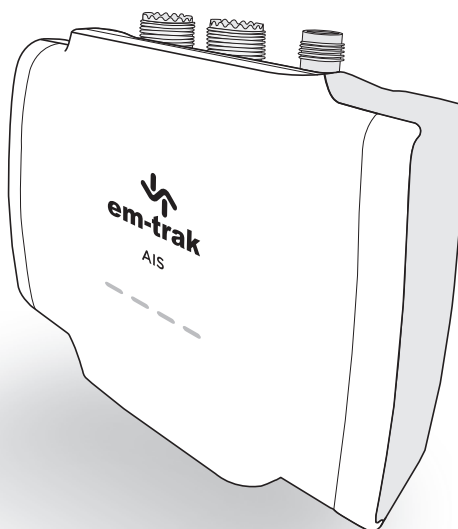


AIS Class B transceiver

Installation and operation manual



Thank you for purchasing this AIS Class B transceiver.

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 or support@em-trak.com who will be pleased to offer any assistance you require.

Table of contents

1	Notices	4
1.1	Safety warnings	4
1.2	General notices	4
2	About your AIS class B transceiver	8
2.1	About AIS	8
2.2	Static and dynamic vessel data	9
2.3	Important information for US customers	9
2.4	Special features	10
2.5	Product range	11
2.6	What's in the box?	12
2.7	Website support tools	12
2.8	Mobile app	13
2.9	Transceiver overview	13
3	Installation	15
3.1	Preparing for Installation	15
3.2	Installation procedures	20
4	Configuring your AIS transceiver	32
4.1	Switching on your AIS transceiver for the first time	32
4.2	Configuring your AIS transceiver	32
4.3	Introduction to proAIS2	33
4.4	Installing proAIS2	33
4.5	Configuration using proAIS2	33
4.6	WiFi and Bluetooth Configuration using ProAIS2	34
4.7	Configuration using the CONNECT-AIS	37
5	Operation	38
5.1	Using the AIS transceiver	38

5.2 Switch functions 38

5.3 Indicator functions 39

6 Voyage Data Recorder..... 41

7 Technical Information..... 42

7.1 NMEA 2000 PGN List 42

8 Troubleshooting..... 45

9 Specifications..... 47

10 List of abbreviations..... 50

List of figures and tables

Table 1	Product variants.....	11
Figure 1	Items included with the product	12
Figure 2	AIS transceiver overview	13
Figure 3	Electrical connections to the AIS transceiver.....	14
Figure 4	Typical installation configuration without antenna splitter....	16
Figure 5	Typical installation configuration with antenna splitter	17
Figure 6	AIS transceiver dimensions	21
Figure 7	AIS transceiver mounting.....	22
Figure 8	External GNSS antenna mounting.....	23
Figure 9	Position of the GNSS antenna connector	24
Figure 10	Position of the VHF antenna connector.....	24
Table 2	Colour coding of wires in the accessory cable.....	26
Figure 11	Connecting an external switch.....	27
Figure 12	Connecting to the NMEA0183 data port.....	29
Figure 13	Position of the VHF radio connector	30
Figure 14	Connecting the power supply	31
Figure 15	Typical mobile devices for WiFi and Bluetooth connection..	35
Figure 16	Indicator location on the AIS transceiver unit	39
Table 3	NMEA 2000 PGN List.....	44

1 Notices



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

1.1 Safety warnings



This equipment must be installed in accordance with the instructions provided in this manual.



This AIS transceiver is an aid to navigation and must not be relied upon to provide accurate navigation information. AIS is not a replacement for vigilant human lookouts and other navigation aids such as RADAR. The performance of the transceiver may be seriously impaired if not installed as instructed in the user manual, or due to other factors such as weather and or nearby transmitting devices. Compatibility with other systems may vary and is reliant on the third party systems recognising the standard outputs from the transceiver. The manufacturer reserves the right to update and change these specifications at any time and without notice.



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

1.2 General notices

1.2.1 Position source

All marine Automatic Identification System (AIS) transceivers utilise a satellite based location system such as the Global Positioning Satellite (GPS) network.

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

1.2.2 Compass safe distance

The compass safe distance of this unit is 0.2m or greater for 0.3° deviation.

1.2.3 RF emissions notice

Caution: The AIS transceiver generates and radiates radio frequency electromagnetic energy. This equipment must be installed and operated according to the instructions contained in this manual. Failure to do so can result in personal injury and / or AIS transceiver malfunction.

Caution: Never operate the AIS transceiver unless it is connected to a VHF antenna.

To maximise performance and minimise human exposure to radio frequency electromagnetic energy you must make sure that the antenna is mounted at least 1.5 metres away from the AIS transceiver and is connected to the AIS transceiver before power is applied. The system has a Maximum Permissible Exposure (MPE) radius of 1.5m. This has been determined assuming the maximum power of the AIS transceiver and using antennas with a maximum gain of 3dBi. The antenna should be mounted 3.5m above the deck in order to meet RF exposure requirements. Higher gain antennas will require a greater MPE radius. Do not operate the unit when anyone is within the MPE radius of the antenna (unless they are shielded from the antenna field by a grounded metallic barrier). The antenna should not be co-located or operated in conjunction with any other transmitting antenna. The required antenna impedance is 50 Ohms.

1.2.4 Warranty

This product is supplied with standard warranty as defined in the accompanying warranty information.

1.2.5 Disposal of this product and packaging

Please dispose of the AIS transceiver in accordance with the European WEEE Directive or with the applicable local regulations for disposal of electrical equipment.

Every effort has been made to ensure the packaging for this product is recyclable. Please dispose of the packaging in an environmentally friendly manner.

1.2.6 Accuracy of this manual

The AIS transceiver may be upgraded from time to time and future versions of the AIS transceiver may therefore not correspond exactly with this manual. Information contained in this manual is liable to change without notice. The manufacturer of this product disclaims any liability for consequences arising from omissions or inaccuracies in this manual and any other documentation provided with this product.

1.2.7 Radio Equipment Directive

The manufacturer of this product declares that this product is in compliance with the essential requirements and other provisions of the Radio Equipment Directive 2014/53/EU and as such displays the CE mark. The RED declaration of conformity is provided as part of this documentation pack. The declaration of conformity is provided with the product document pack.



1.2.8 FCC notice

This equipment has been tested and found to comply with the limits for a class B 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.



WARNING: It is a violation of the rules of the Federal Communications Commission to input an MMSI that has not been properly assigned to the end user, or to otherwise input any inaccurate data in this device.

1.2.9 Industry Canada notice

This device complies with Industry Canada license-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 B 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 B est conforme à la norme NMB-003 du Canada.

2 About your AIS class B transceiver

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 the Global Navigation Satellite System (GNSS) and communication between vessels is by Very High Frequency (VHF) digital transmissions.

There are a number of types of AIS device as follows:

- **Class A transceivers.** These are similar to class B transceivers, but are designed to be fitted to large vessels such as cargo ships and large passenger vessels. Class A transceivers transmit at a higher VHF signal power than class B transceivers and therefore can be received by more distant vessels. They also transmit Class A transceivers are mandatory on all vessels over 300 gross tonnes on international voyages and certain types of passenger vessels under SOLAS regulations.
- **Class B transceivers.** Similar to class A transceivers in many ways, but are normally lower cost due to the less stringent performance requirements. Class B transceivers transmit at a lower power and at a lower reporting rate than class A transceivers.
- **AIS base stations.** AIS base stations are used by Vessel Traffic Systems to monitor and control the transmissions of AIS transceivers.
- **Aids to Navigation (AtoN) transceivers.** AtoN's are transceivers mounted on buoys or other hazards to shipping which transmit details of their location to the surrounding vessels.
- **AIS receivers.** AIS receivers will generally receive transmissions from class A transceivers, class B transceivers, AtoN's and AIS base stations but do not transmit any information about the vessel on which they are installed.

This product is an AIS Class B transceiver.

2.2 Static and dynamic vessel data

There are two categories of information transmitted by an AIS transceiver: static and dynamic data.

The vessel's dynamic data, which includes location, speed over ground (SOG) and course over ground (COG), is calculated automatically using the internal GNSS receiver.

Static data is information about the vessel which must be programmed into the AIS transceiver. This includes:

- Maritime Mobile Service Identity (MMSI)
- Vessel name
- Vessel call sign (if available)
- Vessel type
- Vessel dimensions

In most countries the operation of an AIS transceiver is included under the vessel's marine VHF license provisions. The vessel on to which the AIS unit is to be installed must therefore possess a current VHF radiotelephone license which lists the AIS system, vessel Call Sign and MMSI number.



An MMSI number is required in order for the AIS transceiver to operate. Please contact the relevant authority in your country for more information.

2.3 Important information for US customers

There are specific laws in the USA regarding the configuration of AIS class B transceivers.

If you are a US resident and intend to use your AIS class B transceiver in US waters, you should make sure that your retailer has configured your product prior to supplying it to you. If your AIS transceiver has not been pre-configured please contact your dealer or support@em-trak.com for details of how to have it configured.



In the United States of America, the MMSI and static data must only be entered by a competent installer. The end user of the equipment is not authorised to enter their own vessel data.

2.4 Special features

Some variants of this AIS Transceiver are WiFi and Bluetooth enabled, allowing for AIS data to be streamed from the transceiver to a 3rd party device or to the em-trak app "CONNECT-AIS".

WiFi and Bluetooth enabled transceivers also provide an in-built vessel data logger which will continuously record its own GNSS position and can be downloaded using proAIS2 or CONNECT-AIS.

2.5 Product range

The em-trak AIS Class B transceivers are available with several different feature options

This manual covers the following product variants. See table below.

Model No	Transmission standard	Internal antenna splitter	WiFi and Bluetooth	Voyage data recording
B921	CSTDMA	No	No	No
B922	CSTDMA	No	Yes	Yes
B923	CSTDMA	Yes	No	No
B924	CSTDMA	Yes	Yes	Yes
B951	SOTDMA	No	No	No
B952	SOTDMA	No	Yes	Yes
B953	SOTDMA	Yes	No	No
B954	SOTDMA	Yes	Yes	Yes

Table 3 Product variants

2.6 What's in the box?

Figure 1 shows the items included with your AIS transceiver purchase. The following sections give a brief overview of each item. If any of the items are not present contact your dealer or support@em-trak.com.

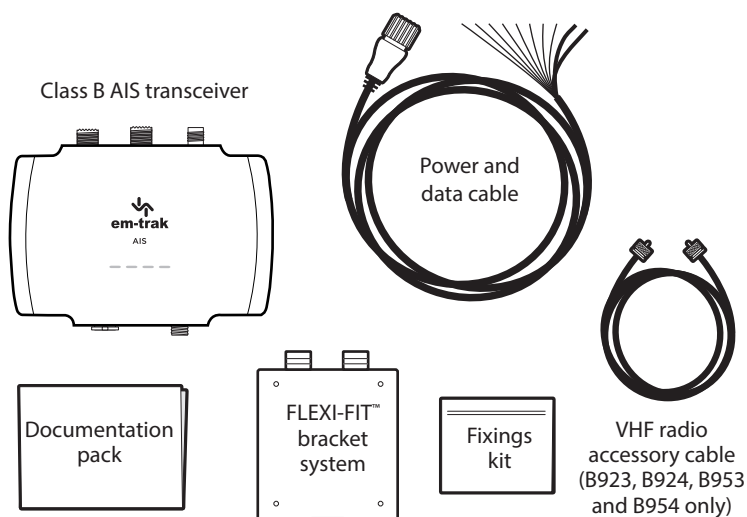


Figure 1 Items included with the product

2.7 Website support tools

The em-trak website has various tools to support the installer and user (See www.em-trak.com/installation):

- proAIS2 software tool. configure the AIS transceiver. Please refer to section 4 for details of the configuration process and how to use the proAIS2 tool.
- English and alternative language versions of the product manual. The manual should be read thoroughly prior to any attempt to install or use the AIS transceiver.

2.8 Mobile app

An em-trak mobile app CONNECT-AIS is available for Apple and Android devices from the App store and Google play.



2.9 Transceiver overview

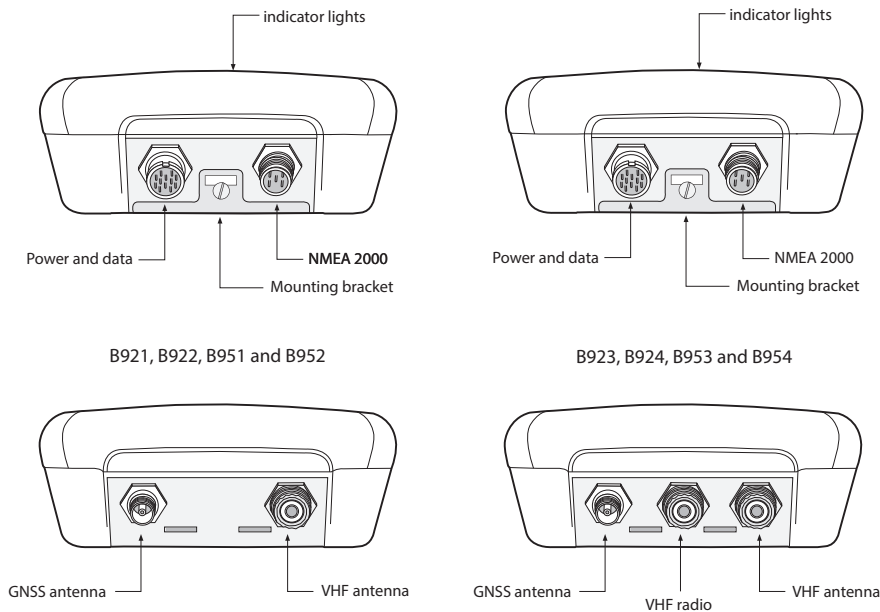


Figure 2 AIS transceiver overview

2.9.1 Electrical connections

The AIS transceiver has the following electrical connections:

- Power supply
- NMEA0183 data ports for connection to chart plotters or other NMEA0183 compatible equipment
- USB for connection to a PC or Mac
- External switch input for silent mode control
- NMEA2000 port for connection to an existing NMEA2000 network.

In addition on the B921, B922, B951 and B952 transceivers there are two other connections for the VHF antenna and a GNSS antenna. Figure 3 shows an overview of the electrical connections to the AIS transceiver.

On the B923, B924, B953 and B953 transceivers there are three other connections for the VHF antenna, VHF Radio input and a GNSS antenna. Figure 3 shows an overview of the electrical connections to the AIS transceiver.

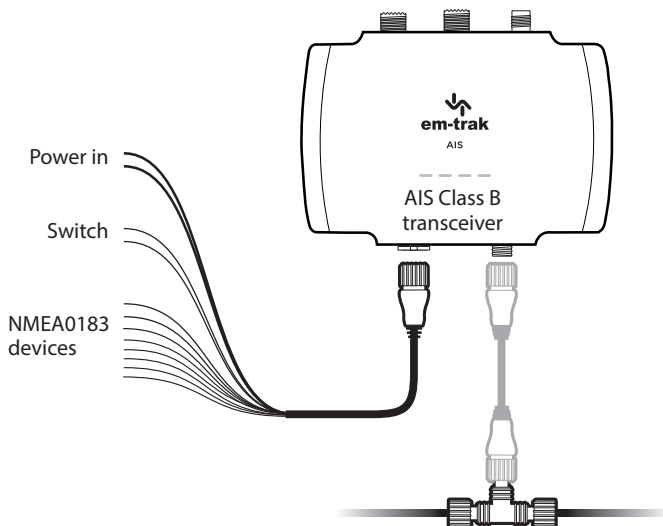


Figure 3 *Electrical connections to the AIS transceiver*

3 Installation

3.1 Preparing for Installation

Before starting the installation you will need to download the manual and ProAIS2 software from the em-trak website www.em-trak.com/installation. If you have a WiFi and Bluetooth enabled variant you can configure the unit using your mobile phone and CONNECT-AIS, the app available for download from the App Store and Google Play.



Figure 4 shows a typical installation configuration for the AIS transceiver without an antenna splitter.

Figure 5 shows a typical installation configuration for the AIS transceiver with an antenna splitter.

Please take the time to familiarise yourself with the system elements and their connections prior to attempting installation.

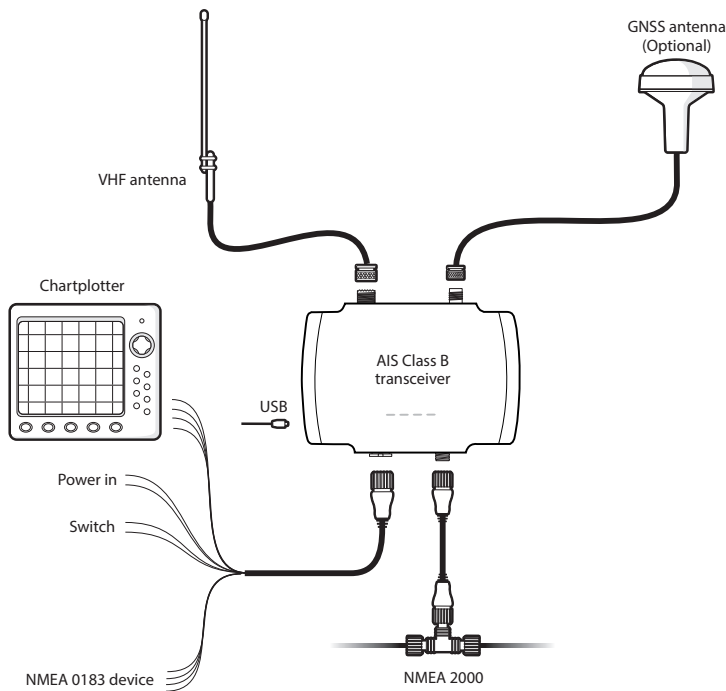


Figure 4 *Typical installation configuration without antenna splitter*

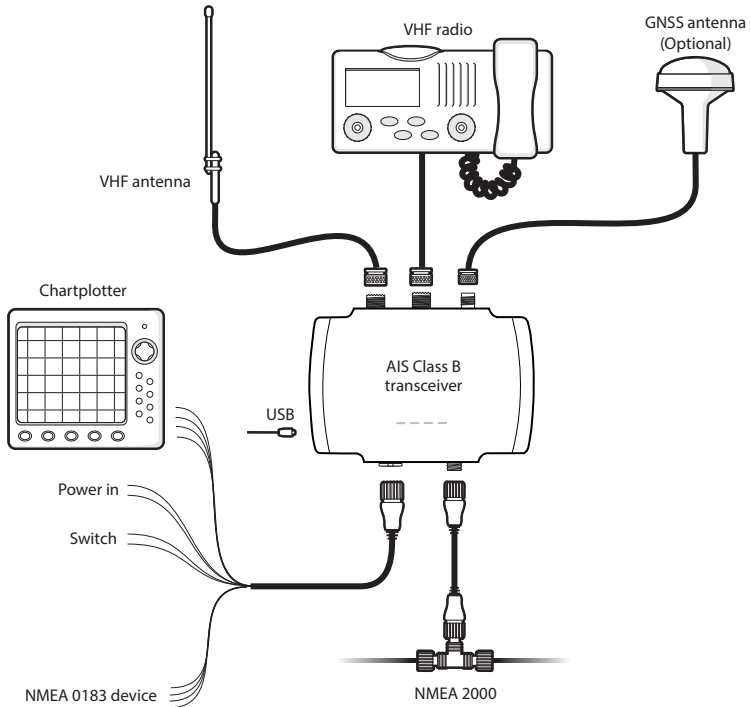


Figure 5 Typical installation configuration with antenna splitter

In addition to the items provided with your AIS transceiver the following items may also be required for the installation:

3.1.1 Screwdriver

A small flat-headed screwdriver will be required to tighten the screw in the mounting bracket.

3.1.2 VHF antenna

Connection to a suitable VHF antenna will be required for the AIS transceiver to receive and transmit.

The standard transceiver variants will require an AIS antenna (tuned to 162MHz) for optimum performance.

Transceiver/splitter variants will require a broadband antenna (tuned to 159MHz) so it will be compatible with both VHF radio (156MHz) and AIS (162MHz). Please take note of the warnings in section 1 regarding the use of antennas.

3.1.3 Optional switch

A switch can be connected to the transceiver to enable and disable 'silent mode' (see section 3.2). A latching toggle switch is recommended for this feature.

3.1.4 VHF antenna cable

Please check that the VHF antenna you intend to use has sufficient cable to reach between the VHF antenna and the AIS transceiver unit. If it is not sufficient you will need an extension cable. RG-58 or RG-8X can be used for short distances, however for longer runs we would recommend a low loss cable like RG-213. For reference the VHF antenna connector type on the AIS transceiver unit is SO 239, and it is intended to mate with a PL 259 connector.

3.1.5 Power cable

The AIS transceiver unit is supplied with a two metre long power and data cable. If you require a longer cable to reach your power supply, please ensure it is capable of carrying currents up to 2A peak / 200mA nominal for the B92x variants, and 2.5A peak / 220mA nominal for the B95x variants. Means of connecting the cables together will also be required, and we recommend ScotchlokTM connectors for this purpose.

3.1.6 Chart plotter

Your AIS transceiver can be interfaced with a chartplotter to display other vessels equipped with AIS. Please refer to the user manual supplied with your chart plotter for details of how to connect and configure your chart plotter

for use with AIS devices. Depending on the interfaces supported by your chartplotter, you can connect in the following ways:

- NMEA 0183 - we recommend that 38400 baud is used for outputting AIS data. This is also known as NMEA HS by some manufacturers.
- NMEA 2000 - you can connect to an existing NMEA 2000 network using a drop cable. This will allow you to output AIS data to any compatible devices that are connected on the network.
- WiFi - you can send AIS data over WiFi to any compatible chartplotter. This only applies to WiFi and Bluetooth enabled variants.

3.1.7 USB cable

A micro USB cable will be required to connect the transceiver to a PC or laptop. This will be necessary if your transceiver is not already programmed. Configuration over USB requires our software tool, proAIS2.

The USB interface can also be used to output AIS data to suitable navigation software installed on a PC or laptop.

This is not required for WiFi and Bluetooth enabled variants, which can also be configured using the CONNECT-AIS app.

3.1.8 Mobile devices

WiFi and Bluetooth enabled transceivers can be connected wirelessly to any compatible mobile device.

Data can be streamed to three devices simultaneously when in Access Point mode.

You can use a smart phone to configure the transceiver using the CONNECT-AIS app, available for download from the App Store and Google Play.



3.2 Installation procedures

Before beginning installation of your AIS transceiver, please ensure you have any necessary additional items as detailed in section 3.1. It is strongly recommended that you read all of the instructions in this manual prior to installation.

If after reading this manual you are unsure about any element of the installation process please contact your dealer or support@em-trak.com for advice.

The following sections explain the installation process step by step for each of the main elements of the system.

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 0.2m from a compass or any magnetic device.
- There should be adequate space around the AIS transceiver for routing of cables. See Figure 6 for details of the AIS transceiver dimensions.
- The ambient temperature around the AIS transceiver should be maintained between -25°C and +55°C.
- The AIS transceiver should not be located in a flammable or hazardous atmosphere such as in an engine room or near to fuel tanks.
- The transceiver should be mounted horizontally, with the LEDs facing up, for optimum performance of the internal GNSS antenna.
- A mounting bracket and four self tapping screws are supplied for attachment of the AIS transceiver to a suitable surface. Please refer to Figure 7 for guidance.
- The AIS transceiver should be mounted in a location where the indicators are readily visible as they provide important information on the status of the AIS transceiver.

- The transceiver should be mounted at least 1m away from sources of interference like VHF radios, transmitting antennas, radar, etc.

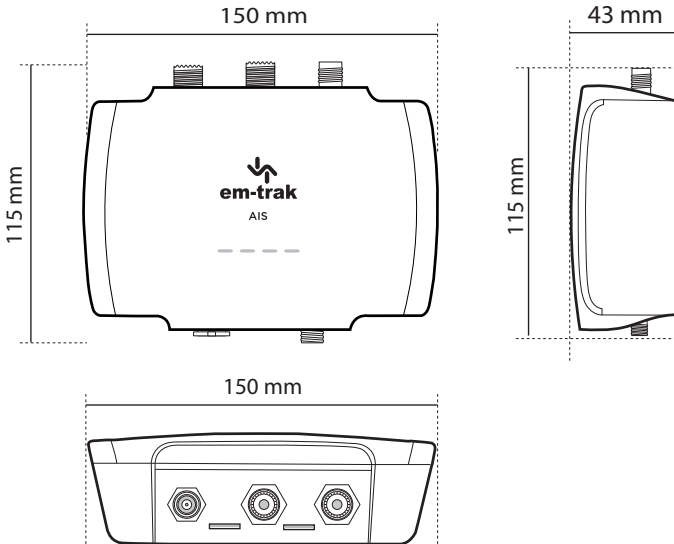


Figure 6 AIS transceiver dimensions

1. Mount the bracket to the suitable surface using the four self-tapping screws provided. A mounting template is provided to assist with drilling the correct hole positions.
2. Connect all the RF and power and data cables.
3. Clip the AIS transceiver onto the security bracket by lining up the two tabs with the corresponding slots and sliding the unit down. The tab on the unit should then engage with the slot in the mounting bracket.
4. Screw the captive security screw in the bracket into the AIS transceiver to lock it in place. See Figure 7

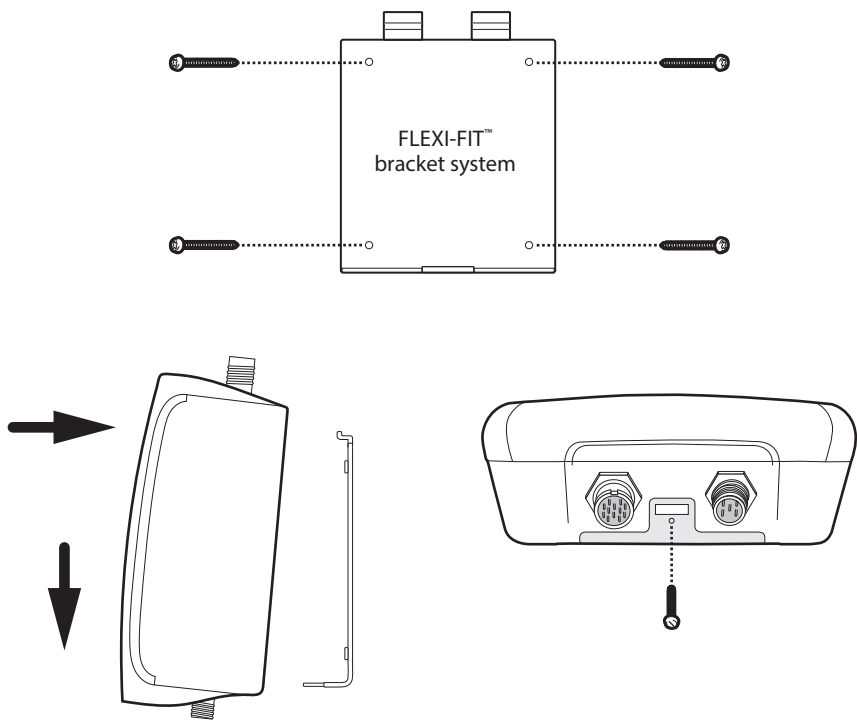


Figure 7 AIS transceiver mounting

Step 2 - Installing an optional external GNSS antenna (Not supplied)

The unit has an internal GNSS antenna. There is also the facility to connect an optional external GNSS antenna, which is available for purchase from em-trak. Please contact support@em-trak for more information.

Please note the following guidelines when installing an external GNSS antenna.

- You will require a one inch 14 TPI threaded pole to mount the GNSS antenna.
- You should ensure the GNSS antenna has a good clear view of the entire sky.
- The GNSS antenna should not be mounted up a mast where the motion of the vessel will cause the antenna to swing and potentially reduce the position accuracy.
- Do not mount your antenna in the direct path of a radar or any other transmitting equipment.
- Feed the ten metre long cable attached to the GNSS antenna cable through the pole and screw the antenna onto the pole mount as shown in Figure 8.
- Route the cable to your AIS transceiver unit.
- Connect the cable from the GNSS antenna to the GNSS connector on the AIS transceiver as shown in Figure 9.

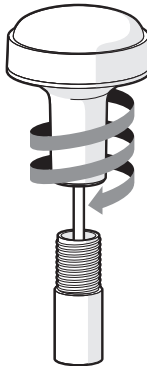


Figure 8 External GNSS antenna mounting

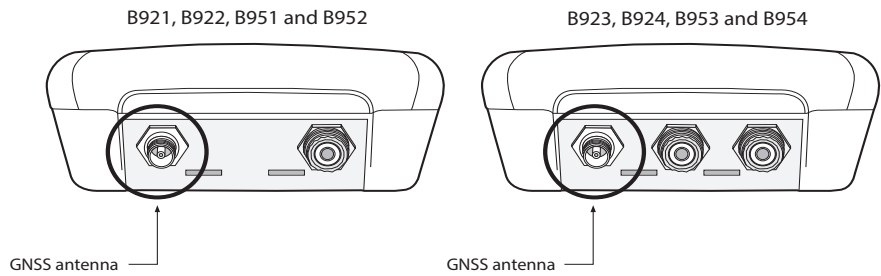


Figure 9 Position of the GNSS antenna connector

Step 3 - Connecting the VHF antenna

Route the cable from the VHF antenna to the AIS transceiver and connect to the VHF connector on the AIS transceiver as shown in Figure 10.

The standard transceiver variants (B921, B922, B951 and B952) will require an AIS antenna (tuned to 162MHz) for optimum performance.

Transceiver/splitter variants (B923, B924, B953 and B954) will require a broadband antenna (tuned to 159MHz) so it will be compatible with both VHF radio (156MHz) and AIS (162MHz).

The connector type on the AIS transceiver is SO239. The VHF antenna requires a PL259 connector to mate with this. If your VHF antenna does not use this type of connector please contact your dealer or support@em-trak.com for details of available adapters.

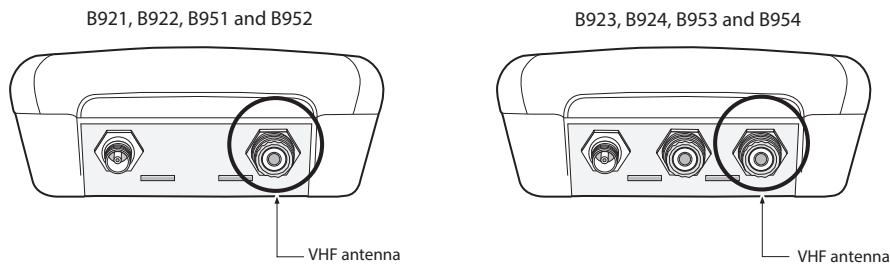


Figure 10 Position of the VHF antenna connector

Step 4 - Connecting the accessory cable

An accessory cable is supplied with the product to provide connections to power, the external switch, the NMEA0183 data ports and USB. The cable has a pre-molded connector at one end which should be connected to the connector on the unit marked 'POWER/0183'.

The other end of the cable has twelve colour coded bare wires ready for connection. The table below in Figure 1 lists the function of each colour coded wire for reference.

Wire colour	Description	Function
Red	Power in +	Power supply connections
Black	Power in -	
Light Green	Switch connection	External switch connections for silent mode
Orange	Switch connection	
Brown	NMEA0183 port 1 TX+	High speed NMEA0183 output (38,400baud) intended for connection to chart plotters
Blue	NMEA0183 port 1 TX-	
White	NMEA0183 port 1 RX+	
Green	NMEA0183 port 1 RX-	

Purple	NMEA0183 port 2 TX+	Low speed NMEA port (4,800baud) intended for connection to other NMEA0183 compatible sensors for multiplexing of data to the chart plotter
Pink	NMEA0183 port 2 2TX-	
Grey	NMEA0183 port 2 RX+	
Yellow	NMEA0183 port 2 RX-	

Table 5 Colour coding of wires in the accessory cable



Please check your wiring very carefully before applying power to the product. Failure to wire the product correctly could result in permanent damage.

Step 5 - Connecting an external switch

A toggle switch can be connected to the AIS transceiver to provide remote control of silent mode.

Connect the toggle switch between the light green and orange wires as shown in Figure 11. Connection of an external switch to toggle silent mode is optional and not essential for normal operation of the product.



Do not connect a voltage source across the switch inputs as this may damage the transceiver.

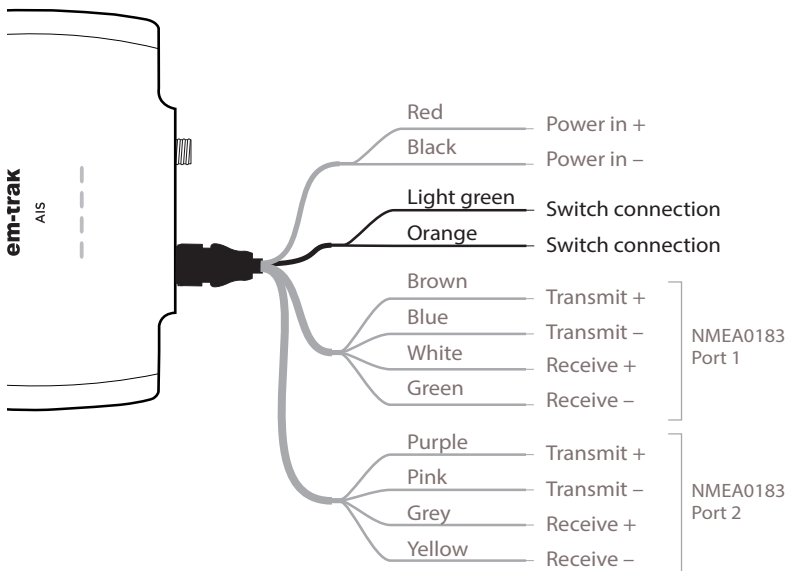


Figure 11 Connecting an external switch

Step 6 - Connection to an NMEA2000 network

The AIS transceiver can be connected to an existing NMEA 2000 network to provide AIS and position data to other connected devices such as chartplotters, instruments, sensors, etc.

Connection is made by a Micro-C drop cable. This item is not supplied so you will need to purchase one from your local dealer.

Starter kits are available to purchase if you do not already have an NMEA 2000 network.

The list of supported NMEA 2000 data (PGN's) is detailed in Section 7.1

Step 7 - Connecting to NMEA0183 compatible equipment

The NMEA0183 data ports allows connection to your chart plotter or other NMEA0183 compatible equipment. Each port consists of four wires colour coded as shown in Table 5 and in Figure 12.

Other manufacturers may use different signal names, however the following general guidelines will apply:

- positive signals should be connected together
- negative signals should be connected together
- transmit signals should be connected to receive signals and vice versa.

Please refer to your equipment manual for more information.

The AIS transceiver has a configurable high speed port which operates at 38,400baud at default. The port is intended primarily to connect to a chart plotter, but can be used to connect to other NMEA0183 devices. Please ensure your equipment is configured to use the correct baud rate.

Both ports support bi-directional multiplexing, which means that any data received on port 1 will be automatically output on port 2, and vice versa.

This can be useful when connecting to a chartplotter that only has a single NMEA0183 port, so a sensor can be connected to port 2 on the transceiver, where the received sensor data will combine with AIS data and get output on port 1.

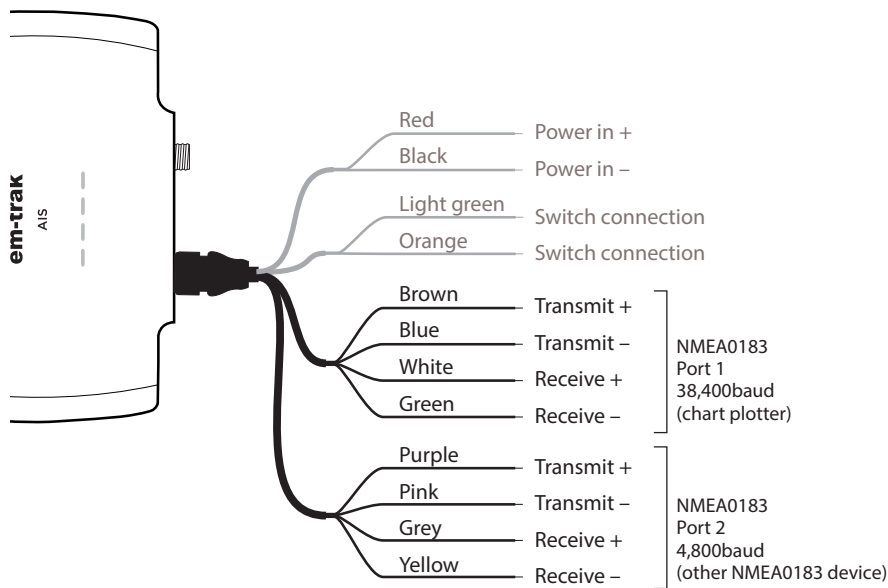


Figure 12 Connecting to the NMEA0183 data port

Step 8 - USB Connection

A micro USB cable will be required to connect the transceiver to a PC or laptop. This item is not supplied but is widely available for purchase.

USB drivers will need to be installed for Windows operating systems (Windows 7 and up). These are installed automatically by using either Windows Update or when installing proAIS2. proAIS2 is available for download from www.em-trak.com/installation

USB drivers are typically not required for MacOS X operating systems.

Step 9 - Connecting the VHF radio (applies to splitter variants only)

A standard marine band VHF radio can be connected to the splitter variants of the transceiver, so that one VHF antenna can be used for both VHF radio and AIS.

Using the supplied VHF radio accessory cable, route the cable from the VHF radio connector to the AIS transceiver connector shown in Figure 13.

Both ends of the supplied cable are fitted with PL-259 connectors, which are designed to mate with corresponding SO-239 connectors.

B923, B924, B953 and B954 only

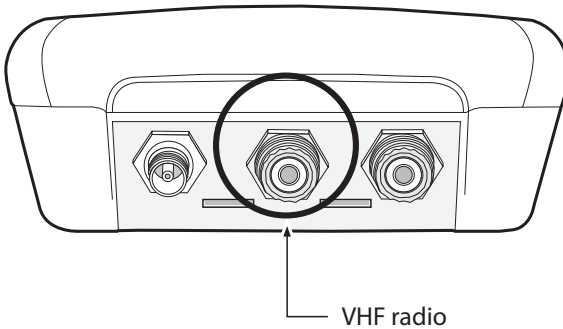


Figure 13 Position of the VHF radio connector

Step 10 - Connecting to a power supply

The AIS transceiver requires a 12V or 24V power supply, typically provided by the vessel's battery to operate correctly.

It is recommended that crimped and soldered lugs are used to connect the AIS transceiver to the power source via a suitable circuit breaker and/or 3A fuse block. The red and black wires as shown in Figure 14 need to be connected as follows:

1. Connect the red wire to a 12V or 24V power supply positive terminal.
2. Connect the black wire to the supply negative terminal.

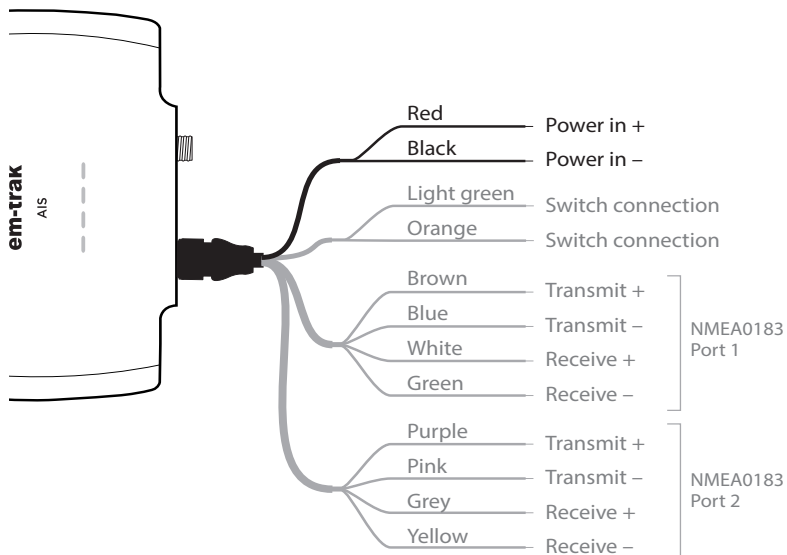


Figure 14 Connecting the power supply

4 Configuring your AIS transceiver

Your AIS transceiver will only be able to transmit once it has been programmed with appropriate vessel data. The minimum required data is MMSI number, vessel name, and vessel type.

4.1 Switching on your AIS transceiver for the first time

When power is applied to the transceiver for the first time all the status indicators will flash briefly, leaving only the amber and red indicators illuminated.

Once the transceiver is successfully configured only the green indicator will be illuminated once power is applied.

4.2 Configuring your AIS transceiver

Depending on the variant of transceiver there are three ways in which your AIS transceiver can be configured:

1. Configuration in advance by your dealer or installer.

If your AIS transceiver has been configured for you by your dealer or installer you can proceed to section 5. This is required for customers who have a vessel registered in the US.

2. Configuration using proAIS2

proAIS2 can be used to program your transceiver. This applies to all variants. proAIS2 is available to download from www.em-trak.com/installation

If your vessel is registered in the US you are not permitted to program the transceiver yourself.

3. Configuration using CONNECT-AIS.

WiFi and Bluetooth enabled variants of the transceiver can be configured using the CONNECT-AIS app.

CONNECT-AIS is available for download from the App Store and Google Play.



US Customers only: It is a violation of the rules of the Federal Communications Commission for the end user to program the vessel data. The vessel data must only be programmed by a competent installer. If your AIS transceiver has not been pre-configured for you please refer to your dealer or support@em-trak.com for advice on how to have the AIS transceiver configured by a competent installer.

4.3 Introduction to proAIS2

proAIS2 is available for download from www.em-trak.com/installation

This software tool can be used to configure your vessel data, check the GNSS antenna performance, view details on surrounding vessels, and monitor and diagnose the performance of the transceiver.

proAIS2 is designed to be installed and used with a PC or Mac connected to the AIS transceiver via USB using a USB cable (Not supplied).

4.4 Installing proAIS2

1. Download and extract the zip file to your local PC or laptop. For Windows installations you will need to open the 'en-us' folder and run the setup.exe or proAIS2.msi files before following the on-screen prompts.
For MacOS X installations you will need to open the OSX folder and run the proAIS2.dmg file.
2. If a security warning appears, click 'Install' to continue with the installation.
3. For Windows installations, the USB drivers can be optionally installed at the same time. This will be required to allow your PC or laptop to recognise the transceiver COM port. Once installation is complete, a start menu folder and shortcut can be created for future use.

4.5 Configuration using proAIS2

For configuration purposes only, it is possible to power the AIS transceiver via its USB connection. This is useful if you wish to configure your AIS transceiver away from the vessel power supply. The AIS transceiver will not transmit or receive any data whilst powered by USB only.

You will require the following information in order to configure your AIS transceiver:

- MMSI
- Vessel name
- Vessel type
- Vessel dimensions and position of your GNSS antenna installation.

For further assistance in configuring your AIS transceiver please refer to the Help menu within proAIS2.



Please ensure that you enter all vessel data accurately. Failure to do so could result in other vessels failing to identify your vessel correctly. The vessel MMSI can only be programmed once using proAIS2, please take care to program your MMSI correctly. If you need to change the MMSI for any reason, please contact your dealer or support@em-trak.com who for support.

4.6 WiFi and Bluetooth Configuration using ProAIS2

This section applies to AIS transceivers with the WiFi and Bluetooth feature only. (B922, B924, B952 and B954)

Using the proAIS2 software, the WiFi and Bluetooth feature can be configured for a user's specific needs.

Connect the AIS transceiver to the computer with a USB cable and apply external power (12-24V). Run the proAIS2 software and press the “*Connect*” button.

4.6.1 WiFi configuration

By selecting the WiFi tab on proAIS2, you are able to configure the various WiFi parameters.

The WiFi interface supports both Client and Access Point modes.

Client mode will allow your transceiver to join an existing network.

Access Point mode enables your transceiver to create it's own network.

The following parameters can be configured:

- WiFi network name (the SSID will be blank, any name can be entered by user),
- IP address of the network (e.g. 192.168.0.1)
- Password - Any 8 characters or more.
- WiFi Channel - Preferably 1, 6, or 11).
- Port address (e.g. 2002)

Once the '*Write Configuration*' button is pressed on proAIS2, the WiFi feature will be enabled with these settings.

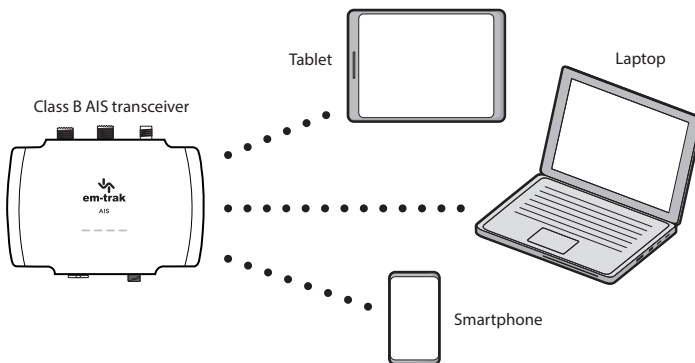


Figure 15 Typical mobile devices for WiFi and Bluetooth connection.

4.6.2 Location Requirements

A number of factors can affect the WiFi and Bluetooth propagation. For optimum performance we recommend that the transceiver is installed near the center of the boat to provide a consistent signal across all areas.

Consider testing the reception to ensure you're happy before you mount the bracket and transceiver.

4.6.3 Distance and signal strength

The distance between WiFi and Bluetooth products should always be kept to a minimum. Products installed close to their maximum WiFi range may

experience slow connection speeds, signal dropouts or not being able to connect at all.

4.6.4 Line of sight and obstacles

For best results, WiFi and Bluetooth products should have a clear, direct line of sight to the transceiver. Any physical obstruction can degrade or even block the signal.

The construction of your vessel can also have an impact on performance. For example, metal structural bulk heads and roofing, power cables and reflective surfaces can reduce and in certain situations, block the signal.

The AIS transceiver should be installed at least 1m(3ft) away from:

- Other WiFi enabled products
- Transmitting products that send wireless signals in the same frequency range
- Other electrical, electronic or electromagnetic equipment that may generate interference.

4.7 Configuration using the CONNECT-AIS

Once CONNECT-AIS is installed on your smart-phone you will need to carry out the following to configure your transceiver:

1. Ensure the AIS transceiver is installed correctly and is powered up by 12 - 24V.
2. Start CONNECT-AIS. You will see a welcome screen.
3. Select "*Lets Begin*" and the "*Setting up your AIS*" screen will appear
4. If you have all your correct vessel information available select "*I'm ready*" You will then see the "*Connect to your devices*" screen which will show all the available WiFi devices within range.
5. Select the number of the AIS transceiver being configured (this is printed on a label on the side of the unit). Create a connection. You will see a message confirming you are connected.
6. CONNECT-AIS will now guide you through configuring your vessel information. Complete the information boxes with the relevant vessel information and select "Next" when done.
7. Insert the vessel dimensions and select "Next" when done
8. Select the position of your GNSS antenna aboard the vessel. (If you are using the internal GNSS antenna within the AIS transceiver then select the position of the AIS transceiver instead). Select "*Complete*" when done.
9. CONNECT-AIS will now display the active chart display which will show other vessels with AIS in the vicinity.

The next time you open CONNECT-AIS it will connect automatically and go straight to the home screen.

5 Operation

5.1 Using the AIS transceiver

Once the unit has been configured it is ready for use. Providing other vessels installed with AIS transceivers are within radio range of your vessel you should see their details appear on your chart plotter, PC / laptop or mobile device. Please note that your full vessel details may not be visible to other vessels immediately as static data messages (containing vessel name, call sign, etc) are required to be transmitted every 6 minutes.

5.2 Switch functions

Using the instructions in Section 3.2 an external switch provides the ability to set the AIS transceiver into 'silent mode'. In silent mode the transmission of your own vessel position ceases, whilst the reception of other vessel's AIS position continues. When silent mode is active the blue indicator will be illuminated. This is also reflected in the Diagnostics tab of proAIS2.



When silent mode is active other vessels will not be able to receive your vessel information on their AIS devices. Your navigational safety may be compromised as a result.

5.3 Indicator functions

The AIS transceiver includes four coloured indicators as shown in Figure 16. The state of the indicators provide information regarding the status of the AIS transceiver.

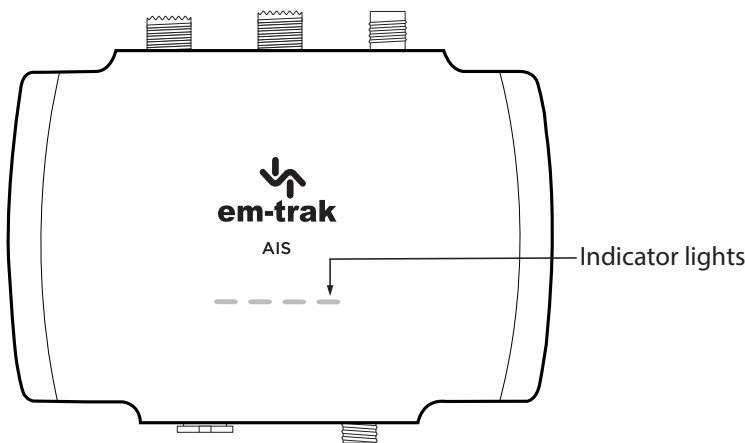


Figure 16 Indicator location on the AIS transceiver unit

The meaning of each indicator is shown in the table below Figure 16 shows the indicator positions on the AIS transceiver.

	Green indicator The AIS transceiver is configured and powered up.
	Red indicator The AIS transceiver has detected a system error. The likely causes of this are detailed in the troubleshooting guide in Section 8. Alarms displayed in the Diagnostic tab of proAIS2 will also assist with troubleshooting.
	Blue indicator When silent mode is activated using the optional silent mode switch the transmitter is disabled.



Amber indicator

The AIS transceiver is not transmitting. This can be for a number of reasons:

- The AIS radio channels are exceptionally busy so there are currently no available slots for transmission.
- The unit has been in silent mode and after deactivating silent mode this amber indicator will illuminate until the first AIS message has been sent
- The AIS transceiver has been commanded by the local authority (via an AIS base station) to cease transmissions.

6 Voyage Data Recorder

This feature is available on AIS transceivers with the WiFi and Bluetooth Features only (B922, B924, B952 and B954).

The transceiver will log your own position at regular intervals if your position has changed by more than 10m. Data is stored for 30 days.

The VDR log can be retrieved from the VDR tab within proAIS2.

The start and end dates of the log file are interrogated so you can select a date range to download.

Once the date range is selected you need to select the download location.

Data is saved as RMC sentences, which can be decoded and displayed by a range of on-line tools and navigation applications.

7 Technical Information

7.1 NMEA 2000 PGN List

The PGN's listed in Table 10 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	in, out	
059904	0EA00	ISO Request	in, out	
060416	0EC00	ISO Transport Protocol - Data	in, out	
060160	0EB00	ISO Transport Protocol - Connection	in, out	
060928	0EE00	ISO Address Claim	in, out	
065240	0FED8	ISO Commanded Address	in	
126208	1ED00	Group Function	in, out	
126464	1EE00	PGN list - Group Function	in, out	
126992	1F010	System time	out	
126993	1F011	Heartbeat	out	
126996	1F014	Product Information	in, out	

PGN (Dec.)	PGN (Hex.)	Title in NMEA database	Usage	NMEA 0183
126998	1F016	Configuration Information	out	
127250	1F112	Vessel Heading	in	HDT/THS
127251	1F113	Rate of Turn	in	ROT
129025	1F801	GNSS Position (Rapid Update)	out	RMC
129026	1F802	GNSS Direction data	out	RMC
129029	1F805	GNSS Position data	out	RMC
129038	1F80E	AIS Class A Position Report	out	VDM/VDO
129039	1F80F	AIS Class B Position Report	out	VDM/VDO
129040	1F810	AIS Class B Extended Position Report	out	VDM/VDO
129041	1F811	AIS AtoN Report	out	VDM/VDO
129793	1FB01	AIS UTC and Date Report	out	VDM/VDO
129794	1FB02	AIS Class A Static and Voyage Related Data	out	VDM/VDO
129795	1FB03	AIS Addressed Binary Message	out	VDM/VDO
129796	1FB04	AIS Acknowledge	out	VDM/VDO
129797	1FB05	AIS Binary Broadcast Message	out	VDM/VDO

PGN (Dec.)	PGN (Hex.)	Title in NMEA database	Usage	NMEA 0183
129798	1FB06	AIS SAR Aircraft Position Report	out	VDM/VDO
129801	1FB09	AIS Addressed SRM	out	VDM/VDO
129802	1FB0A	AIS Safety Broadcast Binary Message	out	VDM/VDO
129809	1FB11	AIS Class B CS Static Data Report Part A	out	VDM/VDO
129810	1FB12	AIS Class B CS Static Data Report Part B	out	VDM/VDO

Table 10 NMEA 2000 PGN List

8 Troubleshooting

Issue	Possible cause and remedy
No indicators are illuminated	• Check that the power supply is connected correctly. • Check that the power supply is a 12V or 24V supply.
The red error indicator is flashing	There may be a problem with the VHF antenna system. This can be confirmed using proAIS2. If the 'High VSWR' alarm is active please check for the following: • Faulty VHF antenna/cable/connectors • Poor connection at the VHF antenna/cable/connectors • Suitability of the VHF antenna (for AIS only we recommend antennas tuned to 162MHz / for splitter variants we recommend antennas tuned to 159MHz) • VHF antenna location (ensure that is isn't mounted near other transmitting antennas or sources of interference, metal structures, or other obstructions)
The red 'error' indicator is illuminated	• Check that the unit is programed with a valid MMSI number. This can be confirmed using the Configuration tab in proAIS2 • Check that the GNSS antenna has a stable position fix. This can be confirmed using the GNSS Status tab in proAIS2 • Check that the power supply is within 12 - 24V. This can be confirmed using the Diagnostics tab of proAIS2

The amber indicator is flashing continuously	• The amber indicator flashes while the transceiver searches for a position fix. If it takes longer than a minute you can check the performance of the GNSS antenna by using the GNSS Status tab of proAIS2
No data is being received by the chart plotter	• Check that the signal wires are connected correctly. • Check that the baud rate matches both the transceiver and the chart plotter. • Confirm that other vessels are within radio range and that they are displayed on the Other Vessels tab of proAIS2.
My vessel name isn't being received by other vessels	• Static data (containing vessel name, call sign, etc) is transmitted every 6 minutes so it may take a few transmissions before all the vessel data is displayed. • Position reports contain critical data like position, MMSI number, vessel speed, etc and this is transmitted more regularly.
I can't establish a connection using WiFi or Bluetooth	• Check that the transceiver is powered by 12 - 24V • Check the configuration parameters using proAIS2 • Check that there are no obstructions between the transceiver and mobile device • Check that there are no sources of interference nearby

If the guidance given above does not rectify the problem you are experiencing, please contact your dealer or support@em-trak.com for further assistance.

9 Specifications

Parameter	Value
Dimensions	149 x 118 x 47 mm (L x W x H)
Weight	Transceiver only variants 380g Transceiver with splitter variants 345g
Power	DC (9.6V - 31.2V)
	Average power consumption Transceiver only variants 170mA at 12VDC Transceiver with splitter variants 220mA at 12VDC
	Peak current rating Transceiver only variants 2A Transceiver with splitter variants 2.5A
GNSS Receiver (AIS Internal)	50 channel IEC 61108-1 compliant
Electrical Interfaces	NMEA0183 38,400kBaud
	NMEA2000 LEN=1
	WiFi 2.4GHz IEEE 802.11 a/b/g/n Output power +18dBm
	Bluetooth V4.0 / Output power +11dBm
Connectors	VHF antenna connector (SO-239)
	VHF radio connector (SO-239) - applies to transceivers with splitter variants only
	External GNSS antenna connector (TNC)
	NMEA2000 connector
	12 way power input / NMEA0183/External switch
	USB micro-c connector

VHF Transceiver	Transmitter x 1
	Receiver x 2 (Receivers time shared between AIS and DSC)
	Frequency: 156.025 to 162.025 MHz in 25 kHz steps
Output Power CSTDMA	33dBm $\pm$ 1.5 dB
Output Power SOTDMA	37dBm $\pm$ 1.5 dB
Channel Bandwidth	25kHz
Channel Step	25kHz
Modulation Modes	25kHz GMSK (AIS, TX and RX)
	25kHz AFSK (DSC, RX only)
Bit rate	9600 b/s $\pm$ 50 ppm (GMSK)
	1200 b/s $\pm$ 30 ppm (FSK)
RX Sensitivity CSTDMA	Less than -107dBm at 20% PER
RX Sensitivity SOTDMA	Better than -107dBm at 20% PER
	Co-channel 10dB
	Adjacent channel 70dB
	IMD 65dB
	Blocking 86dB
Environmental	Water resistant to IPx7 & IPx6
	Operating temperature: -25°C to +55°C
	Tested to IEC 60945 'Exposed' category
Indicators	Power, TX status, error, silent mode status

10 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
RAIM	Receiver Autonomous Integrity Monitoring
RED	Radio Equipment Directive
RF	Radio Frequency
RMC	Recommended minimum specific GNSS data message
ROT	Rate of Turn
RX	Receive
SD	Secure Digital
SO	Self Organised
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

Manufacturer's code: 427
NMEA 2000 Product code: XXXXXX

