i-ais-BS1

AIS Shore Station

Installation and User Manual

Rev 0.1

i-dealteknoloji™

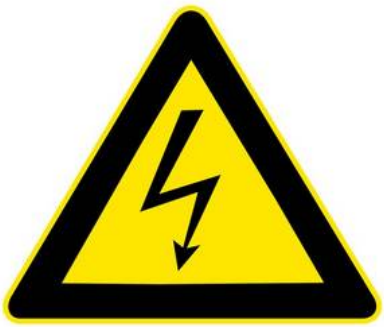
2013

IMPORTANT NOTICES

- The operator of this equipment must read and follow the descriptions in this manual.
- Wrong operation or maintenance can cancel the warranty or cause injury.
- Do not copy any part of this manual without written permission from iDeal Teknoloji.
- If this manual is lost or worn, contact your dealer about replacement.
- The contents of this manual and equipment specifications can change without notice. The example illustrations shown in this manual can be different from the screens you see on your display. The screens you see depend on your system configuration and equipment settings.
- Save this manual for future reference.
- Any modification of the equipment (including software) by persons not authorized by iDeal Teknoloji will cancel the warranty.
- All brand and product names are trademarks, registered trademarks or service marks of their respective holders.

SAFETY INSTRUCTIONS

The operator and installer must read the applicable safety instructions before attempting to install or operate the equipment.



Warning: Switch-off Power Supply

Only install or remove the device when disconnected!
Before maintenance work the device shall be disconnected.

Warning: Product Installation

This equipment must be installed in accordance with the iDeal Teknoloji instructions provided. Failure to do so could result in poor product performance, personal injury, and/or damage to the station.

Safety Notice: RF Radiation Statement

Your **i-ais-BS1 AIS** Shore Station generates and radiates radio frequency (RF) electromagnetic energy.

TABLE OF CONTENTS

1. AIS System General Information

The Automatic Identification System (AIS) is a short range coastal tracking system used on ships and by Vessel Traffic Services (VTS) for identifying and locating vessels by electronically exchanging data with other nearby ships and VTS stations. More detailed, AIS is a broadcast system, operating in the VHF maritime mobile band that is capable of sending ship information such as identification, position, course, speed and more, to other ships and to shore. It can handle multiple reports at rapid update rates and uses high technology to meet these high broadcast rates and ensure reliable and robust ship-to-ship operation.

It has long been realized that an automatic electronic reporting device fitted to a ship would be beneficial to the safety of navigation and the identification and monitoring of maritime traffic. Thus, AIS uses the maritime mobile VHF band for the transmission and reception of its data signals.

AIS allows automatic exchange of shipboard information from the vessel's sensors, including static and voyage related data between one vessel and another and between a vessel and a shore station(s).

Each AIS system consists of one VHF transmitter, two VHF TDMA receivers, one VHF DSC receiver, and a standard marine electronic communications link (IEC 61162/NMEA 0183) to shipboard display and sensor systems. Position and timing information is normally derived from an integral or external global navigation satellite system receiver, including a medium frequency differential GNSS receiver for precise position in coastal and inland waters. Other information broadcast by the AIS, if available, is electronically obtained from shipboard equipment through standard marine data connections. Heading information and course and speed over ground would normally be provided by all AIS-equipped ships. Other information, such as rate of turn, angle of heel, pitch and roll, and destination could also be provided.

1.1. How does AIS Work?

Each station determines its own transmission schedule (slot), based upon data link traffic history and knowledge of future actions by other stations. A position report from one AIS station fits into one of 2250 time slots established every 60 seconds. AIS stations continuously synchronize themselves to each other, to avoid overlap of slot transmissions. Slot selection by an AIS station is randomized within a defined interval, and tagged with a random timeout of between 0 and 8 frames. When a station changes its slot assignment, it pre-announces both the new location and the timeout for that location.

In these way new stations, including those stations which suddenly come within radio range close to other vessels will always be received by those vessels.

The required ship reporting capacity according to the IMO performance standard amounts to a minimum of 2000 time slots per minute, though the system provides 4500 time slots per minute. The SOTDMA broadcast mode allows the system to be overloaded by 400 to 500% through sharing of slots, and still provide nearly 100% throughputs for ships closer than 8 to 10 NM to each other in a ship to ship mode. In the event of system overload, only targets further away will be subject to drop-out, in order to give preference to nearer targets that are a primary concern to ship operators. In practice, the capacity of the system is nearly unlimited, allowing for a great number of ships to be accommodated at the same time.

The system coverage range is similar to other VHF applications, essentially depending on the height of the antenna. Its propagation is slightly better than that of radar, due to the longer wavelength, so it's possible to "see" around bends and behind islands if the land masses are not too high. A typical value to be expected at sea is nominally 20 nautical miles. With the help of repeater stations, the coverage for both ship and VTS stations can be improved considerably.

The system is backwards compatible with digital selective calling systems, allowing shore-based GMDSS systems to inexpensively establish AIS operating channels and identify and track AIS-equipped vessels, and is intended to fully replace existing DSC-based transponder systems.

1.2. AIS Classes

The standardization and development of the “AIS Class-B,” which is more adaptable to small vessels (non-SOLAS vessels), is making progress by reducing the price of the AIS (AIS Class-A), which is the requirement of the Convention.

Class A: Ship borne mobile equipment intended for vessels meeting the requirements of IMO AIS carriage requirement.

Class B: Ship borne mobile equipment provides facilities not necessarily in full accord with IMO AIS carriage requirements.

Below table, message contents of Class A and Class B are compared.

Identifier Information	CLASS A		CLASSB	
	Transmit	Receive	Transmit	Receive
MMSI # (Maritime Mobile Service Identity)	X	X	X	X
Navigation Status (ex 'At Anchor. "Under Way". "Not Under Way")	X	X		X
Rate of Turn - Right or Left	X	X		X
Speed over Ground - 1/10 Knot Resolution from 0 to 102 Knots	X	X	X	X
Position Accuracy - Differential.' GPS	X	X	X	X
Longitude	X	X	X	X
Course over Ground - Relative to True North	X	X	X	X
True Heading - 0 to 359 Degrees Derived from Gyro input	X	X	X	X
Time Stamp - The Universal Time to Nearest Second	X	X	X	X
IMO Number - Unique Reference able Identification	X	X		X
Radio Call Sign	X	X	X	X
Name of Ship	X	X	X	X
Type of Ship/Cargo	X	X	X	X
Location on Ship of Reference Point for Position	X	X	X	X
Type of Position Fixing Device	X	X	X	X
Draught of Ship - 1/10 Meter to 25 5 Meters	X	X		X
Destination	X	X		X
Estimated Time of Arrival at Destination	X	X		X

3. i-ais-BS1 General Information, Basic Parts and Configuration

3.1. General Information

i-ais-BS1 is an AIS station designed for limited scale AIS management and monitoring functions to be performed with a shore installation. It consists of an AIS Transponder for standard AIS functions and a Communication Gateway to be able to communicate with an operation center over IP connectivity.

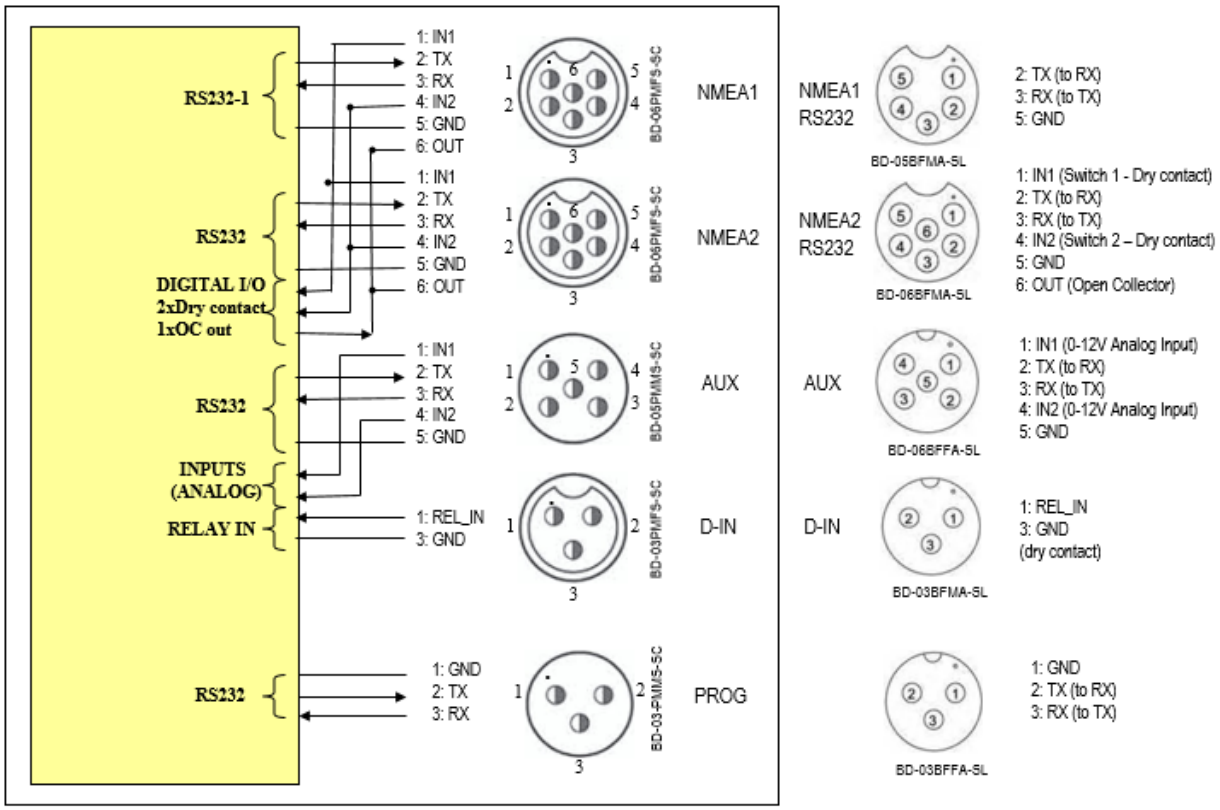
Some of the main features of i-ais-BS1 AIS Shore Station are as follows:

- Remote Management and Monitoring of AIS Network
- Text Messaging with Ships
- Encrypted Binary Messaging
- High sensitivity AIS receiver
- Full band operation

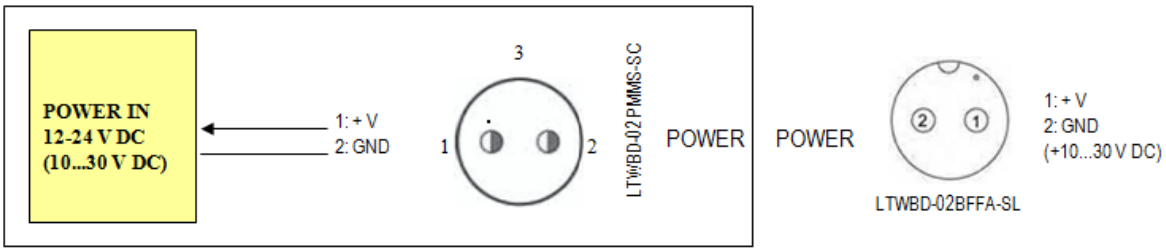
3.2. i-ais-BS1 Electronic Interface

The definition of connectors for i-ais-BS1 is given below.

The front panel connectors:



The back panel connectors:



3.3. i-ais-BS1 Connectors

The front panel view of i-ais-BS1 connectors is as follows:

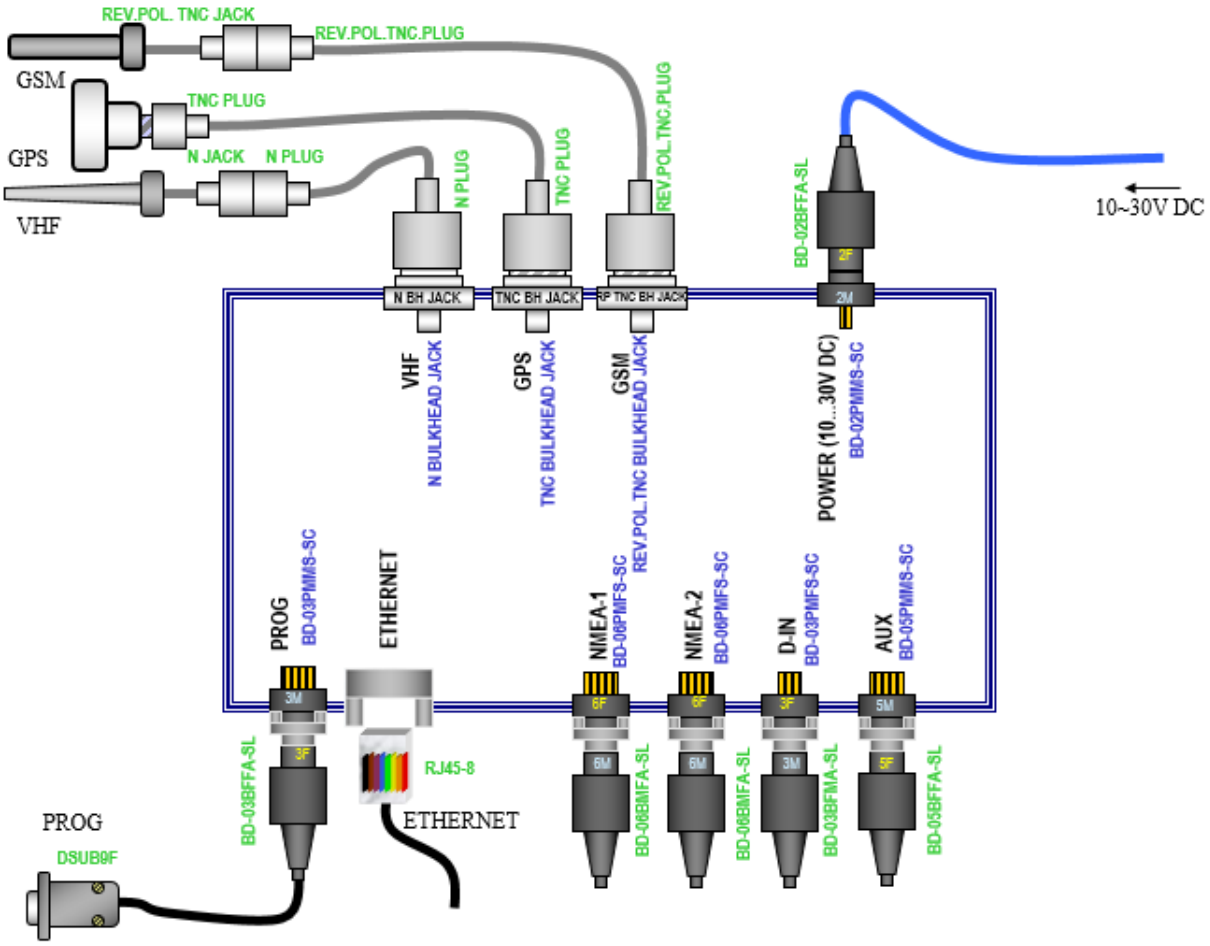
- PROG (Serial Communication Port for Service)
- ETH (Ethernet Port for Main Interface over Communication Gateway)
- NMEA-1, 2 (NMEA Output of AIS Station over RS-232)
- D-IN (Digital Input)
- AUX (Auxiliary RS-232 Interface)

The back panel view of i-ais-BS1 connectors is as follows:

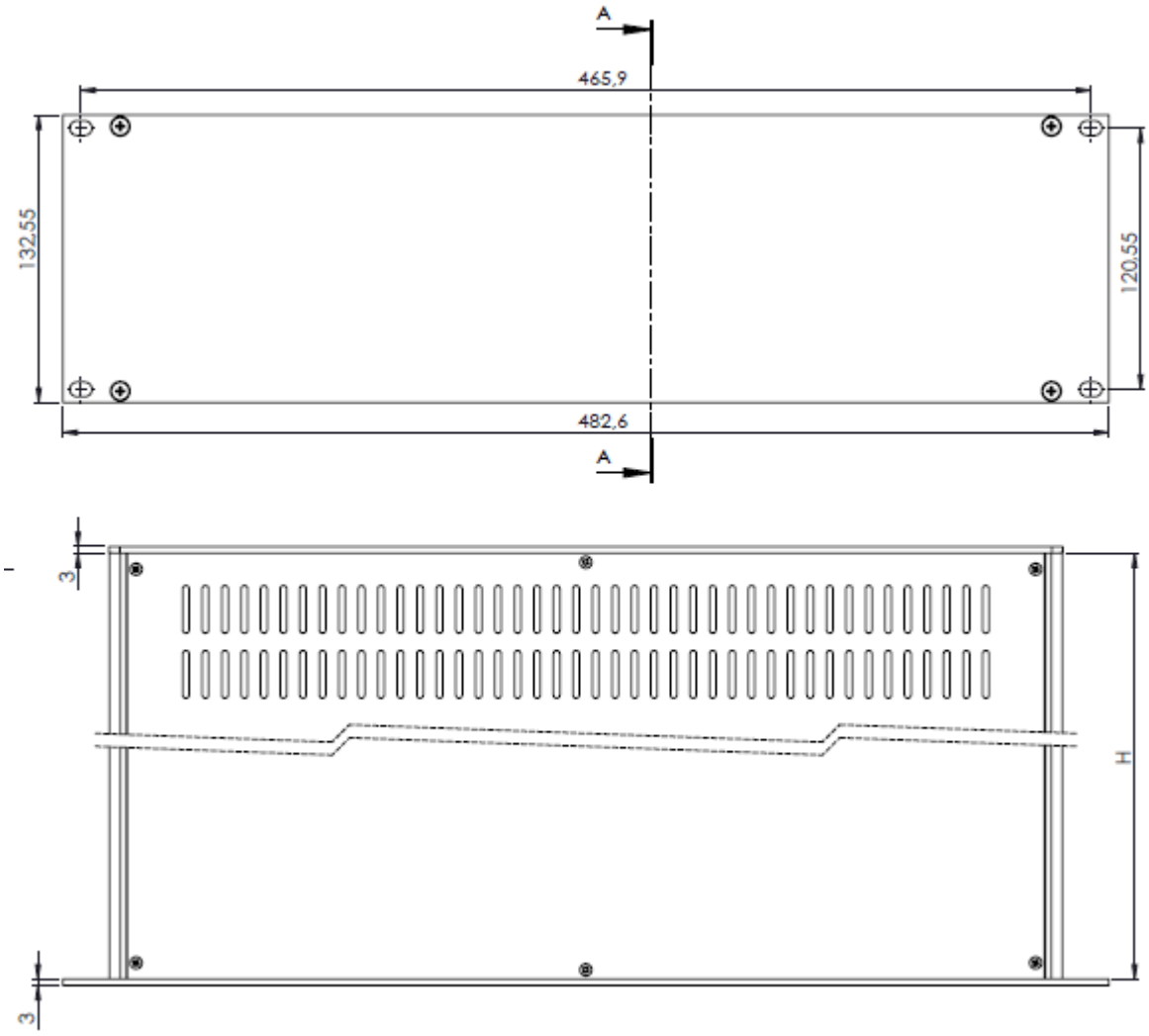
- POWER
- GSM Antenna
- VHF Antenna
- GPS Antenna

3.4. Basic Configuration

The basic configuration of i-ais-BS1 is as follows.



3.5. Mechanical Drawing of i-ais-BS1



4. Installation Guidelines

4.1. i-ais-BS1 Installation Procedure

i-ais-BS1 AIS Shore Station has a standard 19" 3U form factor for rack installation.

i-ais-BS1 should be installed and operated in a "Protected" environment as defined in IEC 60945 Section 4.4.

REMARK: *For a proper operation, i-ais-BS1 should be installed with a VHF antenna which has a VSWR value of 1.5:1 or better, with connecting RF cable.*

4.2. Antenna Installation Precautions

The antenna should be well removed from any major protrusions, such as light house rotating beacon engine and antenna/conductor masts. It should also be as far as practical from gear doors, access doors or other openings that could affect its radiation pattern.

If the antenna is being installed on a light house, ground planes must be added. Conductive wire mesh, radials or thin aluminum sheets embedded in the composite material provide the proper ground plane allowing the antenna pattern (gain) to be maximized for optimum station performance.

The GPS antenna used must be of the active type and must be suitable for marine applications (index of protection, ruggedness, means of mounting, etc.). An antenna should be selected with a gain (in dB) depending on the length of cable between the antenna and the station; after subtraction of cable and connector losses a minimum total gain of 15 dB should be available at the station GPS antenna connector.

The GPS antenna used must be a dedicated antenna, i.e. not shared with any other GPS receiver. Installation of the GPS antenna is critical for the performance of the built in GPS receiver which is used for timing of the transmitted time slots.

The GPS antenna should be mounted in an elevated position and free of shadow effect from any structure and should have a free view through 360 degrees with a vertical angle of 5 to 90 degrees above the horizon.

As the received GPS signal is very sensitive to noise and interference generated by other onboard transmitters, ensure that antenna is placed as far away as possible from RACON/radar transmitters and ensure the GPS antenna is free from direct view of the RACON/radar antenna beam. It is also important that the MF/HF and other VHF transmitter antennas are kept as far away as possible from the antenna.

The VHF antenna should be a dedicated antenna, i.e. not shared with any other VHF transmitter/receiver.

The VHF antenna should be mounted with at least a two meter vertical separation distance from any other VHF antenna used for speech or DCS communication, at least 2-3 meters above sea level for full performance.

Connecting a badly mismatched VHF antenna, leaving the VHF antenna port disconnected, or shorting the VHF antenna port will activate the VSWR alarm, cause the unit to stop sending position reports or cause damage to the station.

To meet the requirements for Radio Frequency Exposure it is necessary to install the VHF antenna correctly and operate i-ais-BS1 equipment according to the instructions. The table below shows suitable safety distances to other equipment that could cause interference with the station.

Object	**Safety distance:**
Radar antenna, X-band	1, 5 m (5 ft)
High efficiency engine	1 m (3 ft)
HF or VHF antennas	3 m (10 ft)
AC power cables with high currency	1 m (3 ft)

4.3. Cabling

The RF coaxial cables should be kept as short as possible to minimize attenuation of the signal. Double shielded coaxial cables equal to or better than LMR200/LMR240 (for GPS) and LMR400 (for VHF) are recommended.

All outdoor connectors on the coaxial cables should be fitted with preventive isolation, such as shrink-stocking with silicone to protect the antenna cable against water penetration. Coaxial cables should be installed in separate signal cable channels/tubes, and at least 10 cm away from any power supply cables. Crossing of cables should take place at right angles (90°).

Coaxial cables should not be exposed to sharp bends, which may lead to changes to the characteristic impedance of the cable. The minimum bend radius should be 5 times the cables outside diameter.

5. Specifications

GENERAL	
Operating Temperature Range	-15ºC to +55º C
Storage Temperature Range	-30ºC to +70º C
Humidity	Up to 93% at 40ºC non-condensing
Power Supply Voltage	12V – 24V DC (max 10V – 30V DC)
Supply Current	400mA (average at 12V)
Size	482.6mm x 206mm x 132.55mm
Weight	3.5kg
Connectors	VHF Antenna: N Female GPS Antenna: TNC Female GSM Antenna: RP TNC Female ETH: RJ-45 Power, Prog, NMEA-1, NMEA-2, D-IN, Aux: Circular Plastic Connectors
AIS	
Operating Frequency Range	156.025 – 162.025 MHz
Channel Spacing	25 kHz
Transmitter Output Power	12.5W (41dBm) nominal 2W (33dBm) low power mode
Modulation	GMSK
# of Receivers	2 (simultaneous operation)
Receiver Sensitivity	Better than -107dBm
Co-Channel Rejection	Better than 10 dB
Adjacent Channel Selectivity	> 70 dB
Spurious Response Rejection	> 70 dB
Intermodulation Response Rejection	> 65 dB
Blocking or Desensitization	> 86 dB
Spurious Radiation (conducted)	< -57 dBm
STANDARDS	
AIS	IEC 62320-2, *Maritime navigation and radiocommunication equipment and systems – Automatic identification system (AIS) – Part 2: AIS AtoN Stations – Operational and performance requirements, methods of testing and required test results* ITU-R M.1371-4, *Technical Characteristics for an Automatic Identification System Using Time Division Multiple Access in the VHF Maritime Mobile Band* IMO Res. MSC.74(69), Annex 3, *Recommendations on Performance Standards for a Universal Shipborne Automatic Identification System (AIS)* IALA Rec. A-126, *The Use of the Automatic Identification System (AIS) in Marine Aids to Navigation Services*

EMC	ETSI EN 301 843-1, *Electromagnetic compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC)standard for marine radio equipment and services; Part 1: Common technical requirements*
Environment (Including vibration)	IEC 60945, *Maritime navigation and radio communication equipment and systems – General requirements – Methods of testing and required test results*
Safety	IEC 60950-1, *Information Technology Equipment – Safety – Part 1: General Requirements*
APPROVALS	
CE Type Approval per R&TTE Directive-99/5/EC	
BSH, Statement of Conformity per IEC62320-2 & ITU-R M.1371-4	
GPS RECEIVER	
# of Channels	50
Time to First Fix	29s Cold Start 29s Warm Start <1s Hot Start
Receiver Sensitivity	-160 dBm Tracking -160 dBm Reacquisition -144 dBm Cold Start

6. Warranty Information

All iDeal products are warranted to be free from defects in materials or workmanship for **one year** from the date of purchase. Within this period, iDeal Technologies, Inc. will, at its sole option, repair or replace any components which fail in normal use. Such repairs or replacement will be made at no charge to the customer for parts or labor, provided that the customer shall be responsible for any transportation cost. This warranty does not cover failures due to abuse, misuse, accident or unauthorized alterations or repairs.

7. Contact Information

iDeal Teknoloji Bilişim Çözümleri A.Ş.

Address: Göztepe Mah. Göksu Evleri Sitesi
Menekşe sk. B237b Anadolu Hisarı
34815 Beykoz / İstanbul

e-mail: info@idealteknoloji.com

Tel: +90 216 680 07 07

Faks: +90 216 680 07 04

Web: http://www.idealteknoloji.com