

## General Information

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### ii. Disclaimer

AMEC is devoted to publish and maintain this product manual. As we continue to improve our AIS products to satisfy all customers' needs, information in this document is subject to change without notice. AMEC does not make any representations or warranties (implied or otherwise) regarding the accuracy and completeness of this document and shall in no event be liable for any loss of profit or any commercial damage, including but not limited to special, incidental, consequential, or other damage.

### iii. Safety Warning



It is important to know that AIS is designed for the purpose of anti-collision and serves as a compliment to navigation. It is not the absolute navigational equipment and does not replace any navigational system installed onboard.

Any AIS device cannot guarantee monitoring and receiving signals from all vessels in the surroundings unless those vessels are equipped with AIS devices.



#### **ELECTRICAL SHOCK HAZARD**

Improper disassemble or modification could cause electrical shocks, fire, or personal injury. Only qualified personnel could work on the interior of the equipment.



#### **MAKE SURE THE POWER SOURCE AND THE POWER INPUT ARE MATCH**

Incorrect power sources will damage the equipment and may even result in fire. Please ensure the correct power input on the adaptor before installation.



#### **AVOID DIRECT CONTACT WITH RAIN OR SPLASHING WATER**

Electrical shock or fire could be resulted if water leaks into the equipment.



#### **NOTE/INFORMATION**

Important notices and information will be noted in this Installation and Operation Manual

### iv. Product Category

This product is categorized as “protected” in accordance with the requirements as defined in IEC 60945.

**v. Compass Safe Distance**

Safe distance to the transponder (and junction box) unit is:

**Standard-magnetic-compass: 0.50 m**

**Steering-magnetic-compass: 0.40 m**

**vi. Hardware / Software Version**

The model name/number, hardware information, and firmware (software) version of the transponder can be found under the LCD display directory at MENU/DIAGNOSTICS/VERSION.

**vii. Manual Revision**

Version 1.0

**viii. Type Approval**

The AMEC CAMINO-701 AIS transponder complies with applicable international standards and is type approved in accordance with the European Marine Equipment Directive.

**ix. Declaration of Conformity**

Hereby, Alltek Marine Electronics Corp. (AMEC) declares that this CAMINO-701 is in compliance with the essential requirements and other relevant provisions of Directive 96/98/EC.

**x. Disposal Instruction**

Do not dispose of this device with unsorted 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.

**xi. Contact Information**

For sales, services, and technical supports, please contact your local AMEC representatives or Alltek Marine Electronics Corp at [www.alltekmarine.com](http://www.alltekmarine.com) or [sales@alltekmarine.com](mailto:sales@alltekmarine.com) .or [service@alltekmarine.com](mailto:service@alltekmarine.com)

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# 1 WHAT IS AIS?

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The Automatic Identification System (AIS) is a Very High Frequency (VHF) radio broadcasting system that transfers packets of data over the VHF data link (VDL) and enables AIS equipped vessels and shore-based stations to exchange identification information and navigational data. Ships with AIS transponders continually transmit their ID, position, course, speed and other data to all nearby ships and shore stations. Such information can aid greatly in situational awareness and provide a means to assist in collision avoidance.

AIS equipment is standardized by ITU, IEC, IALA and IMO and is subject to approval by a certification body. The following AIS devices have been developed for variant applications.

- **AIS Class A:**

mandated by the IMO for vessels of 300 gross tonnages and upwards engaged on international voyages, cargo ships of 500 gross tonnages and upwards, as well as passenger ships. It transmits typically on 12.5 watt output power.

- **AIS Class B:**

provides limited functionality and is intended for non-SOLAS commercial vessels and recreational vessels. It transmits typically on 2 watt output power.

- **AIS Base Station:**

is provided by aids-to-navigation authorities to enable the ship to shore / shore to ship transmission of information. Networked AIS Base Stations can assist in providing overall maritime domain awareness.

- **AIS AtoN (Aids to Navigation):**

provides an opportunity to transmit position and status of buoys and lights through the same VDL, which can then show up on AIS-ready devices within the range.

- **AIS SART:**

Search and Rescue Transmitter using AIS can be used to assist in determining the location of a vessel in distress. It is typically used on life rafts.

- **AIS on Search and Rescue (SAR) Aircraft:**

used on airplanes and helicopters to assist search and rescue operation.

## 2 SYSTEM OVERVIEW

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### 2.1 Product Description

The **AMEC CAMINO-701** is a new generation **AIS Class A transponder** fully compliance with IMO, IEC, and ITU international standards. It provides a compact single box solution, easy to install and operate. The unit is designed with advanced technology which sets a new standard for quality, performance, and value. It is an excellent choice for SOLAS vessels, commercial vessels, and professional vessels.

The CAMINO-701 consists of a transceiver radio unit, an integrated GPS receiver, a controller unit, and a color 3.5" LCD display with menu keypads. The radio has three receivers -- two TDMA receivers and one DSC receiver. The transmitter alternates its transmission 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 CAMINO-701 can be connected to the ship's sensors as required by the IALA guidelines through an external junction box (supplied in the package). The unit can also interface external navigation and presentation systems that support IEC 61162-1 related sentences. It is also capable for connection to Long Range system like Inmarsat C. The CAMINO-701 supports both IMO and Inland AIS which is configurable by the software.

The color LCD display and menu keypads provide an intuitive graphical user-friendly interface to the system. It can display the location of other vessels, aids to navigation and search and rescue vessels. The AIS transmit and receive status are shown on the screen which helps user to know the working status of the unit easily. The LCD and keypad can also be used to send and receive messages, perform configuration as well as supervise the systems status.

### 2.2 Main Features

- Compact AIS Class A solution, easy to install and operate
- Fully compliant with IMO, IEC, and ITU international standards
- Color 3.5" LCD display with variant display modes
- User-friendly intuitive GUI & keypad operation
- Rotary switch dial, click and push, for simple operation
- IMO/Inland AIS mode selectable (optional)
- Multiple sensor input ports and bi-directional data ports
- USB (device only) and NMEA2000 connectivity ready

## 2.3 Interconnection Diagram

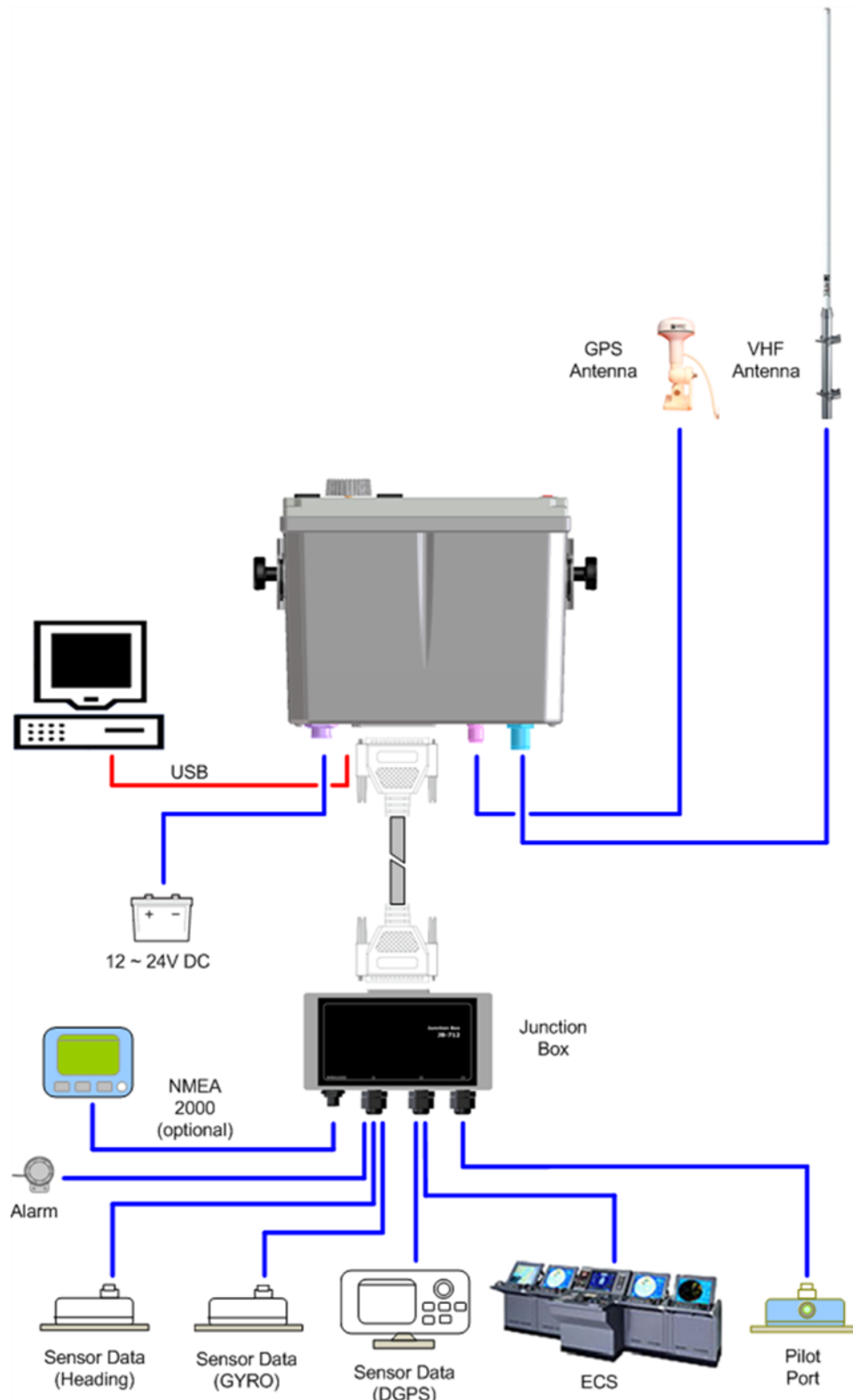


Figure 1 Interconnection Diagram



## 3 INSTALLATION

### 3.1 Equipments in the Box

The standard supply in the package includes the following items. Please contact your local representative if any item is missing.

Description	Quantity
CAMINO-701 Class A AIS Transponder	1
Junction box	1
U-shaped mounting bracket	1
Knobs for u-shaped mounting brackets	2
37-pin extension cable 1.8 m Connector: CDS-37P	1
3-pin power cable 1m Connector: LTW:BB-03RMMS-LC7001	1
USB to Mini-USB data cable 1.8 m	1
Panel mount stainless bracket and screw	2
M3.5X10 screws for u-shaped mounting bracket	5
M4X6 screws for panel mount brackets	6
Panel mount cutting template	1
Screw, wall-plug, mounting stand for junction box	4
Installation and operation manual	1
Software CD	1

#### Optional items

Description	Quantity
GPS antenna with integrated cable 10m	1
Pilot plug box with wired cable 2m	1
Screws for pilot plug box	2

### 3.2 Installation Procedures

Please familiarize the manual content before begin installation. Use the following recommended steps for installation.

1. Mount the transponder unit to a desired location
2. Mount junction box.
3. Install VHF antenna
4. Install GPS antenna
5. Connect all external sensors and data interfaces to the junction box
6. Connect all required cables to the main transponder unit
7. Power on the main transponder unit
8. Complete configuration settings
9. Perform system functional test

### 3.3 RF Cable Requirements

The following RF cables are recommended to install the CAMINO-701.

- **VHF Antenna Cable**  
Type: 5D-FB or equivalent  
Connector: SO-239 (Male)
- **GPS Antenna Cable**  
Type: RG58A/U or equivalent  
Connector: TNC (Male)

### 3.4 VHF Antenna Installation

The quality and positioning of the antenna are the most important factors dictating AIS performance. It is recommended that a VHF antenna with omni directional vertical polarization be specifically tuned for AIS operation band. Since the range of VHF signals is largely decided by line of sight distance, the VHF antenna should be placed as high as possible and at least 5 meters away from any constructions made of conductive materials.

To avoid interference, the VHF antenna location should be placed accordingly as diagram below:

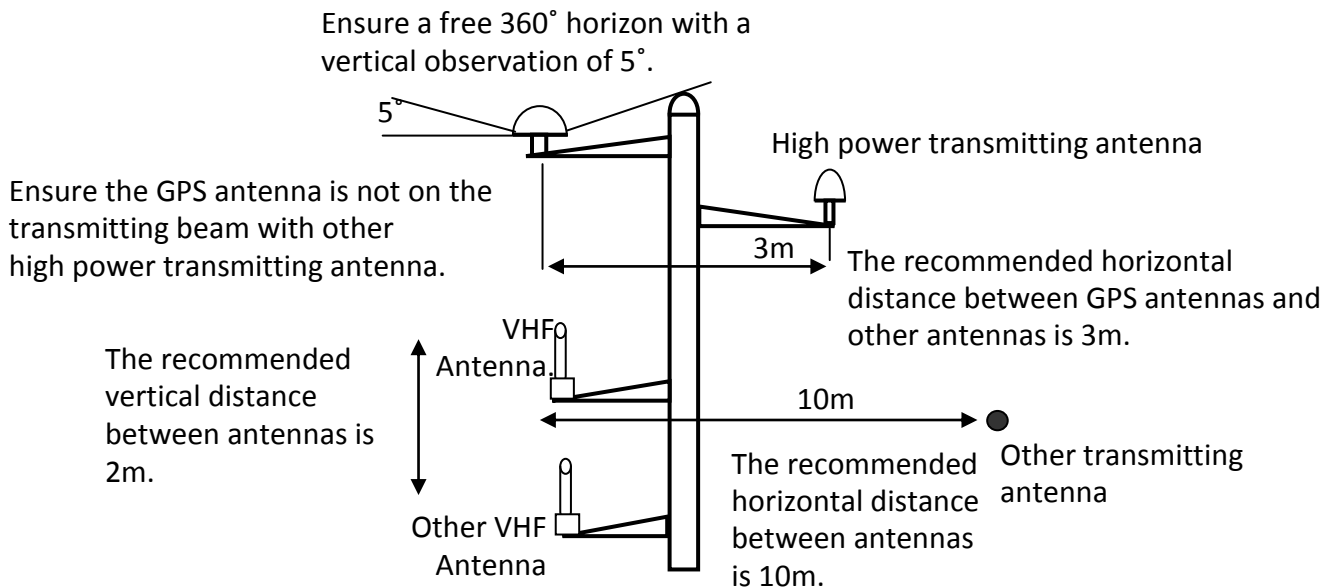


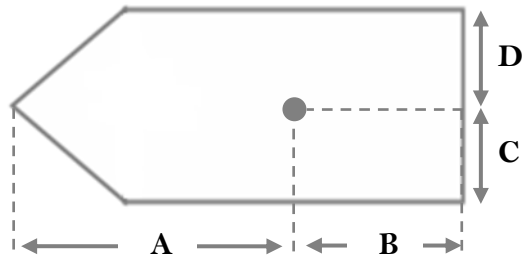
Figure 2 VHF/GPS Antenna Locations

### 3.5 GPS Antenna Installation

The GPS antenna must be installed where it has a clear view of the sky, so that it may access the horizon freely with 360° degrees, with a vertical observation of 5 to 90 degrees above the horizon as illustrated below.

#### GPS ANTENNA LOCATION

Enter the GPS antenna location data in “SHIP SETTING” after the installation.



**Figure 3**      **GPS Antenna location**

We recommend choosing AMEC AIS GPS antenna. To save space, you can also select a VHF/GPS combo antenna provided by AMEC.

## 3.6 Mounting CAMINO-701

Use the following guidelines to check the installation location for your AIS transponder:

- The AIS transponder should be mounted in a location that is accessible and readable to user at all time.
- The transponder should be installed in a protected environment away from direct rain and water contact.
- The transponder is designed to operate in an environment with 15°C ~ 55°C temperature. Environments with excessive heat may cause damages to the transponder.
- The transponder should not be installed near flammable or hazardous environments.
- The AIS transponder should be installed at least 0.5m away from magnetic compasses.

### 3.6.1 Mounting Transponder

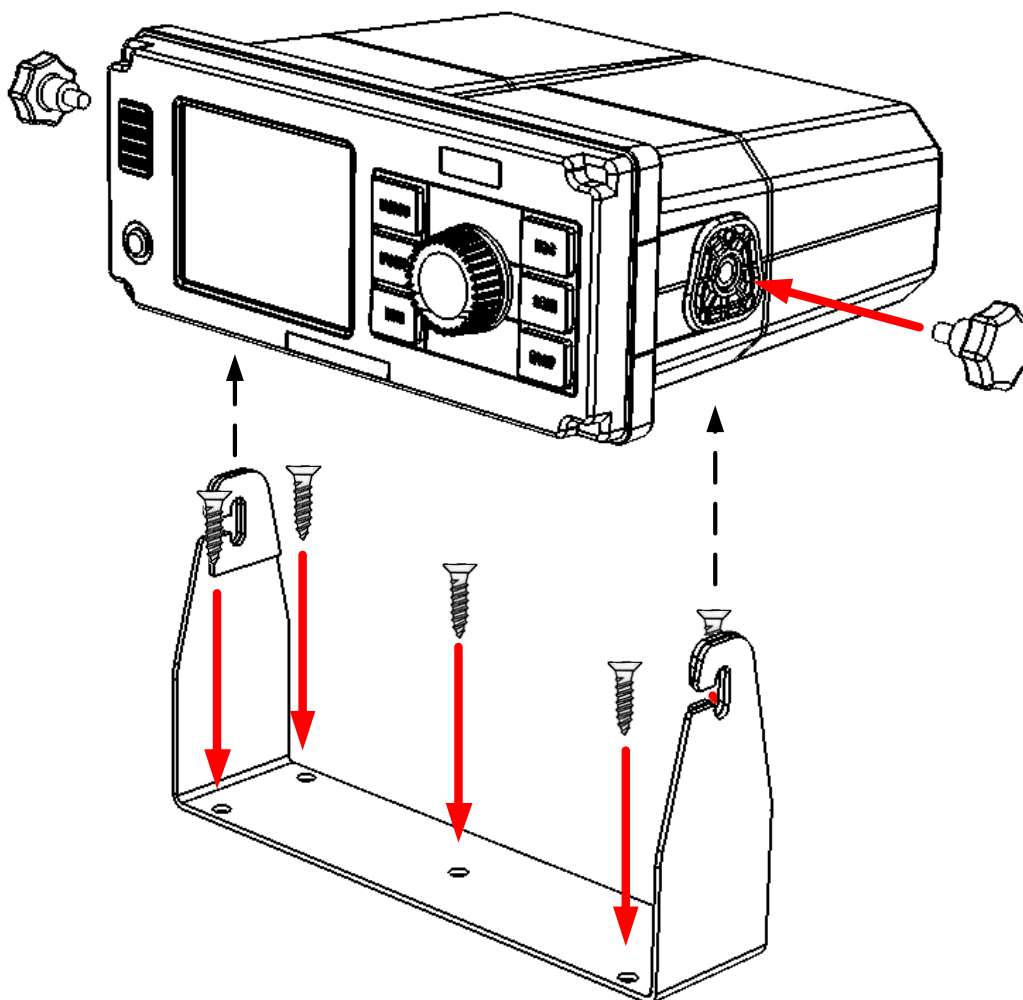
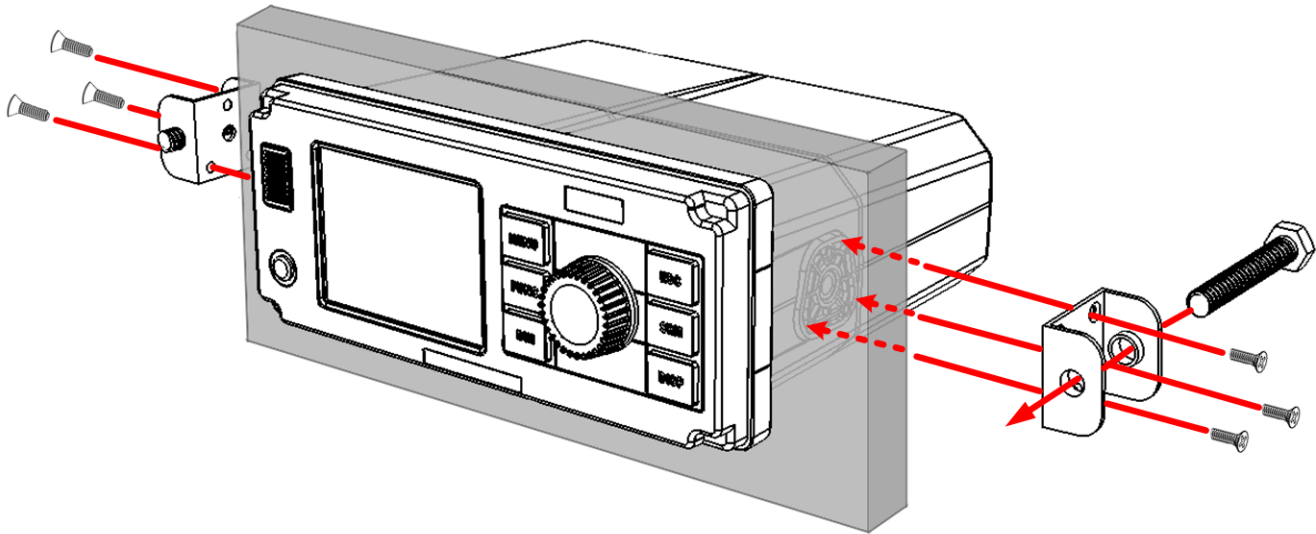


Figure 4 Mounting CAMINO-701

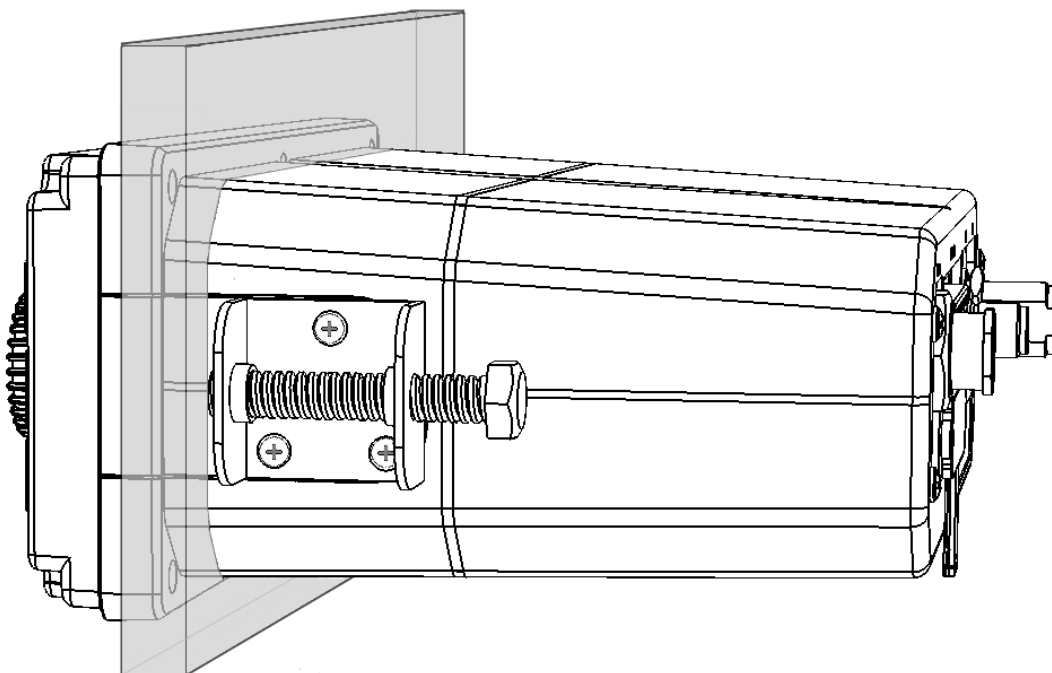
### **Panel Mounting (1)**

1. Line up the mounting template on control panel to sketch an outline for the cutting area.
2. Using a jigsaw carefully cut along the sketched cutting area.
3. If necessary, clean up edge with glass paper or file.
4. Mount the transponder through the opening.
5. From the rear, install the mounting brackets with the M4X6 screws.
6. Apply the mounting bracket screw on each side for a firm fix.



**Figure 5      Panel Mounting (1)**

### **Panel Mounting (2)**



**Figure 5      Panel Mounting (2)**

### 3.6.2 Mounting Junction Box

#### Mounting Junction Box (1)

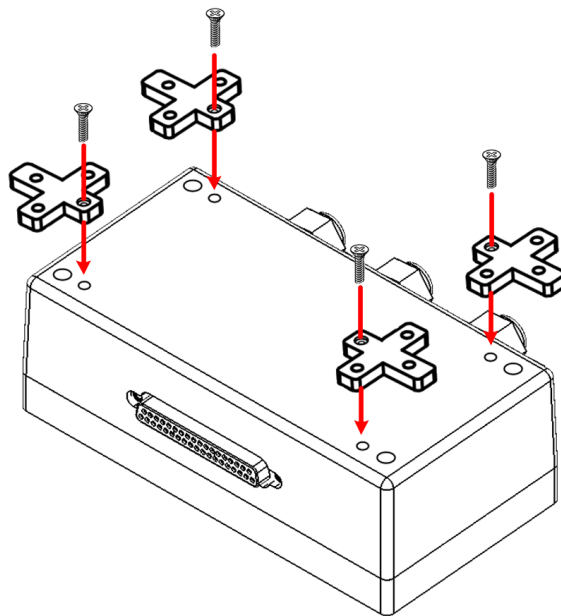


Figure 6 Mounting Junction Box (1)

#### Mounting Junction Box (2)

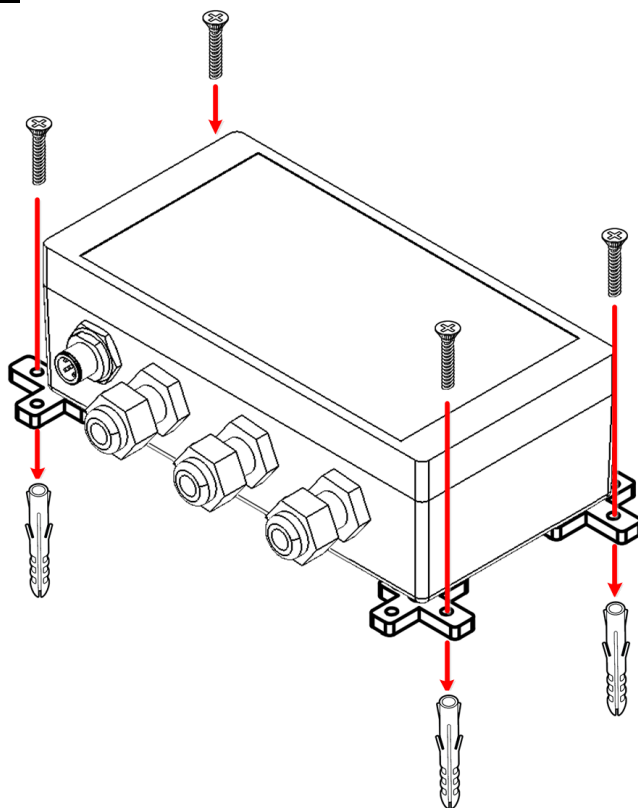
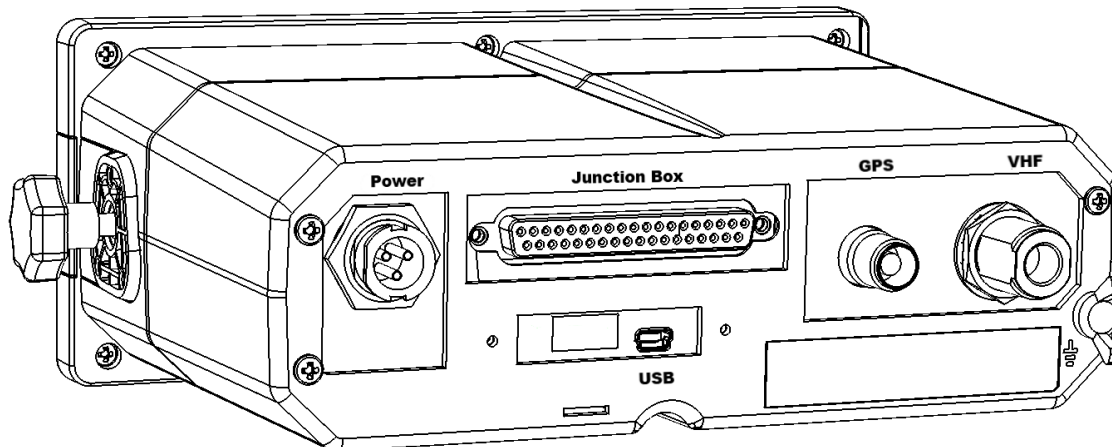


Figure 7 Mounting Junction Box (2)

### 3.7 External Connectors (Transponder Main Unit)



**Figure 8 External Connectors (Main Unit)**

NAME	DESCRIPTION	TYPE OF CONNECTOR
<b>VHF</b>	VHF antenna connector	SO-239 (female)
<b>GPS</b>	GPS antenna connector	TNC (female)
<b>Power</b>	Power input connector	Round type, 3 pins
<b>USB</b>	USB connection to PC	Mini type USB
<b>Junction Box</b>	Extension connection to Junction Box	D-Sub 37 pins

### 3.8 External Connectors (Junction Box)

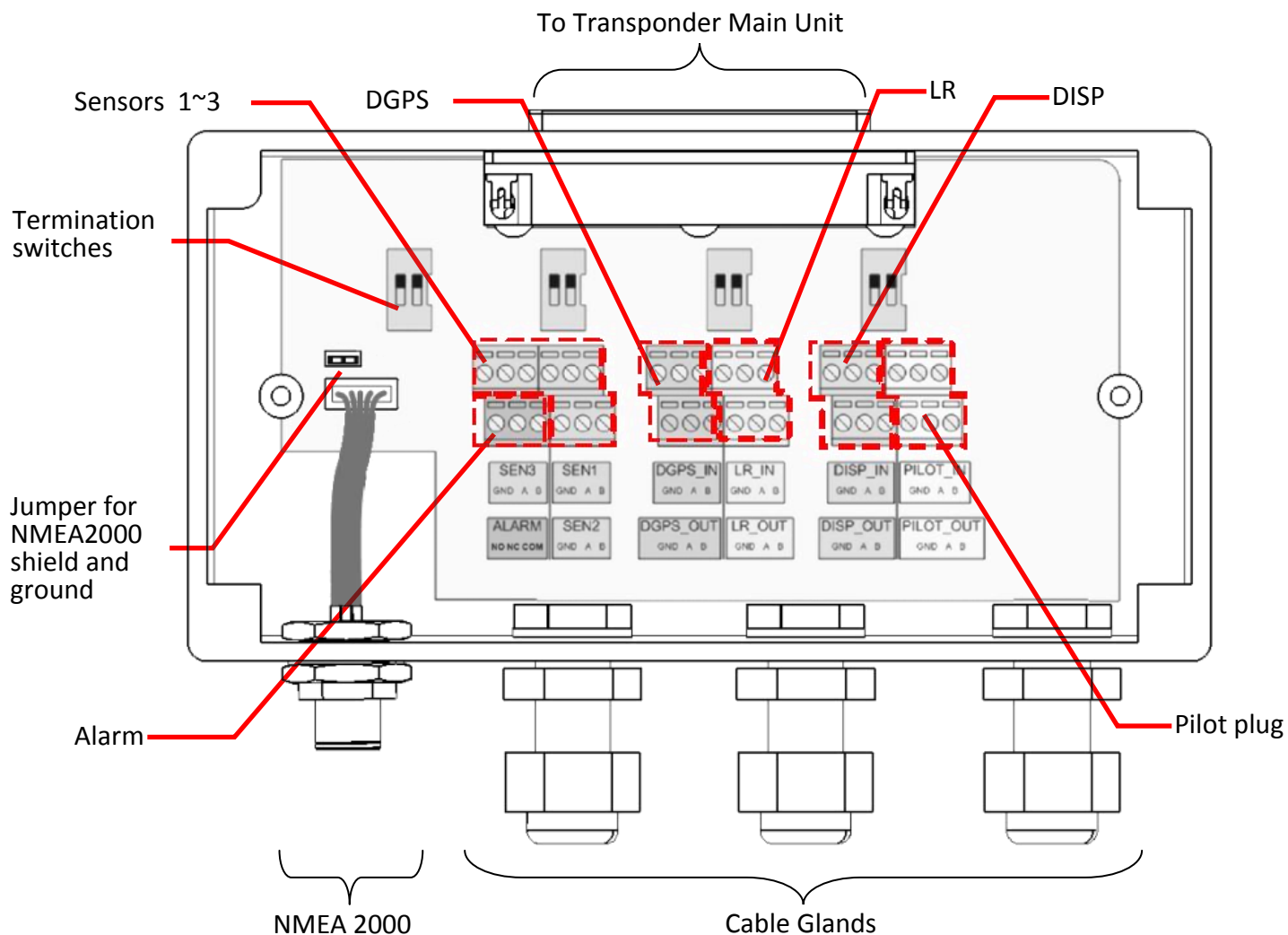


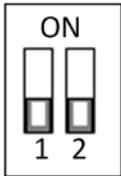
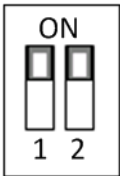
Figure 9 External Connectors (Junction Box)

CONNECTOR	LABEL NAME	DESCRIPTION	FUNCTION USAGE
<b>Sensor 1</b>	SEN1_IN GND	Sensor 1 ground	Connect to data sources such as heading, gyro, or other type of sensors.
	SEN1_IN A	Sensor 1 input A	
	SEN1_IN B	Sensor 1 input B	
<b>Sensor 2</b>	SEN2_IN GND	Sensor 2 ground	Connect to data sources such as heading, gyro, or other type of sensors.
	SEN2_IN A	Sensor 2 input A	
	SEN2_IN B	Sensor 2 input B	
<b>Sensor 3</b>	SEN3_IN GND	Sensor 3 ground	Connect to data sources such as heading, gyro, or other type of sensors.
	SEN3_IN A	Sensor 3 input A	
	SEN3_IN B	Sensor 3 input B	



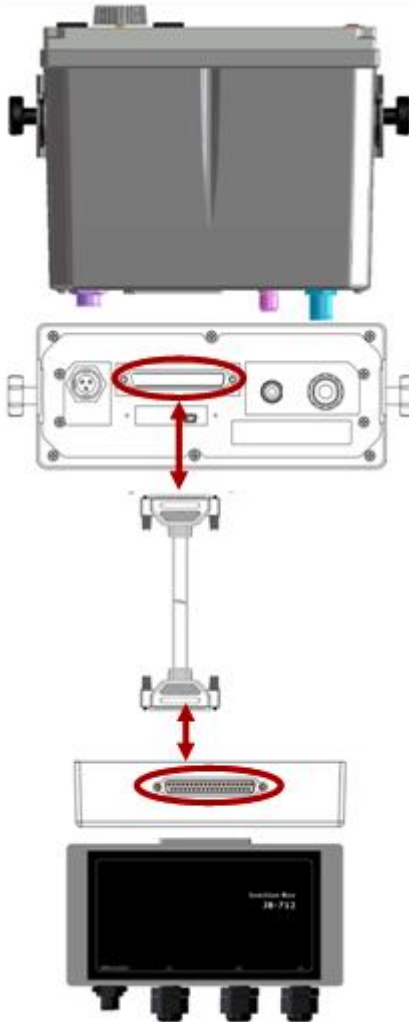
<b>Alarm</b>	ALARM NO	Alarm normally open	
	ALARM NC	Alarm normally closed	
	ALARM COM	Alarm common	
<b>DGPS Input</b>	DGPS_IN GND	DGPS input ground	DGPS sensor
	DGPS_IN A	DGPS input A	
	DGPS_IN B	DGPS input B	
<b>DGPS Output</b>	DGPS_OUT GND	DGPS output ground	DGPS sensor
	DGPS_OUT A	DGPS output A	
	DGPS_OUT B	DGPS output B	
<b>LR Input</b>	LR_IN GND	LR input ground	Long range input
	LR_IN A	LR input A	
	LR_IN B	LR input B	
<b>LR Output</b>	LR_OUT GND	LR output ground	Long range output
	LR_OUT A	LR output A	
	LR_OUT B	LR output B	
<b>Display</b>	DISP_IN GND	DISP input ground	Connect to the data output of an external display system such as ECDIS.
	DISP_IN A	DISP input A	
	DISP_IN B	DISP input B	
	DISP_OUT GND	DISP output ground	Connect to the data input of an external display system such as ECDIS.
	DISP_OUT A	DISP output A	
	DISP_OUT B	DISP output B	

**NOTICE: RTCM-SC-104 beacon input is currently not implemented by the DGPS\_IN input.**

ITEM	USAGE
<b>Termination Switches</b>	<p>The switches provide line termination configuration.</p> <div> <div>Termination off</div> <div>  </div> <div>Termination on</div> <div>  </div> </div>
<b>Jumper for NMEA2000 shield and ground</b>	<p>The jumper's purpose is to wire together NMEA2000 cable's shield and ground. Depending on your scenario, you may choose not to connect them together.</p>

### 3.9 Connecting Extension Cable

Use the 37-pin- extension cable (1.8M) provided in the package connect CAMINO-701 to the junction box.



**Figure 10**      **Connecting CAMINO-701 with Junction Box**

## 3.10 Configuring CAMINO-701

The following items must be completed before initial configuration.

1. Ensure VHF and GPS antennas are well connected to the transponder main unit.
2. Ensure the 37-pin-connector extension cable is well connected from the transponder main unit to the junction box.
3. Ensure the power cable is well connected and supplied with stable voltage/current power source.
4. Ensure applicable external devices are well connected through the junction box.

### 3.10.1 Initial Configuration

The initial configuration, particular, **MMSI** (Maritime Mobile Service Identity) number must be done before operation. The following initial configuration is required:

1. Setup 1: **MMSI** should be correctly programmed. (**MMSI** can be programmed once only)

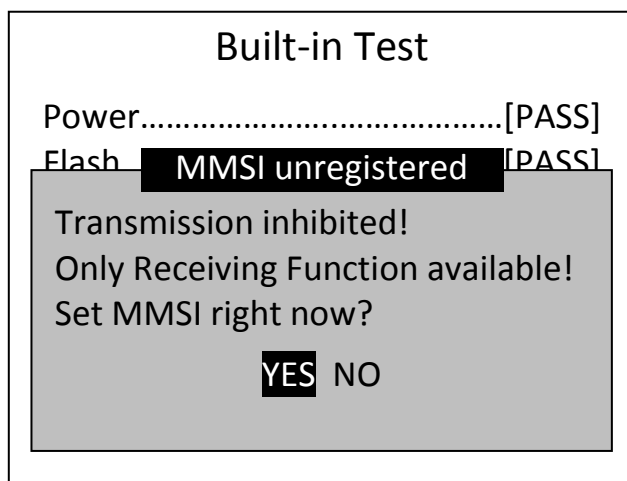


Figure 11 Built-in Test

2. Step 2: Press **MENU** and select main menu item **SHIP SETTING**. (Password required, default is "0000")

A. Setup call sign, ship name, ship type, external/internal GPS antenna position in **OWN SHIP**.

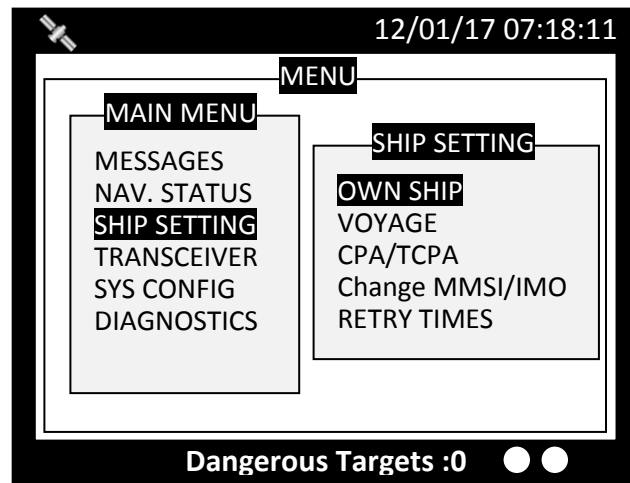


Figure 12 Own Ship

B. If **IMO** identification number is applicable, select main menu item **Change MMSI/IMO** to setup **IMO** number. (**IMO** can be programmed once only.)

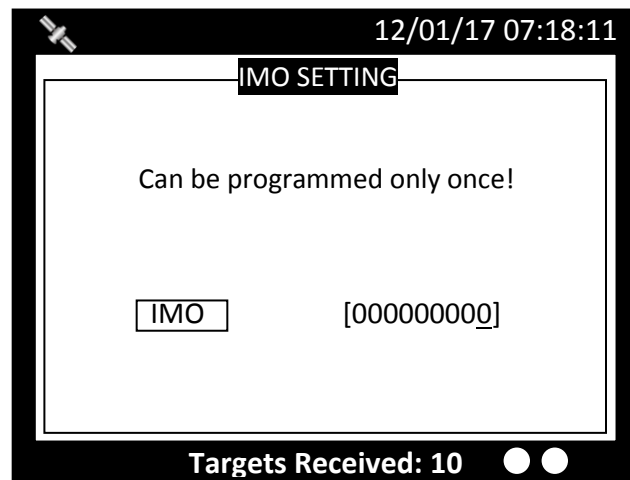


Figure 13 IMO Setting

For more information please refer to **4.3 SHIP SETTING**.

## 4 OPERATION

### 4.1 Panel Description

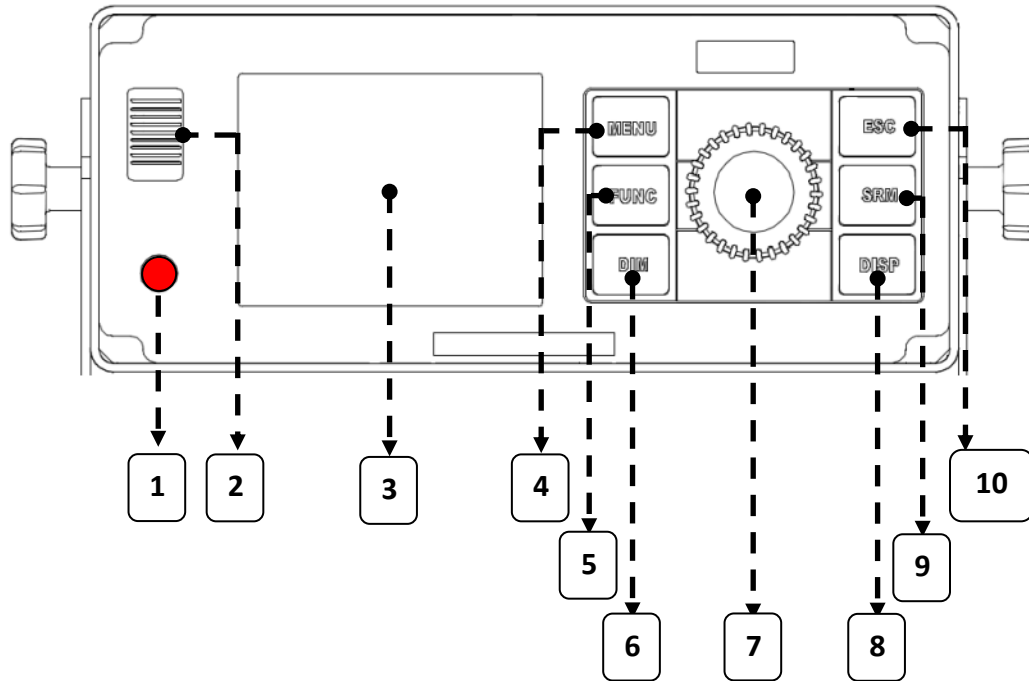


Figure 14 Panel Description

Item Number	Name	Descriptions
1	Power Switch	Power On/Off (push button over 5 seconds)
2	Beeper	Sound for push button
3	Display	3.5" LCD color screen
4	MENU	Return to main menu / detail menu select
5	FUNC	Different function on display mode (Zoom In/Out, etc)
6	DIM	Adjust dim degree
7	Rotary Switch	Rotate to select, press to confirm
8	DISP	Change to different display mode: 1.Radar View                      3.Own Ship Detail 2.Dangerous Target List      4.GPS Satellite Information
9	SRM	Emergency SRM broadcast
10	ESC	Cancel / Back to Main MENU

### 4.1.1 Status Bar

The status bar constantly indicates Date (YY/MM/DD), Time, GPS status, ALR, and SRM.

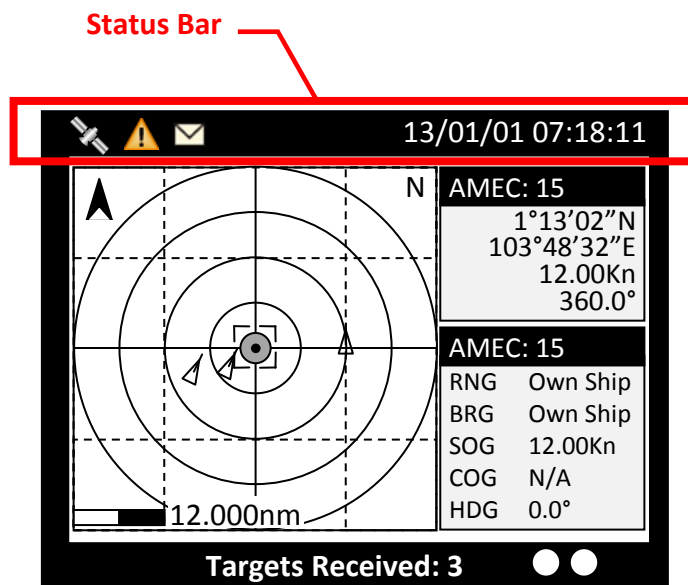


Figure 15 Status Bar

	GPS Status : Position fixed
	GPS Status : Non-fixed
	ALR Status : Alarm messages occurs
	Inbox SRM : Unread coming SRM message

4.1.2 Transmission and Reception Bar

The Transmission & Reception bar constantly displays real time status of transmissions and receptions on any display modes.

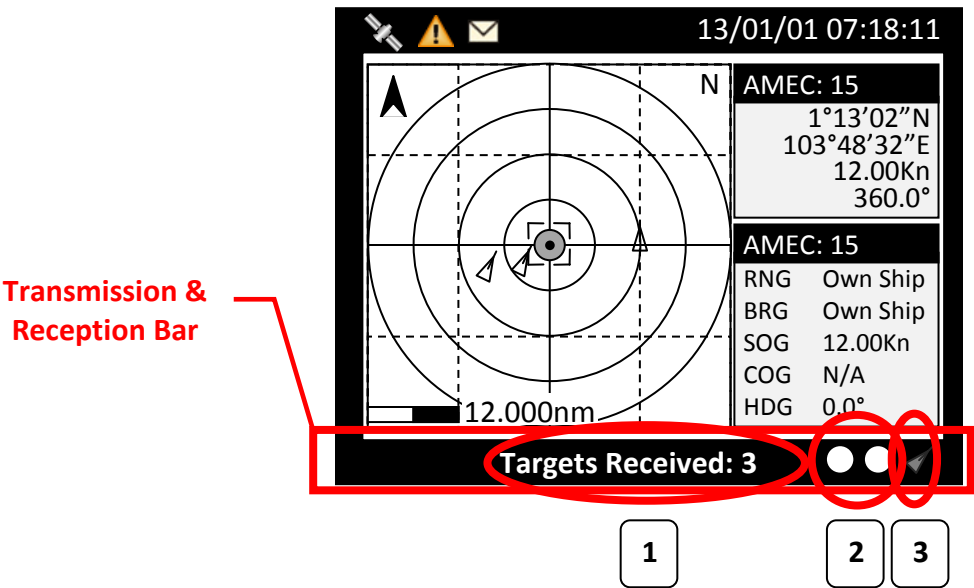








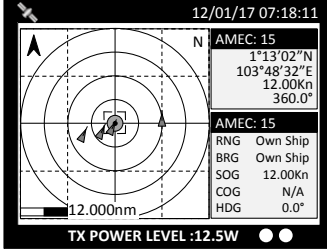
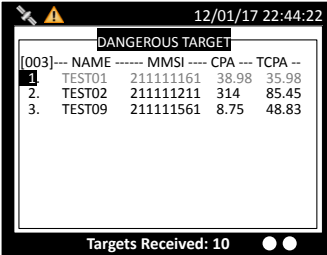
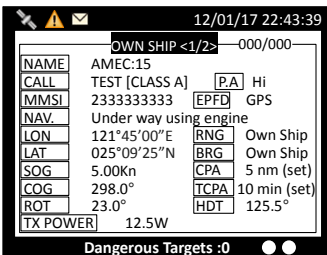
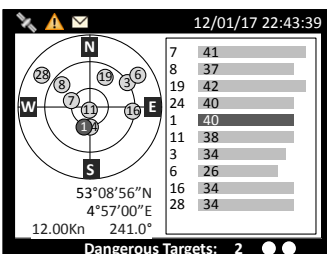
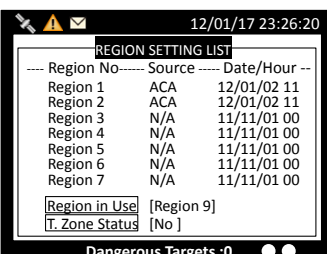


Figure 16 Transmission and Reception Bar

Item Number	Name	Function	
1	Text Banner	Shows the numbers of “Targets Received” and “Dangerous Targets” automatically. In addition, the banner also	
2	<b>Indicators</b>  Ch.87 Ch.88		No transmissions & receptions: No flash
			Reception of AIS message: Flash green color
			Transmission of AIS message: Flash red color
3	Function Icon (Radar view only)	 Zoom In/Out  Up/Down  Left/Right  Target Selected	The function icon indicates the rotary switch’s action differently in operations. Push <b>FUNC</b> can change the rotary switch to different action.

## 4.2 Display Modes

For quick access, users can rotate display modes by simply pressing the **DISP** button.

Display Mode	Screen Shot	Purpose
Radar View		Display all targets on radar view
Dangerous Target List		Shows all dangerous AIS targets presently
Own Ship Detail		Show all the details of own ship
GPS Satellite Information		Show the GPS satellite current usage status
Region Setting List		Show all the Region of own ship



### 4.2.1 Radar View

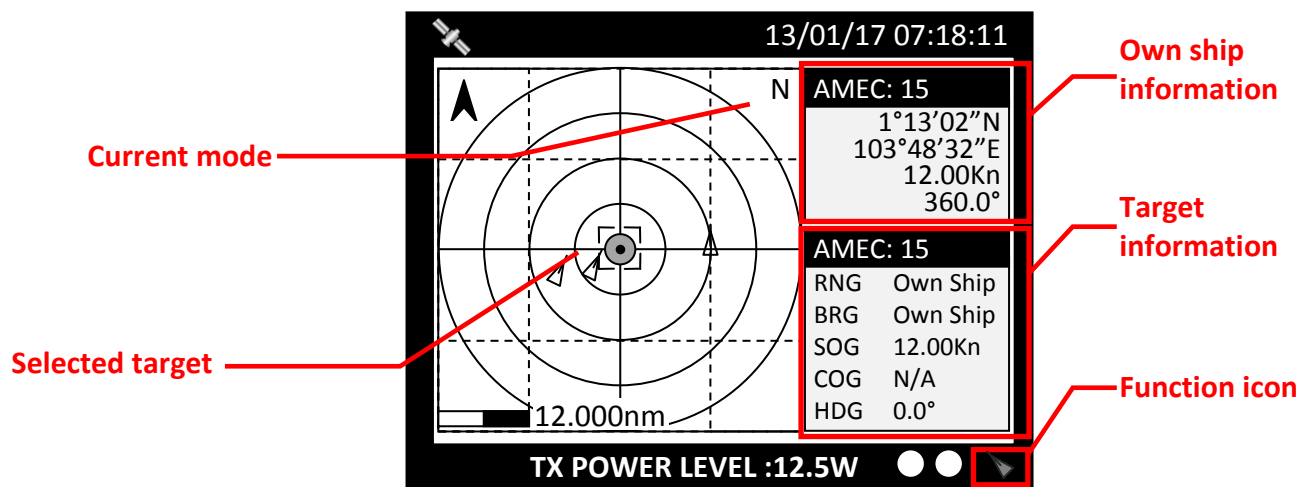


Figure 17 Radar View

Radar View displays own ship and target ships' statuses, and their correlations.

On this view, the vertical grid lines are the longitudinal lines and the horizontal grid lines are the latitudinal lines. Underneath the radar view is a proportional chart scale showing the current ratio displayed.

Radar View supports three ship orientation modes, North up, Head up, and Course up. Each orientation mode is indicated by the uppercase letter (N, H, or C) on the right upper corner. The left upper corner is the north arrow indicating the direction of north.

N	NORTH UP	The chart orientation is fixed and true north is always pointing up.
C	COURSE UP	The orientation is determined by the own ship's traveling course.
H	HEAD UP	The orientation is determined by the direction of own ship's bow.

### 4.2.2 Dangerous Target List

Please refer Section 4.6.7 DANGEROUS LIST

### 4.2.3 Own Ship Detail

Please refer Section 4.6.1 OWN SHIP

### 4.2.4 GPS Satellite Information

Please refer Section 4.10.6 GPS STATUS

## 4.3 Entering Text

The knob on the front control panel is used for entering and editing text. The figures below show the text entering procedures.

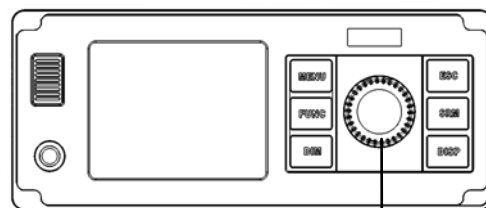
- Turn the knob to traverse the menu items up or down. Once selected, press the knob to select the item for text entering.
- Select a character position to edit. Turn the knob to move the cursor left or right and press the knob to confirm the position.
- System is now in character selection mode as the cursor position is highlighted. Turn the knob to pick an available character and press the knob for character selection.

	A	B	C	D	E	F	G
H	I	J	K	L	M	N	O
P	Q	R	S	T	U	V	W
X	Y	Z	0	1	2	3	4
5	6	7	8	9	[	\	]
^	_	!	"	#	\$	÷	&
'	(	)	*	+	,	-	.
/	:	;	<	=	>	?	@



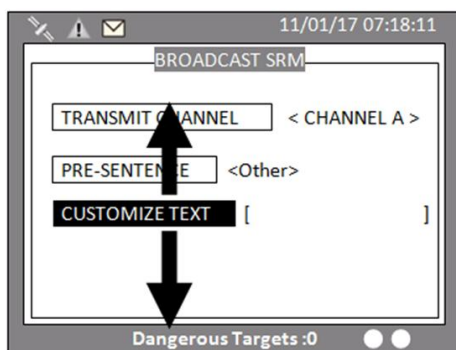
**Space is first character for selection**

- Use steps B and C to finish entering all needed characters. To confirm and save, press down the knob and hold for 2 seconds.



Traverse menu

A

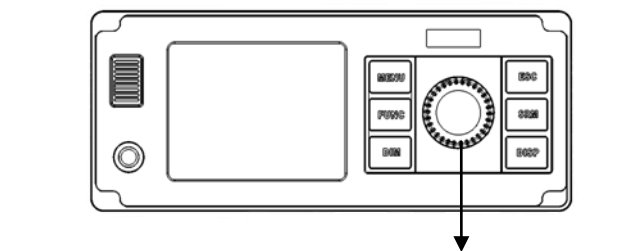


Turn knob to move up or down

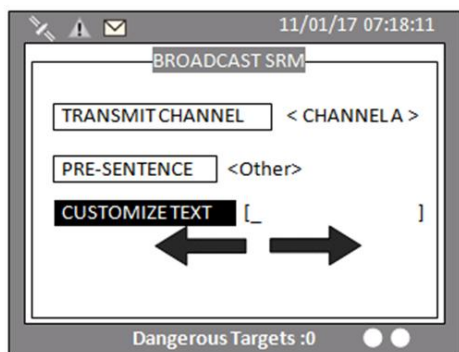
Press to enter



Select a character position



B



Turn knob to move left or right

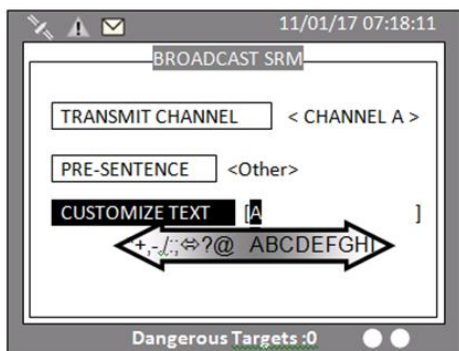


Press to start editing

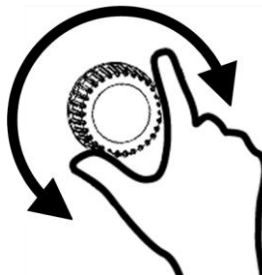


Pick character

C



Turn knob to select character



Press knob to confirm



Confirm and save

D



To save entered text, long press the knob for 2 seconds



Figure 18 Entering Text

## 4.4 Menu Tree Overview

Press **MENU** button to enter **MAIN MENU**. There are 6 menu choices and each holds a sub-menu. See table below.

<b>MESSAGES</b>	<ol style="list-style-type: none"><li>1. INBOX SRM (4.5.1)</li><li>2. OUTBOX SRM (4.5.2)</li><li>3. BROADCASTING SRM (4.5.3)</li><li>4. ADDRESSED SRM (4.5.4)</li><li>5. LONG RANGE (4.5.5)</li></ol>
<b>NAV. STATUS</b>	<ol style="list-style-type: none"><li>1. OWN SHIP (4.6.1)</li><li>2. AIS TARGETS (4.6.2)</li><li>3. REGION LIST (4.6.3)</li><li>4. ALARM LIST (4.6.4)</li><li>5. ALARM HISTORY (4.6.5)</li><li>6. SENSOR STATUS (4.6.6)</li><li>7. DANGEROUS LIST (4.6.7)</li><li>8. FRIEND SHIPS (4.6.8)</li></ol>
<b>SHIP SETTING</b>	<ol style="list-style-type: none"><li>1. OWN SHIP (4.7.1)</li><li>2. VOYAGE (4.7.2)</li><li>3. CPA/TCPA (4.7.3)</li><li>4. CHANGE MMSI/IMO (4.7.4)</li><li>5. RETRY TIMES (4.7.5)</li></ol>
<b>TRANSCEIVER</b>	<ol style="list-style-type: none"><li>1. TRANSCEIVER SETTING (4.8)</li></ol>
<b>SYS CONFIG</b>	<ol style="list-style-type: none"><li>1. CUSTOMIZE (4.9.1)</li><li>2. RADAR VIEW (4.9.2)</li><li>3. MAP CALIBRATION (4.9.3)</li><li>4. SENSOR CONFIG (4.9.4)</li><li>5. FACTORY (4.9.5)</li><li>6. PASSWORD (4.9.6)</li><li>7. LONG RANGE SET (4.9.7)</li><li>8. LONG RANGE BROADCAST (4.9.8)</li><li>9. DEST. TABLE SET (4.9.9)</li></ol>
<b>DIAGNOSTICS</b>	<ol style="list-style-type: none"><li>1. SYSTEM ON/OFF (4.10.1)</li><li>2. MEMORY TEST (4.10.2)</li><li>3. SENSOR PORT (4.10.3)</li><li>4. TFT-PANEL (4.10.4)</li><li>5. KEYBOARD TEST (4.10.5)</li><li>6. GPS STATUS (4.10.6)</li><li>7. TRANSCEIVER (4.10.7)</li><li>8. COMMUNICATION TEST (4.10.8)</li><li>9. PANEL TEST (4.10.9)</li><li>10. VERSION (4.10.10)</li></ol>

#### 4.4.1 How to access and use MAIN MENU

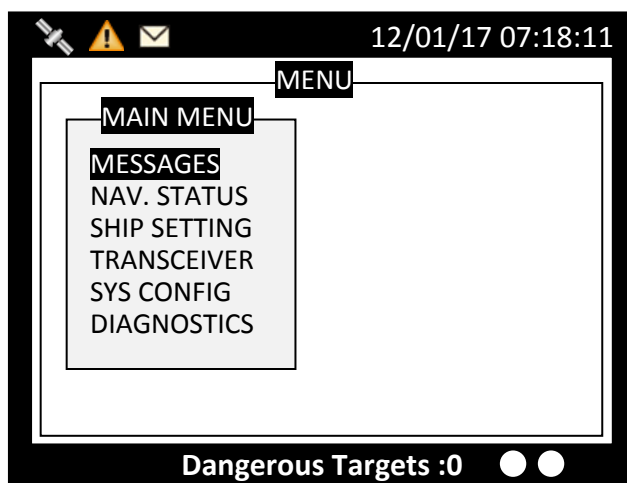


Figure 19 MAIN MENU

Rotate rotary switch to select **MAIN MENU** items and push the rotary switch to select sub-menu items.

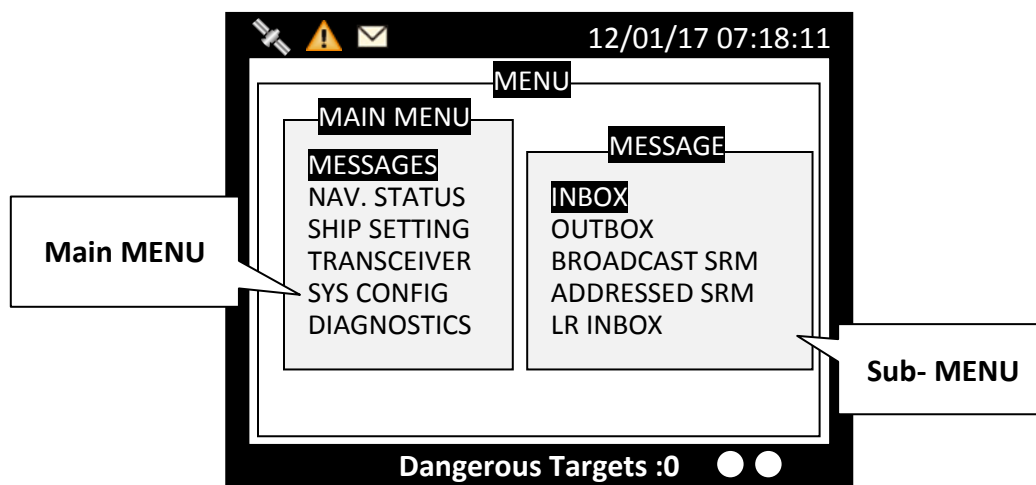


Figure 20 Sub-menu

#### 4.4.2 Menu Item Brief Description

MESSAGES	
INBOX	Log of safety related messages (SRM) received
OUTBOX	Log of safety related messages (SRM) sent
BROADCAST SRM	Send SRM.
ADDRESSED SRM	Send specified targeted SRM.
LR INBOX	Log of received inquiry messages from others.
NAVIGATION STATUS (Display a variety of navigation information)	
OWN SHIP	Your vessel information
AIS TARGETS	Navigation status and boat information of other AIS-equipped vessels.
REGION LIST	Regional information status
ALARM LIST	Alarm information
ALARM HISTORY	Alarm history record
SENSOR STATUS	Display sensor statuses
DANGEROUS LIST	Dangerous ship list
FRIEND SHIPS	Friend ship list
SHIP SETTING (Basic vessel information setting)	
OWN SHIP	Your vessel setting (password required, default is 0000)
VOYAGE	Navigation setting
CPA / TCPA	CPA / TCPA
CHANGE MMSI / IMO	Change MMSI / IMO
RETRY TIMES	Times to resend messages.
TRANSCEIVER (Settings for AIS receiving and sending)	
AIS TX	Transceiver status: turn on or off AIS message transmitting
DSC RX	DSC Monitor: turn on or off DSC monitoring function
GPS ANT. VOLTAGE	GPS antenna feeding voltage: set to 3.3V or 5V

SYSTEM CONFIGURATION	
<b>CUSTOMIZE</b>	Personalization settings
<b>RADAR VIEW</b>	Radar configuration
<b>MAP CALIBRATION</b>	Map offset setting
<b>SENSOR CONFIGURATION</b>	Port configuration
<b>FACTORY</b>	Default factory setting
<b>PASSWORD</b>	Password change (default password: 0000)
<b>LONG RANGE SETTING</b>	Remote inquiry setting
<b>LONG RANGE BROADCAST</b>	Enable/Disable Long Range Broadcast
<b>DESTINATION TABLE SETTING</b>	Table storing destinations
DIAGNOSTICS	
<b>SYSTEM ON/OFF</b>	Device activated log
<b>MEMORY TEST</b>	Memory test
<b>SENSOR PORT</b>	Transmission port test
<b>TFT-PANEL</b>	Screen panel
<b>KEYBOARD TEST</b>	Button test
<b>GPS STATUS</b>	GPS positioning status
<b>TRANSCIVER</b>	Transponder status
<b>COMMUN. TEST</b>	Test communication
<b>PANEL TEST</b>	Test Panel
<b>VERSION</b>	Firmware version

## 4.5 Messages

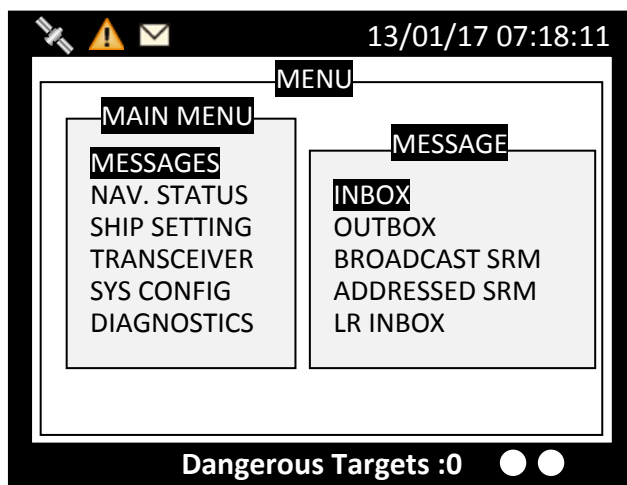



Figure 21 Message

### 4.5.1 Inbox SRM

You can read received SRM messages under Inbox. If there is any unread message, the upper left corner will display , the new message icon.

#### Traversing list

Turn the rotary switch to traverse the message list.

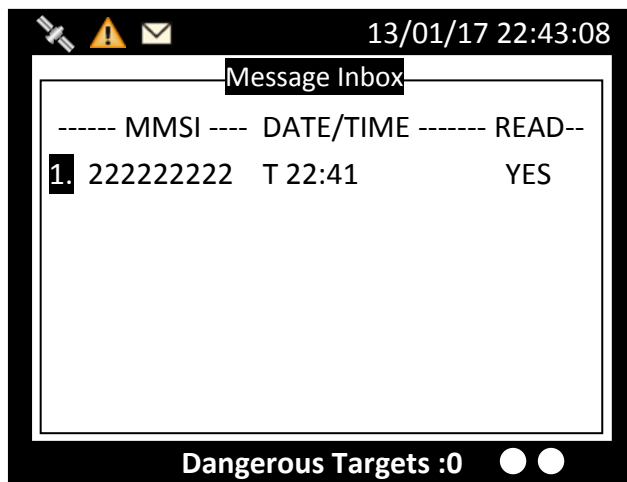


Figure 22 Traversing List



Highlight your choice and pressing down the rotary switch to read message content.

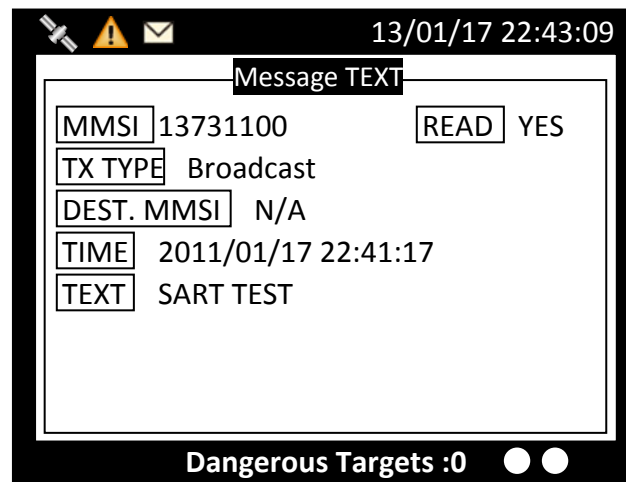


Figure 23 Message Text

### Message deletion

Pressing the **MENU** button will ask whether to delete the highlighted message. Turn rotary switch to choose and press rotary switch to confirm your choice.

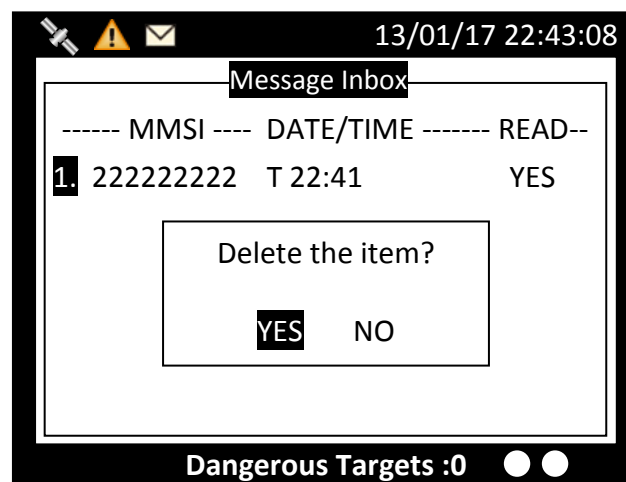


Figure 24 Message Deletion

## 4.5.2 Outbox SRM

You can read sent **SRM** messages under **OUTBOX**. Below are key functions under **OUTBOX**.

### Traversing List

Turn the rotary switch to traverse the message list.



Figure 25 Traversing List

### View message

Highlight your choice and pressing down the rotary switch to view message content.



Figure 26 View Message

### Message deletion

Pressing the MENU button will ask whether to delete the highlighted message. Turn rotary switch to choose and press MENU to confirm the decision.

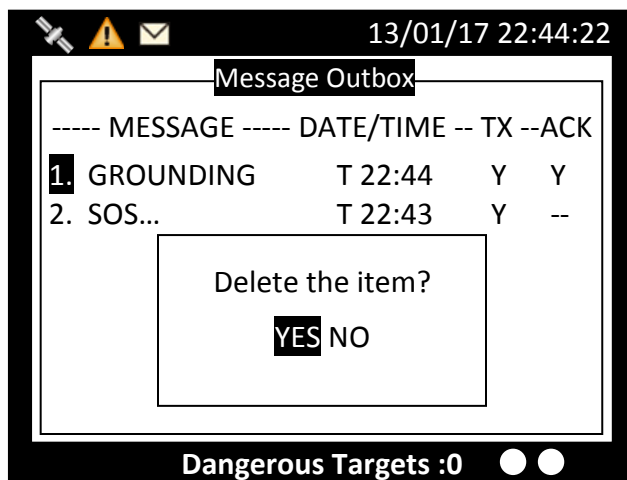


Figure 27 Message Deletion

### 4.5.3 Broadcast SRM

Use this menu to send a Pre-defined or custom message. Turn the rotary switch to traverse all available option.

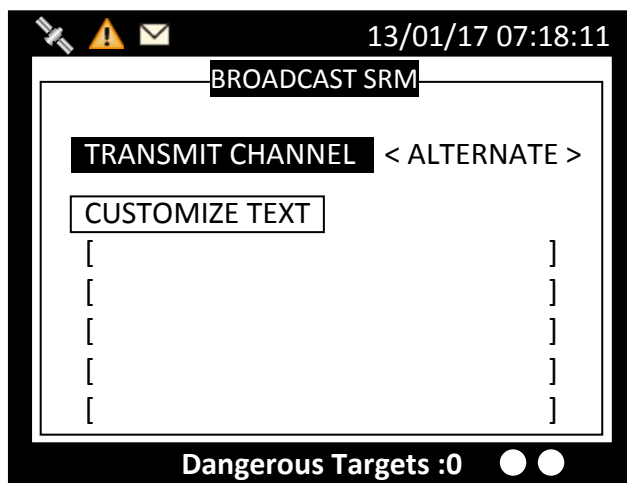


Figure 28 Broadcast SRM

### Selecting SRM channel

**SRM** channel selection is the first option in the screen. Highlight it and press the rotary switch to enter the option. Turn the rotary switch to change the setting.

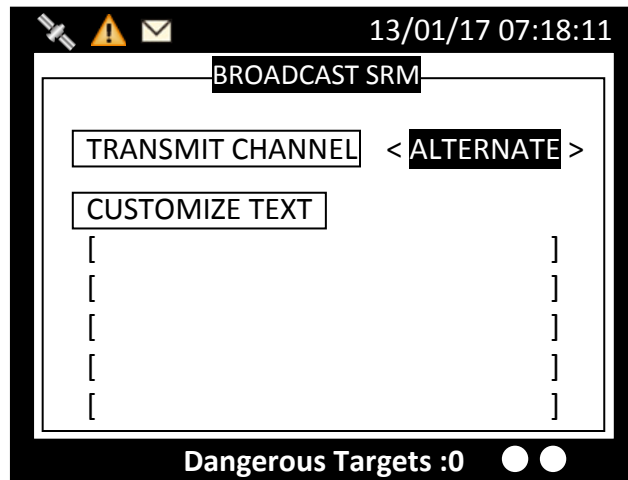


Figure 29 Select SRM Channel

Once finish the settings, press the **rotary switch** again to return.

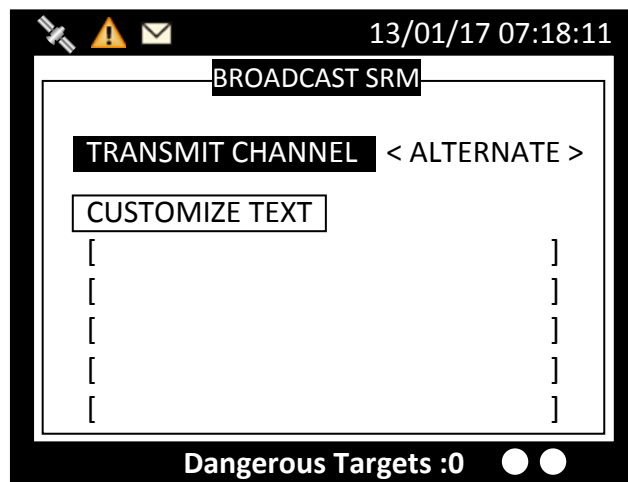


Figure 30 Finish Setting

### Using Predefined-Sentence

You may use **PRE-SENTENCE** option to select a pre-defined message sentences or a customized text. Press the rotary switch to enter and turn the rotary switch to switch sentence selections, and then press the rotary switch to confirm. To use a customized sentence, turn selection to **<Other>**, and remember to enter you customized text at the **CUSTOMIZE TEXT** option.

### Entering SRM customized text

Press the rotary switch to enter text input mode, then turn the rotary switch to traverse character position on the text.

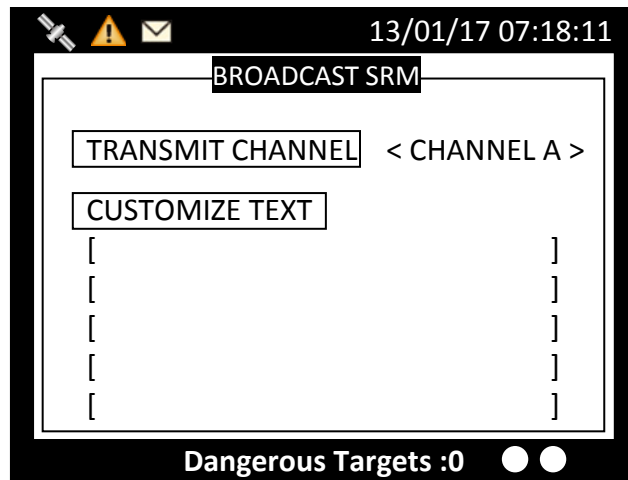


Figure 31 SRM Customized Text

Choose a text location, and then press the rotary switch to enter text input mode. Turn the rotary switch to select a character, and then press the rotary switch to confirm and to return. Repeat these steps till all desired characters are entered.

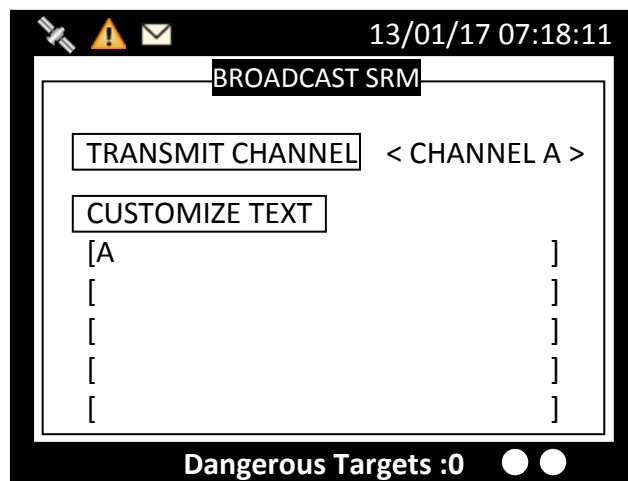


Figure 32 Enter Customized Text

When finished, press ESC to return to **BROADCAST SRM** menu.

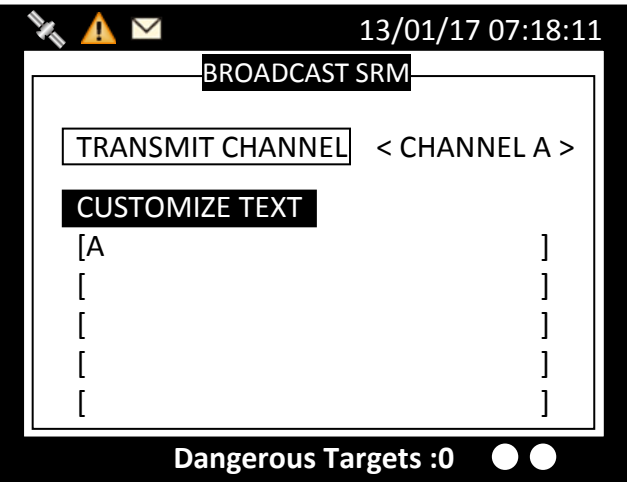


Figure 33      Finish Customized Text

When done with all settings, pressing **MENU** or **ESC** to leave and the system will ask whether to send the message. Select **OK** to send, **CANCEL** to cancel and return to main menu.

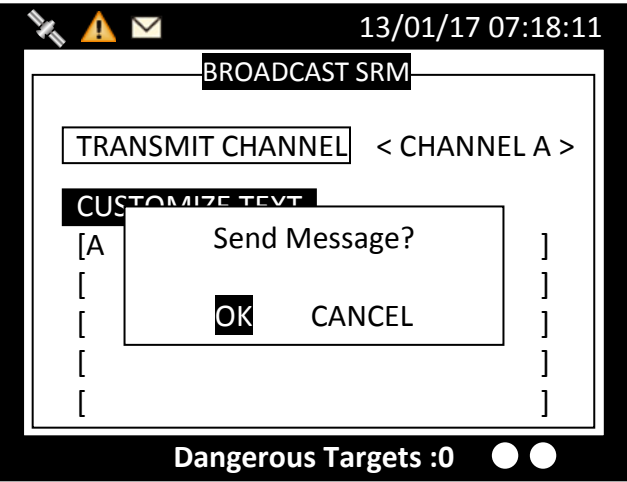


Figure 34      Send Message

4.5.4 Addressed SRM

Press the rotary switch button on **ADDRESSED SRM** will remind to select a target to send.

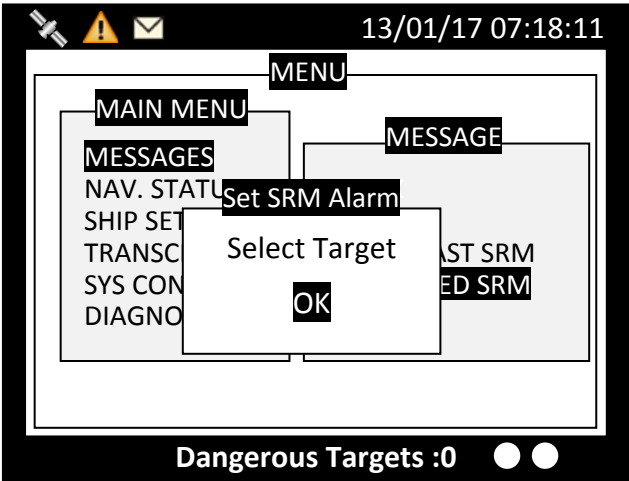


Figure 35 Addressed SRM

Pressing the rotary switch will bring up the vessel list.

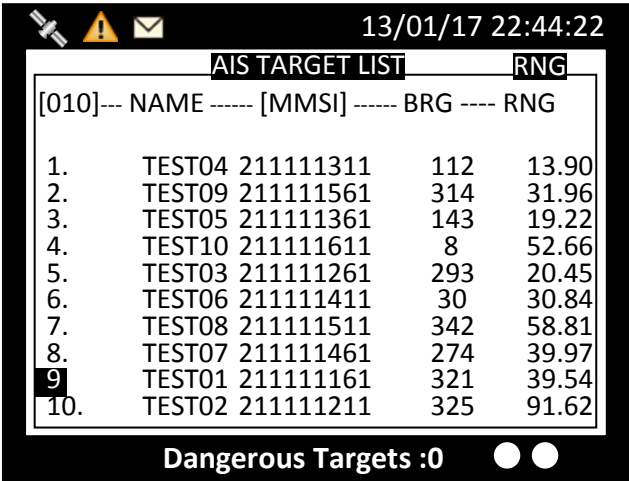


Figure 36 AIS Target List

Select the target vessel by pressing the rotary switch to customize **SRM** sending.

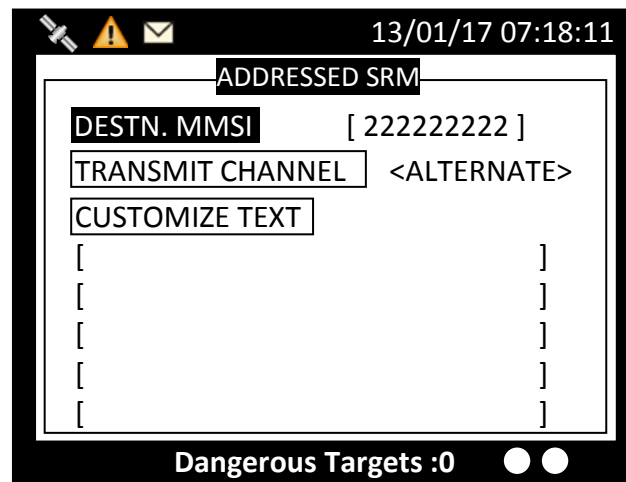


Figure 37 Customize SRM

When changing Destination **MMSI**, choose a text location, and then press the rotary switch to enter text input mode. Turn the rotary switch to select a character, and then press the rotary switch to confirm and to return. Repeat these steps till all desired characters are entered.

When done with all settings, press **MENU** or **ESC** to leave. The system will ask whether to send the message. Select **OK** to send, **CANCEL** to cancel and return to main menu.

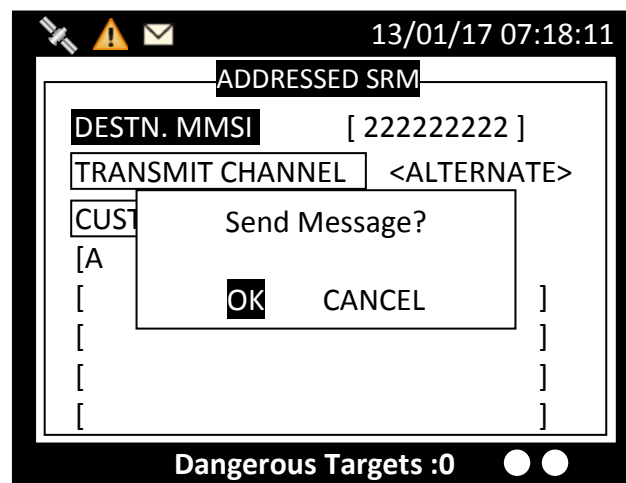


Figure 38 Send Message



4.5.5 Long Range SRM

**LONG RANGE SRM** holds all received Long Range Interrogation messages. Turn the rotary switch to traverse the message list.

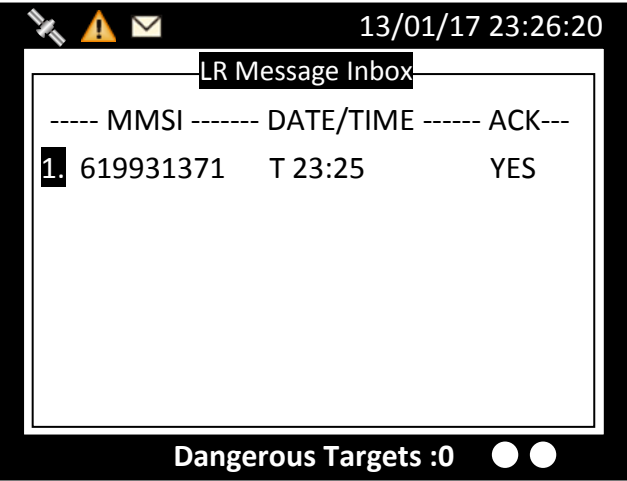


Figure 39 Long Range SRM

Reading message

Press the rotary switch to read the interrogation message content. When finished reading, press **ESC** to leave the page.

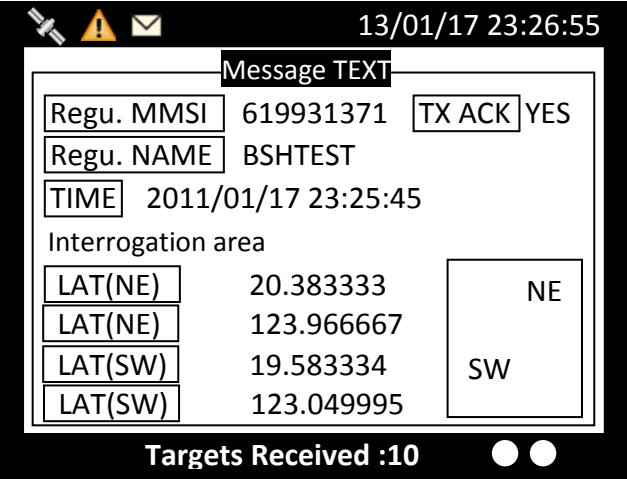


Figure 40 Reading Message

## Message deletion

Under the message list, pressing **MENU** will ask whether to delete the message. Turn rotary switch to choose and press rotary switch to confirm your choice.

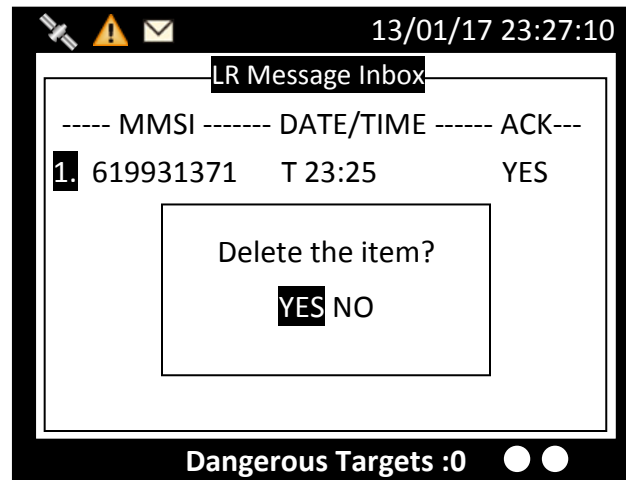


Figure 41 Message Deletion

## 4.6 Navigation Status

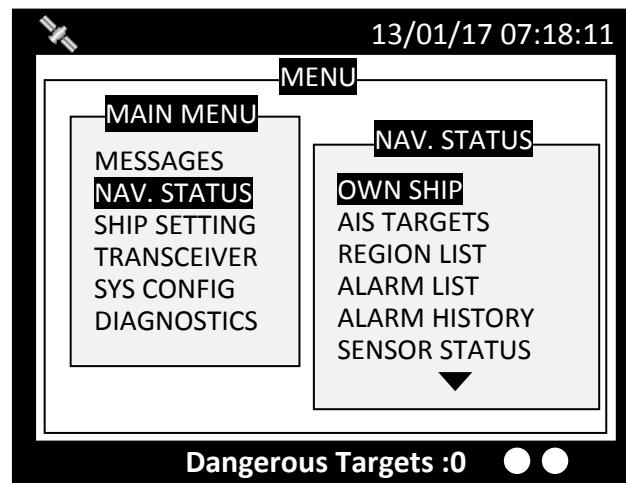


Figure 42 Navigation Status

### 4.6.1 Own Ship

This option displays the full information on your ship, including both dynamic and static data. Turning the rotary switch, can view dynamic and static information alternatively.

#### ■ Static data

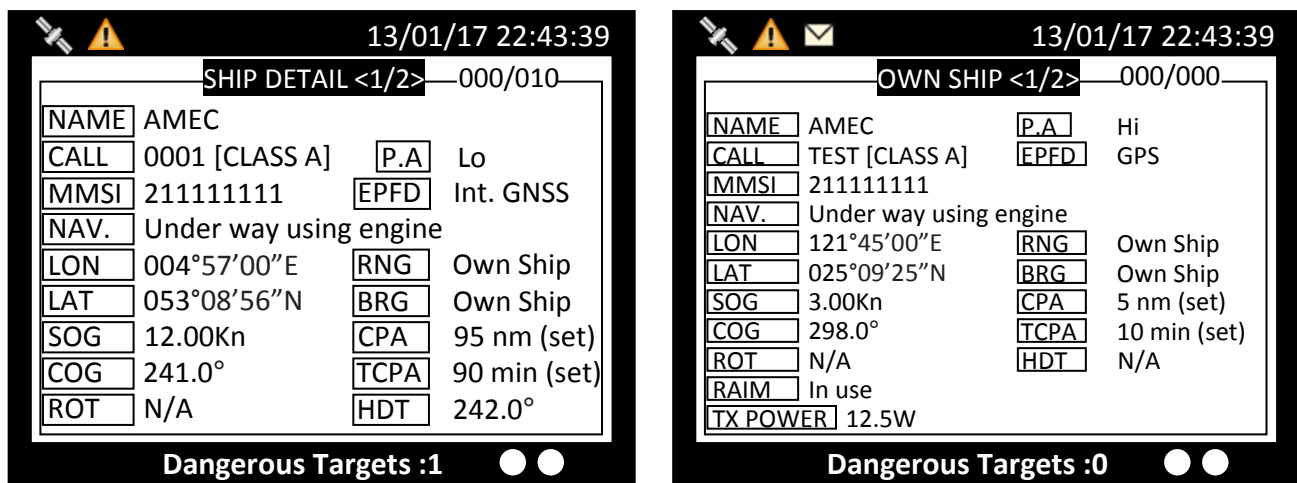





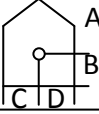
Figure 43 Static Data

## ■ Dynamic data




13/01/17 22:43:39

OWN SHIP <2/2>

000/001




NAME	AMEC			[CLASS A]
CALL	0001	DRAFT	10.0m	
MMSI	211111111	IMO	010200000	
CARGO	DG, HS or MP (Pollutant OS)			
TYPE	WIG			
DEST	TPI	DTE	AVAILABLE	
ETA	11/18 22:00			
BEAM	85m	A:40m C:22m		
LENGTH	81m	B: 41m D:32m		

Dangerous Targets :0

Figure 44      Dynamic Data

### 4.6.2 AIS Targets

This option displays all receive AIS messages of other boats. It can show their dynamic or static information. Turn the rotary switch to select an AIS target.




13/01/17 22:44:22

AIS TARGET LIST				RNG
[010]---	NAME -----	[MMSI] -----	BRG ----	RNG
1	TEST01	211111161	321	39.54
2.	TEST09	211111561	314	31.96
3.	TEST05	211111361	143	19.22
4.	TEST10	211111611	8	52.66
5.	TEST03	211111261	293	20.45
6.	TEST06	211111411	30	30.84
7.	TEST08	211111511	342	58.81
8.	TEST07	211111461	274	39.97
9.	TEST01	211111161	321	39.54
10.	TEST02	211111211	325	91.62

Dangerous Targets :0

Figure 45      AIS Targets

Press the rotary switch, to read the selected vessel dynamic information.

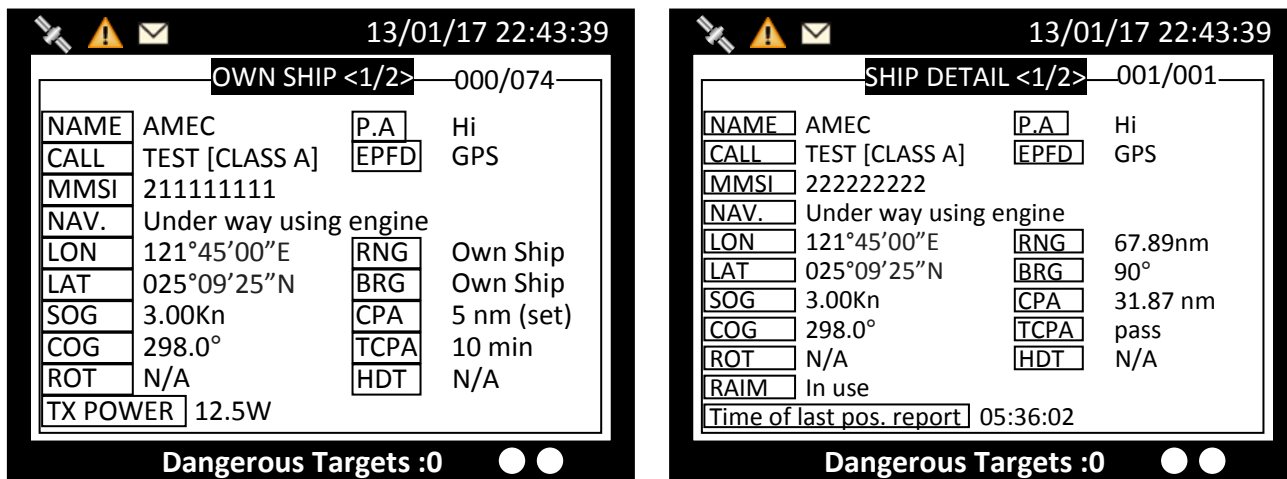


Figure 46 Ship Information

Press the rotary switch again to read static information.

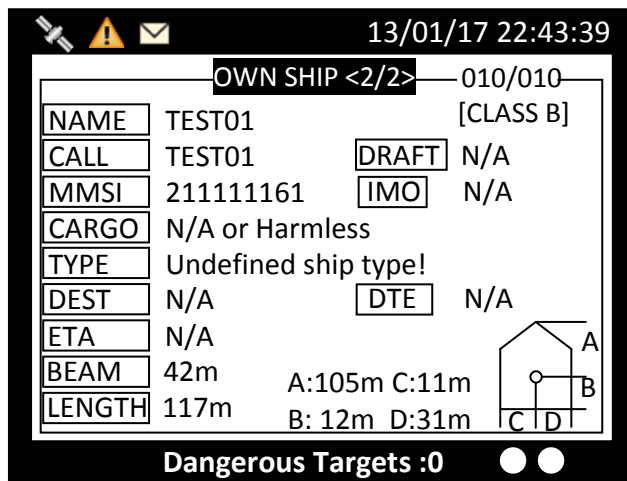


Figure 47 Static Information

Adding Friend Ship

In the list, pressing **MENU** button will ask whether to add this vessel to your **FRIEND SHIP** list.

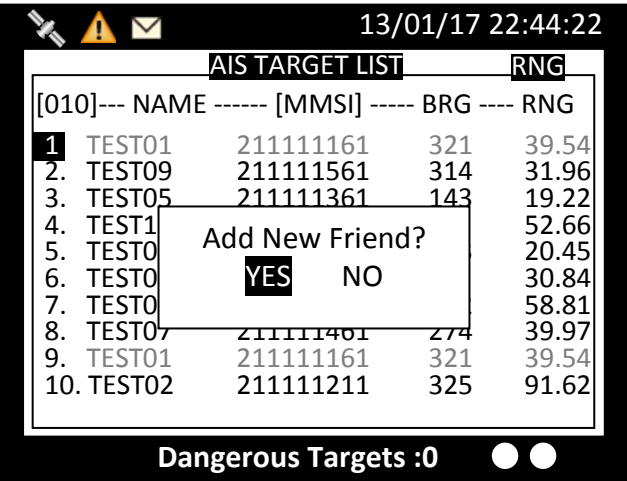


Figure 48 Adding Friend Ship

Sorting AIS Target List

Pressing the **FUNC** button can sort the list according to vessels' **MMSI**, distance, or direction.

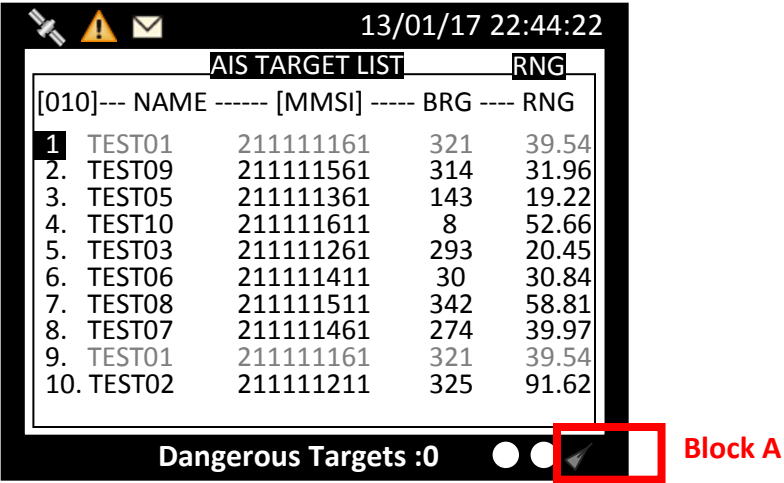





Figure 49 Sorting AIS Target List

In the screenshot above, the block A indicates the current sorting method.

	By MMSI, in ascending order
	By direction, in ascending order
	By distance, in ascending order

4.6.3 Region List

This option list all saved region information.

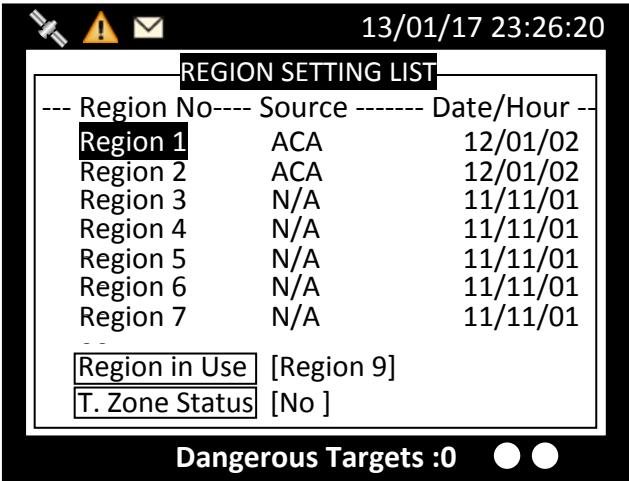


Figure 50 Region List

Turn the rotary switch to traverse the list. Press the rotary switch enables you to read the highlighted region information.

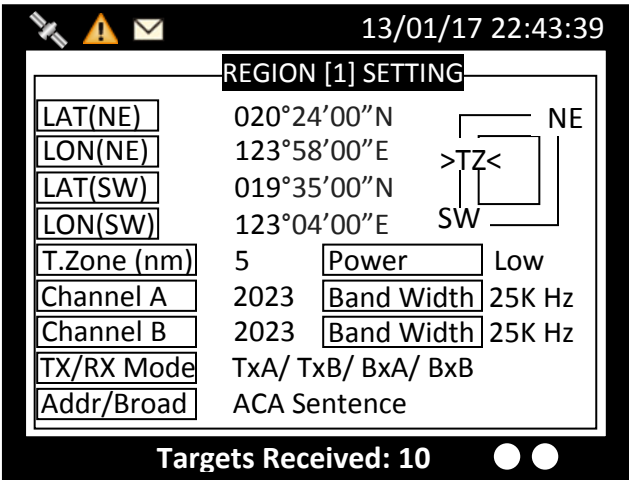
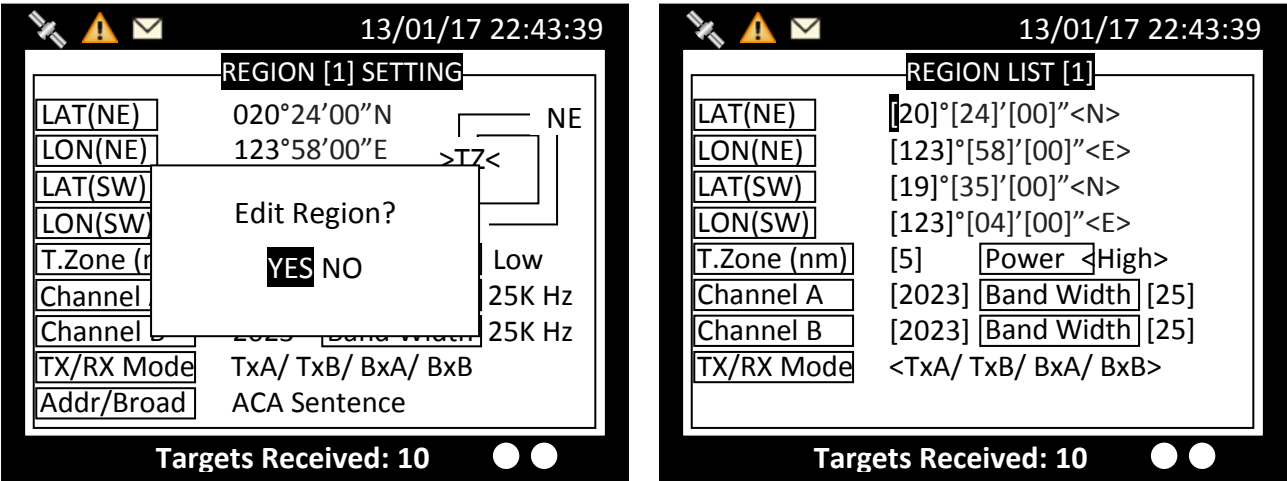


Figure 51 Region Setting

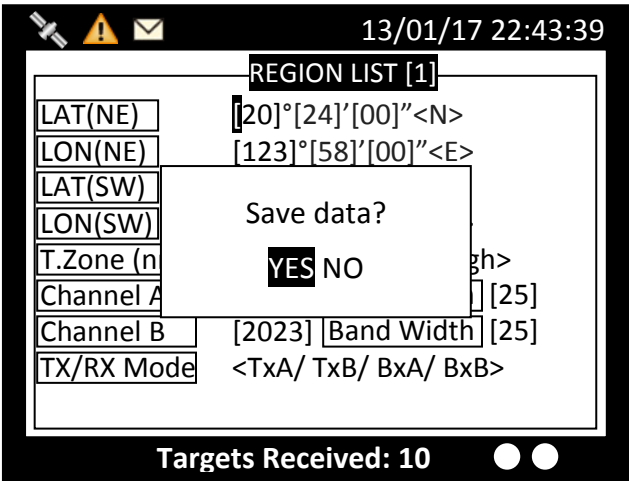
**Modify region content**

Press **MENU** at the region information page, enables you to modify the region information.



**Figure 52      Modify Region Content**

To save, pressing MENU or ESC will ask whether to save the changes.  
If the region information is un-modifiable, saving does not change the original information.



**Figure 53      Save Data**



4.6.4 Alarm List

This command lists all current AIS ALR statuses.

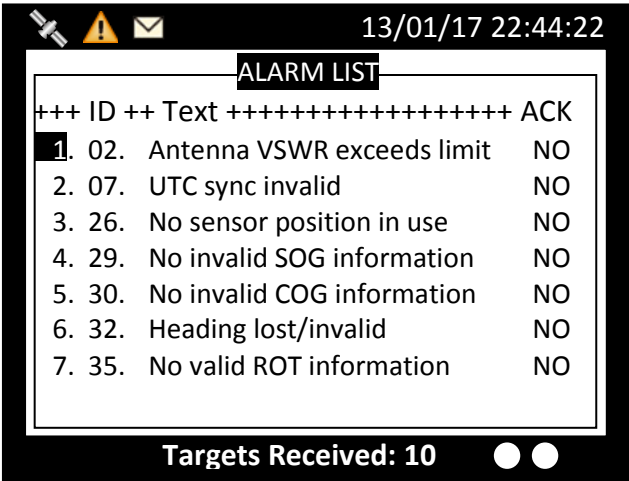


Figure 54 Alarm List

By pressing **MENU**, enables you to send **ACK** message to **AIS**. If the **ALR** information has not yet responded, an indication icon will appear on left upper corner till all **ARL** information is received.

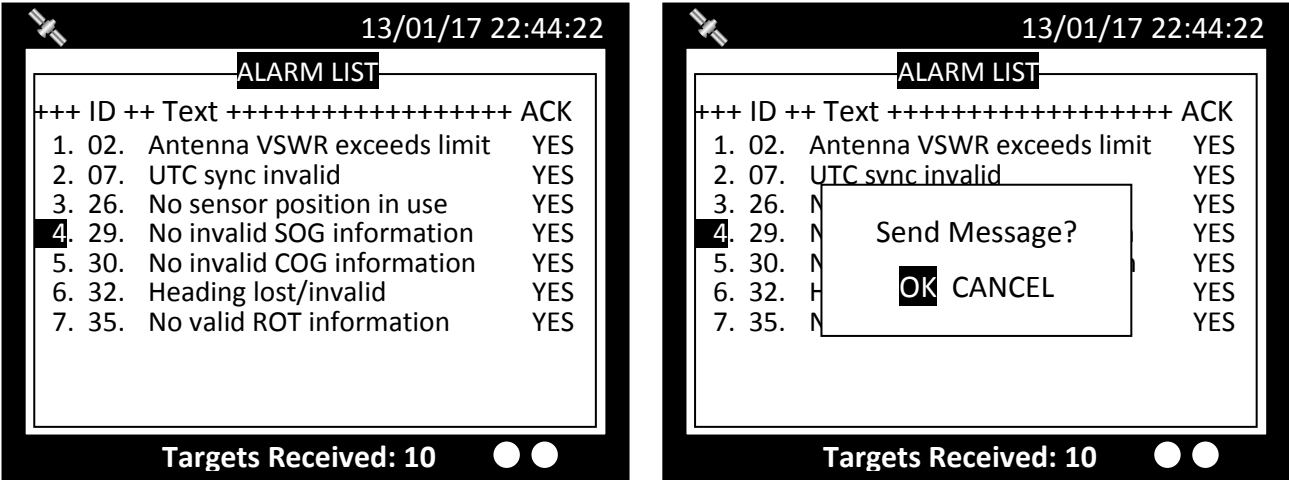


Figure 55 Send Message

## 4.6.5 Alarm History

This command lists all recorded alarm and its time of occurrence.

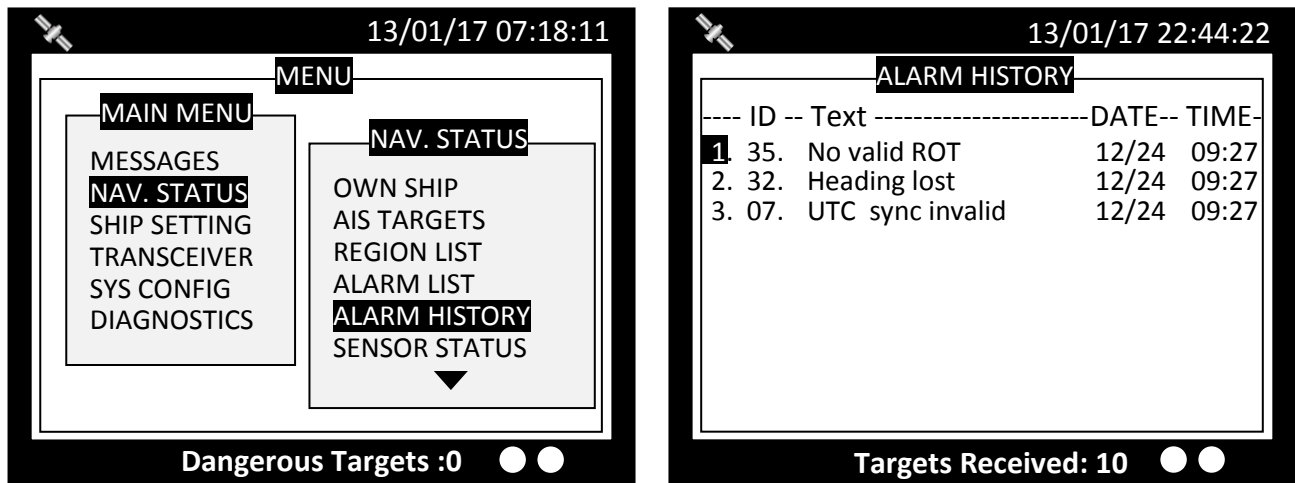


Figure 56 Alarm History

## 4.6.6 Sensor Status

Display sensor statuses:

SENSOR	STATUS
POSITION STATUS	EXT. DGNSS / INT. DGNSS MSG.17 / EXT. GNSS / INT. GNSS / NO GPS
POSITION QUALITY	No position Manual position Dead reckoning position valid position with no time stamp Position > 10m Position with RAIM > 10 m Position <= 10 m Position with RAIM <= 10 m Outdated position > 200 m
UTC STATUS	VALID / LOST
COG STATUS	INT. COG / EXT. COG / LOST
SOG STATUS	INT. SOG / EXT. SOG / LOST
HEADING STATUS	VALID / LOST
ROT STATUS	VALID / OTHER ROT / LOST

The channel status below records TXT message received times.

AIS: Channel management parameters changed.

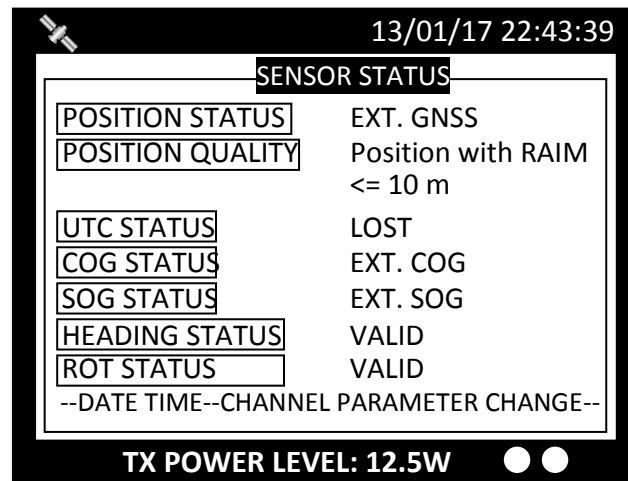


Figure 57 Sensor Status

#### 4.6.7 Dangerous List

Any vessel with less than the safe encountering time (**TCPA**) and distance (**CPA**) will be listed in **DANGEROUS LIST** for navigation purposes and safety references.

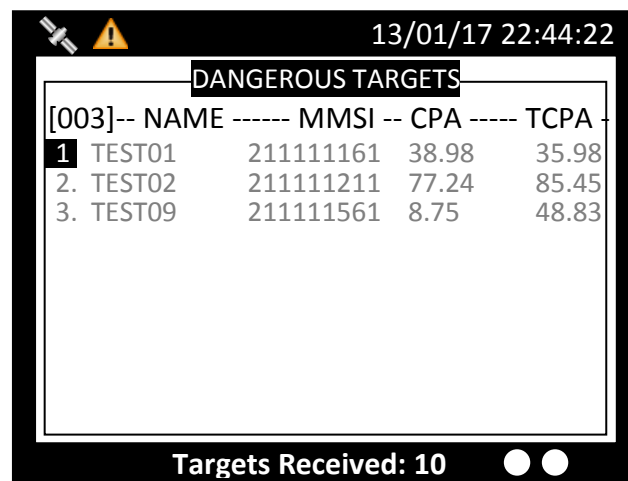


Figure 58 Dangerous List

Turn the **rotary switch** to select a vessel and press to read its information.

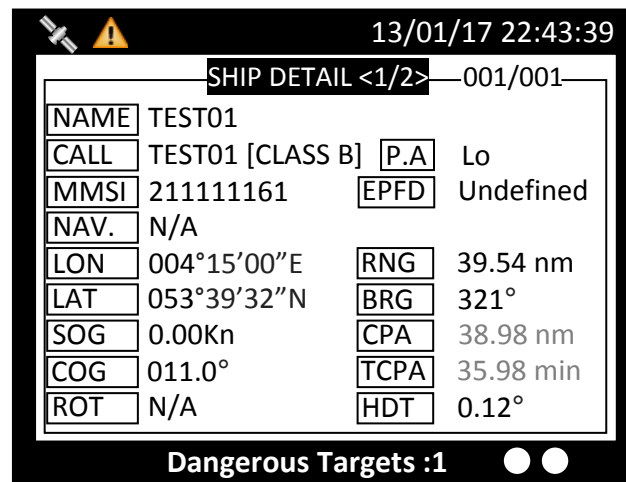


Figure 59 Ship Detail (1)

Press the **rotary switch** again to go the second page for more detail.

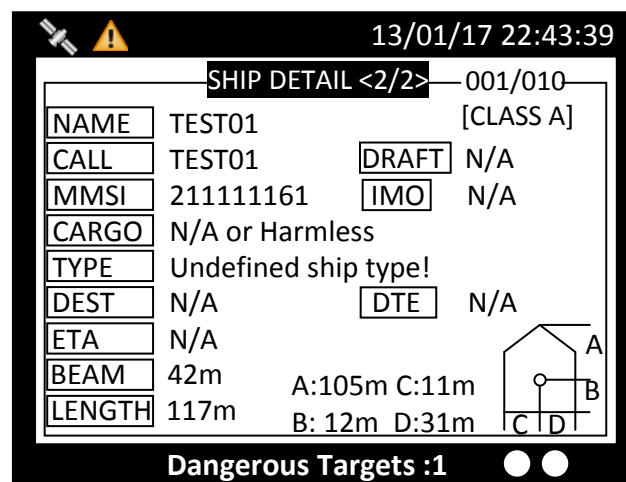


Figure 60 Ship Detail (2)

## 4.6.8 Friend Ships

This command displays the list of all registered friend ships.

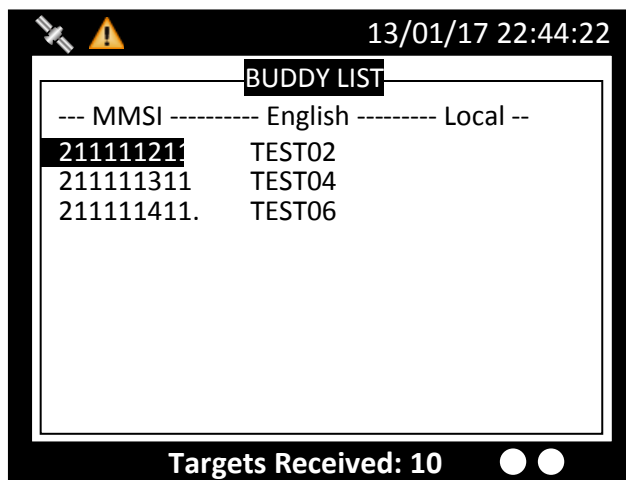


Figure 61 Buddy List

Turn the **rotary switch** to traverse the message list.

Highlight your choice and pressing down the **rotary switch** to read the ship information.

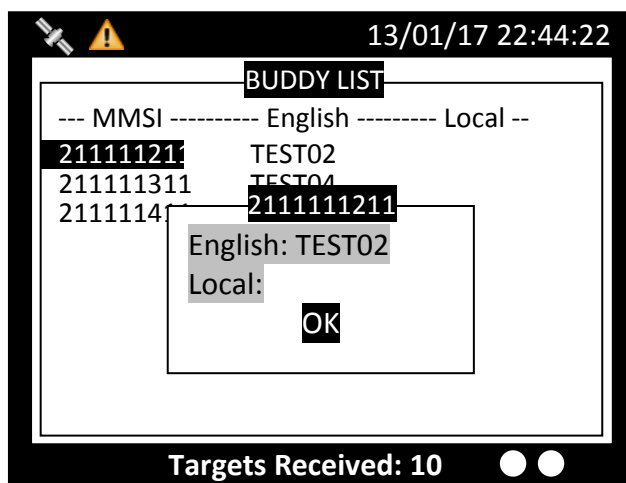


Figure 62 Ship Information

Press the **MENU** button for deletion on the highlighted ship. Turn **rotary switch** to choose and press **rotary switch** to confirm your choice.

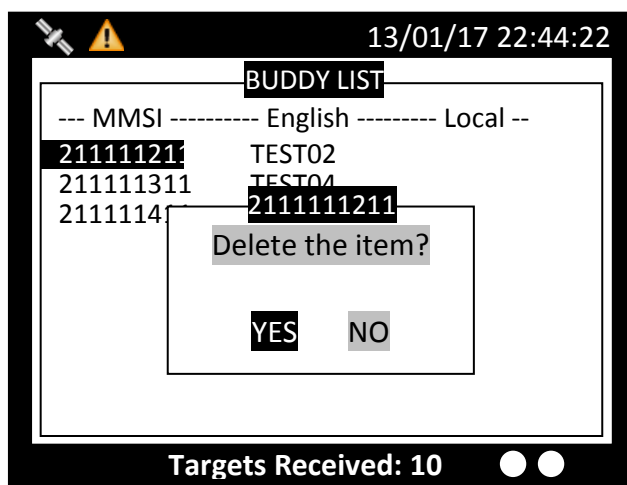


Figure 63 Delete the Item

## 4.7 Ship Setting

This sub-menu lists all the ship information settings of your ship. There are a total of 4 setting commands.

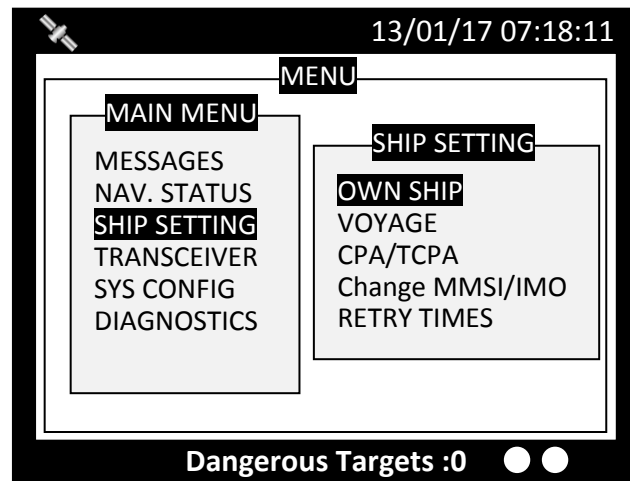


Figure 64 Ship Setting

### 4.7.1 Own Ship

To access **OWN SHIP** setting, you are required to enter your password (The default password is **0000**).

Choose a text location, and then press the **rotary switch** to enter text input mode. Turn the **rotary switch** to select a character, and then press the **rotary switch** to confirm and to return. Repeat these steps till all desired characters are entered.

After entering the password, press down the rotary switch for 3 seconds to confirm.

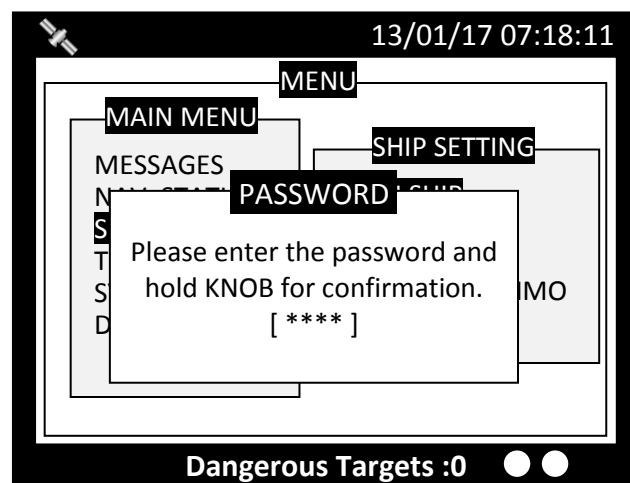


Figure 65 Own Ship

If the password is correct, the system will proceed to the settings page, else a system message will indicate that the password is wrong.

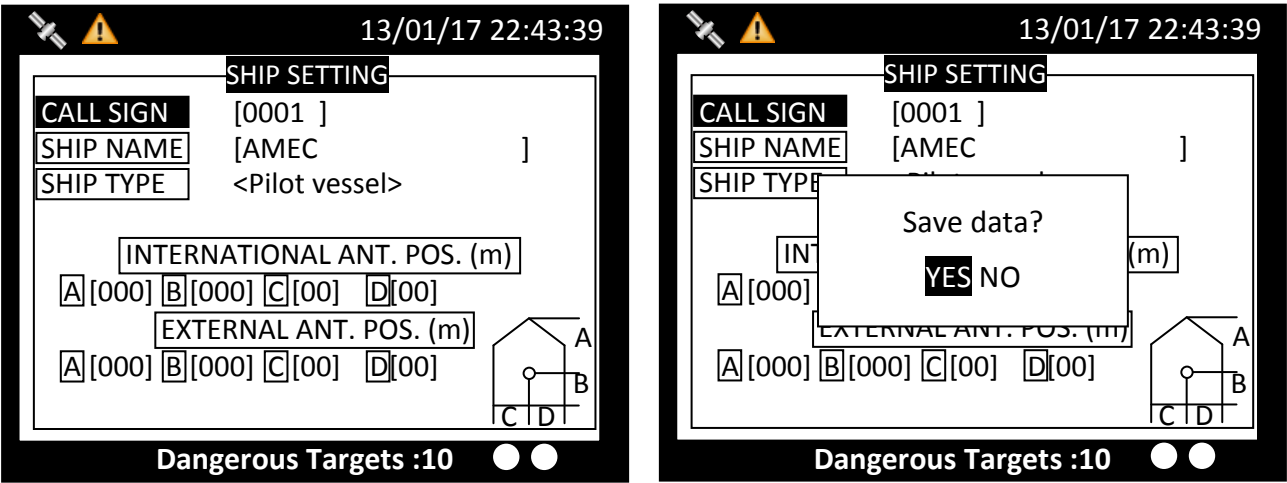


Figure 66 Own Ship Setting

Pressing **MENU** or **ESC** button will ask whether to save data. Turn **rotary switch** to choose and press **rotary switch** to confirm your choice.

4.7.2 Voyage

**VOYAGE** provides navigation functionalities, such as navigation destination, time of arrival, navigation status, etc.

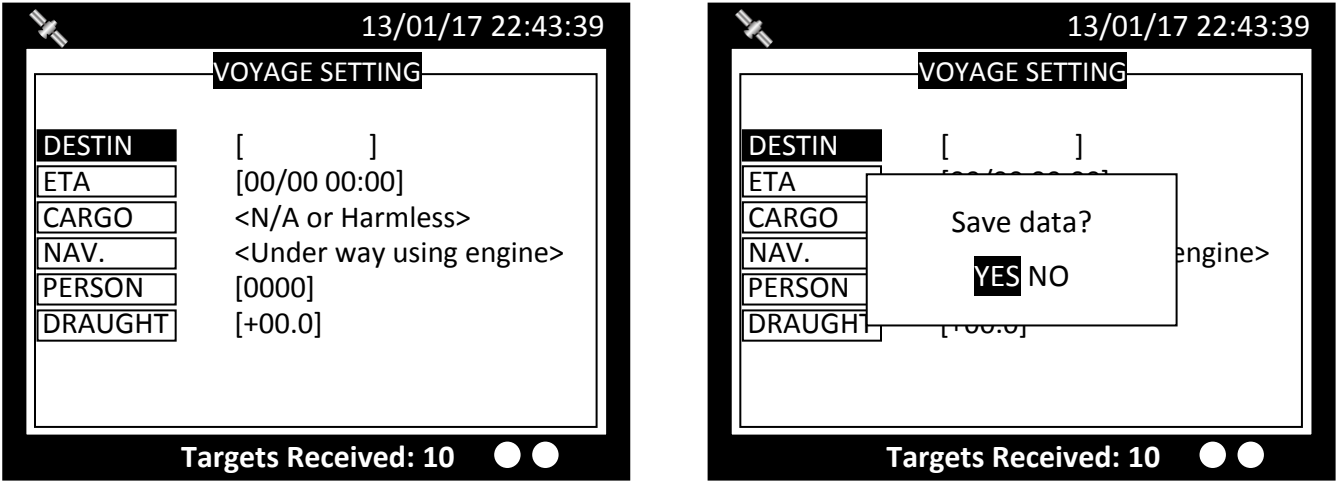


Figure 67 Voyage Setting

Pressing **MENU** or **ESC** button will ask whether to save data. Select **YES** to save and exit, or **NO** to exit without saving.



### 4.7.3 CPA/TCPA

This command holds the settings to configure dangerous ship criteria (**TCPA** and **CPA**) and the alarm.

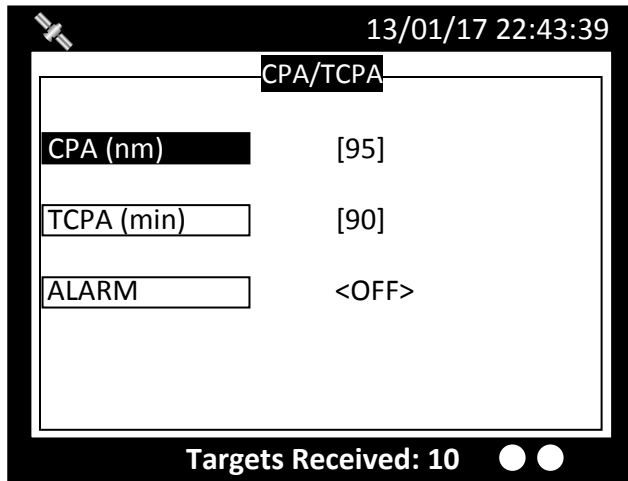
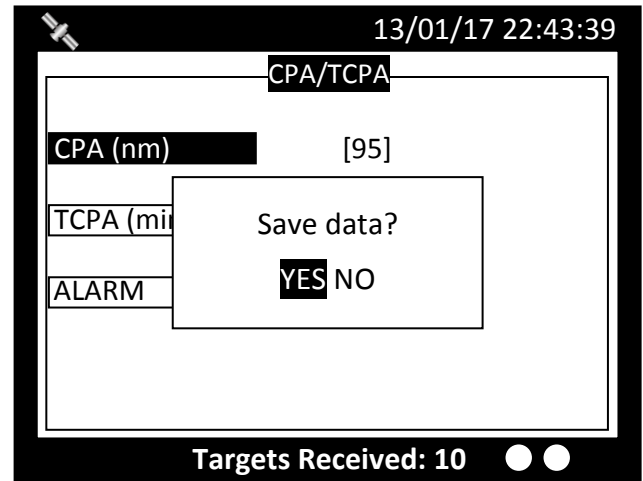


Figure 68



CPA/TCPA

Pressing **MENU** or **ESC** button will ask whether to save data. Select **YES** to save and exit, or **NO** to exit without saving.

### 4.7.4 Change MMSI/IMO

This command provides settings to enter **MMSI** and **IMO**. Saving is one time only. Therefore, it is important to double check before saving.

Turn **rotary switch** to traverse the items and press to enter the setting screen.

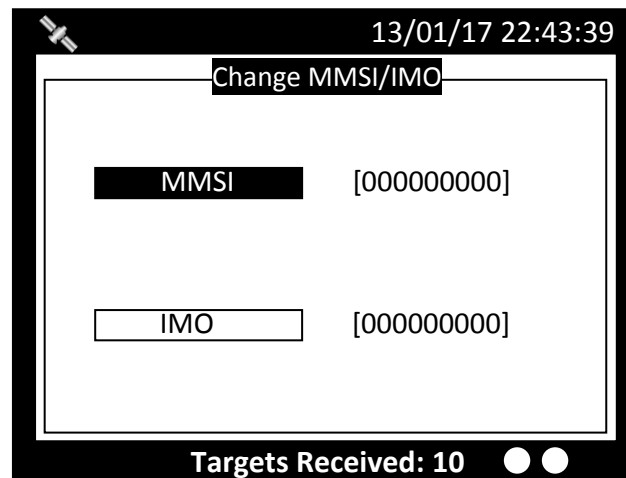


Figure 69

Change MMSI/IMO

Turn the **rotary switch** to change the position and press **rotary switch** to enter text input mode. Turn the **rotary switch** to change value and press **rotary switch** again to confirm. Repeat these procedures till all values are entered.

Double check to ensure value is entered correctly and press **MENU** or **ESC** to save.

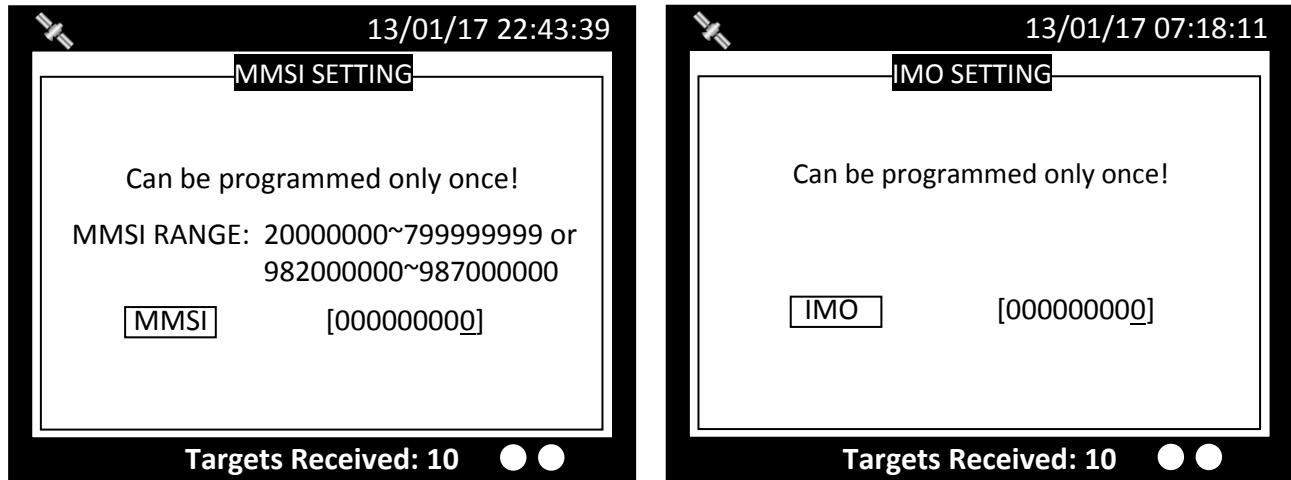


Figure 70 MMSI/IMO Setting

The system will ask for your confirmation.

**BOTH NUMBERS CAN ONLY BE PROGRAMMED ONLY ONCE!**

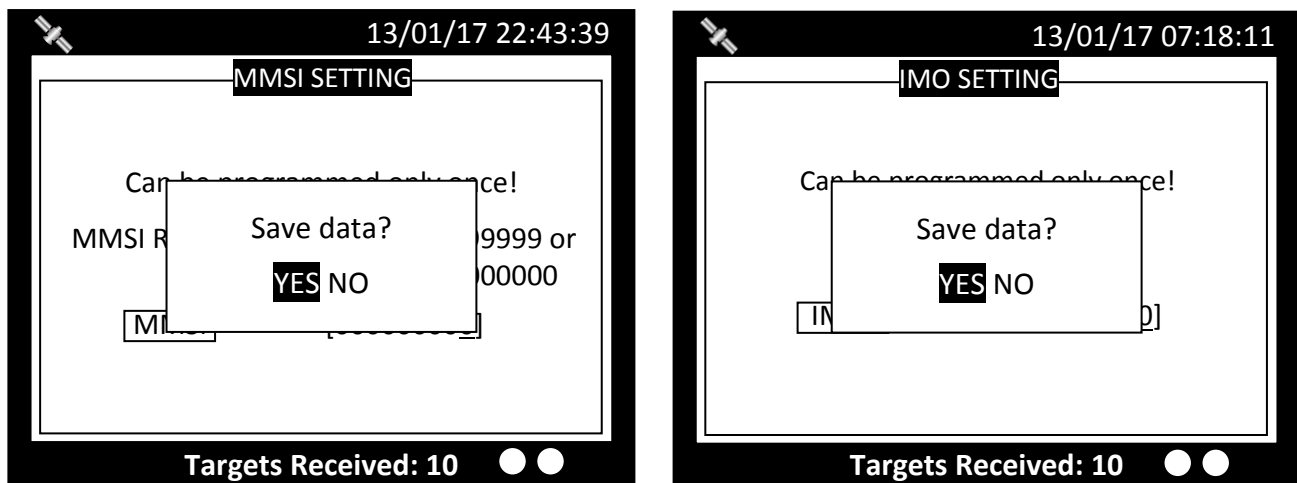


Figure 71 Save Data

### 4.7.5 Retry Times

In order to resend messages when the transmitted Message 6 or Message 12 receives no response of Message 7 or Message 13, set the Retry Times to set the resending times.

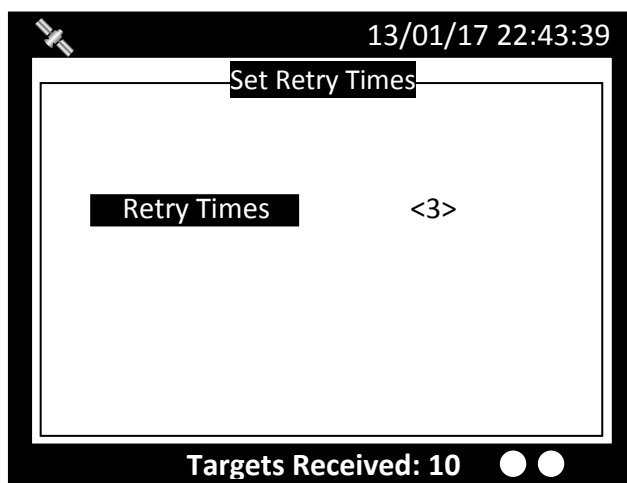


Figure 72      Retry Times

## 4.8 Transceiver

**TRANSCEIVER** setting sub-menu holds the settings of the transceiver statuses and the supplied voltage for the GPS antenna.

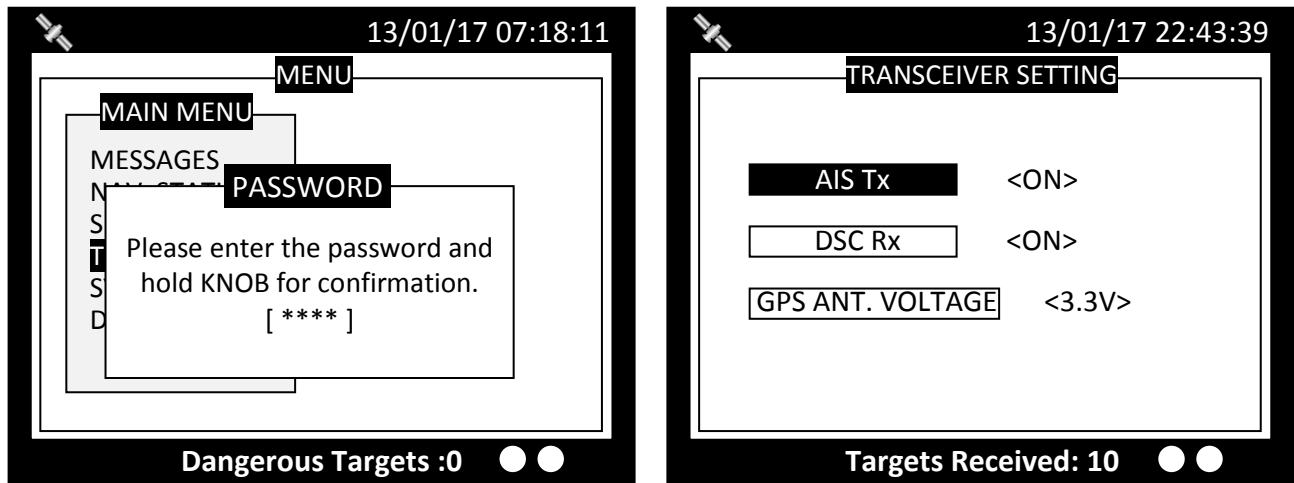


Figure 73 Transceiver

Pressing **MENU** or **ESC** button will ask whether to save data. Select **YES** to save and exit, or **NO** to exit without saving.

Added AIS TX POWER option to configure transmit power, provided with 12.5W and 1W transmit options.

## 4.9 Sys Config

System configuration provides the preference settings of the device.

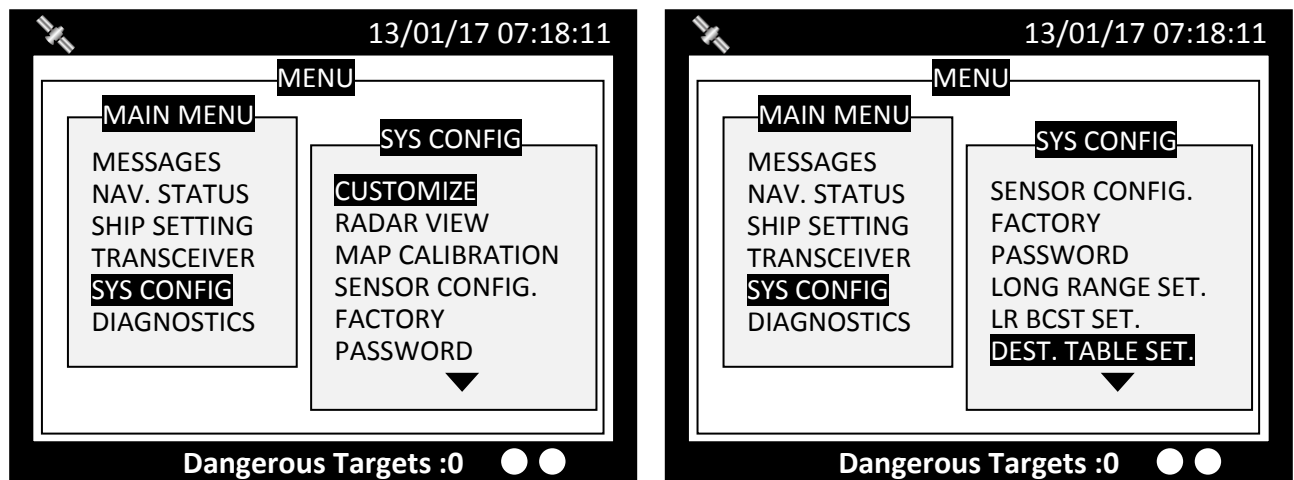


Figure 74 System configuration

### 4.9.1 Customize

Customize provides personalization settings.

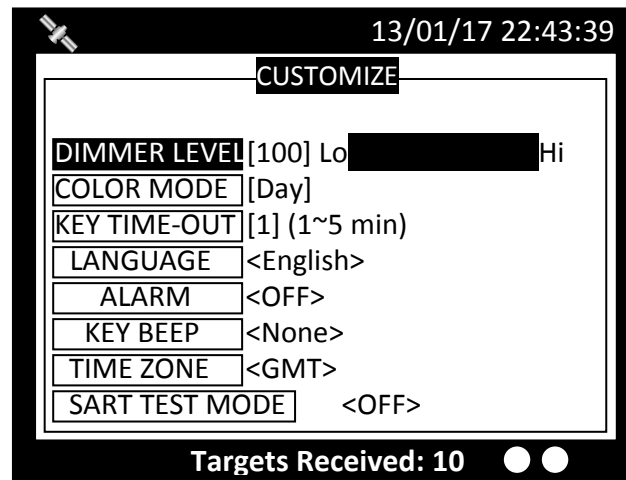


Figure 75 Customize

Pressing **MENU** or **ESC** button will ask whether to save data. Select **YES** to save and exit, or **NO** to exit without saving.

### 4.9.2 Radar View

This setting provides user the ability to center the radar map on given coordinates.

Turn **rotary switch** to choose either latitude or longitude and press **rotary switch** to confirm. Once pressed, turn **rotary switch** to choose a parameter and press **rotary switch** again to enter input mode. When finished, press **ESC** to return to the level before. Continue these procedures till all settings are set.

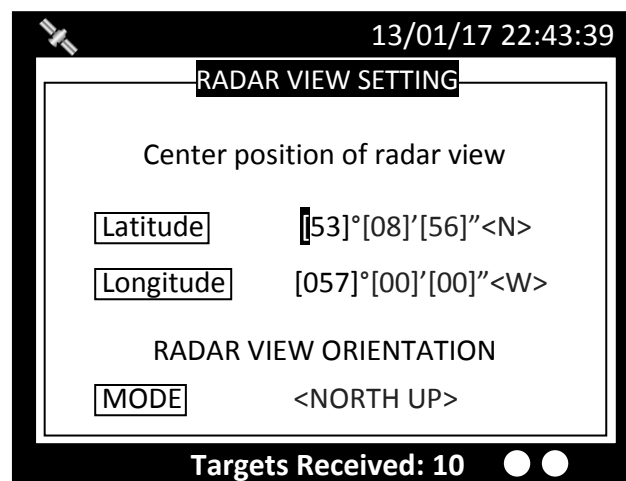


Figure 76 Radar View Setting

Pressing **MENU** or **ESC** button will ask whether to save data. Select **YES** to save and exit, or **NO** to exit without saving. Added with RADAR VIEW ORIENTATION mode, with NORTH UP/ COURSE UP / HEAD UP.

### 4.9.3 Map Calibration

This setting offers user functions to calibrate map data. Turn **rotary switch** to select either latitude or longitude to offset. Press **rotary switch** to enter input mode. Turn **rotary switch** to select an offset value. Once finished press **ESC** to return to the previous level to continue the setting.

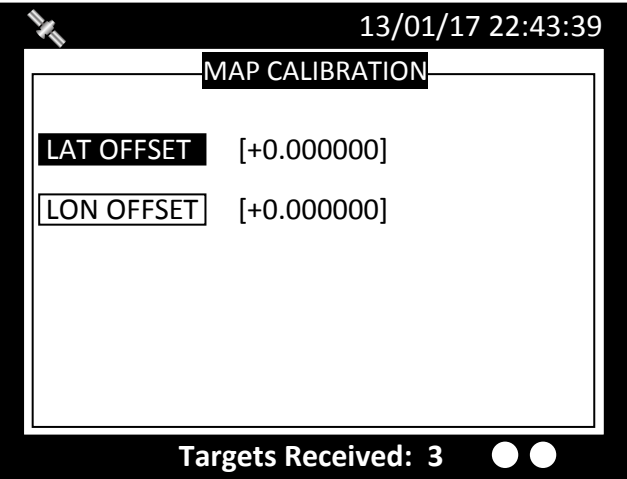


Figure 77 Map Calibration

Pressing **MENU** or **ESC** button will ask whether to save data. Select **YES** to save and exit, or **NO** to exit without saving.

### 4.9.4 Sensor Config

**Sensor Configuration** provides user to set port baud rates. Turn **rotary switch** to select a port to modify and press **rotary switch** to change the specified port baud rate. Turn **rotary switch** to change the desired rate. When finished, press **rotary switch** again to return to the previous level.

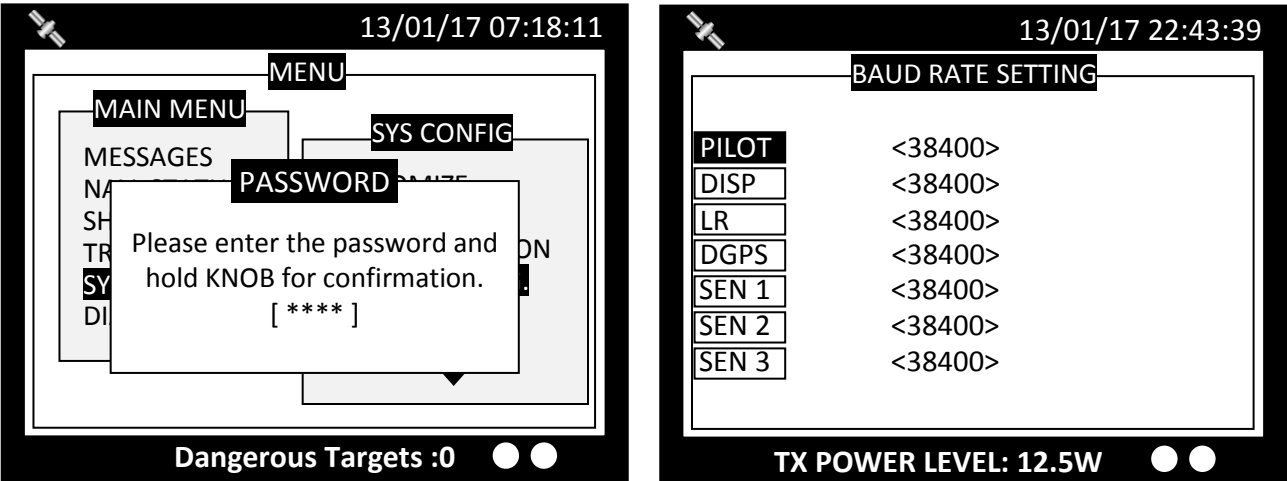


Figure 78 Baud Rate Setting

Pressing **MENU** or **ESC** button will ask whether to save data. Select **YES** to save and exit, or **NO** to exit without saving.

## 4.9.5 Factory

**FACTORY** option enables user restore default factory setting. It restores system preference settings and **CPA/TCPA** values.

Choose a password text location, and then press the **rotary switch** to enter text input mode. Turn the **rotary switch** to select a character, and then press the **rotary switch** to confirm and to return. Repeat these steps till all desired characters are entered.

After entering the password, press down the rotary switch for 3 seconds to confirm.

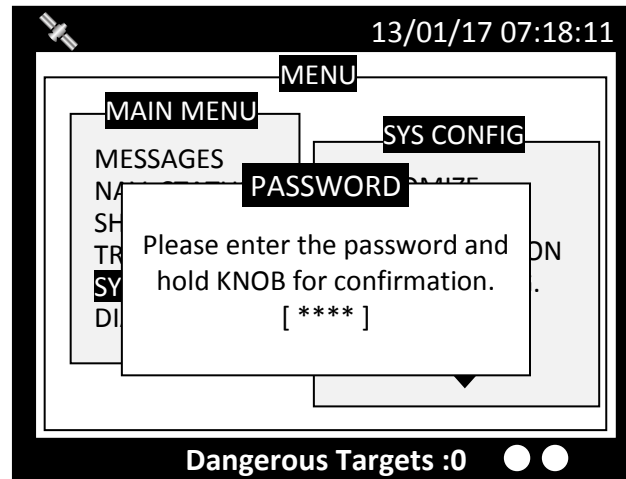


Figure 79 Factory

After entering the password, the system will ask for your confirmation. Turn **rotary switch** to choose and press **rotary switch** to confirm your choice.

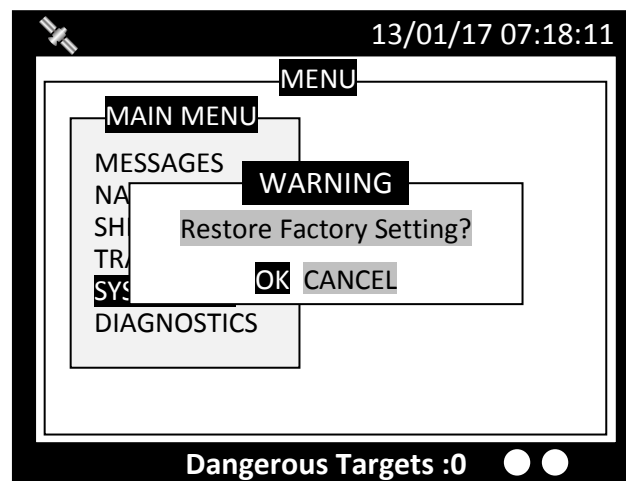


Figure 80 Factory Setting

## 4.9.6 Password

This option enables changing user password. (Default password: “0000”)

Set the information with the order of “**OLD PASSWORD**”, “**NEW PASSWORD**”, “**CONFIRM NEW PASSWORD**”. Turn **rotary switch** to traverse the items and press **rotary switch** to enter input mode. Under input mode, turn **rotary switch** to select text position and press **rotary switch** to confirm. Repeat till all four values are entered.

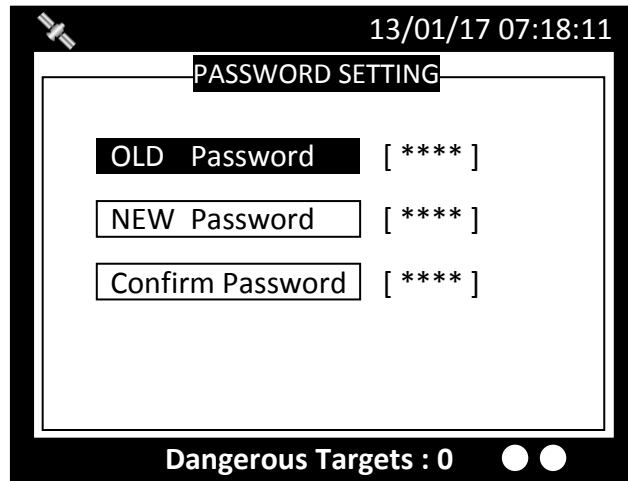


Figure 81 Password

Pressing **MENU** or **ESC** button will ask whether to save data. Select **YES** to save and exit, or **NO** to exit without saving.

### 4.9.6.1 Changing the Password

The password is required in some menu items due to information security. (Default password: “0000”) Please go to **Main MENU** item **Sys Config** and select sub-menu item **Password** to change it. For password setting, please refer to **4.5.6 PASSWORD**.

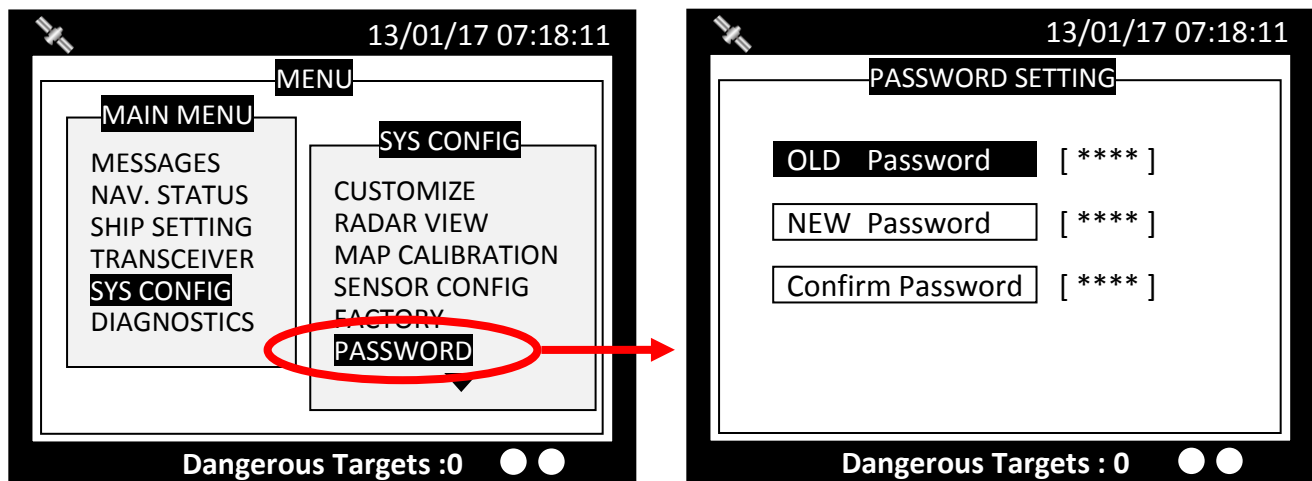


Figure 82 Changing Password



4.9.7 Long Range Setting

This option provides user choices to auto-response remote interrogation and settings of the response information.

You can either set **MODE** to either **AUTO** or **MANUAL**. The setting for the rest of information is either **SUPPLY** or **REJECT**.

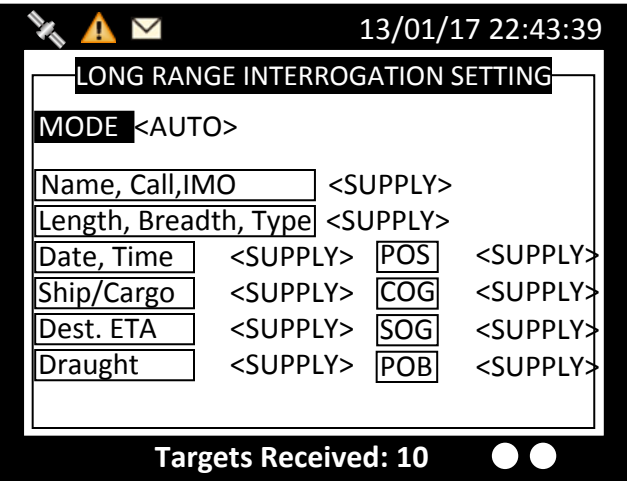


Figure 83 Long Range Setting

Pressing **MENU** or **ESC** button will ask whether to save data. Select **YES** to save and exit, or **NO** to exit without saving.

4.9.8 Long Range Broadcast

Class A transmits Message 27 every 3 minutes through the channels alternately. Provided here are the options to enable or disable Long Range Broadcast and the transmitting channel for Message 27.

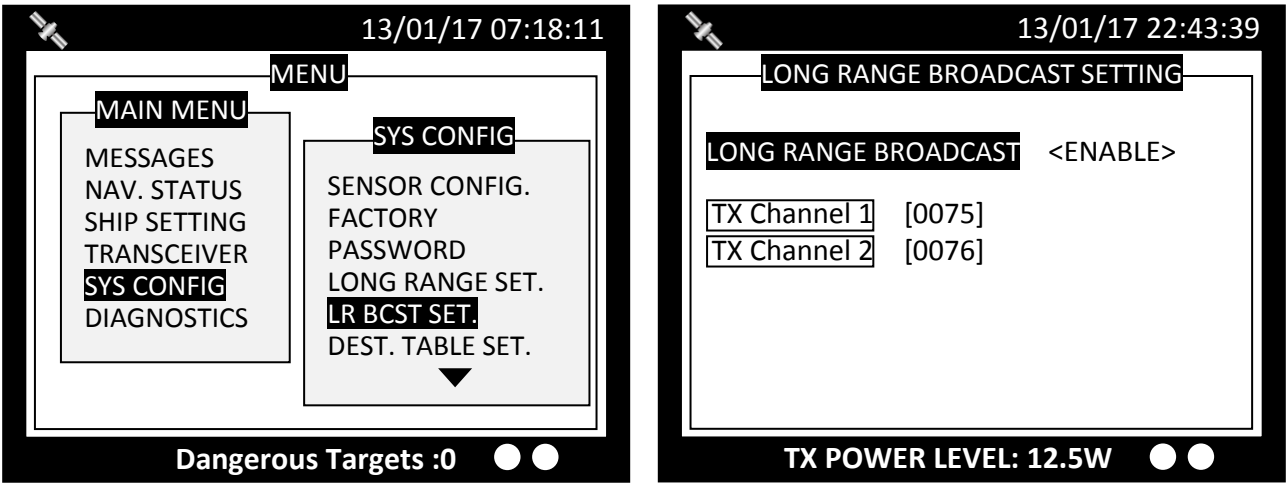


Figure 84 Long Range Broadcast



Only AIS channel numbers can be entered for TX channel. Channel 2078, 2088, and the current channel used in the region cannot be used.

### 4.9.9 Destination Table Setting

Save up to 10 destinations. Use rotary knob to traverse text and to modify. Press Menu to save changes.

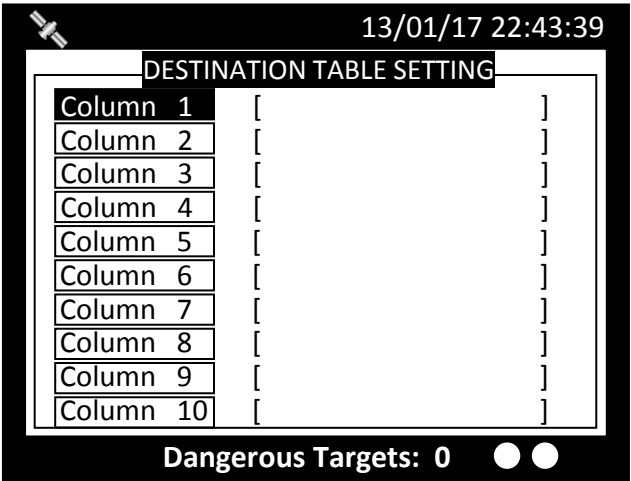


Figure 85 Destination Table Setting

## 4.10 Diagnostics

**DIAGNOSTICS** sub-menu provides users to check system statuses. There are a total of 8 check options.

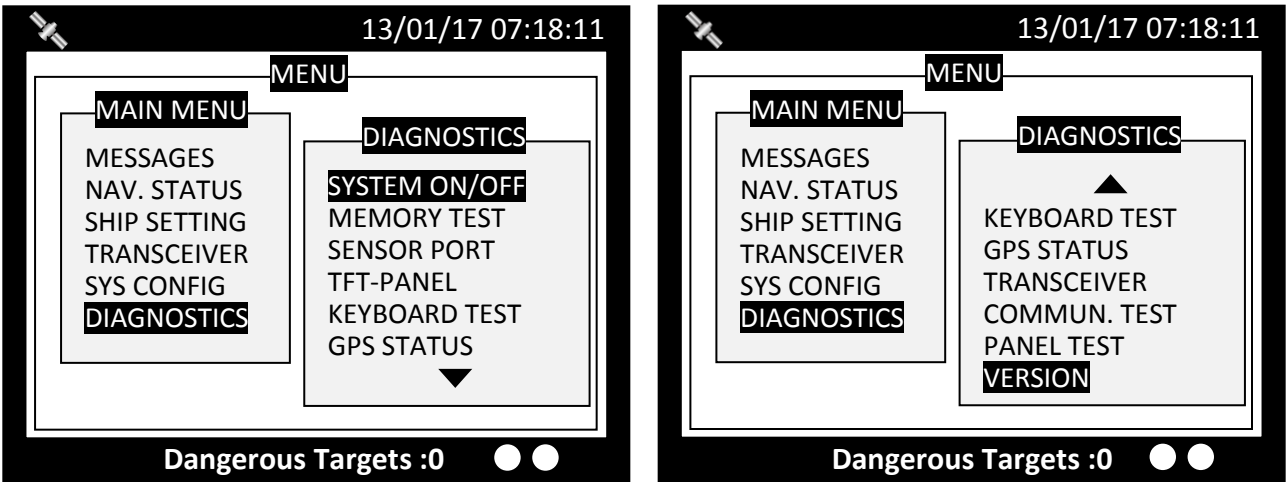


Figure 86 Diagnostic

### 4.10.1 System On/Off

This option provides activation history. (when a power-off session is less than 15 minutes, the session would not be registered in the history)

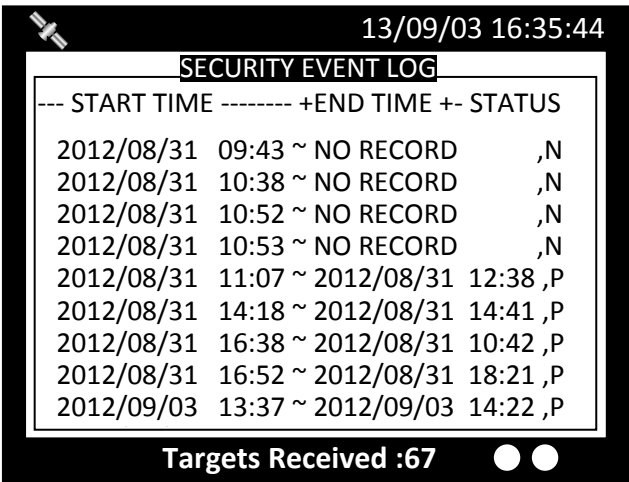


Figure 87 System On/Off

When finished viewing, press **MENU** or **ESC** to exit.

4.10.2 Memory Test

This option provides memory testing on the unit.

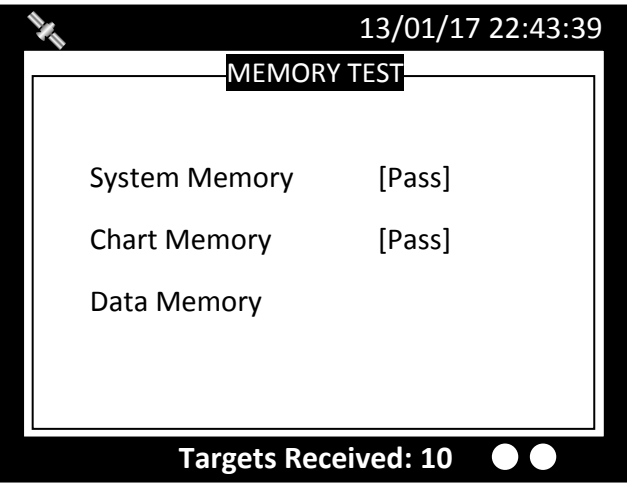


Figure 88 Memory Test

When finished, press **ESC** to exit.

4.10.3 Sensor Port

This option provides an overview on all port baud rates and information.

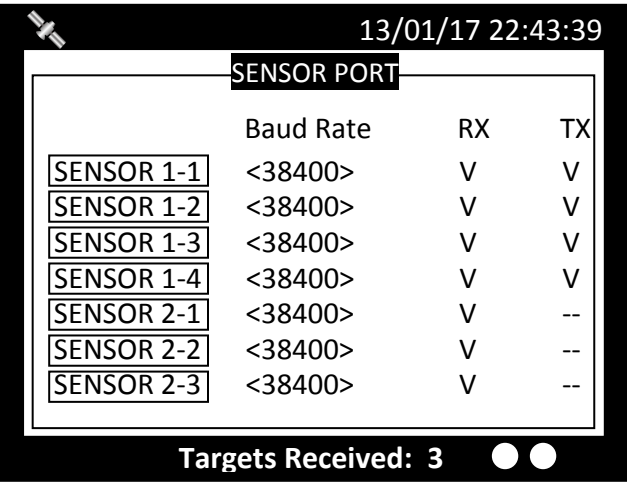


Figure 89 Sensor Port

When finished, press **ESC** to exit.

4.10.4 TFT-Panel

This option provides color information on the monitor. When finished, press **ESC** to exit.

Black	Orchid
Red	Pink
Green	Plum
Blue	Quartz
Magenta	Salmon
Yellow	Silver
Aquamarine	Thistle
Bronze	Turquoise
Copper	Violet
Feldspar	Wheat
Gold	Aliceblue
Grey	Antiquewhite
Khaki	Azure
Maroon	Beige
Orange	White

Figure 90      TFT-Panel

4.10.5 Keyboard Test

This option provides keyboard testing.

Pressing button during testing, a corresponding button on the screen will response.

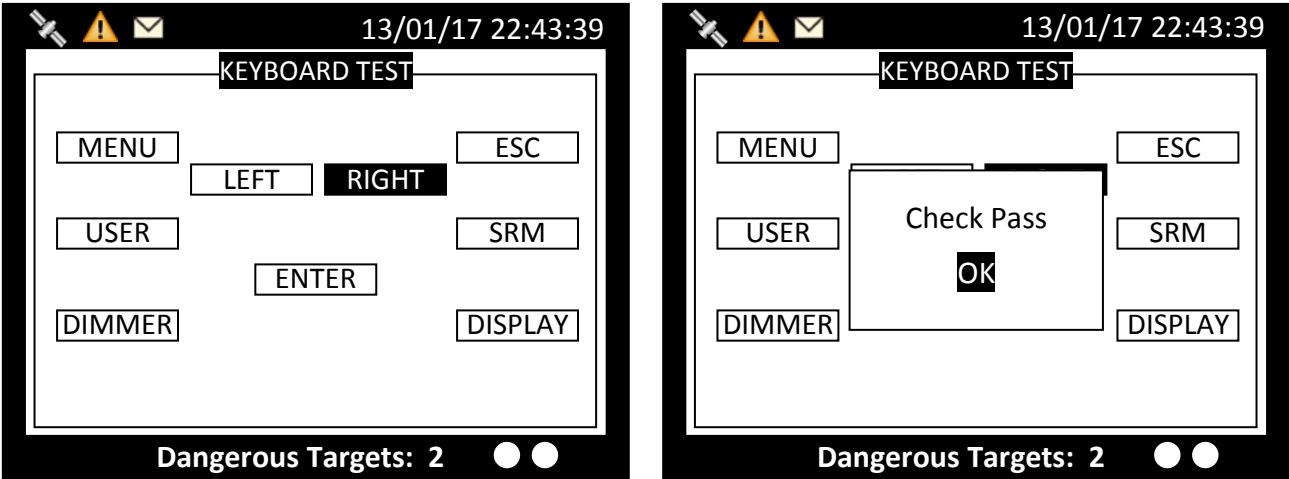


Figure 91      Keyboard Test

After all buttons are tested, a message will indicate. Press **rotary switch** for **OK** to exit.  
To quit test without completing, wait for 30 seconds and the system will return to the main menu.

## 4.10.6 GPS Status

This option provides **GPS** satellite status information.

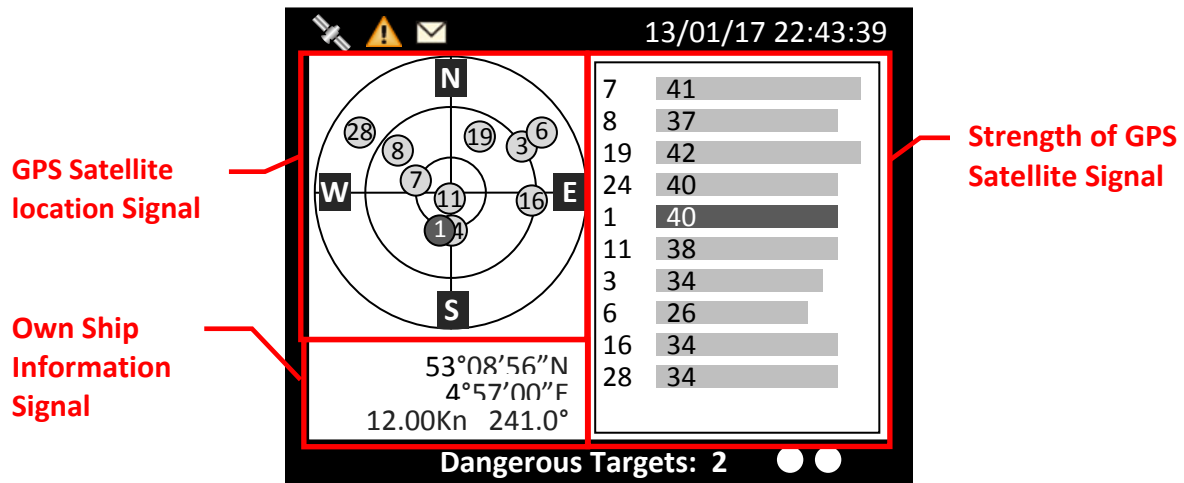


Figure 92 GPS Status

Green indicates satellite being used for GPS fix.  
Red indicates satellite not being used.

## 4.10.7 Transceiver

The **TRANSCIVER** command provides user to view its status. When finished, press **ESC** to exit.

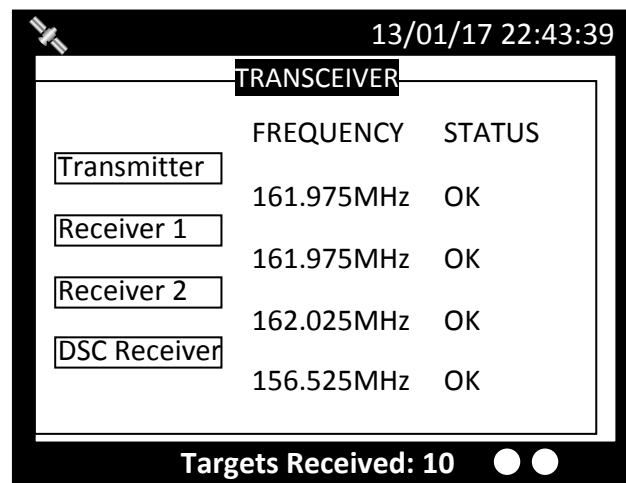


Figure 93 Transceiver

4.10.8 Communication Test

Communication can be tested. The procedure starts by having the Class A unit transmits Message 10 to an addressed Class A MMSI. The target MMSI, once received Message 10, will return Message 11. The test is complete when the Class A unit successfully receives the Message 11.

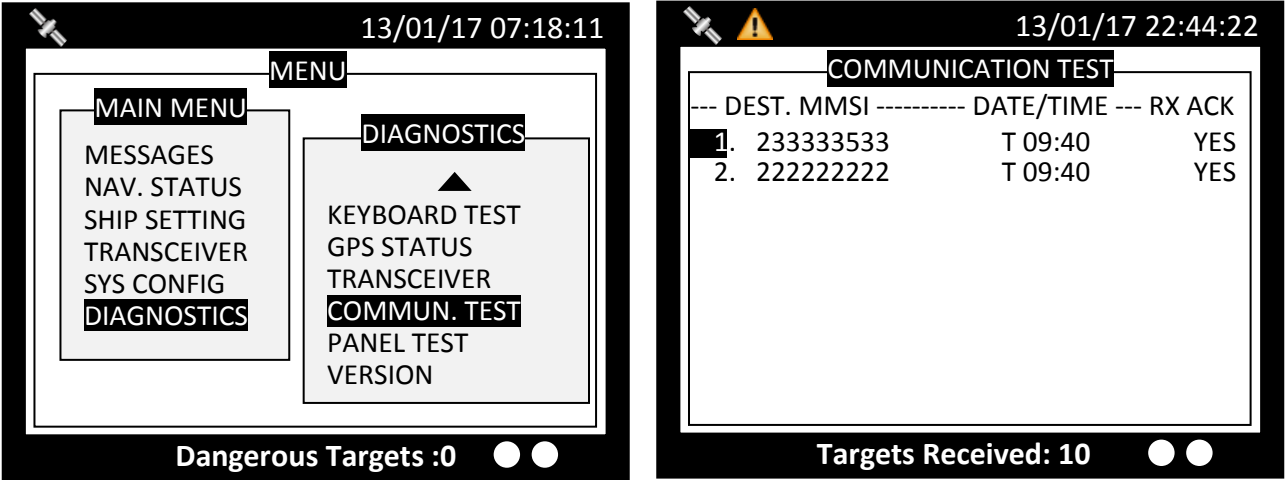


Figure 94 Communication Test

Under the communication test page, pressing the MENU button enables the transmission of Message 10. Only Class A units with GPS fix are listed and eligible for communication testing. If no valid Class A targets found in range, the screen would show as below.

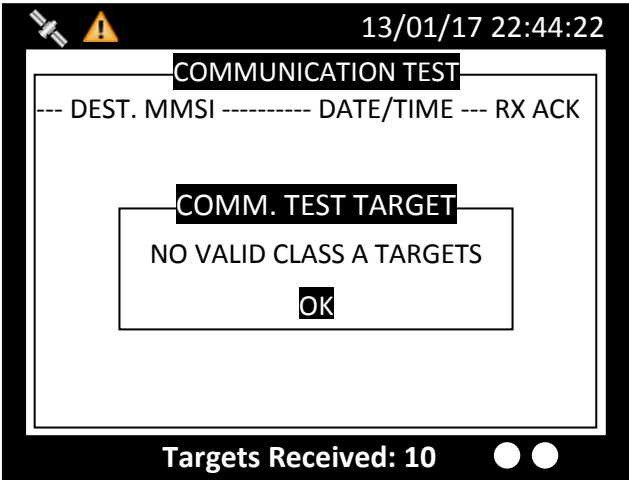
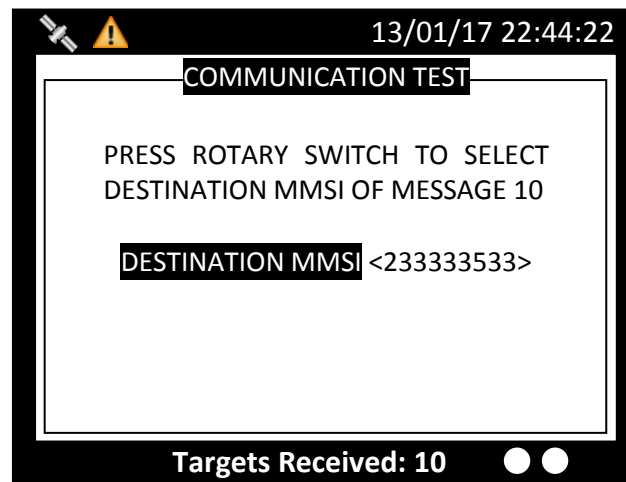


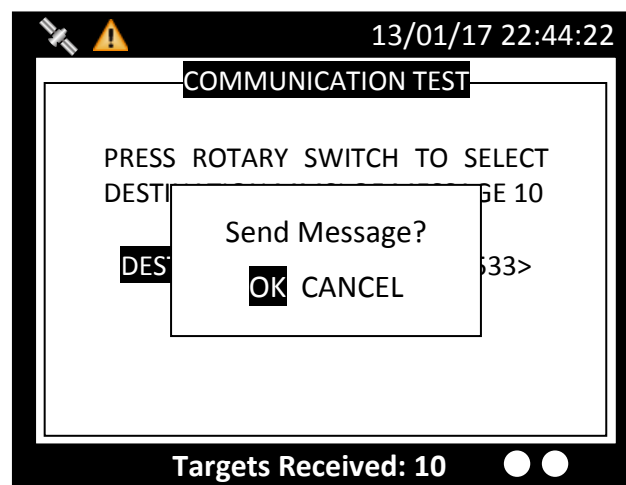
Figure 95 No Valid Targets

As a valid Class A is present, the test procedure proceeds to the screen below.



**Figure 96      Valid Target**

After pressing the knob, turn the knob to selected destination MMSI for testing. The destination MMSI numbers are the nearest Class A targets found close to the Class A unit. Press ESC or MENU to pick selection and the unit will prompt to confirm message sending. Select OK to proceed testing.



**Figure 97      Send Message**



4.10.9 Panel Test

Test the brightness of the screen.

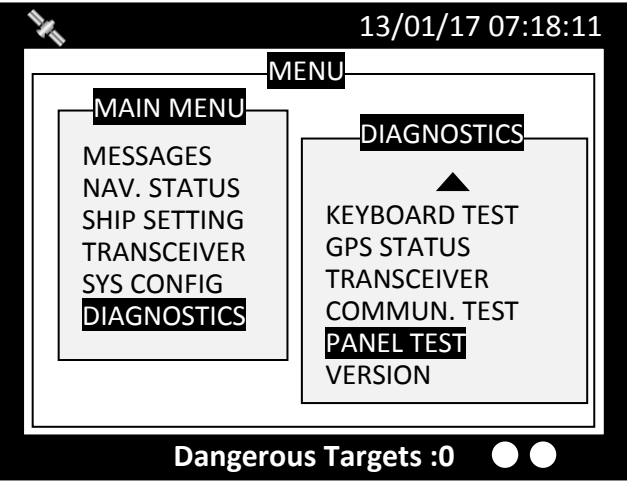


Figure 98 Panel Test

In the main function page, select “PANEL TEST”. Press “FUNC” to switch the white cube into different sizes. Rotate the rotary switch to test in different brightness. To exit the function, press “MENU” or “ESC”.

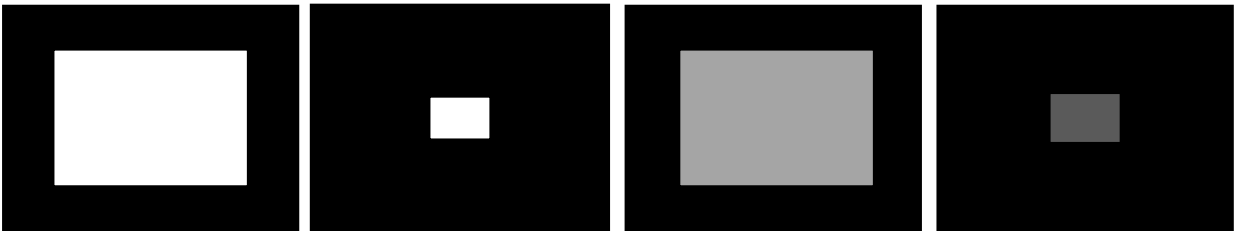


Figure 99 Test with Size and Brightness

4.10.10 Version

Provide model name, hardware information, firmware version, etc. When finished, press **ESC** to exit.



Figure 100 Version

## 5 TECHNICAL SPECIFICATIONS

### 5.1 Applicable Standards

IEC 61993-2	IEC 62288
IEC 60945 Ed. 4, 2002	IEC 62388
IEC 61162-1 Ed. 3, 2007	IMO Resolution A.851 (20): 1997
IEC 61162-2 Ed. 1, 1998	IMO Resolution MSC.43(64)
IMO MSC.74 (69) Annex 3	IMO Resolution MSC.74(69)
ITU-R Recommendation M.1371-4	ITU-R Recommendation M.825-3
IMO Resolution A.694 (17): 1991	ITU-R Recommendation M.1084-4
IEC 61108	ITU-T Recommendation O.153

### 5.2 VHF Transceiver

Frequency Range	156.025 MHz ~ 162.025 MHz
Channel Bandwidth	25 KHz
Modulation	GMSK / FM
Data Rate	9,600 bps
Number of AIS Transmitter	1
Number of AIS Receiver	2
Number of DSC Receiver	1
AIS Channel 1	CH 87B (161.975 MHz)
AIS Channel 2	CH 88B (162.025 MHz)
Tx Power Output	1/12.5 Watt (30/33/41 dBm $\pm$ 1.5 dB)
Rx Sensitivity	< -107 dBm @ 20% PER

### 5.3 DSC Receiver

Frequency	156.525 MHz
Modulation	FSK
Channel Bandwidth	25K
Sensitivity	< -107 dBm @ BER < 10 <sup>-2</sup>
Spurious Response Rejection	$\geq$ 70 dB for signal @ -104 dBm; BER $\leq$ 1 %

### 5.4 GPS Receiver (Internal)

Receiving Channels	50 channels
--------------------	-------------

Tracking & Navigation Sensitivity	$\geq -159$ dBm
Reacquisition Sensitivity	$\geq -159$ dBm
Horizontal Position	< 2.5 m Autonomous < 2.0 m SBAS
Receiver Type	SBAS: WAAS, EGNOS, MSAS, GAGAN

## 5.5 Power Supply

Supply Voltage	12V / 24V DC
Power Consumption	Less than 9W average @ 12V DC; Less than 65W peak power @ 12V DC

## 5.6 LCD Display

Screen Size	3.5" color TFT
Pixel Number (Resolution)	320 x 240
Viewing Mode	Radar View/ Alphanumeric views / Satellite View
Dimmer Control	Step-less Setting

## 5.7 Keypad & Rotary Switch

6 Keypads with Back-light	1 for SRM, 1 for Menu, 1 for Dimmer, 1 for ESC, 1 for Display, 1 for Nav. Status
Rotary Switch	Multi-Function

## 5.8 Connection Interface

GPS Antenna Connector	TNC (Female)
VHF Antenna Connector	SO-239 (Female)
Sensor Interfaces 1 to 3	IEC 61162-1 or -2
Pilot / Auxiliary	IEC 61162-2
External Display	IEC 61162-2
Long-range	IEC 61162-2
DGNSS correction input	RTCM-SC-104
Alarm relay	Normally closed
USB	Mini type B USB interface
NMEA2000	IEC61162-3
Alarm Output	Relay contact

## 5.9 Environmental

Operating Conditions	IEC 60945 "protected" category
Operating Temperature	-15°C ~ 55°C

Operating Humidity	95% RH at 40°C
Waterproof	IPX2

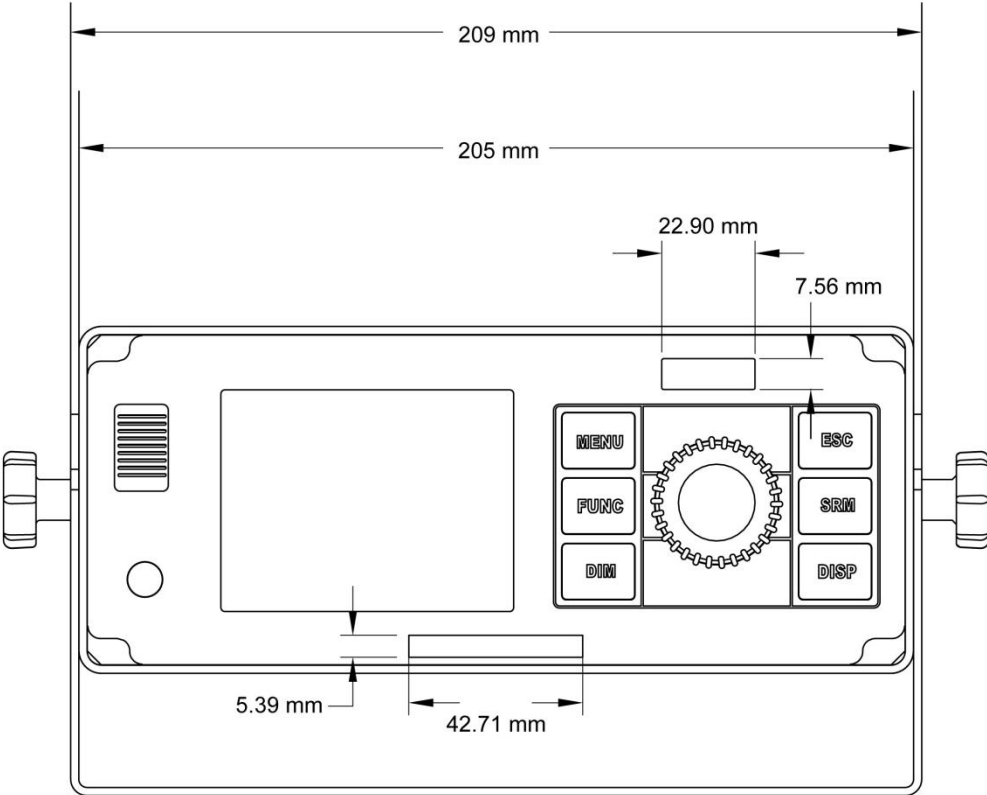
## 5.10 Physical

Width	261 mm (10.28 inch)
Height	184 mm (7.25 inch)
Depth (include connectors)	102 mm (4.02 inch)
Weight	$\leq 2.5$ kg

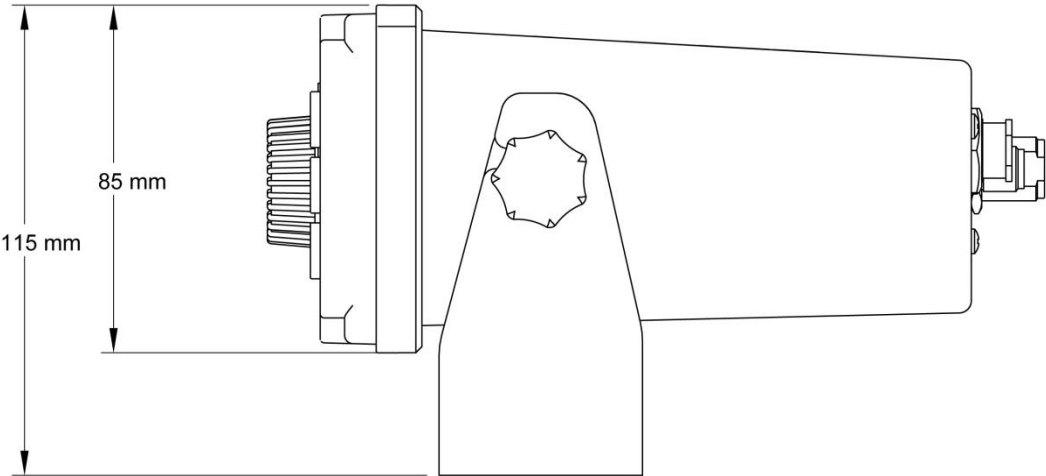
# 6 MECHANICAL DIMENSIONS

## 6.1 CAMINO-701 Transponder Main Unit

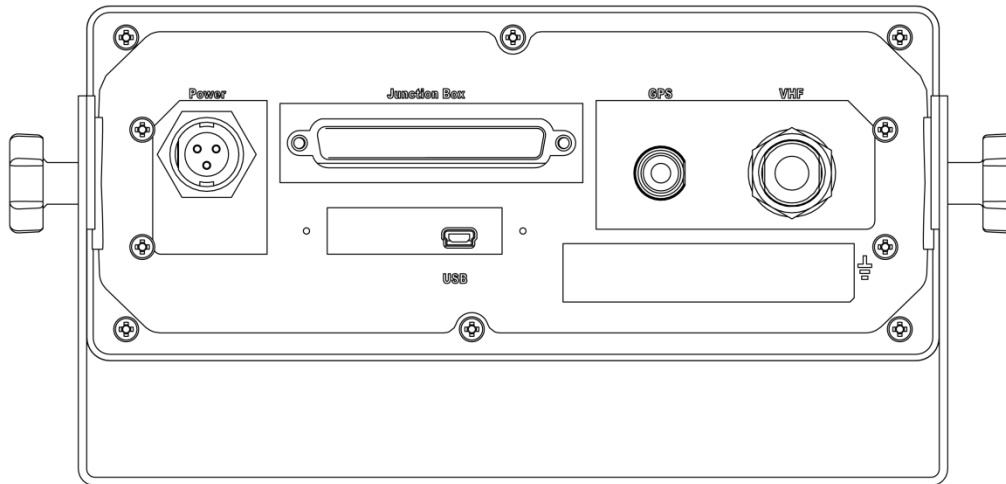
Front (size: mm)



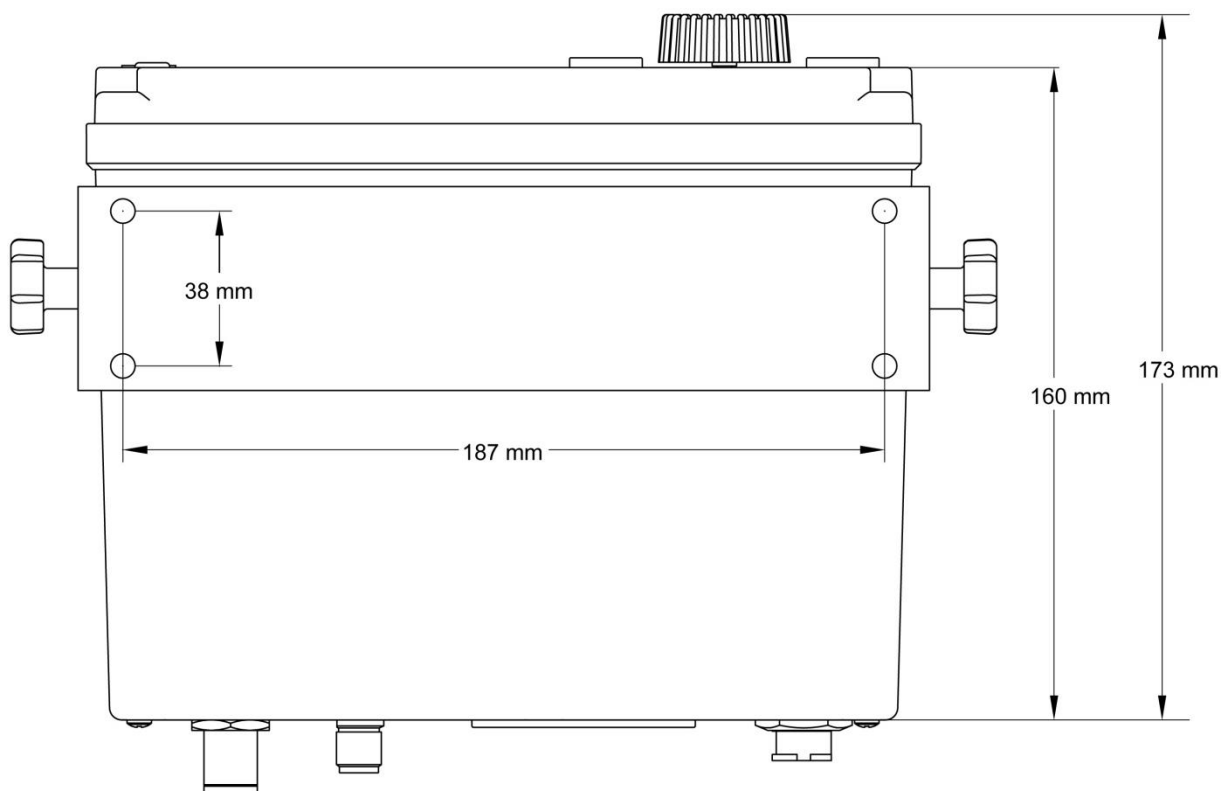
Side (size: mm)



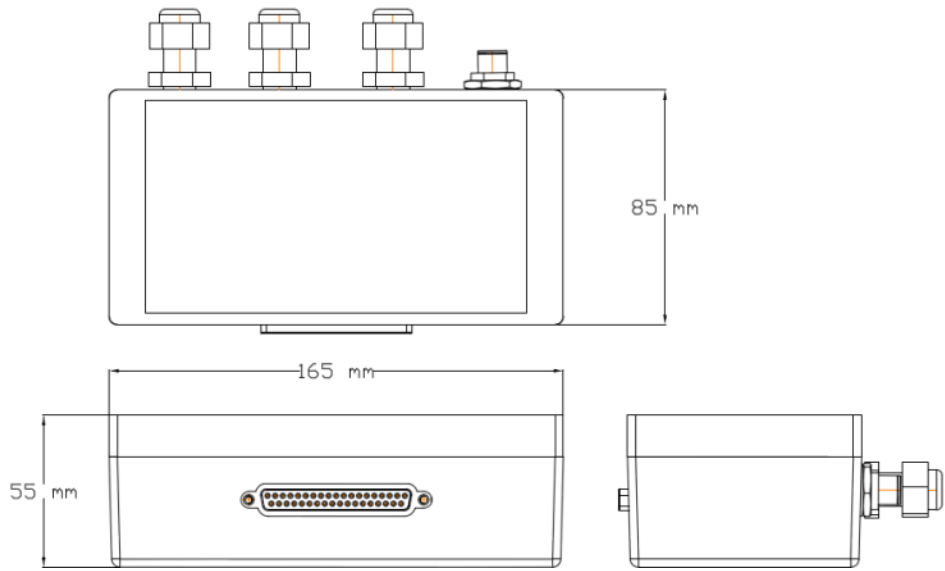
**Back** (size: mm)



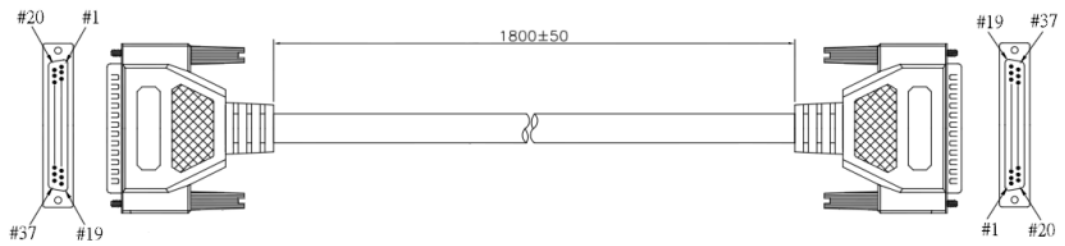
**Bottom** (size: mm)



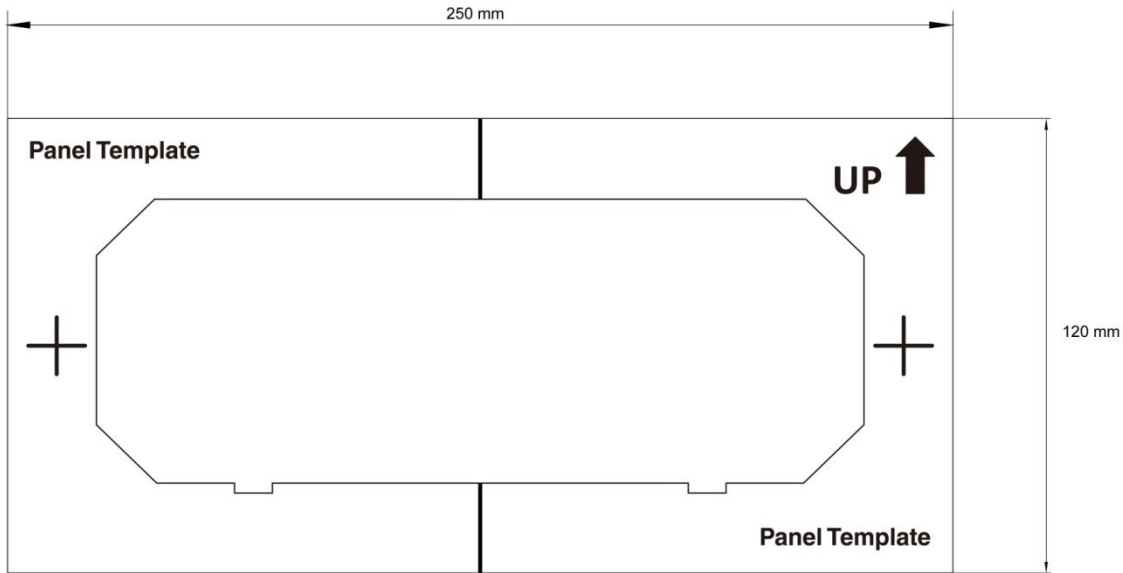
6.2 Junction Box



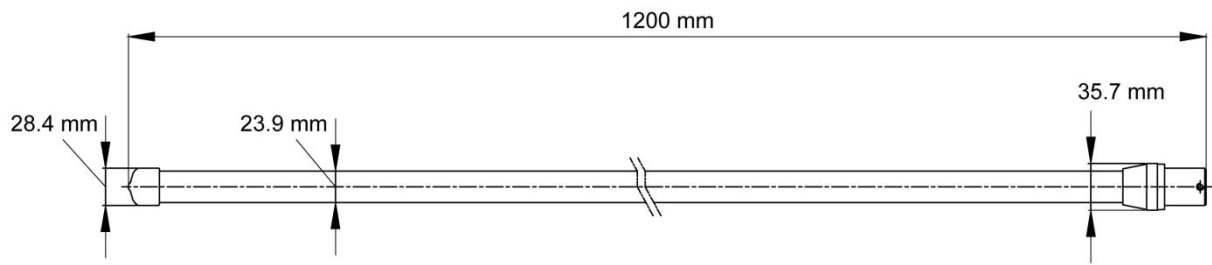
6.3 Extension Cable



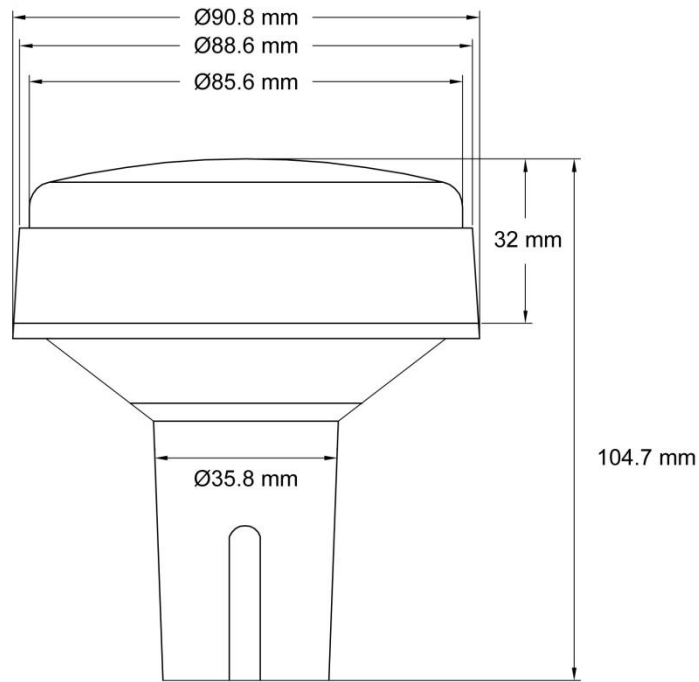
6.4 Mounting Template (not to scale)



6.5 VHF Antenna



6.6 GPS Antenna





# APPENDIX

## A.1 IEC 61162-2 Data Interface

The CAMINO-701 Class A AIS Transponder provide two types IEC 61162-2 data interface for user application, this first type include 3 sensor data input ports, which is input only and the second type include 4 bi-direction input/output port. Each type data port will be description in the subsequent section in detail.

### A.1.1 Sensor Data Input Ports

- The schematic of sensor data input port is shown in Figure 1, a standard V.11 transceiver IC (Texas Instruments SN65176B) combines with high speed photocopler are used as the main components to receive data from external input. It is isolated from external inupt to system side. An optional 120 ohm loop termination is built in junction, which is selectabe by dip switch and should be switched to on position when long cable connecting to the data source. Each sensor data input port is isolated from other sensor data input ports and from the transceivers internal power supply. The input impedance on A/B wires is great than 12K ohm and the level on the A/B wires is defined in the following:
- Logic low input:  $A-B < -0.2V$
- Logic high input:  $A-B > +0.2V$

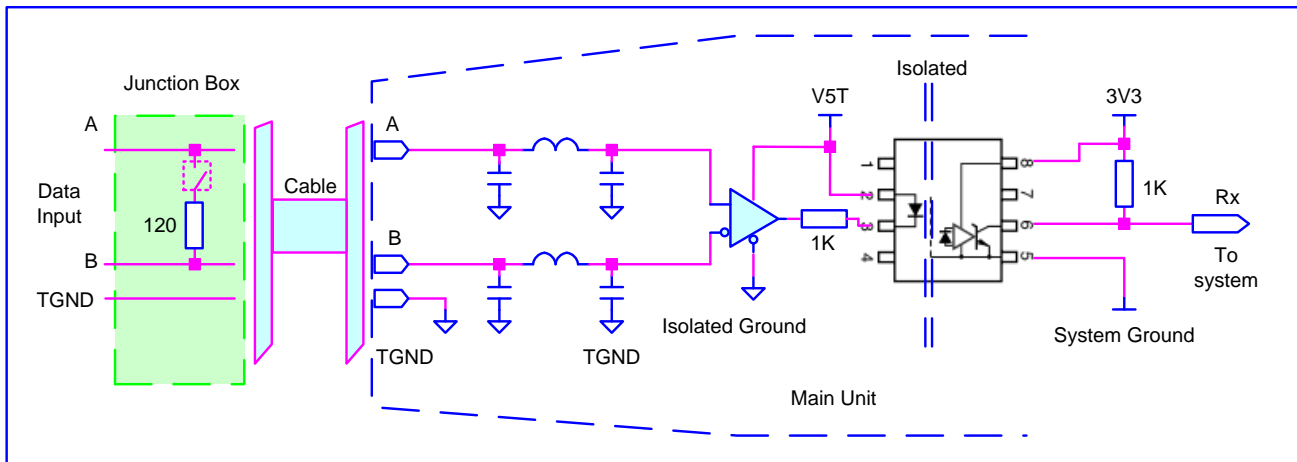
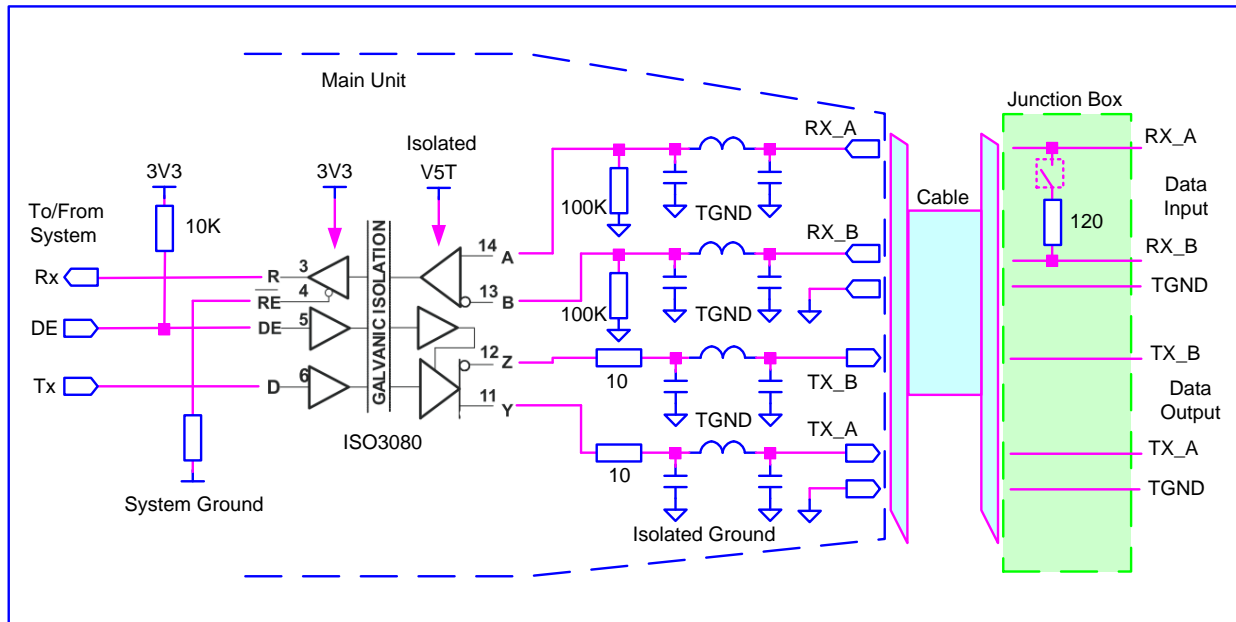


Figure A1 Schematic of sensor data input port.

### A.1.2 Bi-directional Data Ports

The schematic circuit of bi-directional data port is shown in Figure A2. An isolated full-duplex RS-485 transceiver (Texas Instrument ISO3080) is used as main component to handle both data input and output from external data port interface. It is isolated between external data port interface and system side of the main unit. An optional 120 ohm loop termination is built in junction box for receiver direction, which is selectable by dip-switch and should be switched to ON position when long cable connecting to the data source. Each bi-directional data port is isolated from the other data ports and from the transponder's internal power supply. The transponder internal power supply is fully isolated from the external power supply.



**Figure A2: Schematic of bi-directional data port.**

The output driver capability of bi-direction data port can provide maximum 60mA, and the minimum differential output swing under 100 ohm load can be 2.3V.

#### **A.1.3 A and B Signal Lines**

Refer to sections A.1.1 and A.1.2.

#### **A.1.4 Output Driver**

The output driver capability of bi-direction data port can provide maximum 60mA, and the minimum differential output swing under 100 ohm load can be 2.3V.

#### **A.1.5 Input Load**

Refer to sections A.1.1 and A.1.2.

#### **A.1.6 A1.6 Hardware Input/Output Circuit**

Refer to sections A.1.1 and A.1.2.

## A.2 Supported IEC 61162 Data Sentences

Data Port	Input Sentences	Output Sentences
Sensor 1 Sensor 2 Sensor 3	DTM, GNS, RMC, VBW, HDT, HDG, ROT, GBS, GLL, VTG, THS, GSA	N/A
DGPS	DTM, GNS, RMC, VBW, HDT, HDG, ROT, GBS, GLL, VTG, THS, GSA	N/A
External Display	ABM, ACA, ACK, AIR, BBM, SSD, VSD, AIQ, LRI, LRF, SPW, EPV	ABK, ACA, VDM, VDO, TXT, ALR, LRF, LR1, LR2, LR3, EPV
Pilot	ABM, ACA, ACK, AIR, BBM, SSD, VSD, AIQ, LRI, LRF, SPW, EPV	ABK, ACA, VDM, VDO, TXT, ALR, LRF, LR1, LR2, LR3, EPV
Long Range	LRI, LRF	LRF, LR1, LR2, LR3

## A.3 Transmission Interval

Sentence	Interval
VDO	Once a second
ALR (active)	Once every fifteen second
ALR (inactive)	Once every thirty second

## A.4 Interpretation of Input Sentences

### A.4.1 ABM – AIS Addressed Binary and Safety Related Message

This sentence supports ITU-R M.1371 Messages 6 and 12 and provides an external application with a means to exchange data via an AIS transponder.

!--ABM,x,x,x,xxxxxxxxx,x,xx,s—s,x*hh<CR><LF>			
Field No.	Format	Description	Remark
1	x	Total number of sentences needed to transfer the message	
2	x	Sentence number	
3	x	Sequential message identifier	
4	xxxxxxxx	The MMSI of the destination AIS unit for the ITU-R M.1371 message	
5	x	AIS channel for broadcast of the radio message	
6	xx	ITU-R M.1371 message ID	
7	s—s	Encapsulated data	
8	x	Number of fill-bits	

### A.4.2 ACA – AIS Channel Assignment Message

An AIS device can receive regional channel management information.

\$--ACA,x,lll.l,a,yyyyy.yy,a,lll.l,a,yyyyy.yy,a,x,xxxx,x,xxxx,x,x,a,x,hhmmss.ss*hh<CR><LF>			
Field No.	Format	Description	Remark
1	x	Sequence Number	
2	lll.l,a	Region northeast corner latitude – N/S	
3	yyyyy.yy,a	Region northeast corner longitude – E/W	
4	lll.l,a	Region southwest corner latitude – N/S	
5	yyyyy.yy,a	Region southwest corner longitude – E/W	
6	x	Transition zone size	
7	xxxx	Channel A	
8	x	Channel A bandwidth	
9	xxxx	Channel B	
10	x	Channel B bandwidth	
11	x	Tx/Rx mode control	
12	x	Power level control	
13	a	Information source	
14	x	In-use flag	
15	hhmmss.ss	Time of “in use” change	

#### A.4.3 ACK – Acknowledge Alarm

This sentence is used to acknowledge an alarm condition reported by a device.

\$--ACK,xxx*hh<CR><LF>			
Field No.	Format	Description	Remark
1	xxx	Unique alarm number (identifier) at alarm source	

#### A.4.4 AIQ - Query Sentence

This sentence is used to inquire AIS sentence information.

\$--AIQ,c—c*hh<CR><LF>			
Field No.	Format	Description	Remark
1	c—c	Support query sentence of ACA, TXT.	

#### A.4.5 AIR – AIS Interrogation Request

This sentence supports ITU-R M.1371 message 15. It provides an external application with the means to initiate requests for specific ITU-R M.1371 messages from AIS unit.

\$--AIR,xxxxxxxx,x.x,x.x,x.x,xxxxxxxx,x.x,x*hh<CR><LF>			
Field No.	Format	Description	Remark
1	xxxxxxxx	MMSI of interrogated station 1	
2	x.x	ITU-R M.1371 message requested from station-1	
3	x	Message sub-section	ignored
4	x.x	Number of second message requested from station-1	
5	x	Message sub-section	ignored
6	xxxxxxxx	MMSI of interrogated station-2	
7	x.x	Number of messages requested from station-2	
8	x	Message sub-section	ignored

#### A.4.6 BBM – AIS Broadcast Binary Message

This sentence supports generation of ITU-R M.1371 binary messages 8 and 14. This provides the application with a means to broadcast data, as defined by the application only.

!--BBM,x,x,x,x.x,s—s,x*hh<CR><LF>			
Field No.	Format	Description	Remark
1	x	Total number of sentences needed to transfer the message	
2	x	Sentence number	
3	x	Sequential message identifier	
4	x	AIS channel for broadcast of the radio message	
5	x.x	ITU-R M.1371 Message ID (8 or 14)	
6	s—s	Encapsulated data	
7	x	Number of fill-bits	

#### A.4.7 DTM – Datum Reference

Local geodetic datum and datum offsets from a reference datum.

\$--DTM,ccc,a,x.x,a,x.x,a, x.x,ccc*hh<CR><LF>			
Field No.	Format	Description	Remark
1	ccc	Local datum	
2	a	Local datum subdivision code	ignored
3	x.x, a	Lat offset, min, N/S	ignored
4	x.x, a	Lon offset, min, E/W	ignored
5	x.x	Altitude offset, m	ignored
6	ccc	Reference datum	

#### A.4.8 EPV – Command or Report Equipment Property Value

\$--EPV,a,cc,c--c,x.x,c--c*hh<CR><LF>			
Field No.	Format	Description	Remark
1	a	Sentence status flag	
2	cc	Destination equipment type	
3	c--c	Unique identifier	
4	x.x	Property identifier	
5	c--c	Value of property to be set	

#### A.4.9 GBS – GNSS Satellite Fault Detection

This sentence is used to support receiver autonomous integrity monitoring (RAIM).

\$--GBS, hhmmss.ss, x.x, x.x, x.x, xx, x.x, x.x, x.x *hh <CR><LF>			
Field No.	Format	Description	Remark
1	hhmmss.ss	UTC time of the GGA or GNS fix associated with this sentence	
2	x.x	Expected error in latitude	
3	x.x	Expected error in longitude	
4	x.x	Expected error in altitude	ignored
5	xx	ID number of most likely failed satellite	ignored
6	x.x	Probability of missed detection for most likely failed satellite	ignored
7	x.x	Estimate of bias on most likely failed satellite	ignored
8	x.x	Standard deviation of bias estimate	ignored

#### A.4.10 GLL – Geographic Position – Latitude/Longitude

Latitude and longitude of vessel position, time of position fix and status.

\$--GLL, llll.ll, a, yyyy.yy, a, hhmmss.ss, A, a *hh<CR><LF>			
--	--	--	--

Field No.	Format	Description	Remark
1	llll.ll, a	Latitude, N/S	
2	yyyyy.yy, a	Longitude, E/W	
3	hhmmss.ss	UTC of position	
4	A	Status, A=data valid V=data invalid	
5	a	Mode indicator	

#### A.4.11 GNS – GNSS Fix Data

Fix data for single or combined satellite navigation systems (GNSS). This sentence provides fix data for GPS, GLONASS, possible future satellite systems and systems combining these.

\$-- GNS, hhmmss.ss, llll.ll, a, yyyyy.yy, a, c--c,xx,x.x,x.x,x.x,x.x,x.x,a *hh<CR><LF>			
Field No.	Format	Description	Remark
1	hhmmss.ss	UTC of position	
2	llll.ll, a	Latitude, N/S	
3	yyyyy.yy, a	Longitude, E/W	
4	c--c	Mode indicator	
5	xx	Total number of satellites in use	ignored
6	x.x	HDOP	ignored
7	x.x	Antenna altitude, m, re:mean-sea-level (geoid)	ignored
8	x.x	Geoidal separation, m	ignored
9	x.x	Age of differential data	ignored
10	x.x	Differential reference station ID	ignored
11	a	Nacigational status indicator	

#### A.4.12 GSA – GNSS DOP and Active Satellites

GNSS receiver operating mode, satellites used in the navigation solution reported by the GGA or GNS sentences, and DOP values. If only GPS, GLONASS, etc. are used for the reported position solution, the talker ID is GP, GL, etc. and the DOP values pertain to the individual system.

\$--GSA, a, x, xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,xx,x.x,x.x,x.x*hh<CR><LF>			
Field No.	Format	Description	Remark
1	a	Mode: M = manual, forced to operate in 2D or 3D mode A = automatic, allowed to automatically switch 2D/3D	
2	x	Mode: 1 = fix not available, 2 = 2D, 3 = 3D	
3	xx,xx,xx,xx,xx,x x,xx,xx,xx,xx,xx ,xx	ID numbers of satellites used in solution	
4	x.x	PDOP	
5	x.x	HDOP	
6	x.x	VDOP	

#### A.4.13 HDG – Heading, Deviation and Variation

Heading (magnetic sensor reading), which if corrected for deviation will produce magnetic heading, which if offset by variation will provide true heading.

\$--HDG, x.x, x.x, a, x.x, a*hh<CR><LF>			
Field No.	Format	Description	Remark
1	x.x	Magnetic sensor heading, degrees	
2	x.x,a	Magnetic deviation, degrees E/W	
3	x.x,a	Magnetic variation,degrees E/W	

#### A.4.14 HDT – Heading True

Actual vessel heading in degrees true produced by any device or system producing true heading.

\$--HDT, x.x, T*hh<CR><LF>			
Field No.	Format	Description	Remark
1	x.x, T	Heading, degrees true	

#### LRF – AIS Long-Range Function

This sentence is used in both long-range interrogation requests and long-range interrogation replies. The LRF-sentence is the second sentence of the long-range interrogation request pair, LRI and LRF (see the LRI-sentence).



\$--LRF,x,xxxxxxxx,c—c,c—c,c—c*hh<CR><LF>			
Field No.	Format	Description	Remark
1	x	Sequence number	
2	xxxxxxxx	MMSI of requestor	
3	c—c	Name of requestor	
4	c—c	Function request	
5	c—c	Function reply status	

#### A.4.15 LRI – AIS Long-Range Interrogation

The long-range interrogation of the AIS unit is accomplished through the use of two sentences. The pair of interrogation sentence formatters, a LRI sentence followed by a LRF sentence, provides the information needed by a universal AIS unit to determine if it should construct and provide the reply sentences (LRF, LR1, LR2, and LR3).

\$--LRI,x,a,xxxxxxxx,xxxxxxxx,IIII.II,a,yyyy.yy,a,IIII.II,a,yyyy.yy,a*hh<CR><LF>			
Field No.	Format	Description	Remark
1	x	Sequence number	
2	a	Control flag	
3	xxxxxxxx	MMSI of requestor	
4	xxxxxxxx	MMSI of destination	
5	IIII.II,a	Latitude – N/S	
6	yyyy.yy,a	Longitude – E/W	
7	IIII.II,a	Latitude – N/S	
8	yyyy.yy,a	Longitude – E/W	

#### A.4.16 RMC – Recommended Minimum Specific GNSS Data

Time, date, position, course and speed data provided by a GNSS navigation receiver.

\$--RMC, hhhmss.ss, A, IIII.II,a, yyyy.yy, a, x.x, x.x, xxxxxx, x.x,a, a, a*hh<CR><LF>			
Field No.	Format	Description	Remark
1	hhmmss.ss	UTC of position fix	
2	A	Status	
3	IIII.II,a	Latitude, N/S	
4	yyyy.yy, a	Longitude, E/W	
5	x.x	Speed over ground, knots	
6	x.x	Course over ground, degrees true	
7	xxxxxx	Date: dd/mm/yy	
8	x.x,a	Magnetic variation, degrees, E/W	
9	a	Mode indicator	
10	a	Navigational status	

#### A.4.17 ROT – Rate of Turn

Rate of turn and direction of turn.

\$--ROT, x.x, A*hh<CR><LF>			
Field No.	Format	Description	Remark
1	x.x	Rate of turn, °/min	
2	A	Status: A = data valid, V = data invalid	

#### A.4.18 SPW - Security Password Sentence

This sentence can be used for authentication. For this purpose the sentence has to be applied before the protected sentence (for example EPV, SSD).

\$--SPW,ccc,c--c,x,c--c*hh<CR><LF>			
Field No.	Format	Description	Remark
1	ccc	Password protected sentence	
2	c--c	Unique Identifier	
3	x	Password level	
4	c--c	Password	

#### A.4.19 SSD – AIS Ship Static Data

This sentence is used to enter static parameters into a shipboard AIS unit. The parameters in this sentence support a number of the ITU-R M.1371 Messages.

\$--SSD,c—c,c—c,xxx,xxx,xx,xx,c,aa*hh<CR><LF>			
Field No.	Format	Description	Remark
1	c—c	Ship's call sign	
2	c—c	Ship's name	
3	xxx	Pos. ref., point dist. "A,"	
4	xxx	Pos. ref.,point dist. "B,"	
5	xx	Pos. ref., point dist. "C,"	
6	xx	Pos. ref.,point dist. "D,"	
7	c	DTE indicator flag	
8	aa	Source identifier	

#### A.4.20 THS – True Heading and Status

Actual vessel heading in degrees true produced by any device or system producing true heading. This sentence includes a "mode indicator" field providing critical safety related information about the heading data, and replaces the deprecated HDT sentence.

\$--THS,x.x,a*hh<CR><LF>			
Field No.	Format	Description	Remark
1	x.x	Heading, degrees true	
2	a	Mode indicator	

#### A.4.21 VBW – Dual Ground/Water Speed

Water-referenced and ground-referenced speed data.

\$--VBW, x.x, x.x, A, x.x, x.x, A, x.x, A, x.x, A*hh<CR><LF>			
Field No.	Format	Description	Remark
1	x.x	Longitudinal water speed, knots	ignored
2	x.x	Transverse water speed , knots	ignored
3	A	Status : water speed, A = data valid, V = data invalid	ignored
4	x.x	Longitudinal ground speed , knots	
5	x.x	Transverse ground speed , knots	
6	A	Status , ground speed, A = data valid, V = data invalid	
7	x.x	Stern transverse water speed , knots	ignored
8	A	Status : stern water speed,A = data valid, V = data invalid	ignored
9	x.x	Stern transverse ground speed ,knots	ignored
10	A	Status : stern ground speed,A = data valid, V = data invalid	ignored

#### A.4.22 VSD – AIS Voyage Static Data

This sentence is used to enter information about a ship's transit that remains relatively static during the voyage.

\$--VSD,x.x,x.x,x.x,c—c,hmmss.ss,xx,xx,x.x,x.x*hh<CR><LF>			
Field No.	Format	Description	Remark
1	x.x	Type of ship and cargo category	
2	x.x	Maximum present static draught	
3	x.x	Persons on-board	
4	c—c	Destination	
5	hmmss.ss	Estimated UTC of arrival at destination	
6	xx	Estimated day of arrival at destination	
7	xx	Estimated month of arrival at destination	
8	x.x	Navigational status	
9	x.x	Regional application flags	

#### A.4.23 VTG – Course Over Ground and Ground Speed

The actual course and speed relative to the ground.

\$--VTG, x.x, T, x.x, M, x.x, N, x.x, K,a*hh<CR><LF>			
Field No.	Format	Description	Remark
1	x.x, T	Course over ground, degrees true	
2	x.x, M	Course over ground, degrees magnetic	ignored
3	x.x, N	Speed over ground, knots	
4	x.x, K	Speed over ground, km/h	ignored
5	a	Mode indicator	

## A.5 Interpretation of Output Sentences

### A.5.1 ABK – AIS Addressed and Binary Broadcast Acknowledgement

The ABK-sentence is generated when a transaction, initiated by reception of an ABM, AIR, or BBM sentence, is completed or terminated.

\$--ABK,xxxxxxxxx,x,x.x,x,x*hh<CR><LF>			
Field No.	Format	Description	Remark
1	xxxxxxxxx	MMSI of the addressed AIS unit	
2	x	AIS channel of reception	
3	x.x	ITU-R M.1371 Message ID	
4	x	Message sequence number	
5	x	Type of acknowledgement	

### A.5.2 ACA – AIS Channel Assignment Message

An AIS device can receive regional channel management information

\$-ACA,x,llll.ll,a,yyyyy.yy,a,llll.ll,a,yyyyy.yy,a,x,xxxx,x,xxxx,x,x,a,x,hhmmss.ss*hh<CR><LF>			
Field No.	Format	Description	Remark
1	x	Sequence Number	
2	llll.ll,a	Region northeast corner latitude – N/S	
3	yyyyy.yy,a	Region northeast corner longitude – E/W	
4	llll.ll,a	Region southwest corner latitude – N/S	
5	yyyyy.yy,a	Region southwest corner longitude – E/W	
6	x	Transition zone size	
7	xxxx	Channel A	
8	x	Channel A bandwidth	
9	xxxx	Channel B	
10	x	Channel B bandwidth	
11	x	Tx/Rx mode control	
12	x	Power level control	
13	a	Information source	
14	x	In-use flag	
15	hhmmss.ss	Time of “in use” change	

### A.5.3 ALR – Set Alarm State

Local alarm condition and status. This sentence is used to report an alarm condition on a device and its current state of acknowledgement.

\$--ALR,hhmmss.ss,xxx,A, A,c--c*hh<CR><LF>			
Field No.	Format	Description	Remark
1	hhmmss.ss	Time of alarm condition change, UTC	
2	xxx	Unique alarm number (identifier) at alarm source	

3	A	Alarm condition, A = threshold exceeded, V = not exceeded	
4	A	Alarm's acknowledge state, A = acknowledged, V = unacknowledged	
5	c--c	Alarm's description text	

#### A.5.4 EPV – Command or Report Equipment Property Value

\$--EPV,a,cc,c--c,x.x,c--c*hh<CR><LF>			
Field No.	Format	Description	Remark
1	a	Sentence status flag	
2	cc	Destination equipment type	
3	c--c	Unique identifier	
4	x.x	Property identifier	
5	c--c	Value of property to be set	

#### A.5.5 LR1 – AIS Long-Range Reply Sentence 1

The LR1 sentence identifies the destination for the reply and contains the information items requested by the “A” function identification character (see the LRF sentence).

\$--LR1,x,xxxxxxxx,xxxxxxxx,c—c,c—c,xxxxxxxx*hh<CR><LF>			
Field No.	Format	Description	Remark
1	x	Sequence number	
2	xxxxxxxx	MMSI of responder	
3	xxxxxxxx	MMSI of requestor	
4	c—c	Ship's name, 1 to 20 characters	
5	c—c	Call sign, 1 to 7 characters	
6	xxxxxxxx	IMO number, 9-digit number	

#### A.5.6 LR2 – AIS Long-Range Reply Sentence 2

The LR2-sentence contains the information items requested by the “B, C, E and F” function identification characters,(see the LRF sentence)

\$--LR2,x,xxxxxxxx,xxxxxxxx,hhmmss.ss,IIII.II,a,yyyyy.yy,a,x.x,T,x.x,N*hh<CR><LF>			
Field No.	Format	Description	Remark
1	x	Sequence number	
2	xxxxxxxx	MMSI of responder	
3	xxxxxxxx	Date: ddmmyyyy, 8 digits	
4	hhmmss.ss	UTC time of position	
5	IIII.II,a	Latitude – N/S	
6	yyyyy.yy,a	Longitude, E/W	
7	x.x,T	Course over ground, degrees, true	
8	x.x,N	Speed over ground, knots	

### A.5.7 LR3 – AIS Long-Range Reply Sentence 3

The LR3 sentence contains the information items requested by the “I, O, P, U and W” function identification character (see the LRF sentence).

\$--LR3,x,xxxxxxxx,c—c,xxxxxx,hhmmss.ss,x.x,x.x,x.x,x.x,x.x*hh<CR><LF>			
Field No.	Format	Description	Remark
1	x	Sequence number	
2	xxxxxxxx	MMSI of responder	
3	c—c	Voyage destination, 1 to 20 chars	
4	xxxxxx	ETA date: ddmmyy	
5	hhmmss.ss	ETA time	
6	x.x	Draught	
7	x.x	Ship/cargo	
8	x.x	Ship length	
9	x.x	Ship breadth	
10	x.x	Ship type	
11	x.x	Persons, 0 to 8191	

### A.5.8 LRF – AIS Long-Range Function

This sentence is used in both long-range interrogation requests and long-range interrogation replies. The LRF-sentence is the second sentence of the long-range interrogation request pair, LRI and LRF (see the LRI-sentence).

\$--LRF,x,xxxxxxxx,c—c,c—c,c—c*hh<CR><LF>			
Field No.	Format	Description	Remark
1	x	Sequence number	
2	xxxxxxxx	MMSI of requestor	
3	c—c	Name of requestor	
4	c—c	Function request	
5	c—c	Function reply status	

### A.5.9 TXT – Text Transmission

For the transmission of short text messages. Longer text messages may be transmitted by using multiple sentences.

\$--TXT,xx,xx,xx,c--c*hh<CR><LF>			
Field No.	Format	Description	Remark
1	xx	Total number of sentences	
2	xx	Sentence number	
3	xx	Text identifier	
4	c--c	Text message	

#### A.5.10 VDM – AIS VHF Data-Link Message

This sentence is used to transfer the entire contents of a received AIS message packet, as defined in ITU-R M.1371 and as received on the VHF Data Link (VDL), using the “six-bit” field type.

!--VDM,x,x,x,a,s—s,x*hh<CR><LF>			
Field No.	Format	Description	Remark
1	x	Total number of sentences needed to transfer the message	
2	x	Sentence number	
3	x	Sequential message identifier	
4	a	AIS channel	
5	s—s	Encapsulated ITU-R M.1371 radio message	
6	x	Number of fill-bits	

#### A.5.11 VDO – AIS VHF Data-Link Own-Vessel Report

This sentence is used to transfer the entire contents of an AIS unit’s broadcast message packet, as defined in ITU-R M.1371 and as sent out by the AIS unit over the VHF data link (VDL) using the “six-bit” field type.

!--VDO,x,x,x,a,s—s,x*hh<CR><LF>			
Field No.	Format	Description	Remark
1	x	Total number of sentences needed to transfer the message	
2	x	Sentence number	
3	x	Sequential message identifier	
4	a	AIS channel	
5	s—s	Encapsulated ITU-R M.1371 radio message	
6	x	Number of fill-bits	