

# **IALA Guideline No. 1059**

## **On The Comparison of AIS Stations**

**Edition 1**

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## Document Revisions

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

<b>Date</b>	<b>Page / Section Revised</b>	<b>Requirement for Revision</b>

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## Comparison of AIS Stations

### 1. Introduction

Since the introduction of the Automatic Identification System (AIS) a number of different types of AIS stations have been designed. All AIS stations work on the same internationally agreed frequencies, through access on the VHF Data Link (VDL). The following documents have been developed to guarantee the interoperability between the different AIS stations:

- ITU Recommendation ITU-R M.1371-3
- IALA Technical Clarifications on Recommendation ITU-R M.1371-3

These documents describe the radio link as well as the entire set of AIS messages to be used by any AIS station on the VDL. They do not provide detailed specifications for individual types of AIS stations.

The individual specifications of the different types of AIS stations are drafted by the International Electrotechnical Commission (IEC) and are described in the following documents which are published or under development (in order of the tables in the next sections):

Class A	IEC 61993-2
Class B "SO"	IEC 62287-2
Class B "CS"	IEC 62287-1
AtoN	IEC 62320-2
Base station	IEC 62320-1
Repeater	NA*
SART	IEC 61097-14
SAR Aircraft	NA*
Limited base station	NA*

\* NA Not Available

Until now there was no single document that provided an overview of all types of AIS stations and the operational and performance compared with the standards. This guideline compares the AIS stations in three different ways:

- The behaviour of an AIS station as a transmitting station. The first table describes which AIS messages can be transmitted by each AIS station.
- The behaviour of an AIS station as a receiving station. All transmitted AIS messages will be received by all AIS receivers. The second table describes what the AIS station is doing with received AIS messages.
- The technical parameters from the ITU Recommendation, applicable for each type of AIS station. The third table follows the same structure of the ITU Recommendation:
  - Physical Layer
  - Link Layer
  - Network Layer

## **1.1 Remarks**

AIS AtoN stations are divided, from a technical point of view, as follows:

- Type 1. No receiver. Transmitter can only use pre-defined time slots, reserved by another AIS station (i.e. a base station).
- Type 2. Receiver used for control functions - for configuration only. Transmitter uses pre-defined time slots only (see Type 1).
- Type 3. Full receiving capability. This type can operate in the autonomous mode.

From an operational point of view AIS AtoN stations are identified as follows:

- Real AIS AtoN. The AIS station is physically located on the AtoN.
- Synthetic AIS AtoN. AtoN messages for a specific AtoN are transmitted from a remote location (i.e. from another AtoN or a Base station).
- Virtual AIS AtoN. A remote AIS Station (another AtoN or a Base Station) transmit a message to identify an AtoN in a location where it does not physically exist. The virtual AIS AtoN can only be seen by other AIS units.

Unlike AIS Base Stations, Limited Base Stations (LBS) have no control of the VHF Data Link.

## **2. Warning**

AIS Repeater stations, AIS for SAR Aircraft and Limited Base stations are still under development at IALA and/or IEC. Specifications or behaviour in the tables are subject to changes that may arise during further development. These will be incorporated in future revisions of this guideline.

### 3. AIS Messages, Transmit behaviour

**Table 1: AIS Station vs Message Types Transmit behaviour**

Transmit behaviour	Class A	Class B "SO"	Class B "CS"	AtoN Type 1	AtoN Type 2	AtoN Type 3	Base Station	Repeater	SART	SAR Aircraft	Limited base Station
Message											
1	T	P	P	P	P	P	V <sup>2</sup>	Ot	T	P	P
2	T	P	P	P	P	P	V <sup>2</sup>	T	P	P	P
3	T/I	P	P	P	P	P	V <sup>2</sup>	T	P	P	P
4	P	P	P	P	P	P	T/I/V	T	P	P	P
5	T/I	P	P	P	P	P	V <sup>2</sup>	Ot	P	P	P
6	T	T	Ot <sup>1</sup>	Ot	Ot	Ot	T/V	Ot	P	Ot	Ot
7	T	T	Ot <sup>1</sup>		P	Ot	T/V	?	P	T	T
8	T	T	Ot <sup>1</sup>	Ot	Ot	Ot	T/V	Ot	P	T	T
9	P	P	P	P	P	P	V <sup>2</sup>	T?	P	T	P
10	T	P	P	P	P	P	T/V	T	P	T	P
11	T	P	P	P	P	P	V <sup>2</sup>	T	P	P	P
12	T	T	P	Ot	Ot	Ot	T/V	T	P	T	T
13	T	T	Ot	P	P	Ot	T/V	T	P	T	T
14	T	T	Ot	Ot	Ot	Ot	T/V	T	T	T	T
15	T	P	P	P	P	P	T/V	T	P	T	T
16	P	P	P	P	P	P	T/V	T	P	P	P
17	P	P	P	P	P	P	T/V	P	P	P	P
18	P	T/I	T/I	P	P	P	V <sup>2</sup>	T	P	P	P
19	P	T/I	I	P	P	P	V <sup>2</sup>	T	P	P	P
20	P	P	P	P	P	P	T/V	T	P	P	P
21	P	P	P	T	T	T	V <sup>2</sup>	T	P	P	T
22	P	P	P	P	P	P	T/V	T	P	P	P
23	P	P	P	P	P	P	T/V	T	P	T	P
24A	P	I	I/T	P	P	P	Oi/Ot/V	T	P	I/T	I/T
24B	P	I	I/T	P	P	P	V <sup>2</sup>	T	P	I	P

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Transmit behaviour	Class A	Class B "SO"	Class B "CS"	AtoN Type 1	AtoN Type 2	AtoN Type 3	Base Station	Repeater	SART	SAR Aircraft	Limited base Station
Message											
25	T	P	P	Ot	Ot	Ot	T/V	T	P	T	P
26	T	T	P	P	P	P	T/V	T	P	T	T
27	T	P	P	P	P	P	V <sup>2</sup>	P	P	P	P

- R**            Receives and Processes
- T**            Transmit by own station
- V**            Transmit if VDM sentence is received via PI
- F**            Forward to PI
- I**            Responds if interrogated by msg 15
- P**            Not allowed/prohibited
- Ot**          Optional Tx
- Or**          Optional Rx
- Oi**          Optionally if interrogated

**Notes**

1. IEC 62287 prohibits MSGs 6, 7 & 8 but this needs to be addressed as binary messages should be allowable for Class B.
2. The Base Station is capable of broadcasting all messages via a VDM PI input, however these messages should not be transmitted.

#### 4. AIS Messages, Receive behaviour

**Table 2: AIS Stations vs Message Types** **Receive Behaviour**

Receive behaviour	Class A	Class B "SO"	Class B "CS"	AtoN Type 1	AtoN Type 2	AtoN Type 3	Base Station	Repeater	SART	SAR Aircraft	Limited base Station
Message											
1	R/F	R/F <sup>3</sup>	R/F <sup>3</sup>	NA	NA	R/F	R/F	R	NA	R/F	R/F
2	R/F	R/F <sup>3</sup>	R/F <sup>3</sup>	NA	NA	R/F	R/F	R	NA	R/F	R/F
3	R/F	R/F <sup>3</sup>	R/F <sup>3</sup>	NA	NA	R/F	R/F	R	NA	R/F	R/F
4	R/F	R/F <sup>3</sup>	R/F <sup>3</sup>	NA	NA	R/F	R/F	R	NA	R/F	R/F
5	R/F	R/F <sup>3</sup>	R/F <sup>3</sup>	NA	NA	R/F	R/F	R	NA	R/F	R/F
6	R/F	R/F	Or	NA	NA	R/F	R/F	R	NA	R/F	R/F
7	R/F	R/F	Or	NA	NA	R/F	R/F	R	NA	R/F	R/F
8	R/F	R/F	Or	NA	NA	R/F	R/F	R	NA	R/F	R/F
9	R/F	R/F	R/F <sup>3</sup>	NA	NA	R/F	R/F	R	NA	R/F	R/F
10	R/F	NA	NA	NA	NA	NA	R/F	R	NA	NA	R/F
11	R/F	NA	NA	NA	NA	NA	R/F	R	NA	NA	R/F
12	R/F	R/F <sup>3</sup>	R/F <sup>3</sup>	NA	NA	R/F	R/F	R	NA	R/F	R/F
13	R/F	R/F <sup>3</sup>	NA	NA	NA	R/F	R/F	R	NA	R/F	R/F
14	R/F	R/F	R/F <sup>3</sup>	NA	NA	R/F	R/F	R	NA	R/F	R/F
15	R/F	R/F	R/F	NA	NA	NA	R/F	R	NA	R/F	R/F
16	R/F	R/F	NA	NA	NA	NA	NA	R	NA	R/F	R/F
17	R/F	R/F	Or	NA	NA	R/F	R/F	R	NA	R/F	R/F
18	R/F	R/F	R/F <sup>3</sup>	NA	NA	R/F	R/F	R	NA	R/F	R/F
19	R/F	R/F	R/F <sup>3</sup>	NA	NA	R/F	R/F	R	NA	R/F	R/F
20	R/F	R/F	R/F <sup>3</sup>	NA	NA	R/F	R/F	R	NA	R/F	R/F
21	R/F	R/F	R/F <sup>3</sup>	NA	NA	R/F	R/F	R	NA	R/F	R/F
22	R/F	R/F	R/F <sup>3</sup>	NA	NA	NA	NA	R	NA	R/F	R/F
23	R/F	R/F	R/F	NA	NA	NA	NA	R	NA	R/F	R/F
24A	R/F	R/F	R/F <sup>3</sup>	NA	NA	R/F	R/F	R	NA	R/F	R/F



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Receive behaviour	Class A	Class B "SO"	Class B "CS"	AtoN Type 1	AtoN Type 2	AtoN Type 3	Base Station	Repeater	SART	SAR Aircraft	Limited base Station
Message											
24B	R/F	R/F	R/F <sup>3</sup>	NA	NA	R/F	R/F	R	NA	R/F	R/F
25	R/F	R/F	R/F <sup>3</sup>	NA	NA	R/F	R/F	R	NA	R/F	R/F
26	R/F	R/F	R/F <sup>3</sup>	NA	NA	R/F	R/F	R	NA	R/F	R/F
27	NA	NA	NA	NA	NA	NA	Or	NA	NA	NA	NA

**R**            Receives and Process  
**F**            Forward to PI  
**Or**            Optional Rx  
**NA**          Not applicable

**Notes**

3. Only if the Class B has a presentation port.

## 5. Parameters AIS stations

**Table 3: Parameters of AIS Stations**

Station type	Class A	Class B "SO"	Class B "CS"	AtoN Type 1	AtoN Type 2	AtoN Type 3	Base Station	Repeater	SART	SAR Aircraft	Limited Base Station
<b>Physical layer</b>											
Dual Channel	C	C	C	R	R	C	C	C	C	C	O
Single Channel	N	N	N	O	O	N	N	N	N	N	O
Full Frequency Range capability	C	O	O	O	O	O	C	O	N	O	O
Rx/Tx	C	C	C	N	N	C	C	C	N	C	C
Tx only	N	N	N	C	C	N	N	N	C	N	N
DSC Functionality	R	R	R	N	N	N	O	N	N	R	R
Operating frequency assignment capability	C	O	O	N	N	N	N	N	N	C	O
Tx Power in Watts 12.5/2/1 or Manufacturer to Define	12.5/1	MTD	2	MTD	MTD	MTD	MTD	12.5/2	MTD	MTD	12.5/1
<b>Link layer</b>											
<i>TDMA Synchronisation</i>											
UTC Direct	C	C	O	C	C	C	C	C	C	C	C
UTC Indirect	C	O	O	N	N	N	C	C	N	C	O

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<b>Station type</b>	<b>Class A</b>	<b>Class B "SO"</b>	<b>Class B "CS"</b>	<b>AtoN Type 1</b>	<b>AtoN Type 2</b>	<b>AtoN Type 3</b>	<b>Base Station</b>	<b>Repeater</b>	<b>SART</b>	<b>SAR Aircraft</b>	<b>Limited Base Station</b>
Use semaphore synchronisation	C	O	N	N	N	N	C	C	N	C	N
Act as semaphore	C	O	N	N	N	N	C	N	N	C	N
<i>Timing</i>											
Long Transmission packets. No of slots	3	3	1 (2)	3	3	3	5	3	1	3	2
<i>Mode of operation</i>											
Autonomous	C	C	C	C	C	C	C	C	C	C	C
Assigned	C	C	C	N	N	N	N	N	N	C	C
Polled	C	C	C	N	N	N	C	N	N	C	C
Limitation maximum permissible number of slots per frame.	20	3 <sup>4</sup>	3 <sup>4</sup>	20	20	20	None	None <sup>5</sup>	10	20	20
<i>VDL Access schemes</i>											
SOTDMA	C	C	N	N	N	N	N	N	N	C	N
RATDMA	C	C	N	N	N	C	O	C	N	C	C
ITDMA	C	C	N	N	N	N	N	N	N	C	C
FATDMA	N	N	N	C	C	C	C	O	N	N	N
CSTDMA	N	N	C	N	N	O	N	N	N	N	N
FUTDMA	N	N	N	N	N	N	O	N	Y	N	N
<b>Network layer</b>											
<i>Channel operation &amp; management</i>											

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<b>Station type</b>	<b>Class A</b>	<b>Class B "SO"</b>	<b>Class B "CS"</b>	<b>AtoN Type 1</b>	<b>AtoN Type 2</b>	<b>AtoN Type 3</b>	<b>Base Station</b>	<b>Repeater</b>	<b>SART</b>	<b>SAR Aircraft</b>	<b>Limited Base Station</b>
Default channel operation AIS 1 & AIS 2	C	C	C	C	C	C	C	C	C	C	C
Channel management msg 22	C	C	C	N	N	N	N	N	N	C	C
DSC telecommand	C	O	O	N	N	N	N	N	N	C	N
Manual input	C	N	N	N	N	N	N	N	N	N	N
Presentation interface	C	N	N	N	N	N	C	N	N	C	C
Reporting Modes A, B or C.	N	N	N	C	C	C	N	N	C Mode B only	N	N
Frequency agile	C	O	O	O	O	O	C	O	N	O	O
Slot re-use Data link congestion.	C	C	N	N	N	C	C	C	N	C	N
Long range	C	N	N	N	N	N	N	N	N	N	N

- C** Compulsory in any configuration  
**O** Optional  
**R** Receive only  
**MTD** Manufacturer to determine  
**N** Not allowed

**Notes**

4. The limitation is for messages 6, 8, 12 & 14.  
5. The development of AIS Repeater Stations is on going within IEC and the limitation on the maximum number of slots per frame is yet to be determined.