AMEC

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CAMINO-701 [AIS Class A]

INSTALLATION and OPERATION MANUAL

General Information

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ii. Disclaimer

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iii. Safety Warning

It is important to know that AIS is designed for the purpose of anti-collision and serves as a complement to navigation. It is not the absolute navigational equipment and does not replace any navigational system installed on board.
Any AIS device cannot guarantee monitoring and receiving signals from all vessels in the surroundings unless those vessels are equipped with AIS devices.

The coastline map in this transponder is neither verified nor approved by Hydrographic Authorities. It is not an Electronic Chart System and therefore should not be used for navigation. The information provided by the coastline map is for reference only and should be used together with other navigation sources and 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

Hardware version: A701-010

Software version: 1.0.6.23

The model name/number, hardware information, and firmware (software) version of the transponder can be identified through MKD at MENU/DIAGNOSTICS/VERSION. The software maintenance/upgrade of the transponder can be carried out on board via USB interface. The onboard documentation as described in Appendix C can be used to assist reflecting software maintenance records.

vii. Manual Revision

Version 1.10

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 or sales@alltekmarine.com or service@alltekmarine.com

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1 WHAT IS AIS?

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

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
- Knob 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

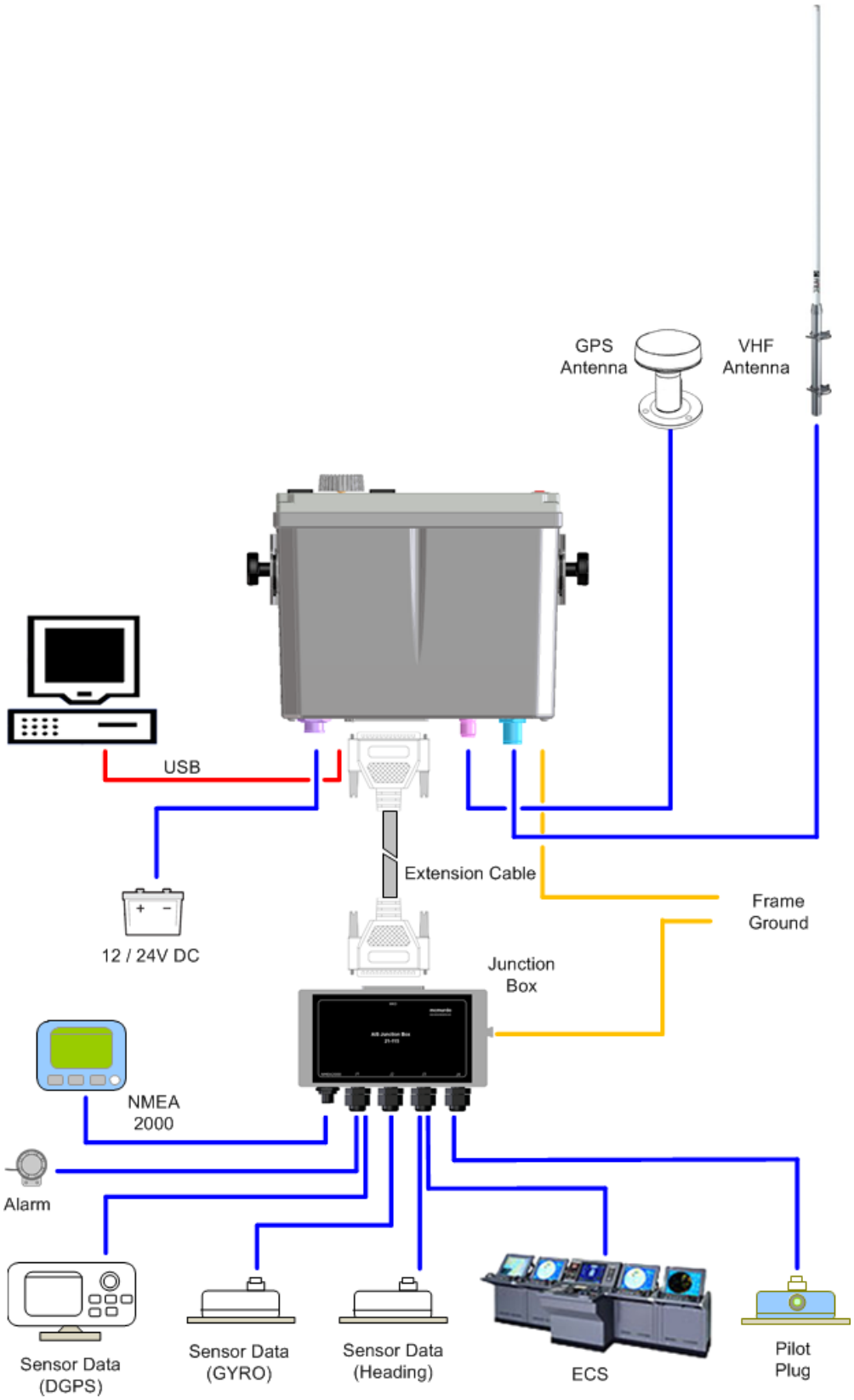


Figure 1 Interconnection Diagram

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**
GPS antenna mounting bracket kit	**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:

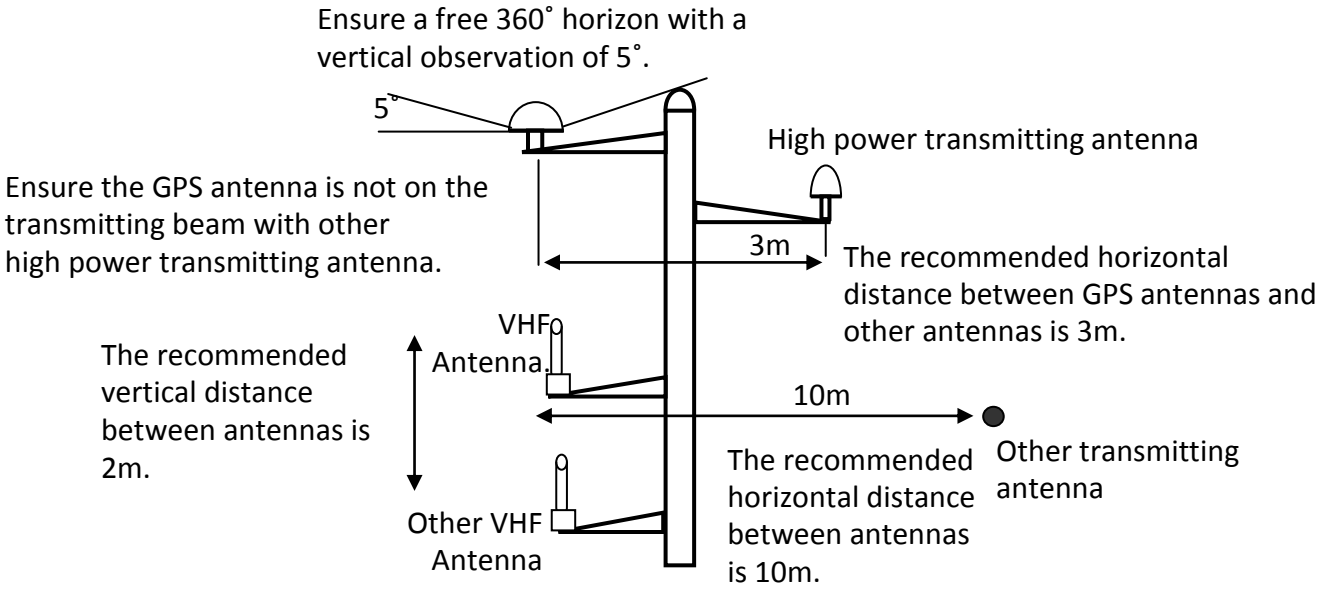


Figure 2 VHF/GPS Antenna Locations

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.

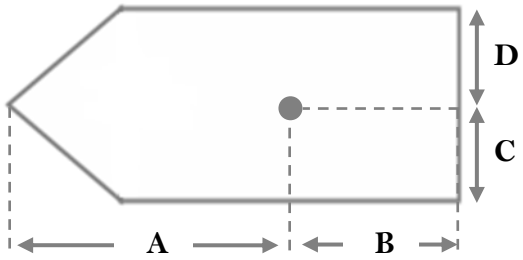


Figure 3 GPS Antenna location

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

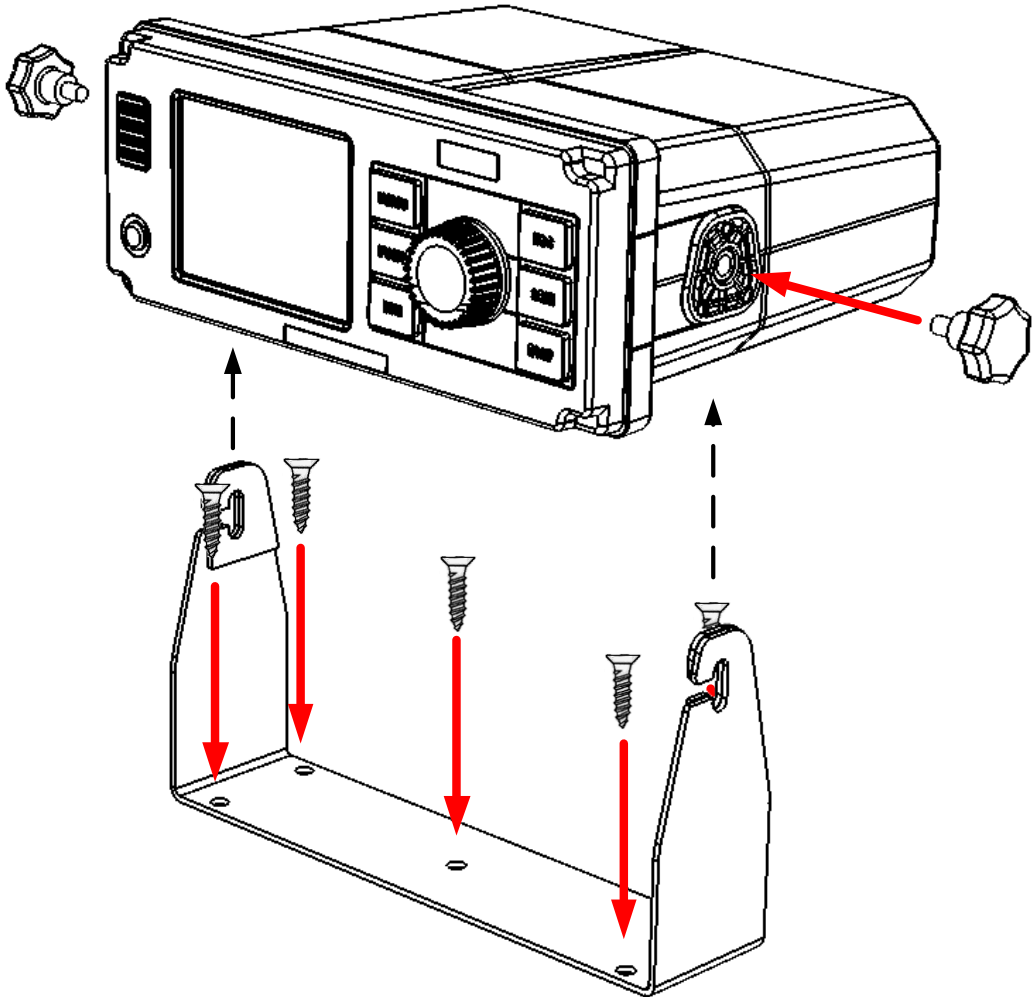


Figure 4 Mounting CAMINO-701

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.

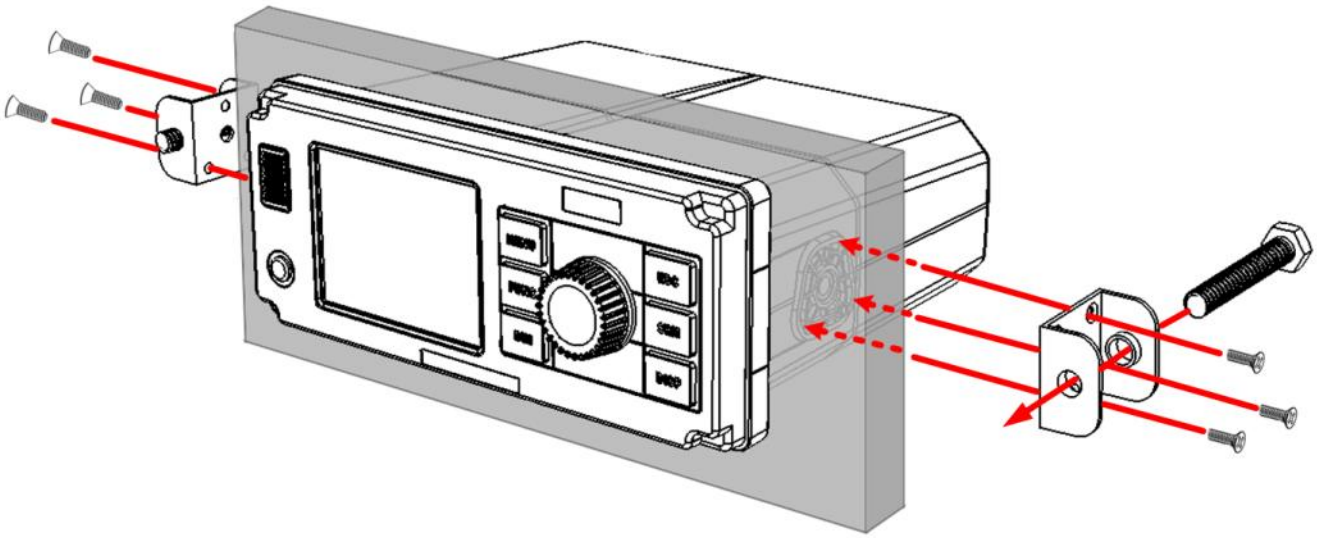


Figure 5 Panel Mounting (1)

Panel Mounting (2)

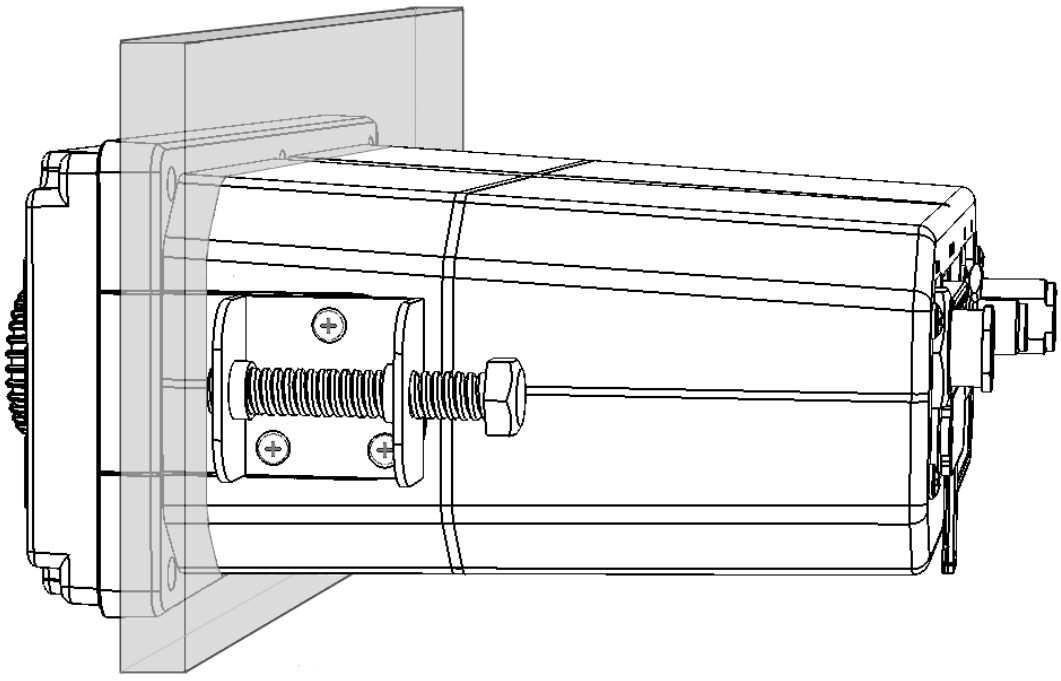


Figure 5 Panel Mounting (2)

3.6.2 Mounting Junction Box

Mounting Junction Box (1)

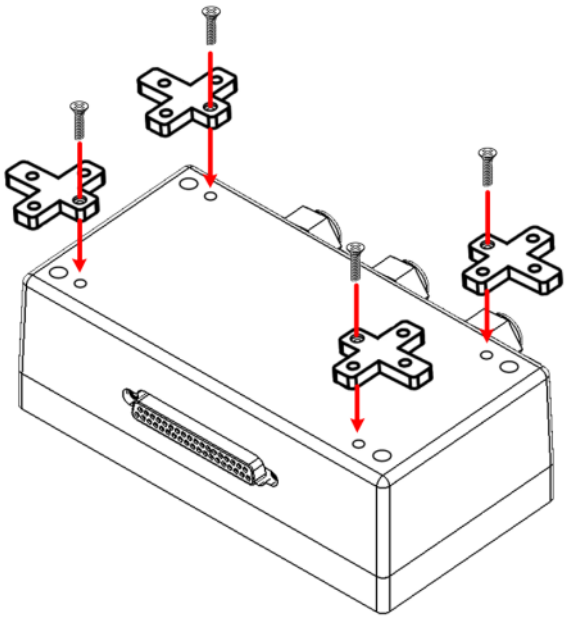


Figure 6 Mounting Junction Box (1)

Mounting Junction Box (2)

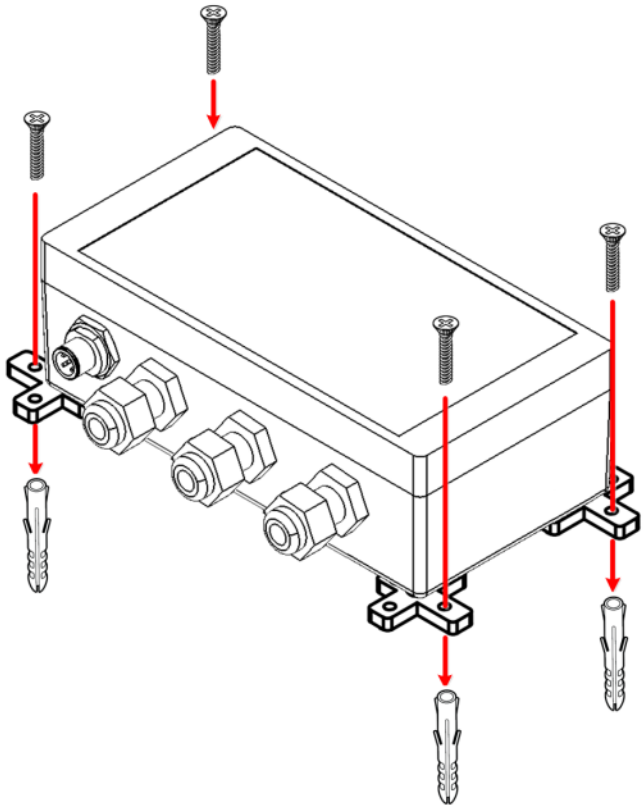
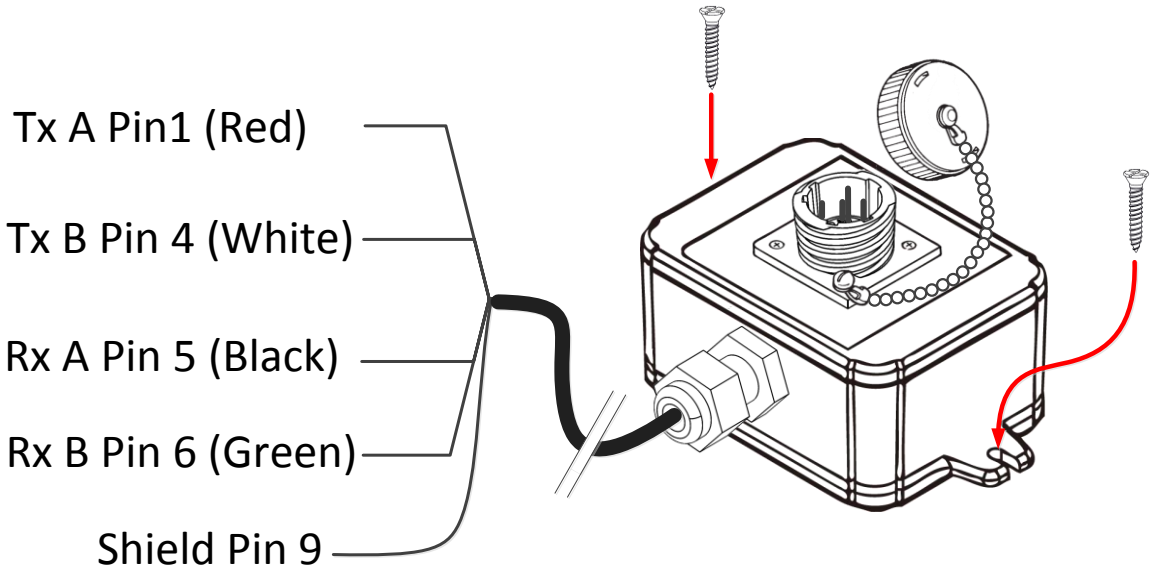


Figure 7 Mounting Junction Box (2)

3.6.3 Mounting Pilot Plug

The Pilot Plug device provides connecting interface to pilots and other mariners to connect their own PC or other portable device to Camino701 on board.

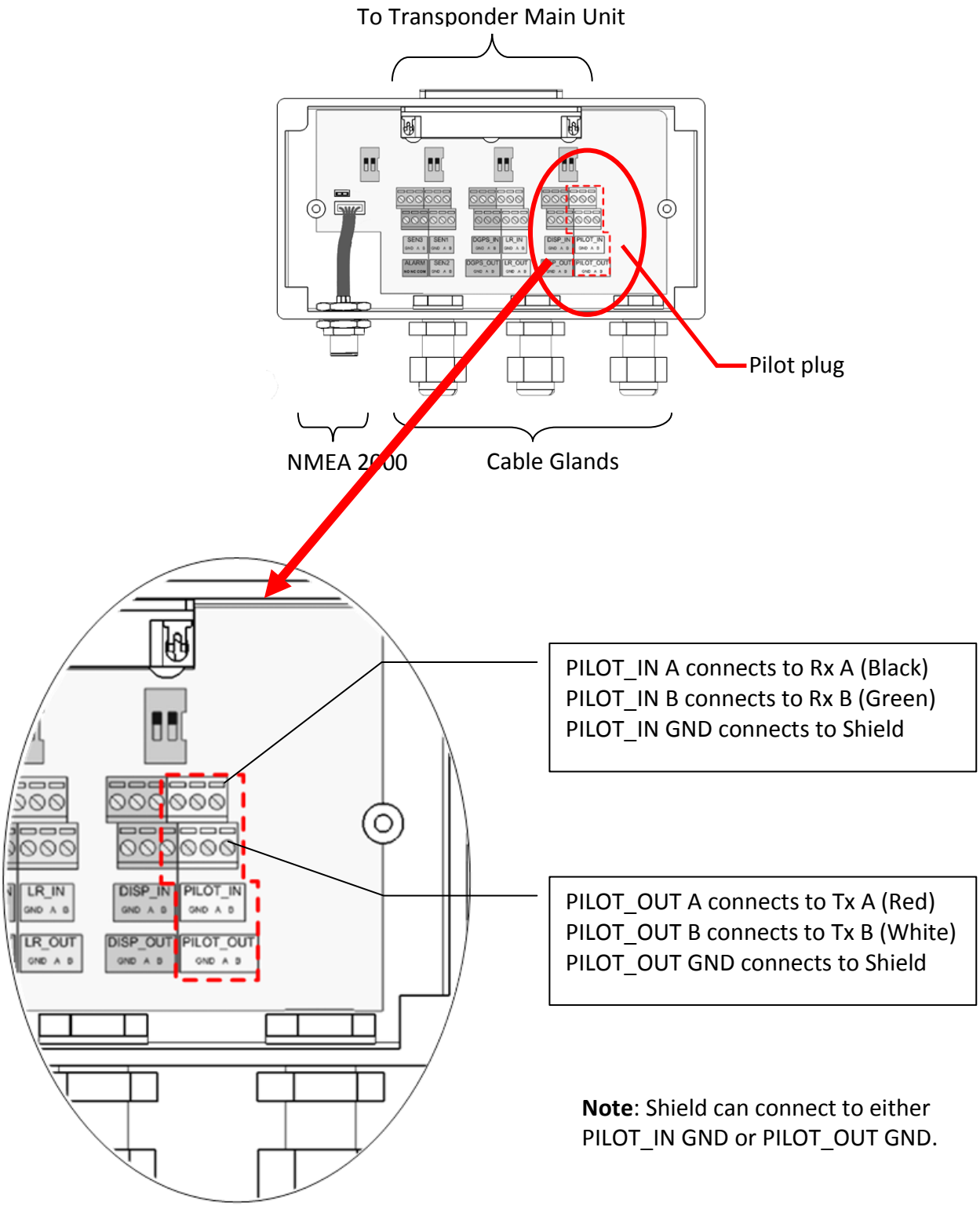
Camino-701 Pilot Plug



Pin Number	Function	Wire Color
Pin 1	Tx A	Red
Pin 2	--	
Pin 3	--	
Pin 4	Tx B	White
Pin 5	Rx A	Black
Pin 6	Rx B	Green
Pin 7	--	
Pin 8	--	
Pin 9	Shield (Ground)	

Connecting to Camino-701 Junction Box

Use the following guidelines to connect the Pilot Plug to the Camino701 Junction box.
Please refer to section 3.8 External Connectors (Junction Box).



Note: Shield can connect to either PILOT_IN GND or PILOT_OUT GND.

3.7 External Connectors (Transponder Main Unit)

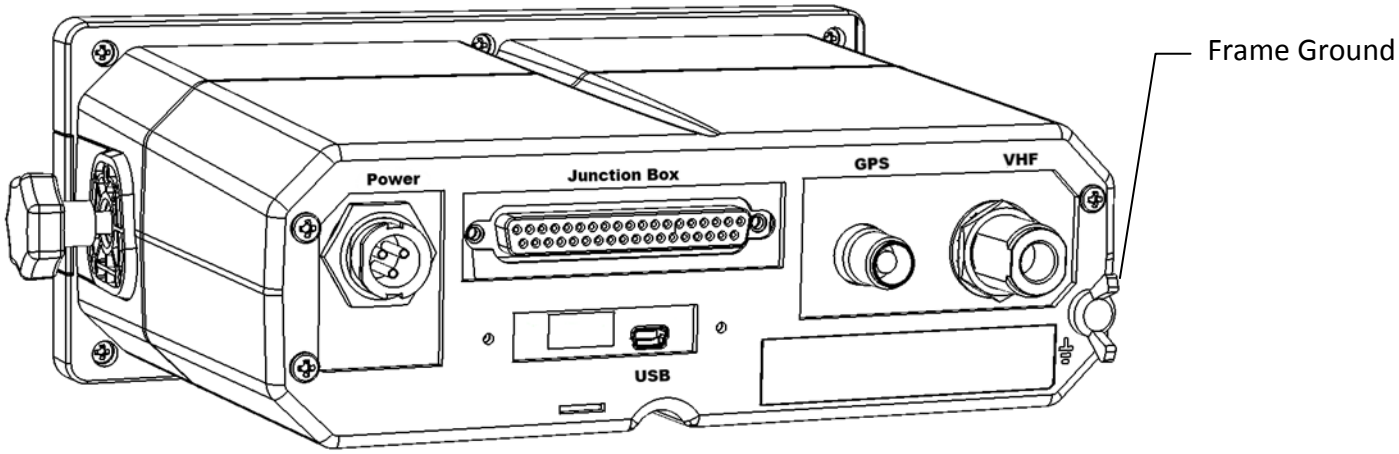


Figure 8 External Connectors (Main Unit)

NAME	DESCRIPTION	TYPE OF CONNECTOR
VHF	VHF antenna connector	SO-239 (female)
GPS	GPS antenna connector	TNC (female)
Power	Power input connector	Round type, 3 pins
USB	USB connection to PC	Mini type USB
Junction Box	Extension connection to Junction Box	D-Sub 37 pins
Frame Ground	Connect to ship frame	

Note: Some boats require frame ground connection of all electronic devices on the ship frame.

3.8 External Connectors (Junction Box)

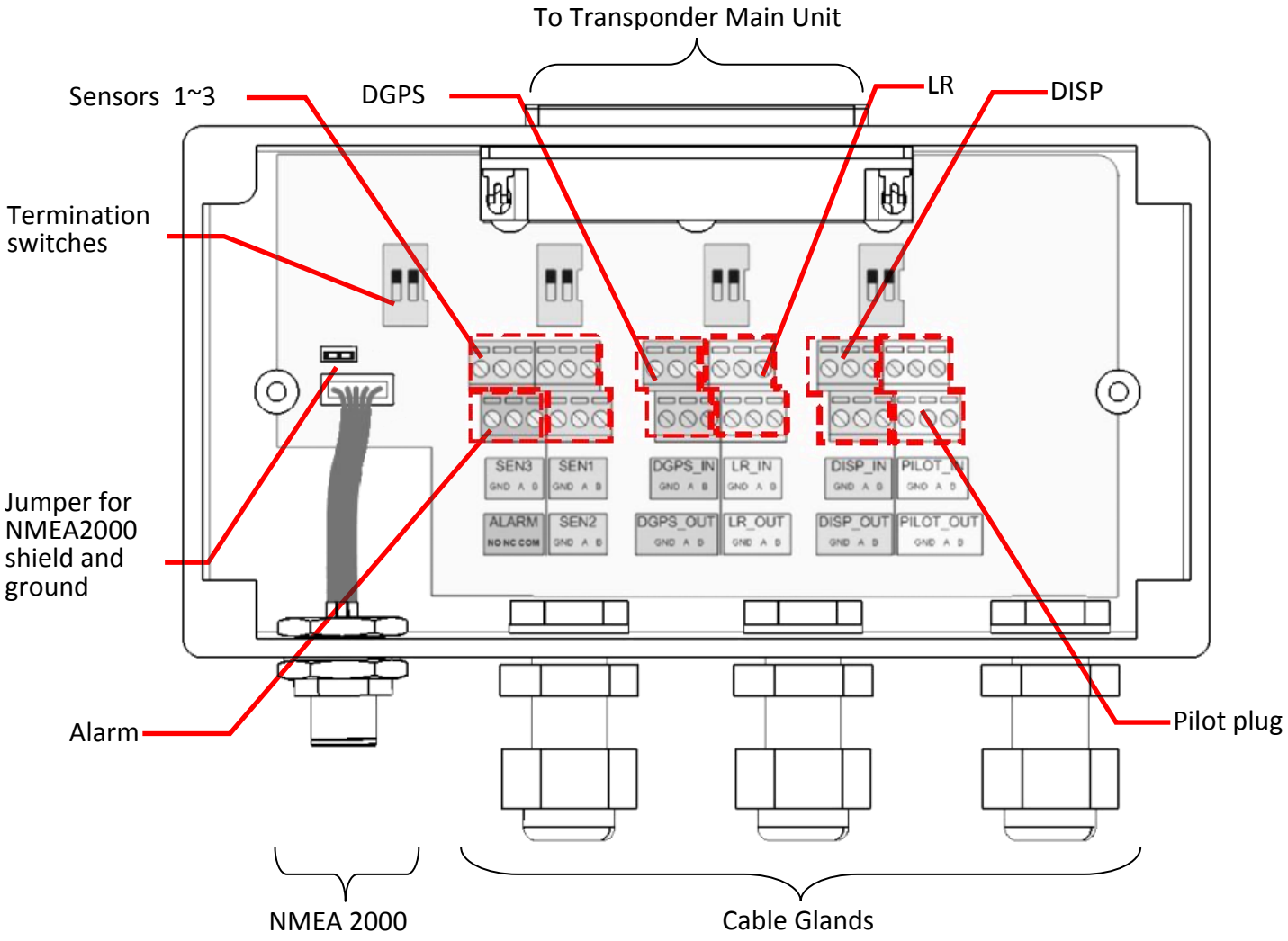
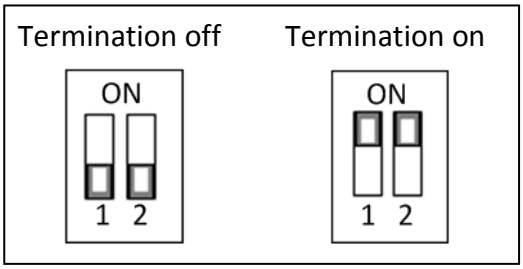


Figure 9 External Connectors (Junction Box)

CONNECTOR	LABEL NAME	DESCRIPTION	FUNCTION USAGE
Sensor 1	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	
Sensor 2	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	
Sensor 3	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	

Pilot Plug	PILOT_IN GND	Input Ground	Pilot Plug port
	PILOT_IN A	Input A	
	PILOT_IN B	Input B	
	PILOT_OUT GND	Output Ground	
	PILOT_OUT A	Output A	
	PILOT_OUT B	Output B	
Alarm	ALARM NO	Alarm normally open	
	ALARM NC	Alarm normally closed	
	ALARM COM	Alarm common	
DGPS Input	DGPS_IN GND	DGPS input ground	DGPS sensor
	DGPS_IN A	DGPS input A	
	DGPS_IN B	DGPS input B	
DGPS Output	DGPS_OUT GND	DGPS output ground	DGPS sensor
	DGPS_ OUT A	DGPS output A	
	DGPS_ OUT B	DGPS output B	
LR Input	LR_IN GND	LR input ground	Long range input
	LR_IN A	LR input A	
	LR_IN B	LR input B	
LR Output	LR_OUT GND	LR output ground	Long range output
	LR_ OUT A	LR output A	
	LR_ OUT B	LR output B	
Display	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
Termination Switches	The switches provide line termination configuration. 
Jumper for NMEA2000 shield and ground	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.

3.9 Connecting Extension Cable

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

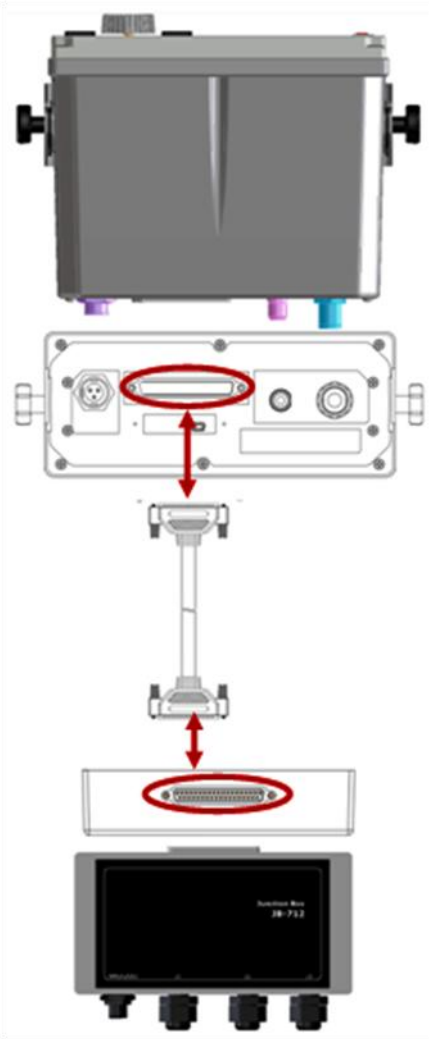


Figure 10 Connecting CAMINO-701 with Junction Box

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.

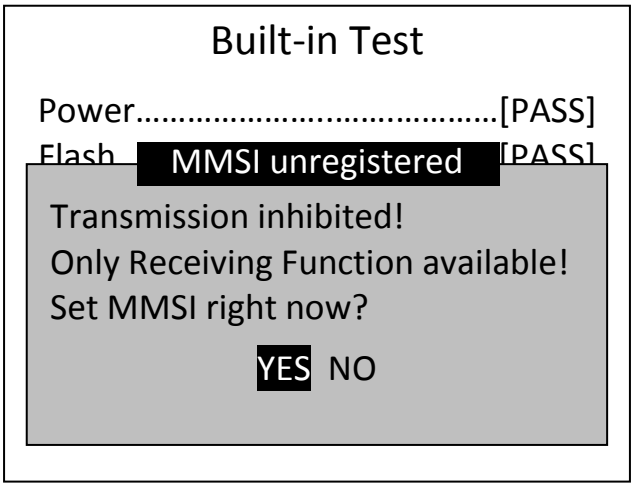


Figure 11 Built-in Test

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**.

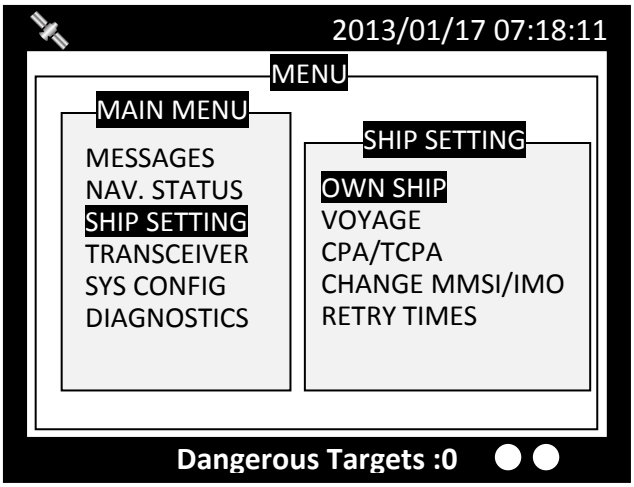


Figure 12 Own Ship

B. If **IMO** identification number is applicable, select main menu item **Change MMSI/IMO** to setup **IMO** number.

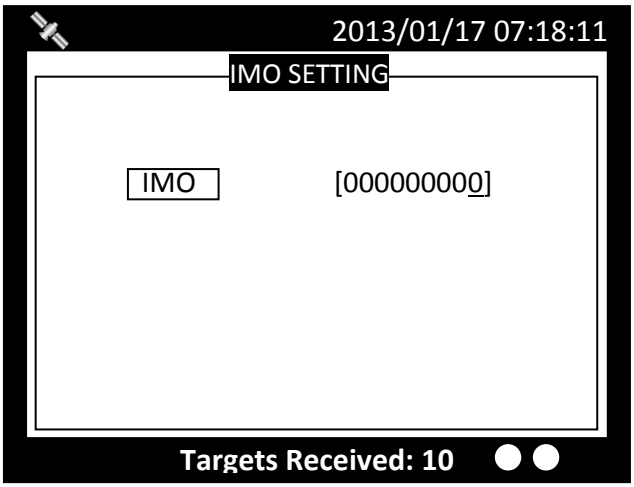


Figure 13 IMO Setting

For more information please refer to **4.7 SHIP SETTING**.

4 OPERATION

4.1 Panel Description

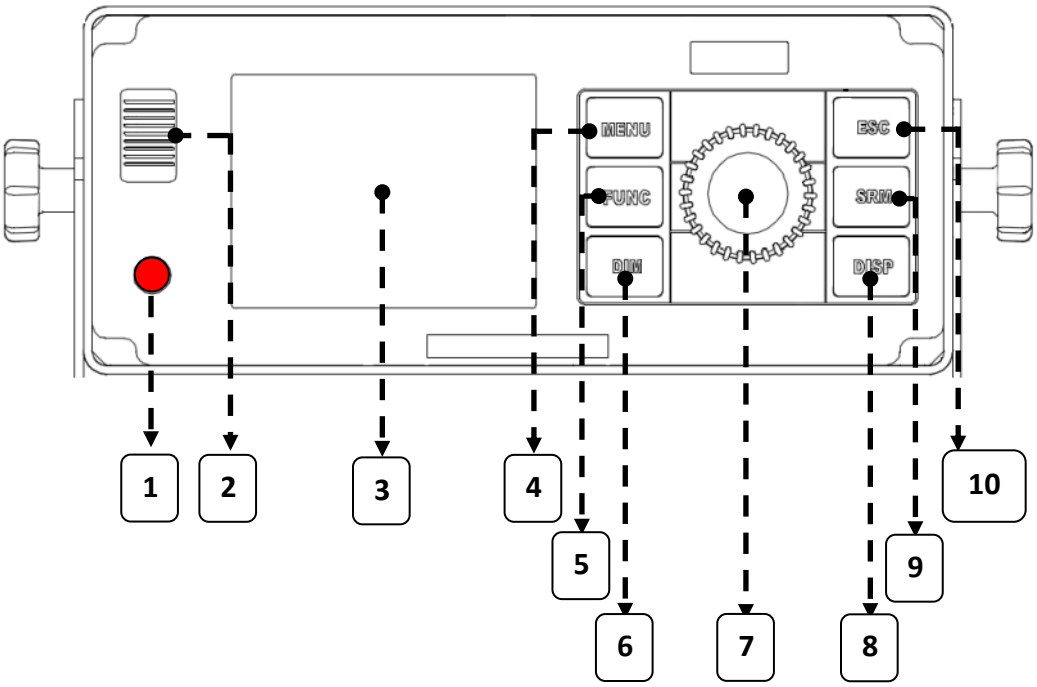


Figure 14 Panel Description

Item Number	Name	Descriptions
1	**Power Switch**	Power On/Off (push button over 5 seconds)
2	**Beeper**	Sound for when buttons are pushed
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 (refer to 4.2.7)
7	**Knob**	Rotate to select, press to confirm
8	**DISP**	Change to different display mode: 1 Coastal View 2 Radar View 3. AIS Target List 4. Dangerous Target list 5. Own Ship Detail 6. GPS satellite information 7. Region Setting List
9	**SRM**	Emergency SRM broadcast
10	**ESC**	Cancel / Back to Main MENU

4.1.1 Status Bar

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

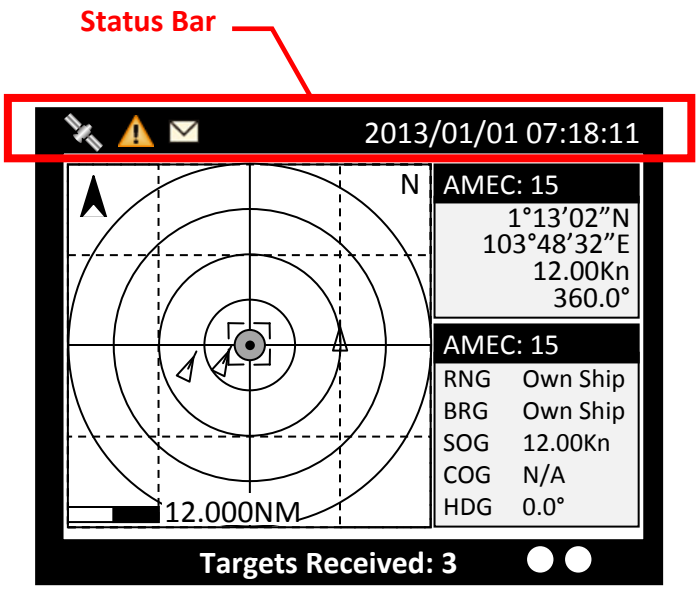


Figure 15 Status Bar

	GPS Status： Position fixed
	GPS Status： Non-fixed
	ALR Status： Alarm messages occurs
	Inbox SRM： Unread coming SRM message
	SART/MOB： SART or MOB message received

4.1.2 Transmission and Reception Bar

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

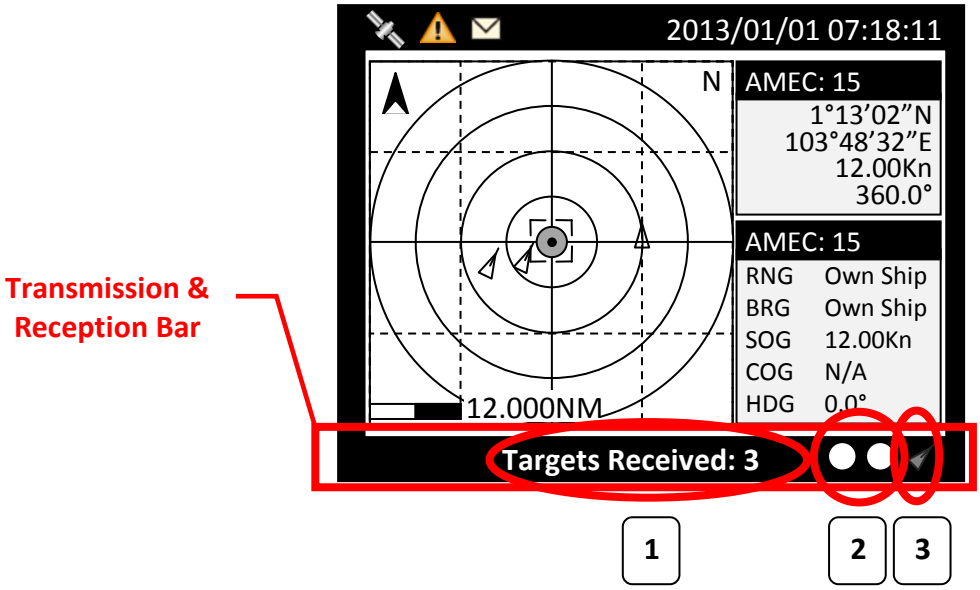
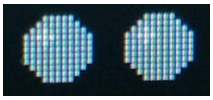
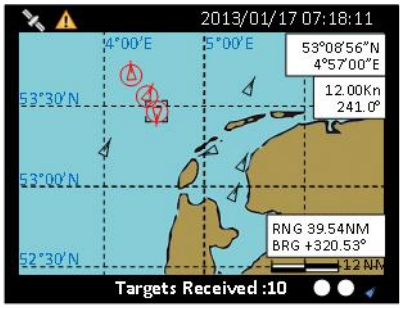
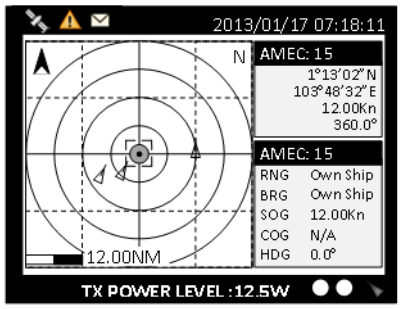
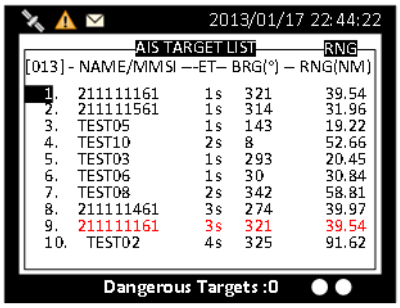
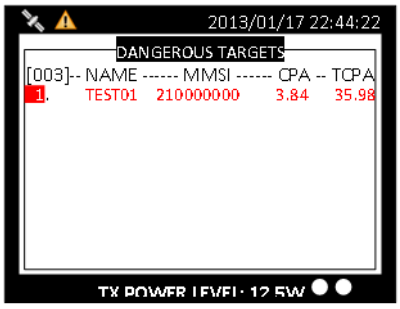
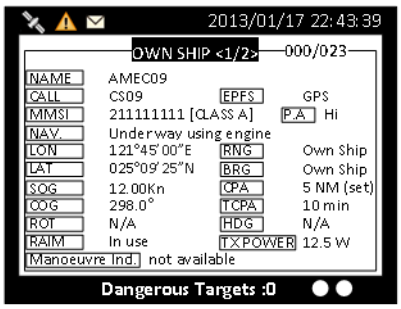


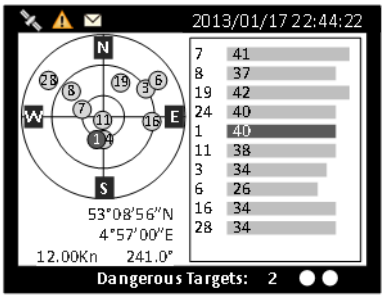
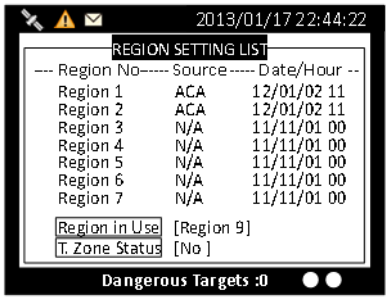
Figure 16 Transmission and Reception Bar

Item Number	Name	Function	
1	**Text Banner**	Shows the numbers of "Targets Received" and "Dangerous Targets" automatically.	
2	**Indicators**  **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 (Coastal view only)**	Zoom In/Out Up/Down Left/Right Target Selected SART/MOB	The function icon indicates the knob's action differently in operations. Push FUNC enables the knob to operate different actions
	Function Icon (Radar view only)	Zoom In/Out Target Selected SART/MOB	

4.2 Display Modes

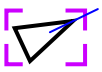
For quick access, users can rotate display modes by simply pressing the **DISP** button.

Display Mode	Screen Shot	Purpose
Coastal View		Display all targets on basic coastline map
Radar View		Displays all targets on radar view
AIS Target List		Shows all received ship data (Refer to section 4.6.2 AIS Targets)
Dangerous Target List		Shows all dangerous AIS targets presently (Refer to section 4.6.7 Dangerous List)
Own Ship Detail		Shows all the details of own ship (Refer to section 4.2.5 Own Ship Detail)

GPS Satellite Information		Shows the GPS satellite current usage status (Refer to section 4.2.5 GPS Satellite Information)
Region Setting List		Show all the Region of own ship (Refer to section 4.6.3 Own Ship Detail)

4.2.1 Target Symbol Descriptions

Symbols for each AIS target displayed on the radar view is as described below:

Own Ship 	**GPS Reception: Normal / Color: Black and Gray** Under normal GPS reception, own ship is located in the center of the radar view.
Own Ship 	**GPS Reception: No GPS / Color: Blue** Without GPS reception, own ship needs to be located manually.
AIS Target 	**Color: Black** Ship equipped with AIS system in the surrounding sea will appear on the radar view as an AIS target.
Selected Target 	**Color: Black / Flashing Colored Frame** Use the arrow keys to select any target on the radar view. After selected, press <ENT> and the detailed information on each target can be viewed.
Dangerous Target 	**Color: Red / Circled Frame** When distance to a ship is smaller than CPA/TCPA, the target will be circled in RED. Use the arrow keys to select the dangerous target and to view its detailed information.
Friend Ship 	**Color: Magenta** If any pre-stored Friend Ship is nearby, the Friend Ship will appear in Magenta on the radar view.

Lost Signal Target	**Color: Black / Red Cross** If reception of an AIS target **has ceased** over 10 minutes, a "**X**" will be displayed over it. The target will disappear from the Radar View after its reception **has ceased** for one hour.
AtoN (Real)	**Color: Black / Plus Sign** The icon will be displayed if any AIS AtoN (Aids to Navigation) Real is in the range of reception.
AtoN (Virtual)	**Color: Black / Plus Sign and Undercut** The icon will be displayed if any AIS AtoN (Aids to Navigation) Virtual is in the range of reception.
AtoN(Off position)	**Color: Red / Plus Sign** The icon will be displayed if any AIS AtoN (Aids to Navigation) is in off position status.
SAR	**Color: Black** The icon will be displayed if any air plane is in the range of reception.
SART	**Color: Red / Cross** The icon will be displayed if any SART message is sent out.
Base Station	**Color: Green** The icon will be displayed when any base station is in the reception range.

4.2.2 Coastal View

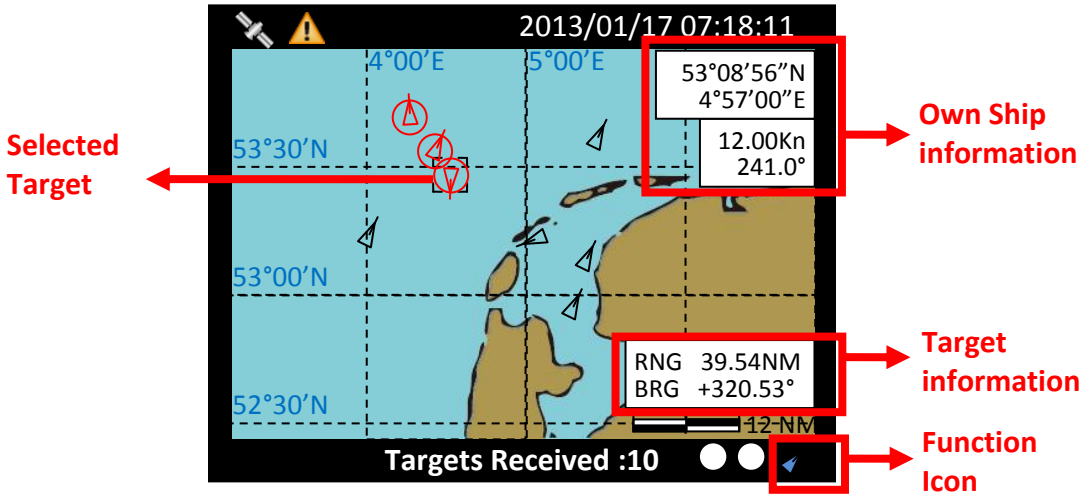


Figure 17 Coastal View

Item	Function	
Own Ship information	Own-ship information for latitude, longitude, SOG and COG	
Target information	Display the target information such as range and rearing relatively to the own ship	
Function Icon (Coastal View)	Zoom In/Out Up/Down Left/Right Target Selected SART/MOB	Function icon (Coastal View)

The coastline map in this transponder is neither verified nor approved by Hydrographic Authorities. It is not an Electronic Chart System and therefore should not be used for navigation. The information provided by the coastline map is for reference only and should be used together with other navigation sources and devices.

4.2.3 Radar View

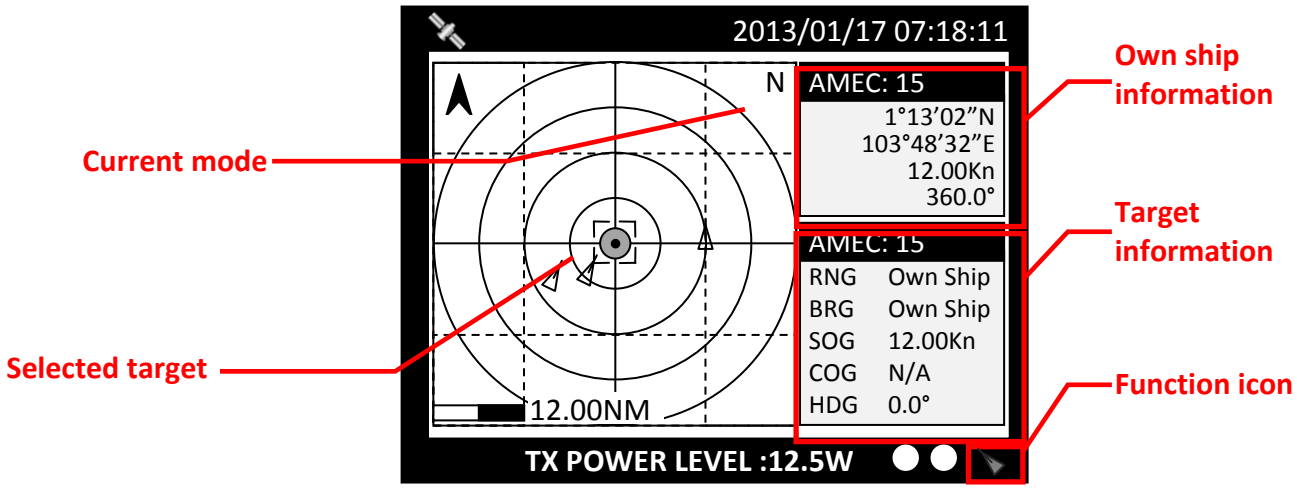


Figure 18 Radar View

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.

4.2.4 Dangerous Target List

Please refer Section **4.6.7 DANGEROUS LIST**

4.2.5 Own Ship Detail

Please refer Section **4.6.1 OWN SHIP**

4.2.6 GPS Satellite Information

Please refer Section **4.10.6 GPS STATUS**

4.2.7 Dimmer Setting

Press the button “DIM” to enter the dimmer setting page.

Figure 19 Dimmer Setting

Button	Description
Knob (Turn left/right)	Adjust screen brightness (decrease/increase)
Knob (Press)	Save and leave the page
DIM	Restore screen brightness to default setting (100)
MENU、ESC	Leave the page without saving

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.

A. Turn the knob to traverse the menu items up or down. Once selected, press the knob to select the item for text entering.

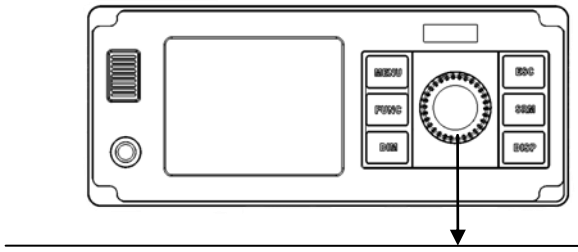
B. Select a character position to edit. Turn the knob to move the cursor left or right and press the knob to confirm the position.

C. 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	[	\	]
^	_	!	“	#	$	÷	&
‘	(	)	*	+	,	-	.
/	:	;	<	=	>	?	@

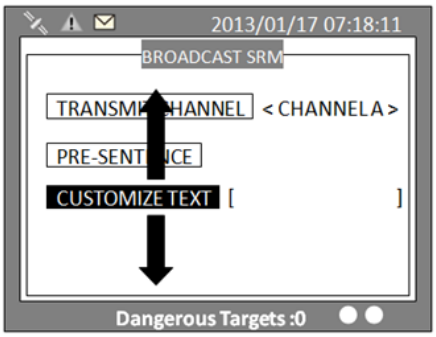
Space is first character for selection

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



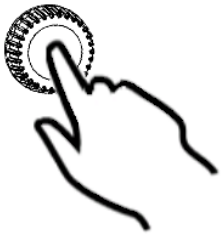
Traverse menu

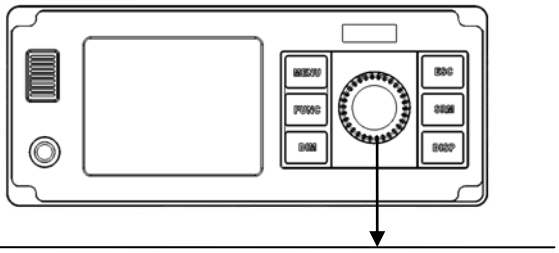
A



Turn knob to move up or down

Press to enter



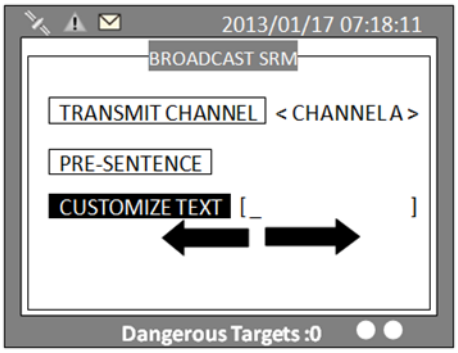


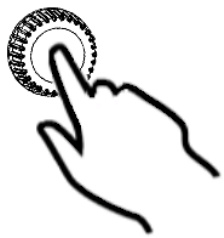
Select a character position

Turn knob to move left or right

Press to start editing

B



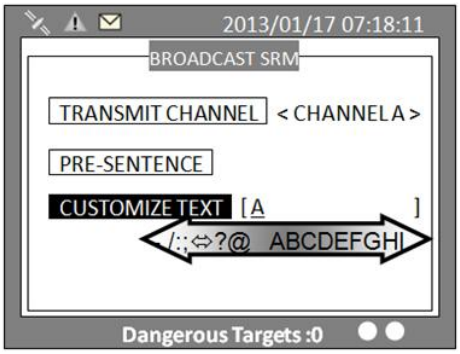


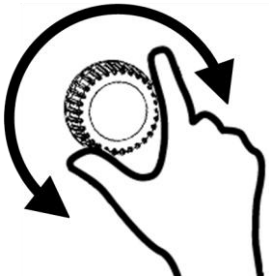
Pick character

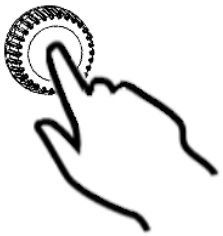
Turn knob to select character

Press knob to confirm

C







Confirm and save

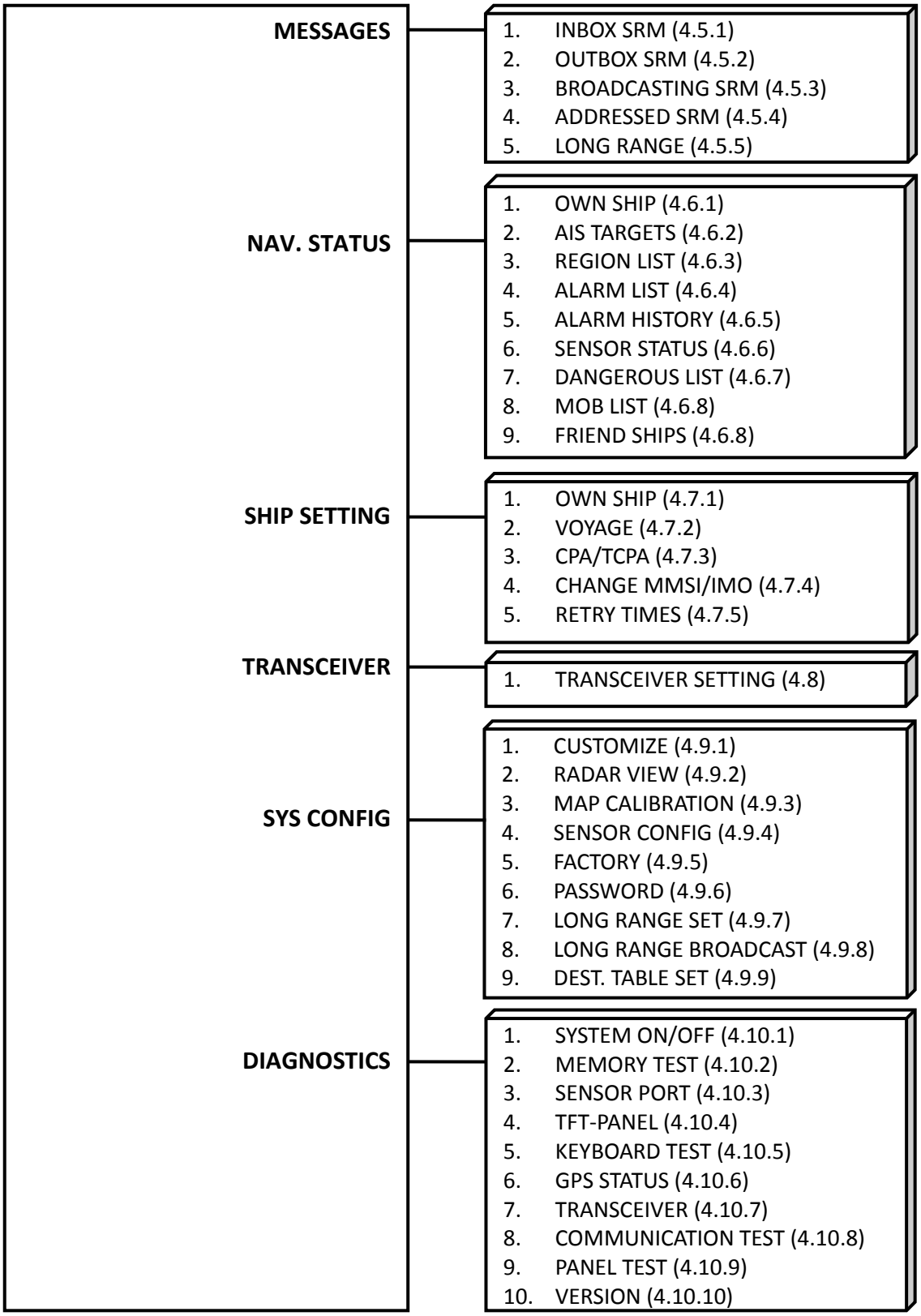
To save entered text, long press the knob for 2 seconds

D

Figure 20 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.



4.4.1 How to access and use MAIN MENU

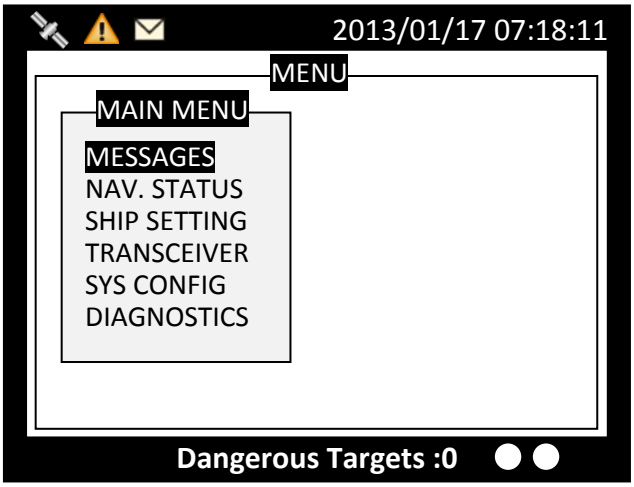


Figure 21 MAIN MENU

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

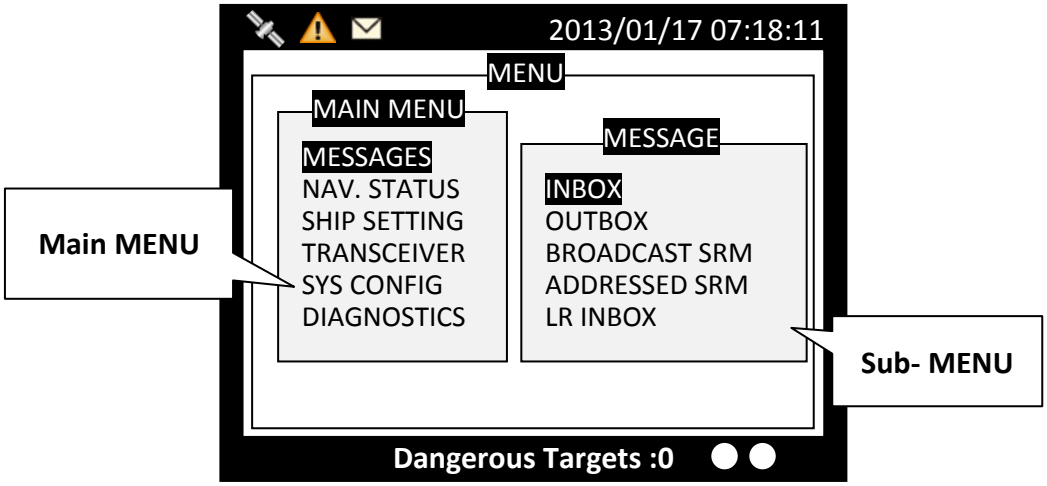


Figure 22 Sub-menu

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

4.5 Messages

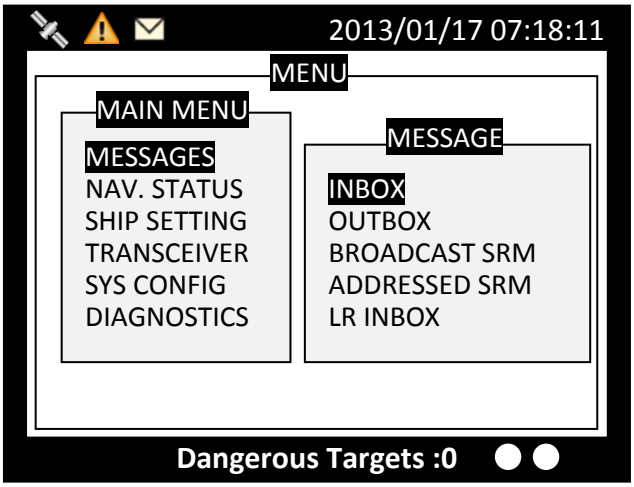


Figure 23 Message

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 knob to traverse the message list.

Figure 24 Traversing List

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

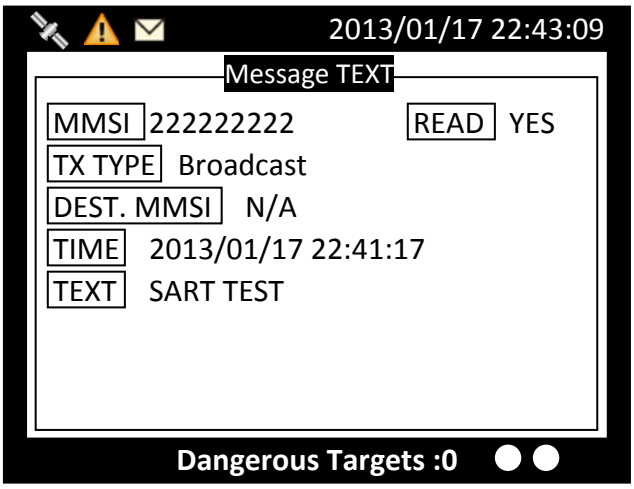


Figure 25 Message Text

Message deletion

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

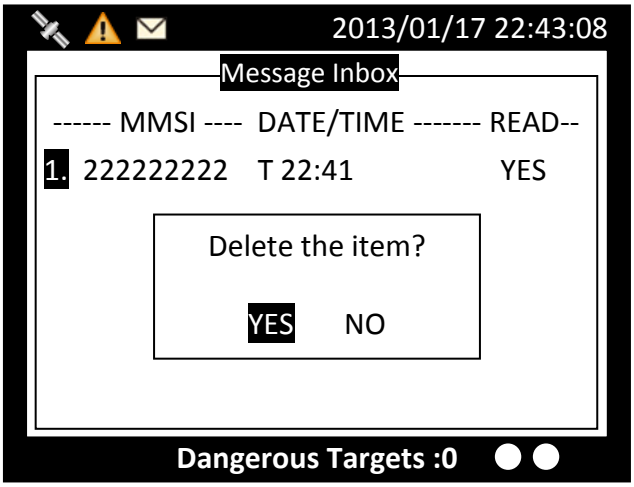


Figure 26 Message Deletion

4.5.2 Outbox SRM

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

Traversing List
Turn the knob to traverse the message list.

Figure 27 Traversing List

View message
Highlight your choice and pressing down the knob to view message content.

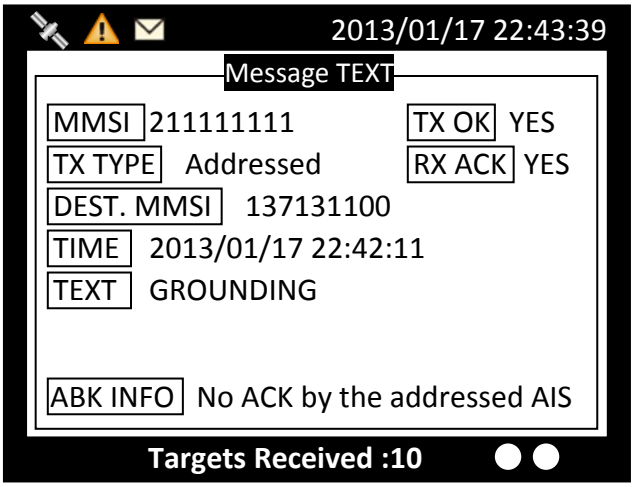


Figure 28 View Message

Message deletion

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

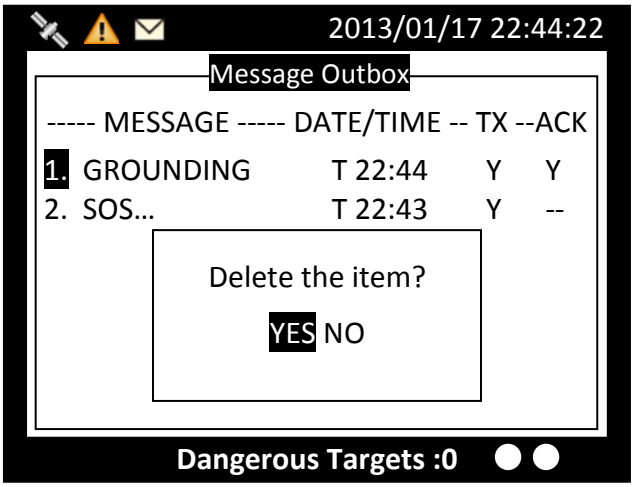


Figure 29 Message Deletion

4.5.3 Broadcast SRM

Use this menu to send a Pre-defined or custom message. Turn the knob to traverse all available option. Maximum length for the customized message is 90 characters.

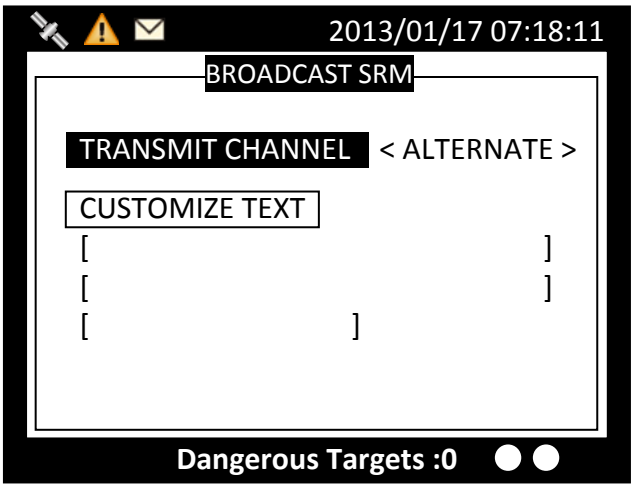


Figure 30 Broadcast SRM

Selecting SRM channel

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

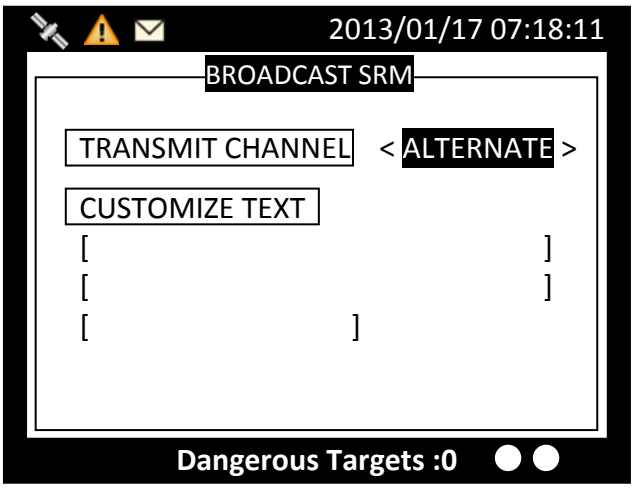


Figure 31 Select SRM Channel

Once finish the settings, press the **knob** again to return.

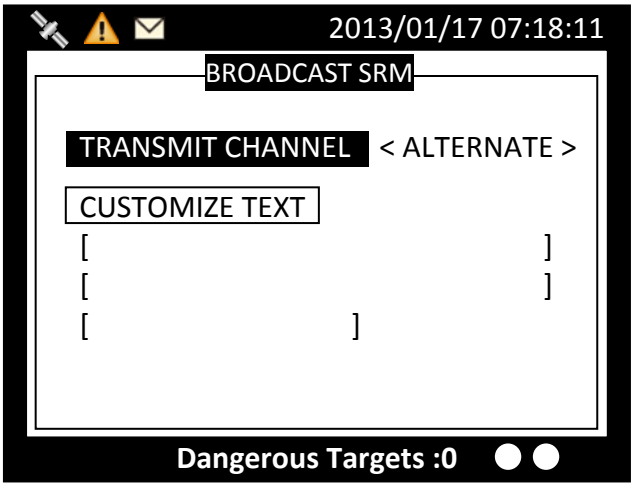


Figure 32 Finish Setting

Using Predefined-Sentence

You may use **PRE-SENTENCE** option to select a pre-defined message sentences or a customized text. Press the knob to enter and turn the knob to switch sentence selections, and then press the knob 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 knob to enter text input mode, then turn the knob to traverse character position on the text.

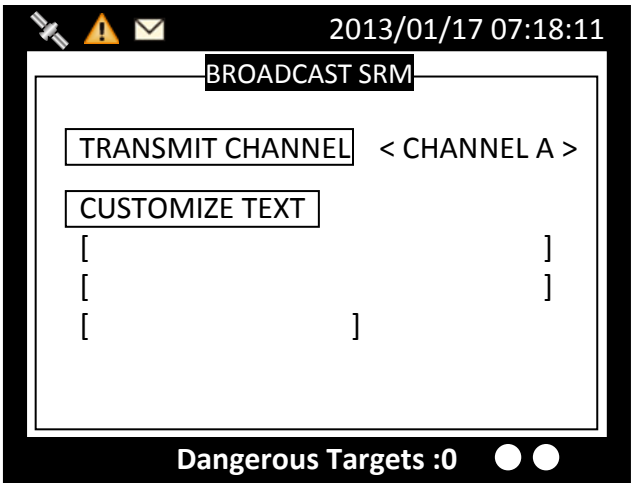


Figure 33 SRM Customized Text

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

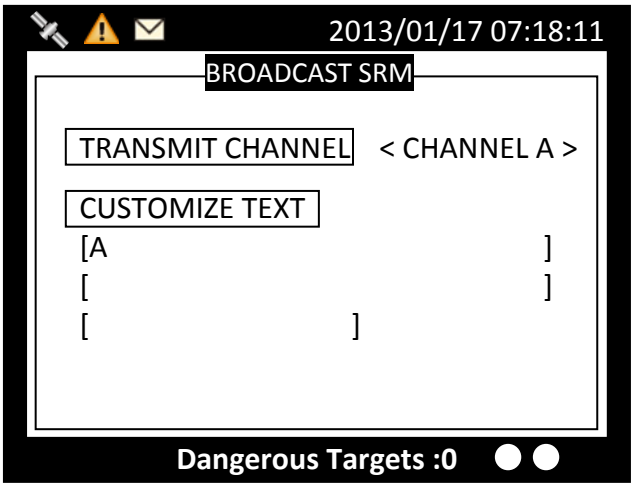


Figure 34 Enter Customized Text

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

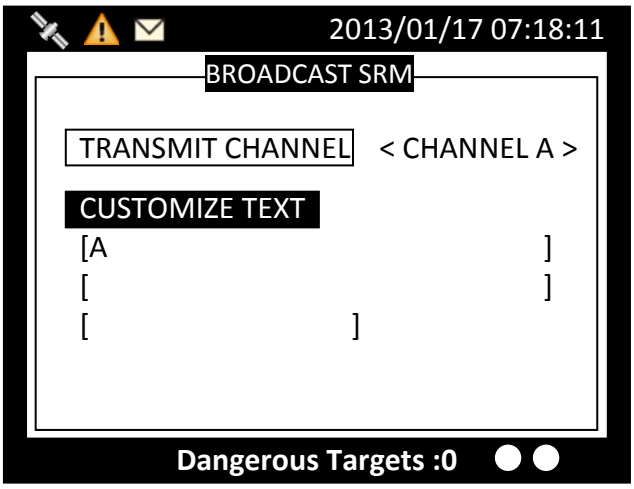


Figure 35 Finish Customized Text

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.

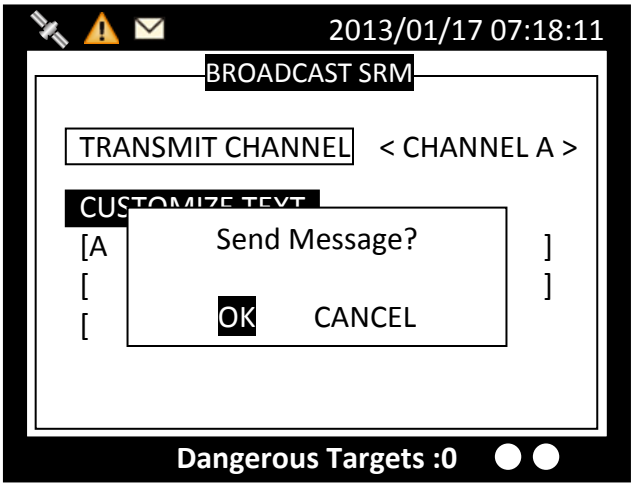


Figure 36 Send Message

4.5.4 Addressed SRM

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

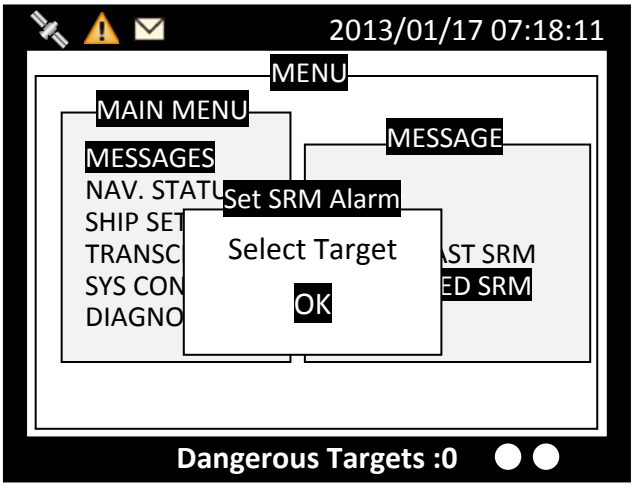


Figure 37 Addressed SRM

Pressing the knob will bring up the vessel list.

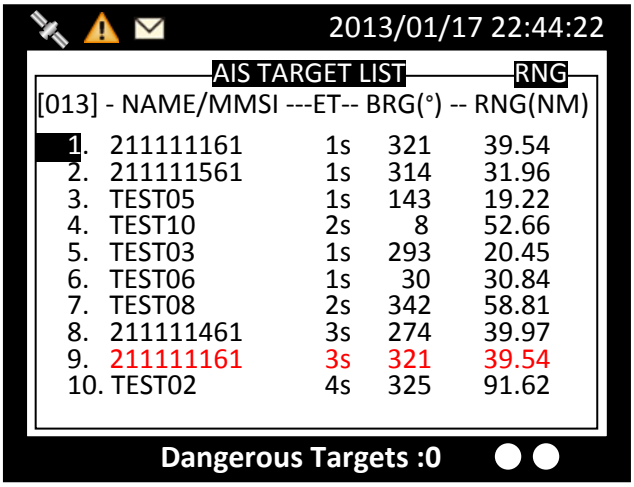


Figure 38 AIS Target List

Select the target vessel by pressing the knob to customize **SRM** sending. Maximum length for the customized message is 85 characters.

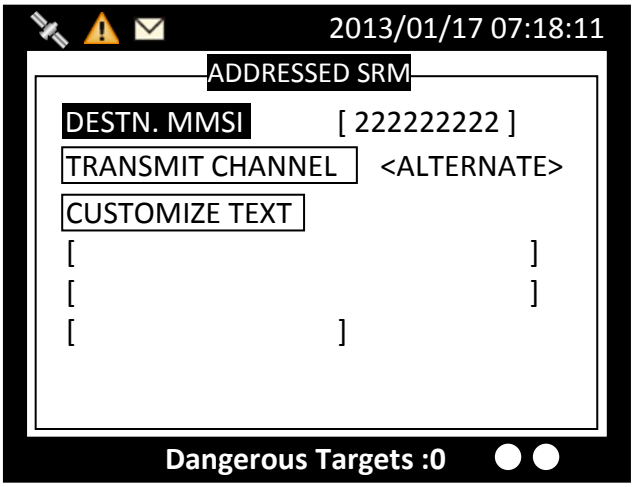


Figure 39 Customize SRM

When changing Destination **MMSI**, choose a text location, and then press the knob to enter text input mode. Turn the knob to select a character, and then press the knob 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.

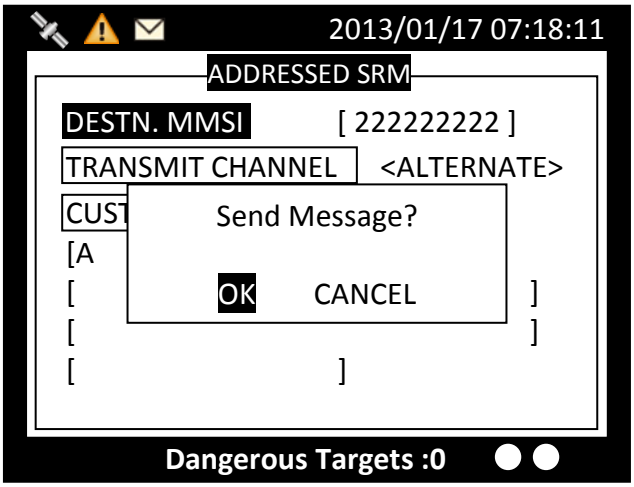


Figure 40 Send Message

4.5.5 Long Range SRM

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

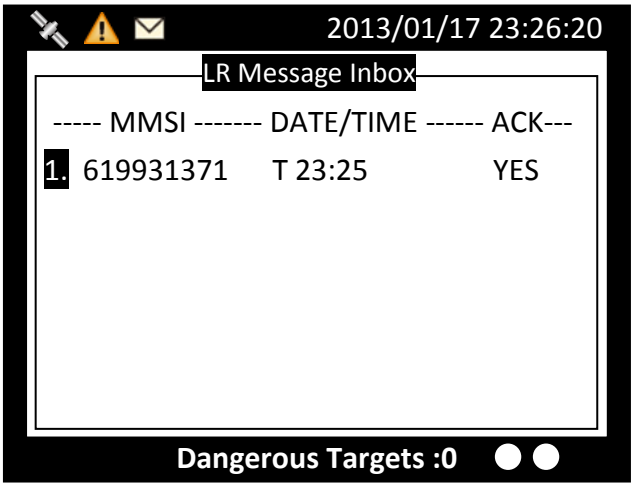


Figure 41 Long Range SRM

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

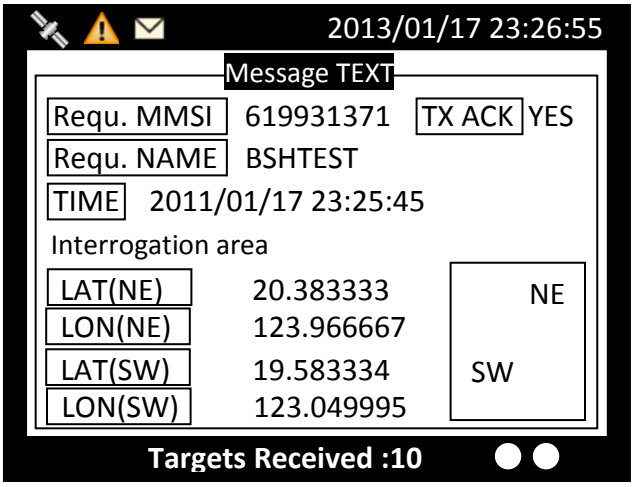


Figure 42 Reading Message

Message deletion

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

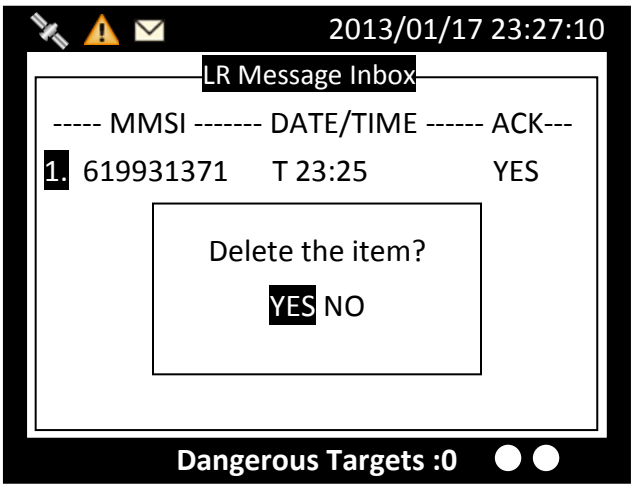


Figure 43 Message Deletion

4.6 Navigation Status

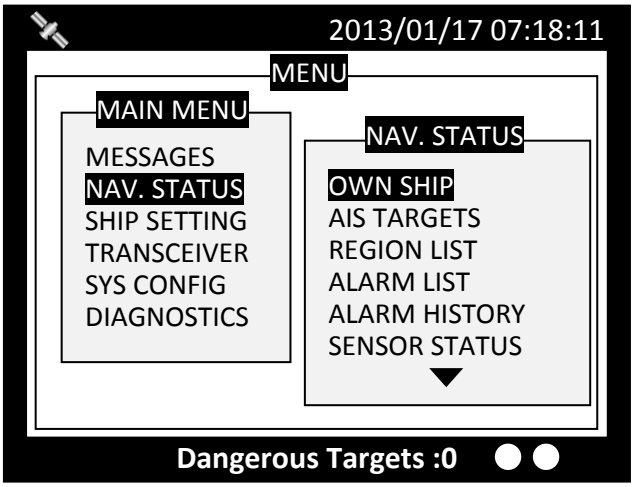


Figure 44 Navigation Status

4.6.1 Own Ship

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

- **Static data**

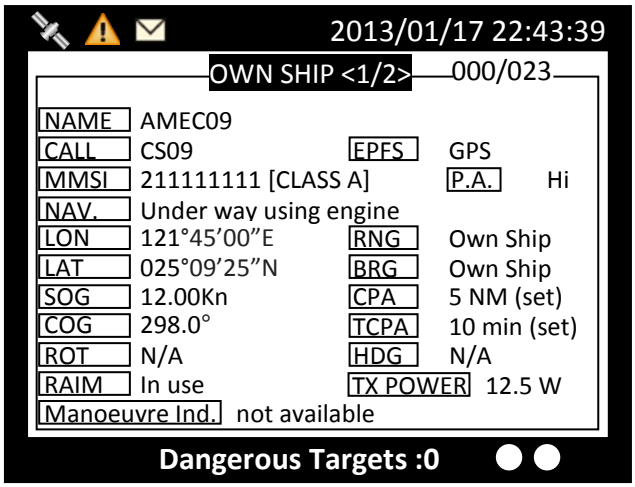


Figure 45 Static Data

■ **Dynamic data**

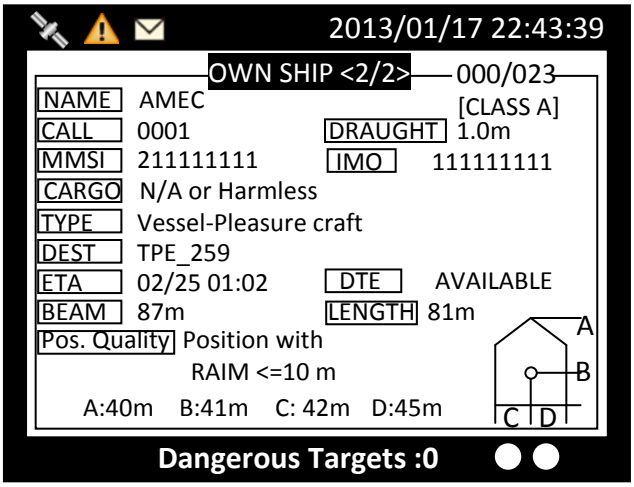


Figure 46 Dynamic Data

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 knob to select an AIS target.

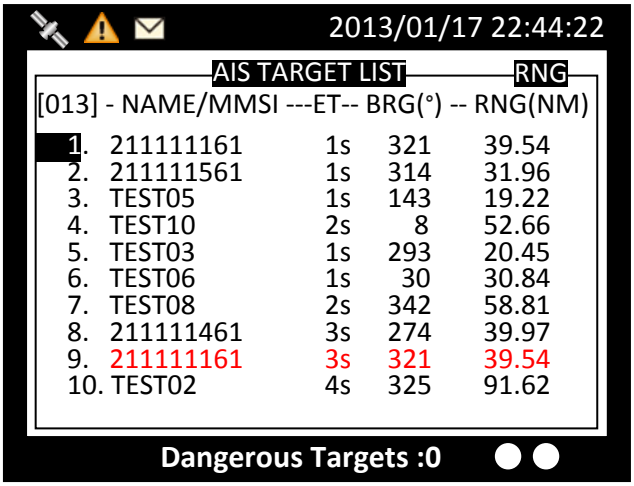


Figure 47 AIS Targets

Press the knob, to read the selected vessel dynamic information.

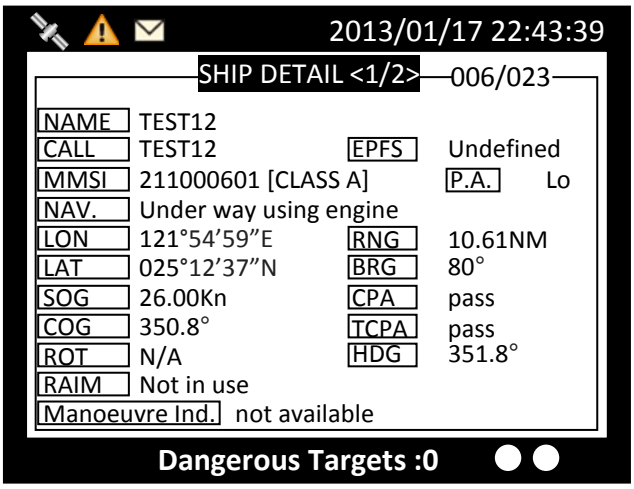


Figure 48 Ship Information

Press the knob again to read static information.

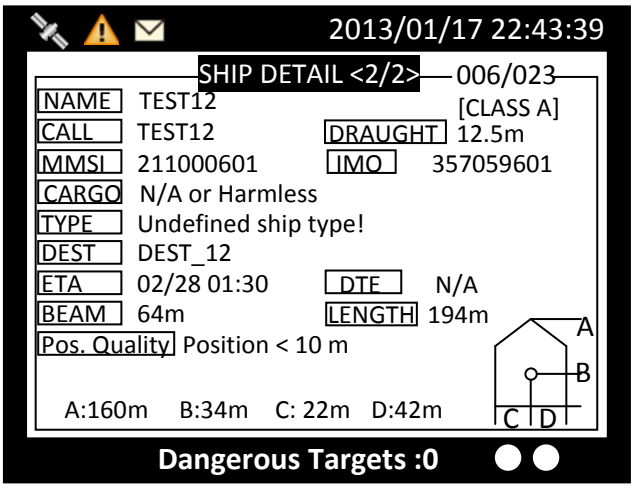


Figure 49 Static Information

Adding Friend Ship

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

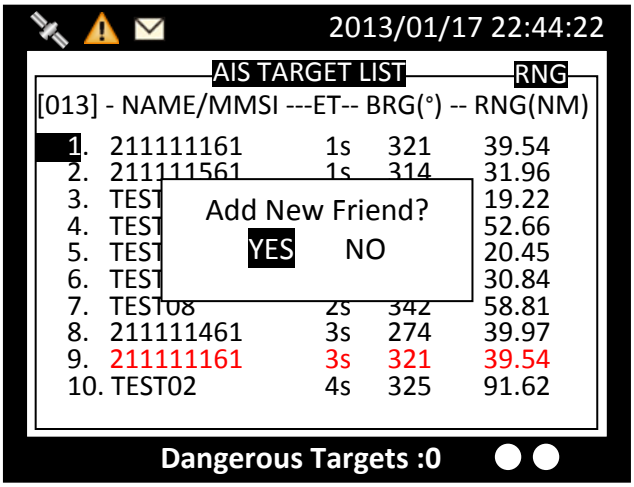


Figure 50 Adding Friend Ship

Sorting AIS Target List

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

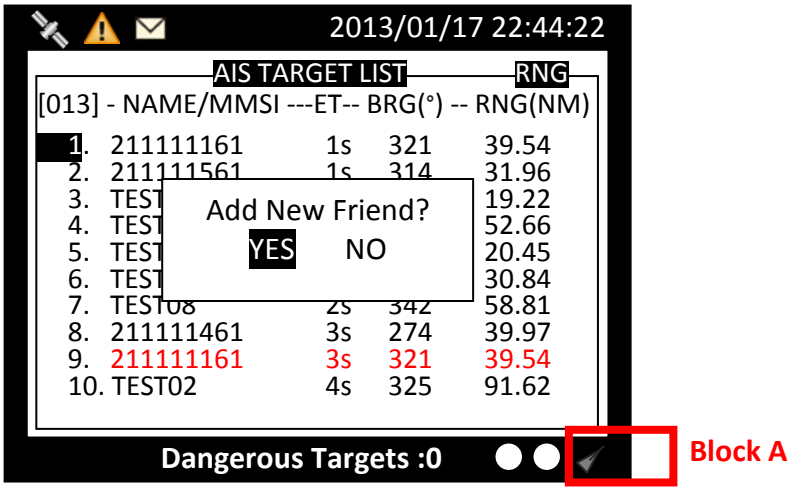


Figure 51 Sorting AIS Target List

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.

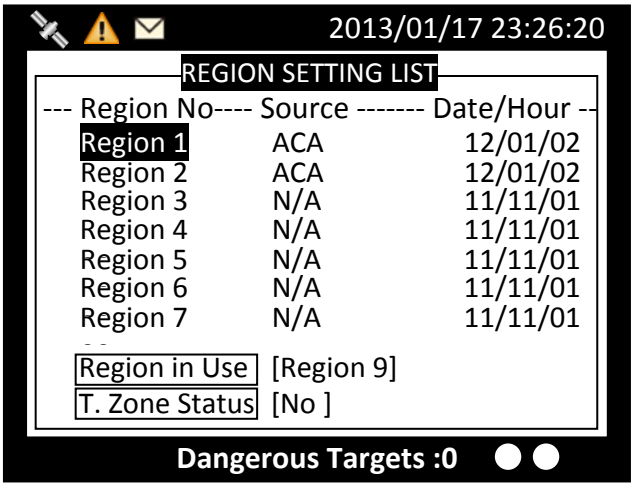


Figure 52 Region List

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

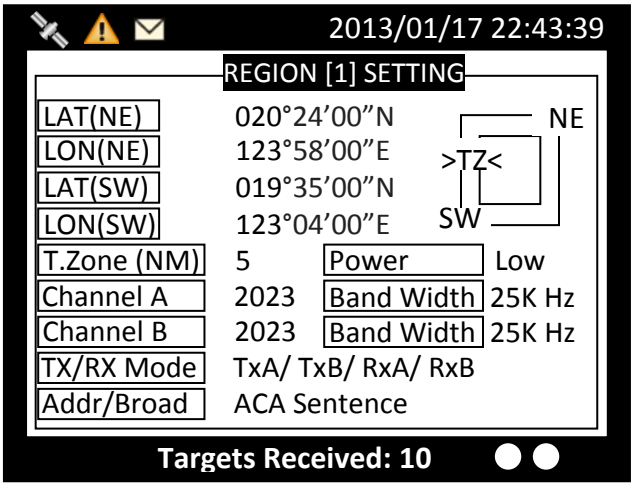


Figure 53 Region Setting

Modify region content

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

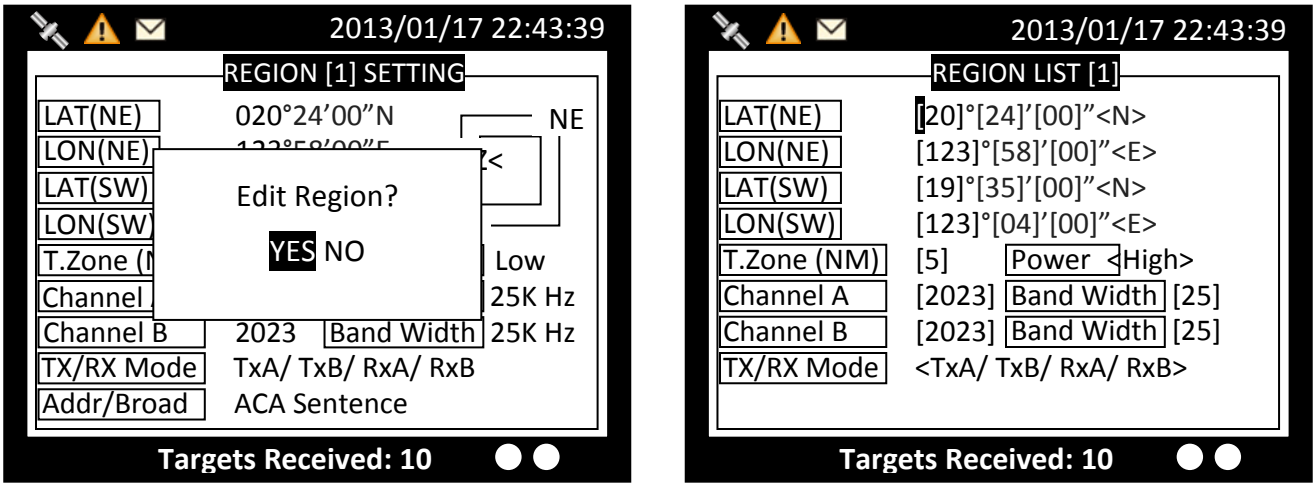


Figure 54 Modify Region Content

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.

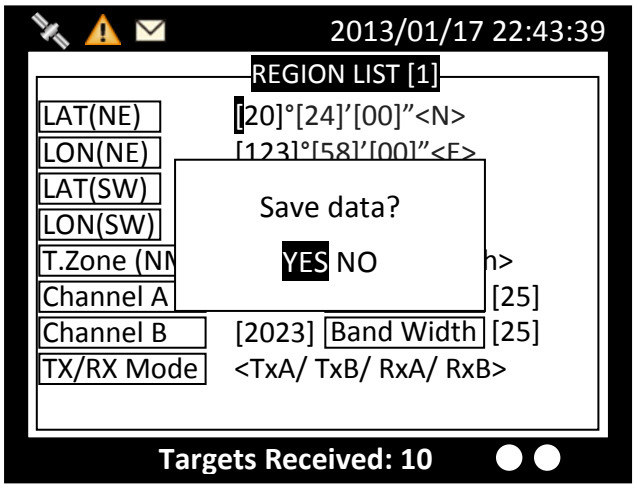


Figure 55 Save Data

4.6.4 Alarm List

This command lists all current AIS ALR statuses.

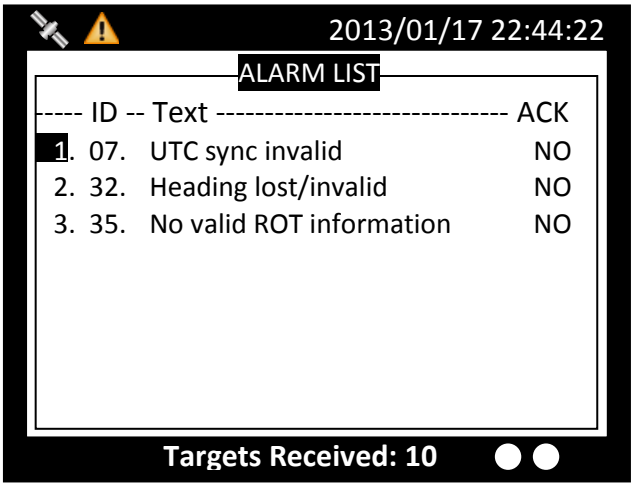


Figure 56 Alarm List

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.

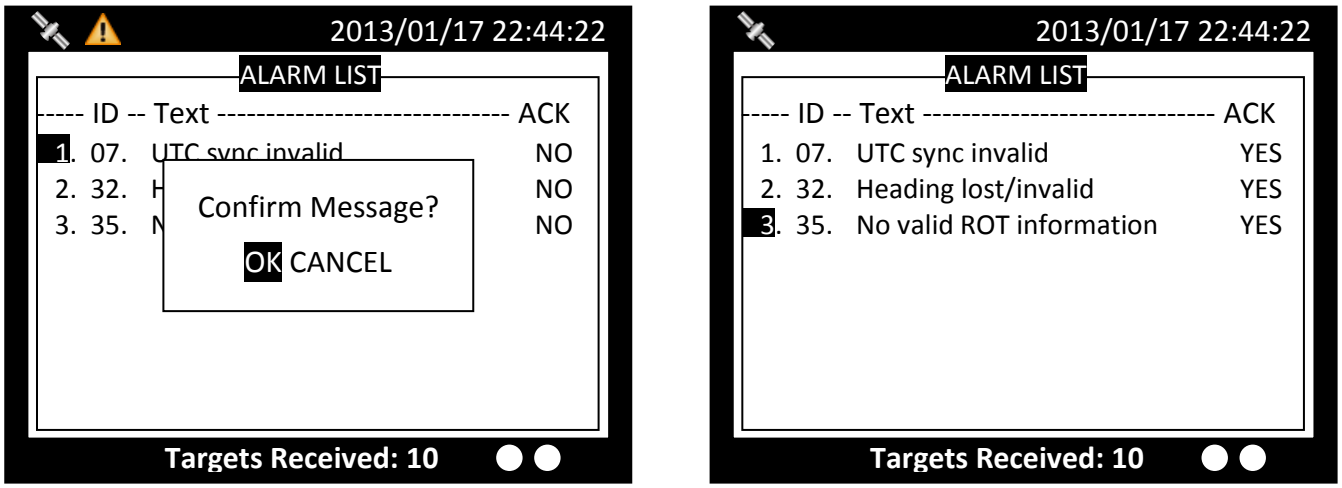


Figure 57 Send Message

4.6.5 Alarm History

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

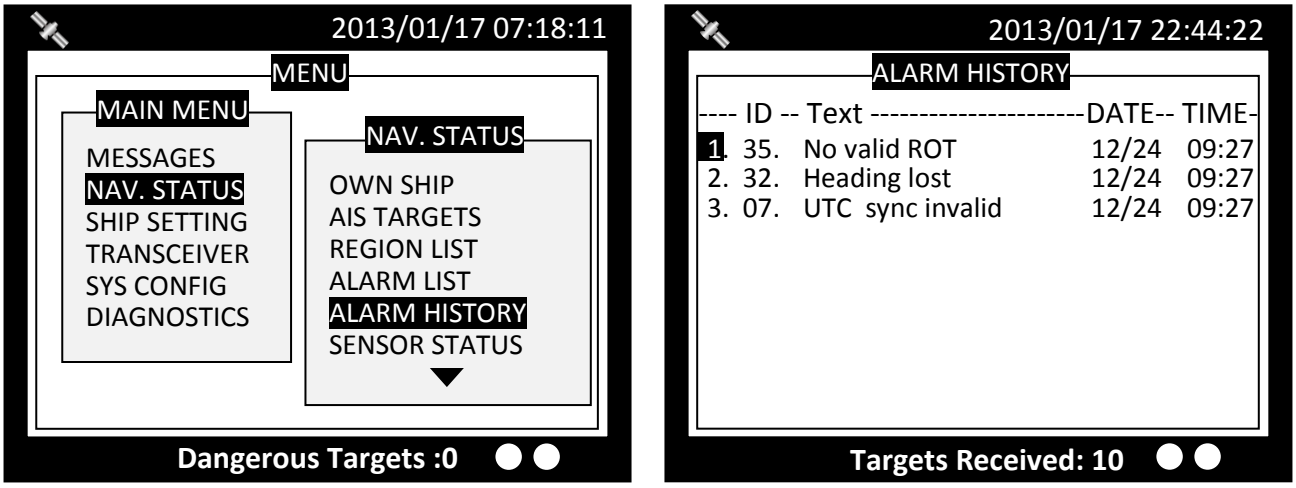


Figure 58 Alarm History

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.

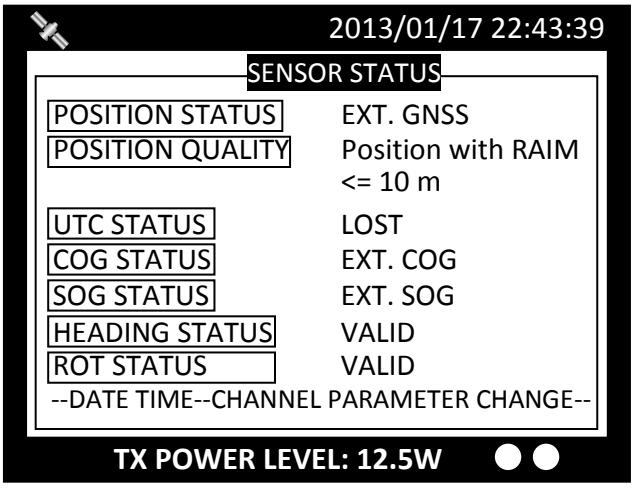


Figure 59 Sensor Status

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.

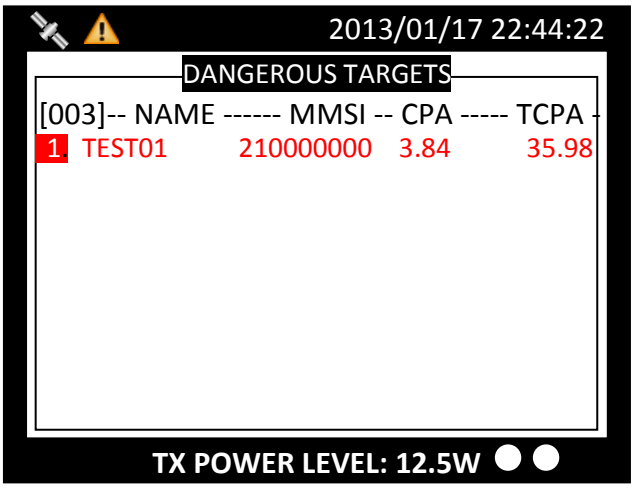


Figure 60 Dangerous List

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

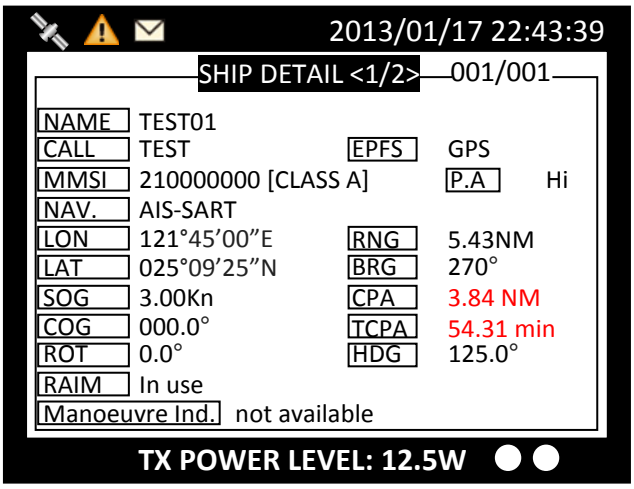


Figure 61 Ship Detail (1)

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

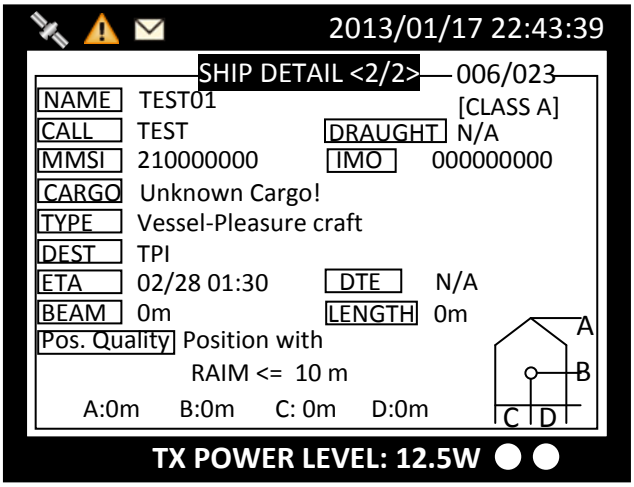


Figure 62 Ship Detail (2)

4.6.8 MOB List

This command enables adding, removing, or modifying of MOB list entries.

Button	Action
MENU	Add, Remove entry
Knob Button	Modify a selected entry

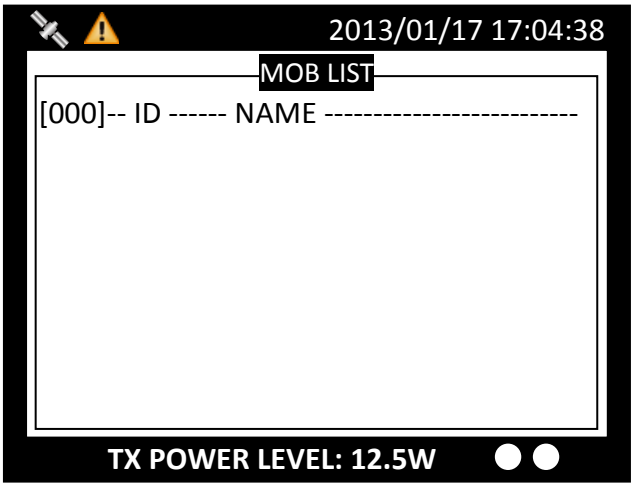


Figure 63 MOB List (1)

After pressing the Menu button, a prompt appears.

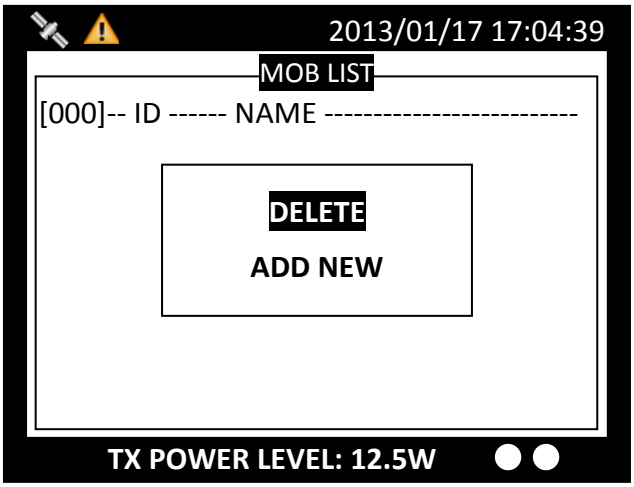


Figure 64 MOB List (2)

Select ADD NEW to enter edit mode.

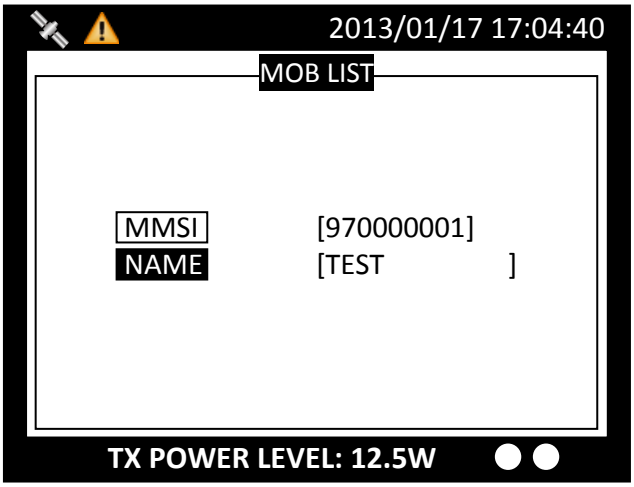


Figure 65 MOB List (3)

When finished entering MMSI and the assigned name, press MENU or ESC to save or leave without saving.

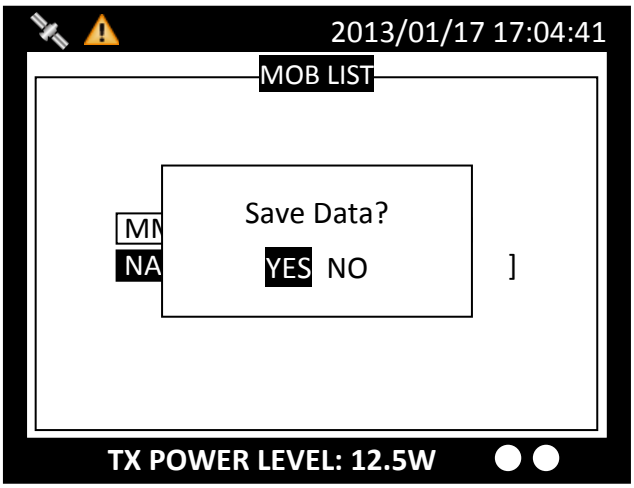


Figure 66 MOB List (4)

After finished adding, the list now has the new MMSI. To modify an entry, only need to press the knob to enter edit mode.

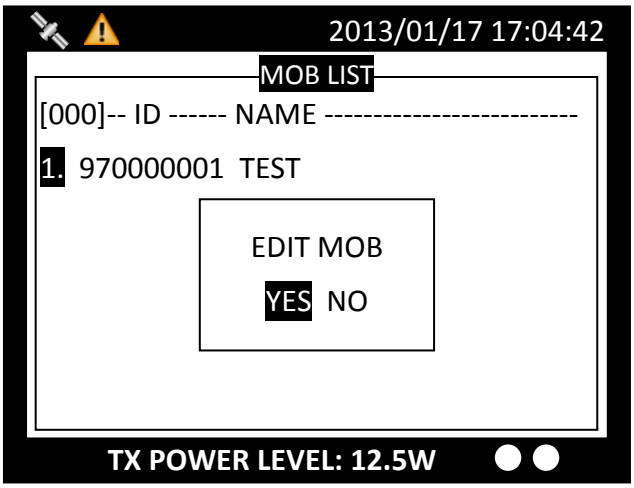


Figure 67 MOB List (5)

4.6.9 Friend Ships

This command displays the list of all registered friend ships.

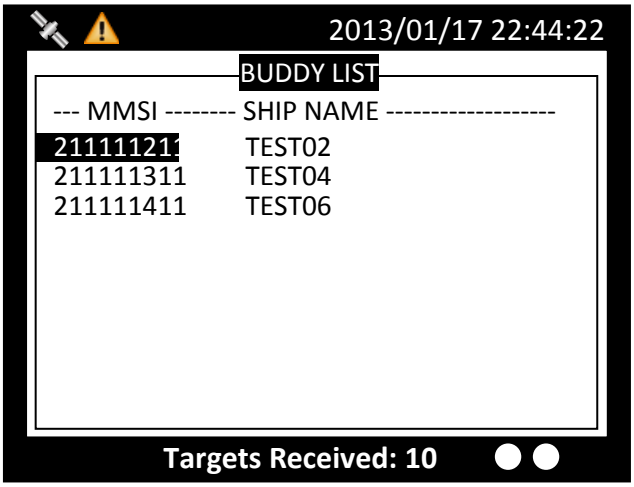


Figure 68 Buddy List

Turn the **knob** to traverse the message list.

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

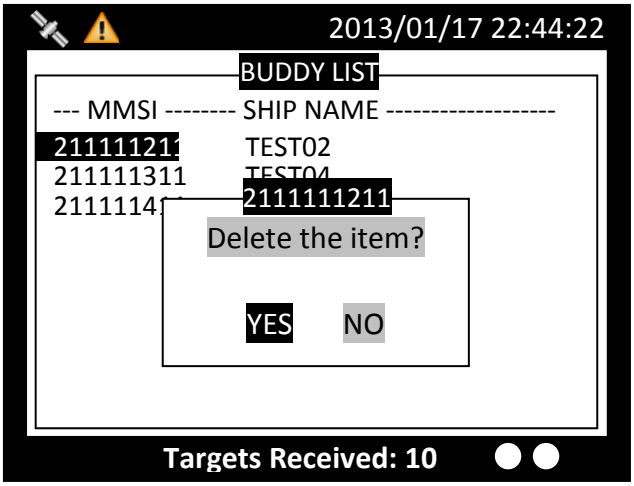


Figure 69 Delete the Item

4.7 Ship Setting

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

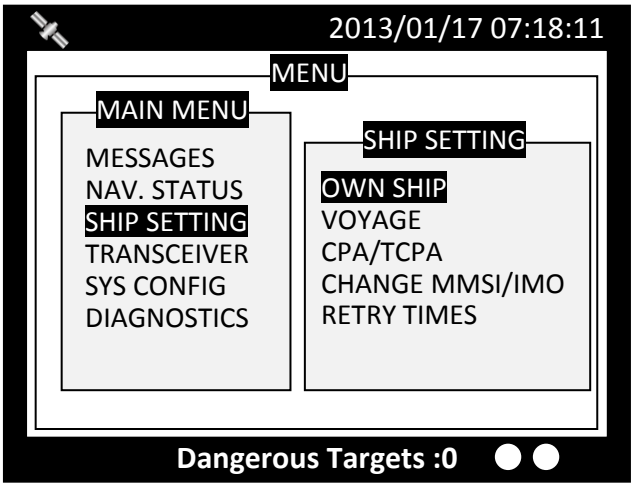


Figure 70 Ship Setting

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

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

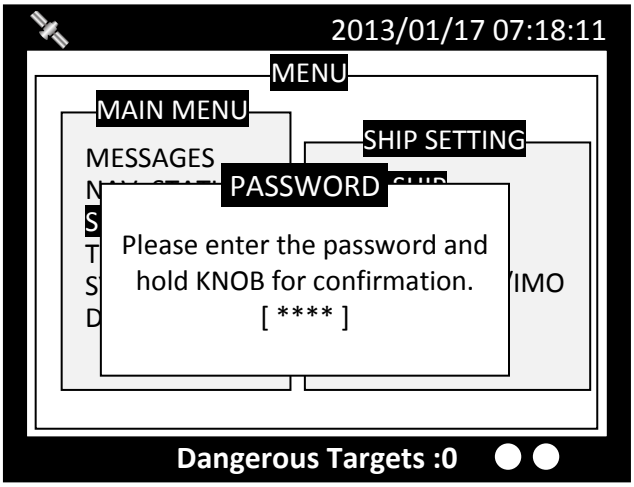


Figure 71 Own Ship

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

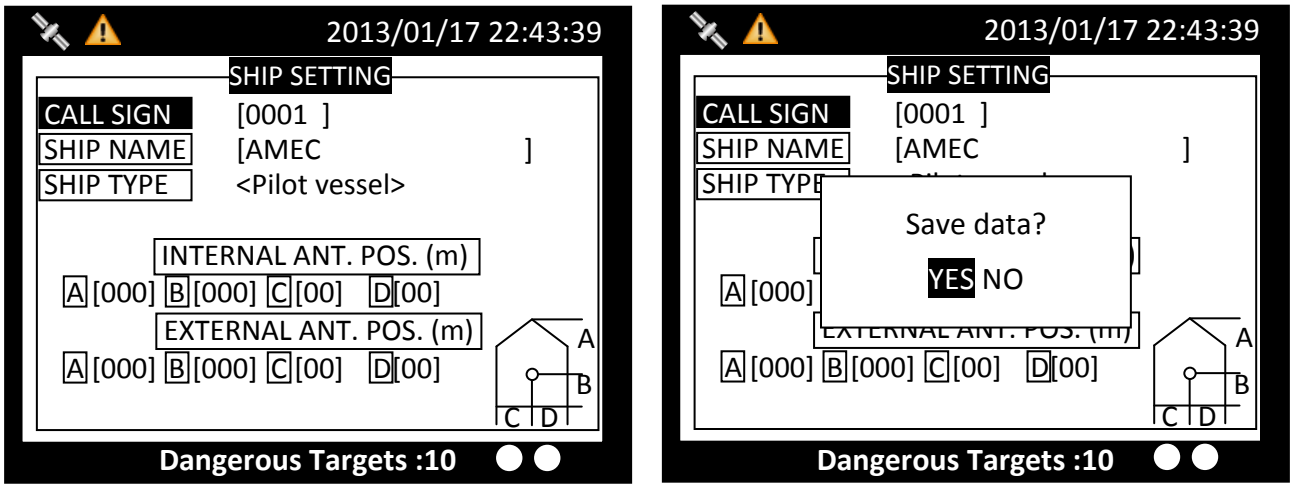


Figure 72 Own Ship Setting

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

4.7.2 Voyage

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

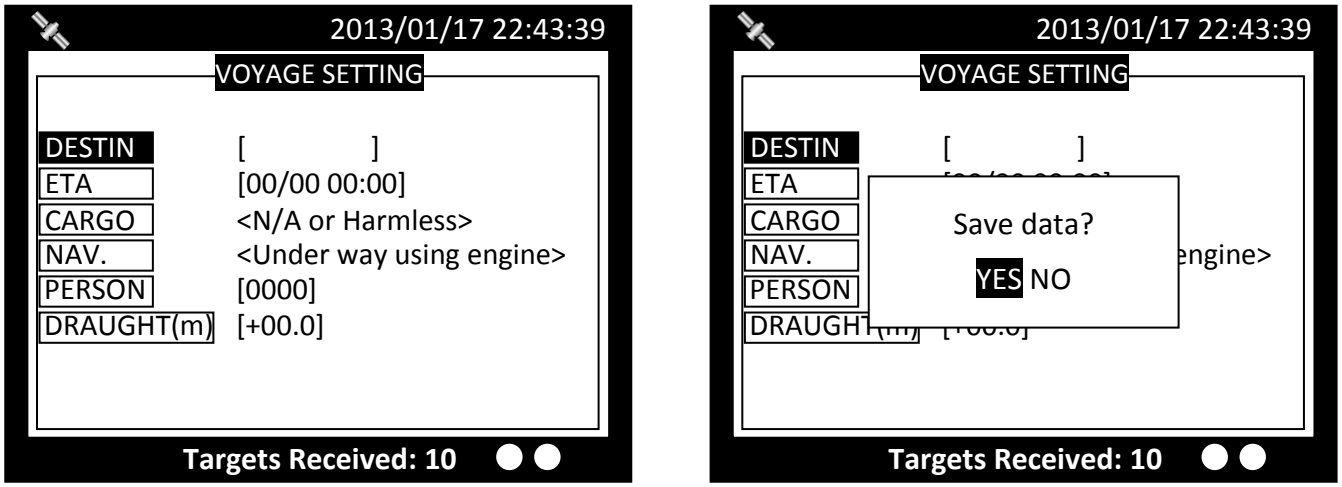


Figure 73 Voyage Setting

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.

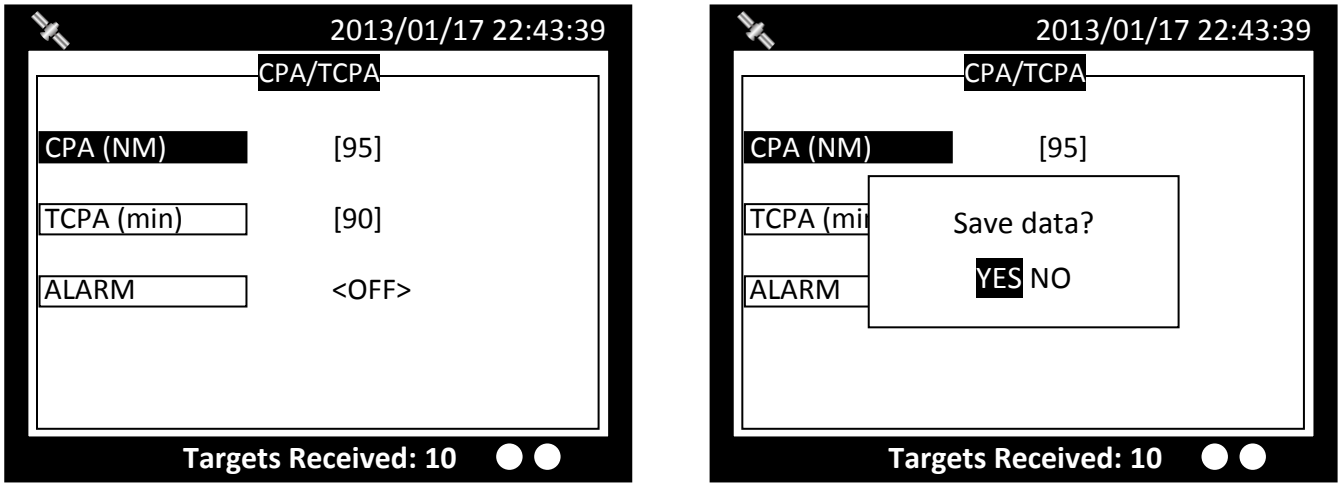


Figure 74 CPA/TCPA

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

Before entering Change MMSI/IMO page, please enter the password (Default password: **"0000"**). Press and hold the knob for 3 seconds as confirmation.

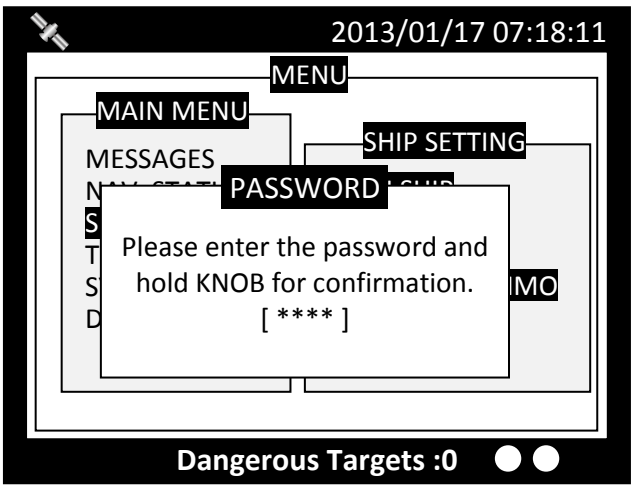


Figure 75 Change MMSI/IMO (1)

This command provides settings to enter **MMSI** and **IMO**.

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

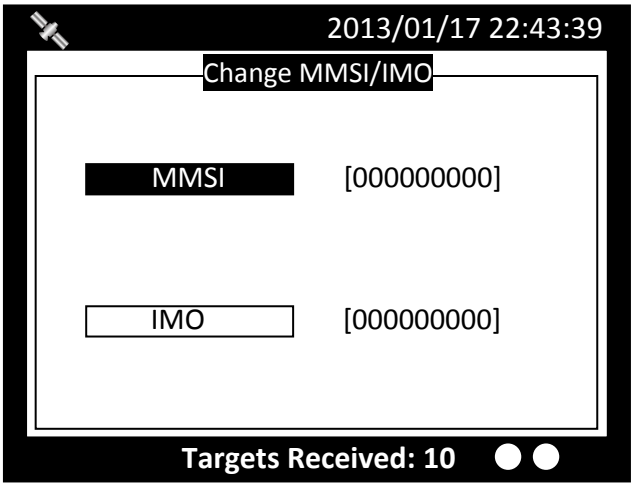


Figure 76 Change MMSI/IMO (2)

Turn the **knob** to change the position and press **knob** to enter text input mode. Turn the **knob** to change value and press **knob** 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.

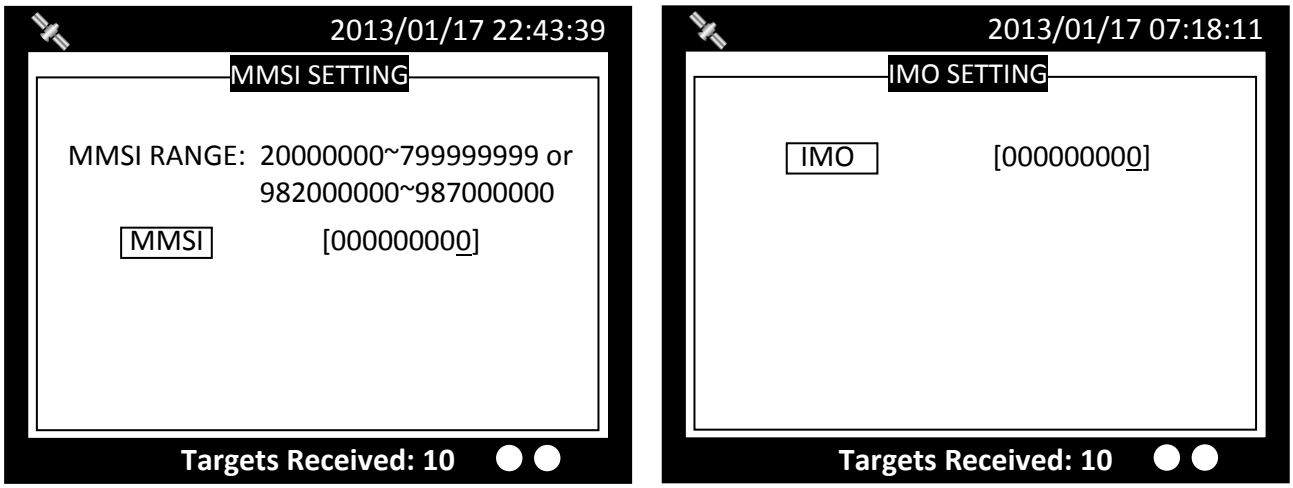


Figure 77 MMSI/IMO Setting (3)

The system will ask for your confirmation.

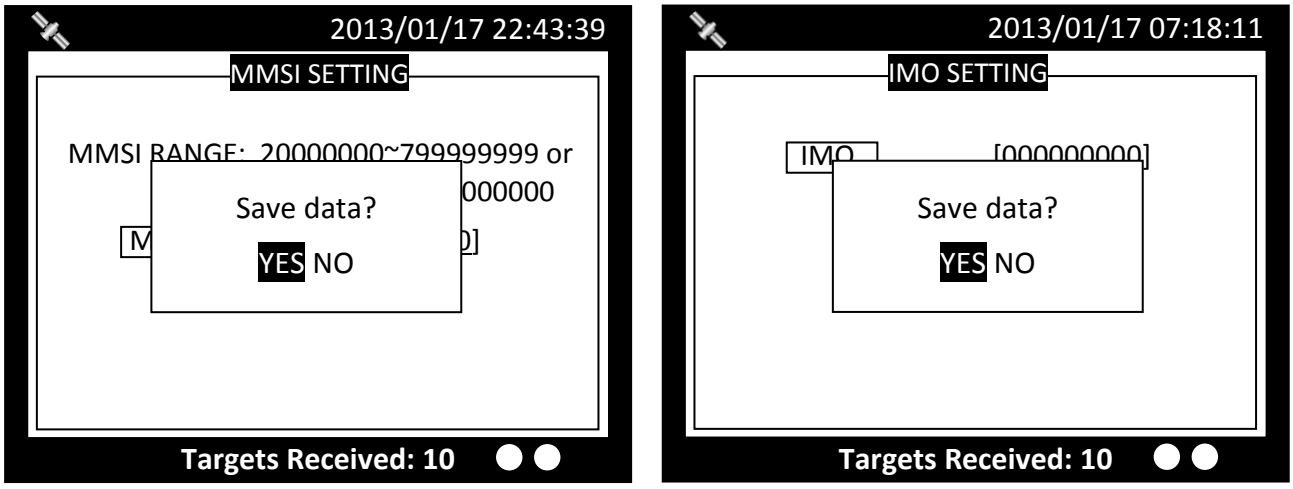


Figure 78 Save Data

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.

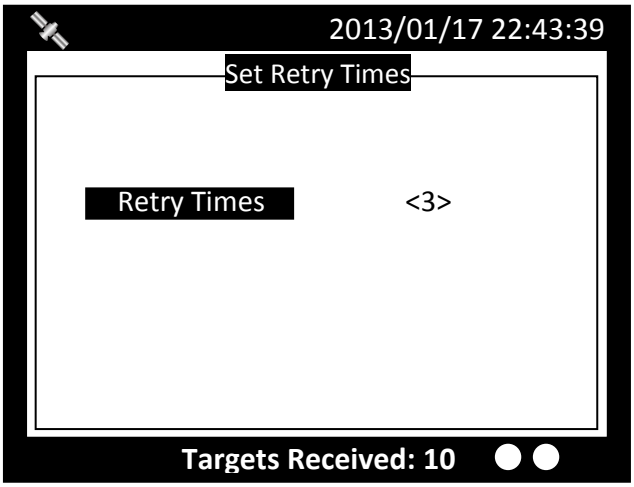


Figure 79 Retry Times

4.8 Transceiver

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

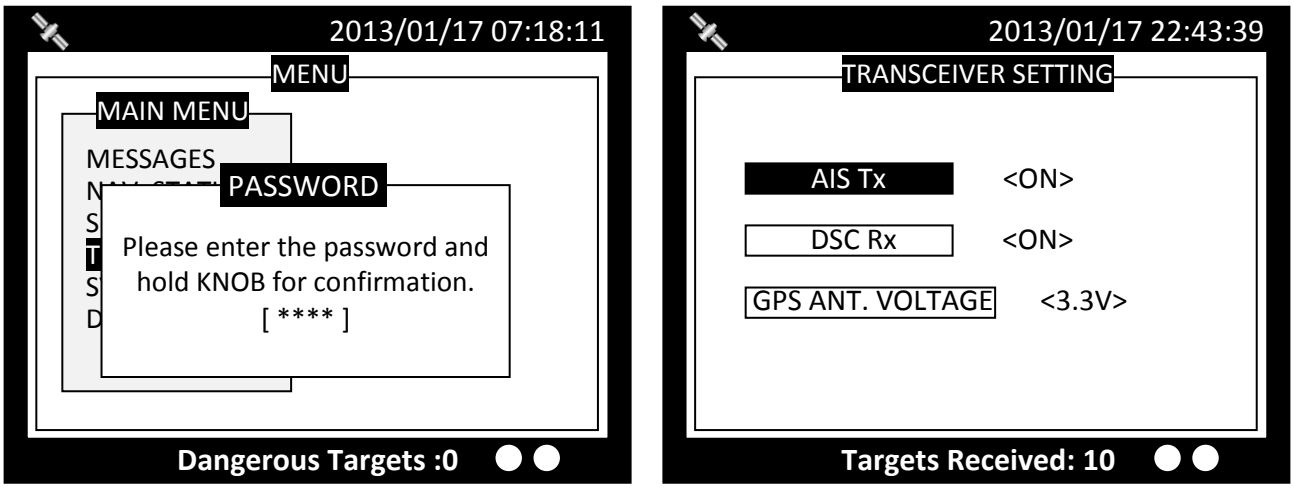


Figure 80 Transceiver

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.

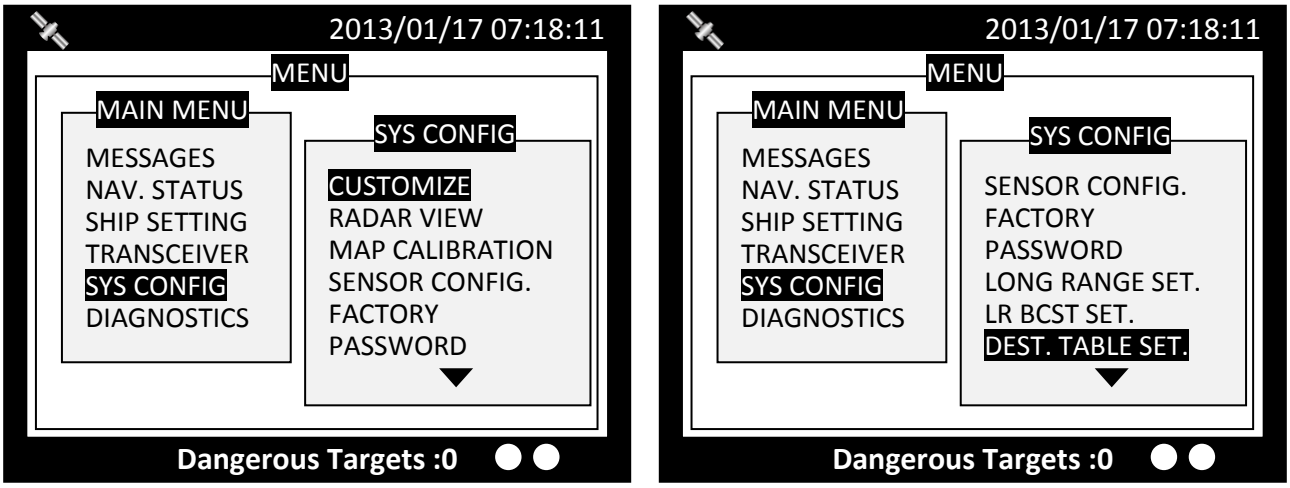


Figure 81 System configuration

4.9.1 Customize

Customize provides personalization settings.

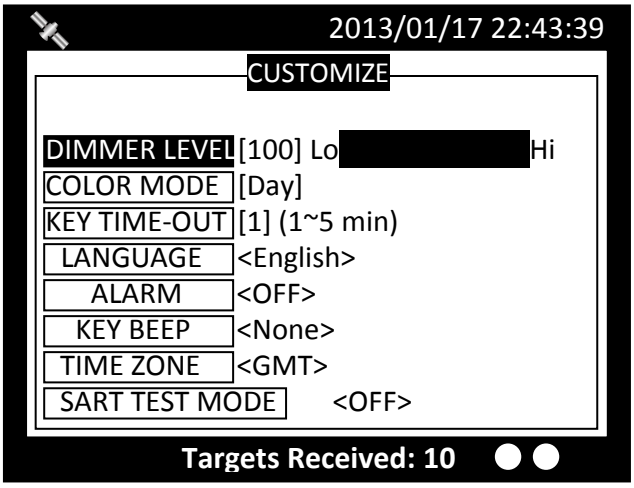


Figure 82 Customize

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

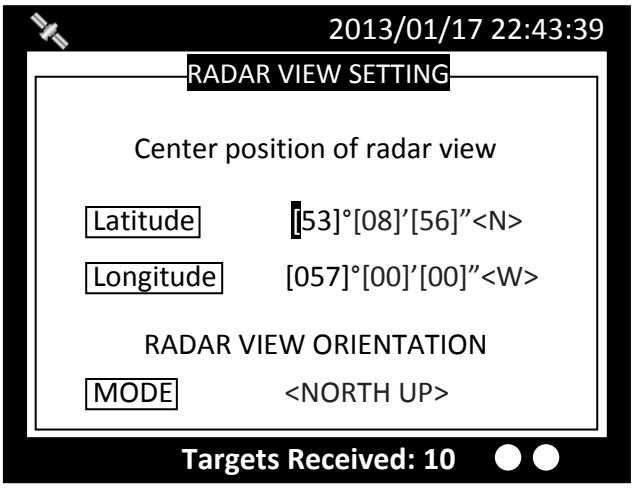


Figure 83 Radar View Setting

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 **knob** to select either latitude or longitude to offset. Press **knob** to enter input mode. Turn **knob** to select an offset value. Once finished press **ESC** to return to the previous level to continue the setting.

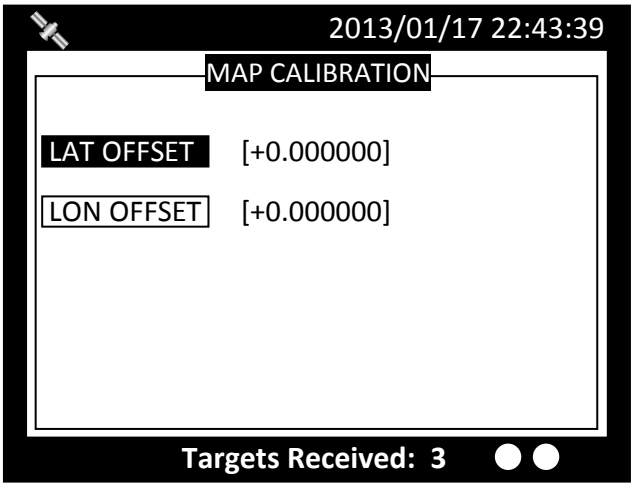


Figure 84 Map Calibration

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 **knob** to select a port to modify and press **knob** to change the specified port baud rate. Turn **knob** to change the desired rate. When finished, press **knob** again to return to the previous level.

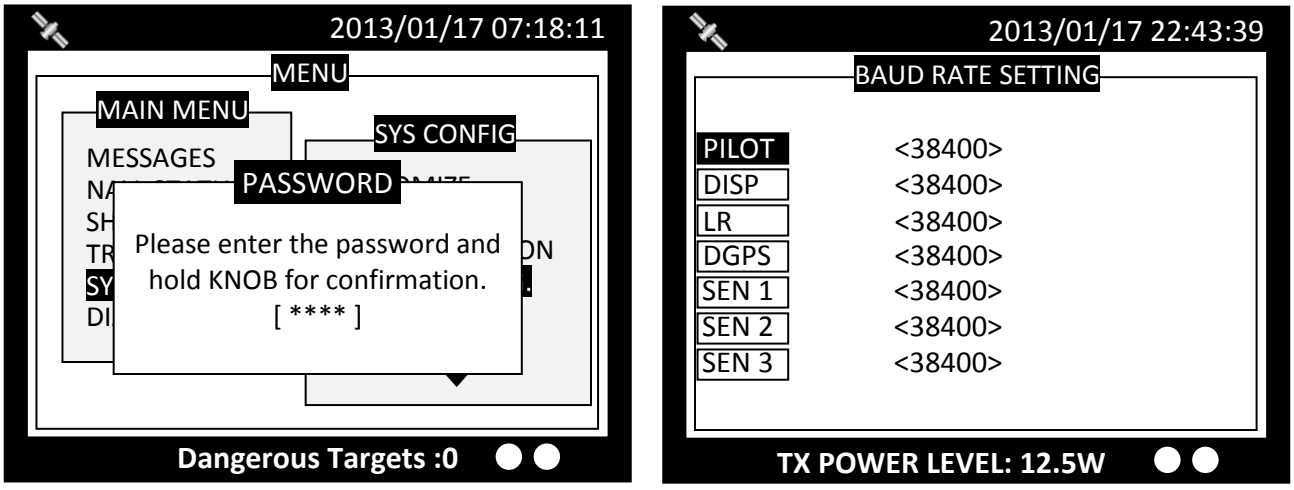


Figure 85 Baud Rate Setting

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

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

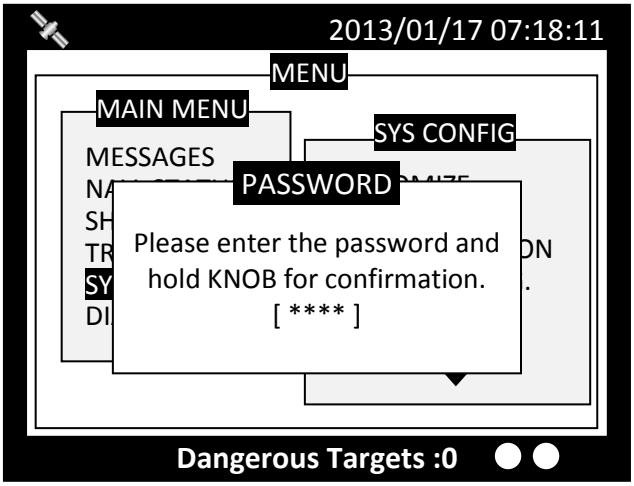


Figure 86 Factory

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

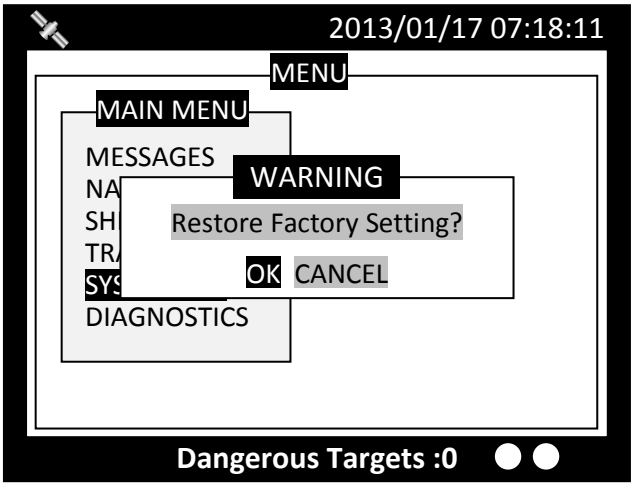


Figure 87 Factory Setting

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 **knob** to traverse the items and press **knob** to enter input mode. Under input mode, turn **knob** to select text position and press **knob** to confirm. Repeat till all four values are entered.

Figure 88 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**.

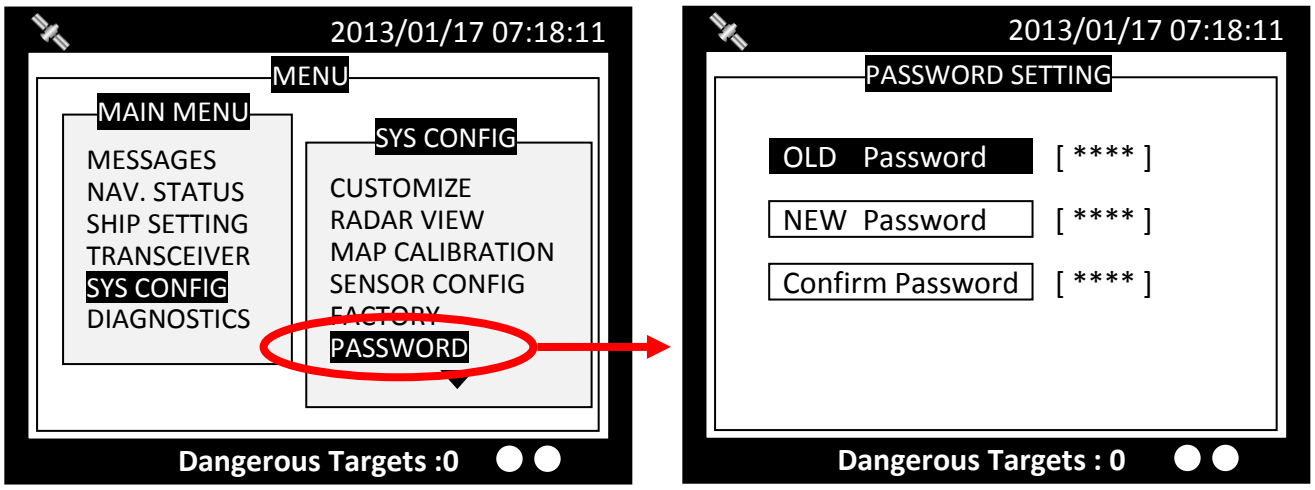


Figure 89 Changing Password

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**.

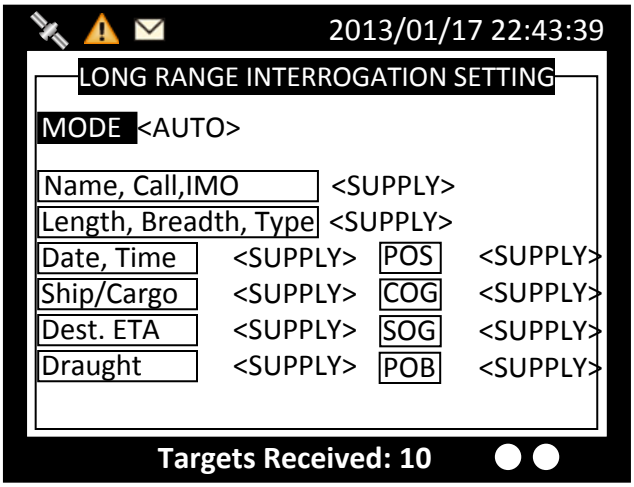


Figure 90 Long Range Setting

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.

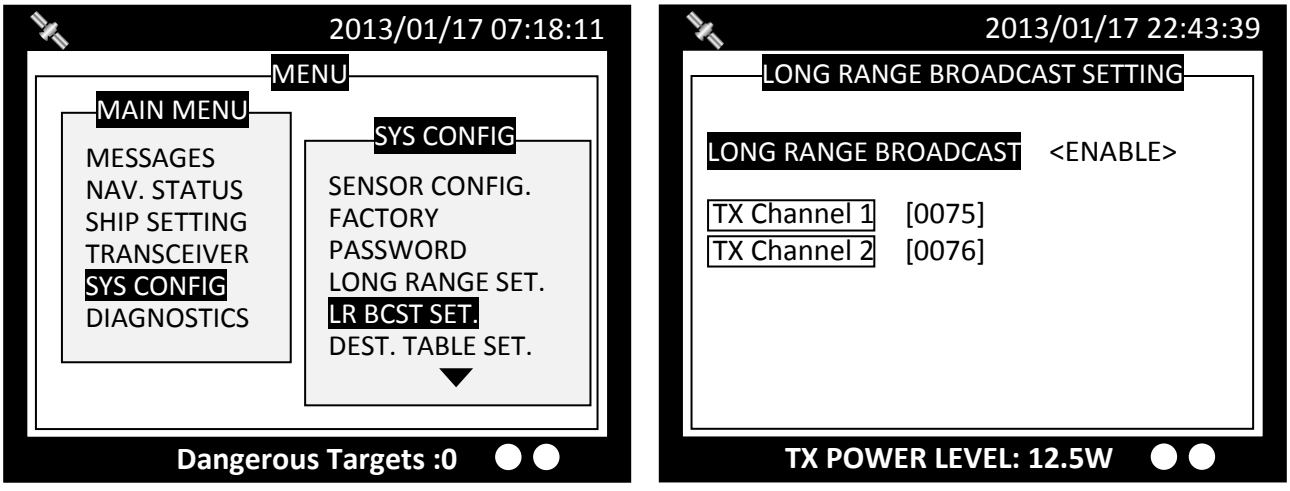


Figure 91 Long Range Broadcast

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.

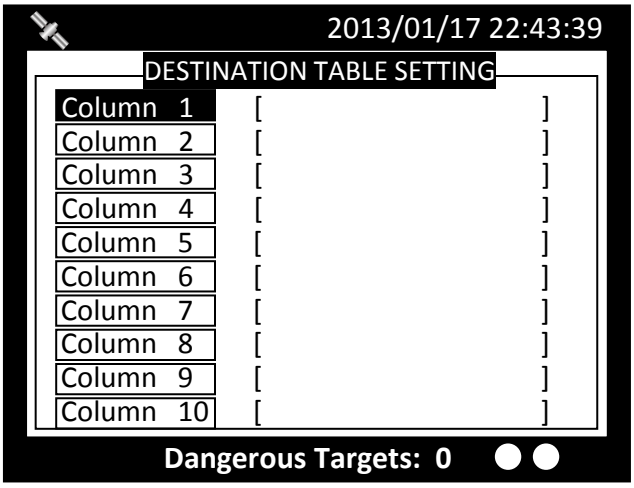


Figure 92 Destination Table Setting

4.10 Diagnostics

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

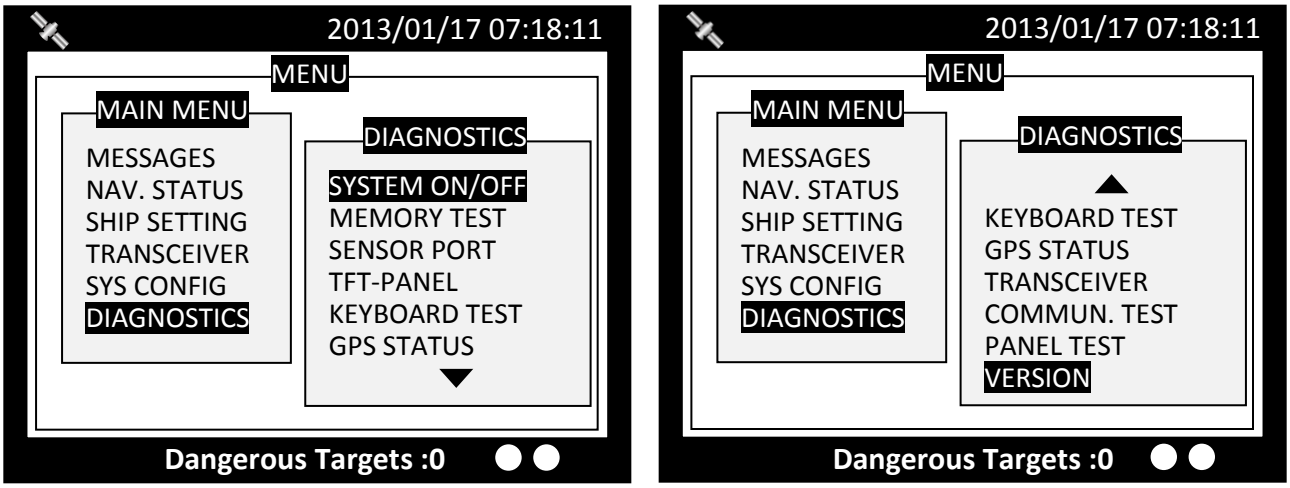


Figure 93 Diagnostic

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)

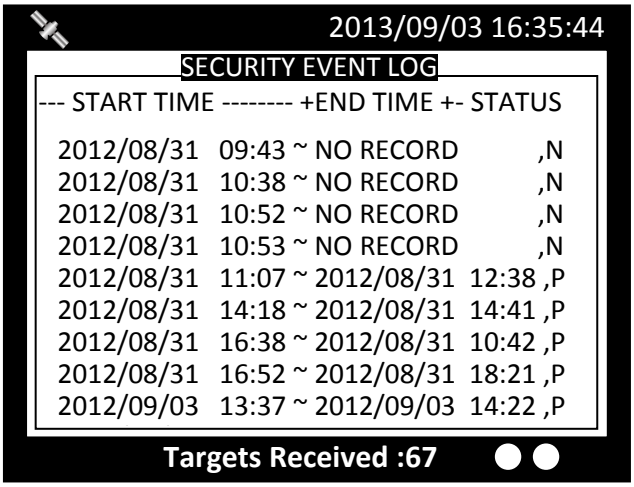


Figure 94 System On/Off

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

4.10.2 Memory Test

This option provides memory testing on the unit.

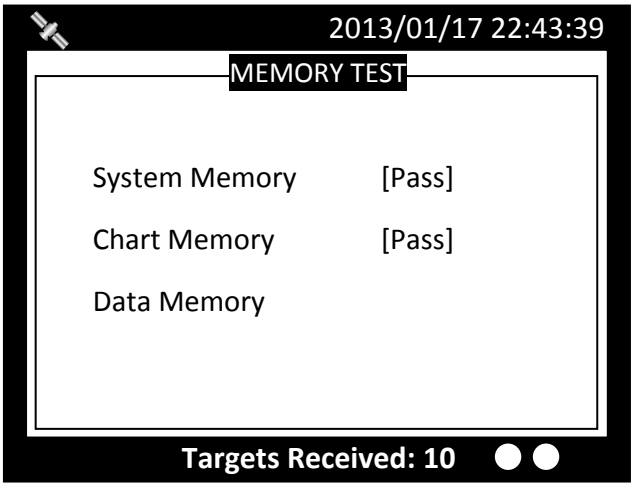


Figure 95 Memory Test

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

4.10.3 Sensor Port

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

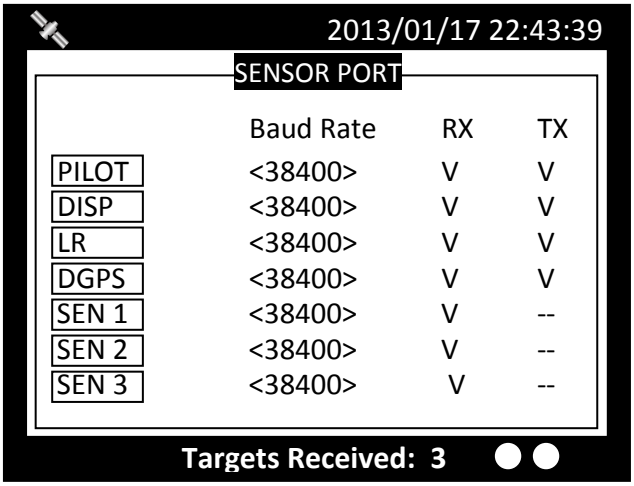


Figure 96 Sensor Port

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.

Figure 97 TFT-Panel

4.10.5 Keyboard Test

This option provides keyboard testing.

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

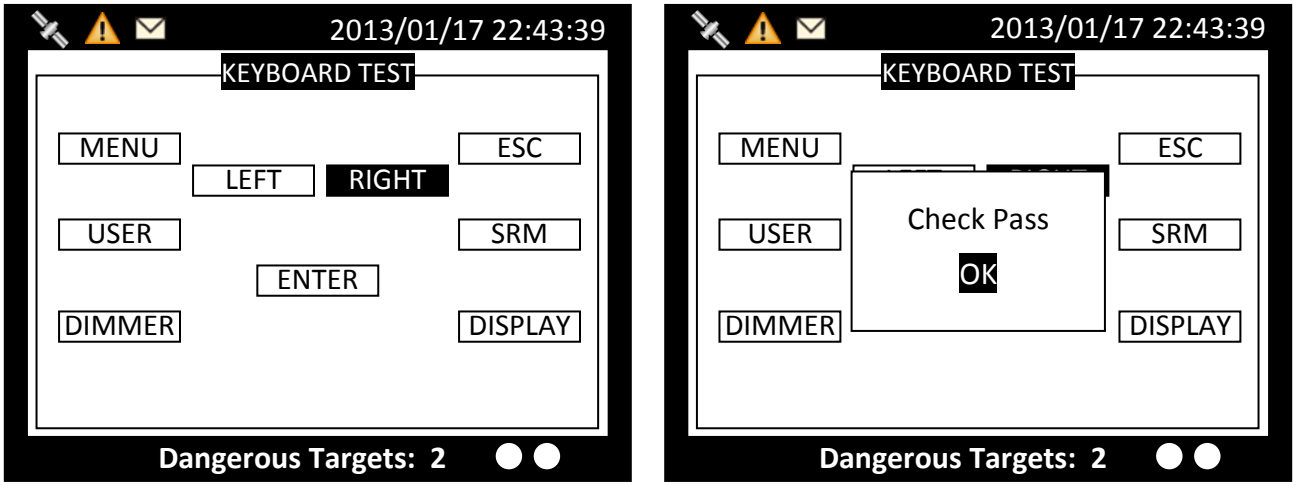


Figure 98 Keyboard Test

After all buttons are tested, a message will indicate. Press **knob** 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.

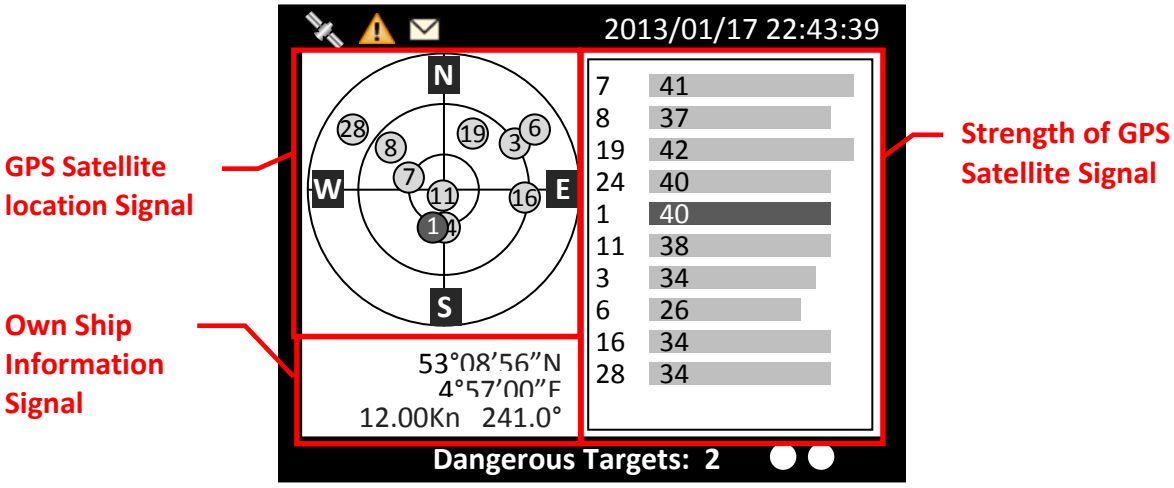


Figure 99 GPS Status

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

4.10.7 Transceiver

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

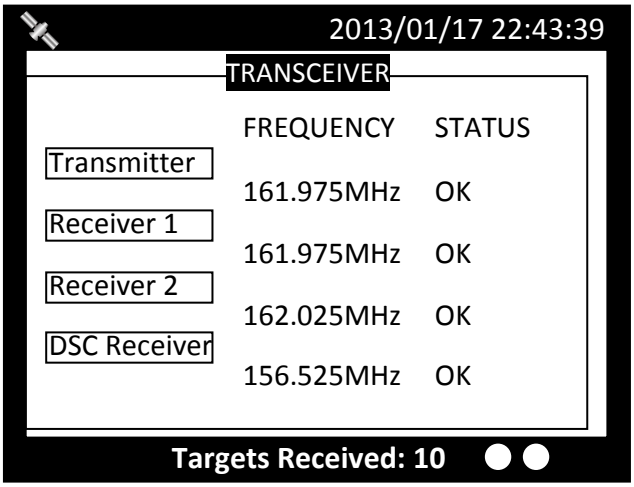


Figure 100 Transceiver

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.

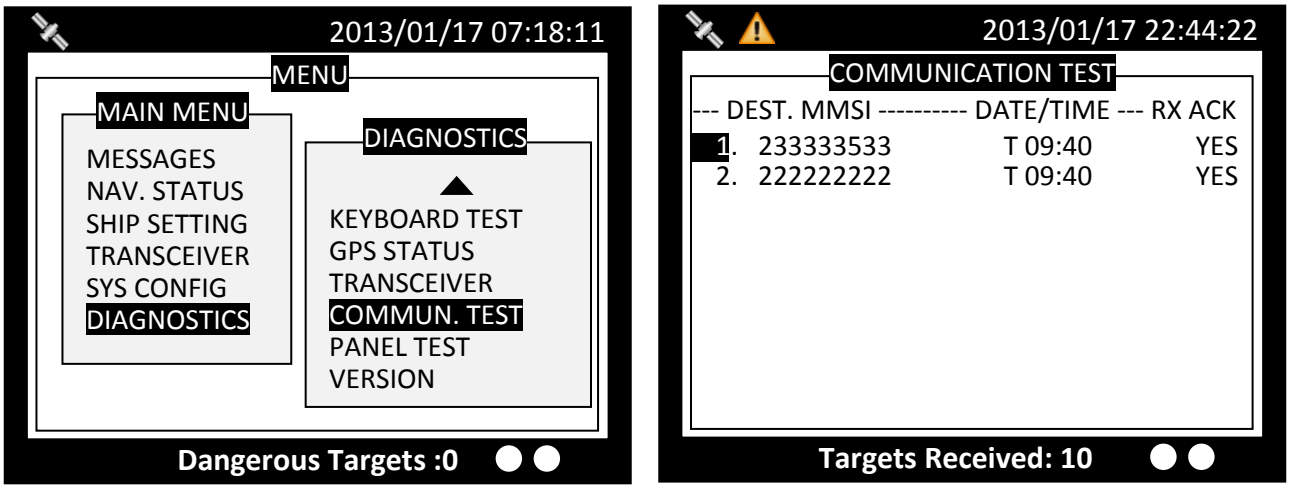


Figure 101 Communication Test

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.

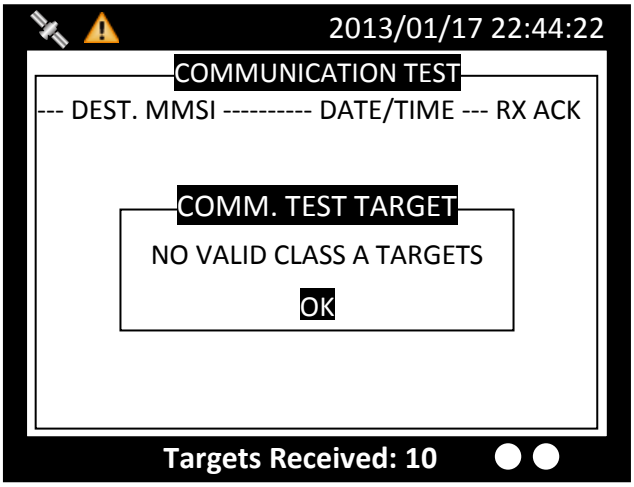


Figure 102 No Valid Targets

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

Figure 103 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.

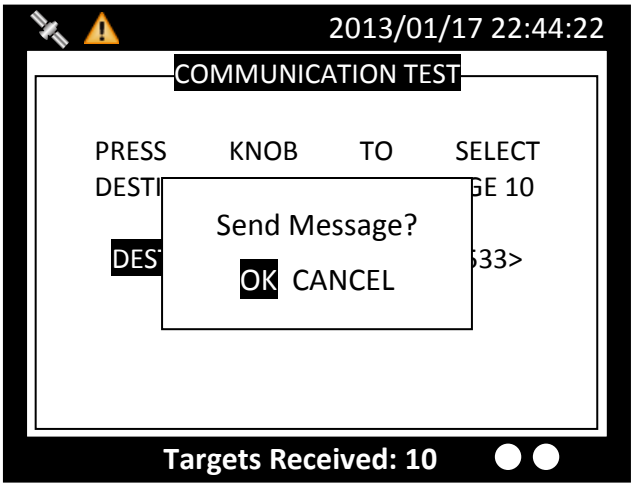


Figure 104 Send Message

4.10.9 Panel Test

Test the brightness of the screen.

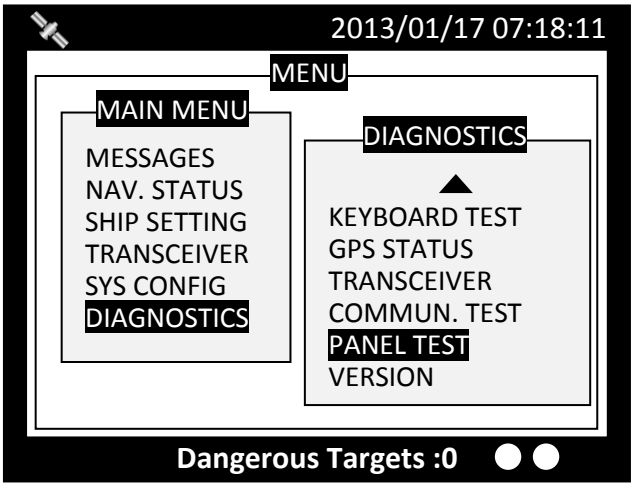


Figure 105 Panel Test

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

Figure 106 Test with Size and Brightness

4.10.10 Version

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

Figure 107 Version

5 TECHNICAL SPECIFICATIONS

5.1 Applicable Standards

IEC 61993-2 Ed. 2, 2012	IEC 62288 Ed. 1.0, 2008
IEC 60945 Ed. 4, 2002	IEC 62388 Ed. 1.0, 2007
IEC 61162-1 Ed. 4, 2010	ITU-R Recommendation M.1084-5
IEC 61162-2 Ed. 1, 1998	ITU-R M.493
IMO MSC.74 (69) Annex 3	ITU-R M.541
ITU-R Recommendation M.1371-4	
IEC 61108-1, Ed. 2, 2003	

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 (30/41 dBm ± 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^{-2}
Spurious Response Rejection	≧ 70 dB for signal @ -104 dBm; BER ≦ 1 %
Blocking	≧ 84 dB for signal @ -104 dBm; BER ≦ 1 %

5.4 GPS Receiver (Internal)

Receiving Channels	50 channels
Tracking & Navigation Sensitivity	≧ -159 dBm
Reacquisition Sensitivity	≧ -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	Basic coastline map/ Radar View/ Alphanumeric views /Satellite View
Dimmer Control	Step-less Setting

5.7 Keypad & Knob

6 Keypads with Back-light	1 for SRM, 1 for Menu, 1 for Dimmer, 1 for ESC, 1 for Display, 1 for Nav. Status
Knob	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	≦2.5 kg

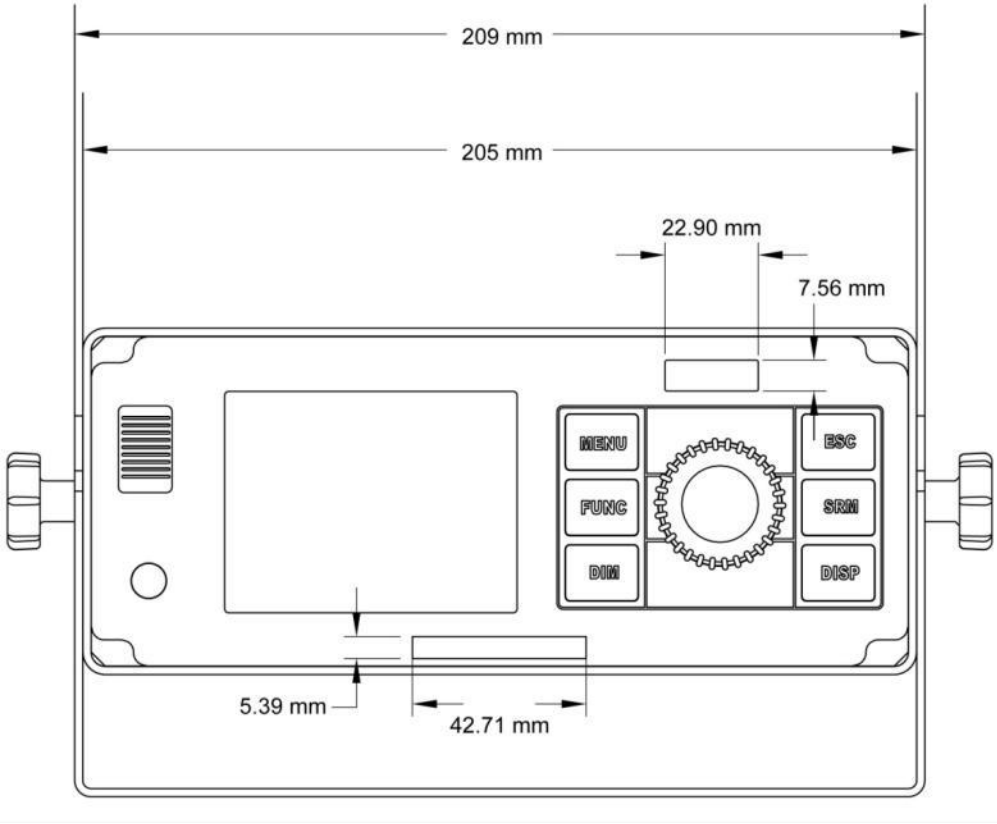
5.11 Pilot Plug

Cable length	2 m
Connector type	Std. Sex 206486-2

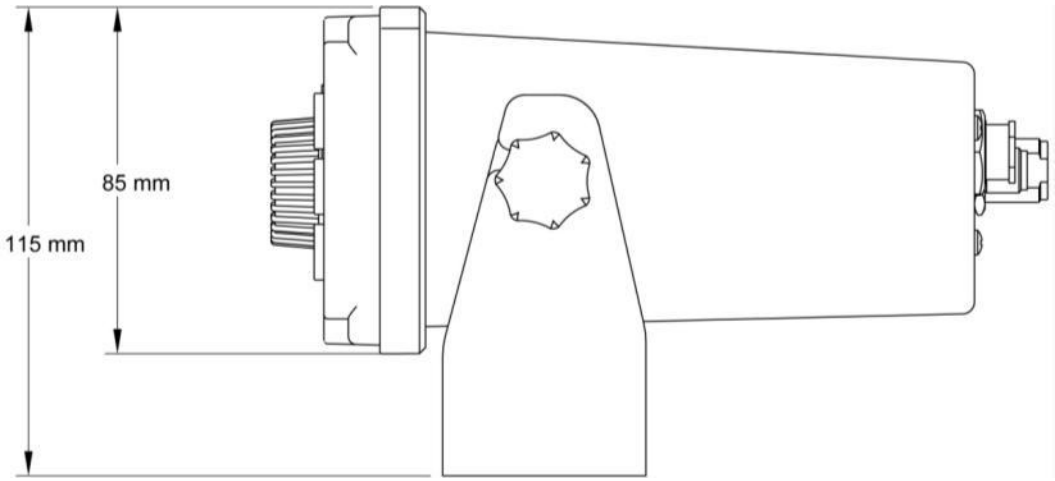
6 MECHANICAL DIMENSIONS

6.1 CAMINO-701 Transponder Main Unit

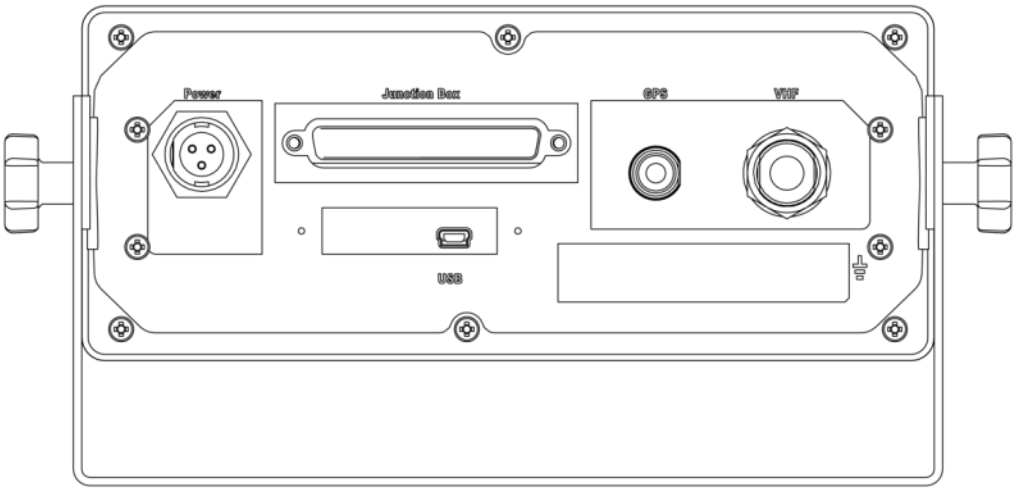
Front (size: mm)



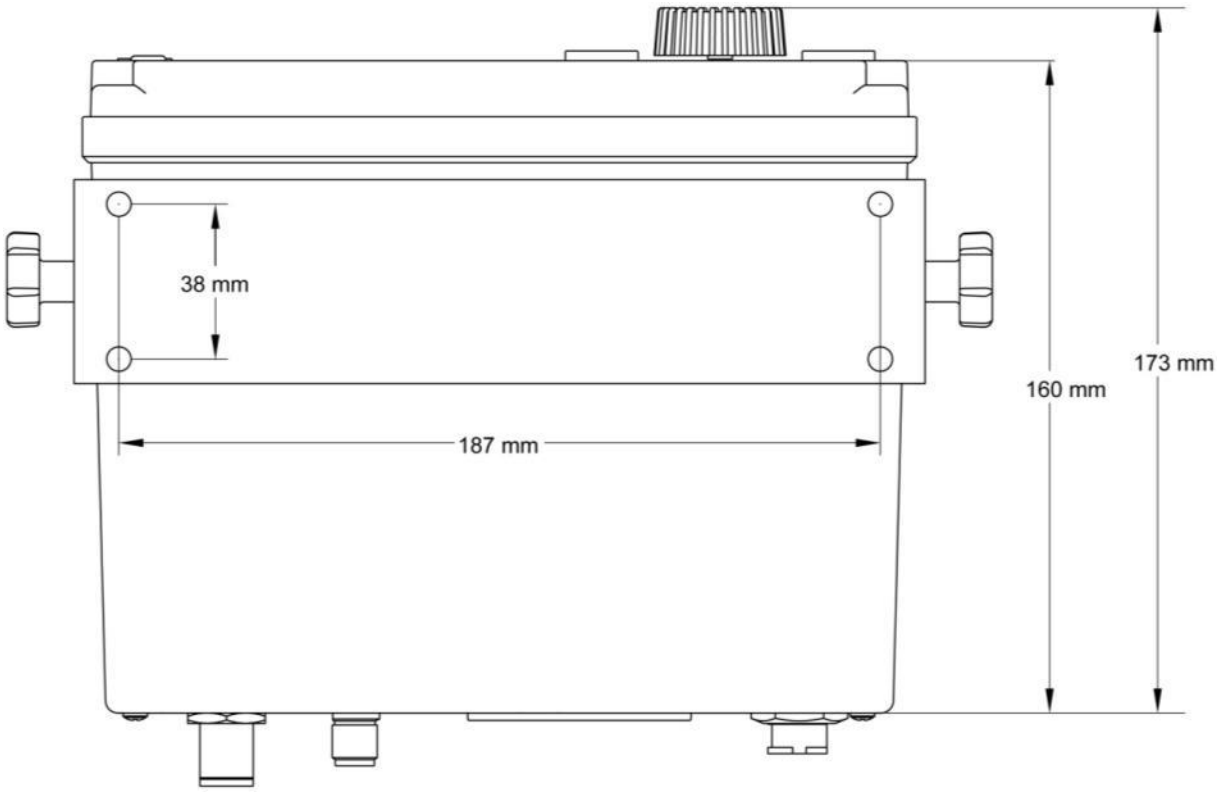
Side (size: mm)



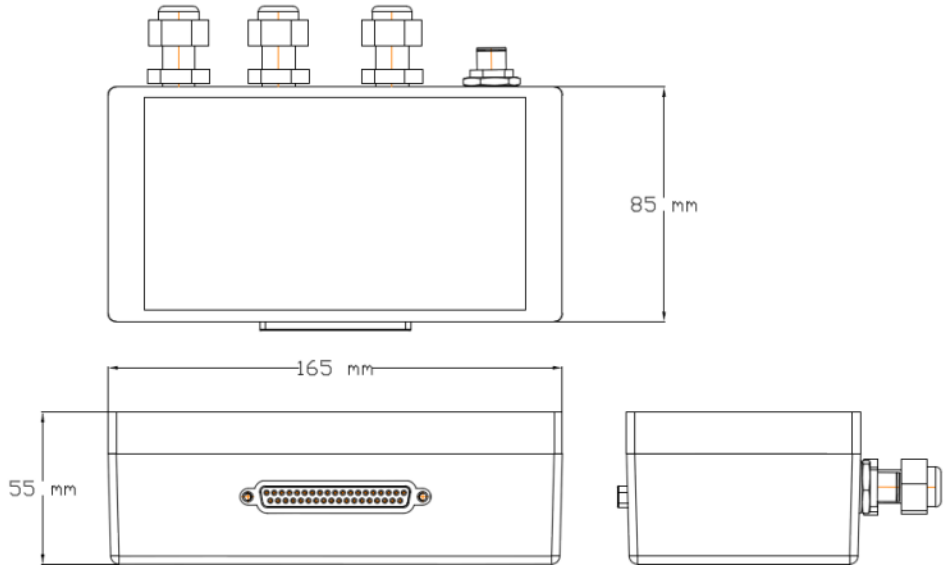
Back (size: mm)



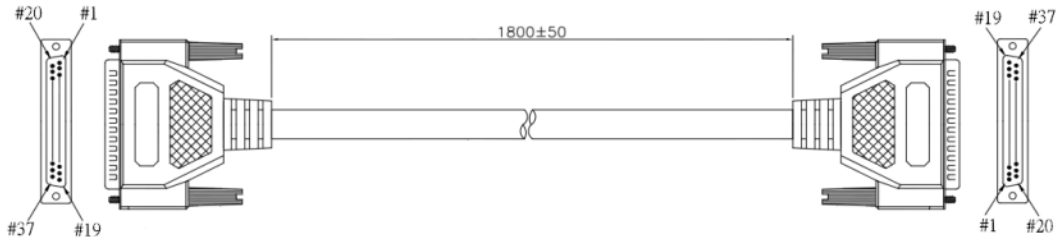
Bottom (size: mm)



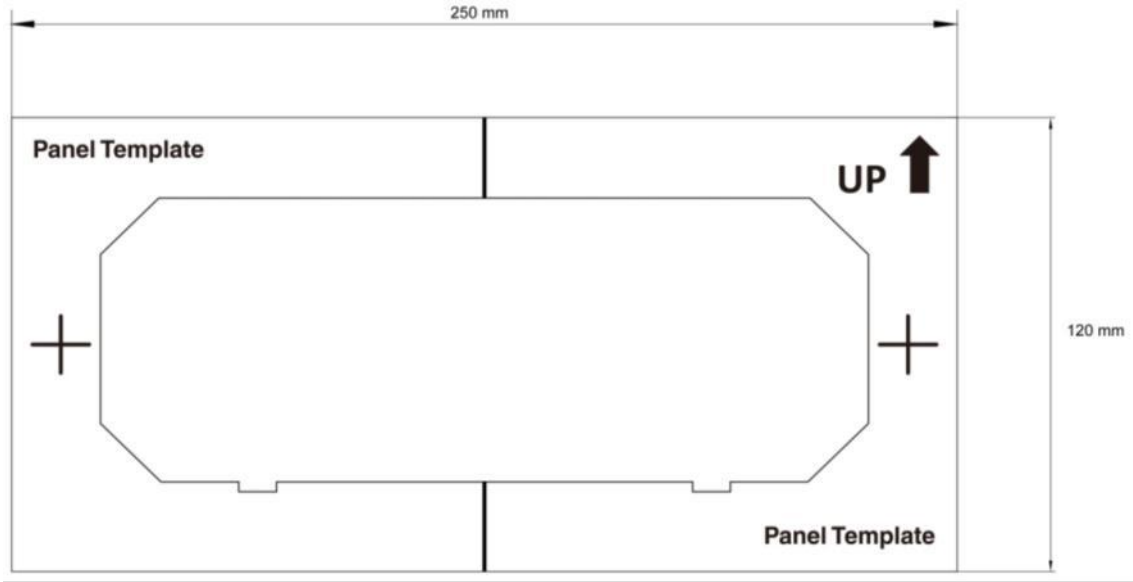
6.2 Junction Box



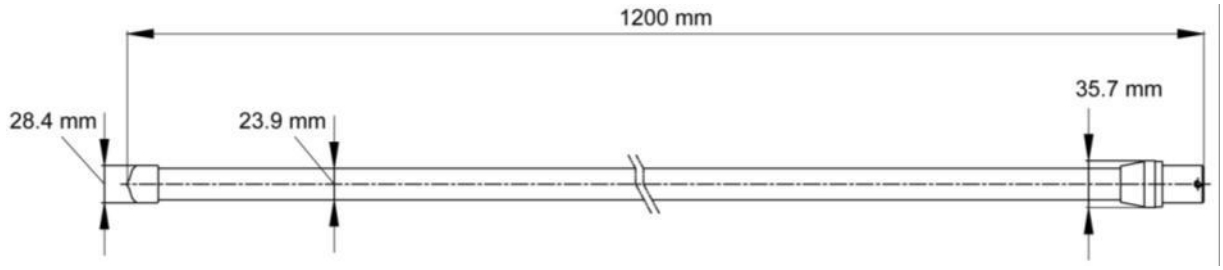
6.3 Extension Cable



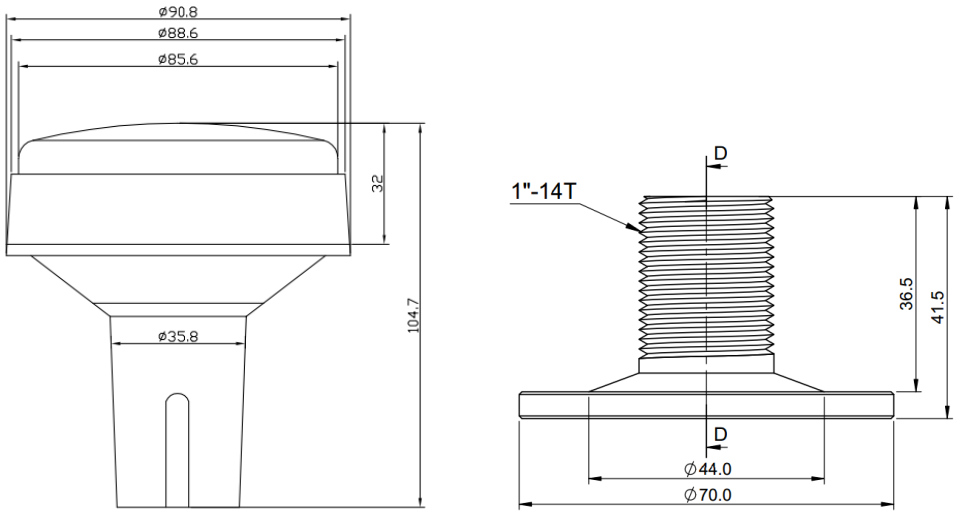
6.4 Mounting Template (not to scale)



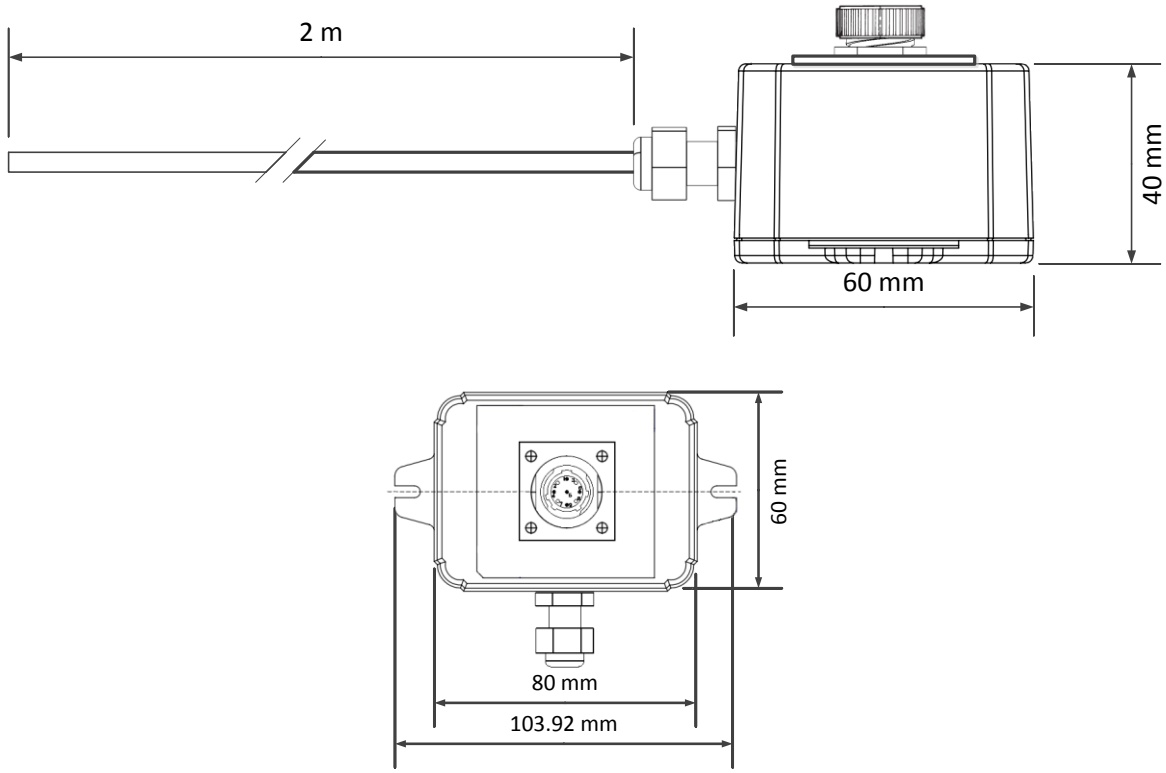
6.5 VHF Antenna



6.6 GPS Antenna



6.7 Pilot Plug



7 TROUBLESHOOTING

Use the following guide to perform simple troubleshooting in case the transponder is not function accordingly.

Symptom	Possible Cause	Solution
Transponder cannot power on	Faulty connector to power Polarity reverse Power supply current too low	Check power connection Check power connection Check power supply
No picture on display	Unit not powered up Dimmer level set too low	Press power key Increase Dimmer level
No map detail	Coastline detail not active	Switch to coastline view
No GPS position data	Antenna or cabling problem	Check antenna cable and connections
No AIS transmission	MMSI not entered Transmitter disabled Power supply voltage too low	Enter MMSI number Enable transmitter Check power supply
No AIS target	VHF cabling problem	Check antenna cable and connections
AIS range seems too low	VHF antenna and cabling	Check VHF antenna and cable installation
Sensor ports not response	Cable installation	Check related wiring
Data port not response	Cable installation	Check related wiring

8 ABBREVIATIONS

Terms of abbreviations:

ACK	Acknowledgement	**AtoN**	Aid to Navigation
AIS	Automatic Identification System	**AUTO**	Automatic
ALR	Alarm	**AUX**	Auxiliary
ANT	Antenna		
BIIT	Built-In Integrity Test	**BRG**	Bearing
CH	Channel	**CPA**	Closest Point of Approach
COG	Course Over Ground		
DEST/DESTN	Destination	**DISP**	Display
DISP	Display	**DIST**	Distance
DGNSS	Differential GNSS	**DSC**	Digital Selective Calling
DGPS	Differential GPS	**DTE**	Data Terminal Equipment
ECDIS	Electronic Chart Display and Information System	**EPIRB**	Electronic Position Indicating Radio Beacon
ECS	Electronic Chart System	**ESC**	Escape
EGNOS	European Geo-stationary Navigational Overlay System	**ETA**	Estimated Time of Arrival
ENC	Electronic Navigation Chart	**EXT**	External
EPFS	Electronic Position Fixing System		
FCC	Federal Communications Commission	**FSK**	Frequency Shift Keying
FM	Frequency Modulation	**FUNC**	Function
GAGAN	GPS-aided geo-augmented navigation	**GND**	Ground
GLONASS	Global Orbiting Navigation and Safety System	**GNSS**	Global Navigation Satellite System
GMDSS	Global Maritime Distress and Safety System	**GPS**	Global Positioning System
GMSK	Gaussian Minimum Shift Keying	**GYRO**	Gyro Compass
HDG	Heading		
IALA	International Association of Lighthouse Authorities	**IMO**	International Maritime Organisation
I/O	Input/Output	**IN**	Input
ID	Identification	**INFO**	Information
IEC	International Electotechnical Commission	**ITU-R**	International Telecommunications Union - Radio
KN	Knots		
LAT	Latitude	**LON**	Longitude

LCD	Liquid Crystal Display	**LR**	Long Range
MED	Maritime Equipment Directive	**MMSI**	Maritime Mobile Service Identity
Min	Minute	**MOB**	Man Overboard
MKD	Minimum Keyboard and Display	**MSAS**	Multi-functional Satellite Augmentation System
NAV	Navigation	**NMEA**	National Marine Electronics Association
NM	Nautical Mile		
OUT	Output		
PI	Presentation Interface		
RAIM	Receiver Autonomous Integrity Monitoring	**ROT**	Rate of Turn
RH	Relative Humidity	**RTCM**	Radio Technical Commission for Maritime services
RNG	Range	**Rx**	Receive / Receiver
S	Second	**SOG**	Speed Over Ground
SART	Search and Rescue Transponder	**SOLAS**	Safety of Life at Sea
SAR	Search and Rescue	**SRM**	Safety Related Message
SBAS	Satellite Based Augmentation System	**SYS**	System
TCPA	Time to Closest Point of Approach	**Tx**	Transmit
TDMA	Time Division Multiple Access	**Tx / Rx**	Transmit / Receive
UHF	Ultra High Frequency	**UTC**	Universal Time Co-ordinate
USB	Universal Serial Bus		
VDL	VHF Data Link	**VSWR**	Voltage Standing Wave Ratio
VHF	Very High Frequency		
WAAS	Wide Area Augmentation System		

APPENDIX (A)

A.1 IEC 61162-2 Data Interface

The CAMINO-701 Class A AIS Transponder provides 2 types of IEC 61162-2 data interfaces for user applications. The first interface type includes 3 input-only sensor data ports and the second interface type includes 4 bidirectional input/output ports. Data port for each interface type will be described in the following section below.

A.1.1 Sensor Data Input Ports

The schematic of input-only sensor data port is shown in Figure A1. The schematic includes a standard V.11 transceiver IC (Texas Instruments SN65176B) combined with high speed photocoupler which are used as the main components to receive external data. The transceiver IC is isolated from external input. To avoid signal reflection, the transceiver IC has an optional built-in 120Ω loop termination, which is selectable by the dip-switch on the junction box and the switch should be set to on position when connecting external data source with long cable. All sensor data-input ports are isolated from one another and are also isolated from internal power supply. The input impedance on A/B wires is greater than 12 KΩ and the levels on the A/B wires are defined in the following:

- Logic low input: A-B < -0.2V
- Logic high input: A-B > +0.2V

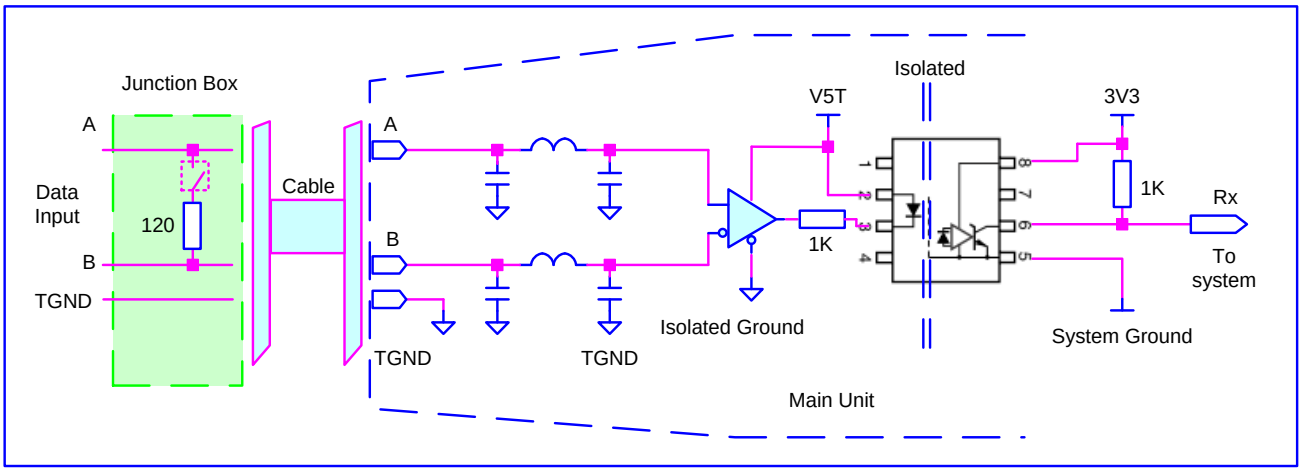


Figure A1 Schematic of sensor data input port.

A.1.2 Bidirectional Data Ports

The schematic of bidirectional data port is shown in Figure A2. The schematics inscludes an isoltated full duplex RS-485 transceiver IC (Texas Instrument ISO3080) which is used as the main component to handle both data input and output from external data source. The transceiver IC is isolated from external input. To avoid signal reflection, the transceiver IC has an optional built-in 120Ω loop termination, which is selectable by the dip-switch on the junction box and the switch should be set to on position when connecting external data source with long cable. All bidirectional data ports are isolated from one another and are also isolated from internal power supply. The transceiver internal power supply is fully isolated from the external power supply.

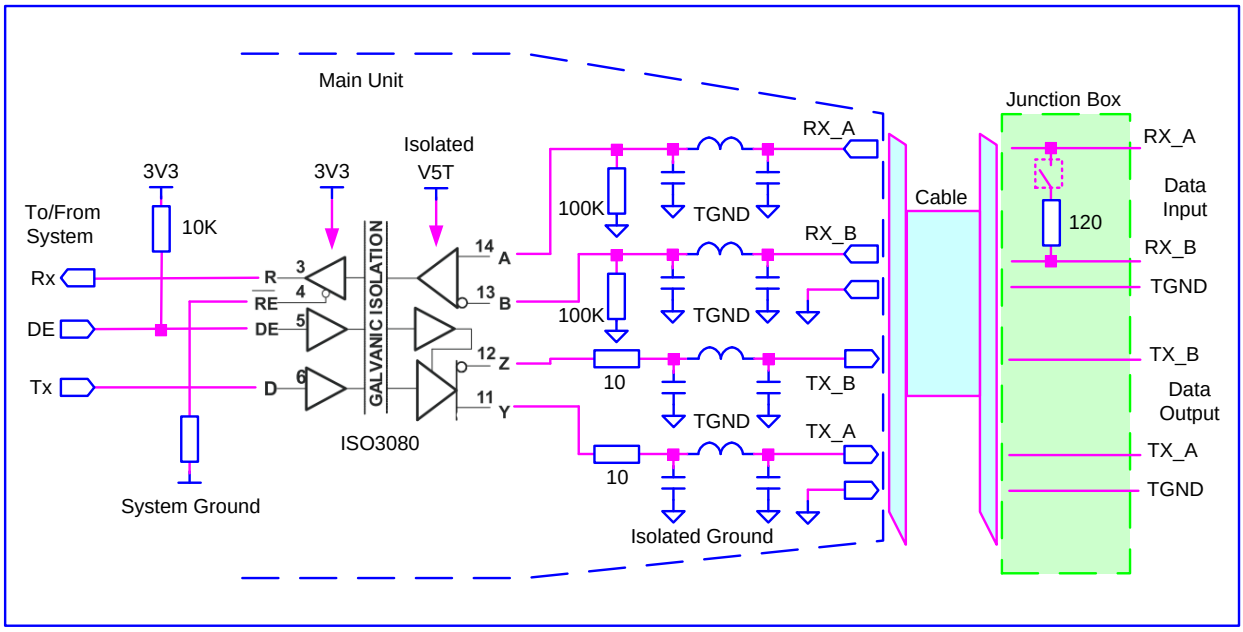


Figure A2 Schematic of bidirectional data port.

The output driver capability of bidirectional data port can provide a maximum of 60mA, and the minimum differential output swing under 100 Ω 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 Hardware Input/Output Circuit

Refer to sections A.1.1 and A.1.2.

A.2 Presentation Interface of CAMINO-701

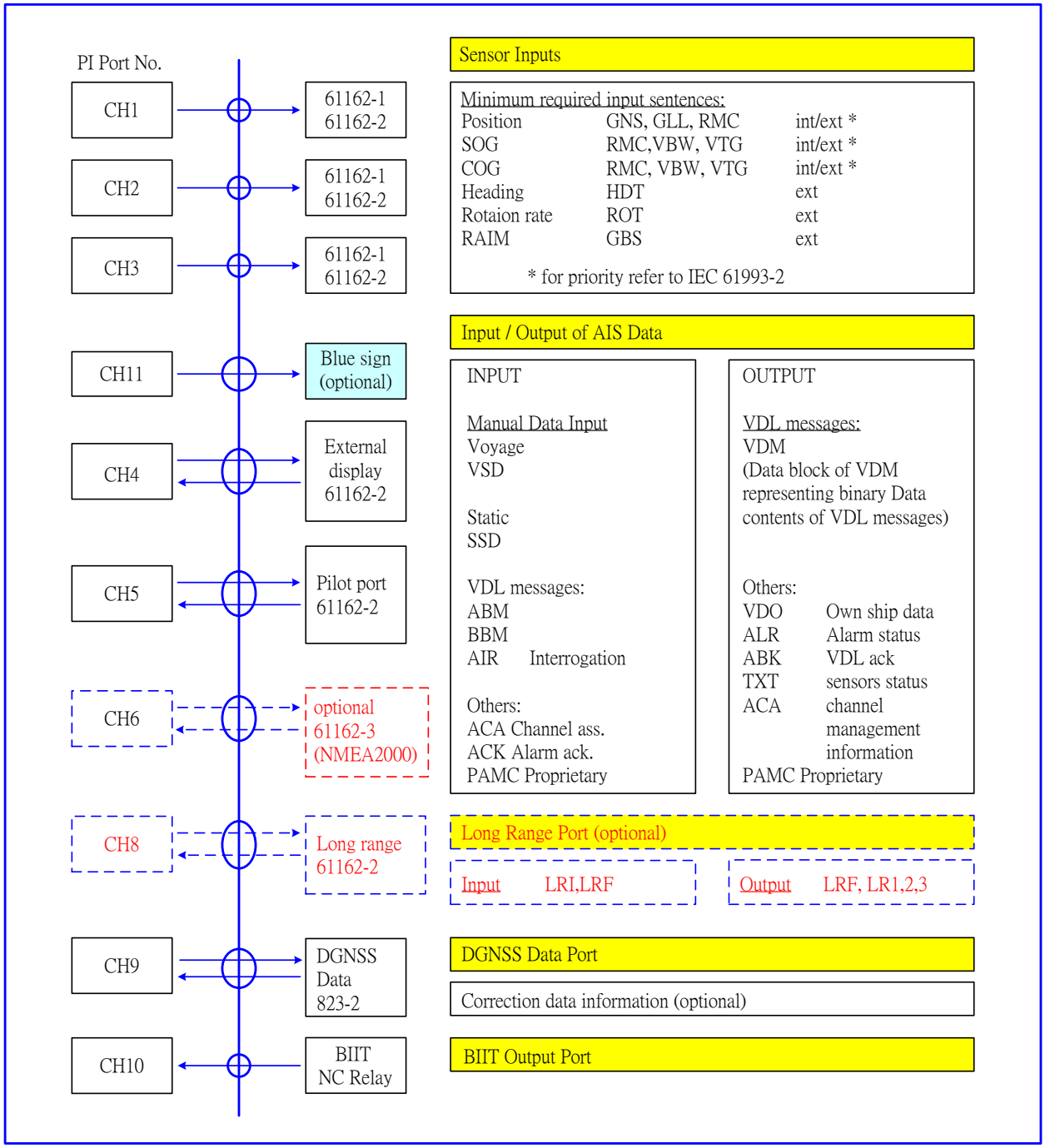


Figure A3 Presentation Interface of CAMINO-701

A.3 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.4 Transmission Interval

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

A.5 Interpretation of Input Sentences

A.5.1 ABM – AIS Addressed Binary and Safety Related Message

This sentence supports ITU-R M.1371 Messages 6, 12, 25, 26 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	xxxxxxxxx	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.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,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 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.5.4 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, EPV, SSD, VSD, TXT.	

A.5.5 AIR – AIS Interrogation Request

This sentence supports ITU-R M.1371 messages 15 and 10. It provides an external application with the means to initiate requests for specific ITU-R M.1371 messages from AIS unit.

$--AIR,xxxxxxxxx,x.x,x,x.x,x,xxxxxxxxx,x.x,x*hh<CR><LF>			
Field No.	**Format**	**Description**	**Remark**
1	xxxxxxxxx	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	xxxxxxxxx	MMSI of interrogated station-2	
7	x.x	Number of messages requested from station-2	
8	x	Message sub-section	ignored

A.5.6 BBM – AIS Broadcast Binary Message

This sentence supports generation of ITU-R M.1371 binary messages 8, 14, 25, and 26. This provides the application with a means to broadcast data, as defined by the application only.

!--BBM,x,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	
6	s—s	Encapsulated data	
7	x	Number of fill-bits	

A.5.7 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.5.8 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.5.9 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.5.10 GLL – Geographic Position – Latitude/Longitude

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

$--GLL, llll.ll, a, yyyyy.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.5.11 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,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.5.12 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,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,xx, 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.5.13 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.5.14 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	

A.5.15 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,xxxxxxxxx,c—c,c—c,c—c*hh<CR><LF>			
Field No.	**Format**	**Description**	**Remark**
1	x	Sequence number	
2	xxxxxxxxx	MMSI of requestor	
3	c—c	Name of requestor	
4	c—c	Function request	
5	c—c	Function reply status	

A.5.16 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,xxxxxxxxx,xxxxxxxxx,llll.ll,a,yyyyy.yy,a,llll.ll,a,yyyyy.yy,a*hh<CR><LF>			
Field No.	**Format**	**Description**	**Remark**
1	x	Sequence number	
2	a	Control flag	
3	xxxxxxxxx	MMSI of requestor	
4	xxxxxxxxx	MMSI of destination	
5	llll.ll,a	Latitude – N/S	
6	yyyyy.yy,a	Longitude – E/W	
7	llll.ll,a	Latitude – N/S	

8	yyyyy.yy,a	Longitude – E/W	

A.5.17 RMC – Recommended Minimum Specific GNSS Data

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

$--RMC, hhmmss.ss, A, llll.ll,a, yyyyy.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	llll.ll,a	Latitude, N/S	
4	yyyyy.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.5.18 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.5.19 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.5.20 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.5.21 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.5.22 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.5.23 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,hhmmss.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	hhmmss.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.5.24 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.5.25 PAMC, DBG – Proprietary Sentences, Debug

The proprietary sentences are additional sentences only applicable to this product. Its main usage is for enabling testing mode and parameter settings.
This sentence is used for configuration. It commands unit with given parameters.

$PAMC,C,c-c,x,x,x,x,x,x,x,x*hh<CR><LF>			
Field No.	**Format**	**Description**	**remark**
1	C	Command : “C”	
2	c-c	Function type. For example, DBG.	
3	x	Parameter Id 1 , 0-998	
4	x	Parameter value 1 , 0- 1000000000	
5	x	Parameter Id 2 , 0-998	
6	x	Parameter value 2, 0- 1000000000	
7	x	Parameter Id 3 , 0-998	
8	x	Parameter value 3, 0- 1000000000	
7	x	Parameter Id 4 , 0-998	
8	x	Parameter value 4, 0- 1000000000	

This sentence is used for retrieving responses.

$PAMC,R,c-c,x,x,x,x,x,x,x,x*hh<CR><LF>			
Field No.	**Format**	**Description**	**Remark**
1	R	Response : “R”	
2	c-c	Function type. For example, DBG.	
3	x	Parameter Id 1 , 0-998	
4	x	Parameter value 1 , 0- 1000000000	
5	x	Parameter Id 2 , 0-998	
6	x	Parameter value 2, 0- 1000000000	
7	x	Parameter Id 3 , 0-998	
8	x	Parameter value 3, 0- 1000000000	

7	x	Parameter Id 4 , 0-998	
8	x	Parameter value 4, 0- 1000000000	

A.5.26 PAMC, DSC – Proprietary Sentences, Digital selective calling

When AIS transponder receives DCS messages, this sentence is used to output DSC pattern.

$PAMC,R,DSC,c-c*hh<CR><LF>			
Field No.	**Format**	**Description**	**Remark**
1	c-c	DSC pattern	

A.6 Interpretation of Output Sentences

A.6.1 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.1371Message ID	
4	x	Message sequence number	
5	x	Type of acknowledgement	

A.6.2 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,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.6.3 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.6.4 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.6.5 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,xxxxxxxxx,xxxxxxxxx,c—c,c—c,xxxxxxxxx*hh<CR><LF>			
Field No.	**Format**	**Description**	**Remark**
1	x	Sequence number	
2	xxxxxxxxx	MMSI of responder	
3	xxxxxxxxx	MMSI of requestor	
4	c—c	Ship's name, 1 to 20 characters	
5	c—c	Call sign, 1 to 7 characters	
6	xxxxxxxxx	IMO number, 9-digit number	

A.6.6 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,xxxxxxxxx,xxxxxxxx,hhmmss.ss,llll.ll,a,yyyyy.yy,a,x.x,T,x.x,N*hh<CR><LF>			
Field No.	**Format**	**Description**	**Remark**
1	x	Sequence number	
2	xxxxxxxxx	MMSI of responder	
3	xxxxxxxx	Date: ddmmyyyy, 8 digits	

4	hhmmss.ss	UTC time of position	
5	llll.ll,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.6.7 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,xxxxxxxxx,c—c,xxxxxx,hhmmss.ss,x.x,x.x,x.x,x.x,x.x,x.x*hh<CR><LF>			
Field No.	**Format**	**Description**	**Remark**
1	x	Sequence number	
2	xxxxxxxxx	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.6.8 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,xxxxxxxxx,c—c,c—c,c—c*hh<CR><LF>			
Field No.	**Format**	**Description**	**Remark**
1	x	Sequence number	
2	xxxxxxxxx	MMSI of requestor	
3	c—c	Name of requestor	
4	c—c	Function request	
5	c—c	Function reply status	

A.6.9 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.6.10 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.6.11 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	

APPENDIX (B)

B.1 Monitoring of System Functions and Integrity

In case a failure is detected in one or more of the following functions or data, an alarm will be triggered and displayed on the menu-tree under Alarm List, and the system (transponder) will react as described in the following table.

Alarm's description text	Alarm ID	Reaction of the system (transponder)
AIS: Tx malfunction	001	Stop transmission
AIS: Antenna VSWR exceeds limit	002	Continue operation
AIS: Rx channel 1 malfunction	003	Stop transmission on affected channel
AIS: Rx channel 2 malfunction	004	Stop transmission on affected channel
AIS: Rx channel 70 malfunction	005	Continue operation
AIS: general failure	006	Stop transmission
AIS: UTC sync invalid	007	Continue operation using indirect or semaphore synchronisation
AIS: MKD connection lost	008	Continue operation
AIS: internal / external GNSS position mismatch	009	Continue operation
AIS: NavStatus incorrect	010	Continue operation
Heading sensor offset	011	Continue operation
AIS: active AIS SART	014	Continue operation
AIS: external EPFS lost	025	Continue operation
AIS: no sensor position in use	026	Continue operation
AIS: no valid SOG information	029	Continue operation using default data
AIS: no valid COG information	030	Continue operation using default data
AIS: Heading lost/invalid	032	Continue operation using default data
AIS: no valid ROT information	035	Continue operation using default data

B.2 Antenna VSWR Exceeds Limit

There is a built-in RF output power detector, which is used to monitor the VSWR of VHF antenna port. If the antenna VSWR exceeds limit, an alarm will be reported while the unit operates continuously. The system will output an ALR 002 at related PI port.

B.3 Detection of Tx Malfunction

A built-in lock detector (high active) is used to monitor the local oscillator (PLL circuit) of the transmitter. If the operation of PLL circuit becomes abnormal, a logic low (TX malfunction) will be sent from the lock detector to notify the system. At the same time, system will also output an ALR 001 at the related PI port.

B.4 Detection of Rx Malfunction

The CAMINO-701 also has 3 built-in lock detectors (high active) to monitor each local oscillator (PLL circuit) of receiver channel 1, channel 2, and channel 70 respectively. If the operation of PLL circuit becomes abnormal, a logic low level will be sent from the lock detector to notify the system. At the same time, the system will output ALR 003 or ALR 004 or ALR 005 at the related PI port to indicate the CH1 or CH2 or CH70 RX malfunctions respectively.

APPENDIX (C)

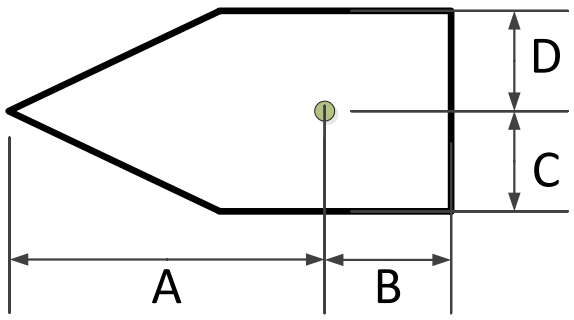
Installation and Maintenance Record

The following installation record should be completed and retained on board the vessel for maintenance records.

Vessel Information			
Vessel Name		**Flag State**	
IMO Number		**MMSI Number**	
Owner/Company		**Radio call sign**	
Type of vessel		**Gross tonnage**	
Length	**m**	**Beam**	**m**

AIS Class A Transponder Information			
Transponder S/N		**Pilot Plug S/N**	
Junction Box S/N		**GPS Ant. S/N**	
Password			
Power supply	**Voltage: V**	**Maximum output current: A**	
Note			

GPS/GNSS Antenna Location			
A= Distance to Bow	**m**	**C= Dist. To Port-Side**	**m**
B= Distance to Stern	**m**	**D= Dist. To Starboard**	**m**



Connected Sensors and Devices		
Connected Port	**Equipment**	**Model Number**
Sensor 1		
Sensor 2		
Sensor 3		
Ext Display Port		
Pilot Port		
Long Range Port		
DGNSS Data Port		
Other Device		

Installer Information		
Company Name		
Technician's Name		
Telephone/Mobile No.		
Address		
Place	**Date**	**Installer's Signature**

Software Revisions

The transponder is delivered with software version according to the following table which is to be filled in and maintained either by manufacturer, distributor, dealer, or installation company. When software update is done, the new software (firmware) version can be identified through MKD at MENU/DIAGNOSTICS/VERSION (please refer to section 4.10.10 in the manual). Each new software upgrade requires information recorded to reflect the change made.

Software Maintenance Record			
Software Version	**By**	**Date**	**Change**
1.0.6.23	AMEC	2013.04.12	Initial release

Note: