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USER MANUAL R450-X SERIES

R450-X Network AIS Receiver with Ethernet & WiFi – SKU: 001-2516
R450-XG Network AIS Receiver with Ethernet, GNSS & WiFi – SKU: 001-2519

R450-XE Network AIS Receiver with Ethernet (No WiFi) – SKU: 001-2517
R450-XGE Network AIS Receiver with Ethernet & GNSS (No WiFi) – SKU: 001-2518

R450-X-Series-MA-v07r03
2026-04-10
ENGLISH

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1 R450-X SERIES AIS RECEIVER MODELS

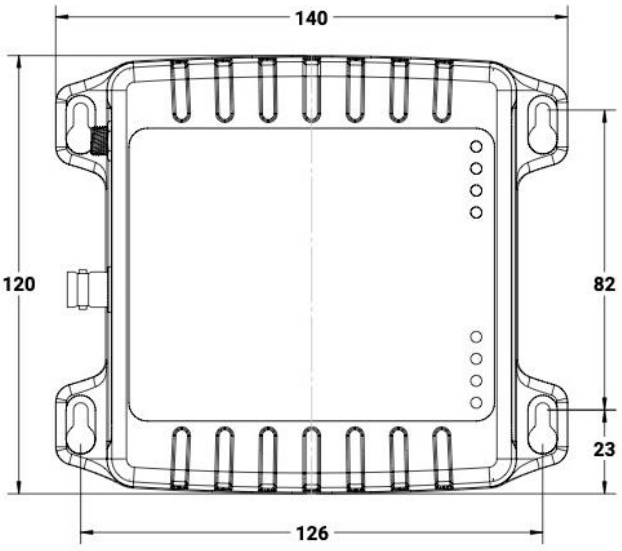
R450-X Network AIS Receiver
With USB, Ethernet & WiFi

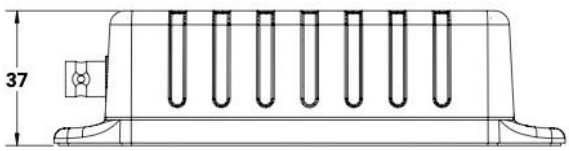
R450-XG Network AIS/GNSS Receiver
With USB, Ethernet & WiFi

Note: E suffix variants do not include a WiFi module

1.1 Major Dimensions

Measured in mm





2 DOCUMENT

2.1 About This Manual

This Manual provides installation, operating Instructions and fault-finding procedures for the equipment to which it relates.

After installation, this manual should remain with the vessel to which it relates.

This manual is made available in electronic Portable Document Format (PDF). In PDF format, the following categories are all enabled as active hyperlink references: (1) The titles of each section; (2) document cross-references; (3) the table of contents.

This document may therefore be navigated quickly and effectively by using a mouse or other pointing device to activate each of these hyperlinks. This is a printer friendly document, designed to be printed 2-sided as a booklet with A5 pages on A4 stock paper.

2.2 Revision History

Document name:	Date:	Details:	Author:
R450-X-Series-MA-v07r00	2025-09-01	First Issue	TSI
R450-X-Series-MA-v07r01	2026-02-17	Updates to R450-XG GPS Receiver	TSI
R450-X-Series-MA-v07r02	2026-03-02	GPS to GNSS terminology update & addition of ‘E’ variants	TSI
R450-X-Series-MA-v07r03	2026-04-10	Environmental Specifications	TSI

3 NOTICE

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4 GENERAL NOTICES

SAFETY: Make sure the power supply is switched off before you make any electrical connections to the unit.

INSTALLATION: This equipment must be installed in accordance with the instructions provided in this manual. Failure to do so could result in poor performance, personal injury and/or damage to your vessel and/or connected equipment.

CONNECTION: To ensure the performance of the unit, as part of the installation it is recommended that adequate grounding is connected to the unit. Further to this, it is recommended that the power input supply is provided by a clean DC source with filtering if required.

CABLES: The supplied cables should only be cut, shortened or lengthened by an appropriate supplier.

COMPASS: The compass safe distance of this unit is 0.5 m or greater for 0.3° deviation.

In accordance with a policy of continual development and product improvement, hardware and software may be upgraded from time to time, and future versions of equipment may therefore not correspond exactly with this manual.

When necessary, upgrades to the product will be accompanied by updates or addenda to this manual. Information contained in this manual is liable to change without notice.

Comar Systems Ltd. disclaims any liability for consequences arising from omissions or inaccuracies in this manual and any other documentation provided with this product.

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.

5 INTRODUCTION

5.1 Background to AIS

AIS (Automatic Identification System) is a maritime safety system that allows vessels to automatically exchange identification, position, course, and speed information over VHF radio. This data is crucial for improving situational awareness and reducing the risk of collisions at sea.

While AIS transponders are mandatory for most commercial vessels over 300 gross registered tonnes (GRT) on international voyages – as required by IMO regulations, the information they transmit can also be received by AIS receivers. These receivers, including land-based systems, play a vital role in monitoring vessel movements, supporting traffic management, coastal surveillance, port operations, and maritime data services.

This product is an AIS receiver designed to capture AIS transmissions from vessels within VHF range, providing real-time visibility of maritime traffic for shore-based applications.

5.2 The R450 Series

The R450 Series is a range of professional-grade dual-channel AIS receivers designed specifically for coastal and shoreside monitoring of AIS-equipped vessels. These receivers decode all AIS message types—including Class A, Class B, AtoNs, and SARTs—delivering reliable real-time vessel tracking for port authorities, government agencies, and maritime operators.

Within the series, the R450-D and R450-X models provide the same core functionality and form factor, but differ in the embedded modules, meaning models can be selected based on network infrastructure and connectivity requirements:

- **D Series models** (e.g. R450-D, R450-DG) use a Digi® network module, offering support for up to 32 simultaneous UDP connections.
- **X Series models** (e.g. R450-X, R450-XG) use a Lantronix® XPort® module, which supports up to 4 TCP and 1 UDP client/server connections.
- **E Suffix models** (e.g. R450-DE, R450-DGE, R450-XE, R450-XGE) are Ethernet-only variants and do not include a Wi-Fi module.
- **G Suffix models** (e.g. R450-DG, R450-DGE, R450-XG, R450-XGE) include an integrated GNSS receiver.

Information transmitted from vessels fitted with AIS transponders includes:

- Name of Vessel
- Call Sign
- Type of Vessel
- Speed (SOG)
- Course (COG)
- Heading
- Position
- Navigational Status
- Vessel Dimensions
- MMSI Number
- IMO Number
- Draft
- Rate of Turn
- Size of Vessel
- Status
- Destination
- ETA
- Cargo

Note: Not all the above information is necessarily transmitted by each vessel.

6 PARTS LIST

Before proceeding with the installation of any R450 Series model, check the contents of the box, which should include:

- The R450-X AIS Receiver Unit, or R450-XG AIS and integrated GNSS Receiver Unit
- Universal 100–250 V AC to 12 V DC power supply
- BNC to UHF Antenna Connector Adaptor
- USB Cable
- Network Cable

7 INSTALLATION

7.1 Mounting

The R450 is designed for internal, protected area environments. Mount the unit on a flat surface using #6 (3.5 mm diameter) pan head screws, ensuring it is located close to power, Ethernet, and antenna connections. Maintain a minimum compass safe distance of 0.5m and avoid placing the unit near excessive heat, vibration, or electrical noise sources.

7.2 Power Connection

The unit is supplied with a universal 100–250 V AC to 12 V DC power supply. Fit the appropriate AC plug for your region, then insert the 2.1 mm DC jack into the power socket.

Alternatively, the R450 can be powered from a clean DC power source in the range of 9–30 V DC, capable of supplying at least 1 A. The centre pin of the DC power socket is positive.

7.3 Antenna Installation

The R450 requires connection to a dedicated VHF antenna (not supplied). The antenna should be omnidirectional and tuned for the marine band (around 162 MHz). Use a high-quality 50 Ω coaxial cable and connect it to the BNC connector on the side of the unit.

For optimal reception:

- Mount the antenna as high as possible with a clear line of sight to the horizon.
- Avoid obstructions such as buildings, masts, or metal structures.
- A typical installation at 20 m elevation will provide reception of AIS transmissions at ranges of 25 nautical miles or more.
- Directional antennas, such as Yagis, may be used to improve reception in a specific direction if required.

7.4 USB Connection

R450 Series units can be monitored locally by connecting them via the USB port to a PC.

The USB port is configured on the PC as a Virtual COM port (VCP).

The Windows Device Manager can be used to find the COM Port number, and status of the attached device, as well as checking and updating USB drivers.

Windows Operating systems should automatically load the correct driver, however, the latest drivers, and drivers for other operating systems, can be downloaded from: *https://ftdichip.com/drivers/vcp-drivers/*

The AIS data received via the USB connection can be viewed on suitable AIS compliant software. Software such as AIS Dispatcher, h*ttps://www.aishub.net/ais-dispatcher*, can be used to view the data, and forward it to other applications.

For graphical representation of the positions of vessels from which AIS messages have been received, a charting program, such as OpenCPN can be used: *https://opencpn.org/*.

7.5 R450-XG GNSS Receiver

The R450-XG contains an integral GNSS receiver allowing positional data and AIS data to be output together from the receiver. A standard active 3.3 V DC GNSS antenna (10–30 dB gain) must be connected to the supplied TNC adaptor cable for the GNSS receiver to operate.

The internal GNSS receiver outputs the following NMEA 0183 GPRMC sentence:

$--RMC,hhmmss.ss,A,llll.ll,a,yyyyy.yy,a,x.x,x.x,ddmmyy,x.x,a,a*hh<CR><LF>

No other GNSS sentences are transmitted.

The RMC sentence provides the essential navigation data, including UTC time, date, position (latitude and longitude), speed over ground (SOG), and course over ground (COG).

> **Note: As the device is primarily an AIS receiver, additional GNSS output sentences are disabled to ensure that NMEA 0183 bandwidth remains available for AIS message transmission.**

7.5.1 GNSS Receiver Technical Specification:

- Channels: 32 Parallel Channels
- GNSS Constellations: GPS, GLONASS
    - Frequency: 1575.42 MHz (GPS)
    - Frequency: 1598.0625 – 1605.375 MHz (GLONASS)
- SBAS (Satellite-Based augmentation system): Yes
- Update Rate: 1 sec
- Hot Start: <2 sec
- Warm Start: <25 sec
- Cold Start: <35 sec

8 OPERATION

Operation of R450 Series units are fully automatic and only require Power, VHF and (GNSS for 'G' Series units):

On powering up the unit:

- The green LED marked ON should illuminate
- The Channel LEDs should come on briefly then go off
- The Channel A and B LEDs should flash momentarily when information from nearby transceivers is received
- Data is then output for visual or textual viewing on compatible electronic charting systems or other systems or devices.

8.1 The range of AIS transmission

The reception range of AIS signals is comparable to that of marine VHF radio, as both operate within the same frequency band. AIS operates in the 162 MHz range, which is line-of-sight and therefore heavily influenced by antenna height, placement, and environmental conditions.

Reception range is primarily determined by the elevation and quality of the receiving antenna. For example:

- An antenna mounted on the rail of a yacht typically achieves up to 15 nautical miles.
- Relocating the antenna to the masthead (approx. 10–15 metres elevation) can extend reception to 20 nautical miles or more.
- A shore-based installation with an unobstructed view of the sea and an antenna height of 20 metres or greater can typically receive AIS transmissions from vessels 25–30 nautical miles away, depending on transmission power and atmospheric conditions.

For best results, the antenna should:

- Be mounted as high as practical, with a clear line of sight to the horizon.
- Be omnidirectional, unless a focused reception zone is desired (in which case a directional antenna like a Yagi can be used).
- Have a gain suited to the application – higher gain antennas on land can significantly increase effective range but may reduce coverage in vertical elevation.

Obstacles such as buildings, hills, or masts can obstruct the signal and reduce performance. Always prioritise height and line-of-sight for optimal AIS reception.

9 CONFIGURATION

9.1 Connection to a Network or PC

These models can be connected to a standard PC via USB or Network Router / Switch via Ethernet. Note if connecting directly to a PC you will need a crossover cable.

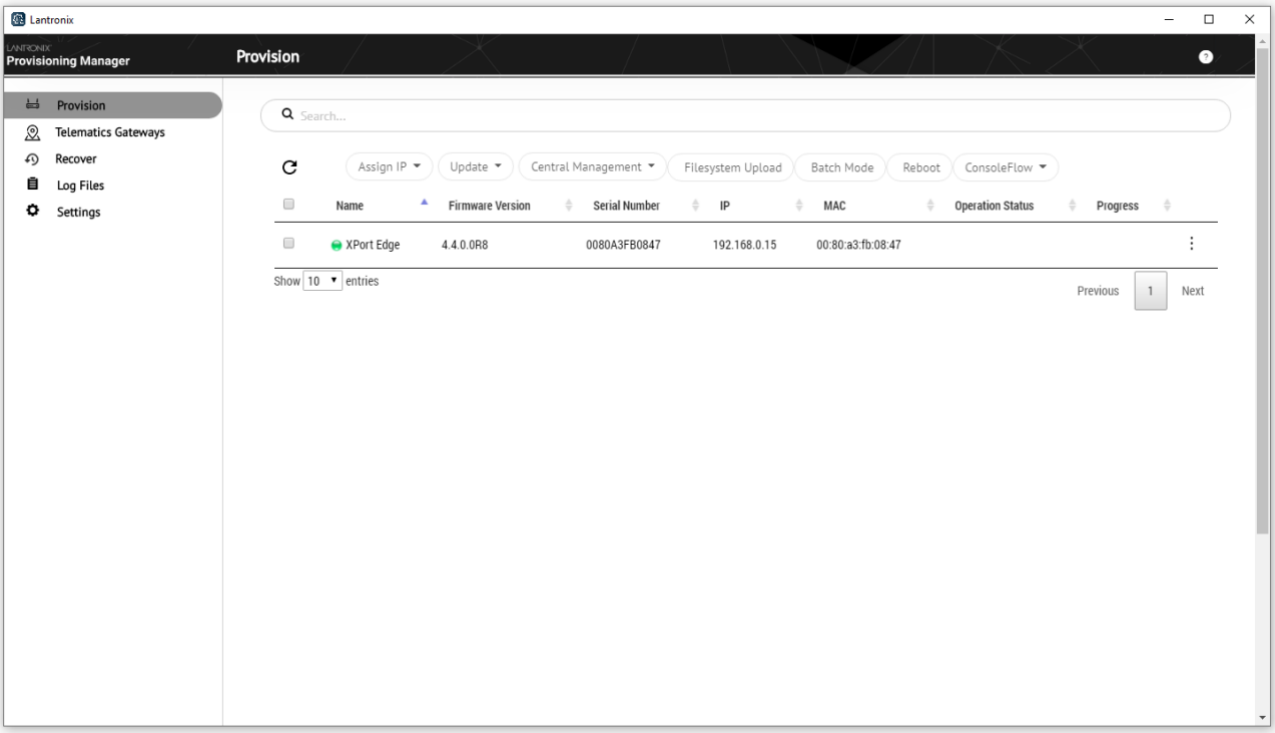
When connected to a network the yellow LED on the socket should be illuminated, if not, the unit has not detected a link. The green LED will blink when data is transmitted or received.

9.2 Configuring the Network

Start by downloading the R450-X Series software from our website at: comarsystems.com/software-downloads, and copy the Lantronix Provisioning Manager executable program to your PC.

Open the Lantronix Provisioning Manager from the location on your PC.

If you have connected the R450-X to your local network, the device will be displayed in the device list as shown in the example below:



9.3 Discovery Troubleshooting Tips

9.3.1 Firewalls

Check to make sure that any software firewalls (common examples are Windows Firewall and most popular Anti-Virus software) are disabled. These can block the discovery process, also any physical firewall will almost certainly block the discovery process as well.

9.3.2 Routers or Switches

Is there a router between the computer running the *Provisioning Manager* utility and the XPort device itself? Normally, routers will block the discovery process. If possible remove them and use a hub instead. If there is a switch in between this may or may not be a problem. Occasionally they are configured to block the discovery traffic. If unsure use a hub or a direct Ethernet cable connection. In case the port on your Router/Switch/Hub is at fault, try an alternative port as well.

9.3.3 Cabling

If nothing else works try using a direct crossover Ethernet cable directly between the computer and the XPort device. Another option is to try another Ethernet cable.

9.3.4 Ethernet LED

Check the Ethernet Link LED on the XPort device. Is it lit solid? If not, there is not a valid network connection and it will not be possible to discover the device.

9.3.5 Network Adapters

Make sure the proper network adapter is enabled, also ensure all other network adapters are disabled. If more than one network adapter is enabled, this can cause the discovery process to fail.

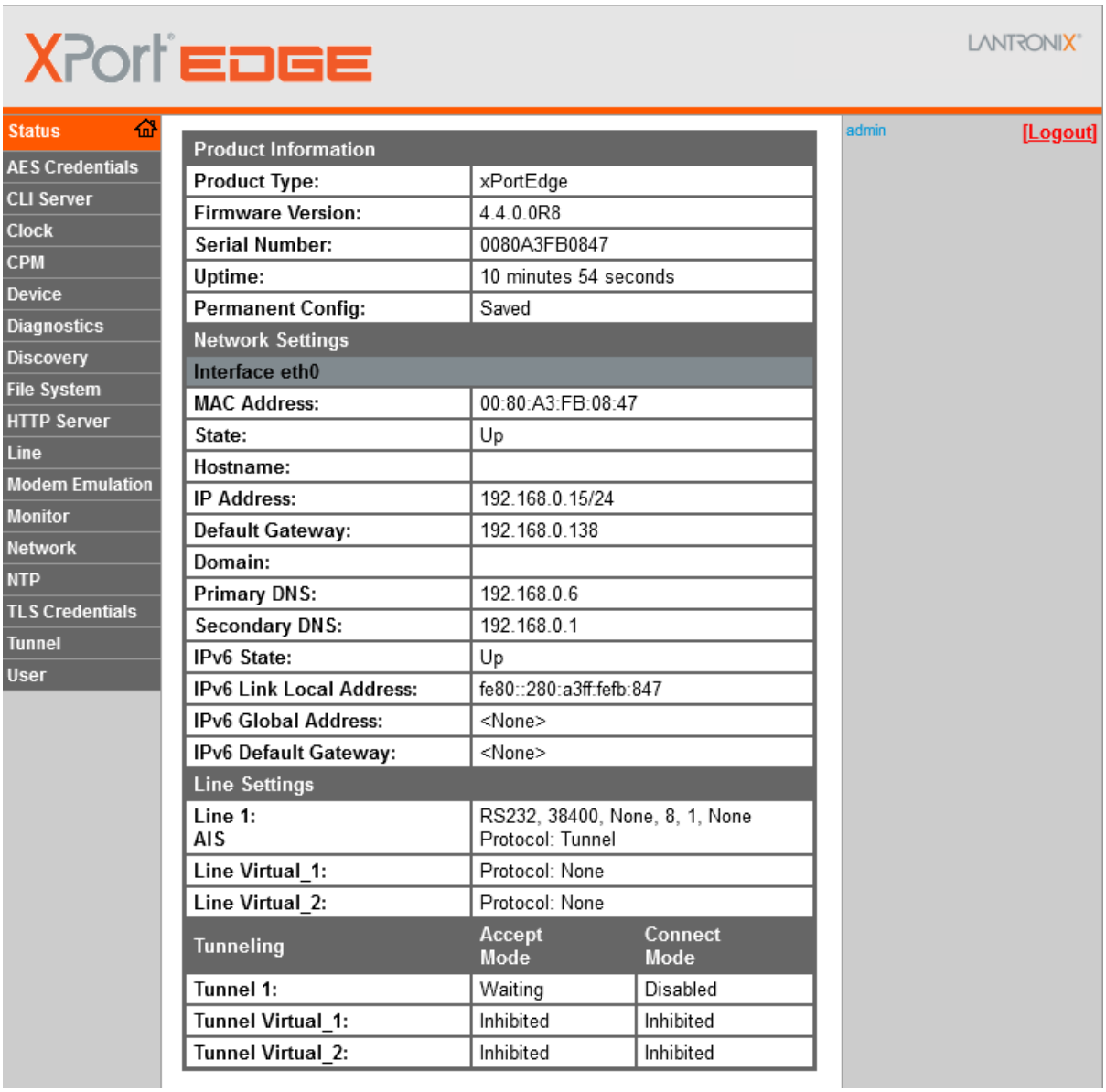
9.4 Configuring the Network Settings

To configure the XPort Edge Ethernet module used in your R450-X, type the discovered IP address from the *Provisioning Manager* into your browser to login to the *Lantronix Edge* web interface. The default login details are:

Username: **root** Password: **dbps**

Once entered it will connect you directly to the internal web browser, and open it on its home page as below and configure the device to your requirements:

Note: To comply with Schedule 1 of The Product Security and Telecommunications



10 WIFI CONFIGURATION

Applies to Non-E Variants Only – The R450-XE, and R450-XGE do not have a WiFi Module.

This unit uses a USR WIFI232-B2 Module. The WiFi module can be configured to provide an access point (for a WiFi device to connect to) or as a Station (to connect to an Access Point, or WiFi network), or both.

Providing an access point for a mobile device to connect to (enabling AIS data from the Receiver or Transponder to be viewed on the device), it is only necessary to set-up the Application Settings – see 'Application Settings' below.

If the device also needs to connect to the Internet (to receive Map Data etc), it will be necessary to connect both the Mobile device, and the Receiver or Transponder to a WiFi access point / network which has an Internet Connection. On the Comar device, this is done by setting the WiFi module in STA (Station) Mode.

If the WiFi module is set to STA mode, it will no longer be possible to log-on to the Access Point to change / update the settings. Setting the WiFi module to 'AP+STA' operation, will allow it to work as an Access Point as well as a 'Station'. If you need to use STA mode, it is preferable to configure the WiFi module for 'AP+STA' operation.

10.1 Default Setting

By default, the WiFi module is set to AP (Access Point) Mode. The User name and Password for the Web Interface is:

- User Name (Account) = admin
- Password = admin

> **Note: Maintaining the default user & password provides no security for the WiFi connection. It is strongly suggested to change these via the web interface if required.**

To restore the WiFi module to its default settings, use the 'WiFi Reset' button located on the underside of the device. This button can be accessed through the top-most hole on the bottom of the enclosure (furthest from the Ethernet port) using a pin or similar tool. Press and hold the button for 5 seconds, then release. The module will reboot with its default settings after approximately 10 seconds.

10.2 Web Configuration Interface

10.2.1 Connection

It is possible to connect to the Web Interface, and perform set-up operations using a mobile phone, however for ease, it is recommended to use a PC. No special software is required for configuration – all necessary settings can be made using a standard web-browser.

On the device, search for the WiFi Access point called 'USR-WIFI232-B2_xxxx, and connect to it.

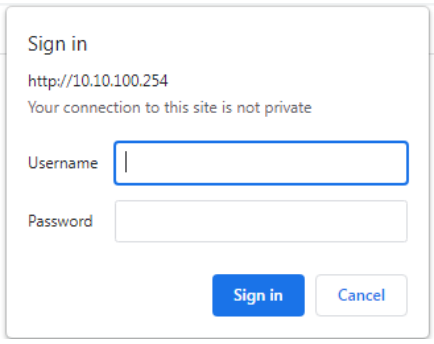
Once connected to the WiFi Access Point, open a web browser, and navigate to the address 10.10.100.254.

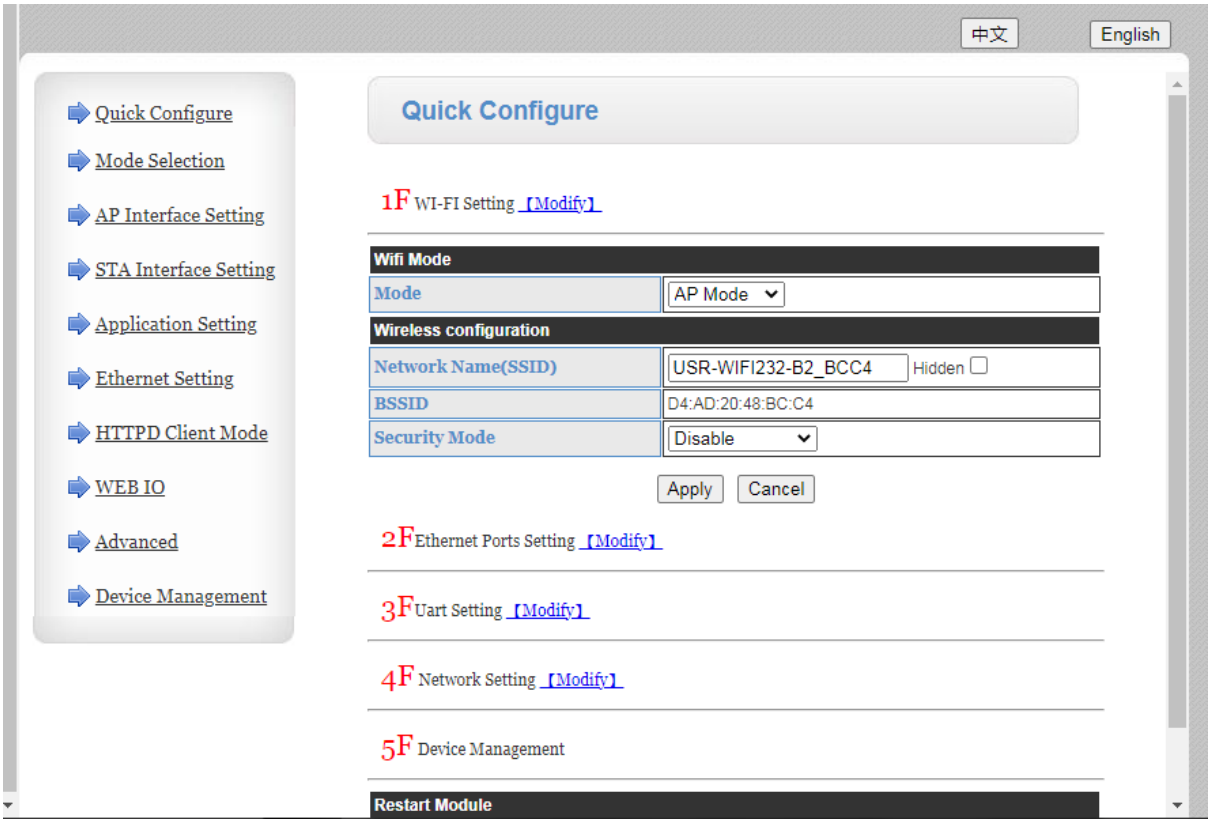
10.2.2 Log-in

When requested, enter the default Username and Password listed on the previous page.

The main page of the Web Interface presents various options which can be used for adjusting the relevant settings.

The Web Interface can display in English or Chinese by clicking the relevant button at the top right of the page.





The Page Links on the left-hand side can be used to access the various settings pages.

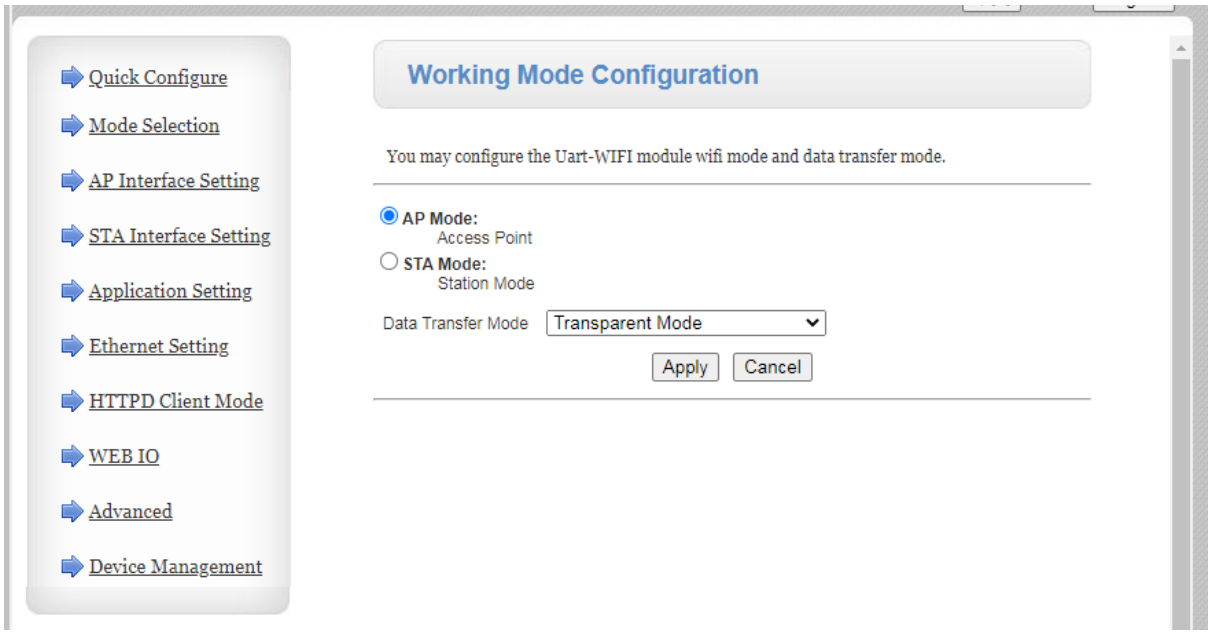
'Ethernet Setting', 'HTTPD Client Mode' and 'WEB IO' settings are not applicable to this application.

10.2.3 Applying Changes

When any changes are made to settings via the Web Configuration Interface, you should click the 'Apply' button underneath the section where the changes have been made. The page will instruct you to 'Restart to use new setting'. It is possible, and advisable to change all required settings before restarting the module.

10.3 Mode Selection

The *Mode Selection* page allows selection of the basic operation as AP or STA Mode, as well as the Data Transfer Mode



For Access Point only (a device can connect to the WiFi module directly, and receive AIS data) the Module needs to be set to AP Mode.

For Station Mode (e.g. to connect the Wifi Module to a Wifi router, so a device also connected to the router can get Internet access and AIS data), or for AP+STA operation (so the WiFi Module can work as a Station AND allow configuration via an Access Point), the Module needs to be set to STA Mode.

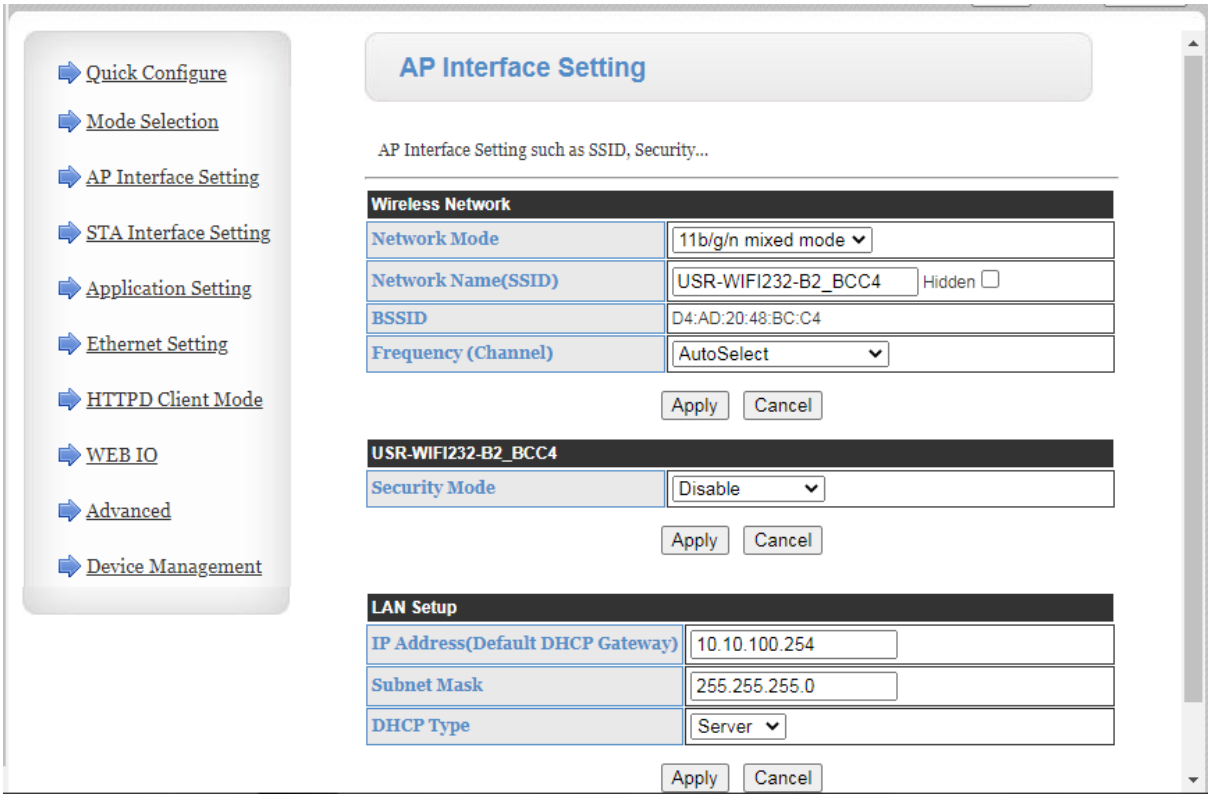
For AP+STA Mode, the Working Mode configuration must be set to STA Mode, and the AP+STA setting in the STA Settings page, must be set to ON.

For transmitting AIS data from the receiver / transceiver the Data Transfer Mode needs to be set to Transparent Mode).

10.4 AP Interface Setting

The *AP Interface setting* page allows configuration of the Access Point settings.

This applies in AP Mode, or in AP+STA Mode.



You can:

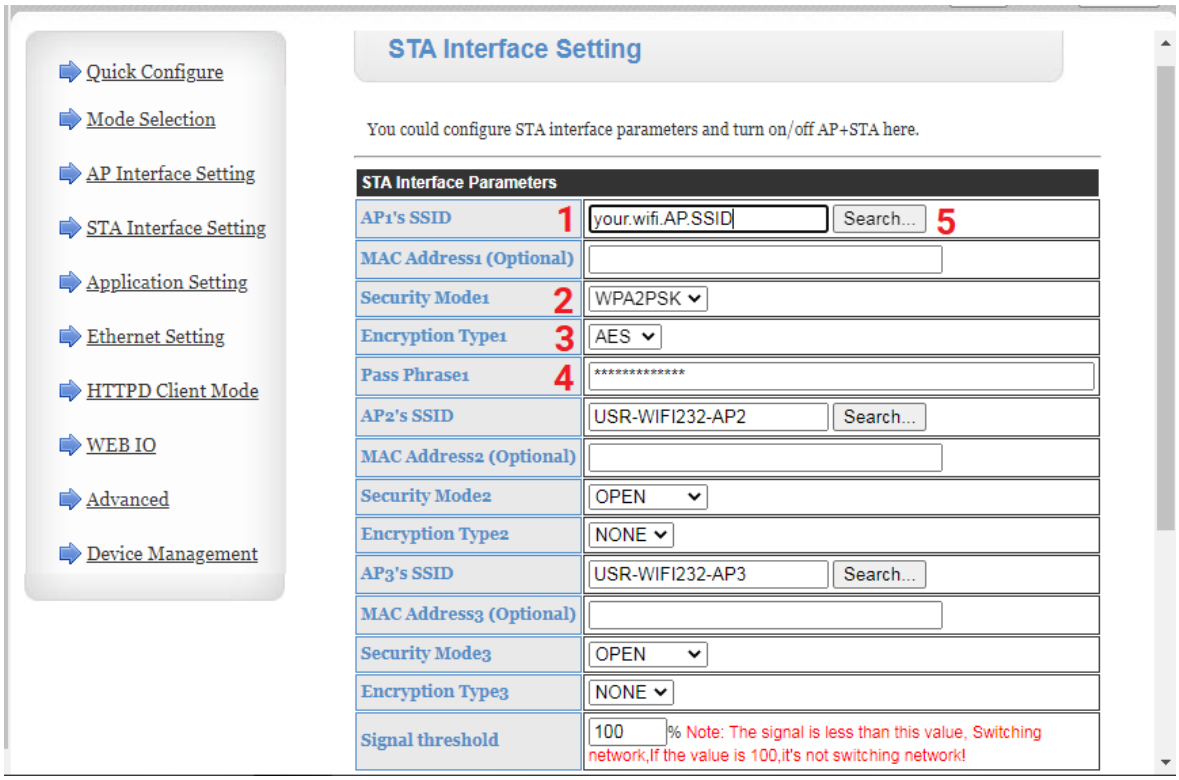
- Set the WiFi communication protocol, (Network Mode)
- Set the SSID (Network ID)
- View the MAC Address (BSSID)
- Set the WiFi Channel (Frequency) used

You can also set the Security Mode, WPA, and set a Password for the Access Point and set-up details of the IP Address, Subnet Mask, and DHCP Server status.

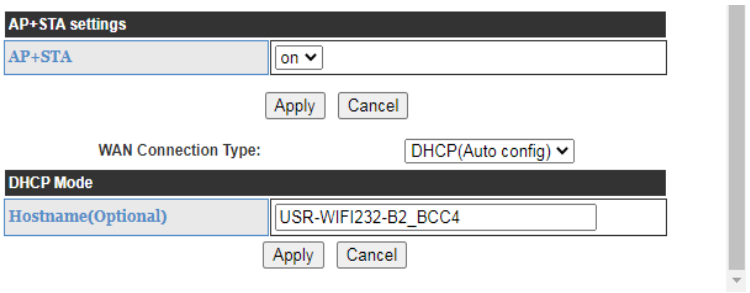
10.5 STA Interface Setting

The *STA Interface setting* page allows configuration of the STA settings. This applies in STA Mode, or in AP+STA Mode.

For STA Mode or AP+STA Mode, the Mode Selection needs to be set to STA Mode, before making the settings for STA Mode.



AP+STA Mode Setting



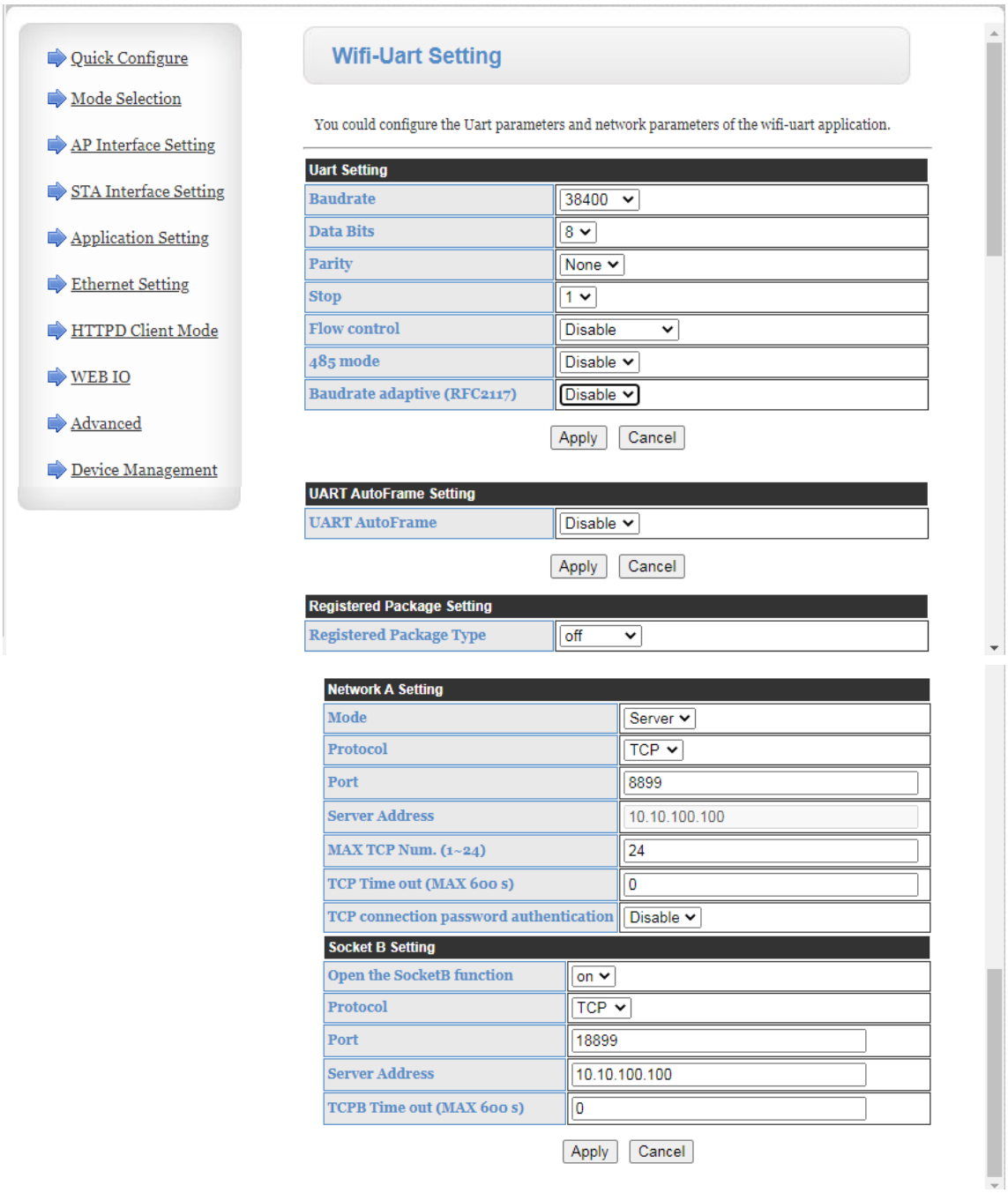
You can enter details (SSID (1), Security Mode (2), Encryption Type (3), and Password (Pass Phrase (4)) for the Access point you wish to connect to, or you can click the 'Search' button (5), to search for, and select an available WiFi Network. You will still need to enter the Password (4) for your chosen network)

The WiFi Module also has the ability to select and choose between up to 3 different Wifi Networks depending on Signal Strength.

Details should be entered for each and a signal level, below which module will look for an alternative network (from those entered).

10.6 Application Settings

The *Application Settings* page allows you to enter the communication parameters for the Ethernet communications, as well as the local serial port (for receiving the AIS data)



The UART Settings are the settings for the serial port input of the WiFi module which connects to the AIS Message data stream within the Comar device. For AIS devices, this should always be set to Baudrate = 38400, Data Bits = 8, Parity = None, Stop =1, Flow Control = Disabled, 485 mode = disabled, and Adaptive Baudrate = Disabled, as shown above.

The Network A setting is the primary method of transmission of AIS data over the WiFi connection. These will largely depend on the requirements of the application using the data.

It can be selected as Client or Server, and can use UDP or TCP protocol.

In TCP Server Mode, it can accept up to 24 simultaneous connections from (and therefore send AIS data to) TCP servers.

- In TCP Client Mode, it can connect to a single TCP server at a remote Address.
- In UDP Client mode, it can send AIS data as UDP packets to a single IP address, but can also send data to any device on the local network (same sub-net) by using the UDP broadcast address (xxx.xxx.xxx.255).

Socket B Setting can be used as a secondary channel to send AIS data to a second application, but can only operate in Client mode.

10.7 Device Management

The *Device Management* page can be used to change the User Name (Account) and Password for the Web Configuration Interface log-in.

It also has a button for '*Restart Module*' which can be used, once all settings have been made, to restart the module, to the changes take effect.

Restart will take up to 10 seconds.

If the Access Point is still active in the new settings, and the settings for the access point have not been changed, the Device (Laptop) used, should automatically re-connect to the Access Point and refreshing the web page should return to the main page of the Web Interface.

11 TROUBLESHOOTING

11.1 No power LED

Check the power supply and that the unit is connected correctly to a 12 or 24V dc supply

Check the polarity of the supply is correct. The center pin of the 2.1mm jack is positive

11.2 Channel 1 and Channel 2 LEDs do not flash

Check that a VHF antenna is fitted and correctly connected

Check that the antenna is correctly positioned, i.e. at a suitable location to visibly 'see' vessels

11.3 Channel 1 and Channel 2 lights flash, but no data is received

If the red channel lights flash then data is being received from nearby vessels.

Check that the correct data cable is connected to the PC or NMEA device

Check on the PC application or device that the correct port is assigned and the correct baud rate is setup. The correct baud rate is 38,400

11.4 I can receive ships on my display, but no names are shown

Remember that the names of ships as well as other static information are only sent every 6 minutes or when requested by another station

12 SPECIFICATIONS

The R450 Series Units are compact dual channel synthesized VHF Receivers designed to receive and decode all transmissions from vessels fitted with Class A or B AIS transceivers, Aids to Navigation, and SARTS.

12.1 Physical	
Weight:	250 g
Dimensions:	L 140 mm × W 120 mm × D 37 mm
Mounting:	To flat surface, #6 (3.5 mm Dia) pan head screws
Connections:	RJ45 Ethernet 10/100 Base-T (Lantronix® Xport) USB 2.0 Port: Type B BNC coaxial to VHF/AIS antenna R450-XG: TNC Coaxial to GNSS antenna*
Construction:	ABS enclosure, PETG-CF connector panels
Finish:	Black fine-texture ABS
12.2 Electrical	
Power Supply:	12 V DC, 3 W nominal (9–30 V DC)
Antenna Impedance:	50 Ω
Data Output:	NMEA 0183 VDM message via USB, Ethernet, and Wi-Fi** Models with G suffix include GNSS messages*
12.3 Operational	
Frequency	Channel A 161.975 MHz Channel B 162.025 MHz
Channel Spacing:	25 kHz
Sensitivity:	AIS: Up to -112 dBm @ 20% MER R450-XG GNSS: Up to -163 dBm*
Demodulation:	GMSK
Data Rate:	9600
Antenna Impedance:	50 Ω
Display:	4 Indicator LEDs (On, Ch A, Ch B, WiFi**)
Data Types Received:	Name of Vessel; MMSI Number; Position; Speed (SOG); Course (COG); Type of Vessel; Call Sign; Heading; Rate of Turn; Navigational Status; Vessel Dimensions; Destination

12.4 **Environmental**	
IP Rating:	IP40
Operating temp:	-15°C to +55°C
Storage Temperature:	-15°C to +70°C
Operating Humidity:	0-93% RH, non-condensing
Compass:	Safe Distance 50 cm
12.5 Network	
WiFi Module: **	Built-in, 2.4 GHz
WiFi Modes Supported: **	Access Point, Station, AP+STA
WiFi Security: **	WPA/WPA2, configurable SSID & password
WiFi Network Protocols: **	TCP/IP, UDP/IP
LAN Network Protocols:	TCP, TCP/AES, TLS, UDP, DHCP, HTTP
Data Output:	AIS (and R450-XG GNSS*) as NMEA 0183 over TCP/UDP, or USB
LAN Connections:	Up to 4 each for TCP Client / Server 1 only for UDP Client/Server
WiFi** / LAN Configuration:	Via integrated web interface
12.6 Additional	
Supplied:	R450-X AIS Receiver unit, or R450-XG AIS Receiver with Integrated GNSS, or R450-XE, R450-XGE Non-WiFi Variants
Supplied:	Universal 100–250 V AC to 12 V DC Power Supply
Supplied:	BNC to UHF Antenna Connector Adaptor
Supplied:	2m Ethernet cable, 1m USB cable
Download:	Network configuration program
Download:	AIS viewing program
Download:	USB to virtual COM port driver

*Applies to R450-XG Units Only
** Not included with E variants

13 TRANSMISSION SPECIFICATION

13.1 Class A AIS Units

Static information:
Transmitted every 6 minutes, or immediately when amended or upon request.

Dynamic information:
Transmitted based on vessel speed and whether the course is changing.

Class A Shipborne Mobile Equipment Reporting Intervals:

Ship's Dynamic Condition	Reporting Interval
At anchor or moored, speed ≤ 3 knots	3 minutes
At anchor or moored, speed > 3 knots	10 seconds
Underway, 0–14 knots	10 seconds
Underway, 0–14 knots and changing course	3 1/3 seconds
Underway, 14–23 knots	6 seconds
Underway, 14–23 knots and changing course	2 seconds
Underway, >23 knots	2 seconds
Underway, >23 knots and changing course	2 seconds

13.2 Class B AIS Units

Static Information:
Transmitted every 6 minutes

Dynamic Information:
CSTDMA (Carrier Sense Time Division Multiple Access) – less advanced & typical of most leisure Class B units:

- Every 3 minutes if vessel speed is ≤ 2 knots
- Every 30 seconds if vessel speed is > 2 knots

SOTDMA (Self-Organised Time Division Multiple Access) – Used by Class B SOTDMA units like the Comar T350B:

- Every 15 seconds while underway
- Slot reservations and retransmissions follow the same method as Class A
- Offers higher transmission priority, increased reliability, and better performance in busy areas compared to CSTDMA.

> **Note: While the standard interval for SOTDMA Class B is 15 seconds, some units may transmit more frequently (e.g. every 5 seconds) when course changes are detected, depending on manufacturer implementation.**

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This warranty does not cover failures due to abuse, misuse, accident or unauthorised alteration or repairs – This does not affect the statutory rights of the consumer.

Changes or modifications not made by Comar Systems or an authorised repairer will: (1) Void the warranty issued by Comar Systems (2) Void the user's authority to operate the equipment.

> **Note: Every effort has been made to ensure that all information contained in this manual is accurate at the time of going to press. We therefore cannot take any responsibility for the content of this manual and advise that you take normal steps to ensure that the information is at its most current when you are reading this manual.**

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