IALA RECOMMENDATION

R0126 (A-126)
THE USE OF THE AUTOMATIC IDENTIFICATION SYSTEM (AIS) IN MARINE AIDS TO NAVIGATION SERVICES

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DOCUMENT REVISION

Revisions to this document are to be noted in the table prior to the issue of a revised document.

Date	Details	Approval
June 2004	1st issue	
June 2007	Entire document Release of IEC 62320-2 and of ITU-R M.1371-3	
June 2008	Section 4.4 Improvement of sub-sections on power drain, off position, AtoN status bits, and addition of wreck marking.	
June 2011	Edition 1.5. Entire document Updated to reflect developments in AIS AtoN.	
September 2020	Edition 1.6 Editorial corrections.	
December 2021	Edition 2.0 Addition of MAtoN status bits and MID info. Updated to reflect other development in AIS AtoN.	Council 74

THE COUNCIL

RECALLING that the aim of IALA is to foster the safe, economic and efficient movement of vessels, through improvement and harmonisation of Marine Aids to Navigation worldwide and other appropriate means, for the benefit of the maritime community and the protection of the environment.;

NOTING Regulation V/19.2.4 of the 1974 SOLAS Convention, as amended, on the carriage of AIS equipment on board ships;

NOTING that work carried out by IALA on shipborne automatic identification systems has facilitated the development and adoption of a suite of technical and operational publications by other bodies such as IMO, ITU, IHO and IEC:

- ITU-R *M. 825-3 on the characteristics of a transponder system using DSC techniques for use with VTS and ship-to-ship identification;*
- ITU-R *M-585-8 Assignment and use of identities in the maritime mobile service;*
- ITU-R *M. 1371-5 on the Technical Characteristics for a Ship-borne Automatic Identification System (AIS) Using Time Division Multiple Access in the Maritime Mobile Band;*
- IEC *61993-2 Ed3.0 Class A Shipborne equipment of the Universal Automatic Identification System (AIS) - Operational and Performance requirements, methods of testing and required test results;*
- IMO Recommendation on *Performance Standards for a ship-borne Automatic Identification System* (AIS)*, (MSC 74(69) Annex 3);*
- IEC *62288 Maritime navigation and radiocommunication equipment and systems – Presentation of navigation related information on shipborne navigational displays – General requirements, methods of testing and required test results;*
- IEC *62320-1 AIS Base Stations – Minimum operational and performance requirements – methods of test and required test results;*
- IEC *62320-2 AIS AtoN stations - Minimum operational and performance requirements - methods of test and required test results;*
- IMO Res*. A.1106(29) 2015 Revised Guidelines for the onboard use of shipborne automatic identification systems AIS;*
- IMO *MSC 232(82) Performance Standards for ECDIS;*
- IMO *MSC.192(79) Performance standards for radar equipment;*
- IMO *MSC.191(79) as amended, Performance Standards for the Presentation of Navigation-Related Information;*
- IMO *MSC SN.1/Circ.243/Rev.1 Amended Guidelines for the Presentation of Navigation-Related Symbols, Terms and Abbreviations;*
- IMO *MSC.1/Circ. 1473 Policy on use of AIS Aids to Navigation;*
- IMO *SN.1/Circ.289 - Guidance on the use of AIS application-specific messages;*

- IMO *SN.1/Circ.290 - Guidance for the presentation and display of AIS application-specific messages information;*
- IEC *62287-1 Maritime radionavigation and communication equipment and systems – Class B shipborne equipment of the Automatic Identification System (AIS) using CSTDMA techniques – Operation and performance requirements, method of test and required test results;* and
- IEC *62287-2 Maritime radionavigation and communication equipment and systems – Class B shipborne equipment of the Automatic Identification System (AIS) using SOTDMA techniques – Operation and performance requirements, method of test and required test results*;

NOTING FURTHER that IALA has adopted:

- Recommendation *R0123 (A-123) on the Provision of Shore Based Automatic Identification Systems (AIS);*
- Recommendation *R0124 (A-124) The AIS Service;*
- Recommendation *R0143 Provision of Virtual Aids To Navigation;*
- Recommendation *R1016 Mobile Marine Aids to Navigation;*
- Guideline *G1154 Use of Mobile Aids to Navigation;*
- Guideline *G1081 Provision of Virtual Aids to Navigation;*
- Guideline *G1084 Authorization of AIS AtoN;*
- Recommendation *R1015 Marking of Hazardous Wrecks;*
- Guideline *G1046 Response plan for the marking of new wrecks; and*
- The *IALA NAVGUIDE,* which includes a section on the use of AIS as a Marine Aid to Navigation;

(Reference documents are the latest from the date of issuance of these guidelines. Readers have to consider that some will be amended or revoked, and care should be taken to follow up with the most up to date information)

RECOGNIZING that the use of AIS in VTS operations will assist in the development and maintenance of a traffic image, particularly with respect to the:

- identification of vessels;
- tracking of vessels;
- simplification of information exchange; and,
- provision of additional information to assist in vessel traffic management;

RECOGNIZING ALSO that an AIS transponder could provide information and data that could:

- be used as an aid to navigation;
- complement existing aids to navigation;
- monitor the performance of aids to navigation;
- monitor the “on station” position of floating aids to navigation;
- provide identity, state of “health” and other navigational information such as meteorological and hydrological data, if available, to ships and shore authorities; and

- be used to assess traffic type and pattern to assist in providing the appropriate level of service and mix of aids to navigation;

HAVING CONSIDERED the various applications of AIS that have been identified by IMO, ITU, IEC and IALA;

HAVING DECIDED that, in addition to the transfer of data from ship to ship, ship to shore and shore to ship, as identified by IMO, the Automatic Identification System is defined as a system for use as:

- a Marine Aid to Navigation;
- a tool to assist in VTS operations; and
- a tool to assist aids to navigation service providers;

ADOPTS the "AIS Aids to Navigation Service" set out in the annex of this recommendation; and,

RECOMMENDS that National members and other appropriate authorities providing Marine Aids to Navigation services use appropriate AIS units as part of their Marine Aids to Navigation services for:

- the provision of information and data to shipping; and
- monitoring and control purposes.

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THE USE OF THE AUTOMATIC IDENTIFICATION SYSTEM (AIS) IN MARINE AIDS TO NAVIGATION SERVICES

1. BACKGROUND

Automatic Identification System (AIS) is an autonomous broadcast system, operating in the VHF maritime mobile band. It exchanges information such as vessel identification, position, course, speed, etc. between mobile and fixed stations. It handles multiple reports, using Time Division Multiple Access (TDMA) technology ensuring reliable and robust operation. The main purpose of shipborne AIS is:

- to be used in ship-to-ship mode for collision avoidance;
- as a means for littoral States to obtain information about a ship and its cargo; and
- as a VTS tool, i.e., ship-to-shore (traffic management).

Chapter V of the 1974 SOLAS Convention (as amended) requires mandatory carriage of AIS equipment on all vessels constructed on or after 01 July 2002. Implementation for other types and sizes of SOLAS Convention vessels was required to be completed not later than 31 December 2004. Presently, only Minimum Keyboard Display (MKD) is required by SOLAS carriage requirements, no mandatory interface to shipborne equipment is required.

AIS, as applied to Marine Aids to Navigation (AtoN), improves and enhances services provided to mariners. The purpose of this document is to provide recommendations and guidance for the use of AIS in this field.

2. INTRODUCTION

The use of AIS within marine aids to navigation services is broadcasting of the aids to navigation report message (Message 21) and other AIS messages. This service is generally provided from an AIS AtoN Station or a base station.

The International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) define an AtoN as:

> "a device or system external to vessels that is designed and operated to enhance the safe and efficient navigation of vessels and/or vessel traffic".

The primary purpose of an AIS AtoN Station is to promote and enhance safety and efficiency of navigation by one or more of the following:

- providing a positive and all-weather means of identification;
- complementing existing services (e.g., racons) from AtoN;
- transmitting accurate positions of floating AtoN;
- indicating if a floating AtoN is off position;
- promulgation of Application Specific Messages including:
    - marking or delineating tracks, routes, areas, and limits (for example, areas to be avoided and Traffic Separation Schemes (TSS));
    - marking offshore structures (for example, wind turbines, wave and tidal energy devices, oil and gas platforms); and
    - providing weather, tidal, and sea state data;
- provide additional AtoN capability through the use of Virtual AIS AtoN, where installation of physical AtoN is technically or operationally difficult;

- enable timely marking of new immobile hazards; and
- enable marking of mobile hazards by use of Mobile AtoN.

A further set of benefits for the AtoN provider include the following:

- Monitoring the status of an AtoN.
- Tracking an AtoN that is off position.
- Identifying ships involved in collisions with AtoN.
- Gathering real-time information on the "state of health" of an AtoN.
- Remotely controlling changes in AtoN parameters.
- Providing statistics on reliability of AtoN.
- Extending the coverage of AIS monitoring.

2.1. AIDS TO NAVIGATION REPORT

ITU-R M.1371 defines the "Aids to Navigation Report" (Message 21). An AIS AtoN service enables AtoN providers to broadcast information such as the:

- Type of AtoN
- Name of the AtoN
- Position of the AtoN
- Position accuracy indicator
- Type of position fixing device
- On/Off position status
- Physical and Virtual AtoN identification
- Dimension of the AtoN and reference positions
- Status of the AtoN systems

2.2. TECHNICAL STANDARD FOR AIS ATON STATIONS

Technical standards for AIS AtoN are defined in IEC document *IEC62320-2 AIS AtoN stations - Minimum operational and performance requirements - methods of test and required test results.*

There are three classifications of an AIS AtoN station, with different functionality. They are summarized below and are fully described in *IEC 62320-2*.

2.2.1. TYPE 1 AIS ATON STATION

The Type 1 AIS AtoN Station is a transmit-only station, operating in FATDMA mode. Hence the slots used by the Type 1 AIS AtoN Station need to be reserved by a national competent authority, using Message 20, transmitted from an AIS station in the coverage area. The Type 1 unit must be configured to use the slots reserved for it before being placed into service.

This is the simplest type of AIS AtoN station, likely to have low cost and power consumption.

2.2.2. TYPE 2 AIS ATON STATION

The Type 2 AIS AtoN Station is similar to a Type 1, but has, in addition, an AIS receiver of limited capability which allows the Type 2 Station to be remotely configured via the AIS VDL. This receiver operates on a single AIS channel. This type appears to have been discontinued by the manufacturers.

2.2.3. TYPE 3 AIS ATON STATION

The Type 3 AIS AtoN Station is more complex than the Type 1 and Type 2 and contains two AIS receiving processes that allow it to participate fully on the AIS VDL. This means that in addition to FATDMA, the Type 3 station can function in RATDMA mode.

The Type 3 station is therefore capable of:

- Autonomous operation, not requiring slot reservations (RATDMA).
- Autonomous operation using slots reserved by a national competent authority, using message 20, transmitted from another AIS Station in the coverage area (FATDMA).
- Receiving and relaying AIS messages, including control and configuration messages for itself or for other AIS AtoN stations in a chain. See *IEC 62320-2* for more details of chaining.
- Repeating AIS messages.
- Indirect synchronization, using its receiving processes.

3. SUPPLEMENTARY AIS AtoN MESSAGES

In addition to Aids to Navigation Report, Message 21, an AIS AtoN may also transmit different other Messages. The main ones are Messages 6, 7, 8, 12, 13, 14, and 25. Note that Type 1 AIS AtoN stations, not having full AIS receiver capability, cannot send Messages 7 or 13.

Table 1 Summary of most common AIS AtoN Station messages

Msg ID	Message Name	Message Description	Application examples
6	Binary Addressed Message	Binary data for addressed communication	Monitoring of AtoN lantern, power supply, etc.
7	Binary acknowledge message	Acknowledge of addressed binary message	
8	Binary Broadcast Message	Binary data for broadcast communication	Meteorological and hydrological data
12	Addressed Safety Related Message	Safety related data for addressed communication	Warn AtoN malfunctioning
13	Safety related acknowledge message	Acknowledge of addressed safety related message	
14	Broadcast Safety Related Message	Safety related data for broadcast communication	Warn AtoN malfunctioning
25	Single slot binary message	Binary data for addressed or broadcast communication	Status report

Refer to *IEC62320-2.*

Note that Messages 6, 8, 25, and 26 are now referred to as Application Specific Messages (ASM).

3.1. MESSAGE 6

Message 6, Addressed Binary Message, can be employed by an AIS AtoN for sending AtoN status reports to the national competent authority responsible for the AtoN. Useful data includes those for battery, lantern status, and solar power system charging current. The benefits for the competent authority include knowledge of equipment status, opportunity for preventative maintenance, early notification of faults, and ultimately increased availability. Such performance information can be fed back into the design process for AtoN systems. Refer to annex C for examples of Message 6 for AtoN monitoring.

3.2. MESSAGE 8

Message 8 is a binary broadcast message. IMO has published a limited list of Message 8, Application Specific Messages, for international use (IMO *SN.1/Circ.289*). Competent authorities may use other Message 8 formats on a regional basis.

As an example, among the list of IMO Application Specific Messages is a message for meteorological and hydrological data. Sensors on the AtoN provide this data to the AIS AtoN Station, which in turn broadcasts this Message 8.

3.3. MESSAGE 25

Message 25 is a single slot binary message that can for example be used to send encrypted configuration data. See *IEC 62320-2* for further details.

3.4. MESSAGE 26

Message 26 may also be received, processed, and transmitted by an AIS AtoN station. Note that this message is not included in *IEC62320-2*.

3.5. OVERALL

IALA maintains a register of regional Application Specific Messages. The purpose of this register is harmonization. The register accepts information on Messages 6, 8, 25, and 26. Go to www.iala-aism.org for further information.

AIS may be applied to both floating and fixed AtoN, and more than one AIS message format may be transmitted as noted above. The national competent authority for the AtoN should establish procedures to verify the broadcast information and the correct operation of the AIS AtoN Station.

4. IMPLEMENTATION

4.1. AIS ATON SERVICE AVAILABILITY DEFINITION

The recommended AIS AtoN service availability definition is as follows:

The AIS AtoN service shall have a service availability corresponding to IALA Category 1, 2, or 3 (depending on the importance of AtoN) for the intended transmissions. Normal AIS AtoN operation is the transmission of the following correct information in Message 21:

- MMSI, according to ITU category
- The type of AtoN
- The name of the AtoN
- A valid 2D position of the AtoN within the accuracy indicated by the position accuracy indicator
- A position accuracy indicator
- Type of position fixing device
- Off position indicator
- Time stamp
- Dimensions of the AtoN and reference positions
- Virtual AtoN flag
- RAIM flag

The AIS AtoN transmissions containing the AtoN information shall have a signal level of greater than or equal to –107dBm when measured at the air-antenna interface of the user's receiver (IEC standard) within the following coverage areas:

- 5-10 NM. of the AIS AtoN for floating AtoN depending on height of AtoN.
- 10-25 NM. of the AIS AtoN for fixed AtoN depending of height of AtoN.

Synthetic and Virtual AIS AtoN signal sent from AIS Base Station might have different coverage area depending on the location of the AtoN inside the coverage area (the edge, centre, etc.). National competent authorities shall develop their own procedures for dealing with coverage area and consider the use of multiple stations if necessary. Note that the service availability shall be calculated as a three year rolling average for all AIS AtoN.

Expected signal strength can be computed for a suitable measuring point using standard propagation calculations.

Information and guidance on how to obtain needed information from applicants regarding commissioning of AIS AtoN are given in IALA Guideline *G1084*.

4.2. PHYSICAL, SYNTHETIC, AND VIRTUAL AIS ATON

AIS AtoN can currently be implemented in three ways – Physical, Synthetic and Virtual.

For Virtual AIS AtoN reference should be made to IALA Recommendation *R0143*, and to IALA Guideline *G1081*.

4.2.1. PHYSICAL AIS ATON

A Physical AIS AtoN station is a Physical AtoN fitted with an AIS AtoN device. It is displayed as a solid line diamond with crossed lines centred at the reported position of the AtoN.

4.2.2. SYNTHETIC AIS ATON

AtoN that physically exists, but which is transmitted from a geographically separated AIS AtoN station (base station or standalone unit) is a Synthetic Predicted AIS AtoN. It is displayed as a solid line diamond with crossed lines centred at the reported position of the AtoN.

IEC62320-2 states that "for Synthetic AIS AtoN messages, the repeat indicator field shall be set to 1, 2, or 3 to signify that the message is transmitted from a position other than that provided in the message".

There are 2 types of Synthetic AIS AtoN, “Monitored Synthetic AIS AtoN” and “Predicted Synthetic AIS AtoN”.

4.2.2.1. Monitored Synthetic AIS AtoN

A “Monitored Synthetic AIS AtoN” is transmitted as a message 21 from an AIS Station that is located remotely from the AtoN. The AtoN physically exists and there is a communication link between the AIS Station and the AtoN. The communication between the AtoN and AIS confirms the location and status of the AtoN.

A Monitored Synthetic AIS AtoN ensures the integrity of the Message 21.

4.2.2.2. Predicted Synthetic AIS AtoN

A “Predicted Synthetic AIS AtoN” is transmitted as a Message 21 from an AIS Station that is located remotely from the AtoN. The AtoN physically exists but the AtoN is not monitored to confirm its location or status.

A Predicted Synthetic AIS AtoN does not ensure the integrity of the Message 21, and therefore is not recommended for use on floating AtoN.

The use of Predicted Synthetic AIS AtoN broadcasts for fixed AtoN is acceptable as the location will not change, but the status of the AtoN is not verified.

4.2.3. VIRTUAL AIS ATON

A “Virtual AIS AtoN” is transmitted as a Message 21 for an AtoN that does not physically exist. It is displayed as a thin dashed line diamond with crossed lines centred at the reported position of the AtoN.

When a Virtual AIS AtoN is used, the AtoN symbol or information would be available for presentation to a mariner, even though there is no physical AtoN such as a buoy or beacon. A base station or AtoN station would broadcast this message.

The “Virtual AtoN Flag” in Message 21 would be set to 1, to clearly identify this as a Virtual AIS AtoN.

An example of where Virtual AIS AtoN could be useful is the marking of hazards to navigation on a temporary basis (see IALA Recommendation *R1015 Marking of Hazardous Wrecks*, and IALA Guideline *G1046 Response plan for the Marking of New Wrecks*), until more permanent AtoN can be established.

4.3. MMSI NUMBERS FOR AIS ATON

4.3.1. MMSI NUMBERS FOR ALL AIS ATON

All AIS AtoN Stations should have a radio licence.

All AIS AtoN Stations must include a Maritime Mobile Service Identity (MMSI) number in its own transmissions. The MMSI is a unique identifier issued by the appropriate national MMSI issuing authority. All AIS AtoN MMSI numbers, as defined in *ITU-R M.585-8*, are of format 99 followed by a three-digit MID followed by a four-digit unique identifier. The MID identifies the country that issues the VHF licence for the AIS AtoN Station. The four-digit unique identifier starts with 1 (99MID1XXX) for physical and synthetic AtoN Stations and starts with 6 (99MID6XXX) for virtual AtoN Stations. The AtoN type that is the Mobile AtoN has its own four-digit unique identifier that starts with 8 (99MID8XXX).

4.3.2. MMSI NUMBERS FOR SYNTHETIC AND VIRTUAL AIS ATON

Each Synthetic, Mobile AtoN (MAtoN) and Virtual AIS AtoN must have a unique MMSI number. The Repeat Indicator in Message 21 is used to indicate that the message is broadcast from another location i.e., not the location given in the Message 21.

Table 2 Summary of MMSI and Virtual AIS AtoN flag settings

Type of AIS AtoN or AtoN	MMSI (ITU-R.M585-8)	Virtual AtoN Flag (ITU-R. M1371-5)
Physical[1]	99MID1XXX	0
Synthetic[2]	99MID1XXX	0
Virtual	99MID6XXX	1
MAtoN[3]	99MID8XXX	1[4] or 0

Notes:

1 According to *ITU-R.M585-8*, the name of type is Physical AIS AtoN.

2 According to *ITU-R.M1371-5*, the virtual AtoN information is virtual/pseudo AtoN.

3 Mobile AtoN is considered a new type of AtoN but it is not a new type of AIS AtoN. It is displayed as a solid line diamond (Physical AIS AtoN) or a thin dashed line diamond (Virtual AIS AtoN), both topped by letter "M" and a compass rose inside centred at the reported/predicted position.

4 Usage of Virtual for MAtoN requires to apply firm rules regarding the position update, such as having the capability of reporting the moving object every 3 minutes or better.

4.3.3. FATDMA RESERVATIONS

FATDMA reservations are required for Type 1 AIS AtoN Stations. Additionally, a Type 3 AIS AtoN Station may use FATDMA.

FATDMA slots should be coordinated by national competent authorities according to IALA Recommendation R0124 (A-124) Annex 14. Individual slots allocations for AIS AtoN Stations require transmission of a message 20 in the coverage area. This can be transmitted by an AIS station that is capable of control of the VDL.

Efficient use of the FATDMA allocations can be improved by having several buoys in the same area using the same slots but in different frames. For example 3 buoys, each with a 3 minute reporting interval, in the same area could be configured such that Buoy A transmits in frames 0, 3, 6, … Buoy B transmits in frames 1, 4, 7,…. and Buoy C transmits in frames 2, 5, 8,…. all using the same slots.

4.4. REPORTING INTERVALS FOR AIS ATON MESSAGES

4.4.1. MESSAGE 21

The reporting interval for Message 21 should be chosen so that a vessel receives an appropriate number of Messages 21 from coming into range of the AIS AtoN broadcast until reaching the AIS AtoN location. Reception of three messages is desirable.

Factors to take into account are:

- Vessel speed of approach
- Topology, for example, vessels approaching from around a headland
- Nominal transmission range

Current generation AIS AtoN units have reduced power drain compared with early AIS AtoN units. A short reporting interval configuration for current AIS AtoN units therefore may not cause a significant increase in power drain over a long reporting interval.

On the other hand, in some countries today VDL loading becomes more important than the above consideration, and the interval between Messages 21 is set primarily by limiting the slot usage by AIS AtoN stations. This ensures that enough VDL capacity is available for a satisfactory use of the VDL by vessels and base stations.

4.4.2. REPORTING INTERVALS FOR OTHER MESSAGES

Reporting intervals for other messages should be based on operational requirements. Two examples follow:

4.4.2.1. Message 6 for AtoN monitoring.

This message need only be sent as often as the national competent authority requires that data. However, in practice, power consumption by the AIS AtoN will be minimized if this message is sent just before or just after a Message 21. This is because most AIS AtoN devices will power down parts of their operating system between transmissions ("sleep mode"), and so sending Message 6 during a Message 21 wake-up portion of the sleep mode cycle does not add an extra wake-up period. Sending additional messages during the awake portion of the cycle has only a minimal effect on AIS AtoN device power consumption. (Examples are provided in appendix 3)

4.4.2.2. Message 8 for Meteorological and Hydrological data.

Again, this should be coordinated with the wake-sleep cycle for Message 21. However, by its nature, this message is required less frequently, so that a multiple of the Message 21 reporting interval would be appropriate. In situations where the Message 8 for Meteorological and Hydrological data is repeated by an AIS Base Station, the reporting interval at the AIS AtoN station might be reduced to 30 or 60 minutes, for example.

4.5. FACTORS AFFECTING THE POWER DRAIN OF AN AIS ATON STATION

The power drain of an AIS AtoN station is dependent on a number of factors which are usually available for setting via the unit configuration method. These are:

- VDL access method – FATDMA will give substantially lower power drain than RATDMA.
- FATDMA slot selection – if Mode B is used, then the Channel A and Channel B slots should be close together in time, to minimize the period for which processes in the AIS AtoN unit are active.
- Reporting interval – an extended reporting interval will, of course, reduce power drain, but the interval should satisfy the guidance given in 4.3 above.
- Configuration of the AIS AtoN unit - the AIS AtoN unit could be designed or configured to enter into a "sleep" mode when not active.

Repetition of the AIS AtoN messages by a local AIS shore station, during the reporting interval of the AIS AtoN station, may allow the reporting interval of the AIS AtoN unit to be extended. For example, the AIS AtoN may have a 10 minute reporting interval, but the local AIS shore station repeats the AIS AtoN message every frame, i.e., every minute. Consideration should be given to the coverage areas of the AIS AtoN unit and the base station to ensure that operational requirements are met.

An advantage of repeating from an AIS shore station may be to increase the coverage area of the AIS AtoN Station.

4.6. REPEATING AIS SART MESSAGES

AIS SART messages can be repeated by a Type 3 AIS AtoN Station, if the repeat indicator is 0, 1, or 2. If the SART messages are repeated it should be done in such a manner that the repeated broadcast does not interfere with the original SART transmissions.

When the AIS SART message is repeated, the repeat indicator should be increased. An AIS SART message with repeat indicator of 3 should not be repeated.

An AIS AtoN station should not repeat an AIS SART test message.

4.7. AIS VDL CHANNELS FOR AIS ATON MESSAGES – REPORTING MODES

4.7.1. REPORTING MODES FOR MESSAGE 21

There are three reporting modes for Messages 21

1 *Mode A* – Message 21 transmission alternates between Channel 1 and Channel 2 in a subsequent frame that is nominally one reporting interval later. Message 21 content is updated for each message, or

2 *Mode B* – The same Message 21 transmitted on Channel 1 and Channel 2 in quick (nominally 4 seconds) succession. The first transmission of each Message 21 may be on either Channel 1 or Channel 2. The second transmission shall be on the other channel), or

3 *Mode C* – Message 21 transmitted on a single channel, either Channel 1 or Channel 2. Message 21 content updated at each reporting interval.

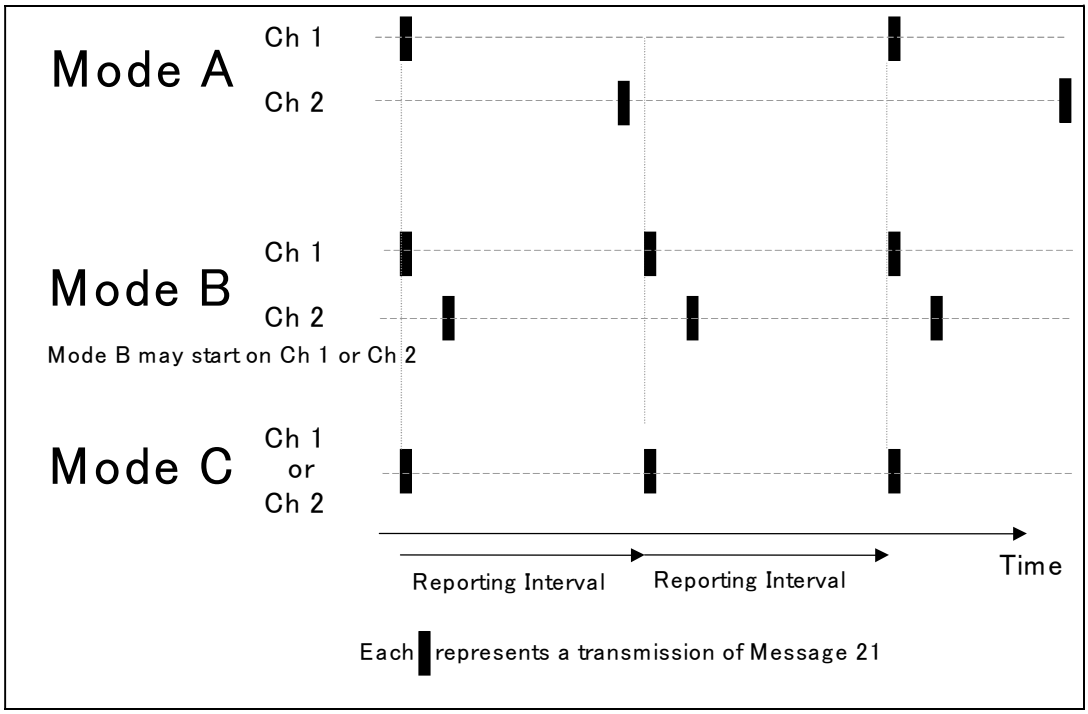


Figure 1 Reporting Modes for Message 21

The Type 1 AIS AtoN stations may transmit on a single AIS channel, either Channel A or Channel B, or on both channels. The Type 3 AIS AtoN station should transmit on both channels.

Mode B should be used for AIS AtoN Stations to give the best probability of reception.

4.7.2. REPORTING MODES FOR OTHER MESSAGES

Reporting modes for other messages should be based on operational requirements. Two examples follow.

4.7.2.1. Message 6 for AtoN monitoring

This application is essentially point to point transfer of monitoring data, and so a single channel, Mode C, may be sufficient.

4.7.2.2. Message 8 for Meteorological and Hydrological data

This application is likely to be intended for the benefit of shipping and so to increase the likelihood of reception, the use of Mode A or B is recommended.

4.8. CONFIGURATION OF MESSAGE 21, AIDS TO NAVIGATION REPORT

Configuration of an AIS AtoN station, and of the essential Message 21, is described in *IEC 62320-2*.

4.8.1. POSITION MONITORING FOR FLOATING AIDS

The AIS AtoN Station should transmit its current position as given by the global navigation satellite system (GNSS) on the floating AtoN.

The position derived from an GNSS can be used in conjunction with the reference, or charted, position and a "guard zone" to monitor the position of floating AtoN and to generate an "Off position" alarm which sets the off-position indicator bit (flag) in Message 21. The alarm is generated when the GNSS position is outside the guard zone parameters, meaning that the position threshold has been exceeded.

The guard zone parameters for a floating aid (with mooring) needs to be determined and entered into the physical AIS AtoN unit configuration settings. Assuming no movement of its anchor, the area within which a floating aid will always be found is determined by the movement permitted by its mooring length and the minimum depth of water and by the errors inherent in the positioning method used (including accuracy of the fixing method used when the AtoN was deployed). When these factors are added together, they determine the area within which a floating aid position must be maintained. After certain basic assumptions are made, the approximate size of this zone can be calculated for each floating aid using the mooring length, minimum water depth and the position fixing accuracy used for that AtoN. A tolerance factor may be added in order to reduce the likelihood of temporarily barely exceeding the "Off position" threshold.

A proper guard zone parameter setting, will give the mariner an alarm when the floating aid is "Off position". This is the main benefit of this feature. If it is not properly set, it will either never alarm (too wide) or alarm constantly (too narrow).

The improper setting of the reference position (or charted) and the guard zone parameters may result in the GNSS receiver of the unit being permanently enabled which will significantly increase power consumption.

More information on a floating AtoN swinging radius calculation can be found on the IALA *G1066 The Design of Floating Aid to Navigation Moorings).*

IEC 62320-2 does not prescribe any specific algorithm for computing off position for the purpose of setting the off-position flag in Message 21. This algorithm is left to the AIS AtoN manufacturer or national competent authority to decide.

When selecting an off-position algorithm, consideration should be given to spurious position fixes from the GNSS. A single spurious position fix from the GNSS should not set the Off-position flag in Message 21.

The setting of the off position indicator in Message 21 should be the result of a determination of the AtoN position, based on multiple GNSS position fixes. The GNSS should be operational long enough to obtain a stable and reliable position fix, considering the accuracy required to determine if the AtoN is inside or outside the guard zone. The specific algorithm used may be decided by the manufacturer. Two examples of algorithms are in appendix 1.

The use of systems that augment the GNSS is recommended, to improve the accuracy and reliability of the position data.

4.8.2. NAME OF ATON

The AIS AtoN name is part of the information contained in the AIS AtoN digital message (Message 21). Given the lack of uniformity worldwide concerning the naming, some guiding principles will enable more consistency. Some of the important elements to consider are:

Using a short name will prevent cluttering the shipborne display when users are displaying the name tag. Recognized international or national abbreviations or acronyms might help reduce the length.

Use of numbering and lettering that respect IALA's Maritime Buoyage System (e.g., Even or odd, numbered from seaward, etc.).

Avoid repeating some of the information already available in other fields of the Message 21 and/or Nautical Publications (fixed, floating, MMSI, virtual, colour, etc.).

Message 21 has two name fields, the main field (20 char.) and the extended one (14 char.). Consider that not all shipborne navigational equipment may display the extended field.

Consider that adding the Maritime Safety Information (MSI) number as a reference in the Virtual AtoN name requires editing the information broadcast as it changes and that this might be limiting when using a stand-alone AIS AtoN mobile station.

4.8.3. THE "DIMENSION/REFERENCE FOR POSITION ATON FIELD"

This field should indicate the "dimension/reference for position" parameter of the AtoN object itself and not the dimensions of the area in which a floating aid can move (guard zone) or dimensions of a "dangerous zone" around the AtoN.

For fixed AtoN, a numeric value should be used as noted in the table below. The orientations established by the dimensions A, B, C & D should face true north, south, west & east respectively. By setting A and C to zero, the reference point becomes the north-west corner.

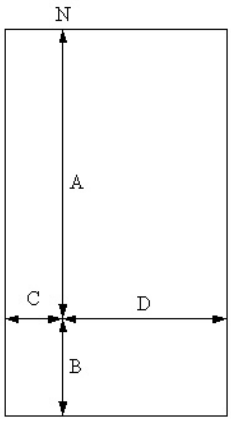
For floating aids larger than 2m x 2m, the dimensions of the AtoN should always be given as a circle, i.e., the dimensions should always be as follows: A=B=C=D>1. (This is due to the fact that an orientation of the floating aid is not transmitted.)

For floating objects smaller than or equal to 2m x 2m the values of the fields should be set to A=B=C=D=1.

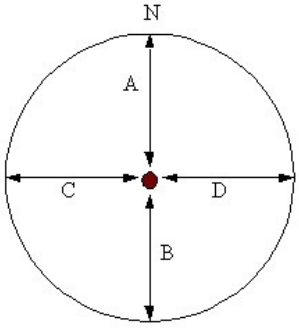
When transmitting virtual AtoN information, i.e., the virtual AtoN flag is set to one (1), the dimension should be set to A=B=C=D=0 (=default). This should also be the case, when Type of AtoN is set to "reference point".

Offshore structures that are not fixed, such as rigs, should be considered as Code 31 type from Table 1. These structures shall have their "Dimension/reference for position" parameter as determined below.

Fixed offshore structures, Code 3 type from Table 1, shall have their "Dimension/reference for position" parameter as determined below. Hence, all offshore AtoN and structures have the dimension determined in the same manner and the actual dimensions are contained in Message 21.



Dimension/reference for position, for a fixed AtoN	
	Numeric
A	0 - 511
B	0 - 511
C	0 - 63
D	0 - 63



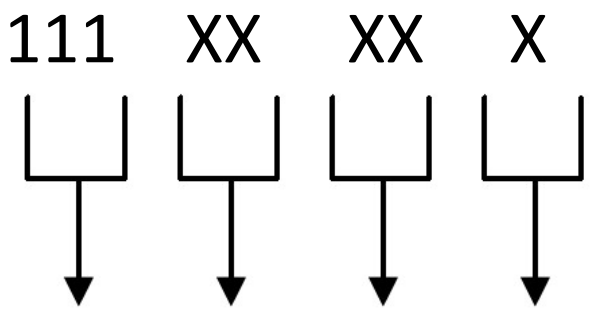
Dimensions for a floating AtoN and both fixed and floating offshore structures (table 34bis Codes 3 and 31)	
A+B ≤ 2m	A=B=C=D=1
A+B > 2m	A=B=C=D>1

Figure 2 Dimension/reference for position AtoN field

4.8.4. AtoN Status Bits

AIS message 21 provides for eight status bits that are intended to provide information on the operating status of the AtoN and/or its component (i.e.,, light on/off/inoperative, RACON fitted, operational/inoperative, direction of movement (COG) of a MAtoN). The bits 8, 7 and 6 binary digits of the Status Bits represent its page ID, for eight possible pages. Page 00000000 represents no data available, as default. The 8th binary bit is the most significant, the 1st binary bit the least significant.

Page 111, 101 and 001 are defined as follows:



AtoN light, RACON and health status 8 bits format: 111 XX XX X			
Page id (8th, 7th and 6th bit)	**RACON Status (5th and 4th bit)**	**Light Status (3rd and 2nd bit)**	**Health Status (1st bit)**
111	00 = No RACON installed	00 = No light or no monitoring	0 = Good Health
	01 = RACON installed but not monitored	01 = Light ON	1 = Alarm
	10 = RACON operational	10 = Light OFF	
	11 = RACON Error	11 = Light fail or at reduced range	

Figure 3 Recommended use of status bits (light, racon and health)

NOTES

1 Manufacturer's default setting for the eight AtoN Status bits of Message 21 should be all zeros.

2 The 1st bit is used for alerting that there is a problem at the AIS AtoN Station. This allows a competent authority to avoid using Message 6, which can overload the VHF data link, while still receiving some monitoring information every time Message 21 is sent by the AIS AtoN Station.

3 Health flag alarm should be set to 1 to indicate a fault in or failure of the AtoN system or AIS AtoN station, at this location. Further indication of the fault or failure detail can be achieved by use of additional pages within the eight AtoN Status bits or addressed binary Message 6.

4 By using only page 7 there is no need to toggle through the messages, only Message Id 7 has to be read thus allowing an immediate filtering.

5 Main Light Status - For the main light, a fail is a situation where:

- a The light is off when it should be on.
- b The flash character is incorrect (e.g., an optic drive failure).
- c The "Main light fail" may be set if the main light is operating at a reduced range (e.g.,, running on emergency, lower range, lanterns).

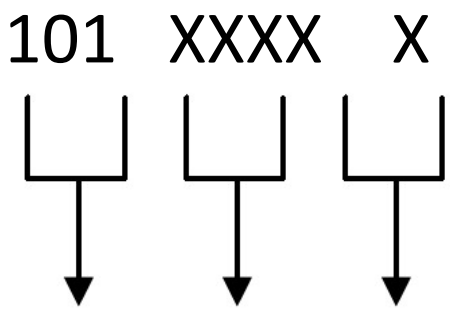
6 Racon Status - For the Racon, a fail is a situation where the Racon unit signals a failure from an on-board built-in integrity test (BIIT). It may also signify a power failure for the Racon;

7 AtoN Alarm Flag:

- a The AtoN Alarm flag is un-set when all the AtoN devices are working correctly, and the mariner should be able to use the AtoN as expected.

b The AtoN Alarm flag is set when any AtoN device has a failure or is not working as expected. For example, if a sector light has failed, this should set the flag. If either the Racon of the main light has failed (or operating at reduced range in the case of the light), then this will also set the flag as well as the correct bit settings in the racon / main light bits. This allows a very simple indication of a problem on the AtoN without needing to decode the rest of the bits (e.g., useful for charting software to provide a quick method of determining the status of the AtoN).

c The flag should not be set by failures that do not directly affect the use of the AtoN by the mariner. For example, a failure of the telemetry system should not be relayed to the mariner. Also, if the station's batteries are running low, this should not set the AtoN Alarm flag (unless it causes a failure of an AtoN device).

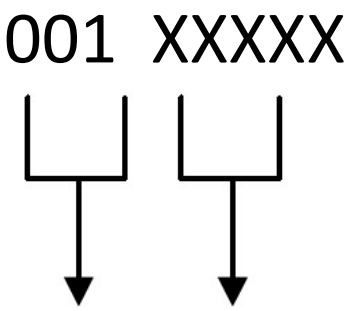


Mobile AtoN & Method and Direction of Movement status 8 bits format : 101 XXXX X		
Page id (8th, 7th and 6th bit)	**Direction not reported field OR Direction of movement (COG) (5th , 4th , 3rd and 2nd bit)**	**Monitoring Status (1st bit)**
101	0000 = No Further Information Default	0 = Monitored
	0001 = Free-floating ABCD values denote an area (e.g., oil spill)	1 = Unmonitored
	0010 = Free-floating ABCD values denote an object (e.g., craft, gear, flotsam, etc.)	
	0011 = Moves as defined (Synthetic) ABCD values denote an object (e.g., craft, gear, flotsam, etc.)	
	0100 = Moves as defined (Synthetic) ABCD values denote an area (e.g., dredging zone)	
	0101 = Tethered from a watercraft (e.g., cable, pipe, net)	
	0110 = Reserved for future use	
	0111 = Self-propelled, but direction not reported or unavailable*	
	1000 = 000° ± 22.5°*	
	1001 = 045° ± 22.5°*	
	1010 = 090° ± 22.5°*	
	1011 = 135° ± 22.5°*	
	1100 = 180° ± 22.5°*	
	1101 = 225° ± 22.5°*	
	1110 = 270° ± 22.5°*	
	1111 = 315° ± 22.5°*	

Note: *The ABCD value are the "dimension/reference for position" parameter of the MAtoN object itself and not the dimensions of the area in which a floating aid can move (guard zone) or dimensions of a "dangerous zone" around the AtoN (refer to the message type 21 dimensions field information).*

* *Status bits relating to; self-propelled and direction of movement are for future development, testing of trial concepts and should only be used after a full risk assessment by a competent authority.*

Figure 4 Recommended use of status bits for MAtoN



Regional AtoN status bits format : 001 (refer to VTT-EG AIS AtoN for Inland Use standard)	
Page id **(8th, 7th and 6th bit)**	**Reserved for regional use** **(5th , 4th , 3rd , 2nd and 1st bit)**
001	

Figure 5 Recommended use of status bits for regional use

4.8.5. TYPE OF MARINE AID TO NAVIGATION

The types of Marine Aids to Navigation listed below are based on the IALA Maritime Buoyage System, where applicable.

National competent authorities may use the eight AtoN Status Bits of the message to indicate additional features with the AtoN, such as: light, racon, light on/off.

The nature and type of AtoN can be indicated with 32 different codes:

Table 3 AtoN codes

	Code	Definition
	0	Default, Type of AtoN not specified
	1	Reference point
	2	RACON or MAtoN
	3	Fixed structure, such as oil platforms, wind farms. (Note: This code should identify an obstruction that is fitted with an Aid-to-Navigation AIS station.)
	4	Emergency Wreck Marking Buoy
Fixed AtoN	5	Light, without sectors
	6	Light, with sectors
	7	Leading Light Front
	8	Leading Light Rear
	9	Beacon, Cardinal N
	10	Beacon, Cardinal E
	11	Beacon, Cardinal S
	12	Beacon, Cardinal W
	13	Beacon, Port hand

	Code	Definition
	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
Floating AtoN	20	Cardinal Mark N
	21	Cardinal Mark E
	22	Cardinal Mark S
	23	Cardinal Mark W
	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

4.8.6. TYPE OF ELECTRONIC POSITION FIXING DEVICE

For fixed AtoN and virtual the surveyed position should be used. The accurate position enhances its function as a radar reference target

4.9. MARKING OF MAN-MADE OFFSHORE STRUCTURES

4.10. WIND TURBINES.

Refer to IALA Recommendation *R0139 The Marking of Man-made Offshore Structures*. The extremities of the wind farm should be considered to be identified by AIS. The use of synthetic AIS AtoN in this application would reduce the number of physical AIS AtoN Stations needed to mark a wind farm.

AIS may be used to mark only the most significant individual wind turbines of a wind farm, e.g., those wind turbines at a corner position, or at the change of direction of a line of wind turbines by utilising Message 21.

An AIS AtoN may also broadcast an Application Specific Message, such as specified in IMO *SN.1/Circ.289* to indicate the area in which wind turbines are located, during their construction.

4.11. WAVE AND TIDAL ENERGY DEVICES

Refer to IALA Recommendation *R0139*. The principles of section 4.7 above should be adopted.

4.12. MARKING OF WRECKS

When an AIS AtoN station is used on an Emergency Wreck Marking Buoy, consideration should be given to the advice given in IALA *R1015* and IALA *G1046*.

5. REFERENCES

[1] ITU, Technical Characteristics for a Universal Automatic Identification System Using Time Division Multiple Access in the VHF Maritime Mobile Band, ITU-R M.1371-5.

[2] IEC 62320-2 AIS AtoN stations - Minimum operational and performance requirements - methods of test and required test results

[3] IMO SN.1/Circ.289 Guidance on the use of AIS Application-Specific Messages

[4] ITU-R M.5858 Assignment and use of maritime mobile service identities

[5] IALA Recommendation R0143 (O-143 on Virtual Aids to Navigation)

[6] IALA Guideline G1081 Virtual Aids to Navigation

Reference documents are the latest from the date of issuance of these guidelines. Readers have to consider that some will be amended or revoked and care should be taken to follow up with the most up to date information.

APPENDIX 1 OFF POSITION INDICATOR, EPFS DATA ALGORITHM

1.1. GENERAL

Multiple EPFS fixes should be used to determine the setting of the off position indicator bit in Message 21. The algorithm used may be determined by the equipment manufacturer. The first example, contributed by the United Kingdom General Lighthouse Authorities follows. This is given as an example only and carries no endorsement from IALA. It may be that other algorithms are simpler or faster or just as effective. It is up to the national competent authority to ensure that the algorithm used is suitable for the purpose. Note that with modern AIS AtoN units, the power drain of the GPS receiver may be a significant portion of the total power budget, so that an algorithm which requires that the GPS receiver be powered up for a long period may be undesirable.

1.2. EXAMPLE 1 – ALGORITHM USED BY UNITED KINGDOM GENERAL LIGHTHOUSE AUTHORITIES

1 The position monitoring system takes at least 5 position fixes and determines if any is outside the guard ring radius. If none is outside, then the AtoN is deemed to be on-position, and the position monitoring system continues in its normal on-position mode (e.g., sleep for 10 minutes).

2 If any of the positions is off-position, then the position monitoring system must take at least 100 position fixes. If 80% or more of the last 100 fixes are outside the guard ring radius, then the AtoN is deemed to be off-position.

3 When in off-position mode, the position monitoring system constantly monitors the position. When 80% or more of the last 100 readings are inside the guard ring radius, then the AtoN is deemed to be back on-position.

1.3. EXAMPLE 2 – UNTESTED ALGORITHM TO ILLUSTRATE AN ALTERNATIVE APPROACH

1 The position monitoring system takes at least 5 position fixes and calculates an average position. It then determines if this average position is outside the guard ring radius. If the average position is inside, then the AtoN is deemed to be on-position, and the position monitoring system continues in its normal on-position mode (e.g., sleep for the remainder of the reporting interval).

2 If the average calculated position is off-position, then the position monitoring system must take at least 100 position fixes. The average position of the 100 position fixes is then calculated. If this 100 fix average is outside the guard ring radius, then the AtoN is deemed to be off-position.

3 When in off-position mode, the position monitoring system constantly monitors the position. When the average of the last 100 readings is inside the guard ring radius, then the AtoN is deemed to be back on-position.

4 The unit may then resume its normal on-position behaviour (e.g., sleep for the remainder of the reporting interval and resume behaviour of a minimum of 5 position fixes per reporting interval).

APPENDIX 2 EXAMPLE OF A SPECIFICATION FOR AN AIS ATON SYSTEM FOR AN EMERGENCY WRECK MARKING BUOY

1. GENERAL

The GLA AIS AtoN enclosure shall be equipped with two AIS AtoN Units in compliance with *IEC 62320-2* Type 3. Transmissions shall alternate between the AIS AtoN Units at the configurable reporting interval. Should one AIS AtoN Unit fail the other shall continue to transmit at its configured reporting interval. Loss of a single AIS AtoN Unit will in effect double the reporting interval.

In terms of the AIS licence, the wreck marker AIS AtoN Unit is a fixed site and not a mobile vessel. However, the location for deployment cannot be determined as such units are used in emergency situations to mark the location of a hazard to navigation. As a consequence, at the time of deployment the VDL access scheme will be RATDMA. It shall be possible to change the VDL access scheme to FATDMA at any time after deployment if the FATDMA slot allocation becomes available for the location.

The AIS AtoN Unit shall transmit a proprietary AtoN status message 6 in addition to message 21 (AIS AtoN). The status message shall monitor the RACON, Light, Battery and ancillary equipment.

The wreck marker AIS AtoN Unit shall be capable of transmitting up to four virtual AIS AtoN as cardinal marks around the wreck.

2. SPECIFIC REQUIREMENTS

2.1.1. POWER CONSUMPTION

The power consumed by the AIS AtoN Units and the associated instrumentation is a matter of principal concern given the limited capacity of the 12 volt battery. The supplier shall state the power consumption of each component part of the system as well as the overall power consumption for reporting intervals of 1, 2, 3, 4, 5, 6, 10 and 15 minutes. Data shall be provided for both FATDMA and RATDMA operation.

The power consumption shall be verified by a witnessed Factory Acceptance Test (FAT). The power consumption for each reporting interval shall be measured over a period of at least 2 hours with all system components and ancillary equipment operating.

2.1.2. SYSTEM RESILIENCE

Each of the two AIS AtoN Units shall have its own DGPS and GPS/VHF antennae such that a common mode of failure for the AIS part of the system is minimized. The other associated equipment and instrumentation may be shared by both AIS AtoN Units or may be dedicated to each AIS AtoN Unit at the supplier's discretion.

2.1.3. SYSTEM CONTROL

Optionally the supplier may propose to control the system by a separate controller (PLC or data logger) or the AIS AtoN Units may control other system components. For example, it would be advantageous to synchronize the sleep/wake cycle of the instrumentation with the sleep/wake cycle required by the reporting interval in order to minimize power consumption. The correct operation of the control system shall be verified during the FAT.

3. SYSTEM TESTING

The system shall be tested at the supplier's works in a laboratory environment and at the GLA sites. Testing at both sites shall include;

- Power consumption
- Functional operation
- Verification of messages 6, and 21
- AIS synchronization and timing
- Compliance with *ITU-R M.1371-5*
- Compliance with *IEC 62320-2*
- FATDMA
- RATDMA
- Monitoring of associated equipment.

4. DEPLOYMENT

Following deployment, the range and coverage shall be determined using a GLA Buoy Tender. The supplier shall provide a rate for providing engineering support during the range and coverage of sea trials.

5. ENCLOSURE

The dual redundant system shall be housed in the standard GLA AIS enclosure.

6. MONITORING

The AIS AtoN Units shall transmit monitoring information using the GLA message 6 as defined in Annex C.

7. OPERATING MODE

The default reporting mode is Mode B of *IEC 62320-2,* but the equipment shall be capable of being configured for Modes A and C also.

The system shall be capable of making a burst of transmissions on each channel in any period with a reporting interval of one minute for both AIS AtoN Units. The anticipated number of transmissions in a burst is ten, but it shall be possible to configure any number between one and 20. The period of the burst shall be configurable between 6 and 20 seconds.

APPENDIX 3 AIS ATON MONITORING

1. GENERAL

AIS Marine Aids to Navigation monitoring can provide a significant benefit to the AtoN authority. Message type 6 is used for this purpose, and different approaches can be taken to address this process.

2. EXAMPLE 1 – GLA FORMAT FOR AIS AIDS TO NAVIGATION MONITORING MESSAGE

3.1.1. INTRODUCTION

One of the functions of the AIS AtoN Transponder is to provide Marine Aids to Navigation monitoring data via AIS message type 6 for the AtoN administration.

This message 6 is an addressed binary message, which is specified by ITU.

3.1.2. MESSAGE INTERVALS

The interval between the transmission of these messages will be synchronized with message 21, although not necessarily at the same reporting rate. If Message 21 is not used at a particular site, then the reporting interval should be selected to minimize the power requirement of the transponder whilst still providing enough data to enable meaningful diagnostic analysis.

3.1.3. CONFIGURATION

The following fields of the message are fixed, and should be user configurable:

- MMSI number of source Unit
- MMSI number of destination Unit
- Destination Area code (DAC)
- Function Identifier (FI)

Table 4 GLA Format for AIS Aids to Navigation Monitoring Message

Parameter	Number of bits	Description
Message ID	6	Identifier for this message 6; always 6.
Repeat Indicator	2	Used by the repeater to indicate how many times a message has been repeated. 0 – 3; default = 0; 3 = do not repeat any more.
Source ID	30	MMSI number of source Unit
Sequence Number	2	0 – 3
Destination ID	30	MMSI number of destination Unit.
Retransmit Flag	1	Retransmit Flag should be set upon retransmission: 0 = no retransmission = default 1 = retransmitted.
Spare	1	Not used. Should be zero.
DAC	10	Destination Area Code. Default: 235 (UK & NI) or 250 (ROI)
FI	6	Function Identifier Default: 10 for this GLA standard message
Analogue (internal)	10	0.05– 36V 0.05V step Supply voltage to AIS Unit 0 – Not Used
Analogue (external - from hardware analogue input No 1	10	0.05 – 36V 0.05V step 0 – Not Used
Analogue (external - from hardware analogue input No 2	10	0.05 – 36V 0.05V step 0 – Not Used
Status Bits 0 / 1 (internal – same as the 5 LSBs of status bits from Message type 21)	5	4 \ / 00 – no RACON installed; 01 – RACON not monitored 3 / \ 10 – RACON operational; 11 – RACON ERROR 2 \ / 00 – no light or no monitoring; 01 – Light ON 1 / \ 10 – Light OFF; 11 – Light ERROR 0 0 - Good Health, 1 - Alarm
Status Bits 0 / 1 (external - derived from hardware digital inputs)	8	7 Digital Input Off/ / On : : 0 Digital Input Off/ / On
Off Position Status	1	Off position or On position 0: On position 1: Off position
Spare	4	For future use. Should be zero.
TOTAL OF BITS.	**136**	**Occupies 1 slot.**

3. EXAMPLE 2 – ADDRESSED BINARY MESSAGE 6 AS USED BY ZENI LITE BUOY CO., LTD

3.1.4. INTRODUCTION

Zeni Lite Buoy Co., Ltd, uses a proprietary message format for addressed binary message 6 for monitoring aids to navigation. The message format is as follows.

3.1.5. MESSAGE INTERVALS

The interval between transmissions of these messages should be synchronized with Message 21.

Table 5 Addressed Binary Message 6 as used by Zeni Lite Buoys Co., Ltd

Parameter	Number of bits	Description
Message ID	6	Identifier for this message 6; always 6.
Repeat Indicator	2	Used by the repeater to indicate how many times a message has been repeated. 0 - 3; default = 0; 3 = do not repeat any more.
Source ID	30	MMSI number of source station.
Sequence Number	2	0 – 3
Destination ID	30	MMSI number of destination station.
Retransmit Flag	1	Retransmit Flag should be set upon retransmission: 0 = no retransmission = default 1 = retransmitted.
Spare	1	Not used. Should be zero.
DAC	10	Destination Area Code. Default: 0
FI	6	Function Identifier. Default: 0
Sub-application ID	16	Default: 1
Voltage Data	12	Lantern supply voltage data. Max 409.6V
Current Data	10	Lantern drain current data. Max 102.3A
Power Supply Type	1	AC or DC. 0: AC 1: DC
Light Status	1	Light On or Light Off. 0: Light Off 1: Light On
Battery Status	1	Good or Low voltage. 0: Good 1: Low voltage
Off Position Status	1	Off position or On position.

Parameter	Number of bits	Description
		0: On position 1: Off position
Spare	6	For future use. Should be zero.
TOTAL OF BITS.	**136**	**Occupies 1 slot.**