A200 AIS Class A / Inland transceiver

Installation and operation manual

em-trak

Thank you for purchasing this AIS Class A transceiver / Inland AIS.

This product has been engineered to offer you the highest level of performance and durability and we hope that it will provide many years of reliable service. We constantly strive to achieve the highest possible quality standards, should you encounter any problems with this product, please contact your dealer who will be pleased to offer any assistance you require.

List of abbreviations

AIS	Automatic Identification System
AIS SART	AIS Search and Rescue Transmitter
AP	Access Point (Relating to WiFi behaviour)
AtoN	AIS Aid to Navigation
CD	Compact Disc
CE	European Declaration of Conformity
COG	Course Over Ground
COM	Common (electrical)
CPA	Closest Point of Approach
CS	Carrier Sense
DC	Direct Current
Dec	Decimal
DGPS	Differential GPS
DGNSS	Differential GNSS
DHCP	Dynamic Host Configuration Protocol
DOP	Dilution of Precision
DSC	Digital Selective Calling
DTM	Datum
ECDIS	Electronic Chart Display and Information System
ENI	Unique European Vessel Identification Number
EPFS	Electronic Position Fixing System
EPIRB	Emergency Position Indicating Radio Beacon
ERI	Electronic Reporting International

ETA	Estimated Time of Arrival
EXT	External
FCC	Federal Communications Committee
GBS	GNSS satellite fault detection message
GFA	GNSS fix accuracy and integrity message
GGA	Global positioning system (GPS) fix data message
GLL	Geographic position - Latitude/longitude message
GLONASS	Globalnaya Navigazionnaya Sputnikovaya Sistema (Russian GNSS)
GND	Electrical Ground
GNS	GNSS fix data message
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
GRS	GNSS range residuals message
GSA	GNSS DOP and active satellites message
GSV	GNSS satellites in view message
HDT	Heading true message
Hex	Hexadecimal
IEC	International Electrotechnical Commission
IMO	International Maritime Organisation
INT	Internal
IPx6	Ingress Protection (to powerful water jets)
IPx7	Ingress Protection (1m immersion for 30 minutes)
ISO	International Standards Organisation
Kt	Knots

LAT	Latitude
LCD	Liquid Crystal Display
LON	Longitude
LR	Long Range
MKD	Minimum Keyboard and Display
MMSI	Maritime Mobile Service Identity
MOB	Man Overboard
NC	Normally Closed (electrical)
NAV	Navigation
NM	Nautical Miles
NMEA	National Marine Electronics Association
PDF	Portable Document Format
PGN	Parameter Group Number
PI	Presentation Interface
R&TTE	Radio and Telecommunications Terminal Equipment Directive
RAIM	Receiver Autonomous Integrity Monitoring
RF	Radio Frequency
RMC	Recommended minimum specific GNSS data message
ROT	Rate of Turn
RX	Receive
SD	Secure Digital
SOG	Speed Over Ground
SOLAS	Safety of Life at Sea
SRM	Safety Related Message

TCP	Transmission Control Protocol
TCPA	Time to Closest Point of Approach
TDMA	Time Division Multiple Access
THS	True heading and status message
TNC	Threaded Neill–Concelman (a type of connector)
TPI	Threads per Inch
TX	Transmit
UDP	User Datagram Protocol
UHF	Ultra High Frequency
UTC	Co-ordinated Universal Time
VBW	Dual ground/water speed message
VDM	All VDL AIS messages received
VDO	AIS own-ship broadcast data
VHF	Very High Frequency
VSWR	Voltage Standing Wave Ratio
VTG	Course over ground and ground speed message
WGS84	World Geodetic System 1984
WEEE	Waste Electrical & Electronic Equipment
WiFi	Wireless networking technology

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1 Notices

When reading this manual please pay particular attention to warnings marked with the warning triangle symbol shown on the left. These are important messages for safety, installation and usage of the AIS transceiver.

1.1 Safety warnings

This equipment must be installed in accordance with the instructions provided in this manual. Failure to do so may seriously affect its performance and reliability. It is strongly recommended that a trained technician installs and configures this product.

This product must be connected to protective ground via the ground connection point. It is essential that the ground connection point is used in all installations, regardless of what other equipment is connected. The ground connection point must be bonded to protective ground using as short a connection as possible.

This equipment is intended as an aid to navigation and is not a replacement for proper navigational judgement. Information provided by the equipment must not be relied upon as accurate. User decisions based upon information provided by the equipment are done so entirely at the users own risk.

Do not install this equipment in a flammable atmosphere such as in an engine room or near to fuel tanks.

It is recommended that this product is not installed in direct sunlight or under a windshield where it may be subject to excessive solar heating.

Do not attempt to service this equipment as doing so may cause fire, electric shock or malfunction and will invalidate the warranty. If any malfunctions are detected contact your supplier or service agent.

NOT ALL SHIPS CARRY AIS. The Officer of the Watch should always be aware that other ships and, in particular, leisure craft, fishing vessels and warships may not be fitted with AIS. Any AIS equipment fitted on other ships as a mandatory requirement may also be switched off based on the Master's professional judgement.

1.2 General notices

1.2.1 Position source

All marine AIS transceivers utilise a satellite based location system such as the GLONASS or GPS.

The accuracy of a GNSS position fix is variable and affected by factors such as the antenna positioning, how many satellites are used to determine a position and for how long satellite information has been received.

1.2.2 Compass safe distance

The compass safe distance of this AIS transceiver is 0.5m or greater for a 0.3° deviation.

1.2.3 Product category

This product is categorized as 'protected' in accordance with the definitions provided in IEC 60945.

1.2.4 Disposal of AIS transceiver and packaging

Please dispose of this AIS transceiver in accordance with the European WEEE Directive or with the applicable local regulations for disposal of electrical equipment. Please dispose of the packaging in an environmentally friendly manner.

1.2.5 Accuracy of this manual

This manual is intended as a guide to the installation, setup and use of this product. If you are in any doubt about any aspect of this product, please contact your dealer.

1.3 Regulatory statements

1.3.1 Declaration of conformity - R&TTE

The manufacturer of this product declares that this product is in compliance with the essential requirements and other provisions of the R&TTE directive. The declaration of conformity is provided as a PDF file on the product CD supplied with the product. The product carries the CE mark, notified body number and alert symbol as required by the R&TTE directive. The product is intended for sale in the following member states: Great Britain, France, Spain, Sweden, Austria, Netherlands, Portugal, Denmark, Norway, Belgium, Italy, Finland, Ireland, Luxembourg, Germany and Czech Republic.

1.3.2 FCC Notice

This equipment has been tested and found to comply with the limits for a class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) This device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

1.3.3 Industry Canada Notice

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:
1.This device may not cause interference, and
2.This device must accept any interference, including interference that may cause undesired operation of the device.
This Class A digital apparatus complies with Canadian ICES-003.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:
1. L'appareil ne doit pas produire de brouillage, et
2. L'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le Fonctionnement.
Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

CE0168

2 Introduction

2.1 About AIS

The marine Automatic Identification System (AIS) is a location and vessel information reporting system. It allows vessels equipped with AIS to automatically and dynamically share and regularly update their position, speed, course and other information such as vessel identity with similarly equipped vessels. Position is derived from GLONASS or GPS and communication between vessels is by VHF digital transmissions.

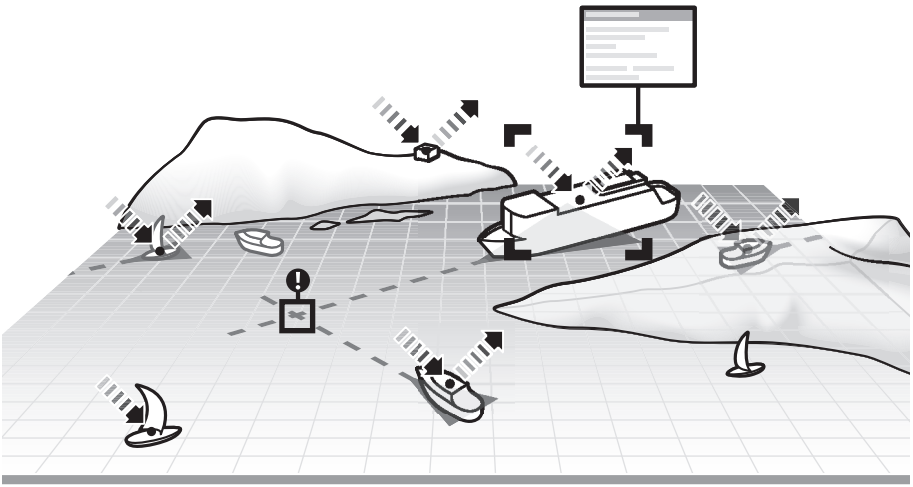

Figure 1 The AIS network

3 Installation and configuration

3.1 What's in the box?

Please ensure all items are present and if any of the items are missing please contact your dealer.

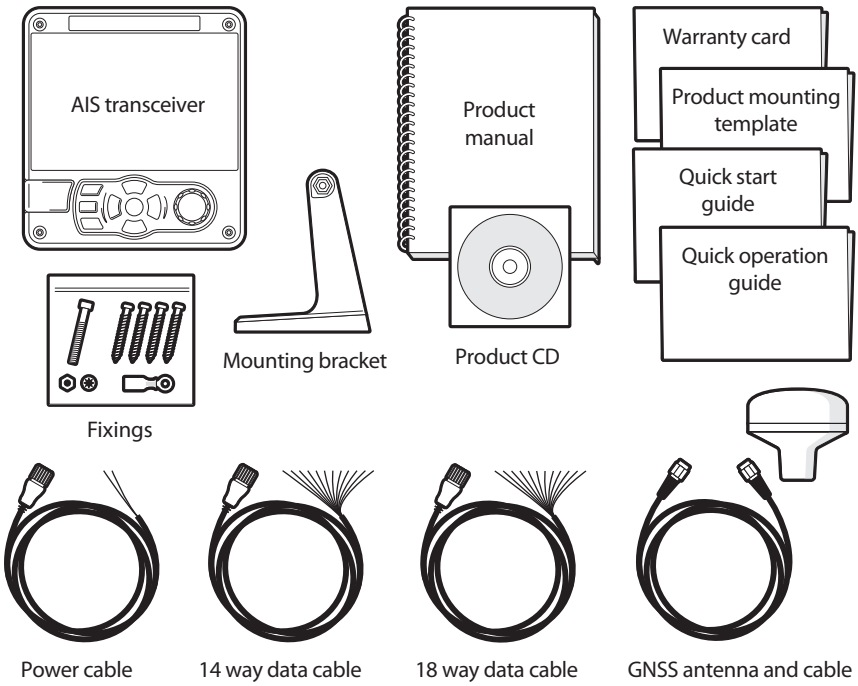

Figure 2 What's in the box?

3.2 Preparing for installation

In addition to the items provided with the AIS transceiver the following items will be required to complete the installation:

3.2.1 VHF Antenna

Connection of a suitable VHF antenna will be required for the AIS transceiver to operate. The antenna cable should be terminated with a PL-259 (or UHF) connector. A surge arrestor should be fitted in line with VHF antenna connector. See section 3.3.3 for more information.

Please take note of the warnings listed at the start of this manual regarding the installation and use of antennas.

3.2.2 Antenna cables

The supplied GNSS antenna is provided with 10 metres (32.8ft) of cable. If this is not sufficient to reach between the desired GNSS antenna location and the AIS transceiver you will require an extension cable. Please contact your dealer for details.

3.2.3 GNSS Antenna mount

A mounting bracket is required for the supplied GNSS antenna.

3.2.4 Data interface cables

Suitable screened, multi core cable will be required to connect the ships sensor (DGPS, Gyro etc.) data ports to the AIS transceiver.

3.3 Installation procedures

Before beginning installation of your AIS transceiver, please ensure that you read all of the instructions in this manual.

The following sections explain the installation process step by step for each of the main system elements. A typical system and connection diagram is provided in Figure 3.

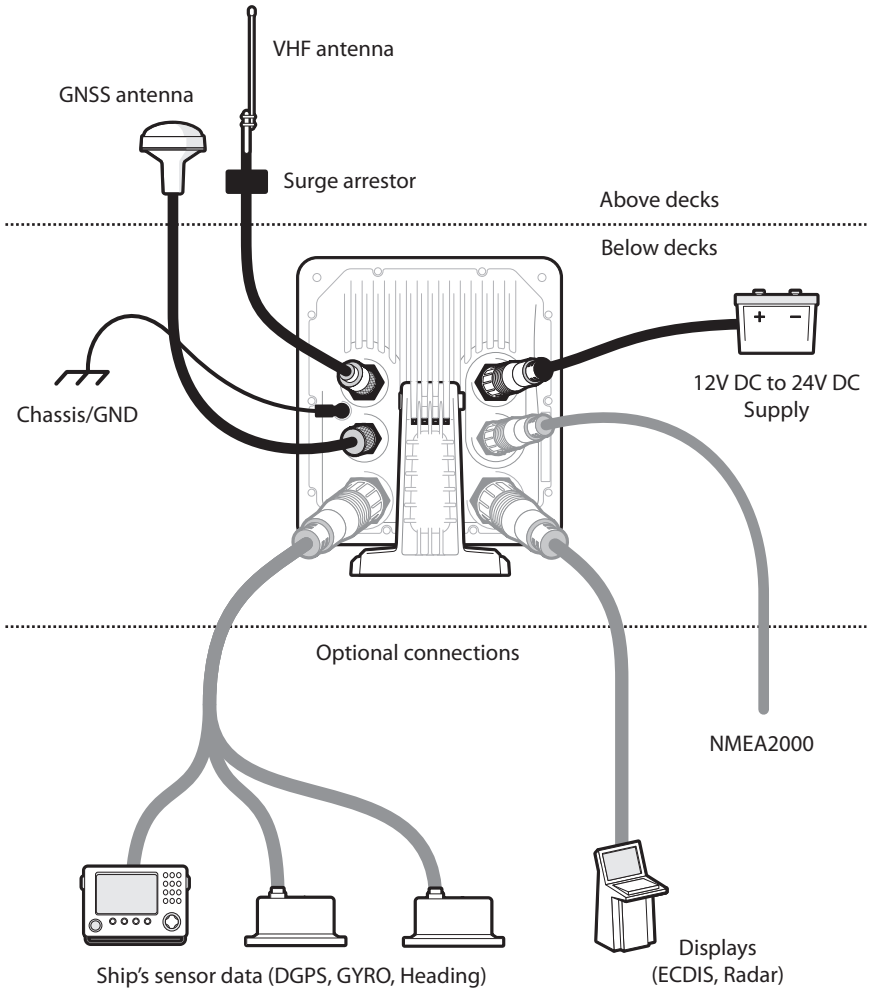

Figure 3 Typical AIS transceiver connection

3.3.1 Step 1 - Installing the AIS transceiver

Please note the following guidelines when selecting a location for your AIS transceiver:

- The AIS transceiver must be fitted in a location where it is at least 0.5m (1ft 8ins) from a compass or any magnetic device.
- There should be adequate space around the AIS transceiver for routing of cables. See Figure 30. for details of the AIS transceiver dimensions.
- The ambient temperature around the AIS transceiver should be maintained between -15°C and +55°C (5°F to 131°F). Ensure adequate ventilation is present when panel mounting the AIS transceiver.
- It is recommended that the AIS transceiver be installed in a 'below decks' environment protected from the weather.
- The AIS transceiver is supplied with four self tapping screws for attachment of the AIS transceiver to a suitable surface using the supplied bracket. Please refer to Figure 5. for guidance.
- The AIS transceiver can be panel mounted using the four self tapping screws provided. Please refer to Figure 6. for guidance. Access behind the panel is required when using this mounting option.
- The AIS transceiver should be mounted in a location where the display is visible to the user at the position from which the vessel is normally operated.

A pilot plug connection option is included in the 18 way connector located on the rear panel of the AIS transceiver. To provide the pilot plug an optional accessory can be purchased.

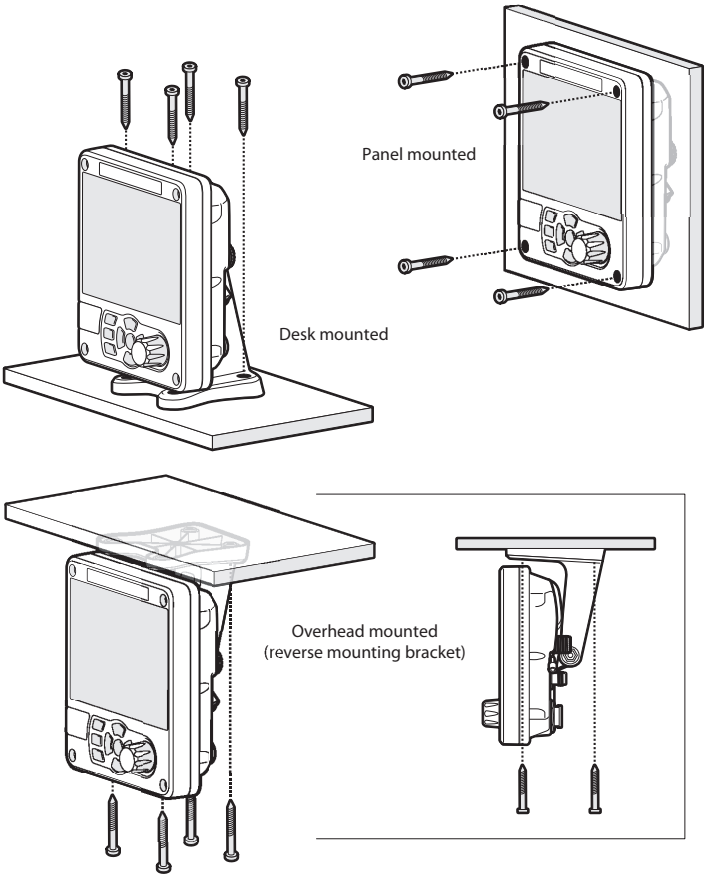

Figure 4 Mounting the AIS transceiver

Refer to Figure 30. for dimensions. A drilling and cutting template is provided with the AIS transceiver.

To panel mount the unit it is necessary to remove the 4 off socket cap screws recessed in front of the unit. See Figure 6.

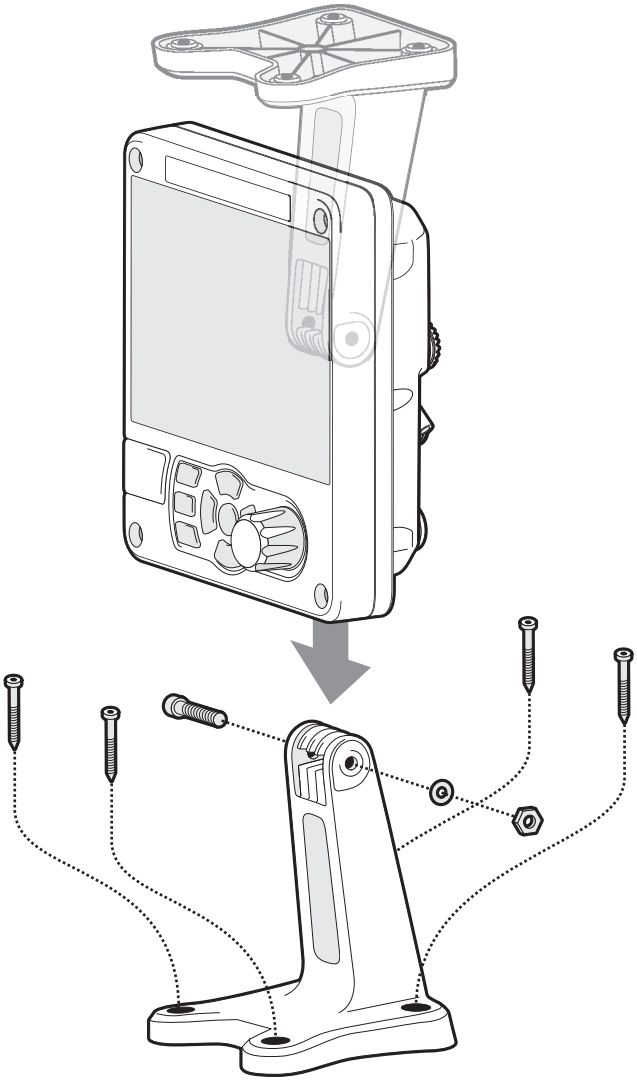

Figure 5 Desk mounting the AIS transceiver

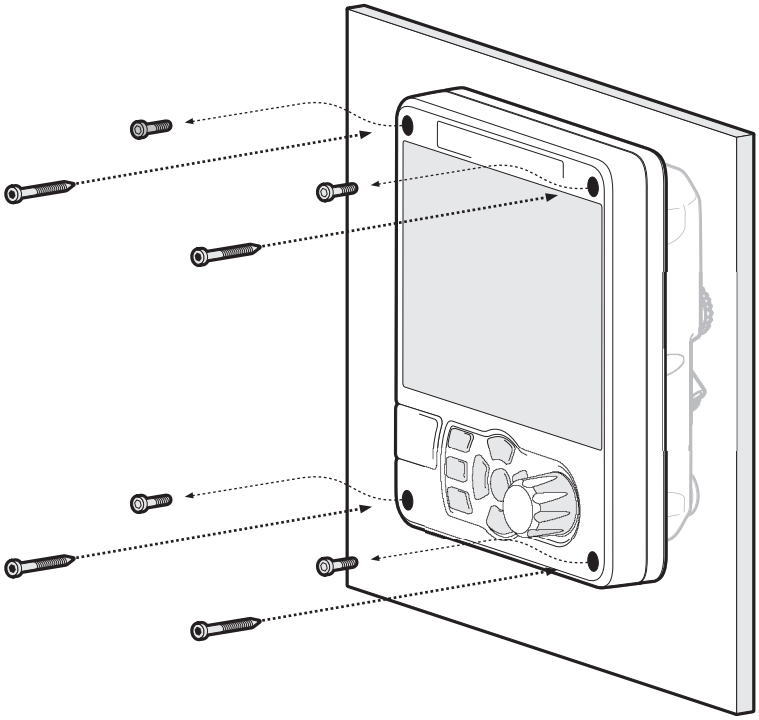

Figure 6 Panel mounting the AIS transceiver

3.3.2 Installing the GNSS antenna

For mounting the GNSS antenna supplied with your AIS transceiver you will require a one inch 14 TPI pole mount. Contact your dealer to source a mount suitable for the installation location.

Please note the following guidelines when selecting a location for the GNSS antenna:

- The GNSS antenna mount should be secured to a rigid surface.

- The GNSS antenna should be located where it has a clear, unobstructed view of the sky overhead.
- The GNSS antenna should be mounted as high as possible, however it is not recommended to mount the antenna on the top of a high mast where the motion of the vessel will cause the antenna to move and potentially reduce the accuracy of the GNSS position.
- Route the GNSS antenna cable to the AIS transceiver. If extension cables are required all junctions should be made using appropriate co-axial connectors and made watertight.

Connect the GNSS antenna cable to the GNSS connector on the AIS transceiver.

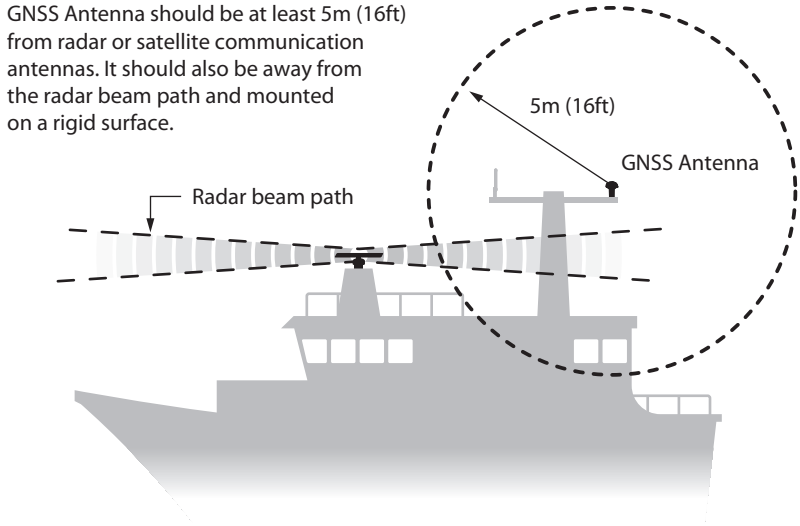

Figure 7 GNSS Antenna location

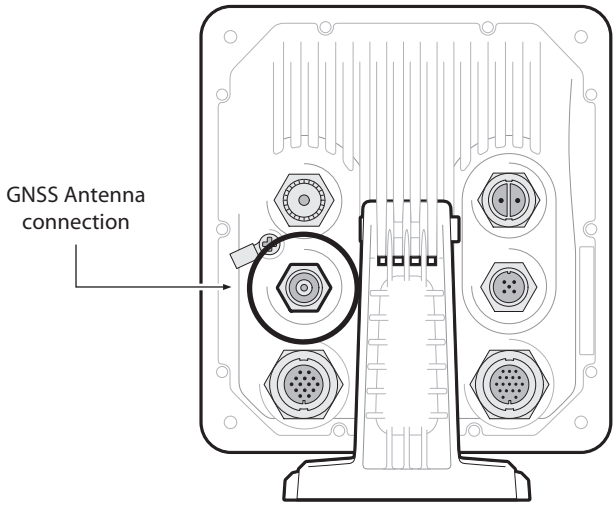

Figure 8 GNSS Antenna connection

3.3.3 Installing the VHF antenna

Please note the following guidelines when selecting and locating the AIS VHF antenna:

- The VHF antenna should be located as high as possible and positioned as far from other antennas as possible.
- The VHF antenna should have omnidirectional vertical polarization.
- Where possible the VHF antenna should be installed at least 3m (10ft) away from other transmitting radio, satellite and radar antennas.
- Ideally the AIS VHF antenna should be mounted directly above or below the ship's primary VHF radiotelephone antenna, with no horizontal separation and with a minimum of 2m vertical separation. Refer to Figure 9. for further guidance.

- The VHF antenna cable should be kept as short as possible to minimize signal loss. High quality, low loss co-axial cable appropriate to the installation location should be used.
- The VHF antenna cable should be terminated in a PL-259 co-axial connector for connection to the AIS transceiver.
- Any outdoor installed connectors in the antenna cables should be waterproof by design.
- Antenna cables should be installed in separate signal cable channels at least 10cm (4ins) away from power supply cables. Crossing of cables should be done at right angles and sharp bends in the antenna cables should be avoided.
- It is recommended that a suitable surge arrestor is fitted in-line with the VHF antenna connector.

Connect the VHF antenna cable to the VHF connector on the AIS transceiver as shown in Figure 10.

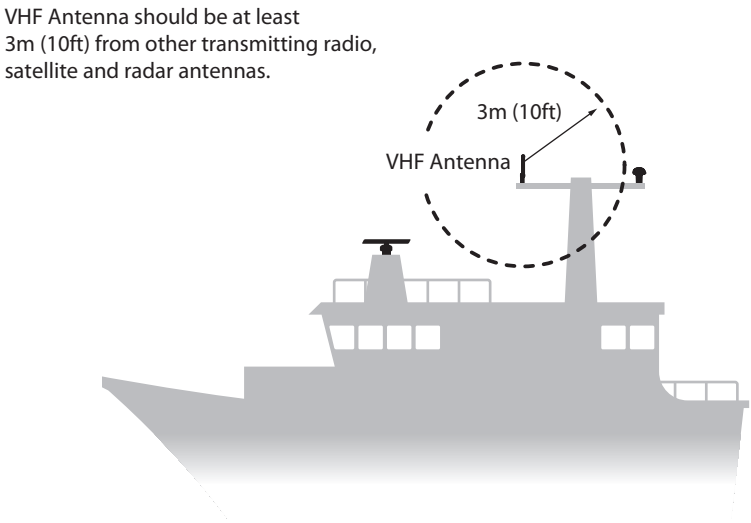

Figure 9 VHF Antenna location

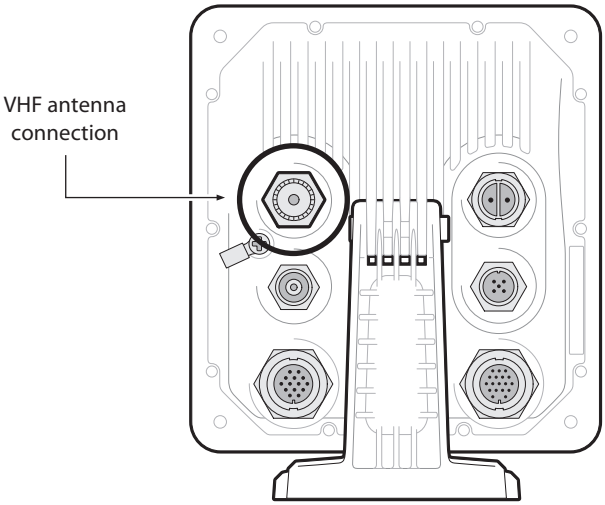

Figure 10 VHF Antenna connection

3.4 Connecting the equipment

3.4.1 Data connections

The AIS transceiver is supplied with a 2m (6.5 ft) 18 way data cable and a 2m (6.5 ft) 14 way data cable for connection of the AIS transceiver to external sensors and equipment.

3.4.2 Sensor configuration

The AIS transceiver has six NMEA0183 (IEC61162-1/2) data ports for connection of ship's sensors and display equipment as described in Table 1. and Table 2.

There are three input only ports for ship's sensor data and three bi-directional high speed ports for connection of display equipment such as radar or electronic chart displays.

3.4.3 Data input ports (14 way connector)

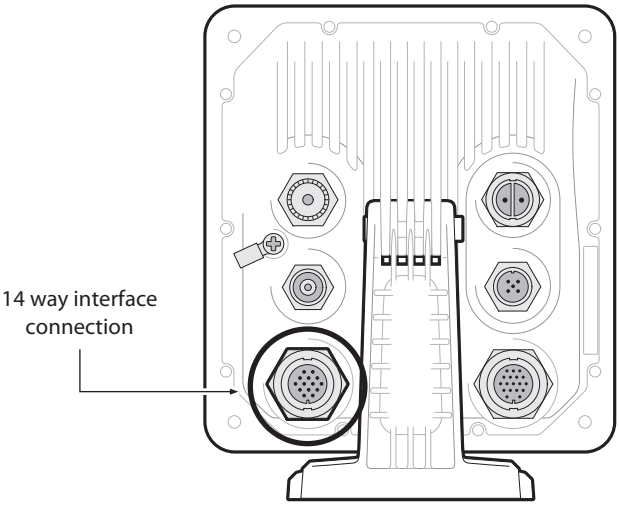

Figure 11 Serial input port connection

SIGNAL	WIRE COLOUR	PIN
BLUE SIGN N	BLACK	1
BLUE SIGN P	BROWN	3
SILENT N	BLUE	6
SILENT P	RED	7
SENSOR 1 RX A	ORANGE	2
SENSOR 1 RX B	PURPLE	5
SENSOR 1 COM	GREEN	8
SENSOR 2 RX A	WHITE	9
SENSOR 2 RX B	WHITE / BLACK	12
SENSOR 2 COM	GREY	11
SENSOR 3 RX A	YELLOW	14
SENSOR 3 RX B	RED / BLACK	13
SENSOR 3 COM	PINK	10
CHASSIS	DRAIN WIRE	4

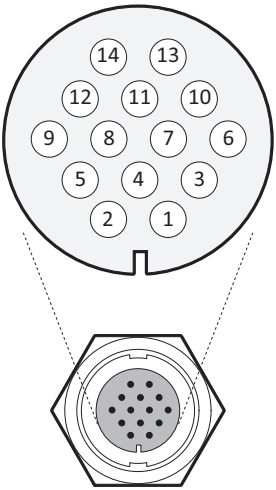

Figure 12 14 Way connector cable wiring connections

Data port	Function	Type	Default baud rate
1	Sensor 1 input (DGNSS - COG / SOG / LAT / LON)	Receive only	4800
2	Sensor 2 input (Rate of Turn)	Receive only	4800
3	Sensor 3 input (Gyro heading)	Receive only	4800

Table 1 14 Way connector serial data ports

Note: Any unused ports should be terminated by a 120 Ohm resistor across RX A and RX B signals.

3.4.4 Silent mode switch

To activate the Silent mode switch, apply a voltage of between 2V and 30V to the SILENT P (Pin 7) and SILENT N (Pin 6) terminals of the 14 way connector.

3.4.5 Data bi-directional ports (18 way connector)

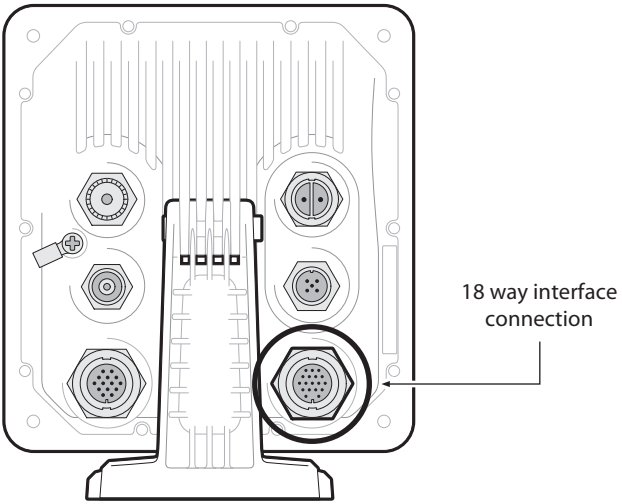

Figure 13 Serial bi-directional port connection

SIGNAL	WIRE COLOUR	PIN
LR DGPS TX A	ORANGE	3
LR DGPS TX B	BROWN	4
LR DGPS RX A	PURPLE	7
LR DGPS RX B	BLUE	8
LR DGPS COM	BLACK	1
PILOT TX A	RED	2
PILOT TX B	RED / WHITE	5
PILOT RX A	PINK	6
PILOT RX B	YELLOW	10
PILOT COM	GREEN	11
ALARM NC	GREY	16
ALARM COM	WHITE	12
EXT DISPLAY TX A	ORANGE / WHITE	13
EXT DISPLAY TX B	BLACK / WHITE	17
EXT DISPLAY RX A	BROWN / WHITE	14
EXT DISPLAY RX B	YELLOW / WHITE	18
EXT DISPLAY COM	GREEN / WHITE	15
CHASSIS	DRAIN WIRE	9

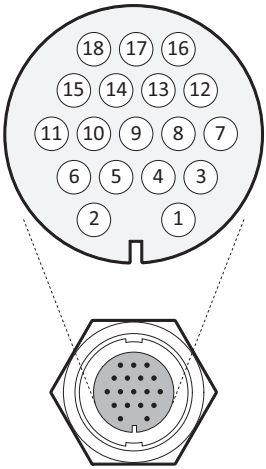

Figure 14 18 Way connector cable wiring connections

Data port	Function	Type	Default Baud rate
4	External display / ECDIS	Bi-directional	38400
5	Pilot port	Bi-directional	38400
6	Long range / DGPS / Ext Display	Bi-directional	38400

Table 2 18 Way connector serial data ports

Note: Any unused ports should be terminated by a 120 Ohm resistor across RX A and RX B signals.

All sensor ports can be configured via the Interface settings menu which can be found under the *'Home'* > *'System settings'* > *'Interfaces'* menu option.

The Interface settings menu also includes the ability to disable the requirement for external GNSS sensors to provide a DTM (Datum) sentence.

If an external GNSS device which does not provide a DTM sentence is connected to the AIS transceiver and the AIS transceiver is configured to require DTM sentences, the external GNSS data will not be accepted by the AIS transceiver. If no DTM sentence is required the WGS84 datum will be used as a coordinate origin and the external GNSS device must be configured to output position using this datum.

3.4.6 Alarm connections

The AIS transceiver also provides connections to the alarm relay contacts. The alarm relay connections are described in Table 3.

Alarm connection	Function	Contact rating
COM	Alarm relay common connection	2A at 220VDC or 60W maximum
NC	Alarm relay normally closed connection	

Table 3 Alarm relay connections

3.4.7 Power connection

Power is connected to the AIS transceiver via the supplied 2 way power cable as shown in Figure 15.

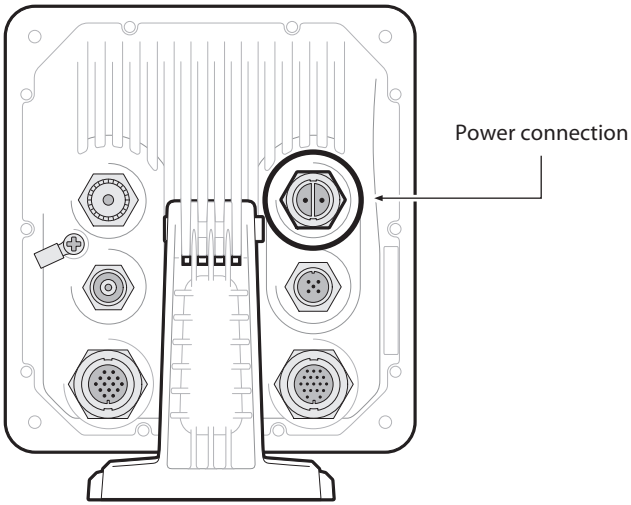

Figure 15 Power connection

Wire colour	Function	Connect to
Red	Power supply +	12VDC to 24VDC power supply from ships emergency power source*
Black	Power supply -	Power supply ground

Table 4 Power supply connections

*Connection to an emergency power source is an IMO requirement for SOLAS vessels.

The power supply current ratings and recommended fusing or circuit breaker currents are as follows:

- A 12VDC supply should be able to provide a peak current of 6.0A and be fused at 10.0A.
- A 24VDC supply should be able to provide a peak current of 4.0A and should be fused at 6.3A.

3.5 Grounding the AIS transceiver

An M4 grounding screw and ring crimp are provided in the fixing kit to allow connection to the grounding point on the rear of the AIS transceiver chassis as indicated in Figure 16.

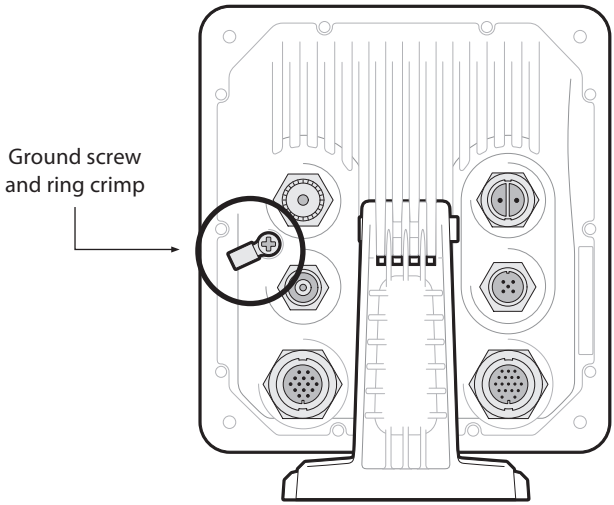

Figure 16 Grounding the AIS transceiver

This product must be connected to protective ground via the ground connection point. It is essential that the ground connection point is used in all installations, regardless of what other equipment is connected. The ground connection point must be bonded to protective ground using as short a connection as possible.

3.6 Connection to an NMEA2000 network (optional)

The AIS transceiver can be connected to an NMEA2000 network by a suitable NMEA2000 network cable available from your local dealer. If your vessel has an NMEA2000 network please refer to the relevant documentation for your NMEA2000 equipment. Once connected, and with your chart plotter also connected you will be able to receive AIS targets on your chart plotter.

3.7 Turning the AIS transceiver on

The AIS transceiver does not have an On / Off switch and will operate immediately that power is applied to the unit.

3.8 Passwords and security

Certain important information stored within the AIS transceiver cannot be changed without knowledge of the password. When trying to edit any of this protected information you will be prompted to enter the password.

The password entry screen is shown in Figure 17. Highlight the required character, then press *'Select'* to enter that character. When all characters of the password have been entered, select *'OK'.*

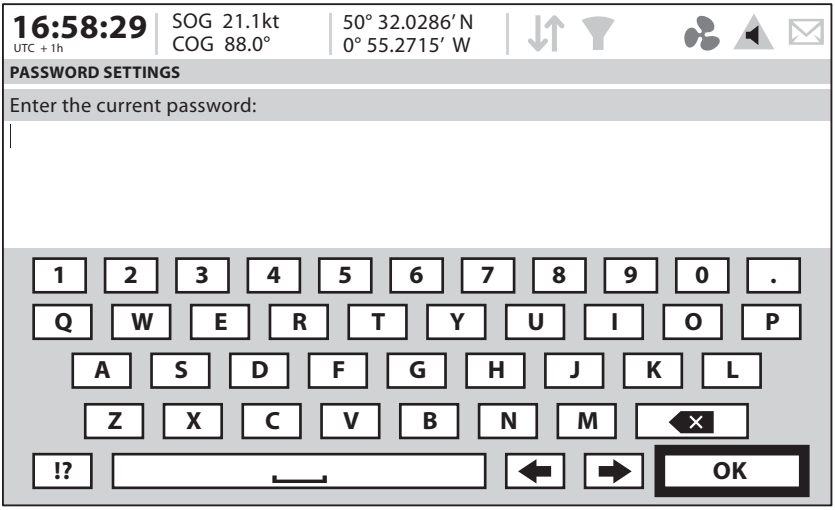

Figure 17 Enter password screen

Following configuration of the AIS transceiver the password should be changed from its default value of '0000' (four zeros) to another alpha numeric code. Password change is carried out by selecting *'Home'* > *'System settings'* > *'User Settings'* > *'Password'*.

The password should be recorded on the installation record found in Section 9

4 Operation

Please read the warning notices at the front of this manual before operating the AIS transceiver.

4.1 Display and controls

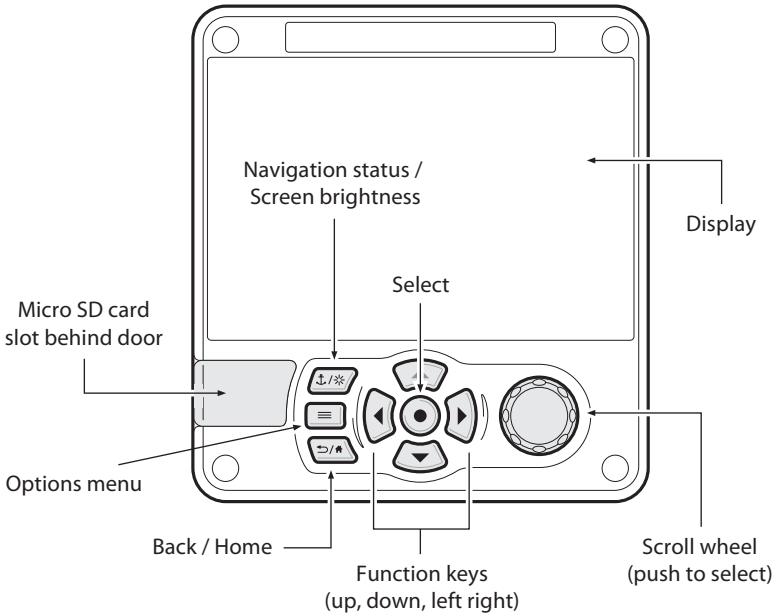

Figure 18 AIS Transceiver front panel

The front panel of the AIS transceiver is shown in Figure 18. with each control marked.

4.2 Button functions

Scroll wheel. This is used to highlight information presented on the display. The scroll wheel can also be pressed to confirm data entry or select information.

Navigation status / Screen brightness key. When pressed with a short press will go to the Navigation status screen. When pressed and held it will go to the *'Display brightness'* screen.

Options menu key. Provides access to additional features and relevant shortcuts on certain screens.

Back / Home key. When pressed with a short press cancels the current operation and moves to the previous menu or if pressed and held will return to the home screen.

Select key. When pressed selects the current option highlighted on the screen.

Up, down, left and right function keys. Provide an alternative means of navigating around the screen.

Speaker. The speaker is located behind the *'Scroll'* wheel and can provide an audible sound when a key is pressed, a message is received, or an alarm is activated. Sounds can be enabled or disabled via the Sound Settings menu.

Micro SD card. The Micro SD card socket (behind the door) is provided to allow uploading of new software to the AIS transceiver.

Display. The display shows essential AIS operating information and allows for configuration of the AIS transceiver via the menus.

4.3 Adjusting display brightness

Press and hold the '*Navigation status / Screen brightness'* key. The screen will change to the *'Display Settings'* screen.

4.4 Changing navigation status

Press the '*Navigation status / Screen brightness'* key. The screen will change to the Navigation menu screen. Move to the desired navigation status icon to select it.

4.5 Menu navigation

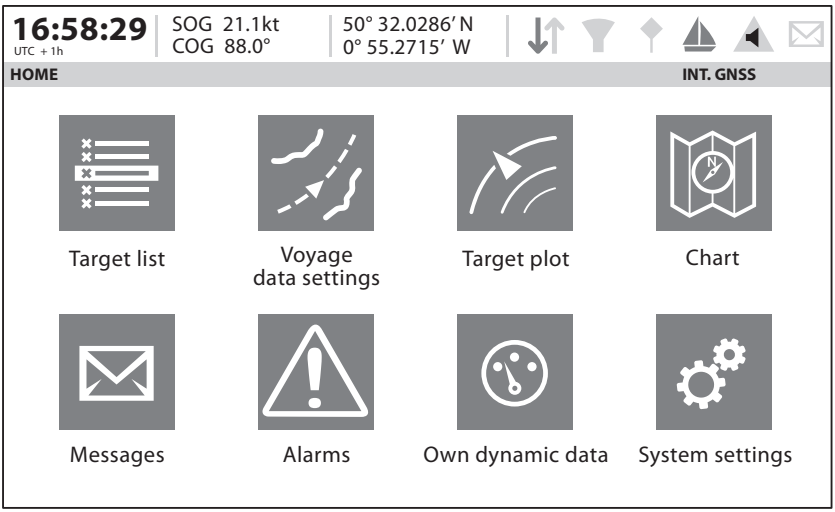

Figure 19 Home page menu screen

4.5.1 Main / Sub menus

Menus are displayed as a set of icons which can be navigated by using the controls. Selection of an icon will then display the information beneath in accordance with Figure 20. Pressing the '*Back / Home'* key will exit the menu.

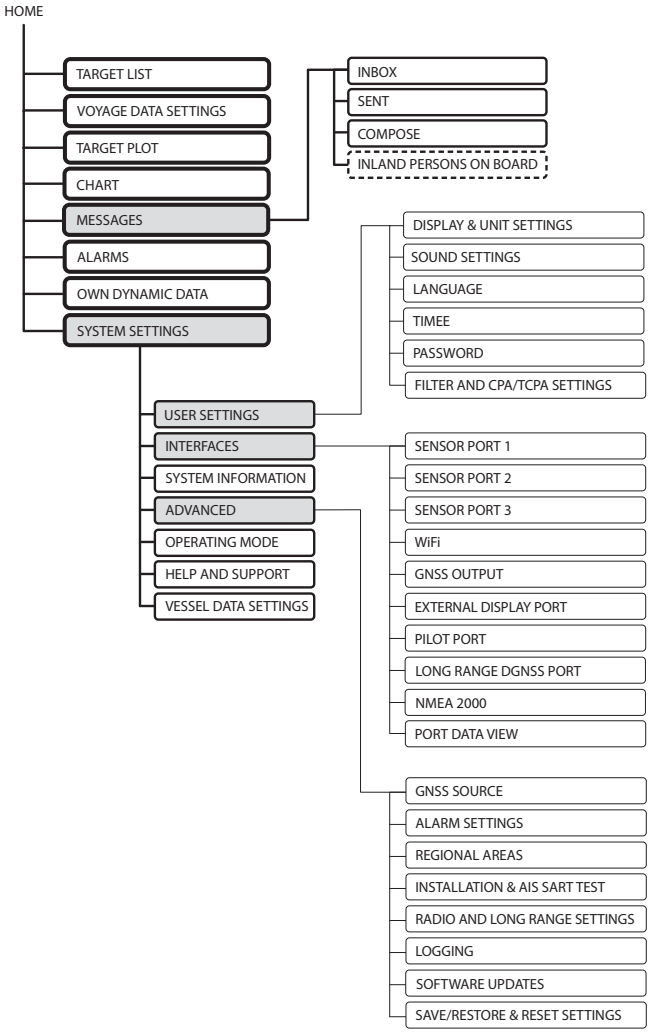

Figure 20 Main menu structure

4.5.2 Data entry screens

Some screens allow you to enter data, such as vessel parameters. On these screens you navigate to the desired field and select the appropriate menu item. Some data entry items require a password, this is shown by means of a 'Padlock' icon. Pressing the *'Back / Home'* key will exit these menus.

4.5.3 Keyboard / Keypad screens

Some screens require text or numeric entry. When these are selected, a virtual keyboard is displayed which can be used to enter text or numbers.

4.5.4 Options menu

On certain screens, the Options Menu will bring up a further list of functions specific to that screen. This is indicated by this icon. ☰

4.6 Information displayed

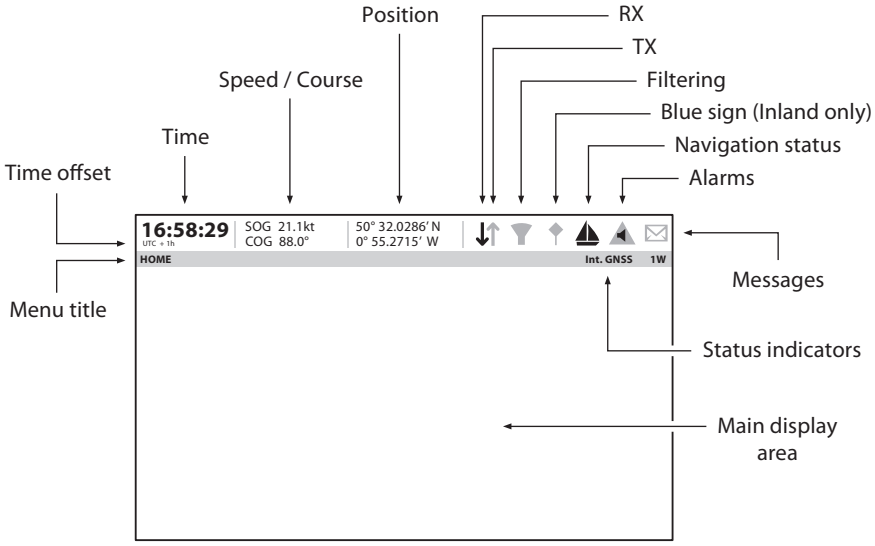

Figure 21 Display layout

4.6.1 Menu title

Refers to the current menu displayed from Figure 20.

4.6.2 Time

Time derived from GNSS satellites or AIS Base Stations.

4.6.3 Time offset

Offset from UTC, set on the *'Time'* menu.

4.6.4 Speed / Course

Vessel speed and course as taken from GNSS satellite data.

4.6.5 Position

Vessel position taken from GNSS source.

4.6.6 Icons

RX - Illuminates to show receiving an AIS message.

TX - Illuminates to show transmission of an AIS message.

Filtering - Illuminated to show that target filter settings apply.

Blue sign - Inland only. Display of Blue Sign status.

Navigation status - Vessel navigation status.

Alarms - Displays an alarm icon to show the presence of acknowledged or unacknowledged AIS alarms.

Messages - Displays an envelope icon with a number to show the presence of AIS messages received See menu *'Messages'*.

Status indicators - Displays the AIS transceiver status as shown in Table 5.

Icon	Description
INLAND	Shown when the AIS transceiver is operating in ‘Inland Waterways’ Mode
1W	Shown when the transmitter is set to 1W mode.
INT GNSS	Shown when the internal GNSS receiver has a valid position fix.
EXT GNSS	Shown when the connected external GNSS receiver has a valid position fix.
NO GNSS	Shown when there is no valid internal or external position fix.
INT DGNSS	Shown when the internal GNSS receiver has a valid differential position fix.
EXT DGNSS	Shown when the connected external GNSS receiver has a valid differential position fix.

Table 5 Status indicators

4.6.7 Alarms

The AIS transceiver performs self checking functions continuously. If a self check fails a display will appear on the screen notifying the operator of this. This will be accompanied by a sound. The alarm can be acknowledged via an on-screen message. The list of currently active AIS Alarms can be displayed by accessing the ‘*Alarms’* menu. If any alarm condition persists, contact your dealer or installer.

Possible alarm conditions are listed Table 6.

Alarm	Description
TX Malfunction	**This alarm will occur if the MMSI has not been configured.** This alarm can also occur if the radio hardware has failed to select the correct frequency, that the output power is too low or a transmitter shutdown has occurred. In this situation, ALR 001 is output over the PI. The alarm will be cleared if the transmitter recovers normal operation.
RX Channel *x* malfunction	This alarm occurs should the receiver hardware malfunction. The receiver is identified by the value of x (as shown below). The following alarms will be generated over the PI in this condition: ALR 003 - Rx Channel 1 ALR 004 - Rx Channel 2 ALR 005 - DSC (Channel 70) If the receiver returns to normal operation this alarm will be cleared.
Antenna VSWR exceeds limit	This alarm occurs if there is a problem with your antenna or antenna connection.
External EPFS lost	This alarm occurs if the position from the external Electronic Position Fixing System (i.e. GNSS) is invalid or lost.
No valid COG information	This alarm occurs if the AIS transceiver has no valid Course Over Ground information from any connected sensor.

Alarm	Description
No valid SOG information	This alarm occurs if the AIS transceiver has no valid Speed Over Ground information from any connected sensor.
Heading lost or invalid	This alarm occurs if the AIS transceiver has no valid heading information from any connected sensor, or if the heading is undefined.
No valid ROT information	This alarm occurs if the AIS transceiver has no Rate Of Turn information from connected sensors or via internal calculation.
No sensor position in use	This alarm occurs if the AIS transceiver has no valid position information from any connected sensor.
UTC Sync Invalid	This alarm indicates that the transmitter is no longer directly synchronized with the GNSS receiver. This may be because the GNSS receiver cannot receive sufficient satellites.
Nav Status Incorrect	Nav Status incorrect This alarm will occur if the navigation status is in conflict with the current speed of the vessel. For example the alarm will activate if the Navigation status is set to moored, but the vessel speed is greater than 3 knots. Correct the navigation status to clear this alarm.

Alarm	Description
Active AIS SART	An active AIS SART (AIS Search and Rescue Transmitter) message has been received. The SART will be displayed as the top item in the target list. Select this item to see the location of the SART.
Internal / External GNSS mismatch	This alarm occurs if the difference in position reported by the internal and external GNSS receivers is too large. Check the vessel dimensions and GNSS antenna locations have been entered correctly.
Heading sensor offset	This alarm occurs if the difference between the course over ground and heading data is greater than 45° for more than 5 minutes. This alarm only occurs if the vessel speed over ground is greater than 5 knots.

Table 6 Alarms list

4.6.8 Messages

AIS text messages and Safety Related Messages (SRMs) can be received from other AIS equipped vessels and also sent to specific vessels (addressed messages) or sent to all vessels in range (broadcast messages).

Reception of an AIS text message is indicated by the presence of the message icon at the top of the screen. This icon is shown whenever there are unread AIS text messages. Messages can be reviewed and replied to via the Inbox.

The AIS transceiver can store up to a maximum of 20 messages in the Inbox and 20 messages in the Sent folder. If the number of messages exceeds 20 then the oldest message will be overwritten.

When a Safety Related Message is received the user will be notified immediately with a pop-up showing the message. Standard text messages are not displayed on receipt, however the message icon will be displayed at the top of the screen.

AIS messages can be viewed, created and transmitted from the *'Messages*' menu.

The available options are:

Compose - takes you to the message composition screen

Inbox - takes you to the received message list view

Sent - shows a list of recently sent messages.

To compose a new message, select the type of message from the drop down menu and the destination. This can be by directly entering the MMSI, or by selecting from a list of visible targets.

The message text is entered using the on screen keyboard. Messages are limited to 80 characters in length.

Class B AIS transceivers are permitted to receive broadcast SRMs and broadcast text messages, however this function is not mandatory. Class B AIS transceivers are not able to receive addressed SRM or text messages. There is therefore no guarantee that text messages or SRMs sent to a Class B AIS transceiver will be received.

4.6.9 Long range messages

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

The AIS transceiver can be configured to automatically respond to Long Range (LR) interrogations, or you can opt to respond to any interrogation manually. Automatic response is the default setting, but this can be changed on the *'Home'* > *'System settings'* > *'Advanced'* > *'Radio and Long range settings'* menu.

When a Long range interrogation is received you will be alerted by an on-screen pop-up message.

In automatic response mode simply review and acknowledge the notification screen using *'Acknowledge'*. In manual response mode you should review the request and select either the *'Respond'* or *'Decline'* option as appropriate.

4.6.10 Chart

The Chart feature is only enabled when this Class A AIS transceiver is operating on a SOLAS vessel.

The AIS transceiver contains an application which will display AIS targets received, along with its own vessel position on a chart style plot.

The chart can be scrolled up, down, left, and right using the *'Function'* keys. Zooming in and out is via the *'Scroll'* wheel.

Targets can be selected by moving the cross hairs over a target and pressing the *'Select'* key.

The *'Options'* menu is also available for more advanced features.

Within the *'Options'* menu, the chart can be oriented to either North, Heading, or Course Up. The chart can be set so that the own vessel position is always in the centre of the screen.

The chart can be de-cluttered by hiding filtered targets, or vessel names from the display.

SOG vectors can also be displayed on the screen if this item is selected from the *'Options'* menu.

Some of the layers displayed on the chart can be removed to provide more clarity on the display. The '*Chart Settings'* screen provides a way of modifying these.

The chart feature is an aid for the display of information only and should not be used for vessel navigation.

4.6.11 Help and support screen

This screen is available from the *'Home'* > *'System Settings'* menu and provides contact information for the product manufacturer.

It also provides relevant information from the User Manual.

4.6.12 User settings screen

From this screen, it is possible to set the display brightness, set the display to a day or night colour scheme, set the operating units to metric or nautical, and configure the sounds emitted by the device. It is also possible from this screen to set the UTC time offset, change the password, change the filter settings and display the menus in a number of non-English languages.

4.7 Configuring vessel information

4.7.1 Pre-configuration checks

To proceed with configuration the steps in Section 3. should already have been completed.

4.7.2 Configuring vessel identification information

The AIS transceiver must be configured with information about the vessel on which it is installed prior to operation. The following information is required to be entered in the *'Home'* > *'system settings'* > *'Vessel data settings'* menu:

- MMSI - Vessel MMSI number, this can usually be found on the ships VHF radio license and should be the same MMSI as used for the VHF / DSC radio.
- Ship name (limited to 20 characters)
- Callsign - Vessel radio call sign (limited to 7 characters)
- IMO - Vessel's IMO identification number (if applicable)
- Ship type - Selected from the menu provided.
- Internal dimensions of the location of the GNSS antenna connected directly to the AIS transceiver (Internal GNSS).
- External dimensions of the location of an optional GNSS antenna connected to the AIS transceiver via an NMEA interface.

4.7.3 Configuring the internal GNSS receiver

The internal GNSS receiver can be configured to operate in one of three modes:

- GLONASS and GPS – in this mode the position fix is derived from both the GLONASS and GPS network in parallel. This mode is the default setting and gives the best performance.
- GPS – in this mode only GPS satellites are used for the position fix.
- GLONASS – in this mode only GLONASS satellites are used for the position fix.

The operating mode can be selected from the *'GNSS source'* option in the *'Home'* > *'System settings'* > *'Advanced'* settings menu.

The antenna dimensions should be entered in metres according to the diagram provided in Figure 22.

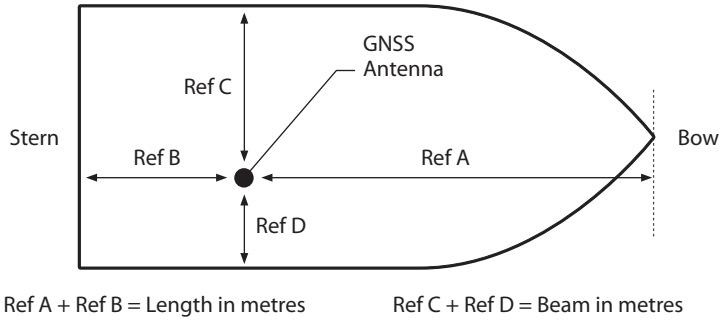

Figure 22 Vessel dimension measurement

4.8 Configuring voyage information

4.8.1 Configure voyage related data

The AIS transceiver must be configured with information about its voyage prior to operation. To enter the vessel identification information select the *'Home'* > '*Voyage Data settings'* option.

The following information is required:

- Destination - Ships next destination port (limited to 20 characters).
- ETA - Estimated time / date of arrival at destination (using UTC time).
- Static draught - Maximum present static draught to the nearest1/10th of a metre.
- Navigation status - Navigational status selected from the icons on the screen.

Persons on board - Number of crew on board (optional).

If the vessel is being operated in Inland mode then further additional data is required to be input. Refer to Section 5 for details.

4.9 Confirming correct operation

Following entry of the vessel and voyage information the AIS transceiver will commence normal operation. Correct operation should be verified as follows:

1. Select the '*Own dynamic data*' option from the *'Home'* menu.
2. Check that the displayed position, course, speed and heading are correct by comparing to the display associated to the connected position source and other data sources.
3. Check that the '*TX'* icon flashes periodically.
4. If the vessel is in an area where other AIS equipped vessels are present press the '*Back / Home*' key and select '*Target list*' to check that data from other AIS equipped vessels is displayed.
5. Go to the *'Home'* > *'System settings'* > *'System Information'* screen and select *'Hardware status',* check that the supply voltage and antenna VSWR are correct.

The AIS transceiver is now operational and should remain powered unless authorised by the local maritime authority. The installation record at the rear of this manual should be completed and left on board the vessel.

4.10 Communication test

It is possible to conduct an AIS communication test with another AIS equipped vessel. This test sends an AIS message to another vessel and checks for a response. The AIS transceiver will display a list of vessels from which one can be selected for a communication test.

This feature can be selected from the *'Home'* > *'System settings'* > *'Advanced'* > *'Installation & AIS SART test'* menu.

From this screen you can also switch on or off the display of test messages from AIS Search and Rescue Transceivers. If '*Display AIS SART Test Messages'* is set to On, messages from AIS SARTs in Test mode will be displayed.

4.11 Displaying AIS targets

4.11.1 Target list

The *'Target list*' screen is the primary screen for displaying AIS targets received. This is the first screen displayed when the unit is switched on, but can also be accessed from the '*Target list'* option on the '*Home*' menu.

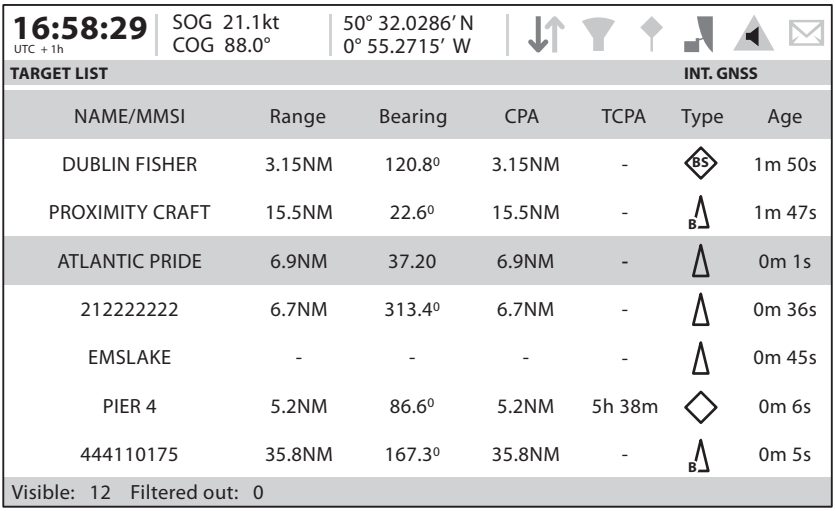

Figure 23 Target list screen

By default the *'Target list'* is sorted by range but can be sorted on any column by using the left and right *'Function'* keys to select a column and pressing the *'Select'* key to sort either in ascending or descending order. Navigation up and down the list is via the up and down arrow keys or scroll wheel. Selecting a highlighted target using the Select key will bring up more details of that target. The *Options* menu on this screen provides additional actions which can be performed on the '*Target list'*.

Different symbols are shown for an AIS target depending on the type of target and its status, these are shown in Figure 24. These symbols are common to the *'Target list'* and *'Target plot'* displays.

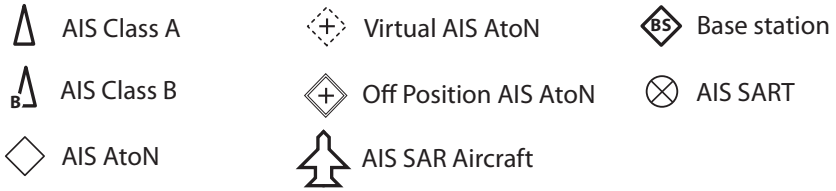

Figure 24 AIS target symbols displayed

4.11.2 Target filtering

From the '*Target list'* options menu, if *'Show Filter Settings'* is selected, a screen is displayed indicating which filter parameters can be set to reduce the amount of data displayed on screen. This screen can also be accessed through *'Home' > 'System settings' > 'User settings'*.

Filters can be toggled on and off on the *'Target list'* by pressing the *'Options menu'* key and selecting *'Toggle Filters On / Off'*. The bottom line of the '*Target list'* shows how many targets are visible or filtered out. If a filter is set, the filter icon is displayed at the top of the screen.
The Filters icon does not represent CPA/TCPA settings.

4.11.3 CPA/TCPA Settings

The AIS transceiver can be configured to identify approaching vessels which fall within certain limits. The Closest Point of Approach (CPA) defines a boundary around the own vessel upon which, if breached, will trigger an alert. Time to Closest Point of Approach (TCPA) can only be set if CPA is set, and will trigger the alert if the time to the CPA limit is breached.

These parameters are set on the *'Home' > 'System settings' > 'User settings' > 'Filtering and CPA/TCPA Settings'* menu.

The target list shows targets which trigger the CPA/TCPA alert in red.

These CPA/TCPA figures are calculated solely on AIS data and should not be used for anti-collision purposes.

Note: Setting the CPA/TCPA filter will not activate the Filters Icon.

4.11.4 Target plot

The '*Target plot'* screen shows the location of other AIS equipped vessels and shore stations relative to your own vessel. The '*Target plot'* screen provides a basic overview of AIS targets and should not be regarded as a substitute for display of AIS information on a dedicated electronic chart display system (ECDIS).

The plot range can be adjusted by rotating the scroll wheel which cycles through the ranges 0.1NM up to 100NM. The range relates to the radius of the outer range ring shown on the screen.

Individual targets can be selected by using the arrow keys. When selected a square outline will appear around the target and the vessel details will be shown on the left hand side of the screen.

By pressing the options menu key, additional display features can be selected.

If the Own Vessel Details option is selected the left hand side of the screen will change to show own vessel dynamic data.

If the MOB Details Display option is selected, the target plot will change to show only AIS-MOB, AIS-SART, and AIS-EPIRB devices. The left hand side of the screen will show the range and relative bearing to whichever target is currently highlighted using the arrow keys.

4.12 Micro SD card data input

On the front of the AIS transceiver under the cover on the lower left hand side is a socket for a Micro SD memory card. See Figure 25. This can be used to upgrade the unit firmware, display detailed charts or to log port data. Note the orientation of the Micro SD card, which is critical to ensure the product is not damaged.

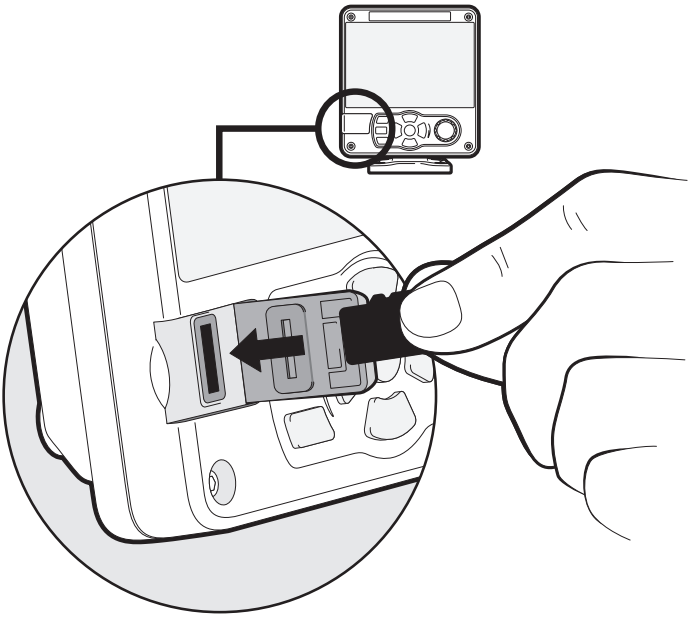

Figure 25 Micro SD card Socket

4.12.1 Loading new charts

The AIS transceiver always contains a basic low resolution world chart.

More detailed resolution charts can be purchased and overlaid onto the AIS transceiver's chart display.

The AIS transceiver will read only Jeppesen C-MAP MAX format Micro SD cards. See your dealer for available charts for your region.

Insert a C-MAP Micro SD card into the Micro SD card socket. The AIS transceiver will then automatically overlay that higher resolution chart region onto the relevant region on the AIS transceiver's world chart.

Remove the Micro SD card and the region will revert back to the basic world chart.

4.12.2 Upgrading the unit firmware

If a Micro SD card that contains valid upgrade firmware is inserted into the card socket, the unit will recognize the new firmware and will display a message asking you if you want to install it. The system will guide you to the appropriate menu screen, where the firmware update can be applied.

4.12.3 Logging ports to the Micro SD card

If a Micro SD card is inserted into the card socket, the AIS transceiver can be configured to output specific data to the card. This is accessed from the individual port menu (from the *'Home' > 'System settings' > 'Interfaces' menu.)* If the *'Log port to SD'* option is set to *'On',* data will be output from that port to the Micro SD card, if one is inserted into the card socket. Only one port can be logged to the Micro SD card at a time.

4.12.4 Saving / Loading settings

From the *'Home' > 'System Settings' > 'Advanced' > 'Save / Restore & Reset settings*' menu, all system settings and AIS transceiver configuration data can be saved to the Micro SD card, if one is inserted into the card socket. Settings previously saved can be restored, thus restoring the AIS transceiver to a previous configuration. *'Reset all settings'* will restore the unit to its factory defaults and is protected by the unit password.

4.13 WiFi Feature

The AIS transceiver provides features to operate with vessel WiFi networks, or to create its own network. Access the WiFi menu through *'Home' > 'System settings' > 'Interfaces' > 'WiFi'.*

4.13.1 Client mode

If client mode is selected, the AIS transceiver will search for available WiFi networks to connect to. If one is selected a password may be required, and upon connection the details of the connection will be shown in the bottom right corner of the screen. Once a WiFi connection is made, the AIS transceiver will output a range of NMEA0183 sentences over the selected WiFi port to any connected devices.

4.13.2 Access point mode

If the AIS transceiver is configured as a WiFi access point (AP) it will create its own WiFi network, allowing other WiFi enabled devices to connect to it. Once connections are made, a range of NMEA0183 sentences will be transmitted from the AIS transceiver to any connected devices.

4.13.3 Advanced WiFi features

Within the *'WiFi'* screen, certain parameters can be changed such as Channel Number, Protocol, Port, Encryption, etc. These are recommended for advanced users only.

WiFi is switched off by selecting *'Disable'* in the *'Select operating mode'* box.

5 Inland mode

5.1 Mode SOLAS / Inland AIS

The AIS transceiver supports both standard ‘high seas’ operation and ‘Inland AIS’ operation. Inland AIS is an extension of AIS intended for use on board vessels navigating Inland waterways.

The information entered and transmitted in Inland mode is not the same as that transmitted in SOLAS mode. After switching modes, please check your voyage and vessel data settings to ensure the configuration is correct.

5.1.1 Switching between ‘Class A’ and ‘Inland AIS’ modes

To switch between operating modes select the *‘Home’* > *‘System settings'* > *‘Operating mode’* option. Set the ‘*Operating mode’* setting to ‘Inland AIS’ or ‘Class A /SOLAS’ before saving the setting. When the AIS transceiver is configured to operate in Inland AIS mode the word ‘INLAND’ is shown permanently in the Menu title bar.

5.1.2 Entering Inland vessel identification settings

Additional vessel identification information is required for Inland operation along with some changes to the standard AIS configuration. The following additional information must be entered into the AIS transceiver:

- A quality setting for the speed, course and heading data sources connected to the AIS is required. The quality setting can be ‘high’ or ‘low’ for each data source. The low setting should be used unless a type approved sensor (e.g. a gyro providing heading information) is connected to the AIS transceiver.

The additional identification information can be entered via the *‘Vessel data settings’* menu.

The following standard AIS vessel identification information must be updated for Inland AIS:

- The vessels ENI - this is an 8 digit number allocated to the vessel.
- The ship and convoy type as an ERI code selected from the menu provided.
- The length and beam of the ship to the nearest 10cm (greater accuracy than standard AIS configuration).

These updates are all made using the process described in section 4.7.2

5.1.3 Entering Inland vessel voyage settings

Additional voyage related information is required for Inland operation along with some changes to the standard AIS configuration. The following additional information must be entered into the AIS transceiver:

- The vessel's load status (Loaded, Unloaded, or Unknown).
- The number of blue cones or blue flag status for the cargo.
- The static draught of the vessel to the nearest centimetre.
- The number of crew, passengers and other shipboard personnel.
- Convoy dimensions - enter the extension beyond the normal vessel size of any convoy attached. See Figure 26.

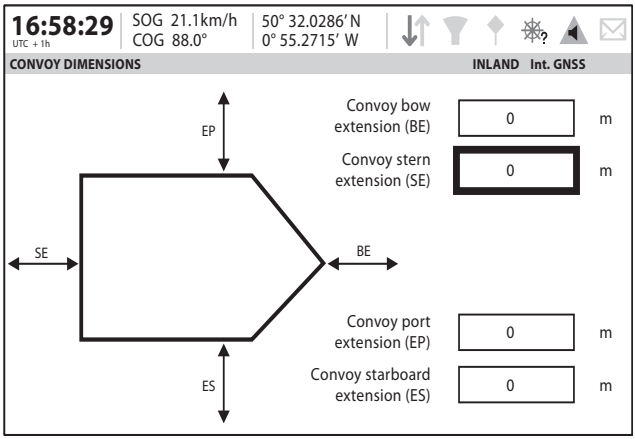

Figure 26 Convoy dimensions screen

The additional identification information can be entered via the '*Voyage data settings'* menu.

The voyage destination should be entered using UN terminal location codes and ERI terminal codes where possible when in Inland Mode

5.1.4 Inland alarm masking

Inland AIS installations do not typically include connection of external GNSS, Heading or Rate of Turn sensors to the AIS transceiver. The system alarms associated with these sensors can be disabled in Inland mode through the *'Alarms'* screen.

5.1.5 Blue Sign switch

When operating in Inland mode it is possible to connect a 'Blue Sign' switch to the AIS transceiver.

The AIS transceiver provides an isolated input for Blue Sign switch connection. It comprises two connections BLUE_SIGN_P and BLUE_SIGN_N. When enabled for Inland Waterways operation and the BLUE_SIGN_P terminal has a positive voltage with respect to BLUE_SIGN_N the Blue Sign status will be present on the display and transmitted accordingly in AIS position reports. See Figure 27.

Neither Blue Sign terminal should be connected to any other point on the AIS transceiver side of any isolation barrier present in the vessel wiring.

Suitable options for connection to the Blue Sign interface are shown in Figure 27.

Settings for the Blue Sign switch are available by selecting the *'Home'* > *'System settings'* > *'Operating mode'* menu.

Select the '*Blue Sign switch'* option to set up the Blue Sign switch.

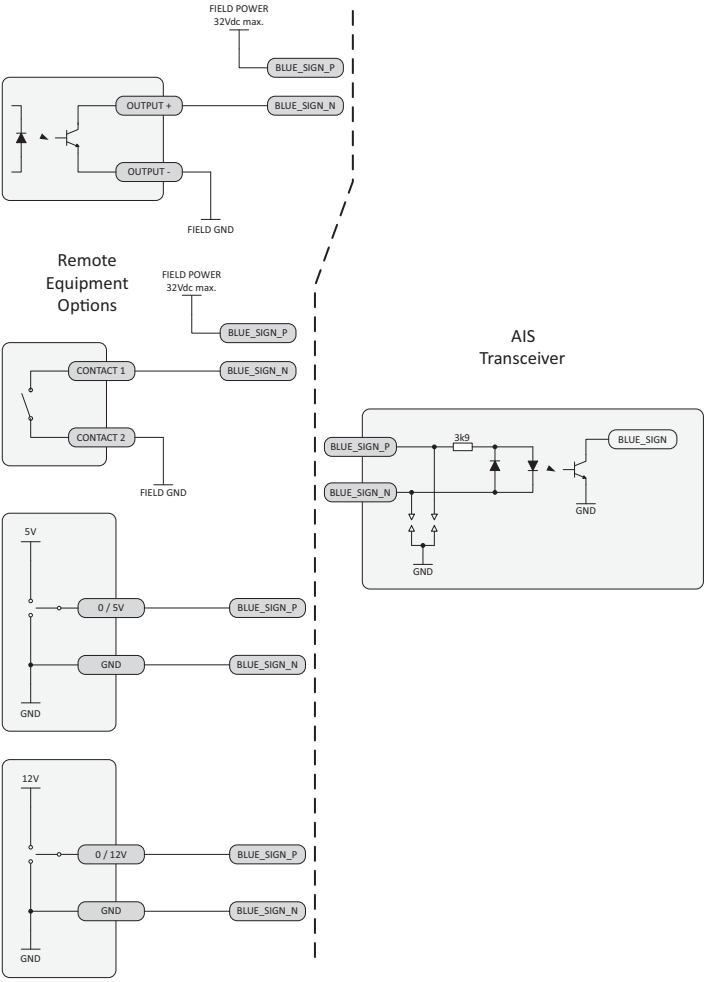

Figure 27 Blue Sign interface connection options

6 Technical information

6.1 Interface circuits

6.1.1 Sensor data input port

The sensor data input port schematic is shown in Figure 28.

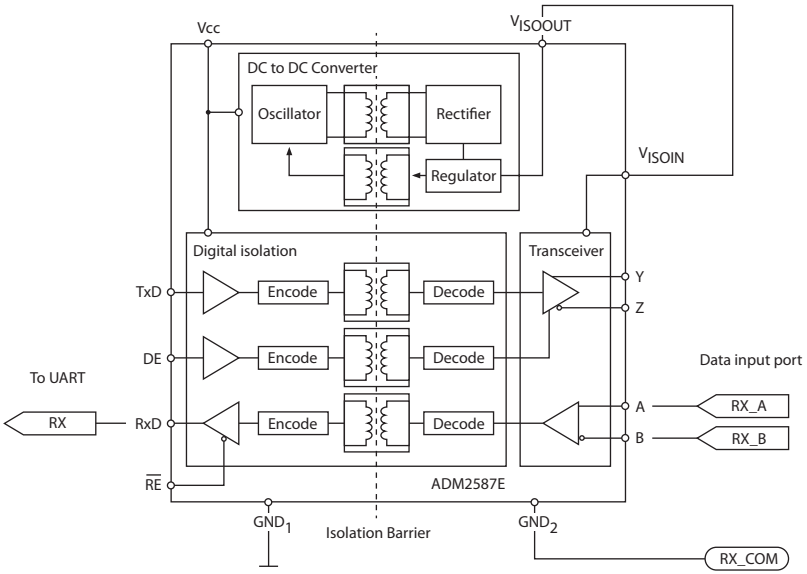

Figure 28 Input port schematic

A logical low input is defined as: A-B < -0.2V.

A logical high input is defined as: A-B > +0.2V.

6.1.2 Bi-directional data ports

The input circuitry of the bi-directional data ports is identical to the input circuitry for the sensor data input ports described in the preceding section. The output circuitry consists of a differential line driver IC (Analog Devices ADM2587E) and is shown in Figure 29.

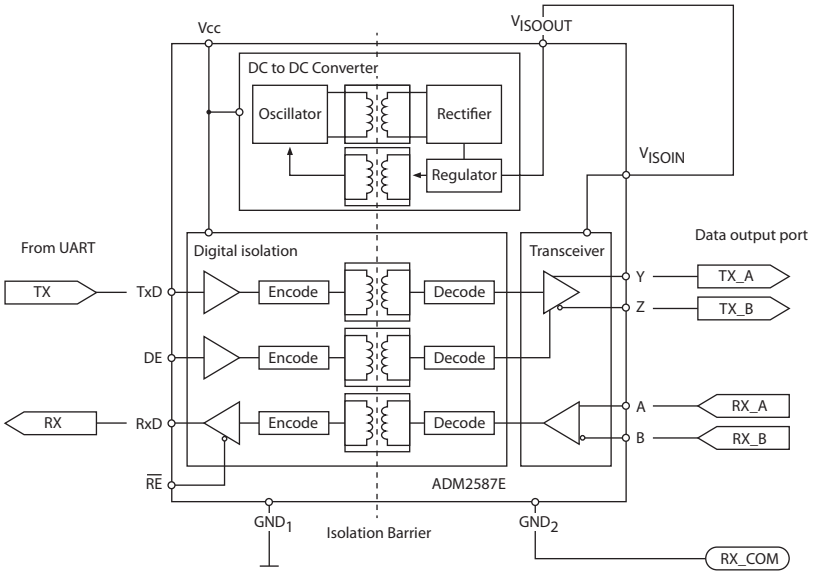

Figure 29 Data output port schematic

Each bi-directional data port is isolated from the other bi-directional data ports and from the AIS transceiver's internal power supply.

6.2 Output drive capability of bi-directional ports

Bi-directional ports can supply an output current of up to 30mA. The output voltages are 0 (low) and 3.3V (high). Effective load resistance should be in excess of 100 Ohms.

6.3 DGNSS Port

The DGNSS correction port is intended for connection to a beacon receiver. The port has the same physical characteristics as the bi-directional data ports as described in the preceding sections. If connection of a beacon receiver is not required this port can be re-configured as an additional bi-directional port to IEC61162-2.

6.4 Input data sentence formats

All data input is via IEC61162 / NMEA 0183 sentences. For details of the sentences and their checksums please refer to IEC61162-1.

6.5 AIS Transceiver overall dimensions

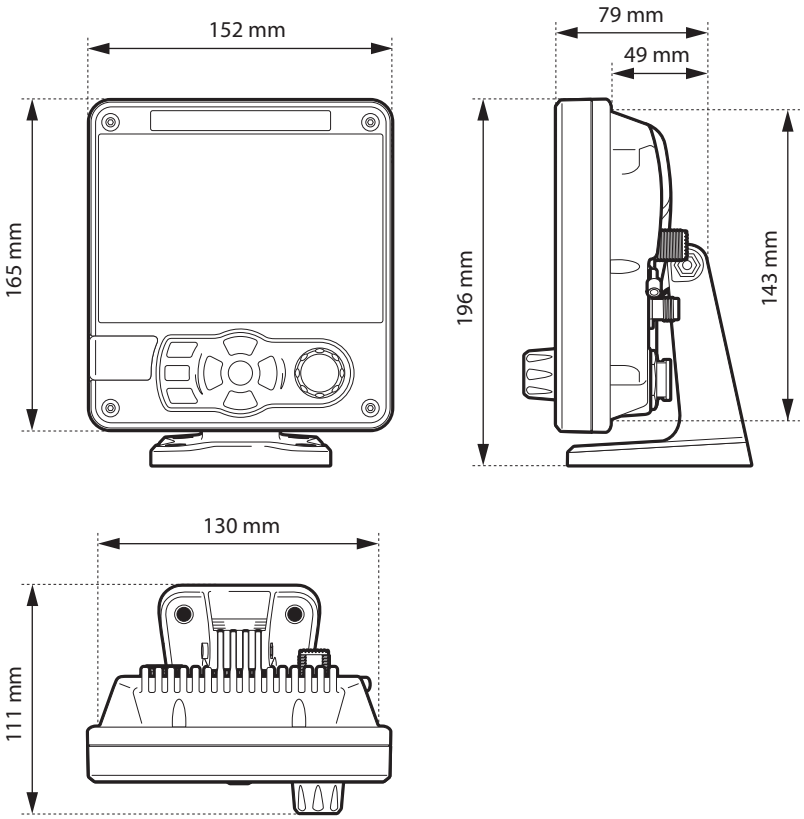

Figure 30 AIS Transceiver dimensions

6.6 GNSS Antenna drawing

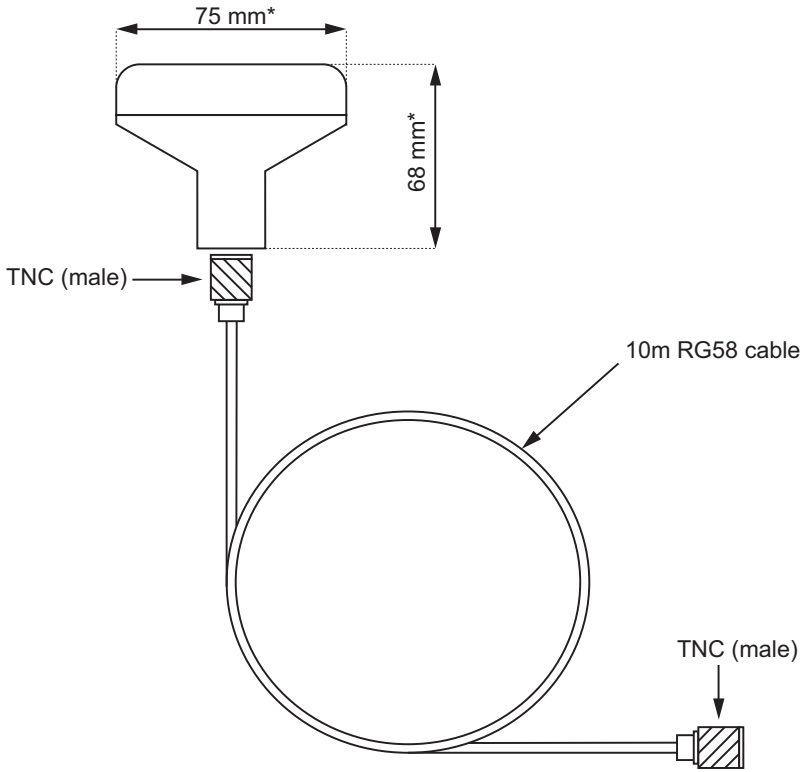

Figure 31 GNSS Antenna

* The dimensions of the supplied antenna may vary from those shown here.

6.7 Transmission intervals

The IEC61162 sentences are in general output in response to a specific event, such as initiation of a binary message via the user interface. Certain messages are output over the ports at regular transmission intervals. Table 7. lists each sentence type and the transmission interval.

Output sentence type	Transmission interval	Comments
VDO	Once a second	Own vessel VDL reports. When a report is not generated by the AIS transceiver a ‘dummy’ VDO is generated in its place.
ALR (inactive)	Once a minute	If no alarms are active, a single empty ALR sentence is output
ALR (active)	Once every thirty seconds	If any alarms are active, an ALR sentence is output for each active alarm.
ABK, ACA, LR1, LR2, LR3, LRF, LRI, TXT, VDM	Only transmitted when specifically initiated by an external event	

Table 7 IEC61162 Transmission interval for periodic sentences

6.8 Interface sentences

The IEC61162 sentences accepted by and output by the AIS transceiver serial data ports are listed in Table 8.

Data port	Input sentences	Output sentences
Sensor 1 Sensor 2 Sensor 3	DTM, GBS, GGA, GLL, GNS, HDT, RMC, ROT, VBW, VTG, THS	N/A
External display Pilot Long range	ABM, ACA, ACK, AIR, BBM, DTM, GBS, GGA, GLL, GNS, HDT, LRF, LRI, RMC, ROT, SSD, VBW, VSD, VTG, EPV, SPW, THS	ABK, ACA, ALR, LR1, LR2, LR3, LRF, LRI, TXT, VDM, VDO, TRL, VER
DGPS	RTCM SC-104 binary format	

Table 8 IEC61162 Sentences input and output

6.9 Unused fields

Unused fields in the above sentences are listed in Table 9. below. All fields of other input and output sentences that are not in this table are used.

Sentence	Unused fields	Description
AIR	9 10 11 12	Channel of Interrogation Message ID 1.1 Station 1 reply slot Message ID 1.2 Station 1 reply slot Message ID 2.1 Station 2 reply slot
DTM	2 3 5 7	Local datum subdivision code Lat offset, min, N/S Longitude offset, min, E/W Altitude offset, (meter)
GBS	4 5 6 7 8	Expected error in altitude ID of most likely failed satellite Probability of missed detection for most likely failed satellite Estimate of bias on most likely failed satellite Standard deviation of bias estimate
GGA	5 6 7 8 9 10 11 12	No. of satellites in use, 00-12 Horizontal dilution of precision Antenna altitude above / below mean sea level (geoid) Units of antenna altitude, m Geoidal separation Units of geoidal separation, m Age of diff. GPS data Differential reference station ID 0000-1023

Sentence	Unused fields	Description
GNS	5 6 7 8 9 10	Number of satellites in use, 00-99 Horizontal dilution of precision Antenna altitude, m, above mean-sea-level Geoidal separation, m Age of differential data Differential reference station ID
RMC	7 8	Date: dd/mm/yy Magnetic variation, degrees, E/W
VBW	1 2 3 7 8 9 10	Longitudinal water speed, knots Transverse water speed, knots Status: water speed Stern transverse water speed, knots Status: stern water speed Stern transverse ground speed Status: stern ground speed
VTG	2	Course over ground, degrees magnetic

Table 9 Unused fields

6.10 Proprietary sentences

The AIS transceiver outputs no proprietary sentences in normal operation.

6.11 Priority of sensor ports

The AIS transceiver automatically assigns a priority scheme to connected sensors. Data from the highest priority sensor will always be used. Sensor input priority is for:

- Position
- COG+SOG

- Heading
- Rate of Turn

The sensor input ports have a priority order as shown in Table 10.

Port	Priority (1 = highest)
Sensor 1	1
Sensor 2	2
Sensor 3	3
External Display	4
Pilot	5
Long Range	6

Table 10 Port priority order

6.11.1 Position priority scheme

Position information is taken from the highest priority source reporting DTM with WGS84 or datum override and RMC. If no RMC sentences are available, position shall be taken from the highest priority source reporting DTM with WGS84 or datum override and any one of:

- GGA
- GNS
- GLL

The following sentences are only processed if they are from the currently selected position source:

- RMC
- GGA
- GNS
- GLL

- GBS
- GRS
- GSA
- GSV
- GFA

When no position has been received on the selected port for 30 seconds, the port is deselected as a position source, and a new source selected as described above.

6.11.2 Course and Speed priority scheme

COG and SOG are taken from the highest priority source reporting any one of:

- RMC (with DTM=WGS84 or datum override)
- VTG
- VBW

VTG and VBW are only processed if they are from the currently selected COG & SOG source. When no COG+SOG has been received on the selected port for 30 seconds, the port shall be deselected as a COG+SOG source, and a new source selected as described above.

6.11.3 Heading priority scheme

Heading shall be taken from the highest priority sensor reporting any one of:

- HDT
- THS

HDT and THS are only processed if they are from the currently selected Heading source. When no heading has been received on the selected port for 30 seconds, the port shall be deselected as a heading source, and a new source selected as described above

6.11.4 Rate of Turn priority scheme

Rate of Turn shall be taken from the highest priority sensor reporting ROT. ROT shall only be processed if they are from the currently selected Rate of Turn source. When no Rate of Turn has been received on the selected port for 30 seconds, the port shall be deselected as a Rate of Turn source, and a new source selected as described above.

6.12 Compatibility mode

Some devices require the use of Compatibility mode for correct operation. When operating in the standard mode the fix quality flag indicates the type of GNSS position that is being reported. In compatibility mode, the fix quality reported will either be No GNSS or GNSS.
On the *'Home'* > *'System settings'* > *'Interfaces'* screen, under the configuration menu for each sensor port there is an On / Off toggle which can be set if Compatibility mode is required for that port.

6.13 Message 24 content

The Unit Serial Number transmitted in AIS Message 24B, in response to a Message 15 request, is encoded as follows (note that these characters represent individual bits in the data):
wwww wwyy yxxx xxxx xxxx
w = week (0 - 52)
y = years since 2014 (0 - 7)
x = incrementing number (0 - 2047)

6.14 NMEA 2000 PGN List

The PGN's listed in Table 11. are supported by the AIS transceiver. There are no unused fields.

PGN (Dec.)	PGN (Hex)	Title in NMEA database	Usage	NMEA 0183
059392	0E800	ISO Acknowledgment	out	
059904	0EA00	ISO Request	in, out	

PGN (Dec.)	PGN (Hex)	Title in NMEA database	Usage	NMEA 0183
060928	0EE00	ISO Address Claim	in, out	
065240	0FED8	ISO Commanded Address	in, out	
126208	1ED00	Group Function	in, out	
126992	1F010	System time	out	
126993	1F011	Heartbeat	out	
126996	1F014	Product Information	in, out	
127520	1F112	Vessel Heading	in	
127251	1F113	Rate of Turn	in	
129025	1F801	GNSS Position (Rapid Update)	out	RMC
129026	1F802	GNSS Direction data	in, out	RMC
129029	1F805	GNSS Position data	in, out	
129038	1F80E	AIS Class A Position Report	out	VDO, VDM
129039	1F80F	AIS Class B Position Report	out	VDO, VDM
129040	1F810	AIS Class B Extended Position Report	out	
129041	1F811	AIS AtoN Report	out	VDO, VDM
129545	1FA09	GNSS RAIM	in	

PGN (Dec.)	PGN (Hex)	Title in NMEA database	Usage	NMEA 0183
129793	1FB01	AIS UTC and Date Report	out	VDO, VDM
129794	1FB02	AIS Class A Static and Voyage Related Data	out	VDO, VDM
129795	1FB03	AIS Addressed Binary Message	out	
129796	1FB04	AIS Acknowledge	out	
129797	1FB05	AIS Binary Broadcast Message	out	
129798	1FB06	AIS SAR Aircraft Position Report	out	VDO, VDM
129801	1FB09	AIS Addressed SRM	out	
129802	1FB0A	AIS Safety Broadcast Binary Message	out	VDO, VDM
129809	1FB11	AIS Class B CS Static Data Report Part A	out	VDO, VDM
129810	1FB12	AIS Class B CS Static Data Report Part B	out	VDO, VDM

Table 11 PGN Lists

6.15 Troubleshooting

Issues	Possible cause and remedy
No data is being received by a connected chart plotter	● Check that the power supply is connected correctly. ● Check that the power supply is a 12VDC or 24VDC supply. ● Check that the connections to the chart plotter are correct.
The screen is not illuminated	● Check that the power supply is connected correctly. ● Check that the power supply is a 12VDC or 24VDC supply. ● Press and hold the *'Navigation status / Screen brightness'* button for at least 5 seconds. The display should return to maximum brightness.

The RED 'Alarm' icon is illuminated or flashing	● The unit may not have a valid MMSI. Check that the AIS transceiver is correctly configured with a valid MMSI. ● The VHF antenna may be faulty. Please check the connection to the VHF antenna and that the VHF antenna is not damaged. The alarm icon may illuminate briefly if the VHF antenna characteristics are briefly affected. ● No GPS position fix can be obtained. Please check the AIS transceiver is located where the internal GPS antenna has a clear sky view or that an external GPS antenna is properly connected and installed. Review the GPS signal strength graph in *'Home'* > *'System settings'* > *'Advanced'* > *'GNSS Source'*. ● The power supply is outside the allowable range. Check that the power supply is within the range 10.8VDC to 31.2VDC ● If none of the above correct the error condition please contact your dealer for advice. ● Check for error and alarm messages in the *'Alarms'* menu.

My MMSI is being received by other vessels but my vessel name is not shown on their chart plotter or PC.	• Some older AIS devices and chart plotters do not process the specific class B message which provides the vessel name (message 24). This is not a fault of your AIS transceiver. Software upgrades are available for many older chart plotters which will correct this issue. The other vessel should update its AIS unit and / or chart plotting software to receive AIS message 24.

Table 12 Troubleshooting

If the guidance given in the table above does not rectify the problem you are experiencing, please contact your dealer for further assistance.

7 Junction box accessory

7.1 What's in the box

Please ensure all items are present and if any of the items are missing please contact your dealer.

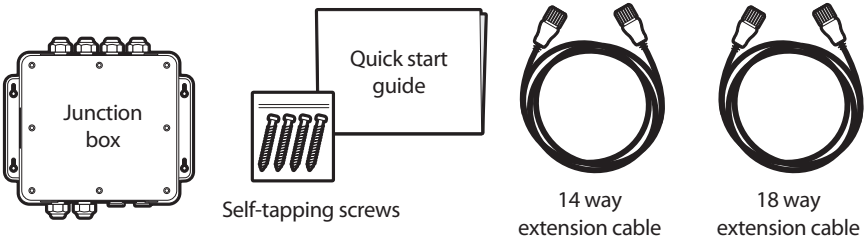

Figure 32 Junction box - What's in the box

7.2 Installation

The junction box should be mounted within 2m of the AIS transceiver, to ensure that the cable can be run without compromising its performance.

- Connect the two extension cables between the AIS transceiver and the junction box.
- Remove the lid of the junction box using a 3mm Allen key. Route your accessory cables through the waterproof cable glands and find the appropriate terminal blocks to fix them to.
- Use the connector wiring diagrams shown in Figure 12. and Figure 14. as your guide.
- Secure the ground / screen / shield of the accessory cables to the metallic strips of the junction box or to the appropriate connection on the terminal block.

- The termination jumpers are there to ensure correct 120 Ohm termination to the serial ports. These will all be fitted by default but if a port requires no termination then that port's jumper can be removed.
- Secure the accessory cables within the junction box with cable ties (not supplied).
- Refit the lid securely to ensure the waterproof integrity of the unit.

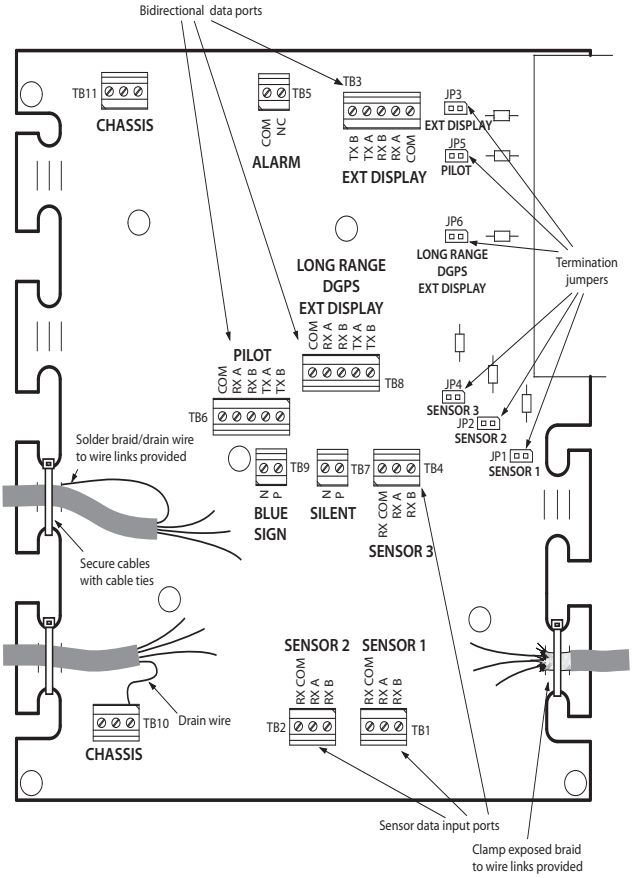

Figure 33 Junction box connections

7.3 Connecting external equipment

- Figure 34. shows an example of how external equipment could be connected through the junction box accessory.

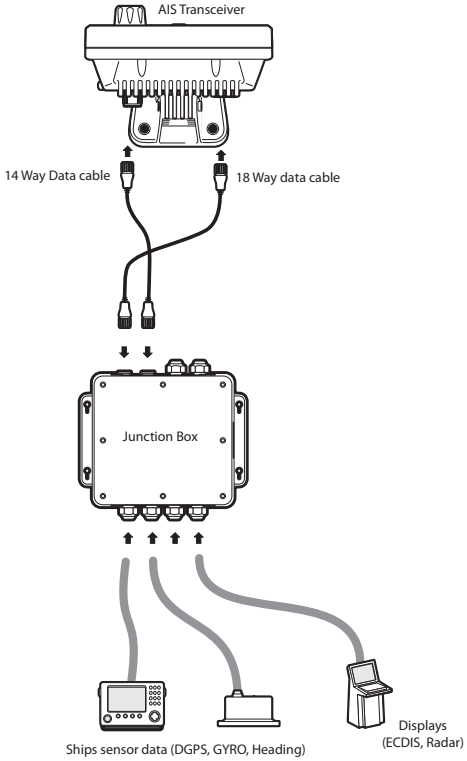

Figure 34 Connecting external equipment

When connecting external equipment the following procedures should be observed.

- The common line should be connected to the sensor port if one is available.

- The shield in the cable used to connect the external equipment should be connected at one end only, Refer to the manufacturers documentation regarding cable construction.
- The chassis connection can be made with **EITHER** a drain wire **OR** directly to the cable shield using exposed wire links on the junction box printed circuit board, depending on the cable construction.

7.4 Technical information

7.4.1 Physical

Junction box dimensions	235mm x 69mm x 233mm (WxHxD)
Junction box weight	0.65kg

7.4.2 Environmental

Operating temperature range	-15°C to +55°C
Maximum operating humidity	90% at +40°C, non-condensing
Water ingress rating	IPx6

7.4.3 Data Connector Information

18 way data connector	Chogori 23018525-04-RC	Mating half	Chogori 23018221-01
14 way data connector	Chogori 23014525-05-RC	Mating half	Chogori 23014221-01

8 Technical specification

8.1 Applicable equipment standards

IEC61993-2 Ed. 2.0 2012-10	Class A shipborne equipment of the universal automatic identification system (AIS) – Operational and performance requirements, methods of test and required test results
IEC60945 4th Ed. 2002-08	Maritime navigation and radio communication equipment and systems – General requirements – Methods of testing and required test results
IEC61162-1 Ed. 4.0 2010-11	Maritime navigation and radio communication equipment and systems – Digital interfaces - Single talker and multiple listeners
IEC61162-2 Ed. 1.0 1998-09	Maritime navigation and radio communication equipment and systems – Digital interfaces - Single talker and multiple listeners, high speed transmission
IEC61162-3 2008+A2:2014	Maritime navigation and radio communication equipment and systems - Digital interfaces - Part 3: Serial data instrument network
ITU-R M.1371-5 02/2014	Technical characteristics for an automatic identification system using time division multiple access in the VHF maritime mobile band

IEC61108-1 2nd Ed. 2003-07	Global Navigation Satellite Systems (GNSS) – Part 1: Global positioning system (GPS) - Receiver equipment - Performance standards, methods of testing and required test results
IEC6118-02 1st Ed. 1998-06	Global navigation satellite systems (GNSS) - Part 2: Global navigation satellite system (GLONASS) - Receiver equipment - Performance standards, methods of testing and required test results
CCNR VTT Ed. 1.2 23.4.2013	Central commission for Navigation on the Rhine, Inland AIS Equipment - Vessel Tracking and Tracing Standard for Inland Navigation

8.2 Product category

Product category	This product is categorised as ‘protected’ in accordance with the definitions provided in IEC 60945

8.3 Physical

AIS Transceiver dimensions	152mm x 165mm x 111mm (WxHxD), see Figure 30. for drawing)
AIS Transceiver weight	1.5kg
Compass safe distance	0.5m (AIS Transceiver)

8.4 Environmental

Operating temperature range	-15°C to +55°C
Maximum operating humidity	90% at +40°C, non-condensing
Water ingress rating	IPx6, IPx7

8.5 Electrical

Supply voltage	12VDC to 24VDC (absolute min 10.8V, absolute max 31.2 V)
Power consumption	< 12W
Current consumption @12 VDC supply	0.9A typical, 6.0A peak
Current consumption @24 VDC supply	0.5A typical, 4.0A peak

8.6 Display and user interface

Display	800 x 480 pixel colour LCD with adjustable backlight
Luminance	500cd/m^2 max, 75cd/m^2 default
Recommended viewing distance	45cm
Keypad	Five function keys and three menu keys with adjustable backlight
Rotary control	Encoder with push function
Speaker	600mW@750Hz 11mm x 15mm

8.7 Internal GNSS

Receiver channels	32 channels GPS and GLONASS operating modes
Time to first fix	Typically 26 seconds
Frequency	L1 GPS band, 1575.42MHz and L1 GLONASS band 1597.1 - 1609.5MHz
Accuracy	2.5m CEP / 5.0m SEP without differential correction 2.0m CEP / 3.0m SEP with SBAS or RTCM DGPS correction
Antenna requirement	Active antenna (5V bias) with gain >15dB

8.8 TDMA Transmitter

Frequency range	156.025MHz to 162.025MHz
Channel bandwidth	25kHz
Output power	1W or 12.5W (automatic selection)
Data transmission rate	9600 bits/s
Modulation mode	25kHz GMSK

8.9 TDMA Receiver

Number of receivers	3
Frequency range	156.025MHz to 162.025MHz
Channel bandwidth	25kHz
Sensitivity	<-107dBm for 20% PER

Modulation mode	25kHz GMSK
Adjacent channel selectivity	70dB
Spurious response rejection	70dB

8.10 DSC Receiver

Number of receivers	1
Frequency	156.525MHz (Channel 70)
Channel bandwidth	25kHz
Sensitivity	-107dBm @ BER $<10^{-2}$
Modulation mode	25kHz AFSK
Adjacent channel selectivity	70dB
Spurious response rejection	70dB

8.11 RF Connections

VHF Antenna connection	SO-239 / UHF
VHF Port impedance	50 Ohms
GNSS Antenna connections	TNC female
GNSS Port impedance	50 Ohms

8.12 Data interface

Sensor data input ports	
Number of ports	3
Standard	IEC61162-1 / -2
Baud rate	4800 baud or 38400 baud
Port impedance	54K Ohms
Bi-directional data ports (including pilot port)	
Number of ports	3
Standard	IEC61162-1 / -2
Baud rate	4800 or 38400 baud
Port impedance	54K Ohms
Differential correction port	
Standard	ITU 823-2 / RTCM SC-104
Baud rate	4800 baud or 38400 baud
Port impedance	54K Ohms
Blue Sign port	
Port impedance	10K Ohms

Silent Mode port	
Port impedance	10K Ohms
NMEA 2000 Port:	
Load equivalency number (LEN)	1

8.13 Power and data connector information

Power connector	Chogori 22002525-04-RC	Mating Half	Chogori 22002221-01
18 way data connector	Chogori 23018525-04-RC	Mating Half	Chogori 23018221-01
14 way data connector	Chogori 23014525-05-RC	Mating Half	Chogori 23014221-01

8.14 Open source licences

This product contains open source software. For details please see the *'System information'* screen.

9 Installation record

The following installation record should be completed and retained on board the vessel once the AIS transceiver has been installed and commissioned.

9.1 Vessel details

Vessel name			
Flag state			
IMO Number		MMSI Number	
Owner		Radio call sign	
Type of vessel		Gross registered tonnage	
Length (m)		Beam (m)	
AIS Transceiver serial number			
Installation password			
Radio software version number			
MKD software version number			

External GNSS antenna location (all dimensions in meters, refer to diagram below			
A=	B=	C=	D=

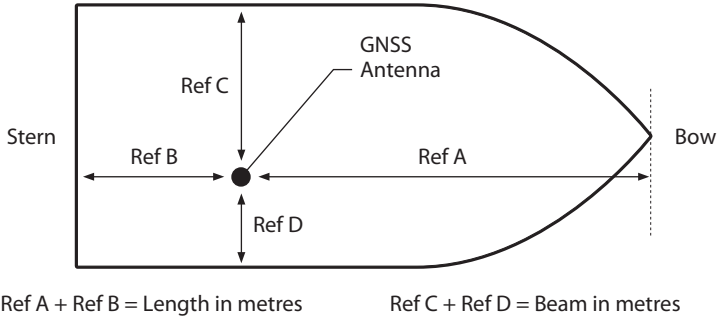

Figure 35 GNSS Antenna position

Connected equipment type (where applicable note equipment and AIS data port in each case.

(D)GPS Receiver	
Gyro compass	
ROT Indication	
Speed log	
ECDIS	
Radar	
Other equipment	
Power supply	

The following drawings should be provided and attached to this installation record.

- Antenna layout for VHF and GNSS antennas
- AIS arrangement drawing
- Block diagram showing interconnection of equipment

Maintenance Record

Modification record number	Details (enter details of modifications to the AIS transceiver including software updates)
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Installer Detail

Installed by (name)	
Installation company name	
Date of installation	
Vessel location at installation	
Signature	

Manufacturer’s code: 427
NMEA 2000 Product code: 12354

em-trak

201-0687:1