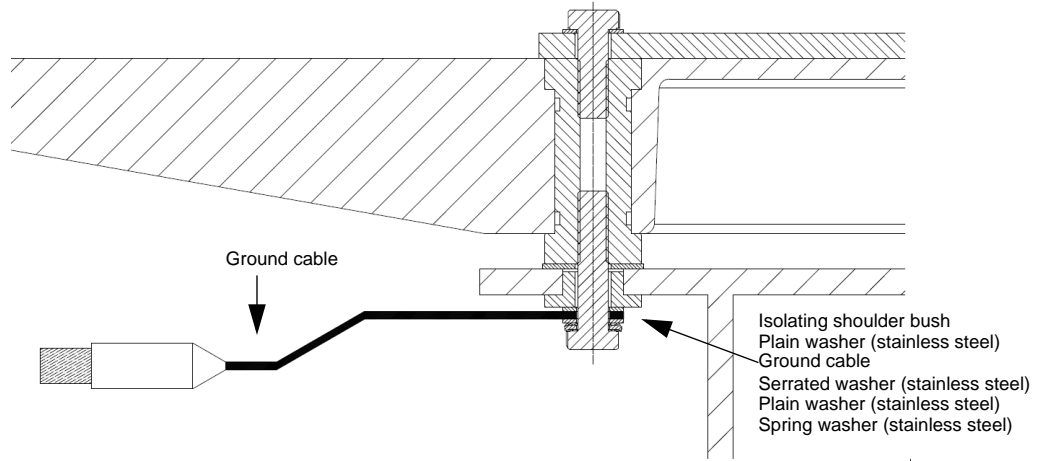


Figure F-8: ADU isolation and grounding cable



## F.7 Jumper cable for grounding

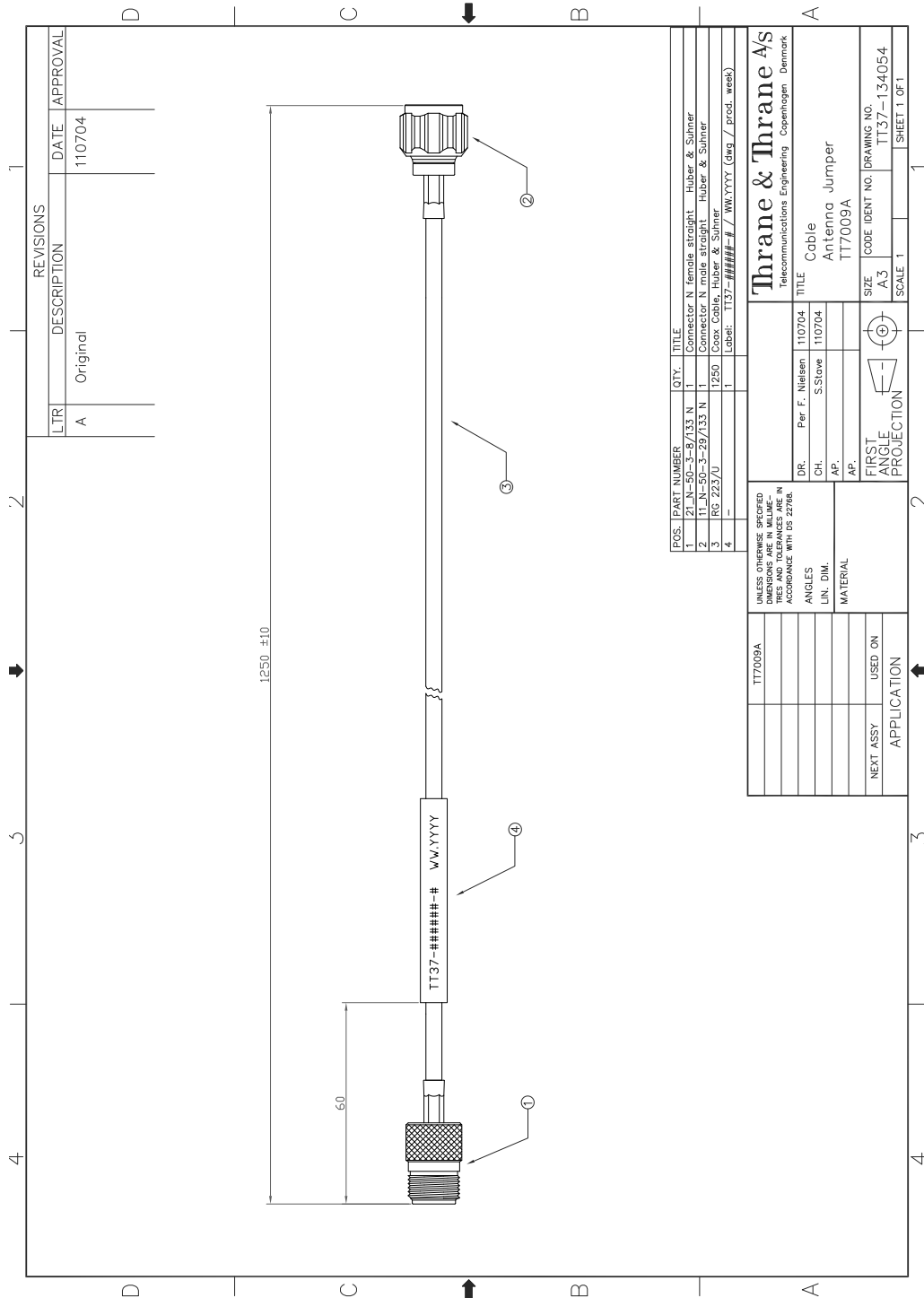


Figure F-9: Jumper cable for grounding (specifications)

## **F.8 RF interference**

Interference induced from nearby high-power RF transmitters might cause system failures and in extreme cases permanent damage to the SAILOR 800/900 VSAT equipment. If there are problems with interference from HF transmitters, it is advisable to mount ferrite clamps on the coax cable in order to provide suppression of induced RF. The ferrites will have no effect on the differential-mode signals but increases the impedance in relation to common-mode RFI.

### **F.8.1 Recommendations**

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

# System messages

## G.1 Event messages – overview

The SAILOR 800/900 VSAT 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 800/900 VSAT detects an event that requires your action, it issues an event message and the red Fail/Pass LED in the LED panel of the ACU is lit. As long as an event is active, it is shown in the ACU display and the web interface (in HELPDESK > Event list or click the event icon on the DASHBOARD).

**Note**

Active events and notifications are shown. As soon as the event is cleared, it is not displayed any longer. It is then moved to the Notifications section. Notifications are cleared after 24 hours.

State the Event ID when contacting your service partner.

The event description might contain a number of digits in brackets, e.g. (00000005). This is supplemental information and used for service and diagnostics purposes.

## G.2 List of ADU events

| Error code (ID) | Unit    | Severity | Description          | Explanation   |
|-----------------|---------|----------|----------------------|---|
| 0A001-0         | Antenna | ERROR    | Production data      | Production data is invalid.   |
| 0A002-0         | Antenna | ERROR    | XIM internal         | Antenna configuration data stored in the PCM module is invalid.   |
| 0A003-0         | Antenna | ERROR    | XIM external         | Antenna configuration data stored in the VIM/TIM module is invalid.   |
| 0A004-0         | Antenna | ERROR    | XIM I/X match        | Antenna configuration data stored in the PCM module does not match the configuration data stored in the VIM/TIM module.   |
| 0A005-0         | Antenna | ERROR    | Antenna type         | The configured antenna type is not supported or unknown.  |
| 0A006-0         | Antenna | ERROR    | PCM FPGA load        | The PCM FPGA cannot be initialised and loaded correctly.  |
| 0A007-0         | Antenna | ERROR    | XIM FPGA load        | The VIM/TIM FPGA cannot be initialised and loaded correctly.  |
| 0A008-0         | Antenna | ERROR    | XIM production       | Production/calibration data stored in the VIM/TIM module is invalid.  |
| 0A00A-0         | Antenna | ERROR    | 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:<br>0x00000000: Device not found (possible cabling problem)<br>0x0000bbaa: Device internal error (replace device)<br>aa=status, bb=state. |
| 0A016-0         | Antenna | ERROR    | Xel DDM ABS device   | Cannot initialise the cross-elevation DDM. Info: See 0A015-0.   |
| 0A017-0         | Antenna | ERROR    | Ele DDM ABS device   | Cannot initialise the elevation DDM. Info: See 0A015-0.   |

Table G-1: ADU event messages

| Error code (ID) | Unit    | Severity | Description          | Explanation  |
|-----------------|---------|----------|----------------------|--|
| 0A018-0         | Antenna | ERROR    | ISM ABS device       | Cannot initialise the ISM Info:<br>0x00000000: Device not found (possible cabling problem)<br>0x000cbbaa: Device internal error (replace device)<br>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:<br>0x00000001: Timeout (operation did not complete in time)<br>0x00000010: Encoder or mechanical problem<br>0x00000020: Zero reference not found<br>0x00000040: End stop not found. |
| 0A022-0         | Antenna | ERROR    | Xel axis calibration | Cross-elevation axis zero reference or end stops not found at expected locations. Check belt, zero reference module, and end stops. Info: See 0A021-0.   |
| 0A023-0         | Antenna | ERROR    | Ele axis calibration | Elevation axis zero reference or end stops not found at expected locations. Check belt, zero reference module, and end stops. Info: See 0A021-0.   |
| 0A024-0         | Antenna | ERROR    | Pol axis calibration | Polarisation axis zero reference or end stops not found at expected locations. Check movement of the polarisation unit and the zero reference module. Info: See 0A021-0.   |
| 0A025-0         | Antenna | ERROR    | Antenna calibration  | One or more errors occurred during antenna start-up Info:<br>0x00000001: Timeout (calibration did not complete in time)<br>0x00000010: Azimuth axis<br>0x00000020: Cross-elevation axis<br>0x00000040: Elevation axis<br>0x00000080: Polarisation axis                 |
| 0A028-0         | Antenna | ERROR    | Demodulator load     | The second receiver demodulator cannot be initialised and loaded correctly.  |

Table G-1: ADU event messages (Continued)

| Error code (ID) | Unit    | Severity | Description          | Explanation  |
|-----------------|---------|----------|----------------------|--|
| 0A029-0         | Antenna | ERROR    | XIM PLL lock         | The PLL on the VIM/TIM does not lock.  |
| 0A02B-0         | Antenna | ERROR    | ABS software version | The ABS software version in the antenna is too old to match the hardware requirements. Upgrade the software.   |
| 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.   |
| 0A041-0         | Antenna | WARNING  | BUC voltage low      | The voltage for the BUC is too low, probably caused by a malfunctioning VIM or BUC.  |

Table G-1: ADU event messages (Continued)

| Error code (ID) | Unit    | Severity | Description      | Explanation   |
|-----------------|---------|----------|------------------|---|
| 0A042-0         | Antenna | WARNING  | BUC voltage high | The voltage for the BUC is too high probably caused by a malfunctioning VIM.  |
| 0A043-0         | Antenna | WARNING  | LNB voltage low  | The voltage for the LNB is too low probably caused by a malfunctioning VIM/TIM or LNB.  |
| 0A044-0         | Antenna | WARNING  | LNB voltage high | The voltage for the LNB is too high probably caused by a malfunctioning VIM/TIM.  |
| 0A045-0         | Antenna | WARNING  | PMM fan          | The fan is not working or the tacho input from the fan is not connected. Check fan cable and fan.   |
| 0A046-0         | Antenna | WARNING  | OMT temperature  | The temperature of the BUC is too high. Check if the fan is working.  |
| 0A047-0         | Antenna | ERROR    | VIM PLL lock     | The PLL of the VIM/TIM is out of lock. Check the 10 MHz reference signal.   |
| 0A048-0         | Antenna | WARNING  | VIM tuner lock   | The PLL of the second receiver (DVB) is out of lock. Check the 10 MHz reference signal.   |
| 0A049-0         | Antenna | WARNING  | Azi encoder slip | A slip of the azimuth encoder has been detected. 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.             |
| 0A04C-0         | Antenna | WARNING  | Pol encoder slip | A slip of the polarisation encoder has been detected. No user interaction is required unless this is a permanent situation in which case the encoder of the polarisation 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.  |

Table G-1: ADU event messages (Continued)

| Error code (ID) | Unit    | Severity | Description           | Explanation   |
|-----------------|---------|----------|-----------------------|---|
| 0A050-0         | Antenna | ERROR    | Azi DDM communication | Communication error between PCM and azimuth DDM. Check SUB-D connectors and cables.   |
| 0A051-0         | Antenna | ERROR    | Xel DDM communication | Communication error between PCM and cross-elevation DDM. Check SUB-D connectors and cables.   |
| 0A052-0         | Antenna | ERROR    | Ele DDM communication | Communication error between PCM and elevation DDM. Check SUB-D connectors and cables  |
| 0A053-0         | Antenna | ERROR    | ISM communication     | Communication error between PCM and ISM. Check SUB-D connectors and cables.   |
| 0A054-0         | Antenna | ERROR    | PMM communication     | Communication error between PCM and PMM. Check SUB-D connectors and cables.   |
| 0A055-0         | Antenna | WARNING  | Azi DDM warning       | The azimuth motor controller has temporarily observed an unusual situation 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.    |

Table G-1: ADU event messages (Continued)



| Error code (ID) | Unit    | Severity | Description     | Explanation  |
|-----------------|---------|----------|-----------------|--|
| 0A059-0         | Antenna | WARNING  | Azi cal. limits | Azimuth axis calibration result check limits exceeded. Pointing performance may be degraded. Info:<br>0x00000040: End stop detected before expected limit<br>0x00000100: Zero width is low      0x00000200: Zero width is high<br>0x00000400: Zero slack is high<br>0x00001000: Friction average is high<br>0x00002000: Friction peak is high<br>0x00004000: Friction asymmetry is high<br>Zero width low/high: Zero reference module placement may be incorrect. Zero slack high: Mechanical slack may be too high. Friction average/peak high: Mechanical friction is higher than expected. Friction asymmetry high: Mechanical imbalance may be too high. |
| 0A05A-0         | Antenna | WARNING  | Xel cal. limits | 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.  |
| 0A05C-0         | Antenna | WARNING  | Pol cal. limits | Polarisation 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 mode without heading input because the elevation is too high.  |

Table G-1: ADU event messages (Continued)

## G.3 List of ACU events

| Error code (ID) | ACU PCB | Severity | Description              | Explanation   |
|-----------------|---------|----------|--------------------------|---|
| 08060-0         | ADM     | WARNING  | ADU modem                | ACU/ADU communication error detected (framing and parity). If the situation is persistent, check if cable specifications comply (length and attenuation).   |
| 08061-0         | ADM     | WARNING  | VMU linux shell password | The specified password (root) for the VSAT modem is not accepted by the modem.  |
| 08062-0         | ADM     | WARNING  | VMU debug shell password | The specified password (user) for the VSAT modem is not accepted by the modem.  |
| 08063-0         | ADM     | ERROR    | ADU 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.   |
| 0806B-0         | ADM     | WARNING  | ROSS connection          | The ACU has lost connection with the ROSS device.   |
| 0806C-0         | ADM     | ERROR    | VMU frequency setup      | There is a mismatch in the frequency setup. Probably the 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. |

Table G-2: ACU event messages

| Error code (ID) | ACU PCB | Severity | Description                  | Explanation   |
|-----------------|---------|----------|------------------------------|---|
| 0806D-0         | ADM     | ERROR    | ADU power                    | The ADU 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.                      |
| 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.                           |
| 08073-0         | ADM     | WARNING  | Slave connection             | The system is configured as a dual antenna master, but no dual antenna slave is connected to it. Either disable the dual antenna master in the web interface or configure a another system as a dual antenna slave.   |
| 08074-0         | ADM     | WARNING  | Master connection            | The system is configured as a dual antenna slave, but it was not possible to connect to the dual antenna master. Check that the IP address entered in the modem profile is correct and check that the master and slave systems are physically connected as described in the manual. |
| 08076-0         | ADM     | WARNING  | Incompatible message version | The system is configured as a dual antenna system, but the software versions on master and slave system are different. Ensure that both master and slave have identical software.   |
| 08078-0         | ADM     | WARNING  | VMU TX frequency invalid     | 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.  |
| 08100-0         | ADM     | ERROR    | PSM low voltage (22 V)       | The ADM measures a different ADU 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.  |

Table G-2: ACU event messages (Continued)

| Error code (ID) | ACU PCB | Severity | Description                   | Explanation  |
|-----------------|---------|----------|-------------------------------|--|
| 08101-0         | ADM     | ERROR    | PSM high voltage (48 V)       | The ADM measures a different ADU 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    | ADU communication             | The ACU cannot communicate with the antenna. Check cable and antenna.  |
| 08107-0         | ADM     | ERROR    | ADM FPGA load                 | The ADM FPGA cannot be initialised and loaded.   |
| 08108-0         | ADM     | ERROR    | TX Power Detector calibration | The power detector calibration is not valid.   |
| 08109-0         | ADM     | ERROR    | ADU 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.  |
| 0810B-0         | ADM     | ERROR    | ADU software version          | Some error occurred during upload of software to the ADU, which means that the ADU software version is not as expected. Either the software in the ACU, does not meet the minimum version required by the ADU, 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    | ACU 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. |

Table G-2: ACU event messages (Continued)

| Error code (ID) | ACU PCB | Severity | Description           | Explanation   |
|-----------------|---------|----------|-----------------------|---|
| 08840-0         | ADM     | WARNING  | Master PLL lock       | The master PLL has lost lock. Check the input reference signal.   |
| 09000-0         | KDM     | ERROR    | KDM 3V3 supply        | Internal 3V3 voltage supply error in the KDM.   |
| 09001-0         | KDM     | ERROR    | KDM 12V supply        | Internal 12V voltage supply error in the KDM.   |
| 09002-0         | KDM     | ERROR    | KDM display           | Display hardware error in the KDM.  |
| 09010-0         | KDM     | ERROR    | KDM link/SW version   | Link to the KDM module could not be established. Either the KDM board is malfunctioning, or - if the system software has just been updated - the software is too old and is not compatible with the KDM hardware. |
| 0B000-0         | PSM     | ERROR    | PSM production data   | Missing or invalid production data in the PSM. 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 G-2: ACU event messages (Continued)



# Approvals

## H.1 Overview

This appendix lists the approvals for SAILOR 800/900 VSAT:

- *CE (R&TTE)*
- *Eutelsat S.A – ESV Summary Sheet*
- *Russian Maritime Register of Shipping*

## H.2 CE (R&TTE)

The SAILOR 800/900 VSAT is CE certified (R&TTE directive) as stated in the “Declaration of Conformity with R&TTE Directive”, enclosed in copy on the next page.



# Thrane & Thrane A/S

## 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-7090B SAILOR 900 VSAT, Maritime Ku-Band Antenna System consisting of:

|          |  |                     |
|----------|--|---------------------|
| TT-7016A | SAILOR 900 Antenna Control Unit (ACU) T19" | PN = 407016A-T19 or |
|          | SAILOR 900 Antenna Control Unit (ACU) TBH  | PN = 407016A-TBH or |
|          | S900 Antenna Control Unit (ACU) N19"       | PN = 407016A-N19 or |
|          | S900 Antenna Control Unit (ACU) NBH        | PN = 407016A-NBH    |

And:

|          |                                      |                     |
|----------|--------------------------------------|---------------------|
| TT-7009B | SAILOR 900 Above Deck Unit (ADU) THR | PN = 407009B-THR or |
|          | S900 Above Deck Unit (ADU) EDK       | PN = 407009B-EDK or |
|          | S900 Above Deck Unit (ADU) NEU       | PN = 407009B-NEU    |

### Equipment Applicability

TT-7090B SAILOR 900 VSAT System consists of an antenna unit (ADU – Above Deck Unit) and an ACU (Antenna Control Unit). The system includes either one of the ACUs (TT-7016A 19" Rack or TT-7016A Bulkhead). VSAT=Very Small Aperture Terminal. 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 Ku-band satellite, which has adequate signal coverage in the current geographic area.

### Declaration

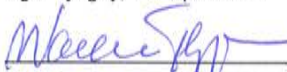
The requirement with respect to the LVD directive 2006/95/EC is met by conforming to the harmonized EU standard EN 60950. The protection requirement with respect to the EMC directive 2004/108/EC is met by conforming to the harmonized EU standard EN 60945. Effective use of frequency spectrum is met by conforming to harmonized EU standard EN 302 340. Confirmed by Nemko, Notified Body No. 0470.

### Manufacturer

Thrane & Thrane A/S  
Lundtoftegårdsvej 93D, DK-2800 Kgs. Lyngby, Denmark  
Porsvej 2, DK-9200 Aalborg SV, Denmark

### Place and Date

Kgs. Lyngby, 17. April 2013

  
Walther Thygesen, CEO  
Thrane & Thrane A/S

Doc. no. 99-139020-A



Page: 1 of 1



# Thrane & Thrane A/S

## 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-7080A SAILOR 800 VSAT, Maritime KU-Band Antenna System, consisting of:

TT-7016A SAILOR ACU VSAT KU

And:

TT-7008A SAILOR 800 VSAT ADU

### Equipment Applicability

TT-7080A SAILOR 800 VSAT System consists of an antenna unit (ADU – Above Deck Unit) and an ACU (Antenna Control Unit). VSAT = Very Small Aperture Terminal. 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 Ku-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 302 340. Confirmed by Nemko, Notified Body No. 0470.

### Manufacturer

Thrane & Thrane A/S

Lundtoftegårdsvej 93D, DK-2800 Kgs. Lyngby, Denmark  
Porsvej 2, DK-9200 Aalborg SV, Denmark

### Place and Date

Kgs. Lyngby, 25. September 2013



Svend Åge Lundgaard Jensen, CFO  
Thrane & Thrane A/S

Doc. no. 99-140287-A



Page: 1 of 1

## H.3 Eutelsat S.A – ESV Summary Sheet

Eutelsat s.A.

ESV Summary Sheet

**Manufacturer:**

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

Tel: + 45 39 55 88 00  
Fax: + 45 39 55 88 88  
<mailto:info@thrane.com>

**Antenna model:**

SAILOR 900 VSAT 407009B-00500

**Antenna aperture dimensions:**

1.03 m

**Standard:**

M

**Characterization date:**

30-04-2013

**System Description:**

Stabilised maritime antenna – ring focus Gregorian configuration – Sandwich foam pre-preg layers radome. Three axis stabilization platform with conical RF tracking.  
BUC NextGenWave 8W rating  
LNB Philtech  
OMT Thrane & Thrane TT 60-131011.

**Models Characterized:**

Standard configuration: linear orthogonal polarization with co-polarized or cross-polarized signal reception option.

**Maximum Allowed EIRP:**

For digital carriers transmitted at the satellite receive contour of 0 dB/K (EESS 502 refers):  
39.8 dBW / 40 kHz for an orbital separation of the adjacent satellite  $\geq 2.5^\circ$   
39.6 dBW / 40 kHz for an orbital separation of the adjacent satellite  $\geq 2.0^\circ$   
35.6 dBW / 40 kHz for an orbital separation of the adjacent satellite  $\geq 1.5^\circ$

**Tx Frequency:**

13.75 – 14.50 GHz

**Rx Frequency:**

10.70-12.75 GHz

**Tx Gain:**

41.1dBi (typical at 14.25 GHz)

**Rx Gain:**

40.2 dBi (typical at 11.7 GHz)

**Tx XPD:**

&gt;30 dB within -1 dB contour

**Rx XPD:**

&gt;30 dB within -1 dB contour

**G/T (measured with radome)**

19.9 dB/K @ 12.75 GHz 30 ° Elevation

**Remarks:**

- The manufacturer states that the RMS pointing error is less than  $0.20^\circ$  for the following ship motions:  
Roll =  $30^\circ$  in a period of 6 sec  
Pitch =  $15^\circ$  in a period of 4 sec  
Yaw =  $10^\circ$  in a period of 10 sec
- The RF performance characterization was performed on one antenna unit with radome, at the France Telecom test range of La Turbie, France on the 18-20 April 2013.
- Thrane & Thrane has inserted in the ACU software a look-up table with the polarization skew of the Eutelsat satellites, to protect against the mishandling of polarization skew values by installers.
- The characterization's validity is subject to regular submission of patterns to confirm that the system remains compliant with the Eutelsat standards.

**Restrictions:**

The use of Rx band 10.7 to 10.95 GHz may be subject to impairments because the isolation of the sidelobes at  $3^\circ$  from the boresight is less than 20 dB at 10.70 GHz (17.8 dB). Nevertheless these operations may be exceptionally authorized according to a valid Eutelsat transmission plan.

**Eutelsat s.a.****ESV Summary Sheet****Manufacturer:**

Thrane & Thrane A/S  
trading as Cobham SATCOM  
Lundtoftegaardsvej 93 D  
DK-2800 Kgs. Lyngby  
DENMARK  
Tel: + 45 39 55 88 00  
Fax: + 45 39 55 88 88  
Website: <http://www.cobham.com/lyngby>

**Antenna model:**

SAILOR 800 VSAT 407008A-00500

**Antenna aperture dimensions:**

83 cm

**Standard:**

M

**Characterization date:**

09-10-2013

**System Description:**

Stabilized maritime antenna – ring focus Gregorian configuration – Sandwich foam RTM (Resin Transfer Molding) radome. Three axis stabilization platform with conical RF tracking.  
BUC NextGenWave 6W rating  
LNB PhilTech  
OMT Thrane & Thrane TT 60-131011.

**Models Characterized:**

Standard configuration: linear orthogonal polarization with co-polarized or cross-polarized signal reception option.

**Maximum Allowed EIRP:**

For digital carriers transmitted at the satellite receive contour of 0 dB/K (EESS 502 refers):  
38.6 dBW / 40 kHz for an orbital separation of the adjacent satellite  $\geq 2.5^\circ$   
34.2 dBW / 40 kHz for an orbital separation of the adjacent satellite  $\geq 2.0^\circ$   
34.0 dBW / 40 kHz for an orbital separation of the adjacent satellite  $\geq 1.5^\circ$

**Tx Frequency:**

13.75 – 14.50 GHz

**Tx Gain:**

40.0dBi (typical at 14.25 GHz)

**Tx XPD:**

$\geq 31.7$  dB within -1 dB contour

**Rx Frequency:**

10.70-12.75 GHz

**Rx Gain:**

37.9 dBi (typical at 11.7 GHz)

**Rx XPD:**

$\geq 30.5$  dB within -1 dB contour

**G/T (measured with radome)**

18.2 dB/K @ 12.75 GHz  $30^\circ$  Elevation


**Remarks:**

- The manufacturer states that the RMS pointing error is less than  $0.20^\circ$  for the following ship motions:  
Roll =  $30^\circ$  in a period of 6 sec  
Pitch =  $15^\circ$  in a period of 4 sec  
Yaw =  $10^\circ$  in a period of 10 sec
- The RF performance characterization was performed on one antenna unit with radome, at the CTS test range of Leatherhead, UK, on the 21-22 August 2013.
- The transmission of the HPA is muted from the ACU when the maximum pointing error exceeds  $0.5^\circ$ , by inhibiting the 10 MHz reference signal to the BUC.
- Thrane & Thrane has inserted in the ACU software a look-up table with the polarization skew of the Eutelsat satellites, to protect against the mishandling of polarization skew values by installers.
- The characterization's validity is subject to regular submission of patterns to confirm that the system remains compliant with the Eutelsat standards.

**Restrictions:**

- The worst excess in the receive side ( $\pm 10^\circ$ ) to the EESS Gain mask is 6.3 dB @  $3^\circ$ .  
The service quality in conjunction with operations in certain Rx bands and/or reduced orbital separations from the adjacent satellites may be impaired due to excessive Rx sidelobe levels. Nevertheless, to achieve the required service quality the level of the outroute carrier may need to be increased according to a valid Eutelsat transmission plan.

## H.4 Russian Maritime Register of Shipping

|  |   |
|--|---|
| <p><b>РОССИЙСКИЙ МОРСКОЙ РЕГИСТР СУДОХОДСТВА</b><br/><b>RUSSIAN MARITIME REGISTER OF SHIPPING</b></p>   | <p>MODTAGET 6.8.3<br/>AALBORG</p> <p>10 DEC. 2013</p>   |
| <p><b>СВИДЕТЕЛЬСТВО О ТИПОВОМ ОДОБРЕНИИ</b><br/><b>TYPE APPROVAL CERTIFICATE</b></p>   |   |
| <p>Изготовитель<br/>Manufacturer</p>   | <p style="text-align: center;"><b>Thrane &amp; Thrane A/S</b></p>   |
| <p>Адрес<br/>Address</p>   | <p style="text-align: center;"><b>Lundtoftegaardsvej 93 D, DK-2800 Kgs., Lyngby, Denmark</b><br/><b>Тел. / Tel.: +45 39 55 88 00, Факс. / Fax.: +45 39 55 88 88,</b><br/><b>Эл. почта / e-mail: info@thrane.com, www.thrane.com</b></p>   |
| <p>Изделие*<br/>Product*</p>   | <p style="text-align: center;"><b>Судовая земная станция (СЗС) спутниковой связи VSAT,<br/>типы "SAILOR 800 VSAT / SAILOR 900 VSAT"</b></p> <p style="text-align: center;"><b>VSAT Ship Earth Station (SES) of satellite communication,<br/>types "SAILOR 800 VSAT / SAILOR 900 VSAT"</b></p> |
| <p>Код номенклатуры<br/>Code of nomenclature</p>   | <p><b>04090000</b></p>  |
| <p>На основании освидетельствования и проведенных испытаний удостоверяется, что вышеупомянутое(ые) изделие(я) удовлетворяет(ют) требованиям Российского морского регистра судоходства.<br/>This is to certify that on the basis of the survey and tests carried out the above mentioned item(s) complies(ly) with the requirements of Russian Maritime Register of Shipping.</p>               |   |
| <p><b>Изделие соответствует применимым требованиям части IV "Радиооборудование" Правил РС по оборудованию морских судов, изд. 2013 г., требованиям Резолюции ИМО А.694(17).</b></p>  |   |
| <p><b>Product meets the applicable requirements of the Part IV "Radioequipment" of the RS Rules for the Equipment of Sea-Going Ships, edition 2013, requirements of IMO Resolutions A.694(17).</b></p>   |   |
| <p>Настоящее Свидетельство о типовом одобрении действительно до <b>15.11.2018</b><br/>This Type Approval Certificate is valid until</p>  |   |
| <p>Настоящее Свидетельство о типовом одобрении теряет силу в случаях, установленных в Правилах технического наблюдения за постройкой судов и изготовлением материалов и изделий для судов.<br/>This Type Approval Certificate becomes invalid in cases stipulated in Rules for the Technical Supervision during Construction of Ships and Manufacture of Shipboard Materials and Products.</p> |   |
| <p>Дата выдачи<br/>Date of issue</p>   | <p>№ <b>13.03831.315</b></p>  |
| <p>Российский морской регистр судоходства<br/>Russian Maritime Register of Shipping</p>  | <p style="text-align: center;"><b>В.И.Евенко / V. Evenko</b><br/>( фамилия, инициалы )<br/>name</p>   |
| <p>М.П. (подпись)<br/>L.S. signature</p>   |   |
| <p>*Дополнительную информацию смотри на обороте.<br/>Additional information see overleaf.</p>  |   |

Технические данные  
Technical data

**Рабочие частоты:**

- SAILOR 800 VSAT: 10.7 - 12.75 ГГц (Ku-Band) - режим приема, 13.75 - 14.5 ГГц (Ku-Band) - режим передачи;
- SAILOR 900 VSAT: 10.7 - 12.75 ГГц (Ku/Ka-Band) - режим приема, 13.75 - 14.5 ГГц (Ku/Ka-Band) - режим передачи.

Режимы работы: доступ в Интернет, телефония IP, телефонная связь с судами.

Источник питания: - постоянный ток - 20.0 - 32.0 В;

- переменный ток - 110 или 220 В  $\pm$  10%, 50/60 Гц  $\pm$  5% (с использованием блока питания SAILOR 6080).

Диапазон рабочих температур: -15°C - +55°C (для блоков, устанавливаемых во внутренних помещениях судна);

-25°C - +55°C (для блоков, устанавливаемых на открытой палубе).

Версия программного обеспечения: 1.xx.

**Frequencies of operation:**

- SAILOR 800 VSAT: 10.7 - 12.75 GHz (Ku-Band) - receiving mode, 13.75 - 14.5 GHz (Ku-Band) - transmitting mode;

- SAILOR 900 VSAT: 10.7 - 12.75 GHz (Ku/Ka-Band) - receiving mode, 13.75 - 14.5 GHz (Ku/Ka-Band) - transmitting mode.

Modes of operation: Internet access, IP telephone, telephone calls between ships.

Power Source: - DC - 20.0 - 32. V;

- AC - 110 or 220 V  $\pm$  10 %, 50/60 Hz  $\pm$  5% (using Power Supply Unit SAILOR 6080).

Operating temperature range: -15°C - +55°C (for protected units);

-25°C - +55°C (for exposed units).

Software version: 1.xx.

Судовая земная станция (СЗС) спутниковой связи VSAT, типы "SAILOR 800 VSAT / SAILOR 900 VSAT", состоит из блоков, перечисленных в Приложении к настоящему Свидетельству о типовом одобрении. VSAT Ship Earth Station (SES) of satellite communication, types "SAILOR 800 VSAT / SAILOR 900 VSAT", consists of units which are listed in the Annex to this Type Approval Certificate.

Техническая документация и дата ее одобрения Российским морским регистром судоходства  
Technical documentation and the date of its approval by Russian Maritime Register of Shipping

**Техническая документация одобрена Главным управлением Российского морского регистра судоходства (исх. No. 315-58-218878 от 29.10.2013 г.):**

**The technical documentation is approved by the Head Office of the Russian Maritime Register of Shipping (Ref. No. 315-58-218878 of 29.10.2013):**

- SAILOR 800 VSAT, Installation Manual, Document number: 98-139995-A;

- SAILOR 900 VSAT, Installation and Maintenance Manual, Document number: 98-138976-B.

Образец изделия испытан под техническим наблюдением Российского морского регистра судоходства.  
Product's specimen has been tested under the technical supervision of Russian Maritime Register of Shipping.

Акт № 13.03550.315 от 30.10.2013  
Report No. \_\_\_\_\_ of \_\_\_\_\_

Область применения и ограничения  
Application and limitations

**Судовая земная станция спутниковой связи VSAT, типы "SAILOR 800 VSAT / SAILOR 900 VSAT", не отвечает требованиям ГМССБ и предназначена для использования на морских судах в качестве дополнительного радиоборудования.**

**VSAT Ship Earth Station, types "SAILOR 800 VSAT / SAILOR 900 VSAT", does not meet the GMDSS requirements and it is intended for use onboard the sea-going ships as an additional radioequipment.**

Вид документа, выдаваемого на изделие  
Type of document issued for product

**Изделие должно поставляться со Свидетельством Российского морского регистра судоходства по форме 6.5.31.**

**The product shall be delivered with the Certificates of the Russian Maritime Register of Shipping in accordance with form 6.5.31.**

02/2012

**13.03831.315**

## Приложение

к Свидетельству о типовом одобрении № 13.03831.315 от 15.11.2013 г.

### Аппенд

to Type Approval Certificate No. 13.03831.315 of 15.11.2013

**Судовая земная станция (СЗС) спутниковой связи VSAT,  
тип "SAILOR 800 VSAT / SAILOR 900 VSAT", состоит из следующих блоков:  
VSAT Ship Earth Station (SES) of satellite communication,  
type "SAILOR 800 VSAT / SAILOR 900 VSAT", consists of the following units:**

| No  | Наименование блока<br>Name of Unit                       | Тип блока<br>Type of Unit    | Примечания<br>Remarks   |
|---|--|------------------------------|---|
| <b>1. Блоки, устанавливаемые на открытой палубе:<br/>1. Above Deck Equipment:</b>             |  |                              |   |
| <b>1.1 Морские антенные системы SAILOR:<br/>SAILOR Maritime Antennas:</b>                     |  |                              |   |
| 1.1.1   | Антенный блок / Antenna Unit,                            | TT-7009<br>(SAILOR 900 VSAT) | Диаметр рефлектора – 1.03 м.<br>Diameter of Reflector – 1.03 m. |
|   |  | TT-7008<br>(SAILOR 800 VSAT) | Диаметр рефлектора – 0.83 м.<br>Diameter of Reflector – 0.83 m. |
| <b>1.2 Передатчики:<br/>Transmitters:</b>   |  |                              |   |
| 1.2.1   | Block Up Converter (BUC)                                 | BUC 8W<br>(SAILOR 900 VSAT)  | Встроен в антенный блок.<br>Built-in Antenna Unit.              |
|   |  | BUC 6W<br>(SAILOR 800 VSAT)  | Встроен в антенный блок.<br>Built-in Antenna Unit.              |
| <b>1.3 Приемники-усилители:<br/>Receiver-amplifier:</b>                                       |  |                              |   |
| 1.3.1   | Low Noise Block (LNB)                                    | VSAT LNB                     | Встроен в антенный блок.<br>Built-in Antenna Unit.              |
| <b>2. Блоки, устанавливаемые во внутренних помещениях судна:<br/>2. Below Deck Equipment:</b> |  |                              |   |
| <b>2.1 Блок управления антенной:<br/>SAILOR Antenna Control Unit:</b>                         |  |                              |   |
| 2.1.1   | Antenna Control Unit (ACU)                               | TT-7016A                     | Для / For SAILOR 800 VSAT /<br>SAILOR 900 VSAT                  |
| <b>2.2 Спутниковые модемы – маршрутизаторы:<br/>Satellite modems / routers:</b>               |  |                              |   |
| 2.2.1   | iDirect Technologies (США)<br>iDirect Technologies (USA) | iINFINITY Series             | iDirect 3000, 5000, 7000  |
|   |  | EVOLUTION Series             | iDirect X3, X5, 8000  |
| 2.2.2   | COMTECH (США)<br>COMTECH (USA)                           | CDM Series                   | CDM570L, 625  |
| 2.2.3   | STM (США)<br>STM (USA)                                   | STM Satlink Series           | SatLink 2900  |
| 2.2.4   | GILAT (Израиль)<br>GILAT (Israel)                        | Gilat SkyEdge Series         | SkyEdge I,<br>SkyEdge II  |
| <b>3. Дополнительные блоки:<br/>3. Optional Units:</b>  |  |                              |   |
| 3.1   | Блок питания<br>Power Supply Unit                        | SAILOR 6080                  | Переменный ток – пост. ток.<br>AC - DC.                         |

Российский морской регистр судоходства  
Russian Maritime Register of Shipping



**В.И.Евенко / V. Evenko**

М.П. / L.S

## H.5 ANATEL Certificado de Homologação

|  REPÚBLICA FEDERATIVA DO BRASIL<br>AGÊNCIA NACIONAL DE TELECOMUNICAÇÕES.  |                               |  |                        |                   |        |   |  |  |
|--|-------------------------------|--|------------------------|-------------------|--------|---|--|--|
| <b>Certificado de Homologação</b><br>(Intransferível)<br><b>Nº 1530-13-8350</b><br>Validade: <b>Indeterminada</b><br>Emissão: <b>31/05/2013</b>  |                               |  |                        |                   |        |   |  |  |
| Solicitante:<br><b>ULSTEIN BELGA MARINE SERVIÇOS DE ELETRÔNICA NAVAL</b><br><b>RUA CURUZU 58 SÃO CRISTÓVÃO</b><br><b>20920440 RIO DE JANEIRO RJ</b>  |                               | Fabricante:<br><b>THRANE &amp; THRANE A/S</b><br><b>LUNDTOFTEGARDSVEJ 93 D DK-2800 KGS.</b><br><b>LYNGBY</b> |                        |                   |        |   |  |  |
| <p>Este documento homologa, nos termos do Regulamento para Certificação e Homologação de Produtos para Telecomunicações, aprovado pela Resolução Anatel nº 242, de 30 de novembro de 2000, o Certificado de Conformidade nº 3055, emitido pelo <b>OCD - Fundação CPqD</b>. Esta homologação é expedida em nome do solicitante aqui identificado e é válida somente para o produto a seguir discriminado, cuja utilização deve observar as condições estabelecidas na regulamentação do(s) serviço(s) ou aplicação(ões) a que se destina.</p> |                               |  |                        |                   |        |   |  |  |
| Tipo:<br><b>Transceptor do SMM por Satélite - Categoria II</b>   |                               |  |                        |                   |        |   |  |  |
| Modelo(s):<br><b>Sailor 900 Vsat</b>   |                               |  |                        |                   |        |   |  |  |
| Serviço/Aplicação:<br><b>Serviço Móvel Marítimo - SMM</b><br><b>Sistemas de Comunicação por Satélite</b><br><b>Comunicação por Satélite</b>  |                               |  |                        |                   |        |   |  |  |
| Características técnicas básicas:  |                               |  |                        |                   |        |   |  |  |
| <table border="1"> <thead> <tr> <th>Faixa de Frequências Tx (MHz)</th> <th>Potência Máxima de Saída (W)</th> <th>Designação de Emissões</th> </tr> </thead> <tbody> <tr> <td>14000,0 a 14500,0</td> <td>7,9799</td> <td>-</td> </tr> </tbody> </table>   | Faixa de Frequências Tx (MHz) | Potência Máxima de Saída (W)   | Designação de Emissões | 14000,0 a 14500,0 | 7,9799 | - |  |  |
| Faixa de Frequências Tx (MHz)  | Potência Máxima de Saída (W)  | Designação de Emissões   |                        |                   |        |   |  |  |
| 14000,0 a 14500,0  | 7,9799                        | -  |                        |                   |        |   |  |  |
| Ensaio de SAR não aplicável.   |                               |  |                        |                   |        |   |  |  |
| Observações:<br><b>Na sua utilização, o(s) produto(s) deve(m) estar em conformidade com as condições – Anatel – estabelecidas para a(s) potência(s) e frequência(s) autorizada(s) pelo órgão técnico competente da Agência Nacional de Telecomunicações – Anatel.</b>  |                               |  |                        |                   |        |   |  |  |
| Constitui obrigação do fabricante do produto no Brasil providenciar a identificação do produto homologado, nos termos do art. 39 do Regulamento anexo à Resolução Anatel nº 242, em todas as unidades comercializadas, antes de sua efetiva distribuição ao mercado, assim como observar e manter as características técnicas que fundamentaram a certificação original.   |                               |  |                        |                   |        |   |  |  |
| <b>As informações constantes deste certificado de homologação podem ser confirmadas no SGCH - Sistema de Gestão de Certificação e Homologação, disponível no portal da Anatel. (www.anatel.gov.br).</b>  |                               |  |                        |                   |        |   |  |  |
| Marcos de Souza Oliveira<br>Gerente de Certificação e Numeração<br>   |                               |  |                        |                   |        |   |  |  |





## 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.

## I

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

ISM             Inertial Sensor Module

## K

KDM             Keyboard and Display Module of the ACU

## L

LAN             Local Area Network

LEN             Load Equivalent Number

LGPL            Lesser General Public License

LNB             Low Noise Block. A device used to amplify or boost the weak received signal without amplifying the noise signals (hence the “low noise” part of LNB) and to convert the high frequencies of the signal into lower frequencies, a process called down converting, for conveyance to the indoor equipment (demodulator) for processing.

LO              Local Oscillator. LO frequency used by BUC and LNB.

## M

MIB             Management Information Base

---

## N

NID Network IDentification

NMEA National Marine Electronics Association (standard). A combined electrical and data specification for communication between marine electronic devices such as echo sounder, sonars, anemometer (wind speed and direction), gyrocompass, autopilot, GPS receivers and many other types of instruments. It has been defined by, and is controlled by, the U.S.-based National Marine Electronics Association.

## O

OMT Ortho Mode Transducer

openAMIP Open Antenna-Modem Interface Protocol, facilitates the exchange of information between an ACU and a satellite router. It allows the router to command the antenna and enables automatic beam switching (ABS).

ORE Optical Reference Encoder

## 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

SMA SubMiniature version A connector, coaxial RF connector.

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.

## T

TMA Thrane Management Application

## U

UCLI User Command Line Interface

## V

VIM VSAT Interface Module

VMU VSAT Modem Unit

VSAT Very Small Aperture Terminal, a two-way satellite ground station or a stabilized maritime VSAT antenna with a dish antenna that is smaller than 3 metres.

## W

WAN Wide Area Network

## X

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

## Z

ZRM Zero Reference Module

## Numerics

10 MHz reference, 6-30

## A

access

limit, 6-49

acquisition

gyro-free, 6-9

search pattern, 6-8

search pattern, inclined orbit, 6-8

time, 6-9

ACU

block diagram, 8-13

description, 2-8

LED, 8-10

ACU display

description, 6-52

ACU events, G-8

ACU interfaces, 2-9

ACU rack version

connector panel, overview, 4-1

grounding, 3-36

installing, 3-35

LEDs, display and keypad, 4-1

administration

settings, 6-46

administrator

log off, 6-49

logon, command line interface, D-2

logon, web interface, 6-47

password, 6-47

password, change, 6-48

password, reset, 6-48

ADU

cable sizes, A-9

connector, 4-3

description, 2-3

grounding, optimal, 3-32

ADU cable

alternatives, 3-34

connection, 3-28

modem attenuation, 3-34

ADU cable loop

DC-resistance, 3-34

ADU events, G-2

aluminum hulls

grounding, F-6

antenna

drainage, 3-20

grounding recommendations, F-3

installation location, 3-3

isolation from mounting base, F-9

mast design, 3-9

obstructions, 3-4

opening, 3-30

radiation, 3-6

stabilization, 2-3

antenna cable

check condition, 6-11

antenna dish position

fix, 2-6, 8-24

approval

Eutelsat, H-4

approvals

CE, R&TTE, H-2, H-3

Apstar, E-2

Astra2 satellite, E-1

attenuation

ADU cable, 3-34

attenuator margin

cable calibration, 6-11

Australia satellite, E-2

azimuth calibration, 6-4

DVB symbol rate minimum, 6-5

flow chart, 6-14

## B

baud rate

NMEA 0183, 4-4

VSAT modem, 6-30

beam switching, C-4

BITE test, 8-10

- block diagram
  - ACU, 8-13
  - DDM, 8-20
  - ISM, 8-24
  - OMT, 8-23
  - PCM, 8-19
  - PMM, 8-22
  - S-bus, 8-27
  - VIM, 8-18
  - ZRM, 8-21
- blockabe
  - performance optimization, C-1
- blocking zones
  - azimuth, 3-5
  - dual antenna, 6-42
  - elevation, 3-5
  - setup, 6-32
  - statistics, 6-40
- braces
  - mast, 2 pieces, 3-15, 3-16
  - mast, 3 pieces, 3-14, 3-16
- browser settings
  - for web interface, 6-22
- BUC
  - LO frequency, A-12
  - output power, 6-24
  - power, 6-17
  - troubleshooting, 8-97, 8-98
- BUC data sheet, A-12
  
- C**
- cable
  - calibration data reset, 6-51
  - ground, F-8
  - power, 5-1
- cable calibration, 6-11
  - attenuator margin, 6-11
  - flow chart, 6-14
  - service, 6-11
- cable loss
  - ADU cable, 3-29
- cable requirements
  - NMEA, 4-4
- cable size
  - N-connector, ADU, A-9
- cable type
  - LAN, 4-6
- calibration
  - azimuth, 6-4, 6-9
  - cable, 6-9, 6-11
  - elevation requirements, 6-5
  - error codes, 6-11
  - flow chart, 6-14
  - NID, 6-5
  - polarisation, 6-5
  - satellite data, 6-5, 6-10, 6-27, E-1
  - service profile, 6-4
- calibration data, 6-51
  - enter, 6-4
  - reset, 6-51
  - update, 8-88
- CE approval, H-2, H-3
- change administrator password, 6-48
- Change network, 6-50
- China satellite, E-1
- command line interface, D-1
  - config, D-3
  - demo, D-3
  - dualantenna, D-4
  - exit, D-4
  - help, D-2
  - modem, D-5
  - satellite, D-5
  - status, D-7
  - supported commands, D-3
  - system, D-8
  - track, D-8
  - user name and password, D-2
  - zone, D-9
- commands
  - Serial, C-15
- commands in command line interface, D-3
- compass safe distance
  - ACU, A-4
  - ADU, A-3
- compression point
  - P1 dB, BUC, 6-25
- COMTECH 570 L and ROSS
  - examples, C-19
- condensation in antenna, 3-20
- config
  - command line interface, D-3

configuration  
   copy, 6-50  
   export, 6-50  
   import, 6-50  
   LAN network, 6-34  
   site map, 6-18  
   step-by-step, 6-1  
 configuration examples  
   COMTECH 570L and ROSS, C-19  
   Gilat SkyEdge II, C-28  
   Inmarsat G5, C-29  
   OpenAMIP, C-10  
   Serial, C-16  
   STM Satlink 2900, C-25  
 Configuration program, 6-1  
 connect  
   power cable, 5-3  
   web interface, 6-1  
 connector  
   ADU, 4-3  
   DC, 4-2  
   DC Input, 4-2  
   LAN, 4-6  
   management PC, 4-6  
   modem control, 4-6  
   NMEA 0183/2000, 4-4  
   RS-232, 4-5  
   RS-422, 4-5  
   service port, 4-6  
   TNC, 4-3  
   VMU Rx-Tx, 4-3, 4-4  
 contact information, 8-2  
 corrosion  
   smoke deposits, 3-21  
 country restrictions  
   VSAT, -v  
 current  
   start up peak, 5-1

## D

DC connector, 4-2  
 DC Input  
   connector, 4-2  
 DDM  
   block diagram, 8-20  
 default  
   reset to factory settings, 6-51  
 default gateway, 6-36

degradation  
   due to the radar, 3-19  
   Ku-band connection, 3-19  
 demo  
   command line interface, D-3  
 DHCP client, 6-35  
 DHCP server, 6-35  
 diagnostic report, 6-41, 8-2  
 display  
   ACU, description, 6-52  
 distance  
   antenna to GPS receiver, 3-19  
   antenna to radar, 3-17  
 DNS setup, 6-36  
 drainage of antenna, 3-20  
 drawing  
   ACU rack version, A-8  
   ADU, A-6  
 dual antenna  
   blocking zone, 6-45  
   cabling, 3-38  
   command line interface, D-4  
   commissioning, 6-46  
   configuration, 6-42  
   installation, 3-37  
   line up, 6-46  
   single antenna use, 6-46  
 dual-antenna mode  
   heading input, 3-38  
   slave DASHBOARD, 6-42  
 DVB symbol rate  
   azimuth calibration, 6-5  
 DVB-S, 6-5  
 DVB-S satellite data, E-1  
 DVB-S2, 6-5

## E

elevation angle  
   minimum, 6-27  
 elevation cutoff, 6-27  
 E-mail setup, 6-36, 6-37  
 error codes, G-1  
   calibration, 6-11  
 error messages, 8-3, G-1  
   ACU, G-8  
   ADU, G-2  
 ETSI  
   elevation angle, 6-27

Eutelsat  
  approval, H-4  
event, G-1  
events  
  ACU, G-8  
  ADU, G-2  
  list of active, 8-3  
exit  
  command line interface, D-4  
export configuration, 6-50  
external heading input, 6-7

## F

factory default  
  calibration data, 6-51  
  reset, 6-51  
factory defaults  
  reset to, 8-4  
failure states  
  view, 8-93  
FCC  
  elevation angle, 6-27  
Features, 2-2  
fiberglass hulls  
  grounding, F-7  
fix antenna  
  lock, 2-6, 8-24  
fixed heading, 6-7  
fixed TX gain, 6-17  
flange thickness, 3-9  
flatness, 3-10  
flow chart  
  calibration, 6-14

## G

gain  
  fixed TX, 6-17  
gateway setup, 6-36  
Gilat SkyEdge II  
  examples, C-28  
GPS receiver  
  distance from antenna, 3-19

grounding, F-1  
  ACU rack version, 3-36  
  ADU, 3-32  
  aluminum hulls, F-6  
  antenna, F-3  
  cable, F-8  
  fiberglass hulls, F-7  
  recommendations, F-2  
  steel hulls, F-3  
  terminal, F-2  
gusset plates, 3-9  
gyro compass  
  heading input, 6-7  
gyro input, 4-4

## H

hatch  
  remove, 3-30  
heading input  
  dual-antenna mode, 3-38  
  external, 6-7  
  fixed, 6-7  
  gyro compass, 6-7  
  NMEA, 4-5  
  none, 6-7, 6-12  
help  
  command line interface, D-2  
helpdesk number, 8-2  
  changing in web interface, 8-2  
host name, 6-20, 6-34  
humidity in antenna, 3-20

## I

impedance  
  cable, 5-3  
  ship, 5-2  
  total, 5-1  
import configuration, 6-50  
inclined orbit  
  search pattern for acquisition, 6-8  
inclined orbit satellites, 6-12  
Inmarsat G5  
  examples, C-29  
installation  
  ACU rack versionl, 3-35  
Interfaces, 4-1, 5-1



- interference, 3-17
  - from radar, 3-17
  - RF, F-12
- IP address
  - for web interface, 6-2, 6-4, 6-15, 8-7
  - OpenAMIP modem, 6-30
  - static, 6-35
- ISM
  - block diagram, 8-24
- J**
- Japan satellite, E-2
- L**
- LAN
  - cable type, 4-6
  - connector, 4-6
  - network setup, 6-34
- LAN configuration
  - default gateway, 6-36
  - DHCP client, 6-35
- LAN connector
  - management, 4-6
- LAN network
  - configuration, 6-34
- LED
  - ACU, 8-10
- license
  - software, -ii
- limit access to web interface, 6-49
- Line up, 6-15
- LNB
  - configuration, A-11
  - Co-pol or X-pol, 6-6
  - data sheet, A-10
  - troubleshooting, 8-99
- LNB LO stability, A-10
- LO frequencies, 6-52, A-12
- LO stability, A-10
- load
  - configuration, 6-50
- lock
  - service hatch, 3-30
- locking pin, 2-6, 8-24
- log off
  - administrator, 6-49
- logon
  - administrator, command line interface, D-2
  - administrator, web interface, 6-47
- M**
- mail server
  - setup, 6-37
- management PC
  - connect, 4-6
- mast
  - 2 braces, 3-15, 3-16
  - 3 braces, 3-14, 3-16
  - design, 3-9
  - flange thickness, 3-9
  - flatness, 3-10
  - foundation, 3-9
  - gusset plates, 3-9
  - height, 3-9
  - without braces, 3-14, 3-15, 3-16
- mast flange, 3-10
- mast for antenna, 3-9
- mast length, 3-14
- master
  - active, dual antenna, 6-42
- Master ACU
  - dual antenna, 6-42
- messages, G-1
  - sent from VMU, OpenAMIP, C-6
- MIB, 6-58
- MIB file
  - download, 6-58
- microwave radiation, -iii
- minimum elevation angle, 6-27
- Model numbers, 2-11
- modem
  - command line interface, D-5
  - signal level, ACU display, 6-54
  - supported types, 6-30
- modem control
  - connector, 4-6
- modem option file
  - Serial, C-15
- modify XIM data, 6-50
- motion centre
  - ship, 3-8

**N**

- navigation, 6-20
- navigation in web interface, 6-21
- N-connector
  - cable sizes, A-9
- network
  - LAN setup, 6-34
- NID
  - calibration, 6-5
- NMEA
  - cable requirements, 4-4
  - connector, 4-4
  - LEN, 4-4
  - supported string, 4-5
- NMEA 0183
  - baud rate, 4-4
- none
  - heading input, 6-7, 6-12
- notifications, 8-3
- NSS6 satellite, E-1

**O**

- obstructions
  - distance and size, 3-4
- OMT
  - block diagram, 8-23
- On/Off switch
  - rack version, 4-2
- OpenAMIP
  - setup, C-4
  - supported commands, C-6
- OpenAMIP IP modem
  - IP address, 6-30
- OpenAMIP keys, C-7
- opening antenna, 3-30
- options
  - order number, 2-11
- options file, C-7
- order number
  - options, 2-11
- order numbers, 2-11
- Osaka, Japan satellite, E-2
- outline drawing
  - ACU rack version, A-8
  - ADU, A-6
- output power
  - TX, BUC, 6-24

**P**

- password
  - administrator, 6-47
  - change, 6-48
  - UCLI, D-2
- PAST, 8-10
- patents, A-5
- PCM
  - block diagram, 8-19
- peak current, 5-1
- performance
  - optimization, blockage, C-1
- permissions
  - user, 6-49
- Person Activated Self Test, 8-10
- placing the antenna, 3-3
- PMM
  - block diagram, 8-22
- polarisation skew, 6-10
- pole mount, 3-9
- POST, 8-10
- power
  - BUC, 6-17
  - sources, 5-1
- power cable
  - connect, 5-3
  - selection, 5-1
- Power On Self Test, 8-10
- power supply, 2-8
- protect access to settings, 6-49
- Proxy server, disabling, 6-22

**R**

- R&TTE approval, H-2, H-3
- radar
  - distance from antenna, 3-17
  - signal degradation, 3-19
- radiation, -iii
- radiation level, 3-6
- recover
  - software update, 8-8
- reference signal, 10 MHz, 6-30
- remove
  - service hatch, 3-30
- report
  - send by e-mail, 6-36

- reset, 6-57, 8-4
    - factory default, 6-51
    - password, 6-48
  - reset administrator password, 6-48
  - reset keys on ACU, 6-57
  - RF interference
    - recommendations, F-12
  - RF loss
    - ADU cable, maximum, 3-29
  - ROAM protocol
    - ROSS, C-18
  - roll period
    - limitations, 3-8
    - mounting height, 3-8
    - ship, 3-8
  - ROSS box, C-18
  - ROSS ROAM protocol, C-18
  - RS-232
    - connector, 4-5
  - RS-422
    - connector, 4-5
  - Rx-Tx
    - connector, 4-3, 4-4
- S**
- safety summary, -iii
  - samples
    - statistics, 6-38, 6-41
  - sampling interval, 6-38, 6-41
  - satellite
    - Apstar, E-2
    - Astra2, E-1
    - Australia, E-2
    - China, E-1
    - command line interface, D-5
    - NSS6, E-1
    - Osaka, Japan, E-2
    - SatMex6, E-1
    - SES, E-1
    - Singapore, E-2
    - Telstar 10, E-2
    - Thaicom 5, E-2
    - Thor 5 T2, E-1
  - satellite data, E-1, E-2
    - calibration, 6-5, 6-10, 6-27
  - SatMex6 satellite, E-1
  - save
    - configuration, 6-50
  - S-bus
    - block diagram, 8-27
  - self test, 2-8, 8-3
  - send e-mail
    - diagnostic report, 6-41
  - Serial
    - examples, C-16
    - setup, C-14
    - supported commands, C-15
  - server setup
    - SMTP, 6-37
  - service
    - cable calibration, 6-11
  - service hatch
    - lock, 3-30
    - remove, 3-30
  - service port
    - rack version, 4-2
  - service profile
    - calibration, 6-4
  - SES satellite, E-1
  - setup
    - diagnostic report, 6-41
    - e-mail, 6-36
    - for statistics report, 6-36
    - statistics report, 6-38
    - user permissions, 6-49
  - shadowing, 3-4
  - ship motion centre, 3-8
  - signal level
    - modem, ACU display, 6-54
  - Singapore satellite, E-2
  - single antenna
    - force out of dual mode, 6-46
  - site map, 6-18
  - SkyEdge II, C-26
  - slave
    - active, dual antenna, 6-42
  - Slave ACU
    - dual antenna, 6-43
  - smoke deposits, 3-21
  - SMTP
    - server, 6-37
  - SMTP login, 6-37
  - SNMP, 6-58
    - community string, 6-58
  - software license, -ii
  - software update, 8-4
    - recover, 8-8
    - TMA, 8-4
    - web interface, 8-7

- software version, 1-1, 6-18
  - verify, 8-8
- source impedance
  - measuring, 5-2
- specifications, A-1
  - ACU, A-4
  - ADU, A-2
  - BUC, A-12
  - cable Comtech VSAT modem, B-2
  - cable iDirect VSAT modem, B-3
  - LNB, A-10
- spreadsheet
  - statistics report, 6-40
- start-up current, 5-1
- static IP, 6-1
- static IP address, 6-35
- statistics
  - sampling frequency, 6-38, 6-41
  - send by e-mail, 6-36
- statistics report, 6-38, 6-39
  - example, 6-40
  - import into spreadsheet application, 6-40
  - setup, 6-38
- status
  - command line interface, D-7
- status messages, 8-10
- steel hulls
  - grounding, F-3
- STM Satlink 2900
  - examples, C-25
- STM Satlink 2900 VSAT modem
  - setup, C-23, C-26
- support
  - contact information, 8-2
- symbol rate
  - DVB, azimuth calibration, 6-5
- system
  - ACU reset, keys to press, 6-57
  - command line interface, D-8
- system configuration
  - copy, 6-50
- System messages, G-1

## T

- technical data, A-1
- Telnet, D-2
- Telstar 10, E-2
- terminal
  - grounding recommendations, F-2

- Thaicom 5, E-2
- Thor 5 T2 satellite, E-1
- TMA
  - add search path, 8-6
  - software update, 8-4
  - software version, 8-4
  - specific software, 8-6
- TMA program, 8-4
- TNC connector, 4-3
- tools needed, 3-2
- track
  - command line interface, D-8
- tracking mode
  - verification, 8-104
- troubleshooting
  - BUC, 8-97, 8-98
  - diagnostic report, 8-2
  - LNB, 8-99
- TT number, 2-11
- TX gain
  - fixed, 6-17
- TX output power, 6-24

## U

- update
  - calibration data, 8-88
- updating software, 8-4
- upload
  - configuration, 6-50
- user name
  - UCLI, D-2
- user permissions, 6-49
  - setup, 6-49

## V

- verification
  - tracking mode, 8-104
- VIM
  - block diagram, 8-18
- VMU connector, 4-3, 4-4

- VSAT modem
  - baud rate, 6-30
  - COMTECH 570L, C-18
  - Gilat SkyEdge II, C-26
  - iDirect iNFINITI, C-14
  - iDirect iNFINITI (OpenAMIP), C-4
  - STM Satlink 2900, C-23, C-26
  - supported types, 6-30
- VSAT modem option file
  - OpenAMIP, C-7
  - Serial, C-15
- VSAT restrictions, -v

## W

- warning messages, G-1
- warnings, 8-3
- warranty, 8-105
- web interface
  - browser settings, 6-22
  - connect, 6-1
  - LAN connector, 4-6
  - navigating, 6-21
  - software update, 8-7
- web mmi
  - LAN connector, 4-6
- Wiring, 4-1, 5-1

## X

- X-elevation bearing test, 8-104
- XIM, 8-93
- XIM data, 8-88
  - modify, 6-50

## Z

- Zeroconf, 6-36
- zone
  - command line interface, D-9
- ZRM
  - block diagram, 8-21





