

PRODUCT MANUAL

NAUTICAST A2

Class-A SOLAS/Inland AIS Transponder

Art. No. 1001001



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GENERAL WARNINGS

All marine Automatic Identification System (AIS) units utilize a satellite based system such as the Global Positioning Satellite (GPS) network or the Global Navigation Satellite System (GLONASS) network to determine their position. The accuracy of these networks is variable and is affected by factors such as the antenna positioning, the number of satellites that are available to determine a position and how long satellite information has been received for. It is desirable wherever possible to verify both your vessel's AIS derived position data and other vessels' AIS derived position data with visual or radar based observations.

In most countries the operation of an AIS unit is included under the vessel's marine VHF license provisions. The vessel onto which the AIS unit is to be installed must therefore possess a valid VHF radiotelephone license which lists the AIS system and the vessel Call Sign and MMSI number. Please contact the relevant authority in your country for more information.

LIMITED WARRANTY

This product is warranted against factory defect in material and workmanship for a period of 24 months from the date of purchase. During the warranty period Nauticast GmbH will repair or at its option, replace the product at no cost to the buyer provided that a return authorization is obtained from Nauticast GmbH, Lützowgasse 12-14 / 3. OG, 1140 Vienna, Austria (see Section Contact & Support information). This warranty does not apply if the product has been damaged by accident or misuse, or as a result of service or modification by unauthorized service personnel. For authorized service partners see our homepage www.nauticast.com or contact Nauticast support directly. Warranty and certification void if device is opened.

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History of Changes

Date	Version	Status	Comments	Responsible
2013-07-15	1.2	Release	First Official Release	Ch. Aschl
2014-01-28	1.3	Release	Changes due to SW update	Ch. Aschl
2014-09-30	2.0	Release	Nauticast, Certification, general rework	V. Janik
2015-06-30	2.1	Release	Updated Certificates, junction box info added	Ch. Aschl
2015-09-10	2.2	Release	Updated Inland documentation for new standard	Ch. Aschl

Software dependencies

This revision of the Manual is valid for the Software version (s) below stated and future versions unless otherwise noted. Please find further information on the Nauticast homepage (www.nauticast.com).

Date	AIS software Version	Status	Comments	Responsible
2014-09-07	1.1.14	Release	Type approved	V. Janik

Current software version can always be verified in the S/W info dialog as described in section 4.23.

Safety Instructions

Note the following compass safe distances:

Equipment	Standard magnetic compass	Steering magnetic compass
Nauticast A2 Transponder	0.60 m	0.45 m
GPS antenna AT575-68	0.30 m	0.30 m
GPS antenna MA-700	0.65 m	0.50 m
Combined VHF/GPS	0.65 m	0.50 m

Disposal Instructions

Broken or unwanted electrical or electronic equipment parts shall be classified and handled as 'Electronic Waste'. Improper disposal may be harmful to the environment and human health. Please refer to your local waste authority for information on return and collection systems in your area.

Contact Information

For installation, service, ordering info and technical support please contact your local Nauticast service partner. A list of dealers and service stations can be found on our website <http://www.nauticast.com>.

1 General Introduction

1.1 Description of AIS

AIS stands for: "Automatic Identification System"

What is AIS?

According to IALA regulations, AIS is defined as follows:

AIS is a broadcast transponder system, operating in the VHF maritime mobile Band (161,975 and 162,025 MHz). It is capable of sending ship information such as identification, position, course, speed and more to other ships and to shore stations. 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 operation.

The Modules of an AIS are:

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

Appropriate application software connects the individual modules.

In which modes do AIS operate?

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

Types of AIS:

- Class A Transponder – This type of transponder is used on open sea waters and is mandatory for ships of 300 gross tonnage or more on international voyages, all cargo ships of 500 gross tonnage or more and on passenger ships.
- Class B Transponder – Used on smaller vessels and pleasure crafts. It transmits with less power than class A transponders and has a lower priority ranking on the data link.
- Base Station – Fixed shore station that is typically connected to an AIS network to collect information from all vessels around a certain port or shore line.
- Repeater Stations – Used to extend the coverage range by repeating incoming messages. Can be implemented as a function in an AIS Base station or an AtoN station.
- SAR (Search and Rescue) Transponder – Used on airplanes and helicopters in search and rescue missions.
- AtoN (Aids to Navigation) – A transceiver that is fitted on buoys and lighthouses in order to send information about their positions.
- Inland AIS – A European standardized extension to Class A systems for use on inland water ways. An inland transponder has additional messages to communicate with bridges, ports and locks and can also send some additional information that are useful on water ways such as blue sign indication, specific hazardous cargo etc.
- SART (Search and Rescue Transmitters) – Distress beacons for life rafts. An active SART signal will always be sorted at the top of the target list to highlight its presence.

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.

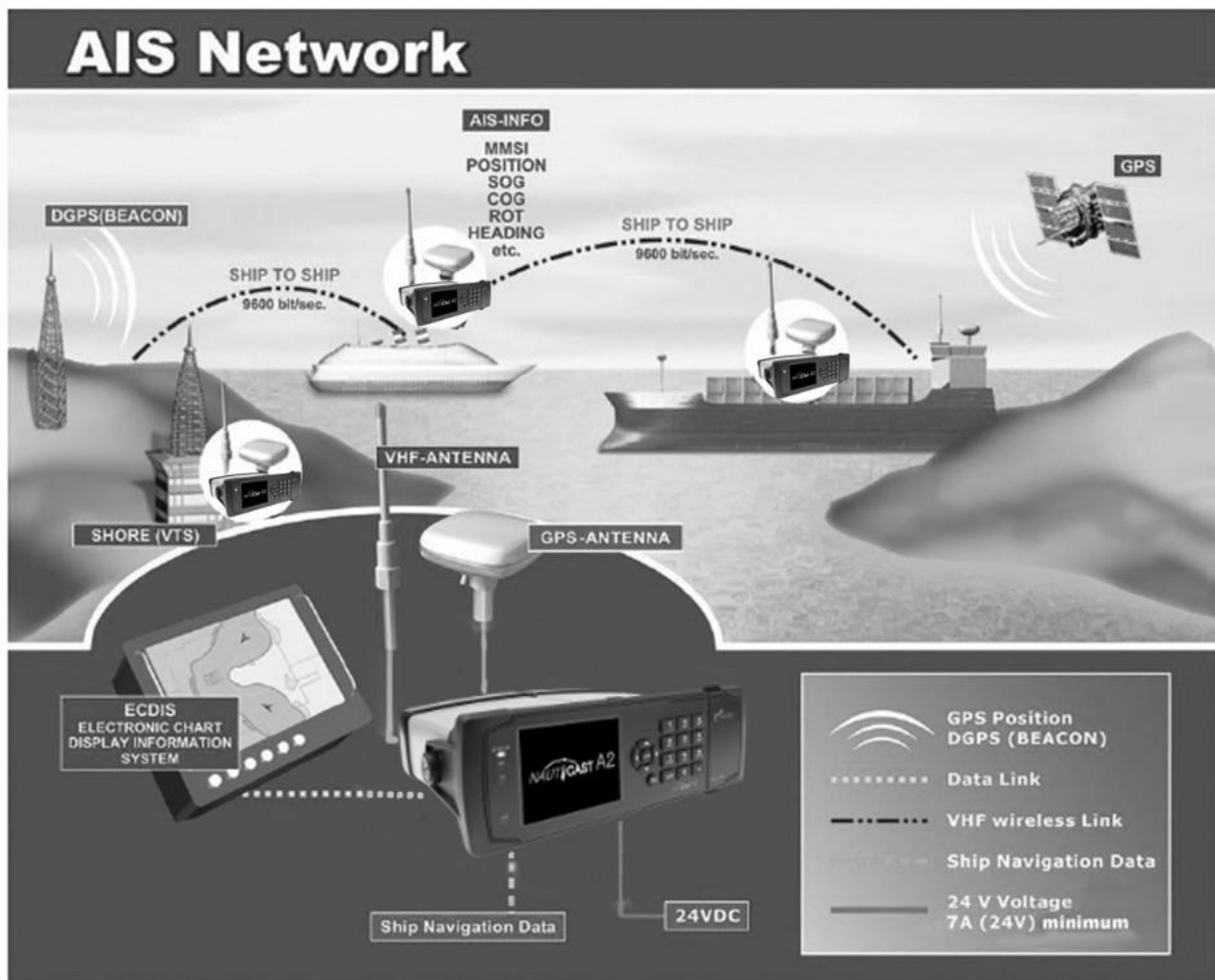


Figure 1 – AIS System

Both vessels in the above illustration are equipped with a NAUTICAST A2 (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.

On the next page, a typical NAUTICAST A2 installation in a common environment is shown. The NAUTICAST A2 is connected to the vessel's emergency power supply, and in connection with the VHF, and GPS-Antennas, the minimal requirements for transponder operation are fulfilled. By means of standardized messages the involved AIS systems exchange certain static data and dynamic information, such as the location and the course of the other ships in the area.

1.2 AIS Networks

The illustration below shows a full AIS covered area (including applications and shore infrastructure).

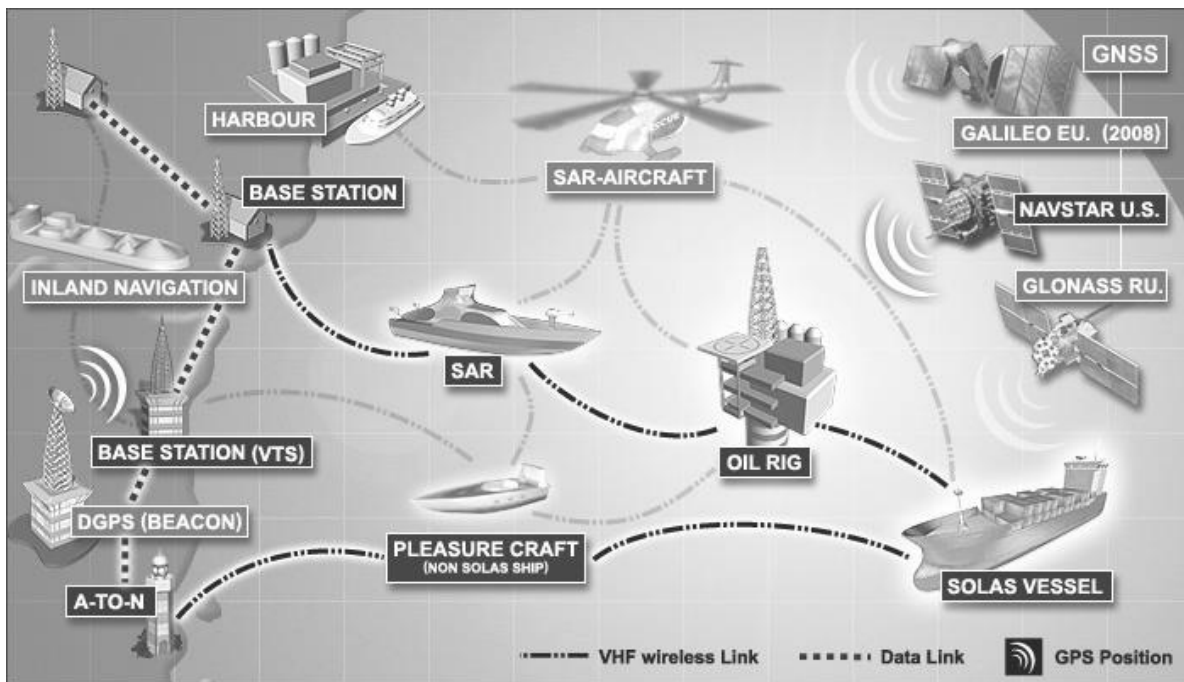


Figure 2 – AIS Network

1.3 Inland AIS

The AIS Inland Standard is an European extension to class A devices for use on inland waterways. AIS Inland transponders support additional messages for communication with Bridges, Ports and locks. Blue Sign or dangerous cargo messages can also be transmitted.

Note:

The NAUTICAST A2 AIS can operate in both modes, standard (SOLAS) class A and Inland, depending on the user's needs.

2 System Overview

2.1 Product Description

The NAUTICAST A2 System consists of a transceiver radio unit, a GPS receiver, a controller unit and a colour LCD with a numerical keypad. The radio has three receivers, two tuneable TDMA receivers and one DSC receiver. The transmitter alternates its transmissions between the two operating TDMA. The controller unit creates and schedules data packets (containing dynamic, static and voyage related data) for transmission based on the IMO performance standard for AIS.

The NAUTICAST A2 shall be connected to the ship's sensors as required by the installation guidelines published by IALA. The NAUTICAST A2 can interface external navigation and presentation systems that support required IEC 61162-1 sentences. Refer to chapter 8 for more information. The NAUTICAST A2 is prepared for connection to Long Range systems like Inmarsat C.

The colour LCD and numerical keypad provides a graphical user-friendly interface to the system. It is possible to plot the location of other vessels, aids to navigation and search and rescue vessels. The LCD and numerical keypad can also be used to send and receive messages, perform configuration as well as supervise the systems status.

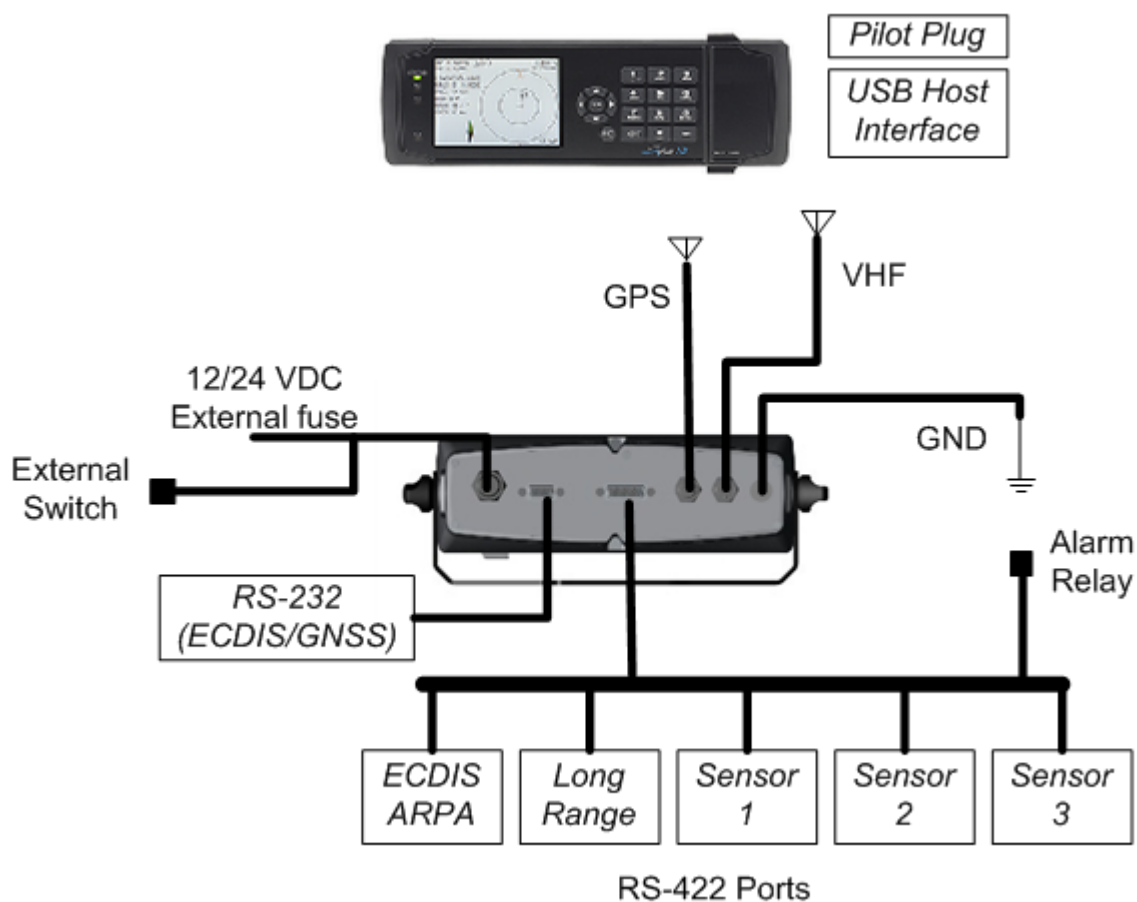


Figure 3 – System Overview

2.2 Main features

- Multi-colour 3.5" LCD with numerical keypad interface.
- USB Host interface for connection of USB keyboard and USB flash memories.
- Individual visual display settings for day and night operations.
- Broadcast of Dynamic, Static and Voyage related information.
- Standardized interface for connection to ship sensors e.g. GNSS, Gyro, Rate of Turn Indicator, ECDIS/ECS and ARPA.
- Plot capable of presenting up to 500 targets in the vicinity of the own ship.
- Messaging views for generation and presentation of safety related messages and text messages.
- Pilot plug integrated to the front of the transponder unit.
- Channel management capability for areas without access to the worldwide allocated AIS frequencies.
- Possibility to generate Long Range AIS reply over satcom equipment such as Inmarsat C.
- In addition to the normal high (12,5W) and low (1W) power mode, the NAUTICAST A2 has a 1W tanker mode in accordance with requirements for tanker operations in port.
- Reception and processing of AIS messages 18,19 and 24A/B as transmitted by AIS Class B 'CS' Transponders.
- Easily upgraded with the latest software release from Nauticast using USB memory.
- Save/Restore configuration using USB Storage.

3 Installation

IMPORTANT: AUTHORITIES MANDATE that after the physical installation has been successfully completed, all ship data and settings be entered into the AIS transponder. See Section 4 for further instructions.

3.1 Installation Requirements

General Requirements:

Please note that international conventions, regulations, instructions and guidelines have to be followed when installing the NAUTICAST A2.

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 A2 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 sections 3.5 and 3.6)
- All available interfaces must be installed.
- The vessels power supply must suffice, and the GNDSS power supply has to be used.
- Installation of the pilot plug in conning position (close to the pilot's work place).

3.2 Installation Overview

Basic Equipment:

Name	Part number	Qty.
NAUTICAST A2 AIS Transponder SOLAS Class A & Inland AIS	1001001	1
Power Cable 2m	1001002	1
Nauticast A2 Installation Guide	1001001-3	1
Nauticast A2 Operating Instructions	1001001-6	1
Nauticast A2 Documentation on USB drive	1001001-1	1

Table 1 – NAUTICAST A2 Basic Equipment

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 A2 consists of one unit, which integrates all necessary modules.

Step-by-Step Installation Procedure:

When installing the NAUTICAST A2, it is recommended to follow the steps described in this manual. Details of the installation procedure can be found in the coming sections.

Recommended installation steps:

1. Mount the NAUTICAST A2 at conning station
2. Mount the junction box (if used)
3. Mount the alarm relay unit (if available)
4. Mount the VHF antenna
5. Mount the GPS antenna
6. Connect antennas, all external systems and sensors to the NAUTICAST A2
7. Power up the system
8. Set configuration parameters
9. Perform system functional check

3.3 Mounting the NAUTICAST A2

3.3.1 Location

The NAUTICAST A2 should be mounted close to the position from which the ship is normally operated, preferably on the bridge console close to the conning position.

When mounting the NAUTICAST A2, please consider the following:

- The NAUTICAST A2 shall be connected to ship ground using the earth terminal found on the rear plate.
- The temperature and humidity should be moderate and stable at the place of mounting, +15°C to +35°C (Operating temperature: -15°C to +55°C.)
- Select a location away from excessive heat sources
- Ensure that there is enough airflow to avoid high ambient temperatures
- Avoid areas where there is a high flow of humid salt air
- Avoid places with high levels of vibrations and shocks
- Avoid mounting the NAUTICAST A2 in direct sunlight for the best readability
- Ensure that the cables can be connected without violating their minimum bending radius
- The unit can affect magnetic compasses. The minimum compass safe distance is 0.60 meters to a standard magnetic compass and 0.45 meters to a steering magnetic compass

Regarding the physical size please see the Appendix A – Drawings containing all mechanical drawings.

3.4 Mount the junction box (optional equipment)

1. Find a suitable location for the junction box. The signal cable (Art. No. 1001013) connecting the transponder to the junction box is normally 2m long hence this is the maximum distance between the junction box and the transponder unit. If space is limited, the cable glands may be removed. If the glands are removed make sure all cables are properly fastened using cable ties internally.
2. Open the lid of the junction box. This is done with a 3mm HEX key.
3. Fix the box on an appropriate surface/place. Use the four screw holes that are located on the feet of the junction box.
4. Pull the cables through suitable anti-vibration glands. These glands are located on the front and back of the junction box. Please note that the glands can be removed if the cables are too thick. With the glands mounted, the maximum supported cable diameter is 15mm. Without the glands mounted, the maximum supported cable diameter is 19.5mm.
5. Shielded cables should be stripped down to the shielding and fastened with cable ties (not included). There are eleven cable tie fastening points on the circuit board, one for every anti-vibration gland on the junction box. Make sure that the cable shielding touches the tin plated area at the fastening point. The maximum supported cable tie width is 4.5mm.
6. Tighten the anti-vibration glands so that the cables are secured.
7. Connect the cables to the terminal blocks.
8. Fix the lid to the box casing.

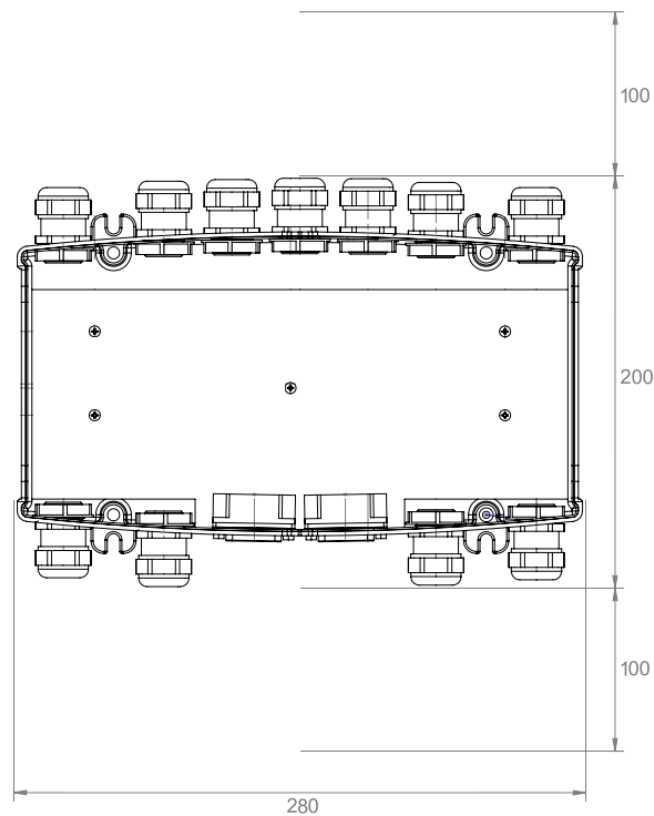


Figure 4 – Recommended clearance area

3.4.1 Junction box connections

Figure 5 shows how the NAUTICAST A2 system can be connected to the junction box using the NAUTICAST A2 cable "A2 - connection box 2m D-D" (Art. No. 1001013).

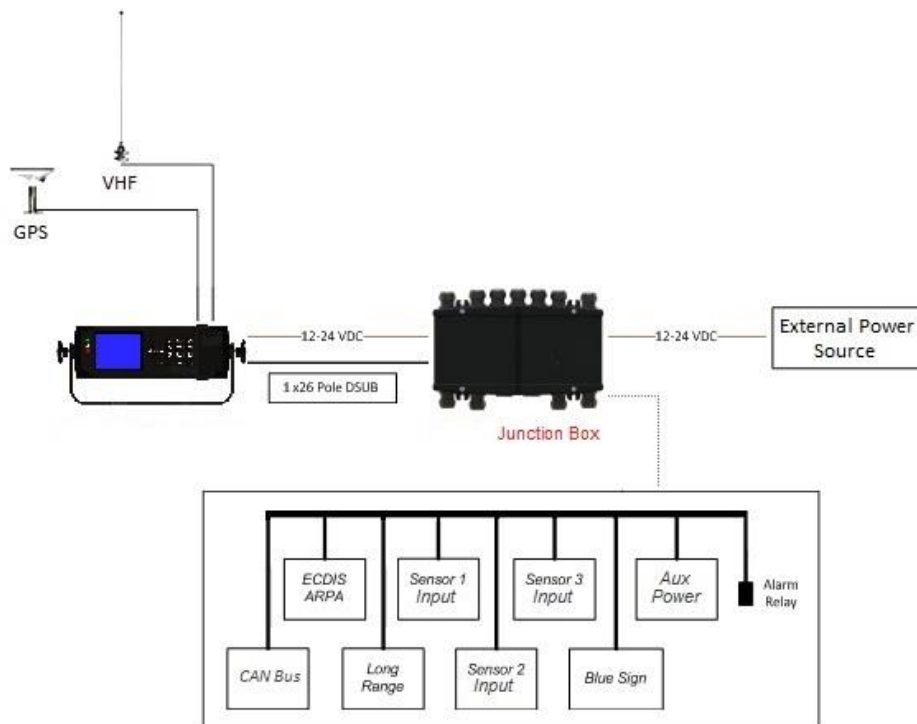


Figure 5 – Junction box connections

3.4.2 Junction box internals

The junction box can be used with both the NAUTICAST A2 and other AIS transponders. However, the NAUTICAST A2 has a reduced number of input and output ports and will therefore not use all terminals

available in the junction box.

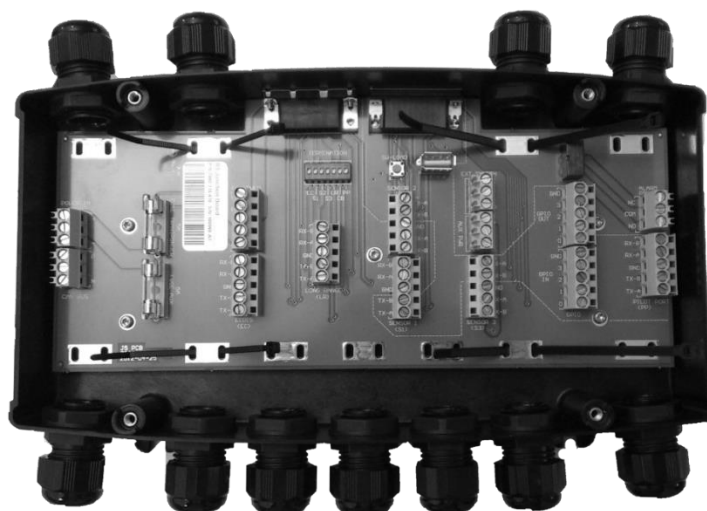


Figure 6 –Junction box without cover

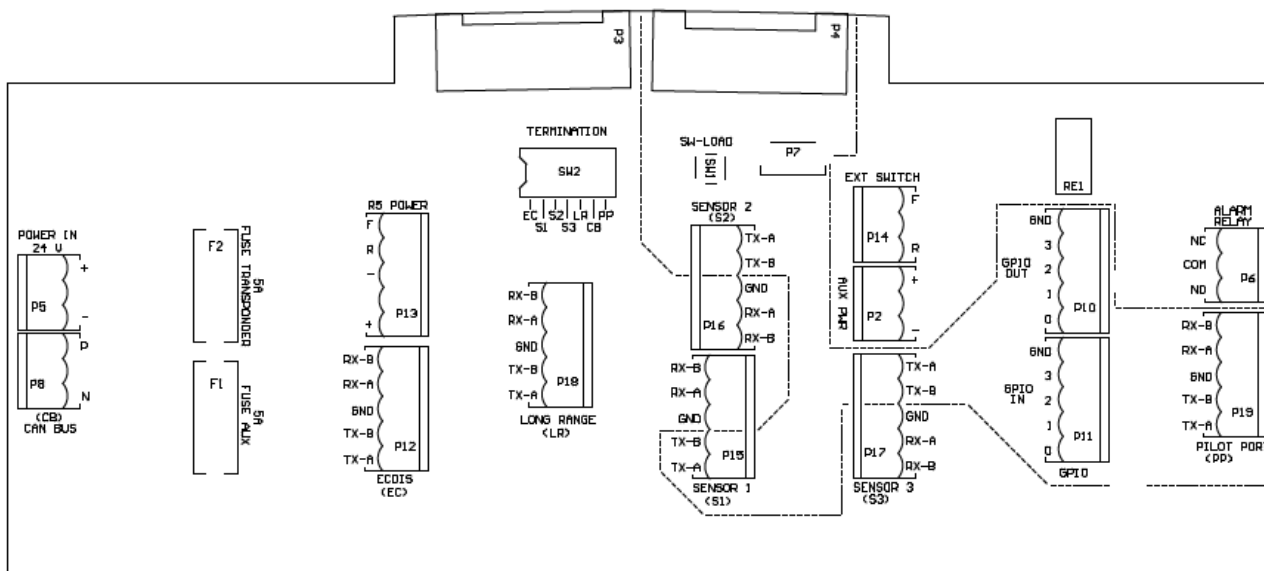


Figure 7– Circuit Board Layout and markings

The table below details all the screw terminal connections when connected to a NAUTICAST A2 transponder.

Note: OUT means signal FROM transponder. IN means signal TO transponder.

Terminal Marking	Pin Marking	Signal	Connects to
AUX PWR	+	Ext Power In by AUX PWR FUSE	Not used for NAUTICAST A2
	-	Power In -	Not used for NAUTICAST A2
POWER IN	+	Ext Power In +	External power source
	-	Ext Power In -	External power source
ALARM RELAY	NC	Alarm Relay NC	Junction box Alarm relay
	COM	Alarm Relay COM	Junction box Alarm relay
	NO	Alarm Relay NO	Junction box Alarm relay
CAN BUS	P	CAN Bus P	Not used for NAUTICAST A2
	N	CAN Bus N	Not used for NAUTICAST A2

GPIO OUT	0	GPIO OUT 0	Not used for NAUTICAST A2
	1	GPIO OUT 1	Not used for NAUTICAST A2
	2	GPIO OUT 2	Not used for NAUTICAST A2
	3	GPIO OUT 3	Not used for NAUTICAST A2
	GND	GPIO OUT GND	Not used for NAUTICAST A2
GPIO IN	0	GPIO IN 0	Not used for NAUTICAST A2
	1	GPIO IN 1	Not used for NAUTICAST A2
	2	GPIO IN 2	Not used for NAUTICAST A2
	3	GPIO IN 3	Not used for NAUTICAST A2
	GND	GPIO IN GND	Not used for NAUTICAST A2
ECDIS	TX-A	ECDIS TX-A	RS422 Pin 2
	TX-B	ECDIS TX-B	RS422 Pin 1
	GND	ECDIS GND	RS422 Pin 10
	RX-A	ECDIS RX-A	RS422 Pin 12
	RX-B	ECDIS RX-B	RS422 Pin 11
POWER	+	Power +	Power Cable Red
	-	Power -	Power Cable Black
	R	Power R	Power Cable Brown
	F	Power F	Power Cable Orange
EXT SWITCH	F	Ext Switch F	Terminal power F
	R	Ext Switch R	Terminal power R
SENSOR 1	TX-A	Sensor 1 TX-A	Not used for NAUTICAST A2
	TX-B	Sensor 1 TX-B	Not used for NAUTICAST A2
	GND	Sensor 1 GND	RS422 Pin 13
	RX-A	Sensor 1 RX-A	RS422 Pin 4
	RX-B	Sensor 1 RX-B	RS422 Pin 3
SENSOR 2	TX-A	Sensor 2 TX-A	Not used for NAUTICAST A2
	TX-B	Sensor 2 TX-B	Not used for NAUTICAST A2
	GND	Sensor 2 GND	RS422 Pin 14
	RX-A	Sensor 2 RX-A	RS422 Pin 6
	RX-B	Sensor 2 RX-B	RS422 Pin 5
SENSOR 3	TX-A	Sensor 3 TX-A	Not used for NAUTICAST A2
	TX-B	Sensor 3 TX-B	Not used for NAUTICAST A2
	GND	Sensor 3 GND	RS422 Pin 23
	RX-A	Sensor 3 RX-A	RS422 Pin 16
	RX-B	Sensor 3 RX-B	RS422 Pin 15
LONG RANGE	TX-A	Long Range TX-A	RS422 Pin 18
	TX-B	Long Range TX-B	RS422 Pin 17
	GND	Long Range GND	RS422 Pin 9
	RX-A	Long Range RX-A	RS422 Pin 8
	RX-B	Long Range RX-B	RS422 Pin 7
PILOT PORT	TX-A	Pilot Port TX-A	Not used for NAUTICAST A2
	TX-B	Pilot Port TX-B	Not used for NAUTICAST A2
	GND	Pilot Port GND	Not used for NAUTICAST A2
	RX-A	Pilot Port RX-A	Not used for NAUTICAST A2
	RX-B	Pilot Port RX-B	Not used for NAUTICAST A2

Table 2 - Screw terminals

For signal description see Table 9 and for serial port default baud rates see Table 7

Below table details additional components in the Junction box

Item	Description
SW2	Termination Switches for ECDIS, Sensor 1, Sensor 2, Sensor 3, Long Range, CAN Bus and Pilot Port
SW1	Push-button for Software Load - Not used for NAUTICAST A2
P3	D-SUB Connector for cable connected to transponder port RS422
P4	D-SUB Connector for Signal Cable connected to transponder port I/O - - Not used for NAUTICAST A2
P7	USB connector for Software Upgrade of Transponder -- Not used for NAUTICAST A2
F1	5A fuse for AUX PWR -- Not used for NAUTICAST A2
F2	5A fuse for POWER

Table 3 - Additional Junction box components

3.5 Mount the NAUTICAST A2 VHF antenna

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.

3.5.1 VHF 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 interference effects, the following guidelines apply:

- The AIS VHF antenna should have omnidirectional vertical polarization.
- 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.

3.5.2 VHF Cabling

The cable should be kept as short as possible to minimize attenuation of the signal. Double shielded coaxial cable equal or better than RG214 is recommended to minimize the effects from electromagnetic interference from high power lines, radar or other radio transmitter cables.

The table below gives recommendation on cables that can be used for the VHF-antenna connections, the cables used should always be of marine approved type. The cable attenuation shall be kept as low as possible; a 3 dB loss is the same as cutting the signal strength in half.

Type	Attenuation @ 150 MHz (dB/100m)	Ø (mm)	Weight (kg/100m)
------	---------------------------------	--------	------------------

RG 214	7	10.8	18.5
RG 217	5	13.8	30.1
RG 225	8	10.9	23.3

Table 4 – VHF Antenna Cables

Example: A cable of 40 meter RG 214 has a cable attenuation of 2.8 dB.

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.

3.6 Mount the NAUTICAST A2 GPS Antenna

The NAUTICAST A2 shall be connected to a GPS antenna type Procom GPS-4 (1001022), Nauticast Standard GPS antenna (3001002) or to a combined GPS/VHF antenna AC Marine VHF/GPS-2 (1001027). 5V DC is supplied through the antenna lead for the antenna preamplifier.

Please note the Compass Safe Distances in section 6.3 "Transponder Environment".

If the combined AC Marine GPS/VHF antenna is used the diplexer unit shall be installed in an indoor environment.

Attention should be paid to the location and installation of the different antennas on the ship in order to obtain the best possible efficiency. How and where the GPS antenna and cable is installed will greatly affect its sensing efficiency.

3.6.1 GPS 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.

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.

3.6.2 GPS Cabling

The gain of the GPS antenna built-in pre-amplifier shall match the cable attenuation. The resulting installation gain (pre-amplifier gain minus cable attenuation) shall be within 0 to 26 dB. A minimum value of 10 dB is recommended for optimum performance.

A double shielded coaxial cable is recommended. The coaxial cable should be routed directly between the GPS antenna and the NAUTICAST A2 GPS connector in order to reduce electromagnetic interference effects. The cable should not be installed close to high-power lines, such as radar or radio transmitter lines or the AIS VHF antenna cable. A separation of 1 meter or more is recommended to avoid interference due to RF-coupling. Crossing of antenna cables should be done at 90 degrees to minimise magnetic field coupling.

The table below gives recommendation on cables that can be used for the Transponder GPS-antenna connections, the cables used should always be of marine approved type. Due to the high frequency it's important that the attenuation in the cable is low for the specific frequency (1.5 GHz).

Type	Attenuation @ 1.5 GHz (dB/m)	Ø (mm)	Weight (kg/100m)
RG 58	0.9	5	3.7
RG 400	0.6	4.95	6.3
RG 223	0.6	5.40	5.5
RG 214	0.35	10.8	18.5
RG 225	0.3	10.9	23.3

Table 5 – GPS Antenna Cables

For optimum performance approximately +10dB gain should be available when the cable attenuation has been subtracted from the GPS-antenna preamplifier gain. The net gain shall not exceed +26dB.

Example:

Cable type	Preamplifier gain (dB)	Required min cable length (m)	Recommended max. cable length (m)
RG 58	12	0	2
RG 58	26	0	18
RG 58	30	4.5	22
RG 223	12	0	3.5
RG 223	26	0	26.5
RG 223	30	6.5	33.5
RG 214	12	0	6
RG 214	26	0	46
RG 214	30	11.5	57

Table 6 – GPS Antenna Cable Examples

Min length = (Preamp. Gain – 26 dB)/Cable attenuation per meter

Max length = (Preamp. Gain – 10 dB)/Cable attenuation per meter

Coaxial cables (marine approved type) should be installed in separate signal cable channels/tubes and at least 10 cm away from power supply cables. Crossing of cables should be done at right angles (90°).

Coaxial cables should not be exposed to sharp bends, which may lead to a change of the characteristic impedance of the cable. The minimum bending radius should be 5 times the cable's diameter.

All outdoor installed connectors should be weather proofed, e.g. with shrink tubing, watertight seal tape or butyl rubber tape and plastic tape sealing, to protect against water penetration into the antenna cable.

Secure the cable properly near the cable ends.

Grounding

Coaxial down-leads must be used. The coaxial shielding screen should be connected to ground at one end.

3.7 Electrical Installation

The protocol of the serial port interfaces is compliant to IEC 61162-1Ed.4 (2010-11).

All serial ports in the NAUTICAST A2 have the same capabilities with one exception, any Long Range equipment must be connected to the Long Range port.

The primary external position sensor should be connected to the Sensor 1 port since this port has the highest priority. The serial ports in the NAUTICAST A2 can also receive differential corrections in RTCM format for correction of the internal GPS receiver. The ports in the NAUTICAST A2 have different default baud rates but they can all be configured to any baud rate of 4800, 9600, 38400, 57600 or 115200 bps. The priority levels for input of sensor data on the different ports are listed below:

Priority	Identification	Default Baud Rate	Port direction
1 (Highest priority)	Sensor 1	4800 bps	Input (See note 1)
2	Sensor 2	4800 bps	Input
3	Sensor 3	4800 bps	Input
4	ECDIS	38400 bps	Input / Output (See note 2)

5	Long Range	9600 bps	Input / Output (See note 2)
6	Pilot	38400 bps	Input / Output (See note 2)
7 (Lowest priority)	RS-232	38400 bps	Input / Output (See note 2)

Table 7 Port Priorities and Default Baud Rates

NOTE 1: This means that if valid position data from external position sources are input on e.g. both Sensor 1 and ECDIS port, the position data from Sensor 1 will be used.

NOTE 2: Output will be limited if baud rate is below 38400 bps. VDM and VDO messages will not be output.

If the same data is provided using different NMEA sentences on the same port, the priority depends on the sentence in accordance with Table 8.

Priority	Position	COG/SOG	HDG	ROT
1(Highest)	RMC	RMC	THS	ROT
2	GNS	VTG	HDT	-
3	GGA	VBW	OSD	-
4	GLL	OSD	-	-

Table 8 – Sentence priority

3.7.1 Output Drive Capacity for Serial Ports

Each serial port transmitter in the NAUTICAST A2 can have a maximum of 25 listeners consuming 2.0 mA each.

3.7.2 Input Load

Input impedance for each listener input is 6.4 k Ω .

3.7.3 Schematics of a NAUTICAST A2 Serial Transceiver

Each of the RS422 serial interfaces on the NAUTICAST A2 fulfils the requirements of IEC 61162-2 and IEC 61993-2. A detailed schematic of one of the serial ports in the NAUTICAST A2 is shown below.

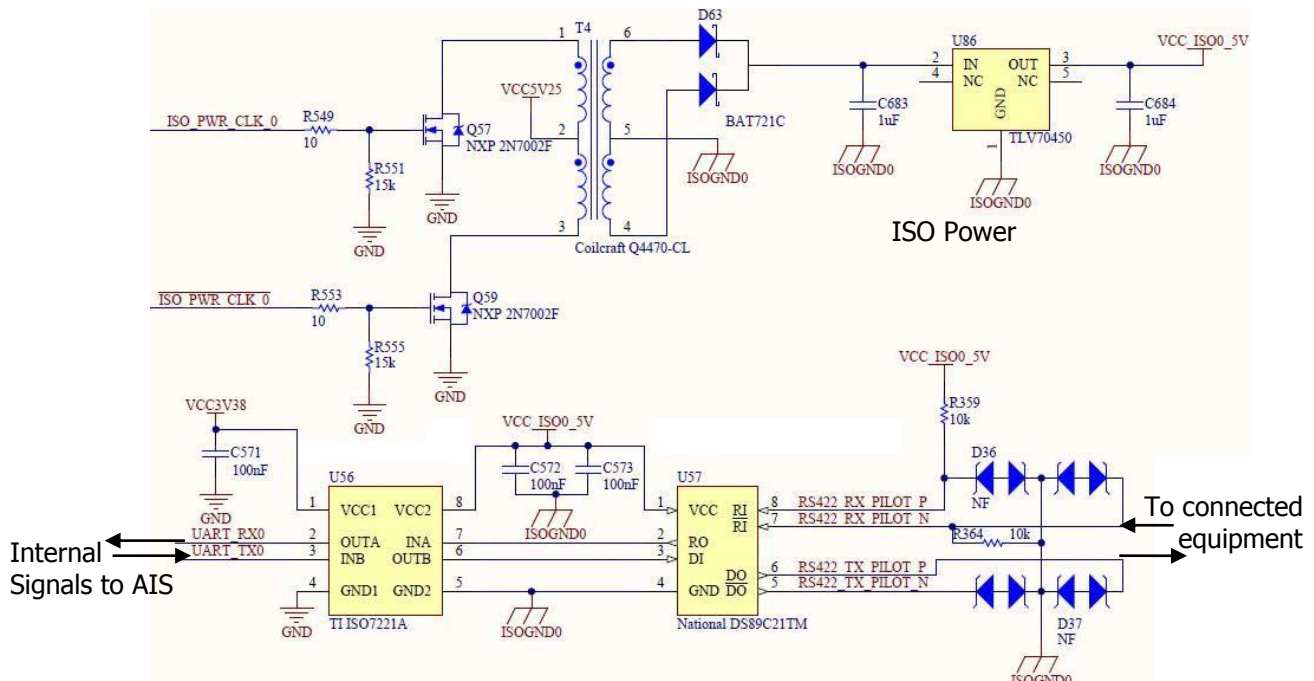


Figure 8 – Serial Port Schematics

3.7.4 Data Interface Cable with open ends, 1001003

Pin	In/Out	Signal Name	Signal Type	Colour
1	Out	ECDIS - TxB (+)	RS422	White
2	Out	ECDIS - TxA (-)	RS422	Brown
3	In	Sensor1 - RxB (+)	RS422	Green
4	In	Sensor1 - RxA (-)	RS422	Yellow
5	In	Sensor2 - RxB (+)	RS422	Grey
6	In	Sensor2 - RxA (-)	RS422	Pink
7	In	Long Range - RxB (+)	RS422	Blue
8	In	Long Range - RxA (-)	RS422	Red
9	-	Long Range - GND	RS422	Black
10	-	ECDIS - GND	RS422	Violet
11	In	ECDIS - RxB (+)	RS422	Grey / Pink
12	In	ECDIS - RxA (-)	RS422	Red / Blue
13	-	Sensor1 - GND	RS422	White / Green
14	-	Sensor2 - GND	RS422	Brown / Green
15	In	Sensor3 - RxB (+)	RS422	White / Yellow
16	In	Sensor3 - RxA (-)	RS422	Yellow / Brown
17	Out	Long Range - TxB (+)	RS422	White / Grey
18	Out	Long Range - TxA (-)	RS422	Grey / Brown
19	-	Alarm Relay - GND	-	White / Pink
20	Out	Alarm Relay - Out	-	Pink / Brown
21	-	GND	-	White / Blue
22	-	-	-	Brown / Blue
23	-	Sensor3 - GND	RS422	White / Red
24	-	Alarm Relay - VCC	-	Brown / Red
25	In/Out	CAN (+)	Differential CAN bus	White/Black
26	In/Out	CAN (-)	Differential CAN bus	Brown/Black

Table 9 – 26-pin High Density D-sub

3.7.5 RS232 Data Cable

Pin	Signal Name
1	Not Connected
2	Tx (Transponder side)
3	Rx (Transponder side)
4	Not Connected
5	GND
6	Not Connected
7	Not Connected
8	Not Connected
9	Not Connected

Table 10 – 9-pin female D-sub

3.7.6 Power Cable, 1001002

Pin	Signal Name	Colour
1	24VDC positive	Red
2	GND	Black
3	External Switch (R)	Brown
4	External Switch (F)	Orange

Table 11 – 4-pin male circular ConXall

3.7.7 Pilot Plug RS-422

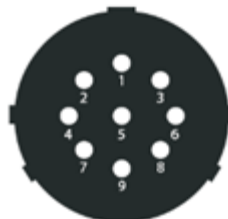


Figure 9– Pilot plug pin numbering

Pin	Signal Name
9	GND
1	TX-A
5	RX-A
4	TX-B
6	RX-B

Table 12– 9-pin pilot plug

3.7.8 External Switch

The Power Cable enables connection of an external switch to the NAUTICAST A2. This switch can be used as a Silent switch or, if configured as an Inland AIS system, as a Blue sign switch.'

3.7.8.1 Blue Sign installation (Inland Mode only)

If the blue sign switch should be used, the parameter "External Switch" must be configured to "Blue Sign" in Misc. Interface view accessed from *Main Menu → Config → Interfaces → Miscellaneous*.

The status of the blue sign can be controlled by input on the brown and orange wires of the Power Cable.

The status of the Blue Sign will be read by the NAUTICAST A2 and output on the VHF data link when operating in "Inland Mode" (see section 0 for more details). Connect the blue sign switch to pin 3 (brown wire) and pin 4 (orange wire) of the Power Cable together with an external parallel resistor. When the switch is open, blue sign will be off. When the switch is closed, blue sign will be on.

The external resistor value depends on the power supply voltage the NAUTICAST A2 is using:

- 12V: 2.2kΩ resistor, 10% tolerance, at least 1/8W power rating
- 24V: 10kΩ resistor, 10% tolerance, at least 1/8W power rating

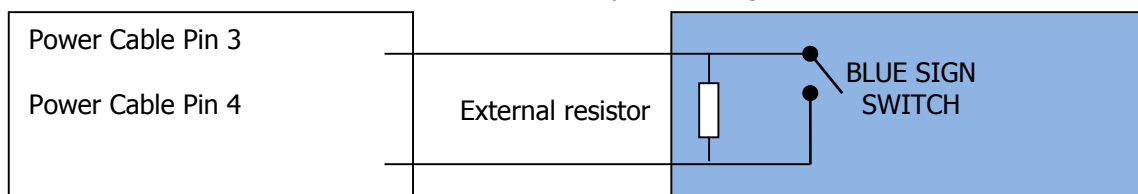


Figure 10 – Blue Sign Switch

3.7.8.2 Silent switch installation

It is possible to connect a silent switch to the NAUTICAST A2 to quickly turn off transmissions.

If a silent switch is to be used, the parameter "External Switch" must be configured to "Silent Switch" in Misc. Interface view accessed from *Main Menu → Config → Interfaces → Miscellaneous*.

The silent switch should be connected in the same way as the blue sign switch. However, the external resistor may be omitted for the silent switch.

When the circuit is closed (brown and orange wires connected with each other), the NAUTICAST A2 will

transmit as normal. When the circuit is open, the NAUTICAST A2 will be completely silent.

3.7.9 Alarm Relay

It is required that the AIS alarm output (relay) is connected to an audible alarm device or the ship's alarm system, if available.

Alternatively, the ship's BIIT alarm system may use the alarm messages output on the AIS Presentation Interface (PI) provided the alarm system is AIS compatible. The AIS Alarm Relay is either mounted directly on a board or on the wall.

The alarm relay wires have the following colour codes in the 26-pole NAUTICAST A2 data interface cable:

RELAY VCC	Brown/Red
RELAY GND	White / Pink
RELAY OUT	Pink / Brown

Table 13 – Alarm Relay Wires

Figure 6 shows the alarm relay and its dimensions and explains how to connect the alarm relay to the data cable and how to connect the load (Alarm Circuit) to the alarm relay. The operating voltage of the alarm relay is 3 to 60 VDC with a load current of 0.1 to 2 A (3A when using a heat sink).

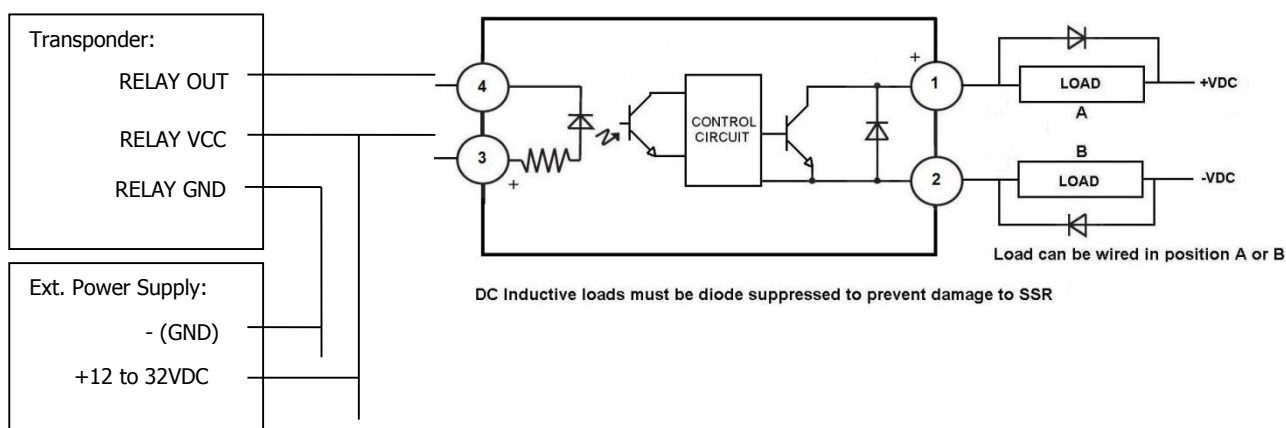
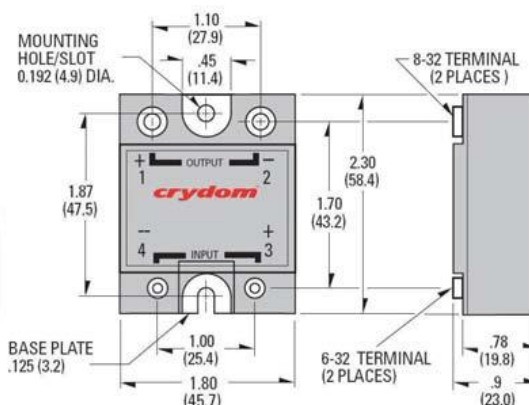


Figure 11 – Alarm Relay

3.8 System Configuration

When the physical and electrical installation of the system is complete, the NAUTICAST A2 needs to be configured. The installer is required to set the parameters listed below. For detailed information about the configuration parameters and how to set them, refer to section 4.2.1 and 4.4.

- MMSI number (Maritime Mobile Service Identity)
- IMO vessel number (should be set to zero for Inland vessels)
- Call Sign
- Ship Name
- Ship Type (Only when operating in Class A mode)
- Height Over Keel
- Ship dimensions and antenna positions. Refer to section 4.4.4 Main Menu → Config → Ship Dimensions for more information.

If the NAUTICAST A2 is operating in Inland mode, the following parameters also need to be configured:

- ENI, Unique European Ship Number
- ERI Ship Type (ERI code and standard AIS ship type will be set automatically by the NAUTICAST A2 when selecting an ERI Ship Type from list in Ship Static view.
- Quality setting for SOG, COG and HDG. Should be set to low if no type approved sensor (e.g. a gyro or speed log) is connected to NAUTICAST A2.

When the NAUTICAST A2 has been installed according to the procedures described in previous sections, it is recommended to make a first functional check of the system. Check the following things to ensure that the NAUTICAST A2 is fully functional.

- Check the Transmitted Own Ship Data view to make sure that the configured data is sent by the NAUTICAST A2 on the VHF link, refer to section 4.10 "View Transmitted Own Ship Information" for more information.
- Make sure that there are no unexpected active alarms in the alarm list, see section 4.18 "Alarms".
- Perform a communication test to ensure that the NAUTICAST A2 can send and receive messages from other AIS transponders. Refer to section 4.25 "Communication Test" for information on how to perform a communication test.

4 Operation

4.1 System Mode

The NAUTICAST A2 can operate in two different system modes, Class A mode and Inland mode. The Class A mode should be used for vessels falling under the carriage requirements of Chapter V of the International Convention for the Safety of Life at Sea (SOLAS).

The Inland mode should be used for vessels travelling on European inland waterways that falls under the carriage requirements of European River Information Services (RIS). When Inland mode is enabled, additional views for ETA/RTA messaging and convoy settings will be enabled. The NAUTICAST A2 will also output binary messages with Inland Static and Voyage data.

As default, the NAUTICAST A2 will operate in Class A mode. It is possible to switch system mode in the System Settings view, see section 0 for more information.

4.2 LED's and Controls

This section describes the controls and status LED's on the front panel of the NAUTICAST A2. It is also possible to connect a USB keyboard via the USB Host interface that can be found under the hatch of the front panel.



Figure 12 –Nauticast A2 Front View

1. STATUS LED (multi-colour)

This LED is constant green when the transponder is operating and no alarms are active. The LED is constant red if there is an active alarm and it is flashing red if there is an unacknowledged alarm.

2. RX LED (yellow)

This LED is flashing yellow when the transponder is receiving a message on the VHF link.

3. TX LED (red)

This LED is flashing red when the transponder is transmitting a message on the VHF link.

4. LIGHT SENSOR

The light sensor will automatically dim the backlight of the display depending on measured input light to the sensor.

5. ARROW KEYPAD and ENTER

The arrow keypad (<> and \updownarrow) is used to navigate in menus, lists and edit fields. The centre button of the keypad is an **ENTER** button which is used to select the highlighted choice in a menu, list or edit control.

6. ESC

The **ESC** button is used to return to the previous screen or to cancel an edit change of a data field.

7. ALPHANUMERIC KEYS

These keys are used for entering text and numbers. To write a number in a numeric field, press the key once. To write a character in a text field, press once for the character associated with the key, twice for the second character and so on. When pressing twice on key "1" when editing a text field, a popup view with special characters appears. Choose the desired special character by using the **ARROW KEYPAD** and **ENTER**.

When a USB keyboard is used, the normal letters, numbers and special characters can be used. Only American keyboard layout is supported.

8. OPT

This button is an "Option key" which is only active in some of the dialogs. When pressed, it gives the user a list of options that can be performed on the highlighted item. In e.g. the Target List view the **OPT** button can be used to send an SRM to the highlighted target. In the Main Menu view, the **OPT** button is used to quickly change navigational status. When a USB keyboard is used, the **ALT** button of the keyboard corresponds to **OPT** button on the NAUTICAST A2 keypad.

If the **OPT** button is pressed for more than 5 seconds, the visual settings in the NAUTICAST A2 will be restored to default, i.e. LCD backlight, LED intensity and button backlight will all be 80% and day mode will be used.

9. BACKSPACE

The **BACKSPACE** button is used to erase the character to the left of the marker in an edit field.

4.2.1 Change Settings of a Parameter

Several of the views in the NAUTICAST A2 contain parameters that can be edited. To edit a parameter, select it by using the **ARROW KEYPAD** and press **ENTER**.

Then enter data in one of the following ways:

- **Numbers:** Press the **ALPHANUMERIC KEY** that corresponds to each digit. To delete a digit, press function key **BACKSPACE**. Some of the parameters are decimal numbers. The **OPT** button can then be used to insert a decimal point.
- **Text:** Press the **ALPHANUMERIC KEY** that corresponds to each character. Press the key once for the first character, twice for the second character and so on. Press the key "**1**" twice to, where allowed, bring up a menu for entering special characters. To delete a character, press function key **BACKSPACE**. When entering passwords both lower and upper case letters can be used. To change between upper and lower case letters, press function key **OPT** and choose "Caps Lock Off" or "Caps Lock On".
- **List of predefined values:** Use the **AV** keys to select between the predefined values.
- **List of predefined values and numeric input:** In some of the views like the AIS Message Send view where it is possible to send an SRM to a target, it is possible to select an MMSI in a list of predefined values. The predefined MMSI values are the MMSI numbers that have been received by the transponder. It is also possible to enter a new MMSI number that has not been received yet. To do this, simply input a numerical value with the **ALPHANUMERIC KEYS**.

Press **ENTER** when done. If desired, use the **ARROW KEYPAD** keys to select a new parameter to be edited, or navigate to the Save/Send button located above the list of parameters and press **ENTER** to save the parameters / send the message.

Use the **ESC** key to undo changes and to return to the previous view.

NOTE: DO NOT TURN OFF TRANSPONDER WITHIN 2 SECONDS OF A PARAMETER CHANGE!

4.3 Main Menu – Tree View

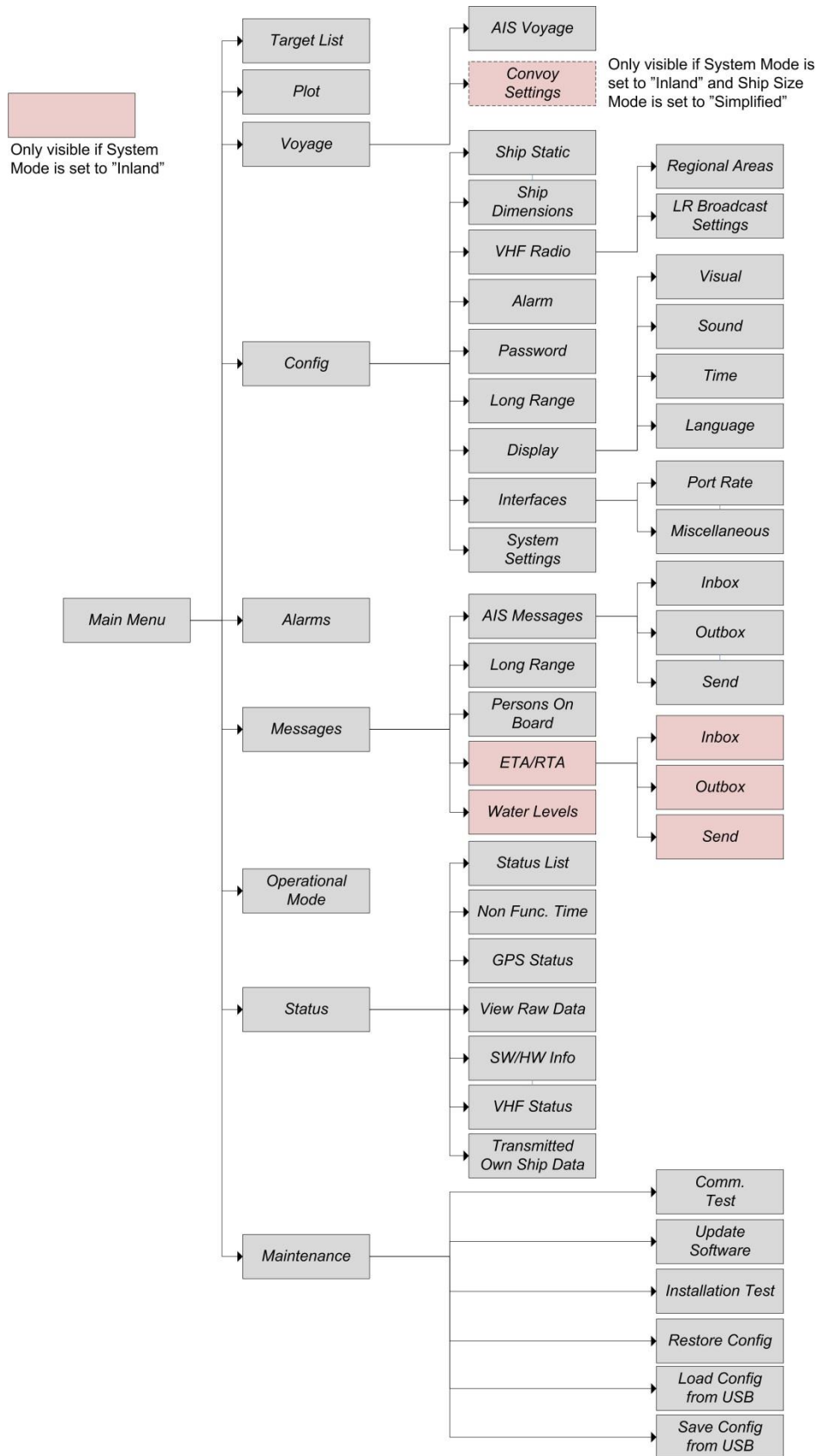


Figure 13 – Menu Tree

4.3.1 Navigating in Menus

Use the **ARROW KEYPAD** buttons **<>** and **↵** to navigate between the view buttons in the different menus. Press the **ENTER** button to enter the currently selected view. It is also possible to directly select a view by pressing the **ALPHANUMERIC KEY** that corresponds to the number in the upper left corner of the view button.

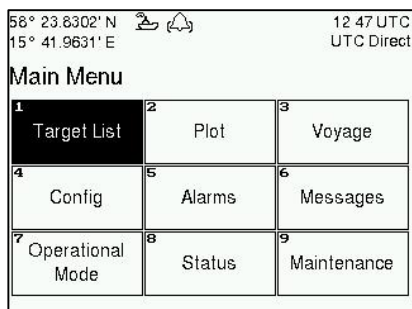


Figure 14 – Main Menu

4.4 Configuration Parameters

This section describes the different configuration parameters that can be set in the NAUTICAST A2. Some of the parameters will only be available when operating in "Class A" mode; these parameters are marked with **light grey**. Parameters that are only available when operating in "Inland" mode are marked with **dark grey**. Common parameters for both system modes are white.

4.4.1 Main Menu → Voyage → AIS Voyage

The parameters in AIS Voyage view are used for input of voyage specific information that is sent over the AIS link. These parameters should typically be configured before each voyage.

When the NAUTICAST A2 system mode is set to "Inland", additional voyage parameters for inland water way voyages are available. The system mode can be configured in the System Settings view described in section 0.

Parameter Name	Description
Navigational Status	Changes the navigational status reported by own ship. It is also possible to quickly change navigational status by pressing the OPT button when standing in the Main Menu.
Destination	The destination for the current voyage
Estimated Time of Arrival (ETA)	The estimated time of arrival to destination of current voyage
Draught (Class A)	The vertical distance measured from the lowest point of a ship's hull to the water surface, in meters (one decimal precision)
Persons on Board	Total number of persons on board
Hazardous Cargo (X,Y,Z,OS)	Classification of current cargo according to X,Y,Z,OS
Draught (Inland)	The vertical distance measured from the lowest point of a ship's hull to the water surface, in meters (two decimal precision)
Air Draught	The vertical distance measured from the ship's waterline to the ship's highest point, in meters (two decimal precision)
Hazardous Cargo (Blue Cones)	Blue cone classification of cargo
Loaded / Unloaded	Specifies if the ship cargo is loaded or unloaded
Crew Members	Number of crew members on board
Passengers	Number of passengers on board
Personnel	Number of shipboard personnel on board

4.4.2 Main Menu → Operational Mode

Parameter Name	Description
Tx Mode	This parameter determines the transmission of the NAUTICAST A2. If set to "Silent", the NAUTICAST A2 will be completely silent on the VHF radio and it will not answer on interrogations. If a silent switch is used, this parameter will be locked and "Silent Switch Used" will be displayed as parameter value.

4.4.3 Main Menu → Config → Ship Static

Parameter Name	Description
MMSI	Maritime Mobile Service Identity reported by own ship
IMO	International Maritime Organization number reported by own ship
Ship Name	Ship name reported by own ship
Call Sign	Call sign reported by own ship. Shall be set to ATIS code for Inland vessel installations.
Height over Keel	Height over keel in meters (one decimal precision). Height over Keel information is sent as a response to an "Extended Ship Static and Voyage Related Data" request message.
Ship Type (IMO)	Type of Ship according to ITU-R M.1371-4. Both numerical input and selection from list is possible.
ENI	Unique European Vessel Identification Number reported by own ship
ERI Ship Type	Ship or combination type according to numeric ERI classification. Both numerical input and selection from list is possible. See chapter 10.1 "Inland ERI Ship Types" for available types.
Quality Speed	Shall be set to low if no type approved speed sensor is connected to transponder
Quality Course	Shall be set to low if no type approved course sensor is connected to transponder
Quality HDG	Shall be set to low if no type approved heading sensor is connected to transponder

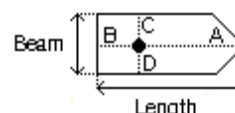
4.4.4 Main Menu → Config → Ship Dimensions

The parameters in the Ship Dimensions view depends on the configuration parameter "Ship Size Mode" in the Misc. Interfaces view. The Ship Size Mode parameter can be set to either Standard or Simplified (default). The Ship Size Mode affects how the user should input ship size and antenna position information and how it is interpreted.

Standard Mode (not available in Inland mode)

In this mode the user must input:

- *Convoy/ship length* [m] (one decimal precision)
- *Convoy/ship beam* [m] (one decimal precision)
- *A, B, C, D* for internal antenna [m]
- *A, B, C, D* for external antenna [m]



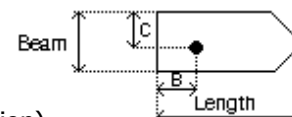
It is the users responsibility to input correctly rounded data ($A+B$ = *Convoy/ship length* rounded up, $C+D$ = *Convoy/ship beam* rounded up).

If the user inputs data which is not correctly rounded the "Ship size mismatch" alarm will be activated.
The output on the AIS data link will be exactly the values input by the user.

Simplified Mode (default)

In this mode the user inputs:

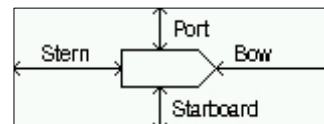
- *Ship length* [m] (one decimal precision)
- *Ship beam* [m] (one decimal precision)
- *C, B* for internal antenna relative to ship [m] (one decimal precision)
- *C, B* for external antenna relative to ship [m] (one decimal precision)



When operating in Inland Mode, extra convoy size can be added to ship dimension

Extra convoy size on each side (value = 0 if convoy not used):

- *Bow* [m] (one decimal precision)
- *Stern* [m] (one decimal precision)
- *Port side* [m] (one decimal precision)
- *Starboard* [m] (one decimal precision)



The extra convoy parameters can be configured from **Main Menu→Voyage→Convoy Settings** when the Ship Size Mode is set to "Simplified".

In this mode there is no way for the user to input mismatching data, all parameters uses the same precision and each measurement is entered only once (in standard mode it is for example possible to enter three different lengths of ship: *Convoy/ship length*, *internal A+B* and *external A+B*). In simplified mode the transponder will automatically calculate and correctly round the A, B, C and D values reported on the VHF link.

4.4.5 Main Menu → Config → VHF Radio → Regional Areas

This view shows the regional areas set in the transponder. To make a new regional area or to edit or delete an existing regional area, press the **OPT** button and choose the desired action. The following parameters can be edited when "New Area" or "Edit Area" is chosen:

Parameter Name	Description
Channel A	The channel number for AIS channel A (2087 = default) that should be used in the regional area.
Channel B	The channel number for AIS channel B (2088 = default) that should be used in the regional area.
Zone Size	The transitional zone size of the regional area in nautical miles (NM).
Tx Mode	Decides on which channels the transponder will use when transmitting in the regional area. When set to "Silent", the transponder will stop automatic transmissions on AIS channels A and B.
Power	Output power for the transponder in the regional area. High = 12.5 W, Low = 1 W.
LAT NE	The latitude for the North East corner of the regional area
LON NE	The longitude for the North East corner of the regional area
LAT SW	The latitude for the South West corner of the regional area
LON SW	The longitude for the South West corner of the regional area

4.4.6 Main Menu → Config → VHF Radio → LR Broadcast Settings

Parameter Name	Description
LR Broadcast Ch. 1	The first channel number for broadcasting long range message 27. The message is sent every 6 minutes on each channel so if both channels are configured a message 27 will be broadcasted every 3 minutes. If this parameter is set to zero no long range broadcast transmissions will be sent on this channel.
LR Broadcast Ch. 2	The second channel number for broadcasting long range message 27. The message is sent every 6 minutes on each channel so if both channels are configured a message 27 will be broadcasted every 3 minutes. If this parameter is set to zero no long range broadcast transmissions will be sent on this channel.

4.4.7 Main Menu → Config → Alarm

In this view all alarms can be configured to either "Enabled" or "Disabled". When the alarm is enabled, an active alarm will affect the external alarm relay, the buzzer in the NAUTICAST A2 and show a popup dialog in the display. When the alarm is set to disabled it will not affect anything when the alarm becomes active. For more information about the alarm view, refer to section 4.18 "Alarms". For a list of all the alarms that can occur, refer to section 7.3 "Troubleshooting with Alarm Messages."

4.4.8 Main Menu → Config → Password

Parameter Name	Description
New User Password	Changes the user level password for the NAUTICAST A2. The default user level password is "user"
New Admin Password	Changes the admin level password for the NAUTICAST A2. The default admin level password is "admin"
Restore Code	It is possible to restore both user password and admin password to the default values above with a secret restore code. To obtain the restore code, contact Nauticast Technical Support and be prepared to provide the serial number of the transponder unit.

4.4.9 Main Menu → Config → Long Range

Parameter Name	Description
Reply Mode	When set to "Auto" the NAUTICAST A2 will automatically respond to any Long Range interrogation messages. When set to "Manual" the operator is responsible for sending a response or refusal to any Long Range interrogation message. This can be done from the <i>Long Range</i> view that is accessed from <i>Main Menu → Messages → Long Range</i> . For more information see section 4.14 "Long Range Interrogations". The information that is sent in a response is automatically filled in by the NAUTICAST A2 depending on the Long Range filter settings (the parameters below).
Ship ID (A)	Filter setting that defines if a Long Range response message should include ship name, call sign and IMO number.
Message Date/Time (B)	Filter setting that defines if a Long Range response message should include information about date and time of message composition.
Latitude / Longitude (C)	Filter setting that defines if a Long Range response message should include position.
Course Over Ground (E)	Filter setting that defines if a Long Range response message should include COG.
Speed Over Ground (F)	Filter setting that defines if a Long Range response message should include SOG.
Destination And ETA (I)	Filter setting that defines if a Long Range response message should include destination and ETA.
Draught (O)	Filter setting that defines if a Long Range response message should include draught.
Ship Type And Cargo (P)	Filter setting that defines if a Long Range response message should include ship type and cargo information.
Ship Size And Type (U)	Filter setting that defines if a Long Range response message should include ship's length, beam and type.
Persons On Board (W)	Filter setting that defines if a Long Range response message should include number of persons on board.

4.4.10 Main Menu → Config → Display → Visual

It is possible to completely turn off the backlight on LCD, buttons and LED's. It may then be difficult to read the NAUTICAST A2 display and find the way to the correct configuration parameter in order to increase the backlight again. If this should happen, it is possible to hold down the **OPT** button for 5 seconds to restore the display to default settings.

Parameter Name	Description
Dimming Mode	If set to "Manual", the LCD backlight, button backlight and LED brightness are controlled by the user with the parameters described below. If set to "Automatic", the LCD backlight, button backlight and LED brightness will automatically be controlled with the light sensor on the front of the NAUTICAST A2. The less ambient light registered by the light sensor, the lower percentage of backlight and brightness will be used. Default: Manual.
Toggle Day/Night	Toggle between day or night mode. In Day mode the display background is white and in night mode the background is black. There are also separate settings for the LCD backlight, LED intensity and button backlight in the different day/night modes. Default: Day
Backlight	Changes the LCD backlight where 0% is completely turned off and 100 % is maximum brightness. Separate Day/Night values. Default: 80%.
LED Light Intensity	Changes the light intensity of the three LED's on the front of the NAUTICAST A2. It is possible to turn off the LED's completely by setting a 0% light intensity. However, if there is an active, unacknowledged alarm in the NAUTICAST A2, the light intensity of LED's will temporarily be set to 10% until the alarm is acknowledged. Separate Day/Night values. Default: 80%.
Button Illumination	Changes the brightness of the button backlight on the NAUTICAST A2. Separate Day/Night values. Default: 80%.

4.4.11 Main Menu → Config → Display → Sound

Parameter Name	Description
Alarm Waiting For ACK	Determines how the NAUTICAST A2 sound buzzer should behave when an alarm is active and waiting for acknowledgement. This setting does NOT affect the behaviour of the alarm relay or any external alarm system.
Long Range Message	Controls the behaviour of the NAUTICAST A2 sound buzzer when an LR interrogation message is received.
AIS Message	Controls the behaviour of the NAUTICAST A2 sound buzzer when a SRM or binary text message is received.
Inland RTA	Controls the behaviour of the NAUTICAST A2 sound buzzer when an Inland RTA (Recommended Time of Arrival) message is received.

4.4.12 Main Menu → Config → Display → Time

Parameter Name	Description
Time Zone	This parameter defines if the times that are displayed in the NAUTICAST A2 should be in UTC or LOC (local) time. If local time is chosen, the offset from UTC must be specified with the three parameters listed below.
Offset sign	The sign of the local time offset from UTC.
Hours	The local time hour offset from UTC.
Minutes	The local time minute offset from UTC.

4.4.13 Main Menu → Config → Interface → Language

Parameter Name	Description
Language	Changes the language in all the menus and views of the NAUTICAST A2. The changes will take effect immediately when pressing "Save".

4.4.14 Main Menu → Config → Interface → Port Rate

Parameter Name	Description
Baud Rate	Changes the baud rate (bits per second) for the corresponding serial port.
Checksum	When set to "Required", all messages that are input on the corresponding serial port to the NAUTICAST A2 must have a valid checksum. When set to "Disabled", messages both with and without checksum are accepted on the corresponding serial port.

4.4.15 Main Menu → Config → Interface → Miscellaneous

Parameter Name	Description
SSD Password	Changes the value of the SSD password level. When set to "None", no password is required when configuring the transponder with an SSD sentence from e.g. an ECDIS via the serial port interface. When set to "User", an SPW sentence with the correct user level password must be sent before the SSD on the serial port interface.
Ship Size Mode	This affects how the user should input the ship size, convoy size and antenna positions. See section 4.4.4 for more details.
AIS GPS Output Port	Defines on which serial port the NAUTICAST A2 should output data from the internal GPS. When set to "None" no internal GPS data will be output.
External Switch	This parameter specifies if there is a blue sign switch or silent switch connected to the orange and brown wires of the NAUTICAST A2 Power Cable. If no switch is used, set the parameter to "No Function". See sections 3.7.8.1 and 3.7.8.2 for more information about the blue sign switch and silent switch.
Require Text Msg ACK	This parameter determines if an ACK msg is required as a response when sending addressed binary text messages to another target.
Automatic PoB Broadcast	Enable automatic 6 minute periodic broadcast of passenger information. See section 4.13 for details on message types.

4.4.16 Main Menu → Config → System Settings

Parameter Name	Description
System Mode	Determines if the NAUTICAST A2 should operate as a Class A transponder or as an Inland transponder. This parameter affects which config parameters and menus that are visible in the system.
Range Unit	This parameter determines the unit for the range value of targets in the Target List, Extended Info view and Plot view. The range value can be calculated in nautical mile (NM), kilometre (km) or statute mile (Sm).
Speed Unit	This parameter determines the unit for the SOG value of targets in Extended Info view and Plot view. The SOG values can be calculated in knots (kn), kilometres per hour (km/h) or miles per hour (mph).
Plot Compass	This parameter determines how the plot of AIS targets should be oriented. If set to "North Always Up", the plot will always have north up and own ship will rotate according to heading input. If set to "Own Ship Bow Always Up", the plot will always have own ship pointing up and rotate the rest of the plot according to heading input.

4.4.17 Main Menu → Maintenance → Installation Test

Parameter Name	Description
Sensor Data Source	<p>This parameter specifies which port the NAUTICAST A2 should use as its sensor source. The default value of this parameter is "Automatic" which means that the NAUTICAST A2 will accept sensor information on any port and use the information on the port with highest priority.</p> <p>If Sensor Data Source is set to anything other than "Automatic", the NAUTICAST A2 will only accept sensor information if it comes from the port specified by this parameter.</p> <p>The parameter reverts to "Automatic" after a reboot.</p>
SART Test Mode	<p>This parameter determines if SART Test targets should be displayed in Target List and Plot views of the NAUTICAST A2. It also controls if connected systems, for example ECDIS, will receive SART Test targets.</p>

4.5 Alarm and Alert Pop-ups

The NAUTICAST A2 features alarm and alert pop-ups that can appear any time during operation. To acknowledge an alarm or alert message, press **ENTER**. An example of an alarm message is shown below.

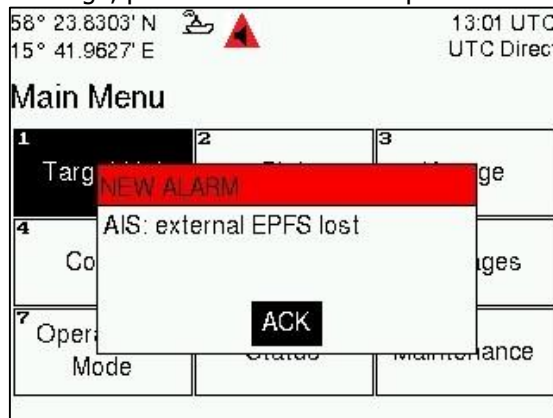


Figure 15 – New Alarm Message

4.6 Status Bar

The top of the screen of the NAUTICAST A2 always displays a summary of the system's status. See illustration below.

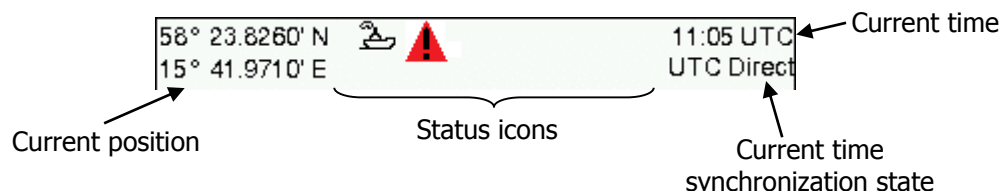


Figure 16 – Status Bar

If a valid navigation position is available, it is displayed to the left. The status icons are displayed in the middle and the current time is shown to the right. Time is either UTC or local (LOC). Beneath the current time there is also information about the transponder's synchronization state.

The synchronization state can be:

- **UTC Direct** – This is the normal state where the NAUTICAST A2 gets the UTC time from its own internal GPS receiver.
- **Indirect Synchronization** – The NAUTICAST A2 is synchronizing based on receipt of data from other AIS transmitters.

NOTE: It is possible to be in Indirect Synchronization but still have a valid position in the upper left corner of the status bar. The position information may be from an external GPS sensor, but UTC Direct synchronization can only be taken from the internal GPS receiver.

4.7 Status Icons

The status icons that can be displayed are:

- Unread message (safety related message, text message or RTA)
- Unread Long Range message (automatic reply)
- Unread Long Range message (manual reply)
- Active, unacknowledged alarms
- Active, acknowledged alarms
- 1W mode (Indicates 1 Watt TX mode for Tankers is enabled.) See NOTE below for details.
- Blue Sign On (only available when System Mode is "Inland")
- Blue Sign Off (only available when System Mode is "Inland")
- Silent Mode activated, either with Tx Mode parameter or silent switch.

Navigational status, being one of:

- Navigational status is undefined
- At anchor or moored
- Under way using engine
- Navigational status is one of: Not under command, Restricted manoeuvrability, Constrained by her draught, Aground, Engaged in fishing, Under way sailing, Reserved for future use.

NOTE: The transponder will automatically engage 1W mode when the following conditions are met: Ship type = Tanker, Nav Status = Moored and SOG <= 3 knots, otherwise 1W mode will be automatically disengaged. The Tanker 1W mode is fully automatic and cannot be disengaged by other external control.

4.8 View Remote Ship Information

The NAUTICAST A2 will power up in *Target List* view. This view, also referred to as the *minimal display*, is accessed from the *Main Menu* view. The *Main Menu* view can be reached by pressing **ESC** repeatedly from any other view. The *Target List* view displays a list of all targets sorted by range from own ship (closest first). The list includes MMSI or ship's name (Ship Id), range (RNG), bearing (BRG) and time since last report was received (Age) for each AIS target received by the system.

58° 23.8264' N		14:16 UTC	
15° 41.9715' E		UTC Direct	
Ship Id	RNG	BRG	Age
⊗ SART ACTIVE: 97	10.2 NM	199 °	2m39s
Δ BLACK PEARL	0.0 NM	298 °	0s
Δ CATRINA	17.8 NM	354 °	2m39s
Δ LUDWIG II	18.5 NM	128 °	2m39s
■ BS: 477995087	21.7 NM	55 °	2m39s
✚ HELI 13	30.8 NM	200 °	2m39s
✚ R4AS	106 NM	349 °	7s

Figure 17 – Target List

The **OPT** button can be used in the *Target List* view to send a safety related message (SRM) to the selected target. For more information about AIS messages, refer to section 4.12.

For extended information about a target in the list, select the ship with the **ΛV** key and press **ENTER**.

The *Extended Information* view includes static, dynamic and voyage related data for the selected target. In this view it is also possible to query for static and voyage data as well as persons on board information by using the **OPT** button.

58° 23.8269' N		08:54 UTC	
15° 41.9730' E		UTC Direct	
Extended Info.		MMSI: 477995050	
Parameter	Value		
--Static data--			
Callsign	IA56		
IMO	9876541		
Type of Ship	Ship Type Not Available		
Ship Name	LUDWIG II		
Length of Ship	200.0 m (A:100, B:100)		
Beam of Ship	20.0 m (C:10, D:10)		

Figure 18 – Extended Info

Press **ESC** to return to *Target List* view.

4.9 View Plot of Targets

The location of targets relative to your own ship is visualized in the *Plot* view. The view is accessed from the *Main Menu* view. Use the **ARROW KEYPAD<>** to select any of the targets on the display or **AVto** Zoom In and Zoom Out.

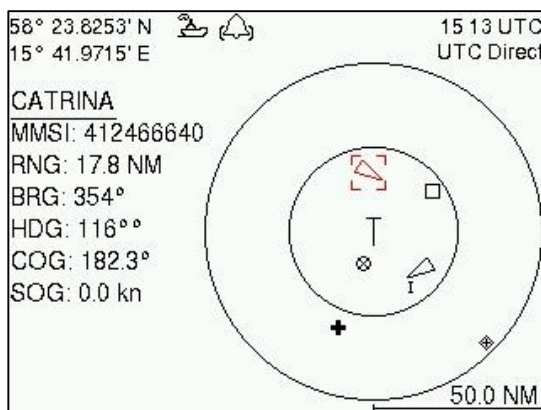


Figure 19 – Target Plot

For extended information about a target select it using the **<>** key and press **ENTER**.

The own ship target is displayed as a 'T' shaped symbol. Class B targets are indicated by a 'B' appended to the target icon and Inland targets are indicated by either an 'I' or by a blue sign symbol appended to the target (not shown in the figure above).

The **OPT** button can be used in the *Plot* view to send a safety related message (SRM) to the selected target. For more information about AIS messages, refer to section 4.12.

4.10 View Transmitted Own Ship Information

The information transmitted by the NAUTICAST A2 on the VHF link is viewed in the *Transmitted Own Ship Data* view. This view is accessed from *Main Menu* → *Status* view and includes the static, dynamic and voyage related data actually sent by the NAUTICAST A2. The view reflects the contents of the last transmitted AIS message, thus there may be some delay from the time the parameters are changed until they are displayed in the *Transmitted Own Ship Data* view.

58° 23.8305' N	09:28 UTC
15° 41.9626' E	UTC Direct
Transmitted Own Ship Data MMSI: 463986124	
Parameter	Value
--Static data--	
Callsign	BJ 73
IMO	71283656
Type of Ship	Passenger Ship
Ship Name	M/S ROXEN
Length of Ship	118 m (A: 113, B: 5)
Beam of Ship	10 m (C: 3, D: 7)

Figure 20 – Transmitted Own Ship Data

4.11 Enter and Read Voyage Related Information

Voyage related information (for transmit via AIS) is displayed in the *AIS Voyage* view. The view is accessed from *Main Menu*→*Voyage*→*AIS Voyage*. Voyage related data includes destination, estimated time of arrival (ETA) and number of people aboard.

58° 23.8272' N 11:06 UTC	
15° 41.9720' E UTC Direct	
AIS Voyage Save	
Parameter	Value
--General AIS--	
Navigational Status	Under Way Using Engine
Destination	STOCKHOLM
ETA (mm-dd hh:mm)	04-29 12:30 UTC
--Inland AIS--	
Draught	4.60 m
Air Draught	17.00 m

Figure 21 – AIS Voyage

4.12 Handling Safety Related Messages (SRM) and Text Messages

Safety related messages (SRMs) and text messages can be sent to specific targets (addressed messages) or broadcast to all targets. The Inbox, Outbox and Send views for SRMs and text messages can be accessed from *Main Menu*→*Messages*→*AIS Messages*.

58° 23.8300' N 14:25 UTC	
15° 41.9620' E UTC Direct	
AIS Messages	
1 Inbox	2 Outbox
3 Send	

Figure 22 - AIS Messages

4.12.1 Read Received Messages

Received messages can be accessed in the *Inbox* view. Unread SRMs and text messages are indicated with a letter icon in the status bar and are marked with red colour in the inbox.

58° 23.8302' N 11:37 UTC		
15° 41.9626' E UTC Direct		
Inbox		
Time (UTC)	Sender	Type
Mar 16 11:36	222333444	Broadcast Text
Mar 16 11:36	222333444	Broadcast SRM
Mar 16 11:36	266125000	Addressed SRM
Message Content		
WARNING, STORM AHEAD!		

58° 23.8257' N 11:21 UTC	
15° 41.9727' E UTC Direct	
Message Content	
WARNING, STORM AHEAD!	

Figure 23 – AIS Message Inbox

Select a message with **ARROW KEYPAD** buttons ΔV . A preview of the selected message is shown at the bottom of the screen. To read the entire message and mark it as being read, press **ENTER**. When the message is read, navigate back to the inbox by pressing **ESC**.
It is possible to reply to, forward or delete the selected message by pressing the **OPT** button.

4.12.2 Send SRMs and Text Messages

SRMs are composed and sent in the Send view accessed from *Main Menu*→*Messages*→*AIS Messages*→*Send*. Use the **ARROW KEYPAD** buttons ΔV to navigate between the text input field, list of parameters and "Send" button.

56° 23.8259' N 15° 41.9734' E		11 25 UTC UTC Direct
Send		Send
Message Type	Addressed SRM	
Channel	No Preference	
MMSI	315645987	
Characters Left: 45		
NO, WE HAVE THE SITUATION UNDER CONTROL		

Figure 24 – AIS Message Send view

Sent messages can be viewed in the *Outbox* view accessed from *Main Menu*→*Messages*→*AIS Messages*→*Outbox*.

56° 23.8302' N 15° 41.9626' E		11 38 UTC UTC Direct
Outbox		
Time (UTC)	Receiver	Type
Mar 16 11:38	266125000	Addressed SRM
Mar 16 10:24	266125000	Addressed SRM
Mar 16 10:23		Broadcast Text
Message Content		Status: Pending
NO, WE HAVE THE SITUATION UNDER CONTROL		

Figure 25 – AIS Message Outbox

4.13 Send Persons On Board

In the *Send Persons On Board* view it is possible to send information about the number of persons on board (PoB) to another vessel. The PoB message can be sent as either addressed or broadcast. The PoB message can also be sent in two different versions:

The IMO version sends the total number of persons on board as a binary message with international FI 16. The Inland (IWW) version sends a message with number of crew, personnel and passengers as a binary message with inland FI 55. The information sent in the messages is automatically filled in by the NAUTICAST A2 depending on the voyage configuration made in *Main Menu*→*Voyage*→*AIS Voyage*.


58° 23.8260' N 		14 42 UTC
15° 41.9735' E		UTC Direct
Persons on Board		<input type="button" value="Send"/>
Parameter	Value	
Message Type	Broadcast (Inland)	
Channel	No Preference	
--PoB Info (Read Only)--		
Crew Members	75	
Passengers	1320	
Personnel	98	

Figure 26 – Persons On Board

4.14 Long Range Interrogations

An AIS transponder can receive long range interrogation messages to poll for certain information. A received interrogation message is indicated by a LR icon in the status bar. If the "Long Range Reply Mode" parameter has been configured to "Auto", the NAUTICAST A2 will automatically send a response to the interrogation. If the "Long Range Reply Mode" parameter is set to "Manual", the operator must send a response or refusal from the *Long Range Message* view accessed from *Main Menu* → *Messages* → *Long Range*. For more information about the "Reply Mode" parameter and Long Range filter settings, see section 4.4.9.


58° 23.8302' N 		11:43 UTC
15° 41.9626' E		UTC Direct
Long Range		
Time (UTC)	Sender	ABCEFIOPUW
Mar 16 11:42	666777888	XXXXX----
<div style="display: flex; justify-content: space-around; font-weight: bold;"> ABCEFIOPUW </div>		
Request	? ? ? ? ? ? ? ? ?	
Reply	x x x x x - - - -	
Mar 16 11:42 UTC		

Figure 27 – Long Range

To send a reply or refusal to the interrogation or to delete an interrogation from the message list, use the **ARROW KEYPAD** buttons **ΔV** to mark the desired interrogation and then press the **OPT** button and choose the desired option.

The Long Range view uses the following symbols to indicate the status of a request or reply message:

- ?** – The information is requested by the sender
- X** – The information is available and provided
- !** – The information requested is refused

4.15 Inland ETA and RTA

The NAUTICAST A2 has capability to send Inland ETA (Estimated Time of Arrival) messages and receive Inland RTA (Recommended Time of Arrival) messages which are used when communicating with ports, locks and bridges on the inland water ways. This is done from the *ETA/RTA* view that can be accessed from *Main Menu* → *Messages* → *ETA/RTA*. Sent ETA messages can be viewed in the *Outbox* view, received RTA messages can be viewed in the *Inbox* view and new ETA messages can be composed in the *Send* view.

58° 23.8297' N 15° 41.9621' E		14:25 UTC UTC Direct		58° 23.8269' N 15° 41.9731' E		13:59 UTC UTC Direct	
ETA/RTA				Send			
1 Inbox		2 Outbox		3 Send		<input type="button" value="Send"/>	
				MMSI: 7990101 ETA (mm-dd hh:mm): 05-20 13:00 UTC UN Country Code: AT UN Location Code: VIE Fairway Section: 00003 Fairway Hectometre: 00008 Terminal Code: SPG1 Tugboats (7 = N/A): 7			
58° 23.8292' N 15° 41.9613' E				58° 23.8267' N 15° 41.9719' E			
11:55 UTC UTC Direct				14:29 UTC UTC Direct			
ETA Outbox				RTA Inbox			
Status		Receiver		ETA (mm-dd hh:mm)		MMSI	
Received by tarç		7990101		05-20 13:00 UTC		Recommended Arrival	
						7990101	
UN Country / Location Code: AT VIE Fairway Section No. / Hecto.: 00003 / 00008 Terminal Code: SPG1 Tugboats (7 = N/A): 7 Air Draught: 13.00				UN Country / Location Code: AT VIE Fairway Section No. / Hecto.: 00003 / 00008 Terminal Code: SPG1 Operational Status: Limited Operation			

Figure 28 – ETA/RTA

4.16 Inland Water Levels

The NAUTICAST A2 can receive and display Inland water levels messages. All received water levels messages can be viewed in the *Water Levels* view that can be accessed from *Main Menu* → *Messages* → *Water Levels*.

58° 23.8262' N 15° 41.9731' E		15:11 UTC UTC Direct	
Water Levels			<input type="button" value="Clear"/>
Country	Gauge ID	Water Level [m]	Age [h:m:s]
DK	123	10.00	00:00:26
DK	124	-20.00	00:00:26
DK	125	30.00	00:00:26
DK	126	-40.00	00:00:26
NO	1	30.00	00:00:05
NO	10	-5.00	00:00:35
NO	20	1.00	00:00:35

Figure 29 – Inland Water Levels

4.17 Regional Areas

All regional areas that are stored in the NAUTICAST A2 can be viewed in the Regional Areas view which is accessed from *Main Menu* → *Config* → *VHF Radio* → *Regional Areas*. The list shows the north east and south west corners of the area. The area is marked with blue colour if it is in use by the NAUTICAST A2. To view more information about the area, edit the area or create a new area, press the **OPT** button and choose the desired option.

58° 23.8250' N 15° 41.9725' E 13:05 UTC UTC Direct				58° 23.8249' N 15° 41.9714' E 13:05 UTC UTC Direct				58° 23.8252' N 15° 41.9706' E 13:05 UTC UTC Direct			
Regional Areas				Regional Areas				Regional Areas			
LAT NE	LON NE	LAT SW	LON SW	LAT NE	LON NE	LAT SW	LON SW	Parameter	Value		
59°27.6'N	017°18.9'E	58°45.6'N	015°38.7'E	59°27.6'N	017°18.9'E	58°45.6'N	015°38.7'E	Channel A	2087		
58°27.6'N	017°18.9'E	57°45.6'N	016°18.9'E	58°27.6'N	017°18.9'E	57°45.6'N	016°18.9'E	Channel B	2088		
58°27.6'N	016°18.9'E	57°45.6'N	015°38.7'E	58°27.6'N	016°18.9'E	57°45.6'N	015°38.7'E	Zone size	5		
								Tx Mode	Both		
								Power	High		
								LAT NE	00° 00.0' N		
								LON NE	000° 00.0' E		

Figure 30 – Regional Areas

4.18 Alarms

All currently active and enabled alarms are shown in the *Alarm* view that can be accessed from *Main Menu* → *Alarms*. As default, only alarms that are configured as "Enabled" will be shown in the list. It is possible to also show disabled active alarms by pressing **OPT** button and choose "Show All Alarms". For a list of all alarms, see section 7.3.

58° 23.8274' N 15° 41.9731' E 10:49 UTC UTC Direct	
Active Alarms (Only Enabled)	
Description	
AIS: no valid ROT information	
AIS: Heading lost/invalid	
AIS: NavS	
Options	
Show Enabled Alarms	
Show All Alarms	

Figure 31 - Alarms

4.19 Status List

Current status indications are listed in the *Status List* view that can be accessed from *Main Menu* → *Status* → *Status List*. The different status indications that can occur are listed in section 7.8.

58° 23.8293' N 15° 41.9611' E 11:55 UTC UTC Direct	
Status List	
Time (UTC)	Status Indication
Mar 16 11:50:33	AIS: internal SOG/COG in use
Mar 16 11:50:40	AIS: internal GNSS in use
Status: AIS: internal SOG/COG in use	

Figure 32 - Status List

4.20 Non Functional Time

This view displays information about times when the NAUTICAST A2 has been turned off or for some other reason not been transmitting for more than 15 minutes. The view is accessed from *Main Menu* → *Status* → *Non Func. Time*.

58° 23.8293' N 15° 41.9611' E 11:56 UTC UTC Direct

Non Functional Time

Date/Time Off (UTC)	Date/Time On (UTC)
2012 Mar 07 13:15	2012 Mar 08 11:51
2012 Mar 08 15:15	2012 Mar 08 15:36
2012 Mar 08 16:22	2012 Mar 09 13:19
2012 Mar 09 13:20	2012 Mar 09 13:37

Reason: Power Off

Figure 33 - Non Functional Time

4.21 GPS Status

This view displays the satellites received by the NAUTICAST A2 internal GPS receiver. The list is sorted by the satellites ID (PRN number) and shows elevation, azimuth and signal to noise ratio (SNR) for each satellite. The view also displays the total number of satellites in view and the total number of satellites used in the position calculation reported by GGA sentence.

58° 23.8269' N 15° 41.9720' E

10 22 UTC
UTC Direct

GPS Status

ID	Elevation (°)	Azimuth (°)	SNR (dB-Hz)
2	22	242	29
3	5	63	20
4	4	207	22
5	49	289	31

Satellites in View: 14
Satellites in Use: 9

Figure 34 – GPS Status

4.22 View Raw Data

This view displays the incoming data on the selected serial port. It is also possible to pause the data on the screen by pressing the "Freeze" button. Use the **ARROW KEYPAD** buttons **▲▼** to navigate to the Freeze button and press **ENTER**. The View Raw Data view can be a helpful tool when trouble shooting the system to see what sensor input is actually received on each port. The view can be accessed from *Main Menu* → *Status* → *View Raw Data*.



58° 23.8301' N		 		<input type="checkbox"/>	12:37 UTC
15° 41.9616' E		UTC Direct			
View Raw Data				<div>Freeze</div>	
View Port		Internal GPS			
\$GPVTG,T,M,0.007,N,0.013,K,A*26					
\$GPRGA,1237.12,00,5823.83016,N,0154.196161,E,1.09,0.95,60.0,M,30.5,M,1.65					
\$GPGSA,A,3,01,17,20,32,23,31,12,11,14,00,1.54,0.95,1.22*0E					
\$GPGSV,3,1,09,01,70,173,49,11,45,167,47,12,06,014,38,14,30,05,0,41*73					
\$GPGSV,3,2,09,17,37,295,45,20,62,246,48,23,15,199,43,31,21,10,2,46*75					
\$GPGSV,3,3,09,32,82,135,49*41					
\$GPZDA,1237.12,00,12,01,2012,00*61					
\$GPGBS,1237.12,00,1.3,1.2,1.4,000,*41					

Figure 35 - View Raw Data

4.23 SW/HW Info

This view displays the software and hardware revisions for the NAUTICAST A2 and is accessed from *Main Menu* → *Status* → *SW/HW Info*. **NOTE: This information should always be provided when in contact with Nauticast Technical Support.**

58° 23.8299' N	12:36 UTC
15° 41.9614' E	UTC Direct
SW/HW Info	
Parameter	Value
S/W Version	R5 0.11
H/W Version	R5 Solid 0
Serial Number	000001
H/W Part Number	7000 118-130 A
--Unlocked Modules--	
Class A Mode	Unlocked
Inland Mode	Unlocked

Figure 36 - SW/HW Info

4.24 VHF Status

The VHF Status view shows the currently used settings. Channel number, frequency, power and operation mode are displayed for each VHF transceiver in the NAUTICAST A2. This information is useful when troubleshooting to make sure that the NAUTICAST A2 transponder uses the expected VHF radio settings. If e.g. a regional area is set and in use, this will affect the parameters in the VHF Status view.

58° 23.8299' N	12:37 UTC
15° 41.9616' E	UTC Direct
VHF Status	
Parameter	Value
--Transceiver A--	
Rx Channel	2087
Rx Frequency	161975 kHz
Tx Channel	2087
Tx Frequency	161975 kHz
Tx Power	12.5 W
Tx Control	Active

Figure 37 - VHF Status

4.25 Communication Test

When installing the NAUTICAST A2, or when performing annual testing, a communication test shall be done to ensure that other transponder system can receive the NAUTICAST A2 transmissions. This can be done from the Communication Test view accessed from *Main Menu* → *Maintenance* → *Comm. Test*.

When entering the Communication Test view a suggested target with a suitable range (between 15 NM and 25 NM) will be selected in the MMSI parameter field if such a target has been received by the NAUTICAST A2. It is however possible to select a different target for the communication test. To start the test, use the **ARROW KEYPAD** button \blacktriangle to select the "Send" button and press **ENTER**. The status of the test will be shown beneath the parameter list. If no response is received within 15 seconds from the selected target a fail message will be shown.

58° 23.8269' N	10:18 UTC
15° 41.9694' E	UTC Direct
Comm. Test	Send
Parameter	Value
MMSI	578632123 Range: 0.0
	333444555 Range:
Status: No Test Running.	

58° 23.8250' N	10:19 UTC
15° 41.9720' E	UTC Direct
Comm. Test	Send
Parameter	Value
MMSI	578632123 Range: 0.0
Status: Waiting For Reply From MMSI: 578632123	

58° 23.8251' N	10:20 UTC
15° 41.9711' E	UTC Direct
Comm. Test	Send
Parameter	Value
MMSI	578632123 Range: 0.0
Status: Reply Received From MMSI: 578632123	

Figure 38 - Communication Test

4.26 Update Software

The software in the NAUTICAST A2 is easy upgradable via the USB Host interface located behind the front hatch. To perform a software update, follow the instructions in the *Update Software* view which can be accessed from *Main Menu*→*Maintenance*→*Update Software*. For more information about the upgrade procedure, refer to chapter 5 "

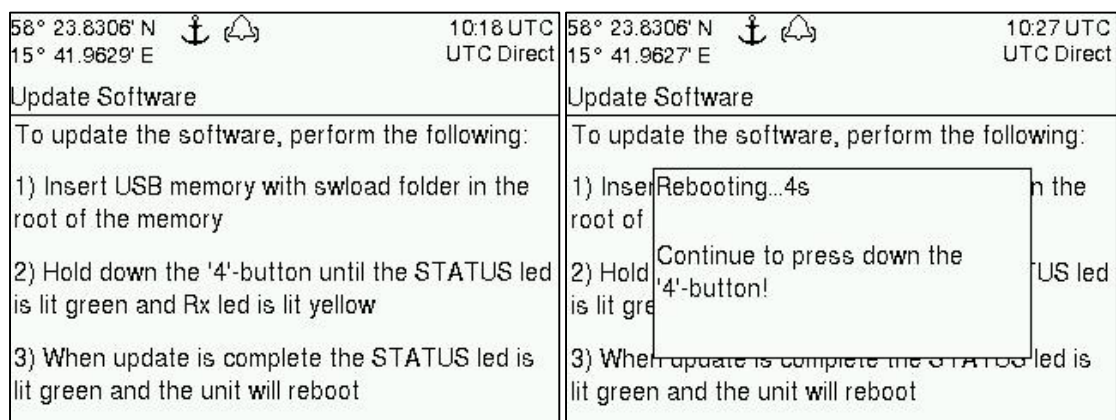


Figure 39 - Update Software

4.27 Restore Config

All configuration parameters described in section 4.4 "Configuration Parameters" can be set to default values from the *Restore Config* view which can be accessed from *Main Menu* → *Maintenance* → *Restore Config*.

NOTE: The MMSI parameter will also be reset to zero and therefore the transponder will stop transmitting and the alarm "Tx Malfunction" will become active.

4.28 Save Configuration to USB memory

The NAUTICAST A2 AIS Transponder System has the capability to save all configuration settings to an USB memory. The configuration file can be used as backup so that the NAUTICAST A2 AIS system can be restored to a previous configuration; however during normal software upgrade of the NAUTICAST A2 AIS system the configuration parameters will NOT be changed so a backup is usually not needed.

The saved configuration file can also be used to load several NAUTICAST A2 systems with the same settings. To save the configuration to a file on a USB memory, follow the steps below:

1. Insert a FAT32 formatted USB memory in the USB host interface port in the NAUTICAST A2.
2. Enter the *Save Config to USB* view which is accessed from *Main Menu* → *Maintenance* → *Save Config to USB*.

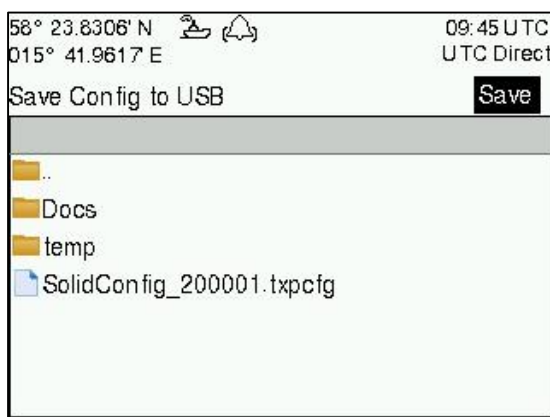


Figure 40 – Save Config to USB

3. *Open* the folder on the USB memory where the transponder configuration file should be saved. Use the arrow keypad to navigate between folders and files on the USB memory. Only folders and transponder configuration files will be listed in the view. To view the contents of a sub folder, mark

the folder and press ENTER. To go back to the previous folder, mark the folder “..” on the top of the list and press ENTER.

4. Press the “Save” button. A popup will appear where a file name can be entered.

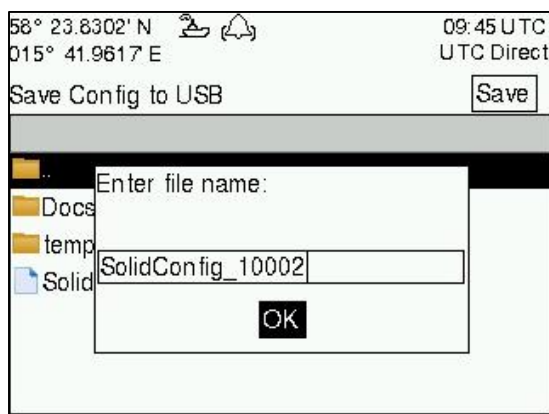


Figure 41 – Enter file name

5. Press OK to save the configuration to the specified file and directory on the USB

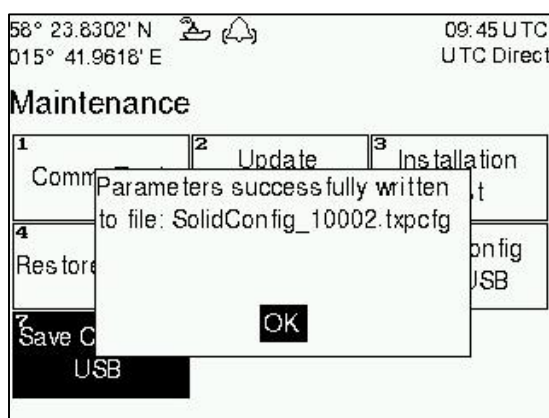


Figure 42 – Configuration Saved Successfully.

4.29 Load Configuration from USB memory

To load and directly use a configuration from an existing configuration file on a USB memory, follow the below steps:

1. Insert the USB memory with the configuration file in the USB host interface port on the NAUTICAST A2.
2. Enter the *Load Config from USB* view which is accessed from *Main Menu* → *Maintenance* → *Load Config from USB*.



Figure 43 – Load Config from USB

3. Select the desired configuration file.
Use the arrow keypad to navigate between folders and files on the USB memory. Only folders and transponder configuration files will be listed in the view. To view the contents of a sub folder, mark the folder and press ENTER. To go back to the previous folder, mark the folder ".." on the top of the list and press ENTER.
4. Press ENTER to load the selected file. A confirmation popup will appear.

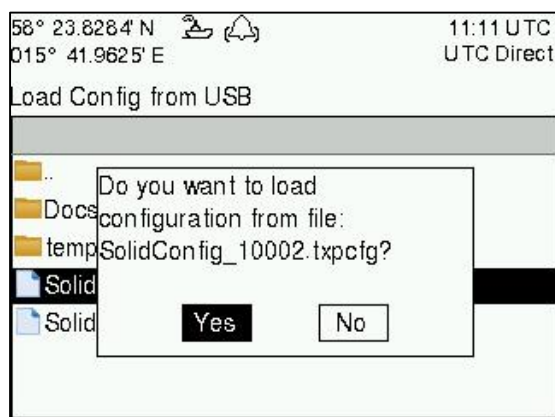


Figure 44 – Confirmation popup

5. Check that the correct configuration file is selected. Press "Yes" in the confirmation popup. A password popup will appear. Fill in the admin password (default = "admin") and press OK.

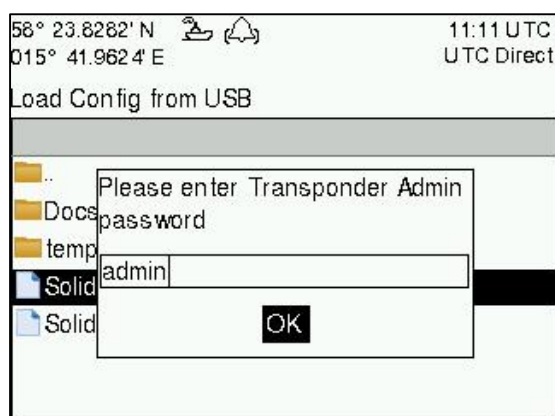


Figure 45 – Password popup

6. The configuration file will be loaded in the NAUTICAST A2 and the settings will take effect immediately.

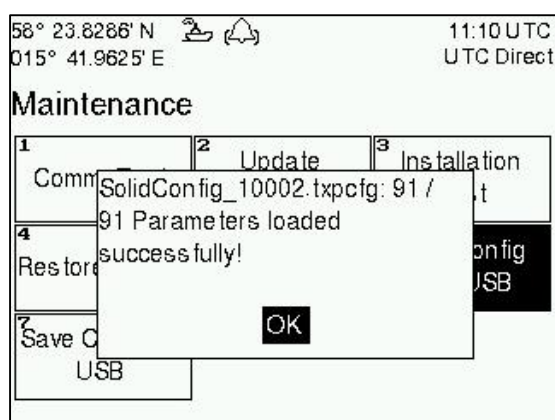


Figure 46 – Configuration successfully loaded from USB

5 Software Upgrade

Note: After updating the software add a sticker stating the new software version close to the product label.

The NAUTICAST A2 is easy upgradable through the USB host interface located behind the front hatch. To upgrade the software in the NAUTICAST A2, perform the following steps:

- Unzip the NAUTICAST A2 upgrade package in the root folder of an USB memory stick. There should now be a folder called swload in the USB root folder.
- Insert the USB memory stick in the USB host interface located behind the front hatch.
- Hold down the '4'-button on the front of the NAUTICAST A2 and reboot the system. The '4'-button must be held down until the **STATUS LED** is lit green and **Rx LED** is lit yellow. (The software upgrade can also be initiated from the *Update Software* view in the NAUTICAST A2. Refer to section 4.26 "Update Software" for more information.)

The upgrade takes a couple of minutes, with progress indicated using the transponders LEDs as indicated in table 14.

The software upgrade is complete when the **STATUS LED** is lit green. The NAUTICAST A2 will automatically reboot after 3 seconds. Check that correct SW has been loaded in the SW/HW Info view which can be accessed through *Main Menu* → *Status* → *SW/HW Info*.

If the upgrade process fails, The **STATUS LED** will be lit red and one of the **Rx LED** or **Tx LED** starts blinking. Should this happen, debug according to the error indicated. "USB not found" indicates a problem with the USB media. Try reformatting as FAT32 or try a different make/model of USB memory.

Hold down the '4'-button and reboot the NAUTICAST A2 to try again.

	STATUS	Rx	Tx
Upgrade mode started	GREEN	YELLOW	
Upgrade in progress (<2 minutes typically)		Blinking YELLOW	
Upgrade complete (automatic reboot after 3 sec)	GREEN		
Error: USB Not Found	RED	Blinking YELLOW 0.5Hz	
Error: No SW found on USB	RED	Blinking YELLOW 4Hz	
Error: Flash erase failed	RED		Blinking 0.5 Hz RED
Error: Flash write failed	RED		Blinking 4 Hz RED

Table 14 – LED Indicators during Software Upgrade

6 Technical Specifications

6.1 Transponder Physical

Dimensions:	Height: 87 mm Width: 238 mm Depth: 173 mm
Dimensions: Incl. gimbal mount	Height: 124 mm (minimum) Width: 292 mm Depth: 173 mm
Weight:	2.25 kg 2.45 kg incl gimbal mount

6.2 Transponder Electrical

Supply Voltage:	24 VDC (12VDC)
Power Consumption(Ø/Max):	17W/24W (48W)
Peak Current	1 A (4A)

6.3 Transponder Environment

This product complies with the R&TTE directive, 1999/5/EC

Temperature:	-15°C to +55°C (Operational) -30°C to +80°C (Storage)
Vibrations:	IEC 60945 ed. 4
EMC:	IEC 60945 ed. 4
Radio Type Approval:	IEC 61993-2 ed. 2
Compass Safe Distance NAUTICAST A2	60 cm (for standard magnetic compass) 45 cm (for steering magnetic compass)
Compass Safe Distance GPS Antenna AT575-68W	30 cm (for standard magnetic compass) 30 cm (for steering magnetic compass)
Compass Safe Distance GPS Antenna MA-700	65 cm (for standard magnetic compass) 50 cm (for steering magnetic compass)
Compass Safe Distance Combined VHF/GPS-1	65 cm (for standard magnetic compass) 50 cm (for steering magnetic compass)

6.4 Transponder VHF Transceiver

Receivers:	156 – 163 MHz (TDMA) 156.525 MHz fixed (DSC, Channel 70)
Transmitter:	156 – 163 MHz
Channel bandwidth:	25 kHz
Output Power:	High: 12,5 W Low: 1W "Tanker 1W Mode": 1W
VHF antenna connector:	BNC-Female
Antenna Input Impedance:	50 ohm

6.5 Transponder Internal GPS Receiver

Type:	GPS L1, C/A Code, 50 Channels SBAS: WAAS, EGNOS, MSAS, GAGAN
Update rate:	2 Hz
Accuracy:	< 2.5 m (GPS, CEP, 50%, 24 hours static) < 2.0 m (SBAS, CEP, 50% 24 hours static)
Antenna feeding:	5 VDC
GPS Antenna connector:	TNC-Female
Antenna Input Impedance:	50 ohm

6.6 AIS Alarm Relay

Max switching current:	0,1 – 2 A (with heat sink up to 3A)
Max switching voltage:	3 –60 VDC

7 Troubleshooting

The Nauticast A2 is a very rugged and stable device, so that in the majority of cases erroneous configurations rather than real hardware defects are the cause of perceived malfunctioning.

7.1 Troubleshooting Prerequisites

A transponder operating environment may naturally affect and render complicated the search for the root cause of a system defect. It is always advisable to start by minimizing all possible interference sources in order to simplify the troubleshooting.

- Disconnect other NMEA equipment from the NAUTICAST A2 (ECDIS, RADAR, NAV, etc.)
- Switch off other emission sources (RADAR, SATCOM, VHF, etc.)

We encourage applying the latest software available for the NAUTICAST A2 if any problems are experienced. It may contain bug-fixes and other improvements solving already known issues. Check supplied software release notes to see what has been changed in the new software.

7.2 Troubleshooting with the Front Panel LED's

It is very fast and effective to use the LED's to verify the status of the NAUTICAST A2. This should always be the first step in the troubleshooting.

7.2.1 STATUS LED (multi-colour)

- The STATUS LED is constantly lit green when the transponder is operating and no alarms are active.
- The STATUS LED is constantly lit red if there is one or more acknowledged active alarms in the transponder, but no unacknowledged alarms. Refer to section 7.3 for interpretation of the alarms.
- The STATUS LED is flashing red if there is one or more unacknowledged alarms in the transponder. Refer to section 7.3 for interpretation of the alarms.

If neither colours are lit, nor flashing, then check the power supply and make sure that:

- The voltage is correct and stable
- The polarity is correct and not switched
- The available current is sufficient for start-up and transmission
- The external fuse is functional
- The power cable is undamaged
- The power connector is properly connected and secured

Also check so that the LED backlight is not completely turned off in the Visual Config view accessed from *Main Menu*→*Config*→*Display*→*Visual*.

7.2.2 Rx LED (yellow)

The Rx LED is flashing yellow when the transponder is receiving a message from the VDL. This can be intermittently.

If there is verified traffic on the VDL and the Rx LED still is dark, then check the alarm list for any active alarms. Refer to section 7.3 for interpretation of the alarms.

Lack of reception may be an indication of a VHF antenna problem or connectivity issues. Check the installation for problems.

7.2.3 Tx LED (red)

The Tx LED is flashing red when the transponder is transmitting a message to the VDL. The transmission interval is between 2 – 360 seconds. Refer to section 7.5.

If the Tx LED is completely dark, then check so that the transmission is not switched off either through an active regional area or by the Tx Mode parameter. It is possible to check the status on each transceiver in the VHF Status view described in section 4.24.

If the transmission is activated and there is still no red flashing, then check the alarm list for any active alarms. Refer to section 7.3 for interpretation of the alarms.

7.3 Troubleshooting with Alarm Messages

The NAUTICAST A2 constantly monitors itself for failures, abnormal conditions and other important parameters. Some of the monitoring trigger alarms and those alarms are excellent aids in the troubleshooting process. An active alarm can have two states, unacknowledged or acknowledged. The state of an alarm will affect the STATUS LED. Refer to section 7.2.1.

A new alarm (unacknowledged) will raise a pop-up window that needs to be acknowledged by the user. The active alarms can be found in the alarm view. Refer to section 4.18.

All active alarms are outputted on all the serial interface ports every 30 seconds. The alarm status can for example be used in interfacing ECDIS systems or centralized alarm systems. The alarms can also be monitored or recorded for troubleshooting purposes by for example a terminal application.

The status of an alarm can be identified by two letters in the alarm sentence, "**A**" and "**V**". The alarm sentence is constructed as: **\$AIALR,hhmmss.ss,xxx,A,A,c-c**, where:

hhmmss.ss = Time (UTC) of alarm condition change

xxx = Unique alarm identifier

A = Alarm condition (A = Active, V = Inactive)

A = Alarm's acknowledge state, A = acknowledged, V = unacknowledged

c-c = Alarm's description text

\$AIALR,hhmmss.ss,xxx,V,A,c-c: Tx malfunction: Alarm is **Inactive**

\$AIALR,hhmmss.ss,xxx,V,V,c-c: Tx malfunction: Alarm is **Inactive**

\$AIALR,hhmmss.ss,xxx,A,A,c-c: Tx malfunction: Alarm is **Active** and **Acknowledged**

\$AIALR,hhmmss.ss,xxx,A,V,c-c: Tx malfunction: Alarm is **Active** and **Unacknowledged**

The alarms that can occur in the NAUTICAST A2 are listed below:

7.3.1 AIS: Tx Malfunction (ID 001)

A Tx Malfunction alarm is generated if there is a malfunction in the radio transmitter hardware or if the antenna VSWR exceeds an allowed ratio. If the radio transmitter returns to normal operation or if VSWR returns to a value below the allowed threshold, the alarm is cleared. The Tx Malfunction alarm is also generated when the MMSI is configured to "0", in which case the NAUTICAST A2 will not transmit.

7.3.2 AIS: Antenna VSWR Exceeds limit (ID 002)

The VSWR (Voltage Standing Wave Ratio) of the antenna is checked for every transmission and if it exceeds a given ratio then a VSWR alarm is generated. If the VSWR goes below the allowed threshold, the alarm is cleared.

7.3.3 AIS: Rx Ch A Malfunction (ID 003)

7.3.4 AIS: Rx Ch B Malfunction (ID 004)

7.3.5 AIS: Rx Ch C Malfunction (ID 005)

The radio receivers are continuously monitored and if any part of the receivers' hardware should malfunction, an Rx Malfunction alarm is generated for that receiver. If the radio receiver returns to normal operation, the alarm is cleared.

7.3.6 AIS: General Failure (ID 006)

This alarm is generated if the NAUTICAST A2 fails to initiate the radio or if a severe hardware failure has occurred. If this alarm occurs, contact your retailer.

7.3.7 AIS: UTC Sync Invalid (ID 007)

This alarm is generated when the NAUTICAST A2 loses UTC direct synchronization (cannot synchronize from internal GPS receiver).

7.3.8 AIS: MKD connection lost (ID 008)

This alarm is active if the communication between the control unit and the display unit in the NAUTICAST A2 does not work.

7.3.9 AIS: Internal/External GNSS position mismatch (ID 009)

This alarm is generated if the difference between the internal and external GNSS position is more than 100 m for more than 15 minutes.

7.3.10 AIS: NavStatus incorrect (ID 010)

This alarm is generated if the navigational status is incorrect. If e.g. the navigational status is set to "At Anchor" but the ship is moving faster than 3 knots, the NavStatus incorrect alarm will become active.

7.3.11 AIS: Heading sensor offset (ID 011)

This alarm is active when SOG (Speed Over Ground) is greater than 5 kn and the difference between COG (Course Over Ground) and HDT (True Heading) is greater than 45° for 5 min.

7.3.12 AIS: Active AIS SART (ID 014)

This alarm is generated when the NAUTICAST A2 has received an active AIS SART position report.

7.3.13 AIS: External EPFS Lost (ID 025)

This alarm is generated if the position from the external Electronic Position Fixing System is invalid (i.e. no external GNSS). Due to the fall back arrangement for the positioning sensor this alarm can be inactive up to 30 seconds (during which the internal GNSS is used) before the alarm is activated.

7.3.14 AIS: No Sensor Position In Use (ID 026)

This alarm is active if the NAUTICAST A2 does not have a valid position (latitude/longitude) from any sensor.

7.3.15 AIS: No Valid SOG Information (ID 029) / No Valid COG Information (ID 030)

These alarms are active if the NAUTICAST A2 does not have a valid SOG (Speed Over Ground) or a valid COG (Course Over Ground) from any sensor. The SOG and COG is based on the speed log (if external GNSS is used and a valid heading is available) or the GNSS currently in use.

7.3.16 AIS: Heading Lost/Invalid (ID 032)

This alarm is generated if either the heading information is lost/invalid (from external sensors) or if the heading is undefined.

7.3.17 AIS: No Valid ROT Information (ID 035)

This alarm is active if ROT (Rate of Turn) is undefined or if no valid ROT information is available from external sensor or internal calculations.

7.3.18 IAIS: Ship Size mismatch (ID 060)

This alarm is active when the inland parameters length and beam of ship does not match the antenna position parameters A, B, C and D.

7.3.19 AIS: Tx disabled externally (ID 072)

This alarm is active when an external silent switch is used and the switch has disabled transmissions.

7.4 Troubleshooting via the Display

There is a lot of information and data accessible via the display that can be useful for troubleshooting, and that can help finding a presumed problem. The following items are just a few examples of what to look at.

7.4.1 Transmitted Own Ship Data View

When the transponder transmits data on the VDL, it also simultaneously outputs this data on all the serial ports. This information is displayed in the Transmitted Own Ship Data view.



58° 23.8305' N			09:28 UTC
15° 41.9626' E			UTC Direct
Transmitted Own Ship Data			MMSI: 463986124
Parameter		Value	
--Static data--			
Callsign		BJ 73	
IMO		71283656	
Type of Ship		Passenger Ship	
Ship Name		M/S ROXEN	
Length of Ship		118 m (A: 113, B: 5)	
Beam of Ship		10 m (C: 3, D: 7)	

Figure 47 – Transmitted Own Ship Data

7.4.2 Target List

The target list is primarily useful when analyzing the receiving functionality. The propagation characteristics of VHF radio frequencies are close to line of sight. A harsh radio environment, reflections in cables, connectors or the antenna will shorten the effective range.

58° 23.8261' N		1417 UTC	
15° 41.9712' E		UTC Direct	
Ship Id	RNG	BRG	Age
⊗ SART ACTIVE: 97	10.2 NM	199 °	3m14s
△ BLACK PEARL	0.0 NM	303 °	5s
△ CATRINA	17.8 NM	354 °	3m14s
△ LUDWIG II	18.5 NM	128 °	3m14s
■ BS: 477995087	21.7 NM	55 °	3m14s
✚ HELI 13	30.8 NM	200 °	3m14s
✚ R4AS	106 NM	349 °	0s

Figure 48 – Target List

7.4.3 Date and Time

The date and time (UTC) in the upper right corner of the display is provided by the transponder. If the date and time are not correct, the transponder's internal GPS does not have a position fix. This will also be indicated by the alarm "UTC sync invalid". This problem is normally caused by a GPS-antenna failure or damaged antenna cables. This problem may also be caused by interference from radio equipment on-board.

7.4.4 View Raw Data

The *View Raw Data* view can be used to see received data on the ports of the NAUTICAST A2. It is useful for troubleshooting to make sure that connected sensors provide correct data to the NAUTICAST A2 unit. The "View Port" parameter determines from which port the data displayed in the view are taken. It is possible to pause the view by pressing the "Freeze" button. All data that is received while the view is paused will not be displayed in the view.




58° 23.8301' N		 		<input type="checkbox"/> 12:37 UTC
15° 41.9616' E				UTC Direct
View Raw Data		<div>Freeze</div>		
View Port		Internal GPS		
\$GPVTG,,T,,M,0.007,N,0.013,K,A*26				
\$GPGGA,1237.12,00,5823.83016,N,01541.96161,E,1,09,0.95,60.0,M,30.5,M,,*65				
\$GPGSA,A,3,01,17,20,32,23,31,12,11,14,,,*1.54,0.95,1.22*0E				
\$GPGSV,3,1,09,01,70,173,49,11,45,167,47,12,06,014,38,14,30,05				
0,41*73				
\$GPGSV,3,2,09,17,37,295,45,20,62,246,48,23,15,199,43,31,21,10				
2,46*75				
\$GPGSV,3,3,09,32,82,135,49*41				
\$GPZDA,1237.12,00,12,01,2012,00,00*61				
\$GPGTS,1237.12,00,1.3,1.2,1.4,,,*41				

Figure 49 – View Raw Data

7.4.5 Status List

The status list view is used to display status indications that are stored in the transponder. The indications are created when an important event has occurred in the transponder. Time of occurrence and status indication text are shown in the view. A list of all possible indications can be found in section 7.8 Indication Messages.

58° 23.8261' N  10:23 UTC
15° 41.9712' E UTC Direct

Status List

Time	Status Indication
2011-04-28 11:38:12	AIS: Leave Semaphore ▶
2011-04-28 12:40:26	AIS: Leave Semaphore M
2011-04-28 14:20:46	AIS: Leave Semaphore ▶
2011-04-28 16:10:35	AIS: Leave Semaphore ▶

Status: AIS: Leave Semaphore Mode

Figure 50 – Status List

7.5 Reporting Intervals for Class A Transponders

The different information types are valid for different time periods and therefore they need different update intervals. These update intervals are defined in the AIS standard (ITU-R M.1371) and should be applied by all transponders. There are however some exceptions from this, which can be found in the standard. Class B transponders have for example different intervals than the Class A transponder.

All this needs to be taken in consideration while troubleshooting thus it affects the anticipated behaviour of a transponder.

Information type / Condition	Nominal reporting interval
Static Information	6 min, on amendment, on request
Voyage related information	6 min, on amendment, on request
Dynamic information (See conditions below)	
- Ship at anchor or moored and not moving faster than 3 knots	3 minutes
- Ship at anchor or moored and moving faster than 3 knots	10 seconds
- Ship 0-14 knots	10 seconds
- Ship 0-14 knots and changing course	3 1/3 seconds
- Ship 14-23 knots	6 seconds
- Ship 14-23 knots and changing course	2 seconds
- Ship > 23 knots	2 seconds
- Ship > 23 knots and changing course	2 seconds

Table 15 – Reporting Intervals

7.6 F.A.Q

7.6.1 I cannot see the vessel on the Internet AIS service

Websites providing AIS services like e.g. www.marinetraffic.com does not cover all the seas of the world, but only specific coastal areas where AIS receivers have been installed and that upload the data to the websites. The vessel must be in reception range of these AIS receivers to show up on the Internet AIS service. If wrong information about your ship shows up on these websites (e.g. pictures or wrong position), this doesn't mean your AIS is not working correctly. If the data is shown correctly on the AIS, the incorrect information is mostly due to false information delivered to these websites through other sources.

7.6.2 I can "see" the other vessel, but they do not "see" my vessel

There are several reasons why this might happen. The first thing to check is if the NAUTICAST A2 is transmitting at all or if it is transmitting in low power mode. In *VHF Status* view described in section 4.24 it is possible to check the status on all NAUTICAST A2 VHF transceivers. Make sure that correct channels and power mode are used. There might be a regional area set in the transponder that changes the operating mode of the NAUTICAST A2. Regional areas are listed in the *Regional Area* view (see section 4.17).

The MMSI must also be configured in order for the NAUTICAST A2 to transmit. If the MMSI is zero, the NAUTICAST A2 will be silent.

Another possibility is that the other vessels' transponder requires a shorter reception range in order to receive the NAUTICAST A2 transmissions. In the *Target List* view and the *Plot* view it is possible to see the range and bearing to other vessels.

7.6.3 The VHF range seems to be short

As a general rule, the VHF range is equal to line of sight from the antenna position, which means that the higher the antenna is installed, the longer the range will be. It is also important to follow the guide lines for an antenna installation thoroughly. Section 0 describes how to best install the VHF antenna.

7.6.4 I can only receive a few GPS satellites

The position of the GPS antenna is of high importance to optimize the GPS reception. Follow the guide lines of GPS antenna installation described in section 0.

If the ship is close to a harbour or shore with high structures or travelling in an area with high terrain, the GPS reception might be lowered. The GPS antenna must be installed where it has a clear view of the sky. The objective is to see the horizon freely through 360 degrees with a vertical observation of 5 to 90 degrees above the horizon.

The GPS antenna cable should also be as short as possible and with 50 Ω impedance. A very long antenna cable or faulty impedance can heavily reduce the GPS reception.

7.7 Contact & Support information

Contact your local dealer for NAUTICAST A2 support. Please visit www.nauticast.com to see our worldwide service partners.

Nauticast GmbH

Lützowgasse 12-14/ 3. OG

1140 Vienna

Austria

Tel: +43 (1) 5 237 237-240

Fax: +43 (1) 5 237 237-150

Mail: support@nauticast.com

Web: www.nauticast.com

To enable us to provide you with precise and thorough support please contact support@nauticast.com per Email and include the "Technical Support / Problem Report using all relevant information provided by the SW/HW Info view which can be accessed from *Main Menu* → *Status* → *SW/HW Info*.

7.8 Indication Messages

The indication messages, with identity and type information, are listed below:

ID	Type	Message text
021	Status	External DGNSS in use
022	Status	External GNSS in use
023	Status	Internal DGNSS in use (beacon)
024	Status	Internal DGNSS in use (msg 17)
025	Status	Internal GNSS in use
027	Status	External SOG/COG in use
028	Status	Internal SOG/COG in use
031	Status	Heading valid
033	Status	Rate of Turn Indicator in use
034	Status	Other ROT source in use
036	Event	Channel management parameters changed
056	Event	Channel management zone memory changed
061	Status	Enter semaphore mode
062	Event	Leave semaphore mode
063	Event	NVM Checksum errors
064	Event	RATDMA overflow
066	Status	Tanker Low VHF Power Mode
067	Status	Beacon correction received
068	Status	VDL correction received (id XXXX)
069	Status	No correction received

7.9 Long Range Definitions

A = Ship's name, call sign, and IMO number

B = Date and time of message composition

C = Position

E = Course over ground (COG)

F = Speed over ground (SOG)

I = Destination and Estimated Time of Arrival (ETA)

O = Draught

P = Ship/Cargo

U = Ship's length, breadth, type

W = Persons on board

8 Interpretation of Input Sentences

All interface ports accept the full set of input listed below sentences, except the sentences listed in section 8.4.1 that are unique to the Long Range interface port.

The protocol of the serial input sentences shall be compliant to IEC 61162-1Ed.4 (2010-11) for maximum interoperability.

8.1 GPS and Sensor Input Sentences

8.1.1 DTM - Datum Reference

If local code is other than WGS84, then the positions report from that port is discarded.

\$--DTM,ccc,a,x.x,a,x.x,a,x.x,ccc

Field	Format	Name	Comment
1	--DTM	Sentence Id	Used
2	ccc	Local Datum Code	Interpret if it's WGS84 or not
3	A	Local Datum Subdivision Code	Ignored
4	x.x	Lat Offset (2 fields)	Ignored
5	a		Ignored
6	x.x	Long Offset (2 fields)	Ignored
7	a		Ignored
8	x.x	Altitude Offset	Ignored
9	ccc	Reference Datum Code	Ignored

8.1.2 GBS - GNSS Satellite Fault Detection

If this sentence is received once a second from the position source in use, the RAIM flag will be set to TRUE.

\$--GBS,hhmmss.ss,x.x,x.x,x.x,xx,x.x,x.x,x.x

Field	Format	Name	Comment
1	--GBS	Sentence Id	Used
2	hhmmss.ss	UTC Time of GGA or GNS	Ignored
3	x.x	Expected Error in latitude	Used
4	x.x	Expected Error in longitude	Used
5	x.x	Expected error in altitude	Ignored
6	xx	ID number of most likely failed satellite	Ignored
7	x.x	Probability of missed detection	Ignored
8	x.x	Estimate of bias in meters	Ignored
9	x.x	Standard Deviation of bias estimate	Ignored

8.1.3 GGA - Global Positioning System Fix Data

\$--GGA,hhmmss.ss,lll.ll,a,yyyy.yy,a,x,xx,x.x,x.x,M,x.x,M,x.x,xxxx

Field	Format	Name	Comment
1	--GGA	Sentence Id	Used
2	hhmmss.ss	UTC of position	UTC Second is used to indicate Time Stamp
3	lll.ll	Latitude	Used
4	a		
5	yyyy.yy	Longitude	Used
6	a		
7	x	GPS quality indicator	Used, 1 -> Position with Low Accuracy 2 -> Position with High Accuracy 3 -> Position with Low Accuracy 6 -> Dead Reckoning with Low Accuracy 7 -> Manual mode with low accuracy OTHER -> No Position Used when the GPS is the internal GPS (Used in proprietary sentences)
8	xx	Satellites in use	Ignored
9	x.x	Horizontal dilution of precision	Ignored
10	x.x	Antenna altitude	Ignored
11	M	Units of antenna altitude, meter	Ignored
12	x.x	Geoidal separation	Ignored
13	M	Units of geoidal sep.	Ignored
14	x.x	Age of differential GPS data	Ignored
15	xxxx	Differential reference station ID	Ignored

8.1.4 GLL – Geographic position, latitude/longitude

\$--GLL,III,II,a,yyyy.yy,a,hmmss.ss,A,a

Field	Format	Name	Comment
1	--GLL	Sentence Id	Used
2	III,II	Latitude	Used
3	a		
4	yyyy.yy	Longitude	Used
5	a		
6	hmmss.ss	UTC of position	UTC Second is used to indicate Time Stamp
7	A	Status	Used
8	a	Mode indicator	NULL -> Message is ignored A -> Position with Low Accuracy D -> Position with High Accuracy E -> Dead Reckoning Mode with Low Accuracy M-> Manual Mode with Low Accuracy OTHER -> No Position

8.1.5 GNS – GNSS fix data

If the Mode Indicator is a NULL field, the sentence is ignored.

\$--GNS,hmmss.ss,III,II,a,yyyy.yy,a,C--C,xx,x.x,x.x,x.x,x.x,x.x,x.x

Field	Format	Name	Comment
1	--GNS	Sentence Id	Used
2	hmmss.ss	UTC of position	UTC Second is used to indicate Time Stamp
3	III,II	Latitude	Used
4	a		
5	yyyy.yy	Longitude	Used
6	a		
7	C--C	Mode indicator	A, P -> Position with low accuracy D, R, F -> Position with high Accuracy E -> Dead Reckoning Mode with Low accuracy M -> Manual Mode with low accuracy OTHER -> No Position
8	xx	Total number of satellites	Used when the GPS source is the internal GPS (used in proprietary sentences)
9	x.x	HDOP	Ignored
10	x.x	Antenna altitude, meter	Ignored
11	x.x	Geoidal separation	Ignored
12	x.x	Age of differential corrections	Ignored
13	x.x	Differential reference station ID	Ignored

8.1.6 HDT - Heading, True

The use of this sentence is talker identifier dependent.

\$--HDT,x.x,T

Field	Format	Name	Comment
1	--HDG	Sentence Id	Used
2	x.x	Heading, degrees true	Used
3	T		

NOTE: HDT input must be sent at least every 3 seconds for the NAUTICAST A2 to calculate ROT from the HDT input.

8.1.7 OSD – Own ship data

\$--OSD,x.x,A,x.x,a,x.x,a,x.x,x.x,a

Field	Format	Name	Comment
1	--OSD	Sentence Id	Used
2	x.x	Heading, degrees true	Used if heading status is 'A'
3	A	Heading status	Used
4	x.x	Vessel course, degrees true	Used as COG
5	a	Course reference	Used ¹
6	x.x	Vessel speed	Used as SOG
7	a	Speed reference	Used ¹
8	x.x	Vessel set	Ignored
9	x.x	Vessel drift	Ignored
10	a	Speed units	Used to convert SOG to knots

8.1.8 RMC – Recommended minimum specific GNSS data

\$--RMC,hhmmss.ss,A,IIII.II,a,yyyy.yy,a,x.x,x.x,xxxxxx,x.x,a,a

Field	Format	Name	Comment
1	--RMC	Sentence Id	Used
2	hhmmss.ss	UTC of position	UTC Second is used to indicate Time Stamp
3	A	Status	Used
4	IIII.II	Latitude	Used
5	a		
6	yyyy.yy	Longitude	Used
7	a		
8	x.x	Speed over ground, knots	Used
9	x.x	Course over ground, degrees true	Used
10	xxxxxx	Date	Ignored
11	x.x	Magnetic variation	Ignored
12	a		
13	a	Mode indicator	NULL -> Message is ignored A -> Position with low accuracy D -> Position with high accuracy E -> Dead Reckoning Mode with Low accuracy M -> Manual Mode with low accuracy OTHER -> No Position

8.1.9 ROT – Rate of turn

The rate of turn value is only used if the talker identifier is TI. Otherwise the value will only be used to determine the direction, i.e. "Moving Right" or "Moving Left".

\$--ROT,x.x,A

Field	Format	Name	Comment
1	--ROT	Sentence Id	Used
2	x.x	Rate of turn	Used if Status is set to 'A'
3	A	Status	Used

8.1.10 THS–True heading and status

The use of this sentence is talker identifier dependent. This sentence includes a status indication and replaces the deprecated HDT message. Status must be a = autonomous.

\$--THS,x.x,A

Field	Format	Name	Comment
1	--THS	Sentence Id	Used
2	x.x	Heading, degrees true	Used
3	A	Mode Indicator	Used

NOTE: THS input must be sent at least every 3 seconds for the NAUTICAST A2 to calculate ROT from the THS input.

8.1.11 VBW - Dual Ground / Water Speed

The current position source must be external GPS, and heading must be available for the transponder to accept this sentence.

\$--VBW,x.x,x.x,A,x.x,x.x,A,x.x,A,x.x,A

Field	Format	Name	Comment
1	--ROT	Sentence Id	Used
2	x.x	Longitudinal water speed	Ignored
3	x.x	Transverse water speed	Ignored

¹ SOG and COG are used if both COG reference and SOG reference are set to either: B, P, R

4	A	Status: water speed	Ignored
5	x.x	Longitudinal ground speed	Used if Status is set to A
6	x.x	Transverse ground speed	Used if Status is set to A
7	A	Status: ground speed	Used
8	x.x	Stern transverse water speed	Ignored
9	A	Status stern water speed	Ignored
10	x.x	Stern transverse ground speed	Ignored
11	A	Status stern ground speed	Ignored

8.1.12 VTG – Course over ground and ground speed

\$--VTG,x.x,T,x.x,M,x.x,N,x.x,K,a

Field	Format	Name	Comment
1	--VTG	Sentence Id	Used
2	x.x	Course over ground, degrees true	Used
3	T	Course over ground, degrees magnetic	Ignored
4	x.x	Speed over ground, knots	Used
5	M	Speed over ground, km/h	Ignored
6	x.x	Mode indicator	Used
7	N		
8	x.x		
9	K		
10	a		

8.1.13 ZDA – Time and date

This message is only interpreted if it's received from the internal GPS (the time synchronisation source).

\$--ZDA,hhmmss.ss,xx,xx,xxxx,xx,xx

Field	Format	Name	Comment
1	--ZDA	Sentence Id	Used
2	hhmmss.ss	UTC	Used
3	xx	Day (UTC)	Used
4	xx	Month (UTC)	Used
5	xxxx	Year (UTC)	Used
6	xx	Local zone hours	Ignored
7	xx	Local zone minutes	Ignored

8.2 General Input Sentences

8.2.1 ACK – Acknowledge Alarm

\$--ACK,xxx

Field	Format	Name	Comment
1	--ACK	Sentence Id	Used
2	xxx	ID of the alarm source	Used

8.2.2 EPV – Command or report equipment property value

\$--EPV,a,c--c,c--c,x.x,c--c,

Field	Format	Name	Comment
1	--EPV	Sentence Id	Used
2	a	Sentence status flag	Used
3	c--c	Destination equipment type	Used, AI or STT
4	c--c	Unique Identifier	Used, may be null
5	x.x	Property identifier	Used
6	c--c	Value of property to be set	Used

8.2.3 SPW – Security Password Sentence

\$--SPW,ccc,c--c,x,c--c

Field	Format	Name	Comment
1	--SPW	Sentence Id	Used
2	ccc	Password protected sentence	Used
3	c--c	Unique Identifier	Used, may be NULL
4	x	Password level	Used
5	c--c	Password	Used

8.2.4 HBT – Heartbeat Supervision Sentence

\$--HBT,x.x,A,x

Field	Format	Name	Comment
1	--SPW	Sentence Id	Used
2	x.x	Configured repeat interval	Used (Limited to 60 sec)
3	A	Equipment status	Used
4	x	Sequential sentence identifier	Ignored

8.3 AIS Specific Input Sentences

8.3.1 ABM – Addressed Binary and Safety-Related Message

!--ABM,x,x,x,xxxxxxxx,x,x,x,s--s,x

Field	Format	Name	Comment
1	--ABM	Sentence Id	Used
2	x	Total nr of sentences	Used if in interval 1..9, otherwise the sentence is ignored
3	x	Sentence number	Used if in interval 1..total sentences, otherwise the sentence is ignored
4	x	Sequential message identifier	Used if in interval 0..3, otherwise the sentence is ignored
5	xxxxxxxx xx	MMSI of Destination	Used
6	X	AIS Channel	Used
7	x.x	Message Id	Used if 6 or 12, otherwise the sentence is ignored
8	s--s	Encapsulated Data	Used
9	x	Number of filled bits	Used

8.3.2 ACA – AIS Regional Channel Assignment Message

The zone created of this sentence must be accepted by the channel management rules (size of zone, distance to own position, valid channel number etc). If the zone isn't accepted, the zone will be ignored.

\$--ACA,x,IIII.II,a,yyyy.yy,a,IIII.II,a,yyyy.yy,a,x,xxxx,x,xxxx,x,x,x,a,x,
hhmmss.ss

Field	Format	Name	Comment
1	--ACA	Sentence Id	Used
2	x	Sequence number	Ignored
3	IIII.II	NE latitude (2 fields)	Used
4	a		
5	yyyy.yy	NE longitude (2 fields)	Used
6	a		
7	IIII.II	SW latitude (2 fields)	Used
8	a		
9	yyyy.yy	SW longitude (2 fields)	Used
10	a		
11	x	Transitional zone size	Used
12	xxxx	Channel A	Used
13	x	Channel A bandwidth	Used
14	xxxx	Channel B	Used
15	x	Channel B bandwidth	Used
16	x	Tx/Rx mode	Used
17	x	Power level	Used
18	a	Information source	Ignored
19	x	In use flag	Ignored
20	hhmmss.s s	Time of In use change	Ignored

8.3.3 AIQ – Query Sentence

\$--AIQ,ccc

Field	Format	Name	Comment
1	--	Talker ID of requester	Used
2	AIQ	Talker ID for device	Used
3	ccc	Approved sentence formatter of data being requested	It's possible to query the following sentences: ACA, ALR, EPV, LRI, SSD, TRL, TXT and VSD

8.3.5 AIR – AIS Interrogation Request

This sentence can also be used to do a "UTC Request".

\$--AIR,xxxxxxxxx,x.x,x.x,x.x,xxxxxxxxx,x.x,x,x

Field	Format	Name	Comment
1	--AIR	Sentence Id	Used
2	xxxxxxxxx x	MMSI 1	Used
3	x.x	Message ID 1.1	Used
4	x	Message sub section	Ignored
5	x.x	Message ID 1.2	Used, may be NULL
6	x	Message sub section	Ignored
7	xxxxxxxxx x	MMSI 2	Used, may be NULL
8	x.x	Message ID 2.1	Used, may be NULL
9	x	Message sub section	Ignored
10	x	Channel	Used, may be NULL

8.3.6 BBM – Broadcast Binary Message

\$--BBM,x,x,x,x,x,x,s--s,x

Field	Format	Name	Comment
1	--BBM	Sentence Id	Used
2	X	Total number of sentences	Used if in interval 1..9, otherwise rejected
3	X	Sentence number	Used if in interval 1..total number of sentences, otherwise rejected.
4	X	Sequential message identifier	Used if in interval 0..9, otherwise rejected
5	X	AIS channel	Used
6	x.x	Message Id	Used if 8 or 14
7	s--s	Encapsulated data	Used
8	X	Number of filled bits	Used

8.3.7 SSD – Ship Static Data

\$--SSD,c--c,c--c,xxx,xx,xx,c,aa

Field	Format	Name	Comment
1	--SSD	Sentence Id	Used
2	c--c	Call sign	Used, may be NULL
3	c--c	Name	Used, may be NULL
4	xxx	Pos ref A	Used to change position reference for the position source in use. May be NULL.
5	xxx	Pos ref B	Used to change position reference for the position source in use. May be NULL.
6	xx	Pos ref C	Used to change position reference for the position source in use. May be NULL.
7	xx	Pos ref D	Used to change position reference for the position source in use. May be NULL.
8	c	DTE	Ignored
9	aa	Source identifier	Used

8.3.8 VSD – Voyage Static Data

\$--VSD,x.x,x.x,x.x,c--c,hmmss.ss,xx,xx,x.x,x.x

Field	Format	Name	Comment
1	--VSD	Sentence Id	Used
2	x.x	Type of ship and cargo	Used
3	x.x	Maximum present draught	Used
4	x.x	Persons on-board	Used
5	c--c	Destination	Used
6	hmmss.s s	Est. UTC of arrival	Used
7	Xx	Est. day of arrival	Used
8	Xx	Est. month of arrival	Used
9	x.x	Navigational status	Used
10	x.x	Regional application flags	Used

8.4 Long Range Input Sentences

8.4.1 On Long Range Port

The LR sentences can only be used with the Long Range interface port.

8.4.1.1 LRF – AIS long-range function

\$--LRF,x,xxxxxxxx,c--c,c--c,c--c

Field	Format	Name	Comment
1	--LRF	Sentence Id	Used
2	x	Sequence number	Used
3	xxxxxxxx x	MMSI of requestor	Used
4	c--c	Name of requestor	Used
5	c--c	Function request	Used
6	c--c	Function reply status	Used

8.4.1.2 LRI – AIS long-range interrogation

\$--LRI,x,a,xxxxxxxx,xxxxxxxx,IIII.II,a,yyyyy.yy,a,IIII.II,a,yyyyy.yy,a

Field	Format	Name	Comment
1	--LRI	Sentence Id	Used
2	x	Sequence number	Used
3	xxxxxxxx x	MMSI of requestor	Used
4	xxxxxxxx	MMSI of destination	Used
5	IIII.II	Latitude	Used
6	a	N / S	Used
7	yyyyy.yy	Longitude	Used
8	a	E / W	Used

8.4.2 On Other Input Ports

LRF – AIS long-range function

\$--LRF,x,xxxxxxxx,c--c,c--c,c--c

Field	Format	Name	Comment
1	--LRF	Sentence Id	Used
2	x	Sequence number	Used
3	xxxxxxxx x	MMSI of requestor	Used
4	c--c	Name of requestor	Used
5	c--c	Function request	Used
6	c--c	Function reply status	Used

8.5 Proprietary Input Sentences

All Nauticast Proprietary Sentences will have talker ID PSTT.

8.5.1 Proprietary Query message PSTT,101

\$PSTT,101,c--c,

Field	Format	Name	Comment
1	PSTT	Proprietary Nauticast Sentence	Used
2	101	Sentence Query	Used
3	c--c	Proprietary sentence to query	Used

9 Interpretation of Output Sentences

9.1 Proprietary Output Sentences (PSTT)

In addition to the standardized IEC sentences, the NAUTICAST A2 is able to output the proprietary sentences listed below. All Nauticast Proprietary Sentences have talker ID "PSTT".

9.1.1 \$PSTT,10A – UTC Date and Time

This sentence provides UTC Date and Time, i.e. NAUTICAST A2 system time (based on internal GNSS time). It is output approximately once every 10 seconds (± 1 s).

\$PSTT,10A,YYYYMMDD,HHMMSS

Field	Format	Name	Comment
1	10A	Sentence Id	10A always
2	YYYYMMDD	Date	Year, month and day in decimal notation. (00000000 = Not available)
3	HHMMSS	Time	Hour, minute and second in decimal notation. (999999 = Not available)

Example: \$PSTT,10A,20121028,135230*<FCS><CR><LF>

= Date October 28, 2012

= Time 13:52:30 UTC

9.1.2 \$PSTT,10C – Data Link Status

This sentence provides information about the traffic on the VHF data link. It is output approximately once every 60 seconds. Traffic load is calculated over the last frame (i.e. 60 seconds). Number of units is derived from the internal user list and is generally the number of received units within the last few minutes.

\$PSTT,10C,C,LLL,NNNN

Field	Format	Name	Comment
1	10C	Sentence Id	10C always
2	C	Channel	A = VDL Channel A B = VDL Channel B
3	LLL	Traffic Load	Data link traffic load in percent, 0-100.
4	NNNN	Number of Units	Number of units occupying the data link

9.1.3 \$PSTT,146 – System Operational Mode Status

This sentence reports the system operational mode. This sentence is output on change, periodically every minute and on request using PSTT,101.

\$PSTT,146,x,x,x*hh<CR><LF>

Field	Format	Name	Comment
1	146	Sentence Id	146 always
2	X	1 W Mode	0 = Default 1 = 1 Watt
3	X	System Mode	0 = Class A 1 = Inland
4	X	Transmit mode	0 = Normal 1 = Silent

9.1.4 \$PSTT,1F3 – Transponder Restart

This sentence will be output when the transponder has restarted.

\$PSTT,1F3,R

Field	Format	Name	Comment
1	1F3	Sentence Id	1F3 always
2	R	Restart Reason	0 = Unknown 1 = Cold Start 2 = General Protection Fault 3 = Power Fail 4 = Warm Start

9.2 Long Range Output Sentences

9.2.1 On Long Range Port

9.2.1.1 LR1 – AIS long-range reply sentence 1

\$--LR1,x,xxxxxxxx,xxxxxxxx,c--c,c--c,xxxxxxxx

Field	Format	Name	Comment
1	--LR1	Sentence Id	Used
2	x	Sequence number	Used
3	xxxxxxxx x	MMSI of responder	Used
4	xxxxxxxx x	MMSI of requestor (reply destination	Used
5	c--c	Ship's name	Used
6	c--c	Call sign	Used
7	xxxxxxxx x	IMO Number	Used

9.2.1.2 LR2 – AIS long-range reply sentence 2

\$--LR2,x,xxxxxxxx,xxxxxxxx,hhmmss.ss,llll.ll,a,yyyy.yy,a,x.x,T,x.x,N

Field	Format	Name	Comment
1	--LR2	Sentence Id	Used
2	x	Sequence number	Used
3	xxxxxxxx x	MMSI of responder	Used
4	xxxxxxxx	Date	Used
5	hhmmss.s s	UTC time of position	Used
6	llll.ll	Latitude	Used
7	a	N / S	Used
8	yyyy.yy	Longitude	Used
9	a	E / W	Used
10	x.x	Course over ground	Used
11	T	Validity of COG	Used
12	x.x	Speed over ground	Used
13	N	Validity of SOG	Used

9.2.1.3 LR3 – AIS long-range reply sentence 3

\$--LR3,x,xxxxxxxx,c--c,xxxxxx,hhmmss.ss,x.x,x.x,x.x,x.x,x.x,x.x

Output rate: On event

Field	Format	Name	Comment
1	--LR3	Sentence Id	Used
2	x	Sequence number	Used
3	xxxxxxxx x	MMSI of responder	Used
4	c--c	Voyage destination	Used
5	xxxxxxxx	ETA Date	Used
6	hhmmss.s s	ETA time	Used
7	x.x	Draught	Used
8	x.x	Ship / Cargo	Used
9	x.x	Ship length	Used
10	x.x	Ship width	Used
11	x.x	Ship type	Used
12	x.x	Persons	Used

9.2.1.4 LRF – AIS long-range function

\$--LRF,x,xxxxxxxx,c--c,c--c,c--c

Output rate: On event

Field	Format	Name	Comment
1	--LRF	Sentence Id	Used
2	x	Sequence number	Used
3	xxxxxxxx x	MMSI of requestor	Used
4	c--c	Name of requestor	Used
5	c--c	Function request	Used
6	c--c	Function reply status	Used

9.2.2 On All Other Output Ports

9.2.2.1 LRF – AIS long-range function

\$--LRF,x,xxxxxxxx,c--c,c--c,c--c

Output rate: On event

Field	Format	Name	Comment
1	--LRF	Sentence Id	Used
2	x	Sequence number	Used
3	xxxxxxxx x	MMSI of requestor	Used
4	c--c	Name of requestor	Used
5	c--c	Function request	Used
6	c--c	Function reply status	Used

9.2.2.2 LRI – AIS long-range interrogation

\$--LRI,x,a,xxxxxxxx,xxxxxxxx,IIII.II,a,yyyyy.yy,a,IIII.II,a,yyyyy.yy,a

Output rate: On event

Field	Format	Name	Comment
1	--LRI	Sentence Id	Used
2	x	Sequence number	Used
3	xxxxxxxx x	MMSI of requestor	Used
4	xxxxxxxx	MMSI of destination	Used
5	IIII.II	Latitude	Used
6	a	N / S	Used
7	yyyyy.yy	Longitude	Used
8	a	E / W	Used

9.3 AIS Output Sentences

9.3.1 ABK – AIS Addressed and binary broadcast acknowledgement

\$ -- ABK,xxxxxxxx,x,x,x,x,x

Output rate: On event.

Field	Format	Name	Comment
1	--ABK	Sentence Id	Used
2	xxxxxxxx	MMSI of the addressed AIS unit	Used
3	x	AIS channel of reception	Used
4	x.x	ITU - R M.1371 Message ID	Used
5	x	Message sequence number	Used
6	x	Type of acknowledgement	Used

9.3.2 ACA – AIS Regional Channel Assignment Message

\$--ACA,x,IIII.II,a,yyyy.yy,a,IIII.II,a,yyyy.yy,a,x,xxxx,x,xxxx,x,x,x,a,x, hhmmss.ss

Output rate: On event. On request.

Field	Format	Name	Comment
1	--ACA	Sentence Id	Used
2	x	Sequence number	Ignored
3	IIII.II	NE latitude (2 fields)	Used
4	a		
5	yyyy.yy	NE longitude (2 fields)	Used
6	a		
7	IIII.II	SW latitude (2 fields)	Used
8	a		
9	yyyy.yy	SW longitude (2 fields)	Used
10	a		
11	x	Transitional zone size	Used
12	xxxx	Channel A	Used
13	x	Channel A bandwidth	Used
14	xxxx	Channel B	Used
15	x	Channel B bandwidth	Used
16	x	Tx/Rx mode	Used
17	x	Power level	Used
18	a	Information source	Ignored
19	x	In use flag	Ignored
20	hhmmss.ss	Time of In use change	Ignored

9.3.3 ALR – Set alarm state

\$--ALR,hhmmss.ss,xxx,A, A,c--c

Output rate: On event, on request, and automatically. Output every 30s for active alarms and every 60s when no active alarms.

Field	Format	Name	Comment
1	--ALR	Sentence Id	Used
2	hhmmss.ss	Time of alarm condition change, UTC	Used
3	Xxx	Unique alarm number (identifier) at alarm source	Used
4	A	Alarm condition A = threshold exceeded V = not exceeded	Used
5	A	Alarm's acknowledge state A = acknowledged V = unacknowledged	Used
6	c--c	Alarm's description text	Used

9.3.4 EPV – Command or report equipment property value

\$--EPV,a,c--c,c--c,x.x,c--c

Output rate: On request.

Field	Format	Name	Comment
1	--EPV	Sentence Id	Used
2	a	Sentence status flag	Used
3	c--c	Destination equipment type	Used
4	c--c	Unique Identifier	Used
5	x.x	Property identifier	Used
6	c--c	Value of property	Used

9.3.5 NAK – Negative acknowledgement

\$--NAK,cc,ccc,c--c,x.x,c--c

Output rate: On event

Field	Format	Name	Comment
1	--NAK	Sentence Id	Used
2	cc	Talker identifier	Used
3	ccc	Affected sentence formatter	Used
4	c--c	Unique Identifier	Used
5	x.x	Reason code for negative acknowledgement	Used
6	c--c	Negative acknowledgement's descriptive text	Used

9.3.6 SSD – Ship Static Data

\$--SSD,c--c,c--c,xxx,xxx,xx,xx,c,aa

Output rate: On request.

Field	Format	Name	Comment
1	--SSD	Sentence Id	Used
2	c--c	Call sign	Used, may be NULL
3	c--c	Name	Used, may be NULL
4	xxx	Pos ref A	Used to change position reference for the position source in use. May be NULL.
5	xxx	Pos ref B	Used to change position reference for the position source in use. May be NULL.
6	xx	Pos ref C	Used to change position reference for the position source in use. May be NULL.
7	xx	Pos ref D	Used to change position reference for the position source in use. May be NULL.
8	c	DTE	Ignored
9	aa	Source identifier	Ignored

9.3.7 TRL – AIS transmitter non functioning log

\$--TRL,x.x,x.x,x,xxxxxxxx,hhmmss.ss,xxxxxxxx,hhmmss.ss,x

Output rate: On request. Up to 10 sentences in a burst.

Field	Format	Name	Comment
1	--TRL	Sentence Id	Used
2	x.x	Total number of log entries	Used
3	x.x	Log entry number	Used
4	x	Sequential message identifier	Used
5	xxxxxxxx	Switch off date	Used
6	hhmmss.ss	Switch off UTC time	Used
7	xxxxxxxx	Switch on date	Used
8	hhmmss.ss	Switch on UTC time	Used
9	X	Reason code1	Used

9.3.8 TXT – Text transmission

\$--TXT,xx,xx,xx,c--c

Output rate: On request, on event.

Field	Format	Name	Comment
1	--TXT	Sentence Id	Used
2	xx	Total number of sentences	Used
3	xx	Sentence number	Used
4	xx	Text identifier	Used
5	c--c	Text message	Used

9.3.9 VDM – AIS VHF data-link message

!--VDM,x,x,x,a,s--s,x

Only output on serial port when baudrate is 38400 bps or higher.

Output rate: On VHF message receive event.

Field	Format	Name	Comment
1	--VDM	Sentence Id	Used
2	X	Total number of sentences needed to transfer the message	Used
3	X	Sentence number	Used
4	X	Sequential message identifier	Used
5	A	AIS channel	Used
6	s--s	Encapsulated ITU-R M.1371 radio message	Used
7	X	Number of fill bits	Used

9.3.10 VDO – AIS VHF data-link own-vessel report

!-VDO,x,x,x,a,s-s,x

Only output on serial port when baudrate is 38400 bps or higher.

Output rate: On VHF transmission event. "Dummy" messages once per second.

Field	Format	Name	Comment
1	--VDO	Sentence Id	Used
2	X	Total number of sentences needed to transfer the message	Used
3	X	Sentence number	Used
4	X	Sequential message identifier	Used
5	A	AIS channel	Used for transmission event. Not used for "dummy" position messages.
6	s-s	Encapsulated ITU-R M.1371 radio message	Used
7	X	Number of fill bits	Used

9.3.11 VER – Version

\$-VER,x,x,aa,c--c,c--c,c--c,c--c,c--c,x

Output rate: On request.

Field	Format	Name	Comment
1	--VER	Sentence Id	Used
2	x	Total number of sentences	Always 1
3	x	Sentence number	Always 1
4	aa	Device Type	Used
5	c--c	Vendor ID	Used
6	c--c	Unique Identifier	Used
7	c--c	Manufacturer serial number	Used
8	c--c	Model code	Used
9	c--c	Software revision	Used
10	c--c	Hardware revision	Used
11	x	Sequential message identifier	Always NULL

9.3.12 VSD – Voyage Static Data

\$-VSD,x,x,x,x,x,c--c,hhmmss.ss,xx,xx,x.x,x.x

Output rate: On request.

Field	Format	Name	Comment
1	--VSD	Sentence Id	Used
2	x.x	Type of ship and cargo	Used
3	x.x	Maximum present draught	Used
4	x.x	Persons on-board	Used
5	c--c	Destination	Used
6	hhmmss.ss	Est. UTC of arrival	Used
7	Xx	Est. day of arrival	Used
8	Xx	Est. month of arrival	Used
9	x.x	Navigational status	Used
10	x.x	Regional application flags	Used

10 Glossary

ACK	Acknowledgement
AFSK	Audio Frequency Shift Keying
AIS	Automatic Identification System
Ant	Antenna
App	Application
ARPA	Automatic Radar Plotting Aid
BRG	Bearing
BS	Base Station
Ch	Channel
COG	Course Over Ground
Comm	Communication
DGNSS	Differential Global Navigational Satellite System
Disp	Display
DTE	Data Terminal Equipment
DSC	Digital Selective Calling
ECDIS	Electronic Chart Display and Information System
EGNOS	European Geostationary Navigation Overlay Service
EPFS	Electronic Position Fixing System
ETA	Estimated Time of Arrival
Ext	External
GALILEO	European GNSS
GLONASS	Russian GNSS
GMSK	Gaussian Minimum Shift Keying
GNSS	Global Navigational Satellite System
GPS	Global Positioning System
HDG	Heading
HDOP	Horizontal Dilution Of Precision
Hecto	Hectometre
H/W	Hardware
IALA	International Association of Lighthouse Authorities
ID	Identifier
IEC	International Electrotechnical Commission
IMO	International Maritime Organization
Int	Internal
ITU	International Telecommunications Union
LAT	Latitude
LED	Light Emitting Diode
LOC	Local
LON	Longitude
LR	Long Range
Msg	Message
MKD	Minimum Keyboard and Display
MSAS	MTSAT Satellite Augmentation System (Japan)
NMEA	National Marine Electronics Association
MMSI	Maritime Mobile Service Identity
N/A	Not available
NE	North East

No	Number
NVM	Non-Volatile Memory
PoB	Persons on board
Pos	Position
RAIM	Receiver Autonomous Integrity Monitoring
RNG	Range
RATDMA	Random Access Time Division Multiple Access
ROT	Rate Of Turn
RTA	Recommended Time of Arrival
Rx	Receive
SAR	Search And Rescue
SART	Search And Rescue Transmitter
SBAS	Satellite Based Augmentation System
SNR	Signal to Noise Ratio
SOG	Speed Over Ground
SRM	Safety Related Message
Sync	Synchronization
SW	South West
S/W	Software
TDMA	Time Division Multiple Access
Transp	Transponder
Tx	Transmit
UN	United Nations
UTC	Universal Time Coordinated
VHF	Very High Frequency
VSWR	Voltage Standing Wave Ratio. (A low value indicates a problem with the antenna or connections/cables to the antenna.)
WAAS	Wide Area Augmentation System (United States)

10.1 Inland ERI Ship Types

ERI Ship Type	Description	IMO Ship Type
8000	Vessel Type Unknown	99
8010	Motor Freighter	79
8020	Motor Tanker	89
8021	Motor Tanker Liquid (N)	80
8022	Motor Tanker Liquid (C)	80
8023	Motor Tanker Dry Cargo	89
8030	Container Vessel	79
8040	Gas Tanker	80
8050	Motor Freighter Tug	79
8060	Motor Tanker Tug	89
8070	Motor Freighter (Ships Alongs.)	79
8080	Motor Freighter With Tanker	89
8090	Motor Freighter Push Freighter(s)	79
8100	Motor Freighter Push Tank-Ship(s)	89
8110	Tug Freighter	79
8120	Tug Tanker	89
8130	Tug Freighter Coupled	31
8140	Tug Freighter/Tanker Coupled	31
8150	Freightbarge	99
8160	Tankbarge	99
8161	Tankbarge Liquid cargo (N)	90
8162	Tankbarge Liquid cargo (C)	90
8163	Tankbarge Dry Cargo	99
8170	Freightbarge Containers	89
8180	Tankbarge Gas	90
8210	Pushtow One Cargo Barge	79
8220	Pushtow 2 Cargo Barges	79
8230	Pushtow 3 Cargo Barges	79
8240	Pushtow 4 Cargo Barges	79
8250	Pushtow 5 Cargo Barges	79
8260	Pushtow 6 Cargo Barges	79
8270	Pushtow 7 Cargo Barges	79
8280	Pushtow 8 Cargo Barges	79
8290	Pushtow >=9 Cargo Barges	79
8310	Pushtow one Tank/Gas barge	80
8320	Pushtow 2 Barges (>= 1 T/G)	80
8330	Pushtow 3 Barges (>= 1 T/G)	80
8340	Pushtow 4 Barges (>= 1 T/G)	80
8350	Pushtow 5 Barges (>= 1 T/G)	80
8360	Pushtow 6 Barges (>= 1 T/G)	80
8370	Pushtow 7 Barges (>= 1 T/G)	80
8380	Pushtow 8 Barges (>= 1 T/G)	80
8390	Pushtow >=9 Barges (>= 1 T/G)	80
8400	Tug Single	52
8410	Tug One or More Tows	31
8420	Tug Assisting a Vessel or Linked.	31
8430	Pushboat Single	99
8440	Passenger Ship Ferry Cruise	69
8441	Ferry	69
8442	Red Cross Ship	58
8443	Cruise Ship	69
8444	Passenger Ship No Accomodation	69
8450	Service Vessel Police etc.	99
8460	Vessel Maint. Derric etc.	33
8470	Object Towed	99
8480	Fishing Boat	30
8490	Bunkership	99
8500	Barge Tanker Chemical	80
8510	Object Not Specified	99
1500	General Cargo Vessel	79
1510	Unit Carrier Maritime	79
1520	Bulk Carrier Maritime	79
1530	Tanker	80
1540	Liquified Gas Tanker	80
1850	Pleasure Craft >= 20m	37
1900	Fast Ship	49
1910	Hydrofoil	49

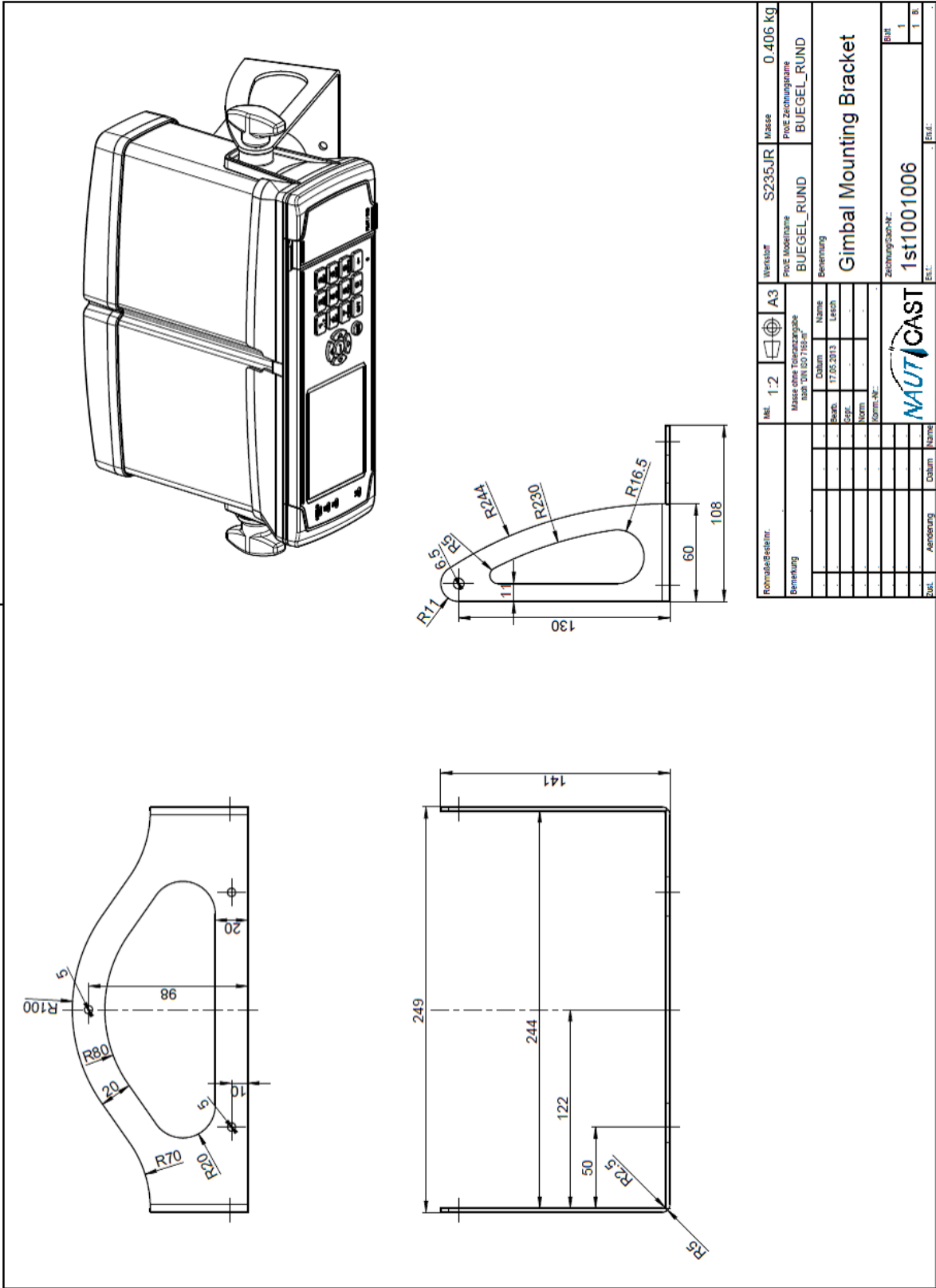
10.2 Units

bps	Bits per second
W	Watt
m	Meter
kHz	Kilo Hertz
dB-Hz	Decibel-Hertz
NM	Nautical Mile
km	Kilometer
Sm	Statute Mile
kn	Knots
km/h	Kilometer per Hour
mph	Miles per Hour
mm-dd hh:mm	month-day hour:minute
h:m:s	hours:minutes:seconds

11.1 Appendix A – Drawings

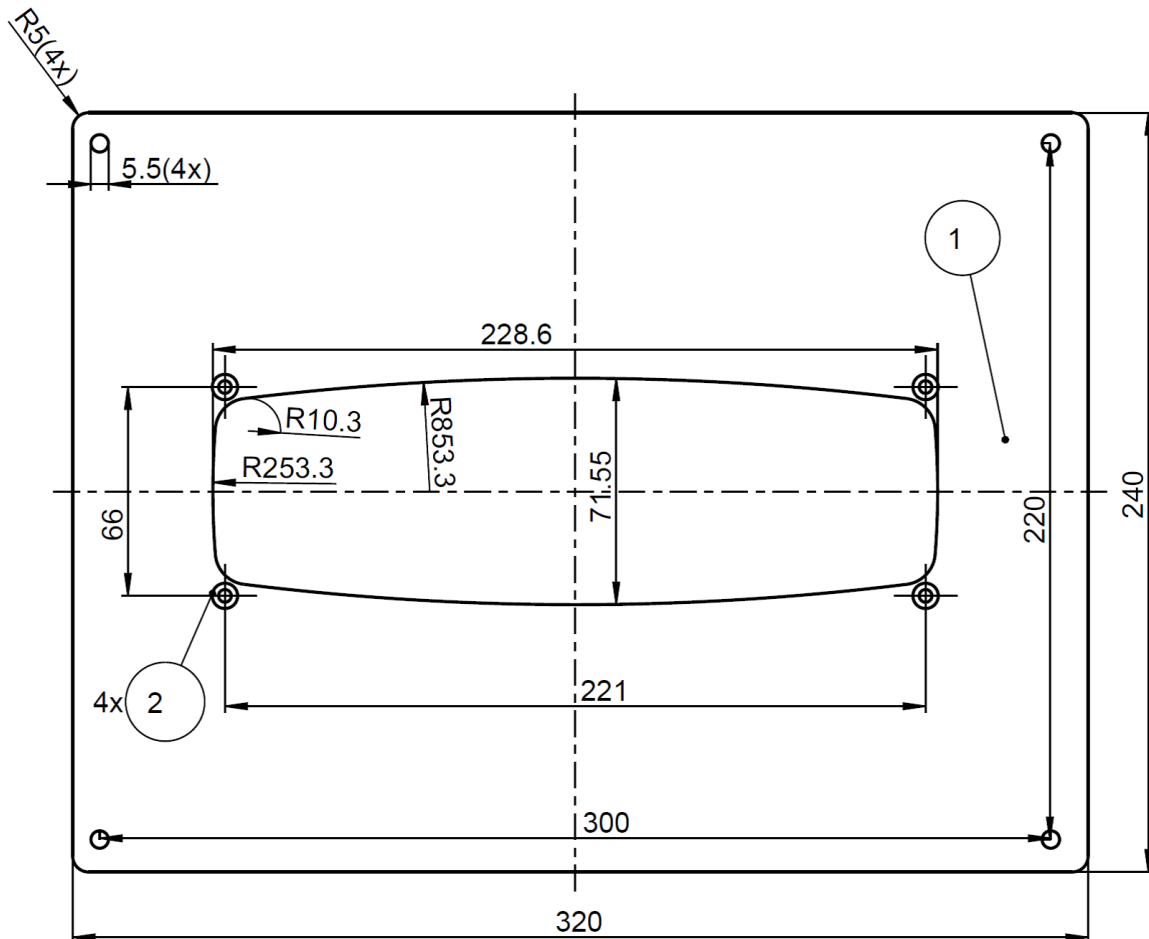
[illegible]

11.1.2 Gimbal Mount:





11.1.3 Upgrade Retrofit Frame

Pos.	Benennung	Sachnr./Normbez.	Werkstoff	Masse	Anz.
1	Upgrade Retro Fit Frame Drop In Mount	1st1001052	Blech 2.5	1.208	1
2	M4 Gewindeeinpressbuchse		S235JR	0.003	4



Es sind Bohrungen entsprechend
der verwendeten M4
Gewindeeinpressbuchsen vorzunehmen

Rohmaße/Bestellnr.				Mst. 1:1				A4		Werkstoff Blech 2.5		Masse 1.219 kg	
Bemerkung				Masse ohne Toleranzangabe nach "DIN ISO 2768-m"				Pro/E Modellname MONTAGERAHMEN		Pro/E Zeichnungsname MONTAGERAHMEN			
					Datum		Name		Benennung Upgrade Retro Fit Frame Drop In Mount				
				Bearb.	03.07.2013		Lesch						
				Gepr.									
				Norm									
				Komm.-Nr.:				Zeichnung/Sach-Nr.: 1st1001052				Blatt 1	
												1 Bl.	
Zust.	Aenderung	Datum	Name					Ers.f.:				Ers.d.:	

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Email: support@nauticast.com

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Version 2, June 1991

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Also add information on how to contact you by electronic and paper mail.

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This is free software, and you are welcome to redistribute it under certain conditions; type `show c' for details.

The hypothetical commands `show w' and `show c' should show the appropriate parts of the General Public License. Of course, the commands you use may be called something other than `show w' and `show c'; they could even be mouse-clicks or menu items--whatever suits your program.

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`Gnomovision' (which makes passes at compilers) written by James Hacker.

<signature of Ty Coon>, 1 April 1989

Ty Coon, President of Vice

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11.3 Appendix C – Declaration of Conformity


EG – Konformitätserklärung EC – Declaration of Conformity Déclaration CE de Conformité



Diese Konformitätserklärung bestätigt, dass das unten benannte Produkt den Auflagen der Direktive 96/98/EU für maritime Ausrüstung, geändert durch EC Council Directive 2012/32/EU und 2013/52/EU entspricht, und von der benannten Stelle Nr. 0735 (BSH) typengeprüft wurde.

We hereby declare that the following product is in compliance with the Requirements of the Marine Equipment Directive (MED) 96/98/EC and the last modification by Directive 2012/32/EC and 2012/52/EC, and has been type examined by the Notified Body No. 0735 (BSH).

Cette déclaration de conformité déclare que le produit est conforme à Directive 96/98/CE à l'équipement maritime, telle que modifiée par la directive 2012/32/CE et 2013/52/CE, et a été testé par l'organisme notifié no. 0735 (BSH).

Produktbezeichnung: Product Name / Nom du produit	NAUTICAST™ A2
Zertifikate der benannten Stellen: Certificates from the notified Body / Certificats des Organismes Notifiés	EC Type Examination (Module B) Certificate.: 4581/001/4322644/14 USCG-Module B No.: 165.155/EC0735 Bundesamt für Seeschifffahrt und Hydrographie (BSH-Cert) Notified Body 0735: BSH-Cert, Bernhard-Nocht-Str. 78, 20359 Hamburg, Germany
Spezifizierte Standards: Specified Standard(s) / Standard(s) Spécifié(s)	IMO A.694(17) IMO MSC.74(69) Annex 3 IMO MSC.191(79) ITU-R M.1371-4 (Class A), 2010 ITU-R M.825-3, 1998 ITU-R M.1084-5, 2012 IEC 61993-2 Ed.2.0, 2012 IEC 61108-1 Ed.2.0, 2003 IEC 60945 Ed.4.0 (2002) incl. Corr. 1 (2008) IEC 61162-1 Ed.4.0, 2010 IEC 61162-2 Ed.1.0, 1998 IEC 62288 Ed.1.0 (2008)
Dokumentnummer: Document number / Num. du document	2014-09
Anschrift: Address / Adresse	Nauticast GmbH Lützowgasse 12-14 / 3. OG, AT-1140 Vienna, Austria
Hersteller: Manufacturer / Fabricant	Saab TransponderTech AB Lützowgasse 12-14 / 3. OG, AT-1140 Vienna, Austria
Ort, Datum: place, date / Lieu, Date	Wien / Vienna / Vienne, 2014-09-30
Unterschrift: Signature / Signature	 Wolfgang Ogrisek Managing Director

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.
Cette déclaration certifie la conformité avec les directives indiquées mais n'implique aucune garantie des propriétés. Les instructions de sécurité de la documentation accompagnant le produit doivent être suivies.

ISO 9001:2008 Zertifizierung / ISO 9001:2008 Certification / ISO 9001:2008 Certification
Nauticast GmbH hat ein Qualitätsmanagement System nach ISO 9001:2008 implementiert, ist ISO-zertifiziert und wurde zuletzt am 22. August 2014 zertifiziert.
Nauticast GmbH maintains a Quality Management System according to ISO 9001:2008, is ISO and received the latest ISO certification 22nd August 2014.
Nauticast GmbH dispose d'un système de gestion de la qualité selon la norme ISO 9001: 2008, et a reçu dernièrement la certification ISO en 22 Août 2014.



Bundesrepublik Deutschland

Federal Republic of Germany

BSH-Cert

Benannte Stelle – Navigations- und Funkausrüstung
beim Bundesamt für Seeschifffahrt und Hydrographie
Notified Body – Navigation and Radiocommunication Equipment
at the Federal Maritime and Hydrographic Agency



NOTIFIED
BODY
0735

EC TYPE EXAMINATION (MODULE B) CERTIFICATE

This is to certify that:

BSH-Cert, specified as a "notified body" under the terms of „Schiffssicherheitsgesetz“ of 09 September 1998 (BGBl. I, p. 2860) modified last 08 March 2012 (BGBl. I, p. 483), 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 and the last modification by Directive 2012/32/EU.

Manufacturer **Saab TransponderTech AB**
Address **Låsblecksgatan 3, 58941 Linköping, SWEDEN**

Applicant **Nauticast GmbH**
Address **Lützowgasse 12-14, 1140 Vienna, AUSTRIA**

Annex A.1 Item (No & item designation) **4.32 Universal automatic identification system equipment (AIS)**

Product Name **Nauticast A2**

Trade Name(s) **Nauticast A2**

Specified Standard(s)

IMO Resolution A.694(17)	IEC 61993-2 Ed.2.0, 2012
IMO Resolution MSC.74(69) Annex 3	IEC 61108-1 Ed.2.0, 2003
IMO Resolution MSC.191(79)	IEC 60945 Ed.4.0, 2002 incl. Corr. 1, 2008
ITU-R M.1371-5 (Class A), 2015	IEC 61162-1 Ed.4.0, 2010
ITU-R M.825-3, 1998	IEC 61162-2 Ed.1.0, 1998
ITU-R M.1084-5, 2012	IEC 62288 Ed.2.0, 2014

Based on the Directive 2013/52/EU, additional applied version: Directive 2014/93/EU
This certificate remains valid unless cancelled, expired or revoked.

Date of issue: **12 June 2015**

Issued by: **BSH-Cert**

Bernhard-Nocht-Str. 78, 20359 Hamburg, Germany

Expiry date: **11 June 2020**

Notified body 0735

Certificate No.: **4581/001/4322749/15**

USCG-Module-B No.: **165.155/EC0735**

Unique Identifier: **4322749**

This certificate consists of 2 pages.



Kai-Jens Schulz-Reifer



This certificate is issued under the authority of the „Bundesministerium für Verkehr und digitale Infrastruktur“.
V 2015-04-30



Bundesrepublik Deutschland
Federal Republic of Germany
Fachstelle der WSV für Verkehrstechniken FVT
Traffic Technologies Centre



WSV.de
Wasser- und
Schifffahrtsverwaltung
des Bundes

Zulassungsurkunde (rev. 1) *Type Approval Certificate*

Nr.: R - 4 - 222

Gemäß dem von der Zentralkommission für die Rheinschifffahrt (ZKR) beschlossenen
In accordance with the regulation adopted by the Central Commission for the Navigation on the River Rhine (CCNR)

**Standard Schiffsverfolgung und Aufspürung in der Binnenschifffahrt,
Edition 1.01 vom 10.10.2007**

und den
and the

**Betriebs- und Leistungsanforderungen, Prüfmethode und geforderten
Prüfergebnissen gemäß Test Standard für Inland AIS, Edition 1.01 vom
22.10.2008**

wird das Inland AIS Bordgerät
the Inland AIS equipment

Nauticast A2 Inland AIS

des Herstellers
of the manufacturer

Saab TransponderTech AB, Låsblecksgatan 3, 58941 Linköping, Sweden

bestehend aus
components necessary for operation

Nauticast A2 Inland AIS Transponder unit;

Part No.: 7000 118-130; SW Version No.: R5 Solid 1.x.x

GPS antenna; Part No.: 7000 000-485 (MA 700) or 7000 000-135 (AT575-68) or
7000 000-435 (VHF/GPS)

VHF antenna; Part No.: 7000 000-077 or equivalent

als Inland AIS Gerät für die Binnenschifffahrt zugelassen.
has been approved as Inland AIS equipment for Inland Navigation.

Die Zulassung wird dem Antragsteller:
The type approval has been issued for the applicant:

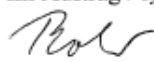
Nauticast GmbH, Lützowgasse 12-14 / 3 OG, 1140 Vienna, Austria

erteilt.

Die Zulassungsinhaber hat jede Änderung dieses Gerätetyps der Fachstelle der WSV für
Verkehrstechniken mitzuteilen.

The manufacturer shall inform Fachstelle der WSV für Verkehrstechniken of any modification to the type tested products.

Fachstelle der WSV für Verkehrstechniken
Im Auftrag / by order


(Bober)

Koblenz, den 10.07.2014



For more information
and the latest updates visit us at

www.nauticast.com



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