

x100
Reference Guide

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Declaration of conformity to Directive 2014/53/EU

Certificate Number: DK-RED003134 i01

We, em-Trak Marine Electronics of Wireless House Westfield Industrial Estate Midsomer Norton Bath, BA3 4BS United Kingdom. Hereby declare that the product known as X100AIS Class B SOTDMA DSC/VHF Radio (431-0002) to which this declaration relates, (Radio Equipment Directive 2014/53/EU) is in conformity with the relevant sections of the following standards and/or other normative documents:

For Article 3.1(a) [Health & Safety]:

Health:

EN 62311:2008

Safety:

EN 62368-1:2020

IEC 60945:2002-08

For Article 3.1(b) [EMC]:

EN 301 843-1 v2.1.1

IEC 60945:2002-08

EN 301 489-1 V2.2.3

EN 301 489-17 V3.2.4

EN 301 489-19 V2.1.1

EN 301 843-1 V2.2.1

EN 301 843-2 V2.2.1

For Article 3.2 [Spectrum usage]:

IEC 62287-2:2017

IEC 60945:2002-08

EN 300 328: v2.2.2

EN 303 413: v1.2.1

EN 301 025 V2.3.1

EN 300 698 V2.3.1

For Article 3.3(g) [Emergency access – R&TTE related]:

IEC 62287-2:2017

IEC 60945:2002-08

IEC 61108-1:2003

EN 301 025 V2.3.1

Declaration of conformity to Directive 2014/53/EU

We also declare that all essential radio test suites have been carried out and that the above-named product is in conformity with the essential requirements of Directive 2014/53/EU.

A power / data cable is provided to enable the product to operate as intended in line with optimum performance and EU directive 2014/53/EU. The NEXUS Base is pre-loaded with application software radio v220200.01 and software network v220400.01

The conformity assessment procedure for Directive 2014/53/EU Articles 3.2 and 3.3 has been followed with the involvement of the following Notified Body:

TÜV SÜD DANMARK ApS, Johanne Møllers Passage 1, 3. sal, 1799 Copenhagen V, Denmark [NB No. 2443]

Signed:



Name: Gary Evans
Position: Head of quality & supply chain
Date: 30th April 2025

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em-trak Marine Electronics Limited

Wireless House

Westfield Industrial Estate

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Bath BA3 4BS

England

Website: www.em-trak.com

Be aware that information in regards to this product can change without notice, this is not an installation or operation guide. Click [here](#) to make sure that you have the latest version of these manuals.

For support and online help click [here](#), alternatively email: Support@em-trak.com.

Safety information

Various symbols are used in this manual and on the product itself to ensure correct usage, to prevent danger to the user and others, and to prevent property damage. The meanings of these symbols are described below. It is important that you read these descriptions thoroughly and fully understand the contents.



WARNING

Indicates a hazardous situation that may result in death or serious injury if the appropriate safety precautions are not needed.



CAUTION

Indicates a hazardous situation that may result in minor or moderate injury if the appropriate safety precautions are not needed.



INFORMATION

Information, hints and advice for better understanding of the instructions to be observed in the operation of the device.

Labelling

The label can be found on the X100. If the label(s) become unstuck, contact em-trak Marine Electronics Limited for a replacement.



WARNING

Hot surface

Coming into contact with a hot surface may cause burning.

Certified Installation

em-trak Marine Electronics Limited recommends a certified installation by an em-trak Marine Electronics Limited approved installer. Certified installations qualify you for enhanced product

warranty benefits. Contact your em-trak Marine Electronics Limited dealer for further details, and refer to the separate warranty document packed with your product.

WARNING

 This product must be installed and operated in accordance with the instructions provided. Failure to do so could result in personal injury, damage to your vessel and poor product performance.

em-trak Marine Electronics Limited highly recommends a certified installation by an em-trak Marine Electronics Limited approved installer. A certified installation qualifies for enhanced product warranty benefits. Register your warranty on the em-trak Marine Electronics Limited website: em-trak.com.

WARNING

 This product is NOT designed for use in hazardous or flammable atmospheres. Do NOT install in a hazardous or flammable atmosphere (such as in an engine room or near fuel tanks).

WARNING

 Only connect the X100 to a 12 or 24V DC power source.

CAUTION

 Ground the X100 using the M3 tapped hole on the rear of the X100 during EVERY installation.

CAUTION

 Isolate the VHF antenna from any vessel metalwork using a suitable, insulated (i.e. plastic) mounting bracket to prevent galvanic corrosion.

CAUTION

 Switch OFF the vessel's power supply before installing this product. Do NOT connect or disconnect equipment with the power on unless otherwise instructed to do so in this document.

CAUTION

 Do NOT connect this unit to a system which has positive grounding.

Product Disposal

Dispose of this product in accordance with the WEEE (Waste Electrical and Electronic Equipment) Directive.

The WEEE Directive requires the recycling of waste electrical and electronic equipment, which contains materials, components, and other substances that may be hazardous and present a risk to human health and the environment when WEEE is not handled correctly.

IMO (International Maritime Organization) and SOLAS (Safety of Life at Sea)

The equipment described in this document is intended for use on leisure marine vessels and work boats NOT covered by the IMO and SOLAS Carriage Regulations.

About AIS (Automatic Identification System)

AIS is primarily used for collision-risk management and navigation safety. It can automatically transmit and receive vessel information, such as the vessel name, MMSI (Maritime Mobile Service Identity) number, vessel code, vessel type position data, speed, course, destination and

Important Information

more information depending on the transceiver class. Information exchanged among vessels and base stations on the VHF maritime mobile band. This information helps to identify other nearby vessel stations.

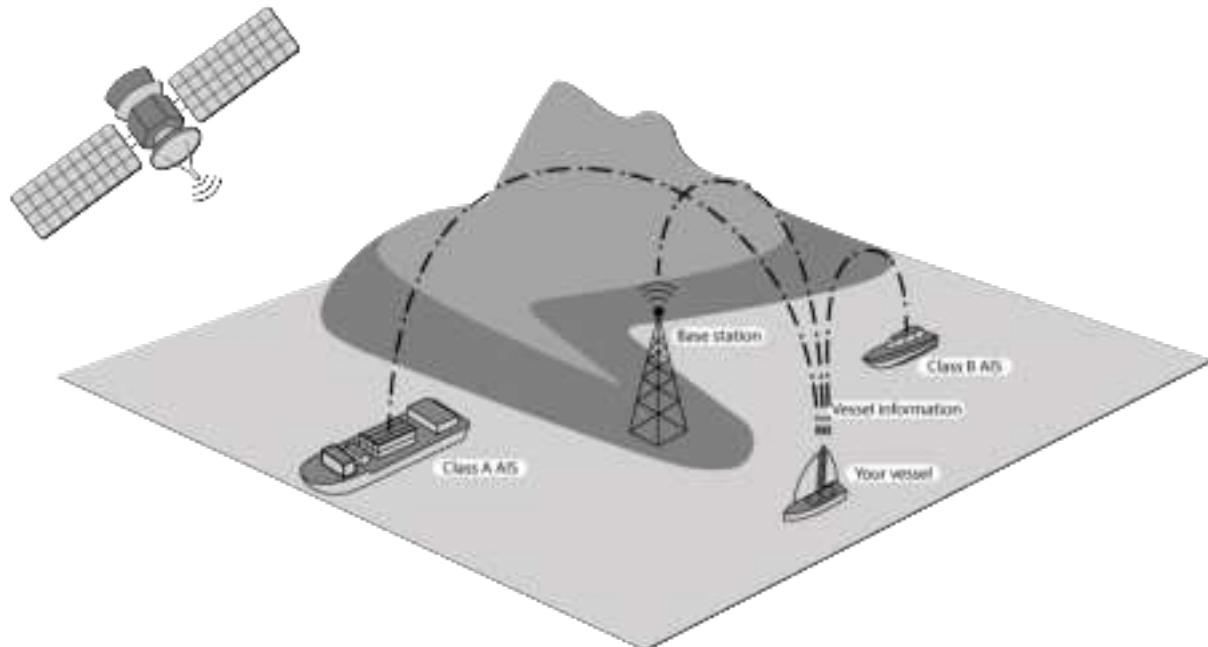


Figure 1 : AIS network

AIS classes

There are seven classes of AIS stations, vessels, base stations, Search and Rescue (SAR), Aids to Navigation (AtoN), Search and Rescue Transmitter (SART), Man Overboard (MOB), and Emergency Position Indicating Radio Beacon- AIS (EPIRB-AIS).

The X100 is a Class B device.

Under the Safety Of Life At Sea convention, all SOLAS vessels, as described below, are required to install a Class A AIS transponder:

- Upwards of 300 gross tonnage engaged on international voyages.
- Passenger vessels, irrespective of size, engaged on international voyages.
- Vessels upwards of 500 gross tonnage, not engaged on international voyages.

Class B AIS transponders are incompatible with Class A AIS transponders but do not impact the class A network.

Many commercial vessels and some leisure craft, not classified as requiring a Class A unit, choose to install Class B units to avoid accidents at sea.

FCC

WARNING

FCC Warning (Part 15.21)



Changes or modifications to this equipment not expressly approved in writing by em-trak Marine Electronics Limited Incorporated could violate compliance with FCC rules and void the user's authority to operate the equipment.

Compliance Statement (Part 15.19)

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

FCC Interference Statement (Part 15.105 (b))

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. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

1. Reorient or relocate the receiving antenna.
2. Increase the separation between the equipment and receiver.
3. Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
4. Consult the dealer or an experienced radio / TV technician for help.

Maximum Permissible Exposure



WARNING

Perform regular radio checks when using your vessel, as recommended in radio training and certification schemes and radio equipment rules of use.



WARNING

Under no circumstances should a DSC distress alert be sent from your radio for test purposes. Such action is a violation of rules of use for radio equipment, and can result in heavy fines.

CAUTION

For optimal radio performance and minimal human exposure to Radio Frequency (RF) electromagnetic energy, you must ensure that the antenna is:

- connected to the radio before transmitting.
- located where it will be away from people.
- located at least 1.8 meters (5.9 feet) from the radio's main unit.



Failure to observe these guidelines may expose those within the Maximum Permissible Exposure (MPE) radius to RF radiation absorption that exceeds the FCC MPE limit. It is the radio operator's responsibility to ensure that no person comes within this radius.

Innovation, Science and Economic Development Canada (ISED)

This device complies with license-exempt RSS standard(s).

Operation is subject to the following two conditions:

1. This device may not cause interference.
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.

Innovation, Sciences et Développement économique Canada (Français)

Cet appareil est conforme aux normes d'exemption de licence RSS.

Son fonctionnement est soumis aux deux conditions suivantes:

1. cet appareil ne doit pas causer d'interférence, et
2. cet appareil doit accepter toute interférence, notamment les interférences qui peuvent affecter son fonctionnement.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

Water Ingress

Water ingress disclaimer

Although the waterproof rating capacity of this product meets the stated water ingress protection standard (refer to the product's Technical Specification), water intrusion and subsequent equipment failure may occur if the product is subject to high-pressure washing. em-trak Marine Electronics Limited will not warrant products subjected to high-pressure washing.

Disclaimer

em-trak Marine Electronics Limited does not warrant that this product is error-free or is compatible with products manufactured by any person or entity other than em-trak Marine Electronics Limited.

em-trak Marine Electronics Limited is not responsible for damages or injuries caused by your use or inability to use the product, by the interaction of the product with products manufactured by others, or by errors in information utilised by the product supplied by third parties.

Warranty Registration

Register your product ownership to receive warranty benefits. Visit <https://em-trak.com/> to register online. Your product includes a barcode label indicating the units serial number. You will need this serial number when registering your product online. Retain the barcode label for future reference.

Document and Product Information

Licensing

Before using this product for the first time, check your national requirements for both the operator and equipment licensing.

IT IS YOUR RESPONSIBILITY TO DETERMINE WHETHER OR NOT YOU REQUIRE A LICENSE IN YOUR AREA BEFORE OPERATING THIS EQUIPMENT.

In many regions, the following authorisations are required from the relevant regulatory authority:

1. Ship Station VHF license;
2. Operator's license;
3. MMSI (Maritime Mobile Service Identity) number.

licenses are typically issued by the National Regulatory Authorities (NRAs) for each country.

Important:

It may also be necessary to obtain an Operator's license before an MMSI number for your vessel. The DSC and AIS functions of the radio will not work without a valid MMSI number.

USA Licensing Requirements

FCC station license requirement.

An FCC Ship Radio Station license and Call Sign are not required for most recreational vessels travelling in US waters. However, you must obtain a license if your vessel travels to foreign ports. Ships that use satellite communications or telegraphy must be licensed by the FCC.

For more information, refer to the FCC website (Licensing tab):
<https://www.fcc.gov/licensing-databases/licensing>.

Canada Licensing Requirement

You do not need a license to operate this product within the sovereign waters of Canada or the United States of America (USA).

You will need a license to operate this radio outside of Canada or the USA. To obtain licensing information, visit the Innovation, Science and Economic Development Canada (ISED) (previously known as Industry Canada) website: <https://tc.canada.ca/en>.

Europe Licensing Requirement

See the X100 Installation and Operation Guide for use on the inland waterways of contracting governments of the Regional Arrangement on the Radio Communication Service for Inland Waterways (RAINWAT).

Europe licensing requirements

Before the initial use of a VHF radio in Europe, obtain the following authorisations from the relevant regulatory authority.

- Ship Station VHF license — authorises two-way VHF communications with other vessels, aircraft, and shore stations. This license applies to a specific vessel and is usually valid for the vessel's lifetime. Transfer the Ship Station VHF license to the new owner if you sell your vessel.
- Operator's license — authorises an individual operator to conduct two-way VHF communications with other vessels, aircraft and shore stations. For most non-commercial

operators, this license is referred to as a "Restricted Radiotelephone Operator Permit" or "Restricted Certificate of Competence in Radiotelephone".

- Maritime Mobile Service Identities (MMSI) number — a nine-digit number sent over a radio frequency channel in order to identify the originating vessel/station.

Use the same MMSI number to program your radio if your vessel has one assigned. In Europe, the user can program the MMSI number. In some regions, you must obtain a radio operator's license before you are issued an MMSI number. In these areas, you can request an MMSI number from the same authority that issues the Operator's license or Ship Station VHF license.

It is also the radio operator's responsibility to be familiar with all relevant rules and regulations related to radio use. In regions in which a VHF transceiver is compulsory, a current copy of the applicable government rules and regulations must be accessible to the operator.

The following table lists the relevant issuing authority for licenses in each region, along with a link to the relevant website. Many authorities allow you to apply for a license online.

Country	Code	Regulatory Authority	Website
Austria	AT	Austrian Regulatory Authority for Broadcasting and Telecommunications	http://www.rtr.at
Belgium	BE	Belgian Institute for Postal services and Telecommunications (BIPT)	http://www.bipt.be
Bulgaria	BG	Communications Regulation Commission	http://www.crc.bg
Croatia	HR	Croatian Post and Electronic Communications Agency	https://www.hakom.hr/
Cyprus	CY	Office of Electronic Communications & Postal Regulation	http://www.ocecpr.org.cy/nqcontent
Czech Republic	CZ	The Czech Telecommunication Office	http://www.ctu.eu
Denmark	DK	Danish Energy Agency	https://ens.dk/en
Estonia	EE	Estonian Competition Authority	http://www.konkurentsiamet.ee
Finland	FI	Finnish Communications Regulatory Authority	http://www.ficora.fi/en

Country	Code	Regulatory Authority	Website
France	FR	Autorité de Régulation des Communications Électroniques et des Postes	http://www.arcep.fr
Germany	DE	Bundesnetzagentur	https://www.bundesnetzagentur.de/
Greece	EL	Hellenic Telecommunications and Post Commission	https://www.eett.gr/
Hungary	HU	National Media and Infocommunication Authority	http://www.nmhh.hu
Iceland	IS	Post and Telecom Administration	http://www.pfs.is/default.aspx?cat_id=101
Ireland	IE	Commission for Communications Regulation	http://www.comreg.ie
Italy	IT	Autorità per le Garanzie nelle Comunicazioni	http://www.agcom.it
Lichtenstein	LI	Office for Communications	https://www.llv.li
Lithuania	LT	Communications Regulatory Authority	http://www.rrt.lt/en/home.html
Luxembourg	LU	Institut luxembourgeois de régulation	https://web.ilr.lu
Latvia	LV	Elektronisko sakaru direkcija	https://www.vases.lv/lv/content/juras-sakaru-atlaujas
Malta	MT	Malta Communications Authority	http://www.mca.org.mt
Holland	NL	Autoriteit Consument & Markt	https://www.acm.nl/nl
Norway	NO	Norwegian Communications Authority	http://www.nkom.no
Poland	PL	Prezes Urzędu Komunikacji Elektronicznej	http://www.uke.gov.pl

Country	Code	Regulatory Authority	Website
Portugal	PT	Autoridade Nacional de Comunicações	https://www.anacom.pt
Romania	RO	National Authority for Management and Regulation in Communications of Romania	http://www.ancom.org.ro/en
Slovenia	SL	Agency for communication networks and services of the Republic of Slovenia	http://www.akos-rs.si
Slovakia	SK	Telecommunications Regulatory Authority of the Slovak Republic	http://www.teleoff.gov.sk/index.php?ID=9
Spain	ES	Comisión Nacional de los Mercados y la Competencia	https://www.cnmc.es/en
Sweden	SE	Swedish Post and Telecom Authority	http://www.pts.se
Switzerland	CH	Office fédéral de la communication	http://www.bakom.admin.ch
Turkey	TR	Information And Communication Technologies Authority	https://btk.gov.tr/
United Kingdom & Northern Ireland	UK (NI)	OFCOM	http://www.ofcom.org.uk

Rest of the world licensing requirements

In many regions, you will need to acquire the following authorisations from the relevant regulatory authority:

1. Ship Station VHF license;
2. Operator's license;
3. MMSI number.

Important: It is your responsibility to determine whether a license is required in your area before operating this equipment.

3rd party licenses

Roboto, Roboto_Mono, Manrope

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esp_littlefs

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g711

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nlohmann

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Specifications

Dimensions and weight

Width	217 mm
Height	84 mm
Depth	152 mm +200 mm for cable routing
Weight	1.6 kg, 1.7 kg (with mounting bracket)

Environmental specification

Operating Temperature	-25°C (-13°F) to +55°C (131°F)
Storage Temperature	-25°C (-13°F) to +70°C (158°F)
Relative Humidity	95%
Water Proofing	IPx6 & IPx7
Connections	<ul style="list-style-type: none"> 2 x NMEA 0183 1 x NMEA 2000 LEN (Load equivalency number)=1 1 x Audio (Bare Wire) 1 x GPS antenna (TNC) 1 x VHF connection port 1 x Wi-Fi/Bluetooth antenna (antenna provided)

Power specification

Nominal Supply Voltage	12Vdc to 24Vdc (Reverse polarity and over voltage protected)
Operating voltage range	9.6Vdc to 31.2Vdc
Power consumption	<ul style="list-style-type: none"> Transmit 6A Standby: 0.6A Receive: 0.46A

Transmitter

Channels	All available US, International and Canadian VHF marine bands
Frequency Range	Tx 156.00 to 162.025 international including AIS Tx 155.500 to 162.425 private
Frequency stability	+/- 1.5 ppm
Channel spacing	25 kHz

Power output	<ul style="list-style-type: none"> Low power setting 1 W High power setting 25 W
Spurious emissions	Better than -36 dBm at 25 W (Less than 0.25 μ W)
Maximum deviation	+/- 5 kHz
Antenna impedance	50 Ohms (typical)

Receiver

Channels	All available US, International and Canadian VHF marine bands
Frequency range	Rx 156.205 to 162.025 International including AIS Rx 155.500 to 163.275 private and WX
Sensitivity	Better than 1 microvolt EMF @ 20dB SINAD
Squelch sensitivity	Less than 2 dB μ EMF
Hum and noise	Better than -40 dB
Audio distortion	Less than 10%
Receiver sensitivity	Distance: 119dBm (0.25 μ V) @ 12dB SINAD (typical) Local: 110dBm (0.7 μ V) @ 12dB S
Adjacent channel selectivity	More than 70 dB
Spurious response rejection	More than 70 dB
Inter modulation rejection	More than 68 dB
Fuse requirements	Fast Acting In-line Fuse = 5 x 20mm 12 A

Speakers

Base speaker power output	2W
Fist-mic speaker power	1W
External speaker power	15W (4 Ω)

GNSS

Channels	72
Cold Start	30s
Receiver IC Sensitivity	-167 dBm (Tracking) / -148 dBm (Acquisition)
GNSS compatibility	<ul style="list-style-type: none"> GPS GLONASS Beidou Galileo
SBAS compatibility	<ul style="list-style-type: none"> WAAS EGNOS MSAS
Special features	Active Jamming and Interference Reduction
Operating frequency	<ul style="list-style-type: none"> GPS L1 C/A GLONASS L10F Beidou EB1/C
Signal Acquisition	Automatic
Almanac Update	Automatic
Geodetic Datum	WGS-84
Refresh Rate	1 Hz
Antenna	<ul style="list-style-type: none"> Internal: Ceramic chip mounted near top of unit External: Passive antenna connection via TNC connector
Position Accuracy	<ul style="list-style-type: none"> Without SBAS: <= 15 metres 95% of the time With SBAS: <= 5 metres 95% of the time

Regulatory bodies and application submissions

Country	Regulatory Body	Website links
UK	OFCOM	http://www.ofcom.org.uk
USA	FCC (www.fcc.gov)	<ul style="list-style-type: none"> www.boatus.com www.seatow.com www.usps.org/lc/bare/mmsi.html
Canada	Industry Canada	www.ic.gc.ca
Australia	Australian Maritime Safety Authority (AMSA)	http://www.amsa.gov.au/mmsi/
Holland	Agentschap Telecom	www.agentschaptelecom.nl
Belgium	Belgisch Instituut voor Postdiensten en Telecommunicatie	www.bipt.be
Germany	Bundesnetzagentur	https://www.bundesnetzagentur.de/DE/Sachgebiete/Telekommunikation/Unternehmen_Institutionen/Frequenzen/SpezielleAnwendungen/Seefunk/Seefunk-node.html
Denmark	søfartsstyrelsen	www.søfartsstyrelsen.dk
France	Agence Nationale Des Fréquences	https://www.anfr.fr/accueil
Italy	Ministero dello sviluppo economico - Direzione generale per le attività territoriali	https://www.mimit.gov.it/it/
Spain	Ministerio De Fomento	https://www.fomento.gob.es/MFOM/LANG_CASTELLANO/DIRECCIONES_GENERALES/MARINA_MERCANTE/ RADIOCOMUNICACIONES/MMSI/
Sweden	PTS	www.pts.se
Finland	Viestintävirasto	https://www.viestintavirasto.fi/en/spectrum/radiolicences/Boatingandnavigation.html
Iceland	Post and telecom administration in Iceland	www.pfs.is
New Zealand	Radio Spectrum Management	https://www.rsm.govt.nz

Country	Regulatory Body	Website links
Chile	Directemar	www.nauticentro.cl
Panama	Autoridad Maritima de Panama	https://www.amp.gob.pa/

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