SRT

CS100 AIS Coast Station Transceiver
Installation and operation manual

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1   Glossary

AIS	Automatic Identification System
AtoN	Aid to Navigation
BIT	Built-In Test
FATDMA	Fixed Access Time Division Multiple Access
GLONASS	Global Navigation Satellite System (term specific to the satellite navigation system operated by the Russian Federation)
GNSS	Global Navigation Satellite System (general term used to refer to any satellite navigation system)
GPS	Global Positioning System
IALA	International Association of Lighthouse Authorities
IEC	International Electrotechnical commission
ITU	International Telecommunication Union
MID (in the context of MMSI)	Maritime Identification Digits
MMSI	Maritime Mobile Service Identity
NMEA	National Marine Electronics Association
RACON	A radar transponder used to mark navigational hazards.
RATMDA	Random Access Time Division Multiple Access
RED	Radio Equipment Directives
RS232	Serial data communications standard - see TIA-232-F
RS422	Serial data communications standard - see TIA-422-B
SART	Search And Rescue Transponder
SOLAS	Safety of Life at Sea
SDI-12	Serial Data Interface at 1200 Baud
USB	Universal Serial Bus
UTC	Coordinated Universal Time

VDL	VHF Data Link
VHF	Very High Frequency
VSWR	Voltage Standing Wave Ratio

2 Notices

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

2.1 Safety warnings

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

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

2.2 General notices

2.2.1 Position source

All marine Automatic Identification System (AIS) transceivers utilise a satellite based location system such as the Global Positioning Satellite (GPS) network. The general term for satellite based location systems is Global Navigation Satellite System or GPS. This manual refers to either GNSS or GPS depending on context.

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

2.2.2 Product category

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

2.2.3 Disposal of the product and packaging

Please dispose of this product 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 the product is recyclable. Please dispose of the packaging in an environmentally friendly manner.

2.2.4 Accuracy of this manual

This manual is intended as a guide to the installation, setup and use of this product. Every effort has been made to ensure the accuracy of this manual, however due to continuous product development this manual may not be accurate in all respects, therefore no guarantee is offered. If you are in any doubt about any aspect of this product, please contact your supplier.

The part number and revision number of this manual are shown on the front cover.

2.3 Regulatory information

2.3.1 Radio Equipment Directive (RED)

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.

$\mathsf{C}\mathsf{E}$

2.3.2 FCC and Industry Canada notices

A. FCC Part 15.19(a) statement:

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.

A. Part 15 Clause 15.105 [EMC Class A/B statement]:

Note: 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 or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/TV technician for help.

B. Part 15 Clause 15.21 [Do not modify warning]

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

C. RSS-Gen license-exempt notice:

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

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.

D. RSS-Gen antenna notice:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

E. FCC & IC RF Exposure related information

RF Exposure Guidance: This equipment complies with FCC and Industry Canada radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter not described under this FCC ID and IC certification number, except in accordance with FCC and Industry Canada multi-transmitter product procedures.

Guide d'Exposition RF : ce matériel est conforme aux normes FCC et Industrie Canada relatives aux limites maximales d'exposition aux radiations en milieu non-contrôlé. Cet équipement doit être installé et opéré à une distance de plus de 20cm entre la source de radiation et le corps de l'utilisateur. Cet émetteur ne peut être situé à proximité de ou opérer conjointement avec tout autre émetteur ou toute antenne non-classifiés sous le numéro de certification FCC ID et IC, sauf s'ils respectent la procédure FCC et Industrie Canada concernant tout produit multi-émetteurs.

3   Introduction

3.1   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 GPS 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 designed to be fitted to commercial 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 more frequently. Class A transceivers are mandatory on all vessels over 300 gross tonnes on international voyages and certain types of passenger vessels under the SOLAS mandate.

- **Inland AIS stations.** Similar to Class A transceivers with additional features for use on Inland waterways.

- **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.** AtoNs are transceivers mounted on buoys or other hazards to shipping which transmit details of their location to the surrounding vessels.

- **AIS Coast Station transceivers.** Coast Station transceivers are a type of AIS AtoN designed to be installed on land and used primarily as receiving stations for monitoring AIS traffic. Coast Stations share many of the features of AIS AtoNs.

- **AIS receivers.** AIS receivers receive transmissions from Class A transceivers, Class B transceivers, AtoNs and AIS base stations but do not transmit any information about the vessel on which they are installed.

This product is an AIS Coast Station transceiver.
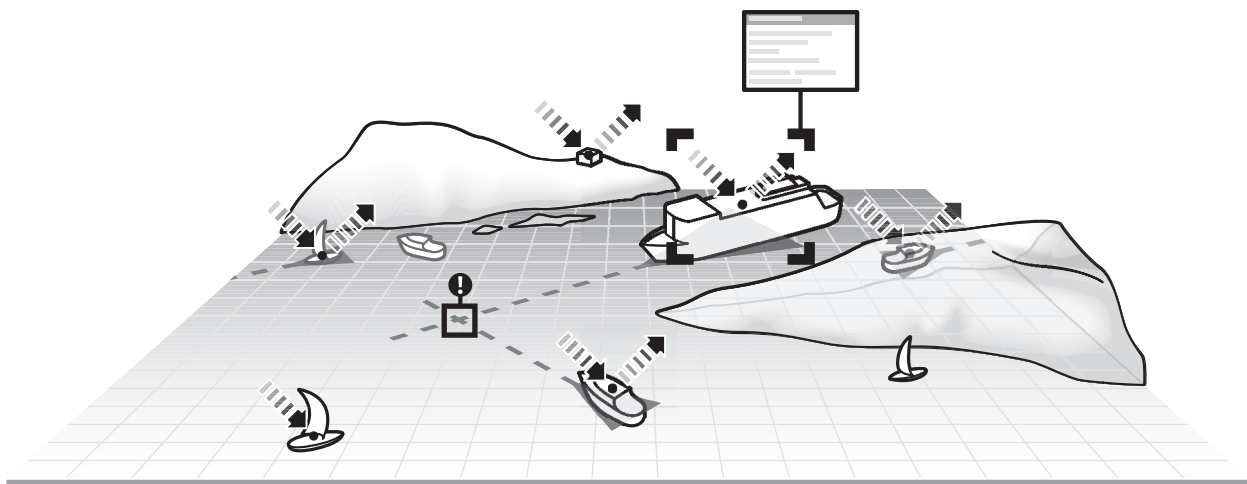
Figure 1   The AIS network

3.2   Typical Coast Station system installation

A typical application for the Coast Station is relaying AIS messages received at the coast to viewing and database applications via the Internet. The Coast Station is connected to a VHF antenna for AIS reception and provided with an Ethernet connection to an Internet access point.

The Coast Station is configured to stream the received AIS data to a pre-configured network destination specified with an IP address and port number. The Coast Station can support both TCP and UDP operation, and can operate either as a server or a client. Typically the Coast Station is configured as a TCP client configured to push data to the public IP address of a central database server.

Alternatively the Coast Station can be connected directly to a PC via USB. Note that the tag block feature described in section 6 is not supported over the USB connection. Figure 2, Figure 3 and Figure 4 show possible connection schemes.

Figure 2   Coast Station installation for connection to a remote viewer/database via Ethernet

Figure 3   Coast Station installation for connection to a local viewer/database via Ethernet

Figure 4   Coast Station installation for connection to a local viewer/database via USB

3.3   Coast Station modes of operation

The Coast Station can operate as either an AIS receiver or an AIS AtoN. The Coast Station will operate as an AIS receiver by default and will receive and process all received AIS messages. When the Coast Station is configured as an AIS AtoN it can not only 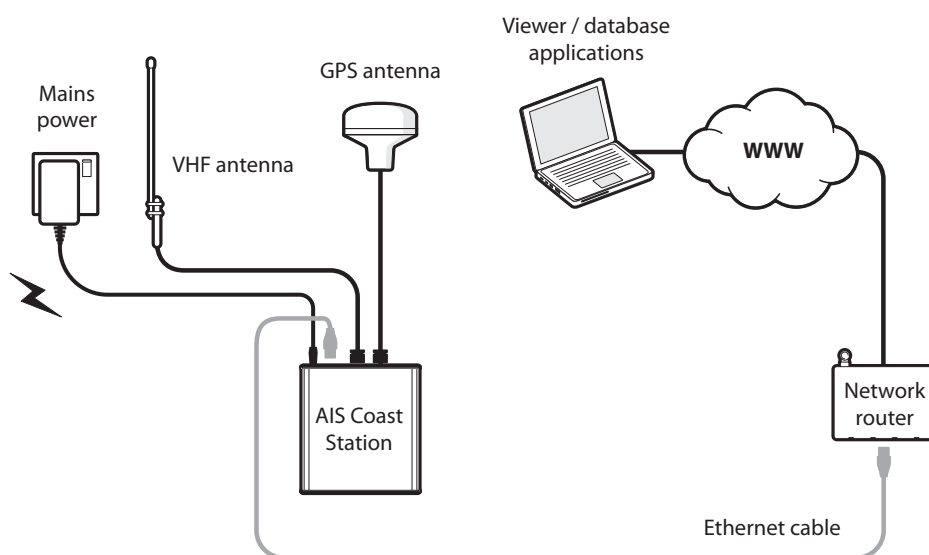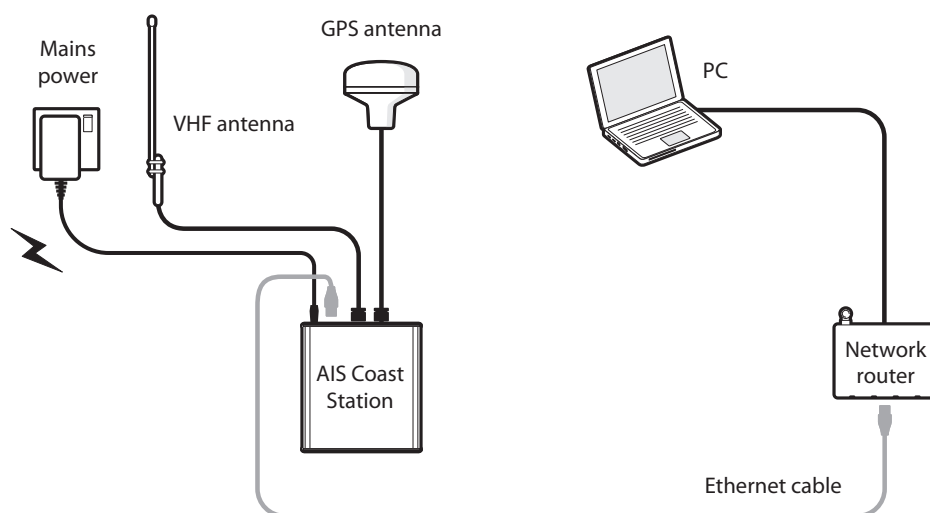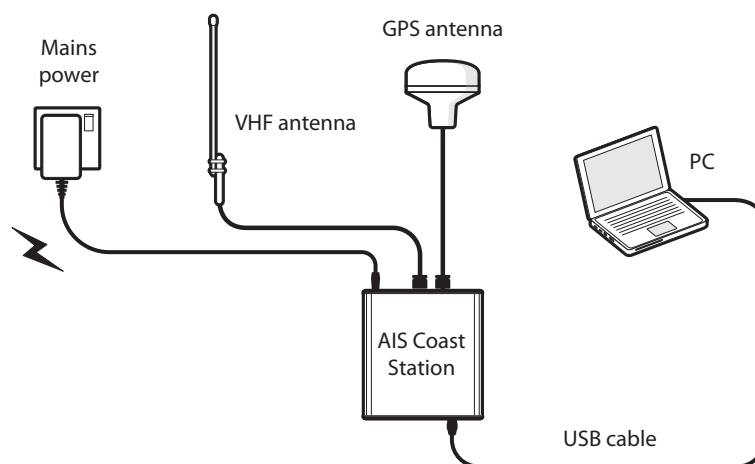receive AIS messages, but also transmit AIS AtoN messages. Please refer to section 7 for further details of how to configure the Coast Station as an AIS AtoN.

3.4   Internal data logging

The Coast Station includes internal data logging capability for received AIS messages with up to 32GB capacity. Internal data logging will continue if network connectivity to the Coast Station is lost. Logged data can be uploaded from the Coast Station on request when network connectivity is restored. See section 6 for details of commands used to query and upload logged data. Note that upload of logged data requires that the Coast Station is configured for TCP connection (as described in section 5.3).

Utilisation of the internal storage capacity will depend on the level of AIS traffic in the area where the Coast Station is deployed. A rough estimate of the log capacity can be determined from the number of AIS messages received per minute:

AIS messages received/minute	approximate daily log size	approximate log capacity
100 messages/minute	≈11MB/day	≈2900 days
1000 messages/minute	≈112MB/day	≈285 days
2000 messages/minute	≈225MB/day	≈142 days
4000 messages/minute	≈450MB/day	≈71 days

For reference a single receiver station in Singapore harbour generates approximately 8MB of data per hour or 192MB per day, giving an expected log capacity of approximately 166 days.

> ⚠ **The data log operates on a 'rolling' basis. Once internal data log storage is full the oldest logged data will be erased to allow storage of new data.**

4   Connections and status indicators

The Coast Station has a number of connections and status indicators as follows and shown in Figure 5 and Figure 5:

- VHF antenna connector for connection to a VHF antenna (not supplied). AIS messages are received and transmitted via the VHF antenna

- GPS antenna connector for connection to the supplied GPS antenna. The Coast Station requires a GPS position fix in order to transmit any AIS messages and to provide a time reference for data logging.

- Ethernet connector for connection to a Local Area Network (LAN) using the supplied Ethernet cable.

- Power connector for connection to a mains power source using the supplied mains adaptor.

- Reset button used to manually reset the Coast Station to its default settings if required.

- USB connector for direct connection to a PC for configuration of the transceiver using proAtoN or direct monitoring of AIS traffic.

- Ethernet configuration port for direct connection to a PC for configuration of network settings.

Status indicators showing the status and activity of the Coast Station including power status, AIS reception and network activity.
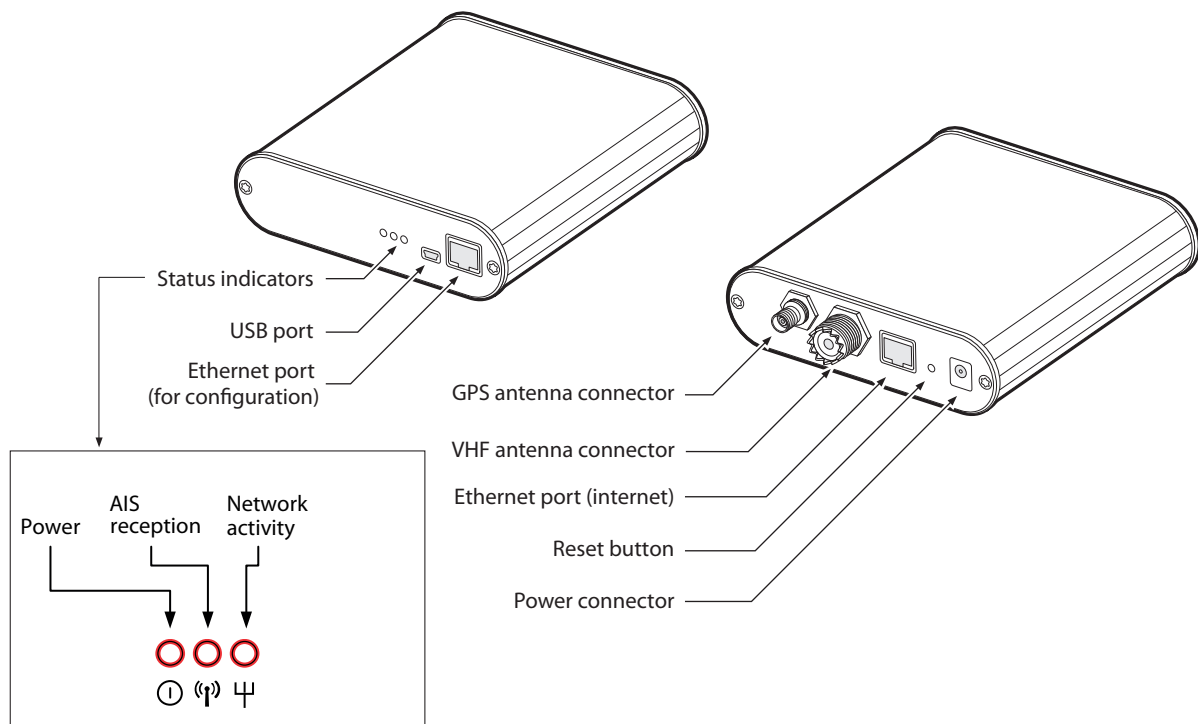
Figure 5   Coast Station connections

5   Installation and configuration

5.1   What's in the box

Figure 6 shows the items included with the Coast Station transceiver. The following section gives a brief overview of each item. Please ensure all items are present and if any are missing please contact your supplier.
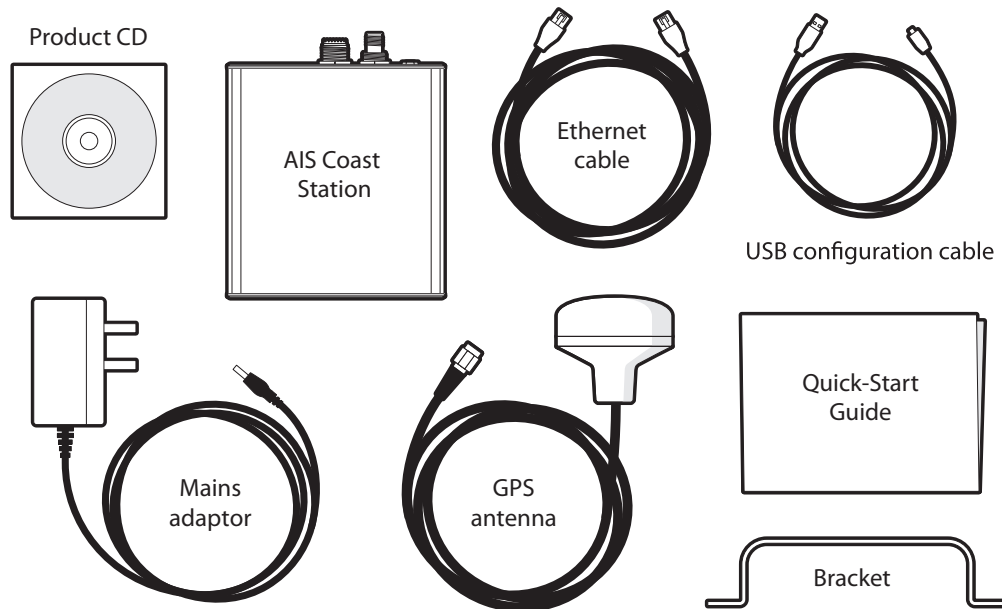
Figure 6   What's in the box - typical configuration

- The Coast Station transceiver.
- An Ethernet cable for connection to an Internet access point (router) and for network configuration.
- A mains power supply with interchangeable plug heads for international use.
- A CD containing product documentation and configuration software.
- A GPS Antenna with 10m cable.
- A USB cable for connection to a PC for AIS configuration using proAtoN.
- A quick-start guide providing simple instructions of how to complete basic product set-up.
- A bracket for securing the Coast Station to a desk or shelf.

5.2   Preparing for installation

No special tools or equipment are required for installation.

5.2.1   Coast Station location

The Coast Station is designed for installation in a protected environment, i.e. indoors or inside a fully weather-proof enclosure. The Coast Station must not be installed in a location where it may be exposed to rain or spray.

5.2.2   VHF antenna and cable

⚠ **The performance and reliability of the VHF antenna is essential to correct operation of the transceiver. Ensure that a high quality antenna suitable for use in the appropriate environmental conditions is selected. Ensure all co-axial connections are well made and**

⚠ **The VHF antenna should be installed according to the manufacturer's instructions.**

⚠ **The VHF antenna must be installed with at least 1 metre horizontal separation from any other VHF antenna mounted at the same level.**

The VHF antenna should have the following specification:

- Centre frequency 159MHz
- VSWR < 2.0
- Impedance 50 Ohms
- Power handling 12.5 Watts
- Gain 3dBi or 6dBi

It is recommended that high quality RG213 or RG214 co-axial cable is used to connect the VHF antenna to the transceiver. The antenna cable should be as short as possible and no more than 30 metres (100 feet) in length.

When selecting the installation location for the VHF antenna:

- Install the antenna as high as possible.
- Keep the antenna away from any large vertical metallic structures.

Install the antenna with at least 1 metre horizontal separation from any other VHF antenna mounted at the same level.

5.2.3   GPS antenna and cable

The supplied GPS antenna should be used and located externally with a clear view of the sky. Installation of the GPS antenna is required to enable the data logging feature of the Coast Station.

5.2.4   Power supply

The Coast Station should be connected to a mains supply using the supplied mains adaptor with the appropriate international plug type attached.

⚠ **If at any time during installation or use of the Coast Station there is a requirement to perform a 'power reset' it is important that both the power supply adaptor and the USB connector are removed from the Coast Station as the USB connection can provide power to some parts of the Coast Station. When re-applying power the power adaptor should be connected first followed by the USB connector if required.**

5.3 Network configuration

The Coast Station must be configured with various network settings so that received AIS data can be correctly routed to the required destination. The Coast Station is configured through a web browser in a similar way to routers and other network devices.

Configuration can be carried out either before or after installation, however it is recommended the Coast Station is configured and tested before deployment in a remote location to ensure the network settings are correct.

During network configuration the PC used to configure the Coast Station must be disconnected from other networks. The PC used to configure the Coast Station should be set to automatically assign IP addresses.

5.3.1 Configuration connections

- Connect the supplied mains power adapter to the Coast station and switch on the power. The power indicator will illuminate.
- Connect the supplied Ethernet cable between the front panel Ethernet connector (marked 'CONFIG') and a PC or laptop. Other network connections to the PC or laptop must be disabled at this point.

5.3.2 Accessing the Coast Station configuration interface

- Open a web browser on the PC or laptop and enter the default IP address (192.168.16.254) for the Coast Station in the address bar.
- When prompted for a username and password enter "admin" for both. The configuration username and password can be changed during configuration if required using the options in the 'Management menu'.
- Access to the configuration interface is now available in the web browser. The initial menu and status screen will be as shown in Figure 7.
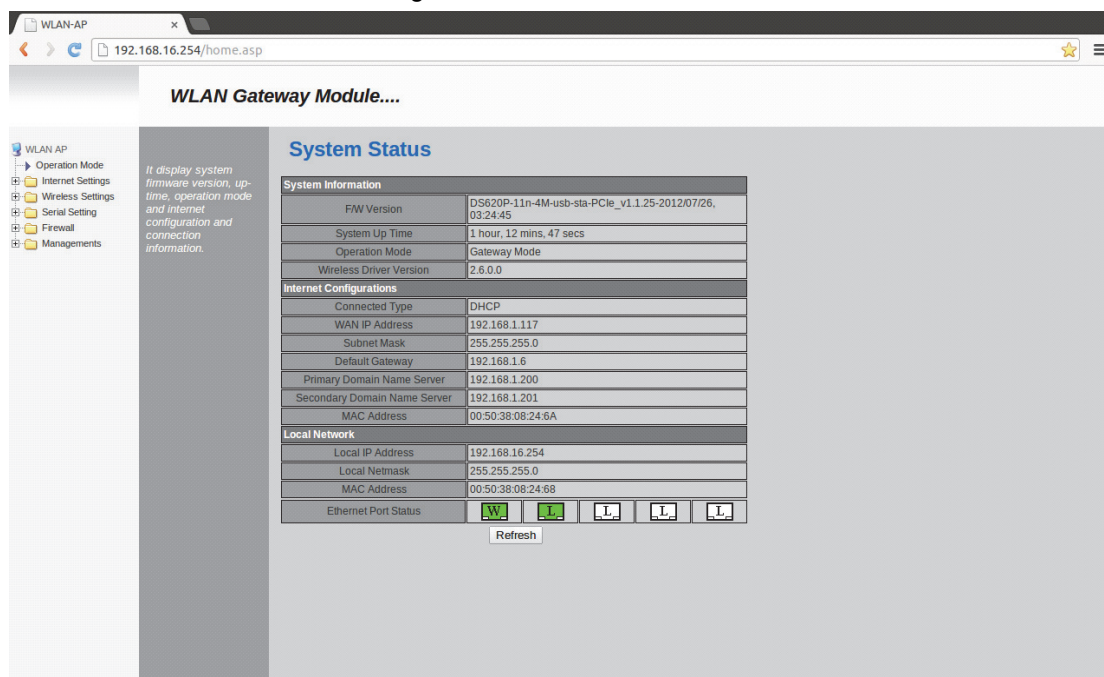
Figure 7   Coast Station network configuration home screen

5.3.3 Configuring the operating mode

The following steps will configure the Coast Station to forward all received AIS data to a remote server. The server must have a static IP address and the port number for AIS data delivery must be known.

After configuration the Coast Station will automatically attempt to connect to this IP address. If the connection is lost due to network issues the Coast Station will attempt automatic reconnection.

The basic operating mode of the Coast Station network interface must first be configured:

- From the menu bar at the left of the configuration screen select the 'Operation Mode' menu.
- Select the 'Gateway' option
- Click the 'Save' button at the bottom of the screen
- Wait whilst the configuration is applied.
- It may be necessary to refresh the web page after the configuration countdown has completed.

5.3.4 Configuring internet settings

The Coast Station must be configured for Internet (WAN) connection; specifically it must be configured to obtain an IP address:

- Either automatically via DHCP, or
- Manually by assigning a static IP address

Note: This **does not** affect the internal IP address of the Coast Station used for accessing the configuration menu via the 'CONFIG' Ethernet connector on the front panel.

The configuration steps are as follows:

- From the menu bar at the left of the configuration screen select the 'Internet settings' menu.
- Select the 'WAN' option
- For most installations the 'DHCP (Auto config)' option should already be selected and no changes are required.
- If the Coast Station is to be configured with a static IP address select this option from the drop down at the top of the screen and complete the required address fields.

5.3.5 Configuring serial port settings

The Coast station must be configured to forward AIS data using the correct protocol and server address settings. The configuration values will depend on the configuration of the remote server the Coast Station is sending data to.

- From the menu bar at the left of the configuration screen select the 'Serial Setting' menu.
- Select the 'Serial port #1' option.
- Configure the 'Main connection configuration' settings as follows:
  - Select either a UDP or TCP connection, as appropriate to the remote connection configuration. A TCP connection is recommended as this provides a bi-directional connection which can be used for remote configuration and control of the Coast Station. Select the operating mode as either server or client. Typically Client mode should be selected. In this mode the Coast Station will attempt to connect to a remote server (i.e., it is initiating the connection). *Server mode is only appropriate when the Coast Station is accessible with a public IP address and suitable NAT configuration at the Internet access point.*
  - Enter the IP address for the remote server. This should be a public IP address accessible on the Internet.
  - Enter the server port number the Coast Station should connect to. The port number is usually defined by the server application that will be receiving data from the Coast Station. The 'Reconnect interval' should be left at the default 10 seconds.
  - The 'Connection' option should be set to 'System Bootup'
  - The serial port baud rate should be changed to 115200 baud, other settings are correct as default, 8 data bits, no parity, 1 stop bit and no flow control.
- Click the 'Save' button at the very bottom of the screen.

5.3.6   Testing the configuration

Configuration of the Coast Station is now complete. To test the configuration, connect the Ethernet port on the rear of the Coast Station (marked 'ETHERNET') to an access point or Router with access to the public internet. The Coast Station will acquire an IP address via DHCP and commence streaming received AIS data to the configured server address.

The Coast Station must be able to receive AIS targets to test the connection, so connection of a VHF antenna and presence of AIS targets is also required. If the configuration is correct the AIS activity LED on the Coast Station will flash to indicate target reception, and the Ethernet activity LED will flash to indicate network activity. You should now confirm that AIS data is being received at the remote server.

5.4   Resetting the Coast Station

An incorrect or incomplete configuration may result in the Coast Station configuration web page being unavailable. The Coast Station network interface can be reset to factory configuration using the recessed reset button on the rear panel (see Figure 5).

To reset the Coast Station apply power, then press and hold the reset button for **at least 10 seconds.** After reset the Coast Station configuration interface will be available as described in section 5.3.

6   Coast Station data communication protocol

The Coast Station generates NMEA0183 sentences with a standard format TAG block for transport over a TCP/IP connection. The tag block includes three parameters as defined in the table below. Further information on NMEA0183 TAG blocks can be found in the latest NMEA0813 standard document.

TAG block parameter	Contents
s (Source identification)	The name of the Coast Station, taken from the first 15 characters of the Coast Station name (see section 6.1)
c (UNIX time)	The Unix time stamp (seconds since 1/1/1970) for reception of the proceeding AIS message. For Live data this is the current time, for logged data this is the time the logged data was captured.
t (Text string)	Text describing the proceeding data as either live or logged. The text is either 'LIVE' or 'LOGGED'. When uploaded logged data from the Coast Station this parameter is used to differentiate live and logged data in the output data stream.

An example sentence including TAG block is provided below:

```
\s:COAST STATION 1,c:1409580181,t:LIVE*60\!AIVDM,1,1,,B,13:PSCgP00wle`bMEsOf4?wp2D00,0*3E
```

This shows a live data sentence from the Coast Station 'Coast Station 1' received at UNIX time 1409580181 (Mon, 01 September 2014 14:03:01 GMT).

```
\s:COAST STATION 1,c:1409581305,t:LOGGED*7B\!AIVDM,1,1,,A,3;VjmcOP4hOle`2MEs7hKwwp00T1,0*31
```

The second examples shows upload of logged data from Mon, 01 September 2014 14:21:45 GMT.

6.1   Setting the Coast Station name

The Coast Station can operate as an AIS receiver or as a AIS AtoN. When the Coast Station is operated as an AIS AtoN the name is set during configuration as defined in section 7.4. However, when the Coast Station is used as an AIS receiver it is not possible to set the Coast Station name via the 'Real AtoN' tab in proAtoN as this will only be successful if an MMSI is also programmed into the Coast Station and MMSIs are not required for receive only AIS devices.

Note that it is not essential to set the Coast Station name. Omitting to set the Coast Station name will mean the 'source identification' field in the tag block will be empty. All other functionality is unaffected.

To configure the Coast Station name in AIS receiver mode:

1. Install and launch proAtoN as described in section 7.1.
2. Connect the Coast Station to a PC as described in 7.2.
3. Connect proAtoN to the Coast Station as described in 7.3.
4. Go to the serial tab in proAtoN and enter the command $PSMT,CST,SETNAME, <name> as shown below where the name chosen is 'COAST STATION', then click 'Send'.
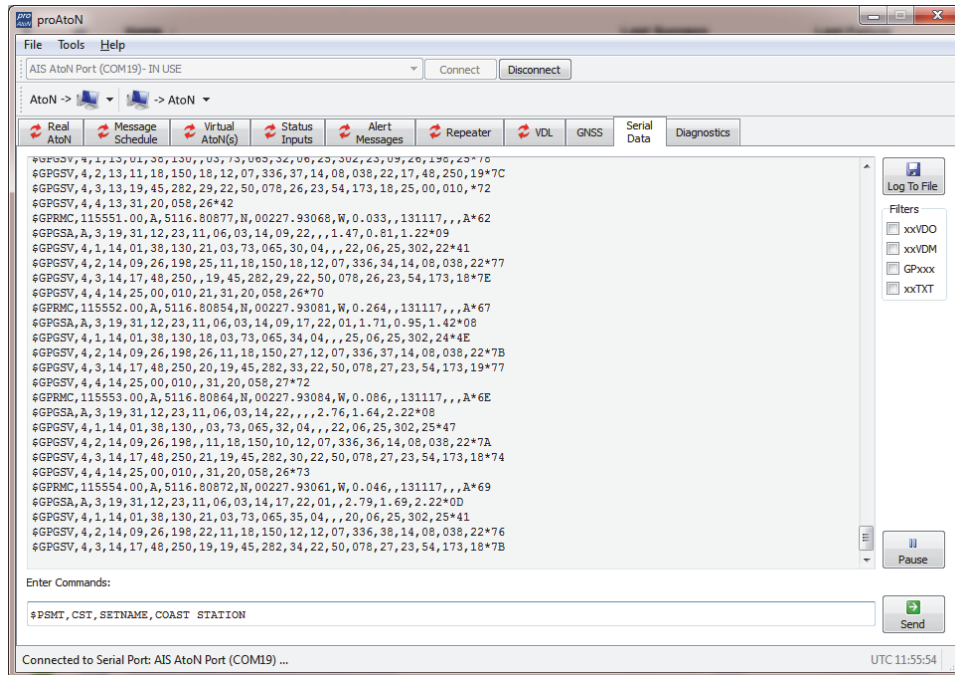
Figure 8   Configuration of Coast Station name in AIS receiver mode

6.2   Heartbeat output

The Coast Station outputs a regular heartbeat sentence. This sentence allows the status of connectivity to the Coast Station to be monitored. The heartbeat sentence takes the format:

```
\s:COAST STATION 1,c:1409649473,t:LIVE*6E\$AIHBT,5.0,A,3*23
```

Where:

```
$AIHBT,configured_repeat_interval,equipment_status,sequential_sentence_identifier*23
```

The configured repeat interval is 5.0 seconds. The equipment status will always return 'A' indicating normal operation.

6.3   Coast Station control sentences

The following proprietary NMEA sentences are used to control the internal data logging process. Commands may be sent via the network connection from a remote server application. It is also possible to configure the AIS AtoN element of the Coast Station using NMEA0183 sentences defined for AIS AtoN configuration. Please contact SRT Marine Systems technical support (support@srt-marinesystems.com) for further information and advice on remote network configuration of the Coast Station AtoN parameters.

6.3.1   Query the internal data log

```
$PSMT,CST,QUERY*14
```

Query the Coast Station for the duration covered by the internal data log. The Coast Station returns the date and time stamps for the oldest and most recent data in the internal log. An example response is:

```
\s:COAST STATION 1,c:1409583076,t:LIVE*6A\$PSMT,CST,01-09-2014 14:51:15,01-09-2014 14:20:42,ACK*13
```

This indicates the internal data log runs from 14:20:42 on 1st September 2014 to 14:51:15 on the same day. All times are UTC. The 'ACK' at the end of the response indicates that logged data is available. A 'NACK' is returned in this field if no logged data is available.

6.3.2 Query the remaining storage capacity

`$PSMT,CST,FSSPACE*0F`

Query the Coast Station for the remaining internal data log storage space. The available space is returned as follows:

`$PSMT,CST,FSSPACE,freespace,ACK*4B`

Where freespace is the available space in KB. For example the following response would indicate 31154528KB (or 29.711GB) capacity remaining.

`\s:COAST STATION 1,c:1409583294,t:LIVE*64\$PSMT,CST,FSSPACE,31154528,ACK*4B`

6.3.3 Upload data

To upload data from the Coast Station internal data log the start and end time for the log must be provided. The command sentence format is as follows:

`$PSMT,CST,UPLOAD,startdate,starttime,stopdate,stoptime*hh`

For example:

`$PSMT,CST,UPLOAD,010914,142500,010914,143500*5C`

This example requests data upload from 14:25:00 to 14:35:00 on the 1st September 2014.

This command requests upload of all data between the start time and date and the stop time and date. It is recommended that the time window for upload is minimised to reduce upload duration.

The checksum (*hh) must be calculated according to the final command contents before the command is sent to the Coast Station. Tools to calculate checksums for NMEA sentences can be found on-line or alternatively please contact SRT Marine Systems for assistance.

If the requested data is available the Coast Station will responds with an acknowledgement sentence. An 'ACK' in the last field of the response indicates the requested data is available and upload will commence.

`\s:COAST STATION 1,c:1409583744,t:LIVE*6C\$PSMT,CST,UPLOAD,010914,142500,010914,143500,ACK*39`

If the requested data is not available the Coast Station will respond with a negative acknowledgement (NACK) sentence:

`\s:COAST STATION 1,c:1409584932,t:LIVE*64\$PSMT,CST,UPLOAD,010913,142500,010913,143500,NACK*77`

6.3.4 Stop data upload

`$PSMT,CST,STOPUPLOAD*45`

Upload of requested data will continue until all data between the start and stop time stamps is uploaded. This command may be sent at any time to stop the upload. The acknowledgement response is of the format:

`\s:COAST STATION 1,c:1409649374,t:LIVE*6E\$PSMT,CST,STOPUPLOAD,ACK*20`

6.3.5 Stop data logging process

`$PSMT,CST,STOPLOGGING*05`

This command will stop the data logging process. Note that data logging will be automatically restarted if power to the Coast Station is cycled. This command should be used prior to clearing the internal data log using the clear command below. The acknowledgement response is of the format:

`\s:COAST STATION 1,c:1409649423,t:LIVE*6B\$PSMT,CST,STOPLOGGING,ACK*60`

6.3.6 Clear internal data log

`$PSMT,CST,CLEARLOGS*10`

This command will clear (erase) all logged data. This is irreversible. Data logging should be stopped using the stop command documented above prior to clearing the log. Once the log has been cleared logging may be restarted either by power cycling the Coast Station, or using the start logging command provided below. The acknowledgement response is of the format:

`\s:COAST STATION 1,c:1409653081,t:LIVE*6C\$PSMT,CST,CLEARLOGS,ACK*75`

6.3.7 Start data logging process

`$PSMT,CST,STARTLOGGING*5D`

This command re-starts the internal data logging process. Note that data logging will be automatically restarted if power to the Coast Station is cycled. The acknowledgement response is of the format:

`\s:COAST STATION 1,c:1409649461,t:LIVE*6D\$PSMT,CST,STARTLOGGING,ACK*38`

7 Configuration using proAtoN

The proAtoN PC application is supplied on the CD packaged with the transceiver. The application provides features for configuration of the transceiver and confirming correct operation before deployment.

> ⚠ **If the Coast Station is intended only as a receiving station there is no requirement to complete any of the configuration described in this section. The majority of configuration options described in this section relate to the use of the Coast Station as a shore based AIS AtoN Transceiver in conjunction with networked receive capability.**

The main features of the application are:

- Configuration of essential transceiver parameters such as MMSI, name and dimensions
- Configuration of reporting schedules
- Configuration of virtual and/or synthetic AtoN reporting schedules
- Configuration of other messaging features
- GPS diagnostics
- System diagnostics and alarm display

7.1 proAtoN Installation

proAtoN should be installed from the CD supplied with the transceiver. The steps to complete the installation are as follows:

1. Insert the CD into your PC
2. Navigate to the *proAtoN* folder on the CD
3. Double click the 'setup.exe' item to start the installation process
4. Follow on screen instructions to complete the installation

Following successful installation the application can be launched from the proAtoN folder in the Windows start menu. USB device drivers for the transceiver are installed automatically during installation of proAtoN.

7.2 Connection of the Coast Station to a PC

The Coast Station should be connected to a PC via its USB connector using the supplied USB cable.

7.3 Application layout

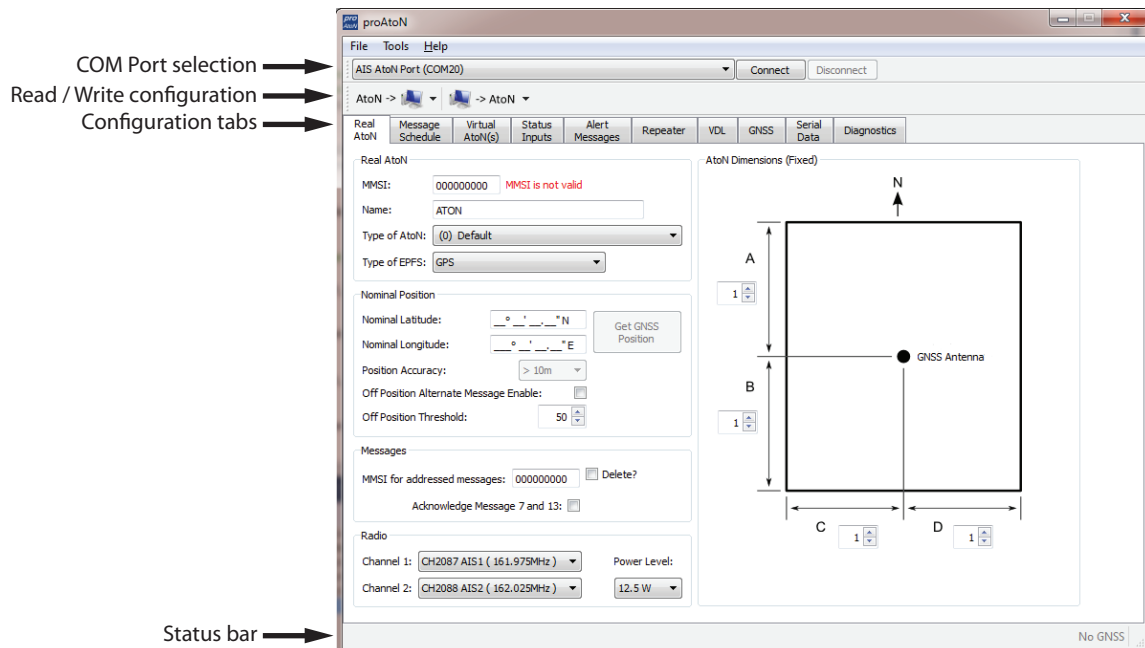The basic layout of the proAtoN application is provided in Figure 9.

Figure 9 proAtoN application layout

⚠ **Note that the Status Inputs, Alert Messages and VDL tabs are not relevant to the Coast Station product and should not be configured.**

COM Port selection

When connected via USB the COM port associated with the transceiver will be listed in the selection drop down. To connect to the transceiver select the 'AIS AtoN Port' option from the drop down and click the 'Connect' button.

Read / Write configuration

Clicking the left hand button will transfer current configuration information from the transceiver to proAtoN.

Clicking the right hand button will configure the transceiver with the information currently displayed in proAtoN.

It is possible to select transfer of configuration information relating only to the currently selected tab, or to all tabs by clicking the drop down arrow to the right of each button. The default operation for each button is to read or write data relating to the selected tab only. It is highly recommended that prior to deploying the AtoN the "Send all Configuration" option is used on the write button.

Configuration tabs

The configuration and status of the transceiver is displayed through a number of tabs.

- Real AtoN tab: Configuration of AtoN MMSI, name, type, dimensions, position and radio parameters.
- Message schedule tab: Configuration of FATDMA or RATDMA message schedules.
- Virtual AtoN tab: Configuration of virtual and/or synthetic AtoN transmissions.
- Status input tab: Not relevant for Coast Station.
- Alert messages tab: Not relevant for Coast Station.
- Repeater: Configuration of message repeats for messages #6, #8, #21 and SART messages.
- VDL: Not relevant for Coast Station.
- GNSS: Displays signal strength and status information for the transceiver GPS receiver.

- Serial data: Displays raw IEC61162 (NMEA0183) data output from the transceiver and provides a means of sending control commands to the Coast Station.
- Diagnostics: Displays software version information, alarms and other key status information.

When connected to a transceiver a synchronisation status icon is displayed alongside the title of each tab. This icon indicates the current synchronisation status of the information displayed in that tab with the internal configuration of the transceiver. The synchronisation status icons are shown in Figure 10.

Green - Tab synchronised

Red - Tab not synchronised

Blue - Synchronisation in progress

Tab edited (sync required)
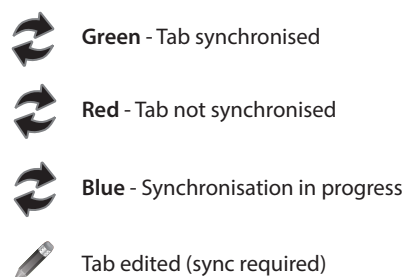
Figure 10   proAtoN tab synchronisation icons

Synchronisation is achieved by either writing the configuration displayed in proAtoN to the transceiver (click the write configuration button), or reading the current configuration from the transceiver for display in proAtoN (click the read configuration button).

Status bar

The status bar displays the current connection status of the application (bottom left) and the current GPS time (if available, bottom right).

7.4   Transceiver configuration

The following sections describe the configuration options available and their effect on the behaviour of the transceiver. Configuration of an AIS AtoN transceiver requires knowledge of the local AIS environment and may require interaction with shore infrastructure. Familiarity with the current IALA guidelines on the use of AIS Aids to Navigation (IALA A-126) is assumed.

7.4.1   Configuration of 'Real' AtoN parameters

The following parameters associated with the 'real' AIS AtoN transceiver should be configured via the 'Real AtoN' tab:

- MMSI

  The MMSI number associated with the 'real' AtoN. Typically the MMSI number for a 'real' AtoN station follows the format 99MID1XXX where MID is the appropriate national MID and XXX is a number unique to this station.

- Name

  The name of the AtoN station as broadcast to other AIS users. Up to 34 characters are available for the name.

- Type of AtoN

  Select from a list of possible types of AtoN. The types are as defined by IALA in IALA A-126.

- Type of EPFS

  Select the type of EPFS (Electronic Position Fixing System) used by the transceiver. Note this selection does not affect the hardware configuration, only the contents of the 'Type of EPFS' field in transmitted AtoN position reports. The transceiver is equipped with a GPS module by default. Alternatively for a fixed or shore based transceiver a surveyed position type can be selected. Note that when the surveyed position is selected the surveyed position is broadcast to other AIS users and GPS position information is ignored.

- Nominal position

  Enter the nominal or charted position of the AtoN. This is the position transmitted to other AIS users for a fixed AtoN when the 'Surveyed' EPFS type is selected. For all other configurations this position is used to perform 'off position' calculations only; the actual GPS position is broadcast to other users.

  ○ The application can average the current GPS position over 5 minutes and use this value for the nominal position. Click the 'Get GPS position' button to the right of the latitude and longitude fields to begin this process. **N.B. The GPS location should only be captured at the installation location.**

  ○ The position accuracy can only be entered when the type of EPFS is set to 'Surveyed'. The accuracy should be set in accordance with the accuracy of the surveyed position.

- Off position alternate message enable

  The current GPS position is compared to the nominal position according to the algorithm defined in IALA A-126 Annex A, Example 1. The off position threshold distance is specified in metres. If the transceiver determines that it is 'off position' then the alternate reporting schedule for message #21 (index 2) is enabled. For example, the alternate reporting schedule could be configured to decrease the reporting interval if the AtoN has drifted off position. The off position flag in message #21 is set when off position regardless of this setting.

  The transceiver off position algorithm is always operational and compares the current GPS position to the nominal position of the transceiver.

- MMSI for addressed messages

  This is the destination MMSI used for all addressed message types generated by the transceiver. This is usually the MMSI of a shore station collecting status information from the transceiver. It is also possible to enable the acknowledgement of received binary messages (via message #7 or #13).

- Dimensions

  The dimensions of the AtoN should be entered to the nearest metre. Guidance on the appropriate configuration of dimensions for various types of AtoN can be found in IALA A-126.

- Radio channels

  Selection of alternative radio channels for AIS transmission and reception is possible, however in most cases the default channels (AIS1 and AIS2) should be used.

- Transmitter power level

  The transmitter power level for the transceiver can be selected as 1W, 2W, 5W or 12.5W. The default value of 12.5W is appropriate for most scenarios.

7.4.2 Message schedule configuration

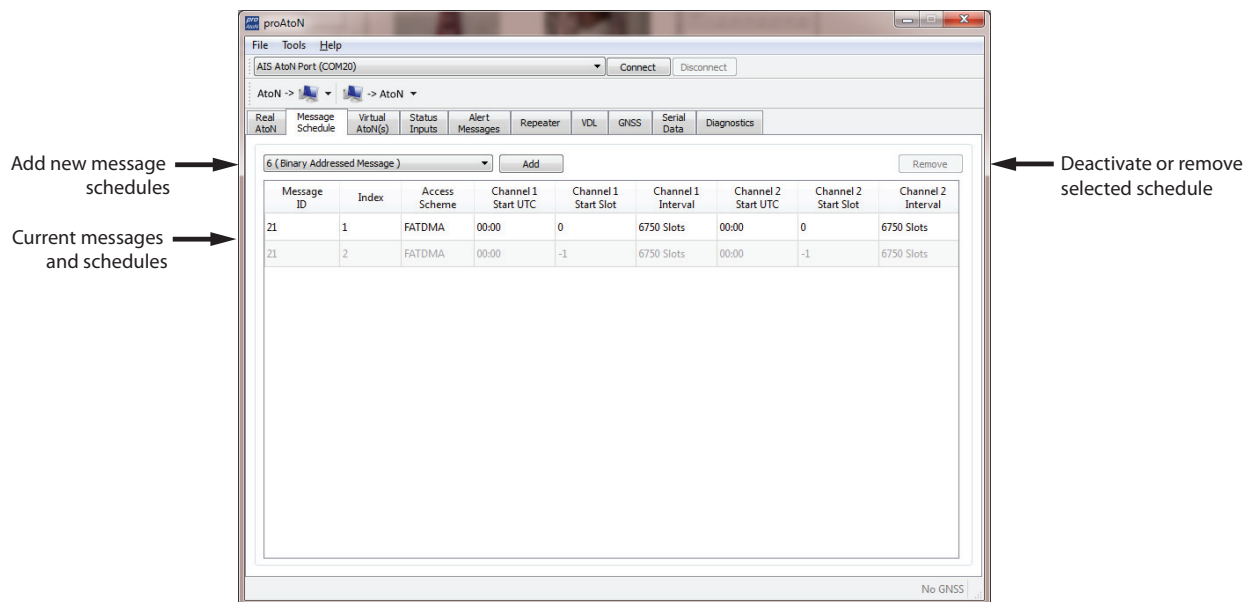The layout of the message schedule tab is described in Figure 11.

Figure 11   proAtoN message schedule tab layout

Default messages

An AIS AtoN position report is made using AIS message #21. This message occupies two AIS slots. The default configuration shown in proAtoN includes two message #21 schedule configurations. The first configuration, index 1, is the primary position reporting schedule for the transceiver. The second, index 2, is the alternate position reporting schedule selected when the 'off position' monitor is enabled and the AtoN is determined to be off position (see section 7.4.1). If the alternate 'off position' schedule is not required it can be deactivated by selecting the associated row in the message schedule table and clicking the 'Deactivate' button. When deactivated the alternate schedule will be greyed out.

Access scheme selection

The access scheme for each message must be selected as either FATDMA or RATDMA (see section 3.2). The selection is made by selecting the required row in the schedule table, then clicking on the current access scheme in that row. A drop down menu will then appear in that location allowing selection of the required access scheme.

- FATDMA

    Configuration of an FATDMA schedule continues in section 7.4.3.

- RATDMA

    Configuration of an RATMDA schedule continues in section 7.4.4.

7.4.3 FATDMA Schedule configuration

Using the FATDMA (Fixed Access TDMA) access scheme the actual slot for each transmission made by the transceiver is specified. There are 2250 slots per minute (or frame) on each AIS channel. The scheduled slots must be reserved for the transceiver by an AIS base station operating in the same area using AIS message #20. Further information on FATDMA reservations and slot allocation schemes can be found in IALA A-124, Appendix 14.

The parameters required for an FATDMA schedule are as follows.

Channel 1 start UTC

This is the hour and minute for transmission on channel 1. This specifies the AIS frame (minute) within a day in which the start slot for channel 1 resides.

Channel 1 start slot

This is the slot number for the first transmission on channel 1. The slot number can range from -1 (transmission disabled on this channel) to 2249. Note that each message #21 transmission occupies two slots and associated base station slot reservations must therefore reserve two slots.

Channel 1 interval

This is the interval in slots between transmissions on channel 1. The interval can range from 0 to 3240000 slots, which equates to an interval of one day. Typically the interval is set to 13500 slots (6 minutes) on each channel which results in an overall interval of 3 minutes.

Channel 2 start UTC

This is the hour and minute for transmission on channel 2. This specifies the AIS frame (minute) within a day in which the start slot for channel 2 resides. Typically the channel 2 start time is offset by 3 minutes from the start time used for channel 1. With a 6 minute reporting interval on each channel this results in a transmission every 3 minutes on alternating channels.
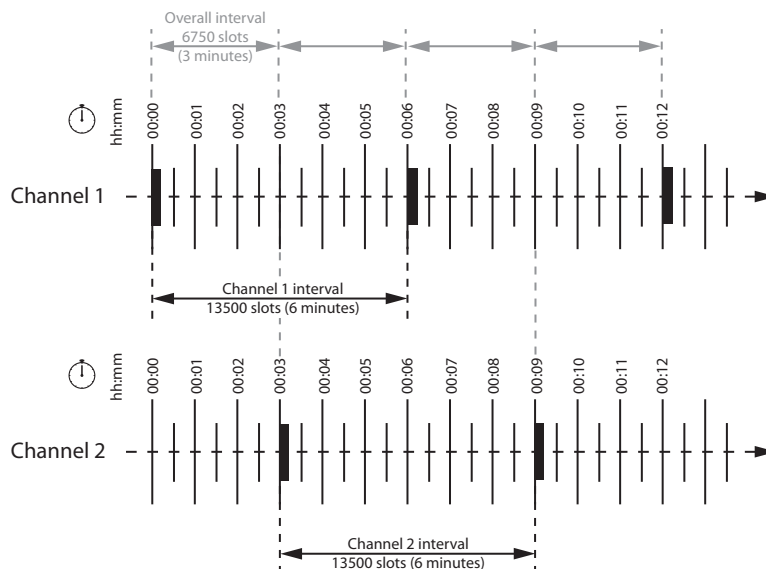
Channel 2 start slot

This is the slot number for the first transmission on channel 2. The slot number can range from -1 (transmission disabled on this channel) to 2249. Note that each message #21 transmission occupies two slots and associated base station slot reservations must therefore reserve two slots.

Channel 2 interval

This is the interval in slots between transmissions on channel 2. The interval can range from 0 to 3240000 slots, which equates to an interval of one day. Typically the interval is set to 13500 slots (6 minutes) on each channel which results in an overall interval of 3 minutes.

Example FATDMA schedule

A typical transmission schedule requires that the AIS AtoN transceiver transmit AIS message #21 every three minutes on alternating channels. The transmission schedule is presented diagrammatically in Figure 12.

Figure 12   Example FATDMA schedule

This schedule can be configured using the following values:

- Channel 1 start UTC = 00:00 (the first frame of every hour)
- Channel 1 start slot = 0 (the first slot in the frame, so slots 0 and 1 are used by the message #21 transmission)

- Channel 1 interval = 13500 slots (this equates to a 6 minute interval as there are 2250 slots per minute)

- Channel 2 start UTC = 00:03 (the third frame of every hour)

- Channel 2 start slot = 0 (the first slot in the frame, so slots 0 and 1 are used by the message #21 transmission)

- Channel 2 interval = 13500 slots (this equates to a 6 minute interval as there are 2250 slots per minute)

The transceiver is now configured to report message #21 on channel 1 every 6th minute, and on channel 2 every 6th minute, but offset by three minutes from channel 1. This results in a transmission of message #21 every three minutes on alternating channels. The actual start slot selected for each channel will depend on the FATDMA allocations in the area of operation.

7.4.4   RATDMA Schedule configuration

Using the RATDMA (Random Access TDMA) access scheme the time for each transmission made by the transceiver is specified. The transceiver will determine the actual slots used for transmission based on internal knowledge of the AIS environment gained from the AIS receivers.

The parameters required for an RATDMA schedule are as follows.

Channel 1 start UTC

This is the hour and minute of the frame in which transmission will occur on channel 1. The slot used within this frame will be determined by the transceiver.

Channel 1 interval

This is the interval in minutes between transmissions on channel 1. A typical value is 6 minutes.
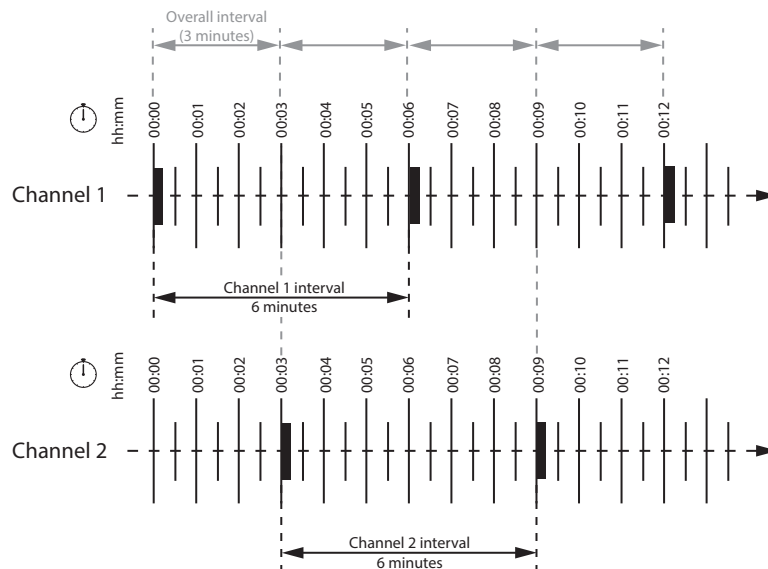
Channel 2 start UTC

This is the hour and minute of the frame in which transmission will occur on channel 2. The slot used within this frame will be determined by the transceiver.

Channel 2 interval

This is the interval in minutes between transmissions on channel 1. A typical value is 6 minutes.

Example RATDMA schedule

A typical transmission schedule requires that the AIS AtoN transceiver transmit AIS message #21 every three minutes on alternating channels. The transmission schedule is presented diagrammatically in Figure 13.

Figure 13   Example RATDMA schedule

This schedule can be configured using the following values:

- Channel 1 start UTC = 00:00 (the first minute of every hour)
- Channel 1 interval = 6 minutes
- Channel 2 start UTC = 00:03 (the third minute of every hour)
- Channel 2 interval = 6 minutes

The transceiver is now configured to report message #21 on channel 1 every 6th minute, and on channel 2 every 6th minute, but offset by three minutes from channel 1. This results in a transmission of message #21 every three minutes on alternating channels. The exact timings of the transmissions within the selected minute will vary as the transceiver selects available slots using RATDMA.

7.4.5 Virtual AtoN configuration

The transceiver can be configured to transmit position reports for up to five virtual or synthetic Aids to Navigation. This configuration is carried out using the *Virtual AtoN(s)* tab in proAtoN. Within this tab there are sub-tabs relating to each of the five virtual or synthetic AtoNs. The sub-tabs are visible at the left hand edge of the window. The layout of the virtual AtoN configuration tab is provided in Figure 14.
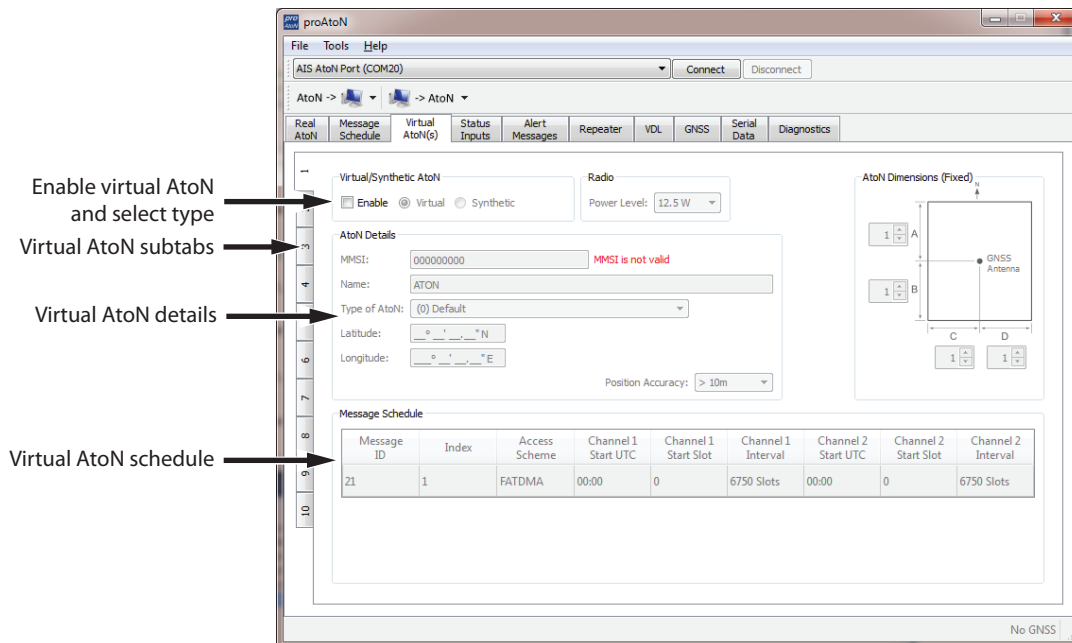

Figure 14   Virtual AtoN configuration tab layout

The following parameters are required to configure a virtual or synthetic AtoN. Note that the 'real' AtoN must be properly configured in order to make use of the virtual AtoN feature.

Virtual / Synthetic AtoN

Each virtual AtoN required must be separately enabled by checking the 'Enable' checkbox. The type of virtual AtoN can then be selected.

- Virtual AtoN

  A virtual AtoN is transmission of message #21 for an Aid to Navigation that does not physically exist. A virtual AtoN may be used to mark a temporary hazard to navigation, e.g., a wreck. For further information on the use of virtual AtoNs please refer to IALA A-126, IALA O-143 and IALA guideline 1081.

- Synthetic AtoN

  A synthetic AtoN is transmission of message #21 from an AIS station located remotely from the physical Aid to Navigation. An example of use is to provide an AIS AtoN target for a buoy or mark that is not capable of supporting AIS AtoN hardware.

Virtual / Synthetic AtoN Details

The basic configuration of a virtual or synthetic AtoN is comparable to that required for a 'real' AIS AtoN. Note that the MMSI number format is different:

- A virtual AtoN MMSI has the format 99MID6XXX, where MID is the appropriate national MID and XXX is a number unique to this station.

- A synthetic AtoN MMSI has the same format as a real AtoN MMSI, e.g., 99MID1XXX, where MID is the appropriate national MID and XXX is a number unique to this station.

The position of the virtual or synthetic AtoN must be configured appropriately to the position of the aid. Note that a virtual AtoN has no dimensions whereas the dimensions of a synthetic AtoN should be configured.

Virtual AtoN schedule

The transmission schedule for a virtual or synthetic AtoN must be configured in the same way as that for the 'real' AtoN. The TDMA access scheme, start times and intervals must be configured in the virtual AtoN tab following the guidance in section 7.4.3 or 7.4.4 as appropriate. When an FATDMA schedule is used it is important to ensure the slot allocations used for the virtual and real AtoNs are different in every case. Also note that two consecutive slots are used for each virtual AtoN report.

7.4.6 Message repeater function

The transceiver can be configured to repeat, or re-transmit, certain messages it receives. Note: messages from virtual AtoN's are not repeated. This feature applies to messages #6, #8, #21 and to SART specific messages #1 and #14. This feature is turned off by default for all message types but can be enabled and configured using the Repeater tab. The number of messages that are repeated is limited by the number of messages waiting to be repeated and the total number of transmissions made per UTC minute.
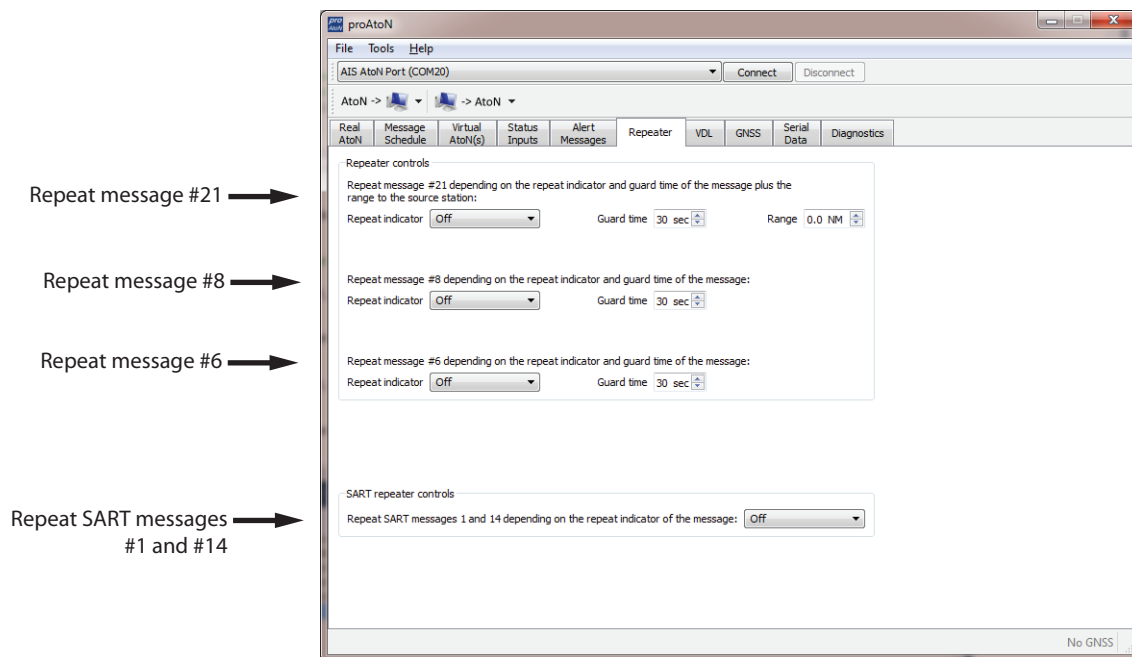

Figure 15   Message repeater tab layout

For each message type, the repeat function can be disabled - Off - or enabled to repeat received messages with a Repeat Indicator (RI) value equal to or less than 0, 1 or 2. The RI value states how many times the message has already been repeated where 0 means it was transmitted by the source.

For messages #6, #8 and #21, a Guard Time can be applied. This creates a period after a message is repeated, during which the same message type from the source MMSI will not be repeated again, regardless of the message's RI value. For example, if a message #6 from MMSI A is repeated then a second message #6 is received from MMSI A within the Guard Time, the second message shall be interpreted and acted upon as necessary but it will not be repeated; however, if a third message #6 from MMSI A is received after the Guard Time has expired, it will be repeated so long as its RI value is less than or equal to that configured for the AtoN.

For message #21, a Range constraint can also be applied. Any message #21 that meets the other criteria for repeating, shall be transmitted if the position reported is within the distance specified by the Range value of the receiving AtoN. A Range value of 0 indicates the restriction is disabled.

7.5   Transceiver diagnostics

The proAtoN application provides a number of features to assist with installation of an AIS AtoN and diagnosis of fault conditions. These features are available through the GPS, Serial Data and Diagnostics tabs in proAtoN.

7.5.1 GPS tab

The GPS tab shows the status of the GPS receiver built into the transceiver. This provides an indication of the quality of the GPS satellite signals being received along with the current position of the transceiver.

At least four satellites with a carrier to noise ratio in excess of 40 dBHz are required for an acceptable position fix. Relocating the transceiver or connecting an external GPS antenna can help improve the signal quality and resulting position accuracy.

The internal GPS receiver supports SBAS (Satellite Based Augmentation Service) to enable improved accuracy and integrity of GPS position fixes. The availability of SBAS depends on the installation location of the transceiver (the WAAS SBAS service covers most of the US and the EGNOS service covers Europe).

7.5.2 Serial data tab

The serial data page shows all data output from the transceiver in NMEA0183 / IEC61162-1 format. It is also possible to send NMEA0183 / IEC61162-1 commands to transceiver if required for technical support or custom configuration. A facility to record the data to a file is provided by clicking the 'Log to File' button.

Certain sentence types can be filtered out of the output window by checking the relevant sentence type in the 'Filters' section of this tab.

7.5.3 Diagnostics tab

The Diagnostics tab provides system version and status information. This information may be required when requesting technical support for the product. The Diagnostic tab does not work when proAtoN is connected to the NMEA0183 port, it only works when it is connected to the USB port.

AtoN Details

- The connected AtoN Type is displayed as Type 1 or Type 3
- The application and bootloader software versions for the connected AtoN are displayed
- The serial number of the connected AtoN is displayed

Power status

- The VHF antenna VSWR (Voltage Standing Wave Ratio) as measured at the last AIS transmission is displayed. This value is for indication only. A value better than 3:1 is expected for a good antenna system. The alarm limit for antenna VSWR is set to 5:1. A perfect antenna would give a VSWR of 1:1.
- The system supply voltage is displayed in volts. The system supply voltage is generated internally and a fault with the system supply indicates an internal fault.

Active alarms

The transceiver incorporates BIT (Built-In Test) routines which continuously monitor key operating parameters. Should an integrity test fail the failure will be indicated in the active alarms area.

Alarm text	Description / Resolution
Tx Malfunction	A transmitter malfunction has been detected - please contact your supplier.
Antenna VSWR exceeds limits	The VHF antenna VSWR is above the permitted limit. Check the VHF antenna, cable and connections are sound. The VSWR measured at the last transmission is displayed on the proAtoN diagnostics tab.
Rx Channel 1 malfunction	A receiver malfunction has been detected - please contact your supplier.
Rx Channel 2 malfunction	A receiver malfunction has been detected - please contact your supplier.

Alarm text	Description / Resolution
EPFS failure	No position is available from the internal GPS receiver - please contact your supplier.
DGPS input failed	No data is available from the external source of differential GPS correction data. Please check connections, baud rate and equipment configuration.
Supply voltage	The transceiver power supply voltage is outside of the permitted range. The measured supply voltage is displayed on the proAtoN diagnostics tab.
Low forward power	The transmitter forward power is below a preset limit - please contact your supplier.
Synchronisation lost	Timing information is not available from the internal GPS receiver - please contact your supplier.

7.6　Other features

The proAtoN application provides the following additional features to support transceiver installation and upgrade.

7.6.1　Offline configuration

A complete AtoN configuration including all schedule parameters, virtual AtoN configuration and other settings can be saved to a file. This feature allows a configuration file to be created without access to the transceiver hardware. The file can be loaded at a later time and synchronised with the transceiver hardware.

This feature is available using the 'Save File' and 'Load File' items available on the File menu. The configuration is saved as a .pad file using a format proprietary to the proAtoN application.

When the proAtoN application is launched a new blank configuration file is created. You will be prompted to save this file if changes are made without saving the file prior to closing the application, or if a 'New file' is created from the File menu.

8   Technical specification

8.1   Applicable equipment standards

IEC62320-2 Edition 2.0, 2016	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.1371-5 February 2014	Technical characteristics for an automatic identification system using time-division multiple access in the VHF maritime mobile band
IEC61162-1 Edition 4.0, 2010	Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 1: Single talker and multiple listeners
IEC61162-2 Edition 1.0, 1998	Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 2: Single talker and multiple listeners, high-speed transmission
IEC61108-1 Edition 1.0, 2002	Global Navigation Satellite Systems (GPS) –Part 1: Global positioning system (GPS) - Receiver equipment - Performance standards, methods of testing and required test results
IEC60945 2002	Maritime navigation and radiocommunication equipment and systems – General requirements – Methods of testing and required test results

8.2   AIS Transceiver specification

8.2.1   Physical

Transceiver dimensions	130mm (width) x 140mm (depth) x 35mm (height) excluding connectors
Transceiver weight	0.5kg excluding cables and accessories

8.2.2   Environmental

Operating temperature range	-15°C to +55°C
Water ingress rating (enclosure)	IPx2
Water ingress rating (power and data connectors)	IPx2
Water ingress rating (RF connectors)	IPx2

8.2.3 Electrical

Nominal supply voltage	90-264VAC 50-60Hz
Power consumption	4W

8.2.4 GPS

GPS type	Global Positioning System (GPS)
Receiver channels	50
Time to first fix (cold start)	<36 seconds
Frequency	L1 band, 1575.42MHz
Accuracy	2.5m CEP / 5.0m SEP without differential correction
	2.0m CEP / 3.0m SEP with SBAS or RTCM DGPS correction
Antenna requirement	Active external antenna (3.3V bias) with gain >20dB

8.2.5 TDMA transmitter

| Frequency range	156.025MHz to 162.025MHz
Channel bandwidth	25kHz
Output power	Configurable 1W, 2W, 5W or 12.5W
Data transmission rate	9600 bits/s
Modulation mode	25kHz GMSK

8.2.6 TDMA receivers

Number of receivers	2
Frequency range	156.025MHz to 162.025MHz
Channel bandwidth	25kHz
Sensitivity	<-107dBm for 20% PER
Modulation mode	25kHz GMSK
Adjacent channel sensitivity	70dB
Spurious response rejection	70dB

8.2.7 Connector types

Power	9.5mm DC jack
VHF antenna	SO239 socket
GPS antenna	Female TNC
USB	Mini-B connector
Ethernet (local)	RJ45
Ethernet (network)	RJ45

8.3   Drawings and dimensions
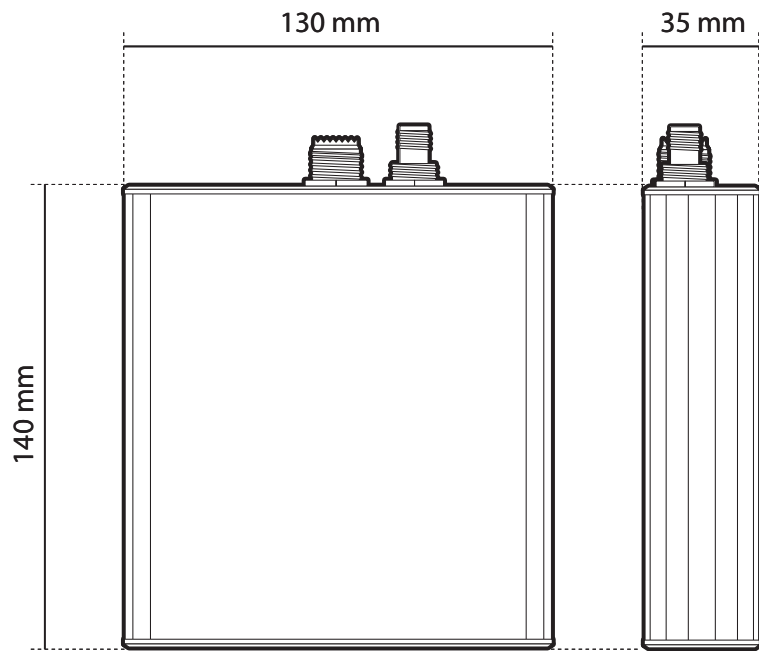
Figure 16   Transceiver dimensions

9   Warranty

SRT Marine Systems plc. is pleased to support your product ("Product") with a limited Warranty (the "Warranty") as specifically described in this document. This Warranty does not affect your statutory consumer rights.

The period of your Warranty is one calendar year commencing from the date of your purchase of the brand new product from an authorised vendor ("Warranty Period"). In order to make a valid claim on your Warranty you will require proof of purchase.

What your Warranty covers

SRT Marine Systems plc. warrants that, subject to correct storage, installation and use as instructed in the Installation Manual, your Product will be substantially free from manufacturing and design defects for the Warranty Period. In the unlikely event of a problem with your Product then you will need to follow the Warranty claim process during which SRT Marine Systems plc. will determine the validity of your claim and the action which needs to be taken. SRT Marine Systems plc.'s decision on all Warranty claims is final and is limited in all respects to the repair or replacement of the product at SRT Marine Systems plc.'s sole discretion.

What this Warranty does not cover

The Warranty does not cover the effects of normal wear and tear. The Warranty is immediately invalidated in the event that the Product has been opened and or tampered with in any way or not stored, installed or used as described in the Installation Manual, or subsequently issued directions from SRT Marine Systems plc. This Warranty does not cover the data that is received by the Product as it is subject to external factors out of SRT Marine Systems plc.'s control. This Warranty does not cover the product when, following testing by SRT Marine Systems plc., it has been deemed to be damaged by any third party device.

How to make a Warranty claim

In the unlikely event of a problem you should first consult your Installation Manual to ensure that you have followed all the instructions correctly. If you still wish to make a Warranty claim you will need to return the Product to the SRT Marine Systems plc. vendor from where it was purchased who will process a claim with SRT Marine Systems plc. on your behalf. If for whatever reason this is not possible then you should contact SRT Marine Systems plc. directly by e-mail at enquiries@srt-marinesystems.com, or via our web site, www.srt-marinesystems.com providing the date of purchase, vendor purchased from, exact product model number, the product serial number and a detailed description of the problem. In all cases SRT Marine Systems plc.'s decision on the validity of any Warranty claim and the remedy is final.

Limitation of liability

SRT Marine Systems plc.'s entire liability and responsibility is limited by the Warranty described herein. The Warranty is non-transferable and therefore is only valid for the original purchaser of the new product from an authorised SRT Marine Systems plc. vendor.   Any additional Warranty offered by vendors is entirely at their own risk unless specifically sanctioned by SRT Marine Systems plc. in the form of a written commitment. SRT Marine Systems plc. is not liable for any direct, indirect, consequential and or vicarious liabilities which may arise through your use of the Product, including but not limited to any consequences resulting from the inability to use the Product and or misinterpretation and or quality of the information generated by the Product. The entire extent of the liability from SRT Marine Systems plc. to you in respect of the Product in all situations and respects shall be limited to the net amount you paid for the Product from the original vendor.