User Manual

AIS AtoN Station

NAN-X000

NAN-X000 UM.E 20200804-01

NOTICE TO USERS

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- Please read this manual carefully to ensure proper use before installation and operation of the NAN-X000.

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- Please keep the manual for your future reference.

MODIFY RECORD

No.	Modify by	Date	Paragraph	Version	Reason
1	Q/A	2020/08/04		01	First edition

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1. OUTLINE

AIS is the abbreviation for Automatic Identification System, which is of a radio communication system working with TDMA technology.

Generally there are three types of AIS transponders:

- Shipborne AIS transponder (class A and class B)
- AIS base station transponder
- AtoN AIS transponder

AIS's communication modes include SOTDMA, RATDMA, ITDMA, FATDMA and CSTDMA, which are used for different terminals and different applications.

AIS, as applied to aids to navigation (AtoN), improves and enhances services provided to mariners.

The main communication mode of AIS AtoN Station is RATDMA and FATDMA. It should be noted, SOTDMA can work separately from the base station. But FATDMA must rely on the base station to work, which slot position of the message is fixed, needs to be reserved by the AIS base station to avoid slot collision.

According to the definition of IALA and IEC, there are three types of AIS AtoN Station, type I, II and III AIS AtoN Station. NAN-X000 is the type I AIS AtoN Station.

Table 1 AIS AtoN Station Summary

Item	I type	II type	III type
Communication Mode	FATDMA	RATDMA FATDMA	RATDMA FATDMA
Built-in Receiver	0	1	2
Transmission Channel	1-2 proposal	1-2 proposal	2 proposal

2. PRODUCT DESCRIPTION

2.1 OVERVIEW

NAN-X000 AIS AtoN Station conforms to the international standards such as ITU-R M. 1371-5, IEC 62320-2, IEC60945.

2.2 PRODUCT FEATURES

NAN-X000 has all the basic functions of AIS AtoN station, such as position status (AtoN name, type, ID, floating information, etc.) broadcasting, light status (lights on / off, battery voltage, current, etc.) transmission.

As type I AIS AtoN station, NAN-X000 is transmit-only, without any receiver process, which operates only at slots preserved by AIS base stations. The TX mode of NAN-X000 adopts A or B mode recommended by IALA, i.e., two adjacent transmissions are alternately performed on two different channels, or two adjacent transmissions are performed on both channels.

NAN-X000 is specially designed to be used for buoys, which carries limited batteries to supply any additional electronic equipment. It can also be used on lighthouse, light vessel ， oil platforms, harbor electronic fences and big rigs at sea.

Figure 1 NAN-X000 Outlook

2.3 SPECIFICATIONS

Table 2 NAN-X000 Specifications

Item	Specifications
Frequency	161.975MHz, 162.025MHz
Power Supply	DC12V
Average Power Consumption	≤50mA Condition: GNSSS always, MSG 6/ MSG21: 3 minutes interval
Operating Temperature	-15℃~+55℃
IP Grade	IP66
Position Information	BDS & GPS receiver
Communication Mode	FATDMA
TX Power	12.5W
TX Mode	A or B (Refer to Figure 2)
Message Type	MSG 6/21
Transmission Interval	3~60 minutes (to be configurated)
Position Information TX Interval	3~60 minutes (to be configurated)

Note: If TX Mode is Mode A, the last message is transmitted on channel 1, and the next message is transmitted on channel 2. Compared with the Mode B, this mode occupies fewer slots.
If TX Mode is Mode B, the same message transmitted on Channel 1 and Channel 2 in quick (nominally 4 seconds) succession. The first transmission of each message may be on either Channel 1 or Channel 2. The second transmission shall be on the other channel.

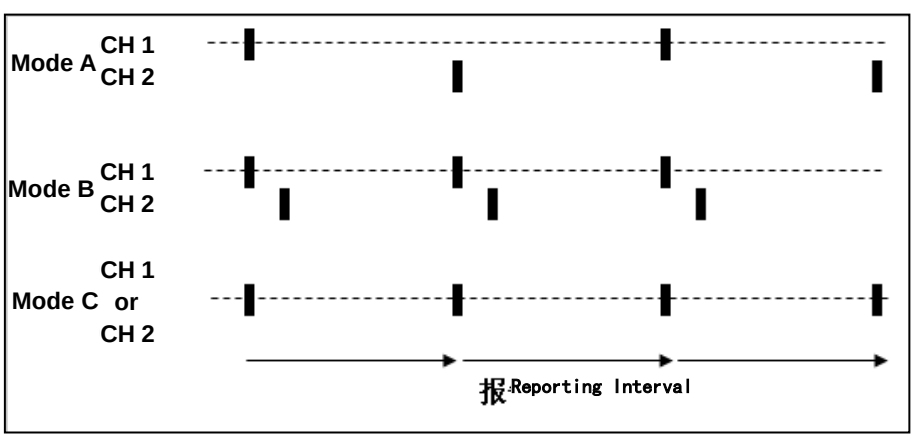


Figure 2 TX Mode

2.4 SAMPLING PARAMETERS

Table 3 Light Sampling Parameters

NO	ITEM	Display Accuracy	Sampling Accuracy	Measuring Range
1	Light Operating Current	0.1A	10mA	0-5A
2	Battery Operating Voltage	0.1V	10mV	0-20V

2.5 PRODUCT COMPATIBILITY

NAN-X000 can work normally in the existing AIS system.

2.5.1 Compatible with Shipborne AIS transponder

NAN-X000 is strictly designed according to the ITU, IEC standards, and compatible with the shipborne AIS transponder which conforms to the international standards.
The main function of AIS AtoN Station is transmitting **MSG21** position message. These messages can be received by the shipborne AIS transponder.

2.5.2 Compatible with AIS base station transponder

MSG6 and **MSG21** which transmitted by NAN-X000 can be received by the AIS base station installed domestically, and displayed well in ECS.
AIS base station has the slot reservation function, that can support NAN-X000 also.

3. PRODUCT FUNCTION

3.1 MAIN MESSAGE

The main messages used for NAN-X000 transmitting are **MSG6** and **MSG21**.

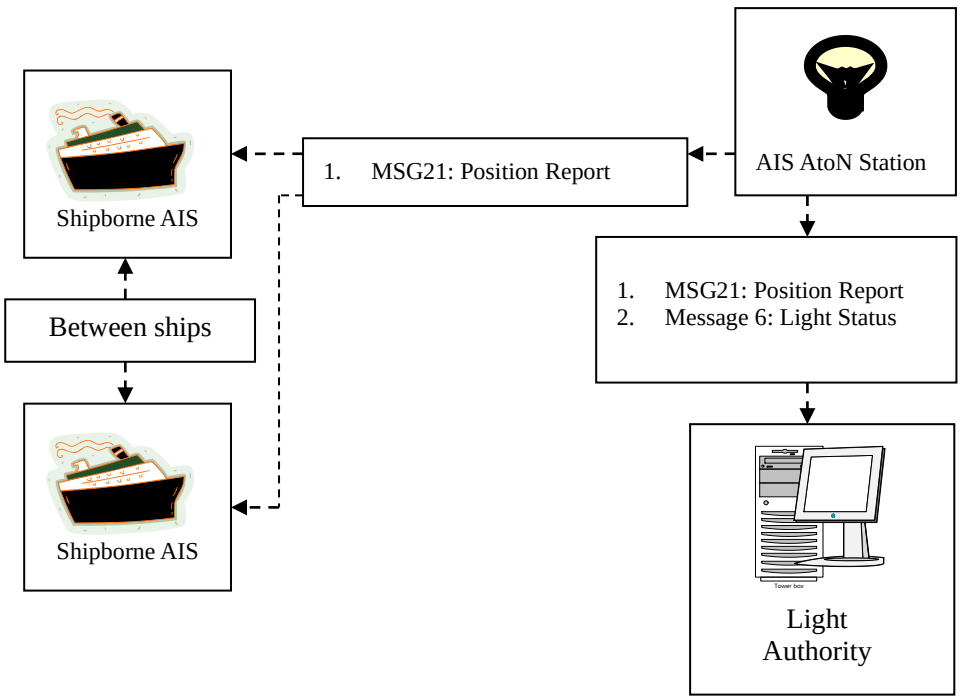


Figure 3 Message Flow

MESSAGE 6 （MSG6）

MSG6, addressed Binary Message, can be employed by an AIS AtoN Station for sending AtoN status reports to the AIS base station, and then be transferred to the light authority responsible for the AtoN monitoring.

MSG6 includes:

- AtoN ID
- Light Status (such as: ON)
- Current (such as: 0.4A)
- Voltage (such as: 13.2V）

MSG6 transmitted by NAN-X000 can be compatible with the main existing AIS base station (including ICAN system in China).

MESSAGE 21（MSG21）

MSG21, broadcast Binary Message, can be employed by an AIS AtoN Station for sending AtoN position reports to the AIS base station and shipborne AIS transponder.

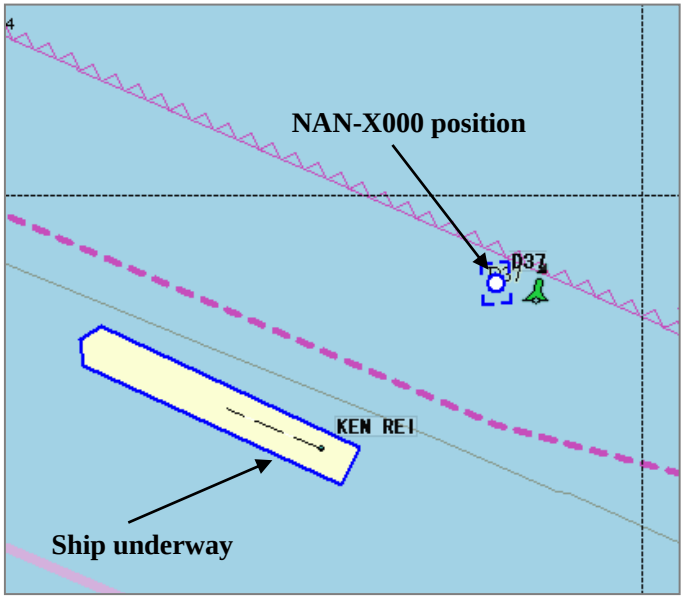
MSG21 includes:

- AtoN MMSI
- AtoN Name
- AtoN Type
- Position Accuracy
- Position Latitude
- Position Longitude
- Type of Position Fixing
- Time Stamp
- Position Status

MSG21 transmitted by NAN-X000 can be compatible with the main existing AIS base station (including ICAN system in China). These messages can be received by the shipborne AIS transponder which conforms to the international standards.

3.2 MESSAGE RECEIVING AND DISPLAY

3.2.1 Shipborne AIS transponder



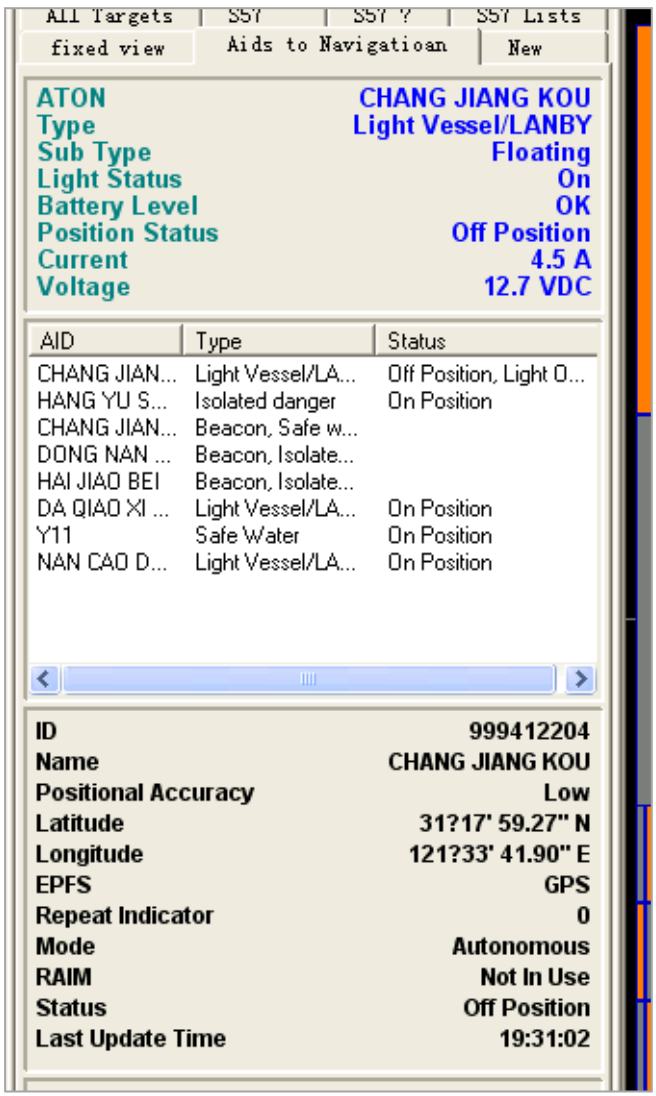
Shipborne AIS transponder can receive **MSG21**. While it's received, the position, name etc. of AtoN will be displayed. And a AtoN pattern will be marked on ECS installed.

Figure 4
NAN-X000 Display on ECS

Note: Some shipborne AIS transponders may not be designed according to the international standards, so couldn't decode MSG21. Please consult the relevant manufacturers.

3.2.2 Light authority

Light authority can receive **MSG6** and **MSG21**. These messages can be displayed in electric chart software of AIS base station normally. NAN-X000 is compatible with the majority of such software.
The display of **MSG6** and **MSG21** received is as follows:



A、 Light Status

Used for light monitoring from the authorities. Light status includes position status, light on/off, working current/voltage etc. These data are transmitted by **MSG6** (addressed).

B、Position Report

Used for sending AtoN position reports (including AtoN name, MMSI, position etc.) to the light authorities and all shipborne AIS transponders.
These data are transmitted by **MSG21** (broadcast).

Figure 5 NAN-X000 Message Received on AIS Base Station Display

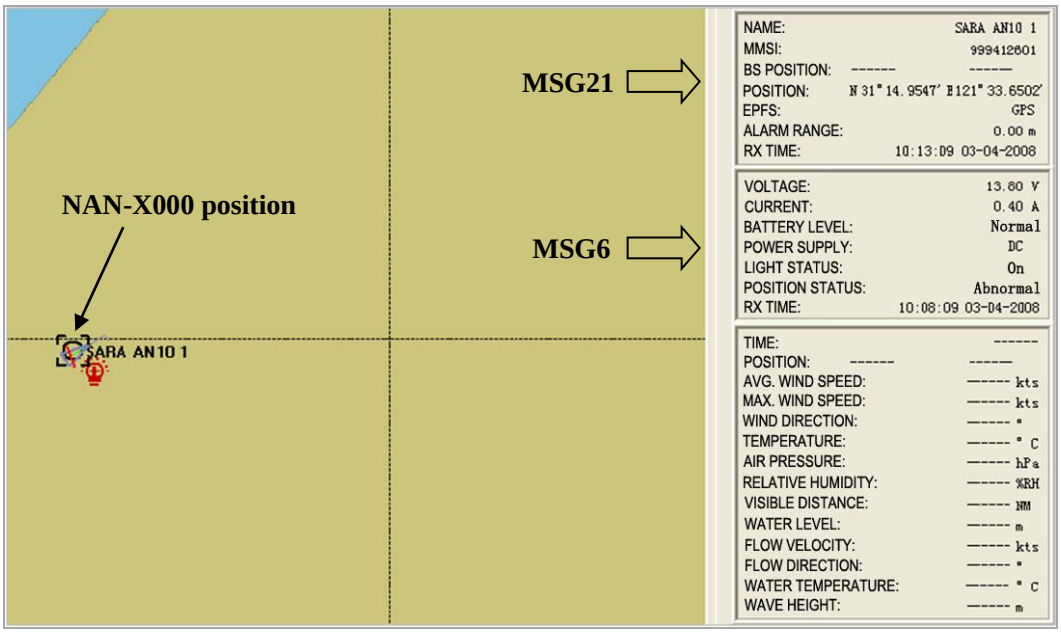


Figure 6 NAN-X000 Message Received on ECDIS Display etc.

3.3 PRODUCT FUNCTIONS

Identification: Mainly used for ships to identify the AtoN, includes AtoN name, the floating alarm, etc.

Remote Test: Mainly used for light monitoring from the authorities, includes AtoN position status, light on/off, working current/voltage etc. If any abnormal message received, the authority can deal with in time.

4. PRODUCT APPLICATIONS

Please consider the following situation while choose NAN-X000.

（1） Purpose

If the AIS AtoN Station is only for sending **MSG21** and **MSG6**, for broadcasting position report and monitoring light status, our NAN-X000 is the better choice due to its good cost performance, and needn't additional investment in new solar cells and batteries, etc.

（2） Application

NAN-X000 can only installed within the coverage of base stations. It can be used on buoys, lightships, lighthouses and other aids to navigation facilities.

NO	TYPE	STRUCTURE	INSTALLATION
1	NAN-1000	GPS antenna inside VHF antenna inside	buoys, lightships, lighthouses etc.
2	NAN-2000	GPS antenna inside VHF antenna outside	Special structure aids to navigation facilities, shore-based environment, etc.
3	NAN-4000	GPS antenna inside VHF antenna integrated	buoys, lightships, lighthouses etc.
4	NAN-5000	GPS antenna outside VHF antenna outside	Special structure aids to navigation facilities, shore-based environment, etc.

5. PRODUCT SETTING

Before installing the NAN-X000, it should make the following settings by specialized software, please consult the manufacturer or dealer.

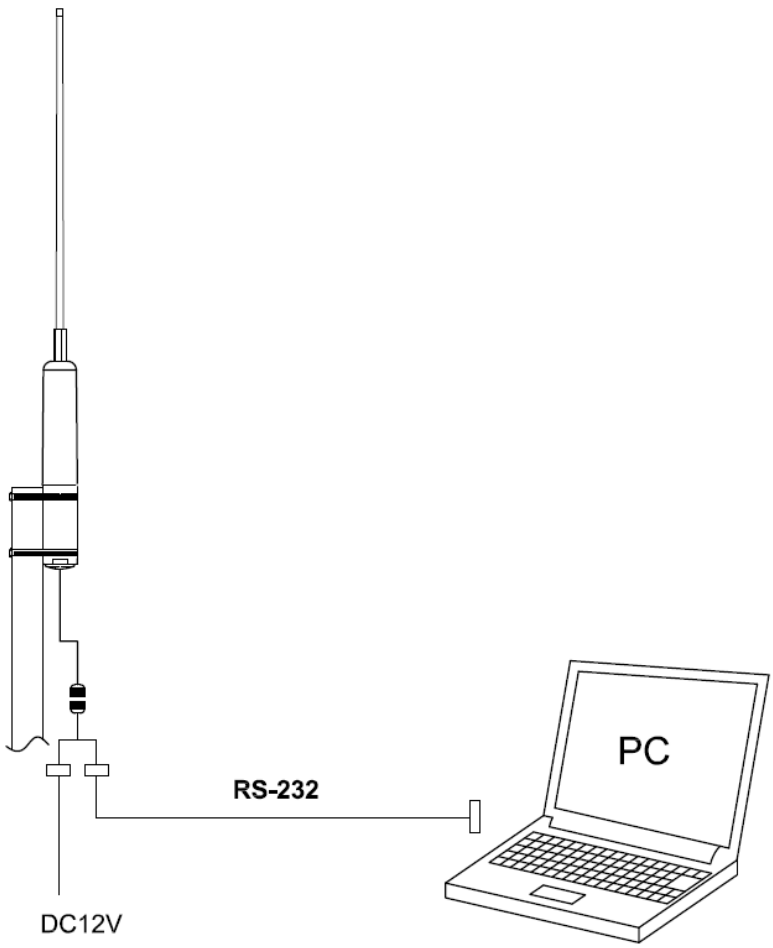


Figure 7 Setting Connection (For example: NAN-4000)

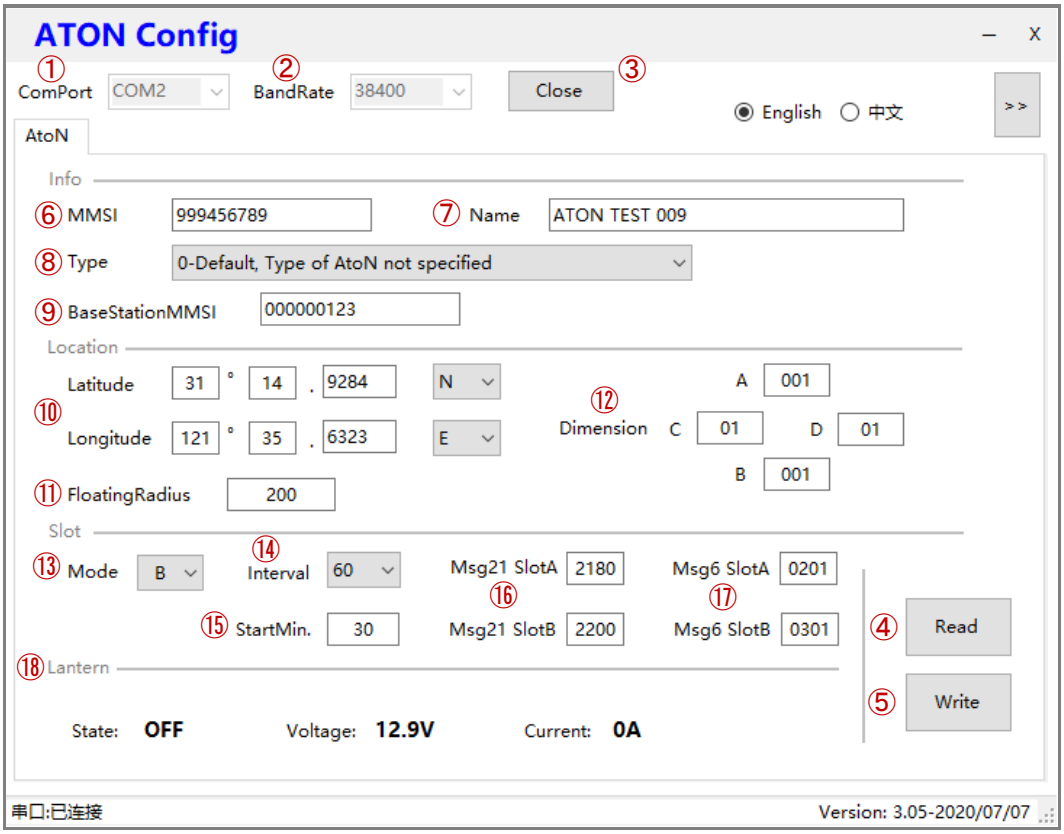


Figure 8 Basic Parameter Setting

① **Com Port**: Serial port selection.

② **Baud Rate**: Choose a different baud rate (38400bps).

③ **Open**: Click to open or close serial port.

④ **Read**: Click to read setting and status data from the AtoN.

⑤ **Write**: Click to write setting data to the AtoN.

⑥ **MMSI**: Set by light authority. Refer to the relevant rules.

⑦ **Name (** AtoN): Set by light authority. Refer to the relevant rules.

⑧ **Type(** AtoN): Set in the pull-down menu. Refer to the APPENDIX B.

⑨ **Base Station MMSI**: This setting is used for transmitting MSG6 and other addresses message. Generally, it should set the nearest base station's MMSI.

⑩ **Latitude/Longitude**: Chart position of the AtoN.

⑪ **Floating Radius**: Radius of the area in which a AtoN can move. Unit: m.

When the actual position of the AtoN exceeds the floating radius of the chart position, the relevant field of the **MSG21** will become "FLOAT".

⑫ **Dimention**: A, B, C, D are the dimensions between AIS antenna and AtoN, face true north, south, west and east respectively. Refer to the APPENDIX C.

⑬ **Mode**: TX mode (A or B).

⑭ **Interval**: TX interval (3-60 minutes).

⑮ **Start Min.**: TX start time.

⑯ **Msg21 Slot A/B**: Tx Slot No, 0~2249 configured.

⑰ **Msg6 Slot A/B**: Tx Slot No, 0~2249 configured.

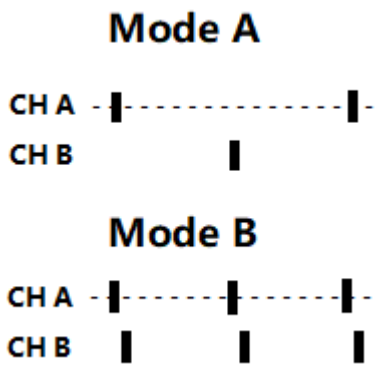
Description:

MSG21 occupies 2 slots.

MSG6 occupies 1 slot.

Mode A: AIS transmits on channel A and channel B alternately according to the TX interval.

Mode B: AIS transmits on both channel A and channel B according to the TX interval.



AtoN group:

The slot numbers assigned to the AtoN are reserved by the AIS base station through the MSG20, and other AIS stations shall not use these reserved slots. The AtoN is transmitted at a certain interval, so in the idle minutes, the reserved slots are not fully used. For example, the TX interval is 3 minutes, the AtoN transmits the message at the 0^{th} minute, but the slot is free in the 1^{st} minute and the 2^{nd} minute. In order to improve the utilization of slots, the AtoN can be grouped when using the same slot configured.

For example:

MSG21 slot of channel A is 1300, **MSG21** slot of channel b is 1500.

In Mode A, if the TX interval is 3 minutes, six AtoN can be grouped.

No.0: Start time 0

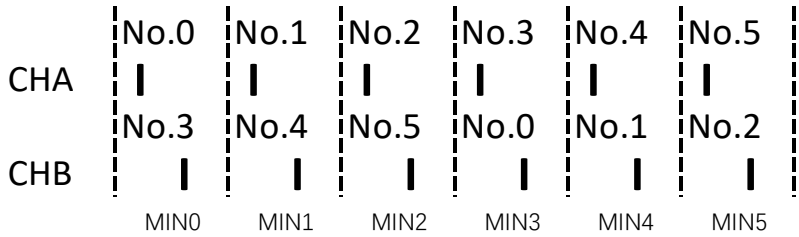
No.1: Start time 1

No.2: Start time 2

No. 3: Start time 3

No.4: Start time 4

No. 5: Start time 5

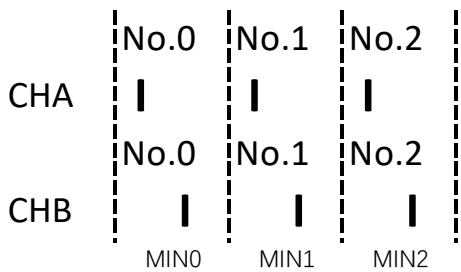


In Mode B, if the TX interval is 3 minutes, three AtoN can be grouped.

No.0: Start time 0

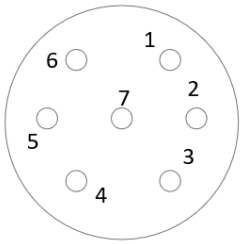
No.1: Start time 1

No.2: Start time 2



⑱ **Lantern**: Lantern status can be read, such as ON/OFF state, voltage and current.

6. INTERFACE DEFINITION



1	POWER SUPPLY (+)
2	POWER SUPPLY (-) (RS232-GND)
3	LANTERN (+)
4	LANTERN (-)
5	RS232-RXD
6	RS232-TXD

[APPENDIX A] TERMS DESCRIPTION

TERM	DESCRIPTION
AIS	Automatic Identification System
IMO	International Maritime Organization
IALA	International Association of Maritime Aids to Navigation & Lighthouse Authorities
ITU	International Telecommunications Union
ITU-R	International Telecommunications Union- Radio Bureaux
IEC	International Electrotechnical Commission
TDMA	Time Division Multiple Access
SOTDMA	Self Organized Time Division Multiple Access
FATDMA	Fixed Access Time Division Multiple Access
RATDMA	Random Access Time Division Multiple Access
ITDMA	Incremental Time Division Multiple Access
GPS	Global Positioning System
MMSI	Maritime Mobile Safety Identification
VTS	Vessel Traffic System

[APPENDIX B] AtoN CODE DEFINITION

	CODE	DEFINITION
	0	Default, Type of A to N not specified
	1	Reference point
	2	RACON
	3	Fixed structure off shore, such as oil platforms, wind farms. (Note: This code should identify an obstruction that is fitted with an Aid-to-Navigation AIS station.)
	4	Spare, Reserved for future use.
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
	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

[APPENDIX C] SETING DIMENSION/REFERENCE FOR POSITION

This field should indicate the 'dimension' 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 metric value should be used as noted in the table below. The orientations established by the dimensions A, B, C and D should face true north, south, west and east respectively. By setting A and C to zero, the reference point becomes the north-west corner.

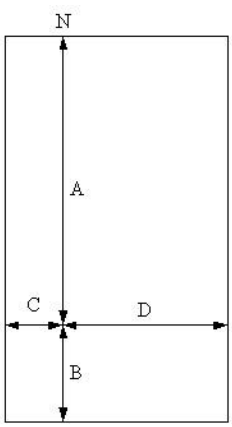
For floating AtoN larger than 2m×2m, the dimensions of the AtoN should always be given as a circle, i.e. A=B=C=D>1. (This is due to the fact that an orientation of the floating AtoN is not transmitted.)

For floating AtoN smaller than or equal to 2m×2m, the dimension value should be set to A=B=C=D=1.

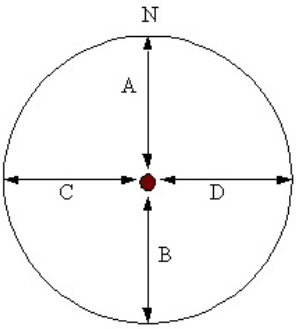
When transmitting virtual AtoN information, the virtual AtoN flag is set to '1', the dimension value should be set to A=B=C=D=0 (default). This should also be the case, when Type of AtoN is set to 'reference point'.

Off shore structures that are not fixed, such as rigs, should be considered as Code 31 type (Refer to the table below). These structures shall have their 'Dimension/reference for position' parameter as determined below.

Fixed off shore structures (Code 3type from the table), shall have their 'Dimension/reference for position' parameter as determined below. Hence, all off shore AtoN and structures have the dimension determined in the same manner and the actual dimensions are contained in **MSG21**.



Dimension/Reference for position (fixed AtoN)	
	Numeric
A	5
B	2
C	1
D	3



Dimensions for a floating AtoN and both fixed and floating off shore structures (Code 3 and 31）	
A+B ⩽ 2m	A=B=C=D=1
A+B > 2m	A=B=C=D>1

[APPENDIX D] INSTALLATION DRAWING