SIMRAD

V5035
Class A / Inland AIS

Operator and Installation Manual

English

www.navico-commercial.com

Preface

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Disclaimer

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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.

This device is meant to enhance situational awareness and may not prevent vessel collisions in all circumstances. It is your obligation to be aware of your surroundings and to ensure safe operation of the vessel.

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 power input 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

→ ***Note:*** Important notices and information are noted in this manual.

Product category

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

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

RF exposure safe distance

SIMRAD V5035 has been tested and meets applicable limits for radio frequency (RF) exposure. This device generates and radiates RF electromagnetic energy and requires a Maximum Permissible Exposure of 1.9m during operation.

Hardware/software version

- Hardware version: A701-0xx
- Software version: 1.0.6.xx

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.

Type approval

The SIMRAD V5035 AIS transponder complies with applicable international standards and is type approved in accordance with the European Marine Equipment Directive and CCNR standard for Inland AIS.

Declaration of conformity

Navico declare under our sole responsibility that this V5035 conforms with the requirements of the European Council Directive 2014/90/EU on Marine Equipment. All compliance documents are available on the product's section on the following website: www.navico.com/commercial.

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.

Contact information

For sales, service and technical supports, contact your local Simrad representatives or Simrad at: www.navico-commercial.com.

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4 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 Receiver

Only receives AIS signal and does not have transmitter to send out AIS signal. Suitable for recreational vessels that do not want to send out its vessel information.

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 help 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

Product description

The SIMRAD V5035 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 V5035 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.

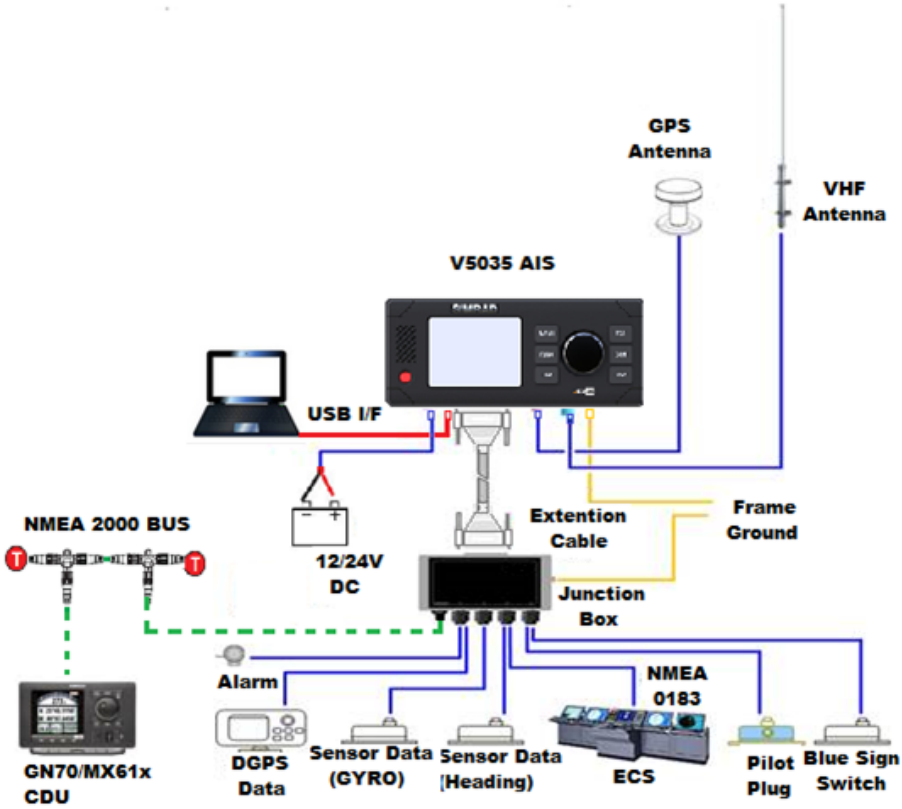
The V5035 can connect to the ship's sensors as required by IALA guidelines through an external junction box (supplied). The unit can also interface external navigation and presentation systems that support IEC 61162-1 related sentences. It is also capable for connection to Long Range system like Inmarsat C. The V5035 supports 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.

Main features

- IMO Compliant Class-A AIS system
- Supplied as a standalone system with junction-box, GPS antenna and Pilot Plug
- Easily integrates with Simrad GPS and Charting systems via NMEA2000 interface.
- Perfect complement to Simrad IMO GPS/GNSS systems (GN70, MX610, MX612)
- Multiple sensors input ports and bi-directional data ports
- Control knob and keypad for easy operation
- Color 3.5" LCD display
- Support type P of BAM function type

Interconnection diagram



3 Installation

Equipment in the box

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

Class A AIS Transponder unit
000-12249-001

Junction box
000-12324-001

Pilot plug
000-12325-001

GPS antenne ANT-21
with 10 m cable
000-12326-001

U-shaped mounting
bracket kit
000-12327-001

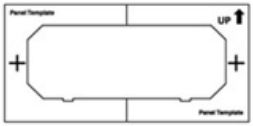
37-pin extension
cable 1.8 m
000-12328-001

3-pin power
cable 1 m
000-12329-001

USB to Mini-USB
cabale 1.8 m
Included

Junction box
mounting kit
Included

Panel mount
holder kit
Included



Panel mount cutting
template
Included

User manual
988-10838-003

Parts list	Part number
V5035 Class A AIS Transponder unit w/GPS antenna and USB cable	000-12249-001
Junction box	000-12324-001
Pilot plug	000-12325-001
U-bracket mounting kit	000-12327-001
37-pin extension cable	000-12328-001
3-pin power cable	000-12329-001
Panel mount holder kit	000-12330-001
User manual	988-10838-003

Installation procedures

Familiarize yourself with the manual content before you 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 .

RF cable requirements

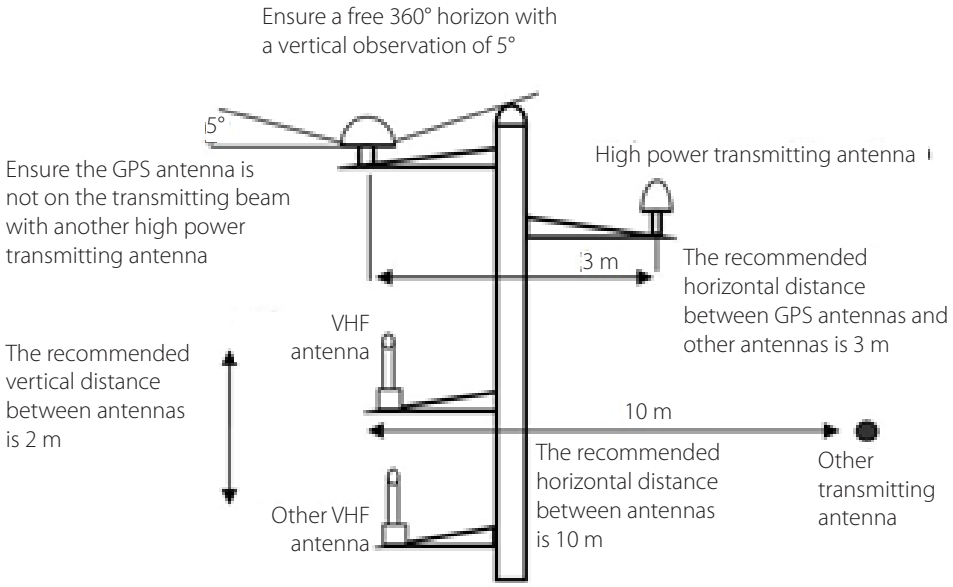
The following RF cables are recommended to install the V5035:

- VHF Antenna Cable
  Type: 5D-FB or equivalent
  Connector: SO-239 (Male)
- GPS Antenna Cable
  Type: RG58A/U or equivalent
  Connector: TNC (Male)
  Cable and connector are supplied as part of the GPS antenna.

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 as shown in the diagram below:

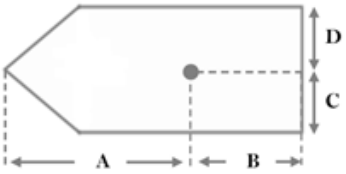


GPS antenna installation

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.

GPS antenna location

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

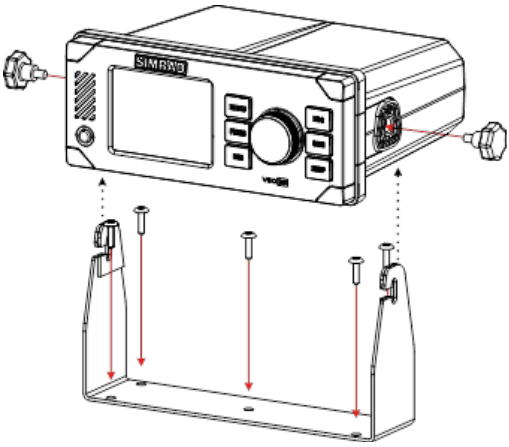


Mounting SIMRAD V5035

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 0.5 m away from magnetic compasses.

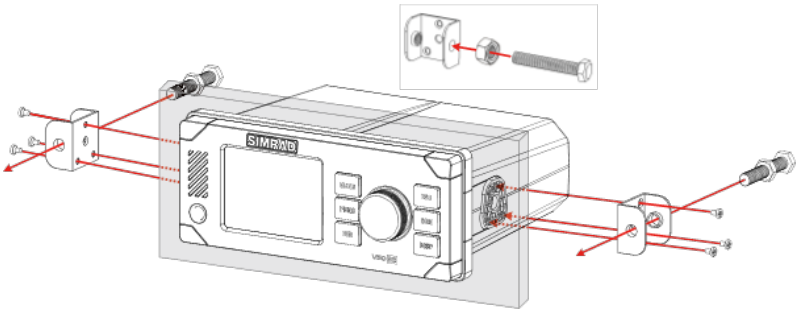
Mounting transponder



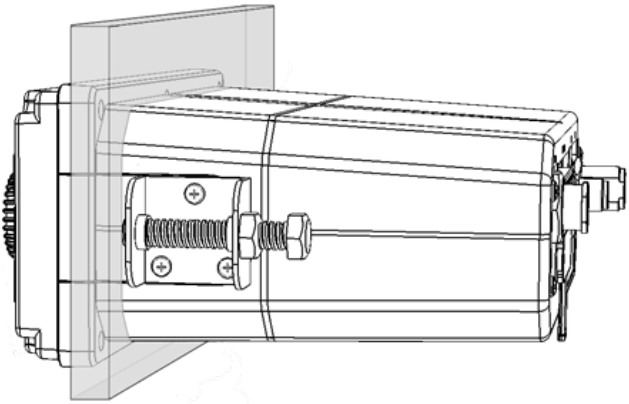
Panel mounting

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 M3X8 screws.
6. Apply the mounting bracket screw on each side for a firm fix.

➔ ***Note:*** The brackets are directional so ensure the correct one is fitted to each side.

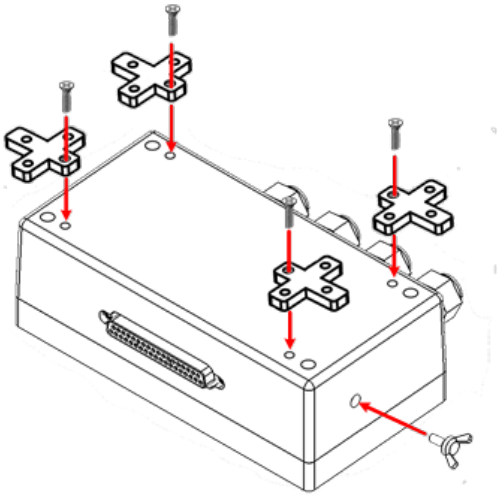


Panel mounting (1)

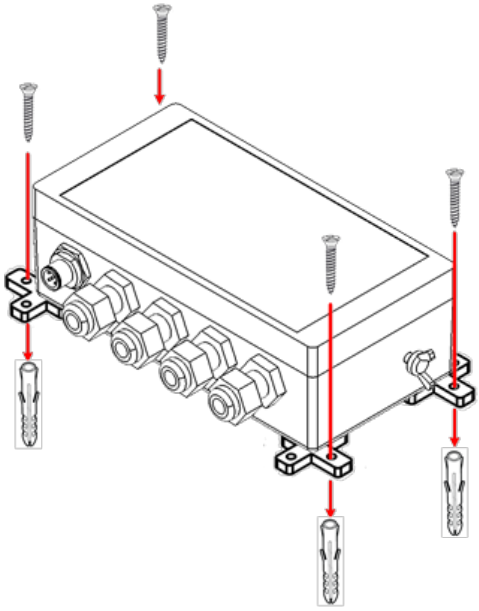


Panel mounting (2)

Mounting junction box



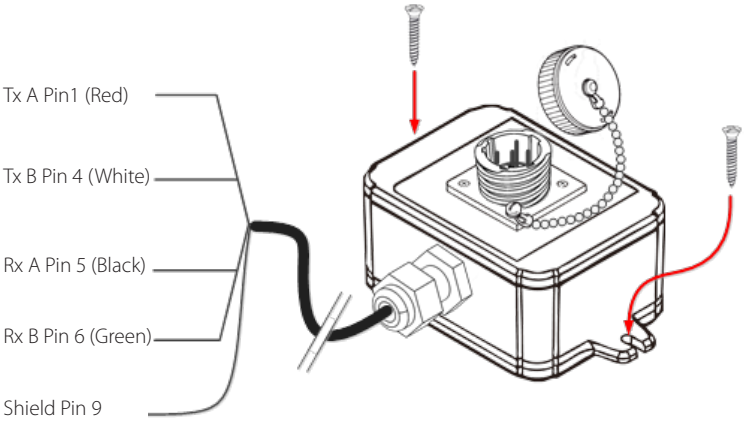
Mounting junction box (1)



Mounting junction box (2)

Mounting pilot plug

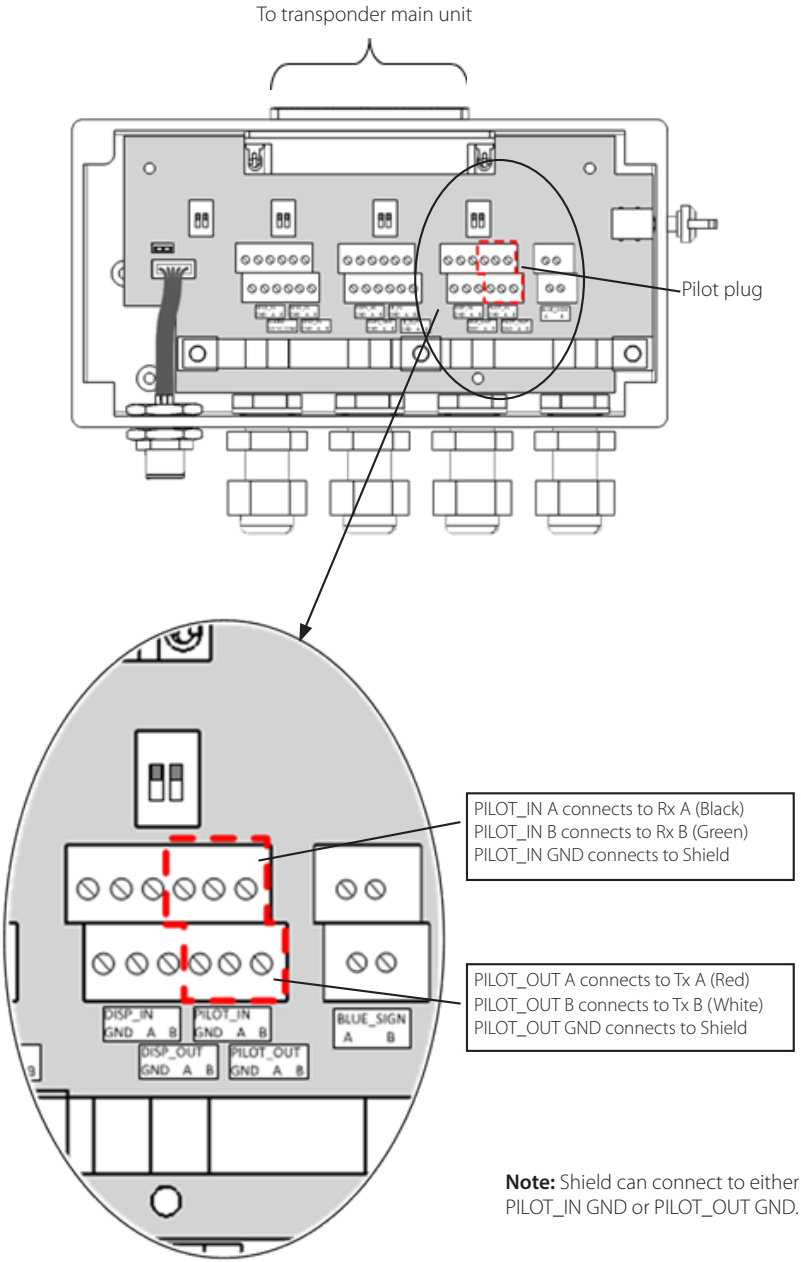
The pilot plug provides a connecting interface to pilots and other mariners to connect their own PC or other portable device to V5035 on board.



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 MX5035 junction box

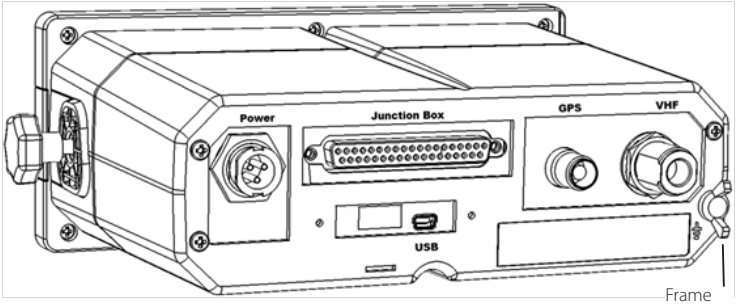
Use the following guidelines to connect the pilot plug to the V5035 junction box. Refer to **External connectors (junction box)** page



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

21.

External connectors (transponder 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	

Vessel power supply requirement

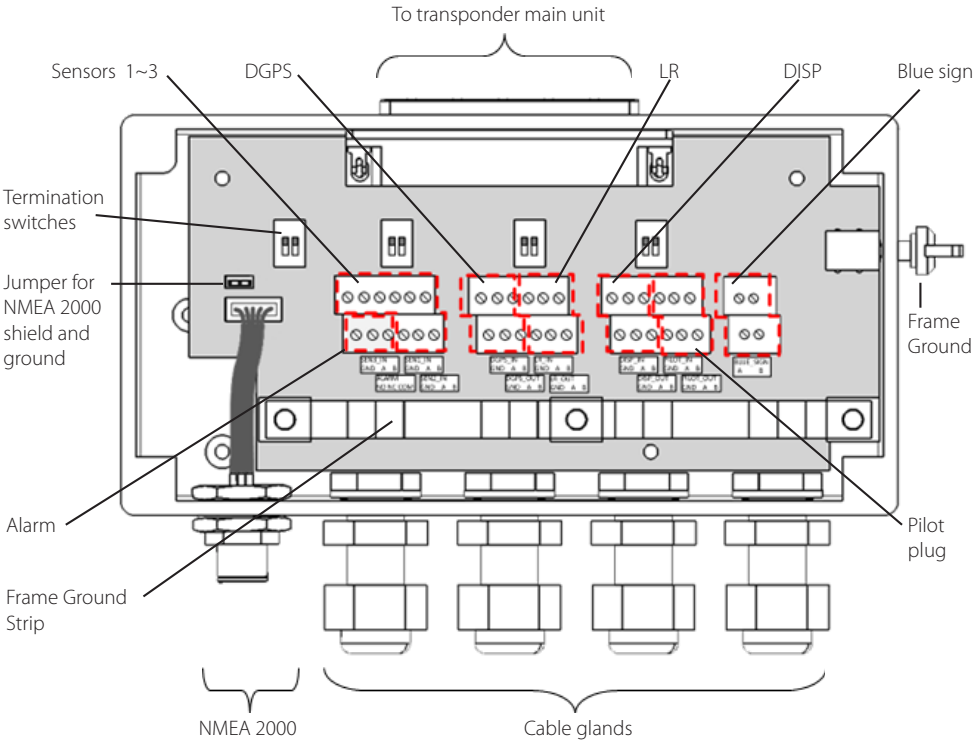
Connect to the ship's power source, ideally an uninterrupted power supply (UPS), through a 2-pole switched fused supply to allow isolation for servicing. Power requirement is 12-24 V DC typical 5 A minimum. Required conductor area, cable length 0-10 m is 1.5 mm2 ø minimum.

→ ***Note:*** The Class A power supply requirement should comply with IMO guidelines for the class of vessel concerned. National authorities and classification societies may have their own power supply requirements; these should also be considered.

→ ***Note:*** Some boats require frame ground connection of all electronic

devices on the ship frame.

External connectors (junction box)

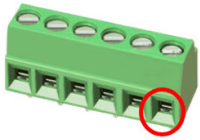


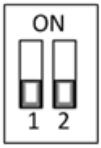
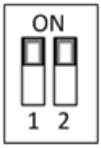
Connector	Label name	Description	Function usage
Sensor 1	SEN1_IN GND	Sensor 1 ground	Connect to data sources such as heading, gyro, or other type of sensors.
	SEN1_IN A	Sensor 1 input A	
	SEN1_IN B	Sensor 1 input B	
Sensor 2	SEN2_IN GND	Sensor 2 ground	Connect to data sources such as heading, gyro, or 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	

Connector	Label name	Description	Function usage
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	
Blue sign	BLUE_SIGN A		Connect to a blue sign switch.
	BLUE_SIGN B		

➔ ***Note:*** RTCM-SC-104 beacon input is currently not implemented by the DGPS_IN input.

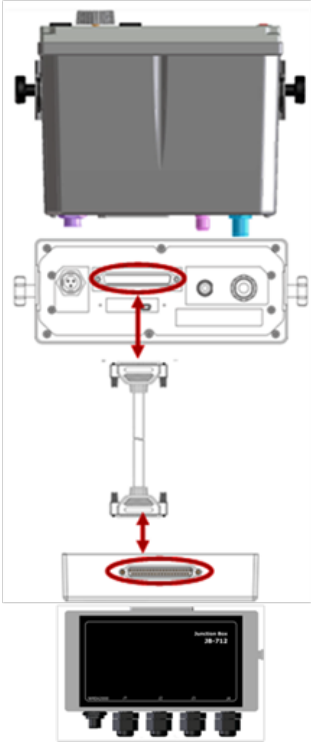
➔ ***Note:*** Suitable electric wire gauge (single wire) for installing Junction Box: AWG 26 ~ 16. See diagram below.



Item	Usage
Termination switches	The switches provide line termination configuration. Termination off  Termination on 
Jumper for NMEA 2000 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.

Connecting extension cable

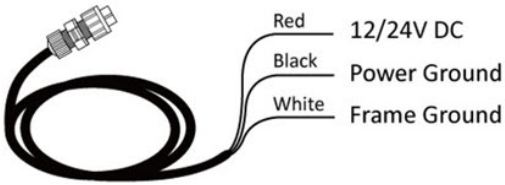
Use the 37-pin- extension cable (1.8M) provided in the package connect V5035 to the junction box.



Connecting V5035 with junction box

Connecting to power supply

The V5035 requires a 12V or 24V DC power supply (9.6 to 31.2V operation range) capable of supplying 8A peak current. The red wire and the black wire on the 3-pin cable are used to connect the power supply's positive and negative terminals. A 10 Amp fuse or circuit breaker must be used in the connection between the power supply and the unit.



V5035 power connection

Configuring the V5035

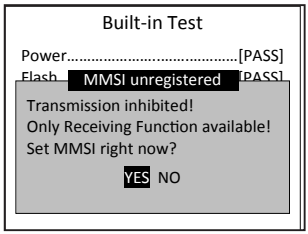
The following items must be completed before initial configuration.

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

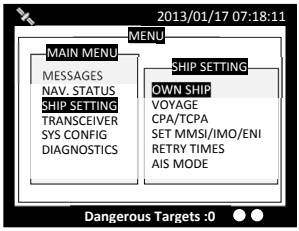
Initial configuration

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

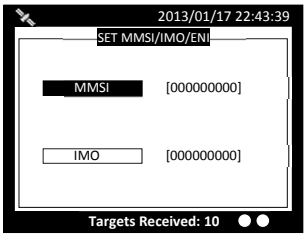
1. Setup 1: MMSI should be correctly programmed.



2. Press **MENU** and select main menu item **SHIP SETTING**. (Password required, default is "0000")
3. Set up call sign, ship name, ship type, external/internal GPS antenna position in **OWN SHIP**.



4. If IMO identification number is applicable, select main menu item **SET MMSI/IMO/ENI** to set up IMO number.



For more information, refer to SHIP SETTING, page 59.

4 Operation

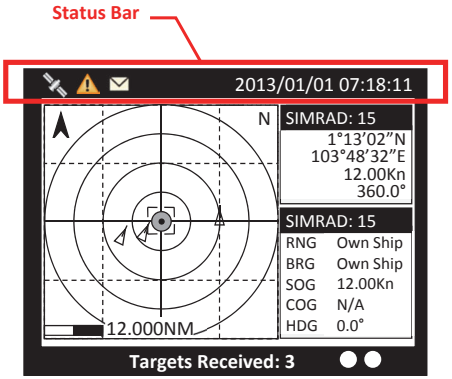
Panel description

Item	Name	Description
1	Power switch	Power On/Off (push over 5 seconds)
2	Beeper	Sounds when buttons are pushed and by MOB alarm
3	Display	3.5" LCD color screen

Key	Description
MENU	Return to main menu / detail menu select
FUNC	Different function on display mode (Zoom In/Out, etc) and has different roles in submenus
DIM	Adjust dim degree (refer to page 35)
Knob	Rotate to select, press to confirm
DISP	Change to different display modes: 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
SRM	Emergency SRM broadcast
ESC	Cancel/Back to main menu, or press and hold for 3 seconds to access Active Alert list

Status bar

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



Icon	Description
	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
	EMMA warning (RFM23): warning received
	ETA/RTA: message received
	Water levels (RFM24): message received

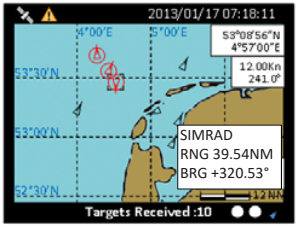
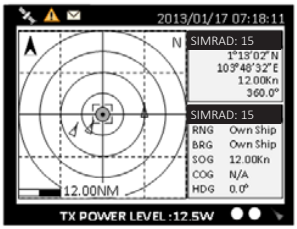
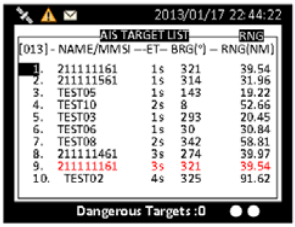
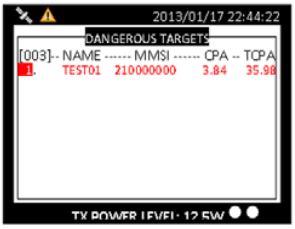
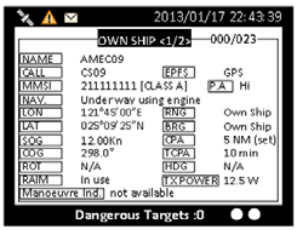
Transmission and reception bar

The Transmission & Reception bar constantly displays real time status of transmissions and receptions on any display modes. The 3 default displayed messages are received AIS targets, dangerous targets, and Tx power level.

Item	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 SART/MOB alert icon only available when valid SART or MOB target is received
	Function Icon (Radar view only)	zoom in/out target selected SART/MOB	
4	Inland mode	IL	Indicate the system is running Inland mode
	Blue sign	B	Indicate Blue Sign device is connected

Display modes

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

Mode	Screenshot	Purpose
Coastal view		Display all targets on basic coastline map (Refer to Coastal View, page 33)
Radar view		Displays all targets on radar view (Refer to Radar View, page 34)
AIS target list		Shows all received ship data (Refer to AIS Targets, page 50)
Dangerous target list		Shows all dangerous AIS targets presently (Refer to Dangerous List, page 58)
Own ship detail		Shows all the details of own ship (Refer to Own Ship detail, page 49)

GPS satellite information		Shows the GPS satellite current usage status (Refer to GPS Status, page 7675)
Region setting list		Show all the Region of own ship (Refer to Own Ship detail, page 49)

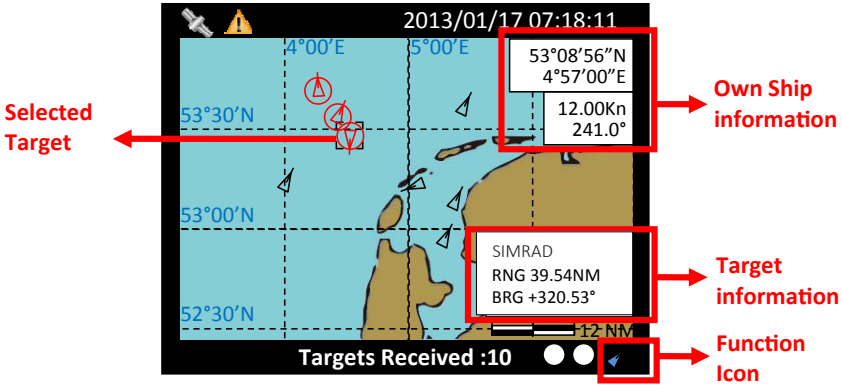
Target symbol descriptions

Symbols for each AIS target on the radar view are described below:

Symbol	Description
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.

Symbol	Description
Friend ship	Color: Magenta If any pre-stored Friend Ship is nearby, the Friend Ship will appear in Magenta on the radar view.
Los 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.

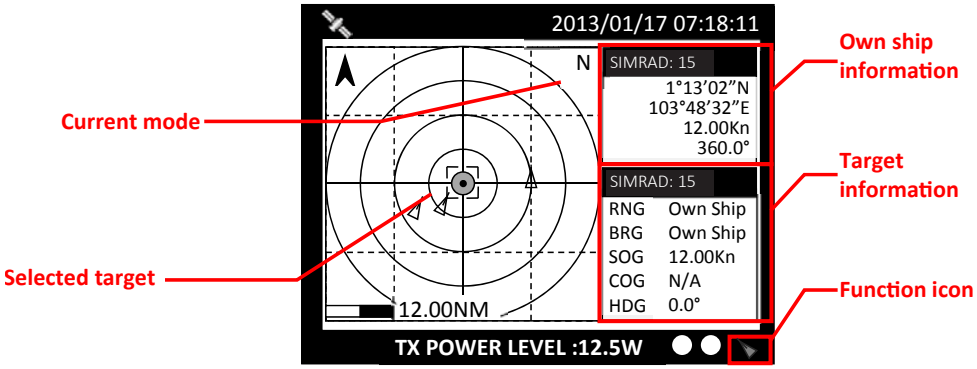
Coastal view



Item	Function
Own ship information	Own-ship information for latitude, longitude, SOG and COG
Target information	Display the target information such as vessel name or MMSI as well as range and bearing relatively to the own ship
Function icon (coastal view)	Users can select one of the 5 viewing modes by pressing the FUNC button. Turn the knob to change the selected range, position, AIS target or SART/MOB target
zoom in/out	The plot range can be adjusted by turning the knob which cycles through the ranges 24, 12, 6, 3, 1.5, 0.75, 0.5, 0.25, 0.125 and 0.05 nm.
up/down	Turn the knob to move the map vertically
left/right	Turn the knob to move the map horizontally
target selected	Turn the knob to navigate between different AIS targets, while press the knob to see more details of the target.
SART/MOB	This icon appears only when valid SART or MOB target is received. Turn the knob to navigate between different SART/MOB targets, press the knob to see more details of the target.

The coastline map in this transponder is neither verified nor approved by Hydrographic Authorities. It is not an Electronic Chart System and 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.

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.

Under Radar View, only 3 function icons are available - Zoom In/Out, Select Target and SART/MOB. The operation with FUNC button is same as described in page 33.

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.
H	COURSE UP	The orientation is determined by the own ship's traveling course.
C	HEAD UP	The orientation is determined by the direction of own ship's bow.

Dimmer setting

Press the button "DIM" to enter the dimmer setting page.

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

Entering text

The knob on the front control panel is used for entering and editing text.

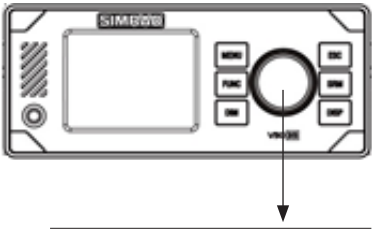
1. Turn the knob to traverse the menu items up or down. Once selected, press the knob to select the item for text entering.
2. Select a character position to edit. Turn the knob to move the cursor left or right and press the knob to confirm the position.
3. The system is now in character selection mode 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	[	\	]
^	_	!	"	#	$	÷	&
'	(	)	*	+	,	-	.
/	:	;	<	=	>	?	@

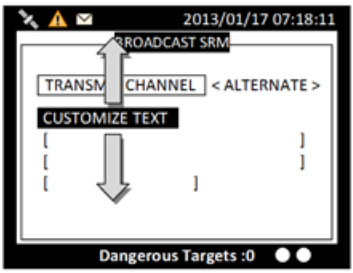
→ ***Note:*** Space is first character for selection.

4. Use steps 2 and 3 to finish entering all needed characters.
5. To confirm and save, press down the knob and hold for 2 seconds.

The following illustrations show the procedure:



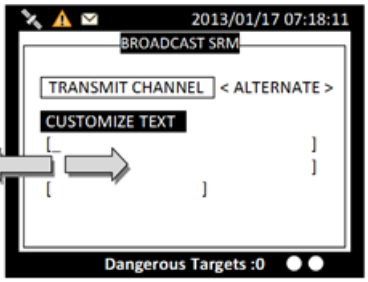
1: Traverse menu



Turn knob to move up or down

Press to enter

2: Select a character position



Turn knob to move left or right

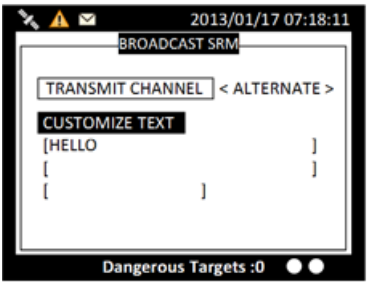
Press to start editing

3: Pick character

Turn knob to select character

Press to confirm

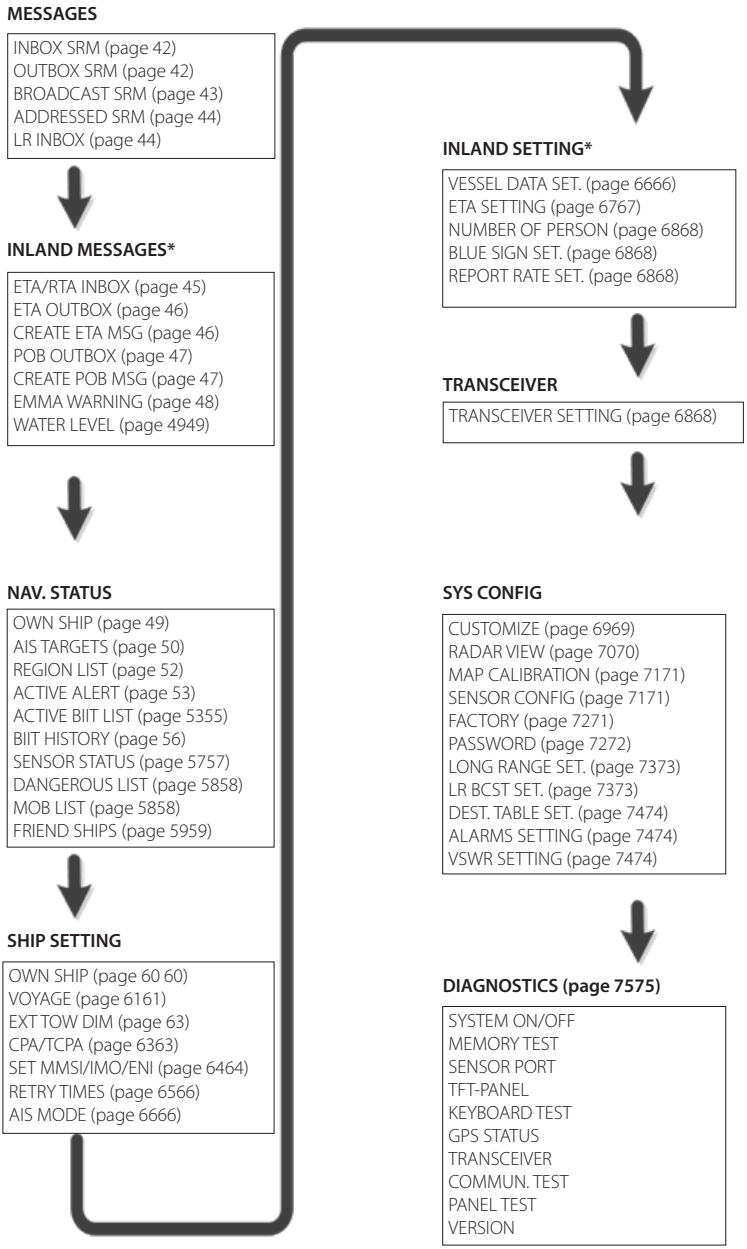
4. Confirm and save



To save entered text, press and hold the knob for 2 seconds.

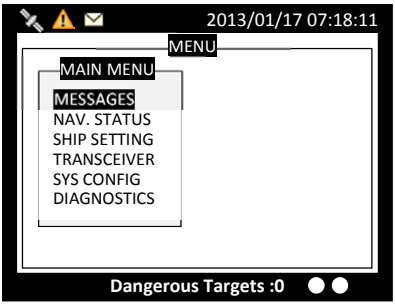
Menu tree overview

Press MENU button to enter MAIN MENU. Please note inland menus, Inland Messages and Inland Settings, are only available when the unit operates under inland mode.

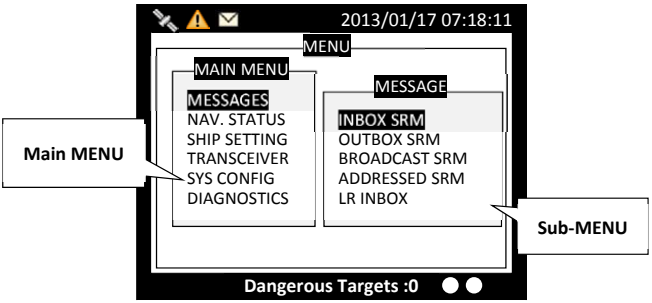


*** Inland mode only**

How to access and use MAIN MENU



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



Menu item brief description

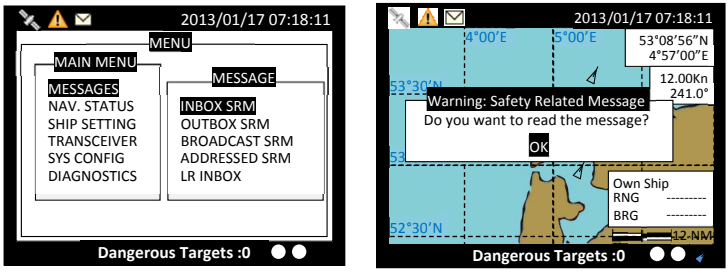
MESSAGES	
INBOX SRM	Log of safety related messages (SRM) received
OUTBOX SRM	Log of safety related messages (SRM) sent
BROADCAST SRM	Send SRM
ADDRESSED SRM	Send specified targeted SRM
LR INBOX	Log of received inquiry messages from other
INLAND MESSAGES	
ETA/RTA INBOX	Log of ETA(RFM21), RTA(RFM22) message received
ETA OUTBOX	Log of ETA(RFM21) sent
CREATE ETA MSG	Create ETA(RFM21) message
POB OUTBOX	Log of PERSON message (RFM55 or IFM16) sent

CREATE POB MSG	Create PERSON message (RFM55 or IFM16)
EMMA WARNING	Log of EMMA warning (RFM23) received
WATER LEVEL	Log of WATER LEVEL (RFM24) received
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
ACTIVE ALERT	Display all activated alerts. To access Active Alert, directly press and hold ESC button for 2 seconds
ACTIVE BIIT LIST	Display all activated BIIT
BIIT HISTORY	BIIT 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
EXT TOW DIM	Extended tow dimension values setting
CPA / TCPA	CPA / TCPA
SET MMSI / IMO / ENI	Change MMSI / IMO / ENI number
RETRY TIMES	Times to resend messages
AIS MODE	Configure AIS Mode to SOLAS or INLAND
INLAND SETTING	
VESSEL DATA SET.	Configure Vessel data
ETA SETTING	Configure ETA
NUMBER OF PERSON	Set number of persons
BLUE SIGN SET.	Set Blue sign settings
REPORT RATE SET.	Set report rate settings

TRANSCEIVER (Setting 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 Note:- Antenna supplied with unit is a 3.3V unit
SYSTEM CONFIGURATION	
CUSTOMIZE	Personalization settings
RADAR VIEW	Radar configuration
MAP CALIBRATION	Map offset setting
SENSOR CONFIG.	Port configuration
FACTORY	Default factory setting
PASSWORD	Password change (default password: 0000)
LONG RANGE SET.	Remote inquiry setting
LR BCST SET.	Enable/Disable Long Range Broadcast
DEST TABLE SET.	Table storing destinations
ALARM SETTING	Configure ALR sentence status (Enable/ Disable)
VSWR SETTING	VSWR setting
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

Messages

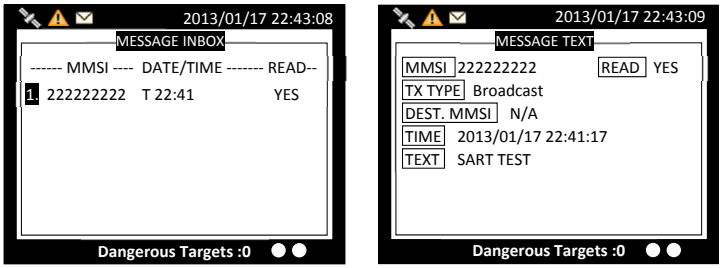
The transponder features SRM alert pop-ups that can appear any time during operation. When a SRM (Safety Related Messages) from other AIS equipped vessels is received, you can either read and acknowledge it by pressing the knob or ignore the message by press ESC. If there is any unread message, the upper left corner will display , the new message icon. An example of a pop-up SRM message is shown below.



Message and SRM pop-up alert

Inbox SRM

You can read received SRM messages under Inbox. Turn the knob to traverse the message list and highlight your choice. Read the message content by pressing the knob.

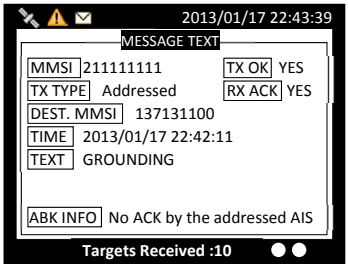


Received message list and message details

When pressing the FUNC button, system will ask whether the highlighted message should be deleted. Press knob to confirm your choice.

Outbox SRM

You can read all sent SRM messages under OUTBOX. Turn the knob to traverse the message list and highlight your choice. Read the message content by pressing the knob.



Sent message list and message details

When pressing the FUNC button, system will ask whether the highlighted message should be deleted. Press knob to confirm your choice.

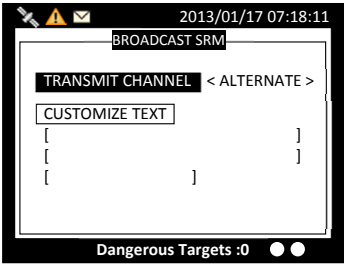
When an addressed message is sent, the addressee will return an acknowledgement upon receipt of the message. The received acknowledgement is shown as "Y" in above example.

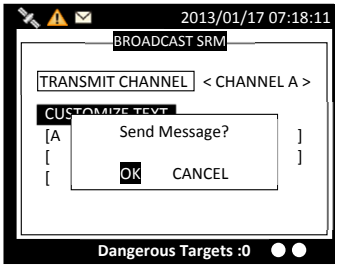
Broadcast SRM

This submenu allows the users to compose a Safety Related Message (SRM). Maximum length for the message is 90 characters. TRANSMIT CHANNEL gives you the option to send the message through channel A, B or Alternate. By Alternate, which is the default option, the system will select the channel automatically.

Press the knob to enter text input mode, then use the knob to enter text. When text editing is finished, press ESC to leave the text input mode.

To send the message, press MENU or ESC and the system will ask whether to send the message. Select OK to send, CANCEL to cancel and return to main menu.



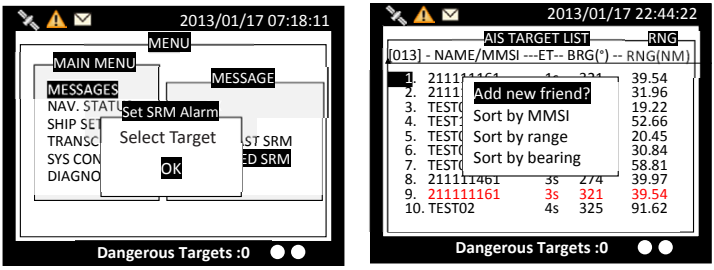


Edit and send Broadcast SRM

Addressed SRM

ADDRESSED SRM means a SRM addressed to a certain MMSI number which can be selected from the target list or input manually. By entering into the submenu "ADDRESSED SRM", users will be prompted to select the addressee from the target list. Here you can either pick the addressee or press ESC to leave the target list and enter the MMSI number manually.

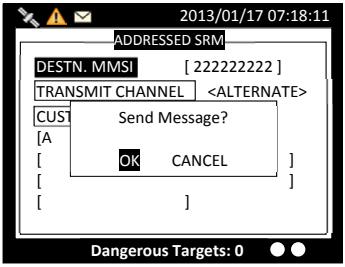
Press the FUNC button and you have the possibility to add the selected vessel to your friend list, or to sort the list by MMSI, range or bearing. Please refer to page 5051 for more details.



Addressed SRM

After entering the MMSI number, choose the transmit channel as described in page 43, then compose the message. Maximum length for the message is 85 characters.

To send the message, press MENU or ESC and the system will ask whether to send the message. Select OK to send, CANCEL to cancel and return to main menu.



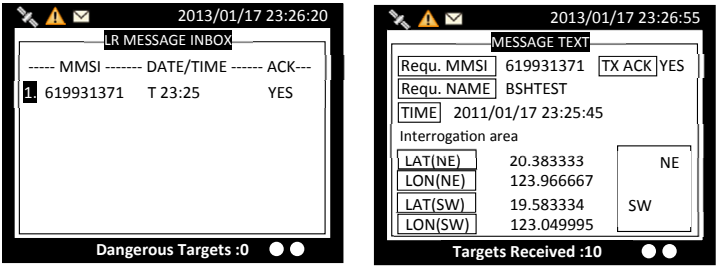
Send message

Long range message inbox

When the transponder is connected to a long range communication system via the long range communication port then long range interrogations may be received. These are requests for information from a distant base station beyond normal AIS

operation range. LONG RANGE MESSAGE INBOX holds all received Long Range Interrogation messages.

Turn the knob to traverse the message list.



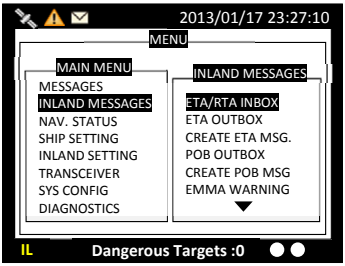
Long range message box

Turn the knob to traverse the message list and highlight your choice. Read the message content by pressing the knob.

When pressing the FUNC button, system will ask whether the highlighted message should be deleted. Press knob to confirm your choice.

Inland messages

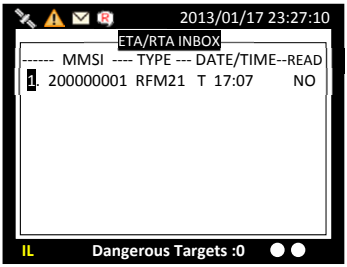
The transponder has capability to send Inland ETA (Estimated Time of Arrival) messages and receive Inland RTA (Recommended Time of Arrival) messages which are used when communicating with ports, locks and bridges on the inland water ways. Note that the menu is only available when the unit is operating under inland mode.

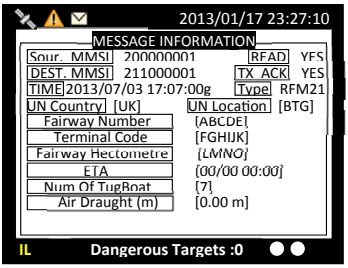


Inland message

ETA/RTA inbox

The received messages of ETA (RFM21) and RTA (RFM22) can be read in the ETA/RTA Inbox. Turn the knob to traverse the message list and highlight your choice. Read the message content by pressing the knob.

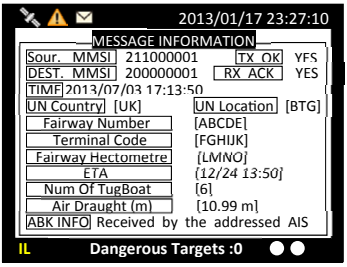




ETA/RTA inbox and message information

ETA outbox

The submenu displays log of sent ETA (RFM21) messages. Turn the knob to traverse the message list and highlight your choice. Read the message content by pressing the knob.



ETA outbox and message information

Create ETA message

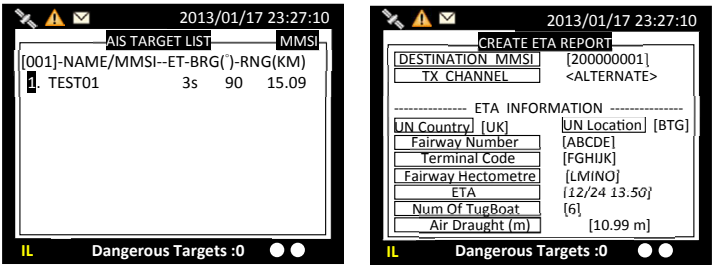
For more information about ETA settings, please refer to page 6767.

In this submenu users can compose ETA (RFM21) message. By entering into the submenu, users will be prompted to select the addressee from the target list. Here you can either pick the addressee from the list or press ESC to leave the target list and enter the MMSI number manually.

TX CHANNEL gives you the option to send the message through channel A, B or Alternate. By Alternate, which is the default option, the system will select the channel automatically.

After ETA (RFM21) transmitted, if no RTA (RFM22) is received within 15 minutes, transponder will transmit ETA (RFM21).

After the addressee is selected, you can configure the ETA message.



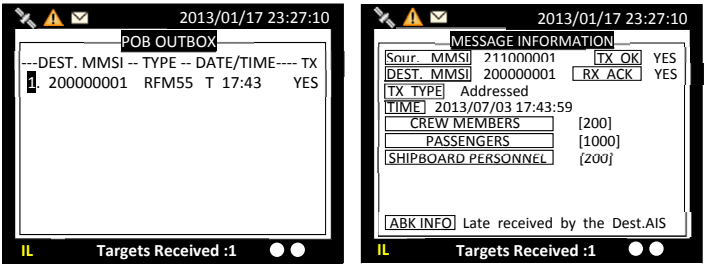
Target selection and ETA report

Use the knob to select a message and press it to display content.

POB outbox

The submenu displays log of sent Number of person on board (RFM55/IFM16) messages. The IMO version sends the total number of persons on board as a binary message with international IFM16.

The Inland (IWW) version sends a message with number of crew, personnel and passengers as a binary message with inland branch RFM55.



POB outbox and POB message information

Use the knob to select a message and press the knob to display message content.

Create POB message

In this submenu users can compose number of person on board (RFM55/IFM16) messages. Number of person onboard can be configured in Inland Setting 0.

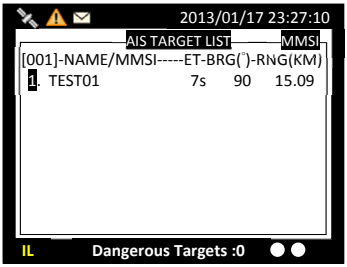
By entering into the submenu, users will be prompted to select the addressee from the target list. Here you can either pick the addressee from the list or press ESC to leave the target list to enter the MMSI number manually or broadcast the POB message without specifying any addressee.

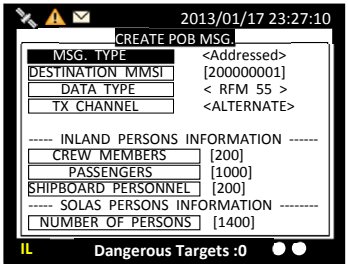
When "Broadcast" is selected, just omit the DESTINATION MMSI. Any entered number will be ignored.

The DATA TYPE provides the option either to send the data in RFM16 or RFM55, as described in page 47.

Tx CHANNEL gives you the option to send the message through channel A, B or Alternate. By Alternate, which is the default option, the system will select the channel automatically.

After ETA (RFM21) transmitted, if no RTA(RFM22) is received within 15 minutes, transponder will transmit ETA(RFM21).

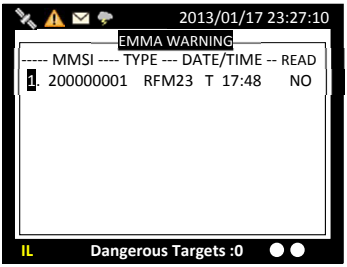


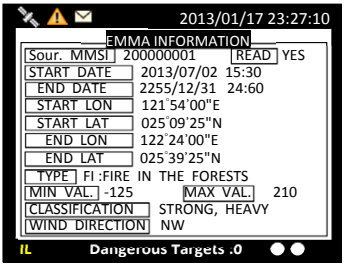


Target list and POB message content

EMMA warning

The submenu displays log of EMMA warning (RFM23) messages. EMMA (European Multiservice Meteorological Awareness system) Information is transmitted as broadcast message from shore to ship as local weather warnings.



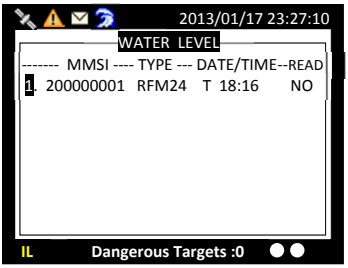


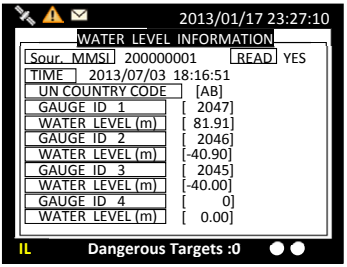
EMMA warning log and message content

Use the knob to select a message and press the knob to display message content.

Water level

This submenu displays received water level (RFM24) messages from base station to ship about local water level information.





Water level log and message content

Use the knob to select a message and press the knob to display message content.

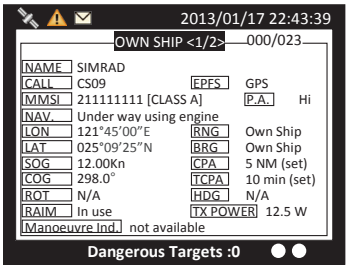
Navigation status

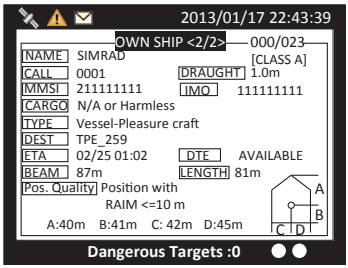
Own ship

This option displays the full information on your ship, including both dynamic and static data.

Turn the knob to change between dynamic and static information.

Static data and dynamic data

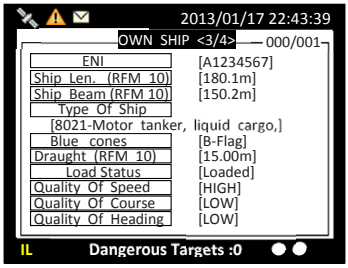


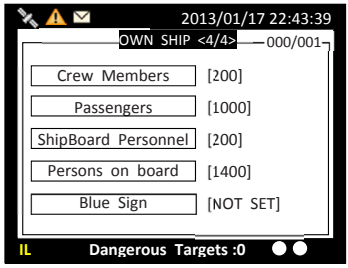


Static data and dynamic data

Inland vessel information

The following information is only available under inland mode.

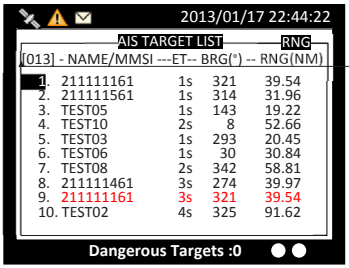


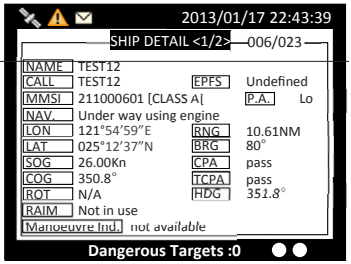


Additional inland vessel information

AIS targets

This option displays all received AIS information of other vessels including dynamic and static information. Press the knob to select an AIS target and then press the knob to go through dynamic and static information of the selected vessel. There are two pages of ship details for SOLAS mode and another two pages for inland mode.

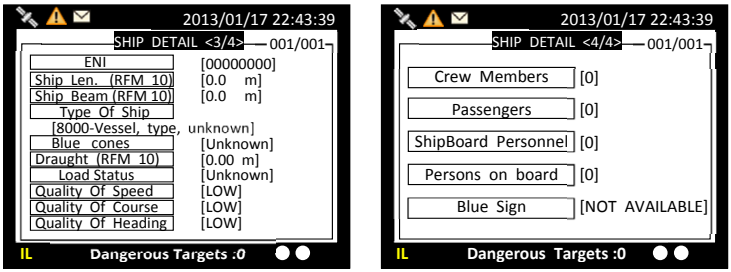




AIS targets and details

Turn the knob to continue reading the dynamic and static information of the selected vessel.

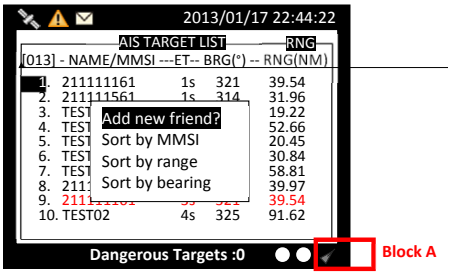
Additional inland information is available under inland mode.



Ship's inland information

Adding friend ship

In the list, press FUNC button will open the pop-up window with the question whether the selected vessel should be added to your FRIEND SHIP list, or to sort the list according to vessels' MMSI, distance, or direction.



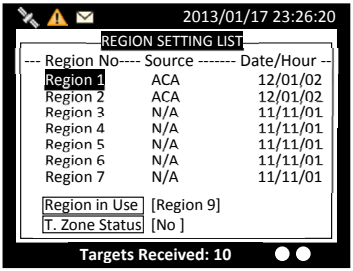
Adding friend ship

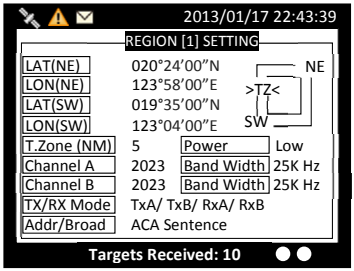
In the screenshot above, block A indicates the current sorting method.

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

Region list

The region list displays all saved region areas. Turn the knob to traverse the list. Press the knob enables you to read the highlighted region information.

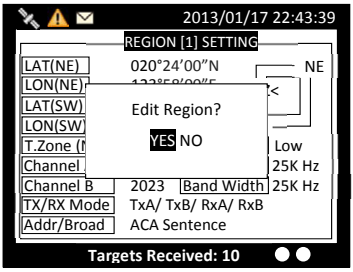


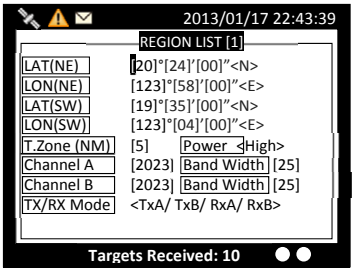


Region list and region setting

Editing existing region content

You can modify the region area setting by pressing FUNC button at the region information page. Use the scroll wheel to scroll to the field to edit, then press the knob to enter the value.





Modify region content

To save the settings, press MENU or ESC and the system will ask whether the changes should be saved. Select OK to save or CANCEL to discard and return to main menu. If the region information is unchangeable, saving does not change the original information.

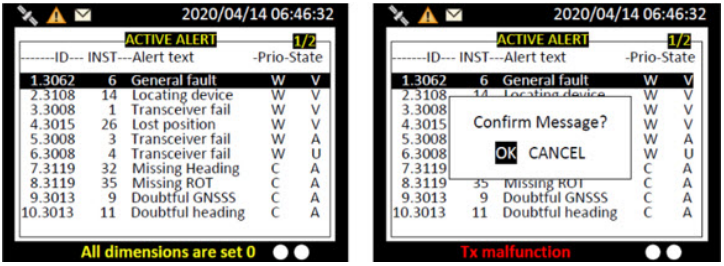
Active alert

There are 2 ways to access the Active Alert: either through Main Menu/Navigation Status/Active Alert or with the hot key by holding the ESC key for 3 seconds and the unit will enter the Active Alert screen.

The list on screen shows all current AIS alerts and their status. Use the scroll wheel to navigate the list. You can acknowledge (ACK) the warning (priority: W). The system will ask for confirmation if the chosen alert should be acknowledged. If the alert active, an indication icon will appear on left upper corner. If the warning "active – unacknowledged" activated, icon will be flashing till all acknowledgement are made.

The display priority order, in sequence with the newest alert on top within each display priority, is:

1. "active – unacknowledged" and "active silenced" warnings
2. "rectified – unacknowledged" warnings
3. "active – acknowledged" warnings
4. "active" cautions.



Alert list (BAM) and acknowledgement

Table – BAM alert instance

Alert ID	Alert text	Additional information	Prio	Cat	Escal	BIIT ID
3108	Locating device	Check AIS targets	W	B	W	14
3062	General fault	Check AIS equipment	W	B	W	6
3008	Transceiver fail	Not transmitting, check AIS	W	B	W	1
		Not receiving, check AIS	W	B	W	3 ` 4
3015	Lost position	Own ship position not transmitted	W	B	W	26

3116	Impaired radio	Reduced coverage (antenna VSWR)	C	B		2
		Ch1 inoperative, check AIS	C	B		3
		Ch2 inoperative, check AIS	C	B		4
		DSC inoperative	C	B		5
3113	Sync in fallback	Check AIS for UTC time synchronisation	C	B		7
3003	Lost ext EPFS	Check external position sensor	C	B		25
3119	Missing COG	Not transmitting COG	C	B		30
	Missing SOG	Not transmitting SOG	C	B		29
	Missing heading	Not transmitting heading	C	B		32
	Missing ROT	Not transmitting rate of turn	C	B		35
3013	Doubtful GNSS	Int/Ext GNSS position mismatch	C	B		9
	Doubtful heading	Difference with COG exceeds limit	C	B		11
3019	Wrong NavStatus	Check NavStatus setting	C	B		10
3009	Lost MKD	Cannot display safety-related messages	C	B		8
Note 1, Alert priority (Prio): W (Warning) ` C (Caution) °						

Table - Alert state and audible annunciation for warnings

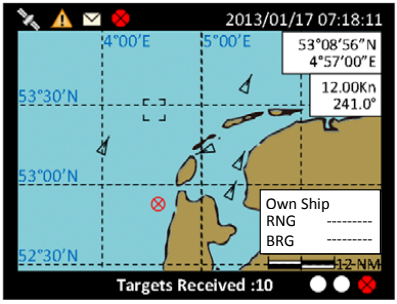
Alert state	Audible annunciation
V: active – unacknowledged	2 short audible signals and repeated as a warning after 3 minutes
S: active – silenced	None
A: active – acknowledged	None
U: rectified – unacknowledged	None

Table - Alert state and audible annunciation for cautions

Alert state	Audible annunciation
A: active	None

V5035 features SART/MOB (locating device) alert that can appear any time during operation. When SART/MOB message is received, the icon will appear in the status bar with beeping sounds from the beeper. Press any button to stop the sound.

An example of an alert message is shown below.



SART/MOB message alert

Active BIIT list

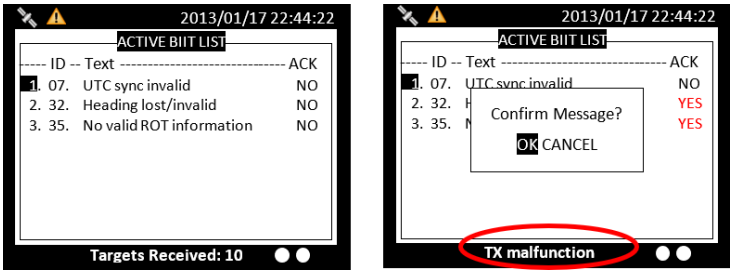
The list on screen shows all current device alerts and their status. Use the scroll wheel to navigate the list.

You can acknowledge (ACK) the alert message either by pressing FUNC or by pressing the knob. The system will ask for confirmation if the chosen alert should be acknowledged.

The transponder performs a function self-check continuously. If a self-check fails, an alert will occur. Appendix B shows all possible alert scenarios.

However, the following 5 alerts require the user´s immediate attention and will be displayed directly on the Transmission and Reception Bar:

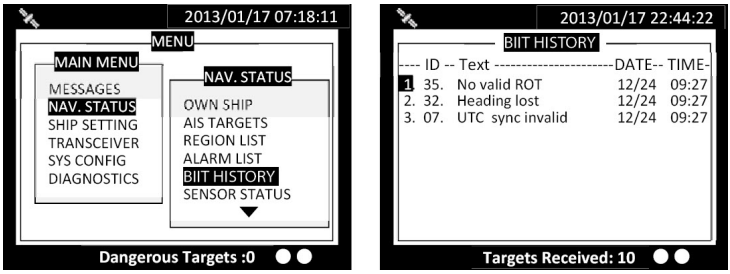
- Tx malfunction: transmission function fails
- Antenna VSWR exceeds limit
- NavStatus incorrect: wrong NavStatus
- Improper MMSI: no valid MMSI
- GPS antenna port shorted



Active BIIT list and acknowledgement

BIIT history

This submenu lists all recorded BIIT alert and its time of occurrences.

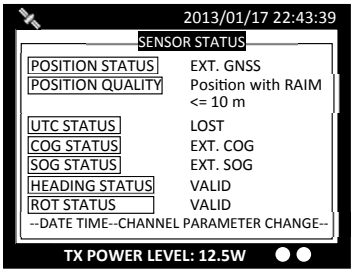


BIIT history

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 (Note 1)
COG STATUS	INT. COG / EXT. COG / LOST
SOG STATUS	INT. SOG / EXT. SOG / LOST
HEADING STATUS	VALID / LOST
ROT STATUS	VALID / OTHER ROT / LOST
Note 1: If V5035 not connect internal GPS, will lost UTC and time is unsynchronized. V5035 will continue operation using indirect or semaphore synchronization.	

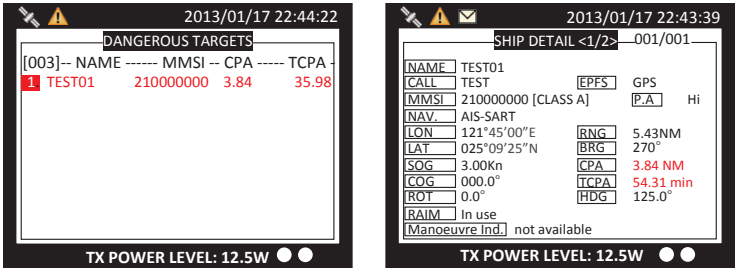


Sensor status

Dangerous list

With the setup of closest point of approach (CPA) and time to CPA (TCPA) (refer to page 63), this submenu provides an efficient way to monitor vessels with insufficient CPA and TCPA. The dangerous targets can also be observed on coastal and radar view.

Turn the scroll wheel to navigate the list and press the knob to read information of the selected vessel. Turn the knob again to go the second page for more details.

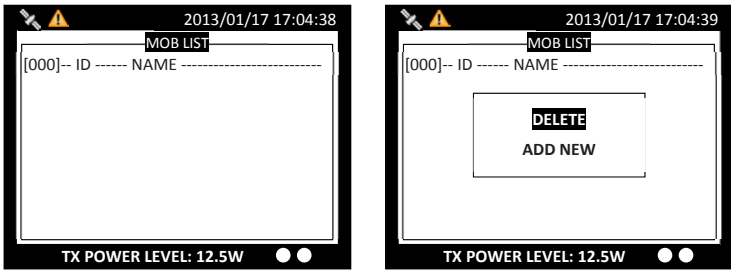


Dangerous list and vessel details

MOB list

With the setup of MOB list, MOB can be easily traced by the person's name not just by the MMSI number on the MOB device.

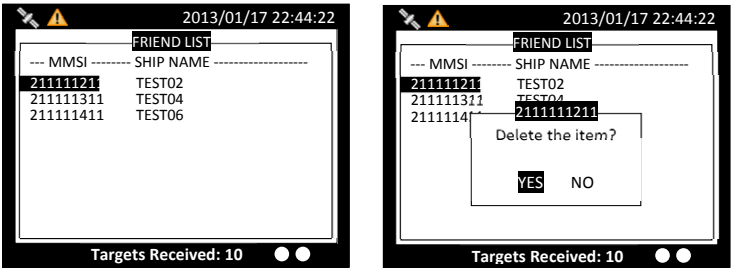
This submenu enables adding, removing, or modifying of MOB list entries.



In the list, press FUNC button will open the pop-up window with the question whether the selected entry should be deleted, or to add a new entry to the list. After MMSI number and name are assigned, press MENU or ESC to save or leave without saving.
The existing entry can be modified by pressing the knob to enter the text edit mode. Use the knob to edit the list and press MENU or ESC to save or leave without saving.

Friend ships

The users can easily recognize the friend ships on coastal view and radar view, when the list of friend ships is set up. This submenu allows you to add, delete and edit the list of all registered friend ships.



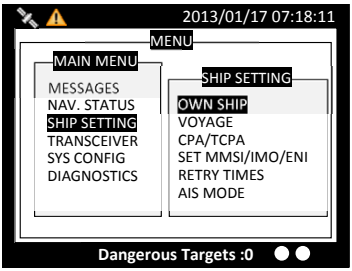
List of friend ships

In the list, press FUNC button will open the pop-up window with the question whether the selected vessel should be deleted. After MMSI number and name are assigned, press MENU or ESC to save or leave without saving.

The existing entry can be modified by pressing the knob to enter the text edit mode. Use the knob to edit the list and press MENU or ESC to save or leave without saving.

Ship setting

This menu list provides access to settings that are required during installation of the transponder. There are a total of 5 submenus.

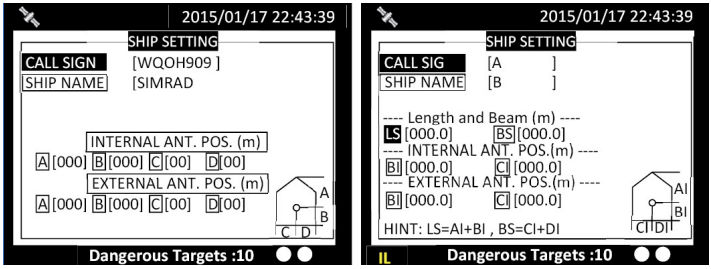


Own ship

This section is password protected and can only be accessed using the password (page 72).

The following information about the vessel should be correctly set up by installation prior to operation:

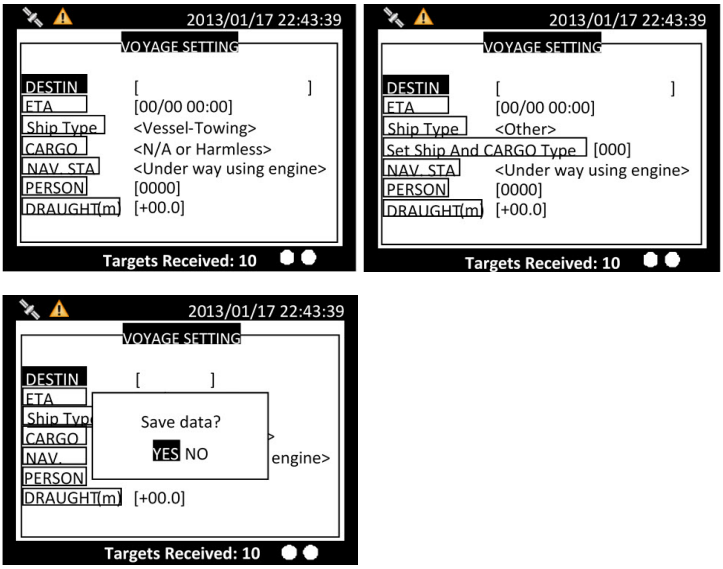
- Call Sign - Vessel radio call sign (limited to 7 characters)
- Ship Name - limited to 20 characters
- Position of internal GPS antenna - giving the location of the GNSS antenna connected to the AIS transceiver (Internal GPS)
- Position of external GPS antenna - giving the location of the GNSS antenna connected to any external position source connected to the AIS transceiver
- Length and Beam – measured length and width of the ship (inland mode only)



Ship setting in SOLAS mode (left) and inland mode (right)

Voyage

SOLAS mode



SOLAS voyage setting

In this submenu the following navigational information can be configured:

- Destination – Ship's next destination port (limited to 20 characters). When destinations are defined in "Destination Table Setting" (see page 74), user can set the Destination by clicking on FUNC button. Each time when the FUNC button is pressed, the Destination displayed will rotate in the order from Column 1 to Column 10 as configured in the table.
- ETA – Estimated time/date of arrival at destination (UTC time).
- Ship Type – use the scroll wheel to select the type of vessel from the list.
- Cargo – use the scroll wheel to select the suitable status from the list. When "Other" of Ship Type setting is selected, **Set Ship And CARGO Type** will show up on screen instead of **CARGO**, user can enter a pre-defined number of "Ship And CARGO Type" into it.
- Navigational status – use the scroll wheel to select the suitable status from the list.

- Person – the number of people on board.
- Draught – Maximum present static draught to the nearest 1/10th of a meter.

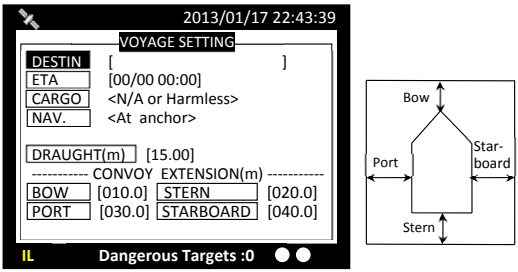
To save the settings, press MENU or ESC and the system will ask whether the changes should be saved. Select OK to save or CANCEL to discard and return to main menu.

➔ ***Note:*** If Ship Type is Tanker, by regulation, whenever the ship navigation status is "Moored", the transponder's transmission power is automatically changed to 1W for safety measures.

Inland mode

Under inland mode, voyage configuration does not include PERSON setting. To set up number of person on board, please go to INLAND SETTING/NUMBER OF PERSON.

By CONVOY EXTENSION, the dimensions of the vessel are set to the maximum rectangular size of the convoy when operating in inland AIS mode.

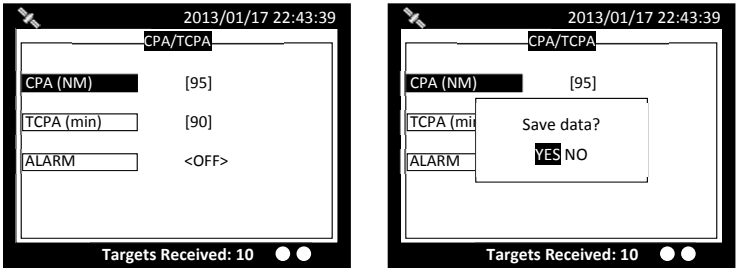


Inland voyage setting

CPA/TCPA

In this submenu the closest point of approach (CPA) and time to CPA (TCPA) can be set. The vessels with insufficient CPA and TCPA will be displayed in the dangerous list (page 58) and on coastal and radar view.

- CPA – in nautical miles
- TCPA – in minutes
- Alarm – when alarm is connected to the transponder via junction box, you can choose whether alarm should be activated when a dangerous target appears.



CPA/TCPA

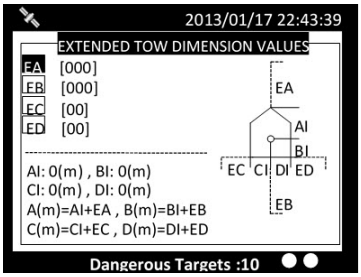
To save the settings, press MENU or ESC and the system will ask whether the changes should be saved. Select OK to save or CANCEL to discard and return to main menu.

Extended tow dimension values

It is beneficial to navigation safety for the true dimensions of vessels to be available via AIS Message 5. Currently, the ABCD values in Message 5 are difficult to change once set, requiring a password that may not be available to the vessel navigator.

This is not a problem for most vessels, except those engaged in towing operations by pushing ahead or alongside (navigational status is 12). In these instances, it may be desirable to provide easier access to and modification of vessel dimension values.

When navigational status is 12, user can set extended tow dimension values on this page.



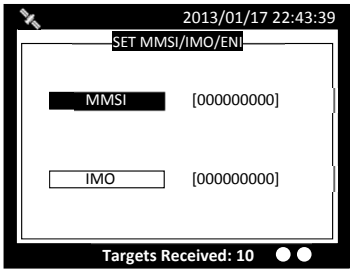
Extended tow dimension values

Set MMSI/IMO/ENI

This section is password protected and can only be accessed using the password (page 72).

SOLAS mode

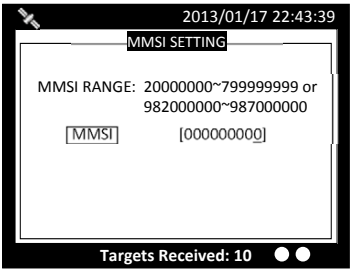
This submenu provides access to set MMSI and IMO. Use the knob to choose the menu option either MMSI or IMO.

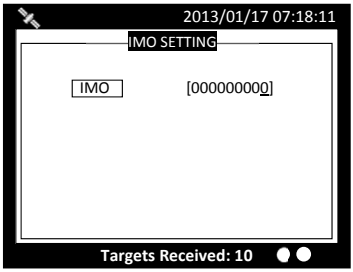


Set MMSI/IMO/ENI

For SOLAS vessels, the MMSI number can be entered in a valid range which is indicated on the input screen.

To save the settings, press MENU or ESC and the system will ask whether the changes should be saved. Select OK to save or CANCEL to discard and return to main menu.

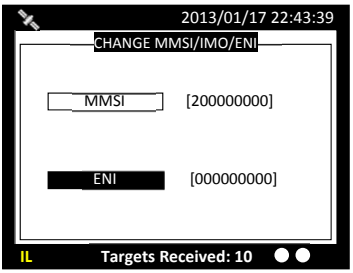


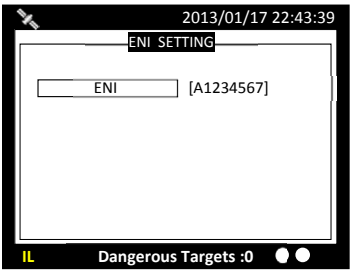


MMSI/IMO setting

Inland mode

The ENI (unique European Vessel Identification Number) setting is only available under inland mode, while IMO setting is not accessible in this mode. The procedure to set/change MMSI number is same as described in "SOLAS mode" on page 64.





ENI setting

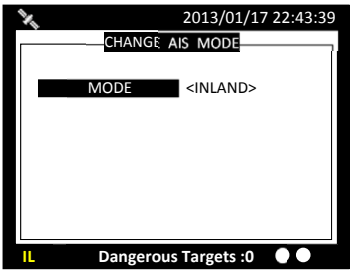
→ ***Note:*** When setting is done, press ESC to exit.

Retry times

In order to resend messages when the transmitted Message 6 or Message 12 receives no acknowledgement of Message 7 or Message 13, you can set how many times you want the system to resend messages. The options are 0 (no repeat), 1 (repeat one time), 2 (repeat 2 times) or 3 (repeat 3 times).

AIS mode

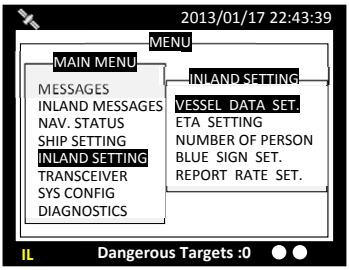
Here you can configure the transponder to operate in SOLAS or INLAND mode. Each mode has some specific submenu and menu options.



Switching between SOLAS and inland modes

Inland setting

All boat information inland setting can be found under this menu.

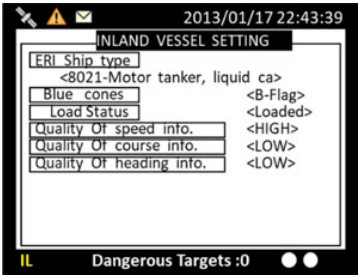


Submenus under inland setting

Vessel data setting

Inland related vessel data can be set in this submenu:

- ERI Ship Type – ERI classification code.
- Blue Cones - The number of blue cones or blue flag status for the cargo (1, 2 or 3 blue cones, or blue flag).
- Load Status - 'Loaded', 'Unloaded', 'Unknown'
- Quality of Speed, Course and heading information - will be shown as 'high' when the target vessel is using an approved sensor to generate this data, or low if the data is derived from internal GNSS only.

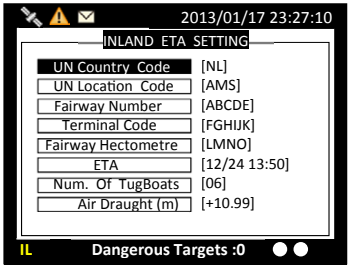


Inland related vessel data

ETA setting

This menu provides ETA (RFM21) related setting:

- UN country and location code - the voyage destination should be entered using UN country (2 characters) and location codes (3 characters) where possible.
- Fairway Number, Terminal Code & Fairway Hectometre: each is limited to 5 characters when available
- ETA - Estimated time / date of arrival at destination (using UTC time)
- Number of Tugboats: The number of assisting tugboats (from 0 to 6 or unknown)
- Air Draught: The air draught of the vessel to the nearest centimeter.



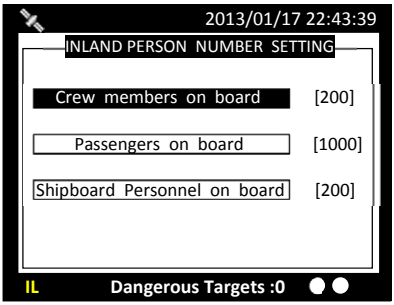
Inland ETA setting

To save the settings, press MENU or ESC and the system will ask whether the changes should be saved. Select OK to save or CANCEL to discard and return to main menu.

Number of person

This submenu provides Number of Person (RFM55) setting:

The number of crew (0 to 254 or unknown), passengers (0 to 8190 or unknown) and other shipboard personnel (0 to 254 or unknown).



Number of person setting

Blue sign setting

Blue Sign information helps you recognize the approaching vessels in your inland waterway area. A 'blue sign' switch may optionally be connected to the AIS transceiver during installation. This setting enables or disables the blue sign switch on the Junction Box.

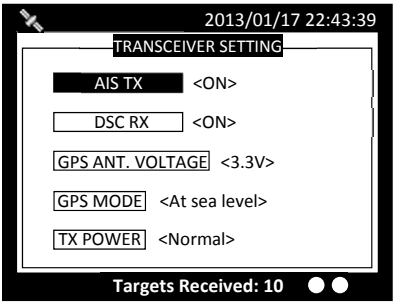
Blue sign switch setting

Report rate setting

Set V5035's report rate. Selectable report rates are AUTO/ 10 SEC./ 5 SEC./ 2 SEC.

Transceiver

This section is password protected and can only be accessed using the password (page 72). The submenu allows the users to switch on or off the transmission and change the supplied voltage of the GPS antenna between 3.3V and 5V. It also enables to switch the transmission power between 12.5W, as "normal", and 1W.

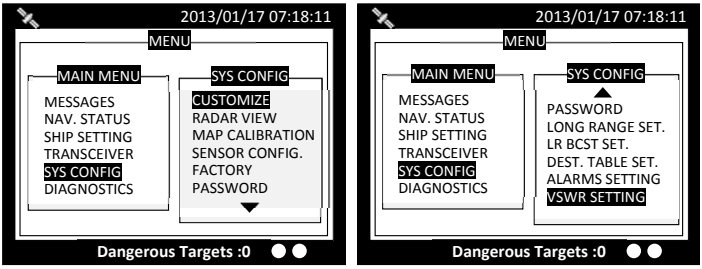


For inland vessels that operate at altitude higher than 500 meters, the transponder needs GPS Mode set to "Altitude higher than 500m" for better GPS positioning performance.
To save the settings, press MENU or ESC and the system will ask whether the changes should be saved. Select OK to save or CANCEL to discard and return to main menu.

System configuration

System configuration provides access to user configurable preferences for V5035. All user settings are stored within the transponder and are maintained if the power supply is switched off.

After the setting is done, press MENU or ESC and the system will ask whether the changes should be saved. Select OK to save or CANCEL to discard and return to main menu.



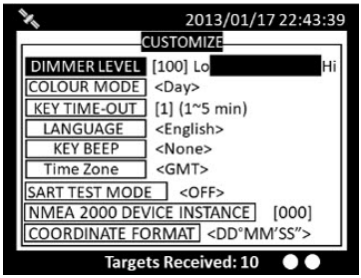
System configuration

Customize

Customize provides personalization settings:

- Dimmer Level - brightness setting from 1 (low) to 100 (high)
- Colour mode - brightness and contrast adjustment for the LCD display along with selection of day or night operating mode. In night mode the display colours are inverted (light text on a dark background).

- Key time-out - time to leave menu screen and switch back to coastal view
- Language - available: select the user interface language from the available language options.
- Key Beep – turn on or off the key beep
- Time Zone – set the time zone
- SART test mode – hide or display the SART test message
- NMEA 2000 device instance is used to identify multiple similar products connected on the same NMEA 2000 network. The setting value is between 000 and 252.
- Coordinate Format – user can choose between DD°MM'SS" (degrees, minutes, seconds) and DD°MM.mm´ (degrees, minutes, decimal minutes) to display the vessel coordinate.

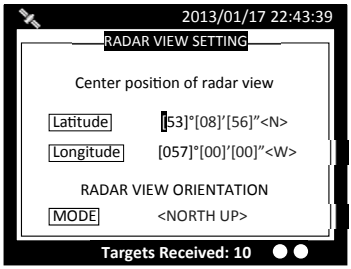


Customize

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.

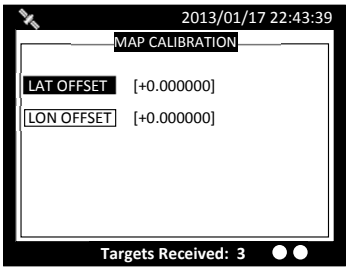


Radar view setting

In this view setting, RADAR VIEW ORIENTATION has NORTH UP/ COURSE UP / HEAD UP view modes.

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.



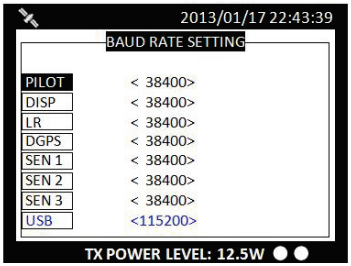
Map calibration

Sensor configuration

This section is password protected and can only be accessed using the password (page 72).

Sensor Configuration provides user to set baud rates for sensor ports and USB port. 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 of sensor ports between 4800/9600/19200/38400. USB port can be configured to any baud rate of 4800/9600/19200/38400/57600 or 115200. Default baud rates of the ports are shown in below example.

When finished, press knob again to return to the previous level.

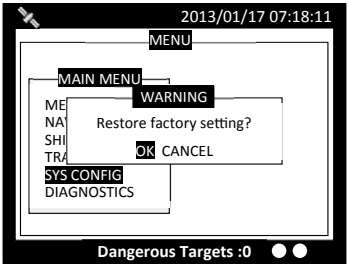


Baud rate setting

Factory

This section is password protected and can only be accessed using the password (page 72).

Press knob to confirm your choice and the following settings will be restored to their original value: MOB/Friend ship List, destination list, time zone, language, dimmer, CPA/TCPA and system password.



Factory setting

Password

This submenu enables users to change user password. Certain important information stored within the transponder can only be changed with the password. Password is required for the access of the following sections:

- Own Ship (page 4960) – contains information about call sign, vessel name and ship type
- Set MMSI/IMO/ENI (page 64) – contains information about MMSI and IMO number
- Transceiver (page 68) – enables the option to activate/ deactivate AIS transmission
- Sensor Configuration (page 7169) – about baud rate configuration of sensors
- Factory (page 7271) – restoration of factory setting
- Alarms Setting (page 7474)
- VSWR Setting (page 7474)

⚠ (Default password: "0000")

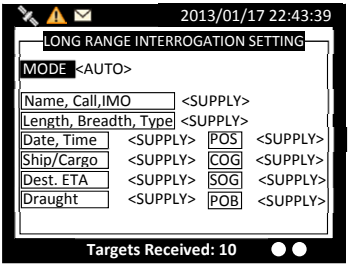
Use the knob in the order of "OLD PASSWORD", "NEW PASSWORD", "CONFIRM NEW PASSWORD". Repeat till all four values are entered.

To save the settings, press MENU or ESC and the system will ask whether the changes should be saved. Select OK to save or CANCEL to discard and return to main menu.

Long range setting

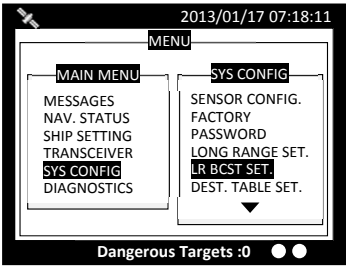
This option provides user choices to auto-response remote interrogation and settings of the response information.

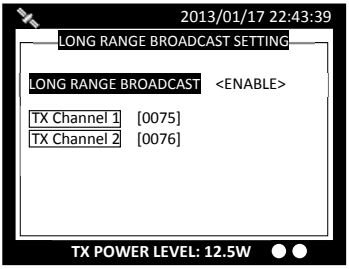
You can either set MODE to either AUTO or MANUAL. The setting for the rest of information is either SUPPLY or REJECT.



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.

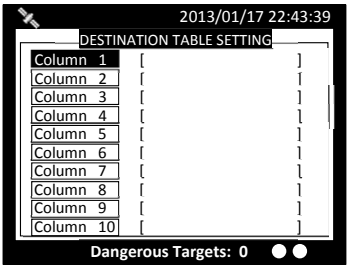




→ ***Note:*** Only AIS channel numbers can be entered for TX channel. Channel 2078, 2088, and the current channel used in the region cannot be used.

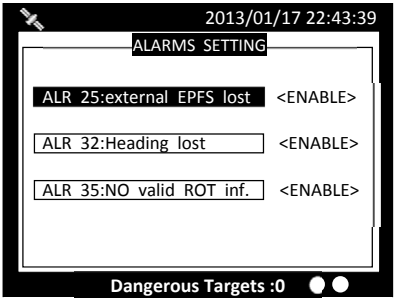
Destination table setting

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



Alarm setting

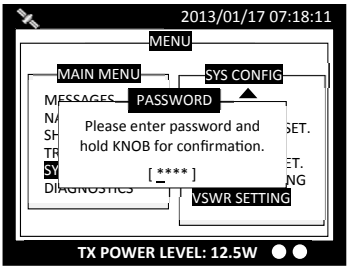
This menu is password protected. The menu can be used to enable or disable ALR 25/32/35 sentence. For instance, if an ALR sentence is disabled, the corresponding alarm would not activate.

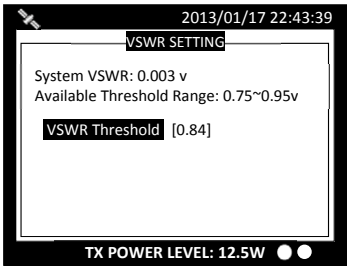


Alarm setting for ALR 25/32/35

VSWR setting

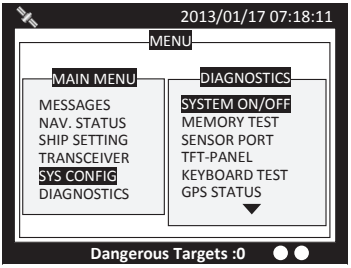
The VSWR setting function allows the fine-adjustment of VSWR threshold according to the cable length and VHF antenna characteristics. This function is password protected (page 72) and should be performed by a qualified service partner or dealer.





Diagnostics

This submenu provides users to check system statuses. There are a total of 8 check options.



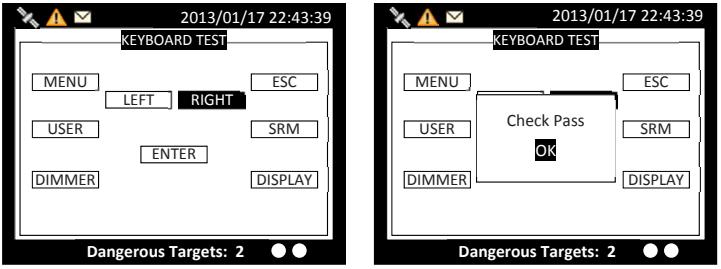
System On/Off: This option provides activation history (any power-off session less than 15 minutes would not be registered in the history).

Memory Test: This option provides memory testing on the unit.

Sensor Port: This option provides an overview of baud rates on all ports and status information.

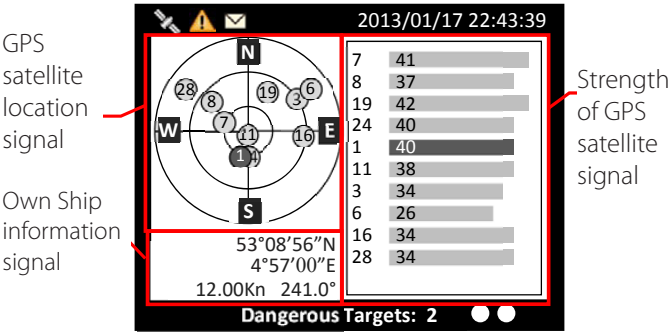
TFT-Panel: This option provides color information on the monitor.

Keyboard Test: This option provides keyboard testing. Pressing button during testing, a corresponding button on the screen will response. 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.



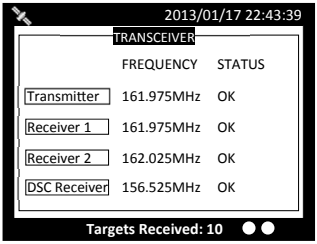
Keyboard test

GPS status: This option provides GPS satellite status information. Green indicates satellite being used for GPS fix. Red indicates satellite not being used.



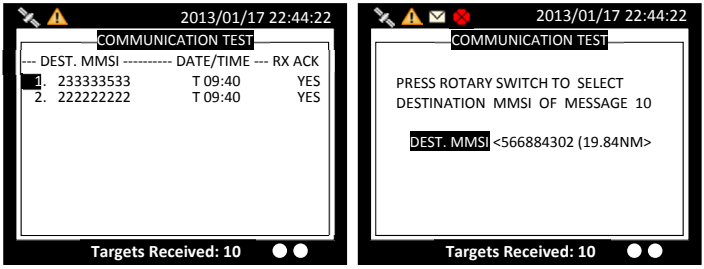
GPS status

Transceiver: This option allows the user to view the frequencies and status. When finished, press ESC to exit.



Transceiver

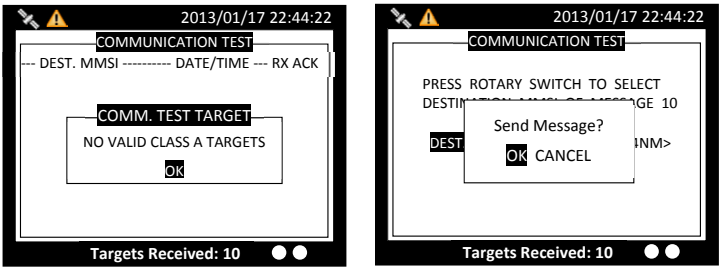
Communication Test: Communication can be tested. The procedure starts by transmitting Message 10 to an addressed Class A MMSI. The addressee MMSI, once received Message 10, will return Message 11. The test is then complete when the transponder successfully receives the Message 11.



Communication test

Press the FUNC button to start the communication test. Follow the on-screen instruction to select a class A MMSI number. Then press MENU, ESC or FUNC and click "OK" to start the transmission of Message 10. Only Class A units with GPS fix are listed and eligible for communication testing.

The left screen below indicates no valid Class A targets found.



No valid targets

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.

Panel test

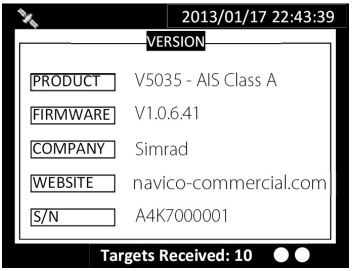
In the submenu users can test the brightness of the screen.

Press "FUNC" to switch the white cube between different sizes. Rotate the scroll wheel quickly to test different stages of brightness. To exit the function, press "MENU" or "ESC".

Test with size and brightness

Version

Provide model name, hardware information, delivered firmware version on the unit, etc. When finished, press ESC to exit.



Version information

5 Technical specifications

Applicable standards

IMO Resolution A694(17)	IEC 61993-2 Ed. 3.0, 2018
IMO Resolution MSC.74(69) Annex 3	IEC 61108-1 Ed. 2.0, 2003
IMO Resolution MSC. 191(79)	IEC 60945 Ed. 4.0, 2002 incl. Corr. 1 2008
ITU-R M 1371-5 (Class A), 2014	IEC 61162-1 Ed. 5.0, 2016
ITU-R M 825-3, 1998	IEC 61162-2 Ed. 1.0, 1998
ITU-R M 1084-5, 2012	IEC 62288 Ed. 2.0, 2014
CCNR test standard for Inland AIS, edition 2.0 (October 2012)	IEC 62923-1 Ed. 1.0, 2018 IEC 62923-2 Ed. 1.0, 2018

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

DSC receiver

Frequency	156.525 MHz
Modulation	FSK
Channel Bandwidth	25 KHz
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 %

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

Power supply

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

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

Keypad and knob

6 keypads with backlight	1 for SRM, 1 for Menu, 1 for Dimmer, 1 for ESC, 1 for Display, 1 for Nav. Status
Knob	Multi-Function

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

Environmental

Operating Conditions	IEC 60945 "protected" category
Operating Temperature	-15°C ~ 55°C
Operating Humidity	95% RH at 40°C
Waterproof	IPX2

Physical

Width	205 mm (8.07 inch)
Height	85 mm (3.34 inch)
Depth (include connectors)	173 mm (6.81 inch)
Weight	≦ 1.16 kg

Pilot plug

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

NMEA 2000 PGN information

This table lists NMEA 2000 messages supported by the V5035 unit.

The "Transmit" PGNs information includes "Own ship" + "Received AIS information from other ships". This is the reason the NMEA2000 PGN list covers both Class A and Class B related information.

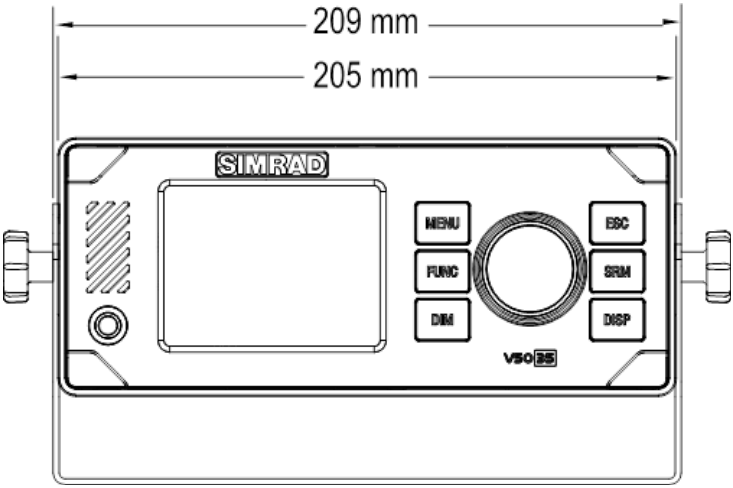
Transmit	
PGN	**Description**
59392	ISO Acknowledgment
59904	ISO Request
60928	ISO Address Claim
126464	PGN List - Transmit PGN's group function
126996	Product Information

129025	Position Rapid Update
129026	COG SOG Rapid Update
129029	GNSS Position Data
129038	AIS Class A Position Report
129039	AIS Class B Position Report
129040	AIS Class B Extended Position Report
129041	AIS Aids to Navigation (AtoN) Report
129539	GNSS DOPs
129540	GNSS Sats in View
129792	AIS DGNSS Broadcast Binary Message
129793	AIS UTC and Date Report
129794	AIS Class A Static and Voyage Related Data
129795	AIS Addressed Binary Message
129796	AIS Acknowledge
129797	AIS Binary Broadcast Message
129798	AIS SAR Aircraft Position Report
129800	AIS UTC/Date Inquiry
129801	AIS Addressed Safety Related Message
129802	AIS Safety Related Broadcast Message
129803	AIS Interrogation
129804	AIS Assignment Mode Command
129805	AIS Data Link Management Message
129806	AIS Channel Management
129807	AIS Group Assignment
129808	DSC Call Information
129809	AIS Class B "CS" Static Data Report, Part A
129810	AIS Class B "CS" Static Data Report, Part B
Receive	
PGN	**Description**
59392	ISO Acknowledgment
59904	ISO Request
60928	ISO Address Claim
127250	Vessel Heading
127258	Magnetic Variation

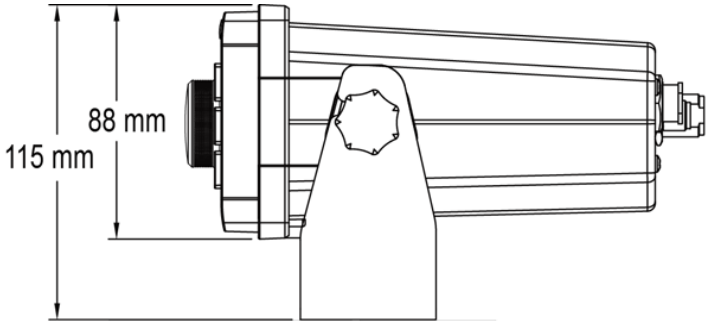
6 Mechanical dimensions

V5035 transponder main unit

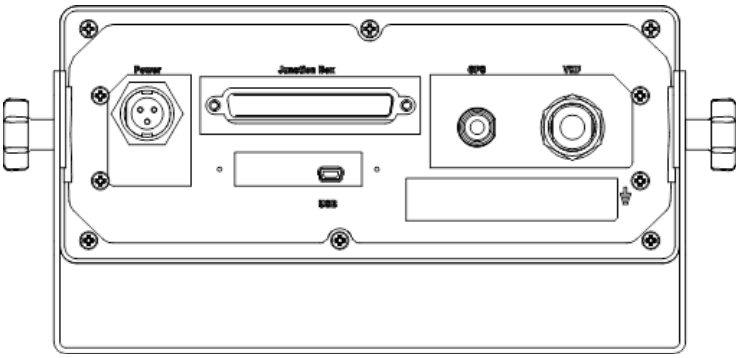
Front (size: mm)



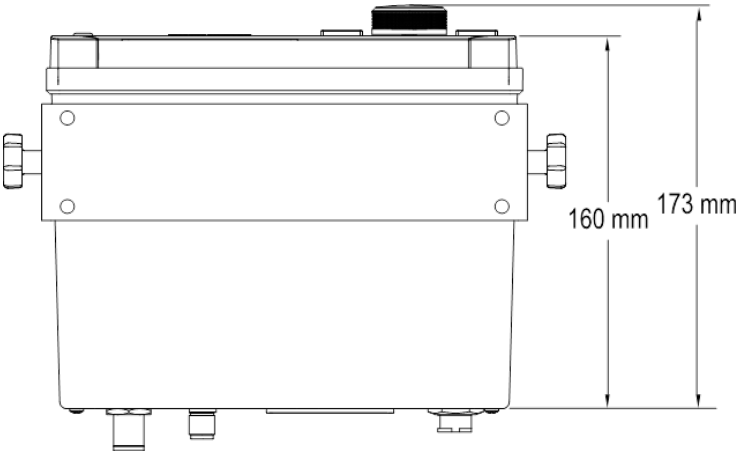
Side (size: mm)



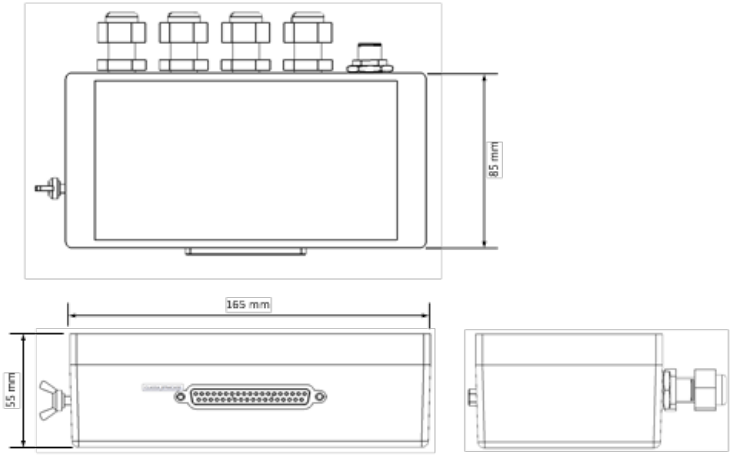
Back (size: mm)



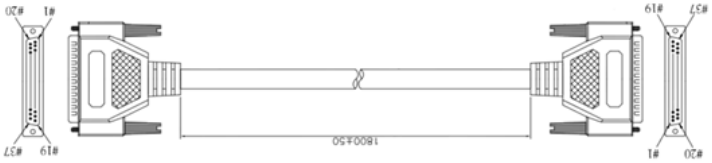
Bottom (size: mm)



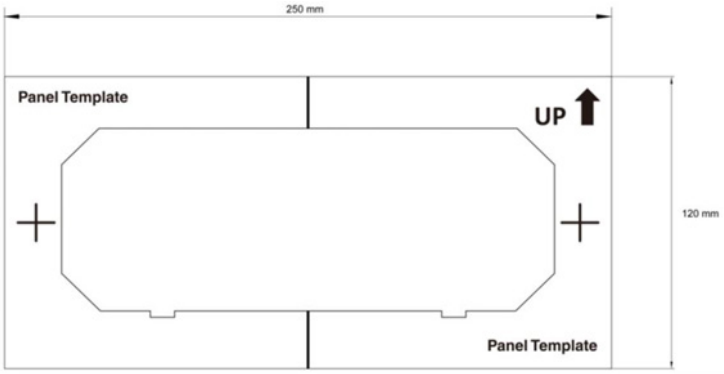
Junction box



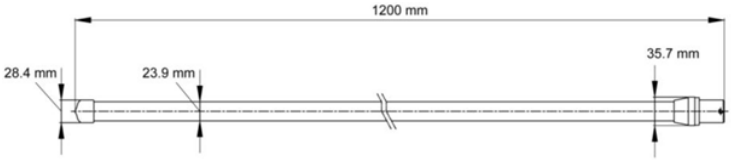
Extension cable



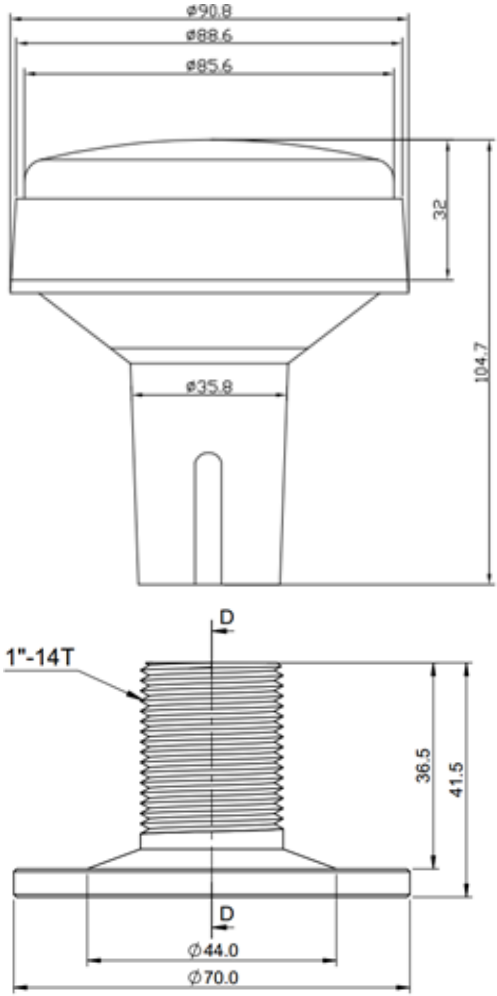
Mounting template (not to scale)



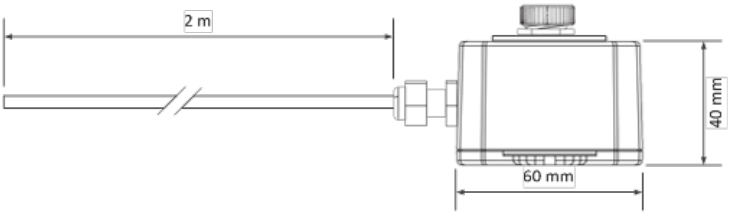
VHF antenna

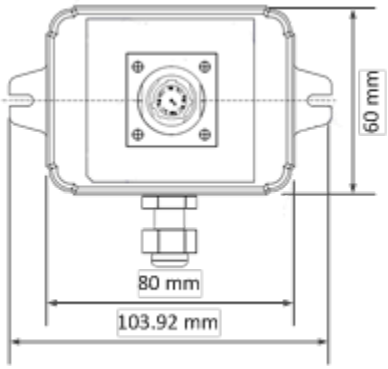


GPS antenna



Pilot plug





7 Troubleshooting

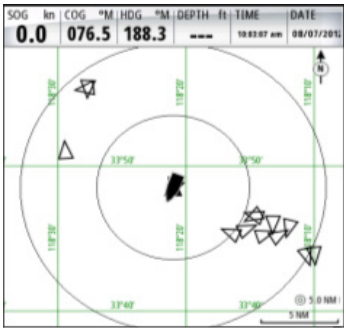
Use this table to perform simple troubleshooting if the transponder is not functioning as expected.

Symptom	Possible cause	Solution
Transponder cannot power on	Faulty connector to power	Check power connection
	Polarity reverse	Check power connection
	Power supply current too low	Check power supply
No picture on display	Unit not powered up	Press power key
	Dimmer level set too low	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	Enter MMSI number
	Transmitter disabled	Enable transmitter
	Power supply voltage too low	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

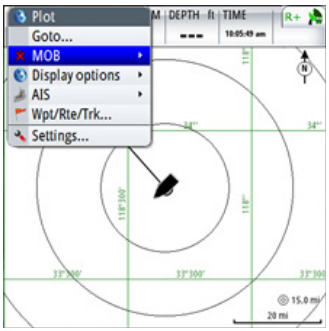
8 GN70/MX61X AIS operation

The GN70/MX610/MX612 CDU can display AIS targets provided by the V5035 AIS transponder by pressing the AIS hot key. You can zoom-out by turning the ROTARY KNOB counter-clockwise or zoom-in by turning it in clockwise direction.

AIS targets can be displayed as overlay on the plotter screen. This feature is an important tool for safe travelling and collision avoidance. You need to have your own MMSI (Maritime Mobile Service Identity) number entered in the CDU to be able to receive addressed messages from AIS and DSC vessels. It is also important to have the MMSI number entered to avoid seeing your own vessel as an AIS target on the plotter. You can define alarms to notify you if an AIS target gets too close or if the target is lost.



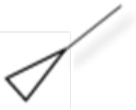
Vessels on AIS/PLOT screen



AIS Plot with Quick Menu

Target symbols

The MX610/MX612 system use the AIS target symbols below:

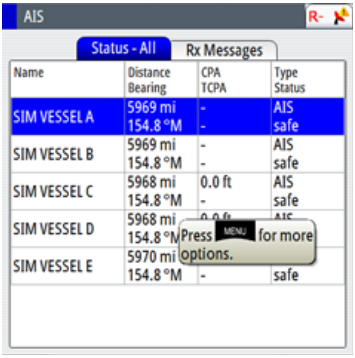
Symbol	Description	
	Sleeping AIS target (not moving or at anchor)	
	Moving and safe AIS target with course extension line	
	Dangerous AIS target, illustrated with bold line	A target is defined as dangerous based on the CPA and TCPA settings. Refer to Defining dangerous vessels on page 59.
	Lost AIS target	When no signals have been received within a time limit a target will be defined as lost. The target symbol represents the last valid position of the target before the reception of data was lost.

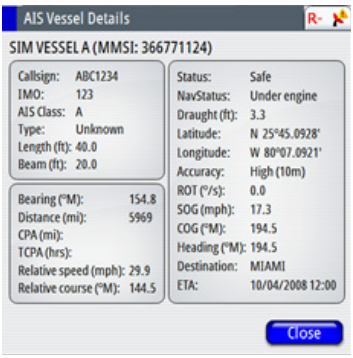
Viewing information about AIS targets

AIS target list

To display a list of AIS target:

1. Press the AIS hot key.
2. Press the MENU key to bring up the quick menu.
3. The Vessel info menu will be highlighted, press ENT.
4. The list of AIS vessels will show.
5. Scroll to the desired AIS target, press ENT to show the vessel details.
6. Press the ENT key to close.
7. To exit, press the CLR a few times or any hot key.

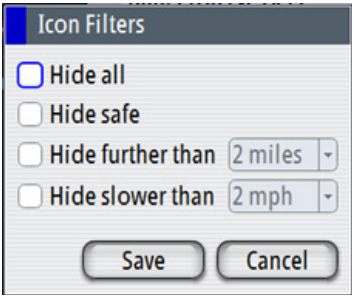




Vessel filter

AIS targets displayed can be filtered to hide all targets or safe targets. It can also filter out targets that are further away or traveling at a certain speed:

1. Press the AIS hot key.
2. Press the MENU key to bring up the quick menu.
3. Scroll to Vessels Filter… menu, press ENT.
4. Select desired action by scrolling to it and pressing ENT to leave a check mark.
5. Scroll to SAVE, press ENT.



Vessel alarms

You can define several alarms to alert you if a target comes within predefined range limits, or if a target is lost.

Alarm ID	Description
Dangerous vessel	Controls whether an alarm shall be activated when a vessel comes within the predefined CPA or TCPA. See Defining dangerous vessels on page 59. Note: The check box controls whether the alarm pop-up box is displayed and if the siren will sound. The CPA and TCPA define when a vessel is dangerous regardless of the enabled/disabled state.
AIS vessel lost	Sets the range for lost vessels. If a vessel is lost within this range this will trigger an alarm.
Vessel message	Controls whether an alarm shall be activated when a message is received from an AIS target.

➔ ***Note:*** Please refer to the GN70/MX61x User manual for more AIS operation.

9 Abbreviations

ACK	Acknowledgement
AIS	Automatic Identification System
ALR	Alarm
ANT	Antenna
AtoN	Aid to Navigation
AUTO	Automatic
AUX	Auxiliary
BIIT	Built-In Integrity Test
BRG	Bearing
CH	Channel
COG	Course Over Ground
CPA	Closest Point of Approach
DEST/DESTN	Destination
DISP	Display
DGNSS	Differential GNSS
DGPS	Differential GPS
DISP	Display
DIST	Distance
DSC	Digital Selective Calling
DTE	Data Terminal Equipment
ECDIS	Electronic Chart Display and Information System
ECS	Electronic Chart System
EGNOS	European Geo-stationary Navigational Overlay System
ENC	Electronic Navigation Chart
EPFS	Electronic Position Fixing System
EPIRB	Electronic Position Indicating Radio Beacon
ESC	Escape
ETA	Estimated Time of Arrival
EXT	External
FCC	Federal Communications Commission

FM	Frequency Modulation
FSK	Frequency Shift Keying
FUNC	Function
GAGAN	GPS-aided geo-augmented navigation
GLONASS	Global Orbiting Navigation and Safety System
GMDSS	Global Maritime Distress and Safety System
GMSK	Gaussian Minimum Shift Keying
GND	Ground
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GYRO	Gyro Compass
HDG	Heading
IALA	International Association of Lighthouse Authorities
I/O	Input/Output
ID	Identification
IEC	International Electotechnical Commission
IMO	International Maritime Organization
IN	Input
INFO	Information
ITU-R	International Telecommunications Union - Radio
KN	Knots
LAT	Latitude
LCD	Liquid Crystal Display
LON	Longitude
LR	Long Range
MED	Maritime Equipment Directive
Min	Minute
MKD	Minimum Keyboard and Display
MMSI	Maritime Mobile Service Identity
MOB	Man Overboard
MSAS	Multi-functional Satellite Augmentation System
NAV	Navigation

NM	Nautical Mile
NMEA	National Marine Electronics Association
OUT	Output
PI	Presentation Interface
RAIM	Receiver Autonomous Integrity Monitoring
RH	Relative Humidity
RNG	Range
ROT	Rate of Turn
RTCM	Radio Technical Commission for Maritime services
Rx	Receive / Receiver
S	Second
SART	Search and Rescue Transponder
SAR	Search and Rescue
SBAS	Satellite Based Augmentation System
SOG	Speed Over Ground
SOLAS	Safety of Life at Sea
SRM	Safety Related Message
SYS	System
TCPA	Time to Closest Point of Approach
TDMA	Time Division Multiple Access
Tx	Transmit
Tx / Rx	Transmit / Receive
UHF	Ultra-High Frequency
USB	Universal Serial Bus
UTC	Universal Time Co-ordinate
VDL	VHF Data Link
VHF	Very High Frequency
VSWR	Voltage Standing Wave Ratio
WAAS	Wide Area Augmentation System

Appendix A

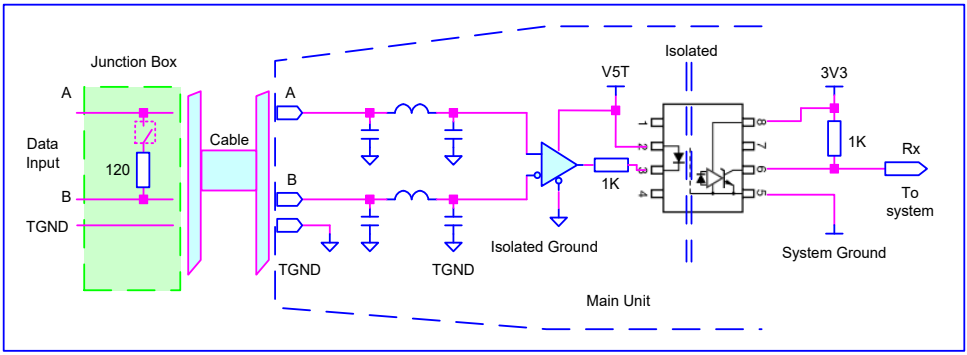
IEC 61162-2 Data Interface

The V5035 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.

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:

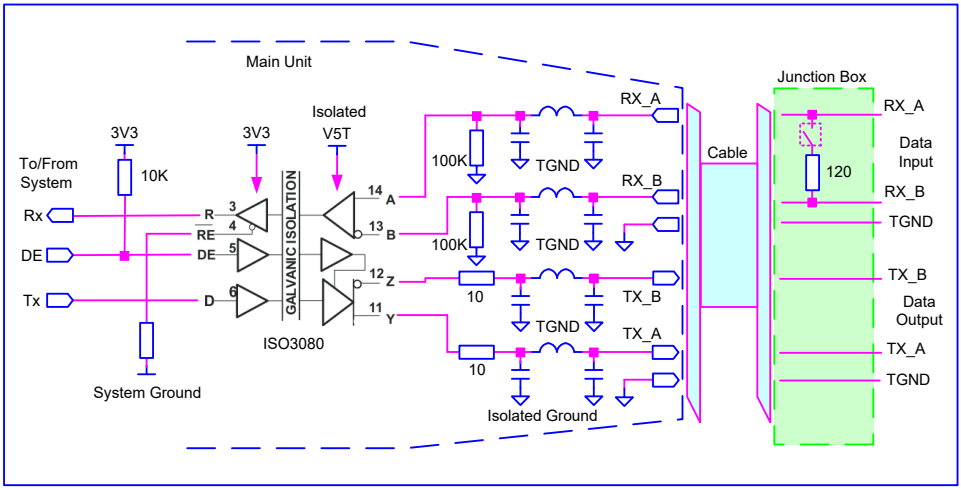
- Logic low input: A-B < -0.2V
- Logic high input: A-B > +0.2V



Schematic of sensor data input port

Bidirectional data ports

The schematic of bidirectional data port is shown in Figure A2. The schematics includes an isolated 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.



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 and B signal lines

Refer to sections Sensor Data Input Ports (previous page) and Bidirectional Data Ports above.

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.

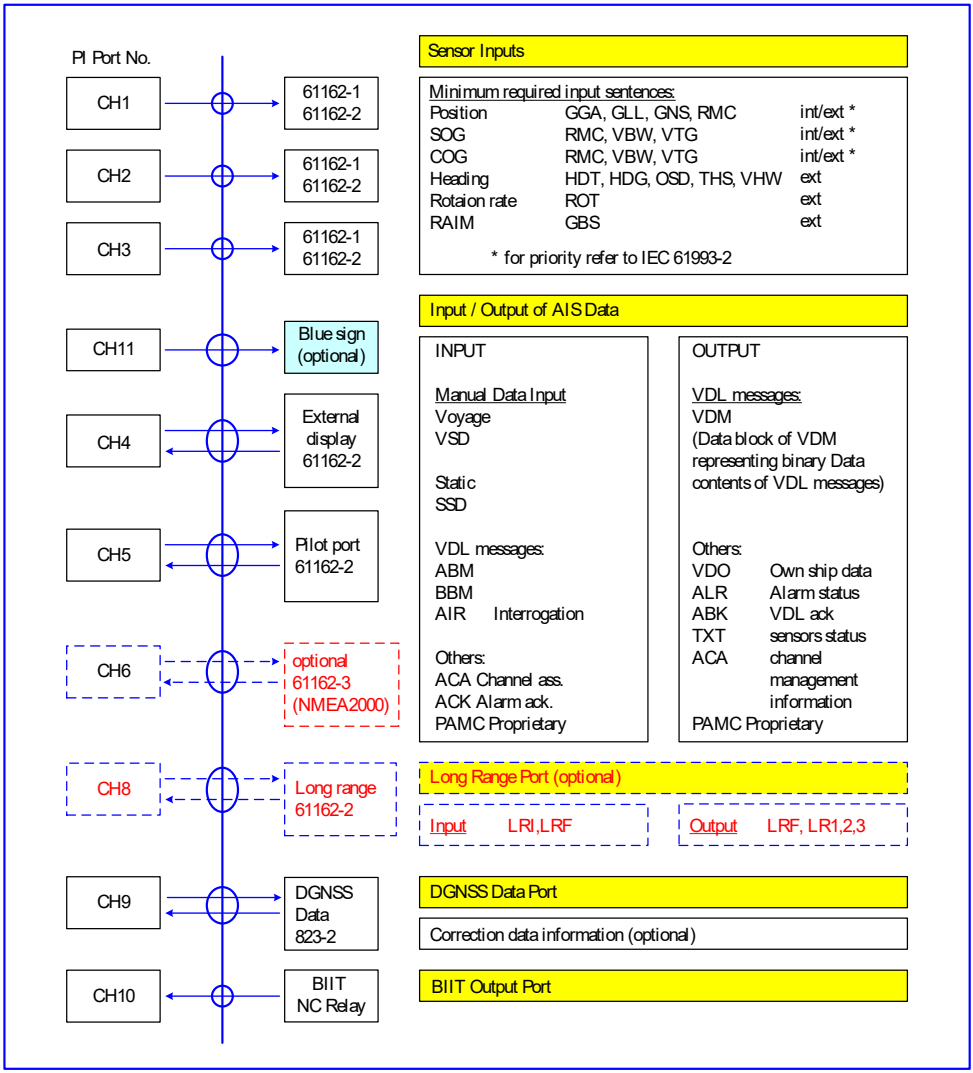
Input load

Refer to sections Sensor Data Input Ports (previous page) and Bidirectional Data Ports above.

Hardware input/output circuit

Refer to sections Sensor Data Input Ports (previous page) and Bidirectional Data Ports above.

Presentation interface of V5035



Supported IEC 61162 data sentences

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

Transmission interval

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

Interpretation of input sentences

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	

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	

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	

ACN – Alert command

This sentence is used for acknowledge, silence, responsibility transfer and to request repeat of alert details in case the reception process has detected, based on ALC, that ALF has been missed.

$--ACN,hhmmss.ss,aaa,x.x,x.x,c,a*hh <CR><LF>			
Field no.	**Format**	**Description**	**Remark**
1	hhmmss.ss	Time	
2	aaa	Manufacturer mnemonic code	
3	x.x	Alert Identifier	
4	x.x	Alert Instance, 1 to 999999	
5	c	Alert command, A, Q, O or S	
6	a	Sentence status flag	

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	

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

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	

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	

EPV – Command or report equipment property value

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

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

GGA – Global positioning system (GPS) fix data

Time, position and fix-related data for a GPS receiver.

$--GGA, hhmmss.ss, llll.ll, a, yyyyy.yy, a, x, xx, x.x, x.x, M, x.x, M, x.x, xxxx*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	x	GPS quality indicator	ignored
5	xx	Number of satellites in use, 00-12, may be different from the number in view	ignored
6	x.x	Horizontal dilution of precision	ignored
7	x.x	Antenna altitude above/below mean sea level (geoid)	ignored
8	M	Units of antenna altitude, m	ignored
9	x.x	Geoidal separation	ignored
10	M	Units of geoidal separation,m	ignored
11	x.x	Age of differential GPS data	ignored
12	xxxx	Differential reference station ID, 0000-1023	ignored

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	

GNS – GNSS fix data

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

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

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	

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	

HDT – Heading true

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

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

LRF – AIS long-range function

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

$--LRF,x,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	

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	

OSD – Own ship data

Heading, course, speed, set and drift summary. Useful for, but not limited to radar/ARPA applications. OSD gives the movement vector of the ship based on the sensors and parameters in use.

$--OSD, x.x,A,x.x, a,x.x,a,x.x,x.x,a*hh<CR><LF>			
Field no.	**Format**	**Description**	**Remark**
1	x.x	Heading, degrees true	
2	A	Heading status: A = data valid, V = data invalid	
3	x.x	Vessel course, degrees true	Ignored
4	a	Course reference, B/M/W/R/P (see Note)	Ignored
5	x.x	Vessel speed	Ignored
6	a	Speed reference,B/M/W/R/P (see Note)	Ignored
7	x.x	Vessel set, degrees true	Ignored
8	x.x	Vessel drift (speed)	Ignored
9	a	Speed units, K = km/h; N = knots; S = statute miles/h	ignored

RMC – Recommended minimum specific GNSS data

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

$-- GNS, hhmmss.ss, llll.ll, a, yyyyy.yy, a, c--c,xx,x.x,x.x,x.x,x.x,x.x,a *hh<CR><LF>			
Field no.	**Format**	**Description**	**Remark**
1	hhmmss.ss	UTC of position 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	

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	

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	

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	

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	

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

VHW – Water speed and heading

The compass heading to which the vessel points and the speed of the vessel relative to the water

$--VHW, x.x, T, x.x, M, x.x, N, x.x, K*hh<CR><LF>			
Field no.	**Format**	**Description**	**Remark**
1	x.x, T	Heading, degrees true	
2	x.x, M	Heading, degrees magnetic	Ignored
3	x.x, N	Speed, knots	Ignored
4	x.x, K	Speed, km/h	Ignored

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	

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	

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	
9	x	Parameter Id 4 , 0-998	
10	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	
9	x	Parameter Id 4 , 0-998	
10	x	Parameter value 4, 0- 1000000000	

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	

Interpretation of output sentences

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	

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	

ALC – Cyclic alert list

The purpose of this sentence is to satisfy the needs for a safe and consistent data distribution with a minimum of data traffic. Each change on an alert's data leads to an incremented Revision counter. So an alert processing device only needs to check the alert entries in the ALC messages to ensure that no ALF message has been lost.

$--ALC,xx,xx,xx,x.x,aaa,x.x,x.x,x.x,x.x,……..,aaa,x.x,x.x,x.x*hh <CR><LF>			
Field no.	**Format**	**Description**	**Remark**
1	xx	Total number of sentences for this message, 01 to 99	
2	xx	Sentence number, 01 to 99 1	
3	xx	Sequential message identifier, 00 to 99	
4	x.x	Number of alert entries	
5	aaa	Manufacturer mnemonic code	
6	x.x	Alert identifier	
7	x.x	Alert instance	
8	x.x	Revision counter	
9	…….	Additional Alert entries	
10	aaa,x.x,x.x,x.x	Alert entry n	

ALF – Alert sentence

This sentence is used to report an alert condition and the alert state of a device. An ALF message shall be published for an alert each time the alert information in this sentence changes and on alert request.

$--ALF,x,x,x,hhmmss.ss,a,a,a,aaa,x.x,x.x,x.x,x,c---c*hh <CR><LF>			
Field no.	**Format**	**Description**	**Remark**
1	x	Total number of ALF sentences for this message, 1 to 2	
2	x	Sentence number, 1 to 2	
3	x	Sequential message identifier, 0 to 9	
4	hhmmss.ss	Time of last change	
5	a	Alert category, A, B or C	
6	a	Alert priority, E, A, W or C	
7	a	Alert state, A, S, N, O, U or V	
8	aaa	Manufacturer mnemonic code	
9	x.x	Alert identifier	
10	x.x	Alert instance, 1 to 999999	
11	x.x	Revision counter, 1 to 99	
12	x	Escalation counter, 0 to 9	
13	c---c	Alert text	

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	

ARC – Alert command refused

This sentence is used for which it is illegal to accept acknowledge or responsibility transfer, e.g. not enough information for decision support available or the source of acknowledgement is not acceptable.

$--ARC,hhmmss.ss,aaa,x.x,x.x,c*hh <CR><LF>			
Field no.	**Format**	**Description**	**Remark**
1	hhmmss.ss	Time	
2	aaa	Manufacturer mnemonic code	
3	x.x,	Alert identifier	
4	x.x,	Alert instance, 1 to 999999	
5	c	Refused alert command, A, Q, O or S	

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	

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	

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	

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	

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	

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	

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	

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

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 BIIT 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

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.

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.

Detection of Rx Malfunction

The V5035 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

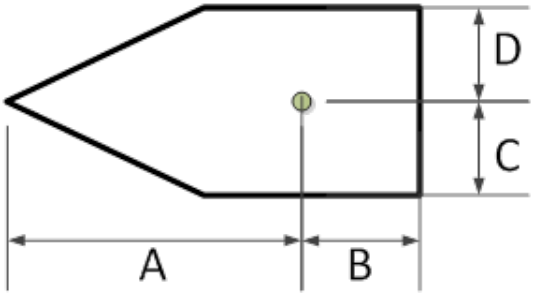
Installation and maintenance record

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 number		
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 installer. When software update is done, the new software (firmware) version can be identified through MKD at MENU/DIAGNOSTICS/VERSION (please refer to "Version" page 77 in the manual). Each new software upgrade requires information recorded to reflect the change made.

Software maintenance record			
Software version	**By**	**Date**	**Change**

Notes

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