USER MANUAL

MTU AIS-C

Rv01

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USER MANUAL

REF: MTUAIS-C-ENG

Rv. 01

Rv.	DATE	REVISION
01	06-08-2020	General Review 2020
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INDEX

MTU AIS-C

1. INTRODUCTION TO AIS

The AIS Automatic Identification System was conceived as an element of radio communication to improve the safety and efficiency of Maritime Navigation

The AIS system is designed to operate in one of the following modes:

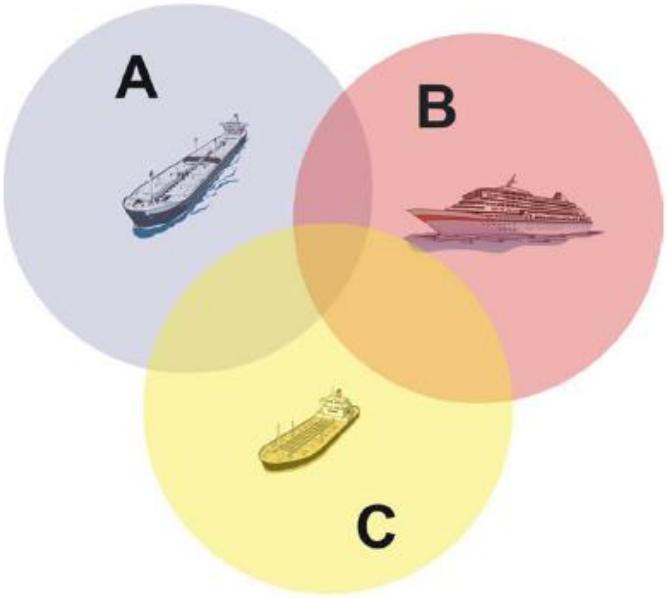
- Collision prevention.
- Identification of ships and goods by the coastal authorities.
- Port traffic management tool.

WHAT IS AIS?

It is basically a digital radio system that uses various instruments and sensors as inputs.
These entries are processed and transmitted in accordance with international standards that have been accepted for the exchange of information.

This process is carried out without intervention from the crew.

The AIS is also capable of transmitting small messages to other ships or base stations by the crew as a free text for information exchange.



1.1. PURPOSE OF AIS.

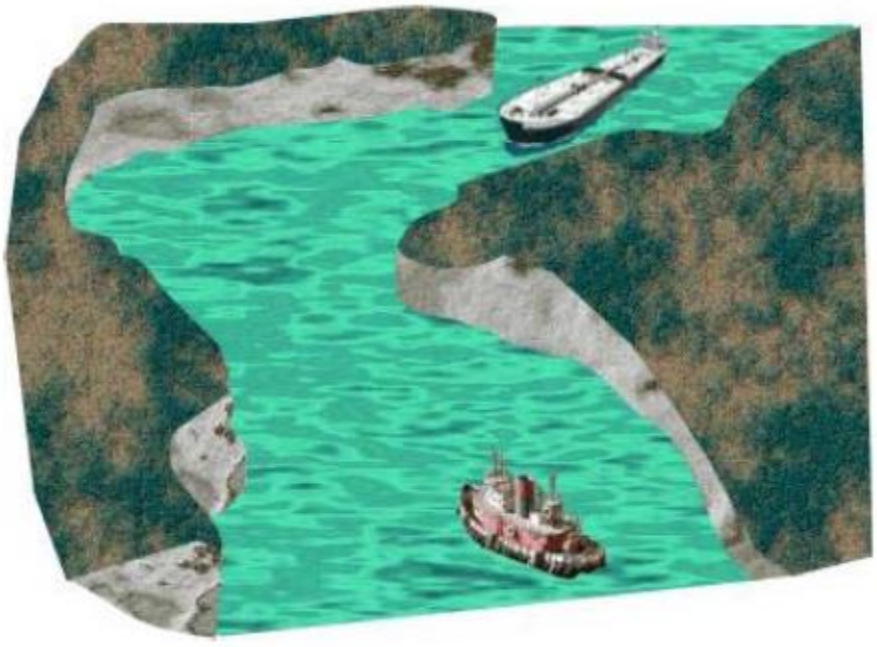
The AIS system allows all ships that equip it to exchange information about navigation. This data can help other ships plan their routes and increase safety. Allows you to include AtoN navigation aids by equipping them with AIS equipment as part of the navigation environment.

The data that can be exchanged is divided into three categories:

STATIC	DYNAMIC	TRIP
IMO number	Coordenadas UTC	Draft
Number	Course	Dangerous goods
Sleeve and longing	Speed	ETA / Destination
Type of boat	Navigation status	Route
GPS antenna position	Rudder	
	Turning speed	

Static information is programmed manually, the dynamics are obtained from the ship's sensors and the travel is regularly updated by the crew during the trip.

As the AIS transponder is a VHF data communication, it allows to identify other ships behind obstacles that with the use of radar would not be seen, and thus be prevented before a visual contact.

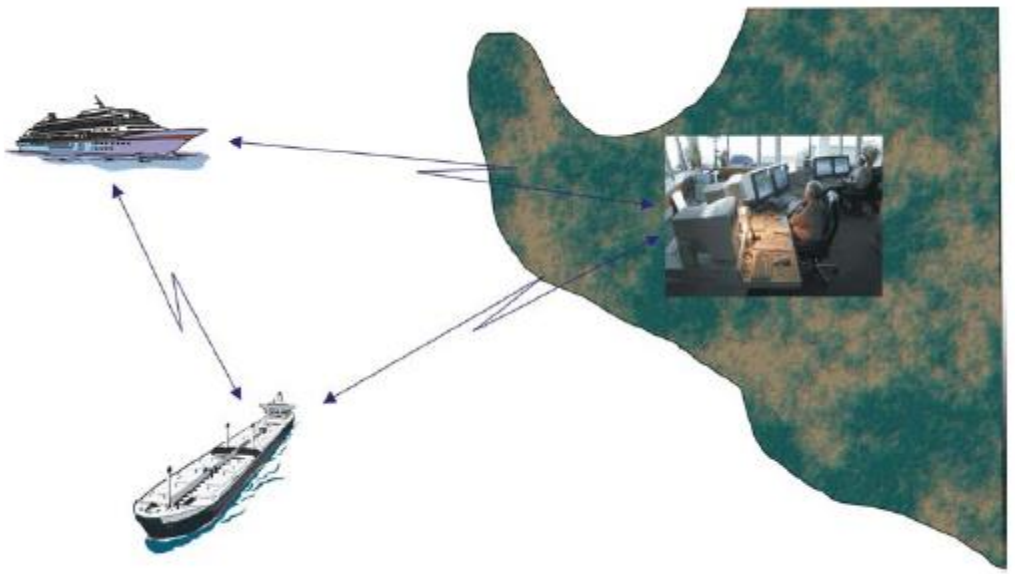


1.2. SHIP TO EARTH INFORMATION.

In coastal waters, local authorities can set up an AIS network to monitor boat traffic through their waters.

These Base Stations can simply monitor AIS information in VHF and can also send messages to AIS transponders installed on ships. The data they can obtain includes name and license plate of the ship, destination, ETA and cargo information. In addition, these base stations emit messages with weather and tide information.

AIS systems record and record all received information so that it can subsequently be reproduced in the event of an accident. The AIS is used in rescue operations, allowing to coordinate and monitor the movements of the ship.



1.3. VESSEL TRAFFIC SYSTEMS VTS

AIS information integrates with VTS systems and provides a powerful tool to monitor ship movements in the port areas. The combination of the use of Radar and AIS on a single VTS display provides very reliable and accurate information, especially in areas outside radar range.

1.4. HOW DOES AIS WORK?

The AIS system can work in three ways:

- Standalone or continuous mode.
- Assigned mode.
- Interrogation mode.

Standalone or continuous mode.

In this mode the AIS transponder transmits your position information freely until it enters the buffer of an AIS base station or other ship. At this point they both synchronize their AIS computers and remain in this state until they communicate with any other AIS drive.

Assigned mode.

In this mode the base station assigns a slot to each AIS transponder within its action area and defines the refresh rate of the data.

Interrogation Mode

The AIS transponder provides position information and other data when questioned by another ship or base station.

BASIC COMPONENTS.
The basic components that allow the operation of an AIS transponder are:

2 TDMA receivers
1 receptor FDMA.
1 trasmisor TDMA
1 microprocessor.
1 interface with navigation sensors.

1.5. FREQUENCIES AND AIS TRANSMISSION.

The internationally defined AIS frequencies for use in maritime traffic are:

AIS 1 = 161,975 MHz
AIS 2 = 162,025 MHz.

AIS transponders can work at different frequencies, within the same band. The working frequencies are defined regionally by the competent national authority.

The AIS can be controlled by DSC (digital selective calling) to move to another frequency with a bandwidth of 25 KHz.

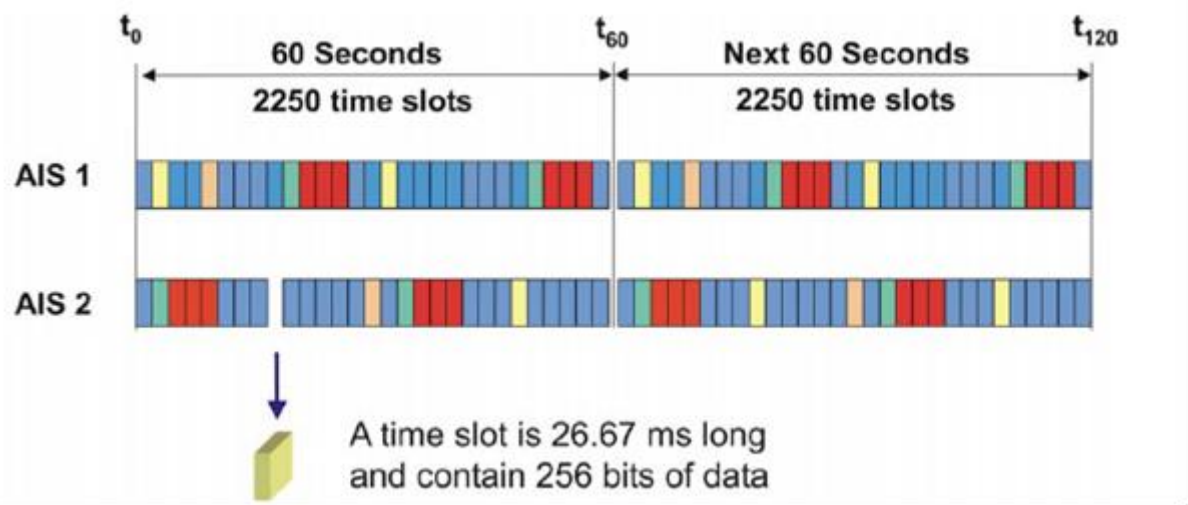
1.6. THE SOTDMA PROTOCOL.

The AIS system employs for communications a self-organized time-division protocol that has been inherited from air navigation.

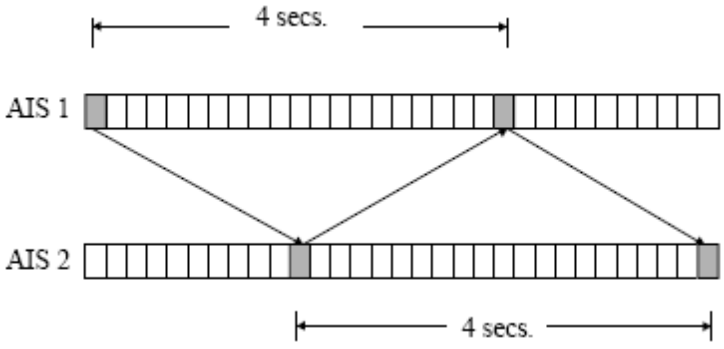
This protocol allows a transponder to quickly integrate into a data network via radio along with other equipment without interference or data collisions.

The protocol also allows communications between terminals in the same way as it is done on GSM telephony networks.

The protocol has a 60s window with 2250 slots and includes 256 bits in each slot.



Each AIS unit has 2 receivers and a transmitter that can transmit in both AIS1 and AIS2 bands as shown in the figure.



This transmission format allows data refresh up to a maximum speed of 2 seconds, spreading half the stream load on each channel. This allows simultaneous ship-ship and ship-to-land communications.

The coverage and distance of communications will depend on the transmission powers (usually 12W on ships and between 2 and 12 W in AtoN); and antennas and their location above MSL sea level.

1.7. DATA REFRESH SPEED.

Navigation information is updated to other ships and base stations according to navigation needs so that no further information is generated than necessary in AIS channels.

The recommended refresh rate for the data is:

TRANSPONDER CLASS A (SINGLE SHIPS)

Navigational conditions	Shipping interval
Boat anchored or moving at less than 3 knots	3 minutes
Boat between 3 – 14 knots	10 seconds
Boat between 3 – 14 knots and changing course	3.5 seconds
Boat between 14 – 23 knots	6 seconds
Boat between 14 - 23 knots changing course	2 seconds
Boat at more than 23 knots	2 seconds
Boat at more than 23 knots changing course	2 seconds

OTHER AIS TEAMS.

Navigational conditions	Shipping interval
Class B at less than 2 knots	3 minutes
Class B between 2 – 14 knots	30 seconds
Class B between 14 - 23 knots	15 seconds
Class B at more than 23 knots	5 seconds
AIS in AIS AtoN Beacons Message 21	3 minutes
AIS Base Station	10 seconds

2. DESCRIPTION OF MTU-AIS-C

The MTU-AIS-C transponder is an AIS-AtoN in an IP 67 watertight box, which provides automatic information about the GPS position of the maritime signal; facilitating the location and identification of buoys, beacons and headlights on the nautical chart of an AIS base station on the ground.

This universal MTU device can send status signals and alarms from any type of beacon, rotating or flashing ones, without the need for additional sensors.

Additionally, it can transmit meteorological and oceanographic data, such as current, wave height, tides, and wind direction and intensity; all this with minimal energy consumption.

The MTU AIS Transponder meets IMO, IEC, ITU and IALA requirements.

2.1. AIS AtoN TYPE 1.

Type 1 transponders are transmitter-only devices and do not have a radio receiver. They can work only using Fixed Access Time Division Multiple Access (FATDMA) mode. This working mode requires a fixed slot for transmission.

2.2. AIS AtoN TYPE 3

Type 3 transponders are transmitter and receiver devices. They can work using FATDMA (Fixed Access Time Division Multiple Access) mode or RATDMA (Random Access Time Division Multiple Access) mode.

3. GENERAL FEATURES

Message 21 content
MMSI Number / Navigation Aid Name.
Position WGS84.
GPS time and date.
Type of navigation aid.
AtoN Indicator: Real, Synthetic, Virtual.
Out-of-position alarm.
Racon fault alarm.
Beacon fault alarm.
Beacon status in Day-Night mode.

Message content 6 GLA (NMEA Interface 0183)
MMSI Number / Navigation Aid Name.
Battery voltage (V).
Beacon current (A).
Beacon status in Day-Night mode.
Beacon fault alarm.
Racon fault alarm.
Out-of-position alarm.
Low battery voltage alarm.
Flasher failure alarm.
5 Optocoupled digital inputs.

Message content 8
MMSI Number / Navigation Aid Name.
Position WGS84.
GPS time and date.
Air/wind temperature: direction and speed, medium and peak. Atmospheric pressure: mean and trend.
Tide level.
Water temperature.

Power	
Power range:	10 a 32 V c.c.
Typical consumption (*):	Type 1: 0.06 Ah/day.
	Type 3: 0.5 Ah/day.

(*) Emission every 3 min, at 12.5W.

Features Radio module MTU AIS RF	
Frequency range:	156,025 a 162,025 MHz
Number of receivers:	2
AIS Frequency 1:	161.975 MHz 25 kHz
AIS Frequency 2:	162.025 MHz 25kHz.
Receiver Sensitivity:	<-107 dBm to 20% PER (Type 3).
Modulation Mode	25KHz GMSK
Auto diagnosis:	Emission power test, ROE measurement and supply voltage

Transmission	
Possible messages:	6, 7, 8, 12, 13, 14, 20, 21, 25
Typical transmission:	Every 3 min. Programmable.
Channel bandwidth	25KHz
Transmission power:	1, 2, 5, 12.5W (adjustable).
Modulation Mode	GMSK 25KHz
Control:	Type 1: FATDMA. Type 3: FATDMA, RATDMA.

GPS	
Integrated Receiver:	50 channels, IEC 61108-1.
Antenna:	Activates 35 dB, external marine type.

Versions	
MTU AIS Type 1:	Only Emitter.
MTU AIS Type 3:	Transmitter and receiver.

Mechanical and environmental characteristics	
Dimensions:	180 x 150 x 90 mm.
Weight:	1.6 kg.
Temperature range:	-25º to 55ºC.
Degree of sealing:	IP 67.

MTU AIS interfaces	
E/S Digital:	5 Optocoupled inputs. 2 Relay outputs. 4 Configurable non-isolated inputs/outputs.
Analog Inputs:	2 Insulated inputs 0-36V. 3 Non-insulated inputs 0-32V. 1 Current sensor 0.1 to 10A. (ISENSE)
Ports:	RS-422 bidirectional 38.400 baud NMEA 0183. RS-422 input 38.400 baud NMEA 0183. Bidirectional 38.400 baud. NMEA 0183. Input 38.400 baud NMEA 0183. 2 Configurable RS-232 ports. USB port for configuration. SDI12 bus

Standards	
IEC AIS Aids to Navigation.	IALA A-126. Edition 1.4.
IEC 62320-2 Edition 1.	IEC 61162-1/2. Edition 2.0.
IEC 60945. Edition 4.	ITU-R M. 1371-4
IEC 61108-1.	

Options
Weather station.
Tidal sensor (ground).
Glonass.
Other parameters available.

3.1. MAIN FEATURES OF THE SYSTEM

- Aid to Navigation (AtoN) identification data emission using Message 21, as well as basic operating status data.
- Capable of transmitting meteorological and oceanographic data through message 8.
- Ideal for monitoring and remote control of beacons, providing alarms and statuses through Message 6.
- Manufactured according to IEC AIS Aids to Navigation standards, IEC 62320-2, IEC 60945, IEC 61108-1, IEC 61162-1/2, ITU-R M.1371-4, IALA A-126.
- Available in two versions:
    - MTU AIS-1: Type 1, transmitter only.
    - MTU AIS-3: Type 3, transmitter-receiver.
- Generating capacity of 10 virtual and synthetic Aids to Navigation (AtoN) as well as repeater function.
- Configuration using PROAtoN software under Windows environment and commands via radio VDL.
- Broken chain position alarm generator.
- Monitoring and Remote-Control Center Software (NETCOM) via AIS, GSM, UHF Radio, Iridium etc.

3.2. CONNECTOR FEATURES

The connectors used in the MTUAIS are from the well-known brand SOURIAU with a degree of sealing IP67.

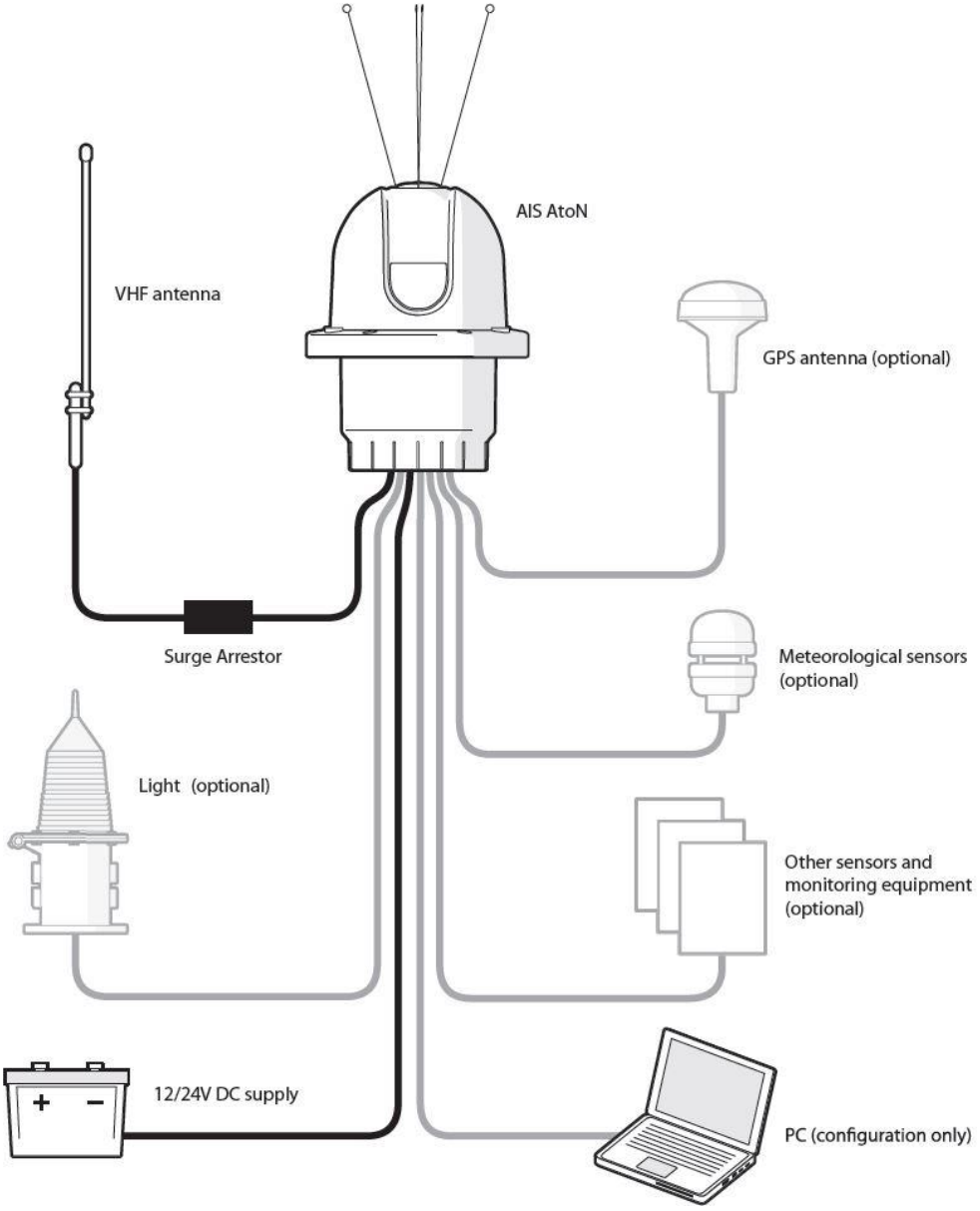
REF.	MTU-AIS CONNECTORS	
W	Power supply and basic Transceiver interface.	Souriau UTS6JC14E19SW.
USB	USB for PC setup	Souriau UTS6JC8E4S.
X	Sensor board connections A	Souriau UTS6JC14E19SX.
Y	Sensor board connections B	Souriau UTS6JC14E19SY.
VHF	VHF radio antenna	N Female
GPS	Antenna GPS reception	TNC Female

4. INSTALLATION

The MTU-AIS-C is designed to be easy to install and configure.

Basic installation requires the connection of a VHF antenna and an optional GPS receiver antenna as the internal GPS antenna can be used.

The complete configuration with all possible options is shown in the following image:



4.1. POWER AND INTERFACE CONNECTOR. "W TYPE"

This connector includes both power and communication in a single connector, called a "W" connector. Provides power to the transponder and RS232 connection. The connector is of the Soriau brand with reference UTS6JC14E19SW. The pins included in the W connector are listed below:

PIN ID	Signal Name	Description
A	VIN-	Negative power connection 0V
B	USER_PWR	Output to 3.3 V DC for interfaces. The maximum current is 200 mA
C	VIN	Positive power connection (10 to 32 V DC)
D	NMEA_0183_TX1-	Port 1 NMEA 0183. TX signal -
E	NMEA_0183_TX1+	Port 1 NMEA 0183. TX + signal
F	NMEA_0183_RX1+	Port 1 NMEA 0183. RX+ signal
G	NMEA_0183_RX1-	Port 1 NMEA 0183. RX signal -
H	NMEA_0183_RX2-	PORT 2 NMEA 0183. RX signal -
J	NMEA_0183_RX2+	PORT 2 NMEA 0183. RX+ signal
K	USER_IO_0	User IO signal 0 (light on/off)
L	USER_IO_1	User IO signal 1 (light status)
M	USER_IO_2	User IO signal 2 (Racon status)
N	GND	Earth for signals
P	RELAY_DR_1	Relay Drive Output 1 *
R	RELAY_DR_2	Relay Drive Output 2 *
S	GND	Earth for signals
T	USER_IO_3	User IO signal 3
U	USER_IO_4	User IO signal 4
V	USER_WKUP	WAKEUP External Input **

* Only available when the configuration includes a sensor interface, otherwise these pins do not connect
** Use only at your provider's instructions.

4.2. SENSOR INTERFACE CONNECTOR. "X TYPE"

This connector includes external sensor connections in the same connector, called an "X" connector.

The connector is of the brand Soriau with reference UTS6JC14E19SX. The pins included in the X connector are listed below:

PIN ID	Signal Name	msg6	Description
A	I SENSE-	IBALIZA	Lamp current sensor loop (return) (max. 10A)
B	AN_1+		Analog input 1 non-isolated (+)
C	I SENSE+	IBALIZA	Lamp current sensor loop (input) (max. 10A)
D	S_RS422_TX1_A		Sensor port RS422 signal TX A+
E	S_RS422_TX1_B		Sensor port RS422 signal TX B-
F	S_RS422_RX1_A		Sensor port RS422 signal RX A+
G	S_RS422_RX1_B		Sensor port RS422 signal RX B-
H	S_RS422_TX1		Port 1 RS232 sensor TX signal
J	S_RS422_RX1		Port 1 RS232 sensor RX signal
K	ISO_DI1+	BIT-0	Digital input 1 isolated (+)
L	ISO_DI1-	free	Digital input 1 isolated (-)
M	ISO_DI2+	BIT-1	Digital input 2 isolated (+)
N	ISO_DI2-	Beacon alarm	Digital input 2 isolated (-)
P	AN_1-		Analog input 1 non-isolated (-)
R	S_DIG_IO_1		Digital input/output 1 not isolated
S	S_RS422_GND		RS422 mass sensor port
T	GND		Signal mass
U	S_DIG_IO_3		Digital input/output 3 not isolated
V	S_DIG_IO_2		Digital input/output 2 not isolated

4.3. SENSOR INTERFACE CONNECTOR. "Y TYPE"

This connector includes external sensor connections in the same connector, called a "Y" connector.

The connector is of the Soriau brand with reference UTS6JC14E19SY. The pins included in the Y connector are listed below:

PIN ID	Signal Name	msg6	Description
A	S_RS232_TX2		Puerto 2 Tx Sensor interface
B	S_RS232_RX2		Puerto 2 Rx Sensor interface
C	S_DIG_IO_4		Digital IO 4 not isolated
D	EXT_ WAKEUP		External Wake Up
E	SDI_DATA		BUS SDI Data signal-
F	ISO_DI_3+	BIT-2	Digital input 3 isolated (+)
G	ISO_DI_3-	Racon alarm NC	Digital input 3 isolated (-)
H	ISO_DI_4+	BIT-3	Digital input 4 isolated (+)
J	ISO_DI_4-	free	Digital input 4 isolated (-)
K	ISO_DI_5+	BIT-4	Digital input 5 isolated (+)
L	ISO_DI_5-	free	Digital input 5 isolated (-)
M	ISO_AN_1+	ANALOG 1	Analog input 1 isolated (+)
N	ISO_AN_1-	0-36V	Analog input 1 isolated (-)
P	ISO_AN_2+	ANALOG 2	Analog input 2 isolated (+)
R	ISO_AN_2-	0-36V	Analog input 2 isolated (-)
S	AN_2+		Analog input 2 non-isolated (positive)
T	AN_2-		Analog input 2 non-isolated (negative)
U	AN_3+		Analog input 3 non-isolated (positive)
V	AN_3-		Analog input 3 non-isolated (negative)

* Only available when the configuration includes a sensor interface, otherwise these pins do not connect

** Use only at your provider's instructions.

4.4. VHF ANTENNA CONNECTOR.

The VHF antenna connector is a female 'N' type connector.

It is recommended to use a coaxial cable type RG213 or similar with a maximum length of 30m to minimize power losses.

The connector must be protected against corrosion by vulcanizing tape.

4.5. GPS ANTENNA CONNECTOR

The GPS antenna connector is a female 'TNC' type connector.

IMPORTANT NOTICE

The GPS antenna must be active type with 3.3V and must be electrically isolated from the VHF radio connector otherwise it may cause damage to the AIS.

4.6. POWER CONNECTOR (W)

The MTU-AIS requires a DC power supply with a rated voltage of 12VDC or 24VDC and can operate in a voltage range between 10V and 32VDC.

The current peak when output at 12V is 3A.

The total average consumption will depend on the configuration used and the messages transmitted periodically.

4.7. INSTALLING THE VHF RADIO ANTENNA

The correct installation of the VHF antenna is essential for the correct performance and reliability of the AIS Transponder.

The VHF radio antenna must have the following minimum specifications:

- Center frequency 162MHz
- VSWR < 2.0
- Impedance 50 Ohms
- Minimum power 12.5 Watts
- Gain 1dBi to 6dBi

4.8. INSTALLING AND CONNECTING A GPS ANTENNA

If the installation requires the use of an active GPS antenna, an antenna with the following minimum characteristics must be used:

- 1575.42MHz center frequency for GPS.
- Active gain antenna at least 20 dB
- Power supply 3.3V
- Impedance 50 Ohms

IMPORTANT: The GPS antenna and its coaxial cable must be isolated from the support structure and VHF radio connection

5. CONFIGURATION USING PROATON SOFTWARE

The configuration software supplied on the CD will be used to adjust the MTU-AIS transponder to be configured and tested.

The main functions are:

- Configuration of essential parameters such as MMSI, name, type and dimensions.
- Setting the emission frequency of a Real Aton.
- Virtual or synthetic Aton broadcast frequency configuration.
- GPS test and diagnosis.
- General test and diagnosis of the System with alarm indication.

IMPORTANT NOTICE

Configurations saved with a certain version of proAtoN software can only serve as templates for future configurations if the proAtoN software version is the same.

5.1. PROAtoN INSTALLATION

The proAtoN software must be installed from the supplied CD.

1. Insert the CD into your laptop.
2. Navigate to the proAtoN folder on the CD.
3. Choose the installation in Spanish or English and start the installation.
4. Follow the on-screen instructions to view to complete the installation.

The installation of the proAtoN performs the installation of the USB drivers, as well as the configuration program required for the connection to the MTU-AIS.

5.2. CONFIGURATION SCREEN

The basic configuration screen is as follows:

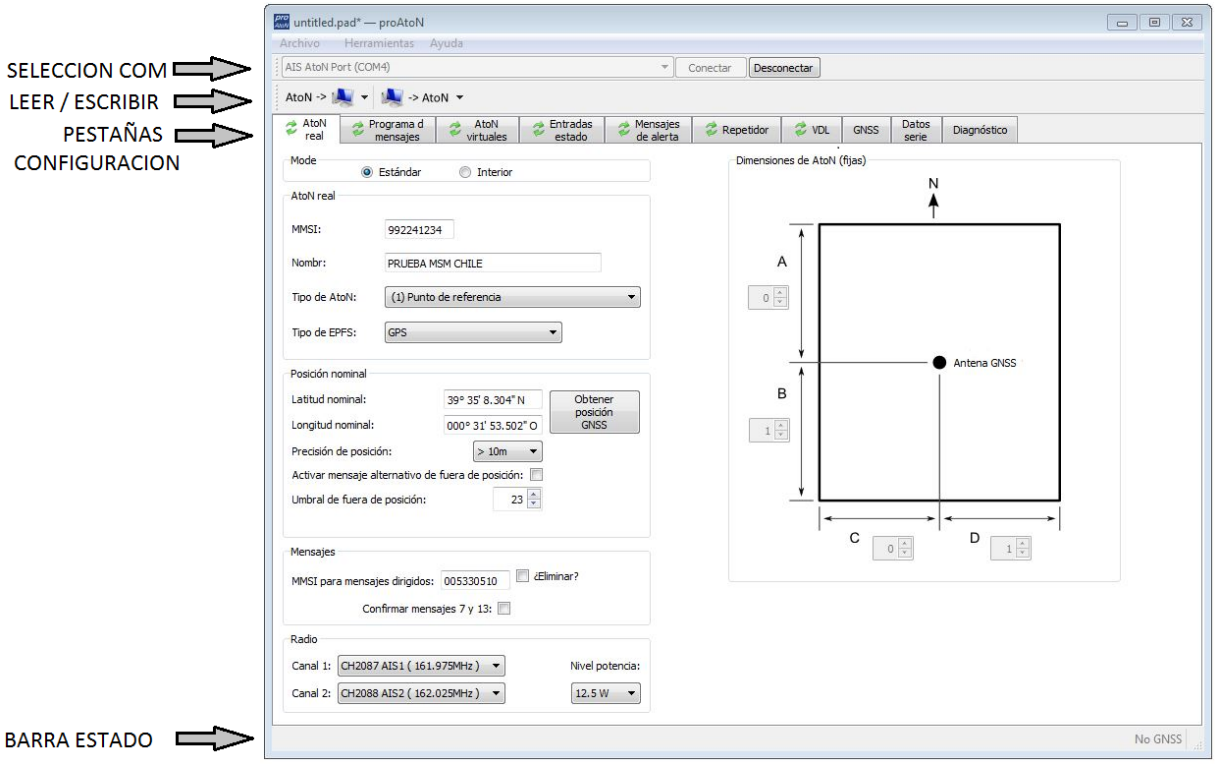


Figura 1. proAtoN General screen

Selection COM Port:
When we connect a PC via the Serial Port to the MTU–AIS it will activate and give us the option to establish the connection using the "Connect" button.

Select Read and write
The key on the left transfers the current MTU-AIS settings to the computer so that we can see the current MTU-AIS settings.

The right key transfers the current ProAtoN configuration of MTU-AIS transponder ProAtoN, so we can modify parameters in the MTU-AIS.

You can choose to transfer all settings tabs or only the current tab.

Configuration tabs
The transponder settings are displayed through the following tabs:

● AtoN Real.
CONFIGURATION of the MMSI AtoN, name, type, dimensions, position and VHF radio parameters.

Message program
Configuring cycles and modes of message transmission according to FATDMA or RATDMA

• Virtual AtoN.
Configuring the transmission of virtual or synthetic 21 messages.

• State entries
Configuring the AtoN state information source. The USER inputs of connector W can be configured using this tab.

• Alert messages.
Configuration of non-recurring alert messages, as well as actions to be taken in the event of a certain alert.

• Repeater
Allows the configuration of the repeater function for the different messages.

● VDL
Allows the configuration of the VDL radio connection.

● GNSS
Displays the signal level of the GPS receiver and status information.

Serial Data
Displays AIS data in IEC61162 (NMEA0183) format as generated by the MTU-AIS.

Diagnostics
Displays the software version, possible, alarms and other status information that may be of interest to the system's diagnostics.

When the PC connects to an MTU-AIS a status icon is displayed next to the tab title that reports whether the information is up-to-date or not.


Green. SYNCHRONISED TAB


RED TAB NOT SYNCHRONIZED WITH THE MTU-AIS


BLUE SYNC IN PROCESS


EDITED AND NOT TRANSMITTED TO MTU-AIS TAB

Synchronization is achieved by a process of reading or writing the MTU-AIS.

STATUS BAR.
The status bar displays the status of the connection, the GPS time.

5.3. MTU-AIS CONFIGURATION

The following sections show the possible configuration options.

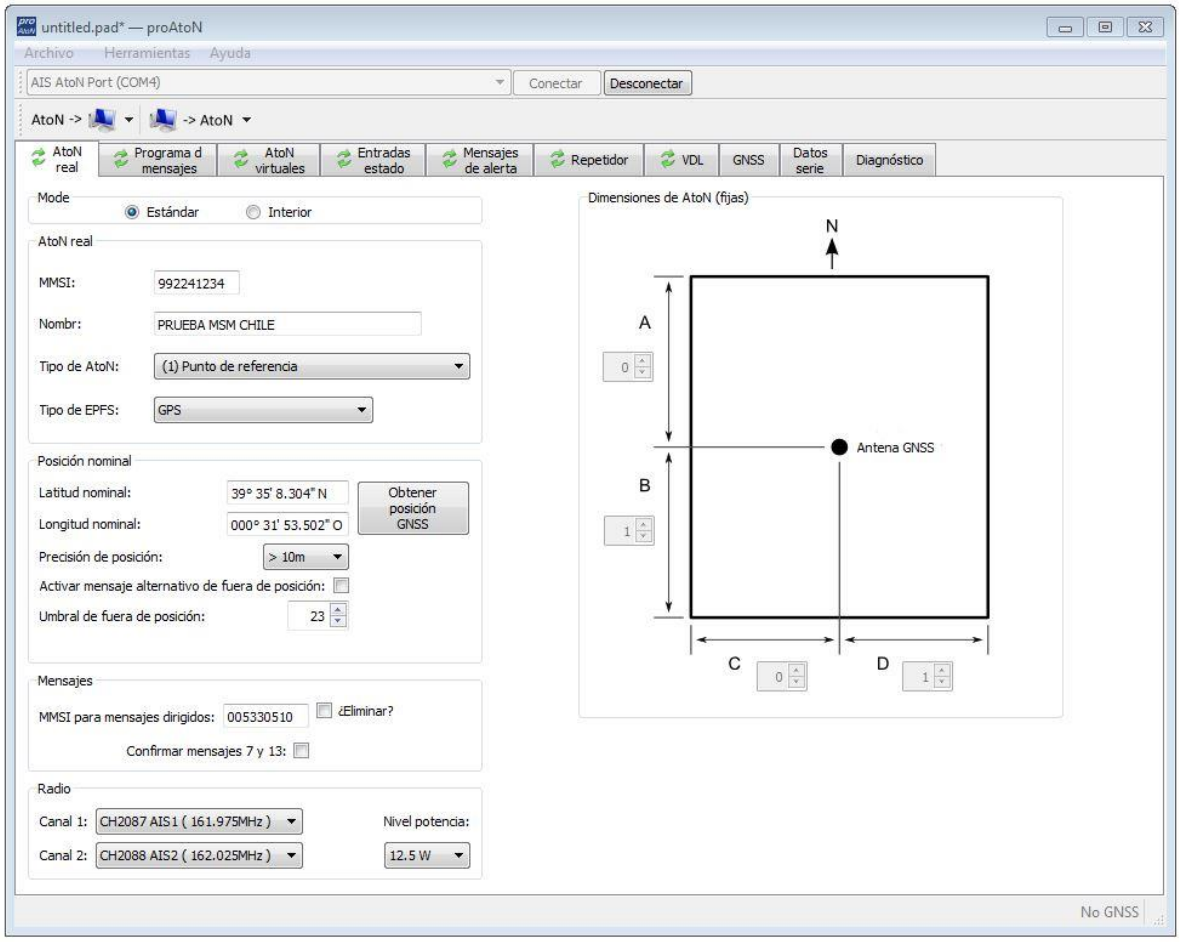
Setting up an AIS AtoN device requires technical knowledge of the AIS System and keep in mind the recommendations of IALA A-126.

The AIS environment present at each site should be known, especially when selecting the broadcast slots.

Before setting up the MTU-AIS we must press the connect button, and at the end we must press disconnect.

5.3.1. ATON-REAL CONFIGURATION.

On the next screen you can configure the parameters for the Real AIS-AtoN



STANDARD or INLAND MODE

The Standard Mode is the one used in maritime navigation and the "inland" mode is the one used in navigation in river channels in Europe.

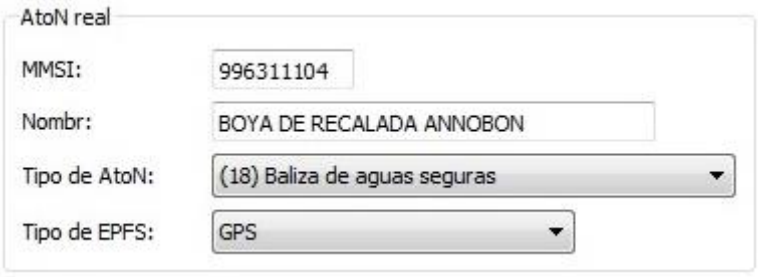
In "inland" mode, msg 21 controls related to the Racon and beacon are disabled.

MMSI
The MMSI identifier is the number associated with the Actual AtoN.
The assignment of MMSI identifiers to AIS equipment is internationally regulated by the ITU according to: Recommendation ITU-R M.585-7 (03/2015).
"Assignment and use of maritime mobile service identities"
https://www.itu.int/rec/R-REC-M.585/es

NUMBER
The name of the navigation aid that is published to other AIS users (Maximum 34 characters).

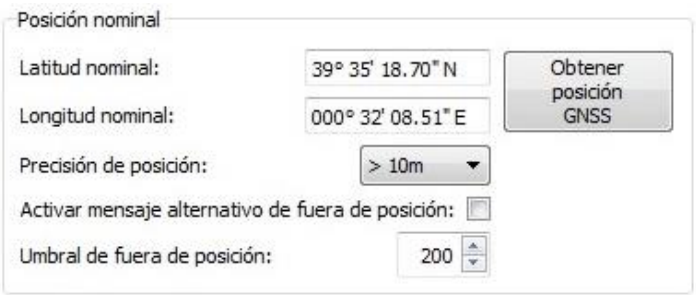
Type of AtoN
Select the AIS-AtoN type from the list of 26 options as defined by the IALA A-126 standard.

Type of EPFS
Select el type of receiver EPFS *(Electronic Position Fixing System)* that is used in the MTU-AIS.
The standard option is the GPS option that is the receiver used in the MTU-AIS.



Nominal Position
The nominal position is the theoretical position where navigation aid is located, in the case of buoys, would be the center of the terminal radius. This position can be entered manually using the coordinates or obtained automatically by clicking on the "Get GNSS Position" button. To set the terminal radius (which is the maximum distance that the buoy can move following the anchoring train, without breaking it) we must enter the maximum allowed displacement value in the "Out of Position Threshold" box. If this terminal radius exceeds the programmed limit, if the mooring line breaks, a warning can be sent to the navigators indicating an "Out of Position" alert as a warning.

There is the option to force the coordinates of the navigation aid position. If the AIS unit is not located in exactly the same position as the navigation aid (for example, a lighthouse with an annexed building where the AIS is located) you can choose in "EPFS type" the "surveyed" option and indicate the position of the headlight.



Accuracy can only be set when the 'Surveyed' option is chosen.

If the alternative out-of-position message is activated, the MTUAIS will send the alternate MSG 21 that will be configured in the "message program" with a faster sending sequence to alert the navigators that the buoy is adrift.

The out-of-position threshold determines the maximum displacement of a buoy relative to the programmed target position.

• **MMSI for addressed messages.**
This is the MMSI identifier used for addressed messages that are generated by the MTU-AIS. Typically, it is the MMSI of the base station that will receive status information.

Dimensions
The dimensions of the AtoN must be introduced approximately 1 meter as recommended by the IALA A-126.

• **Radio channels.**
It is possible to configure the radio channels for the transmission of messages in most cases the AIS1 and AIS2 channels are used.

Radio transmitter power
The power level emitted by the MTU-AIS can be adjusted 1W, 2W, 5W or 12.5W. The standard 12.5W option in most situations except, which, for some reason, you want to limit the transmission range:

5.3.2. CONFIGURING MESSAGE TRANSMISSION.

The message transmission configuration screen is described in the following image:

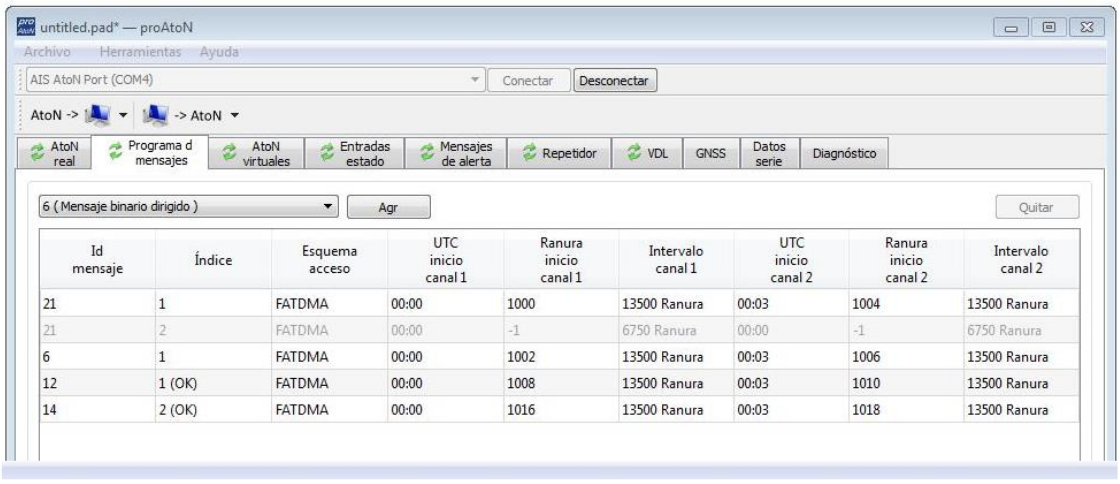


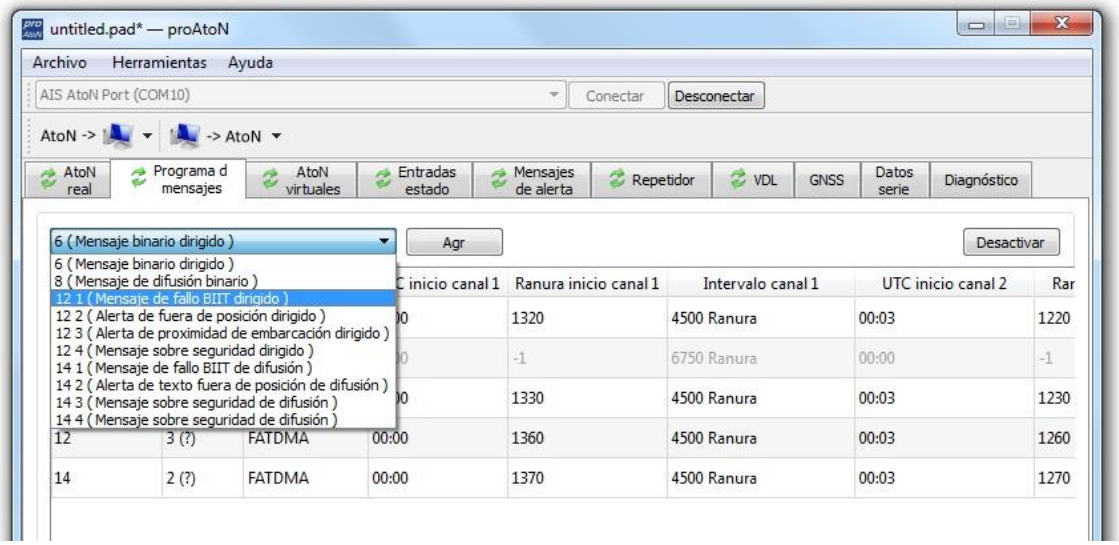
Figura 2. ProAtoN message scheduling

Basic Messages
The typical message of an AtoN AIS is Message 21. This message occupies two slots.

Additional messages:

Message #8 Meteo

- Message #6 Directed binary message
- Message #12 Addressed Security Message (4 OPTIONS)
- Message #14 Security Broadcast Message (4 OPTIONS)



Emission scheme:

FATDMA the RATDMA.

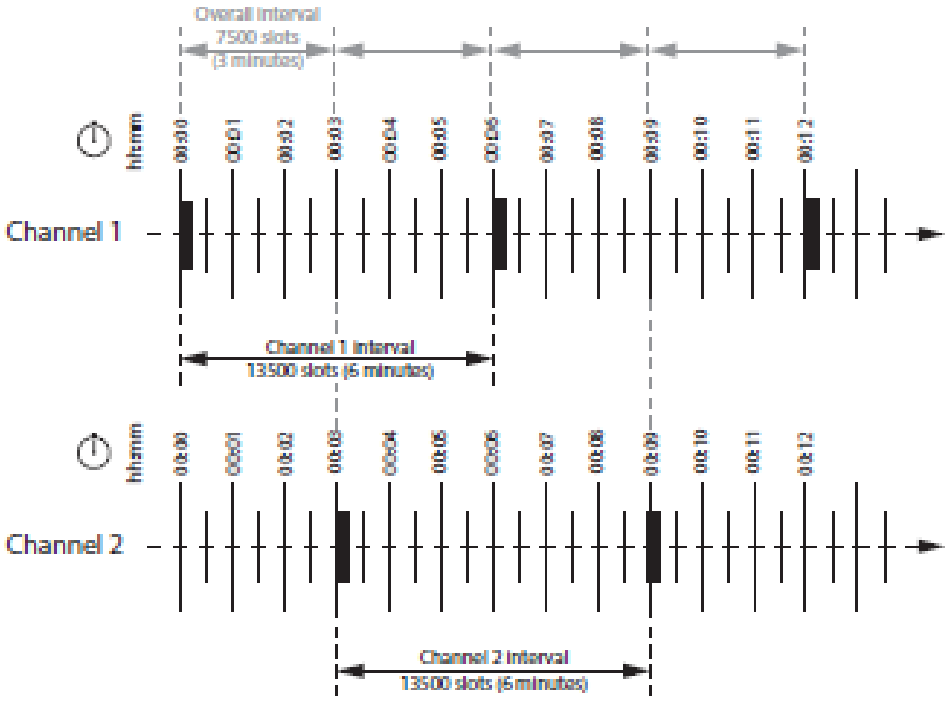


Figura 3. Example of FATDMA emission scheme.

This transmission scheme can be configured as follows:

• Channel 1 start UTC - 00:00 (The first block of every hour)
• Channel 1 start slot s 0 (The first slot in the block when slots 0 and 1 are used for the transmission of message 21).
• Channel 1 interval s 13500 slots (Equivalent to an interval of 6 minutes, 2250 slots per minute)
• Channel 2 start UTC s 00:03 (The third block of every hour)
• Channel 2 start slot s 0 (The first slot in the block when slots 0 and 1 are used for the transmission of message 21).
• Channel 2 interval s 13500 slots (Equivalent to an interval of 6 minutes 2250 slots per minute)

The MTU-AIS is configured for the transmission of a 21 message every 3 minutes alternately for each AIS1 channel and AIS 2 the broadcast will always be performed by the selected slot.

Disable message: A message can be disabled so that even if the message settings are stored, it will not be sent.

5.3.3. VIRTUAL AIS CONFIGURATION

The MTU-AIS can be configured to generate transmission of up to 10 virtual or synthetic

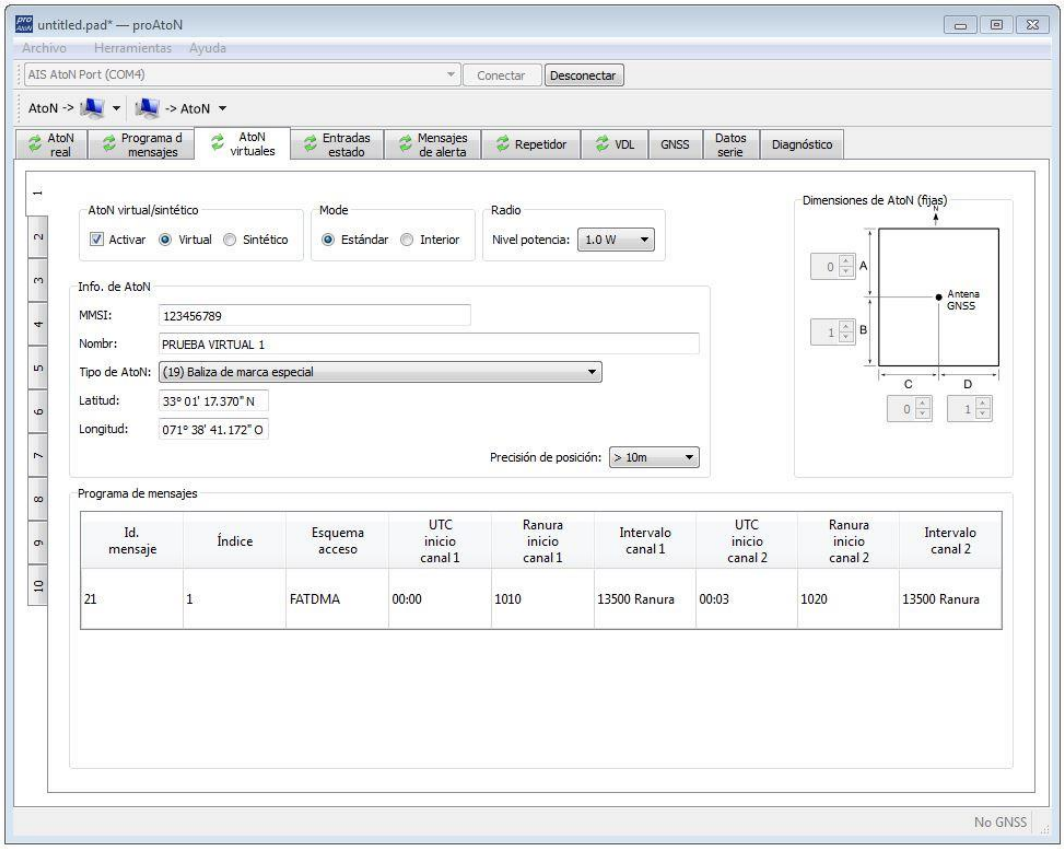


Figura 4. Virtual AIS configuration.

Parameters are required for the transmission of virtual messages and must be configured correctly by users.
The data to be used will be like those used in the previously configured AIS-AtoN Real message.

Synthetic Message:
A 21 message is issued marking an AtoN station that is not equipped with an AIS Transponder, but there is a buoy or beacon tower in the programmed position.

Virtual Message:
A 21 message is issued from an AtoN station that does not physically exist in the programmed position. This creates a virtual AtoN in a place where a real AtoN does not exist. It can be used to mark new hazards.

5.3.4. SETTING UP THE STATUS ENTRIES.

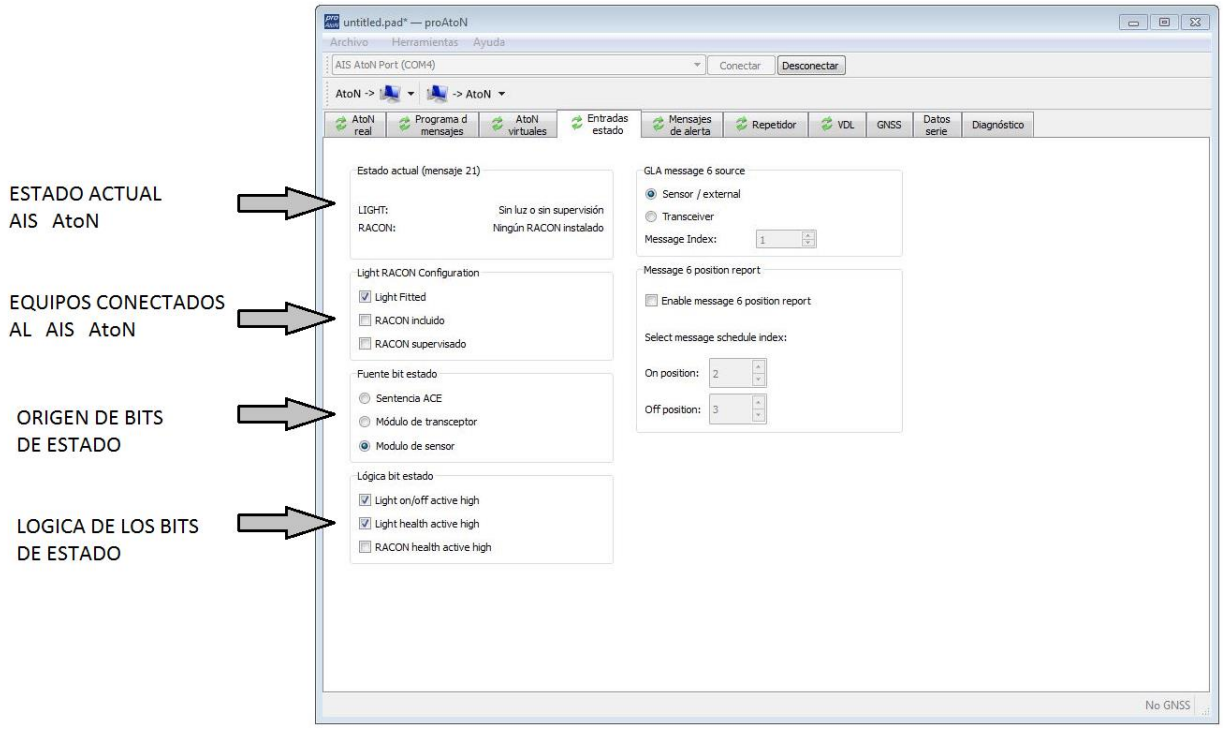
The AtoN Msg 21 status message contains binary-encoded information such as a bit stream.

The status bits contain information about the operation of the beacon, Racon, and the AIS AtoN transceiver itself.

Status information can be obtained from 3 different sources:

- ACE statements through RS422 port.
- Digital inputs of the ATON transceiver module
- Digital inputs of the sensor module.

The following screen describes the Digital Setup and Input screen.



Current status (msg 21)
This section shows the current state of light and Racon. The MTUAIS must be powered for the sensor plate to work.

Beacon and Racon Configuration:
This section allows you to adjust the parameters of the beacon and Racon. Selectors must be selected depending on the installation in which MTU AIS is installed. For example, if the beacon status output is connected to the MTUAIS, it must be selected, if a Racon is installed, it may or may not be monitored and must be selected correctly.

The source of the status bits.
Select the method used to provide status information to the MTUAIS transceiver.

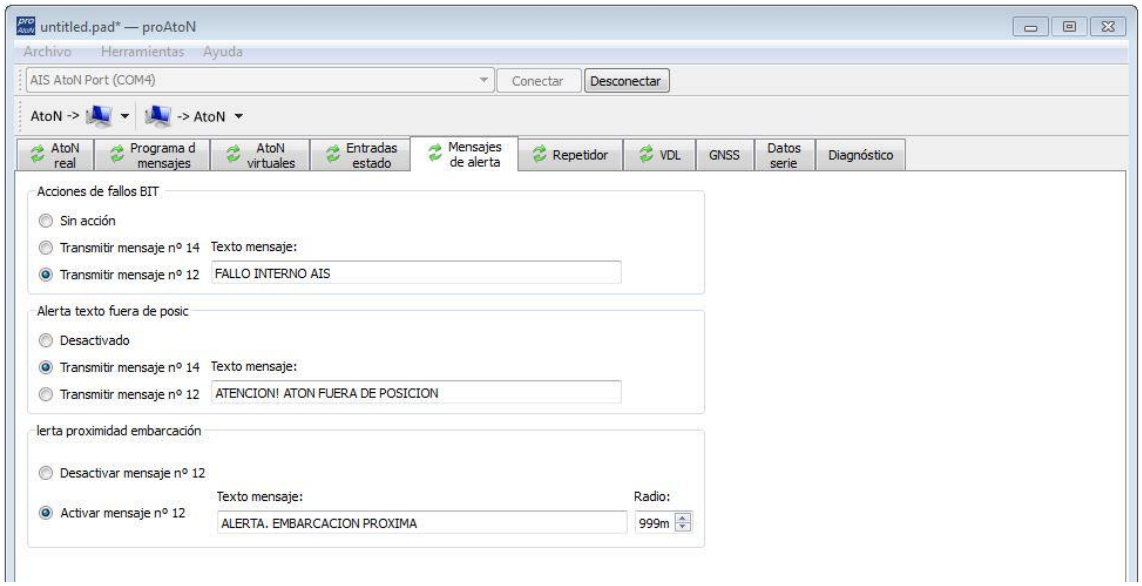
- ACE statements: Through the NMEA port and RS422 will deliver the information to the AIS.
- Transceiver module: Non-isolated digital inputs of the transceptor presents in connector W.
- Sensor module: In models with sensor board, will be connected to the X and Y connector.

State bit logic.
Allows you to select the Negative or Positive logic of the digital inputs for connection to the beacon and Racon.

5.3.5. ALERT MESSAGES.

MTUAIS can be configured to send alert messages under three alert conditions:

- Alert with addressed message in case of System Integrity Alert (BIIT).
- Alert with addressed message in case of proximity of a ship with a configurable distance radius (only available in type 3).
- Alert with addressed message or broadcast when MTUAIS determines that the position is outside the terminal radius determined as the maximum limit. A different message schema can be programmed.



Actions for the BIIT Failure

This section allows the configuration of the text message to be transmitted when a failure in the *Built In Integrity Test* (BIIT fault) is detected. This failure may indicate a problem with the transponder, and it would be prudent to warn ships not to rely on the information provided by the transponder in this situation. Note that the health of the transponder is always transmitted as part of the Standard Navigation Aids position report (Message #21), however, the status contained by this message may not be displayed on all monitors.

The actions available with the BIIT failure are:

No action – no message is transmitted when a BIIT fault is detected

• Transmit message #14. A general text message is transmitted when a BIIT fault is detected. The text contained in the message must be defined in the 'Message text' box.

• Transmit message #12. A targeted text message is transmitted when a BIIT fault is detected. The destination MMSI of the target message is configured on the 'AtoN Real' tab

In addition to the BIIT failure action settings, a schedule must be set up for the associated message on the 'Message Scheduling' tab.

• Message #14 Index 1 should be configured if the message action has #14 selected.

• Message #12 Index 1 should be configured if the message action has #12 selected.

A supply voltage also causes this alarm to be triggered.

Boat Proximity Alert

This section allows you to configure the text message to be transmitted when detecting the intrusion of a ship within a defined radius (or protective circle) around the transponder. This message can be used to warn ships approaching a potential collision with the AtoN. The addressed message is automatically sent to all ships that pierce within the radius of the protective circle.

The available boat proximity alert actions are:

• Disable #12 message – the boat proximity alert function is disabled.

• Enable message #12 – the function is enabled and the content of the text of the message to be transmitted must be defined in the 'Message text' box. The radius of the protection circle for the proximity alert must also be programmed in the 'Radio' box. This value is set to meters.

In addition to configuring the ship proximity alert, you must set up a schedule of the associated message on the 'Message Scheduling' tab.

• Message #12 Index 2 should be configured if the message action has #12 selected.

Out-of-position alert

This section allows you to configure the text message to be transmitted when the transponder detects that a buoy equipped with a MTUAIS is out of position.
Out-of-position detection settings are done on the 'AtoN Real' tab (see section 5.3.1).
Setting up an alternate report-by-message #21 out-of-position schedule is independent of this text alert.

The available out-of-position alert actions are:

• Off – no text message is transmitted when the transponder determines that it is out of position.

• Transmits #14 message. A text message is issued when the transponder detects that it is out of position. The text content of the message must be set in the 'Message text' box.

• Transmits #12 message. A directed text message is transmitted when the out-of-position condition is detected. The target of the defined message is configured on the 'AtoN Real' tab (see section 5.3.1).

In addition to the out-of-position alert settings, an associated message schedule must be set up on the 'Message Scheduling' tab.

• Message #14 index 2 should be configured if the message action has #14 selected.

• Message #12 index 3 should be configured if the message action has #12 been selected.

SART Repeater Mode
This control enables or disables the repetition of SART (Search and Rescue Transponder) messages detected by the AtoN AIS

5.4. OFFLINE CONFIGURATION

This configuration is only possible for the transponder configuration mode. This setting includes all programming parameters, virtual AtoN settings, and other parameters that can be saved to a file. This feature allows the creation of a configuration file without access to the transponder hardware. The file can be uploaded later and synchronized with the transponder hardware.

This feature is available using the 'Save File' and 'Load File' items available in the File menu.

The settings are saved in a "*.pad" file using proAtoN's application own format. When the application starts, a new blank configuration is created. You will be prompted to save the file if changes have been made.

6. MTU-AIS REPEATER FUNCTION.

The proAtoN application provides the ability to configure the MTUAIS repeater function.

Messages 21, 6, 8 and SART 1 and 14 can be repeated with a maximum of three hops.

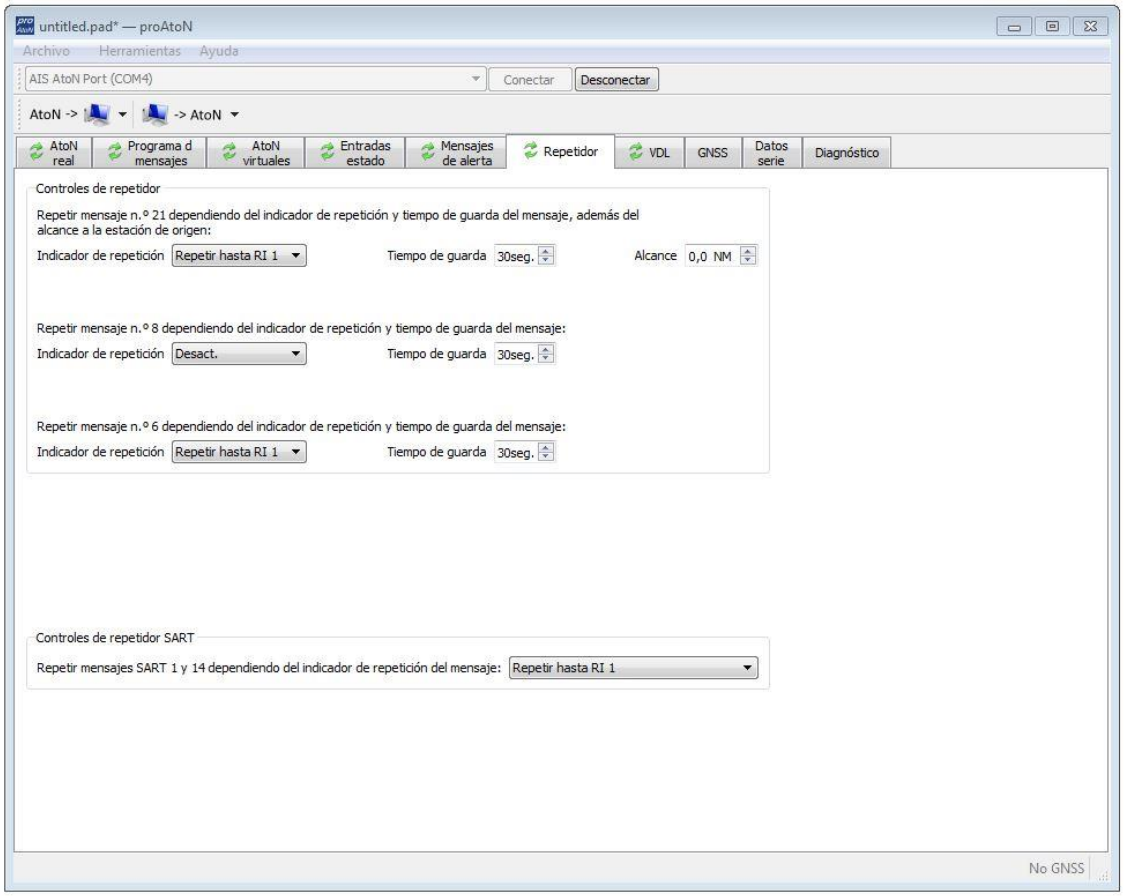
The configuration of each message is done individually and can be selected which message types are repeated.

All AIS messages include a “Repeat Indicator” indicating the number of hops made by the message.

RI-0 are messages that have not been received directly from the source computer.
RI-1 Indicates message has been forwarded 1 time.
RI-2 Indicates message has been forwarded 2 times.

To avoid unnecessary hops and unnecessarily forwarded messages, you must choose the hop scheme correctly based on the geography and distribution of AIS equipment.

There are 3 drop-down tabs where you can limit what type of messages will be forwarded.



The Save time will avoid forwarding two identical messages multiple times and preventing uncontrolled message bounce.

The 21 *Broadcast* message can be limited in distance so as not to repeat messages that are at an excessive distance and may not be interesting for navigators in the area where the forwarding equipment is located.

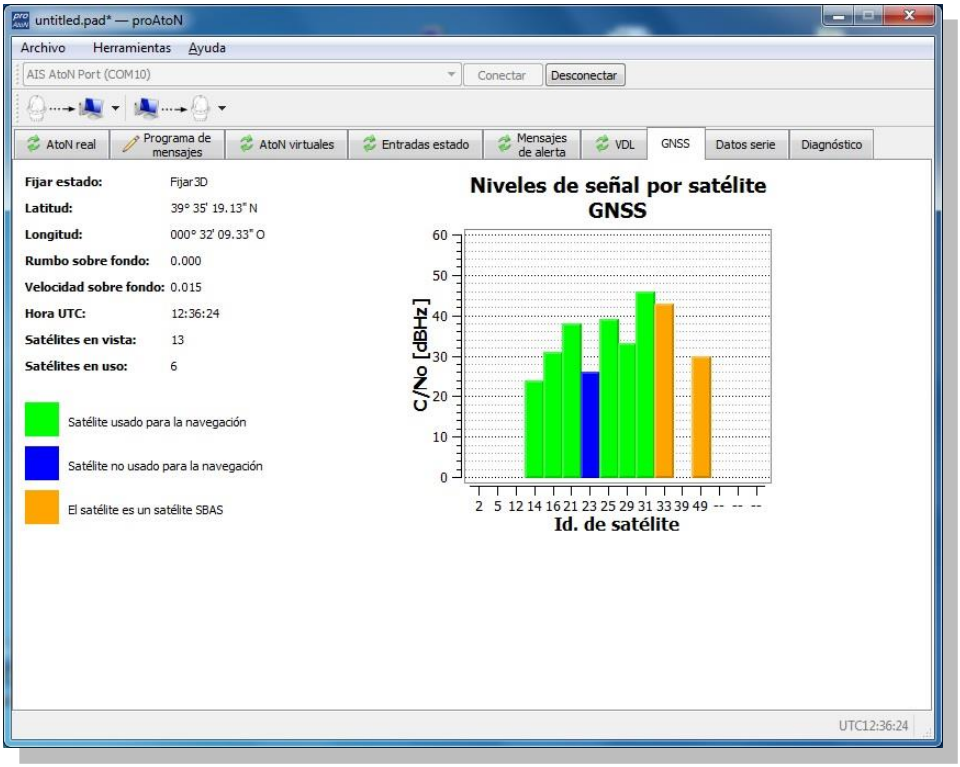
7. MTU-AIS DIAGNOSTIC

The proAtoN application helps in verifying and testing the installation of MTU-AIS equipment, checking the status of antennas and their wiring. There are 3 tabs where we can get information about how AIS works.

7.1. GPS TAB

The GNSS tab allows us to make a diagnosis of the GPS operation.
The information you provide to us is as follows:

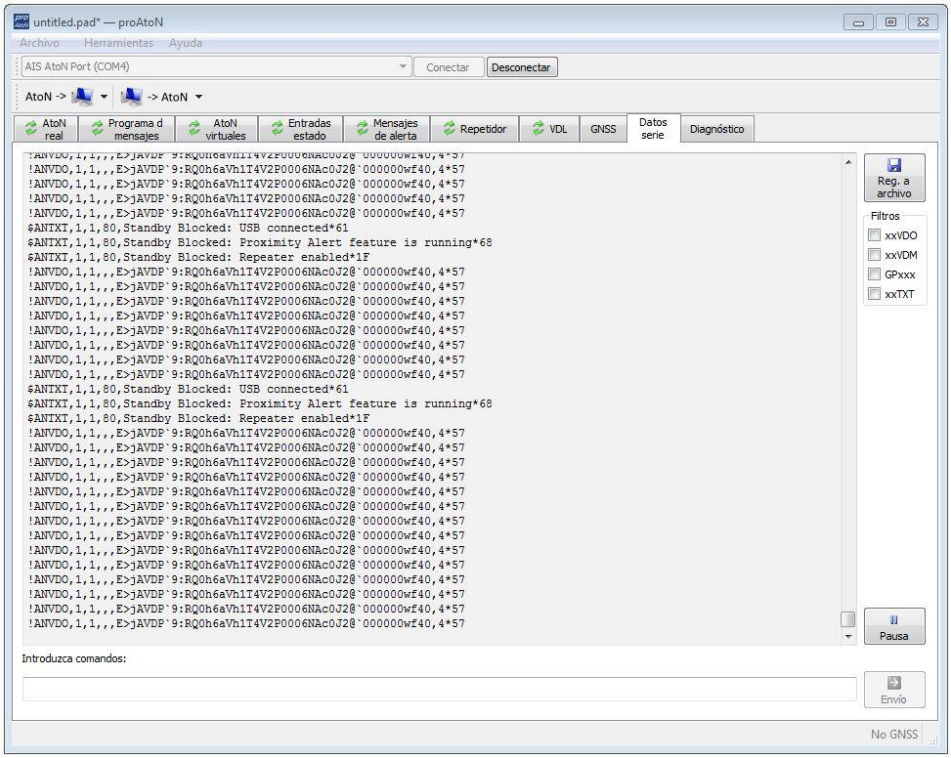
-Position, UTC Time, Speed and heading, Satellites in sight and in use.



The graph represents the signal of detected and in-use satellites, as well as the SBAS correction satellites used. SBAS satellites can be from WAAS, EGNOS and MSAS networks.

7.2. TAB SERIAL DATA.

Displays the AIS data of the receiver in the format NMEA0183 / IEC61162-1 It can record the data in a file and be able to apply filters on the received data.



7.3. DIAGNOSTIC TAB

This tab provides information about the System Software version and its operating status.

AtoN details.

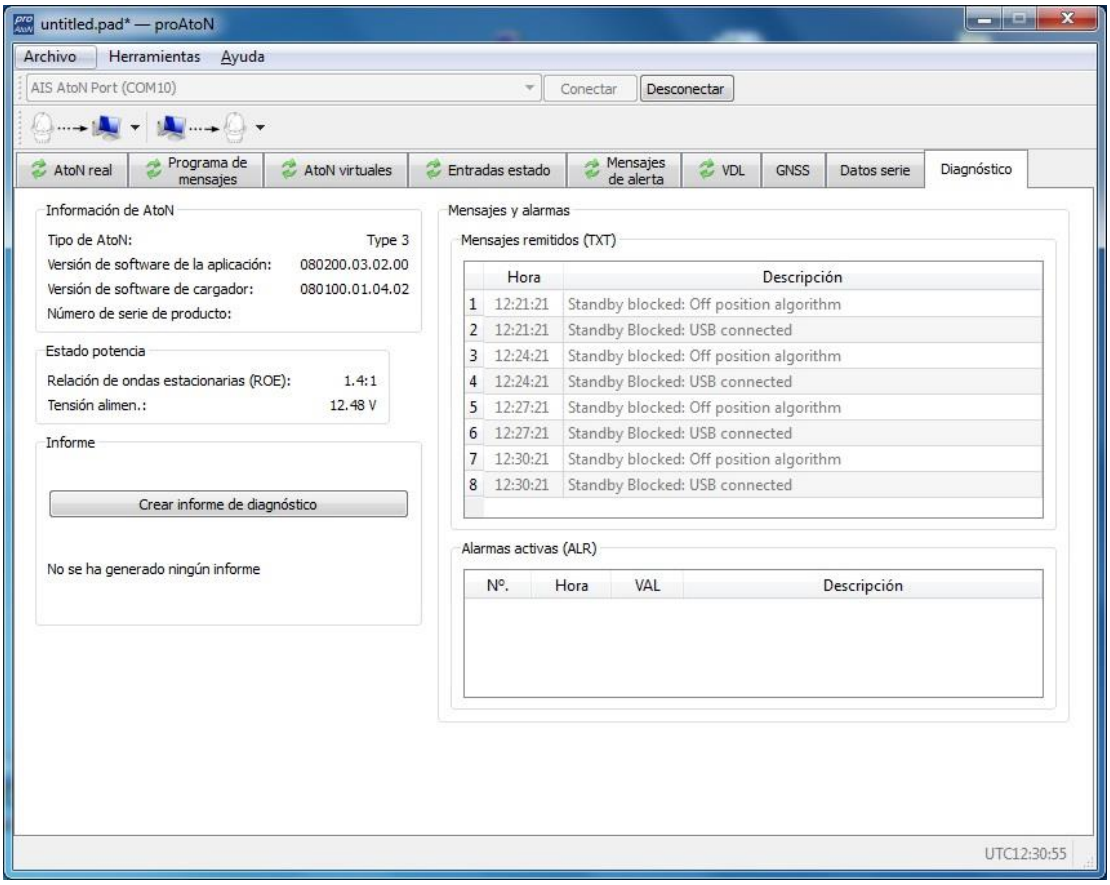
- Reports on the Type-1 or Type-3 connected AtoN model.
- Information about the software version in use.
- Serial number.

Emission power

- Radio transmissions are measured and the ROE (Stationary Wave Ratio) data is displayed.

This value is indicative only.

If the measured value is greater than 5:1 an alarm will occur as the antenna adaptation is faulty and the power reflected in the transmitter is very high which would indicate a wiring defect.



The voltage range must be between 9.6V and 32.6V.

Active alarms.

The MTU-AIS transponder incorporates BIIT (Built In Integrity Test) self-diagnosis circuitry and continuously evaluates work parameters.

Status entries configuration tab.

AtoN AIS position reports (message #21) contain status information encoded as a bit stream.

The status bits contain the basic operational state of a light and RACON connected to the overall state of the transponder. Connecting a light and/or RACON is optional and requires equipment with an appropriate state output.

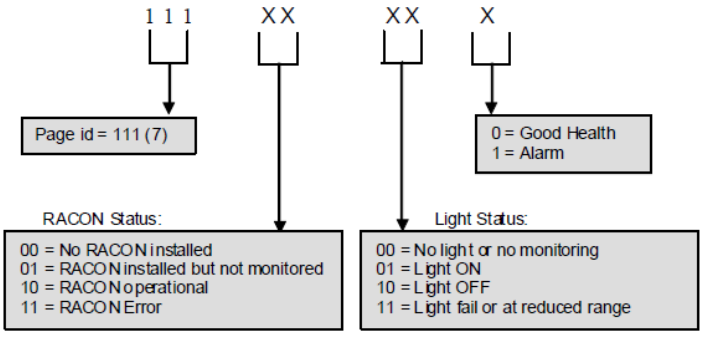


Figure 4 Recommended use of AtoN status bits

8. STAND-BY MODE

During the work of the transponder you can enter low power consumption mode (stand-by).

The reasons for exiting this mode from low power to active mode are:

- USB cable connected to the PC.
- Capture GPS satellites.
- Equipment out of position.
- Repeater function activated.

9. CONFIGURING THE PCA SENSOR MODULE

The PCA sensor board configuration tabs will be activated when connecting to the ProAton to the COM port of an MTUAIS that has the sensor board installed.

The details of each of the 5 configuration tabs are described below.

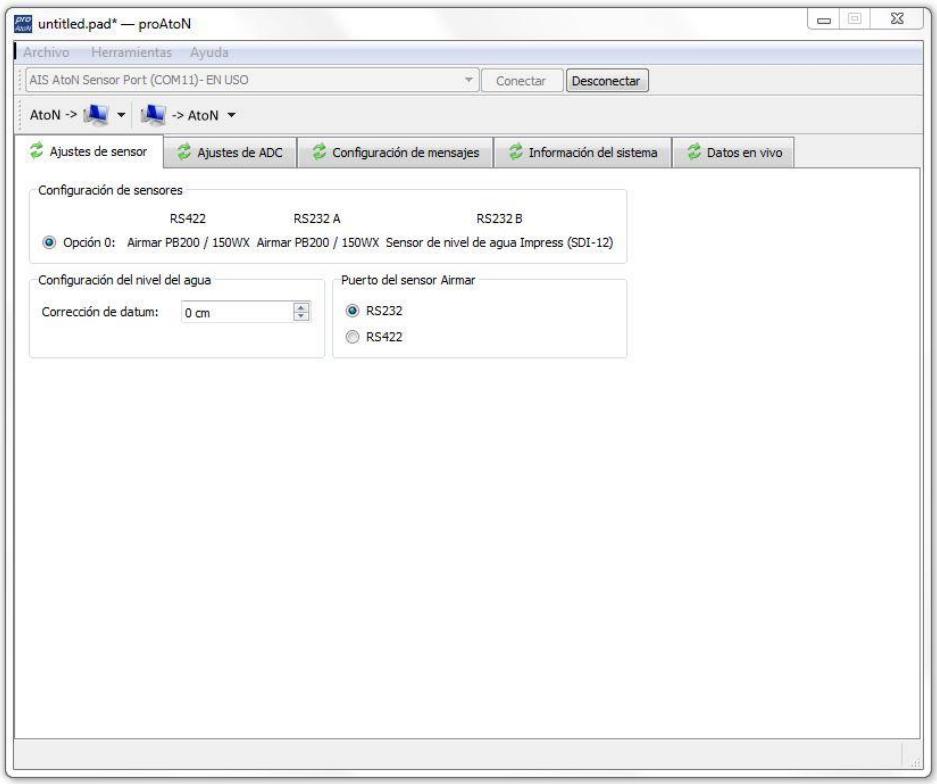
To initially activate the sensor board, first, we need to send a command to the AIS-Tungsten board to tell it that it has a sensor board connected.

The command is as follows:

$PSMT,0,3,0x2C75B2FA,1,sensfit 1,0*35

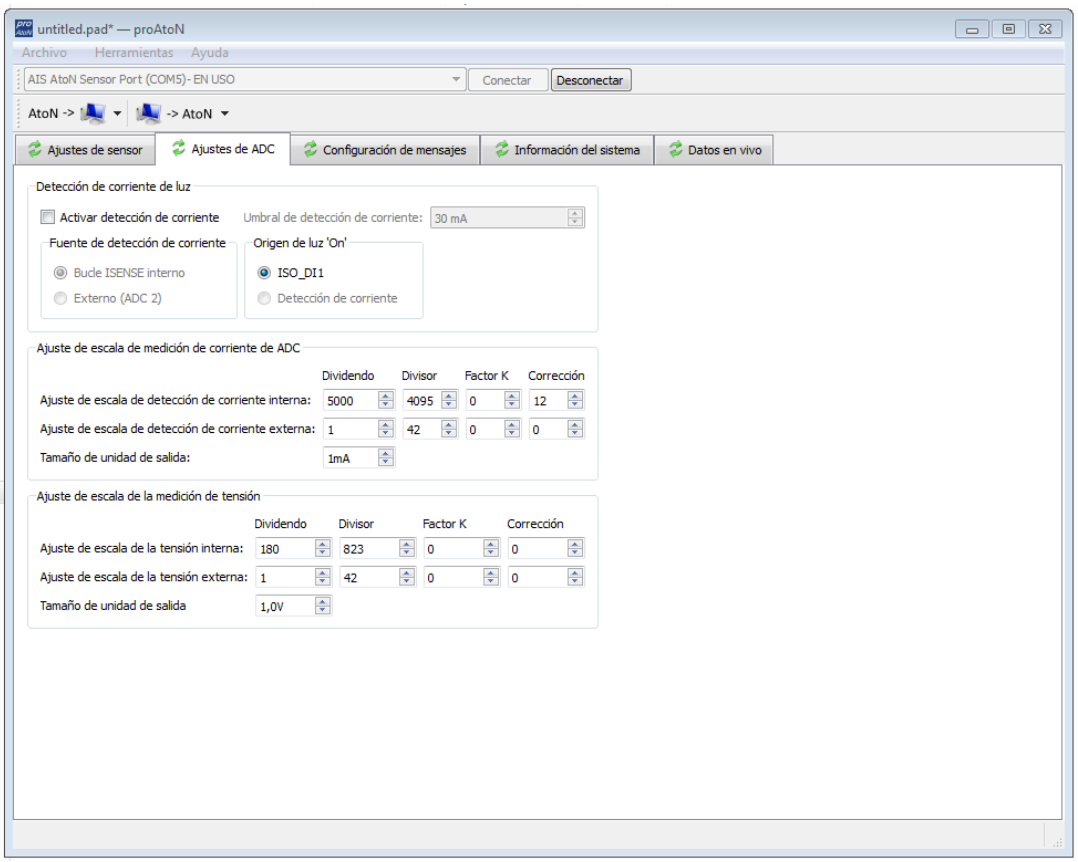
It can be sent from the "Serial Data" tab using the command line at the bottom. After the command is sent, the MTUAIS computer must be restarted.

The initial sensor board configuration screen is as follows:



Analog input configuration tab.

This display contains controls for the beacon current sensor and parameters for scaling ADC converters. There are three groups of controls: Beacon Current Detection, ADC Current Sensor Scaled Adjustment, and Voltage Measurement:



Light Current Detection Group

Checking the 'Enable Current Detection' box allows you to activate the controls described below. The function of each control can be found in the details of the corresponding command.

- Current Detection Threshold.
- Current Detection Source. By Isense or by analog input ADC2
- Light Origin 'On'. Using digital input ISO_DI1

Adjusting ADC current measurement scale

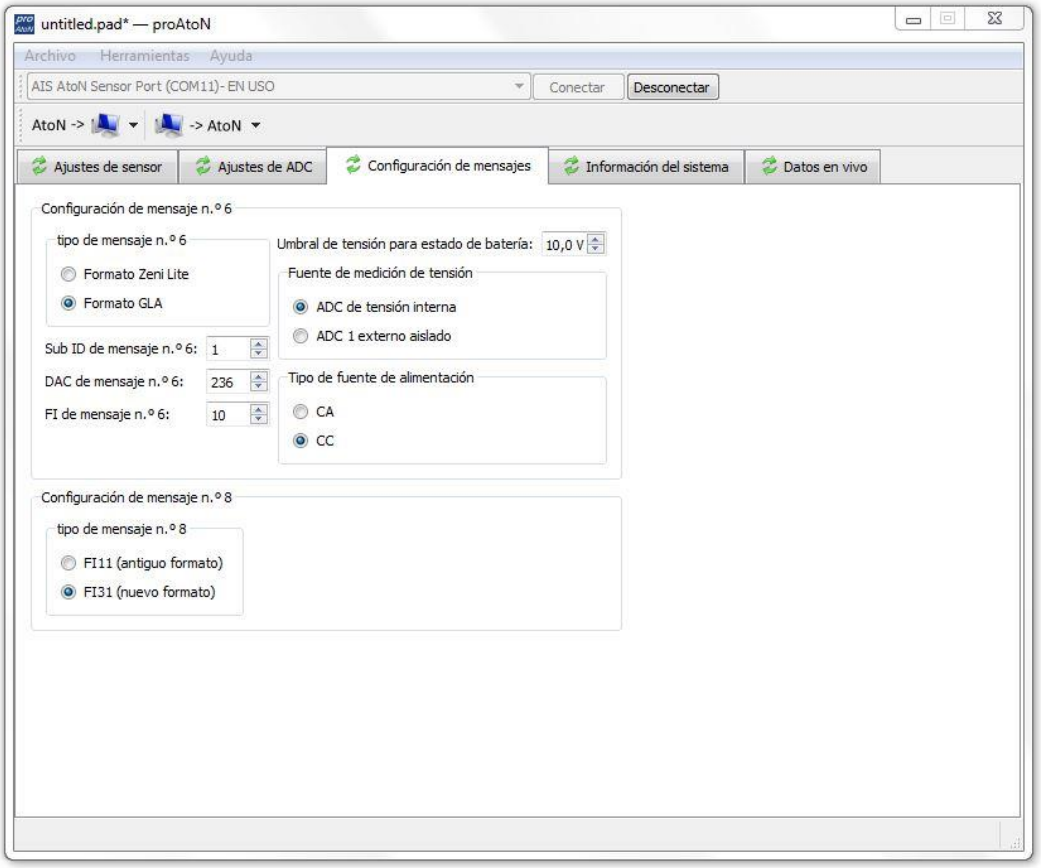
These controls allow you to configure the measurement scale adjustment parameters of the two current sources.
To switch between these two sources, you select through the Current Detection Source control in the Light Current Detection group box above.

Adjusting the Voltage Measurement Scale

These controls allow you to configure the scaling parameters for the two Voltage Measurement Sources.
To switch between these two sources, you select it through the Voltage Measurement Source control on the Message Programming tab.

Message Settings tab

The Message Settings tab, shown in the Figure, contains controls for message loads #6 and message #8. These control groups are based on such messages.



Settings Message #6

This group contains controls for:

- Message Type #6
- Voltage Measuring Source
- Type of Power Supply
- Message Sub ID #6
- #6 Message DAC
- FI Message #6

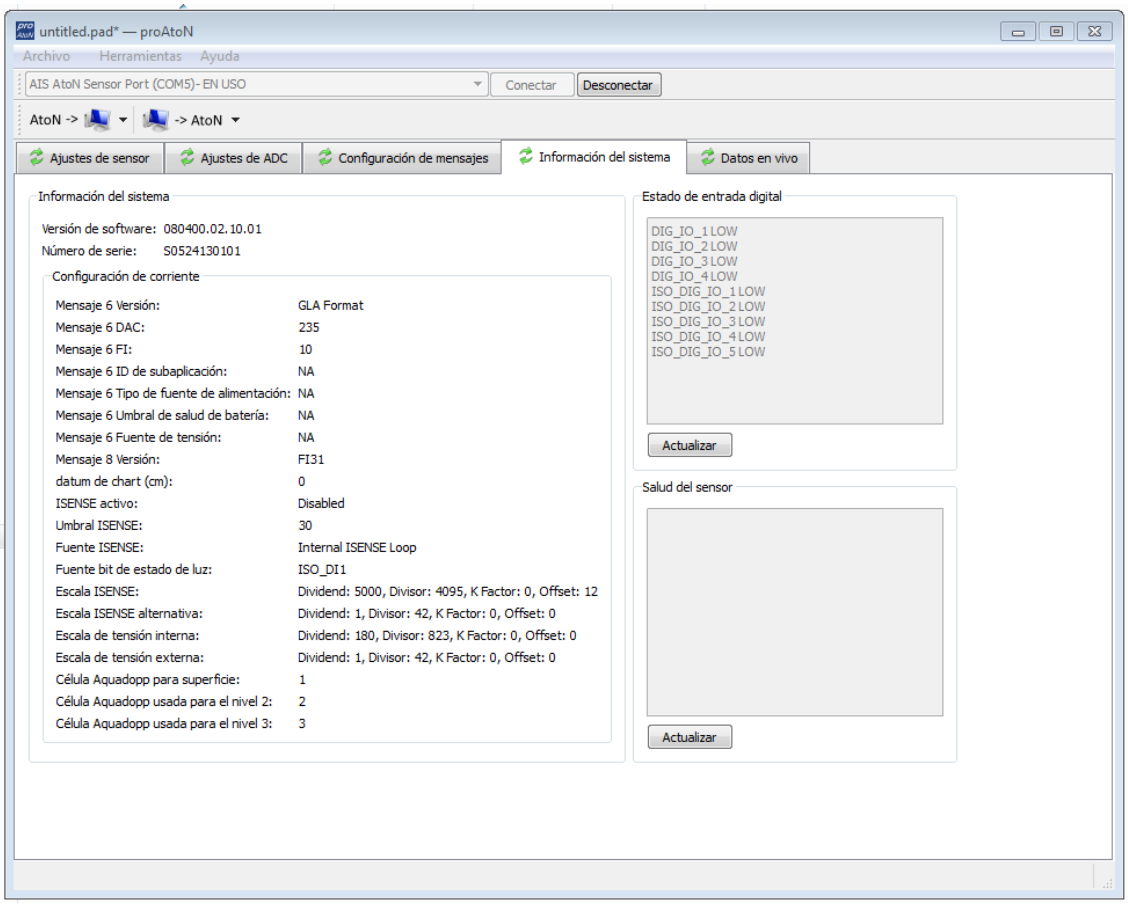
Settings Message #8

This group contains a single control to select the message type #8

- FI 11 for compatibility with the old MGS 8 format
- FI 31 to use the new MGS 8 format

System Information

This tab displays the PCA Sensor data. There are three data groups: System Information, Digital Entry Status, and Sensor Health. See Figure below



System Information

This section shows the Software Version, Serial Number, and details of the current configuration. This section is updated with the 'Recover All Settings' control)

Digital Entry Status

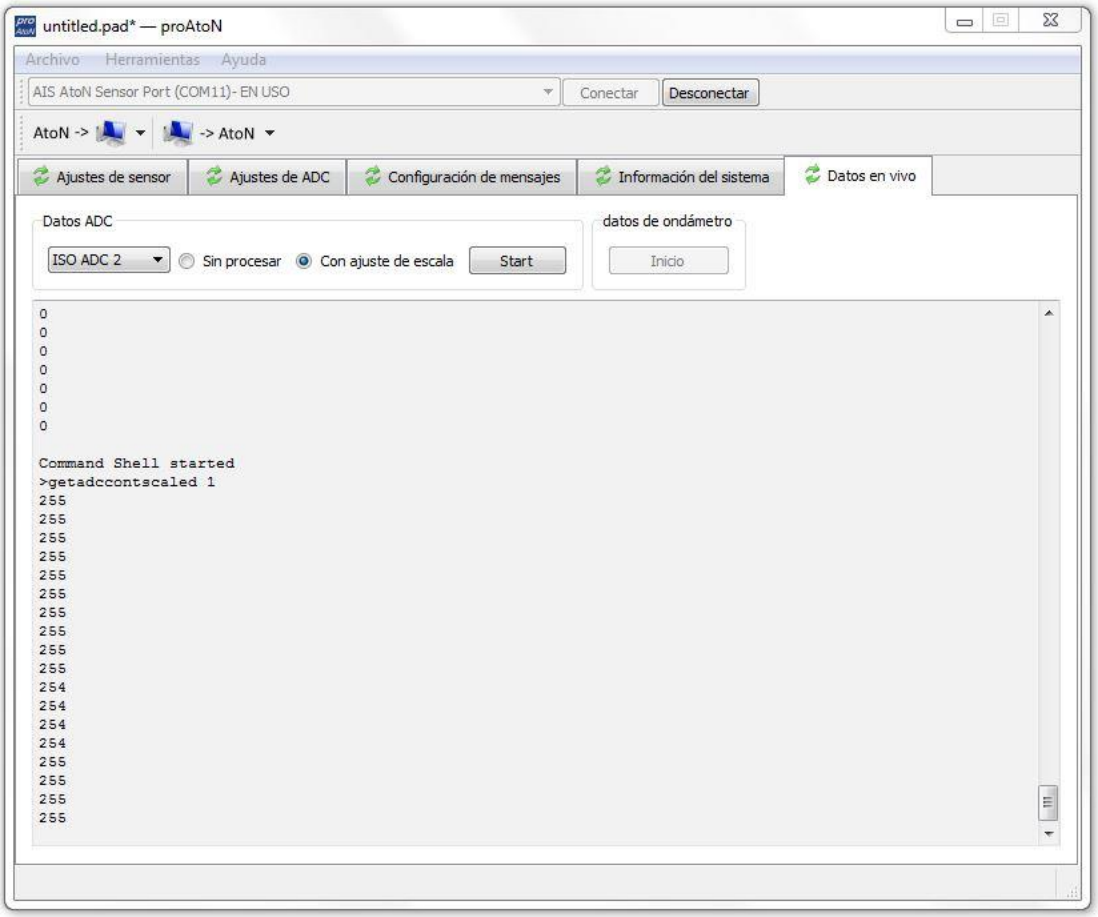
This section shows the current status of digital inputs from the Sensor Interface. The data can be refreshed using the corresponding 'Update' button. It should be noted that this data is taken from the current state of the DI digital entries and not from the stored state used in the messages.

Sensor Health

This section shows the health of each sensor in the current option. The data can be refreshed using the corresponding 'Update' button.

Live Data tab

This tab displays the selected data. Two types of data are available: ADC Data and Ondometer Data (swell meter) (see Figure below).



ADC data

The ADC to use is selected from the drop-down menu. The "Unprocessed" and "Scaled" buttons select the type of data to retrieve from the selected ADC. The Start/Stop button controls the data flow. It should be noted that when the data flow is disabled all other commands are inaccessible.

9.1. MESSAGE DATA MAPPING #6

The message field data source mapping #6 is shown in the table below according to the GLA standard for message 6.

Message #6 data field DAC 235, Fl 10	Data source	Notes
Analog voltage (internal)	Supply voltage to transponder	No additional connection is required for this measurement
Analog voltage (external 1) ISO AN1	Isolated analog input 1 of the Sensor Interface	Note that the default scaling values for this ADC are configured for this message.
Analog voltage (external 2) ISO AN2	Sensor Interface isolated analog input 2	Note that the default scaling values for this ADC are configured for this message.
Status bits (internal, 5-bit)	Light state bits and RACON.	These values will also be used in the message #21 when the sensor is used as a state bit source.
State bits (external, 8 bits)	Bit 0 - Isolated digital input 1 Bit 1 - Isolated digital input 2 Bit 2 - Isolated digital input 3 Bit 3 - Isolated digital input 4 Bit 4 - Isolated digital input 5 Bit 5 – Set to 1 if the current detection of the light >-100mA, but 0 Bit 6 - Non-isolated digital input 1 Bit 7 - Non-isolated digital input 2	The light current sensing bit 5 can be used with the internal ISENSE loop or ISO AN2 input
Out-of-position status	Transponder's out-of-position algorithm	Transponder's out-of-position algorithm

9.2. COMPATIBLE EXTERNAL DEVICES.

The MTUAIS unit currently accepts the following external devices that can be configured in different combinations ("options") and the data used to populate the message #8 of Meteorological and Hydrological Data. Two formats of this message are allowed: DAC 001, FI 31 and DAC 001, FI 11.

- Airmar Weather Station PB200 / 150WX
- Impress S12C Water Temperature and Pressure Probe
- Young RM anemometer
- Current meter AEM-R JFE Advantech Co.
- Vaisala WXT520 Weather Transmitter
- RM Young Weather Station
- Nortek AS Aquadopp profiler
- Gill Metpak Weather Station
- Valeport TideMaster tide meter

Only some combinations of sensors are possible due to the limitations of the interface sensor board as detailed in the attached table.

By default the sensor board the interface is configured to the connection with the Airmar 150-WX meteorological station through the RS port-422 or RS-232 and the Impress tidal meter using B RS-232 port. Contact your provider to configure the interface board to operate with other devices.

The Sensor Interface Board can also be adapted to accept almost any equipment that can be found in an AtoN application. If your application requires an interface with another device that is not included in this list, contact your provider to discuss your requirements.

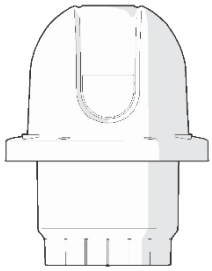
RS-422	RS-232 A
Airmar 150WX*	
Young RM anemometer	Advantech current meter
Vaisala Weather Station	Aquadopp Current Profiler
Young RM anemometer	Aquadopp Current Profiler
Vaisala Weather Station	Advantech current meter
RM Young Weather Station	
MetPak Weather Station	Valeport Tide Meter

* This device can be connected via RS422 or RS232

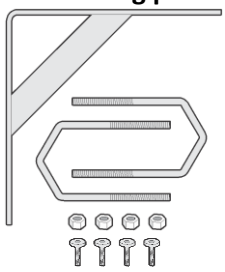
Note: The Impress S12C Water Temperature and Pressure Probe is connected via the SDI-12-interface (which disables the RS-232 B port).

10. ACCESSORIES.

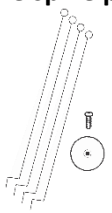
MTU-AIS-C



Pole fixing pack

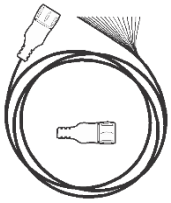


Dome spike pack



Surge arrestor

MTUAIS-C Power Supply cable



23B - Vulcanizing tape 19x10

KIT ANT AIS 3M – Antenna cable 3m

301-0073-USB – Ais Carbon Usb configuration cable

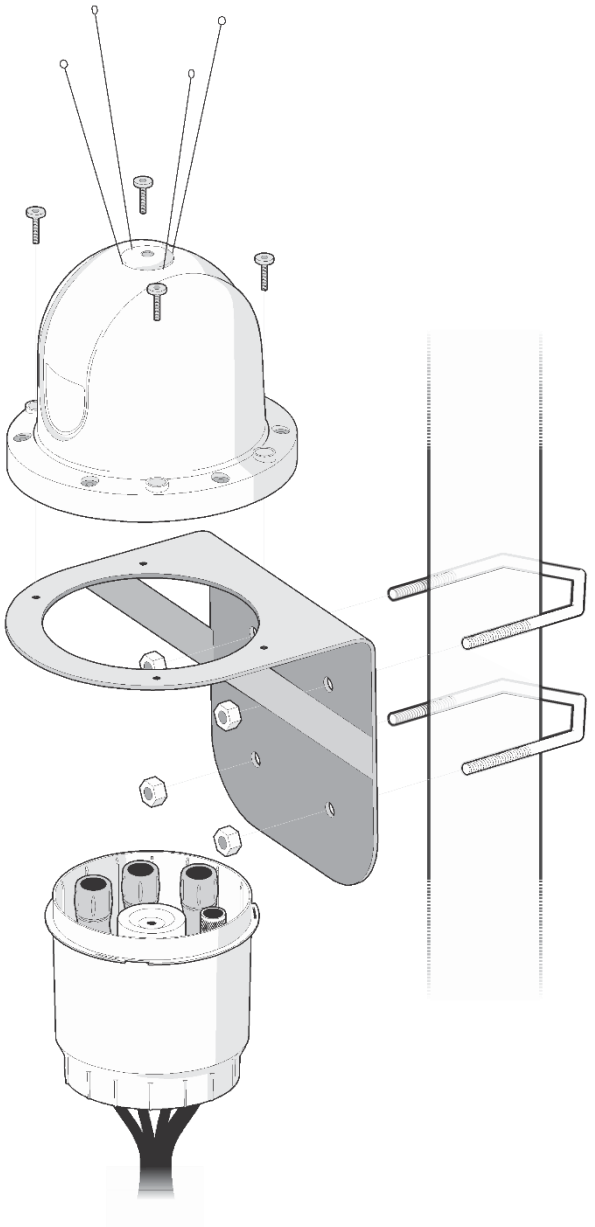
LW-SS – Anntena inox braket

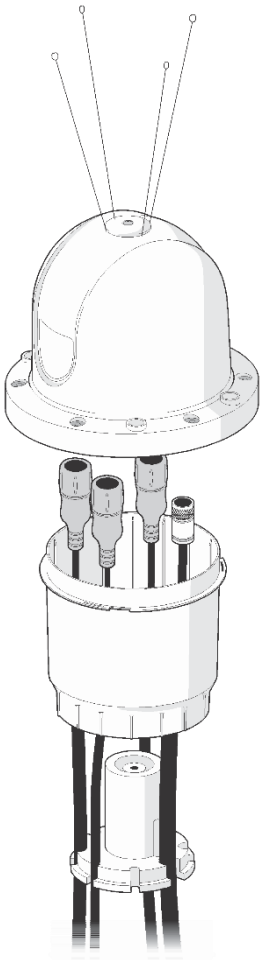
ATCXL2-1/H-N – Ais radio antenna 155-175MHZ

10.1 OPTIONAL (SENSORS)

- **UTS6JC14E19SX – X Aerial connector Souriau**
- **UTS6JC14E19SY – Y Aerial connector Souriau**

11 DRAWING & DIMENSIONS





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