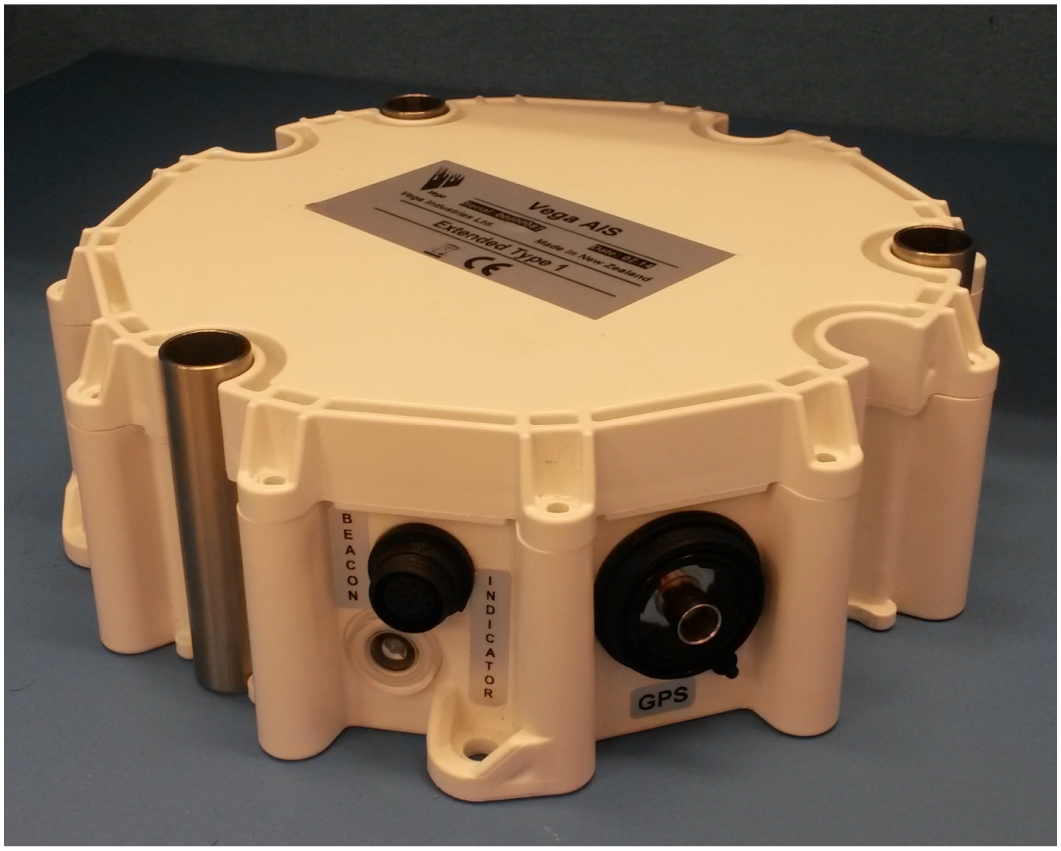
VEGA INDUSTRIES LIMITED

VegaAIS AtoN Station

Installation and Operation Manual



VegaAIS Product Manual	
Available models	VAIS-1S Type 1 Standard Model VAIS-1E Type 1 Extended Model VAIS-3S Type 3 Standard Model VAIS-3E Type 3 Extended Model
Options	Unidirectional Current / Voltage sensor Bidirectional Current / Voltage sensor
Product Version	1
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Manual revision history

Manual Version	Released	Description of Change	Software version	VegaAIS Serial number
1.0.0	Sept 2014	• Pre-release for BSH review		
1.0.1	Dec 2014	• Added voltage reference for power consumption figures		
1.0.2	Dec 2014	• Added Manual Configuration section		
1.0.3	Dec 2014	• Added description of battery protection feature		
1.0.4	Dec 2014	• Initial Release	1.0	21000000+
1.0.5	Jan 2015	• Added General Warning section	1.0	21000000+
1.0.6	Jan 2015	• Add reference to DOC	1.0	21000000+
1.0.7	May 2015	• Added information about external fuses and disconnect devices	1.0	21000000+
1.0.8	June 2015	• Added Type 3 power consumption figures	1.3	21000000+
1.0.9	Aug 2015	• Added Type3 feature descriptions	RC6.0	21000000+
1.0.10	Sept 2015	• Added explanation on MEB sentences	RC6.2	21000000+
1.0.11	Sept 2015	• Added description of SART Message Repeating • Added details on messages 7, 12, 13 and 14	RC6.3	21000000+
1.0.12	Nov 2015	• Added list of European countries where the product is able to be sold (Appendix B).	RC8.0	21000000+
1.0.13	Dec 2015	• Added Wind Gust and WindGustDir to Met/Hydro message. • Revised cable colours in beacon cable and weather station cable	RC9.1	21000036+
1.0.14	Apr 2016	• Added installation drawings	RC10.2	21000037+

Caution: This device generates potentially harmful levels of radio frequency radiation. Please read section 1.1.5 General Warnings before operating this device.

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Product Warranty
Vega warrants that all products supplied are free from labour and material defects, and will repair or replace (at its option) the whole or any part of the products found to be faulty. The standard warranty is valid for 12 months from the date of dispatch. Vega is not to be liable for any charge beyond the point of delivery, including installation, alignment or testing. To claim under warranty the product must be returned to the Vega factory in New Zealand at the users expense.

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SECTION 1 OVERVIEW OF THE VEGA AIS ATON STATION

1.1 Introduction

The VegaAIS AtoN Station is a Type 1 or Type 3 AIS AtoN Station as described in IALA A-126 Edition 1.5, June 2011. The VegaAIS AtoN Station will broadcast information about the location and operation of the Aid to Navigation to vessels and base stations receiving AIS messages.

The VegaAIS unit can also transmit AtoN monitoring information and also relay Meteorological / Hydrographic information as part of the overall AIS system.

1.1.1 Model Range

The following model range is available:

Model	Description
Type 1 Standard Model	Transmit only, FATDMA, no extended I/O
Type 1 Extended Model	Transmit only, FATDMA, extended I/O
Type 3 Standard Model	Transmit and Receive, FATDMA and RATDMA, no extended I/O
Type 3 Extended Model	Transmit and Receive, FATDMA and RATDMA, extended I/O

The extended inputs supported by the Extended models are:

- eight isolated digital inputs
- two isolated analogue inputs
- three additional inputs (optionally isolated) for RACON presence and failure monitoring

1.1.2 Additional Factory Options

Additional Factory options for the VegaAIS AtoN Station:

- Unidirectional Current / Voltage Sensor
- Bidirectional Current / Voltage Sensor

These options are described more fully later in this manual.

1.1.3 Approvals & Certification

The VegaAIS type 1 unit has been tested to IEC 62320-2 by German Federal Maritime and Hydrographic Agency BSH. Certificate number: **BSH/4542/002/4322515/15**.

The VegaAIS type 3 unit has also been tested to IEC 62320-2 by BSH. Certificate number: **BSH/4542/002/4322971/15**.

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

See Appendix B Declaration of Conformance for copies of the Declaration of Conformance for both the Type 1 and Type 3 units.

1.1.4 Quality Assurance

All manufacture and assembly is performed under ISO9001 certification.

1.1.5 General Warnings

RF Emissions:

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 can

result in product malfunction and / or exposure to potentially harmful levels of radio frequency radiation.

Caution: Never operate this device unless it is connected to a VHF antenna.

The system has a Maximum Permissible Exposure (MPE) radius of 1m from the antenna. This has been determined assuming the maximum power of the transponder and using a standard 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,

- 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 antenna should not be collocated or operated in conjunction with any other transmitting antenna.

1.2 Supported AIS Messages

The VegaAIS AtoN Station supports the following messages as defined in ITU-R M.1371-4:

- Message 21 - Aids-to-Navigation report
- Message 6 - Addressed binary message
- Message 7 - Acknowledgement of addressed binary message (message 6)
- Message 8 - Binary broadcast message
- Message 12 - Addressed safety related message
- Message 13 - Acknowledgement of safety related message
- Message 14 - Safety related broadcast message

Message 21 is the primary message for AIS AtoN systems; it is the standardised AtoN status message. The VegaAIS unit complies with the message 21 definition as described in the ITU-R specification above and the IALA Recommendation A-126 Ed 1.5.

The VegaAIS unit can also transmit monitoring data, either addressed (message 6) or broadcast (message 8). Two data formats are currently supported, a proprietary format used to log data to the VegaWeb server, and the IALA GLA format as described in Annex C, Table 4 of the IALA A-126 Recommendation.

The VegaAIS unit can also transmit Meteorological / Hydrographic data. This data is only transmitted as a broadcast message (message 8) and the data format conforms to the IMO SN.1/Circ.289 (2 June 2010) Table 1.1 recommendation.

The safety related messages (messages 12 and 14) are not normally generated by the VegaAIS unit; these are repeated if the SART repeat function is enabled.

Messages 7 and 13 are acknowledgements for addressed binary messages sent to the VegaAIS unit. The automatic acknowledgement can be switched off and on via the configuration.

All the binary messages (messages 6, 8, 12 and 14) may be generated using the NMEA MEB sentence. See Appendix C VEGAAIS MANUAL CONFIGURATION SENTENCES for details on sending messages via MEB sentences.

1.2.1 Aids-to-Navigation Report

As described above, the Aids-to-navigation report complies with the message 21 definition in ITU-R M.1371-4 and IALA Recommendation A-126 Ed 1.5.

The AtoN status bits in message 21 may be generated in a number of ways:

- Fixed status bits
- Light on/off determined from digital input
- Light on/off determined from serial signal (Vega beacons only)
- Light on/off determined by beacon current
- Light ok/fail determined by digital input
- Light ok/fail determined by serial signal (Vega beacons only)
- Light ok/fail determined by light detected off when it should be on
- RACON presence determined from digital input
- RACON failure determined from digital input

These options can be selected using the VegaAIS Configuration Tool. AtoN and RACON status monitoring is more fully described in SECTION 4 ATON AND RACON STATUS MONITORING.

1.2.2 Monitoring Report

Monitoring reports are described in SECTION 5 MONITORING REPORTS.

1.2.3 Meteorological / Hydrographic Report

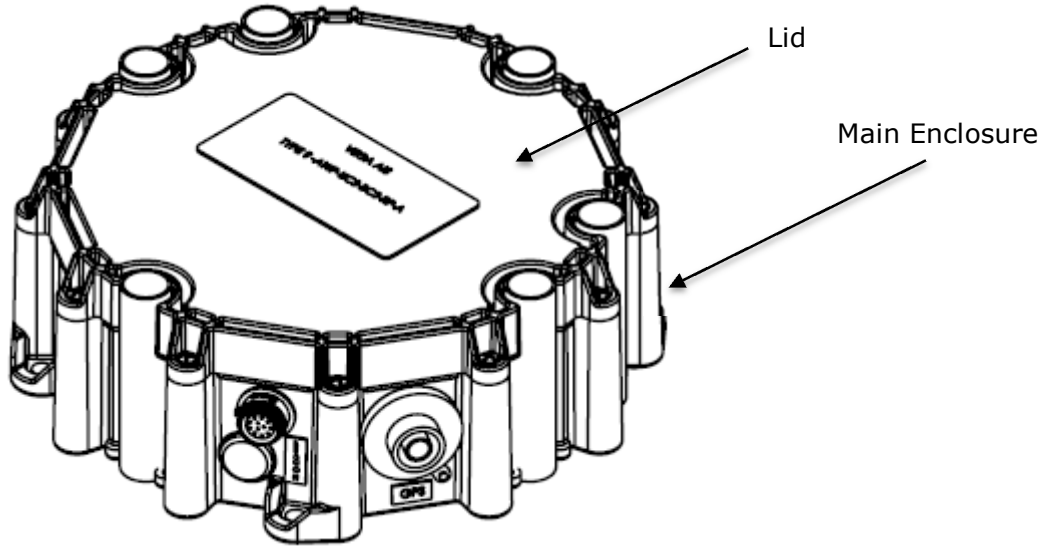
Meteorological/Hydrographic reports are described in SECTION 6 METEOROLOGICAL / HYDROGRAPHIC REPORTS.

1.3 Mechanical Description

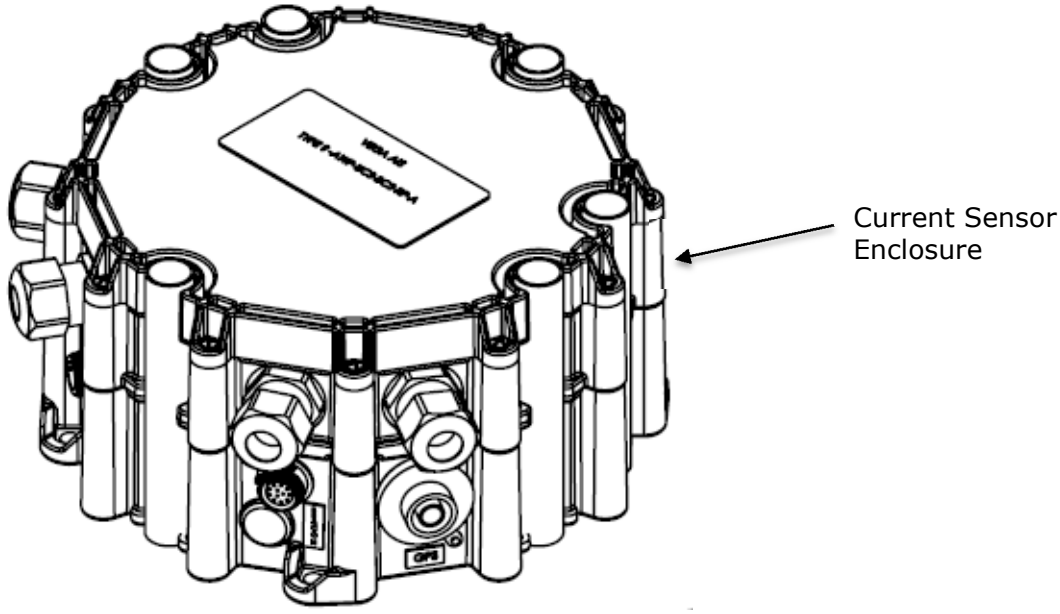
1.3.1 Construction

The standard VegaAIS unit is shown below. Where the current sensor option is required, another enclosure is sandwiched between the main enclosure and the lid.

The main enclosure which is common to all models houses the AIS engine including VHF transmitter and receiver (type3 units only) as well as the AtoN monitoring electronics. This unit is not user serviceable and, to minimise the risk of compromising the sealing, should not be opened.



The current sensor unit is mounted on top of the main unit and houses the screw connections for the current sensor(s) as well as the glands for passing cables in and out of this unit.



The lid fits onto either the main unit or the current sensor unit depending on whether the current sensor unit is fitted. The lid is assembled using self-tapping fasteners into the enclosure. Take care not to over torque these screws when assembling the lid.

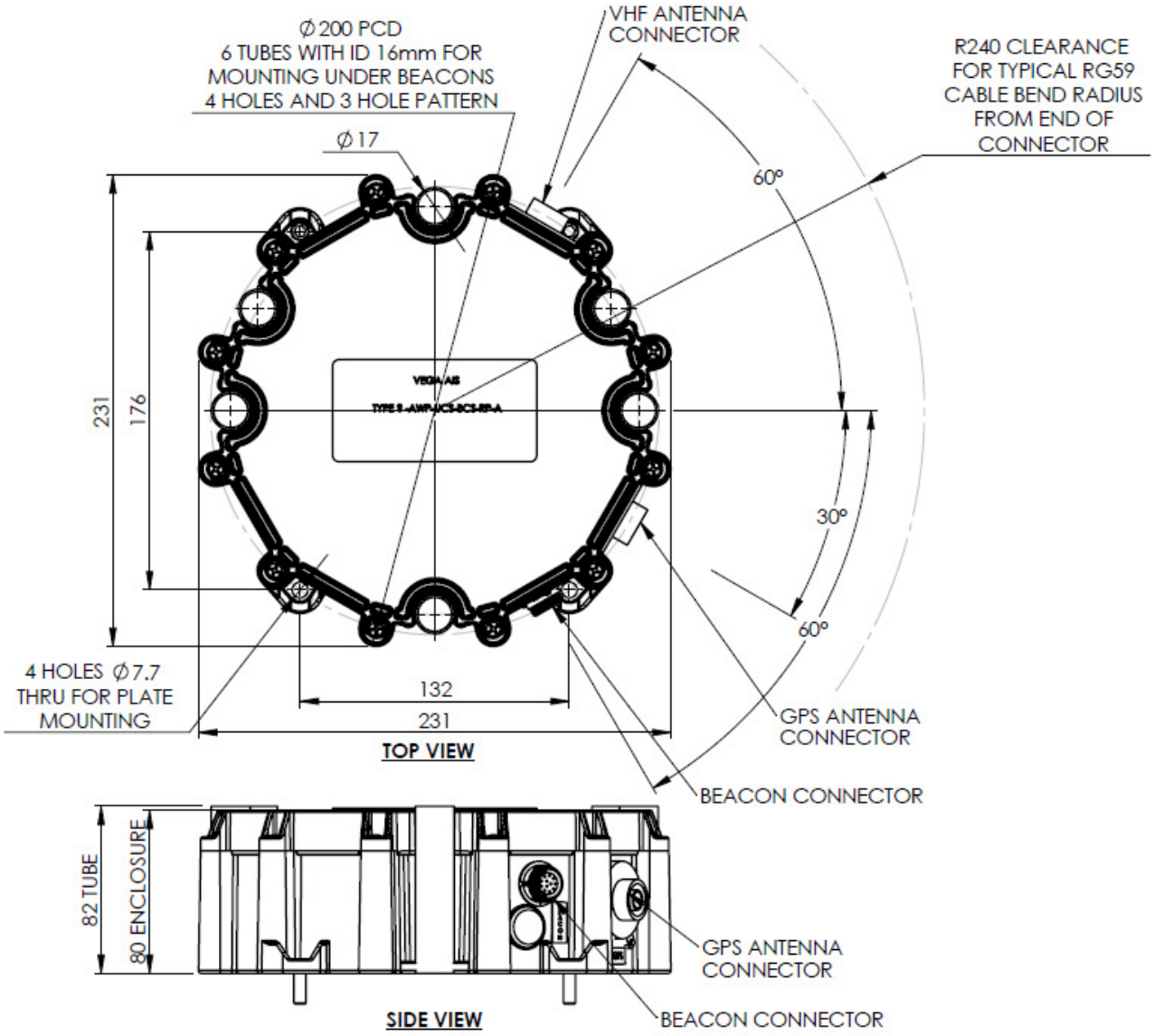
1.3.2 Sealing

The VegaAIS unit is sealed to the IP68 standard against the ingress of moisture, dust, insects and other environmental contaminants. Because the VegaAIS unit does not need to be opened for configuration, these seals can remain undisturbed for extended periods. If the current sensor unit is opened to connect the current sensor terminals, do not let any water accumulate in this compartment and take care to ensure the sealing O ring is correctly located in its O ring groove when reassembling.

1.3.3 Installation

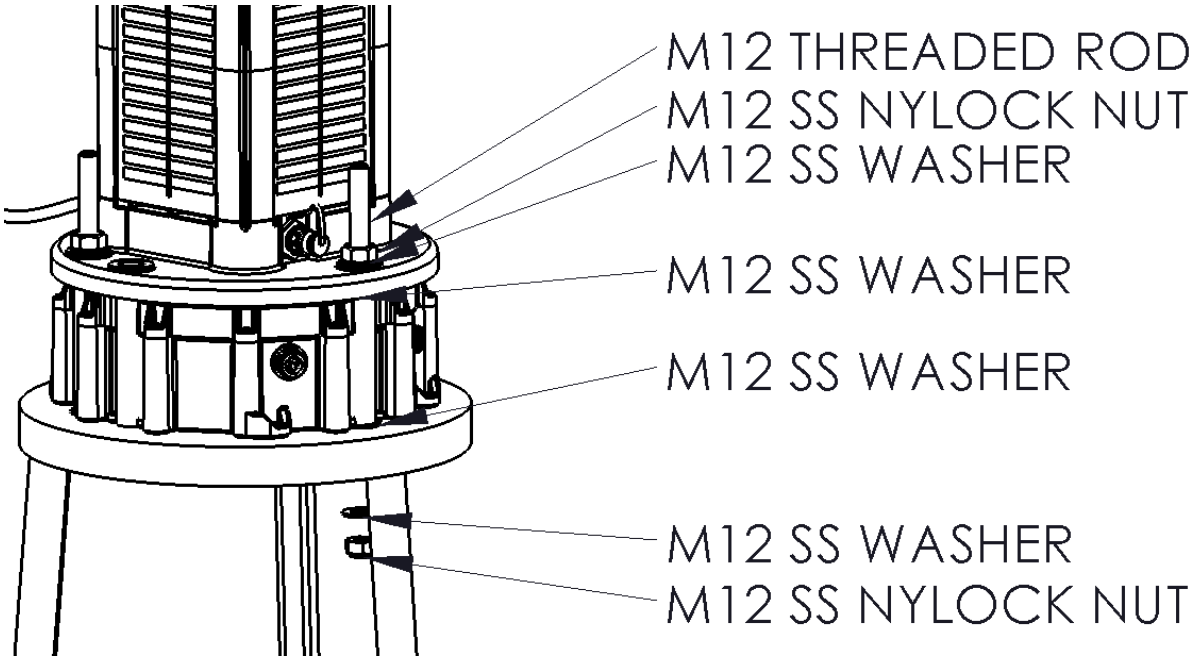
The VegaAIS unit may be mounted under an AtoN using a three or four hole mount on a 200mm PCD. Alternately the VegaAIS unit may be mounted using the four mounting lugs on the base of the main enclosure.

Installation details are shown below.

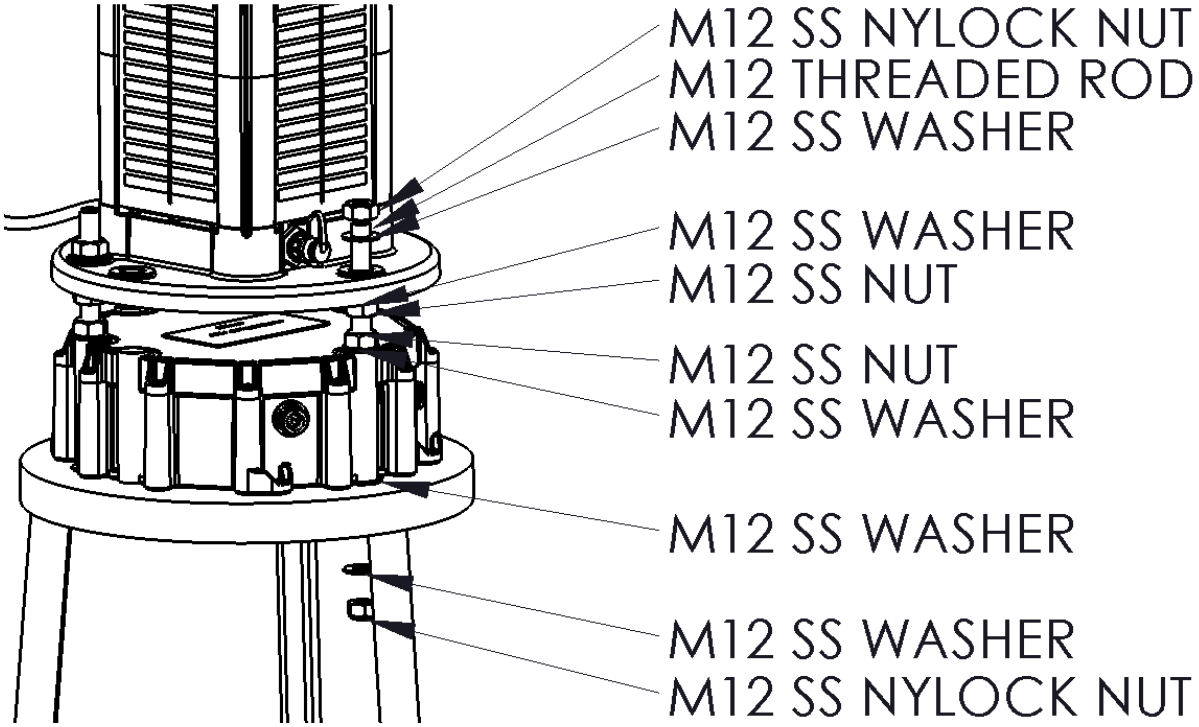


If an AtoN is mounted on top of the VegaAIS unit, the stainless steel anti-crush tubes must be fitted to prevent the VegaAIS unit from bearing the weight of the AtoN. As can be seen in the schematic above, these tubes sit proud of the top of the enclosure and therefore bear the weight and clamping forces of the AtoN.

There are two possibilities for mounting the VegaAIS under an AtoN. Where the AtoN is not required to be levelled, e.g. a buoy mounted unit, the AtoN can sit on top of the VegaAIS unit, as shown below:



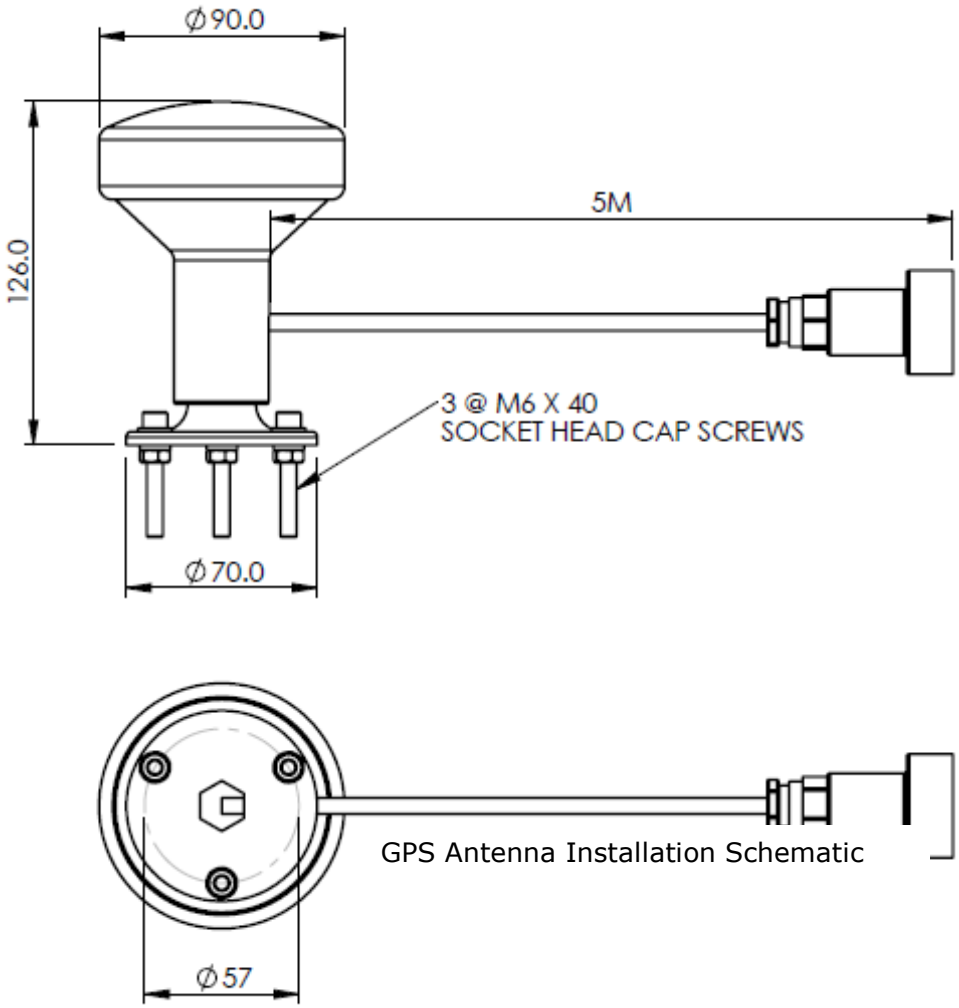
If the AtoN does need to be levelled, the AtoN can be mounted above the VegAIS unit on the threaded rod provided. The AtoN base is clamped between two M12 nuts and therefore the level may be adjusted by altering the position of these nuts.



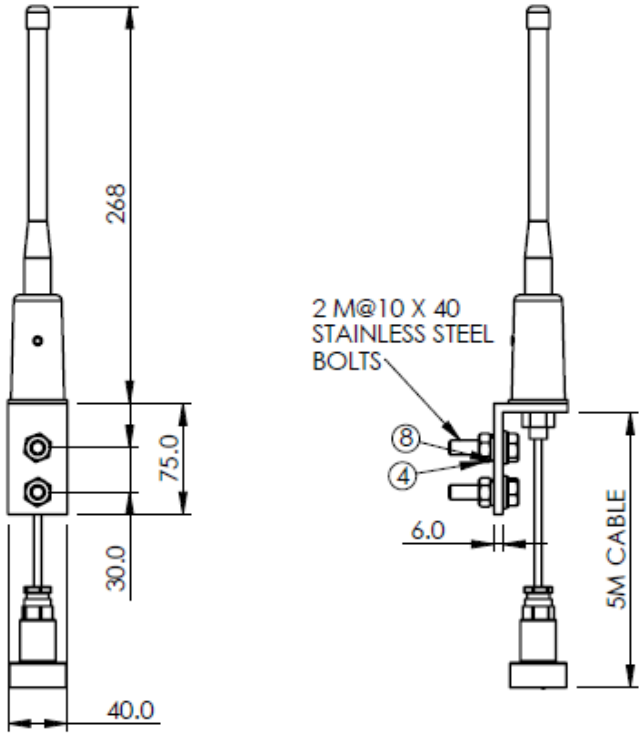
The stainless steel threaded rod supplied is sized for the second installation (with level adjustment). If the AtoN is to be directly mounted on top of the VegaAIS unit, some excess length may need to be removed from the threaded rod.

The VegaAIS unit is supplied with both a GPS and a VHF antenna – installation schematics shown below. These may be mounted on any convenient mounting point with the following provisions.

- The GPS antenna must be mounted such that it has a clear view of the sky. Any obstruction of this view will diminish the performance of the GPS antenna.
- The VHF antenna should be mounted as high as possible and as far away as possible from any metallic structure that may interfere with transmission and reception.
- Both antennas should be mounted with the main axis of the antenna vertical.



GPS Antenna Installation Schematic



VHF Antenna Installation Schematic

Both the GPS and VHF antennas are potted at the antenna and use an IP67 connector to connect to the VegaAIS unit. The connection locations are shown on the VegaAIS installation schematic – these connection locations are also labelled on the VegaAIS unit. Furthermore, the polarities of these two connectors are reversed meaning that it is impossible to connect either antenna to the wrong location.

The other electrical connections are described in the Electrical section below.

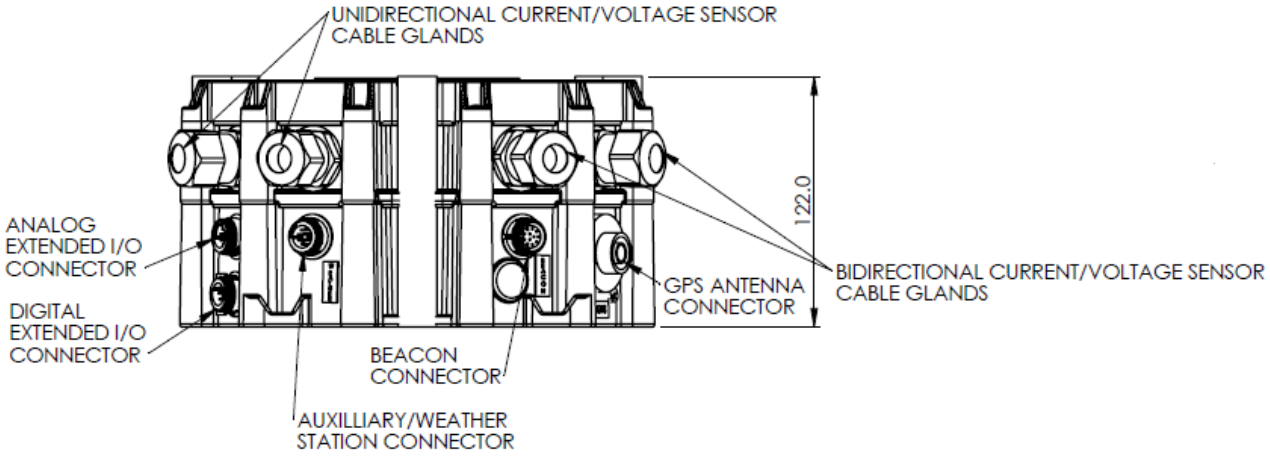
1.4 Electrical

1.4.1 Electrical Connections

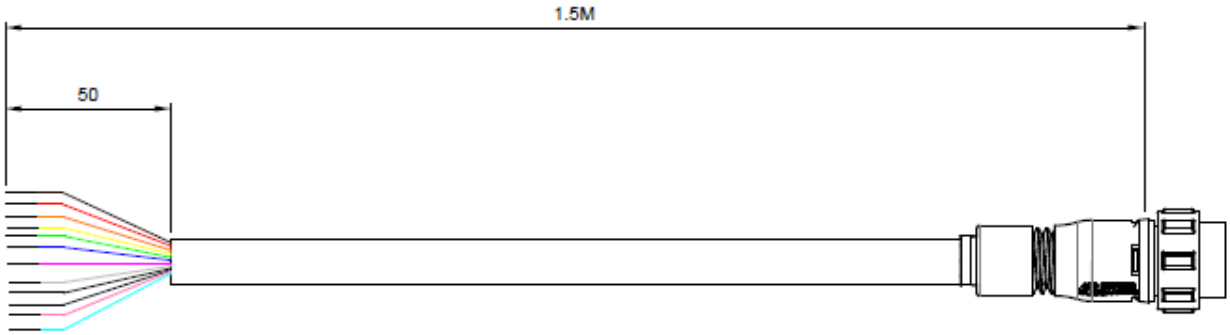
The number of electrical connections will depend on the VegaAIS model and options selected.

All units will have a RF antenna and a GPS antenna connection. The installation of these antennas and their electrical connections are detailed in the Installation section above.

There are four other possible connectors on the main VegaAIS unit; these are called the Beacon Connector, the Weather Station Connector, the Analogue Extended I/O Connector and the Digital Extended I/O Connector. The position of these connectors is shown on the schematic below.



All connectors are labelled on the VegaAIS unit and all connectors have different pin counts and polarity to ensure they cannot be incorrectly connected. Cables are supplied for all installed connections. The supplied cables are 1.5m long with unterminated ends - as shown below.



All units will have at least the Beacon Connector as this contains the serial interface for the configuration tool. The pinout for the Beacon Connector is shown below.

Pin	Colour	Description
1	Red	Positive Supply
2	Black	Ground
3	Orange or Red/Blue	No connection
4	Violet	RS232 Rx – for config tool or connection to Vega smart beacon
5	Yellow	RS232 Tx – for config tool or connection to Vega smart beacon
6	Green	Sync connection
7	Brown	No connection
8	Grey	AtoN on digital input

9	White	AtoN fail digital input
10	Blue	No connection
11	Cyan or Grey/Pink	No connection
12	Pink	No connection

Beacon Cable Pinout

The Extended models will also be supplied with the Analogue Extended I/O Connector and the Digital Extended I/O Connector and cables. The pinouts for these cables is given below.

Pin	Colour	Description
1	Red	Positive Supply
2	Black	Ground
3	Orange	No connection
4	Yellow	RACON fail digital input
5	Green	RACON presence digital input
6	Blue	RACON common
7	Violet	Isolated ADC B negative
8	Grey	Isolated ADC B positive
9	Brown	Isolated ADC A negative
10	Pink	Isolated ADC A positive

Analogue Extended I/O Cable Pinout

Note that the Analogue Extended I/O connector includes the RACON inputs. Therefore, if the RACON port option is selected for a VegaAIS standard mode, this connector will be fitted.

Pin	Colour	Description
1	Brown	Isolated digital input #1
2	Red	Isolated digital input #2
3	Orange	Isolated digital input #3
4	Yellow	Isolated digital input #4
5	Green	Common
6	Blue	Common
7	Violet	Isolated digital input #5
8	Grey	Isolated digital input #6
9	White	Isolated digital input #7
10	Black	Isolated digital input #8

Digital Extended I/O Cable Pinout

If the Weather Station Port option is required then the Weather Station connection and cable will be supplied. The pinout for this cable is given below.

Pin	Colour	Description
1	Red	Positive Supply
2	Black	Ground
3		No connection
4	Violet	RS232 Rx – for weather station comms
5	Yellow	RS232 Tx – for weather station comms
6	Green	Sync connection
7	Blue	RS232 ground
8		No connection
9	White	RS485-B
10	Brown	RS485-A
11	Pink	RS422-A
12	Cyan or	RS422-B

	Grey/Pink	

Weather Station Cable Pinout

These connections are described below:

1.4.1.1 Power Supply / Ground
This input provides power for the VegaAIS unit. Voltage range: 10 – 36VDC. Max current: 2A.

The VegaAIS unit can be powered from the Beacon Connector, the Analogue Extended I/O Connector, the Weather Station Connector or the Unidirectional Current sensor. The VegaAIS unit will automatically switch between these inputs depending on which input is powered.

Do not connect directly to a battery or power supply - an external fuse **must** be fitted between the battery/power supply and the VegaAIS unit.

When powering the VegaAIS unit via the Beacon connector, the Analogue Extended I/O connector or the Weather Station connector, this fuse should be 2.5A. If it is required to disconnect the VegaAIS unit from the supply, just disconnect the appropriate connector that is supplying the power. If more than one connector is supplying power (e.g. a backup supply) then remove all connectors supplying power to the VegaAIS unit. If necessary, mark the cables to be disconnected to completely disconnect the supply so it may be done by an untrained operator.

When powering the VegaAIS unit via the unidirectional current sensor, the value of the fuse depends on the load being powered from the unidirectional current sensor. This fuse should never exceed 40A.

When powering the VegaAIS unit via the unidirectional current sensor, a readily accessible disconnect device should be incorporated in the external power supply so that the VegaAIS unit may be disconnected when required.

1.4.1.2 Beacon Connector RS232 Rx and Tx
This is the RS232 connection used for VegaAIS configuration and (optionally) for communications with a Vega smart beacon. Baud rate 38400bps, 8 bits data, no parity, one stop bit.

1.4.1.3 Sync Connection
This output provides a GPS sync pulse for flash synchronisation of AtoNs. The active sync pulse can be configured to be high or low. Flash character length is also configurable.

1.4.1.4 AtoN On Digital Input
This input can be used to indicate if the AtoN is on or off for use in the Message 21 AtoN Status byte. This input has a configurable pull-up or pull-down resistor. The active polarity is also configurable. Active polarity in this case means the polarity when the AtoN is on.

1.4.1.5 AtoN Fail Digital Input
This input can be used to indicate if the AtoN has failed for use in the Message 21 AtoN Status byte. This input has a configurable pull-up or pull-down resistor. The active polarity is also configurable. Active polarity in this case means the polarity when the AtoN has failed.

1.4.1.6 RACON Fail Digital Input
This input can be used to indicate if the RACON has failed for use in the Message 21 AtoN Status byte. This input has a configurable pull-up or pull-down resistor. The active polarity is also configurable. Active polarity in this case means the polarity when the RACON has failed.

1.4.1.7 RACON Present Digital Input
This input can be used to indicate if a RACON is present or not for use in the Message 21 AtoN Status byte. This input has a configurable pull-up or pull-down resistor. The active polarity is also configurable. Active polarity in this case means the polarity when the RACON is present.

1.4.1.8 Isolated ADC Inputs (A & B)

These are two isolated, differential analogue inputs. Input range 0 – 36VDC. 12 bit ADC.

1.4.1.9 Isolated Digital Inputs (1-8)

These are eight isolated digital inputs referenced to an isolated common. These may be individually configured to be a current source or sink.

1.4.1.10 Boot Input

This pin is used when reprogramming the VegaAIS unit in bootstrap mode. Not currently supported. This input must be left unconnected.

1.4.1.11 Weather Station Connector RS232 Rx and Tx

This is the RS232 connection used for Weather Station communications. Baud rate 38400bps, 8 bits data, no parity, one stop bit.

1.4.1.12 Weather Station Connector RS485-A, RS485-B

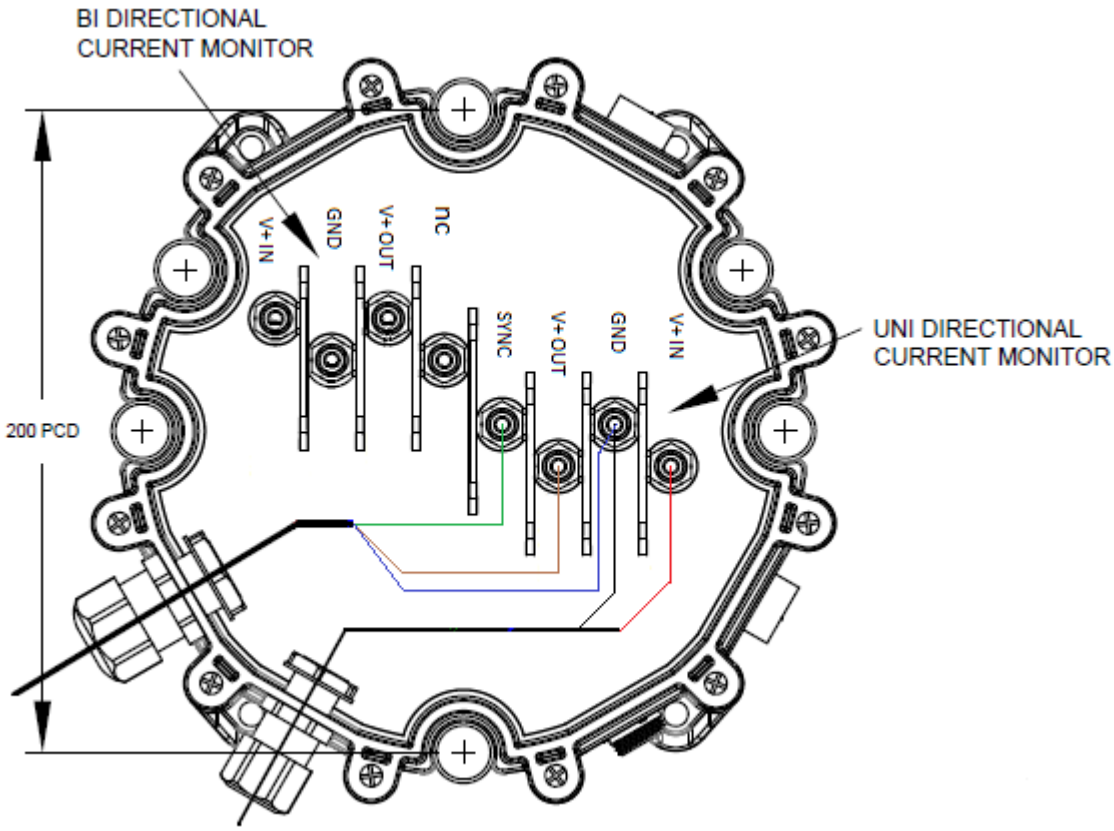
This is the RS485 connection used for Weather Station communications. Baud rate 38400bps, 8 bits data, no parity, one stop bit.

1.4.1.13 Weather Station Connector RS422-A, RS422-B

This is the RS422 connection used for Weather Station communications. Baud rate 38400bps, 8 bits data, no parity, one stop bit.

1.4.2 Current Sensor Connections

If the optional current sensor unit is fitted, then removing the VegaAIS lid will expose the current sensor terminals as shown below.



The diagram above shows the wiring where only the unidirectional current sensor is fitted and is used to measure beacon current. Power is brought in through one gland (red and black wires) and

out to the beacon through the other (brown, blue and green). Many other combinations are possible using up to four glands to route cables.

The current sensors are high side current sensors. Each current sensor has the following connections:

Stud	Description
V+ IN	Positive supply in
GND	Ground
V+ OUT	Positive supply out
SYNC	Sync connection – see 1.4.1.3 [only uni-directional sensor]

The current sensor connections are M5 studs intended for ring crimp terminals. Two cable glands sizes are available: M16: cable sizes 4.5-9mm OD, M20: cable sizes 7.5-13.2mm OD. Up to four glands can be fitted as required.

Whether using the uni-directional or bi-directional current sensor, a fuse must be fitted between the battery and the current sensor connection. The value of the fuse will depend on the expected current but should not exceed 40A.

1.5 Power Consumption

The VegaAIS AtoN Station is intended to be deployed on solar powered installations. As such it has been designed to minimise power consumption as far as possible.

The actual power consumption achieved will depend on a number of factors including message transmission rate, number of messages supported, quality of GPS signal, weather station support and monitoring configuration.

The VegaAIS unit is designed to spend as much time as possible in a low power sleep state. It only wakes up when it has some task to perform – for example sending a message. Therefore high message transmission rates and/or a high number of messages will increase power consumption.

The VegaAIS system needs to achieve a GPS lock prior to each transmission. If the GPS antenna is unable to get a clear view of the sky, the time taken to achieve GPS lock will take longer and the VegaAIS unit will spend more time on than it would otherwise need to – increasing power consumption.

The VegaAIS unit periodically samples its inputs to provide data for Message 21 and monitoring reports. Normally the sample time is very brief and does not have a big impact on power consumption. However, if the unit is configured to measure beacon current on a flashing beacon, the sample period needs to be as long as the flash character. This will increase the power consumption.

If the VegaAIS unit is configured to communicate with a weather station, it will wake up periodically to sample the inputs from that weather station. This will increase power consumption.

Type 3 units will consume more power as they have RF receivers and need to be awake a lot more of the time to receive incoming message to maintain their AIS slot map.

1.5.1 Type 1 VegaAIS

For a basic type 1 configuration, transmitting Message 21 every three minutes on alternating channels (IALA A-126 Mode A) with the basic monitoring requirement, the power consumption is less than 0.2 Ah/day.

Note – the power consumption figure assumes an input voltage of 12VDC.

1.5.2 Type 3 VegaAIS

The Type 3 VegaAIS unit can run in one of two different power modes: normal mode or low power mode. If possible the unit will try to run in low power mode, however under some conditions (e.g. when repeating SART messages), then the unit has to run in normal mode.

The power consumption for both these modes is:

- Normal mode < 3.4 Ah/day
- Low power mode < 1.35 Ah/day

This assumes a basic type 3 configuration transmitting Message 21 every three minutes in RATDMA mode on alternating channels (IALA A-126 Mode A) with the basic monitoring requirement, input voltage of 12VDC and a 5% VDL load.

If the VegaAIS unit is configured to transmit in FATDMA mode, the power consumption under the same conditions is 0.33 Ah/day @12VDC.

1.5.3 Battery Protection Feature

The VegaAIS unit has an optional battery protection feature that prevents batteries from being damaged by over discharging. If the battery voltage falls below a configurable level, the VegaAIS unit will go into a low power state. Normal operation will not be resumed until the battery voltage has risen above another configurable level.

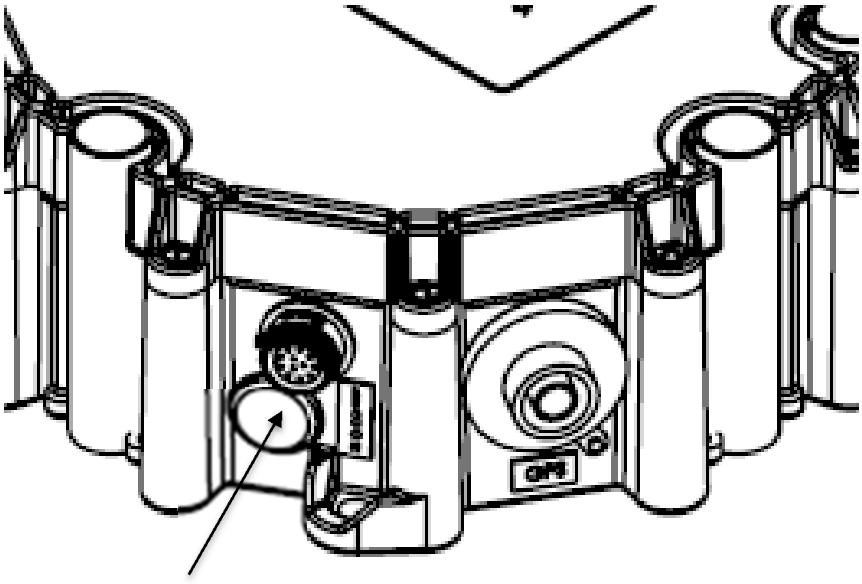
In the low power state the VegaAIS unit stops transmitting all messages and also shuts down or minimises all other tasks so as to draw as little power as possible.

The configurable battery cut-off and recovery levels are set using the VegaAIS Configuration tool or via the proprietary HWCFG sentence – see section Appendix C VEGAAIS MANUAL CONFIGURATION SENTENCES.

This feature can be disabled by setting the battery cut-off level to zero.

1.6 Error Code Reporting

The VegaAIS AtoN Station is fitted with an indicator LED just underneath the Beacon Connector that is used to indicate the state of the unit.



Under normal circumstances the VegaAIS unit the LED indicator will briefly flash green once per minute. The low flash rate is chosen to minimise power consumption.

If an error condition has been recorded the VegaAIS unit will flash out one or more error codes once per minute. These will be flashed in red.

The error codes are three digit flash codes. The number of flashes indicate the digit (e.g. 2 flashes = 2, 8 flashes = 8). Zero is indicated by one long flash. Each digit is separated by a pause. If more than one error code is present, there will be a longer pause between each error code.

For example, the error code 102 will be flashed out as follows:

One short flash (1), short pause, one long flash (0), pause, two short flashes (2)

The error codes reported by the VegaAIS unit are:

Error Code	Fault
100	Configuration Error
101	Accelerometer Error
102	Lost communications with Vega smart beacon
103	Inferred night error
104	AIS Rx error
105	AIS Tx error
106	GPS error
107	AIS self-test error
108	GPS position error
109	ADC error
110	Not used
111	Low battery error

SECTION 2 CONFIGURATION

2.1 VegaAIS Configuration Tool Introduction

Each VegaAIS AtoN Station is supplied with a configuration tool for setting up the operational parameters of the VegaAIS unit. This tool is a Windows application and requires Windows XP or later operating system.

The Configuration tool communicates to the VegaAIS unit over a RS232 serial connection and therefore a serial cable or USB to serial adapter is required.

2.1.1 Installation

Insert the VegaAIS Configuration Tool installation CD into your computer's CD/DVD drive. The installer will start automatically. Follow the prompts until the tool is installed.

If the installer does not automatically start when you insert the CD, the installer can be automatically started by clicking on the setup.exe file on the CD.

The VegaAIS Configuration Tool will be installed under Vega Industries in the Program Files folder. The application is called VegaAIS Configuration Tool.

2.1.2 Default Configuration

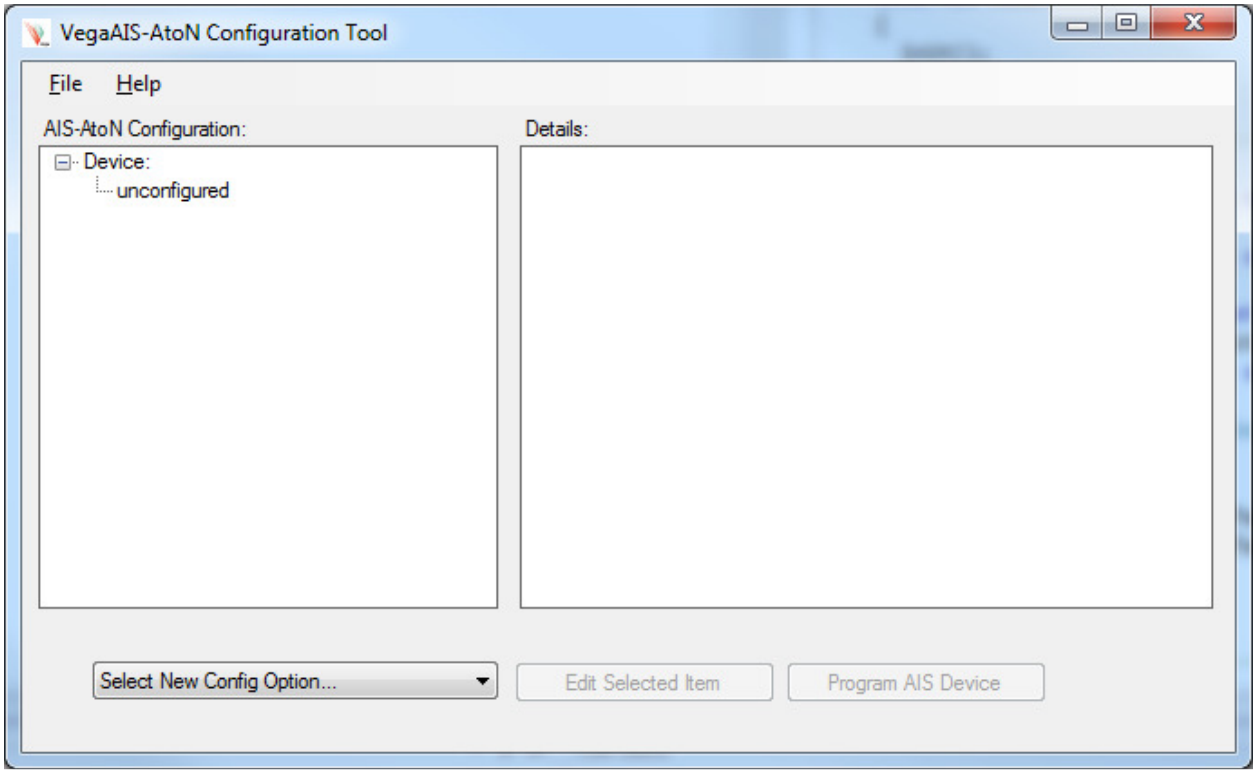
The VegaAIS AtoN Station as supplied from Vega will have a default configuration. This will have no AIS messages defined and therefore will not do anything meaningful until it is configured.

2.1.3 Connection to VegaAIS Unit

In order to read or write a configuration to/from the VegaAIS unit, the configuration tool must be connected via a serial connection (or USB to serial adapter) to the RS232 connection on the Beacon connector. Please see section
Electrical Connections for details on the electrical connection.

2.2 Configuration Tool Instructions

When the Configuration Tool is first started it will display an empty configuration.



The pane on the left hand side displays a tree structure. When a configuration is built up this will show the MMSIs, messages and features defined by the configuration.

The pane on the right hand side shows the details of the configuration item that has been selected in the left hand pane.

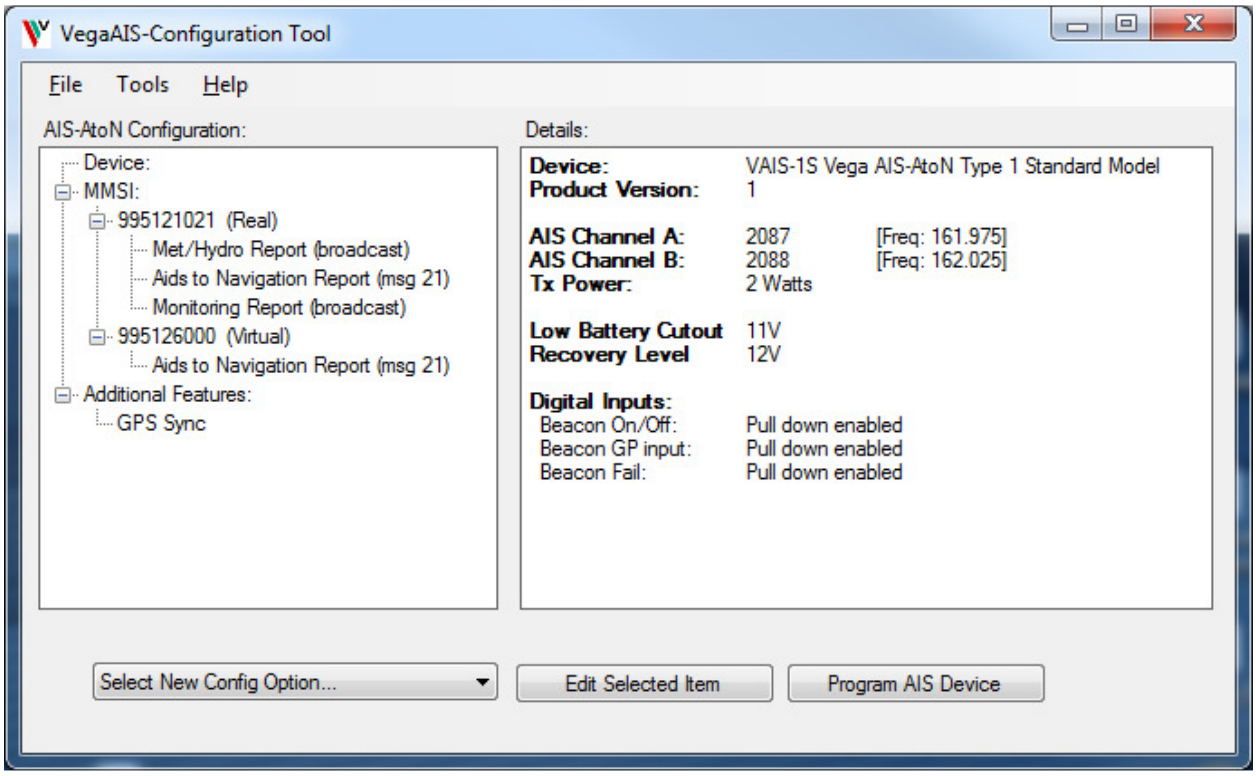
2.2.1 Creating a Configuration

There are four methods for creating a configuration, these are detailed below.

2.2.1.1 Load Configuration from File

Once a configuration has been created, it can be saved to a file. This configuration can be subsequently reloaded by selecting File->Load Configuration or the “Load Configuration from File” option from the New Config Option drop down list.

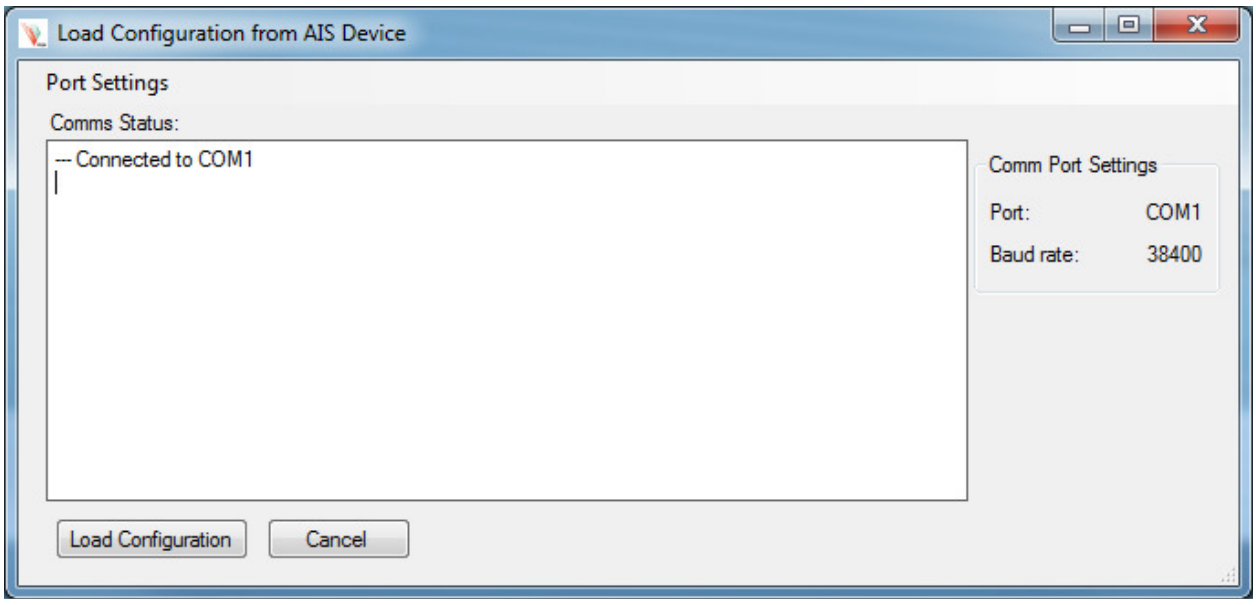
Once loaded, a complete configuration will look something like this:



This configuration can then be edited or programmed to a device.

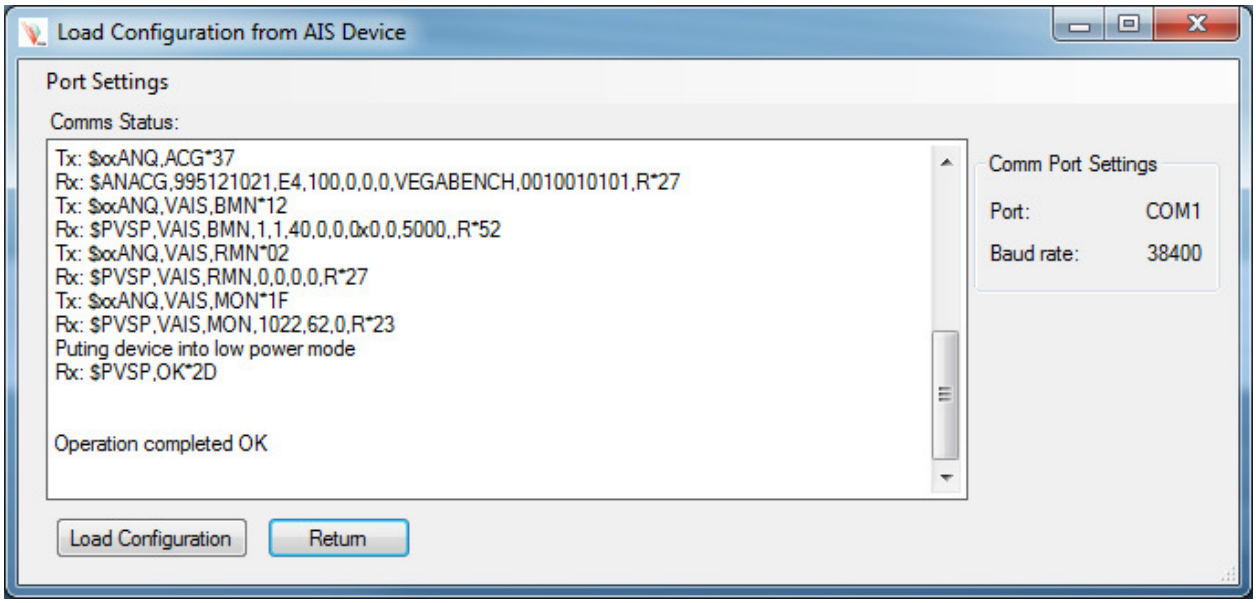
2.2.1.2 Load Configuration from VegaAIS Device

If the configuration tool is connected to a VegaAIS device as described in section 2.1.3, the configuration can be read from that device. Select the “Load Config from Device” option from the New Config option drop down list. This opens the Load Configuration window.



The com port can be changed in the Port Settings menu. Leave the baud rate set at 38400bps unless you have good reason for changing it. Once the correct port is selected and the status indicates a successful connection, clicking the “Load Configuration” button will start the loading of the configuration.

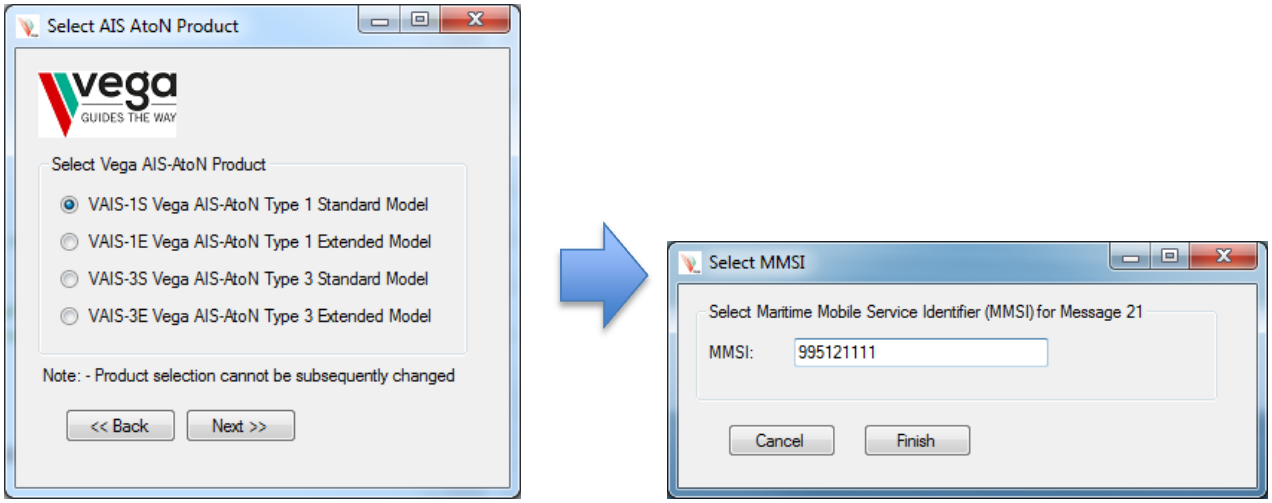
Once the configuration is successfully loaded (as shown below), click “Return” to return to the main screen.



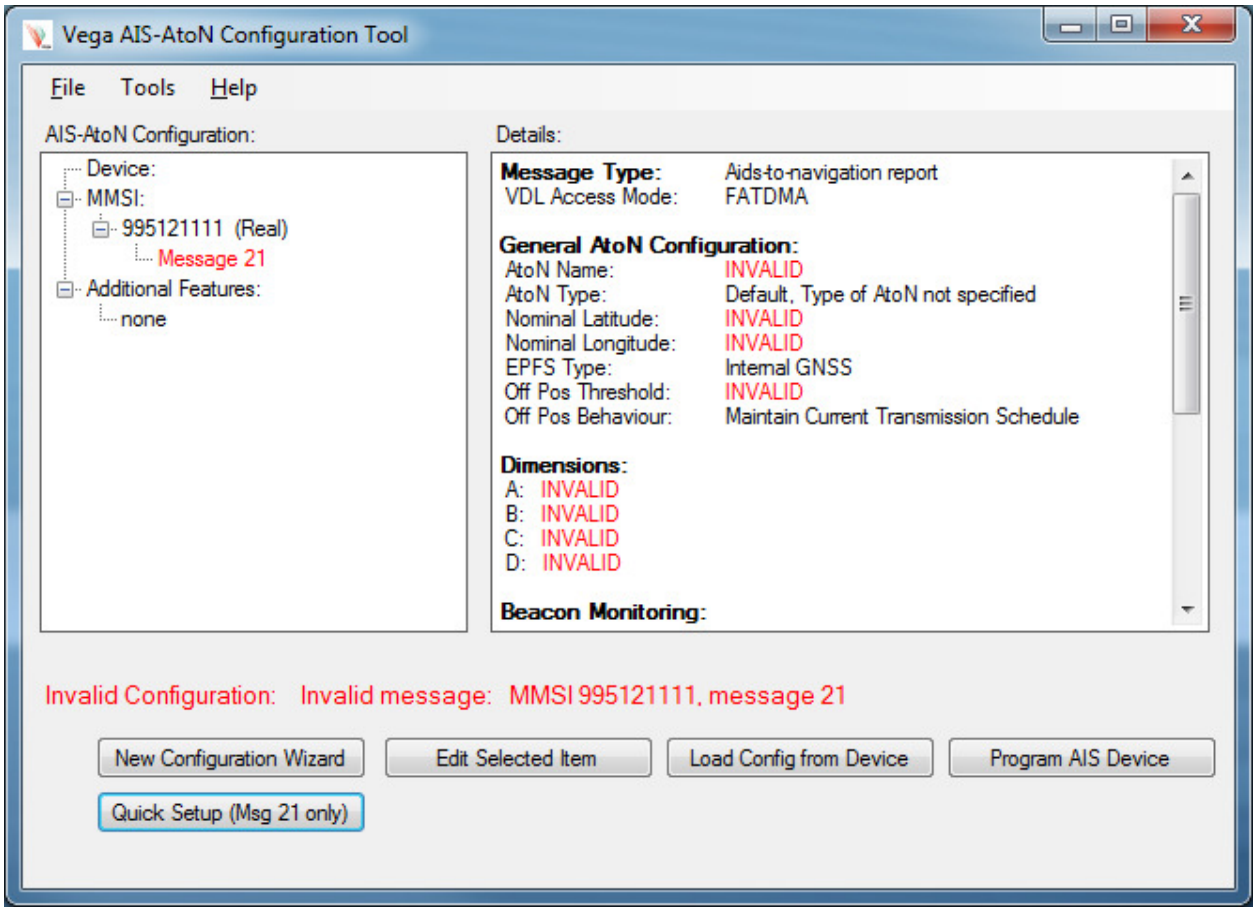
2.2.1.3 Load from Template (Quick Setup)

This option is selected by selecting one of the template options in the New Config option drop down list. These options create a configuration with a single MMSI and a single message 21. The majority of the settings are set to common default values.

The advantage of this approach is that a configuration can be created with the minimum of input from the user. The only settings required are the device type and the MMSI.



The configuration created is only a framework and it requires subsequent editing to fill in the details of the configuration. For this reason some of the message 21 details are deliberately set to invalid values as a prompt to update these values.

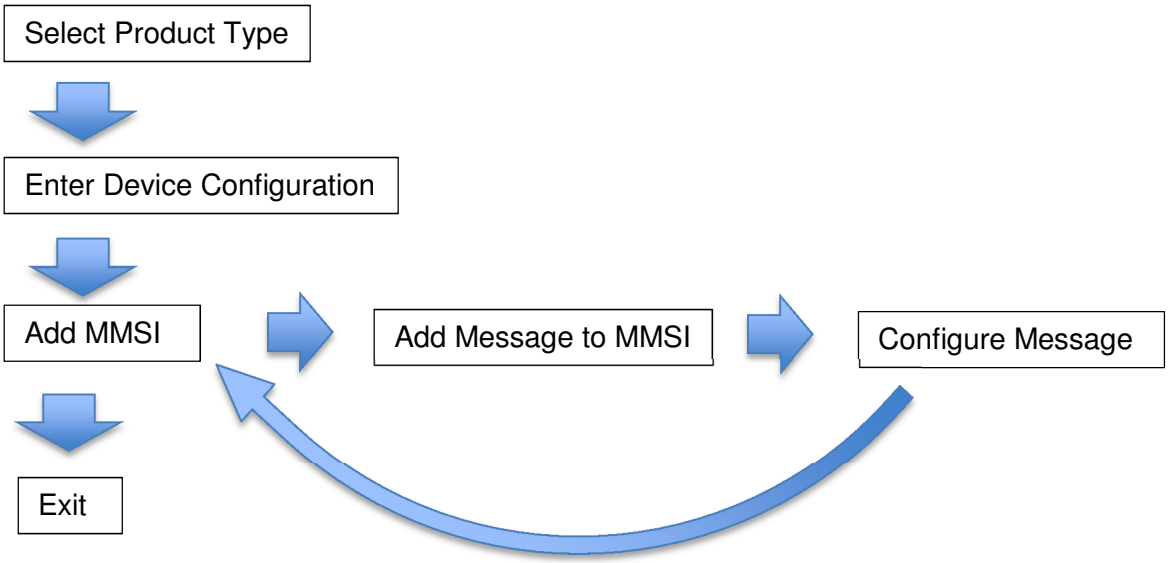


Note the error messages and invalid settings. It is important to check all settings – not just the ones highlighted by the error messages. Click on each tree node in the left hand pane and confirm the details in the right hand pane.

Editing settings is described in section 2.2.2.

2.2.1.4 Create New Configuration

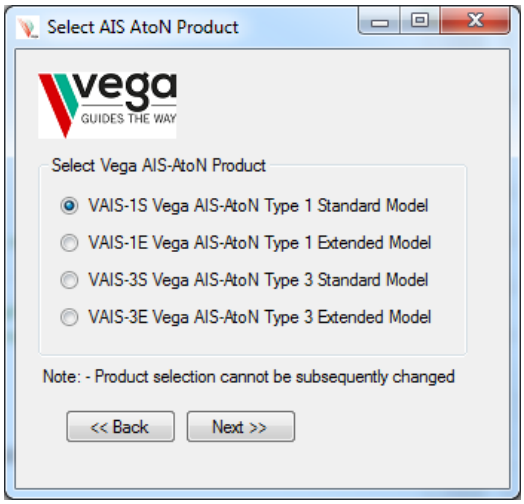
This is the most complex of the options for creating a new configuration as it requires all the settings to be entered manually. The setup process follows a series of steps as outlined below.



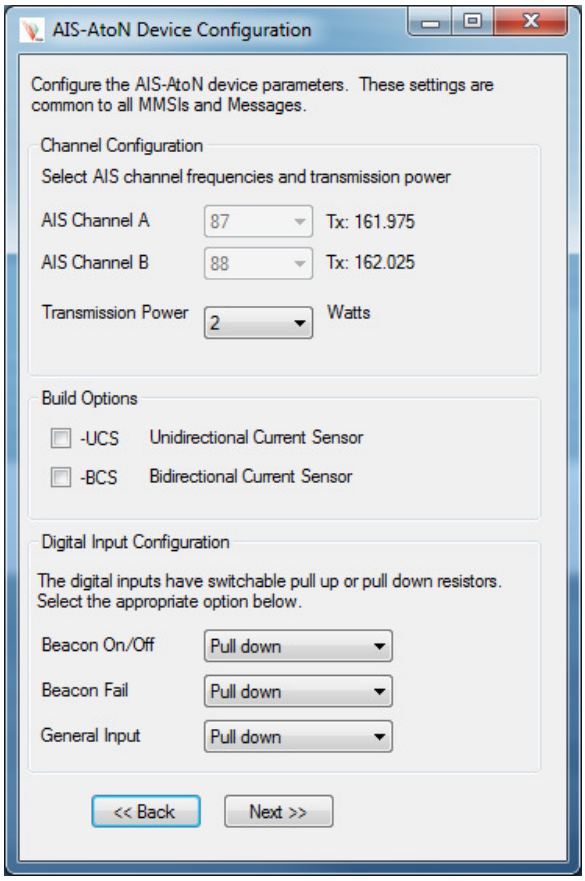
Of course more than one MMSI can be added to a device and more than one Message can be added to a MMSI so it is possible to loop around these elements of the setup procedure.

Generally speaking the setup process will not allow the process to continue to the next step until the current step is completed with no errors.

Step 1 – Select Product Type



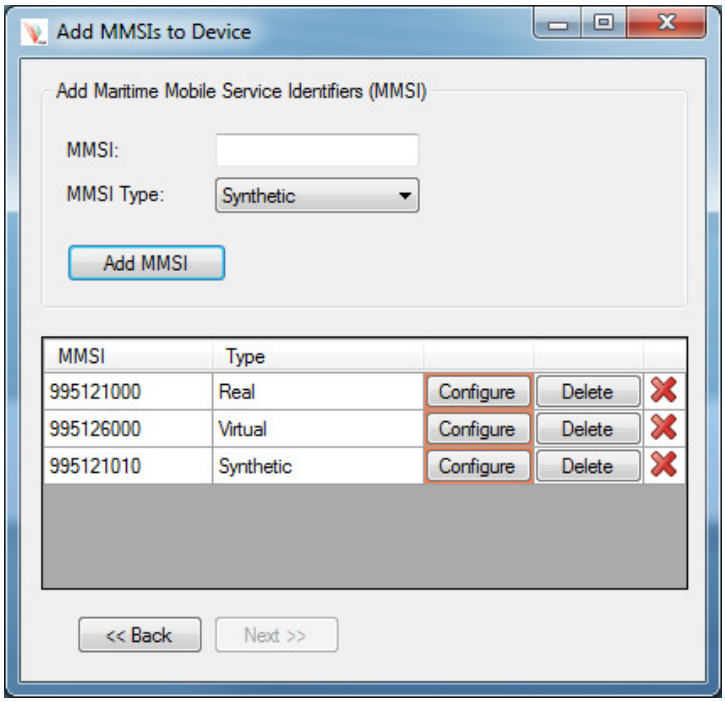
Step 2 – Enter Device Configuration



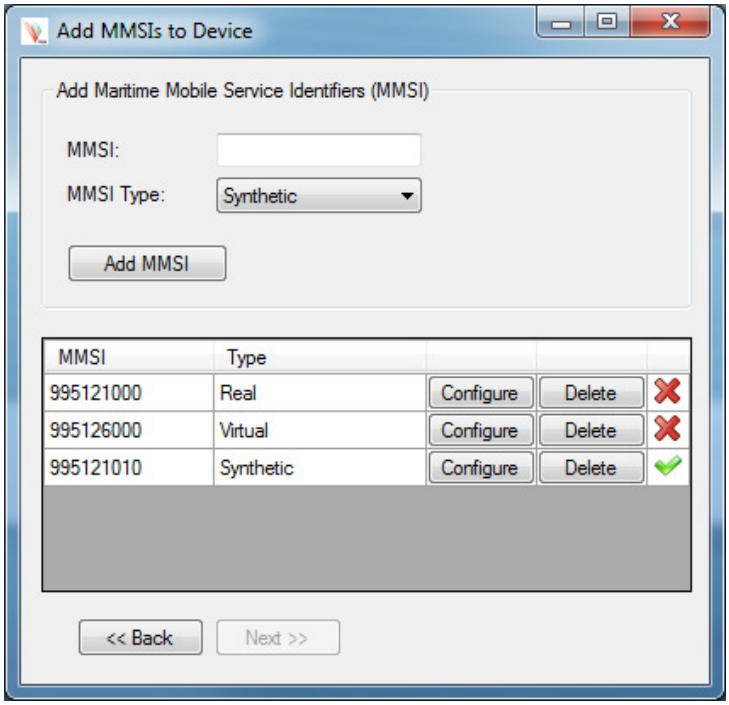
Here is where the global settings are entered, i.e. those that are common to all MMSIs and Messages, e.g. AIS channel and Tx power. This screen also contains device hardware configuration.

Step 3 – Add MMSIs

Add MMSIs here. Note – there can be only one Real MMSI per device.



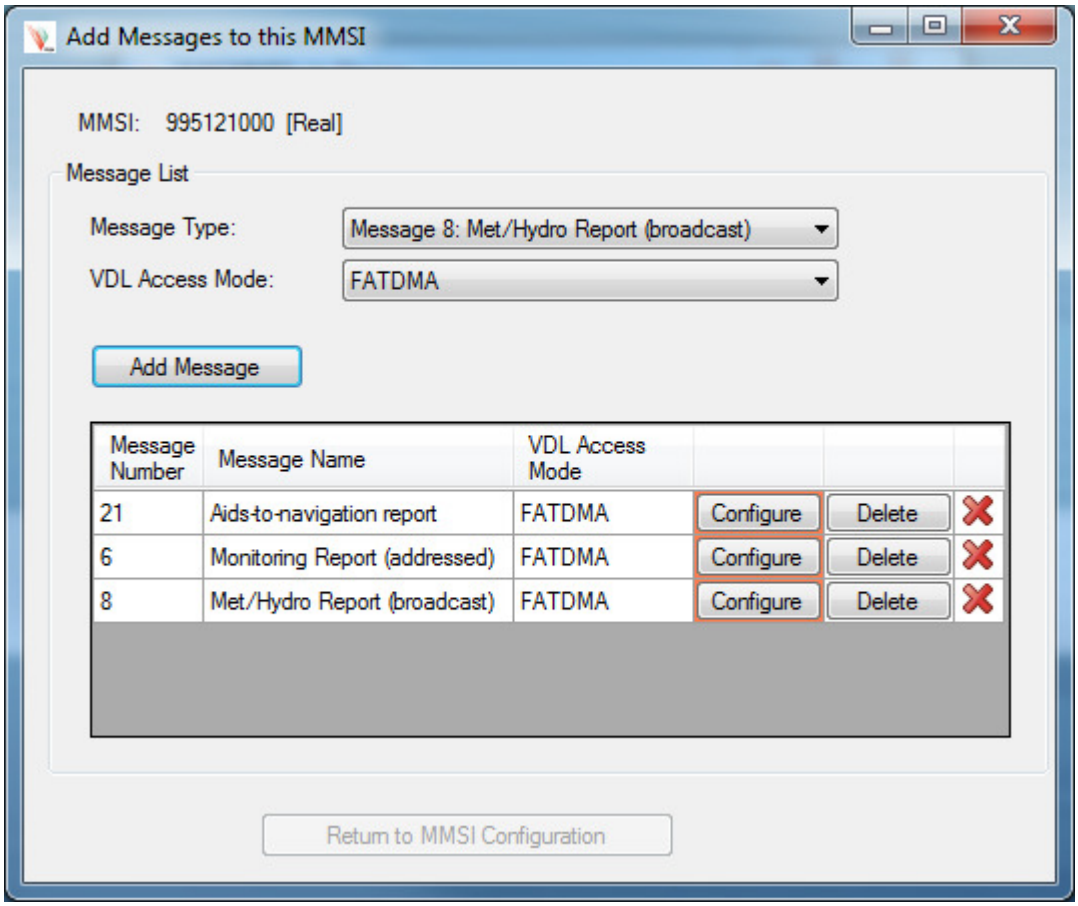
Note the red crosses next to each MMSI, and that the "Next" button is disabled. This indicates that the configuration wizard will not allow the process to continue until all of the MMSIs are correctly configured.



When a MMSI is correctly configured the red cross is replaced by a green tick. However, the configuration wizard will not allow the process to continue until all of the MMSIs are configured.

Step 4 – Add Messages to MMSI

Add Messages to the selected MMSI here. Note – only one report of each type is allowed per MMSI. Monitoring reports can be addressed (message 6) or broadcast (message 8) but not both.



As with the Add MMSI screen, each message initially has a red cross next to it and the "Return to MMSI Configuration" button is disabled. This indicates that the configuration wizard will not allow the process to continue until all of the Messages are correctly configured.

Clicking Configure brings up a message configuration window.

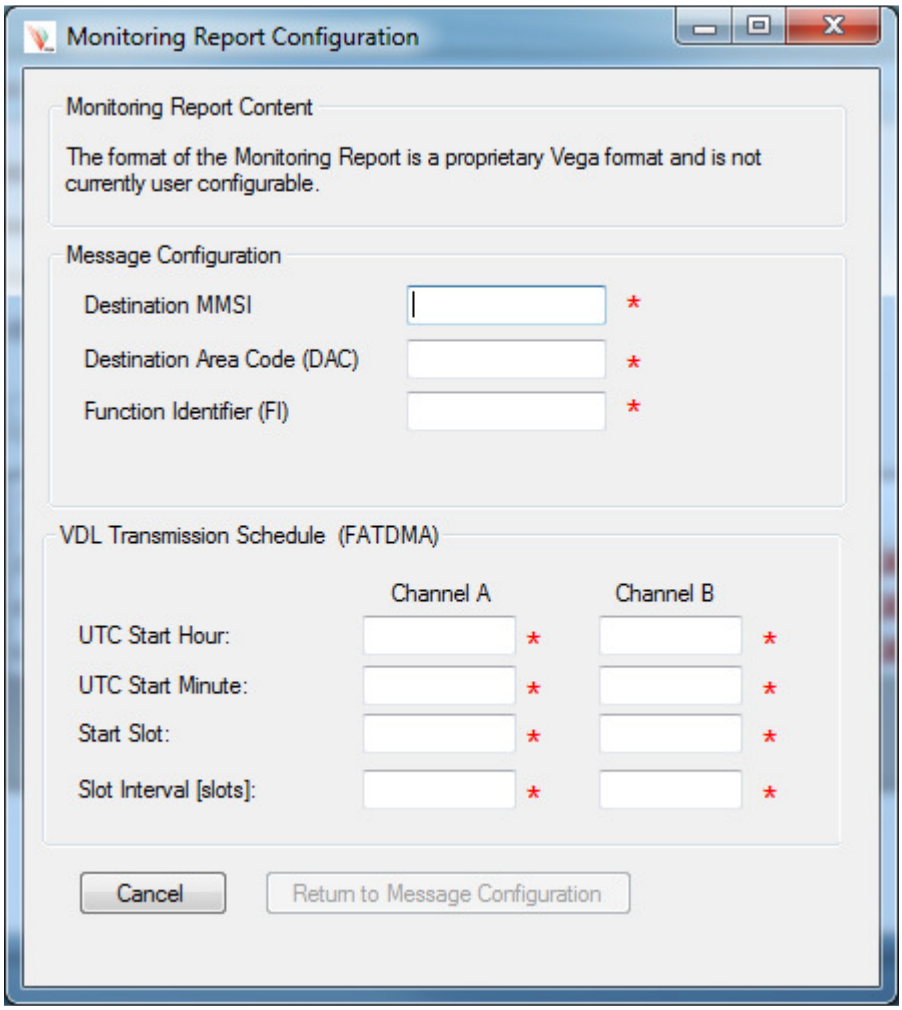
Step 5 – Message Configuration

The message configuration window differs depending on the message selected.

(a) Monitoring Report Configuration

Monitoring is described more fully in SECTION 5 MONITORING REPORTS.

Two monitoring report formats are supported. One is a Vega proprietary monitoring report and is used to log monitoring data on the VegaWeb server. The other is based on the GLA format in the IALA A-126 Recommendation.

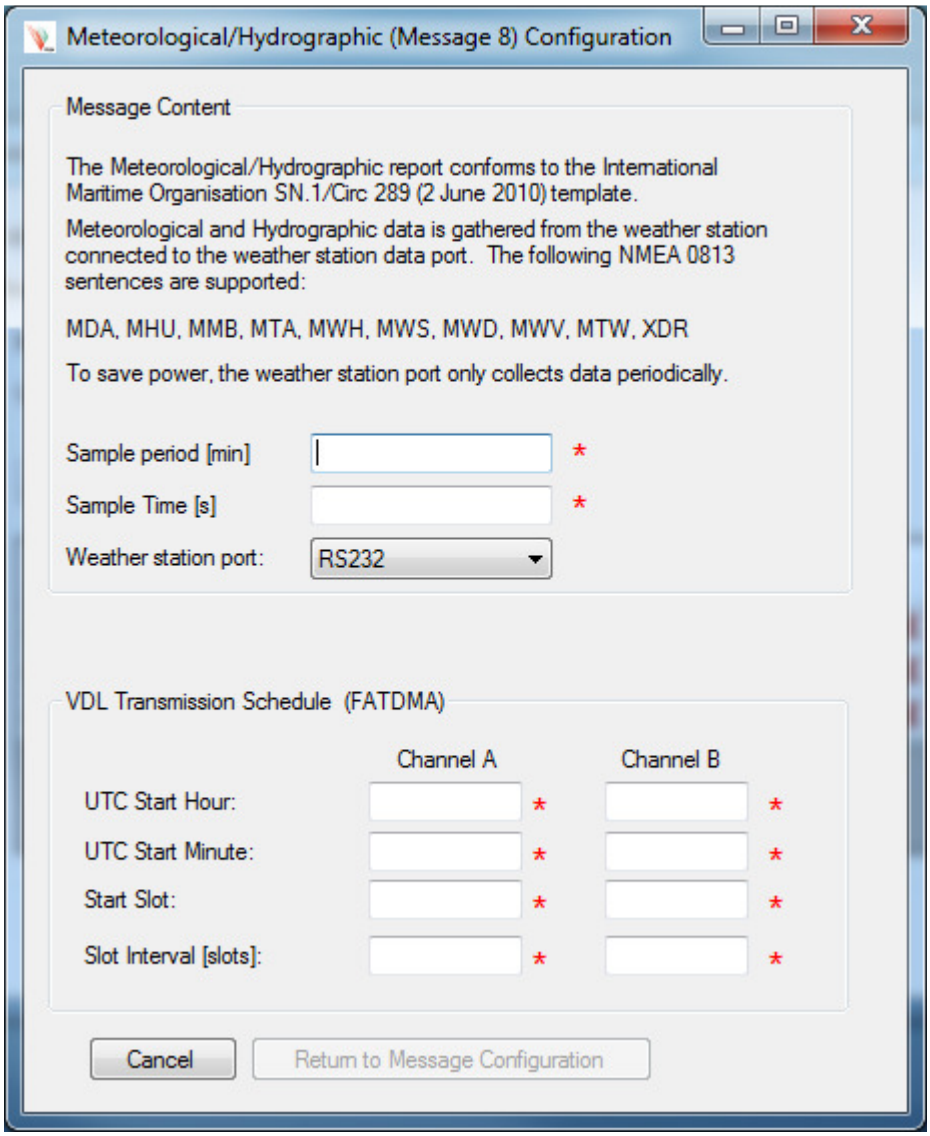


Note the red asterisks next to the parameters, and that the "Return to Message Configuration" button is disabled. The red asterisk indicates that the parameter value is invalid. The wizard will not allow the process to return to the Message Configuration screen until all parameters are valid.

The configuration screen is the same for addressed and broadcast monitoring reports – except that the Destination MMSI is not present on the broadcast message configuration screen.

(b) Meteorological / Hydrographic Report Configuration

Meteorological/Hydrographic Reports are described more fully in SECTION 6 METEOROLOGICAL / HYDROGRAPHIC REPORTS.



Note again the red asterisks next to the parameters, and that the "Return to Message Configuration" button is disabled. The red asterisk indicates that the parameter value is invalid. The wizard will not allow the process to return to the Message Configuration screen until all parameters are valid.

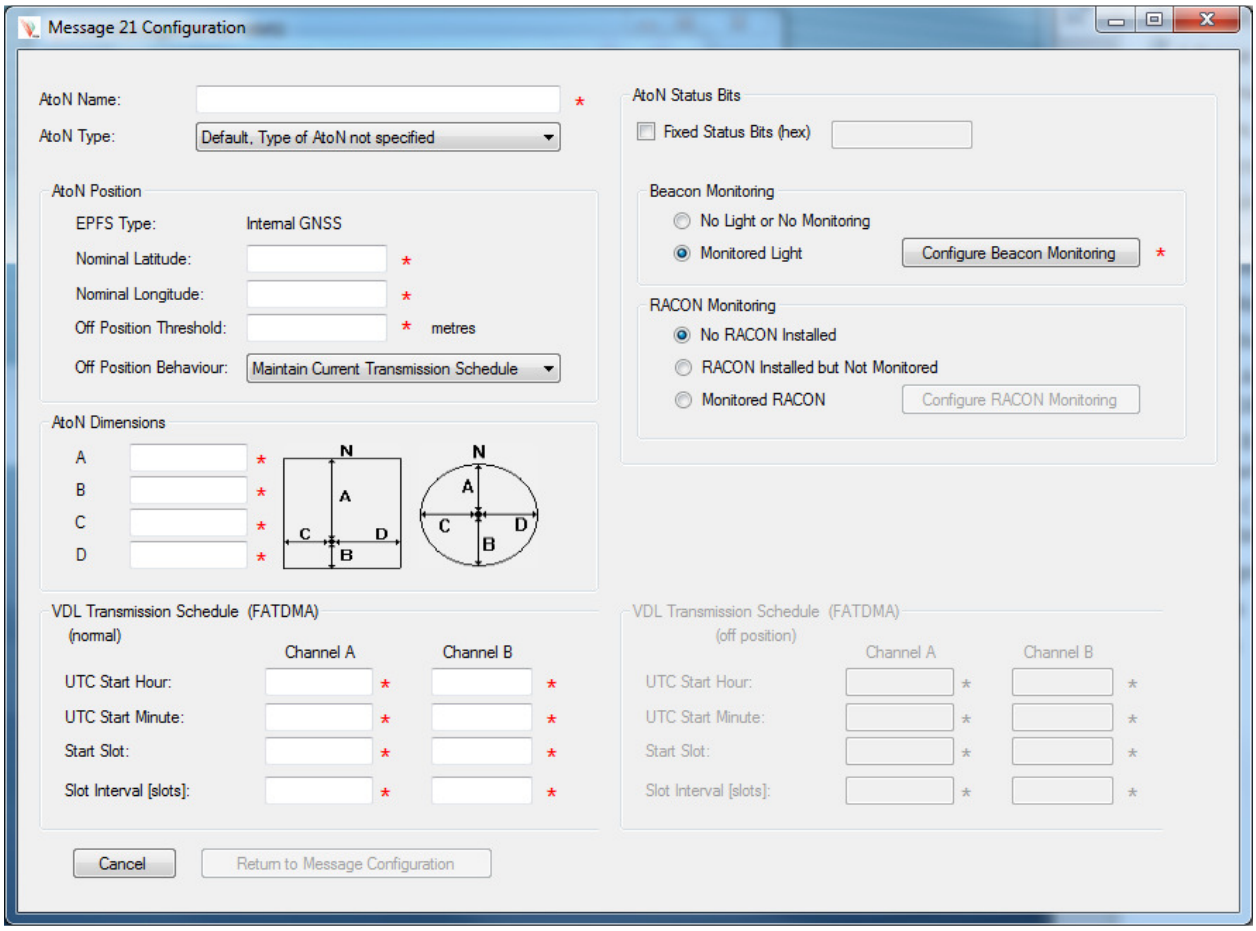
(c) Message 21 – Aids-to-Navigation Report Configuration

There are two parts to the message 21 configuration. One side is the general configuration of the message, e.g. AtoN name, AtoN Type, Nominal position, Off Position Threshold and Behaviour, Dimensions and VDL schedule. The other side is configuration of the content of the message 21 status byte – i.e. how the VegaAIS unit determines AtoN and RACON presence, on/off and failure.

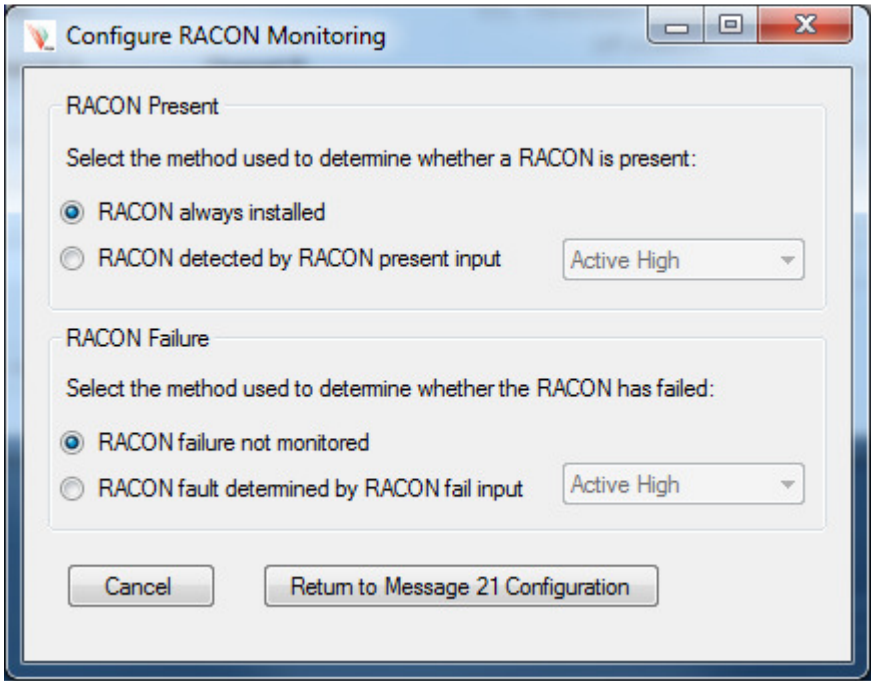
This latter part of the configuration - the methods of AtoN and RACON monitoring is described fully in SECTION 4 ATON AND RACON STATUS MONITORING.

For a Virtual MMSI there are no options for AtoN or RACON monitoring as the status byte is always set to E0 (hex).

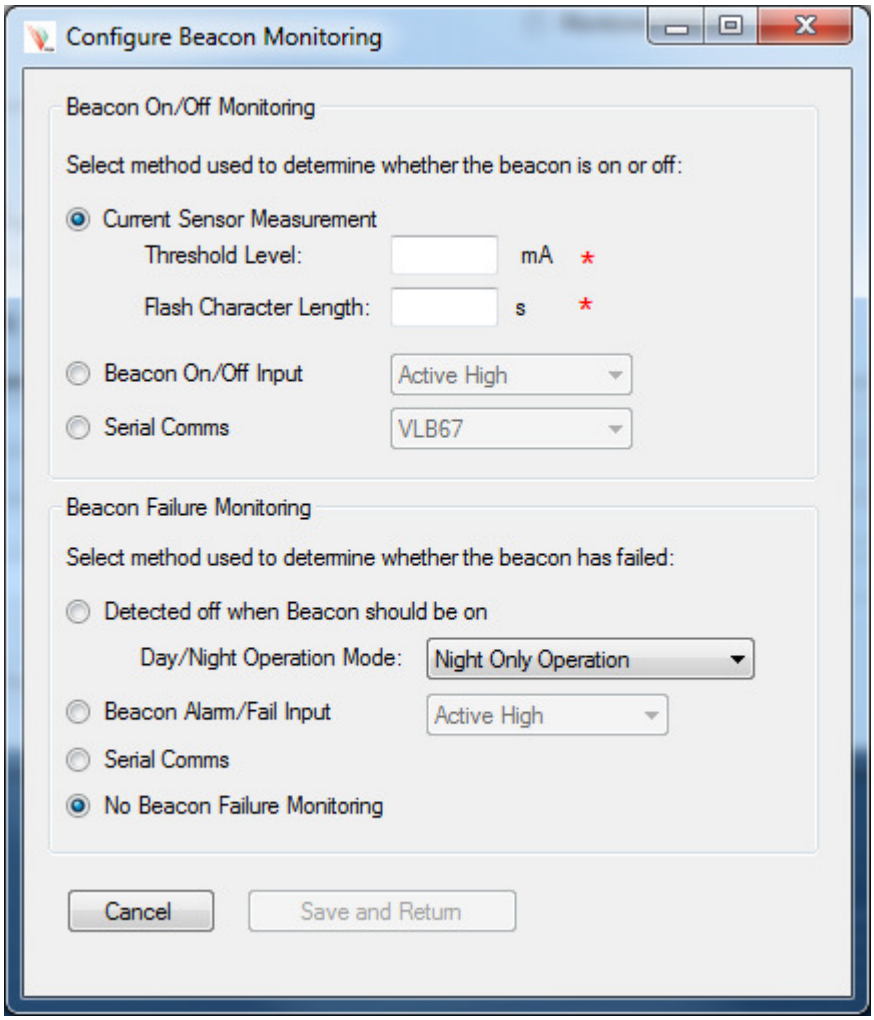
For a Synthetic MMSI the only option for AtoN and RACON monitoring is to set the message 21 status byte to a fixed value.



RACON monitoring parameters are accessed by selecting the “Monitored RACON” option above and clicking the “Configure RACON Monitoring” button. This displays the following window.



AtoN monitoring parameters are accessed by selecting the “Monitored Light” option above and clicking the “Configure Beacon Monitoring” button. This displays the following window.



Once all the MMSI and Message configuration is complete, click “Next” to exit the setup wizard.

Step 6 – Exit

The configuration tool will return to the main screen with the new configuration displayed. Clicking on any node in the Configuration Tree will display the details on that configuration item in the Details pane.

The configuration may be saved using the File->Save Configuration menu item.

2.2.2 Editing a Configuration

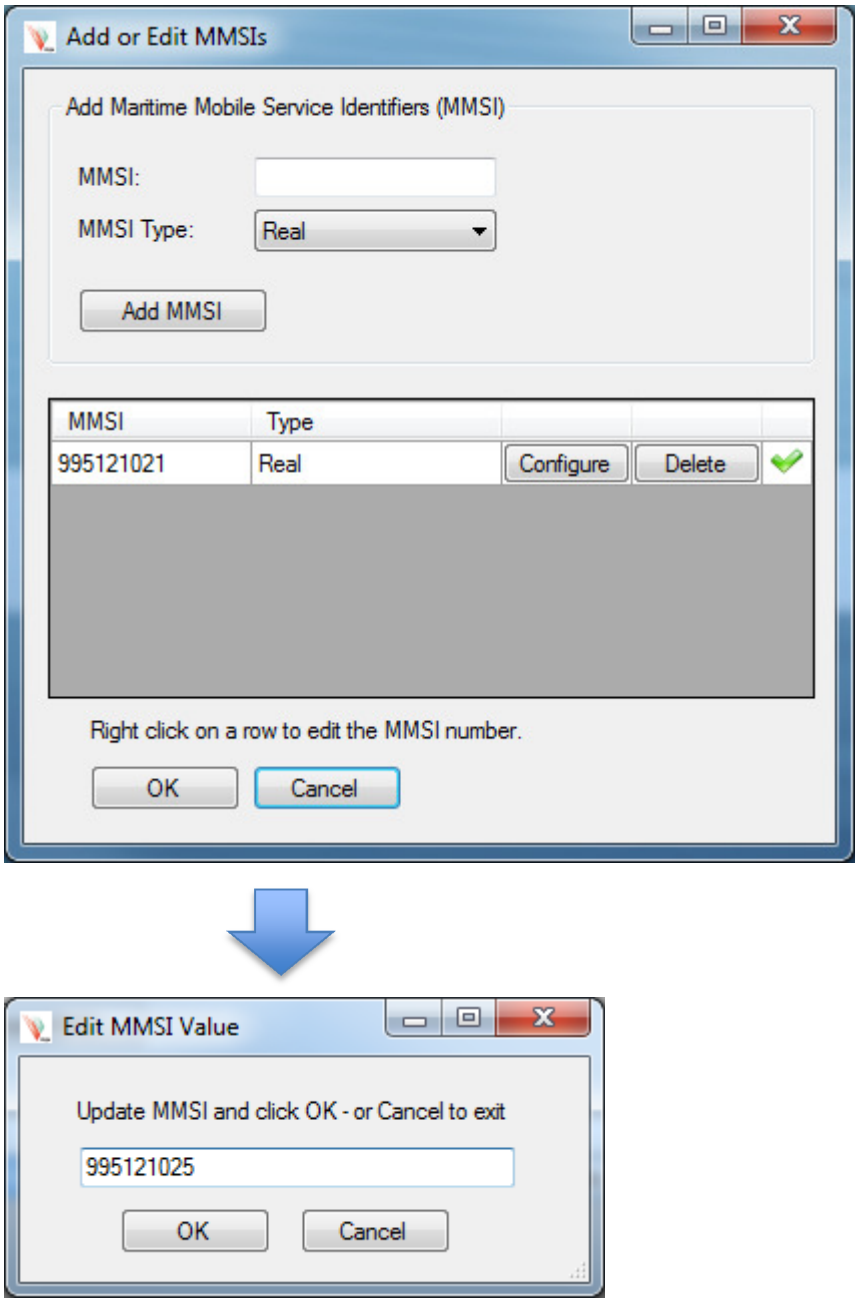
There are a number of ways to edit a configuration item:

- Select a configuration item in the configuration tree and click the “Edit Selected Item” Button.
- Right click on a configuration item in the configuration tree and select “Edit” from the pop-up menu.
- Right click in the Details pane of the configuration item to be edited and select “Edit” from the pop-up menu.

All three of these methods produce the same result – namely opening the configuration window of the item to be edited.

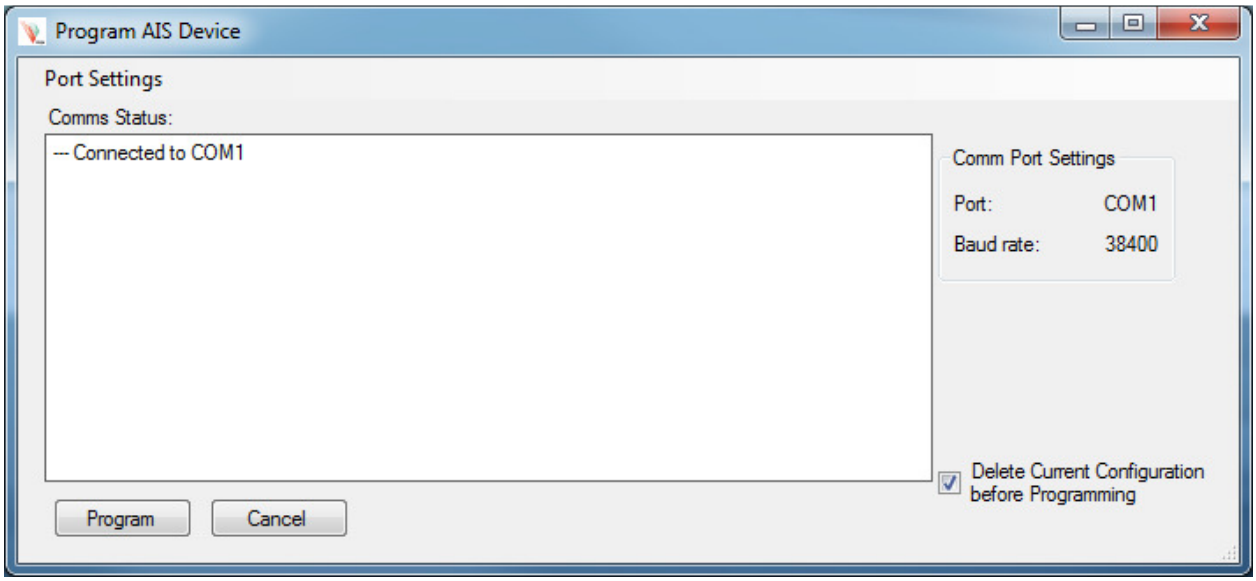
One editing function that may not be immediately obvious is editing a MMSI number. Select the MMSI node in the configuration tree and edit it.

In the “Edit MMSI” window that appears, right click on the row with the MMSI number to be edited and select the “Edit MMSI Number” option from the pop-up menu.



2.2.3 Programming a Configuration

Once a configuration is complete it can be programmed into a VegaAIS device. Connect the configuration tool to a VegaAIS device as described in section 2.1.3. Click the “Program AIS Device” button on the main window. This opens the Program Device window.

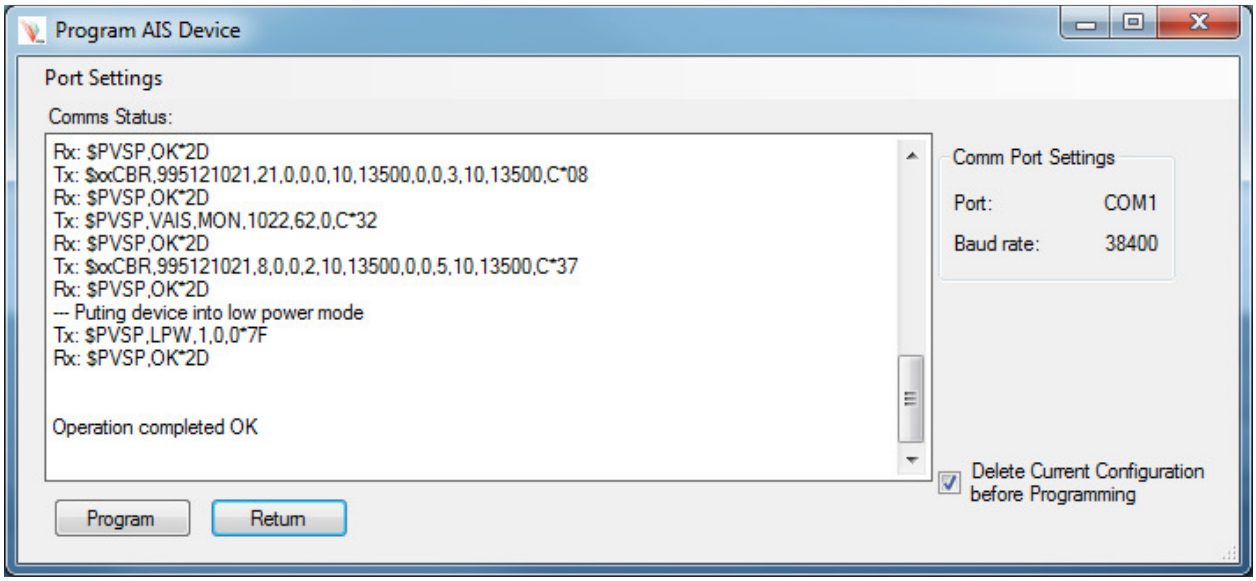


The comm port can be changed in the Port Settings menu. Leave the baud rate set at 38400bps unless you have good reason for changing it.

By default the current configuration is deleted before the new configuration is programmed. There is a checkbox to disable this feature however; it is **strongly recommended** that this checkbox is kept ticked. Programming a new configuration over the top of an existing configuration could result in incorrect and unpredictable behaviour.

Once the correct port is selected and the status indicates a successful connection, clicking the "Program" button will start programming the configuration.

When programming is complete, the tool will report successful completion as shown below.



2.3 Manual Configuration

As an alternative to using the Vega configuration tool, the configuration may be entered manually using a combination of standard and proprietary NMEA 0183 sentences.

It is recommended to use the configuration tool in preference to manual configuration as the tool has safeguards against illegal configuration options.

The configuration sentences are listed in Appendix C VEGAAIS MANUAL CONFIGURATION SENTENCES.

SECTION 3 PROGRAMMING

The VegaAIS AtoN Station does not currently support reprogramming (i.e. firmware updates).

SECTION 4 ATON AND RACON STATUS MONITORING

This section describes the options for monitoring an AtoN and/or RACON for the purposes of populating the AtoN Status Bits in the Aids-to-Navigation message (message 21). The AtoN Status byte is defined in IALA Recommendation A-126 as follows:

MSB	111	XX	XX	X	LSB
	Page ID	RACON Status	AtoN Status	Health bit	

As described earlier there are a number of options for monitoring the attached AtoN and/or RACON. These are described below.

4.1 Fixed Status Bits

This option sets the status byte to a fixed value for all transmissions.

Virtual AtoNs must use a fixed status byte with a value of 0xE0 as these AtoNs do not physically exist.

Synthetic AtoNs must also use a fixed status byte as monitored synthetic AtoNs are not supported. The status byte may however be set to any value.

Real AtoNs can also use a fixed status byte set to any value.

4.2 AtoN Status Monitoring

The two AtoN status bits within the AtoN status byte can take the following values:

00b No light or no monitoring
01b Light ON
10b Light OFF
11b Light fail or at reduced range

The 'No light or no monitoring' option can be selected by configuration. For a monitored light, the light on or off status can be detected by:

- Beacon current measurement
- Beacon On/Off digital input
- Serial communication

Beacon current is measured by the optional uni-directional current sensor. A current threshold and flash character length is required.

The beacon on/off digital input may be configured as Active High or Active Low. This defines the input state when the beacon is On.

Serial comms is only supported with Vega smart beacons.

Light failure may be determined as follows:

- Light detected off when is should be on (requires operation mode: Night only, Day only or Night and Day)
- Beacon fail digital input
- Serial communication
- No failure monitoring

The beacon fail digital input may be configured as Active High or Active Low. This defines the input state when the beacon has Failed.

Serial comms is only supported with Vega smart beacons.

4.3 RACON Status Monitoring

The two RACON status bits within the AtoN status byte can take the following values:

00b No RACON installed
01b RACON installed but not monitored
10b RACON operational
11b RACON error

The “No RACON installed” and “RACON installed but not monitored” options can be selected by configuration. Otherwise RACON presence can be detected using the RACON present digital input. This input may be configured as Active High or Active Low. This defines the input state when the RACON is present.

RACON failure can similarly be detected using the RACON failure digital input. This input may be configured as Active High or Active Low. This defines the input state when the RACON has failed.

Note – if RACON failure detection is disabled and RACON present detection is enabled, then only status bits 00b (No RACON installed) and 01b (RACON installed but not monitored) will be reported. “RACON operational” will not be reported as we cannot determine if the RACON is healthy or not.

SECTION 5 MONITORING REPORTS

The VegaAIS unit can be configured to transmit monitoring reports, either addressed (message 6) or broadcast (message 8). Only one monitoring report is supported.

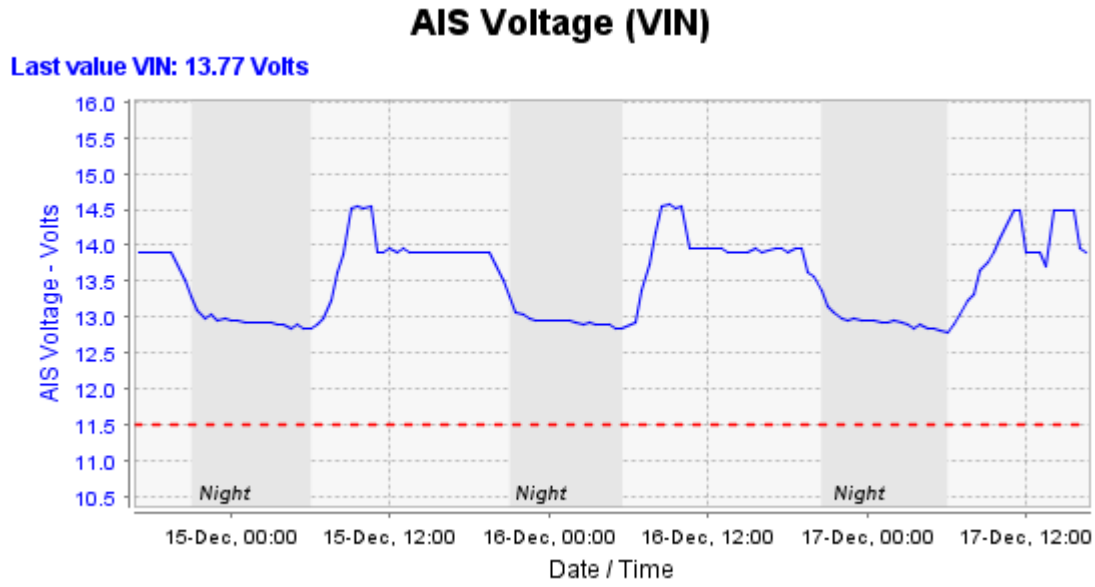
Two data formats are supported, a proprietary format used to log data to the VegaWeb server, and the IALA GLA format as described in Annex C, Table 4 of the IALA A-126 Recommendation.

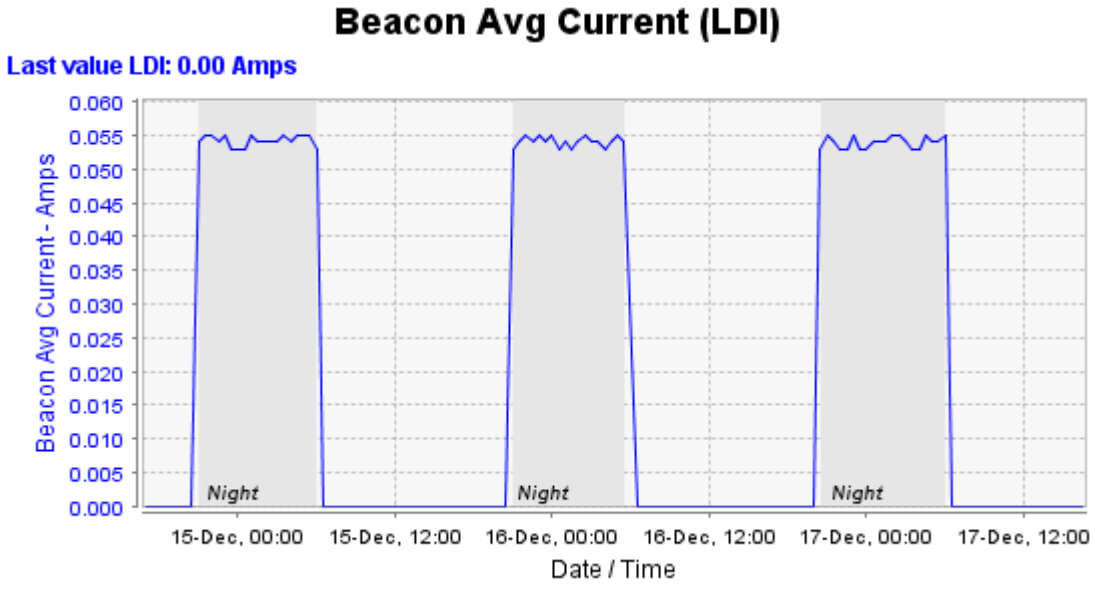
5.1 VegaWeb Monitoring Report

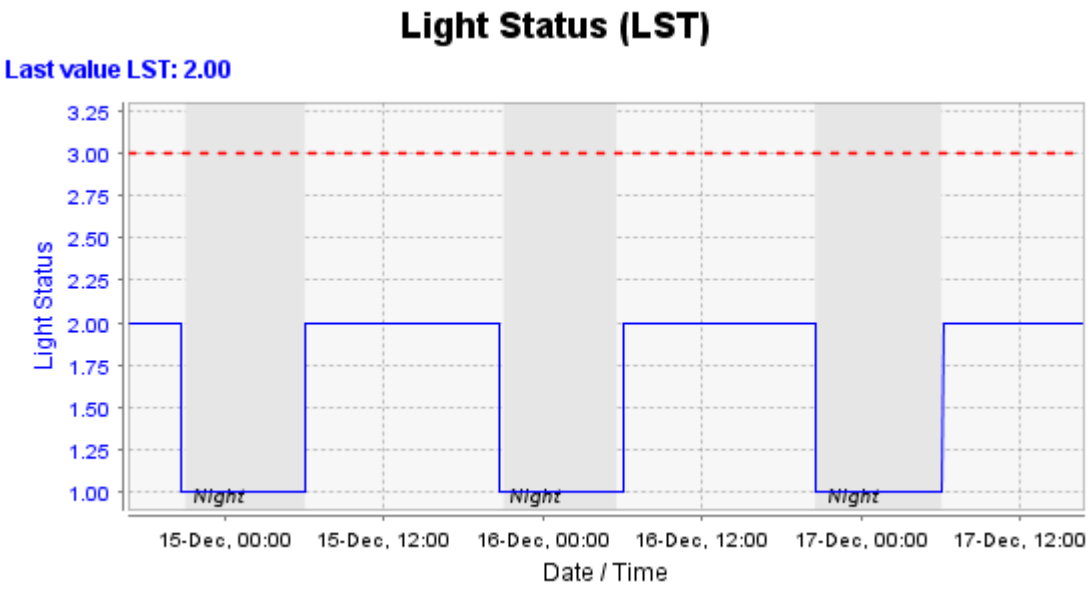
The VegaWeb Monitoring report format is unpublished as it is subject to change without notice - please contact Vega if details for a particular implementation are required.

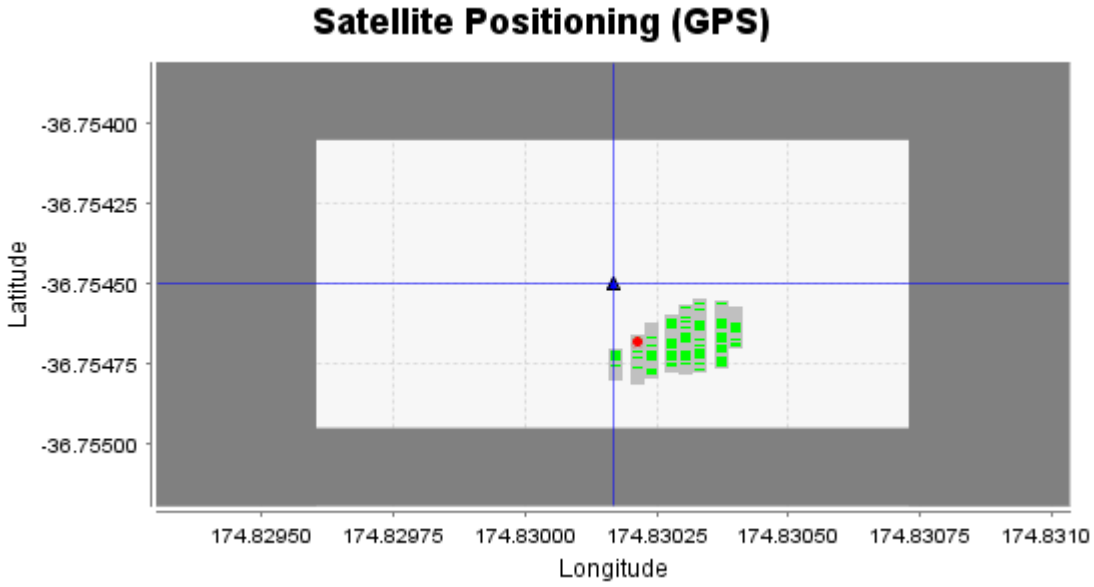
This report is used to log data to the VegaWeb server. A relay application is used to forward the data from the receiving station to the VegaWeb server.

The VegaWeb server can set alarm level on signals and alert users via SMS or email if an alarm threshold is breached. Logged data can be viewed via the VegaWeb website; some sample data is shown below.









5.2 IALA GLA Monitoring Report

The IALA GLA report is based on the template in the IALA Recommendation A126 Annex C, Table 4. This format is reproduced below.

Parameter	No. of bits	Description
Message ID	6	Identifier for Message[1]
Repeat Indicator	2	
Source ID	30	
Sequence Number	2	
Destination ID	30	
Retransmit Flag	1	
Spare	1	
DAC	10	Destination Area Code (user configurable)
FI	6	Function Identifier (user configurable)
Analogue (internal)	10	Source and scaling user configurable

Analogue (external #1)	10	Source and scaling user configurable
Analogue (external #2)	10	Source and scaling user configurable
AtoN Status bits	5	Same as 5 LSB of Msg21 status byte
Status bits	8	User configurable
Off Position Status	1	0: On Position; 1: Off Position
Spare	4	
Total	**136**	**Occupies 1 slot**

Notes:
1. In contrast to the GLA recommendation, this monitoring report may be broadcast or addressed. The above table shows the format of an addressed report, if a broadcast report is chosen then the format of the header changes, the data portion remains unchanged.

As shown above the source signal for the three analogue fields and the eight digital bits is user selectable. The resolution and offset used in packing the signal values into the report fields is also user configurable.

In considering the resolution and offset to use recognise that unscaled voltages are sent with a resolution of 1 Volt per bit, no offset. Unscaled currents are sent with a resolution of 1 Amp per bit, no offset. The reported value is calculated as follows:

$$reportedValue = \frac{(rawValue + offset)}{resolution}$$

Examples:

Say we wish to report a voltage that has a range of 0 to 24 V.
Setting the resolution to 0.05 would scale the output to 0 – 720 with a resolution of 50mV/bit.

Say we wish to report a current that has a range of -10 to 10A
Setting the offset to 10 and the resolution to 0.02 would scale the output to 0 - 1000 with a resolution of 20mA per bit and an offset of 10A.

Obviously the reverse scaling has to be done at the receiving end.

SECTION 6 METEOROLOGICAL / HYDROGRAPHIC REPORTS

The VegaAIS unit may be connected to a NMEA 0183 compliant weather station. The NMEA sentences from the weather station will be compiled into a binary broadcast message and transmitted at a preconfigured rate.

In order to conserve power, the VegaAIS unit only periodically listens for weather sentences from the weather station. The period and duration of these data collection periods may be configured to suit the operation of the weather station and the period of the Met/Hydro message.

6.1 Supported NMEA Weather Sentences

The following NMEA weather sentences are recognised by the VegaAIS unit. A number of these are deprecated in the NMEA standard but are supported for compatibility with older weather stations

Mnemonic	Sentence Name	Notes
MDA	Meteorological Composite sentence	
MHU	Humidity	
MMB	Barometric Pressure	
MTA	Air Temperature	
MWH	Wave Height	
MWS	Wind and Sea State	
MWD	Wind Direction and Speed	
MWV	Wind Speed and Angle	
MTW	Water Temperature	
XDR	Transducer Measurement	Accepts temperature, pressure, relative humidity and salinity.

6.2 Met/Hydro Message Format

The Met/Hydro message conforms to the recommendation in IMO SN.1/Circ.289 (2 June 2010) section 1. As specified, the Met/Hydro message is always transmitted as a binary broadcast message (message 8).

Not all fields in the IMO message are supported, the following table shows the supported fields (greyed out fields not supported).

Parameter	No. of bits	Description
Message ID	6	Identifier for Message 8; always 8
Repeat Indicator	2	
Source ID	30	
Spare	2	
Application Identifier	16	DAC = 001, FI = 31
Longitude	25	
Longitude	24	
Position Accuracy	1	
Time Stamp		
UTC Day	5	
UTC Hour	5	

UTC Minute	6	
Average Wind Speed	7	
Wind Gust	7	
Wind Direction	9	
Wind Gust Direction	9	
Air Temperature	11	
Relative Humidity	7	
Dew Point	10	
Air Pressure	9	
Air Pressure Tendency	2	
Horizontal Visibility	8	
Water Level (incl. tide)	12	
Water Level Trend	2	
Surface Current Speed	8	
Surface Current Direction	9	
Current Speed #2	8	
Current Direction #2	9	
Current Measuring Level #2	5	
Current Speed #3	8	
Current Direction #3	9	
Current Measuring Level #3	5	
Significant Wave Height	8	
Wave Period	6	
Wave Direction	9	
Swell Height	8	
Swell Period	6	
Sea State	4	
Water Temperature	10	
Precipitation (type)	3	
Salinity	9	
Ice	2	
Spare	10	
Total	**360**	**Occupies 2 slots**

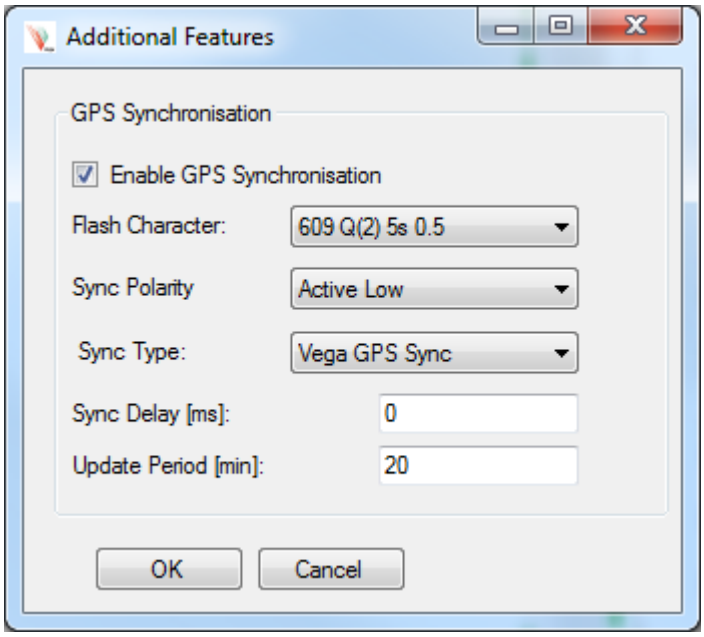
As specified in the IMO Guidance, the Destination Area Code (DAC) for this message is always 001. Similarly the Function Identifier (FI) is always 31.

SECTION 7 ADDITIONAL FEATURES

The VegaAIS unit has a number of additional features designed for operation with AtoNs. These can be enabled / disabled and configured using the configuration tool.

7.1 GPS Synchronisation

The VegaAIS unit can issue a sync pulse to ensure the connected AtoN flashes in sync with other AtoNs in the vicinity. The sync configuration options are shown below:



The period of the flash character is necessary for the sync algorithm. If the actual flash character is not known, choose a flash character from the drop down list with the same period.

The sync polarity allows the active state of the sync pulse to be selected. For Vega AtoNs this is always Active Low.

The Sync Type allows selection of the sync algorithm. This should allow the sync feature to be used on non-Vega AtoNs. For Vega AtoNs always select “Vega GPS Sync”.

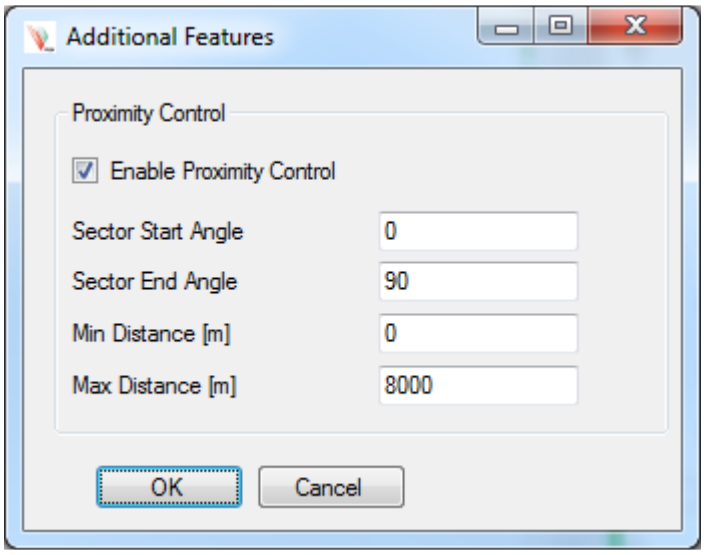
The update period is the time between sync pulses being generated by the VegaAIS unit. In order to save power, these pulses are not issued continuously; they are only issued at the update period rate. It is recommended to set this to 20 minutes as this will ensure the beacon flashes do not drift noticeably while minimising power consumption.

The VegaAIS sync signal is available in the beacon connector, the weather station connector and the uni-directional current sensor terminals in the current sensor enclosure. This allows the sync

7.2 Proximity Control (Type 3 only)

The proximity control feature allows the VegaAIS unit to turn the connected AtoN on and off based on the position of nearby vessels. The VegaAIS unit only knows about AIS equipped shipping so this feature will not work for non-AIS equipped vessels.

The configuration options are shown below:



The proximity control feature requires an active sector to be defined. If a vessel is detected in this active sector then the AtoN is switched on. The active sector is defined by a start angle and an end angle (both True angles) and a minimum and maximum distance.

For example, if the active sector is defined as:

start angle = 0
end angle = 360
min distance = 0
max distance = 10000

Then all shipping within a 10km radius of the VegaAIS unit would cause the AtoN to be switched on.

The proximity control feature switches on the beacon enable output in the VegaAIS beacon connector (i.e. closes the contacts between the two beacon enable lines). This output needs to be wired such that it switches the AtoN on and off – the details of this will depend on the particulars of the installation. The beacon enable output is rated for a max of 200mA.

Note – in order to detect shipping the VegaAIS receivers have to be on all the time. This considerably increases the power consumption of the unit. Please see section 1.5.2 for power consumption figures.

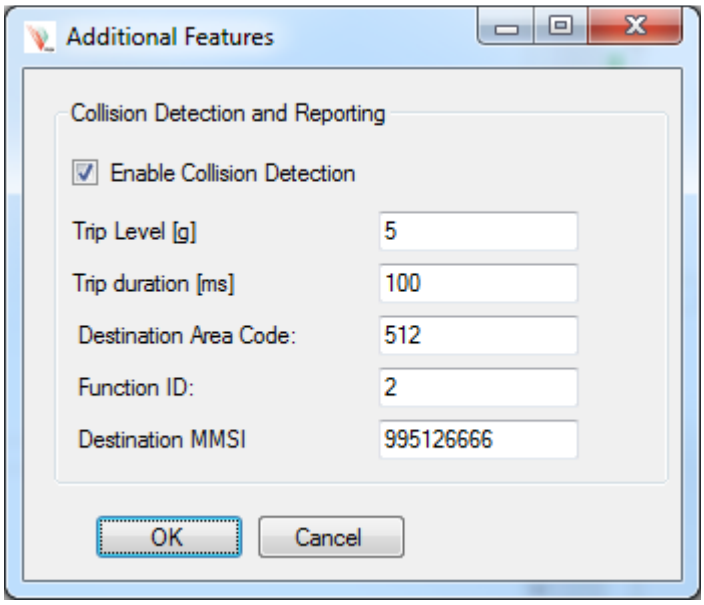
7.3 Collision Detection and Reporting (Type 3 only)

The collision detection and reporting feature, if enabled, causes the VegaAIS unit to issue an addressed binary message (message 6) if a collision is detected. This message contains the MMSI and range of the closest five ships. The intent with this is to be able to identify the ship that collided with the buoy.

Note – as with the Proximity Control feature, the VegaAIS unit only can detect AIS equipped vessels. Therefore if a vessel without AIS collides with the VegaAIS unit, this vessel will not be identified in the collision report

Note also – if the collision is severe enough, the VegaAIS unit or antennas may be damaged to the point where no message can be transmitted.

The configuration options for this feature are shown below:



The Destination Area Code (DAC), Function Identifier (FI) and destination MMSI are uses to populate the collision report. The collision report is always sent out as an addressed binary message, i.e. message 6.

The format of the collision report is as follows:

Parameter	No. of bits	Description
Message ID	6	Identifier for Message 6; always 6
Repeat Indicator	2	
Source ID	30	MMSI of source station (VegaAIS unit)
Sequence number	2	
Destination MMSI	30	
Application Identifier	16	As specified in the configuration
Format ID	8	0 for the format described here
MMSI #1	30	MMSI of closest ship
Range #1	16	Range of closest ship [m]
MMSI #2	30	MMSI of next closest ship
Range #2	16	Range of next closest ship [m]
MMSI #3	30	etc
Range #3	16	
MMSI #4	30	
Range #4	16	
MMSI #5	30	
Range #5	16	
Total	**324**	**Occupies 2 slots**

7.4 SART Message Repeating (Type 3 only)

A Type 3 VegaAIS AtoN Station can repeat distress messages from a Search and Rescue Transponder (SART). SART devices typically contain a 1W transmitter and have a small antenna just above the waterline. This means they have a limited range. If a SART message is repeated

by an AIS AtoN station, this will substantially increase the range of the distress message due to the AIS AtoN's higher power transmitter and the antenna located higher above the waterline.

The VegaAIS Station will repeat Message 1 (Position Report) with Navigational Status = 14 (AIS SART Active), and Message 14 (Safety Related Broadcast Message) with the safety related text equal to SART ACTIVE, MOB ACTIVE or EPIRB ACTIVE.

All SART repeated messages are transmitted at 12.5W even if the AIS AtoN's normal messages are configured for a lower power. This is to ensure the SART messages have the greatest possible range.

The VegaAIS AtoN Station incorporates a filtering mechanism to prevent messages 'ping ponging' between two or more SART repeater devices.

It is important to consider the impact on power consumption of repeating SART messages. A SART device will typically transmit 8 messages every minute for 96 hours. Repeating these messages will increase the power consumption of the AtoN, and this needs to be considered when installing a solar powered application.

In order to allow the best compromise between effectiveness and power consumption, the following power modes are available:

Normal SART Mode
In this mode the receivers are always on and all received SART messages are repeated[1]. This is the most effective mode, but consumes the most power. Please see section 1.5 for details on power consumption.

Low Power SART Mode
In this mode the receivers are normally off and are only switched on one minute before a scheduled transmission. Therefore, if the unit is transmitting message 21 every 3 minutes, the receivers will be on one minute out of every three.

While the receivers are on, they will receive SART messages. When the first SART message is received, the receivers will be switched on permanently and all SART messages received will be repeated[1].

If no SART messages are seen for five minutes, the receivers will be switched off and the AIS AtoN unit will revert back to its normal low power operation.

However, a SART device in range of the AtoN transmitting 8 times every minute will not allow the AIS AtoN unit to switch back to low power mode. Therefore a configurable SART Disable period is available which will intermittently disable SART message repeating.

For example, if the SART Disable period is set to 10 minutes:

First SART message received	- Receivers switched on permanently - All SART message repeated[1]
After 5 minutes	- SART repeating disabled - AIS unit reverts to low power mode
After disable period (10mins)	- SART repeating enabled

The disable period can be set to zero to disable this intermittent operation.

[1] Subject to message queuing and VDL load.

This mode consumes considerably less power than the Normal Mode but runs a risk of missing a SART message that is just on the limits of its range (as the receivers are not always on) and, if the disable period is used, only repeats messages on an intermittent basis.

Whichever mode is selected, the battery protection feature (see section 1.5.3) will protect the battery from excessive discharge. If the battery voltage falls below the low threshold, SART repeating will be stopped until the battery voltage rises above the recovery threshold.

SECTION 8 MAINTENANCE

8.1 Maintenance Cleaning

The VegaAIS AtoN Station requires little to no maintenance.

If necessary, use warm soapy water to wash the outside of the VegaAIS unit and rinse off with clean water. Do not use any solvent-based cleaner.

8.2 Periodic Inspection Check

Periodically check that the VegaAIS unit remains firmly secured and the mounting fasteners are still in good condition. Investigate any corrosion and take appropriate preventive action.

Ensure that both the GPS and VHF antennas are also firmly secured and show no signs of damage. Ensure all cables and connectors are still well secured and are also not damaged.

User Notes

APPENDIX A SPECIFICATIONS

AIS

TDMA Control	FATDMA for Type 1 RATDMA and FATDMA for Type 3
Transmission Method	Configurable. Dual channel transmit, can transmit on single channel if required. Supports IALA A-126 reporting Modes A, B and C
Transmission Period	Configurable.

Electrical

Frequencies	161.975Mhz and 162.025MHz
VHF Tx Power	2 or 12.5 Watts
Indicators	Status (green/red)
Voltage	10 – 36VDC
Over voltage protection	40V on all connections
Back-up Power/Time	Super capacitor FATDMA: 20min backup including one 2 channel transmission RATDMA: backup for at least one 2 channel transmission
Typical Energy Required	FATDMA: <0.2AH/day with 12V supply RATDMA: Normal mode: < 3.4AH/day (12V supply) Low power mode: <1.35AH/day (12V supply) Note – RATDMA figures assume 5% VDL load. Note – all figures assume Msg 21 sent every 3 minutes in IALA A-126 mode A.
Digital Inputs (standard)	Configurable 10k pull-up or pull-down or neither Configurable either active high or low. 4.9V low and 5.9V high.
Isolated Inputs (extended)	Inputs and common isolation 300Vrms For external supply high is >= 7.5VDC For internal supply high is >= 1.4VDC
Isolated Analogue Input (extended)	0 to 36VDC, accuracy +/-0.5%
Current Inputs	Maximum continuous current: 67A Accuracy +/-5%
Voltage Measurement	0 to 36VDC, accuracy +/-1%
Outputs	Configurable either active high or low Open collector outputs 36VDC Contact pair with solid state relay
Data Ports	RS232 Smart Beacon port with standard model Additional RS232/422/485 port optional
GPS	Position, beacon synchronisation, and day/night determination Out of position calculated according to IALA A-126 example 1
GPS Active Antenna Voltage	3.3VDC
Accelerometer	3 axis, trip configurable to 16G
Antenna connectors	Bulgin Buccaneer IP68

Enclosure

Weight and Dimensions	Refer Drawing
Mounting	3 or 4 hole, 200mm PCD or rail mounting Anti-compression sleeves in mounting holes
Material	Strengthened Nylon 6/6
Access	Fully sealed, no user serviceable parts User access to current sensor terminals if fitted.

Standards

AIS Conformance	IEC 61162-1 / IEC 62320-2 ITU-R M.1371.4 IALA Recommendation A-126 Conformity statement issued by BSH R&TTE/CE notified body opinion from BABT
Intrusion	EN60529
Immersion	MIL-STD-20G Method 104A Cond B
Vibration	EN62320-2 referencing EN60945 8.7

EMI / EMC

RF Tx	Output Power: 33-41dBm; Ramp <500us Tx shutdown channel protection 300ms
RF Tx Spurious Emissions	EN62320-2: -36dBm to 1GHz, -30dBm to 4GHz
RF Rx Spurious Emissions	EN62320-2: -57dBm to 1GHz, -47dBm to 4GHz
Type 3 Rx	EN62320-2: Sensitivity -110dBm <=20% PER Intermodulation rejection 70dB
Radiated and Conducted Emissions	EN60945
Electrostatic Discharge	EN61000-4-2: 2002 6kV contact, 8kV air
Fast Transient Immunity	EN61000-4-4: Level 3 as per EN60945: 1kV common mode
Radiated Immunity	EN61000-4-3: 2002 Class 1 Level 3 as per EN60945: 10V/m 80MHz to 2GHz
Conducted Immunity	EN61000-4-6 as per EN60945: 3Vrms sweep at Level 2 and 10Vrms spot test
Surge Immunity	EN61000-4-5: 1995 Class 3 Level 2 0.5kV lead to lead

Environment

Temperature	-30° to +60° Celsius
Intrusion Protection	IP68 to EN60529
Ultraviolet Protection	UV stabilised Nylon
Vibration	Vertical $7m/s^2$ 2Hz to 13.2Hz; Horizontal $7m/s^2$ 13.2Hz to 100Hz; sweep at 0.5 octave/min
Service Life	12 years
Warranty	1 year, refer to Vega warranty terms

APPENDIX B DECLARATION OF CONFORMANCE

Declaration of Conformance to R&TTE 1999/5/EC

VEGA INDUSTRIES LIMITED QF-35 V1.0

Declaration of Conformity (DoC)
for Products under R&TTE Directive 1999/5/EC

Hereby,

Manufacturer	Vega Industries Limited
Postal Address	PO Box 50443, Porirua 5240, New Zealand.
Physical Address	21 Heriot Drive, Porirua 5022, New Zealand.
And	**Hydrosphere UK Ltd**
Authorized Representative within the EU	**Head Office & Registered Office** Units C & D, West End Centre, Colthouse Lane, Upper Froyle, Hampshire, GU34 4JR, UK Tel: 01420 520374 Fax: 01420 520373

declares that this

VegaAIS Type 1, also known as VAIS1S, VAIS1E

is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC, as issued by the Notified Body, TÜV SÜD BABT of Forsythe House, Churchfield Road, Walton-on-Thames, Surry, UK.

The product of the declaration described above is in conformity with the requirements of the following specifications under Directive 1999/5/EC:

Article 3.1(a)	EN 62311:2008
	EN 50383:2002
	EN 60950-1:2006/A2:2013
	EN 60945:2002 including IEC 60945 Corrigendum 1 (2008)
Article 3.1(b)	EN 301 843-1 v1.3.1 (2012-08)
	EN 60945:2002 including IEC 60945 Corrigendum 1 (2008)
Article 3.2	IEC 62320-2:2008, Clause 7
	IEC 61108-1:Ed2 (2003-07)
Article 3.3(e)	IEC 62320-2:2008, Clause 8

22/12/2014	John Brook, Engineering Manager	
(Date of issue of the DoC)	(Name & title of responsible person)	(Signature of responsible person)

VEGA INDUSTRIES LIMITED QF-35 V1.0

Declaration of Conformity (DoC)
for Products under R&TTE Directive 1999/5/EC

Hereby,

Manufacturer	Vega Industries Limited
Postal Address	PO Box 50443, Porirua 5240, New Zealand.
Physical Address	21 Heriot Drive, Porirua 5022, New Zealand.
And	**Hydrosphere UK Ltd**
Authorized Representative within the EU	**Head Office & Registered Office** Units C & D, West End Centre, Colthouse Lane, Upper Froyle, Hampshire, GU34 4JR, UK Tel: 01420 520374 Fax: 01420 520373

declares that this

VegaAIS Type 3, also known as VAIS3S, VAIS3E

is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC, as issued by the Notified Body, TÜV SÜD BABT of Forsythe House, Churchfield Road, Walton-on-Thames, Surry, UK.

The product of the declaration described above is in conformity with the requirements of the following specifications under Directive 1999/5/EC:

Article 3.1(a)	EN 62311:2008
	EN 50383:2002
	EN 60950-1:2006/A2:2013
	EN 60945:2002 including IEC 60945 Corrigendum 1 (2008)
Article 3.1(b)	EN 301 843-1 v1.3.1 (2012-08)
	EN 60945:2002 including IEC 60945 Corrigendum 1 (2008)
Article 3.2	IEC 62320-2:2008, Clause 7
	IEC 61108-1:Ed2 (2003-07)
Article 3.3(e)	IEC 62320-2:2008, Clause 8

24/9/2015	John Brook, Product Design Manager	
(Date of issue of the DoC)	(Name & title of responsible person)	(Signature of responsible person)

The VegaAIS unit is authorised to be sold in the following European countries:

Austria (AT)	Belgium (BE)	Bulgaria(BG)	Cyprus (CY)
Czech Republic (CZ)	Denmark (DK)	Estonia (EE)	Finland (FI)
France (FR)	Germany (DE)	Greece (GR)	Hungary (HU)
Iceland (IS)	Ireland (IE)	Latvia (LV)	Lithuania (LT)

Luxemborg (LU)	Malta (MT)	Netherlands (NL)	Norway (NO)
Portugal (PT)	Romania (RO)	Slovak Republic (SK)	Slovenia (SI)
Sweden (SE)	Switzerland/Liechtenstein (CH)	United Kingdom (UK)	

APPENDIX C VEGAAIS MANUAL CONFIGURATION SENTENCES

As described earlier, the VegaAIS unit supports a range of standard NMEA 0183 and proprietary sentences for configuring the device. These sentences are described below:

Standard Sentences

The format of these sentences is defined in the NMEA 0183 specification.

Mnemonic	Sentence Title
AID	AtoN Identification Configuration Command
ACF	General AtoN Station Configuration Command
ACG	Extended General AtoN Station Configuration Command
CBR	Configure Broadcast Rates for AIS AtoN Station Message Command
DCR	Device Capability Report
VDO	AIS VHF Data Link Own Vessel Report
VER	Version
MEB	Message Input for Broadcast Command

Notes:
1. For internally generated addressed binary messages (message 6, index 0), the proprietary ATON,ADDR sentence is used to set the destination MMSI.

2. Up to five MEB payloads may be stored. The corresponding CBR is used to determine the broadcast rate for the stored message. A proprietary sentence is used to remove stored MEB payloads (see proprietary sentences below).

Binary Message Configuration

Some further clarification about the binary messages (message 6, 8, 12 and 14) is required. The NMEA specification defines an index for each message in order to differentiate between two messages of the same message ID.

The VegaAIS unit reserves message 6 or 8, index 0 for the internally generated monitoring report. Message 8, index 1 is reserved for the internally generated Meteorological / Hydrographic report.

The VegaAIS configuration tool only allows one addressed binary message (message 6). Multiple broadcast binary messages (message 8) are allowed.

The following table summarises this behaviour.

Message ID	Index[1]	Content	Condition
6	0	Monitoring Report	Destination MMSI applied by proprietary ATON,ADDR sentence[2]
6	>0	Applied by MEB	Content and destination MMSI applied by MEB[1]
8	0	Monitoring Report	
8	1	Meteorological / Hydrographic Report	
8	>1	Applied by MEB	Content applied by MEB
12	0 – 7	Applied by MEB	Content and destination MMSI applied by MEB
14	0 - 7	Applied by MEB	Content applied by MEB

Note:
1. Max index number is 7

2. Only one message 6 can be transmitted concurrently. If a MEB sentence is applied for a different index, the original index is deactivated.

Proprietary Sentences

The concept of a proprietary sentence is also defined in the NMEA 0183 specification; however the format of the sentence is manufacturer defined. The proprietary sentences are listed below. The talker identifier for all the proprietary sentences is **PVSP**.

Mnemonic	Sentence Title
VAIS,HWCFG	Hardware Configuration
VAIS,CFG[1]	Configuration Query
VAIS,RST[2]	Configuration Reset
VAIS,BMN	Beacon Monitoring Configuration
VAIS,RMN	RACON Monitoring Configuration
VAIS,MON	Monitoring Report Configuration
VAIS,MNP	Monitoring Report Parameter Mapping
VAIS,MET	Meteorological/Hydrographic Report Configuration
VAIS,SYNC	GPS Sync Configuration
ATON,ADDR	Destination MMSI

Notes:
1. Query only
2. Command only

The format of these sentences is defined below:

Hardware Configuration

$PVSP,VAIS,HWCFG,arg1,arg2,arg3,arg4,arg5,arg6,arg7,[C|R]*CS

Parameter	Description	Range/Type	Notes
Arg1	User modifiable device hardware options	U32 bitmap	1 = present, 0 = not present Bit0 = Uni-directional current sensor Bit1 = Bi-directional current sensor
Arg2	Serial Number	String	Read Only
Arg3	Digital input pull up/pull down direction	U32 bitmap	0 = pull down, 1 = pull up Bit 0 = ID1 Bit 1 = ID2 Bit 2 = ID3 Bit 3 = ID4 Bit 4 = ID5 Bit 5 = ID6 Bit 6 = ID7 Bit 7= ID8 Bit 8 = RACON 1 Bit 9 = RACON 2 Bit 10 = RACON 3 Bit 11 = Beacon On/off Bit 12 = Beacon Input Bit 13 = Beacon OK
Arg4	Bi-directional sensor range	[0|1]	0 = low range, 1 = high range
Arg5	Uni-directional sensor range	[0|1]	0 = low range, 1 = high range
Arg6	Low Battery Level	0 – 36000	mV

Arg7	Recovery Battery Level	0 – 36000	mV

Configuration Query (query only)

$PVSP,VAIS,CFG,arg1,arg2,arg3,R*CS

Parameter	Description	Range/Type	Notes
Arg1	Device type	[0-3]	0 = Type 1 standard 1 = Type 1 extended 2 = Type 3 standard 3 = Type 3 extended
Arg2	Product version	[0-255]	
Arg3	Device h/w options (supported by device)	U32 bitmap	Bit0 = Uni-directional current sensor Bit1 = Bi-directinal current sensor Bit2 = Isolated RACON inputs Bit3 = Isolated DI Bit4 = Isolated ADCs Bit5 = RACON port Bit6 = Weather station port Bit7 = Accelerometer

Note – query only.

Configuration Reset

$PVSP,VAIS,RST,C*CS

Resets all configuration parameters back to factory settings.

Note – command only.

Beacon Monitoring Configuration

$PVSP,VAIS,BMN,arg0,arg1,arg2,arg3,arg4,arg5,arg6,arg7,arg8,[C|R]*CS

Parameter	Description	Range/Type	Notes
Arg0	Beacon Monitoring Type	[0|1|2|3|4]	0 = beacon on/off not monitored 1 = current monitoring 2 = on/off input 3 = serial 4 = fixed
Arg1	Beacon Failure Monitoring	[0|1|2|3]	0 = no failure monitoring 1 = inferred from off when should be on 2 = fail input 3 = serial
Arg2	Current sense threshold	[0-5000]	mA
Arg3	Active State for on/off sensing	[0|1]	0 = output active when OFF 1 = output active when ON
Arg4	Active State for failure sensing	[0|1]	0 = output active when NO FAIL 1 = output active when FAIL
Arg5	Fixed Status bits	[0-0x1F]	Status bits (all stat bits)
Arg6	Operation Mode	[0-3]	0 = Night 1 = Day and Night 2 = Day
Arg7	Flash character	100-60000	Optional. Defaults to 30s if using on/off

	length [ms]		detection via current sensing, otherwise 1.0s.
Arg8	Beacon type	String	Optional. Beacon type .

RACON Monitoring Configuration

$PVSP,VAIS,RMN,arg0,arg1,arg2,arg3,[C|R]*CS

Parameter	Description	Range/Type	Notes
Arg0	RACON Monitoring	[0|1|2]	0 = No RACON installed 1 = RACON always installed 2 = RACON presence monitored via RACON present input
Arg1	RACON Failure Monitoring	[0|1]	0 = RACON failure not monitored 1 = RACON failure monitored via RACON fail input
Arg2	Active State for RACON present sensing	[0|1]	0 = output active when NOT PRESENT 1 = output active when PRESENT
Arg3	Active Polarity for RACON failure sensing	[0|1]	0 = output active when NO FAIL 1 = output active when FAIL

Monitoring Report Configuration

$PVSP,VAIS,MON,arg0,arg1,arg2,[C|R]*CS

Parameter	Description	Range/Type	Notes
Arg0	Destination Area Code (DAC)	0-1023	
Arg1	Function Indicator (FI)	0-63	
Arg2	Report number	0-255	Report number[1]

Notes:
1. Report Number:

Report Number	Description
0	Vegaweb format #0 No user mappings
1	IALA A126 GLA format (table 4) 11 user defined fields (3 analogue + 8 digital)

Monitoring Report Parameter Mapping

$PVSP,VAIS,MNP,arg0,arg1,arg2,arg3,[C|R]*CS

Parameter	Description	Range/Type	Notes
Arg0	Field number		Fields in report are listed sequentially
Arg1	Input channel		See Input Channel list below
Arg2	Resolution * 1000		
Arg3	Offset * 100		

Input Channels:

Channel Number	Description
0	AIS Input Voltage
1	Bi-directional Voltage
2	Unidirectional Voltage
3	Battery Current (bi-directional)
4	Beacon Current (uni-directional)
5	Isolated ADC A
6	Isolated ADC B
7	Isolated Digital Input #1
8	Isolated Digital Input #2
9	Isolated Digital Input #3
10	Isolated Digital Input #4
11	Isolated Digital Input #5
12	Isolated Digital Input #6
13	Isolated Digital Input #7
14	Isolated Digital Input #8
15	RACON On Input
16	RACON OK Input
17	RACON GP Input
18	Beacon On Input
19	Beacon GP Input
20	Beacon OK Input
21	Beacon Voltage
22	Beacon Solar Voltage
23	Beacon Battery Current
24	Beacon Solar Current
25	Beacon LED Current
26	Beacon Current
27	Beacon OK
28	Beacon Day
29	Beacon On
30	Beacon Temperature
31	Beacon Light Sensor

Meteorological/Hydrographic Report Configuration

$PVSP,VAIS,MET,arg0,arg1,arg2,arg3,[C|R]*CS

Parameter	Description	Range/Type	Notes
Arg0	Collection period	U16	Mins (obsolete)
Arg1	Collection duration	U16	s
Arg2	Input port	0-2	0 = RS232, 1 = RS485, 2 = RS422
Arg3	Report number		Not currently used

Monitoring Report Destination MMSI Configuration

$PVSP,ATON,ADDR*CS

Parameter	Description	Range/Type	Notes
Arg0	Destination MMSI	30 bits	Destination MMSI for addressed monitoring report (msg 6, index 0)

GPS Sync Configuration

$PVSP,VAIS,SYNC,arg0,arg1,arg2,arg3,arg4,arg5,[C|R]*CS

Parameter	Description	Range/Type	Notes
Arg0	Enabled/Disable	[0|1]	0 = disable, 1 = enable
Arg1	Flash Duration	100-60000	millisecs
Arg2	Sync Polarity	[0|1]	0 = active low, 1 = active high
Arg3	Delay	0-60000	millisec
Arg4	Sync Type		0 = Vega
Arg5	Update period	5-1440	Minutes
Arg6	Flash Character	000-999	Vega flash character

Collision Detection Configuration (Type 3 units only)

$PVSP,VAIS,CDT,arg0,arg1,arg2,arg3,arg4,arg5,[C|R]*CS

Parameter	Description	Range/Type	Notes
Arg0	Enabled/Disable	[0|1]	0 = disable, 1 = enable
Arg1	Accel trip level	0-20000	G level [mg]
Arg2	Accel trip duration	0-630	millisecs
Arg3	Destination Area Code	10bits	For binary addressed collision report
Arg4	Function Identifier	6 bits	For binary addressed collision report
Arg5	Destination MMSI	30 bits	

Proximity Control Configuration (Type 3 units only)

$PVSP,VAIS,PCTL,arg0,arg1,arg2,arg3,arg4,arg5,arg6,[C|R]*CS

Parameter	Description	Range/Type	Notes
Arg0	Enabled/Disable	[0|1]	0 = disable, 1 = enable
Arg1	Min distance	0-50000	Minimum distance (turns off less than this) [m]
Arg2	Max distance	0-50000	Maximum distance (turns off greater than this) [m]
Arg3	Sector start angle	0-360	True
Arg4	Sector end angle	0-360	True
Arg5	Reserved		
Arg6	Reserved		

Power Control Configuration (Type 3 units only):

$PVSP,VAIS,PMD,arg0,arg1,arg2,arg3,arg4,[C|R]*CS

Parameter	Description	Range/Type	Notes
Arg0	Collision Detection Power Mode	[0|1]	0 = low power, 1 = high power (default)
Arg1	Proximity Control Power Mode	[0|1]	0 = low power, 1 = high power (default)
Arg2	SART Repeater Power Mode	[0|1]	0 = low power, 1 = high power (default)
Arg3	Reserved		
Arg4	Reserved		

SART Repeating Configuration (Type 3 units only):

$PVSP,VAIS,SART,arg0,arg1,arg2,arg3,[C|R]*CS

Parameter	Description	Range/Type	Notes
Arg0	SART Repeating Enable	[0|1]	0 = disabled, 1 = enabled
Arg1	SART Disable Period	0-1440	Intermittent SART disable period [mins]
Arg2	Reserved		
Arg3	Reserved		

Delete MEB Message

$PVSP,MEB,DEL,arg0,arg1,arg2*CS

Parameter	Description	Range/Type	Notes
Arg0	MMSI		Optional
Arg1	Messgae ID		Optional
Arg2	Message Index		Optional

Deletes stored MEB payload. To delete all stored MEBs, omit the optional parameter[s].

Example:	$PVSP,MEB,DEL,990000123,14,4*2F	Deletes msg 14, index 4
Example:	$PVSP,MEB,DEL,990000123*1E	Deletes all 990000123 messages
Example:	$PVSP,MEB,DEL*02	Deletes all stored MEB payloads

APPENDIX D VEGA AIS PRODUCT CODES

Description	Code
Type 1 Standard model	VAIS-1S
Type 1 Extended model	VAIS-1E
Type 3 Standard model	VAIS-3S
Type 3 Extended model	VAIS-3E

Options (add option code to model code)

• Current/Voltage sensor	-SEN

Antennas

• GPS antenna	VegaAIS-GPSANT
• VHF antenna (stubby 300mm)	VegaAIS-VHFANT
• VHF antenna (½ wave, 1m)	VegaAIS-VHFHWANT