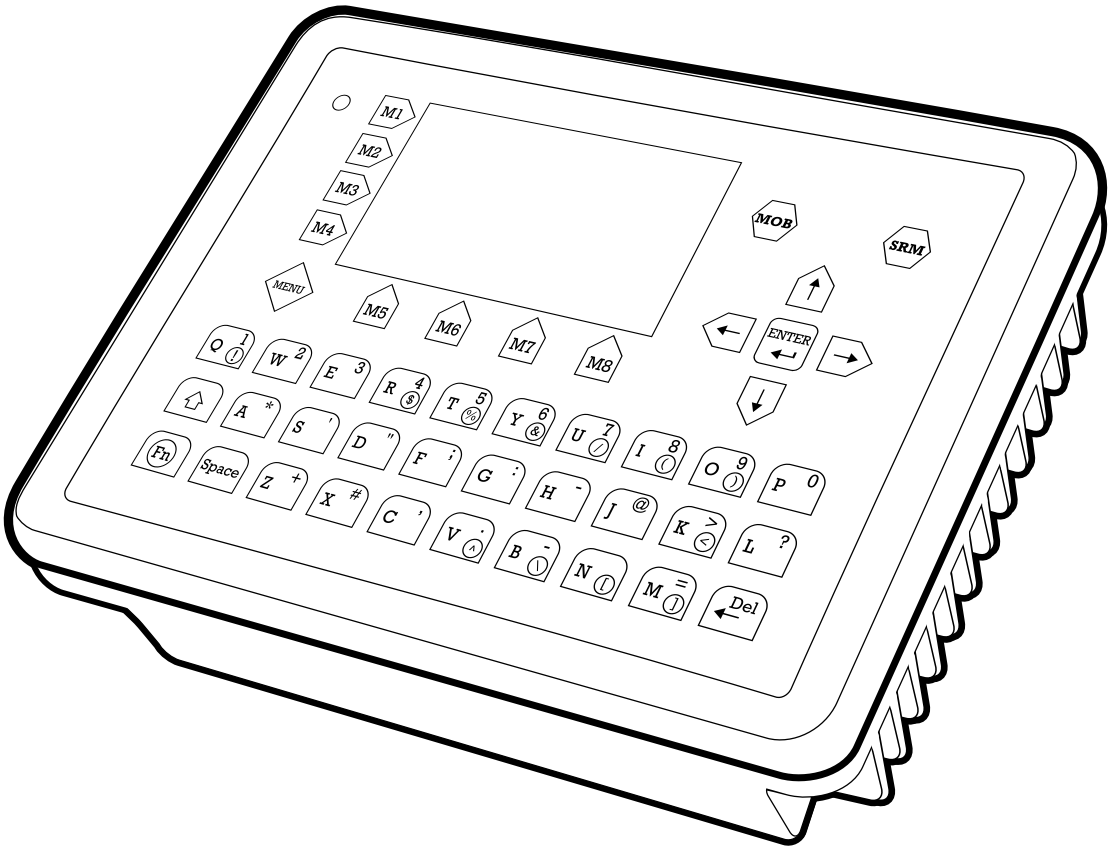
NAUTICAST

AUTOMATIC IDENTIFICATION SYSTEM

Installation Manual

P/N 2607



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History of Changes

Date	Version	Rev.	Status	Comments	Responsible
2003-04-30	1.0.2	A	Released	Dimensional drawings as Annex Wheelmark Certificate as Annex	A. Lesch
2003-06-30	1.0.3	B	Released	Amendments for: Power consummation, Troubleshooting, grounding, external fuse, battery calculation in Appendix	B. Werner
2004-06-03	1.0.4	C	Released	New Approvals, new pictures	B. Werner
2004-07-09	1.0.5	D	Draft	Sensor Configuration	A. Lesch
2004-07-14	1.0.5.	E	Draft	ROT	Gruber
2004-07-15	1.0.5.	F	Released	Sensor Configuration	Werner/Moore
2005-11-01	1.0.6	G	Released	GPS-Antenna, editorial work	A. Lesch
2006-05-24	1.0.7	H	Released	Editorial work	M.D'Arcangelo
2006-11-07	1.0.8	I & J	Released	Character Change Out	M.D'Arcangelo

1 General Introduction

IMPORTANT: **IMO REGULATIONS MANDATES** that after the physical installation has been successfully completed, all ships data and settings be entered into the AIS transponder. See Section 4 for further instructions.

1.1 Description of AIS

What does the abbreviation AIS stand for?

AIS stands for: "Automatic Identification System"

What is AIS?

According to IALA regulations, AIS is defined as follows:

Very simply, the AIS is a broadcast Transponder system, operating in the VHF maritime mobile Band. It is capable of sending ship information such as identification, position course, speed and more, to other ships and to shore. It can handle multiple reports at rapid update rates and uses Self-Organizing Time Division Multiple Access (SOTDMA) technology to meet these high broadcast rates and ensure reliable and robust ship to ship operation.

What are the performance standards of AIS?

The IMO defines the performance standards as follows:

- Ship to Ship working
- Ship to Shore working, including Long Range Application
- Automatic and continuous operation
- Provision of information messaging
- Utilization of maritime VHF channels

Which modules make up an AIS-Transponder?

The Modules:

- DGPS / GPS receiver
- VHF Radio
- Antenna
- Computer (CPU)
- Power Supply

Appropriate application software connects the individual modules.

In which modes does AIS function?

AIS are required to function flawlessly in a variety of modes. The relevant regulations require:

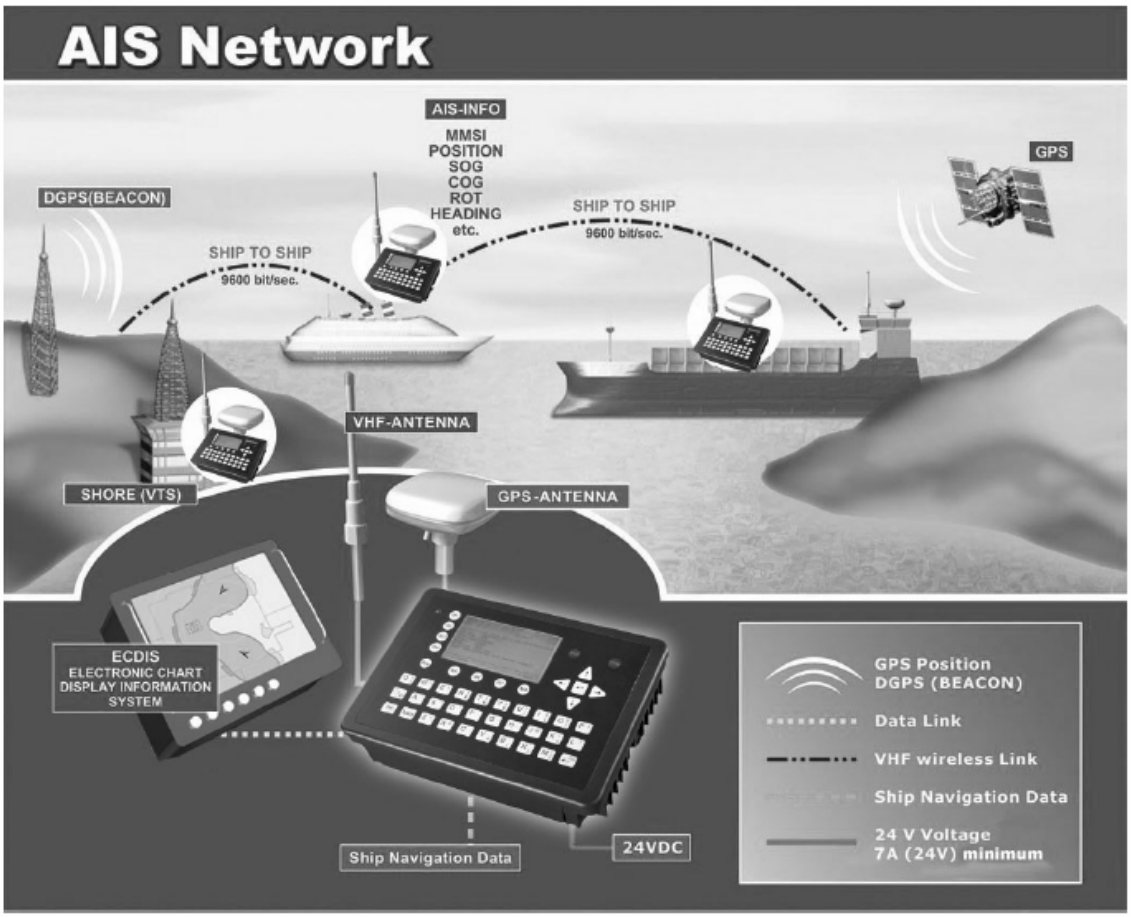
The system shall be capable of

- An "**autonomous and continuous**" mode for operation in all areas. This mode shall be capable of being switched to/from one of the following alternate modes by a competent authority;

- An "**assigned**" mode for operation in an area subject to a competent authority responsible for traffic monitoring such that the data transmission interval and/or time slots may be set remotely by that authority;
- A "**polling** or **controlled**" mode, where the data transfer occurs in response to interrogation from a ship or competent authority.

1.2 AIS in an Operational Environment

This illustration depicts a typical AIS System, where two or more AIS equipped vessels (and shore based systems) are automatically communicating with each other.



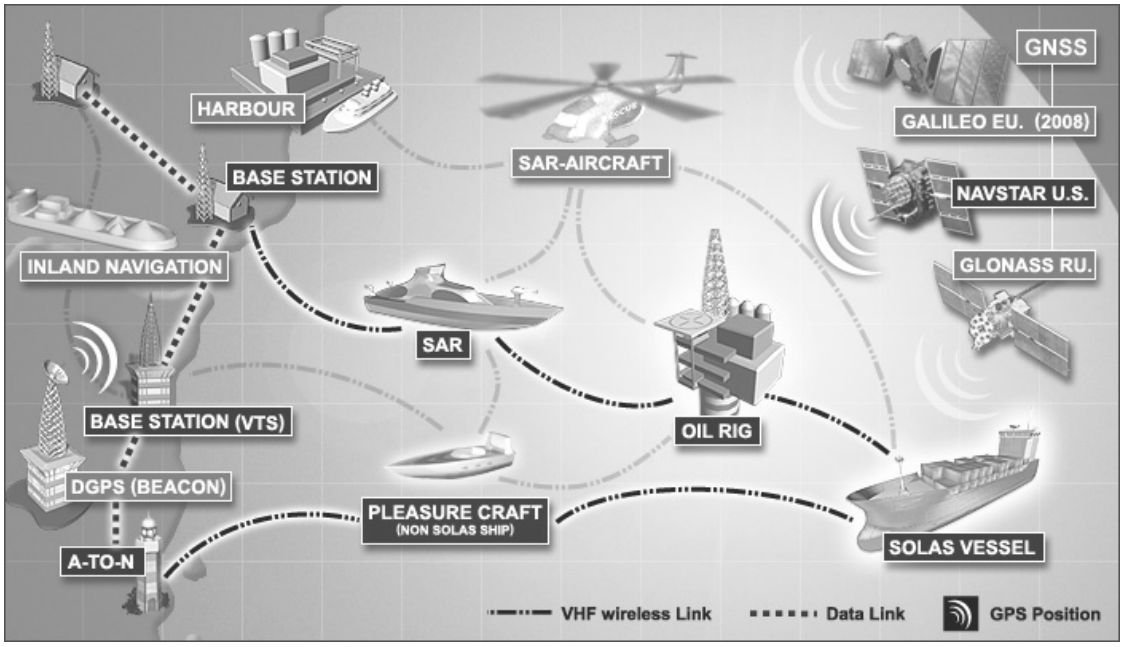
On the bottom, a typical NAUTICAST installation in a common environment is shown. The NAUTICAST is connected to the vessels emergency power supply, and in connection with the VHF, and GPS-Antennas, the minimal requirements for Transponder operation are fulfilled.

Both vessels in the above illustration are equipped with a NAUTICAST (or any other certified AIS-Transponder). Due to “Time – Synchronization” they use the same organization of free and allocated windows (Slots) in the shared VHF Data Link (this method is called “Self Organized Time Division Multiple Access”) to send and receive messages.

Without the necessity of any active interaction, both vessels know exactly who or what is cruising nearby and where the individual object is heading.

1.3 AIS Networks

The scenario below shows a full AIS coverage area (including all applications and complete shore infrastructure).



The Carriage Requirement currently applies exclusively to SOLAS Vessels, but following the current international discussions on maritime security; it is common understanding that other possible AIS users will follow very soon. Shore Based infrastructure will be among the first groups to become AIS equipped.

1.4 Carriage Requirement

1.4.1 Chapter V (Safety of Navigation) Regulation 19, of the SOLAS Convention.

IMO regulations require sea vessels from a size of 300 GT (Gross Tonnage) in international and 500 GT in national waters to be equipped with an AIS-Transponder. The implementation of this legislation began on July 1, 2002 and will be enforced in the following stages:

- July 2002 for all vessels built from this period onwards
- July 2003 for all passenger ships and all tankers which were built before July 1, 2002
- July 2004 for all ships of 50,000 GT and above which were built before July 1, 2002
- July 2005 for all ships from 10,000 GT up to under 50,000 which were built before July 1, 2002
- July 2006 for all ships from 3,000 GT up to under 10,000 which were built before July 1, 2002
- July 2007 for all ships from 300 GT up to under 3,000 which were built before July 1, 2002
- July 2008 for all other ships which do not travel in international waters and were built before July 2002

In some cases, exemptions may be granted to such ships, which will be taken off sea within 2 years of legislation coming into effect.

Refer to IMO Recommendation ITU-R M.1371-1 and IALA-AIS-Guidelines

1.4.2 Accelerated Implementation of AIS:

ANNEX
AMENDMENTS TO THE TO THE INTERNATIONAL CONVENTION FOR THE SAFETY OF LIFE AT SEA, 1974 AS AMENDED CHAPTER V - SAFETY OF NAVIGATION

Regulation 19 - Carriage requirements for ship borne navigational Systems and equipment states:

1 The existing subparagraphs .4, .5 and .6 of paragraph 2.4.2 are replaced by the following:

> “4 in the case of ships, other than passenger ships and tankers, of 300 gross tonnage and upwards, but less than 50,000 gross tonnage, not later than the first safety equipment survey' after 1 July 2004 or by 31 December 2004, whichever occurs earlier; and”

2 The following new sentence has been added at the end of the existing subparagraph 7 of paragraph 2.4;

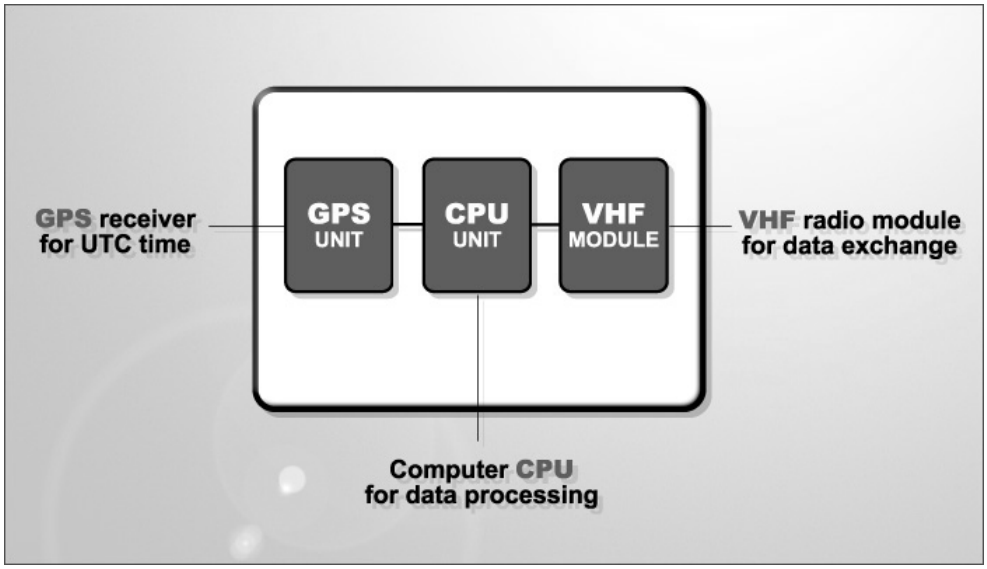
> “Ships fitted with AIS shall maintain AIS in operation at all times except where international agreements, rules or standards provide for the protection of navigational information.”

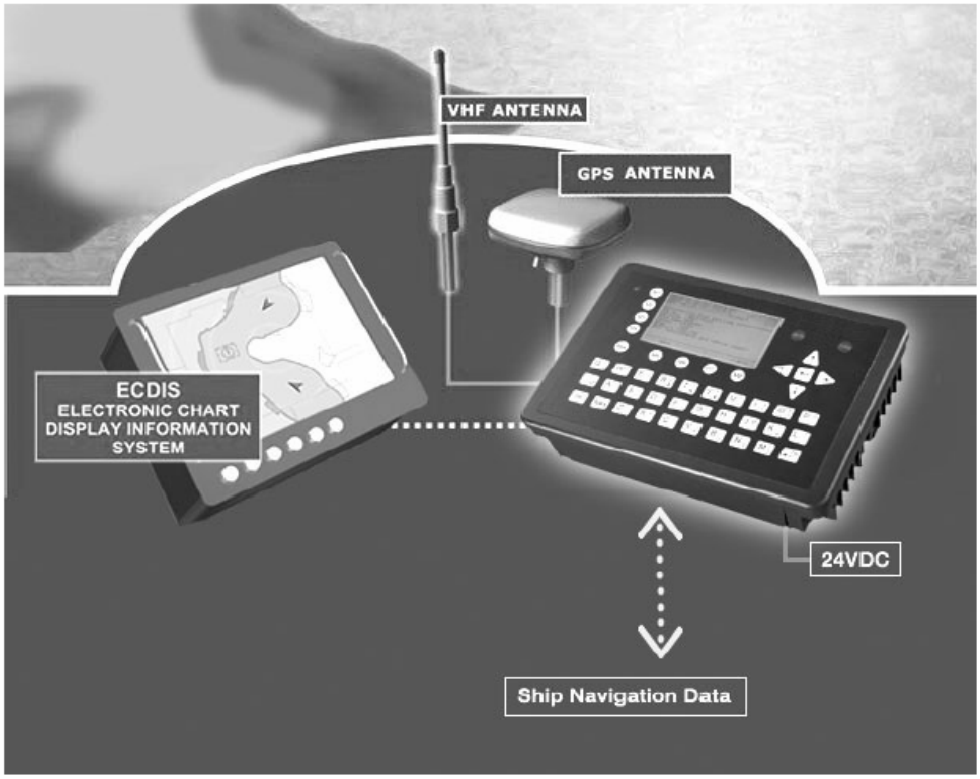
Refer to the International Convention for the Safety of Life at Sea, 1974 (SOLAS), held at IMO, 9-13 December 2002

2 NAUTICAST

2.1 System Overview

Unlike other AIS devices, the NAUTICAST combines all required functions into one cabinet. Additionally, the NAUTICAST gives the operator a number of additional features (easy mounting & installation, environmental protection and smallest dimensions).





3 Installation

3.1 Installation Requirements

General Requirements

Please note that international conventions, regulations, instructions and guidelines have to be adhered to when installing the NAUTICAST.

The following points must be observed before installation can commence:

- Permission by the local authority to install such a device must be granted.
- Trained service personnel must undertake the installation.
- The NAUTICAST must be fitted in a suitable place on the bridge.
- The VHF and GPS Antennas must be installed in a suitable position, where excellent reception conditions apply (refer to Chapter 3.11 Installation of VHF antenna)
- All available interfaces must be installed.
- The vessels power supply must suffice, and the GMDSS power supply has to be used.
- Installation of the pilot plug in conning position (close to the pilot working place).

3.2 Installation Overview

Survey

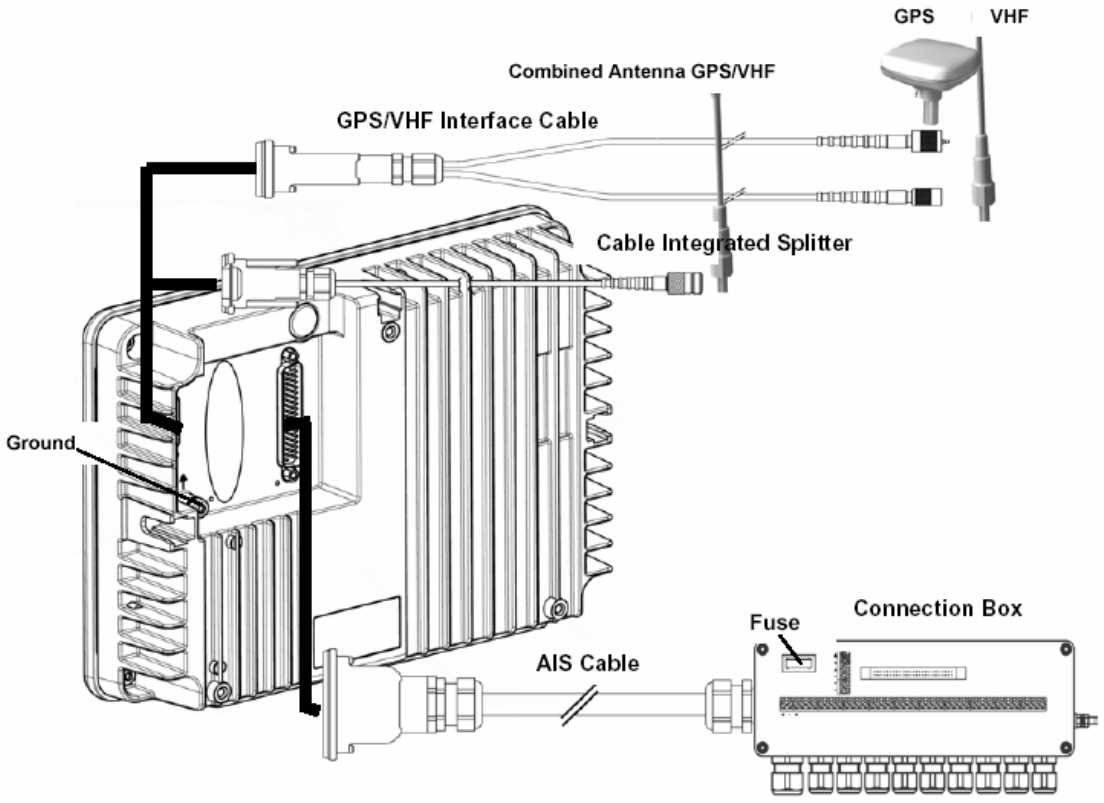
AIS is considered part of the ship's radio station and is surveyed together with radio installation. Surveys on SOLAS Convention ships should be carried out in accordance with the rules laid down in IMO Res. A 746(18) "Survey Guidelines under the harmonized system of survey and certification" (R) 8, and "Protocol of 1988 relating to the International Convention for the Safety of Life at Sea, 1974."

The NAUTICAST consists of one unit, which integrates all necessary modules.

Step-by-Step Installation Procedure:

- Mount the NAUTICAST close to ships operation workstation for traffic surveillance and maneuvering.
- Use the VHF adapter cable (P/N 2612) together with the VHF plug and TNC plug to connect the VHF and GPS antenna cables and antennas.
- The sensors, ECDIS, PC, pilot case, long range devices and auxiliary displays can be connected to the NAUTICAST cabinet by the AIS cable by means of the connection box. The device is driven by a 24V DC 7A supply, which is connected to the power terminal at the connection box. The AIS should be connected to an emergency power source. A battery capacity calculation together with GMDSS-equipment is needed! Please refer to Appendix 8.1 for examples of battery capacity calculations.
- After performing these steps, the NAUTICAST automatically starts operation.
- The NAUTICAST has a ground terminal which has to be connected to ship ground.
- Now configure the required initial system parameters according to Chapter 4 “Starting the NAUTICAST”.

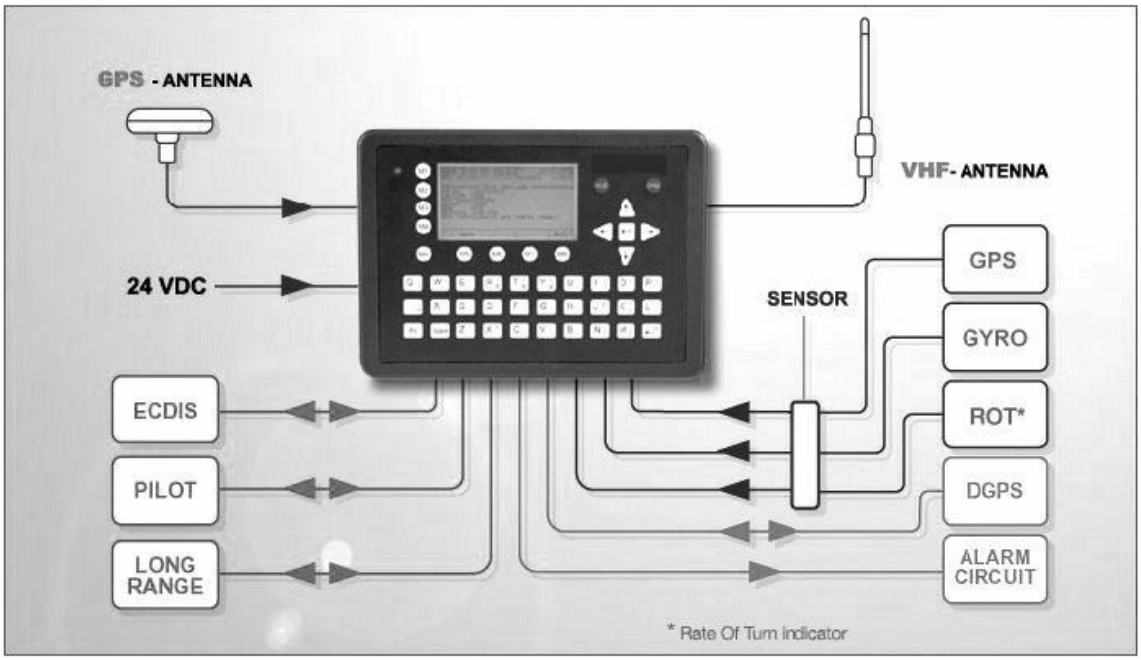
NAUTICAST Connection Diagram



Note: The ACR connection box includes a fuse of 6,3A. If it is not used, then the unit has to be protected against high current by an external slow blow fuse of 6,3A.

Components and Interfaces

The diagram below illustrates which devices can be connected to the NAUTICAST. For a detailed description of sensor connecting e.g. an existing Gyro to the NAUTICAST refer to Chapter 3.7 “Sensor Installation”.



3.3 General Interface Description

Interface	Designation	Speed	Direction
Sensor 1	CH 1	4800bps or 38400bps	Input
Sensor 2	CH 2	4800bps or 38400bps	Input
Sensor 3	CH 3	4800bps or 38400bps	Input
ECDIS	CH 4	38400bps	Input/Output
PILOT	CH 5	38400bps	Input/Output
LONG RANGE	CH 8	38400bps	Input/Output
DGPS (RTCM SC104)	CH 9	9600bps	Input/Output
ALARM CIRCUIT	CH 10	Dry relay contact (power off and alarm state closed)	

3.4 Interface NMEA Description:

3.4.1 Sensor - Interface CH1, CH2, CH3

Refer to Chapter 3.8 for detailed information on Sensor - Interface and Configuration.

3.4.2 ECDIS – Presentation Interface CH 4

Sentence Formatters		Direction	Used Fields
ABK	UAIS Addressed and binary broadcast acknowledgement	out	All fields are provided for Input and Output. For further information please refer to IEC 61993-2 / NMEA 0183 HS V3.0 for detailed field information.
ACA	AIS Channel assignment message	in / out	
ACK	Acknowledge Alarm	in	
AIR	UAIS Interrogation Request	in	
ALR	Set Alarm State	out	
ABM	UAIS Addressed binary and safety related message	in	
BBM	UAIS Broadcast Binary Message	in	
DSC	Digital Selective Calling Information	out	
DSE	Expanded Digital Selective Calling	out	
DSI	DSC Transponder Initialize	out	
DSR	DSC Transponder Response	out	
LRI	UAIS Long-Range Interrogation	out	
LRF	UAIS Long-Range Function	out	
SSD	Station Static Data	in	
TXT	Text Transmission	out	
VSD	Voyage Static Data	in	
VDM	UAIS VHF Data-link Message	out	
VDO	UAIS VHF Data-link Own-vessel report	out	

3.4.3 Pilot Port CH 5

The used sentence formatters for the pilot plug are the same as those listed for the ECDIS port.

Note:
A pilot input/output port is part of an AIS Class A installation. A plug connected to this port should be installed on the bridge near the pilot's operating position, so that a pilot can connect a Personal Pilot Unit (PPU) if required. Also, a power connector for the pilot unit should be available nearby.

The pilot plug should be configured as follows: (Refer to SUB-COMMITTEE ON SAFETY OF NAVIGATION NAV48/18 2.4.2002)

AMP/Receptacle (Square Flanged (-1) or Free-Hanging (-2)), Shell size 11, 9-pin,
Std. Sex 206486-1/2 or equivalent with the following connections:

- Tx A (out-) is connected to Pin 1
- Tx B (out+) is connected to Pin 4
- Rx A (in-) is connected to Pin 5
- Rx B (in+) is connected to Pin 6
- Shield is connected to Pin 9

3.4.4 Long Range CH 8

The AIS long range function requires a compatible long range communication system (e.g. Inmarsat-C or MF/HF radio as part of GMDSS). This connection is required in order to activate the long range function of the AIS. Its input/output port must meet the IEC 61162-2 requirements.

Sentence Formatters		Direction
LRI	UAIS Long Range Interrogation	Input
LRF	UAIS Long-Range Function	Input / Output
LR1	UAIS Long-Range Reply Sentence I	Output
LR2	UAIS Long-Range Reply Sentence 2	Output
LR3	UAIS Long-Range Reply Sentence 3	Output
	Field Information: All fields are provided for input and output. For further information please refer to IEC 61993-2 / NMEA 0183 HS V3.0 for detailed field information.	

3.4.5 DGPS – DGNSS Channel 9

Field / Protocol information:
All fields are provided with further information; please refer to ITU-R M.823-2 / RTCM SC 104 for detailed field information.

3.4.6 Alarm Circuit – BIIT Channel 10

The AIS requires that an alarm output (relay) must be connected to an audible alarm device or the ships alarm system, if available.

Alternatively, the BIIT (built-in integrity test) alarm system may use the alarm messages output on the presentation port (ECDIS Port Channel 5), provided the ECDIS alarm system is connected and AIS compatible.

3.4.7 Proprietary Sentences

The proprietary ACR NMEA sentences have the NMEA registered manufacture talker ID **"NAU".** The $PNAU sentences are an addition to the standard sentences and offer other manufactures full remote control to the Transponder. The NMEA interface developer's manual includes the full description of how to use the proprietary ACR manufacturer sentences.

List of ACR related proprietary sentences:

Proprietary NMEA-Sentences $PNAU

MID – Mobile (MMS) Id

ASD – Advanced Ship Data

RCS – Read Configuration Settings

3.5 Sensor Interface Definitions

All interface ports of the NAUTICAST comply with IEC-61162-1 / -2 and NMEA-0183 HS 3.0 specifications (aligned to RS422 parameters).

3.5.1 Talker drive circuits

The maximum output current is I_{max} = 50mA on each port. The drive circuit meets the requirements of ITU-T V.11.

3.5.2 Listener Receiver Circuits

Multiple listeners may be connected to a single talker. Optional termination resistors (120Ohm) for the input lines are provided in the connection box. The input terminals A, B and C are electrically isolated from the remaining electronics of the listening device.
The input impedance is 30kOhm between A and B lines, disregarding the connection of termination resistors. The minimum input voltage is ±0,3V.
The listener's receiver circuit complies with ITU-T V.11.

3.5.3 Electrical isolation

There are no direct electrical connections between the signal lines A and B.
The signal ground C must not be connected to the ship main ground or power line!
This isolation is in accordance with IEC 60945.

3.5.4 Maximum voltage on the bus

The maximum applied voltage between signal lines A and B and between either line and ground C is in accordance with ITU-T V.11. For protection against incorrect wiring and for unintended connection to older TALKER models, all receiver circuit devices are capable of withstanding 15 V between both lines and signal ground for an indefinite period.

3.5.5 Data transmission

Data is transmitted in serial asynchronous form in accordance with IEC 61162-1**.** The first bit is a start bit, and is followed by data bits, whereby the least significant bit is first.
The following parameters are used:

– Baud rate 38 400 (bits/s) 9600 (bits/s) 4 800 (bits/s)
– Data bits 8 (D7 = 0), parity none
– Stop bits 1.

3.6 Sensor notes

External Sensor

The AIS has interfaces (configurable as IEC 61162-1 or 61162-2) for position, bottom track (BT) speed, heading and rate of turn (ROT) sensors. In general, sensors installed in compliance with other carriage requirements of SOLAS Chapter V should be connected to the AIS System.*1. The sensor information transmitted by AIS should be the same information being used for navigation of the ship. Interfacing problems might occur if the existing on board sensors do not have serial (IEC 61162) outputs. A converter is needed to translate the non conform data to IEC 61162 – sensor data. For Example ACR Converter type P/N 2641.

*1) The fact that AIS is fitted on board a vessel does **NOT** entail the need to install additional sensors other than those stated in the carriage requirements.

External GPS

GNSS position sensors normally have IEC 61162 outputs suitable for direct AIS interfacing. However, it is important to note that:

• The Geodetic Datum of the position data is transmitted by the sensor in WGS84 so that an IEC 61162 DTM sentence is configured.

• AIS is able to process two reference points for its antenna position, one for external, and one for an internal sensor. If more than one external reference point is used, the appropriate information needs to be input to the AIS, so that the reference point information is suitably adjusted.

External Heading

A gyrocompass providing heading information is a mandatory sensor input to the AIS. A converter unit (synchro or step-signal converter to NMEA 0183 v.3.0 for example ACR Converter type P/N 2641 will be needed for AIS connection in the case that the ship's gyrocompass does not provide IEC 61162 output.

External Speed and Course

If a bottom track (BT)log for speed over ground (SOG) is available, it may be connected. A converter (for example Raytheon converter type: 133-812) is needed if the BT-log does not provide IEC 61162 outputs

External Rate of Turn

Not all ships will carry a Rate-Of-Turn (ROT) indicator according to IMO A.526. However, if a rate-of-turn indicator is available and it includes an IEC 61162 interface, it should be connected to the AIS.
If ROT information is not available from a ROT indicator, it may (optionally) be derived from heading information through:

• The gyrocompass itself,

• An external converter unit (see Heading),

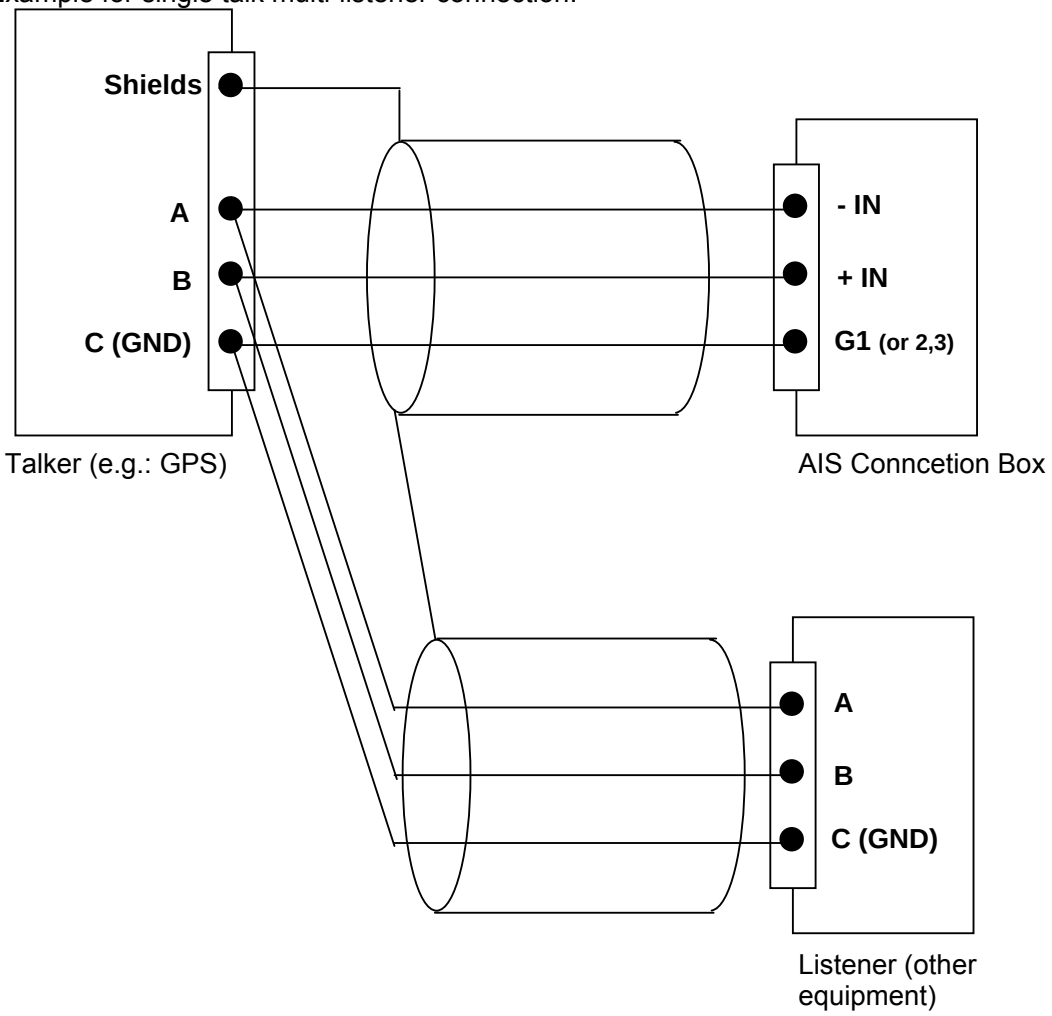
• The AIS itself (calculated ROT).

3.7 Sensor Hardware Installation:

3.7.1 Installation of an RS422 serial interface:

In most cases, the output from a GPS is already being used by existing navigation equipment. It is possible to split an RS 422 output for two devices. If the signal becomes too low, then an NMEA splitter has to be used.

Example for single talk multi-listener connection:



Each interface on the Transponder is a RS422 serial interface
The shield or ship main ground should not be connected with the signal ground (GND).

3.8 Sensor Software Configuration

3.8.1 Introduction

The AIS NAUTICAST requires a connection to various sensor devices. Sensor Configuration should enable compatibility with existing navigation devises aboard any vessel.
This chapter deals with several ways to configure the NAUTICAST and to comply with the requirements of the specific sensor interfaces.

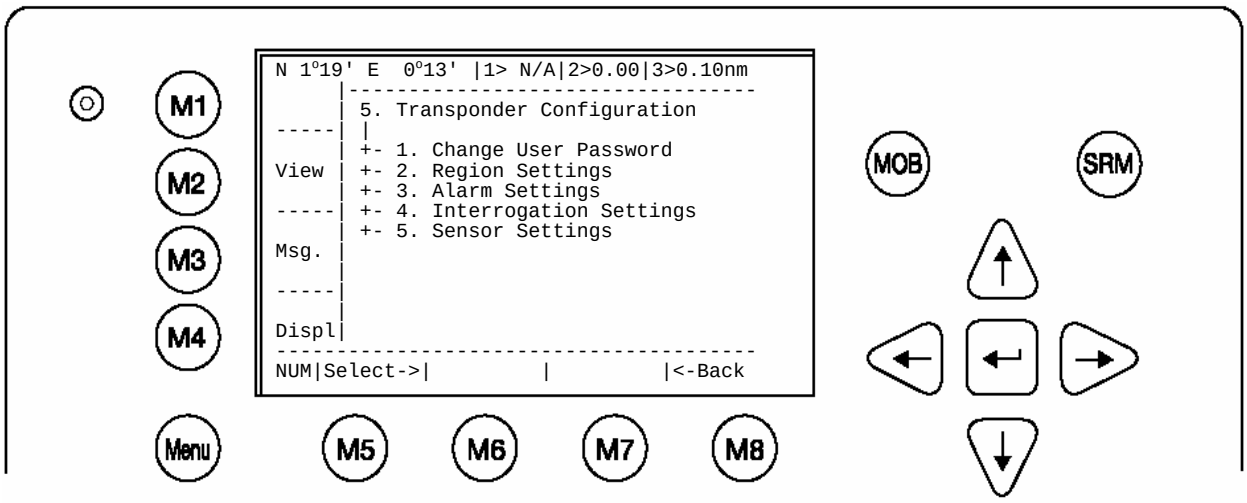
Configuration and display is visible on two screens of the Sensor Configuration Menu. The NAUTICAST offers the following configuration options:

- Set up data speed 4800/9600/38400 baud.
- Monitor the connected sensor inputs for each sensor channel.
- Verify and edit the Sensor Configuration on the display screen.
- Analyze the information received from the connected sensor devices.
- Produce an electronic installation report.
- Configuration of various NMEA protocols.

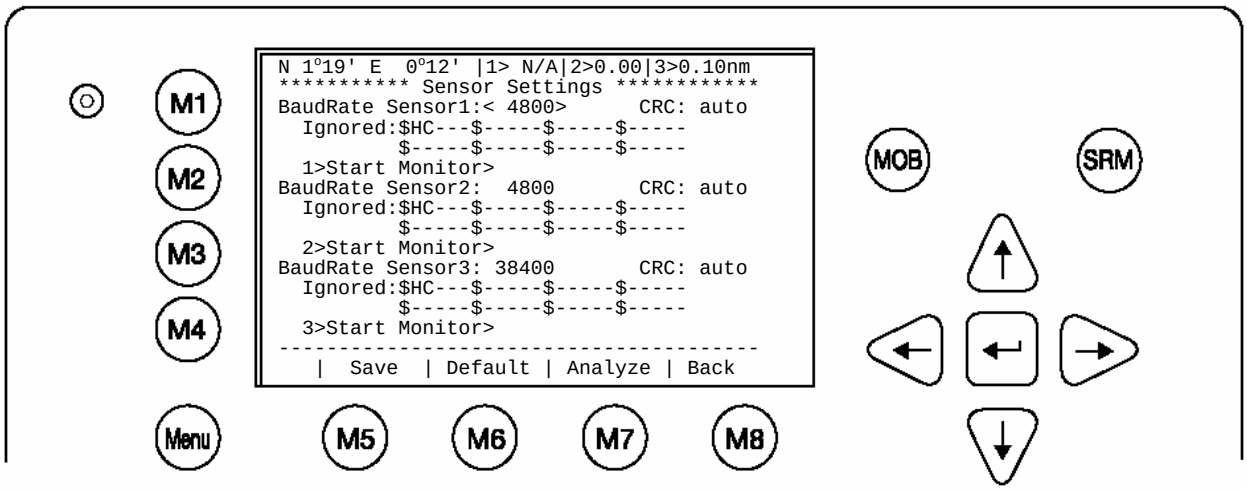
The individual options may be repeated until the required configuration for the connected sensor devices is achieved.
During the configuration process, the NAUTICAST is not operational.

3.8.2 Set up Sensor Speed, Checksum (CRC) and NMEA Talker and Sentence ID

Sensor configuration is available in the AIS software versions higher than 2.0.1.0. It is accessible via the new submenu ‘5. Sensor Settings’ in the Service Password protected menu: ‘5. Transponder Configuration’.



After accessing the Sensor Configuration menu this main configuration screen is active:



A variety of possible settings can be made on this screen. It is possible to navigate from one configuration item to another by pressing the **up** and **down** arrow keys.
Value will be changed by pressing the left and right arrow key.
The fastest way to jump from one sensor to another is by pressing numbers 1 – 3 on the keyboard. (Refer also to chapter 3.8.4 for specific information on a particular sensor)

The following changes can be undertaken for each of the sensor interfaces (by **left** and **right** arrow key):

- Changing the baud rate (4800, 9600 and 38400) to the required speed of the sensor device by pressing the right or left arrow keys.

- Enabling or disabling CRC-Checking by pressing the right or left arrow keys.
  <auto> Sentence will be accepted with or without Checksum
  <on> Checksum must be available

- Configuring NMEA sentences, which the system filters and ignores
  There are 5 entry fields where characters can be input. Two positions of each entry field are for Talker-Id, and three for Sentence-Id, which represents the NMEA-sentence which should be ignored by the system.

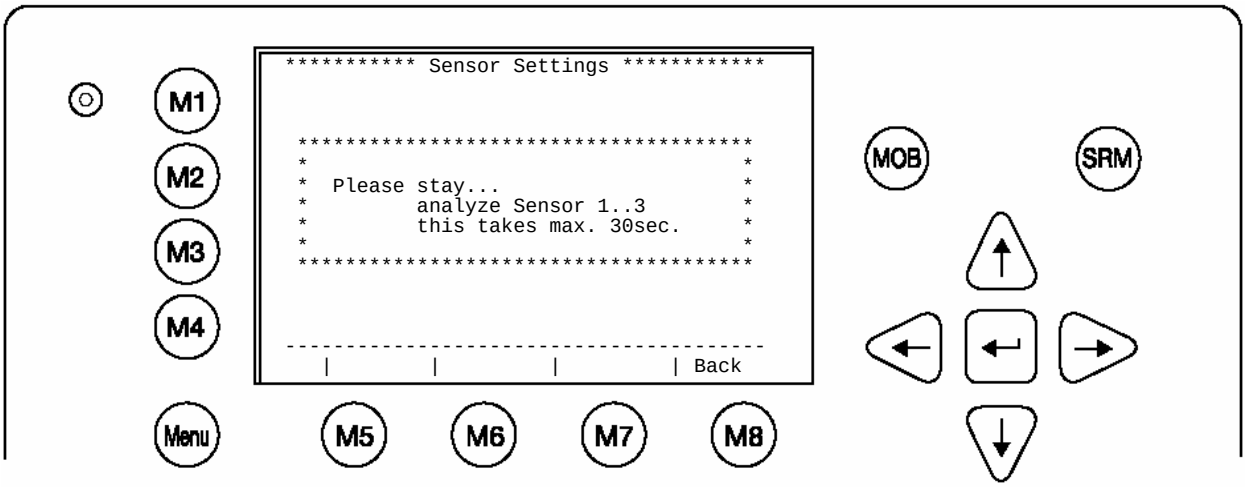
  (i.e. the default setting: "HC" means ignore all NMEA records starting with HC on this particular sensor interface)

  Note: HC stands for magnetic north and should be ignored.

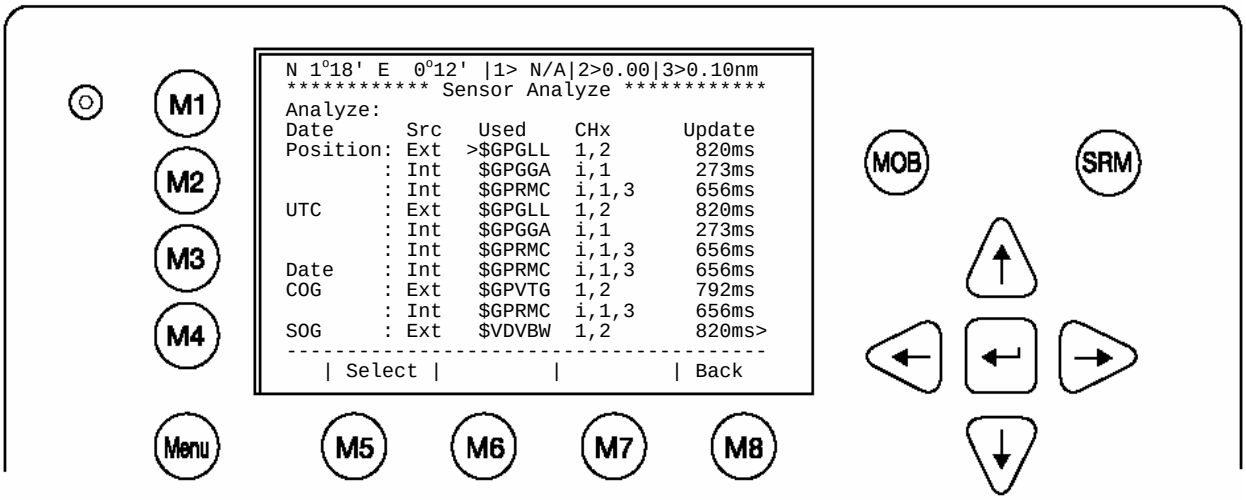
For Example:
--VTG means all VTG sentence IDs will be ignored like GPVTG, GNVTG…
VW--- means all VW Talkers ID from speed log will be ignored like VWVHW, VWVBW

Changes on this screen can be saved by pressing the "**Save**" – Button [M5].
The factory settings can be recalled be pressing the "**Default**" – Button [M6].
Returning back to the previous screen is possible by pressing the "BACK" – Button [M8].

The next step is the analysis of the current sensor interface settings, which can be undertaken with the "**Analyze**" – Button [M7]. After pressing this button, the real-time analysis of the sensor data stream begins. This process takes around 30 seconds and is visible on a temporary screen.



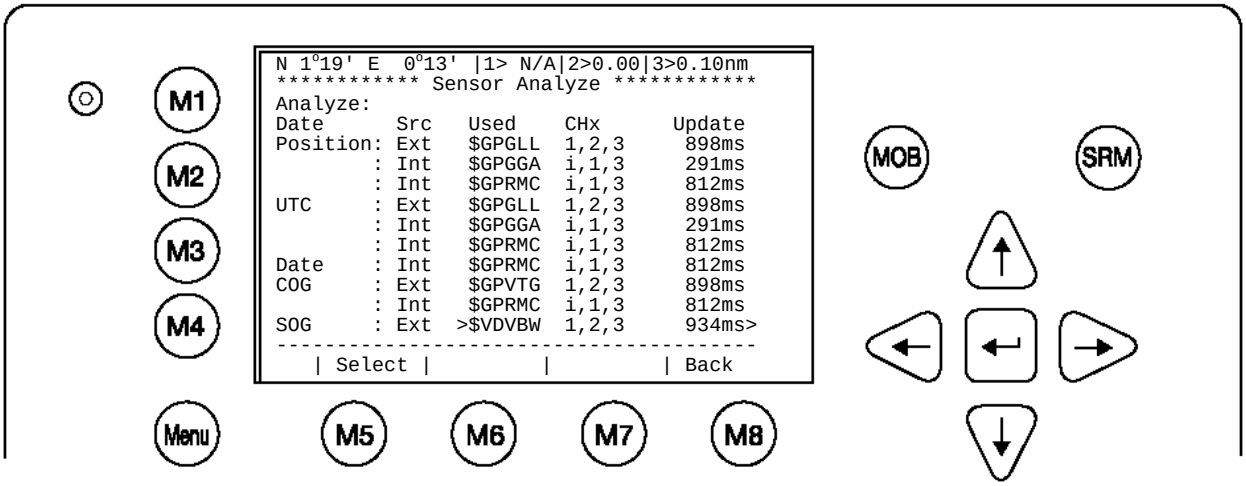
It is possible to interrupt this process by pressing the "**Back**" - Button [M8].
After the analysis is complete, the Transponder will list the data used for the AIS operation.



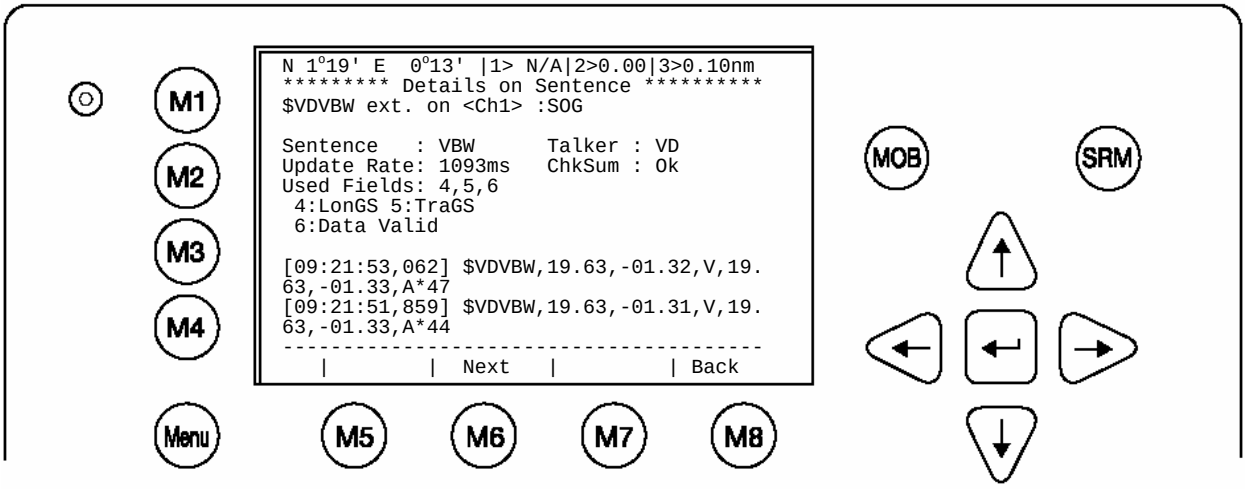
3.8.3 Real-Time Analysis of NMEA Data Streams

After these configuration procedures, an overview of the current Sensor Software Configuration has been attained.

This filtered NMEA data can be analyzed further. The data source is shown on the screen below. The source can be internal or external devices, the received NMEA sentence and the channel where this data was identified (Sensor 1, 2, 3 or calculated), as well as the measured update rate.



To view any NMEA sentence in detail, the required data line can be selected by pressing [Enter]. The detailed information on this source appears as follows:



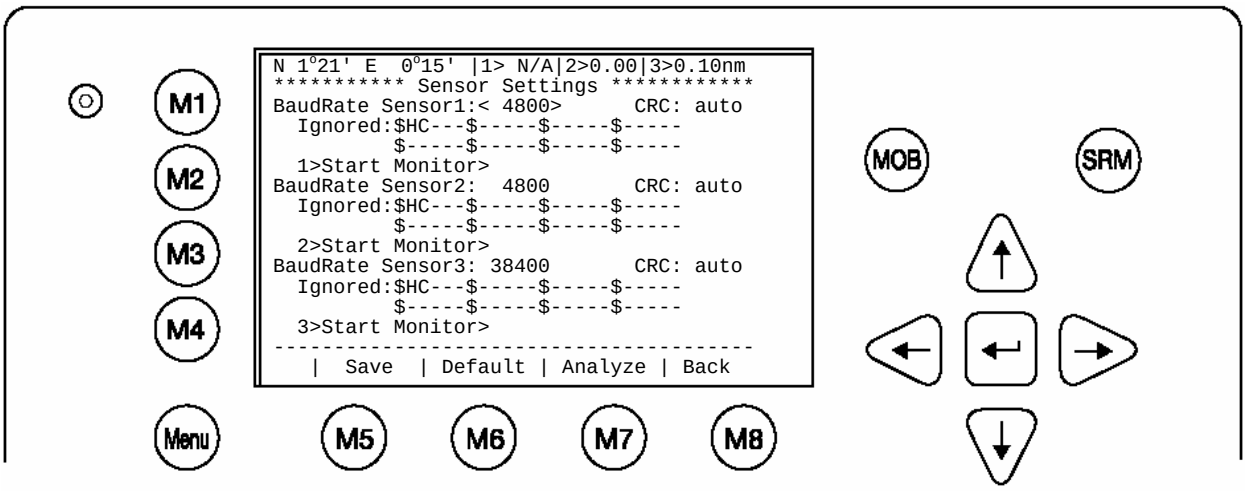
It is possible to scroll through the sources of this sensor interface channel by pressing the "**Next**" –Button [M6]. The previous menu can be accessed at any time by pressing the "**Back**" – Button [M8].

Each time the analysis process for sensor configuration is undertaken; a trace file (see below) is automatically generated and sent out to the ECDIS-Port. This output can also be used as a Sensor Configuration Report.

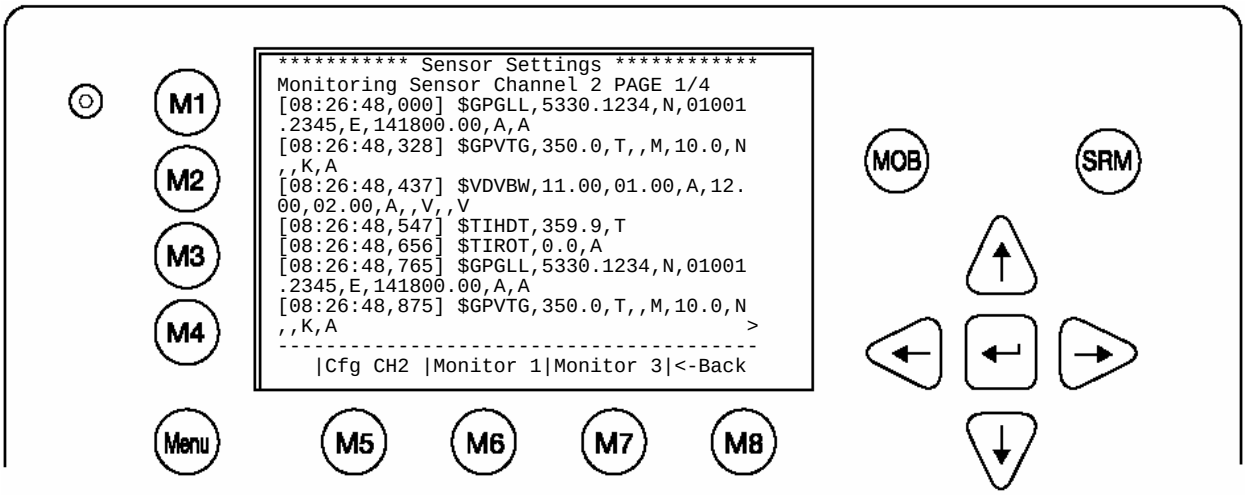
```
$PNAUSCA,4800,4800,4800,1
$PNAUSCD,------------ Sensor Settings ------------
$PNAUSCD,Date    : 06/22/2004 08:57:05
$PNAUSCD,Hardware: AIS Transponder Class A
$PNAUSCD,Software: 2.0.0.11R3
$PNAUSCD,SW Stamp: Jun 14 2004  11:46:10
$PNAUSCD,LAT     : N 53°30.123' LON : E 10° 1.234'
$PNAUSCD,Heading : ExtHDT:0°   iRot : 0°/min
$PNAUSCD,IMO No. : 303174162    MMSI: 2222222
$PNAUSCD,ShipName: U4 CS  : D11233
$PNAUSCD,ShipType: Pilot vessel
$PNAUSCD,Length  : 220m  Beam: 43m
$PNAUSCD,RefPtExt: A200 B20 C10 D33m
$PNAUSCD,RefPtInt: A190 B30 C20 D23m
$PNAUSCD,Cargo   : N/A or harmless
$PNAUSCD,Draught : 24.8m
$PNAUSCD,Dest.   : CASABLANCA
$PNAUSCD,ETA     : 10/13 12:31
$PNAUSCD,NavStat : Engaged in fishing
$PNAUSCD,EPFDType: GPS
$PNAUSCD,------------ Sensor Settings ------------
$PNAUSCD,BaudRate Sensor1: 4800     CRC:auto
$PNAUSCD,Ignored:$-----$-----$-----$-----
$PNAUSCD,       :$-----$-----$-----$-----
$PNAUSCD,BaudRate Sensor2: 4800     CRC:auto
$PNAUSCD,Ignored:$HC---$-----$-----$-----
$PNAUSCD,       :$-----$-----$-----$-----
$PNAUSCD,BaudRate Sensor3: 4800     CRC:auto
$PNAUSCD,Ignored:$HC---$-----$-----$-----
$PNAUSCD,       :$-----$-----$-----$-----
$PNAUSCD,------------ Sensor Settings ------------
$PNAUSCD,Analyze:
$PNAUSCD,Date      Src   Used    CHx      Update
$PNAUSCD,Position: Ext   $GPGLL  1          955ms
$PNAUSCD,UTC     : Int   $GPGGA  i          952ms
$PNAUSCD,Date    : Int   $GPRMC  i          951ms
$PNAUSCD,COG     : Ext   $VDVBW  1  Calc    952ms
$PNAUSCD,SOG     : Ext   $VDVBW  1  Calc    952ms
$PNAUSCD,Heading : Ext   $TIHDT  1          953ms
$PNAUSCD,ROT     : Ext   $TIROT  1          949ms
$PNAUSCD,------------ Sensor Settings ------------
$PNAUSCD,Monitoring Sensor Channel 1
$PNAUSCD,[08:56:35,000] $TIROT,0.0,A
$PNAUSCD,[08:56:35,255] $GPGLL,5330.1234,N,01001
$PNAUSCD,.2345,E,141800.00,A,A
$PNAUSCD,[08:56:35,410] $GPVTG,350.0,T,,M,10.0,N

...
...

$PNAUSCD,[08:49:50,806] $TIHDT,359.9,T
$PNAUSCD,------------ ROT     : ------------------
$PNAUSCD,$TIROT ext. on Ch1 :ROT
$PNAUSCD,
$PNAUSCD,Sentence   : ROT      Talker : TI
$PNAUSCD,Update Rate:  949ms  ChkSum : N/A
$PNAUSCD,Used Fields: 1,2
$PNAUSCD,  1:Rate Of Turn
$PNAUSCD,  2:Data Valid
$PNAUSCD,
$PNAUSCD,[08:49:52,900] $TIROT,0.0,A
$PNAUSCD,[08:49:51,950] $TIROT,0.0,A
$PNAUSCD,[08:49:51,001] $TIROT,0.0,A
$PNAUSCD,
$PNAUSCD,------------ Sensor Settings ------------
```

3.8.4 Sensor Monitoring for Problem Analysis

For specific information on a particular sensor, the NMEA input data can be monitored and is listed on the AIS display.



From the Sensor Configuration main screen one of the three sensor channels may be selected by pressing **1**, **2** or **3** or by using the cursor keys. By pressing the **right** cursor, the monitoring process is started.



Complete NMEA sentence are shown. With **Monitor** 2 [M6] or **Monitor** 3 [M7] another sensor channel can be selected.

3.8.5 Priority Handling of Sensor Sentence

This table shows the priority handling of NMEA sentences. The sentences which are treated with higher priority are listed first.

Positioning System	Source	Priority
		HIGH
Time of Position Latitude/Longitude Position accuracy	GNS GLL GGA RMC	
Rate of Turn(ROT)	ROT	
Reference Datum	DTM	
Speed over Ground	VBW VTG OSD RMC	
Heading	HDT OSD	
RAIM Indicator	GBS	
		LOW

3.8.6 Supported NMEA-0183 Sentences

DTM - Reference

```
       1   2 3   4 5   6 7   8   9
       |   | |   | |   | |   |   |
$--DTM,ccc,a,x.x,a,x.x,a,x.x,ccc*hh<CR><LF>

Field Numbers:
 1) Local datum code (W84,W72,S85,P90,999-user defined, IHO datum code)
 2) Local datum subdivision code
 3) latitude offset, minutes
 4) N or S (North or South)
 5) longitude offset, minutes
 6) E or W (East or West)
 7) altitude offset, meters
 8) Reference datum code ((W84,W72,S85,P90)
 9) CRC

Used Fields: 1,8
     1: Local datum code
     8: Reference datum code
```

GGA - Positioning System Fix Data

```
Time, Position and fix related data form GPS receiver.
                                                      11
       1         2       3 4        5 6 7  8   9  10 |  12 13  14   15
       |         |       | |        | | |  |   |   | |   | |   |    |
$--GGA,hhmmss.ss,llll.ll,a,yyyyy.yy,a,x,xx,x.x,x.x,M,x.x,M,x.x,xxxx*hh
Field Numbers:
 1) UTC
 2) Latitude
 3) N or S (North or South)
```

```
 4) Longitude
 5) E or W (East or West)
 6) GPS Quality Indicator,
    0 - fix not available,
    1 - GPS fix,
    2 - Differential GPS fix
 7) Number of satellites in view, 00 - 12
 8) Horizontal Dilution of precision
 9) Antenna Altitude above/below mean-sea-level (geoid)
10) Units of antenna altitude, meters
11) Geoidal separation, the difference between the WGS-84 earth
    ellipsoid and mean-sea-level (geoid), \-\ means mean-sea-level
    below ellipsoid
12) Units of geoidal separation, meters
13) Age of differential GPS data, time in seconds since last SC104
    type 1 or 9 update, null field when DGPS is not used
14) Differential reference station ID, 0000-1023
15) CRC



Used Fields: 1,2,3,4,5,6,7
     1:UTC   2:Lat 3:LaInd 4:Lon
     5:LoInd 6:Acc 7:Sat
```

GLL - Position - Latitude/Longitude

```
       1       2 3        4 5         6 7 8
       |       | |        | |         | | |
$--GLL,llll.ll,a,yyyyy.yy,a,hhmmss.ss,A,a*hh<CR><LF>
Field Numbers:
 1) Latitude
 2) N or S (North or South)
 3) Longitude
 4) E or W (East or West)
 5) Universal Time Coordinated (UTC)
 6) Status A - Data Valid, V - Data Invalid
 7) Mode indicator
 8) CRC

Used Fields: 1,2,3,4,5,6,7
     1:Lat   2:LaInd 3:Lon 4:LoInd
     5:UTC   6:Valid 7:Acc
```

GNS - Fix Data

```
       1         2       3 4        5 6    7  8   9   10  11  12  13
       |         |       | |        | |    |  |   |   |   |   |   |
$--GNS,hhmmss.ss,llll.ll,a,yyyyy.yy,a,c--c,xx,x.x,x.x,x.x,x.x,x.x*hh
Field Numbers:
 1) UTC
 2) Latitude
 3) N or S (North or South)
 4) Longitude
 5) E or W (East or West)
 6) Mode indicator
 7) Total number of satellites in use,00-99
 8) HDROP
 9) Antenna altitude, meters, re:mean-sea-level(geoid)
 10) Goeidal separation meters
 11) Age of differential data
 12) Differential reference station ID
 13) CRC
```

```
Used Fields: 1,2,3,4,5,6,7
     1:UTC   2:Lat 3:LaInd 4:Lon
     5:LoInd 6:Acc 7:Sat
```

RMC - Minimum Navigation Information

```
                                                                  12
       1         2 3       4 5        6 7   8   9      10  11| 13
       |         | |       | |        | |   |   |      |   | | |
$--RMC,hhmmss.ss,A,llll.ll,a,yyyyy.yy,a,x.x,x.x,ddmmyy,x.x,a,a*hh<CR><LF>
Field Numbers:
 1) UTC Time
 2) Status, V = Navigation receiver warning
 3) Latitude
 4) N or S
 5) Longitude
 6) E or W
 7) Speed over ground, knots
 8) Course over Ground, degrees true
 9) Date, ddmmyy
10) Magnetic Variation, degrees
11) E or W
12) Mode Indicator
13) CRC

Used Fields: 1,2,3,4,5,6,7,8,9,10,11,12
     1:UTC 2:Valid 3:Lat  4:LaInd  5:Lon    6:LoInd
     7:SOG 8:COG   9:Date 10:MagV 11:MagIn 12:Acc
```

VBW - Ground/Water Speed

```
       1   2   3 4   5   6 7
       |   |   | |   |   | |
$--VBW,x.x,x.x,A,x.x,x.x,A*hh<CR><LF>
Field Numbers:
 1) Longitudinal water speed, \-\ means astern
 2) Transverse water speed, \-\ means port
 3) Status, A = Data Valid
 4) Longitudinal ground speed, \-\ means astern
 5) Transverse ground speed, \-\ means port
 6) Status, A = Data Valid
 7) CRC


Used Fields: ,5,6
     4:LonGS 5:TraGS 6:Valid
```

VTG - made good and Ground speed

```
       1   2 3   4 5    6 7  8 9 10
       |   | |   | |    | |  | | |
$--VTG,x.x,T,x.x,M,x.x,N,x.x,K,A*hh<CR><LF>
Field Numbers:
 1) Track Degrees
 2) T = True
 3) Track Degrees
 4) M = Magnetic
 5) Speed Knots
 6) N = Knots
 7) Speed Kilometres per Hour
```

```
 8) K = Kilometres per Hour
 9) Status, A = Data Valid
 10)CRC


Used Fields: 1,5,6,7,8,9
     1:COG 5:SOG 6:SOGIn 7:SOG 8:SOGIn 9:Valid
```

OSD - Ship Data

```
       1   2 3   4 5   6 7   8   9 10
       |   | |   | |   | |   |   | |
$--OSD,x.x,A,x.x,a,x.x,a,x.x,x.x,a*hh<CR><LF>
Field Numbers:
 1) Heading, degrees true
 2) Status, A = Data Valid
 3) Vessel Course, degrees True
 4) Course Reference
 5) Vessel Speed
 6) Speed Reference
 7) Vessel Set, degrees True
 8) Vessel drift (speed)
 9) Speed Units
10) CRC

Used Fields: 1,2,3,4,5,6,9
     1:HDT 2:HDTVal  3:COG    4:COGRef
     5:SOG 6:SOGRef 9:SOGInd
```

HDT - True

```
       1   2 3
       |   | |
$--HDT,x.x,T*hh<CR><LF>
Field Numbers:
 1) Heading Degrees, true
 2) T = True
 3) CRC

Used Fields: 1,2
     1:HDT 2:HDTRu
```

ROT - Of Turn

```
       1   2 3
       |   | |
$--ROT,x.x,A*hh<CR><LF>
Field Numbers:
 1) Rate Of Turn, degrees per minute, \-\ means bow turns to port
 2) Status, A means data is valid
 3) CRC

Used Fields: 1,2
     1:ROT 2:Valid
```

3.8.7 Calculated Values

Processed dynamic ship data such as position, SOG etc. is generated by NMEA sentences.

Exceptions:
If "Calc" is displayed on the sensor analyze screen, this means that this sentence is used for calculating dynamic ship data.

ROT out of HDT
ROT direction left / right -/+ will be calculated out of the HDT Message, if a TIROT sentence (only “TI”-Talker devices are valid) is not connected.

```
ROT > +10°/min  ➔  Output +720°/min
ROT < -10°/min  ➔  Output -720°/min
Other           ➔  Output 0°/min
```

COG information out of VBW
COG will be generated out of VBW, if HDT is available. In this case the atan2 of the longitudinal and transversal speed plus heading is basis of the calculation.

Longitudinal/Transversal SOG from VBW
If VBW is available, SOG is also calculated without HDT.

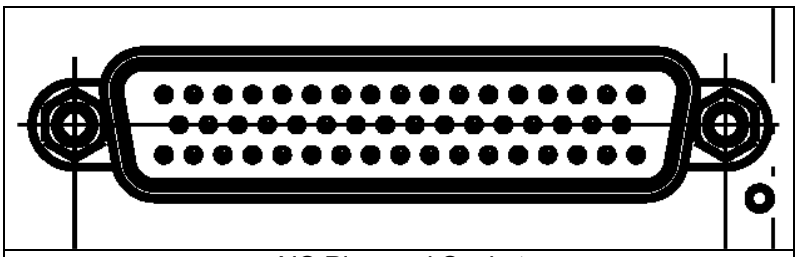
3.8.8 Versions of NMEA Sentences

```
RMC
v2.30 - $GPRMC,122500.00,A,5330.1234,N,01001.2345,E,11.2,352.2,120202,2.0,E,A
v2.20 - $GPRMC,122500.00,A,5330.1234,N,01001.2345,E,11.2,352.2,120202,2.0,E

GLL
v2.30 - $GPGLL,5330.1234,N,01001.2345,E,141800.00,A,A
v2.00 - $GPGLL,5330.1234,N,01001.2345,E,141800.00,A
v1.50 - $GPGLL,5330.1234,N,01001.2345,E

GGA
v2.00 - $GPGGA,092854,5330.1234,N,01001.2345,E,1,3,1.2,65.2,M,45.1,M,,
v1.50 - $GPGGA,092854,5330.1234,N,01001.2345,E,1,3,1.2,65.2,M,45.1,M

VBW
v2.30 - $VDVBW,11.00,01.00,A,12.00,02.00,A,,V,,V
v2.20 - $VDVBW,11.00,01.00,A,12.00,02.00,A

VTG
v2.30 - $GPVTG,350.0,T,,M,10.0,N,,K,A
v2.20 - $GPVTG,350.0,T,,M,10.0,N,,K

OSD
v2.30 - $INOSD,359.9,A,5.2,B,12.6,B,150.0,1.2,N
v2.20 - $INOSD,359.9,A,5.2,B,12.6,B,150.0
```

3.9 Pin-Description AIS-Cable / Socket 50-Pins:

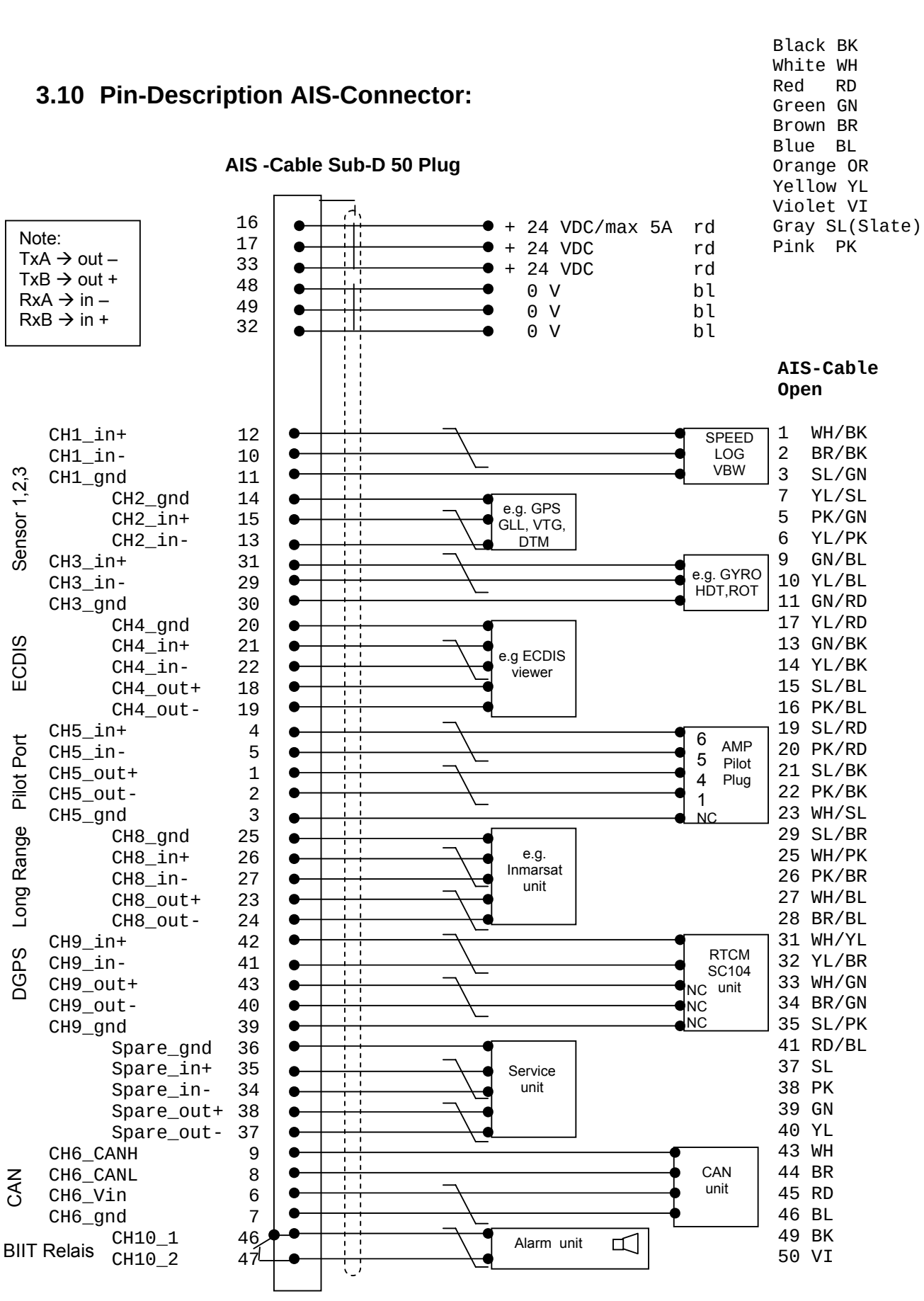
TxA → out –
TxB → out +
RxA → in –
RxB → in +

AIS Cable/Socket (Sub-D 50 Plug)					
1	CH5_out+			**34**	Spare
		18	Ch4_out+		
2	CH5_out-			**35**	Spare
		19	CH4_out-		
3	CH5_gnd			**36**	Spare
		20	CH4_gnd		
4	CH5_in+			**37**	Spare
		21	CH4_in+		
5	CH5_in-			**38**	Spare
		22	CH4_in-		
6	CH6_Vin			**39**	CH9_gnd
		23	CH8_in+		
7	CH6_gnd			**40**	CH9_out-
		24	CH8_in-		
8	CH6_CANL			**41**	CH9_in-
		25	CH8_gnd		
9	CH6_CANH			**42**	CH9_in+
		26	CH8_in+		
10	CH1_in-			**43**	CH9_out+
		27	CH8_in-		
11	CH1_gnd			**44**	Spare
		28	Spare		
12	CH1_in+			**45**	Spare
		29	CH3_in-		
13	CH2_in-			**46**	CH10_1
		30	CH3_gnd		
14	CH2_gnd			**47**	CH10_2
		31	CH3_in+		
15	CH2_in+			**48**	Vin_gnd
		32	Vin_gnd		
16	Vin+ (24V)			**49**	Vin_gnd
		33	Vin+ (24V)		
17	Vin+ (24V)			**50**	Spare
CH1	Sensor	CH4	ext. Display	CH8	Long Range
CH2	Sensor	CH5	aux. Display	CH9	DGNSS
CH3	Sensor	CH6	opt. 61162-3	CH10	BIIT / Relay (max. 30V DC / 1A)
Spare	Do not use				



AIS Plug and Socket

3.10 Pin-Description AIS-Connector:



3.11 Installation of VHF / GPS Antennas

Interference to the Ship's VHF Radiotelephone

The AIS ship borne equipment, like any other ship borne transceiver operating in the VHF maritime band, may cause interference to a ship's VHF radiotelephone. Because AIS is a digital system, this interference may occur as a periodic (e.g. every 20 seconds) soft clicking sound on the ship's radiotelephone. This affect may become more noticeable if the VHF radiotelephone antenna is located close to the AIS VHF antenna, and when the radiotelephone is operating on channels near the AIS operating channels (e.g. channels 27, 28 and 86).

Attention should be paid to the location and installation of the various antennas, in order to support the antenna characteristics in the best possible way.

3.11.1 VHF Antenna Installation

Antenna Location

Location of the mandatory AIS VHF-antenna should be carefully considered. Digital communication is more sensitive than analogue/voice communication to interference created by reflections caused by obstructions such as masts and booms. It may be necessary to relocate the VHF radiotelephone antenna to minimize interference effects.

To minimize the interference effects, the following guidelines apply:

- The AIS VHF antenna should have omni directional vertical polarization providing 3 to 5 dB gain.
- The AIS VHF antenna should be placed in an elevated position, as free standing as possible, with a minimum of 2 meters in horizontal direction from constructions made of conductive materials. The antenna should not be installed close to any large vertical obstruction. The AIS VHF antenna should have a visible sky of 360°.
- The AIS VHF antenna should be installed at least 3 meters away from interfering high-power energy sources such as radar and other transmitting radio antennas, and out of the way of the transmitting beam.
- There should not be more than one antenna on each level. The AIS VHF antenna should be mounted directly above or below the ship's primary VHF radiotelephone antenna, with no horizontal separation and a minimum of 2 meters vertical separation. If it is located on the same level as other antennas, the distance apart should measure at least 10 meters.

See also sample for antenna layout in the Appendix (Drawings and Approvals)

Cabling

The cable should be kept as short as possible to minimize attenuation of the signal. Double shielded coaxial cables equal to or better than RG214 is recommended.
RG214 at VHF attenuation per meter of app. 0,07 dB/m (45m = 3,15db)
VHF AIS frequency app. 162MHz

All outdoor connectors on the coaxial cables should be fitted with preventive isolation, such as shrink-stocking with silicone to protect the antenna cable against water penetration. Coaxial cables should be installed in separate signal cable channels/tubes, and at least 10 cm away from any power supply cables. Crossing of cables should take place at right angles (90°). Coaxial cables should not be exposed to sharp bends, which may lead to changes to the characteristic impedance of the cable. The minimum bend radius should be 5 times the cables outside diameter.

Grounding

Coaxial down-leads must be used for all receiving antennas, and the coaxial screen should be connected to the ground at one end.

3.11.2 GNSS Antenna installation

A Class A AIS must be connected to a GNSS antenna.

Location

The GNSS antenna must be installed where it has a clear view of the sky, so that it accesses the horizon freely through 360°, with a vertical observation of 5 to 90 degrees above the horizon. Small diameter obstructions, such as masts and booms, do not seriously impair signal reception, but such objects must not eclipse more than a few degrees of any given bearing.
The antenna must be located at least three meters away from, and out of the transmitting beam of high-power transmitters (S-Band Radar and/or Inmarsat systems). This includes the ship's own AIS VHF antenna, if it is designed and installed separately. See also sample for antenna layout in Installation Manual Appendix 8.2 (Drawings)
If a DGNSS system is included or connected to the AIS system, the installation of the antenna should be undertaken in accordance with IEC 61108-4, Edition 1.

Cabling

To achieve optimum performance, the gain of the antenna pre-amplifier should match the cable attenuation. The resulting installation gain (pre-amplifier gain - cable attenuation) should be within 0 to 10 dB (RG214 at GPS attenuation per meter of app. 0,35 dB/m (45m = 15,75dB); GPS frequency app. 1,2GHz).
The coaxial cable between the antenna and the AIS ship borne station connector should be routed directly, in order to reduce electromagnetic interference. The cable should not be installed close to high-power lines, such as radar or radio-transmitter lines, or near the AIS VHF antenna cable. A space of one meter or more is recommended in order to avoid degradation due to RF-coupling. Crossing of antenna cables should take place at 90 degrees, to minimize magnetic field coupling.

Attenuation

As described above, the resulting installation gain should be between 0 to 10 dB. If the internal GPS receiver will be overloaded with more than 18dB, then it could be damaged.

Attenuation values

Type	Name	Part number	Total gain
GPS-Antenna	GPS-Antenna Marina 2	2625	+35dBi
GPS-Antenna	Procom GPS4	2622	+35dBi
Comb. GPS/VHF-Antenna	Comrod AC-17	2624	+20dBi (GPS amp gain)
Cable	RG214	2630	-15,75 dB
Adapter	GPS-VHF Adapter cable with 1m RG58 / TNC connector	2612	-1dB
Connector	TNC plug RG214 crimp	2633	-0,1dB

Example

Procom GPS4	+ 35,00dBi
11m RG214 0,35 dB/m	- 3,85dB
maybe 2 TNC plugs	- 0,20dB
Nauticast with Adapter P/N 2610	-1,00dB
Total	29,95dB
Necessary minimum attenuation (=> 12dB Attenuator needed!)	≥11,95dB
GPS Input	≤18,00dB

Attention

If installations are not in compliance to this requirement we cannot guarantee operation nor accept a warranty issue.

Antenna Layout

The position of the VHF and GNSS – antennas must be added to the existing antenna layout of the vessel.

3.11.3 Power Supply

The NAUTICAST must be supplied from the emergency power source. A further requirement is to connect AIS to the reserve power source of the GMDSS. A new battery capacity calculation must then be undertaken. See sample in 8.1 (Samples for battery calculation)

Following documents are needed for the installation approval of the classification

- Antenna Layout (arrangement)
- Battery Calculation
- Connection / Block – Diagram with locations
- Type Approval Certificate

4 Starting the NAUTICAST

Setting up your AIS Transponder for operation.

ATTENTION: IMO REGULATIONS MANADATE THAT YOU ENTER THIS INFORMATION.
After installing the antennas and hardware the following User, Voyage related and Ship Settings data needs to be entered. Upon Start-up (Applying power) enter the following information.

a.) Enter MMSI Number - See paragraph 4.1 on entering information.
b.) Enter IMO Number - See paragraph 4.1 on Entering information.
c.) Voyage related Data – After initial entry of the Voyage related Data any changes in the information below should be edited accordingly.
See Paragraph 4.2 on entering information.

- Enter Cargo Type
- Enter Draught
- Enter Destination
- Enter ETA
- Enter Navigation Status.

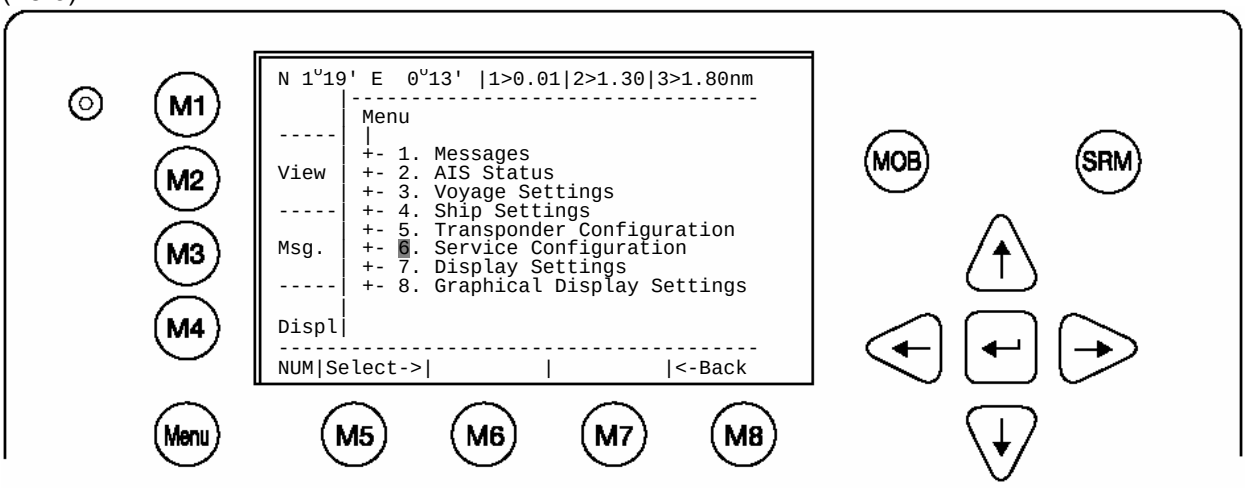
d.) Enter Ship Settings Data - After initial entry of the Ship Settings Data any changes in the information below should be edited accordingly. See Paragraph 4.3 on entering information.

- Enter Call Sign
- Enter Ships Name
- Enter Length of Ship
- Enter Beam of Ship
- Enter Internal GPS antenna Position
- Enter External GPS Antenna Position (If Applicable).
- Enter Ship Type

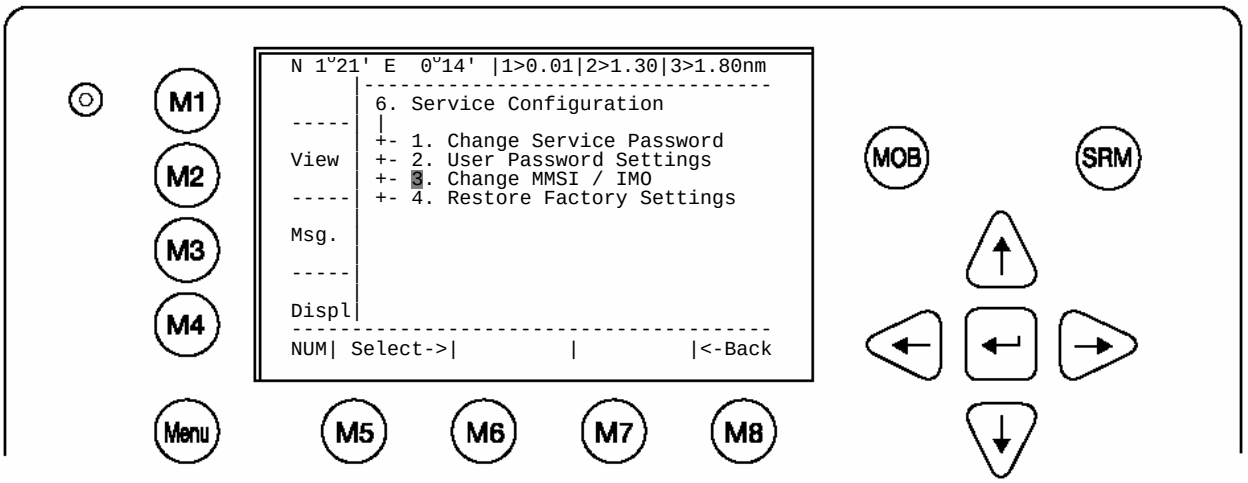
e.) Password – Service and User passwords see section 4.4

4.1 Entering the MMSI and IMO Numbers:

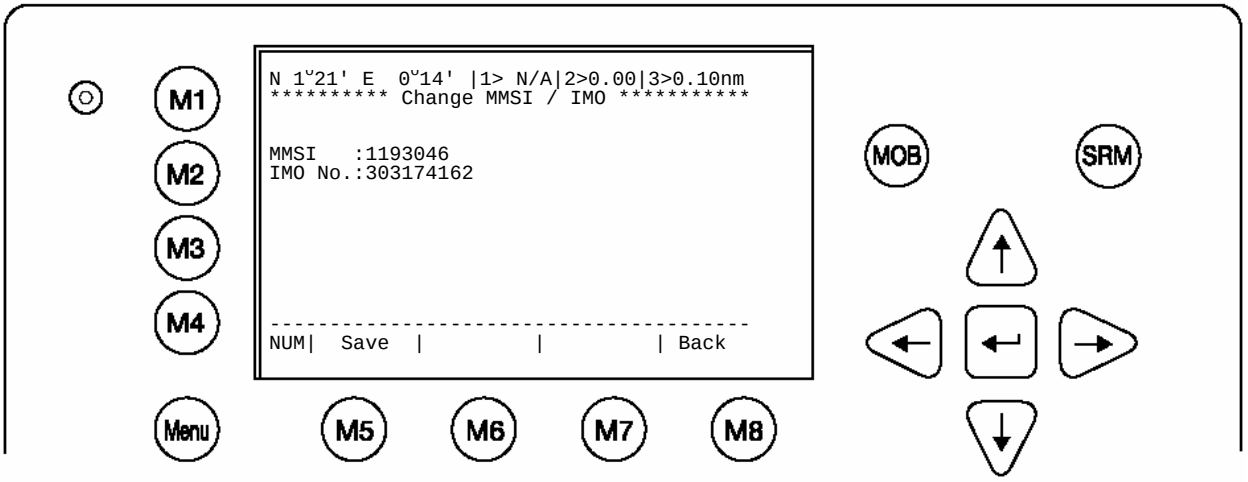
Select from the Main Menu **"Service Configuration" Number 6**. Menu is SERVICE password protected with default password "NAUT". Enter Service Password and use the up and down arrows on keypad to select "Change MMSI / IMO" than press M5 "Select" or "by pressing number 3 on the keypad.
Input your MMSI and IMO number and press Save to store data. Unit will reboot itself after pressing Save. Continue to 4.2 after reboot, if no IMO number is available use the value 0 (Zero).



Service Configuration Menu Example:



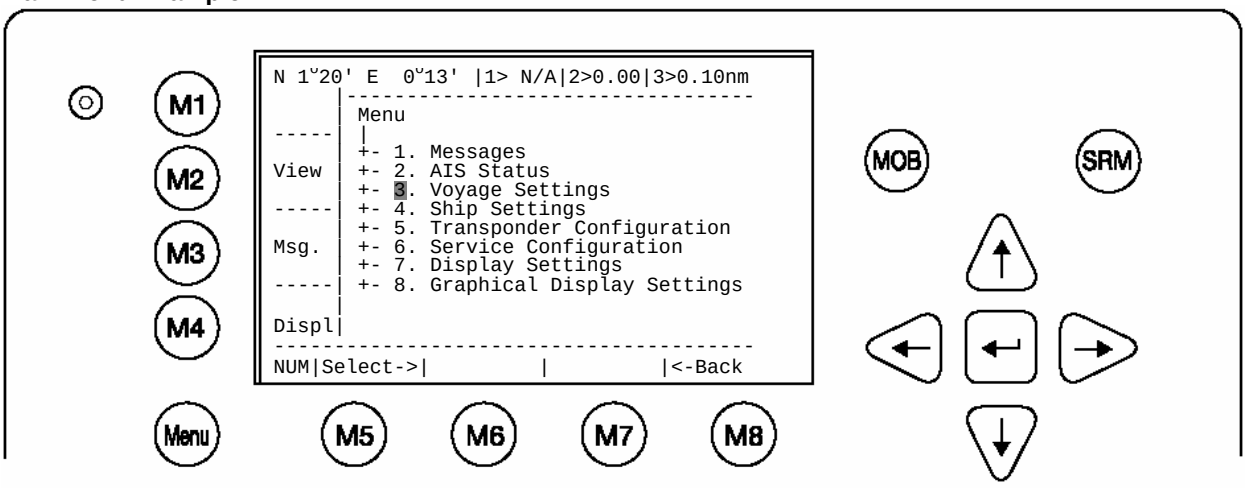
Note: MMSI and IMO Data input are limited to 9 characters.



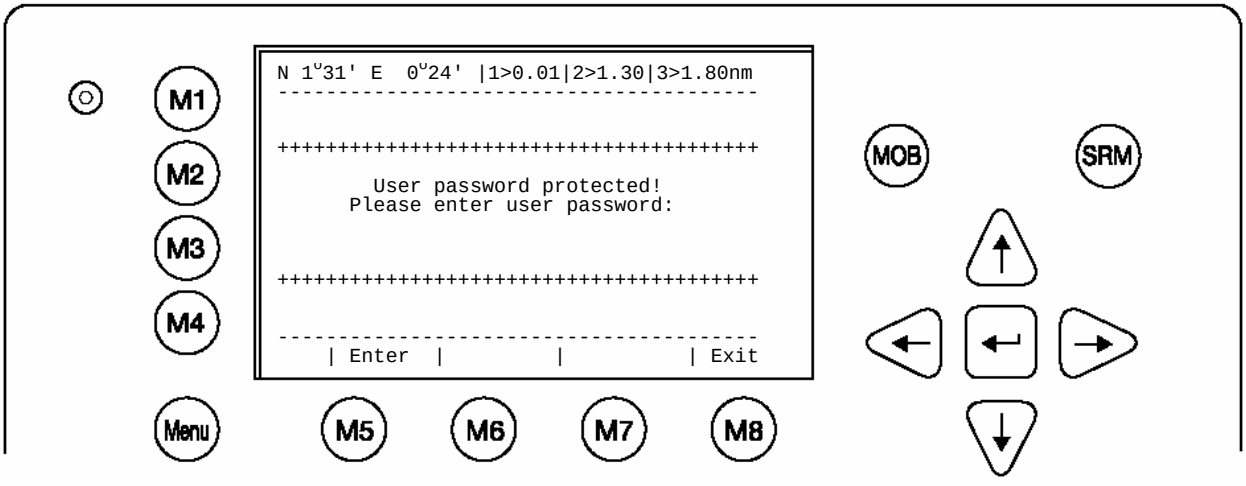
4.2 Entering Voyage Related Data:

Select from the Main Menu “Voyage Settings” Menu is USER password protected with default password “NAUT”. Enter Password and use the up and down arrows to edit Voyage Related data then press Enter or the numeric reference on the keypad to select and edit.
Save after editing.

Main Menu Example:



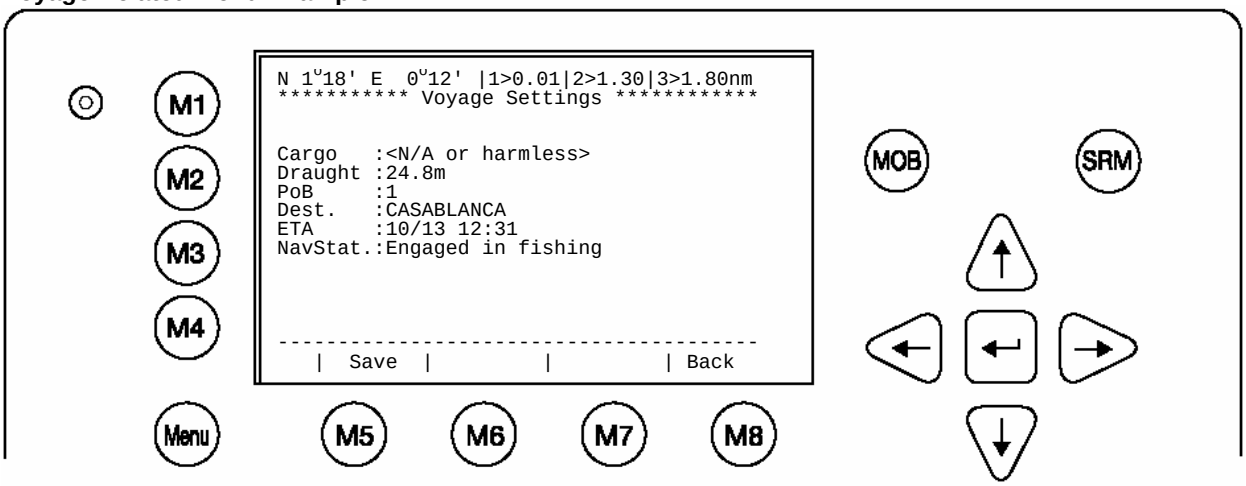
Password inquiry Example: The password query field appears. Input password and press M5 [Enter].



Scroll to the Voyage Setting Fields with M5 [Enter] or up and down arrows and input your vessel data.
Select a default Cargo Type, Draught, POB (Persons on board), Destination, ETA and Navigation Status Setting using the [Left] & [Right] arrow keys.

Save the new settings by pressing [Save], and return to the Main Menu Screen by pressing [Exit]. Press [Back] to return to the Main Menu without saving any changes.

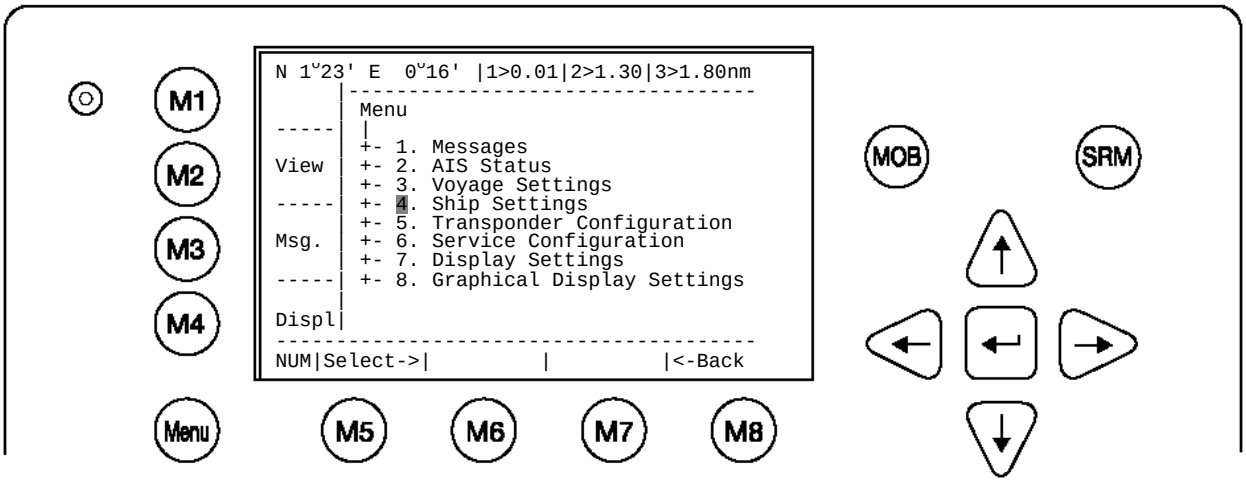
Voyage Related Menu Example:



4.3 Entering Ship Settings:

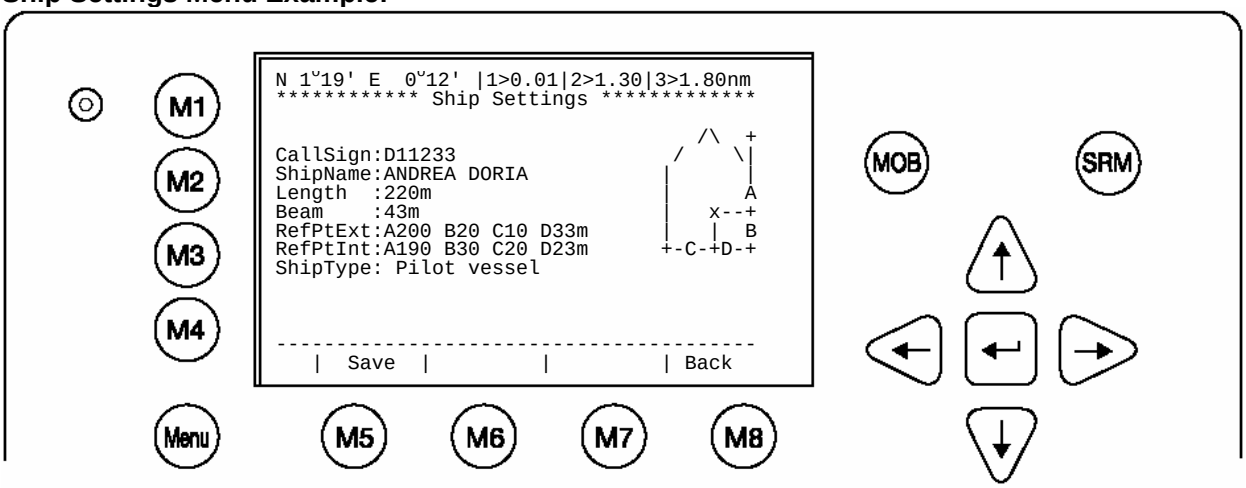
Select from the Main Menu “Ship Settings” Menu is USER password protected with default password “NAUT”. Enter Password and use the up and down arrows to edit Ship Settings then press Enter or the numeric reference on the keypad to select and edit.
Save after editing.

Main Menu Example:



Select Ship Settings and press M5 [Enter]. Enter User Password and Continue.

Ship Settings Menu Example:



Select and enter Call Sign.
Select and enter Ship Name.
Select and enter Length of Ship.
Select and enter Beam of Ship.
Select and enter Internal and External GPS antenna positions.
Select and enter a default ShipType with the [Left] & [Right] arrows.

<u>Setting the Internal and External GPS Antenna Position.</u>

Note: It is critical for the proper orientation of your ship to other AIS users to enter this data accurately.

Example: Length of ship = 220m and Beam = 43m.
GPS ANTENNA location on ship (is x in above Menu example) is located 200 meters from bow (A) and 33 Meters from Starboard side (D).
Note: You can only enter Dimension A and D. B and C are automatically calculated.

You would enter A200D33 (without spaces, no decimals and no commas).
Then Press Save.
The line than should look like the example above for External Reference point.

Note: When only using internal GPS antenna it is ok to have default values for external position since they are not used.

RefPointExt = A200 B20 C10 D33m **(Position of the external GPS antenna)**
A = the distance from bow (front) to the antenna.
B= the distance from the antenna to the stern (rear)
C = the distance from the port (left) side to the antenna
D = the distance from the antenna to the starboard (right) side

Enter RefPtInt (location of the internal GPS antenna) in the same way.

Save the new settings by pressing [Save].
Press [Back] return to the Main Menu Screen without saving any changes.

4.4 Service and User Passwords:

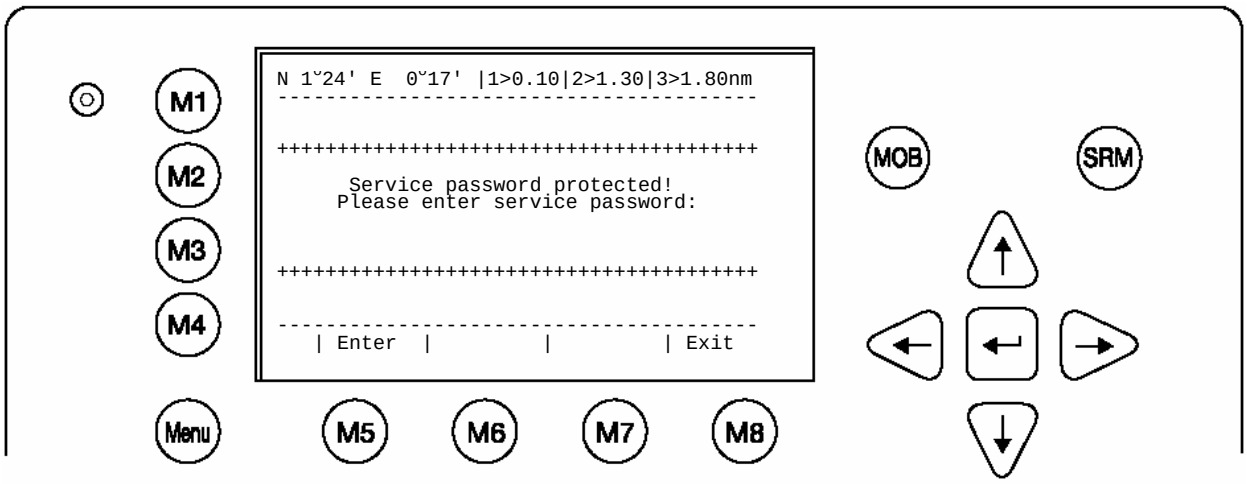
The Transponder system is equipped with two levels of Password Protection, User and Service Password.

1) The User Password, which is the lower security level, allows access to all menus except Menu 6: Service Configuration which is protected by the Service Password.

2) The Service Password is required in order to enter the Service Configuration Menu. This is a higher security level than can not be accessed with the User Password and therefore ensures that the Service Configuration is protected, and limited to authorized service personnel.
The master of the vessel has to ensure that only authorized persons are allowed to make changes to the Service Configuration and ensures that the newly reset password is stored very carefully, as it can not be reset from the default “NAUT” a second time.
WARNING: a master key is not available and the unit would have to be returned to a service center to correct for a lost Service password.
The User Password can be reset in the service configuration menu by entering the Service Configuration menu and creating a new password.

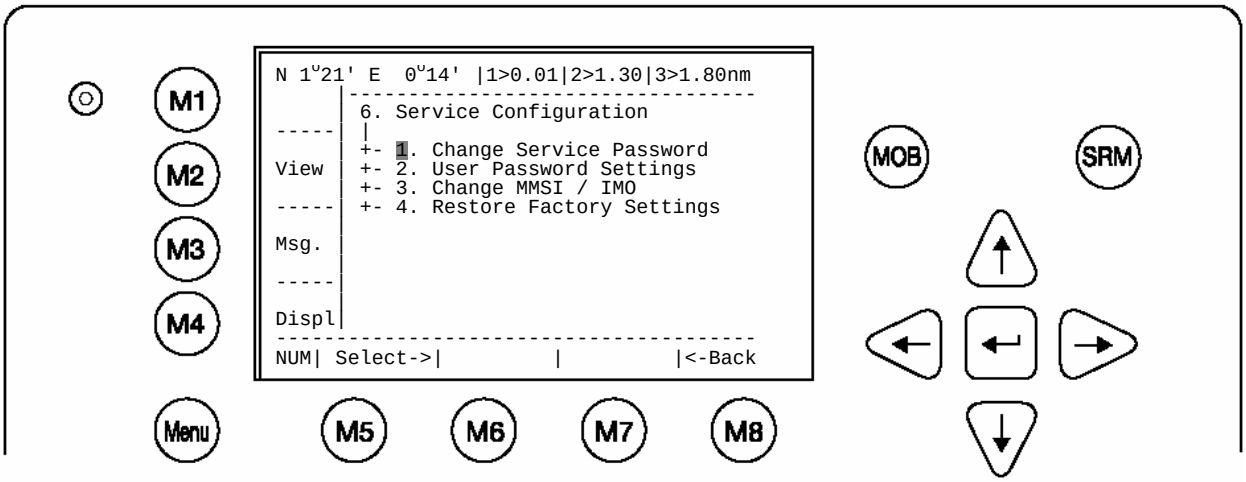
Changing the Service Password

Select “Service Configuration” from the Main Menu with the cursor button [Up] & [Down] or press Number 6 on the keyboard.
The password query field appears. Input default Service Password “NAUT” and press M5 [Enter].

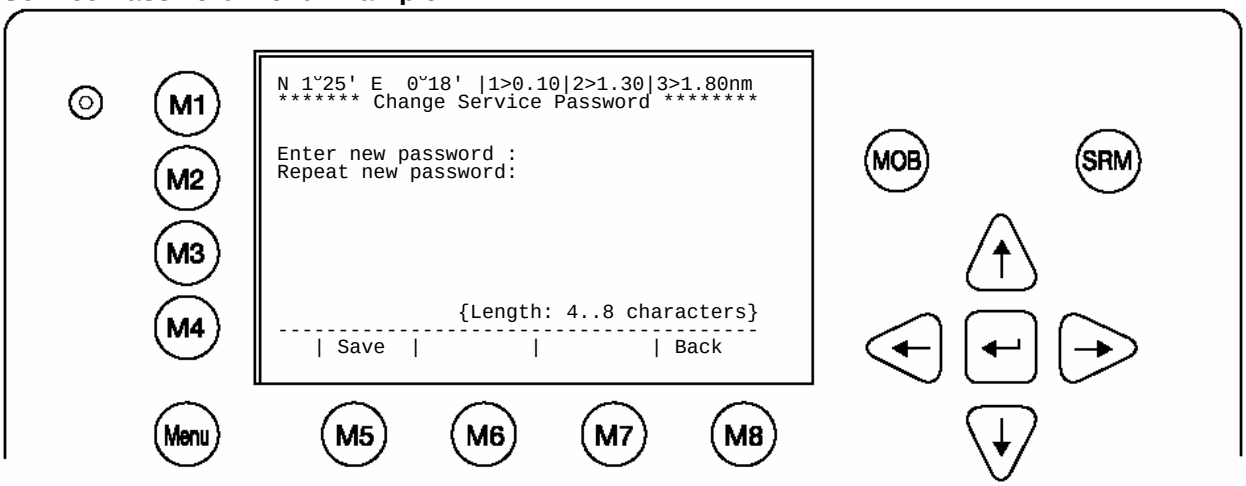


Select Submenu 1 “Change Service Password” with cursor button [Up] & [Down] by pressing Nr. 1 on the keyboard.

Service Menu Example:



Service Password Menu Example:



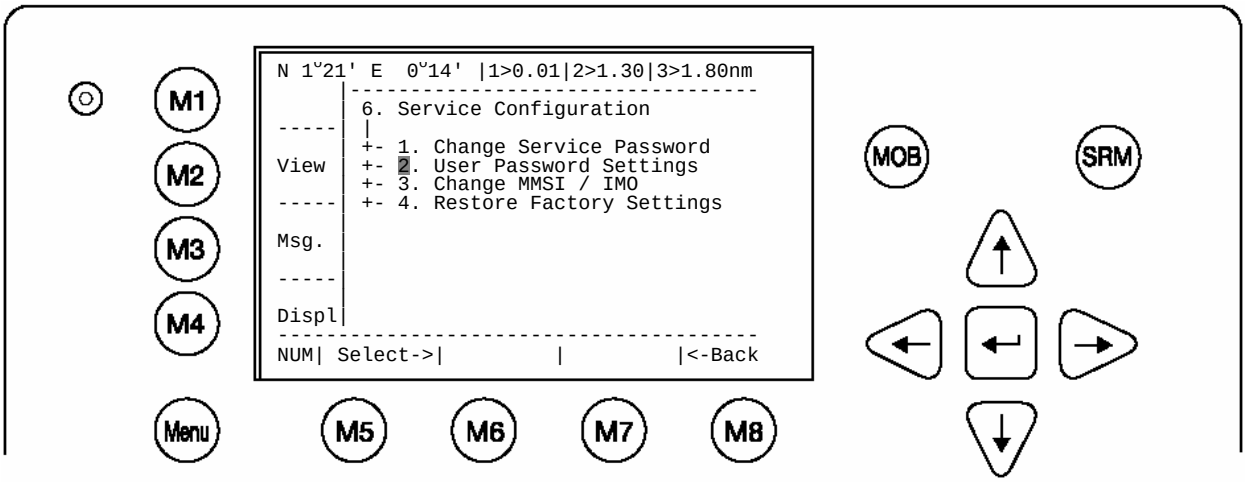
Enter the new Password: Then push Enter (M5).
Repeat the new Password: Then Push Enter (M5).

A minimum of 4, a maximum of 8 characters are allowed. Should the new password include numbers, use the shift key to generate them.

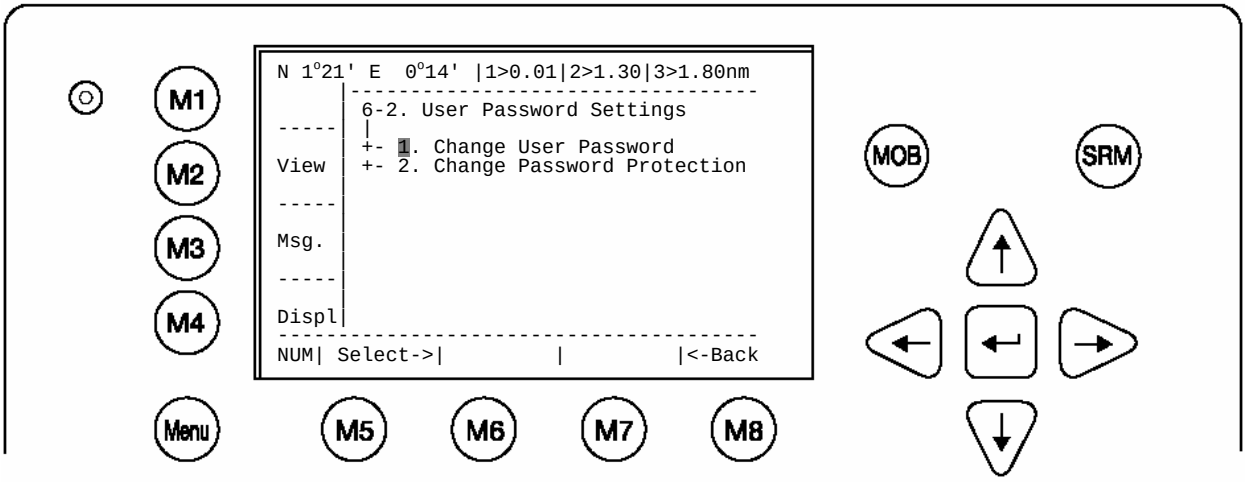
Press Save to store the change.

Changing the User Password

Select Submenu 2 “User Password Settings” with cursor button [Up] & [Down] by pressing Nr. 2 on the keyboard.

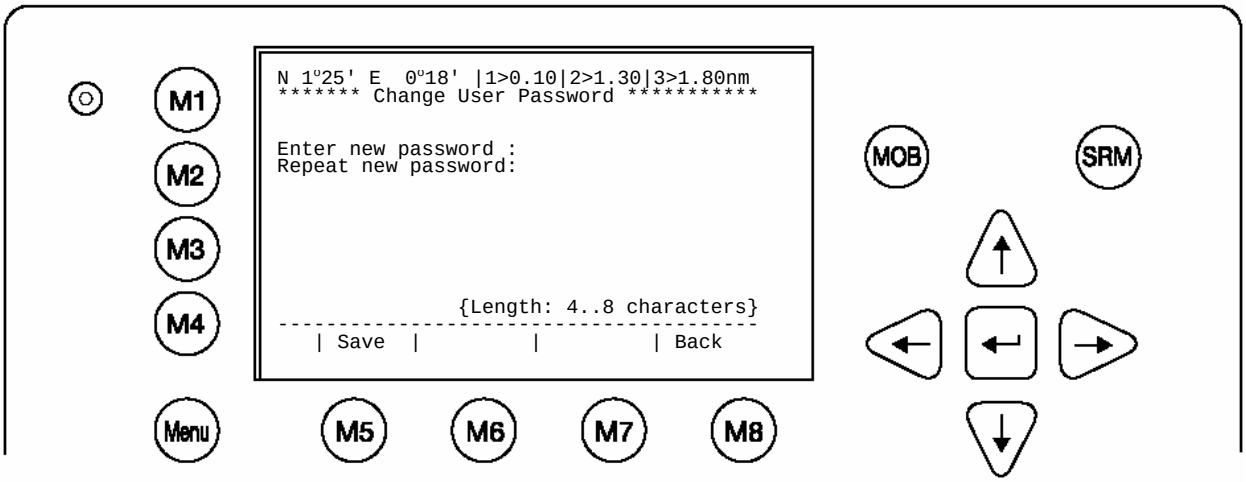


Select Submenu 1 “Change User Password” with cursor button [Up] & [Down] by pressing Nr. 1 on the keyboard.



Enter the new Password:
Repeat the new Password:

A minimum of 4, a maximum of 8 characters are allowed. Should the new password include numbers, use the shift key to generate them.



Press Save to store the changes.

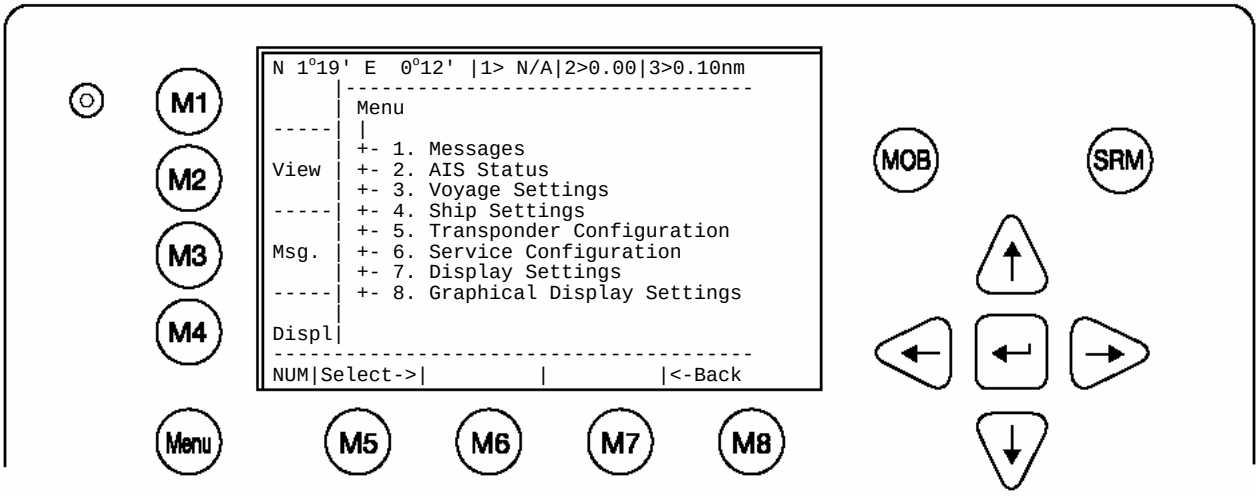
5 Troubleshooting

5.1 Reading and understanding Alarms:

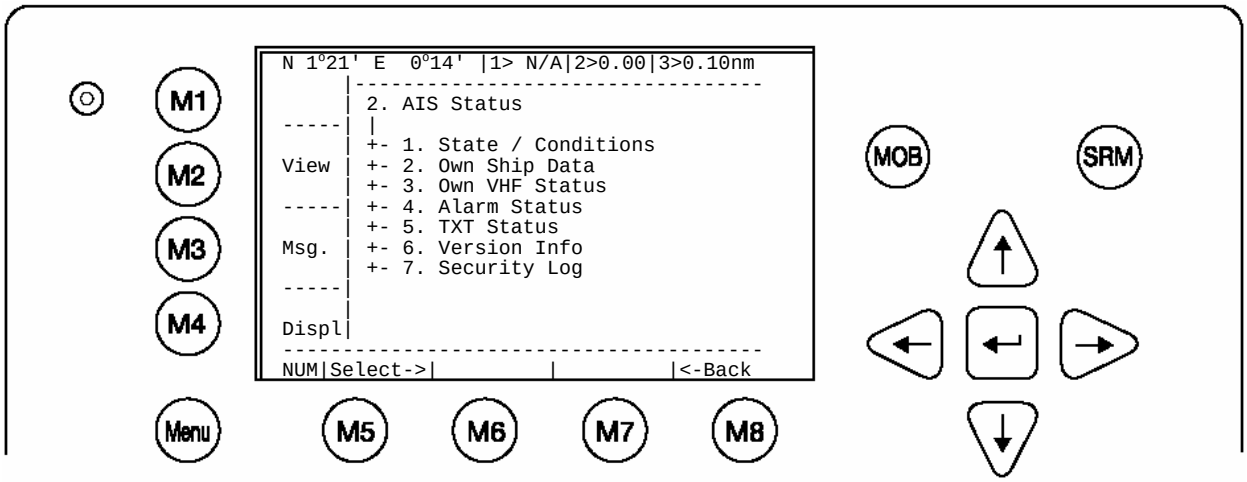
The NAUTICAST differentiates between Alarm and TXT messages. An Alarm informs the user about major system malfunctions and failings in the connected sensors.
The Alarm Status informs the user about all active Alarms. The Alarm will be disabled and deleted from the Alarm Status, as soon as the displayed problem has been rectified.

The TXT status displays additional sensor information and the UTC clock status.
See tables (Chapter 5.2 & 5.3) for Alarm and TXT Messages.

Select “AIS Status” with cursor button [Up] & [Down]
or press Nr. 2 on the keyboard.



Select “Alarm Status” or “TXT Status” with cursor button [Up] & [Down]
or press Nr. 4 or 5 on the keyboard.


N 1°21' E 0°14' |1> N/A|2>0.00|3>0.10nm
2. AIS Status
+- 1. State / Conditions
+- 2. Own Ship Data
+- 3. Own VHF Status
+- 4. Alarm Status
+- 5. TXT Status
+- 6. Version Info
+- 7. Security Log
View
Msg.
Displ
NUM|Select->|
|<-Back
M1
M2
M3
M4
Menu
M5
M6
M7
M8
MOB
SRM

5.2 Alarm Codes

ID	Description Text	Cause/Source	System Reaction / Remedy
01	AIS: Tx malfunction	VHF Antenna, cabling	Reaction: The transponder unit stops transmission. If Alarm ID 01 and ID 02 are simultaneously displayed, then a major antenna problem has arisen. Remedy: Check if the antenna is AIS compatible (156-162 MHz) and if the antenna cabling has a short circuit or is missing any contacts at the connectors. If the ID 01 is displayed as a stand alone message, then the unit requires replacing.
02	AIS: Antenna VSWR exceeds limit (VSWR - Voltage Standing Wave Ratio)	VHF antenna, installation	Reaction: The transponder unit continues transmission. Remedy: Check the antenna and the antenna cabling (RG214 / 50 Ohm cable required).
03	AIS: Rx channel 1 malfunction	Internal error	Reaction: The transponder unit stops transmission on the affected channel, Remedy; If this alarm reoccurs regularly, then the transponder unit requires replacing.
04	AIS; Rx channel 2 malfunction		
05	AIS: Rx channel 70 malfunction		
06	AIS: General failure	Internal error	Reaction: The transponder unit stops transmission. Remedy; The transponder unit requires replacing.
25	AIS; External EPFS lost (EPFS = electronic Position Fixing System such as GPS)	No valid data on Ch1, Ch2 or Ch3 is available	Reaction: The transponder unit continues operation using the position data of the internal GPS. If there is no valid position data available from the internal GPS, error 026 is additionally displayed. Remedy: Id 25 indicates that the sentences GLL, GNS, GGA, RMC cannot be received. Check the sensor and the cabling; check if the system that delivers the data is working. Check the baud rate settings of the sensor inputs. AIS requires the protocol NMEA 0183 V3.0!
26	AIS: No sensor position in use	No valid position from internal GPS or external position sensor	Reaction: The transponder unit continues operation. Remedy: Check the sensor cabling and the antenna of the internal GPS sensor.
29	AIS: No valid SOG information	No valid data from external speed sensor or internal GPS	Reaction: The transponder unit continues operation and displays SOG: N/A Remedy; The sentences VBW, VTG, RMC cannot be received. Check the sensor and the cabling; check if the system that delivers the data is working. Check the baud rate settings of the sensor inputs. AIS requires the protocol NMEA 0183 V3.0!
30	AIS: No valid COG Information	No valid data from external sensor or internal GPS	Reaction: The transponder unit continues operation and displays COG: N/A Remedy: The sentences VBW, VTG, RMC cannot be received. Check the sensor and the cabling, check if the system that delivers the data is working. Check the baud rate settings of the sensor inputs. AIS requires the protocol NMEA 0183 V3.0!
32	AIS: Heading lost/invalid	No valid data from external sensor (Gyrocompass)	Reaction: The transponder unit continues operation Remedy: The sentence for HDT cannot be received. Check the sensor and the cabling, check if the system that delivers the data is working. Check the baud rate settings of the sensor inputs. Mention AIS accepts true heading only (no magnetic).
35	AIS: No valid ROT Information	No ROT indicator is used. No valid data from external sensor	Reaction: The transponder unit continues operation Remedy: The sentence for ROT cannot be received. If a Rate Of Turn indicator is not in use, then it suffices to just acknowledge the alarm. The Alarm Status will store the information that no ROT sensor is available. Otherwise, check the sensor and the cabling. Check if the system that delivers the data is working. Check the baud rate settings of the sensor inputs. AIS requires the protocol NMEA 0183 V3.0!

53	AIS: BATTERY SOON LOW	Battery is soon out of capacity	Reaction: Own ship data is lost after powering on/off the system. Remedy: consider to contact Technical Support for additional help
55	AIS: PRESS ENTER TO EXIT 1W/AUTO TX MODE	Conditions for enabling 1 Watt TX power are not valid	Reaction: Conditions for enabling 1 Watt TX power are not valid. This means that: • the speed is >3kn and / or • the navigational status is NOT moored / at anchor and / or • the ship type is NOT “Tanker” Remedy: • Check the conditions (SOG, Navstat, Shiptype) if GPS is valid (a invalid GPS causes also this alarm)
56	AIS: ENTER MMSI NUMBER	No valid MMSI entered.	Reaction: During the initial boot or after “factory settings” the user is asked to enter a valid MMSI. As long as this is not done, the system does not transmit. Remedy: Enter a valid MMSI

Text Messages

ID	Description Text	Cause/Source	Reaction of the System / Remedy
07	AIS: UTC clock lost	Internal GPS	Reaction: the transponder unit continues operation using indirect or semaphore synchronization Remedy: Check GPS Antenna for AIS.
21	AIS: external DGNSS in use	Information	Reaction: Positioning is fully operational Remedy: no action required
22	AIS: external GNSS in use	Information	Reaction: The transponder unit continues operation using the position data from a GNSS receiver Remedy: no action required
23	AIS: internal DGNSS in use (beacon) 023	Information	Reaction: The transponder unit uses position data from the internal source. The internal GNSS receiver is capable of processing DGNSS corrections. Remedy: no action required
24	AIS: internal DGNSS in use (message 17)		
25	AIS: internal GNSS in use	Information additional to Alarm ID 25	Reaction: The transponder unit continues operation using the position data from the internal GPS. Remedy Check the sensor and the cabling; Check if the system that delivers the data is working; Check the baud rate settings of the sensor input
27	AIS: external SOG/COG in use	Information	Reaction: COG/SOG is in full operation Remedy: no action required
28	AIS: internal SOG/COG in use	Information additional to Alarm ID 29 or ID 30	Reaction: The transponder unit continues operation using the data from the internal GPS. Remedy Check the sensor and the cabling; Check if the system that delivers the data is working; Check the baud rate settings of the sensor inputs
31	AIS: Heading valid	Information	Reaction: Heading is in full operation Remedy: no action required
33	AIS: Rate of Turn Indicator in use	Information	Reaction: A Rate Of Turn indicator is connected and in full operation Remedy: no action required
34	AIS: Other ROT source in use	Information	Reaction: The transponder unit is operating with ROT data rather than with TIROT data - therefore the AIS only differs between + 127 (turning right at 720 degrees per minute or higher) and – 127 (turning left at 720 degrees per minute or higher)

6 Accessories

The following material is included with the NAUTICAST.

NAUTICAST Basic Kit	1 NAUTICAST Transponder 1 installation manual, 1 user Manual 3 caps of plug 1 cable clamp (M5 thread)
includes	1 guide plate Kit 3 angles + 3 mounting screws (screw bolt + square nut)

The NAUTICAST is supplied with some of the components listed below (contents depend on customer requirements).

Category	Description	Order Number
Mountings:	Gimbal Style Mounting Kit + 2 wing bolts + 4 screws	2650
	Mounting kit retro fit-frame + 3 screws, 3 clips, 3 nuts	2651
	19" frame + 3 mounting screws (screw bolt + square nut)	Discontinued
GPS antenna solutions:	Matsushita GPS antenna marine II	2625
	Deck Mounting for GPS Antenna Marine II (plastic) - Glomex (For P/N 2625)	2627
	Pipe Mounting for GPS-antenna Marine II metal(For P/N 2625 GPS)	2626
	Deck Mounting for GPS Antenna Marine II (metal) (For P/N 2625 GPS)	
	Procom GPS antenna GPS 4	2622
	Deck Mounting Kit Metal Horiz. Surface -ProCom (for P/N 2622 and 2623) (Thread 1/12)	2623
VHF antenna solutions:	VH-3200 VHF Stainless Steel Whip Antenna 91.4cm (36 in.) Includes Mounting Kit & Plug PL Male for RG214	2628
	Comrod VHF antenna AV 7 + mounting kit	2621
Single antenna solutions :	Comrod AC 17 - AIS (combined GPS/VHF antenna) + mounting kit + splitter and cable	2624
Cables and Interfaces	GPS / VHF extender with N and TNC connection + 1 pcs N(m)/RG214 crimp + 2 pcs TNC(m)/RG214 crimp + 1 pcs. PL(m)/RG214 crimp	2612
	AIS connection box	2640
	AIS cable open (3m) with all interfaces + pilot plug	2610
	Connector N(m)/RG214 crimp	2631
	Connector PL(m)/RG214 crimp	2632
	Connector TNC(m)/RG214 crimp	2633
	Gyro Converter 9028C	2641

7 Technical Information

PHYSICAL	
Size in mm / inch (w)	201,26mm / 7,92inch
Size in mm / inch (h)	60mm / 2,36inch
Size in mm / inch (d)	281,26mm / 11,07inch
Weight	2490g / 5,50pound
Operating Temperature	-15°C to +55°C / 5°F to 131°F
POWER SUPPLY	
Supply Voltage (galvanic isolated)	24 V DC (-10% +30%)
Input Current	min.7 A (24V)
INTERFACES	
Number of Data Ports	3 Input / 4 I-O / 1 Output
IEC 61162-1/2	(RS422 / NMEA 0183)
ITU-R M.823-2	(RS422 / RTCM SC104)
Bitrate	
CH1 Sensor Input; (i.E.: GPS)	4800 bps or 38400 bps
CH2 Sensor Input; (i.E.: GYRO)	4800 bps or 38400 bps
CH3 Sensor Input; (i.E.: HDG)	4800 bps or 38400 bps
CH4 ECDIS Port (In- / Output) AIS targets, AIS messages	in/ out 38400 bps
CH5 Pilot Port (In- / Output) AIS targets, AIS messages	in/out 38400 bps
CH8 Long Range Port (In- / Output)	in/out 38400 bps
CH9 DGPS correction (In- / Output) (RTCM SC104)	in/out 9600 bps
Alarm Circuit CH10	Dry relay contact (see BIIT – Alarm System)
BUILT IN GPS	
Receiver Architecture	12 channel differential
Tracking Capability	12 satellites sim.
Accuracy Horizontal	10m / 2drms *
Accuracy Vertical	15m / 2drms *
GPS Antenna Connector	TNC
DGPS Accuracy	< 5m / 2drms
*) depends on SA	
GPS Solutions	
Beacon interoperability	
EGNOS interoperability	
WAAS interoperability	
OMNISTAR interoperability	
LongWave interoperability	
VHF interop. (DGPS over Msg.17)	
optional internal Beacon Receiver	
Combined GPS/DGPS Antenna	
BIIT – Alarm System	
Relay breaking capacity	
30V DC	8A
250V AC	8A
OPTIONAL INTERFACES	
Number of Data Ports RS232 Bitrate Simplex / Duplex	up to 5 Up to 115000 bps Duplex
Number of Data Ports IEC 61162-3 CAN (RS485) Bitrate	1 up to 1 Mbps
KEYBOARD	
Integrated	alphanumerical

SPECIFIED STANDARDS	
IMO MSC.74(69) Annex 3	
ITU-R M.1371 (Class A)	
IALA Techn.Clar. of ITU-R M.1371-1 (Ed.1.3)	
IEC 61993-2 (2002)	
IEC 61162-1 (2000)	NMEA 0183-3
IEC 61162-2 (1998)	NMEA 0183-3
IEC 61162-3	NMEA 2000
ITU-R M.823-2	
IEC 61108-1 (1996)	
IEC 60 945 (1996)	
ITU-R M.825-3	
ITU-R M.1084-3	
VHF	
Frequency Range	156 MHz - 162MHz
Channel Spacing	12.5 or 25kHz
Number of RF Channels	3 Receiv. / 1 Transm.
Number of AIS Receivers	2
Number of DSC Receivers	1
Frequency Error	+/- 2.5ppm
VHF TRANSMITTER Output Power	2 Watt to 12.5 Watt (adjustable)
Receive to Transmit Switching Time	< 1ms
Transmit release time	< 1ms
Automatic shutdown	1 sec.
Channel switching time	< 25ms
Attack Time	< 1ms
VHF RECEIVER	
Max. Useable Sensitivity	< -110dBm
Co-channel Rejection	> -8dB (25kHz); > -12dBm (12.5kHz)
Adjacent Channel Selectivity	> 70dB (25kHz); > 60dB (12.5kHz)
Inter-modulation Rejection	> 65dB
Spurious Response Rejection	> 70dB
Blocking	> 84dB
VHF MODEM	
Bitrate GMSK	9600 bps
RF Baud Rate (DSC)	1200bps
Modulation	GMSK / FSK
SOFTWARE	
NAUTICAST Version 2.0.x - installed and ready for use - implemented configuration Software - User friendly Interface to System and AIS Information	
- additional Interface to System Configuration (Windows 2000®)	
- NAUTICAST Demonstrator for training purposes (Windows 2000 Windows XP®)	
HARDWARE	
NAUTICAST Version 1.0.x	
DISPLAY	
Integrated	graphical 240 x 128 adjustable brightness and contrast

8 Contact and Support Information

Contact your local dealer for NAUTICAST support.
Please see our ACR Website for Service Listing.

ACR Electronics Europe GmbH
Handelskai 388 / Top 632
A-1020 Vienna, Austria
Tel: **+43 (1) 5 237 237 - 0**
Fax: **+43 (1) 5 237 237 - 150**
Email: **Technical.Support@acr-europe.com**
Web: **www.acr-europe.com**

ACR Electronics
Customer Service
5757 Ravenswood Road
Fort Lauderdale, FL 33312, U.S.A.
Tel.: **+1 (954) 981-3333**
Fax: **+1 (954) 983-5087**
Email: **info@acrelectronics.com**
Web: **www.acrelectronics.com**

Appendix

8.1 Samples for battery calculation

GMDSS Reserve Battery Calculation (24 V DC)
for Raytheon Marine GmbH GMDSS Compact-Console Area A3 with 250 W MF/HF

According to IMO Regulation COMSAR/Circ.16 4. March 1998

A: with Emergency Generator (SOLAS IV 13.2)

The GMDSS equipment shall be able to operate one (1) hour on reserve power With 50% of time in transmission mode and 50% in receiving mode.

B: without Emergency Generator (SOLAS IV 13.2)

The GMDSS equipment shall be able to operate six (6) hours on reserve power with 50% of time in transmission mode and 50 % of receiving mode.

Equipment	Type	Transmitting	Receiving	Additional
MF/HF	STR 2000 R	15 A	4 A incl.DSC	
Inmarsat C	STR 1500 CN	5 A	1,8 A incl.EGC	
VHF 1 with DSC	VHF1000DSC	6,5 A	0,65 A incl.DSC	
VHF 2 with DSC	VHF1000DSC	6,5 A	0,65 A incl.DSC	
AIS	RM 808 AIS	5,0 A	1,0 A	
Emergency Light				2,5 A
Total		**38 A**	**8,1 A**	**2.5 A**

Calculation:

Case A:

1h x (0.5 I TX + I RX + I Add) x 1.4 = 41.44 Ah
recommend battery capacity is 86 Ah

Charger:

I Charg x 0.1 I Batt/h = 8.6 A
recommend charger is type 20 A

Case B:

6h x (0.5 I TX + I RX + I Add) x 1.4 = 248.66 Ah

The battery calculation should not be used for uninterruptible power supply (UPS) configuration

GMDSS Reserve Battery Calculation (24 V DC)
for Raytheon Marine GmbH GMDSS Compact-Console Area A3 with 400 W MF/HF

According to IMO Regulation COMSAR/Circ.16 4. March 1998

A: with Emergency Generator (SOLAS IV 13.2)

The GMDSS equipment shall be able to operate one (1) hour on reserve power With 50% of time in transmission mode and 50% in receiving mode.

B: without Emergency Generator (SOLAS IV 13.2)

The GMDSS equipment shall be able to operate six (6) hours on reserve power with 50% of time in transmission mode and 50 % of receiving mode.

Equipment	Type	Transmitting	Receiving	Additional
MF/HF	STR 2000	18.75 A	4 A incl.DSC	
Inmarsat C	STR 1500 CN	5 A	1,8 A incl.EGC	
VHF 1 with DSC	VHF1000DSC	6.5 A	0,65 A incl.DSC	
VHF 2 with DSC	VHF1000DSC	6.5 A	0,65 A incl.DSC	
AIS	RM 808 AIS	5.0 A	1,0A	
Emergency Light				2,5 A
Total		**41.75 A**	**8,1 A**	**2.5 A**

Calculation:

Case A:

1h x (0.5 I TX + I RX + I Add) x 1.4 = 44.06 Ah
recommend battery capacity is 86 Ah

Charger:

I Charg x 0.1 I Batt/h = 8.6 A
recommend charger is type 20 A

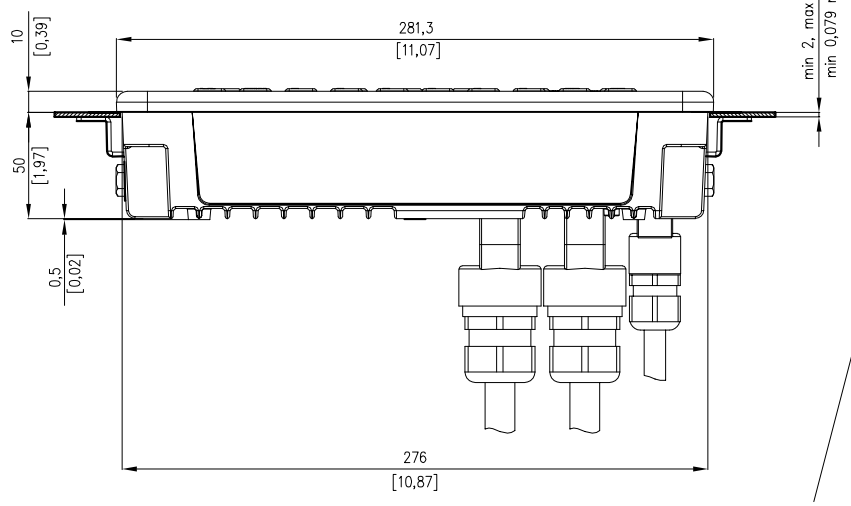
Case B:

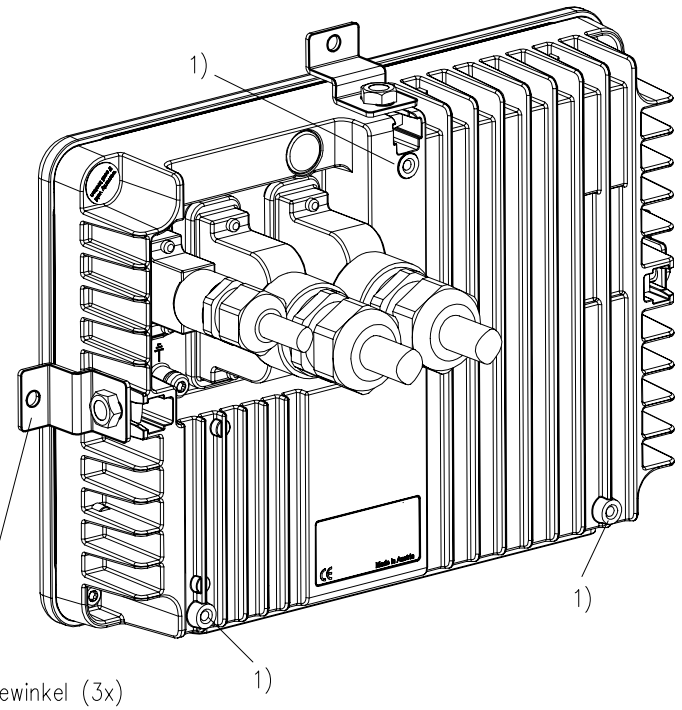
6h x (0.5 I TX + I RX + I Add) x 1.4 = 264.39 Ah

The battery calculation should not be used for uninterruptible power supply (UPS) configuration

8.2 Drawings and Approvals

Pultmontage
console mounting

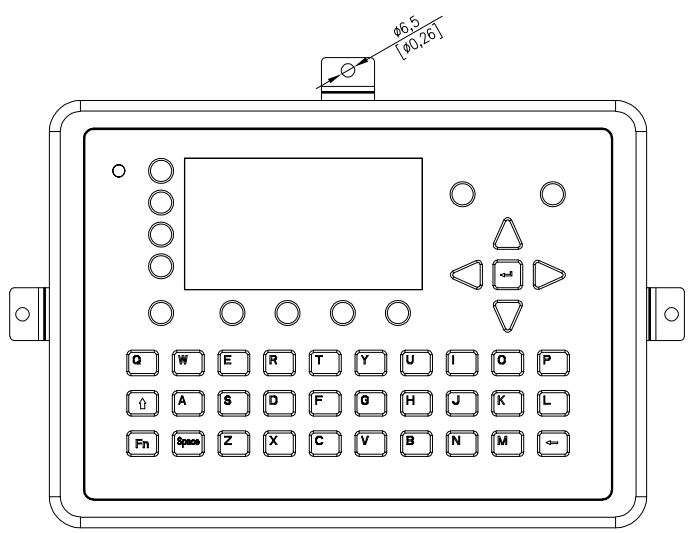


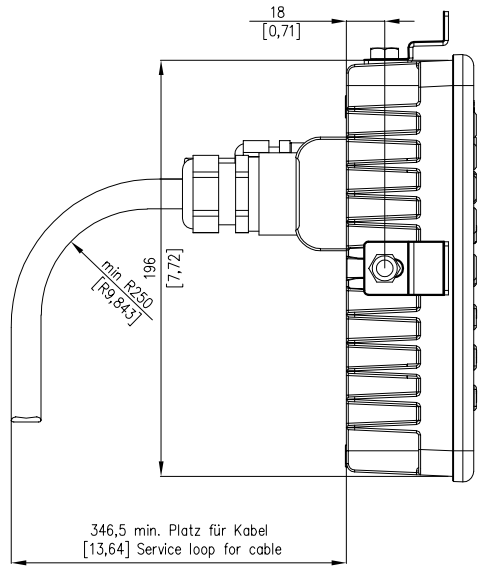


Montagewinkel (3x)
mounting brackets (3x)

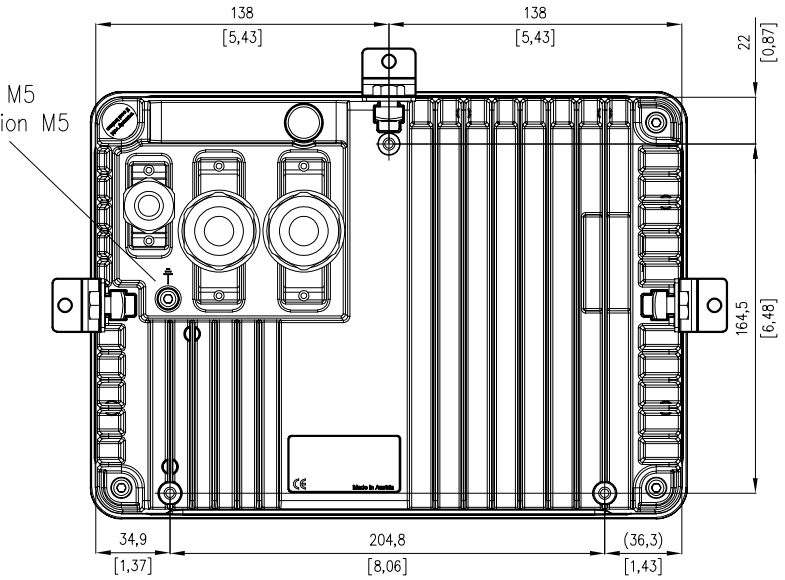
Technische Daten / Specification :

Spannungsversorgung / power supply: 24V DC
Strom / current: 5A
Betriebstemperaturbereich / operation temperature: −15°C to +55°C
Schutzart / type of enclosure: IP65 n. EN60529
magnetischer Schutzabstand / magnetic savety distance: 0,3m
Gewicht / weight: 2400g (ohne Kabel / without cable)
Farbe / color: RAL7021

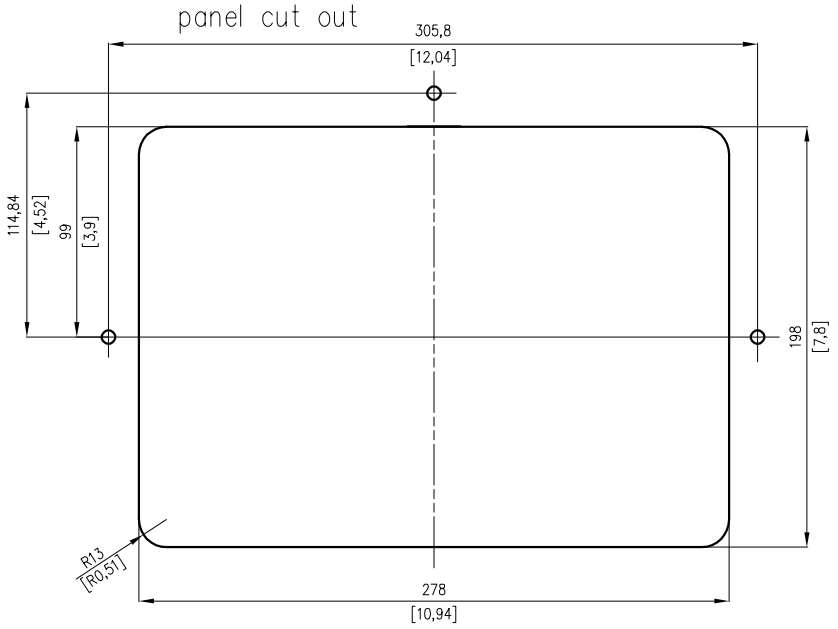




Erdverbindung M5
earth connection M5



Pultausschnitt
panel cut out



1) Befestigungspunkte 3x, Gewindesackloch M5 5tief
fixing points 3x, blind hole thread M5 depth 5

Id-Nr.: 2600662

DISTANCE FROM MAGNETIC COMPASS

STANDARD TYPE:	STEERING TYPE:
0,3m	0,3m

CAD

mm
[INCH]

SCALE –
WEIGHT: 2,4 Kg

		DATE	
DR	29.04.2003	DP	
ACCEPTED	AL	20.05.2003	

DRAWING TITLE
DIMENSIONAL DRAWING
FOR
X-Back DS

DRAWING NO.
NAU-A021DWG

SH 1
OF 2

LTR	REVISIONS	DATE
1		20.05.03

NAUTICAST

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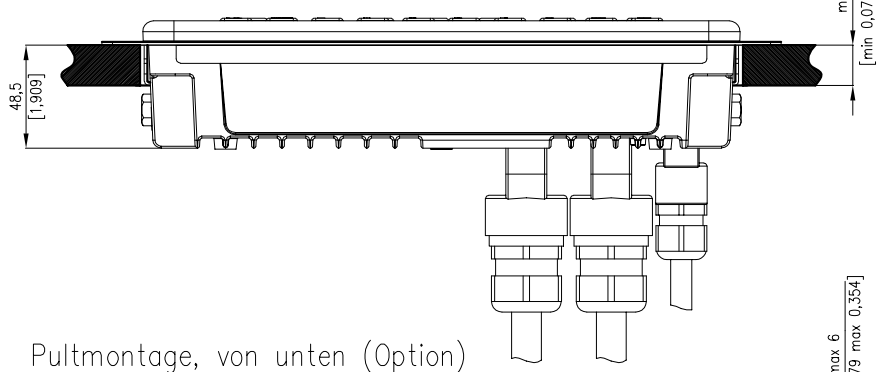
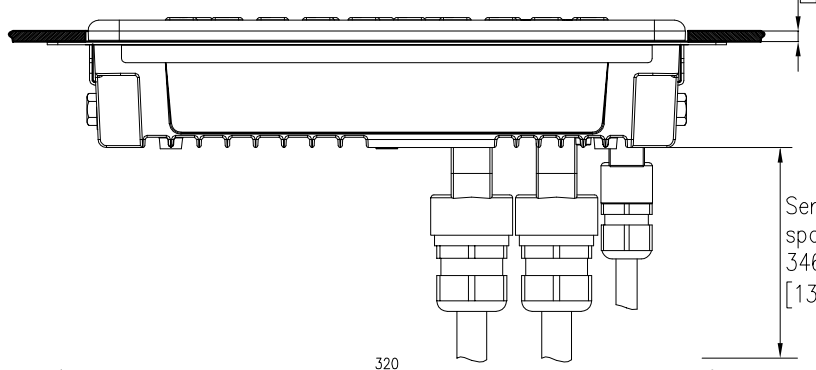
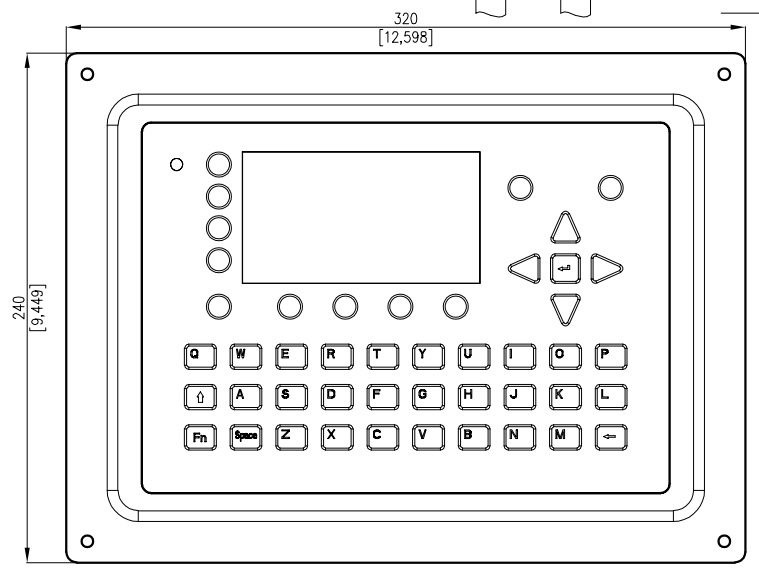
Pultmontage, von oben (Option)
console mounting, from top



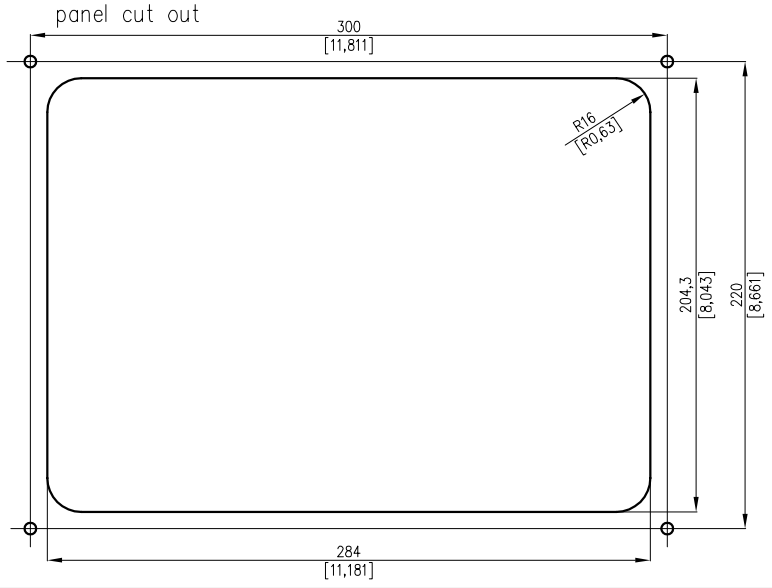
Pultmontage, von unten (Option)
console mounting, bottom up



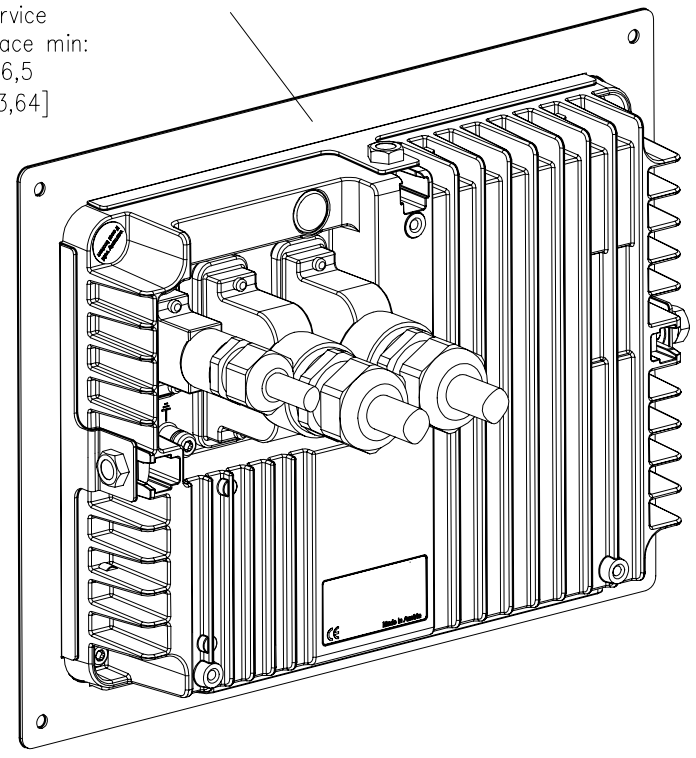
Retrofit frame



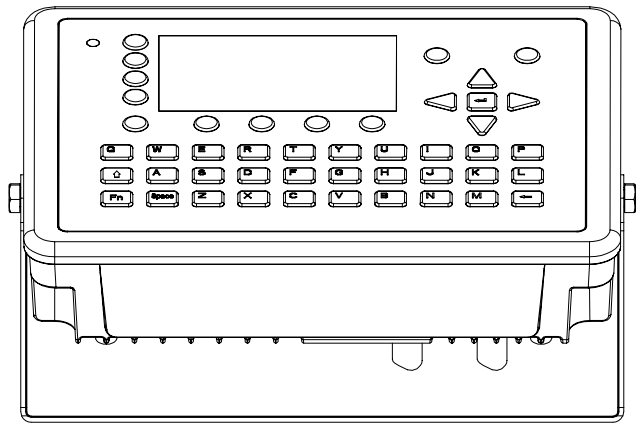
Montageausschnitt
panel cut out

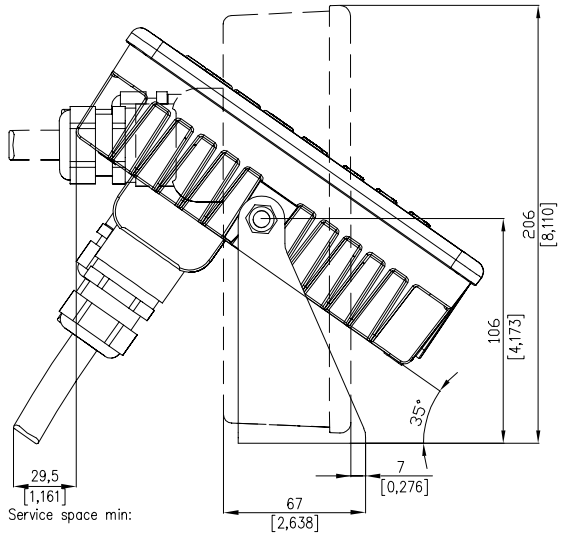


ID-No.: 2600657

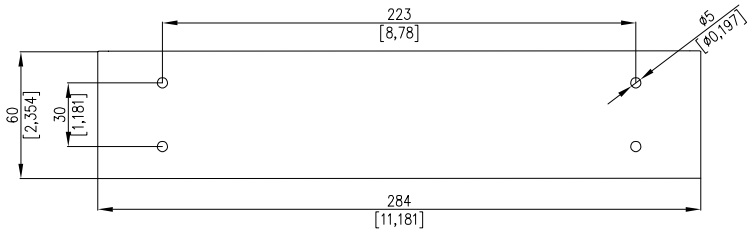


Tisch oder Wandmontage
desk or bulkhead mounting

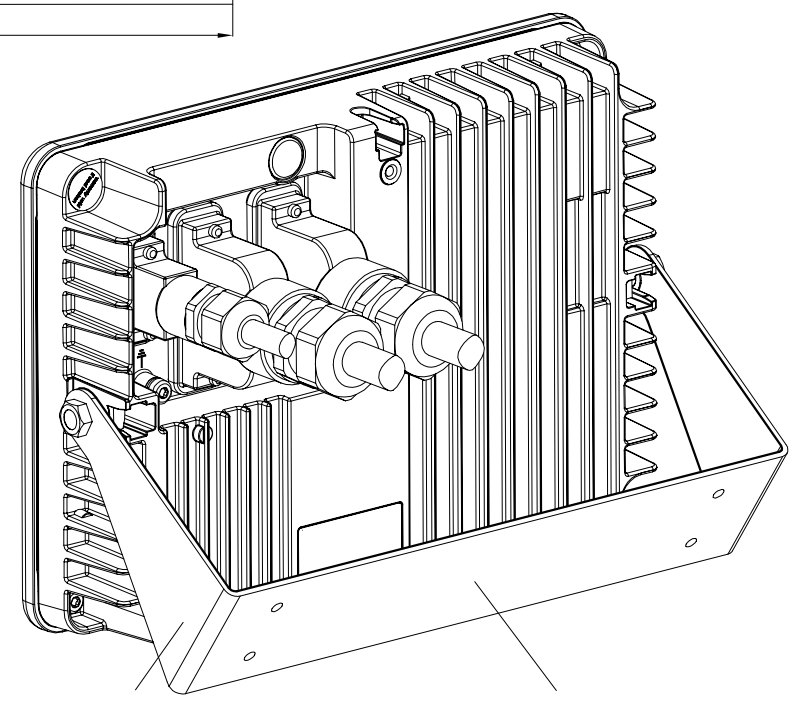




Bohrbild
drilling scheme



Multi purpose
mounting bracket



Montagebügel
mounting bow

ID-No.: 2600656

DISTANCE FROM MAGNETIC COMPASS

STANDARD TYPE:	STEERING TYPE:
0,3m	0,3m

CAD

mm
[INCH]

SCALE –

WEIGHT: 2,6 Kg

LTR	REVISIONS	DATE		DATE	
			DR	29.04.2003	DP
			ACCEPTED	AL 20.05.2003	
1		20.05.03			

NAUTICAST

DRAWING TITLE
DIMENSIONAL DRAWING
FOR
X-Back DS, optional mounting kits

DRAWING NO.
NAU-A021DWG

SH 2
OF 2

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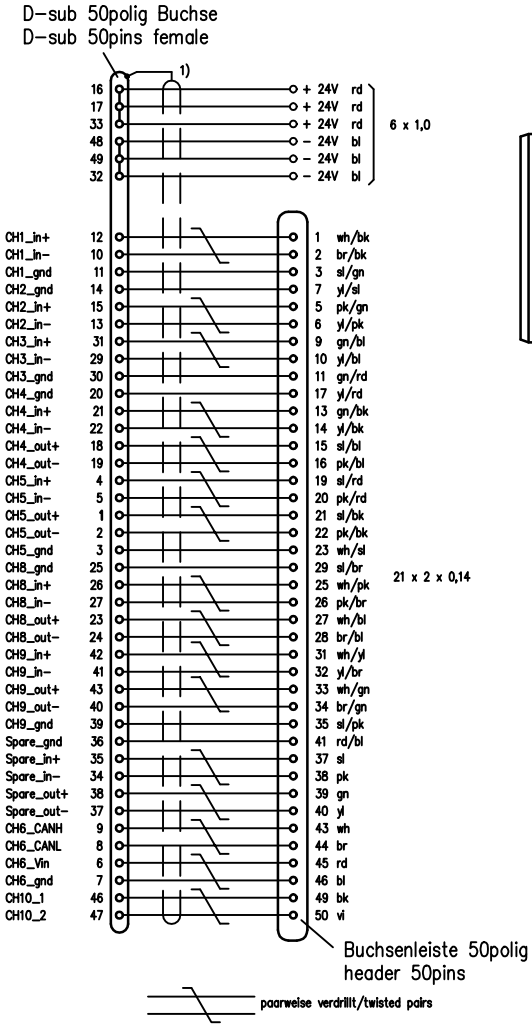
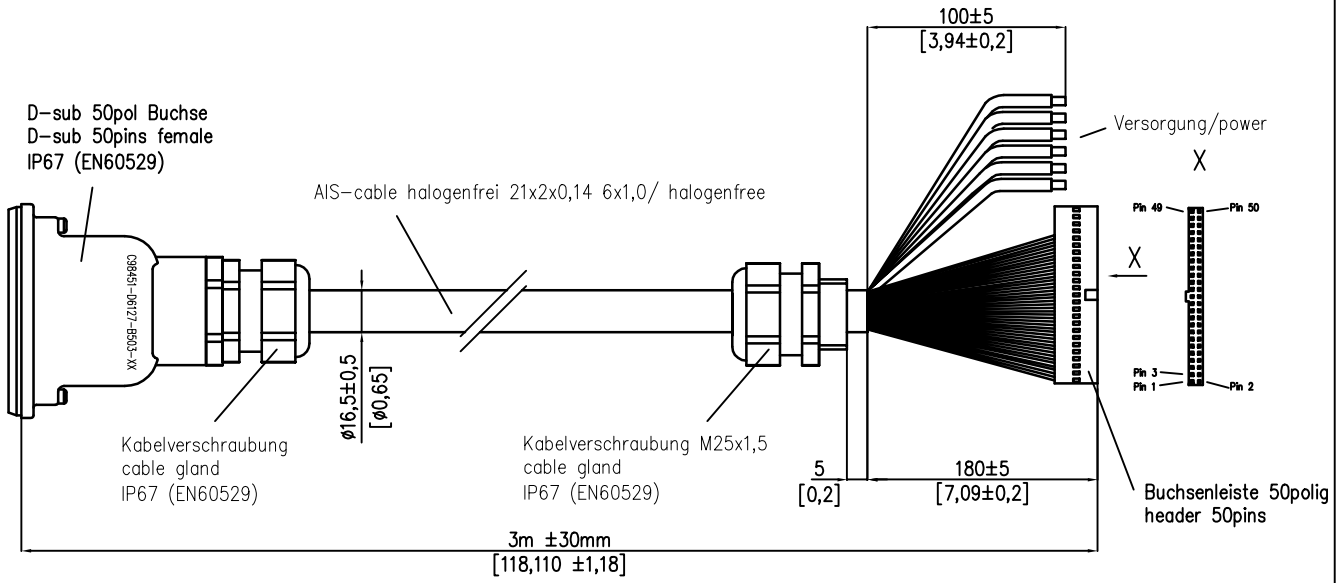
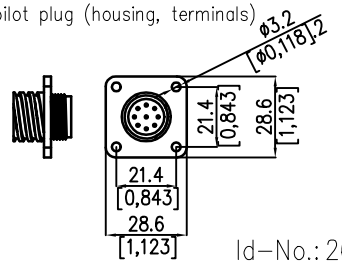
Stromlaufplan
circuit diagram







Id-No.: 2600663

DISTANCE FROM MAGNETIC COMPASS STANDARD TYPE: ...m STEERING TYPE: ...m					CAD	
					SCALE –	WEIGHT: 1,4 Kg
				mm [INCH]		
				DATE	DRAWING TITLE DIMENSIONAL DRAWING FOR AIS cable connection box 3m /[118,110]	
				DR 29.04.2003 DP		
				ACCEPTED AL 29.04.2003		
				NAUTICAST	DRAWING NO. NAU-B503DWG	SH 1 OF 1
1		20.05.03				
LTR	REVISIONS	DATE				

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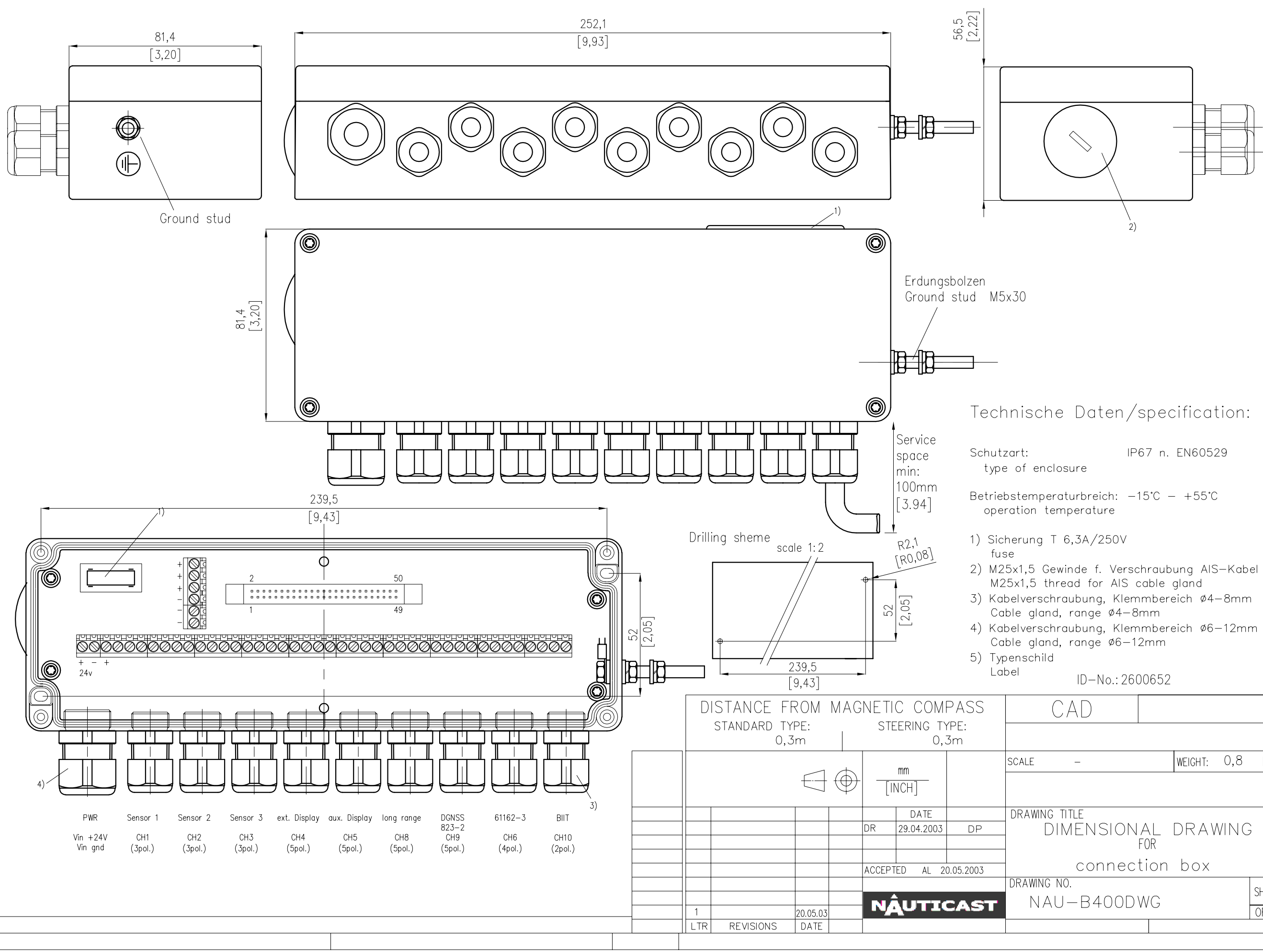

Technische Daten/specification:

Schutzart: IP67 n. EN60529
type of enclosure

Betriebstemperaturbreich: −15°C − +55°C
operation temperature

1) Sicherung T 6,3A/250V
fuse
2) M25x1,5 Gewinde f. Verschraubung AIS-Kabel
M25x1,5 thread for AIS cable gland
3) Kabelverschraubung, Klemmbereich ø4−8mm
Cable gland, range ø4−8mm
4) Kabelverschraubung, Klemmbereich ø6−12mm
Cable gland, range ø6−12mm
5) Typenschild
Label

ID-No.: 2600652

DISTANCE FROM MAGNETIC COMPASS
STANDARD TYPE: 0,3m
STEERING TYPE: 0,3m

CAD

SCALE −
WEIGHT: 0,8 Kg

mm
[INCH]

		DATE	
DR	29.04.2003	DP
ACCEPTED	AL	20.05.2003	

LTR	REVISIONS	DATE
1		20.05.03

DRAWING TITLE
DIMENSIONAL DRAWING
FOR
connection box

DRAWING NO.
NAU-B400DWG

SH 1
OF 1

NAUTICAST

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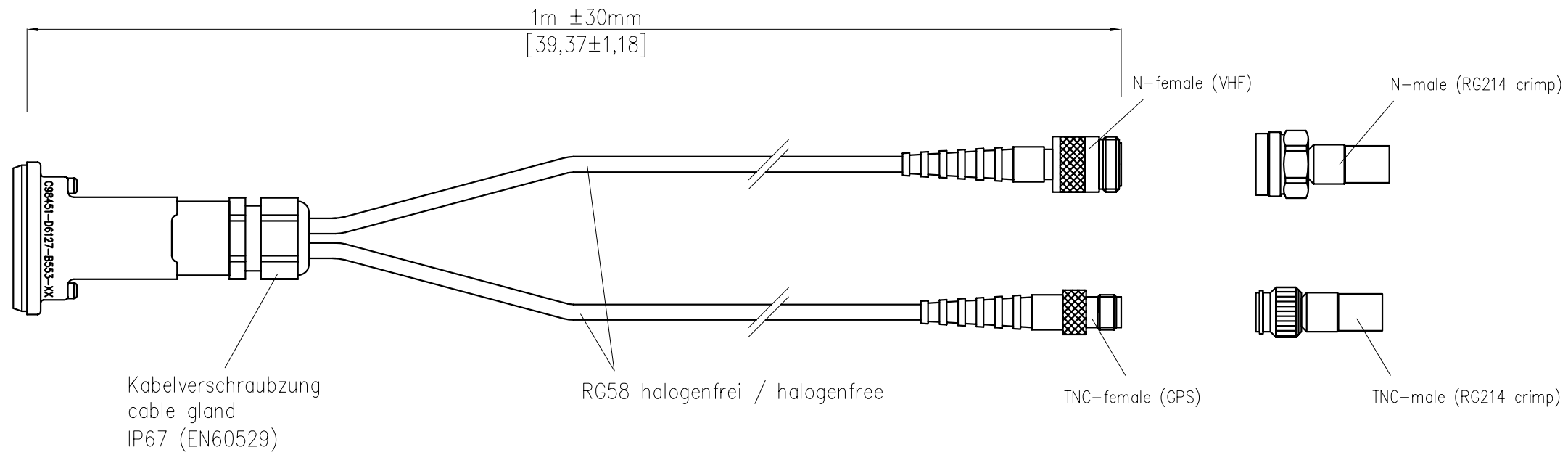
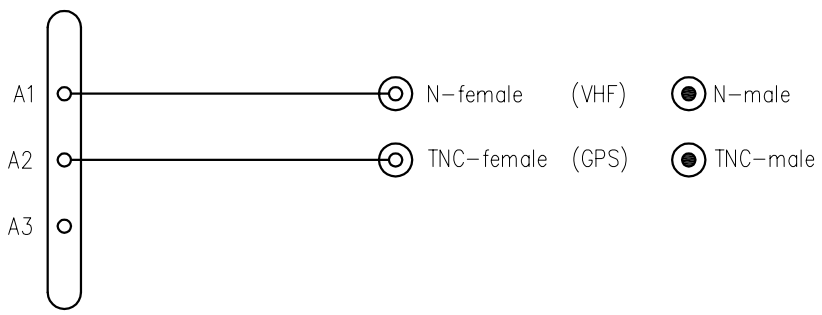


Stromlaufplan
circuit diagram



Id-No.: 2600653

DISTANCE FROM MAGNETIC COMPASS
STANDARD TYPE: ...m
STEERING TYPE: ...m

mm
[INCH]

LTR	REVISIONS	DATE
1		20.05.03

	DATE	
DR	29.04.2003	DP
ACCEPTED	AL 20.05.2003	

CAD

SCALE –

WEIGHT: 0,2 Kg

DRAWING TITLE
Maßzeichnung / DIMENSIONAL DRAWING
FOR
GPS/VHF cable for extension N TNC

DRAWING NO.
NAU-B553DWG

SH 1
OF 1

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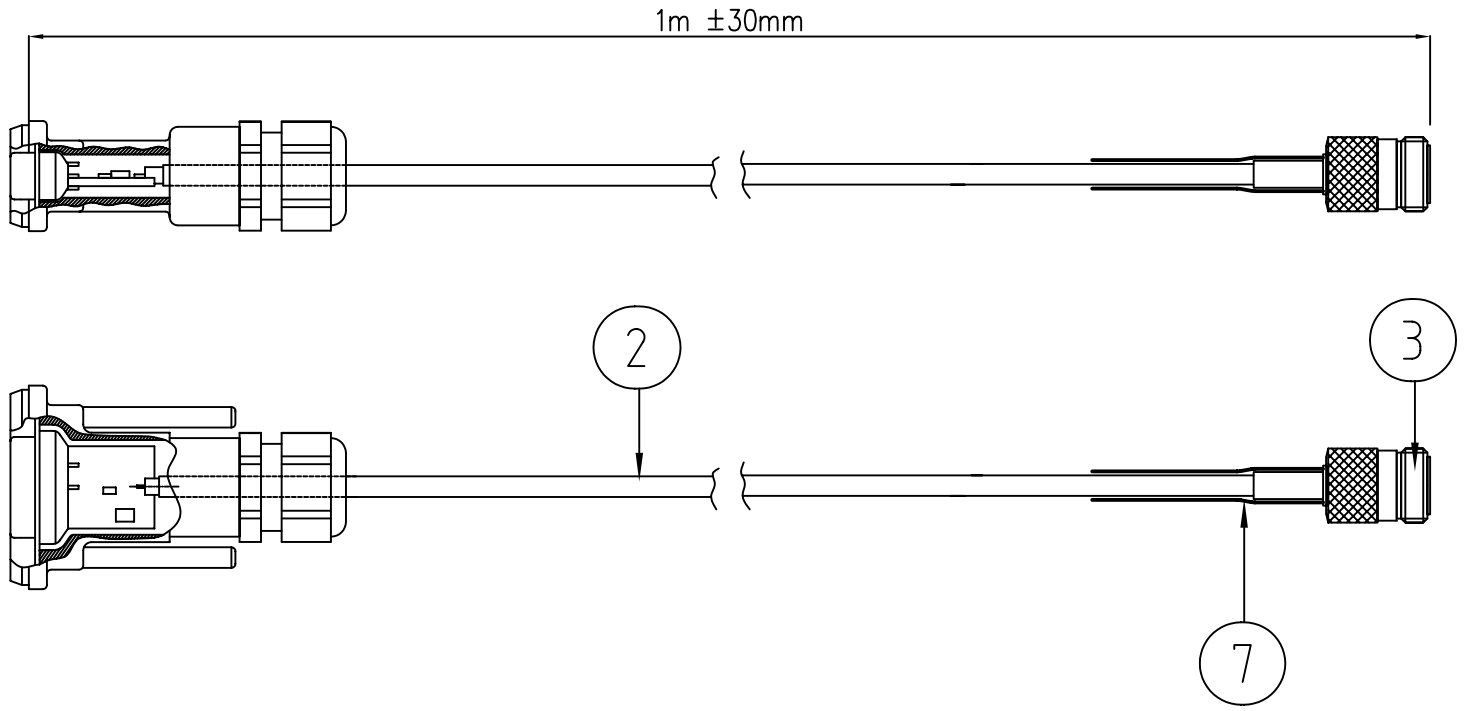
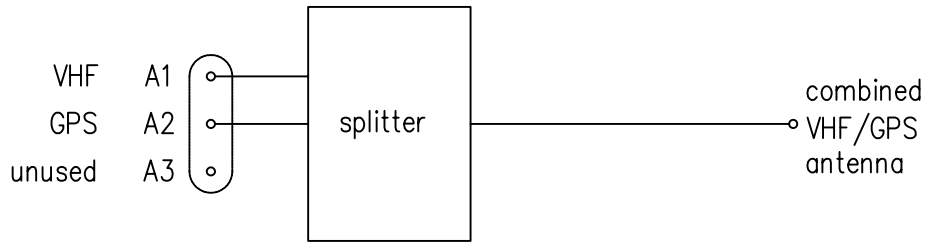


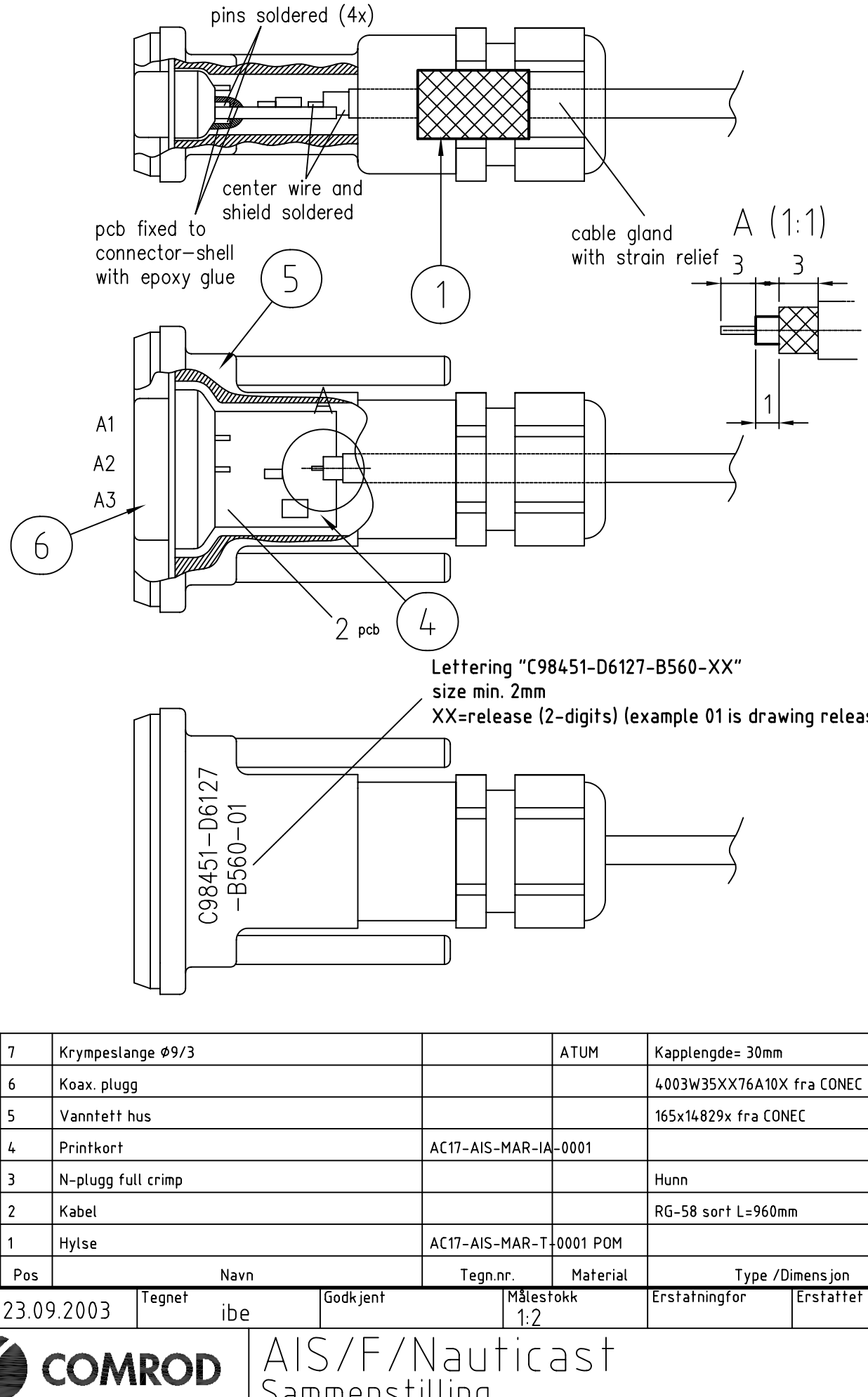
schematic diagramm



Electric specifications
VHF - VHF/GPS antenna :<-0,5db @158MHz
VHF - GPS :<-35db @158MHz
GPS - VHF/GPS antenna :<-2,5db @1575MHz

remark:
items 2 og 3 will not meet the EN60945 enviroment requirements as:
-protection IP67
-salt spray test
-resistiveness to corrosion

delivery conditions:
cable rolled up to a ring, packed into a PE-bag



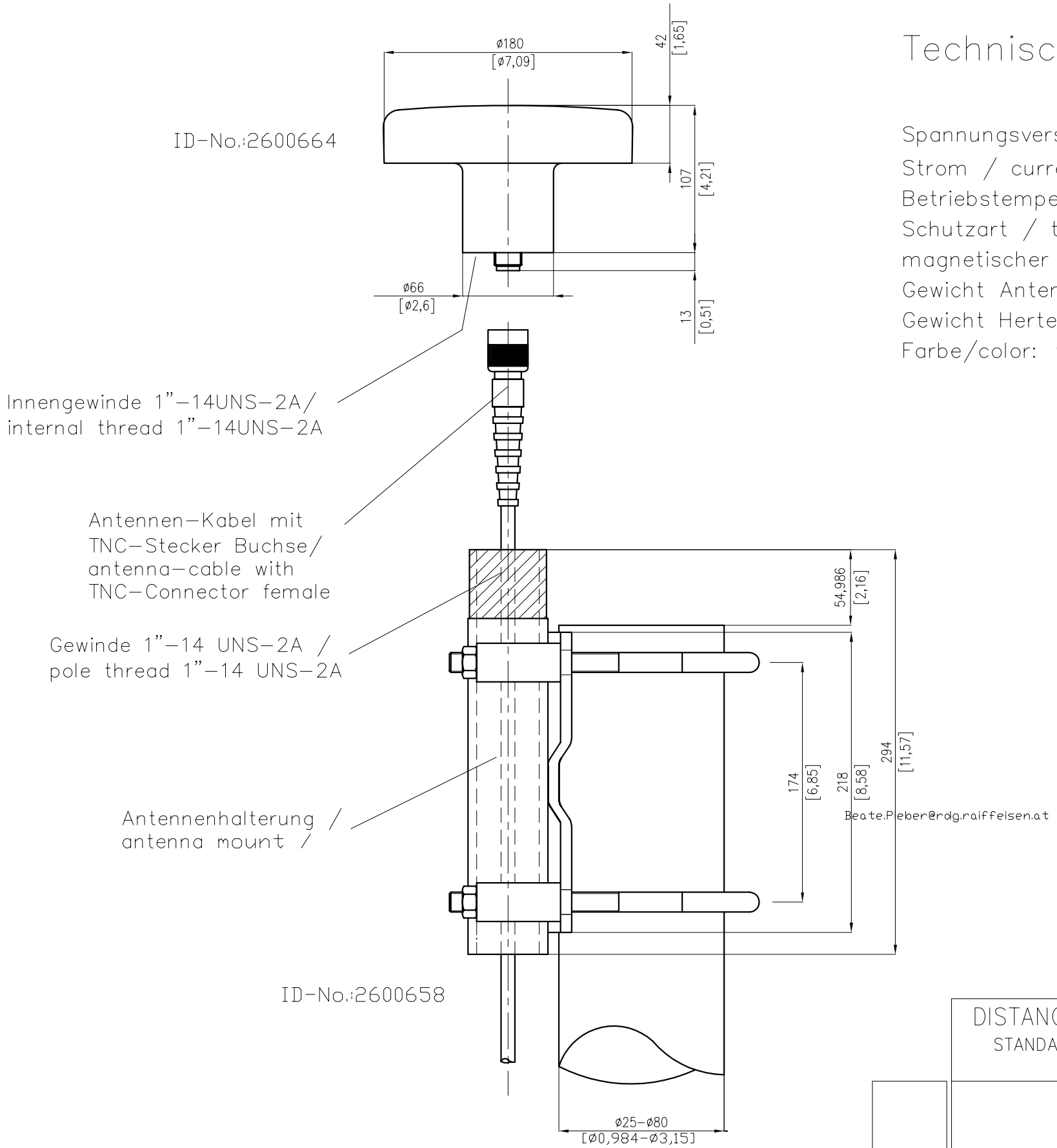
Ant.	Pos	Navn	Tegn.nr.	Material	Type /Dimensjon
1	7	Krympeslange ø9/3		ATUM	Kapplengde= 30mm
1	6	Koax. plugg			4003W35XX76A10X fra CONEC
1	5	Vanntett hus			165x14829x fra CONEC
1	4	Printkort	AC17-AIS-MAR-IA-0001		
1	3	N-plugg full crimp			Hunn
1	2	Kabel			RG-58 sort L=960mm
5	1	Hylse	AC17-AIS-MAR-T-0001 POM		

Dato	Tegnet	Godkjent	Målestokk	Erstatningfor	Erstattet av
23.09.2003	ibe		1:2		

COMROD

AIS/F/Nauticast
Sammenstilling

Tegn.arkiv	Side	Filnavn	Overflate
AC17-AIS-MAR-T-0002			



Technische Daten / Specification :

Spannungsversorgung / power supply: 5±0,5 DC
Strom / current: 27±5mA
Betriebstemperaturbereich / operation temperature: −30°C to +80°C
Schutzart / type of enclosure: waterproof
magnetischer Schutzabstand / magnetic savety distance: 0,3m/11,811inch
Gewicht Antenne / weight antenna: 160±10g (ohne Kabel/without cable)
Gewicht Herterung / weight antenna mount: 800g
Farbe/color: weiss/withe

Horizontale Befestigung /
horizontal mount

Set ID-No.: 2600654

Beate.Pieber@rdg.raiffeisen.at

DISTANCE FROM MAGNETIC COMPASS	
STANDARD TYPE:	STEERING TYPE:
0,3 m	0,3 m

CAD

SCALE –

WEIGHT: 0,96 Kg

mm
[INCH]

LTR	REVISIONS	DATE
1		20.05.03

	DATE	
DR	29.04.2003	DP

ACCEPTED AL 20.05.2003

NAUTICAST

DRAWING TITLE
DIMENSIONAL DRAWING
FOR
GPS antenna Marine II with
antenna mount

DRAWING NO.
NAU-X601DWG

SH 1
OF 1

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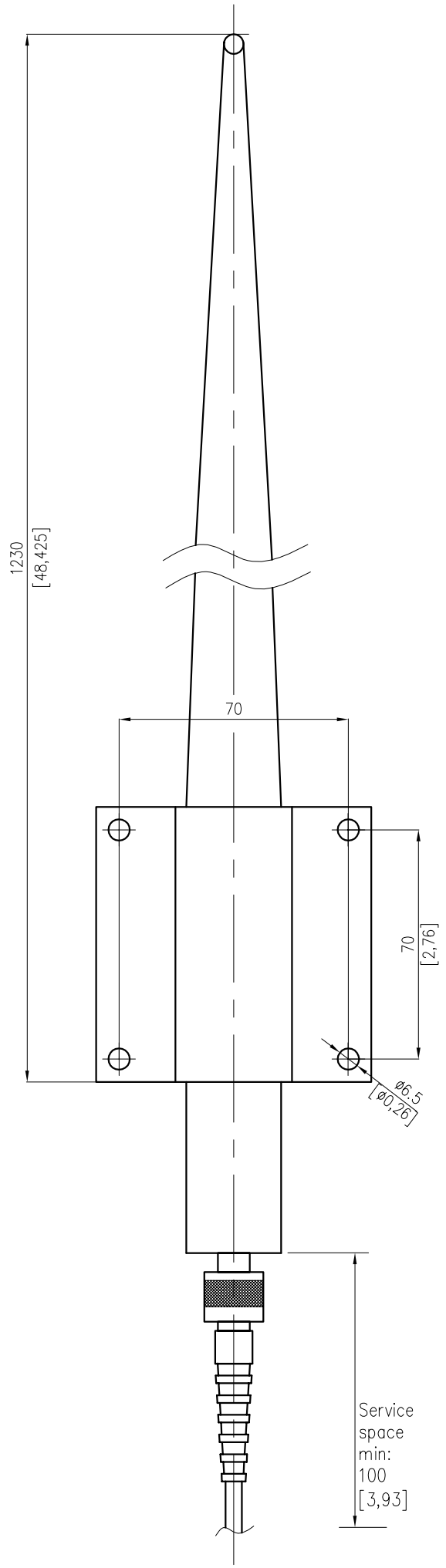

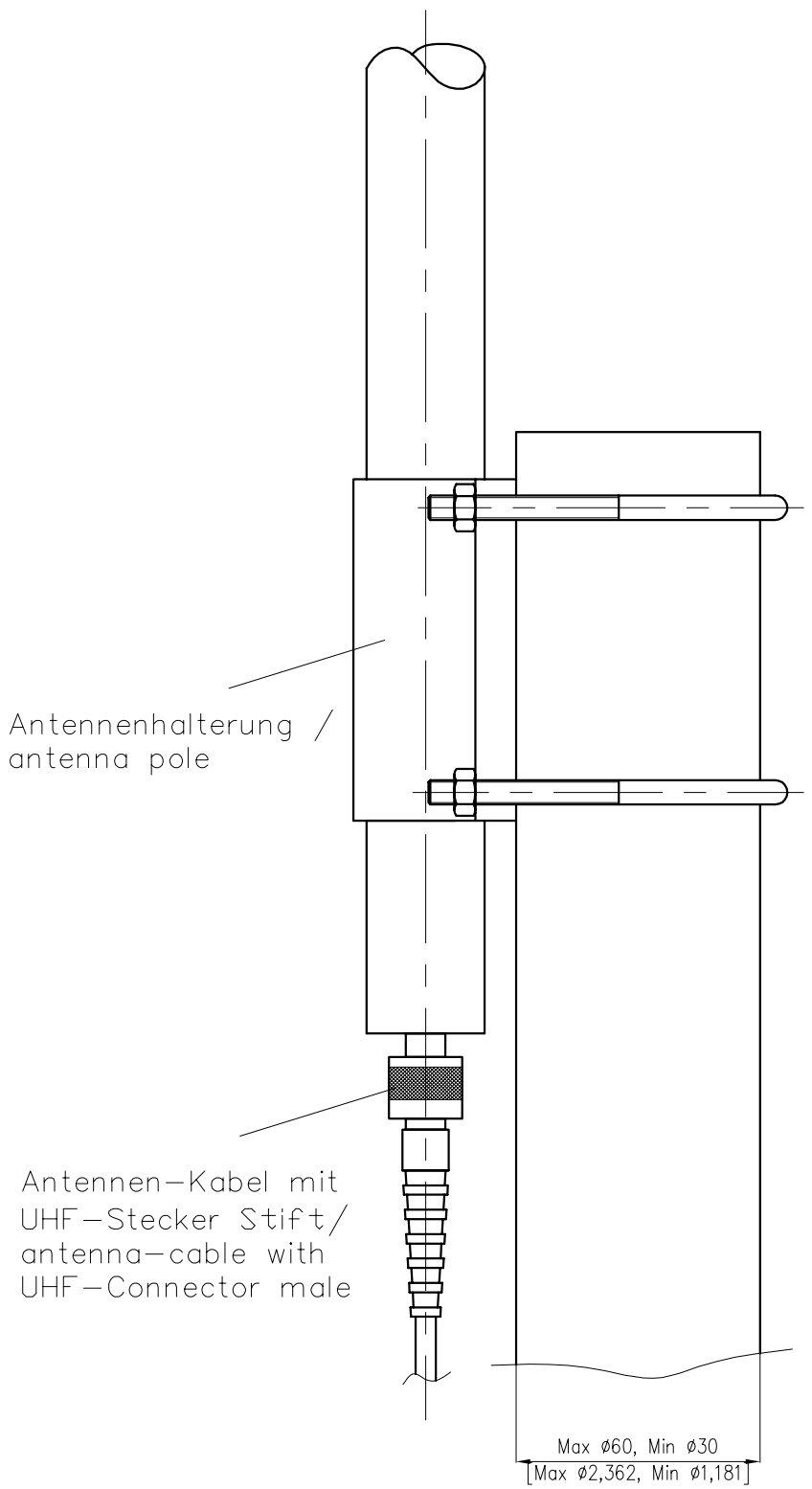

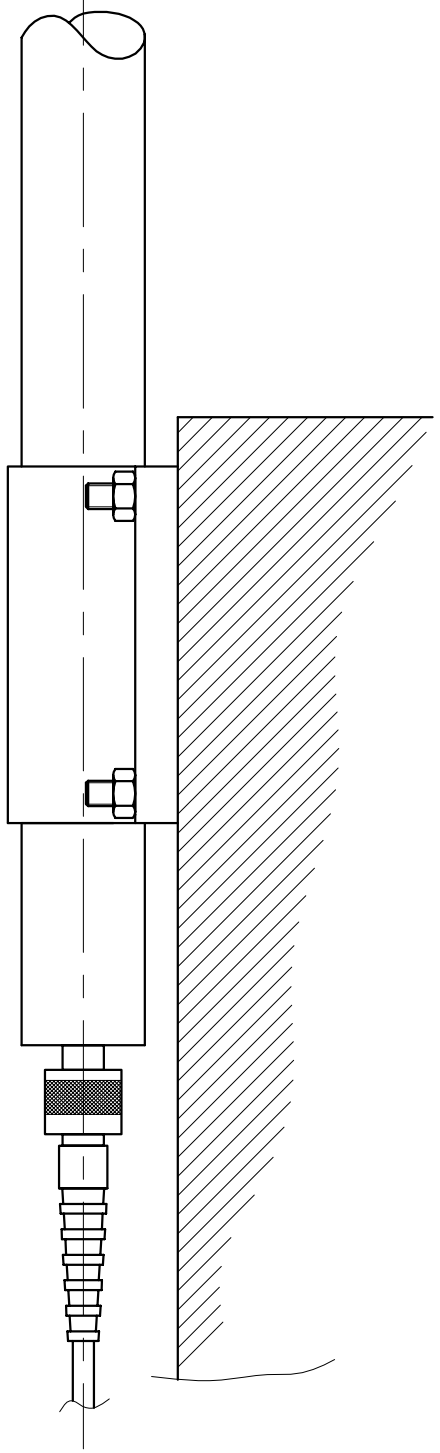

Elektrische Daten / Electrical specification :

übertragener Frequnzbereich /
Frequency range:
156 – 162MHz, VSWR < 1.5:1
145 – 165MHz, VSWR < 2:1
Norminal impedance: 50ohm
Bemessungsleistung / Power rating: 100W
Connector: UHF female is standard
Gleichstrom geerdet / DC–grounded: yes

Mechanische Daten / Mechanical specification :

Höhe / Height: 1,25m (4ft)
Gewicht / Weight: 1kg, including U–bolts
Wind rating: 55m/s = 125mph
Temperaturanzeige / Temperature range:
–55°C, +7°C; –67°F, +160°F

DISTANCE FROM MAGNETIC COMPASS
STANDARD TYPE: ...m
STEERING TYPE: ...m

mm
[INCH]

LTR	REVISIONS	DATE
1		20.05.03

	DATE	
DR	29.04.2003	DP
ACCEPTED	AL 20.05.2003	

CAD

SCALE –
WEIGHT: 1,0 Kg

DRAWING TITLE
DIMENSIONAL DRAWING
FOR
VHF antenna AV7

DRAWING NO.
NAU–B611DWG

SH 1
OF 1

NAUTICAST

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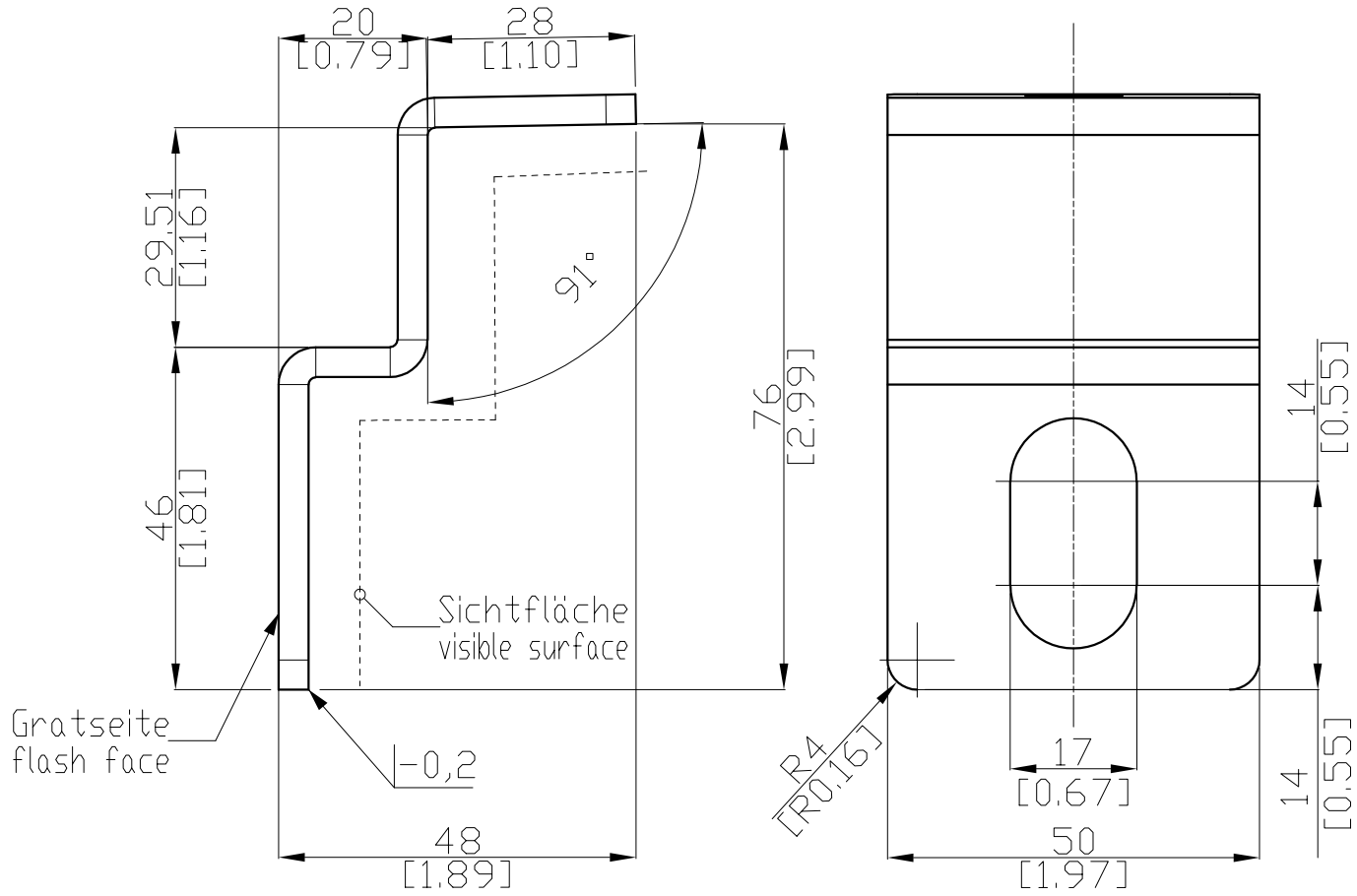

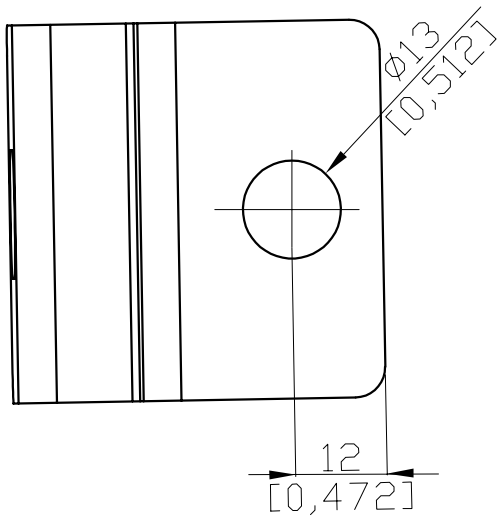

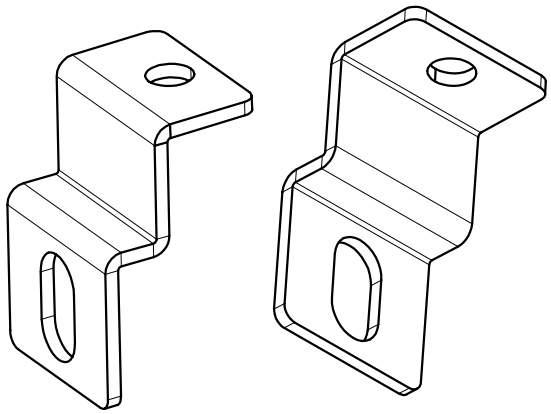

Biegeradius R 0,5
bending radius R 0,5

□bfl.: ---
surface: ---

DISTANCE FROM MAGNETIC COMPASS

STANDARD TYPE: ...m

STEERING TYPE: ...m

CAD

SCALE –

WEIGHT: 0,021 Kg

mm
[INCH]

		DATE	
DR		29.04.2003	DP
ACCEPTED	AL	20.05.2003	

DRAWING TITLE

DIMENSIONAL DRAWING
FOR
mounting bracket

DRAWING NO.

NAU-D501DWG

SH 1
OF 1

NAUTICAST

LTR	REVISIONS	DATE
1		20.05.03

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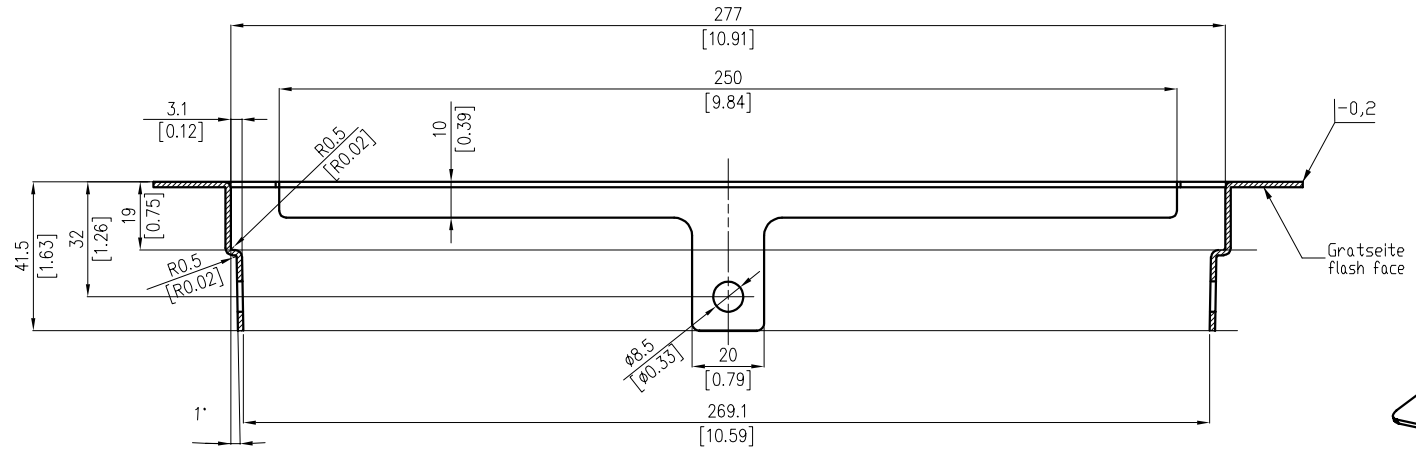

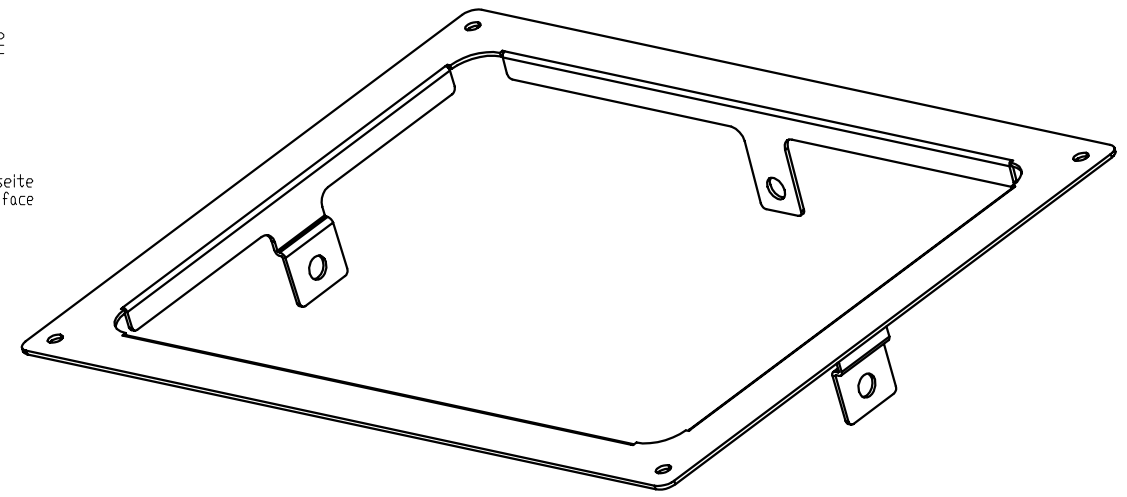

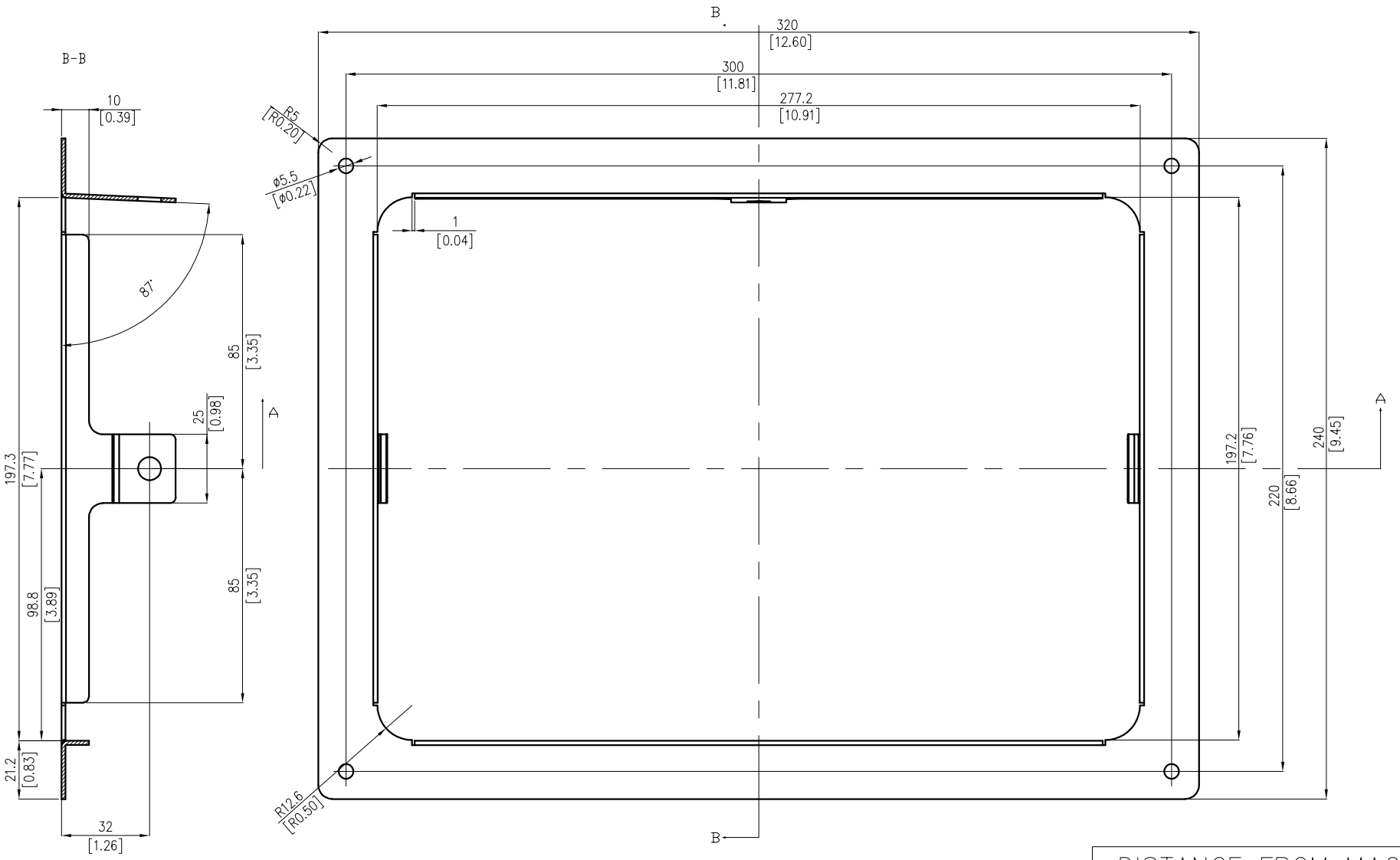

Obfl.: alle Flächen pulverbeschichtet (Polyester)
Seidenglanz Farbe RAL7021
surface finish: powder coated (polyester)
silk lustre Color RAL7021

DISTANCE FROM MAGNETIC COMPASS

STANDARD TYPE:	STEERING TYPE:
...m	...m

mm
[INCH]

CAD

SCALE –

WEIGHT: 0,36 Kg

			DATE	
DR			29.04.2003	DP
ACCEPTED	AL	20.05.2003		

LTR	REVISIONS	DATE
1		20.05.03

DRAWING TITLE
DIMENSIONAL DRAWING
FOR
mounting frame

DRAWING NO.
NAU–D500DWG

SH 1
OF 1

NAUTICAST

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46-EX-D-X00001-C
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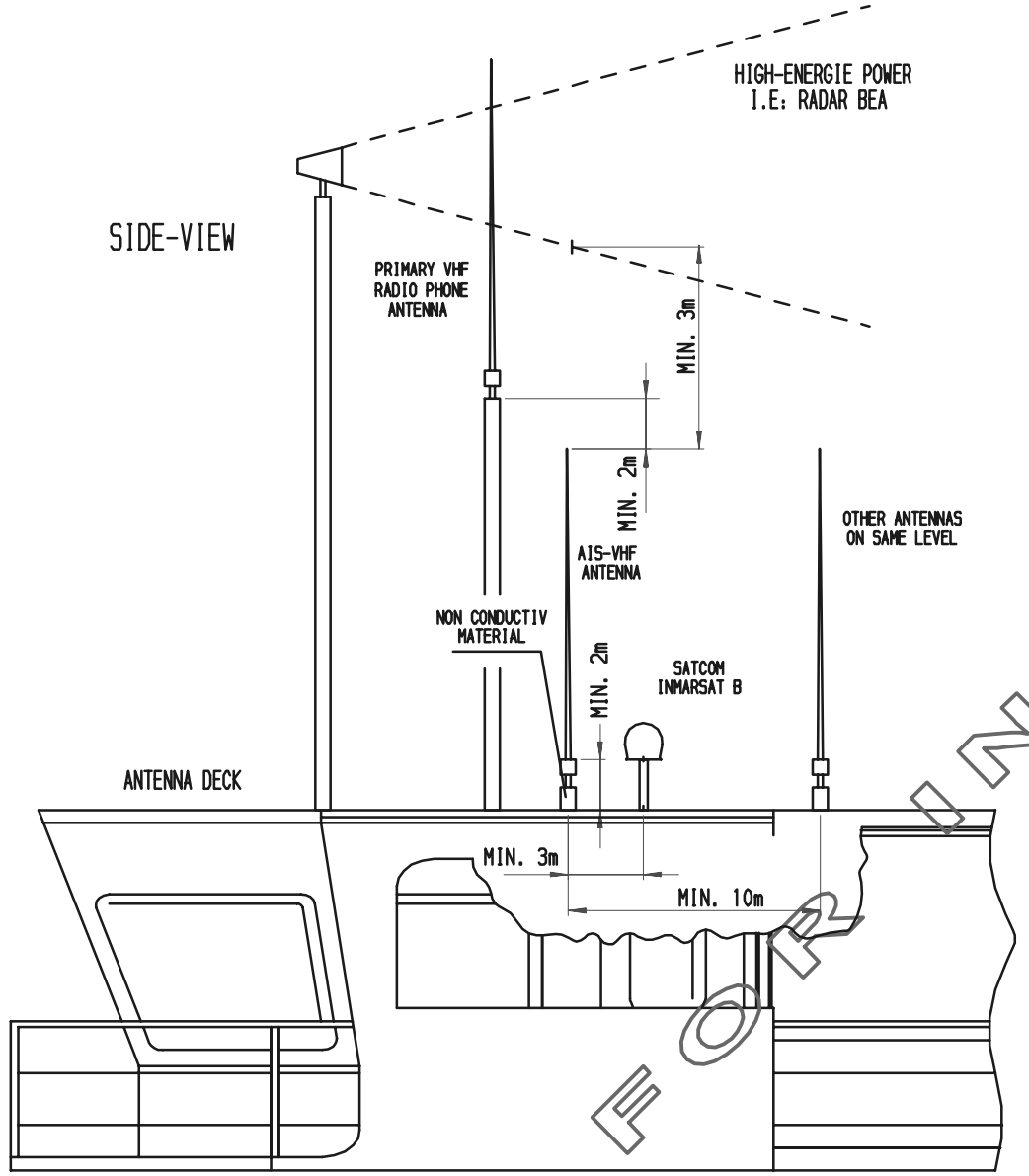
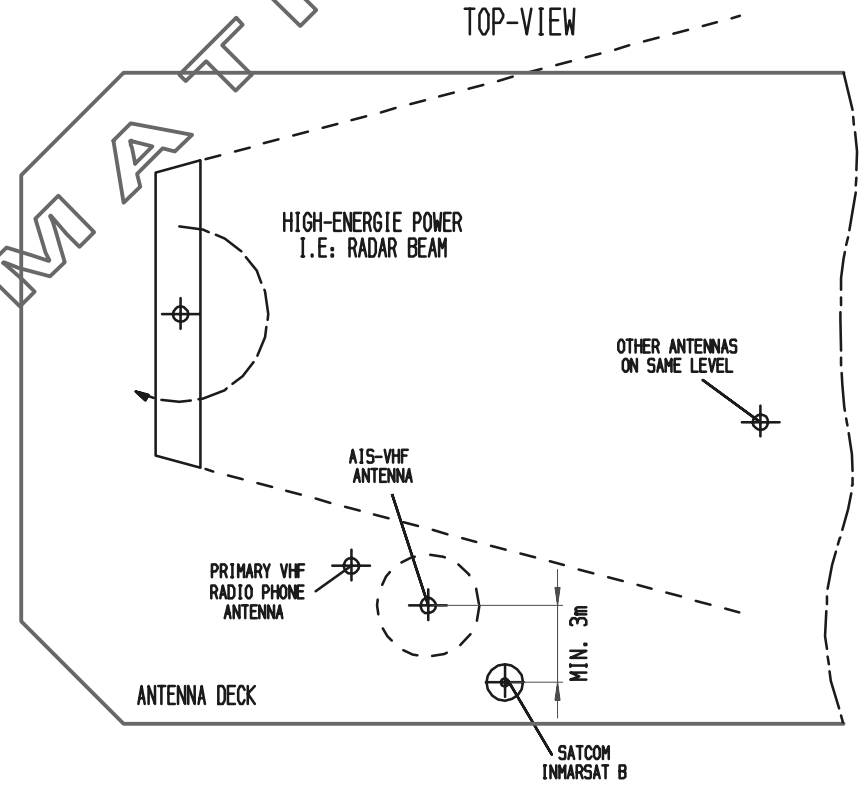
UNINFORMATION!!

SIDE-VIEW



TOP-VIEW



ONLY FOR

Source, Draw.-No. 46-EX-D-X00001-C, coyright Raytheon Marine GmbH, Kiel, Germany

.	.	.	.	2003	Name	Datum	NAUTICAST	UEBERSICHTSPLAN	LAYOUT
.	.	.	.	Bearb.	RG	31.03.		AIS-ANTENNEN	AIS ANTENNAS
.	.	.	.	Gepr.	SEI			-	-
Zust.	Aenderung	Datum	Name	Norm					

46-EX-D-X00001-C	.		
	Sheet 1		
Ers.f.: -	Ers.d.: -	.	Sheets

Bundesrepublik Deutschland

Federal Republic of Germany

Bundesamt für Seeschifffahrt und Hydrographie

Federal Maritime and Hydrographic Agency

BUNDESAMT FÜR SEESCHIFFFAHRT UND HYDROGRAPHIE

EC TYPE EXAMINATION (MODULE B) CERTIFICATE

This is to certify that:

Bundesamt für Seeschifffahrt und Hydrographie, specified as a "notified body" under the terms of „Schiffssicherheitsgesetz" of 9. September 1998 (BGBl. I, p. 2860) modified last 17. October 2005 (BGBl. I, p. 2985), did undertake the relevant type approval procedures for the equipment identified below which was found to be in compliance with the Navigation requirements of Marine Equipment Directive (MED) 96/98/EC as modified by Directive 2002/75/EC.

Applicant	**ACR Electronics Europe GmbH**
Address	**Mariahilfer Straße 50/2/11, 1070 VIENNA, AUSTRIA**
Manufacturer	**ACR Electronics, Inc.**
Address	**5757 Ravenswood Road, FORT LAUDERDALE, FL-33312-6645, USA**
Annex A.1 Item (No & item designation)	**4.32 / Universal automatic identification system equipment (AIS)**
Product Name	**X-Pack DS**
Trade Name(s)	**see page 2**

Specified Standard(s)

IMO MSC.74(69) Annex 3	**IEC 61993-2 (2001)**
ITU-R M 1371-1 (Class A)	**IEC 61162-1 (2000), -2 (1998)**
IALA Technical Clarifications of Rec. ITU-R M, 1371-1 (Edition 1.3)	**IEC 60945 (1996)**
ITU-R M.825-3	**IEC 61108-1 (1996)**
ITU-R M. 1084-3	

This certificate remains valid unless cancelled, expired or revoked.

Date of issue: **2006-05-08**

Expiry date: **2009-04-30**

Issued by: **Bundesamt für Seeschifffahrt und Hydrographie**
Bernhard-Nocht-Str. 78, 20359 Hamburg, Germany
Notified body 0735

Certificate No.: **BSH/4612/4320296/06**

This certificate consists of 2 pages.

Siegel

by order

Schulz-Reifer

BUNDESAMT FÜR SEESCHIFFFAHRT UND HYDROGRAPHIE NOTIFIED BODY

This certificate is issued under the authority of the „Bundesministerium für Verkehr, Bau und Stadtentwicklung".

Components necessary for operation:

Components necessary for operation	Part No.	Remarks
X-Pack DS	NAU-A 002	Software-Version: 2.0x
Connection Box	NAU-B 401	
VHF antenna Glomex	NAU-B 610	or equivalent
VHF antenna Marine II	NAU-B 601	or equivalent

The internal GPS sensor of the X-Pack DS is used as s backup sensor for position reporting

Documentation:

User Manual: Version 1.0x dated: 2002-12
Installation Manual: Version 1.0x dated: 2003-03

Trade names:

The equipment is also available under the following trade names:

		Nauticast part No. of AIS transponder unit:
Raytheon Marine	RM 808 AIS	NAU-A 023
ACR	GlobalWatch UAIS	NAU-A 051
Marine Technologies	Bridgemate AIS	NAU-A 061
ACR	Nauticast	NAU-A 007

Limitations on the acceptance or use of the product:

- - - -

Places of production:

- - - -

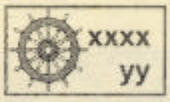
Notes:

The manufacturer shall inform Bundesamt für Seeschifffahrt und Hydrographie, as the notified body, of any modifications to the type-tested product(s) that may affect compliance with the requirements or conditions laid down for use of the product(s).

In case the specified regulations or standards are amended during the validity of this certificate, the product(s) must be re-certified before being placed on board vessels to which such amended regulations or standards apply.

The Mark of Conformity (wheelmark) may only be affixed to the type approved equipment, and a Manufacturer´s Declaration of Conformity may only be issued, if the product quality system fully complies with the Marine Equipment Directive and is certified by a notified body against ANNEX B module D, E, or F of the Directive.

Example for the Application of the "Mark of Conformity":



xxxx number of the Notified Body responsible for quality surveillance module
yy Last two digits of the year in which the mark is affixed.

Notice on legal remedies available:

Objection to this document may be filed within one month after notification. The objection must be filed in writing to, or put on record at, Federal Maritime and Hydrographic Agency, Bernhard-Nocht-Str. 78, 20359 Hamburg, Germany

Bundesrepublik Deutschland

Federal Republic of Germany

Bundesamt für Seeschifffahrt und Hydrographie

Federal Maritime and Hydrographic Agency

BUNDESAMT FÜR SEESCHIFFFAHRT UND HYDROGRAPHIE

EC QUALITY SYSTEM (MODULE D) CERTIFICATE

Bundesamt für Seeschifffahrt und Hydrographie (Federal Maritime and Hydrographic Agency) as the notified body performing EC conformity assessment procedures in compliance with EC Council Directive 96/98/EC of 20 December 1996 on Marine Equipment, last amended by EC Council Directive 2002/75/EC of 2 September 2002, hereby certifies that the manufacturer

ACR Electronics, Inc.
5757 Ravenswood Road

Fort Lauderdale, Florida 33312
USA

maintains and applies a quality system in accordance with the requirements of the Maritime Equipment Directive Annex B, Module D.

Scope:

A.1/4.18	**9 GHz SAR Transponder (SART)**
A.1/5.6	**406 MHz EPIRB (COSPAS-SARSAT)**
A.1/4.32	**Universal automatic identification system equipment (AIS)**
	References: see overleaf
	*****

Date of issue: **27th July 2004** **Issued by:** **Bundesamt für Seeschifffahrt und Hydrographie**

Expiry date: **04th May 2007** **Identification number 0735**

Registration no.: BSH-051-05-2004/3

This certificate consists of 2 pages

BUNDESAMT FÜR SEESCHIFFFAHRT UND HYDROGRAPHIE 16 Siegel

by order

Mühlhausen

BUNDESAMT FÜR SEESCHIFFFAHRT UND HYDROGRAPHIE NOTIFIED BODY 0735

This certificate is issued under the authority of the Bundesministerium für Verkehr, Bau- und Wohnungswesen.
see notes overleaf

Places of production (if different from client or where there are several)

***

Restrictions:

***

References:

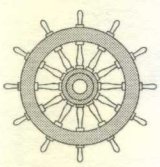
Item		Module B Certificate data		
		Registration number	Date of issue	Notified Body
A.1/4.18	9 GHz SAR Transponder (SART)	QQ-MED-48/03-01	04.11.2003	0191
A.1/4.18	9 GHz SAR Transponder (SART)	QQ-MED-48/03-02	04.11.2003	0191
A.1/4.32	Universal automatic identification system equipment (AIS)	734.2/0051-2/2004	01.05.2004	0735
A.1/5.6	406 MHz EPIRB (COSPAS-SARSAT)	BSH/6492/0039/01	01.08.2001	0735
A.1/5.6	406 MHz EPIRB (COSPAS-SARSAT)	050564/99	18.10.1999	0735

Notes:

This certificate authorises in conjunction with the EC Type Examination (Module B) Certificate of the equipment listed in the scope to affix the "Mark of Conformity" (wheelmark).

This certificate loses its validity if the manufacturer makes any changes or modifications to the approved quality system, which have not been notified to, and agreed with the notified body named on this certificate and/or after lapse of time, withdrawal or revocation of the EC Type Examination (Module B) Certificate.

"Wheelmark" Format and application:



0735/yy

example

yy Last two digits of the year in which mark is affixed.

0735 Notified Body number undertaking quality surveillance

Notice on legal remedies available:

Objection to this document may be filed within one month after notification. The objection must be filed in writing to, or put on record at, Federal Maritime and Hydrographic Agency, Bernhard-Nocht-Str. 78, 20359 Hamburg, Germany

EG - Konformitätserklärung
CE - Declaration of Conformity

Diese Konformitätserklärung bestätigt, dass das unten benannte Produkt den Auflagen der EC Council Directive 96/98/EC vom 20 Dezember 1996 für maritime Ausrüstung, geändert durch die EC Council Directive 2002/75/EC vom 2. September 2002 entspricht und von der benannten Stelle Nr. 0735 (BSH) typengeprüft.
This declaration of conformity certified that the mentioned equipment is in compliance with EC Council Directive 96/98/EC of 20 December 1996 on Marine Equipment, last amended by EC Council Directive 2002/75/EC of 2 September 2002 and has been type examined by the Notified Body No. 0735 (BSH).

Produktbezeichnung: **name of product**	**Nauticast**

OEM Name: Trade Name	X-Pack DS, RM808AIS, GlobalWatch UAIS, Bridgemate AIS

Zertifikate der benannten Stelle: Certificates from the notified Body	EC Type Examination (Module B) Certificate BSH/6412/4320296/06 EC Quality System (Module D) Certificate BSH-051-05-2004/3

Spezifizierte Standards: Specified Standard(s)	IMO MSC.74(69) Annex 3 ITU-R M.1371-1 (Class A) IALA Technical Clarifications of Rec. ITU-R M.1371-1 ITU-R M.825-3 ITU-R M1084-3 IEC 61993-2 (2002) IEC 61162-1 (2000), -2 (1998) IEC 60945 (1996) IEC 61108-1 (1996)

Dokument- Nr.: document-no :	**2006-03**
Hersteller: Manufacturer	**ACR Electronics Europe GmbH**
Anschrift: address	Handelskai 388 / Top 632 A-1020 Vienna, Austria
Ort, Datum: place, date	Vienna, 2006-07-12
Unterschrift: signature	 Andreas Lesch Chief Technology Officer

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, ist jedoch keine Zusicherung von Eigenschaften.
Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten.
This declaration certifies the compliance with the indicated directives but implies no warranty of properties.
The safety instructions of the accompanying product documentation shall be observed.

ISO 9001:2000 Zertifizierung / ISO 9001:2000 Certification
ACR Electronics Europe GmbH hat ein Qualitätsmanagement System nach ISO 9001:2000 implementiert, und ist seit Juli 2003 ISO-zertifiziert.
ACR Electronics Europe GmbH maintains a Quality Management System according to ISO 9001:2000, and received ISO certification in July 2003.

Konformitätserklärung
Declaration of Conformity

Diese Konformitätserklärung bestätigt, dass das unten benannte Zubehör gleich oder besser dem im untenstehenden Zertifikat ausgewiesenen Zubehör ist.
This declaration of conformity certifies that the mentioned accessory is equal or better to the equipment stated in the beyond Certificate.

Produktbezeichnung: **name of product**	**Nauticast (Automatic Identification System)**

OEM Name: Trade Name	X-Pack DS, RM808AIS, GlobalWatch UAIS, Bridgemate AIS

Zertifikate der benannten Stelle: Certificates from the notified Body	EC Type Examination (Module B) Certificate BSH/6412/4320296/06 EC Quality System (Module D) Certificate BSH-051-05-2004/3

Spezifizierte Standards: Specified Standard(s)	IMO MSC.74(69) Annex 3 ITU-R M.1371-1 (Class A) IALA Technical Clarifications of Rec. ITU-R M.1371-1 ITU-R M.825-3 ITU-R M1084-3 IEC 61993-2 (2002) IEC 61162-1 (2000), -2 (1998) IEC 60945 (1996) IEC 61108-1 (1996)

Zubehörtyp : Type of Accessory	**VHF Antenna** **ACR AIS-A3200**
Nauticast Part.No.: Einschränkungen / Hinweise : Restrictions / Comments	**NAU-B 614 / 2628** verlegte Kabellänge < 40 m installed Cable length < 40m

Dokument- Nr.: document-no :	**2006-07**
Hersteller: Manufacturer	**ACR Electronics Europe GmbH**
Anschrift: address	Handelskai 388 / Top 632 A-1020 Vienna, Austria
Ort, Datum: place, date	Vienna, 2006-07-12
Unterschrift: signature	 Andreas Lesch Chief Technology Officer

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, ist jedoch keine Zusicherung von Eigenschaften.
Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten.
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ISO 9001:2000 Zertifizierung / ISO 9001:2000 Certification
ACR Electronics Europe GmbH hat ein Qualitätsmanagement System nach ISO 9001:2000 implementiert, und ist seit Juli 2003 ISO-zertifiziert.
ACR Electronics Europe GmbH maintains a Quality Management System according to ISO 9001:2000, and received ISO certification in July 2003.

Konformitätserklärung
Declaration of Conformity

Diese Konformitätserklärung bestätigt, dass das unten benannte Zubehör gleich oder besser dem im untenstehenden Zertifikat ausgewiesenen Zubehör ist.
This declaration of conformity certifies that the mentioned accessory is equal or better to the equipment stated in the beyond Certificate.

Produktbezeichnung: **name of product**	**Nauticast (Automatic Identification System)**

OEM Name: Trade Name	X-Pack DS, RM808AIS, GlobalWatch UAIS, Bridgemate AIS

Zertifikate der benannten Stelle: Certificates from the notified Body	EC Type Examination (Module B) Certificate BSH/6412/4320296/06 EC Quality System (Module D) Certificate BSH-051-05-2004/3

Spezifizierte Standards: Specified Standard(s)	IMO MSC.74(69) Annex 3 ITU-R M.1371-1 (Class A) IALA Technical Clarifications of Rec. ITU-R M.1371-1 ITU-R M.825-3 ITU-R M1084-3 IEC 61993-2 (2002) IEC 61162-1 (2000), -2 (1998) IEC 60945 (1996) IEC 61108-1 (1996)

Zubehörtyp : Type of Accessory	**GPS Antenna** **Procom GPS 4 Antenna**
Nauticast Part.No.: Einschränkungen / Hinweise : Restrictions / Comments	**NAU-B 602 / 2622** verlegte Kabellänge < 40 m installed Cable length < 40m

Dokument- Nr.: document-no :	**2006-06**
Hersteller: Manufacturer	**ACR Electronics Europe GmbH**
Anschrift: address	Handelskai 388 / Top 632 A-1020 Vienna, Austria
Ort, Datum: place, date	Vienna, 2006-07-12
Unterschrift: signature	 Andreas Lesch Chief Technology Officer

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, ist jedoch keine Zusicherung von Eigenschaften.
Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten.
This declaration certifies the compliance with the indicated directives but implies no warranty of properties.
The safety instructions of the accompanying product documentation shall be observed.

ISO 9001:2000 Zertifizierung / ISO 9001:2000 Certification
ACR Electronics Europe GmbH hat ein Qualitätsmanagement System nach ISO 9001:2000 implementiert, und ist seit Juli 2003 ISO-zertifiziert.
ACR Electronics Europe GmbH maintains a Quality Management System according to ISO 9001:2000, and received ISO certification in July 2003.

Konformitätserklärung
Declaration of Conformity

Diese Konformitätserklärung bestätigt, dass das unten benannte Zubehör gleich oder besser dem im untenstehenden Zertifikat ausgewiesenen Zubehör ist.
This declaration of conformity certifies that the mentioned accessory is equal or better to the equipment stated in the beyond Certificate.

Produktbezeichnung: **name of product**	**Nauticast (Automatic Identification System)**

OEM Name: Trade Name	X-Pack DS, RM808AIS, GlobalWatch UAIS, Bridgemate AIS

Zertifikate der benannten Stelle: Certificates from the notified Body	EC Type Examination (Module B) Certificate BSH/6412/4320296/06 EC Quality System (Module D) Certificate BSH-051-05-2004/3

Spezifizierte Standards: Specified Standard(s)	IMO MSC.74(69) Annex 3 ITU-R M.1371-1 (Class A) IALA Technical Clarifications of Rec. ITU-R M.1371-1 ITU-R M.825-3 ITU-R M1084-3 IEC 61993-2 (2002) IEC 61162-1 (2000), -2 (1998) IEC 60945 (1996) IEC 61108-1 (1996)

Zubehörtyp : Type of Accessory	**Combined GPS/VHF Antenna** Comrod AC17 combined GPS/VHF Antenna + Splitter (in Cable integrated)
Nauticast Part.No.: Einschränkungen / Hinweise : Restrictions / Comments	**NAU-B 620 / 2624** verlegte Kabellänge < 40 m installed Cable length < 40m

Dokument- Nr.: document-no :	**2006-05**
Hersteller: Manufacturer	**ACR Electronics Europe GmbH**
Anschrift: address	Handelskai 388 / Top 632 A-1020 Vienna, Austria
Ort, Datum: place, date	Vienna, 2006-07-12
Unterschrift: signature	 Andreas Lesch Chief Technology Officer

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, ist jedoch keine Zusicherung von Eigenschaften.
Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten.
This declaration certifies the compliance with the indicated directives but implies no warranty of properties.
The safety instructions of the accompanying product documentation shall be observed.

ISO 9001:2000 Zertifizierung / ISO 9001:2000 Certification
ACR Electronics Europe GmbH hat ein Qualitätsmanagement System nach ISO 9001:2000 implementiert, und ist seit Juli 2003 ISO-zertifiziert.
ACR Electronics Europe GmbH maintains a Quality Management System according to ISO 9001:2000, and received ISO certification in July 2003.

Konformitätserklärung
Declaration of Conformity

Diese Konformitätserklärung bestätigt, dass das unten benannte Zubehör gleich oder besser dem im untenstehenden Zertifikat ausgewiesenen Zubehör ist.
This declaration of conformity certifies that the mentioned accessory is equal or better to the equipment stated in the beyond Certificate.

Produktbezeichnung: **name of product**	**Nauticast (Automatic Identification System)**

OEM Name: Trade Name	X-Pack DS, RM808AIS, GlobalWatch UAIS, Bridgemate AIS

Zertifikate der benannten Stelle: Certificates from the notified Body	EC Type Examination (Module B) Certificate BSH/6412/4320296/06 EC Quality System (Module D) Certificate BSH-051-05-2004/3

Spezifizierte Standards: Specified Standard(s)	IMO MSC.74(69) Annex 3 ITU-R M.1371-1 (Class A) IALA Technical Clarifications of Rec. ITU-R M.1371-1 ITU-R M.825-3 ITU-R M1084-3 IEC 61993-2 (2002) IEC 61162-1 (2000), -2 (1998) IEC 60945 (1996) IEC 61108-1 (1996)

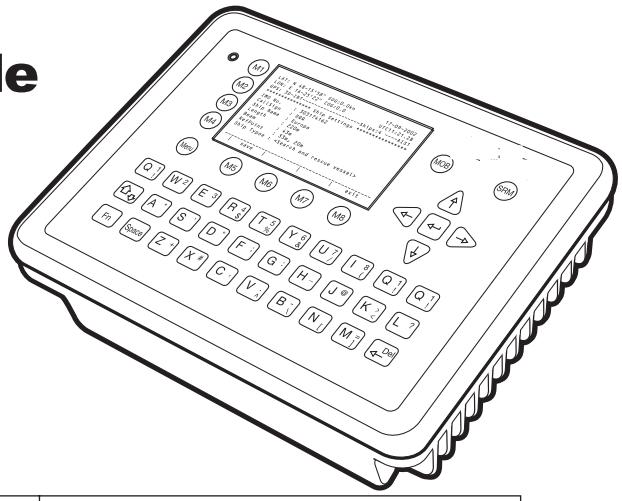
Zubehörtyp : Type of Accessory	**VHF Antenna** **Comrod AV-7**
Nauticast Part.No.: Einschränkungen / Hinweise : Restrictions / Comments	**NAU-B 611 / 2621** verlegte Kabellänge < 40 m installed Cable length < 40m

Dokument- Nr.: document-no :	**2006-04**
Hersteller: Manufacturer	**ACR Electronics Europe GmbH**
Anschrift: address	Handelskai 388 / Top 632 A-1020 Vienna, Austria
Ort, Datum: place, date	Vienna, 2006-07-12
Unterschrift: signature	 Andreas Lesch Chief Technology Officer

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, ist jedoch keine Zusicherung von Eigenschaften.
Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten.
This declaration certifies the compliance with the indicated directives but implies no warranty of properties.
The safety instructions of the accompanying product documentation shall be observed.

ISO 9001:2000 Zertifizierung / ISO 9001:2000 Certification
ACR Electronics Europe GmbH hat ein Qualitätsmanagement System nach ISO 9001:2000 implementiert, und ist seit Juli 2003 ISO-zertifiziert.
ACR Electronics Europe GmbH maintains a Quality Management System according to ISO 9001:2000, and received ISO certification in July 2003.

Quick Replacement Guide



1. Prepare the following tools:

Screwdrivers, spanners
User Password: your personal password
*(factory default setting is '**NAUT**')*

2. Read out your Transponder configuration

Steps to do this:

Press	**Menu**	
Press	**2**	*2.AIS Status*
Press	**2**	*2.Own Ship Data*

Write down the current configuration settings here:

IMO No. :		Dest :	
ShipName :		EAT :	
ShipType :		MMSI :	
Length :		CS :	
Cargo :		Beam :	
Draught :			

Press	**Menu**	
Press	**4**	*4.Ship Settings*
Password	**[UserPassword] [Enter↵]**	

Write down the current configuration settings here:

RefPtExt:	A		B		C		D		RefPtInt:	A		B		C		D	

Press	**Menu**	
Press	**5**	*5.Transponder Configuration*
Password	**[UserPassword] [Enter↵]**	
Press	**5**	*5.Sensor Settings*

Write down the current configuration settings here:

BaudRate Sensor1:	
BaudRate Sensor2:	
BaudRate Sensor3:	

Press	**M8**	*Back*

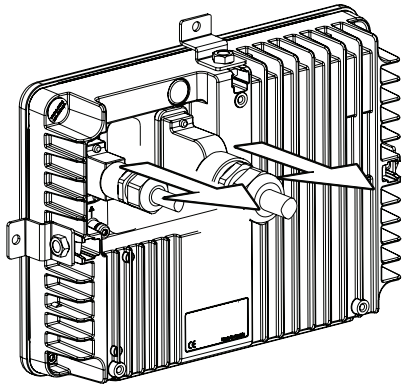
3. Detach the device

3.1. Bracket Mounting
3.2. Frame Mounting

4. Disconnect cables

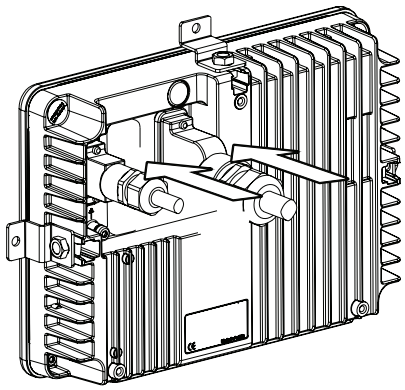
4.1. AIS-Cable to unscrew
4.2. VHF/GPS Cable to unscrew

5. Unpack the new Transponder



6. Connect cables

6.1. AIS-Cable to screw on
6.2. VHF/GPS Cable to screw on



7. Mount the replacement unit

7.1. Bracket Mounting
7.2. Frame Mounting

8. Key in the configuration settings from above:

Following steps to key in the Configuration

Press	**Menu**	
Press	**6**	*6.Service Configuration*
Password	**NAUT [Enter↵]**	*(Default Factory Password)*
Press	**3**	*3.Change MMSI / IMO*

Key in the configuration data from your list: (see page 1)

MMSI:	IMO No:

Press	**M5**	*Save*
Press	**Menu**	
Press	**4**	*4.Ship Settings*
Password	**NAUT [Enter↵]**	*(Default Factory Password)*

Key in the configuration data from your list: (see page 1)

CallSign:	ShipName:	Length:	Beam:	RefPtExt: AxxCxx*	RefPtInt: AxxCxx*	ShipType:

*(B and D are calculated by the AIS)

Press	**Menu**	
Press	**5**	*5.Transponder Configuration*
Password	**NAUT [Enter↵]**	*(Default Factory Password)*
Press	**5**	*5.Sensor Settings*

Key in the configuration data from your list: (see page 1)

BaudRate Sensor1:	BaudRate Sensor2:	BaudRate Sensor3:

Press	**M5**	*Save*

9. Check the functionality

Press	**M2**	*You should see correct values for LAT, LON, SOG, COG, and Time*
Press	**M2**	*You should see your Own Ship Data as noted down before.*

9.1. Change your User Password

Press	**Menu**	
Press	**6**	*6.Service Configuration*
Password	**NAUT [Enter↵]**	*(Default Factory Password)*
Press	**2**	*2.User Password Settings*
Press	**1**	*1.Change User Password*
Enter	**[new password]**	
Repeat	**[new password]**	
Press	**M5**	*Save*