# Virtual AIS Beacon

# Model: VAB1252

# Installation & Configuration Guide

## Important Information

Before installing the Virtual AIS Beacon, it is important that you read and fully understand this guide.

## Warnings and Cautions

**CAUTION**: **Never operate this device unless it is connected to a suitable VHF antenna. Transmitting without an antenna may damage this device.**

**WARNING:** Changes or modifications not expressly approved by Vesper Marine could void the user's authority to operate this equipment.

**CAUTION:** This device generates and radiates electromagnetic energy. This device must be installed and operated according to the instructions contained in this manual. Failure to do so may result in product malfunction and / or exposure to potentially harmful levels of radio frequency radiation.

**CAUTION:** The system has a Maximum Permissible Exposure (MPE) radius of 1m from the antenna. This has been determined assuming the maximum power of the transmitter and using a standard half-wave monopole VHF antenna with a maximum gain of 3dBi and termination impedance of 50 ohms.

When installing the antenna and operating the equipment consider the following:

- The antenna should be mounted as high as possible.
- Higher gain VHF antennas will require a larger MPE radius.
- Do not operate the unit when anyone is within the MPE radius of the antenna.
- The VHF antenna should not be collocated or operated in conjunction with any other transmitting antenna.

## Introduction

The Virtual AIS Beacon is a system which transmits information to assist in marking Aids to Navigation (AtoN) at sea. It works by transmitting data as part of the Universal Ship borne Automated Identification Systems (AIS).

## Regulatory Requirements

*MMSI (Maritime Mobile Service Identity):*

At least one MMSI (Maritime Mobile Service Identity) is required for the Virtual AIS Beacon to begin transmission of an Aid to Navigation (AtoN). MMSI numbers are allocated by the maritime authority responsible for marine radio spectrum in your region.

Each AtoN you intend to transmit requires a unique MMSI.

*VHF radio license:*

Various countries have regulations requiring a VHF radio license to operate an AIS transceiver. Check with your local authorities to determine the requirements for your area.

## Installation and Wiring

## Virtual AIS Beacon Connectors and Wiring
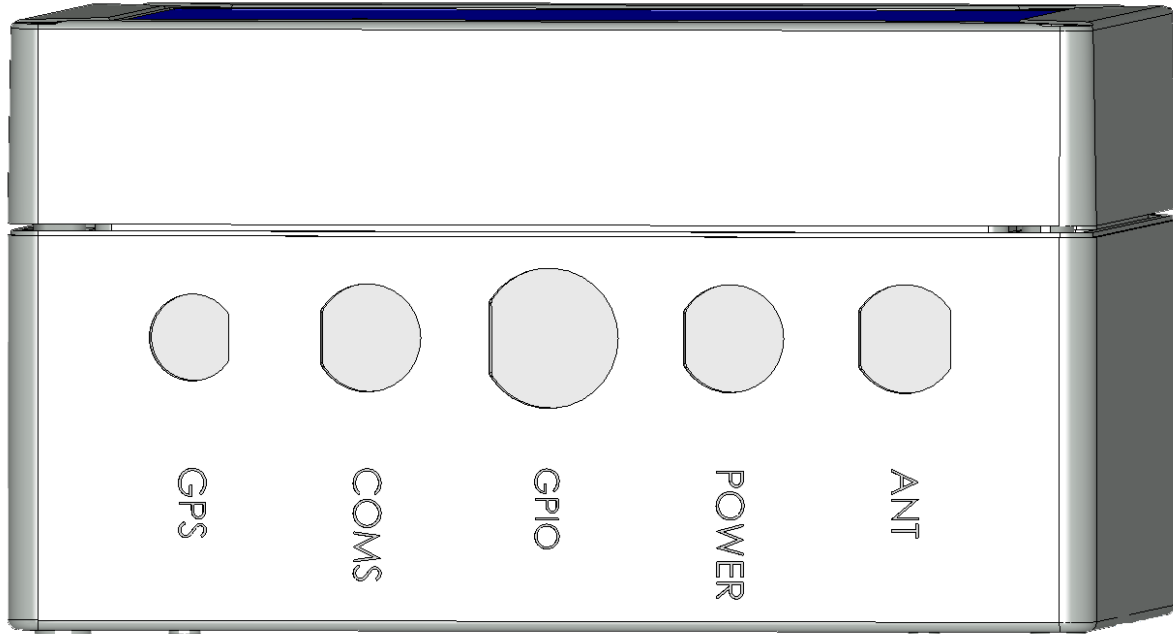


### VHF Antenna Connection (SO239)

The Virtual AIS Beacon must be connected to a suitable VHF antenna either sourced from Vesper Marine or your local marine equipment supplier.

Ensure a VHF antenna is connected to the Virtual AIS Beacon before power is applied to the beacon.

The performance of the VHF antenna is also highly dependent on the environment in which the device is mounted.  When installing the VHF antenna please take into consideration:

- Place your antenna as high as possible and at least 2-3 metres (6-10 ft) above the water surface.
- Place your VHF antenna as far as possible from other antennas and metal structures, especially other VHF, HF and radar antennas. It is not recommended to place the VHF antenna directly alongside another VHF antenna.
- The type of antenna should be an omnidirectional VHF antenna designed for the marine band (156-162 MHz).
- Ideally an AIS-frequency adapted antenna should be used however you may also use a standard marine VHF antenna.

### GPS Antenna Connection (TNC)

The Virtual AIS Beacon is provided with an external GPS antenna. This antenna requires an unobstructed view of the sky. You cannot share this GPS antenna with other equipment.

The performance of the GPS antenna is highly dependent on the environment in which the antenna is mounted. The antenna performance may be reduced if the antenna is under or near large metal structures.

When installing the external GPS antenna please take into consideration:

- Ensure the antenna connector is isolated from metal at all times.
- Do not place the GPS antenna near or in the path of radar or HF antennas.
- The GPS antenna should be situated so it has an unobstructed view of the sky above.
- Any damage caused by using an incompatible GPS antenna is not covered under your warranty.

### Coms Connection (10 Pin)

A 2m (6.5') data cable with a female DB9 plug is supplied with the Virtual AIS Beacon to connect to the Coms Port. An additional 2m (6.5') Ethernet cable with RJ45 plugs is provided to support network connectivity for Ethernet-enabled devices. You may extend these cables as necessary. Firmware upgrades can be carried out using this port. The data cable color code is as follows,

| Color | Port | Function |
|---|---|---|
| Yellow | Com Port (RS232) | RS232 Common |
| Green | | RS232 data in |
| Gray | | RS232 data out |
| Brown | Com Port (Ethernet) | Ethernet TX+ |
| Blue | | Ethernet TX- |
| Black | | Ethernet RX+ |
| Orange | | Ethernet RX- |
| Red | | Do Not Connect (recovery) |
| Pink | | Do Not Connect (recovery) |

### GPIO Connection (16 Pin)

A 2m (6.5') cable with bare wire leads is supplied with the Virtual AIS Beacon to connect to the GPIO Port. You may extend this cable as necessary. The GPIO cable color code is as follows,

| Color | Port | Function |
|---|---|---|
| Blue | GPIO Port | RS232 data in |
| Brown | | RS232 data out |
| White | | RS232 Common |

## Power Connection (2 Pin)

The Virtual AIS Beacon has a 2 pin plug for 12 VDC, peak 4.5A, nominal 0.25A.

Depending on shipping destination a short circuit protected and isolated ground 12VDC 5A AC/DC power pack with a regional IEC power cable may also be supplied.

## Mounting the Virtual AIS Beacon

The Virtual AIS Beacon has footprint dimensions as detailed below and a height of 90mm. The device is mounted by using the fixing lugs. Drill holes in the mounting surface using the lugs as a guide. Fasten with appropriate length screws.

**162**

**122**

**12**

**18.9**

**108**

**186**
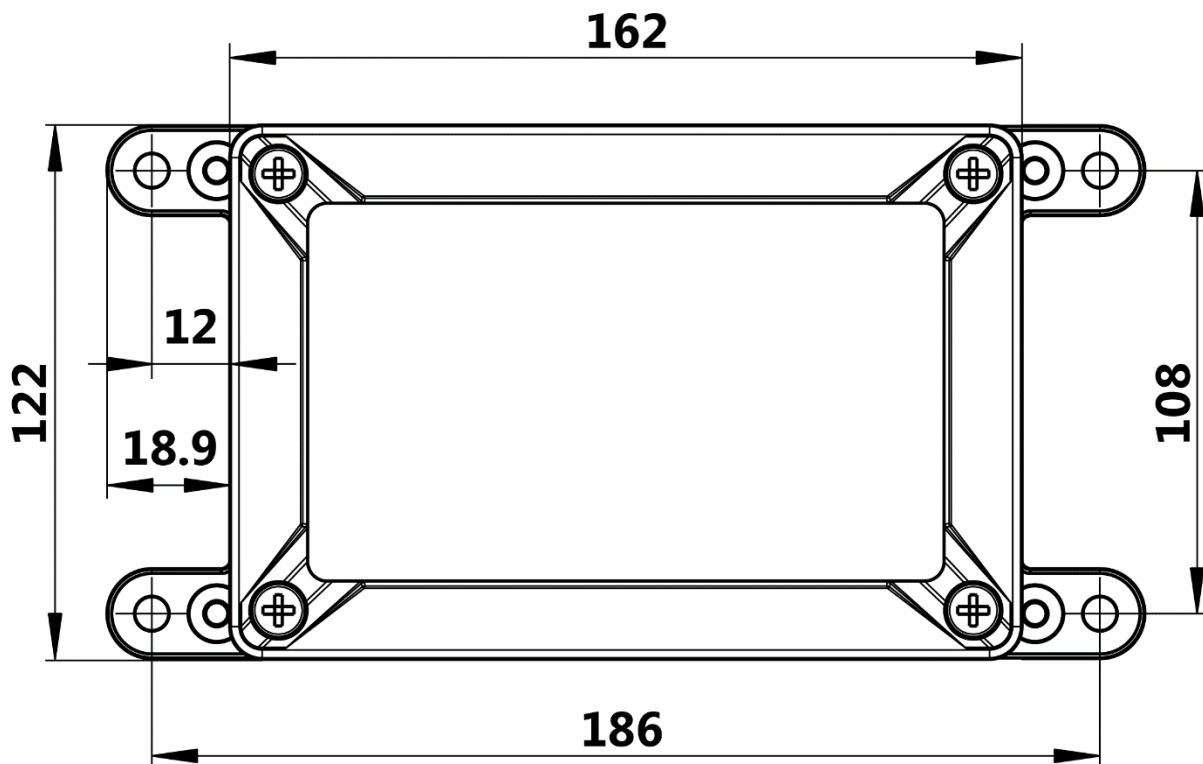
**Caution:** Do not disassemble the unit or remove the screws which hold the Virtual AIS Beacon together. The unit is sealed and disassembly will void the warranty. If you require service or assistance please contact Vesper Marine.

## *LED Status Lights*

Once the VHF antenna, GPS antenna and the power is connected the Virtual AIS Beacon can be turned on. The LED lights on the front panel have the following states:



| | |
|---|---|
| POWER | **Green**: The Virtual AIS Beacon has power. |
| GPS STATUS | **Blue Flashing**: GPS acquiring a fix and/or sync to UTC time (can take up to 12mins to get a sync) |
| | **Blue**: GPS fixed and synchronized to UTC time |
| TRANSMIT | **Green Flash**: On an AIS transmission. |
| | **Red**: Built in integrity check error. Typically this would indicate a bad antenna connection. |
| NETWORK | **Orange**: Link established. |
| | **Green Flashing**: Network connection active. (optional – only applies to Ethernet enabled devices) |

## Ethernet Connection

An Ethernet enabled (optional) Virtual AIS Beacon is configured to both automatically connect to a Vesper Marine secure server and to accept an incoming TCP connection on port 39150. It will use DHCP by default, so once connected to your network it will be automatically assigned an IP address. Once the IP address is found (by a network query or by checking your router address table) its status can be queried on port 80 using an internet browser. On a successful connection you will see the following web page,

irtual AIS Beacon     vespermarine

Status   ⌂
Diagnostics
DNS
Network
Tunnel

### Device Status

| Product Information | |
|---|---|
| Product Type: | Virtual AIS Beacon VAB1252 |
| Firmware Version: | 5.2.0.5B8 |
| Build Date: | May 22 2014 (13:43:03) |
| Serial Number: | 07142207G5MX7U |
| Uptime: | 10 days 01:32:13 |
| Permanent Config: | Unsaved |
| **Network Settings** | |
| Interface: | eth0 |
| Link: | Auto 10/100 Mbps Auto Half/Full (100 Mbps Full) |
| MAC Address: | 00:80:a3:90:76:aa |
| Hostname: | \<None\> |
| IP Address: | 192.168.1.90/24 (DHCP) |
| Default Gateway: | 192.168.1.1 (DHCP) |
| Domain: | \<None\> |
| Primary DNS: | 114.23.1.1 (DHCP) |
| Secondary DNS: | 114.23.2.2 (DHCP) |
| MTU: | 1500 |
| VIP Conduit: | Disabled |
| **Line Settings** | |
| Line 1: | RS232, 38400, None, 8, 1, None |
| Line 2: | Down RS232, 9600, None, 8, 1, None |

| Tunneling | Connect Mode | Accept Mode |
|---|---|---|
| Tunnel 1: | Active | Waiting |
| Tunnel 2: | Disabled | Disabled |

To change the port and protocol used by the accept mode, navigate to the Tunnel Accept Mode page,



Telnet and TCP are the only protocols supported in accept mode. The TCP accept mode IP address and port combination can be used to connect to the Virtual AIS Beacon using the configuration software as described in the following section. You must ensure the Virtual AIS Beacon is configured to use the Ethernet port (default) instead of the serial port. To toggle between the two modes of operation use the NWK command as described in the NMEA Command Interface section.

## *Virtual AIS Beacon Configuration Software*

To use the Virtual AIS Beacon configuration software you will need a connection between the PC and the Virtual AIS Beacon device. Once you are connected the configuration software will allow you to view existing AtoN's that are configured (if any). Configuring and uploading AtoN's is carried out by entering information into each of the fields for each individual Virtual or Synthetic AtoN. AtoN's are added, edited or deleted and then uploaded to the Virtual AIS Beacon by using the Upload button.

## *Connecting a PC to the beacon*

Before connecting the Virtual AIS Beacon to a PC install the vmBeacon software. Once this process is completed open the vmBeacon program and follow the steps below to connect the PC to the Virtual AIS Beacon.

1.  Connect the beacon to your PC using the DB9 plug, connected to a Serial to USB adaptor (not included). If you are using an Ethernet-enabled device to connect to your network, connect the RJ45 plug to your PC.

2.  With the vmBeacon program running select the appropriate com and then click the Connect Button. Once connected all currently defined AtoN's (if any) are displayed.
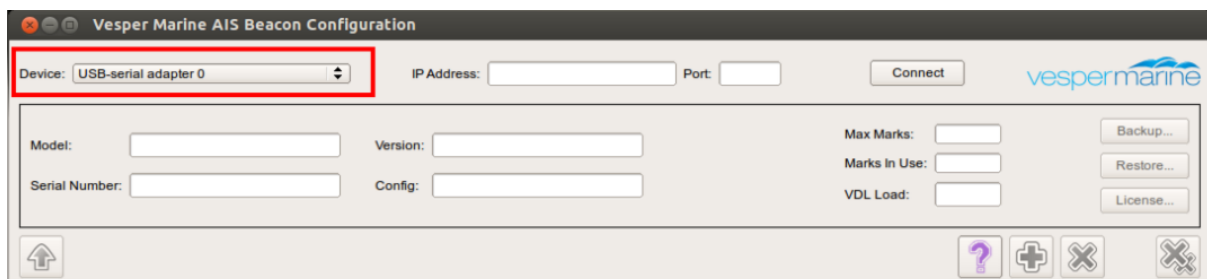


Or, if connecting via Ethernet enter the IP address and Port in these two fields.
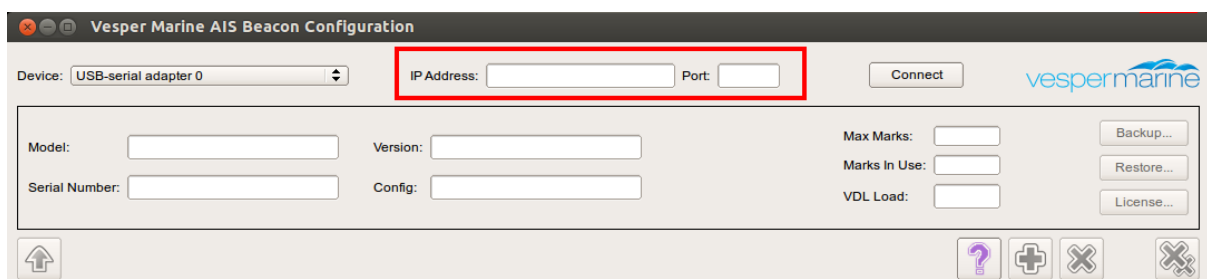
## The Configuration Screen



| MMSI ∨ | Type | Name | Latitude | Longitude | Mode | TDMA | UTC | TX Interval | Synthetic? |
|---|---|---|---|---|---|---|---|---|---|
| 009755351 | Fixed structure | DOCK #001 | 36 50.3381 S | 174 44.6152 E | A | RATDMA | | 30 | ✓ |
| 009755352 | Isolated Danger | WISES REEF #007 | 36 50.3401 S | 174 44.6230 E | C1 | RATDMA | | 90 | ☐ |
| 009755353 | Cardinal Mark N | LONG BAY MARKER #010 | 36 50.3420 S | 174 44.6250 E | C1 | RATDMA | | 30 | ✓ |
| 009755354 | Cardinal Mark S | LONG BAY MARKER #011 | 36 50.3430 S | 174 44.6270 E | B | RATDMA | | 30 | ✓ |

| | |
|---|---|
| Adding a new AtoN is done by clicking the Add Button. |  |
| Deleting a single AtoN is done by selecting an individual AtoN then clicking the Delete Button. |  |
| Deleting All AtoN's is done by clicking the Delete All button and confirming this action. |  |
| Uploading AtoN's to the beacon is done by clicking the Upload Button. |  |
| The Help Button can be used to access this documentation. |  |
| Backing Up the beacon can be carried out by using the Backup Button and saving the configuration to file. |  |
| Restoring a beacon's configuration is carried out by clicking the Restore Button and selecting the backup file that you wish to restore the beacon with. The Upload button must be used to load AtoN's into the beacon once the restore procedure has been completed. |  |

## *Configuration Software Field Descriptions:*

**Beacon Information Fields (Read only)**
Beacon information is shown for reference in the following fields; Model, H/W Rev, Serial Number, Version, etc.

**Max Mark Field (Read only)**
This field shows the maximum number of AtoN's the beacon can have.  The Virtual AIS Beacon requires AtoN Mark Licenses to be purchased, the Max Marks field will show the number of licenses each beacon currently has.  Additional AtoN Mark Licenses can be purchased in blocks. It is possible to have up to 65 AtoN marks however this is dependent on the reporting interval and the mode selected for each AtoN.

**Marks In Use Field (Read only)**
The number in this field indicates the number of AtoN marks currently configured on the beacon.  This field will be updated once the Upload Button is clicked.

**VDL Load Field (Read only)**
This is an indication of the VHF Data Link load.  This number cannot exceed 0.5%.  If you configure AtoN marks and the VDL Load exceeds 0.5% you must change the Mode,  increase the Transmission Interval or remove AtoN's before you are able to Upload to the beacon.

**MMSI Field**
An MMSI is a Maritime Mobile Service Identity, used to identify each AtoN. All Virtual AIS Beacon AtoN marks require a unique MMSI. An AtoN will not be updated to the beacon until a valid MMSI is set.

Note: MMSI numbers may be allocated by the maritime authority responsible for marine radio spectrum in your region.

**Type Field**

This is a list of AtoN types as defined in IALA Recommendation A-126 – *the use of the Automatic Identification Systems (AIS) in Marine Aids to Navigation Services*.  Options are:

Type of AtoN is not specified

Reference point

RACON

Fixed structure off shore,

Reserved for future use

Light, without sectors

Light, with sectors

Leading Light Front

Leading Light Rear

Beacon, Cardinal N

Beacon, Cardinal E

Beacon, Cardinal S

Beacon, Cardinal W

Beacon, Port hand

Beacon, Starboard hand

Beacon, Preferred Channel port hand

Beacon, Preferred Channel starboard hand

Beacon, Isolated danger

Beacon, Safe water

Beacon, Special mark

Cardinal Mark N

Cardinal Mark E

Cardinal Mark S

Cardinal Mark W

Port hand Mark

Starboard hand Mark

Preferred Channel Port hand

Preferred Channel Starboard hand

Isolated danger

Safe Water

Special Mark

Light Vessel / LANBY/Rigs

**Name Field**

You must name each AtoN to facilitate easier identification.  This name will be visible to any vessel with AIS receiving equipment in range of the Virtual AIS Beacon.

**Latitude and Longitude Fields**

The exact location of the AtoN should be entered in these fields.

**Mode Field**

This field allows each AtoN to be configured to use transmission Mode A, B or C.

Mode A allows an AtoN message to be sent on both channels with each AtoN message alternating channels.  Mode B sends the message on both channels during each interval.  It is important to note that although using Mode A allows more AtoN marks to be transmitted from a Virtual AIS Beacon each AtoN message is only transmitted over one channel in each reporting interval not two channels as they are in Mode B. Because Mode B uses both channels for the same message it provides the best probability of reception (see diagram below).

Mode C provides an option to send the messages on one channel only. When configuring this mode options are; C1 (channel 1) or C2 (channel 2). This mode is the least likely of the three modes to be used.

|        |      | Reporting Interval 1 | Reporting Interval 2 | Reporting Interval 3 |
|--------|------|----------------------|----------------------|----------------------|
| Mode A | Ch 1 |                      |                      |                      |
|        | Ch 2 |                      |                      |                      |
| Mode B | Ch 1 |                      |                      |                      |
|        | Ch 2 |                      |                      |                      |
| Mode C | Ch 1 |                      |                      |                      |
|        | Ch 2 |                      |                      |                      |
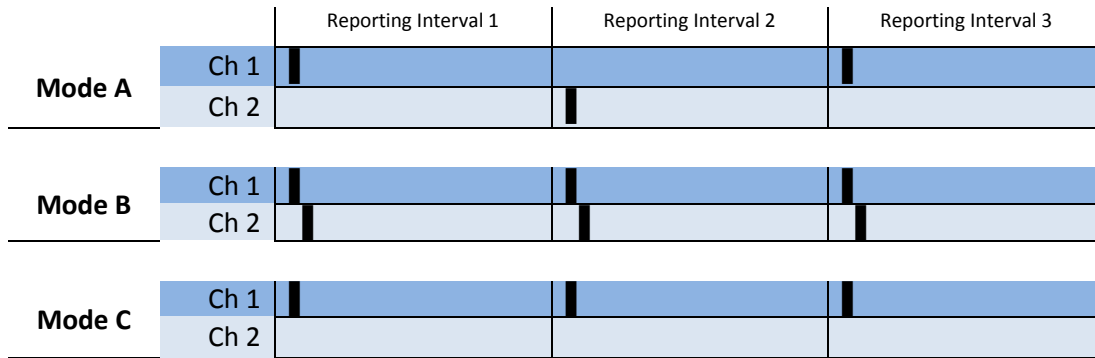
## TDMA Field

This field specifies how the slots will be allocated for transmission of AtoN messages. The two allowed Time Division Multiple Access (TDMA) schemes are Fixed Access TDMA (FATDMA) and Random Access TDMA (RATDMA).

In RATDMA the slots are not pre-announced. The beacon will choose a random slot based on perceived free slots.

In FATDMA slots are fixed and pre-announced by a base station. These slots must be retrieved from a Competent Authority for VDL slot management.

**Note:** FATDMA is disabled by default. Contact Vesper Marine if FATDMA is required for your application.

## TX Interval Field

This field is entered as seconds (30sec to 720sec) and sets the time intervals for each AtoN signal (Message 21) to be transmitted. The recommended and default interval is 180 seconds.

The reporting interval should be chosen so that vessels receive an appropriate number of signals (Messages 21) before coming into close proximity of the AtoN.

Factors to take into account are:

- Vessels likely speed of approach to the AtoN
- Topology, for examples vessels approaching from around a headland
- Importance or critical nature of AtoN
- Nominal transmission range

**UTC Field**

This field allows configuration of the time schedule the AtoN messages keep.

RATDMA does not require UTC time or the start slots to be defined, since they are automatically allocated. For FATDMA, the UTC hour, minute and start slot index must be provided. The valid start slot range is 0 to 2249.

The Channel TX Interval can be provided in slot units (2250 slots per minute). It corresponds to the reporting interval for modes B and C. For mode A, the Channel Transmission Interval is double of the Reporting Interval, as depicted in the figure below.

| | | Channel Transmission Interval 1 | | Channel Transmission Interval 2 | |
|---|---|---|---|---|---|
| | | Reporting Interval 1 | Reporting Interval 2 | Reporting Interval 3 | Reporting Interval 4 |
| **Mode A** | Ch 1 | ▌ | | ▌ | |
| | Ch 2 | | ▌ | | ▌ |
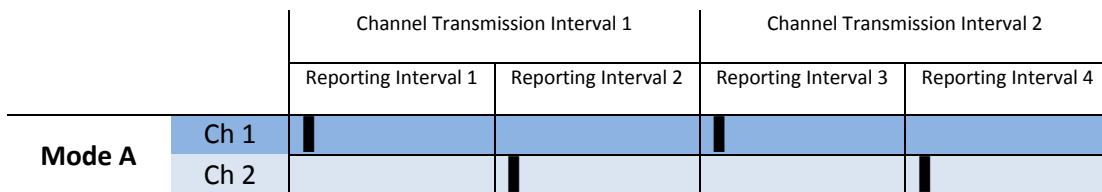
Information provided in these fields must be consistent to the configured transmission mode. For this reason, some fields for each channel on modes A and B must match. This is enforced automatically.

The following figure shows a typical FATDMA configuration for operation on mode A with a 5 minute reporting interval. Each channel is configured with a Channel TX Interval of 10 minutes. A UTC minute offset of 5 minutes is automatically added to allow the alternated transmissions to be spaced 5 minutes apart.
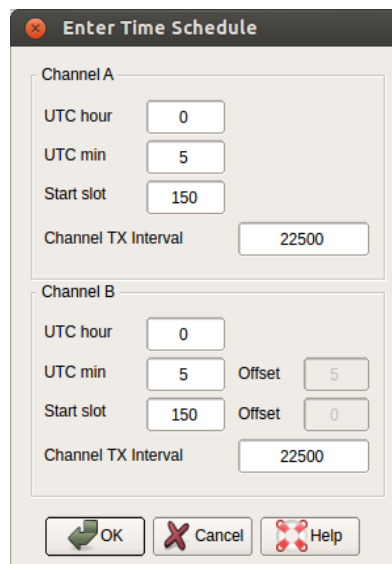
## Synthetic Field

This field provides an option to set the AtoN as a Synthetic or a Virtual Aid to Navigation. A Synthetic Aid to Navigation indicates the position of a physical marker, i.e. channel markers, lateral marker etc. A Virtual Aid to Navigation indicates the position of a location where no physical marker exists such as a submerged rock or virtual shipping lanes.

## TX Count and Seconds Field

These fields are for information purposes and are not editable. The transmission count for each AtoN is displayed for each channel. In addition, the number of seconds that has elapsed since the last transmission is displayed.
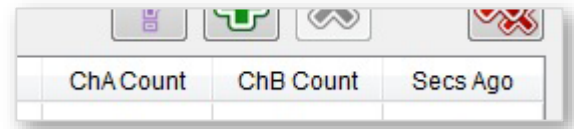


## *Virtual AIS Beacon Firmware Upgrades*

To upgrade the VAB1252 firmware use Vesper Marine's 'Status & Firmware Update' tool. The connection process is the same as described above for the Beacon Configuration software. Connect the device to a PC using the DB9 plug or Ethernet, and select the appropriate com port (or IP address and com port for Ethernet enabled devices) and press connect. The model, serial no., AIS version etc. fields will populate once the device has successfully connected.
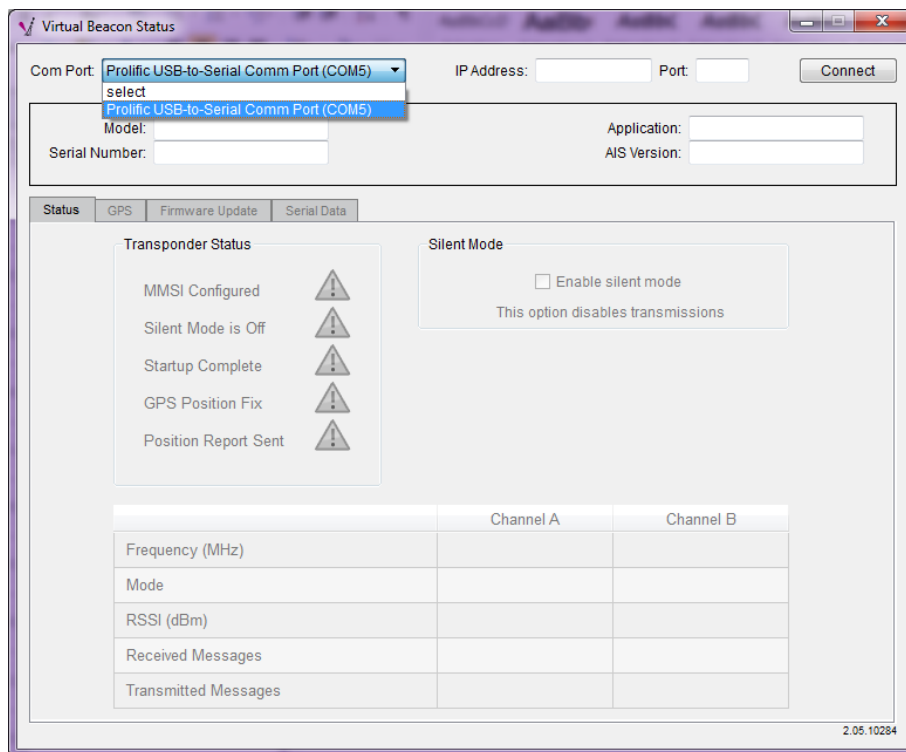
Once connected, click on the 'Firmware Upgrade' tab. From this tab you can browse for the new version of Firmware you wish to upload to the device and load it.
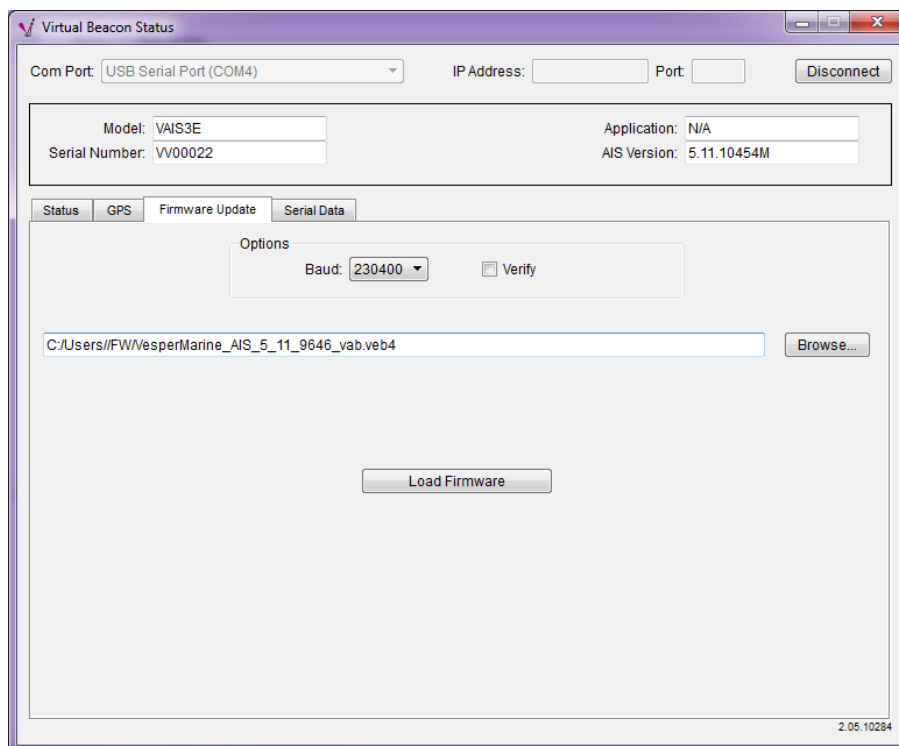


Once the new firmware has been loaded your device will automatically reboot.

## NMEA Command Interface

The Virtual AIS Beacon supports the NMEA-0183 (v4.10) command interface.  All commands start with a formatter such as $XXAID or !XXABM. The first two XX characters indicate the talker ID and are ignored by the Virtual AIS Beacon, so can be set to the caller's preference.

## AtoN Configuration

The Virtual AIS Beacon supports the programming of its virtual AtoN marks using the standard NMEA-0183 (v4.10) sentences. The corresponding legacy sentences as defined in IEC 62320 Appendix A are also supported as indicated in Table 1.

Full sentence details can be obtained from the NMEA-0183 v4.10 standard. Note not all the sentences will respond to a query as indicated by the queryable column.

*Table 1 – Supported Public NMEA 0183 Sentences*

| Formatter | Description | Queryable | IEC 62320 |
|-----------|-------------|-----------|-----------|
| AID | AtoN Identification Configuration | Yes | |
| ACF | General AtoN Station Configuration | Yes | |
| ACG | Extended General AtoN Station Configuration | Yes | ACE |
| CBR | Configure Broadcast Rates for AtoN Station Messages | Yes | AAR |
| MEB[1] | Message Input for Broadcast | No | |
| VER | Version details | Yes | |
| BBM | Binary Broadcast Message | No | |
| ABM | Addressed Binary Broadcast Message | No | |

Note 1: MEB is used to set the message contents. Five MEB payloads may be stored. The corresponding CBR is used to determine the broadcast rates for the stored message.

After a command has been issued the Virtual AIS Beacon will respond with an OK or ERR sentence to indicate a success or failure.

Examples:
```
$PVSP,OK*2D
$PVSP,ERR,NOT FOUND*63
```

## Example Configuration for a Virtual AtoN

A Beacon Cardinal N mark named VIRT ATON with an MMSI of 995121006 at position 36° 50.9866 S, 174° 45.1895 E on a mode A reporting interval of 3 minutes would be set on a Virtual AIS Beacon with a serial number of GZ12345 using:

```
$ABAID,GZ12345,1,995121007,V,C*5B
$ABACG,995121006,00,,,,,0,VIRT ATON,0000000000,C*05
$ABACF,995121006,7,3650.9866,S,17445.1895,E,1,,,,,,09,1,C*06
$ABCBR,995121006,21,0,0,0,1682,13500,1,0,3,1682,13500,C*0F
```

To configure the same AtoN with mode B timing at an interval of 3 minutes:

`$ABCBR,995121006,21,0,0,0,1832,6750,1,0,0,1982,6750,C*07`

To configure the same AtoN with mode C timing at an interval of 3 minutes:

`$ABCBR,995121006,21,0,0,0,2132,6750,1,0,0,-1,0,C*27`

## *Valid AtoN Types*

The AtoN Type is defined in the ACF sentence and can be set to any one of the types shown in Table 2. See ITU-R M.1371.4 Table 71 for additional details.

### *Table 2 – Valid AtoN Types*

| | |
|---|---|
| 00 | Type of AtoN not specified (default) |
| 01 | Reference point |
| 02 | RACON |
| 03 | Fixed structure (eg. oil platforms, wind farms) |
| 04 | Reserved for future use |
| 05 | Light, without sectors |
| 06 | Light, with sectors |
| 07 | Leading light front |
| 08 | Leading light rear |
| 09 | Beacon, Cardinal N |
| 10 | Beacon, Cardinal E |
| 11 | Beacon, Cardinal S |
| 12 | Beacon, Cardinal W |
| 13 | Beacon, Port hand |
| 14 | Beacon, Starboard hand |
| 15 | Beacon, Preferred channel port hand |
| 16 | Beacon, Preferred channel starboard hand |
| 17 | Beacon, Isolated danger |
| 18 | Beacon, Safe water |
| 19 | Beacon, Special mark |
| 20 | Cardinal mark N |
| 21 | Cardinal mark E |
| 22 | Cardinal mark S |
| 23 | Cardinal mark N |
| 24 | Port hand mark |
| 25 | Starboard hand mark |
| 26 | Preferred channel port hand |
| 27 | Preferred channel starboard hand |
| 28 | Isolated danger |
| 29 | Safe Water |
| 30 | Special mark |
| 31 | Light vessel / LANBY/ Rigs |

Note the AtoN must be added to the Virtual AIS Beacon using AID before any of the other configuration sentences can be used. The AtoN must have a valid and unique MMSI and must be set as a virtual AtoN.

To delete the AtoN use the AID sentence with the delete flag set:

```
$ABAID,GZ12345,0,995121007,V,C*5A
```

## *Example Binary Broadcast of an Area Special Message*

To initiate an addressed or broadcast binary message a base MMSI must be loaded into the Virtual AIS Beacon. This MMSI will support the transmission of BBM, ABM, and MEB sentence encapsulated data. There can only be one base MMSI and it cannot be used to transmit a position report.

A transmission will return an ABK to acknowledge the message has been sent and a VDO with contents of the transmitted message.

For example to add a base MMSI 995121000 to send an ASM BBM (Message 8):

```
$ABAID,GZ12345,1,995121000,R,C*58
!ABBBM,2,1,0,0,8,05H0180iqwwv77t6JAC`e000000pwPHR:O7p0000077ugDAD<g000000pw,0*0C
!ABBBM,2,2,0,0,8,irR:OQH0000077v5pACt;000000,4*05
```

## *Decoded Area Special Message*

| DAC | 1 |
|---|---|
| FI | 22 |
| Msg Link ID | 0 |
| Notice Desc | 9 |
| Month, Day | 0 |
| Hour | 24 |
| Minute | 60 |
| Duration | 262143 |
| Scale factor | 1 |
| Precision | 4 |

| | |
|---|---|
| -122.4670 | 37.8073 |
| -122.4688 | 37.8160 |
| -122.4110 | 37.8265 |
| -122.3940 | 37.8177 |
| -122.3990 | 37.8045 |

## Additional NMEA Output Sentences

In addition to the sentences in Table 1 the following standard NMEA 0183 outputs are supported by the Virtual AIS Beacon. These may be output automatically or in response to a query or command.

*Table 3 – Additional NMEA Output Sentences*

| Formatter | Description |
|---|---|
| GGA | Global Positioning System Fix Data |
| RMC | Recommended Minimum Specific GNSS Data |
| GLL | Geographic Position – Latitude/Longitude |
| GSA | GNSS DOP and Active Satellites |
| GSV | GNSS Satellites In View |
| VTG | Course Over Ground & Ground Speed |
| TXT | Text Transmission |
| VDO | AIS VHF Data-Link Own Report |
| VDM | AIS VHF Data-link Message |
| ABK | AIS Addressed and Binary Broadcast Acknowledgement |
| MEB | Message Input for a Broadcast Command |

Full sentence details can be obtained from the NMEA-0183 v4.10 standard.

## Extended AtoN Configuration

In addition to the standard configuration sentences the Virtual AIS Beacon also supports an extended set of commands that start with $PVSP formatter. The supported sentences are summarized in Table 4.

*Table 4 – Sentences Used For Extended Configuration*

| Formatter | Description | Queryable |
|---|---|---|
| SAT | Enable/Disable GPS Satellite Output | No |
| ATON,CLR | Clear all AtoN Configurations | No |
| ATON,PERSIST | Enable/Disable Persistence of a Mark Change | Yes |
| MEB,DEL | Delete a Stored MEB | No |
| NWK | Enable/Disable Ethernet on Coms Port | No |

### SAT – Enable GSA/GSV Output

Enable or disable (default) the output of GSA & GSV sentences to reduce the serial data stream.

Returns:     `$PVSP,OK*2D`

Example:     `$PVSP,SAT,1*72`

Format:      `$PVSP,SAT,x`

     `x`                0=disable GSA/GSV output, 1=enable

### ATON,CLR – Clear all AtoN Configurations

Delete all AtoN's. No further transmissions will occur until new AtoN's are created.

Returns:        `$PVSP,OK*2D`

Example:      `$PVSP,ATON,CLR*4C`

### ATON,PERSIST – Enable Persistence of a Mark Change

Enable (default) or disable the persistence of changes that are made to marks through an ACF. Disabling will prevent the changes from being written to the EEPROM memory. This is useful to avoid wear on the EEPROM memory in cases where changes to the position of a mark are frequent and changes are not required to be preserved over a power cycle.

Returns:        `$PVSP,OK*2D`

Example:      `$PVSP,ATON,PERSIST,1*56`

Format:       `$PVSP,ATON,PERSIST,x`

         `x`              0=disable EEPROM writes, 1=enable

### MEB,DEL – Delete an MEB Message

Delete a stored MEB payload. To delete all stored MEBs omit an optional parameter.

Returns:        `$PVSP,OK*2D`

Example:      `$PVSP,MEB,DEL,990000123,14,4*2F` *(Delete msg 14 index 4)*

Example:      `$PVSP,MEB,DEL,990000123*1E`    *(Delete all 990000123 msgs)*

Example:      `$PVSP,MEB,DEL*02`         *(Delete all)*

Format:       `$PVSP,SAT,xxxxxxxxx,x,x`

         `xxxxxxxxx`        MMSI (optional)

         `x`              Msg ID (optional)

         `x`              Msg Index (optional)

### NWK – Enable Ethernet on Coms Port

Enable (default with Ethernet option) or disable Ethernet on the Coms port. This command cannot be sent when using the Ethernet connection, but can always be sent over a serial RS232 connection on either the Coms or the GPIO port.

Returns:        `$PVSP,OK*2D`

Example:      `$PVSP,NWK,1*66`

Format:       `$PVSP,NWK,x`

         `x`              0=disable Ethernet (use RS232), 1=enable Ethernet

## *Extended NMEA Outputs*

In addition to the sentences in Table 4 the following extended NMEA 0183 outputs are supported by the Virtual AIS Beacon. These all begin with the $PVSP formatter and may be output automatically or in response to a query or command.

### *Table 5 – Extended NMEA Output Sentences*

| Formatter | Description | Queryable |
|-----------|-------------|-----------|
| ATON,CNT | AtoN Count | No |
| ATON,ADDR | Binary Message Address | No |
| ATON,STATS | Transmission Statistics | Yes |
| SYNC | UTC Synchronization Details | Yes |

### *ATON,CNT – AtoN Count*

Reports the active and maximum number of AtoN's currently configured.

Example:       `$PVSP,ATON,CNT,6,10*7F`

Format:        `$PVSP,ATON,CNT,x,x`
       `x`             Count of currently configured AtoN's
       `x`             Maximum number of licensed AtoN's

### *ATON,ADDR –  Binary Message Address*

Reports the the address that will be used by the Virtual AIS Beacon when a base MMSI is configured for broadcasting an addressed binary message.

Example:       `$PVSP,ATON,ADDR,0*1E`

Format:        `$PVSP,ATON,ADDR,xxxxxxxxx`
       `xxxxxxxxx`  MMSI to use as the address

### ATON,STATS – Transmission Statistics

Returns the total transmission count for a given AtoN and the slot count at the last successful transmission.

Example:     `$PVSP,ATON,STATS,512996001,0,0,0,0*4D`

Format:      `$PVSP,ATON,STATS,xxxxxxxxx,x,x,x,x`

| | |
|---|---|
| `xxxxxxxxx` | MMSI |
| `x` | Channel 1 TX count |
| `x` | Channel 1 last TX slot |
| `x` | Channel 2 TX count |
| `x` | Channel 2 last TX slot |

Note: This information together with the SYNC output can be used to determine the exact UTC time of the last transmission on each channel.

This sentence may be queried with $--ANQ,ATON,STATS for all MMSI's or $--ANQ,ATON,STATS,xxxxxxxxx for a single MMSI.


### SYNC – UTC Synchronisation Details

Reports the slot frame to UTC synchronization details for the Virtual AIS Beacon.

Example:     `$PVSP,SYNC,0,0,NONE*08`

Format:      `$PVSP,SYNC,x,x,x`

| | |
|---|---|
| `x` | UTC Hour of frame sync |
| `x` | UTC Minute of frame sync |
| `x` | The slot count at the frame sync. NONE is reported if it is not currently synchronized. |


## AtoN Queries

A query is initiated using the formatter $XXANQ followed by the sentence to be queried. Note XX is ignored by the Virtual AIS Beacon so can be set to the callers preference.

For example to query all the configured marks MMSI details:

`$VMANQ,AID*25`

For a complete summary of the AtoN details query ATON:

`$VMANQ,ATON*7D`

This returns the following sentences: ATON,CNT ATON,ADDR  SYNC followed by the following for each AtoN: AID ACF ACG CBR ATON,STATS

# Technical Information

## System Specifications

| | |
|---|---|
| Access mode | RATDMA or FATDMA |
| Transmission mode | Type 3 AtoN operates in mode A, B or C |
| Radio frequency | 156.025 to 162.025 MHz |
| AtoN marks | Maximum of 65 (dependent on purchased configuration) |
| Message formats | ITU-R M.1371 - Message 6, 8, 12, 14, 21 |
| Number of transmitters | 1 x AIS |
| Number of receivers | 2 AIS / 1 GPS (50 channel with SBAS) |
| AIS receive Sensitivity | -113dBm |
| GPS receiver sensitivity | -142 dBm acquisition.  -159 dBm tracking |
| Power supply | 10-16 VDC. AC/DC isolated power pack 12V, 5A |
| Transmission power output | 41 dbm (12.5W) |
| GPS antenna connector | TNC connector |
| VHF antenna connector | S0239 connector. 50 ohm, max 2:1 VSWR |
| Power connector | 2 pin circular |
| Coms connector | 10 pin circular |
| GPIO connector | 16 pin circular |
| Serial data | 2 x RS232 |
| Operating temperature | -25°C to +55°C (-13°F to 131°F) |
| Water tightness | IP67 |
| Size | 162mm by  122mm by  90mm high - excluding mounting lugs (6.32" x 4.8" x 3.54" high) |
| Power consumption | *Standard model:* 3W nominal, 52W peak (12VDC) *Ethernet model:* 4W nominal, 52W peak (12VDC) |
| GPS antenna | *Construction:* IPx7 sealed enclosure with 10m (32.8 ft) RG58U cable and preinstalled TNC connector. Includes pole (standard 1"x14 marine) and base mount. *Dimensions:* 90mm (3 1/2") diameter x 118mm (4 2/3") height when used with base mount |
| Compliance | * ITU-R M.1371, Technical characteristics for an automatic identification system using time-division multiple access in the VHF maritime mobile band<br>* IEC 62320-5, Automatic Identification Systems (AIS) – Part 2, AIS AtoN Stations – Operational and performance requirements, method of testing and required test results<br>* IEC 61108 - "Maritime navigation and radio communication equipment and systems - Global positioning system performance standards"<br>* IEC 61162 - "Maritime navigation and radio communication equipment and systems - Digital interfaces"<br>*EN 60945 - "Maritime navigation and radio communication equipment and systems - Durability and resistance to environmental conditions"<br>* IALA Recommendation O – 143: On Virtual Aids to Navigation<br>* IALA Recommendation A-126: On The Use of the Automatic Identification System (AIS) in Marine Aids to Navigation Services<br>* NMEA 0183, Standard For Interfacing Marine Electronic Devices |

*Vesper Marine is committed to continuously improving our products. As a result, specifications may change and there may also be differences between the product and this manual.*

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The information contained in this document is to the best of our knowledge correct at the time of publication. However, we reserve the right to change specifications, installation and operating instructions without notice as part of our ongoing product development and improvement programs.

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## *General Warnings*

The Virtual AIS Beacon works in cooperation with other vessels and systems such as AIS transceivers, VHF and GPS. The accuracy of this device and the AIS system can be affected by many factors, including equipment failure or defects, environmental conditions and incorrect installation. Vesper Marine does not warrant that this product is error-free. It is the user's responsibility to exercise common prudence and care when configuring and using the Virtual AIS Beacon.

**Vesper Marine Limited cannot be held liable for any injury, damage or loss caused by, during, or because of the installation, use or inability to use this Virtual AIS Beacon. The Virtual AIS Beacon is to be installed and used entirely at your own risk. By installing and/or using the Virtual AIS Beacon you fully accept this risk and agree to hold Vesper Marine Limited harmless.**

## *Obtaining Warranty Service*

To obtain warranty service, please contact us. If you are unable to contact Vesper Marine directly, then contact the dealer where you purchased the unit.  You must have the original sales receipt.


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**You must contact Vesper Marine and obtain a return authorization before returning equipment for repair.**

## *Declaration of Conformity*

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.

Vesper Marine declares that this product is in compliance with the essential requirements and other provisions of the R&TTE directive 1999/5/EC.

For details and a copy of the Declaration of Conformity see **www.vespermarine.com/compliance**.

This product is for use worldwide, including the following countries:

| AT | BE | BG | CH | CY | CZ | DE | DK | EE | ES |
|----|----|----|----|----|----|----|----|----|----|
| FI | FR | GR | HU | IE | IS | IT | LT | LU | LV |
| MT | NO | NL | PL | PT | RO | SE | SI | SK | UK |

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