AIVDM/AIVDO protocol decoding

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This document is mastered in asciidoc format. If you are reading it in HTML, you can find the original at the GPSD project website

If you find this document useful - and especially if it helps you make money - please contribute to maintaining it by supporting the author's full-time open-source work through [PATREON]. Even a few dollars a week can make a difference.

Introduction

This is a description of how to decode AIVDM/AIVDO sentences. It collects and integrates information from publicly available sources and is intended to assist developers of open-source software for interpreting these messages.

AIVDM/AIVDO sentences are emitted by receivers for AIS, the marine Automatic Identification System. AIS transmitters are fitted to vessels, navigation markers, and certain types of shore station. They periodically squawk their position (and course, when applicable), using TDMA (Time Division Multiple Access) technology similar to the way cellphones do to avoid mutual interference. AIS receivers make this data available for navigation, anti-collision systems, and other uses.

The International Maritime Organization's (IMO) International Convention for the Safety of Life at Sea (SOLAS) requires operating AIS transmitters on all international cargo vessels of more than 300 tons displacement, all cargo vessels of more than 500 tons displacement, and all passenger vessels; see [SOLAS] for details. Individual maritime nations may have stricter and more detailed rules: for those obtaining in U.S. waters, see [US-REQUIREMENTS].

AIS receivers report ASCII data packets as a byte stream over serial or USB lines, using the NMEA 0183 or NMEA 2000 data formats. The RS422 variant of serial specified as a physical layer by NMEA 0183 is common in marine navigation systems; there may be a "pilot plug" [PILOTPLUG] which converts to USB. Alternatively, newer AIS receivers may report directly over RS232 or USB.

AIS packets have the introducer "!AIVDM" or "!AIVDO"; AIVDM packets are reports from other ships and AIVDO packets are reports from your own ship.

A lengthy description of AIS, focusing on the goals and history of the system, but not describing the data protocols in any detail, can be found at [AIS].

Standards

Multiple standards bear on the AIVDM/AIVDO format. This document exists because assembling them into a complete picture is technically difficult and was long impeded by legal barriers as well.

ITU Recommendation M.1371, "Technical Characteristics for a Universal Shipborne Automatic Identification System Using Time Division Multiple Access" [ITU1371], issued in 2001, first described the bit-level format of AIS radio messages. This standard was proprietary and expensive when issued. I did not have access to it or any of its followup revisions while assembling versions of this document up to 1.29.

ITU-R M.1371 was expanded and clarified by "IALA Technical Clarifications on Recommendation ITU-R M.1371-1" [IALA], which is freely available.

There have been three minor revisions of ITU-R M.1371 since it was originally issued. These add interpretations to packet bitfields that were previously marked "spare" and "regional reserved". ITU-R M.1371 revision 4 became available for free download, apparently at some point in early 2011, well after most of this document was assembled.

The ASCII format for AIVDM/AIVDO representations of AIS radio messages seems to have been set by IEC-PAS 61162-100, "Maritime navigation and radiocommunication equipment and systems" [IEC-PAS]. It is proprietary and I have not looked at it. Various public sources indicate that it has been "harmonized" with some version of NMEA 0183, which I also have not looked at because it too is proprietary and expensive, and surrounded by rapacious attack lawyers.

Information Sources

Together, the IALA Technical Clarifications at [IALA] and the Coast Guard's AIS pages at [NAVCEN] describe AIS message payloads type 1-24 almost completely. Certain specialized binary messages of types 6 and 8 defined by the International Maritime Organization are described in [IMO236] and [IMO289]. The detail information on payload formats in this document is mostly derived from these public sources.

Kurt Schwehr is a research scientist at the Center for Coastal and Ocean Mapping at the University of New Hampshire. Much of his research involves AIS. His work blog at [Schwehr] contains sample messages and descriptions of AIS operation in the wild that shed light on various obscure corners of the specification. He has explained the otherwise undocumented Repeat Indicator field and USCG extended AIVDM to me by email. He also communicated some critical information from [IEC-PAS], and supplied information about new messages and fields in ITU-1371-3.

Descriptions of messages 25 and 26 are based on AIS transceiver vendor documentation was originally forwarded to me by a source wishing to remain anonymous; I later checked them against ITU1371-4. Message type 27 was described in ITU1371-4 and added here after that became a freely available download.

Should you set out to write a decoder using this document, you are likely to find that one of your challenges is finding enough AIS packet data to make an effective regression test — especially if you live out of line of sight of any ship traffic and would get nothing from running an AIS receiver. Fortunately, various AIS sites offer live feeds over the Internet that aggregate AIS streams from all over the world. Some charge subscriptions; others offer time-delayed access for free and charge for a real-time feed. Still others are pool sites; you join by contributing your feed and receive all feeds.

AIS Hub ([AISHUB]) is a free, public AIS feed pool. It provides exchange of AIS data in raw NMEA format; all AISHub members share their own received AIS data and receive the merged feed from all other participating parties. It is open-source friendly, offering a Linux port in source of its software for collecting and forwarding AIS data. Peter Stoyanov and the other AIS Hub principals have generously donated a live feed to the GPSD project despite the fact that I live 60 miles inland and cannot send them anything interesting.

Some of what this document explains about the quirks of real-world encoders comes from examples provided by Kurt Schwehr. Other such information, especially for the less common sentences, comes from inspection of sentences forwarded to me from AIS Hub by various interested parties, and more recently from AIS Hub itself.

Improving This Document

To avoid copyright difficulties, I rely only on freely redistributable public documents and paraphrased reports from people who have seen the relevant proprietary standards. If you are such a person, please help by reporting the following to be included in future versions of this document:

- Sample sentences of types 16-17, 22-23, and 25-27.
- Sample sentences of type 6 and 8 conforming to [IMO236], [IMO289], and [INLAND].

For verification purposes, I need the raw sentences together with decoded dumps of their field values. Please note that sample sentences not accompanied by field dumps are **not** useful; I can get plenty of those.

Open-Source Implementations

The GPSD project ships an AIVDM/AIVDO sentence decoder as part of the daemon. This document was developed to be the specification for it, and it will decode all sentence type described herein.

The source-code repository of the GPSD project holds a conforming standalone Python decoder, ais.py, that is not included in shipped releases. It may be useful for developers working in that language.

[Schwehr] includes links to a collection of Python scripts for decoding and analyzing AIVDM sentences. Kurt Schwehr warns that this is research code rather than a production tool.

There is a GNU AIS project at SourceForge. It seems intended primarily to work directly with AIS radios.

The Maritec decoder looks to be pretty high-quality and can be exercised through a public web form. This is a useful resource for anyone qualifying an AIS decoder.

AIVDM/AIVDO Sentence Layer

AIVDM/AIVDO is a two-layer protocol. The outer layer is a variant of NMEA 0183, the ancient standard for data interchange in marine navigation systems; NMEA 0183 is described at [NMEA].

Here is a typical AIVDM data packet:

```
!AIVDM,1,1,,B,177KQJ5000G?tO`K>RA1wUbN0TKH,0*5C
```

And here is what the fields mean:

Field 1, !AIVDM, identifies this as an AIVDM packet.

Field 2 (1 in this example) is the count of fragments in the currently accumulating message. The payload size of each sentence is limited by NMEA 0183's 82-character maximum, so it is sometimes required to split a payload over several fragment sentences.

Field 3 (1 in this example) is the fragment number of this sentence. It will be one-based. A sentence with a fragment count of 1 and a fragment number of 1 is complete in itself.

Field 4 (empty in this example) is a sequential message ID for multi-sentence messages.

Field 5 (B in this example) is a radio channel code. AIS uses the high side of the duplex from two VHF radio channels: AIS Channel A is 161.975Mhz (87B); AIS Channel B is 162.025Mhz (88B). In the wild, channel codes *1* and *2* may also be encountered; the standards do not prescribe an interpretation of these but it's obvious enough.

Field 6 (177KQJ5000G?tO`K>RA1wUbN0TKH in this example) is the data payload. We'll describe how to decode this in later sections.

Field 7 (0) is the number of fill bits requires to pad the data payload to a 6 bit boundary, ranging from 0 to 5. Equivalently, subtracting 5 from this tells how many least significant bits of the last 6-bit nibble in the data payload should be ignored. Note that this pad byte has a tricky interaction with the <[ITU-1371]> requirement for byte alignment in over-the-air AIS messages; see the detailed discussion of message lengths and alignment in a later section.

The *-separated suffix (*5C) is the NMEA 0183 data-integrity checksum for the sentence, preceded by "*". It is computed on the entire sentence including the AIVDM tag but excluding the leading "!".

For comparison, here is an example of a multifragment sentence with a nonempty message ID field:

```
!AIVDM,2,1,3,B,55P5TL01VIaAL@7WKO@mBplU@<PDhh000000001S;AJ::4A80?4i@E53,0*3E
!AIVDM,2,2,3,B,1@0000000000000,2*55
```

Technically, NMEA0183 does not actually require that a !-led sentence be AIS. This format can be used for any encapsulated data. The syntax and semantics of fields 1-4 are fixed, and the fill-bit field and NEA checksum are required, but the payload fields may contain any encapsulated data.

It is, however, a safe bet that any such sentence containing an A or B channel code in field 5 is AIVDM/AIVDO.

Talker IDS

The AI prefix commonly found on these sentences is an NMEA talker ID for a mobile AIS station. Other possible values are as listed:

Table 1. AIS talker IDs

!AB	NMEA 4.0 Base AIS station
!AD	MMEA 4.0 Dependent AIS Base Station
!AI	Mobile AIS station
!AN	NMEA 4.0 Aid to Navigation AIS station
!AR	NMEA 4.0 AIS Receiving Station
!AS	NMEA 4.0 Limited Base Station
!AT	NMEA 4.0 AIS Transmitting Station
!AX	NMEA 4.0 Repeater AIS station
!BS	Base AIS station (deprecated in NMEA 4.0)
!SA	NMEA 4.0 Physical Shore AIS Station

AIVDM/AIVDO Payload Armoring

The data payload is an ASCII-encoded bit vector. Each character represents six bits of data. To recover the six bits, subtract 48 from the ASCII character value; if the result is greater than 40 subtract 8. According to [IEC-PAS], the valid ASCII characters for this encoding begin with "0" (64) and end with "w" (87); however, the intermediate range "X" (88) to "_" (95) is not used.

Table 2. ASCII payload armoring

Char	ASCII	Decimal	Bits
"0"	48	0	000000
"1"	49	1	000001
"2"	50	2	000010
"3"	51	3	000011
"4"	52	4	000100

Char	ASCII	Decimal	Bits
"5"	53	5	000101
"6"	54	6	000110
"7"	55	7	000111
"8"	56	8	001000
"9"	57	9	001001
":"	58	10	001010
";"	59	11	001011
"<"	60	12	001100
"="	61	13	001101
">"	62	14	001110
"?"	63	15	001111
"@"	64	16	010000
"A"	65	17	010001
"B"	66	18	010010
"C"	67	19	010011
"D"	68	20	010100
"E"	69	21	010101
"F"	70	22	010110
"G"	71	23	010111
"H"	72	24	011000
"I"	73	25	011001
"J"	74	26	011010
"K"	75	27	011011
"L"	76	28	011100
"M"	77	29	011101
"N"	78	30	011110
"O"	79	31	011111
"P"	80	32	100000
"Q"	81	33	100001
"R"	82	34	100010
"S"	83	35	100011
"T"	84	36	100100
"U"	85	37	100101
"V"	86	38	100110
"W"	87	39	100111
"`"	96	40	101000
"a"	97	41	101001
"b"	98	42	101010
"c"	99	43	101011
"d"	100	44	101100
"e"	101	45	101101
"f"	102	46	101110
"g"	103	47	101111
"h"	104	48	110000
"i"	105	49	110001
"j"	106	50	110010
"k"	107	51	110011
"l"	108	52	110100
"m"	109	53	110101
"n"	110	54	110110
"o"	111	55	110111
"p"	112	56	111000
"q"	113	57	111001
"r"	114	58	111010
"s"	115	59	111011
"t"	116	60	111100
"u"	117	61	111101
"v"	118	62	111110
"w"	119	63	111111

Concatenate all six-bit quantities found in the payload, MSB first. This is the binary payload of the sentence.

AIS Payload Data Types

Data in AIS message payloads (what you get after undoing the AIVDM/AIVDO armoring) is encoded as bitfields in the sentence. Bitfields may be interpreted in one of the following ways:

- Signed or unsigned integer
- Float (scaled from signed integer)
- Flag or Boolean
- Index into a controlled vocabulary
- Reserved bits
- Spare bits
- Strings

Numeric bitfields are interpreted as big-endian twos-complement integers; when signed, the sign bit is the highest.

Float fields have an associated divisor which should be applied to convert to the correct units. In one case, the ROT field in message types 1-3, the scaling operation involves a more elaborate formula.

Flags are encoded as 1 for true/yes/on, 0 for false/no/off.

Indices into controlled vocabularies are numeric bitfields which must be interpreted using per-field string lists specified in the standards.

Spare fields generally seem to have been inserted in order to put certain field starts on 8-bit boundaries, and should be ignored. Decoders should not, however, assume that spare fields will be all zeroes.

Reserved fields should not be ignored, as they may be assigned for extension data in minor revisions of the AIS standard; it is noted in the message descriptions where this has already occurred. It is good practice for a decoder to make reserved fields available to client applications as uninterpreted bitfields.

Character-string fields within AIS messages are encoded in a special way, referred to as "six-bit" in the tables below. First, chop the string field into consecutive six-bit nibbles without padding (each span of three 8-bit bytes includes 4 of these). Each six-bit nibble maps to an ASCII character. Nibbles 0-31 map to the characters "@" (ASCII 64) through "_" (ASCII 95) respectively; nibbles 32-63 map to characters " " (ASCII 32) though "?" (ASCII 63). Lowercase ASCII letters, the backtick, right and left curly brackets, pipe bar, tilde and DEL cannot be encoded.

Table 3. Sixbit ASCII

000000	0	"@"	010000	16	"P"	100000	32	" "	110000	48	"0"
000001	1	"A"	010001	17	"Q"	100001	33	"!"	110001	49	"1"
000010	2	"B"	010010	18	"R"	100010	34	"""	110010	50	"2"
000011	3	"C"	010011	19	"S"	100011	35	"\#"	110011	51	"3"
000100	4	"D"	010100	20	"T"	100100	36	"$"	110100	52	"4"
000101	5	"E"	010101	21	"U"	100101	37	"%"	110101	53	"5"
000110	6	"F"	010110	22	"V"	100110	38	"&"	110110	54	"6"
000111	7	"G"	010111	23	"W"	100111	39	"\'"	110111	55	"7"
001000	8	"H"	011000	24	"X"	101000	40	"("	111000	56	"8"
001001	9	"I"	011001	25	"Y"	101001	41	")"	111001	56	"9"
001010	10	"J"	011010	26	"Z"	101010	42	"*"	111010	58	":"
001011	11	"K"	011011	27	"["	101011	43	"\+"	111011	59	";"
001100	12	"L"	011100	28	"\"	101100	44	","	111100	60	"<"
001101	13	"M"	011101	29	"]"	101101	45	"-"	111101	61	"="
001110	14	"N"	011110	30	"\^"	101110	46	"."	111110	62	">"
001111	15	"O"	011111	31	"_"	101111	47	"/"	111111	63	"?"

According to the standard, trailing unused characters in six-bit fields will be represented by "@" (six-bit zero); however, real-world encoders are not careful about this and often have nonzero garbage after the "@". The terminating "@" should not be considered part of the text, and any non-"@" characters after it should be discarded. It is also common to space-fill short fields such as ship and station name, so a decoder should strip trailing spaces after stripping at-signs and the garbage after them.

Trailing string fields are often specified as "up to" a certain number of bits. Decoders should be prepared to handle any field length up to that number, including zero.

AIS Payload Interpretation

The following table describes message types that are international standards from [ITU1371] and its revisions. There are also local and regional extensions used on inland waterways such as the Danube and the Thames and in British and Irish coastal waters; pointers to some of these are included later in this document.

Note that many sources use 1-origin numbering for the bits. We'll use 0-origin in this document.

The first 6 bits of the payload (0-5) are the message type. Message types are as follows:

Table 4. Message types

01	Position Report Class A
02	Position Report Class A (Assigned schedule)
03	Position Report Class A (Response to interrogation)
04	Base Station Report
05	Static and Voyage Related Data
06	Binary Addressed Message
07	Binary Acknowledge
08	Binary Broadcast Message
09	Standard SAR Aircraft Position Report
10	UTC and Date Inquiry
11	UTC and Date Response
12	Addressed Safety Related Message
13	Safety Related Acknowledgement
14	Safety Related Broadcast Message
15	Interrogation
16	Assignment Mode Command
17	DGNSS Binary Broadcast Message
18	Standard Class B CS Position Report
19	Extended Class B Equipment Position Report
20	Data Link Management

21	Aid-to-Navigation Report
22	Channel Management
23	Group Assignment Command
24	Static Data Report
25	Single Slot Binary Message,
26	Multiple Slot Binary Message With Communications State
27	Position Report For Long-Range Applications

In normal operation, an AIS transceiver will broadcast a position report (type 1, 2, or 3) every 2 to 10 seconds depending on the vessel's speed while underway, and every 3 minutes while the vessel is at anchor and stationary. It will send a type 5 identification every 6 minutes. (More detail is at [IALA], part 2.3)

Class 6 is used for unencrypted structured extension messages systems conforming to the Inland AIS standard defined by [INLAND], and by local authorities such as the St. Lawrence Seaway and the U.S Coast Guard's PAWSS. This document describes all of the Class 6 special message formats approved for use in [IMO236], [IMO289], and [INLAND].

Class 8 is in common use for private encrypted messages, such as location transmission in military exercises. It is also used for unencrypted structured extension messages by Inland AIS, and by local authorities such as the St. Lawrence Seaway and PAWSS. This document describes all of the Class 8 special message formats approved for use in [IMO236], [IMO289], and [INLAND].

Classes 12 and 14 are used for text messaging, nominally safety-related but also for traffic control and occasionally chatter.

In practice, message types other than 1, 3, 4, 5, 18, and 24 are unusual or rare; many AIS transmitters never emit them.

An MMSI is a Mobile Marine Service Identifier, a unique 9-digit ID for the ship's radio(s). The first three digits convey information about the country in which the ID was issued [ITU-MID]. US vessels travelling solely in U.S. waters sometimes incorrectly omit the leading "3", the geography code for North and Central America and Caribbean, emitting 8-digit MMSIs beginning with the U.S. country code of 669.

According to [MMSI], different formats of MMSI are used for different classes of transmitter. In the format descriptions below, a MID is a three-digit decimal literal ranging from 201 to 775 that identifies a country or other maritime jurisdiction. See [ITU-MID] for a list of MIDs.

Table 5. MID formats

8MIDXXXXX	Diver's radio (not used in the U.S. in 2013)
MIDXXXXXX	Ship
0MIDXXXXX	Group of ships; the U.S. Coast Guard, for example, is 03699999
00MIDXXXX	Coastal stations
111MIDXXX	SAR (Search and Rescue) aircraft
99MIDXXXX	Aids to Navigation
98MIDXXXX	Auxiliary craft associated with a parent ship
970MIDXXX	AIS SART (Search and Rescue Transmitter)
972XXXXXX	MOB (Man Overboard) device
974XXXXXX	EPIRB (Emergency Position Indicating Radio Beacon) AIS

Detailed descriptions of message types 1-24 follow. Message types 1-22 are derived from [IALA]. Message type 23 was described to me by Mike Greene based on [IEC-62287]. Message type 24 was described to me by [Schwehr], whose Python toolkit decodes it. Message types 25-26 are reported by [Schwehr], who observes they were added in Version 3 of [ITU1371]. Message type 27 is direct from [ITU1371] version 4.

The "Member" column in these tables is not derived from any of the ITU standards or amendments. I have invented it in order to be able to describe a lossless textual encoding of AIS sentences in JSON. These names are also chosen for suitability as structure/object member names in computer languages, so that application programming interfaces across different languages can have a common and readily intelligible set to use.

The "T" column declares the data type of the field, and may have any of the values in the following table. It is intended to be used for generating bitfield-extraction code directly from the message type descriptions.

u	Unsigned integer
U	Unsigned integer with scale - renders as float, suffix is decimal places
i	Signed integer
I	Signed integer with scale - renders as float, suffix is decimal places
b	Boolean
e	Enumerated type (controlled vocabulary)
x	Spare or reserved bit
t	String (packed six-bit ASCII)
d	Data (uninterpreted binary)
a	Array boundary, numeric suffix is maximum array size. ^ before suffix means preceding fields is the length. Following fields are repeated to end of message

The field breakdowns in this document have been checked against live decoded data rendered by known-good implementations for message types 1-15, 18-21, and 24. Described but unchecked are 16-17, 22-23, and 25-27. Also, the interpretation of IMO extension subtypes of messages 6 and 8 has yet to be tested.

Bit lengths and length ranges are given because decoders should check them against the message type. Messages with correct checksums but the wrong payload length for their type occur with about 0.3% frequency on AISHub; if you don't reject these, your clients will see spurious zeros or garbage.

Types 1, 2 and 3: Position Report Class A

Type 1, 2 and 3 messages share a common reporting structure for navigational information; we'll call it the Common Navigation Block (CNB). This is the information most likely to be of interest for decoding software. Total of 168 bits, occupying one AIVDM sentence.

Table 6. Common Navigation Block

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 1-3
6-7	2	Repeat Indicator	repeat	u	Message repeat count
8-37	30	MMSI	mmsi	u	9 decimal digits
38-41	4	Navigation Status	status	e	See "Navigation Status"
42-49	8	Rate of Turn (ROT)	turn	I3	See below
50-59	10	Speed Over Ground (SOG)	speed	U1	See below
60-60	1	Position Accuracy	accuracy	b	See below
61-88	28	Longitude	lon	I4	Minutes/10000 (see below)
89-115	27	Latitude	lat	I4	Minutes/10000 (see below)

Field	Len	Description	Member	T	Units
116-127	12	Course Over Ground (COG)	course	U1	Relative to true north, to 0.1 degree precision
128-136	9	True Heading (HDG)	heading	u	0 to 359 degrees, 511 = not available.
137-142	6	Time Stamp	second	u	Second of UTC timestamp
143-144	2	Maneuver Indicator	maneuver	e	See "Maneuver Indicator"
145-147	3	Spare		x	Not used
148-148	1	RAIM flag	raim	b	See below
149-167	19	Radio status	radio	u	See below

The Repeat Indicator is a directive to an AIS transceiver that this message should be rebroadcast. This was intended as a way of getting AIS messages around hills and other obstructions in coastal waters, but is little used as base station coverage is more effective. It is intended that the bit be incremented on each retransmission, to a maximum of three hops. A value of 3 indicates "Do not repeat".

Table 7. Navigation Status

0	Under way using engine
1	At anchor
2	Not under command
3	Restricted manoeuverability
4	Constrained by her draught
5	Moored
6	Aground
7	Engaged in Fishing
8	Under way sailing
9	Reserved for future amendment of Navigational Status for HSC
10	Reserved for future amendment of Navigational Status for WIG
11	Reserved for future use
12	Reserved for future use
13	Reserved for future use
14	AIS-SART is active
15	Not defined (default)

Note, the AIS-SART value was added after [IALA] and designates an AIS transmitter in an survival craft such as a lifeboat. See [AIS-SART] for the field specification and [SART] for background.

Turn rate is encoded as follows:

- 0 = not turning
- 1...126 = turning right at up to 708 degrees per minute or higher
- 1...-126 = turning left at up to 708 degrees per minute or higher
- 127 = turning right at more than 5deg/30s (No TI available)
- -127 = turning left at more than 5deg/30s (No TI available)
- 128 (80 hex) indicates no turn information available (default)

Values between 0 and 708 degrees/min coded by ROT_{AIS}=4.733 * SQRT(ROT_{sensor}) degrees/min where ROT_{sensor} is the Rate of Turn as input by an external Rate of Turn Indicator. ROT_{AIS} is rounded to the nearest integer value. Thus, to decode the field value, divide by 4.733 and then square it. Sign of the field value should be preserved when squaring it, otherwise the left/right indication will be lost.

Speed over ground is in 0.1-knot resolution from 0 to 102 knots. Value 1023 indicates speed is not available, value 1022 indicates 102.2 knots or higher.

The position accuracy flag indicates the accuracy of the fix. A value of 1 indicates a DGPS-quality fix with an accuracy of < 10ms. 0, the default, indicates an unaugmented GNSS fix with accuracy > 10m.

Longitude is given in in 1/10000 min; divide by 600000.0 to obtain degrees. Values up to plus or minus 180 degrees, East = positive, West \= negative. A value of 181 degrees (0x6791AC0 hex) indicates that longitude is not available and is the default.

Latitude is given in in 1/10000 min; divide by 600000.0 to obtain degrees. Values up to plus or minus 90 degrees, North = positive, South = negative. A value of 91 degrees (0x3412140 hex) indicates latitude is not available and is the default.

Course over ground will be 3600 (0xE10) if that data is not available.

Seconds in UTC timestamp should be 0-59, except for these special values:

- 60 if time stamp is not available (default)
- 61 if positioning system is in manual input mode
- 62 if Electronic Position Fixing System operates in estimated (dead reckoning) mode,
- 63 if the positioning system is inoperative.

The Regional Reserved field is intended for use by local maritime authorities. It is not known to be in any actual use up to 2009.

The Maneuver Indicator (143-144) may have these values:

Table 8. Maneuver Indicator

0	Not available (default)
1	No special maneuver
2	Special maneuver (such as regional passing arrangement)

Riverine and inland navigation systems conforming to [INLAND] designate this field "Blue Sign" with the following enumerated values:

Table 9. Blue Sign

0	Not available (default)
1	No
2	Yes

The interpretation of bits 143-147 has been a bit unstable. In [IALA] and therefore in the original [ITU1371], they were described like this:

Field	Len	Description
143-145	3	Regional Reserved

Field	Len	Description
146-147	2	Spare

The interpretation of 143-144 as a special maneuver field is new in revision 3 of [ITU1371].

The RAIM flag indicates whether Receiver Autonomous Integrity Monitoring is being used to check the performance of the EPFD. 0 = RAIM not in use (default), 1 = RAIM in use. See [RAIM] for a detailed description of this flag.

Bits 149-167 are diagnostic information for the radio system. Consult [IALA] for detailed description of the latter.

Type 4: Base Station Report

This message is to be used by fixed-location base stations to periodically report a position and time reference. Total of 168 bits, occupying one AIVDM sentence.

The standard uses "EPFD" to designate any Electronic Position Fixing Device.

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 4
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	MMSI	mmsi	u	9 decimal digits
38-51	14	Year (UTC)	year	u	UTC, 1-9999, 0 = N/A (default)
52-55	4	Month (UTC)	month	u	1-12; 0 = N/A (default)
56-60	5	Day (UTC)	day	u	1-31; 0 = N/A (default)
61-65	5	Hour (UTC)	hour	u	0-23; 24 = N/A (default)
66-71	6	Minute (UTC)	minute	u	0-59; 60 = N/A (default)
72-77	6	Second (UTC)	second	u	0-59; 60 = N/A (default)
78-78	1	Fix quality	accuracy	b	As in Common Navigation Block
79-106	28	Longitude	lon	I4	As in Common Navigation Block
107-133	27	Latitude	lat	I4	As in Common Navigation Block
134-137	4	Type of EPFD	epfd	e	See "EPFD Fix Types"
138-147	10	Spare		x	Not used
148-148	1	RAIM flag	raim	b	As for common navigation block
149-167	19	SOTDMA state	radio	u	As in same bits for Type 1

Table 10. EPFD Fix Types

Code	Position Fix Type
0	Undefined (default)
1	GPS
2	GLONASS
3	Combined GPS/GLONASS
4	Loran-C
5	Chayka
6	Integrated navigation system
7	Surveyed
8	Galileo

Note: though values 9-15 are marked "not used" in [IALA], the EPFD type value 15 (all field bits 1) is not uncommon in the wild; it appears some receivers emit it as the undefined value. Decoders should be prepared to accept this.

Type 5: Static and Voyage Related Data

Message has a total of 424 bits, occupying two AIVDM sentences.

In practice, the information in these fields (especially ETA and destination) is not reliable, as it has to be hand-updated by humans rather than gathered automatically from sensors.

Also note that it is fairly common in the wild for this message to have a wrong bit length (420 or 422). Robust decoders should ignore trailing garbage and deal gracefully with a slightly truncated destination field.

Field	Len	Description	Member/Type	T	Encoding
0-5	6	Message Type	type	u	Constant: 5
6-7	2	Repeat Indicator	repeat	u	Message repeat count
8-37	30	MMSI	mmsi	u	9 digits
38-39	2	AIS Version	ais_version	u	0=[ITU1371], 1-3 = future editions
40-69	30	IMO Number	imo	u	IMO ship ID number
70-111	42	Call Sign	callsign	t	7 six-bit characters
112-231	120	Vessel Name	shipname	t	20 six-bit characters
232-239	8	Ship Type	shiptype	e	See "Codes for Ship Type"
240-248	9	Dimension to Bow	to_bow	u	Meters
249-257	9	Dimension to Stern	to_stern	u	Meters
258-263	6	Dimension to Port	to_port	u	Meters
264-269	6	Dimension to Starboard	to_starboard	u	Meters
270-273	4	Position Fix Type	epfd	e	See "EPFD Fix Types"
274-277	4	ETA month (UTC)	month	u	1-12, 0=N/A (default)
278-282	5	ETA day (UTC)	day	u	1-31, 0=N/A (default)

Field	Len	Description	Member/Type	T	Encoding
283-287	5	ETA hour (UTC)	hour	u	0-23, 24=N/A (default)
288-293	6	ETA minute (UTC)	minute	u	0-59, 60=N/A (default)
294-301	8	Draught	draught	U1	Meters/10
302-421	120	Destination	destination	t	20 6-bit characters
422-422	1	DTE	dte	b	0=Data terminal ready, 1=Not ready (default).
423-423	1	Spare		x	Not used

[INLAND] specifies the following:

- the IMO Number field should be zeroed for inland vessels.
- ATIS code should be used for inland vessels
- ship dimensions should be set to the maximum rectangle size of the convoy
- draught information should be rounded up to nearest decimeter
- For the destination, UN/LOCODE and ERI terminal codes should be used

Ship dimensions will be 0 if not available. For the dimensions to bow and stern, the special value 511 indicates 511 meters or greater; for the dimensions to port and starboard, the special value 63 indicates 63 meters or greater.

Table 11. Codes for Ship Type

Code	Ship & Cargo Classification
0	Not available (default)
1-19	Reserved for future use
20	Wing in ground (WIG), all ships of this type
21	Wing in ground (WIG), Hazardous category A
22	Wing in ground (WIG), Hazardous category B
23	Wing in ground (WIG), Hazardous category C
24	Wing in ground (WIG), Hazardous category D
25	Wing in ground (WIG), Reserved for future use
26	Wing in ground (WIG), Reserved for future use
27	Wing in ground (WIG), Reserved for future use
28	Wing in ground (WIG), Reserved for future use
29	Wing in ground (WIG), Reserved for future use
30	Fishing
31	Towing
32	Towing: length exceeds 200m or breadth exceeds 25m
33	Dredging or underwater ops
34	Diving ops
35	Military ops
36	Sailing
37	Pleasure Craft
38	Reserved
39	Reserved
40	High speed craft (HSC), all ships of this type
41	High speed craft (HSC), Hazardous category A
42	High speed craft (HSC), Hazardous category B
43	High speed craft (HSC), Hazardous category C
44	High speed craft (HSC), Hazardous category D
45	High speed craft (HSC), Reserved for future use
46	High speed craft (HSC), Reserved for future use
47	High speed craft (HSC), Reserved for future use
48	High speed craft (HSC), Reserved for future use
49	High speed craft (HSC), No additional information
50	Pilot Vessel
51	Search and Rescue vessel
52	Tug
53	Port Tender
54	Anti-pollution equipment
55	Law Enforcement
56	Spare - Local Vessel
57	Spare - Local Vessel
58	Medical Transport
59	Noncombatant ship according to RR Resolution No. 18
60	Passenger, all ships of this type
61	Passenger, Hazardous category A

Code	Ship & Cargo Classification
62	Passenger, Hazardous category B
63	Passenger, Hazardous category C
64	Passenger, Hazardous category D
65	Passenger, Reserved for future use
66	Passenger, Reserved for future use
67	Passenger, Reserved for future use
68	Passenger, Reserved for future use
69	Passenger, No additional information
70	Cargo, all ships of this type
71	Cargo, Hazardous category A
72	Cargo, Hazardous category B
73	Cargo, Hazardous category C
74	Cargo, Hazardous category D
75	Cargo, Reserved for future use
76	Cargo, Reserved for future use
77	Cargo, Reserved for future use
78	Cargo, Reserved for future use
79	Cargo, No additional information
80	Tanker, all ships of this type
81	Tanker, Hazardous category A
82	Tanker, Hazardous category B
83	Tanker, Hazardous category C
84	Tanker, Hazardous category D
85	Tanker, Reserved for future use
86	Tanker, Reserved for future use
87	Tanker, Reserved for future use
88	Tanker, Reserved for future use
89	Tanker, No additional information
90	Other Type, all ships of this type
91	Other Type, Hazardous category A
92	Other Type, Hazardous category B
93	Other Type, Hazardous category C
94	Other Type, Hazardous category D
95	Other Type, Reserved for future use
96	Other Type, Reserved for future use
97	Other Type, Reserved for future use
98	Other Type, Reserved for future use
99	Other Type, no additional information

Note that garbage values greater than 99 are supposed to be unused, but are not uncommon in the wild; AIS transmitters seem prone to put junk in this field when it's not explicitly set. Decoders should treat these like value 0 rather than throwing an exception until and unless the controlled vocabulary is extended to include the unknown values.

Type 6: Binary Addressed Message

Message type 6 is an addressed point-to-point message with unspecified binary payload. The St. Lawrence Seaway AIS system, the USG PAWSS system, and the Port Authority of London use this payload for local extension messages. [IMO236] and [IMO289] describe payload use as international extension messages. This type is variable in length up to a maximum of 1008 bits (up to 5 AIVDM sentence payloads).

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 6
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Sequence Number	seqno	u	Unsigned integer 0-3
40-69	30	Destination MMSI	dest_mmsi	u	9 decimal digits
70	1	Retransmit flag	retransmit	b	0 = no retransmit (default) 1 = retransmitted
71	1	Spare		x	Not used
72-81	10	Designated Area Code	dac	u	Unsigned integer
82-87	6	Functional ID	fid	u	Unsigned integer
88	920	Data	data	d	Binary data May be shorter than 920 bits.

Interpretation of the binary payload is controlled by:

- The Designated Area Code, which is a jurisdiction code: 366 for the United States. It uses the same encoding as the area designator in MMMSIs; see [ITU-MID]. 1 designates international (ITU) messages.
- The FID, which is the Functional ID for a message subtype. In some sources this is abbreviated FI.

The following is a non-exhaustive list of standardized DAC-FID pairs in use for type 6.

DAC	FID	Source	Status	Description

1	12	[IMO236]	Deprecated	Dangerous cargo indication
1	14	[IMO236]	Deprecated	Tidal window
1	16	[IMO236]	Deprecated/In Use	Number of persons on board
1	16	[IMO289]	Standard	Number of persons on board
1	18	[IMO289]	Standard	Clearance time to enter port
1	20	[IMO289]	Standard	Berthing data (addressed)
1	23	[IMO289]	In use	Area notice (addressed)
1	25	[IMO289]	Standard	Dangerous Cargo indication
1	28	[IMO289]	Standard	Route info addressed
1	30	[IMO289]	Standard	Text description addressed
1	32	[IMO289]	Standard	Tidal Window
200	21	[INLAND]	Standard	ETA at lock/bridge/terminal
200	22	[INLAND]	Standard	RTA at lock/bridge/terminal
200	55	[INLAND]	Standard	Number of persons on board
235	10	[IALA-A126]	In use	AtoN monitoring data (UK)
250	10	[IALA-A126]	In use	AtoN monitoring data (ROI)

DAC/FID pairs are assigned separately per message type.

Note that the apparent presence of one of these DAC/FID pairs does not guarantee that the message is structured. Decoders should perform range validation on the structured fields and interpret the message as unstructured if any check fails. (As of Aug 2014 no such collisions have been in the wild; but see the parallel note for Type 8.)

A list of binary layouts for selected subtypes of message 6 follows.

IMO236 Dangerous Cargo Indication

This message should be used as a response to a request for Dangerous Cargo Indication from a competent authority. The message content is used to identify the port where the documents for the dangerous goods cargo can be found, e. g. last and next port of call, and to allow the requesting authority to form a danger estimate.

A message 6 subtype. DAC = 001 FID = 12. Fixed length: 360 bits. This is the [IMO236] version, now deprecated; there is a later [IMO289] version.

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 6
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Sequence Number	seqno	u	Unsigned integer 0-3
40-69	30	Destination MMSI	dest_mmsi	u	9 decimal digits
70-70	1	Retransmit flag	retransmit	u	0 = no retransmit (default), 1 = retransmitted
71-71	1	Spare		x	Not used
72-81	10	DAC	dac	u	DAC = 001
82-87	6	FID	fid	u	FID = 12
88-117	30	Last Port Of Call	lastport	t	5 6-bit characters, UN locode
118-121	4	ETA month (UTC)	lmonth	u	1-12, 0=N/A (default)
122-126	5	ETA day (UTC)	lday	u	1-31, 0=N/A (default)
127-131	5	ETA hour (UTC)	lhour	u	0-23, 24=N/A (default)
132-137	6	ETA minute (UTC)	lminute	u	0-59, 60=N/A (default)
138-167	30	Next Port Of Call	nextport	t	5 6-bit characters, UN locode
168-171	4	ETA month (UTC)	nmonth	u	1-12, 0=N/A (default)
172-176	5	ETA day (UTC)	nday	u	1-31, 0=N/A (default)
177-181	5	ETA hour (UTC)	nhour	u	0-23, 24=N/A (default)
182-187	6	ETA minute (UTC)	nminute	u	0-59, 60=N/A (default)
188-307	120	Main Dangerous Good	dangerous	t	20 6-bit characters
308-331	24	IMD Category	imdcat	t	4 6-bit characters
332-344	13	UN Number	unid	u	1-3363 UN Number
345-354	10	Amount of Cargo	amount	u	Unsigned integer
355-356	2	Unit of Quantity	unit	e	See "Cargo Unit Codes"
357-359	3	Spare		x	Not used

Table 12. Cargo Unit Codes

Code	Unit
0	Not available (default)
1	kg
2	metric tons
3	metric kilotons

IMO236 Tidal Window

This message should be used by shore stations to inform vessels about tidal windows which allow a vessel the safe passage of a fairway. The message includes 1-3 predictions of current speed and current direction. Acknowledgment is required.

A message 6 subtype. DAC = 001 FID = 14. Variable length: 190-376 bits This is the [IMO236] version; there is an [IMO289] version with different widths for the latitude, longitude, and current-speed fields (also the order of lat/lon is swapped).

Field	Len	Description	Member	T	Units

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 6
6-7	2	Repeat Indicator	repeat	u	See Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Sequence Number	seqno	u	Unsigned integer 0-3
40-69	30	Destination MMSI	dest_mmsi	u	9 decimal digits
70-70	1	Retransmit flag	retransmit	b	0 = no retransmit (default), 1 = retransmitted
71-71	1	Spare		x	Not used
72-81	10	DAC	dac	u	DAC = 001
82-87	6	FID	fid	u	FID = 14
88-91	4	Month	month	u	1-12; 0 = N/A (default)
92-96	5	Day	day	u	1-31; 0 = N/A (default)
97			tidals	a3	Tidal information array
0-26	27	Latitude	lat	I4	Unit = minutes * 0.0001, 91000 = N/A (default), N positive, S negative.
27-54	28	Longitude	lon	I4	Unit = minutes * 0.0001, 181000 = N/A (default), E positive, W negative.
55-59	5	From UTC Hour	from_hour	u	0-23, 24 = N/A (default)
60-65	6	From UTC Minute	from_min	u	0-59, 60 = N/A (default)
66-70	5	To UTC Hour	to_hour	u	0-23, 24 = N/A (default)
71-76	6	To UTC Minute	to_min	u	0-59, 60 = N/A (default)
77-85	9	Current Dir. Predicted	cdir	u	0-359 deg, 360-N/A (default)
86-92	7	Current Speed Predicted	cspeed	U1	0-126, units of 0.1 knots, 127 = N/A (default).

The group of fields from longitude on may repeat twice more to convey up to three points of tidal information.

IMO236 Number of persons on board

This message should be used by a ship to report the number of persons on board, e.g. on request by a competent authority. Acknowledgement required.

A message 6 subtype. DAC = 001 FID = 16.

[IMO236] describes a fixed-length, 72-bit message with this layout:

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 6
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Spare		x	Not used
40-49	10	DAC	dac	u	DAC = 001
50-55	6	FID	fid	u	FID = 16
55-68	14	# persons on board	persons	u	Unsigned integer 0 = N/A (default) 8191 = >= 8191 persons.
69-71	3	Spare		x	Not used

OPEN-QUESTION: Note that though this is a message 6 subtype and described in [IMO236] with the attribute "addressed", there is no destination address. A strikeout in [IMO236] suggests that this was originally a subtype of 8. It would be good defensive implementation for a decoder to accept either. Bit length may be used to distinguish them.

[IMO289] describes a fixed-length, 136-bit message with this layout:

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 6
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Sequence Number	seqno	u	Unsigned integer 0-3
40-69	30	Destination MMSI	dest_mmsi	u	9 decimal digits
70-70	1	Retransmit flag	retransmit	b	0 = no retransmit (default), 1 = retransmitted.
71-71	1	Spare		x	Not used
72-81	10	DAC	dac	u	DAC = 001
82-87	6	FID	fid	u	FID = 16
88-100	13	# persons on board	persons	u	Unsigned integer, 0 = N/A (default), 8191 = >= 8191 persons.
101-135	35	Spare		x	Not used

IMO289 Clearance Time To Enter Port

This message provides specific ships with information on the port to call and time to enter. It should be transmitted by an authority competent to grant use of the port.

A message 6 subtype. DAC = 001 FID = 18. Fixed length: 360 bits.

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 6

Field	Len	Description	Member	T	Units
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Sequence Number	seqno	u	Unsigned integer 0-3
40-69	30	Destination MMSI	dest_mmsi	u	9 decimal digits
70-70	1	Retransmit flag	retransmit	b	0 = no retransmit (default), 1 = retransmitted.
71-71	1	Spare		x	Not used
72-81	10	DAC	dac	u	DAC = 001
82-87	6	FID	fid	u	FID = 18
88-97	10	Message Linkage ID	linkage	u	Unsigned integer
98-101	4	Month (UTC)	month	u	1-12; 0 = N/A (default)
102-106	5	Day (UTC)	day	u	1-31; 0 = N/A (default)
107-111	5	Hour (UTC)	hour	u	0-23; 24 = N/A (default)
112-117	6	Minute (UTC)	minute	u	0-59; 60 = N/A (default)
118-237	120	Name of Port & Berth	portname	t	20 6-bit characters
238-267	30	Destination	destination	t	5 6-bit characters
268-292	25	Longitude	lon	I3	Unit = minutes * 0.001, 181000 = N/A (default).
293-316	24	Latitude	lat	I3	Unit = minutes * 0.001, 91000 = N/A (default).
317-359	43	Spare		x	Not used

IMO 289 Berthing Data (addressed)

This message provides information on the ship's berth. If sent from a ship it is a berthing request; if it is transmitted by a competent authority it is a berthing assignment.

A message 6 subtype. DAC = 001 FID = 20. Fixed Length: 360 bits.

The 2-bit fields after "availability" describe services which may be available at the berth. They are valid only if this master availability bit is on.

Field	Len	Description	Member/Type	T	Units
0-5	6	Message Type	type	u	Constant: 6
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Sequence Number	seqno	u	Unsigned integer 0-3
40-69	30	Destination MMSI	dest_mmsi	u	9 decimal digits
70-70	1	Retransmit flag	retransmit	b	0 = no retransmit (default) 1 = retransmitted
71-71	1	Spare		x	Not used
72-81	10	DAC	dac	u	AC = 001
82-87	6	FID	fid	u	ID = 20
88-97	10	Message Linkage ID	linkage	u	Unsigned integer
98-106	9	Berth length	berth_length	u	In 1m steps, 1-510m, 511 = >= 511m 0 = N/A (default).
107-114	8	Berth Water Depth	berth_depth	U1	0.1-25.4m in 0.1 steps 255 = >= 25.5m 0 = N/A (default)
115-117	3	Mooring Position	position	e	See "Mooring Position"
118-121	4	Month (UTC)	month	u	1-12; 0 = N/A (default)
122-126	5	Day (UTC)	day	u	1-31; 0 = N/A (default)
127-131	5	Hour (UTC)	hour	u	0-23; 24 = N/A (default)
132-137	6	Minute (UTC)	minute	u	0-59; 60 = N/A (default)
138-138	1	Services Availability	availability	b	0 = services unknown (default) 1 = services known
139-140	2	Agent	agent	e	See "Service Status"
141-142	2	Bunker/fuel	fuel	e	See "Service Status"
143-144	2	Chandler	chandler	e	See "Service Status"
145-146	2	Stevedore	stevedore	e	See "Service Status"
147-148	2	Electrical	electrical	e	See "Service Status"
149-150	2	Potable water	water	e	See "Service Status"
151-152	2	Customs house	customs	e	See "Service Status"
153-154	2	Cartage	cartage	e	See "Service Status"
155-156	2	Crane(s)	crane	e	See "Service Status"
157-158	2	Lift(s)	lift	e	See "Service Status"
159-160	2	Medical facilities	medical	e	See "Service Status"
161-162	2	Navigation repair	navrepair	e	See "Service Status"
163-164	2	Provisions	provisions	e	See "Service Status"
165-166	2	Ship repair	shiprepair	e	See "Service Status"
167-168	2	Surveyor	surveyor	e	See "Service Status"

Field	Len	Description	Member/Type	T	Units
169-170	2	Steam	steam	e	See "Service Status"
171-172	2	Tugs	tugs	e	See "Service Status"
173-174	2	Waste disposal (solid)	solidwaste	e	See "Service Status"
175-176	2	Waste disposal (liquid)	liquidwaste	e	See "Service Status"
177-178	2	Waste disposal (hazardous)	hazardouswaste	e	See "Service Status"
179-180	2	Reserved ballast exchange	ballast	e	See "Service Status"
181-182	2	Additional services	additional	e	See "Service Status"
183-184	2	Regional reserved 1	regional1	e	See "Service Status"
185-186	2	Regional reserved 2	regional2	e	See "Service Status"
187-188	2	Reserved for future	future1	e	See "Service Status"
189-190	2	Reserved for future	future2	e	See "Service Status"
191-310	120	Name of Berth	berth_name	t	20 6-bit characters
311-335	25	Longitude	berth_lon	I3	Minutes * 0.001, 181000 = N/A (default)
336-359	24	Latitude	berth_lat	I3	Minutes * 0.001, 91000 = N/A (default)

The UTC timestamp refers to the time requested or granted for berthing.

The longitude and latitude refer to the center of the berth.

Table 13. Mooring Position

Code	Position
0	Not available (default)
1	Port-side to
2	Starboard-side to
3	Mediterranean (end-on) mooring
4	Mooring buoy
5	Anchorage
6-7	Reserved for future use

Table 14. Service Status

Code	Meaning
0	Not available or requested (default)
1	Service available
2	No data or unknown
3	Not to be used

IMO289 Area Notice (addressed)

This should be used to convey time- and location-dependent information about hazards to navigation. For information-lifetime restrictions and usage guidance, refer to [ITU1371].

A message 6 subtype. DAC = 001 FID = 23. 230 to 1013 bits. There is a related Message 8 subtype for broadcast use.

The message consists of a fixed-length header of 143 bits, followed by 1 to 10 sub-area indications which are fixed-length records 87 bits long. Here is the message header format:

Table 15. Area Notice (addressed) message header

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 6
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Sequence Number	seqno	u	Unsigned integer 0-3
40-69	30	Destination MMSI	dest_mmsi	u	9 decimal digits
70-70	1	Retransmit flag	retransmit	b	0 = no retransmit (default), 1 = retransmitted.
71-71	1	Spare		x	Not used
72-81	10	DAC	dac	u	DAC = 001
82-87	6	FID	fid	u	FID = 23
88-97	10	Message Linkage ID	linkage	u	Unsigned integer
98-104	7	Notice Description	notice	e	See "Area Notice Description"
105-108	4	Month (UTC)	month	u	1-12; 0 = N/A (default)
109-113	5	Day (UTC)	day	u	1-31; 0 = N/A (default)
114-118	5	Hour (UTC)	hour	u	0-23; 24 = N/A (default)
119-124	6	Minute (UTC)	minute	u	0-59; 60 = N/A (default)
125-142	18	Duration	duration	In minutes, 262143 = N/A (default), 0 = cancel this notice.	143
		subarea	a10	Subarea array	0-2
2		shape	u	Subarea shape	3-86

The Message Linkage field is, as usual, for linking to a textual explanatory message sent with the same linkage ID. The standard says that in this context it has the semantics of being an identifier of or reference to an area.

Notice description types are as follows:

Table 16. Area Notice Description

0	Caution Area: Marine mammals habitat
1	Caution Area: Marine mammals in area - reduce speed
2	Caution Area: Marine mammals in area - stay clear
3	Caution Area: Marine mammals in area - report sightings
4	Caution Area: Protected habitat - reduce speed
5	Caution Area: Protected habitat - stay clear
6	Caution Area: Protected habitat - no fishing or anchoring
7	Caution Area: Derelicts (drifting objects)
8	Caution Area: Traffic congestion
9	Caution Area: Marine event
10	Caution Area: Divers down
11	Caution Area: Swim area
12	Caution Area: Dredge operations
13	Caution Area: Survey operations
14	Caution Area: Underwater operation
15	Caution Area: Seaplane operations
16	Caution Area: Fishery – nets in water
17	Caution Area: Cluster of fishing vessels
18	Caution Area: Fairway closed
19	Caution Area: Harbor closed
20	Caution Area: Risk (define in associated text field)
21	Caution Area: Underwater vehicle operation
22	(reserved for future use)
23	Environmental Caution Area: Storm front (line squall)
24	Environmental Caution Area: Hazardous sea ice
25	Environmental Caution Area: Storm warning (storm cell or line of storms)
26	Environmental Caution Area: High wind
27	Environmental Caution Area: High waves
28	Environmental Caution Area: Restricted visibility (fog, rain, etc.)
29	Environmental Caution Area: Strong currents
30	Environmental Caution Area: Heavy icing
31	(reserved for future use)
32	Restricted Area: Fishing prohibited
33	Restricted Area: No anchoring.
34	Restricted Area: Entry approval required prior to transit
35	Restricted Area: Entry prohibited
36	Restricted Area: Active military OPAREA
37	Restricted Area: Firing – danger area.
38	Restricted Area: Drifting Mines
39	(reserved for future use)
40	Anchorage Area: Anchorage open
41	Anchorage Area: Anchorage closed
42	Anchorage Area: Anchorage prohibited
43	Anchorage Area: Deep draft anchorage
44	Anchorage Area: Shallow draft anchorage
45	Anchorage Area: Vessel transfer operations
46	(reserved for future use)
47	(reserved for future use)
48	(reserved for future use)
49	(reserved for future use)
50	(reserved for future use)
51	(reserved for future use)
52	(reserved for future use)
53	(reserved for future use)
54	(reserved for future use)
55	(reserved for future use)
56	Security Alert - Level 1
57	Security Alert - Level 2
57	Security Alert - Level 3
59	(reserved for future use)
60	(reserved for future use)

0	Caution Area: Marine mammals habitat
61	(reserved for future use)
62	(reserved for future use)
63	(reserved for future use)
64	Distress Area: Vessel disabled and adrift
65	Distress Area: Vessel sinking
66	Distress Area: Vessel abandoning ship
67	Distress Area: Vessel requests medical assistance
68	Distress Area: Vessel flooding
69	Distress Area: Vessel fire/explosion
70	Distress Area: Vessel grounding
71	Distress Area: Vessel collision
72	Distress Area: Vessel listing/capsizing
73	Distress Area: Vessel under assault
74	Distress Area: Person overboard
75	Distress Area: SAR area
76	Distress Area: Pollution response area
77	(reserved for future use)
78	(reserved for future use)
79	(reserved for future use)
80	Instruction: Contact VTS at this point/juncture
81	Instruction: Contact Port Administration at this point/juncture
82	Instruction: Do not proceed beyond this point/juncture
83	Instruction: Await instructions prior to proceeding beyond this point/juncture
84	Proceed to this location – await instructions
85	Clearance granted – proceed to berth
86	(reserved for future use)
87	(reserved for future use)
88	Information: Pilot boarding position
89	Information: Icebreaker waiting area
90	Information: Places of refuge
91	Information: Position of icebreakers
92	Information: Location of response units
93	VTS active target
94	Rogue or suspicious vessel
95	Vessel requesting non-distress assistance
96	Chart Feature: Sunken vessel
97	Chart Feature: Submerged object
98	Chart Feature: Semi-submerged object
99	Chart Feature: Shoal area
100	Chart Feature: Shoal area due north
101	Chart Feature: Shoal area due east
102	Chart Feature: Shoal area due south
103	Chart Feature: Shoal area due west
104	Chart Feature: Channel obstruction
105	Chart Feature: Reduced vertical clearance
106	Chart Feature: Bridge closed
107	Chart Feature: Bridge partially open
108	Chart Feature: Bridge fully open
109	(reserved for future use)
110	(reserved for future use)
111	(reserved for future use)
112	Report from ship: Icing info
113	(reserved for future use)
114	Report from ship: Miscellaneous information – define in associated text field
115	(reserved for future use)
116	(reserved for future use)
117	(reserved for future use)
118	(reserved for future use)
119	(reserved for future use)
120	Route: Recommended route
121	Route: Alternative route

0	Caution Area: Marine mammals habitat
122	Route: Recommended route through ice
123	(reserved for future use)
124	(reserved for future use)
125	Other – Define in associated text field
126	Cancellation – cancel area as identified by Message Linkage ID
127	Undefined (default)

Subarea types are as follows:

0	Circle or point
1	Rectangle
2	Sector
3	Polyline
4	Polygon
5	Associated text
6-7	Reserved

Subarea payload layouts are as follows:

Table 17. Circle or Point

Field	Len	Description	Member/Type	T	Units
0-2	3	Shape of area	shape	e	Constant: 0
3-4	2	Scale factor	scale	u	Exponent for area dimensions 1 = meters (default)
5-29	25	Longitude	lon	I3	Longitude of center point, Unit = minutes * 0.001, 181000 = N/A (default).
30-53	24	Latitude	lat	I3	Latitude of center point, Unit = minutes * 0.001, 91000 = N/A (default).
54-56	3	Precision	precision	u	Decimal places of precision (defaults to 4)
57-68	12	Radius	radius	u	Radius of area 0 = point (default), else 1-4095 * 10^scale m
69-86	18	Spare		x	Not used

Table 18. Rectangle

Field	Len	Description	Member/Type	T	Units
0-2	3	Shape of area	shape	e	Constant: 1
3-4	2	Scale factor	scale	u	Exponent for area dimensions 1 = meters (default)
5-29	25	Longitude	lon	I3	Longitude of SW corner Unit = minutes * 0.001, 181000 = N/A (default).
30-53	24	Latitude	lat	I3	Latitude of SW corner Unit = minutes * 0.001, 91000 = N/A (default).
54-56	3	Precision	precision	u	Decimal places of precision (defaults to 4)
57-64	8	E dimension	east	u	Box dimension east 0 = N/S line (default), else 1-255 * 10^scale m
65-72	8	N dimension	north	u	Box dimension north 0 = E/W line (default), else 1-255 * 10^scale m
73-81	9	Orientation	orientation	u	Degrees clockwise from true N, 0 = no rotation (default), else 1-359, 360-511 reserved.
82-86	5	Spare		x	Not used

Table 19. Sector

Field	Len	Description	Member/Type	T	Units
0-2	3	Shape of area	shape	e	Constant: 2
3-4	2	Scale factor	scale	u	Exponent for area dimensions 1 = meters (default)
5-29	25	Longitude	lon	I3	Longitude of center point, Unit = minutes * 0.001, 181000 = N/A (default).
30-53	24	Latitude	lat	I3	Latitude of center point, Unit = minutes * 0.001, 91000 = N/A (default).
54-56	3	Precision	precision	u	Decimal places of precision (defaults to 4)
57-68	12	Radius	radius	u	Radius of area 0 = point (default), else 1-4095 * 10^scale m

Field	Len	Description	Member/Type	T	Units
69-77	9	Left boundary	left	u	Degrees clockwise from true N, 0 = no rotation (default), else 1-359, 360-511 reserved.
78-86	9	Right boundary	right	u	Degrees clockwise from true N, 0 = no rotation (default), else 1-359, 360-511 reserved.

Table 20. Polyline

Field	Len	Description	Member/Type	T	Units
0-2	3	Shape of area	shape	e	Constant: 3
3-4	2	Scale factor	scale	u	Exponent for area dimensions 1 = meters (default)
5			waypoints	a4	Waypoints array
0-9	10	Bearing	bearing	u	True bearing in half-degree steps from previous waypoint; 720 = N/A (default).
10-19	10	Distance	distance	u	Distance from prev. waypoint, 0 = no point (default), else 1-1023 * 10^scale m

The last two fields are repeated 4 times; the final 2 bits of 87 are unused. A polyline must be preceded by either (a) a circle, in which case the first bearing is from the center, or (b) a polyline, in which case the first bearing is from the implied last point.

Table 21. Polygon

Field	Len	Description	Member/Type	T	Units
0-2	3	Shape of area	shape	e	Constant: 4
3-4	2	Scale factor	scale	u	Exponent for area dimensions 1 = meters (default)
5			vertices	a4	Vertices array
0-9	10	Bearing	bearing	u	True bearing in half-degree steps from previous vertex; 720 = N/A (default).
10-19	10	Distance	distance	u	Distance from prev. vertex,

The last two fields are repeated 4 times; the final 2 bits of 87 are unused. A polygon must be preceded by a circle; the first bearing is from the circle center, which is treated as the zero vertex. There is an implied boundary from the last polygon vertex to the zero vertex.

Table 22. Associated text

Field	Len	Description	Member/Type	T	Units
0-2	3	Shape of area	shape	e	Constant: 5
3-86	84	Text	text	t	14 chars of packed 6-bit.

IMO289 Dangerous Cargo Indication

See the IMO236 variant for the meaning of this message.

A message 6 subtype. DAC = 001 FID = 25. Variable length: 117-576 bits. This is the [IMO289] version; there is an earlier [IMO236] version with a different layout, deprecated in [IMO289].

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 6
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Sequence Number	seqno	u	Unsigned integer 0-3
40-69	30	Destination MMSI	dest_mmsi	u	9 decimal digits
70-70	1	Retransmit flag	retransmit	b	0 = no retransmit (default) 1 = retransmitted
71-71	1	Spare		x	Not used
72-81	10	DAC	dac	u	DAC = 001
82-87	6	FID	fid	u	FID = 25
88-89	2	Unit of Quantity	unit	e	See "Cargo Unit Codes"
90-99	10	Amount of Cargo	amount	u	Unsigned integer 0 = N/A (default) 0 = N/A (default)
100			cargos	a28	Cargo types array
0-3	4	Cargo code	code	e	See "Cargo Codes"
4-16	13	Cargo subtype	subtype	u	Unsigned integer 0 = N/A (default)

The last two fields may repeat to describe up to 28 subcargos. The count of repetitions must be computed from the message payload length.

For cargo unit codes, see the description of the IMO236 variant of this message.

Table 23. Cargo Codes

Code	Code under which cargo is carried
0	Not available (default)
1	IMDG Code (in packed form)
2	IGC code
3	BC Code (from 1.1.2011 IMSBC)
4	MARPOL Annex I List of oils (Appendix 1)

Code	Code under which cargo is carried
5	MARPOL Annex II IBC Code
6	Regional use
7-15	Reserved for future use

The subtype field may be interpreted as an IMDG class or division code (if the cargotype is 1 = IMDG code) or as a UN number (if the cargotype is 2 = IGC code) or as a pair of BC class and IMDG class (if the cargotype is 3 = BC code) or as a MARPOL Annex I code (if the cargotype is 4 = MARPOL Annex I) or as a MARPOL Annex II code (if the cargotype is 5 = MARPOL Annex II).

Table 24. Dangerous Cargo Indication: MARPOL Annex I list of oils

0	N/A (default)
1	asphalt solutions
2	oils
3	distillates
4	gas oil
5	gasoline blending stocks
6	gasoline
7	jet fuels
8	naphtha
9-15	reserved for future use

Table 25. Dangerous Cargo Indication: MARPOL Annex II list of oils

0	N/A (default)
1	Category X
2	Category Y
3	Category Z
4	Other substances
5-7	reserved for future use

IMO289 Route Information (addressed)

The content of this message is a time and a list of waypoints describing a course. It has a broadcast equivalent that is a message 8 subtype.

A message 6 subtype. DAC = 001 FID = 28. Variable length: 204-1029 bits.

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 6
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Sequence Number	seqno	u	Unsigned integer 0-3
40-69	30	Destination MMSI	dest_mmsi	u	9 decimal digits
70-70	1	Retransmit flag	retransmit	b	0 = no retransmission (default), 1 = retransmitted.
71-71	1	Spare		x	Not used
72-81	10	DAC	dac	u	DAC = 001
82-87	6	FID	fid	u	FID = 28
88-97	10	Message Linkage ID	linkage	u	Unsigned integer
98-100	3	Sender Class	sender	u	0 = ship (default), 1 = authority, 27 = reserved for future use
101-105	5	Route Type	rtype	e	See "Route Type Codes"
106-109	4	Start month (UTC)	month	u	1-12, 0=N/A (default)
110-114	5	Start day (UTC)	day	u	1-31, 0=N/A (default)
115-119	5	Start hour (UTC)	hour	u	0-23, 24=N/A (default)
120-125	6	Start minute (UTC)	minute	u	0-59, 60=N/A (default)
126-143	18	Duration	duration	u	Minutes from start time, 0 = cancel route, 262,143 = N/A (default),
144-148	5		waycount	u	Waypoint count (1-16), Values 17-31 are not used.
149			waypoints	a^16	Waypoint array
0-27	28	Longitude	lon	I4	Minutes * 0.0001, 181000 = N/A (default), E positive, W negative.
28-54	27	Latitude	lat	I4	Minutes * 0.0001, 91000 = N/A (default), N positive, S negative.

The final pair of fields in the table above is a waypoint. The message may end with 1 to 16 waypoints.

Table 26. Route Type Codes

0	Undefined (default)
1	Mandatory
2	Recommended
3	Alternative
4	Recommended route through ice

0	Undefined (default)
5	Ship route plan
6-30	Reserved for future usage
31	Cancel route identified by message linkage

IMO289 Text description (addressed)

This message may be used to attach a text description to another message with a Message Linkage ID matching this one. It is intended that the combination of MMSI and Message Linkage ID should be unique.

A message 6 subtype. DAC = 001 FID = 30. Variable length: 104-1028 bits.

Intended to be used to associate a text annotation with another message via the Message Linkage ID field.

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 6
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Sequence Number	seqno	u	Unsigned integer 0-3
40-69	30	Destination MMSI	dest_mmsi	u	9 decimal digits
70-70	1	Retransmit flag	retransmit	u	0 = no retransmit (default), 1 = retransmitted
71-71	1	Spare		x	Not used
72-81	10	DAC	dac	u	DAC = 001
82-87	6	FID	fid	u	FID = 30
88-97	10	Message Linkage ID	linkage	u	Unsigned integer
98-?	6-930	Description	description	t	String

There is an equivalent subtype of message 8 that is a broadcast description.

Tidal Window (IMO289)

See the [IMO239] version of this message for intended meaning.

A message 6 subtype. DAC = 001 FID = 32. Variable length: 186-362 bits. This is the [IMO289] version; there is an [IMO289] version with different bit widths for the latitude and longitude fields.

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 6
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Sequence Number	seqno	u	Unsigned integer 0-3
40-69	30	Destination MMSI	dest_mmsi	u	9 decimal digits
70-70	1	Retransmit flag	retransmit	b	0 = no retransmit (default), 1 = retransmitted
71-71	1	Spare		x	Not used
72-81	10	DAC	dac	u	DAC = 001
82-87	6	FID	fid	u	FID = 32
88-91	4	Month	month	u	1-12; 0 = N/A (default)
92-96	5	Day	day	u	1-31; 0 = N/A (default)
97			tidals	a3	Tidal information array
0-24	25	Longitude	lon	I3	Unit = minutes * 0.001, 181000 = N/A (default), E positive, W negative.
25-48	24	Latitude	lat	I3	Unit = minutes * 0.001. 91000 = N/A (default), N positive, S negative.
49-53	5	From UTC Hour	from_hour	u	0-23, 24 = N/A (default)
54-59	6	From UTC Minute	from_min	u	0-59, 60 = N/A (default)
60-64	5	To UTC Hour	to_hour	u	0-23, 24 = N/A (default)
65-70	6	To UTC Minute	to_min	u	0-59, 60 = N/A (default)
71-79	9	Current Dir. Predicted	cdir	u	0-359 true bearing, 360 = N/A (default).
80-87	8	Current Speed Predicted	cspeed	U1	0-250, units of 0.1 knots, 251 = speed >= 25.1 knots, 255 = N/A (default).

The group of fields from longitude on may repeat twice more to convey up to three points of tidal information.

ETA at lock/bridge/terminal (Inland AIS)

A message 6 subtype. DAC = 200 FID = 21. Fixed length, 248 bits.

Should be used by inland vessels only, to send an ETA report to a lock, bridge or terminal in order to apply for a time slot in resource planning.

An acknowledgement by Inland AIS message 22 should be received within 15 minutes. Otherwise, the Inland AIS message 21 should be repeated once.

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 6
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Sequence Number	seqno	u	Unsigned integer 0-3

Field	Len	Description	Member	T	Units
40-69	30	Destination MMSI	dest_mmsi	u	9 decimal digits
70	1	Retransmit flag	retransmit	u	0 = no retransmit (default), 1 = retransmitted
71	1	Spare		x	Not used
72-81	10	DAC	dac	u	DAC = 200
82-87	6	FID	fid	u	FID = 21
88-99	12	UN Country Code	country	t	2 six-bit characters
100-117	18	UN/LOCODE	locode	t	3 six-bit characters
118-147	30	Fairway section	section	t	5 six-bit characters
148-177	30	Terminal code	terminal	t	5 six-bit characters
178-207	30	Fairway hectometre	hectometre	t	5 six-bit characters
208-211	4	ETA month	month	u	1-12, 0=N/A (default)
212-216	5	ETA day	day	u	1-31, 0=N/A (default)
217-221	5	ETA hour	hour	u	0-23, 24=N/A (default)
222-227	6	ETA minute	minute	u	0-59, 60=N/A (default)
228-230	3	Assisting Tugs	tugs	u	0-6, 7 = unknown (default)
231-242	12	Air Draught	airdraught	u	0-4000 * 0.01m, 0 = Unknown (default)
243-247	5	Spare		x	Not used

[INLAND] says of the Destination MMSI field "a virtual MMSI number should be used for each country, each national AIS network should route messages addressed to other countries using this virtual MMSI number".

OPEN-QUESTION: [INLAND] does not specify whether ETA time is UTC or local.

RTA at lock/bridge/terminal (Inland AIS)

A message 6 subtype. DAC = 200 FID = 22. Fixed length, 232 bits.

This message should be sent by base stations only, to assign a RTA at a lock, bridge or terminal to a certain vessel in response to the preceding ETA request.

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 6
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Sequence Number	seqno	u	Unsigned integer 0-3
40-69	30	Destination MMSI	dest_mmsi	u	9 decimal digits
70-70	1	Retransmit flag	retransmit	u	0 = no retransmit (default), 1 = retransmitted
71-71	1	Spare		x	Not used
72-81	10	DAC	dac	u	DAC = 200
82-87	6	FID	fid	u	FID = 21
88-99	12	UN Country Code	country	t	2 six-bit characters
100-117	18	UN/LOCODE	locode	t	3 six-bit characters
118-147	30	Fairway section	section	t	5 six-bit characters
148-177	30	Terminal code	terminal	t	5 six-bit characters
178-207	30	Fairway hectometre	hectometre	t	5 six-bit characters
208-211	4	RTA month	month	u	1-12, 0=N/A (default)
212-216	5	RTA day	day	u	1-31, 0=N/A (default)
217-221	5	RTA hour	hour	u	0-23, 24=N/A (default)
222-227	6	RTA minute	minute	u	0-59, 60=N/A (default)
228-229	2	Status	status	e	See "Status Codes" below
230-231	2	Spare		x	Not used

OPEN-QUESTION: [INLAND] does not specify whether ETA time is UTC or local.

OPEN-QUESTION: No default is specified for the Status field.

Table 27. Lock/Bridge/Terminal status codes

0	Operational
1	Limited operation
2	Out of order
3	N/A

Number of persons on board (Inland AIS)

This message should be sent by inland vessels only, to inform about the number of persons (passengers, crew, and shipboard personnel) on board.

A message 6 subtype. DAC = 200 FID = 55. Fixed length, 168 bits.

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 6
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits

Field	Len	Description	Member	T	Units
38-39	2	Sequence Number	seqno	u	Unsigned integer 0-3
40-69	30	Destination MMSI	dest_mmsi	u	9 decimal digits
70-70	1	Retransmit flag	retransmit	u	0 = no retransmit (default), 1 = retransmitted
71-71	1	Spare		x	Not used
72-81	10	DAC	dac	u	DAC = 200
82-87	6	FID	fid	u	FID = 55
88-95	8	# crew on board	crew	u	Unsigned integer 0-254, 255 = Unknown (default)
96-108	13	# passengers on board	passengers	u	Unsigned integer 0-8190, 8191 = Unknown (default)
109-116	8	# personnel on board	personnel	u	Unsigned integer 0-254, 255 = Unknown (default)
117-167	51	Spare		x	Not used

AtoN monitoring data (GLA)

This message provides AtoN (Aid to navigation) monitoring data for the General Lighthouse Authorities (GLA), which consists of Trinity House (England & Wales), Northern Lighthouse Board (Scotland) and the Commissioners of Irish Lights (Ireland). It is described in [IALA-A126].

A message 6 subtype. DAC = 235 or 250 FID = 10. Fixed length: 136 bits.

DAC and FI are user configurable, DAC=235/FI=10 is used in UK, DAC=250/FI=10 in the Republic Of Ireland.

The interval between the transmissions 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.

OPEN-QUESTION: [INLAND] lists a broadcast (type 8) variant of this message, but without indicating how the Destination MMSI field is to be set or interpreted. Robust implementations should accept and process this variant.

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 6
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Sequence Number	seqno	u	Unsigned integer 0-3
40-69	30	Destination MMSI	dest_mmsi	u	9 decimal digits
70-70	1	Retransmit flag	retransmit	u	0 = no retransmit (default), 1 = retransmitted
71-71	1	Spare		x	Not used
72-81	10	DAC	dac	u	DAC = 235 or 250
82-87	6	FID	fid	u	FID = 10
88-97	10	Analogue	ana_int	u	0.05-36V, 0.05V step Supply voltage to AIS Unit 0 = Not Used
98-107	10	Analogue (ext. #1)	ana_ext1	u	0.05-36V, 0.05V step 0 = Not Used
108-117	10	Analogue (ext. #2)	ana_ext2	u	0.05-36V, 0.05V step 0 = Not Used
118-119	2	RACON status	racon	u	00 = no RACON installed 01 = RACON not monitored 10 = RACON operational 11 = RACON ERROR
120-121	2	Light status	light	u	00 = no light or no monitoring 01 = Light ON 10 = Light OFF 11 = Light ERROR
122	1	Health	health	b	0 = Good Health, 1 = Alarm
123-130	8	Status (external)	stat_ext	u	7 Digital Input 0=Off, 1=On : : 0 Digital Input 0=Off, 1=On
131-131	1	Position status	off_pos	b	0=On position, 1=Off position
132-135	4	Spare		x	Not used

Type 7: Binary Acknowledge

Message type 7 is a receipt acknowledgement to the senders of a previous messages of type 6. Total length varies between 72 and 168 bits by 32-bit increments, depending on the number of destination MMSIs included.

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 7
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Spare		x	Not used
40-69	30	MMSI number 1	mmsi1	u	9 decimal digits
70-71	2	Sequence for MMSI 1	mmsiseq1	u	Not used
72-101	30	MMSI number 2	mmsi2	u	9 decimal digits
102-103	2	Sequence for MMSI 2	mmsiseq2	u	Not used
104-133	30	MMSI number 3	mmsi3	u	9 decimal digits
134-135	2	Sequence for MMSI 3	mmsiseq3	u	Not used
136-165	30	MMSI number 4	mmsi4	u	9 decimal digits

Field	Len	Description	Member	T	Units
166-167	2	Sequence for MMSI 4	mmsiseq4	u	Not used

Use of the MMSI sequence fields was introduced in ITU-1371-5 to indicate the sequence number of the Type 6 to which this responds. In earlier versions these were spare fields.

Type 8: Binary Broadcast Message

Message type 8 is a broadcast message with unspecified binary payload. The St. Lawrence Seaway AIS system, the USG PAWSS system, and the Port Authority of London use this payload for local extension messages. [IMO236] and [IMO289] describe payload use as international extension messages. This type is variable in length up to a maximum of 1008 bits (up to 5 AIVDM sentence payloads).

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 8
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Spare		x	Not used
40-49	10	Designated Area Code	dac	u	Unsigned integer
50-55	6	Functional ID	fid	u	Unsigned integer
56	952	Data	data	d	Binary data, May be shorter than 952 bits.

Interpretation of the binary payload is controlled by DAC/FID as in message type 6. The following is a non-exhaustive list of standardized DAC-FID pairs in use for type 8:

DAC	FID	Sub	Source	Status	Description
1	11		[IMO236]	Deprecated/In Use	Meteorological/Hydrological Data
1	13		[IMO236]	Deprecated	Fairway closed
1	15		[IMO236]	Deprecated	Extended ship and voyage
1	17		[IMO89]	In use	VTS-Generated/Synthetic targets
1	19		[IMO289]	Standard	Marine traffic signals
1	21		[IMO289]	Standard	Weather observation from ship
1	22		[IMO289]	In use	Area notice (broadcast)
1	24		[IMO289]	Standard	Extended ship and voyage
1	26		[IMO289]	Standard	Environmental
1	27		[IMO289]	Standard	Route info broadcast
1	29		[IMO289]	Standard	Text description broadcast
1	31		[IMO289]	In use	Meteorological and Hydrological
200	10		[INLAND]	Standard	Ship static and voyage related data
200	23		[INLAND]	Standard	EMMA warning report
200	24		[INLAND]	Standard	Water levels
200	40		[INLAND]	Standard	Signal status
316/366	1	2	[SEAWAY]	In use	Wind
316/366	1	1	[SEAWAY]	In use	Weather station
316/366	1	3	[SEAWAY]	In use	Water level
316/366	1	6	[SEAWAY]	In use	Water flow
316/366	2	1	[SEAWAY]	In use	Lockage Order
316/366	2	2	[SEAWAY]	In use	Estimated Lock Times
316/366	32	1	[SEAWAY]	In use	Seaway Version Message
366	1	4	[SEAWAY]	In use	PAWS Hydro / Current
366	1	6	[SEAWAY]	In use	PAWS Hydro / Salinity Temp
366	1	3	[SEAWAY]	In use	PAWS Vessel Procession Order

DAC/FID pairs are assigned separately per message type. For St. Lawrence Seaway messages, the DAC may be 316 (Canada) or 366 (U.S.) depending on the transmitter location.

Note that the apparent presence of one of these DAC/FID pairs does not guarantee that the message is structured. Decoders should perform range validation on the structured fields and interpret the message as unstructured if any check fails. Actual false matches with DAC/FID = 200/10 have been observed in the wild.

DAC/FID pairs 1/23, 1/28, and 1/30 have addressed versions described under type 6.

FID types 11-15 are being phased out and are not to be used after 1 Jan 2013. The deprecated IMO236 1/11 has a different binary layout from the IMO289 1/31. FID type 17 is in use; there is a proposed update for it in [IMO289].

Breakdowns of Message 8 subtypes from [IMO289] follow.

Meteorological and Hydrological Data (IMO236)

A message 8 subtype. DAC = 001 FID = 11. Fixed length, 352 bits. This is in use and described in [IMO236], but has been deprecated by [289] in favor of a message with the same title but FID = 31 and a different binary layout. [IMO236] specifies a maximum interval between broadcast of this message of 12 minutes.

Field	Len	Description	Member	u	Units
0-5	6	Message Type	type	u	Constant: 8
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Spare		x	Not used
40-49	10	DAC	dac	u	DAC = 001
50-55	6	FID	fid	u	FID = 11

Field	Len	Description	Member	u	Units
56-79	24	Latitude	lat	I3	Unit = minutes * 0.001, 0x7FFFFF = N/A (default), E positive, W negative.
80-104	25	Longitude	lon	I3	Unit = minutes * 0.001, 0xFFFFFF = N/A (default), N positive, S negative.
105-109	5	Day (UTC)	day	u	1-31, 31=N/A (default)
110-114	5	Hour (UTC)	hour	u	0-23, 31=N/A (default)
115-120	6	Minute (UTC)	minute	u	0-59, 63=N/A (default)
121-127	7	Average Wind Speed	wspeed	u	10-min avg wind speed, knots, 127 = N/A (default).
128-134	7	Gust Speed	wgust	u	10-min max wind speed, knots, 127 = N/A (default).
135-143	9	Wind Direction	wdir	u	0-359, degrees from true north 511 = N/A (default)
144-152	9	Wind Gust Direction	wgustdir	u	0-359, degrees fom true north 511 = N/A (default)
153-163	11	Air Temperature	temperature	u	Dry bulb temp: 0.1 deg C -60.0 to +60.0, 2047 = N/A (default),
164-170	7	Relative Humidity	humidity	u	0-100%, units of 1%, 127 = N/A (default).
171-180	10	Dew Point	dewpoint	u	-20.0 to +50.0: 0.1 deg C, 1023 = N/A (default),
181-189	9	Air Pressure	pressure	u	800-1200hPa: units 1hPa, 511 = N/A (default).
190-191	2	Pressure Tendency	pressuretend	e	0 = steady, 1 = decreasing, 2 = increasing, 3 - N/A (default).
192-199	8	Horiz. Visibility	visibility	U1	0-25.0, units of 0.1nm 255 = N/A (default)
200-208	9	Water Level	waterlevel	I1	-10.0 to +30.0 in 0.1m, 511 = N/A (default).
209-210	2	Water Level Trend	leveltrend	e	0 = steady, 1 = decreasing, 2 = increasing, 3 - N/A (default).
211-218	8	Surface Current Speed	cspeed	U1	0.0-25.0 knots: units 0.1 knot
219-227	9	Surface Current Direction	cdir	u	0-359: deg from true north, 511 = N/A (default)
228-235	8	Current Speed #2	cspeed2	U1	0.0-25.0 in units of 0.1 knot, 255 = N/A (default).
236-244	9	Current Direction #2	cdir2	u	0-359: deg. fom true north, 511 = N/A (default)
245-249	5	Measurement Depth #2	cdepth2	U1	0-30m down: units 0.1m, 31 = N/A (default).
250-257	8	Current Speed #3	cspeed3	U1	0.0-25.0: units of 0.1 knot, 255 = N/A (default).
258-266	9	Current Direction #3	cdir3	u	0-359: degrees fom true north, 511 = N/A (default).
267-271	5	Measurement Depth #3	cdepth3	U1	0-30m down: units 0.1m, 31 = N/A (default).
272-279	8	Wave height	waveheight	U1	0-25m: units of 0.1m, 255 = N/A (default).
280-285	6	Wave period	waveperiod	u	Seconds 0-60: 63 = N/A (default).
286-294	9	Wave direction	wavedir	u	0-359: deg. fom true north, 511 = N/A (default).
295-302	8	Swell height	swellheight	U1	0-25m: units of 0.1m 255 = N/A (default).
303-308	6	Swell period	swellperiod	u	Seconds 0-60: 63 = N/A (default).
309-317	9	Swell direction	swelldir	u	0-359: deg. fom true north, 511 = N/A (default).
318-321	4	Sea state	seastate	e	See "Beaufort Scale"
322-331	10	Water Temperature	watertemp	U1	-10.0 to 50.0: units 0.1 C, 1023 = N/A (default).
332-334	3	Precipitation	preciptype	e	See "Precipitation Types"
335-343	9	Salinity	salinity	U1	0.0-50.0%: units 0.1%, 511 = N/A (default)
344-345	2	Ice	ice	e	0 = No 1 = Yes 2 = (reserved for future use) 3 = not available = default
346-351	6	Spare		x	Not used

[IMO236] says "If there is no data available, default value to be transmitted is the highest available binary value for that particular data field.", the above table reflects that. The day, hour and minute have to be considered not available when all three are set to their individual "N/A" value. For the latitude and the longitude, the highest positive value is used, as the highest available binary value for a signed integer is -1, which would forbid the -0.001/-0.001 position. The replacement FID=31 message has different default values that remove any ambiguities.

[IMO236] gives the length of this message as 352, but lists only 336 payload bits.

Water level is deviation from local chart datum and includes tide.

The waveheight field is labeled as "Significant" in [IMO236], for whatever that means.

The seastate field has a note in [IMO236] reading "(manual input?)"?

WMO 306 Code table 4.201 specifies the following precipitation type values:

Table 28. Precipitation Types

Code	Precipitation Type
0	Reserved
1	Rain
2	Thunderstorm
3	Freezing rain
4	Mixed/ice
5	Snow
6	Reserved
7	N/A (default)

Table 29. Beaufort Scale

Scale	Description	Sea Conditions
0	Calm	Flat.
1	Light air	Ripples without crests.
2	Light breeze	Small wavelets.
Crests of glassy appearance, not breaking.	3	Gentle breeze
Large wavelets.	Crests begin to break; scattered whitecaps.	4
Moderate breeze	Small waves.	5
Fresh breeze	Moderate (1.2 m) longer waves. Some foam and spray.	6
Strong breeze	Large waves with foam crests and some spray.	7
High wind	Sea heaps up and foam begins to streak.	8
Gale	Moderately high waves with breaking crests	forming spindrift. Streaks of foam.
9	Strong gale	High waves (6-7 m) with dense foam.
Wave crests start to roll over. Considerable spray.	10	Storm
Very high waves. The sea surface is white and there	is considerable tumbling. Visibility is reduced.	11
Violent storm	Exceptionally high waves.	12
Hurricane force	Huge waves. Air filled with foam and spray. Sea	completely white with driving spray. Visibility
greatly reduced.	13	
N/A (default)	14-15	

Fairway Closed

This message should be broadcast from shore stations to inform ships, in particular to give guidance to large vessels about temporary closed fairways or sections in ports.

A message 8 subtype. DAC = 001 FID = 13. Fixed length, 472 bits. Described in [IMO236] but deprecated by [IMO289].

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 8
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Spare		x	Not used
40-49	10	DAC	dac	u	DAC = 001
50-55	6	FID	fid	u	FID = 13
56-175	120	Reason For Closing	reason	t	20 6-bit characters
176-295	120	Location Of Closing From	closefrom	t	20 6-bit characters
296-415	120	Location of Closing To	closeto	t	20 6-bit characters
416-425	10	Radius extension	radius	u	0-1000, 10001 = N/A (default)
426-427	2	Unit of extension	extunit	u	0=m, 1=km, 2=nm, 3=cables
428-432	5	From day (UTC)	fday	u	1-31, 0=N/A (default)
433-436	4	From month (UTC)	fmonth	u	1-12, 0=N/A (default)
437-441	5	From hour (UTC)	fhour	u	0-23, 24=N/A (default)
442-447	6	From minute (UTC)	fminute	u	0-59, 60=N/A (default)
448-452	5	To day (UTC)	tday	u	1-31, 0=N/A (default)
453-456	4	To month (UTC)	tmonth	u	1-12, 0=N/A (default)
457-461	5	To hour (UTC)	thour	u	0-23, 24=N/A (default)
462-467	6	To minute (UTC)	tminute	u	0-59, 60=N/A (default)
468-471	4	Spare		x	Not used

No default is specified for the radius field in the standard.

IMO236 Extended Ship Static and Voyage Related Data

This message should be used by a ship to report the height over keel.

A message 8 subtype. DAC = 001 FID = 15 in [IMO236]. Fixed length, 72 bits. Deprecated in [IMO289].

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 8
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Spare		x	Not used
40-49	10	DAC	dac	u	DAC = 001
50-55	6	FID	fid	u	FID = 15
55-66	11	Air Draught	airdraught	u	Height in meters, 0 = N/A (default), 2047 = >= 2047 m,
67-71	5	Spare		x	Not used

VTS-Generated/Synthetic targets

A message 8 subtype. DAC = 001 FID = 17. Variable length: 176-536 bits. This message is laid out identically in [IMO236] and [IMO289]. In [IMO236] it is titled "Pseudo-AIS Targets".

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 8
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Spare		x	Not used
40-49	10	DAC	dac	u	DAC = 001
50-55	6	FID	fid	u	FID = 17
56			targets	a4	Synthetic targets array
0-1	2	Identifier type	idtype	e	0 = id is the MMSI number, 1 = id is the IMO number, 2 = id is the call sign, 3 = Other (default).
2-43	42	Target identifier	id	u	Target ID data.
44-47	4	Spare		x	Not used
48-71	24	Latitude	lat	I3	Minutes * 0.001, 91000 = N/A (default), N positive, S negative.
72-96	25	Longitude	lon	I3	Minutes * 0.001, 181000 = N/A (default), E positive, W negative.
97-105	9	Course Over Ground	course	u	0-359 deg from true north, 360 = N/A (default).
106-111	6	Time Stamp	second	u	Second of UTC timestamp.
112-121	10	Speed Over Ground	speed	u	0-254 in knots, 255 = N/A.

The interpretation of the target identifier field depends on the preceding type key. For 0 and 1 it is a big-endian unsigned binary integer (as shown above). For type 2 and 3 it is 6-bit ASCII text. An unknown target is expressed by type 3 and the string "@@@@@@@".

OPEN-QUESTION: [IMO289] says: "When MMSI or IMO number is used, the least significant bit should equal bit zero of the Target Identifier." It is unclear how "bit zero" is to be interpreted, but it is not possible to reconcile interpreting it as the leading bit of the field with AIS big-endian encoding. Settling this awaits live testing.

The trailing eight fields may be repeated up to 3 times (for a total of 1 to 4 field groups) to represent up to 4 targets.

IMO289 Marine Traffic Signal

This message provides information on a signal station and status of the control signal at the entrance of a harbour or channel where the shipping direction controlled so that the traffic flow be kept in order.

A message 8 subtype described in [IMO289]. DAC = 001 FID = 19. Fixed length: 360 bits.

Field	Len	Description	Member	u	Units
0-5	6	Message Type	type	u	Constant: 8
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Spare		x	Not used
40-49	10	DAC	dac	u	DAC = 001
50-55	6	FID	fid	u	FID = 19
56-65	10	Message Linkage ID	linkage	u	Unsigned integer
66-185	120	Name of Signal Station	station	t	20 6-bit chars
186-210	25	Longitude	lon	I3	Unit = minutes * 0.001 181000 = N/A (default) E positive, W negative.
211-234	24	Latitude	lat	I3	Unit = minutes * 0.001 91000 = N/A (default) N positive, S negative.
235-236	2	Status of Signal	status	u	0=N/A (default 1 = In regular service 2 = Irregular service 3 = Reserved for future use
237-241	5	Signal In Service	signal	e	See "Marine Traffic Signals"
242-246	5	UTC hour	hour	u	0-23, 24=N/A (default)
247-252	6	UTC minute	minute	u	0-59, 60=N/A (default)
253-257	5	Expected Next Signal	nextsignal	e	See "Marine Traffic Signals"
258-359	102	Spare		x	Not used

Table 30. Marine Traffic Signals

Code	Position Fix Type
0	N/A (default)
1	IALA port traffic signal 1: Serious emergency – all vessels to stop
or divert according to instructions.	2
IALA port traffic signal 2: Vessels shall not proceed.	3
IALA port traffic signal 3: Vessels may proceed. One way traffic.	4
IALA port traffic signal 4: Vessels may proceed. Two way traffic.	5
IALA port traffic signal 5: A vessel may proceed only when it has	received specific orders to do so.
6	IALA port traffic signal 2a: Vessels shall not proceed, except that
vessels which navigate outside the main channel need not comply with	the main message.
7	IALA port traffic signal 5a: A vessel may proceed only when it has
received specific orders to do so; except that vessels which navigate	outside the main channel need not comply with the main message.
8	Japan Traffic Signal - I = "in-bound" only acceptable.
9	Japan Traffic Signal - O = "out-bound" only acceptable.
10	Japan Traffic Signal - F = both "in- and out-bound" acceptable.
11	Japan Traffic Signal - XI = Code will shift to "I" in due time.
12	Japan Traffic Signal - XO = Code will shift to "O" in due time.
13	Japan Traffic Signal - X = Vessels shall not proceed, except a vessel
which receives the direction from the competent authority.	14-31

IMO289 Weather observation report from ship

There are two variants of this message. They are distinguished by bit 56, the WMO bit. Field layouts after that bit vary depending on it.

A message 8 subtype described in [IMO289]. DAC = 001 FID = 21. Fixed length: 360 bits.

Table 31. Weather observation report from ship: Non-WMO variant

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 8
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Spare		x	Not used
40-49	10	DAC	dac	u	DAC = 001
50-55	6	FID	fid	u	FID = 21
56-56	1	Variant	wmo	b	Constant: 0 in this variant
57-176	120	Location	location	t	20 6-bit characters
177-201	25	Longitude	lon	I3	Unit = minutes * 0.001, 181000 = N/A (default), E positive, W negative.
202-225	24	Latitude	lat	I3	Unit = minutes * 0.001, 91000 = N/A (default), N positive, S negative.
226-230	5	UTC Day	day	u	1-31, 0=N/A (default)
231-235	5	UTC hour	hour	u	0-23, 24=N/A (default)
236-241	6	UTC minute	minute	u	0-59, 60=N/A (default)
242-245	4	Present Weather	weather	u	wmocode: 0-15
246-246	1	Visibility Limit	vislimit	b	See below
247-253	7	Horiz. Visibility	visibility	U1	0.0-12.6nm, units = nm*0.1, 127 = N/A (default).
254-260	7	Relative Humidity	humidity	u	0-100%: units of 1%, 127 = N/A (default).
261-267	7	Average Wind Speed	wspeed	u	10-min avg wind speed knots, 127 = N/A (default).
268-276	9	Wind Direction	wdir	u	0-359, deg. fom true north, 360 = N/A (default).
277-285	9	Air Pressure	pressure	u	800-1200hPa: units 1hPa, 402 = pressure >= 1201 hPa, 403 - N/A (default), else add 400 to value,
286-289	4	Pressure Tendency	pressuretend	u	WMO FM13 code

Field	Len	Description	Member	T	Units
290-300	11	Air Temperature	airtemp	I1	Dry bulb temp: units 0.1C, -60.0 to +60.0, -1024 = N/A (default).
301-310	10	Water Temperature	watertemp	I1	-10.0 to 50.0 in 0.1 C, 601 = N/A (default), else -10C after scaling.
311-316	6	Wave period	waveperiod	u	Seconds: 0-60, 63 = N/A (default).
317-324	8	Wave height	waveheight	U1	0-25m in units of 0.1m, 255 = N/A (default).
325-333	9	Wave direction	wavedir	u	0-359: deg. fom true north, 360 = N/A (default).
334-341	8	Swell height	swellheight	U1	0-25m: units 0.1m, 255 = N/A (default)
342-350	9	Swell direction	swelldir	u	0-359: deg, fom true north, 360 = N/A (default).
351-356	6	Swell period	swellperiod	u	Seconds: 0-60, 63 = N/A (default).
357-359	3	Spare		x	Not used

The vislimit bit, when on, indicates that the maximum range of the visibility equipment was reached and the visibility reading shall be regarded as > x.x NM.
The standard ([[IMO289]]) does not list the WMO FM13 codes. The following table applies:

Table 32. Weather observation report from ship: WMO Code 45501

Code	Precipitation Type
0	Clear (no clouds at any level)
1	Cloudy
2	Rain
3	Fog
4	Snow
5	Typhoon/hurricane
6	Monsoon
7	Thunderstorm
8	N/A (default)
9-15	Reserved for future use

Table 33. Weather observation report from ship: WMO variant

0-5	6	Message Type	type	u	Constant: 8
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Spare		x	Not used
40-49	10	DAC	dac	u	DAC = 001
50-55	6	FID	fid	u	FID = 21
56-56	1	Variant	wmo	u	Constant: 1 in this variant
57-72	16	Longitude	lon	I3	Unsigned: minutes * 0.01, E positive, W negative, Lon = (value / 100) – 180, 65536 = N/A (default).
73-87	15	Latitude	lat	I3	Unsigned: minutes * 0.01, N positive, S negative, Lat = (value / 100) – 90, 32767 = N/A (default).
88-91	4	UTC Month	month	u	1-12, 15=N/A (default)
92-97	6	UTC Day	day	u	1-31, 63=N/A (default)
98-102	5	UTC hour	hour	u	0-23, 31=N/A (default)
103-105	3	UTC minute	minute	u	0-50, 7=N/A (default), Minute = (value * 10).
106-112	7	Course Over Ground	course	u	0-359, unit = 1 degree, average over last 10 minutes.
113-117	5	Speed Over Ground	speed	U1	0-14.5m/s: SOG = (value * 0.5) for 0-29, 30 = 15 m/s and more, average over last 10 minutes. 31 = N/A (default)
118-124	7	Heading of the ship	heading	u	5-360: units of 5 degrees, HDT = (value * 5) for 1-72, average over last 10 minutes. 127 = N/A (default)
125-135	11	Pressure at sea level	pressure	U1	90-1100 hPa: P = (value/10)+900 for 0-2000
136-145	10	Pressure Change	pdelta	U1	-50-+50hPa: units of 0.1hPa, d = (value/10)-50 for 0-100, averaged over last 3 hours. 1023 = N/A (default)
146-149	4	Pressure Tendency	ptend	u	WMO BUFR table 010063: Averaged over last 3 hours, 0-8, 15 = N/A.

0-5	6	Message Type	type	u	Constant: 8
150-156	7	True Wind Direction	twinddir	u	005-360: deg: average over last 10 minutes, dir = (value*5), value 1-72, 0 = calm, 127 = N/A (default).
157-164	8	True Wind Speed	twindspeed	u	0-127 m/s: average over last 10 mins, speed = value * 0.5, 255 = N/A (default).
165-171	7	Relative Wind Direction	rwinddir	u	005-360 deg: average over last 10 mins, dir = (value*5) for 1-72, 0 = calm, 127 = N/A (default).
172-179	8	Relative Wind Speed	rwindspeed	U1	0-127 m/s: average over last 10 mins, speed = val*0.5 for 0-254, 255 = N/A (default).
180-187	8	Maximum Gust Speed	mgustspeed	U1	0-127 m/s: speed = val*0.5 for 0-254, 255 = N/A (default),
188-194	7	Maximum Gust Direction	mgustdir	u	05-360 deg: dir = (value*5) for 1-72, 0 = calm, 127 = N/A (default).
195-204	10	Air Temperature	airtemp	U1	Dry bulb temp: units 0.1C, 223-323K (c.-50C - +50C). T = (val/10)+223 for 0-1000, 1023 = N/A (default).
205-211	7	Relative Humidity	humidity	u	0-100%: units of 1%, 127 = N/A (default).
212-220	9	Sea Surface Temperature	surftemp	U1	268-318K (c.-5C - +45C): T = (val/10)+268 for 0-500, 511 = N/A (default).
221-226	6	Horiz. Visibility	visibility	U2	0-50000m, Vis = (val**2)*13.073 for 0-62, 63 = N/A (default).
227-235	9	Present Weather	weather	u	BUFR table 020003: Codes 0-510, 511 = N/A (default).
236-240	5	Past Weather 1	pweather1	u	BUFR table 020005: Codes 0-30, 31 = N/A (default).
241-245	5	Past Weather 2	pweather2	u	BUFR table 020004: Codes 0-30, 31 = N/A (default).
246-249	4	Total Cloud Cover	totalcloud	u	0-100%: Cover = val * 10% for 0-10, 15 = N/A (default.)
250-253	4	Cloud amount (low)	lowclouda	u	0-14: BUFR table 020011: 15 = N/A (default).
254-259	6	Cloud type (low)	lowcloudt	u	0-62: BUFR table 020012: 63 = N/A (default).
260-265	6	Cloud type (middle)	midcloudt	u	0-62: BUFR table 020012: 63 = N/A (default).
266-271	6	Cloud type (high)	highcloudt	u	0-62: BUFR table 020012: 63 = N/A (default).
272-278	7	Height of cloud base	cloudbase	U2	0-2500m: h = (value*2).0.16 for 0-125, 126 = more than 2500m, 127 = N/A (default).
279-283	5	Period of Wind Waves	wwperiod	u	0-30s: 31 = N/A (default).
284-289	6	Height of Wind Waves	wwheight	u	Height in meters: 0-30, h = (value * 0.5) for 0-60, 63 = N/A (default).
290-295	6	First Swell Direction	swelldir1	u	10-360 deg: dir = (value*10) for 1-36, 0 = calm, 63 = N/A (default).
296-300	5	First Swell Period	swperiod1	u	Period in seconds: 0-30, 31 = N/A (default).
301-306	6	First Swell Height	swheight1	U1	Height in meters: 0-30, h = (value * 0.5) for 0-60, 63 = N/A (default).
307-312	6	Second Swell Direction	swelldir2	u	10-360 deg: dir = (value*10) for 1-36, 0 = calm, 63 = N/A (default).
313-317	5	Second Swell Period	swperiod2	u	Period in seconds: 0-30, 31 = N/A (default).
318-323	6	Second Swell Height	swheight2	U1	Height in meters: 0-30, h = (value * 0.5) for 0-60, 63 = N/A (default).
324-330	7	Ice deposit (thickness)	icedeposit	u	Thickness: 0-126cm, 127 = N/A (default).
331-333	3	Rate of Ice Accretion	icerate	u	0-6: BUFR table 020032: 7 = N/A (default).
334-336	3	Cause of Ice Accretion	icecause	u	0-6: BUFR table 020033: 7 = N/A (default).
337-341	5	Sea Ice Concentration	seaice	u	0-30: BUFR table 020034: 31 = N/A (default).
342-345	4	Amount and Type of Ice	icetype	u	0-14: BUFR table 020035: 15 = N/A (default).
346-350	5	Ice Situation	icestate	u	0-30: BUFR table 020036: 31 = N/A (default).
351-355	5	Ice Development	icedevel	u	0-30: BUFR table 020037: 31 = N/A (default).

0-5	6	Message Type	type	u	Constant: 8
356-359	4	Bearing of Ice Edge	icebearing	u	Bearing: 45-360 deg, dir = (value*45) for 1-8, 15 = N/A (default).

The "minute" entry actually only identifies the end of a 10-minute interval.

In [IMO289], the Latitude formula is given as "Lat = (value / 100) – 9000". This is incorrect; the decrement needs to be 90 for the range to be -90..+90.

Swell directions are arrival directions.

IMO289 Area Notice (broadcast)

This should be used to broadcast time- and location-dependent information about hazards to navigation. For information-lifetime restrictions and usage guidance, refer to [ITU1371].

A message 8 subtype. DAC = 001 FID = 22. 196 to 981 bits. There is a related Message 6 subtype for addressed use.

The message consists of a fixed-length header of 111 bits, followed by 1 to 10 sub-area indications which are fixed-length records 87 bits long. Here is the message header format:

Table 34. Area Notice (addressed) message header

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 6
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Spare		x	Not used
40-49	10	DAC	dac	u	DAC = 001
50-55	6	FID	fid	u	FID = 22
56-65	10	Message Linkage ID	linkage	u	Unsigned integer
66-72	7	Notice Description	notice	u	See table below
73-76	4	Month (UTC)	month	u	1-12; 0 = N/A (default)
77-81	5	Day (UTC)	day	u	1-31; 0 = N/A (default)
82-86	5	Hour (UTC)	hour	u	0-23; 24 = N/A (default)
87-92	6	Minute (UTC)	minute	u	0-59; 60 = N/A (default)
93-110	18	Duration	duration	In minutes, 262143 = N/A (default), 0 = cancel this notice.	143
		subarea	a10	Subarea array	0-2
2		shape	u	Subarea shape	3-86

The sub-area indications are as described under the addressed form, message type 6 with DAC = 1 and FID = 23.

IMO289 Extended Ship Static and Voyage Related Data

This message should be used by a ship to report the height over keel.

A message 8 subtype. DAC = 001 FID = 24 in [IMO289]. Fixed length, 360 bits. Replaces a deprecated trial message from [IMO236].

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 8
6-7	2	Repeat Indicator	repeat	u	As in CNB
8-37	30	Source MMSI	mmsi	u	9 digits
38-39	2	Spare		x	Not used
40-49	10	DAC	dac	u	DAC = 001
50-55	6	FID	fid	u	FID = 24
56-65	10	Message Linkage ID	linkage	u	Unsigned integer
66-78	13	Air Draught	airdraught	u	Unsigned int, in 0.1m 1-81.9 m. 0 = N/A (default) 81.91 = >= 81.91 m
79-108	30	Last Port Of Call	lastport	t	5 6-bit chars, UN locode
109-138	30	Next Port Of Call	nextport	t	5 6-bit chars, UN locode
139-168	30	Second Port Of Call	secondport	t	5 6-bit chars, UN locode
169-170	2	AIS Class A	ais_state	e	See "SOLAS Status"
171-172	2	Automatic Tracking Aid	ata_state	e	See "SOLAS Status"
173-174	2	BNWAS	bnwas_state	e	See "SOLAS Status"
175-176	2	ECDIS Back-up	ecdisb_state	e	See "SOLAS Status"
177-178	2	Paper Nautical Chart	chart_state	e	See "SOLAS Status"
179-180	2	Echo sounder	sounder_state	e	See "SOLAS Status"
181-182	2	Electronic plotting aid	epaid_state	e	See "SOLAS Status"
183-184	2	Emergency steering gear	steer_state	e	See "SOLAS Status"
185-186	2	GNSS	gnss_state	e	See "SOLAS Status"
187-188	2	Gyro compass	gyro_state	e	See "SOLAS Status"
189-190	2	LRIT	lrit_state	e	See "SOLAS Status"
191-192	2	Magnetic compass	magcomp_state	e	See "SOLAS Status"
193-194	2	NAVTEX	navtex_state	e	See "SOLAS Status"
195-196	2	Radar (ARPA)	arpa_state	e	See "SOLAS Status"
197-198	2	Radar (S-band)	sband_state	e	See "SOLAS Status"
199-200	2	Radar (X-band)	xband_state	e	See "SOLAS Status"
201-202	2	Radio HF	hfradio_state	e	See "SOLAS Status"

Field	Len	Description	Member	T	Units
203-204	2	Radio INMARSAT	inmarsat_state	e	See "SOLAS Status"
205-206	2	Radio MF	mfradio_state	e	See "SOLAS Status"
207-208	2	Radio VHF	vhfradio_state	e	See "SOLAS Status"
209-210	2	Speed Log over ground	grndlog_state	e	See "SOLAS Status"
211-212	2	Speed Log through water	waterlog_state	e	See "SOLAS Status"
213-214	2	THD	thd_state	e	See "SOLAS Status"
215-216	2	Track control system	tcs_state	e	See "SOLAS Status"
217-218	2	VDR/S-VDR	vdr_state	e	See "SOLAS Status"
219-220	2	Reserved		x	Not used
221-224	4	Ice Class	iceclass	e	See "Ice Class"
225-242	18	Shaft Horsepower	horsepower	u	Total ship HP: 1hp units, 262,142 = >= 262,142hp, 262,143 = N/A (default).
243-254	12	VHF Working Channel	vhfchan	u	Channel number, 0 = N/A (default).
255-296	42	Lloyd's Ship Type	lshiptype	t	7 six-bit characters
297-314	18	Gross Tonnage	tonnage	u	0-262,141, 262,142 = >= 262,142hp, 262,143 = N/A (default).
315-316	2	Laden or Ballast	lading	e	0 = N/A (default), 1 = Laden, 2 = Ballast, 3 = Not in use.
317-318	2	Heavy Fuel Oil Bunkered	heavyoil	e	0 = N/A (default), 1 = No, 2 = Yes, 3 = Not in use.
319-320	2	Light Fuel Oil Bunkered	lightoil	e	0 = N/A (default), 1 = No, 2 = Yes, 3 = Not in use.
321-322	2	Diesel Oil Bunkered	dieseloil	e	0 = N/A (default), 1 = No, 2 = Yes, 3 = Not in use.
323-336	14	Total Bunker Oil	totaloil	u	0-16381 in tonnes, 16382 = >= 16382 tonnes, 16382 = N/A (default).
337-349	13	Number of persons	persons	u	0 = N/A (default), 1-8190, 8191 = >= 8191.
350-359	10	Spare		x	Not used

The special value of 81.91 for air draught is probably a drafting error in [IMO289], as the scaled field does not have the precision required to represent it. The actual special value is unknown.

The 2-bit _state fields describe the operational state of various sorts of SOLAS-required navigational equipment. GNSS systems may include GPS, Loran-C, or GLONASS. BNWAS is the Bridge Navigational Watch Alarm System. THD is a Transmitting Heading Device. Paper Nautical Chart state is officially "ECDIS/Paper Nautical Chart" state in [IMO289]. Status codes should be interpreted according to the following table:

Table 35. SOLAS Status

Code	Meaning
0	Not available or requested (default)
1	Equipment operational
2	Equipment not operational
3	No data (equipment may or may not be on board/or its status is unknown)

Table 36. Ice Class

Code	Meaning
0	Not classified
1	IACS PC 1
2	IACS PC 2
3	IACS PC 3
4	IACS PC 4
5	IACS PC 5
6	IACS PC 6 / FSICR IA Super / RS Arc5
7	IACS PC 7 / FSICR IA / RS Arc4
8	FSICR IB / RS Ice3
9	FSICR IC / RS Ice2
10	RS Ice1
11-14	Reserved for future use
15	Not available = default

ACS = International Association of Classification Societies

PC = Polar Class. For further details, see IACS Req. 2007 Requirements concerning POLAR CLASS and MSC/Circ.1056 and MEPC/Circ.399 on Guidelines for ships operating in Arctic ice-covered waters.

FSICR = Finnish-Swedish Ice Class Rules. For further details, see Finnish Maritime Administration's Bulletin No.10/10.12.2008 Ice class regulations 2008 (Finnish-Swedish ice class rules). Note: Authorized classification society equivalents for the Finnish-Swedish Ice Class Rules should also be recognized, as issued in the Finnish Maritime Administration's Bulletin No.4/2.4.2007 (as amended). Both bulletins can be found at www.fma.fi.

RS = Russian Maritime Register of Shipping. For further details see Rules for the classification and construction of seagoing ships, Edition 2008.

VHF channel number is encoded according to Recommendation ITU-R M.1084.

The lshiptype field uses Lloyd's Register STATCODE 5 encoding.

IMO289 Environmental

A message 8 subtype. DAC = 001 FID = 26. Variable length: 168-1008 bits.

Table 37. Environmental message header

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 6
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Spare		x	Not used
40-49	10	DAC	dac	u	DAC = 001
50-55	6	FID	fid	u	FID = 26
56			reports	a5	Sensor records array
0-3	4	Sensor Report Type	sensor	u	See table below
4-8	5	Day (UTC)	day	u	1-31; 0 = N/A (default)
9-13	5	Hour (UTC)	hour	u	0-23; 24 = N/A (default)
14-19	6	Minute (UTC)	minute	u	0-59; 60 = N/A (default)
20-26	7	Site ID	site	u	Binary ID of sensor site
27-111	85	Sensor payload	payload	d	Sensor payload data

The fixed header is followed by 1-5 sensor records, each 112 bits long. The Sensor Report Type is interpreted as follows, and controls the interpretation of the sensor payload data.

Table 38. Sensor report types

0	Site location
1	Station ID
2	Wind
3	Water level
4	Current flow (2D)
5	Current flow (3D)
6	Horizontal current flow
7	Sea state
8	Salinity
9	Weather
10	Air gap/Air draft
11	(reserved for future use)

Here are the payload types for each variant:

Table 39. Site location payload

Field	Len	Description	Member	T	Units
0-27	28	Longitude	lon	I4	As in Common Navigation Block
28-54	27	Latitude	lat	I4	As in Common Navigation Block
55-65	11	Altitude	alt	u	Sensor altitude above MSL, 0-200 in units of 0.1m, 2001 = 200.1 m or higher, 2002 = N/A (default), 2003-2046 reserved.
66-69	4	Sensor owner	owner	e	See "Sensor Owner Codes"
70-72	3	Data timeout	timeout	e	See "Data Timeout Codes"
73-84	12	Spare		x	Not used

Table 40. Sensor Owner Codes

0	Unknown (default)
1	Hydrographic office
2	Inland waterway authority
3	Coastal directorate
4	Meteorological service
5	Port Authority
6	Coast guard
7-13	(reserved for future use)
14	(reserved for regional use)

Table 41. Data Timeout Codes

0	No time period (default)
1	10 minutes
2	1 hour
3	6 hours
4	12 hours
5	24 hours

0	No time period (default)
6-7	(reserved for future use)

Table 42. Station ID payload

Field	Len	Description	Member	T	Units
0	84	Name	name	t	14 chars of six-bit ASCII.
84	1	Spare		x	Not used

Table 43. Wind report payload

Field	Len	Description	Member	T	Units
0-6	7	Average Wind Speed	wspeed	u	10-min avg wind speed, 0-120 in 1-knot units, 121 = 121 knots or greater, 122 = N/A (default), 123-126 = reserved.
7-13	7	Wind Gust	wgust	u	10-min max wind speed, 0-120 in 1-knot units, 121 = 121 knots or greater, 122 = N/A (default), 123-126 = reserved.
14-22	9	Wind Direction	wdir	u	0-359, degrees fom true north >=360 = N/A (default)
23-31	9	Wind Gust Direction	wgustdir	u	0-359, degrees fom true north >=360 = N/A (default)
32-34	3	Sensor Description	sensortype	e	See "Sensor Types"
35-41	7	Forecast Wind Speed	fwspeed	u	Predicted average wind speed, 0-120 in 1-knot units, 121 = 121 knots or greater, 122 = N/A (default), 123-126 = reserved.
42-48	7	Forecast Wind Gust	fwgust	u	Predicted max wind speed, 0-120 in 1-knot units, 121 = 121 knots or greater, 122 = N/A (default), 123-126 = reserved.
49-57	9	Forecast Wind Direction	fwdir	u	0-359, degrees fom true north >=360 = N/A (default)
58-62	5	Day (UTC)	day	u	1-31; 0 = N/A (default)
63-67	5	Hour (UTC)	hour	u	0-23; 24 = N/A (default)
68-73	6	Minute (UTC)	minute	u	0-59; 60 = N/A (default)
74-81	8	Duration	duration	u	Forecast duration in minutes, 255 = N/A (default), 0 = cancel forecast.
82-84	3	Spare		x	Not used

The timestamp group is intended as a valid time of forecast.

Table 44. Sensor Types

0	No data (default)
1	Raw real time
2	Real time with quality control
3	Predicted (based on historical statistics)
4	Forecast (predicted, refined with real-time information)
5	Nowcast (a continuous forecast)
6	(reserved for future use)
7	Sensor not available

Table 45. Water level report payload

0-0	1	Water Level Type	absolute	b	False if relative to reference datum.
1-16	16	Water Level	level	i	In 0.001 meter steps, -327.67 to 327.67, -32767 = -327.67m or less, 32767 = 327.67m or more, -32768 = N/A (default).
17-18	2	Water Level Trend	leveltrend	u	0 = increasing, 1 = decreasing, 2 = steady, 3 = N/A (default).
19-23	5	Vertical Reference Datum	datum	u	See table below
24-26	3	Sensor Description	sensortype	e	See "Sensor Types"
27-27	1	Forecast Water Level Type	absolute	b	False if relative to reference datum.
28-43	16	Forecast Water Level	level	i	In 0.001 meter steps, -327.67 to 327.67, -32767 = -327.67m or less, 32767 = 327.67m or more, -32768 = N/A (default).
44-48	5	Day (UTC)	day	u	1-31; 0 = N/A (default)
49-53	5	Hour (UTC)	hour	u	0-23; 24 = N/A (default)
54-59	6	Minute (UTC)	minute	u	0-59; 60 = N/A (default)
60-67	8	Duration	duration	u	Forecast duration in minutes, 255 = N/A (default), 0 = cancel forecast.
68-84	17	Spare		x	Not used

IMO289 says water level is in 0.1m steps, but this is incompatible with the two digits of precision in the range.

The timestamp group is intended as a valid time of forecast.

Table 46. Vertical Reference Datum

0	Mean Lower Low Water (MLLW)
1	International Great Lakes Datum (IGLD-85)
2	Local river datum
3	Station Datum (STND)
4	Mean Higher High Water (MHHW)
5	Mean High Water (MHW)
6	Mean Sea Level (MSL)
7	Mean Low Water (MLW)
8	National Geodetic Vertical Datum (NGVD-29)
9	North American Vertical Datum (NAVD-88)
10	World Geodetic System (WGS-84)
11	Lowest Astronomical Tide (LAT)
12	pool
13	gauge
14	Unknown/not available (default)
15-30	Reserved for future use

Table 47. Current flow (2D) report payload

Field	Len	Description	Member	T	Units
0-7	8	Current Speed #1	cspeed1	U1	0.0-24.5 knots: units 0.1 knots, 246 = speed >= 24.6 knots, 247 = N/A (default), 248-255 (reserved).
8-16	9	Current Direction #1	cdir1	u	0-359: deg from true north, >=360 = N/A (default).
17-25	9	Measurement Depth #1	cdepth1	u	0-360m down: units 1m, 361 = 361m or greater, 362 = N/A (default), 363-511 (reserved).
26-33	8	Current Speed #2	cspeed2	U1	0.0-24.5 knots, units 0.1 knots, 246 = speed >= 24.6 knots, 247 = N/A (default), 248-255 (reserved).
34-42	9	Current Direction #2	cdir2	u	0-359: deg. fom true north, >=360 = N/A (default)
43-51	9	Measurement Depth #2	cdepth2	u	0-360m down: units 1m, 361 = 361m or greater, 362 = N/A (default), 363-511 (reserved).
52-59	8	Current Speed #3	cspeed3	U1	0.0-24.5 knots: units 0.1 knots, 246 = speed >= 24.6 knots, 247 = N/A (default), 248-255 (reserved).
60-68	9	Current Direction #3	cdir3	u	0-359: degrees fom true north, >=360 = N/A (default).
69-77	9	Measurement Depth #3	cdepth3	u	0-360m down: units 1m, 361 = 361m or greater, 362 = N/A (default), 363-511 (reserved).
78-80	3	Sensor Description	sensortype	e	See "Sensor Types"
81-84	4	Spare		x	Not used

Table 48. Current flow (3D) payload

Field	Len	Description	Member	T	Units
0-7	8	Current Vector component North (u) #1	cnorth1	U1	0.0-24.5 knots: units 0.1 knots, 246 = speed >= 24.6 knots, 247 = N/A (default), 248-255 (reserved).
8-15	8	Current Vector component East (v) #1	ceast1	U1	0.0-24.5 knots: units 0.1 knots, 246 = speed >= 24.6 knots, 247 = N/A (default), 248-255 (reserved).
16-23	8	Current Vector component Up (z) #1	cup1	U1	0.0-24.5 knots: units 0.1 knots, 246 = speed >= 24.6 knots, 247 = N/A (default), 248-255 (reserved).
24-32	9	Measurement Depth #1	cdepth1	u	0-360m down: units 1m, 361 = 361m or greater, 362 = N/A (default), 363-511 (reserved).
33-40	8	Current Vector component North (u) #2	cnorth2	U1	0.0-24.5 knots: units 0.1 knots, 246 = speed >= 24.6 knots, 247 = N/A (default), 248-255 (reserved).
41-48	8	Current Vector component East (v) #2	ceast2	U1	0.0-24.5 knots: units 0.1 knots, 246 = speed >= 24.6 knots, 247 = N/A (default), 248-255 (reserved).
49-56	8	Current Vector component Up (z) #2	cup2	U1	0.0-24.5 knots: units 0.1 knots, 246 = speed >= 24.6 knots, 247 = N/A (default), 248-255 (reserved).

Field	Len	Description	Member	T	Units
57-65	9	Measurement Depth #2	cdepth2	u	0-360m down: units 1m, 361 = 361m or greater, 362 = N/A (default), 363-511 (reserved).
66-68	3	Sensor Description	sensortype	e	See "Sensor Types"
69-84	16	Spare		x	Not used

Table 49. Horizontal current report payload

Field	Len	Description	Member	T	Units
0-8	9	Current Bearing #1	bearing1	u	0-359: deg from true north, >=360 = N/A (default).
9-15	7	Current Distance #1	distance1	u	0-120m: 121 = 121m or greater, 122 = N/A (default), 123-127 (reserved).
16-23	8	Current Speed #1	speed1	U1	0.0-24.5 knots: units 0.1 knots, 246 = speed >= 24.6 knots, 247 = N/A (default), 248-255 (reserved).
24-32	9	Current Direction #1	direction1	u	0-359: deg from true north, >=360 = N/A (default).
33-41	9	Measurement Depth #1	depth1	u	0-360m down: units 1m, 361 = 361m or greater, 362 = N/A (default), 363-511 (reserved).
42-50	9	Current Bearing #2	bearing1	u	0-359: deg from true north, >=360 = N/A (default).
51-57	7	Current Distance #2	distance1	u	0-120m: 121 = 121m or greater, 122 = N/A (default), 123-127 (reserved).
58-65	8	Current Speed #2	speed1	U1	0.0-24.5 knots: units 0.1 knots, 246 = speed >= 24.6 knots, 247 = N/A (default), 248-255 (reserved).
66-74	9	Current Direction #2	direction1	u	0-359: deg from true north, >=360 = N/A (default).
75-83	9	Measurement Depth #2	depth1	u	0-360m down: units 1m, 361 = 361m or greater, 362 = N/A (default), 363-511 (reserved).
84-84	1	Spare		x	Not used

Table 50. Sea state report payload

Field	Len	Description	Member	T	Units
0-7	8	Swell Height	swheight	U1	Units 0.1m: 0.0-24.5m, 246 = height >= 24,6m, 247 = N/A (default), 248-255 reserved, else h = (value * 0.5).
8-13	6	Swell Period	swperiod	u	Period in seconds: 0-60, 61 = N/A (default), 62-63 (reserved).
14-22	9	Swell Direction	swelldir	u	0-359 deg: 0-359 true bearing, 360 = N/A (default), 361-511 reserved,
23-26	4	Sea State	seastate	u	Beaufort scale: 0-12 >= 13 = N/A (default)
27-29	3	Swell Sensor Description	swelltype	e	See "Sensor Types"
30-39	10	Water Temperature	watertemp	U1	-10.0 to 50.0: units 0.1 C, >=601 = N/A (default). 602-1023 reserved, else -10.0m after scaling.
40-46	7	Water Temperature Depth	distance1	U1	0.0-12.0m: 0.1m units, 121 = 12.1m or greater, 122 = N/A (default), 123-126 (reserved).
47-49	3	Depth Sensor Description	depthtype	e	See "Sensor Types"
50-57	8	Wave Height	waveheight	U1	Height 0.0-24.5m: units 0.1m, 246 = height >= 24.6m, 247 N/A (default), 248-255 reserved.
58-63	6	Wave Period	waveperiod	u	0-60: units of seconds, 61 = N/A (default), 62-63 reserved.
64-72	9	Wave Direction	wavedir	u	0-359: true bearing, 360 = N/A (default), 361-511 reserved.
73-75	3	Wave Sensor Description	wavetype	e	See "Sensor Types"
76-84	9	Salinity	salinity	U1	0.0-50.0%: units of 0.1% 501 = salinity >= 50.1% 502 = data N/A (default) 503 - sensor N/A, 504-511 reserved.

The standard does not fix the meaning of a water temperature depth of 127.

Table 51. Salinity report payload

Field	Len	Description	Member	T	Units
0-9	10	Water Temperature	watertemp	U1	-10.0 to 50.0: units 0.1 C, >=601 = N/A (default). 602-1023 reserved, else -10.0m after scaling.

Field	Len	Description	Member	T	Units
10-19	10	Conductivity	conductivity	U1	In Siemens/m, 0.0-7.0, 0.1 S/m steps, 701 = not less than 7.01, 702 = data N/A, 703 = sensor N/A (default), 704-1023 (reserved).
20-35	16	Water Pressure	pressure	U1	Water pressure: 0.0-6000.0, 0.1 decibar steps, 60001 = pressure >= 6000.1, 60002 = data N/A, 60003 = sensor N/A (default), 60004-65536 reserved.
36-44	9	Salinity	salinity	U1	0.0-50.0%: units of 0.1% 501 = salinity >= 50.1% 502 = data N/A (default) 503 - sensor N/A, 504-511 reserved.
45-46	2	Salinity Type	salinitytype	e	0 = measured, 1 = calculated using PSS-78, 2 = calculated using other method, 3 = reserved.
47-49	3	Sensor Description	sensortype	e	See "Sensor Types"
50-84	35	Spare		x	Not used

No default is specified for salinity type.

Table 52. Weather report payload

Field	Len	Description	Member	T	Units
0-10	11	Air Temperature	temperature	i	Dry bulb temp: 0.1 deg C -60.0 to +60.0, -1024 = data N/A (default), 601-1023 reserved.
11-13	3	Temp. Sensor Type	sensortype	e	See "Sensor Types"
14-15	2	Precipitation Type	preciptype	e	0 = rain, 1 = rain and snow, 2 = rain and snow, 3 = other.
16-23	8	Horiz. Visibility	visibility	U1	Units of 0.1 nautical miles, 0.0-24.0, 241 = visibility >= 24.1nm, 242 = data N/A, 243 = sensor N/A (default), 244-255 reserved.
24-33	10	Dew Point	dewpoint	i	-20.0 to +50.0: 0.1 deg C, 501 = N/A (default), 502-511 reserved, -511—201 reserved.
34-36	3	Dewpoint Sensor Type	dewtype	e	See "Sensor Types".
37-45	9	Air Pressure	pressure	u	0 = pressure <= 800hpA, 1-401 = 800-1200hPa, 402 = pressure >= 1201 hPa, 403 - data N/A (default), 404-511 reserved.
46-47	2	Pressure Tendency	pressuretend	e	0 = steady, 1 = decreasing, 2 = increasing, 3 - N/A (default).
48-50	3	Pressure Sensor Type	pressuretype	e	See "Sensor Types"
51-59	9	Salinity	salinity	U1	0.0-50.0%: units of 0.1% 501 = salinity >= 50.1% 502 = data N/A (default) 503 - sensor N/A, 504-511 reserved.
60-84	25	Spare		x	Not used

The standard does not specify how to code *Precipitation Type* when there is none.

Table 53. Air Gap/Air Draft report payload

Field	Len	Description	Member	T	Units
0-12	13	Air Draught	airdraught	U1	1-81.9m in 0.1m steps, 8191 = distance >= 81.91m, 0 = N/A (default).
13-25	13	Air Gap	airgap	U1	1-81.9m in 0.1m steps, 8191 = distance >= 81.91m, 0 = N/A (default).
26-27	2	Air Gap Trend	gaptrend	e	0 = steady, 1 = rising, 2 = falling, 3 = N/A (default).
28-40	13	Forecast Air Gap	fairgap	U1	1-81.9m in 0.1m steps, 8191 = distance >= 81.91m, 0 = N/A (default).
41-45	5	Day (UTC)	day	u	1-31; 0 = N/A (default)
46-50	5	Hour (UTC)	hour	u	0-23; 24 = N/A (default)
51-56	6	Minute (UTC)	minute	u	0-59; 60 = N/A (default)
57-84	28	Spare		x	Not used

Air draught is the vertical distance measured from the ship's waterline to the highest point on the ship. Air gap is the vertical distance measured from the surface of the water to the sensor.
The timestamp is for the forecast air gap.

IMO289 Route Information (broadcast)

The content of this message is a time and a list of waypoints describing a course. It has an addressed equivalent that is a message 6 subtype.
A message 8 subtype. DAC = 001 FID = 27. Variable length: 172-997 bits.

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 8
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits

Field	Len	Description	Member	T	Units
38-39	2	Spare		x	Not used
40-49	10	DAC	dac	u	DAC = 001
50-55	6	FID	fid	u	FID = 27
56-65	10	Message Linkage ID	linkage	u	Unsigned integer
66-68	3	Sender Class	sender	u	0 = ship (default), 1 = authority, 27 = reserved for future use.
69-73	5	Route Type	rtype	e	See below
74-77	4	Start month	month	u	1-12, 0=N/A (default)
78-82	5	Start day	day	u	1-31, 0=N/A (default)
83-87	5	Start hour	hour	u	0-23, 24=N/A (default)
88-93	6	Start minute	minute	u	0-59, 60=N/A (default)
94-111	18	Duration	duration	u	Minutes from start time, 0 = cancel route, 262,143 = not available (default).
112-116	5	Waypoint count	waycount	u	1-16, values 17-31 are not used.
117			waypoints	a^16	Waypoint array
0-27	28	Longitude	lon	I4	Unit = minutes * 0.0001, 181000 = N/A (default), E positive, W negative.
28-54	27	Latitude	lat	I4	Unit = minutes * 0.001, 91000 = N/A (default), N positive, S negative.

The final pair of fields in the table above is a waypoint. The message may end with 1 to 16 waypoints.

For interpretation of the Route Type field, see the table under the "Route Information (addressed)" message (DAC=1, FID=28).

IMO289 Text description (broadcast)

A message 8 subtype. DAC = 001 FID = 29. Variable length: 72-1032 bits.

Intended to be used to associate a text annotation with another message via the Message Linkage ID field.

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 8
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Spare		x	Not used
40-49	10	DAC	dac	u	DAC = 001
50-55	6	FID	fid	u	FID = 29
56-65	10	Message Linkage ID	linkage	u	Unsigned integer
66-?	6-966	Description	description	t	String

There is an equivalent subtype of message 6 that is an addressed description.

Meteorological and Hydrological Data (IMO289) ===

A message 8 subtype. DAC = 001 FID = 31. Fixed length, 360 bits. Supersedes an [IMO236] message with the same title but FID = 11 and a different binary layout. The exact differences are: (a) The addition of the Position Accuracy field, (b) water level has 12 bits of precision rather than 9 (units of centimeters rather than decimeters), and (c) end padding changes from 6 to 10 bits.

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 8
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Spare		x	Not used
40-49	10	DAC	dac	u	DAC = 001
50-55	6	FID	fid	u	FID = 31
56-80	25	Longitude	lon	I3	Unit = minutes * 0.001, E positive, We negative, 181000 = N/A (default).
81-104	24	Latitude	lat	I3	Unit = minutes * 0.001, N positive, S negative, 91000 = N/A (default).
105-105	1	Fix quality	accuracy	b	As in Common Navigation Block
106-110	5	Day	day	u	1-31, 0=N/A (default)
111-115	5	Hour	hour	u	0-23, 24=N/A (default)
116-121	6	Minute	minute	u	0-59, 60=N/A (default)
122-128	7	Average Wind Speed	wspeed	u	10-min avg wind speed: knots, 126 = wind >= 126 knots, 127 = N/A (default).
129-135	7	Gust Speed	wgust	u	10-min max wind speed: knots, 126 = wind >= 126 knots, 127 = N/A (default).
136-144	9	Wind Direction	wdir	u	0-359, true bearing, 360 = N/A (default).
145-153	9	Wind Gust Direction	wgustdir	u	0-359, true bearing, 360 = N/A (default).

Field	Len	Description	Member	T	Units
154-164	11	Air Temperature	airtemp	I1	Dry bulb temp: units 0.1C, -60.0 to +60.0, -1024 = N/A (default).
165-171	7	Relative Humidity	humidity	u	0-100%: units of 1%, 101 = N/A (default).
172-181	10	Dew Point	dewpoint	I1	-20.0 to +50.0: units 0.1C, 501 = N/A (default).
182-190	9	Air Pressure	pressure	u	800-1200hPa, 1hPa, 0 = pressure <= 799hPa, 402 = pressure >= 1201 hPa, 511 = N/A (default).
191-192	2	Pressure Tendency	pressuretend	e	0 = steady, 1 = decreasing, 2 = increasing, 3 = N/A (default).
193-193	7	Max. visibility	visgreater	b	Visibility greater than.
194-200	8	Horiz. Visibility	visibility	U1	Units are 0.1 nautical miles, 127 = N/A (default).
201-212	12	Water Level	waterlevel	I2	-10.0 to +30.0 in 0.01m, -10.0m after scaling, 4001 = N/A (default).
213-214	2	Water Level Trend	leveltrend	e	0 = steady, 1 = decreasing, 2 = increasing, 3 = N/A (default).
215-222	8	Surface Current Speed	cspeed	U1	0.0-25.0: units 0.1 knot, 251 = speed >= 25.1 knots, 255 = N/A (default).
223-231	9	Surface Current Direction	cdir	u	0-359: deg. fom true north, 360 = N/A (default).
232-239	8	Current Speed #2	cspeed2	U1	0.0-25.0 knots: units 0.1 knot, 251 = speed >= 25.1 knots, 255 = N/A (default).
240-248	9	Current Direction #2	cdir2	u	0-359: true bearing, 360 = N/A (default).
249-253	5	Measurement Depth #2	cdepth2	U1	0-30m down: units 0.1m, 31 = N/A (default).
254-261	8	Current Speed #3	cspeed3	U1	0.0-25.0 knots: units 0.1 knot, 251 = speed >= 25.1 knots, 255 = N/A (default).
262-270	9	Current Direction #3	cdir3	u	0-359: true bearing, 360 = N/A (default).
271-275	5	Measurement Depth #3	cdepth3	u	0-30m down: units 0.1m, 31 = N/A (default).
276-283	8	Wave Height	waveheight	U1	Height 0-25m: units 0.1m, 251 = height >= 25.1m, 255 = N/A (default).
284-289	6	Wave Period	waveperiod	u	Seconds, 0-60, units 1s, 63 = N/A (default).
290-298	9	Wave Direction	wavedir	u	0-359: true bearing, 360 = N/A (default).
299-306	8	Swell Height	swellheight	U1	0-25m: units 0.1m, 251 = height >= 25.1m, 255 = N/A (default).
307-312	6	Swell Period	swellperiod	u	0-60, units 1s 360 = N/A (default)
313-321	9	Swell Direction	swelldir	u	0-359: true bearing, 360 = N/A (default)
322-325	4	Sea State	seastate	e	See "Beaufort scale"
326-335	10	Water Temperature	watertemp	I1	-10.0 to 50.0 C: units 0.1 deg, 501 = N/A (default)
336-338	3	Precipitation	preciptype	e	See "Precipitation type"
339-347	9	Salinity	salinity	U1	0.0-50.0%: units of 0.1% 501 = salinity >= 50.1% 510 = N/A (default) 511 = sensor not available
348-349	2	Ice	ice	u	0 = No 1 = Yes 2 = (reserved for future use) 3 = not available = default
350-359	10	Spare		x	Not used

Precipitation types and Beaufort scale are as for the [IMO236] version.

Inland ship static and voyage related data (Inland AIS)

A message 8 subtype. DAC = 200 FID = 10. Fixed length, 168 bits.

This message should be used by inland vessels only to broadcast ship static and voyage related data in addition to message 5. The message should be sent as soon as possible (from the AIS point of view) after message 5.

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 8
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Spare		x	Not used
40-49	10	Designated Area Code	dac	u	Constant: 200
50-55	6	Functional ID	fid	u	Constant: 10
56-103	48	European Vessel ID	vin	t	8 six-bit characters

Field	Len	Description	Member	T	Units
104-116	13	Length of ship	length	u	1-8000 * 0.1m, default 0
117-126	10	Beam of ship	beam	u	1-1000 * 0.1m, default 0
127-140	14	Ship/combination type	shiptype	e	ERI Classification
141-143	3	Hazardous cargo	hazard	e	See "Hazard Codes" below
144-154	11	Draught	draught	u	1-200 * 0.01m, default 0
155-156	2	Loaded/Unloaded	loaded	e	See "Load Status" below
157-157	1	Speed inf. quality	speed_q	b	0 = low/GNSS (default) 1 = high
158-158	1	Course inf. quality	course_q	b	0 = low/GNSS (default) 1 = high
159-159	1	Heading inf. quality	heading_q	b	0 = low/GNSS (default) 1 = high
160-167	8	Spare		x	Not used

OPEN-QUESTION: [INLAND] is not explicit whether the "Ship/combination type" field is to contain full ERI codes with range 8000-8370 or ERI SOLAS codes in the range 1-99. The tables below expand both. Full ERI codes have been observed in the wild.

Table 54. ERI Classification

Code	SOLAS	Description
8000	99	Vessel, type unknown
8010	79	Motor freighter
8020	89	Motor tanker
8021	80	Motor tanker, liquid cargo, type N
8022	80	Motor tanker, liquid cargo, type C
8023	89	Motor tanker, dry cargo as if liquid (e.g. cement)
8030	79	Container vessel
8040	80	Gas tanker
8050	79	Motor freighter, tug
8060	89	Motor tanker, tug
8070	79	Motor freighter with one or more ships alongside
8080	89	Motor freighter with tanker
8090	79	Motor freighter pushing one or more freighters
8100	89	Motor freighter pushing at least one tank-ship
8110	79	Tug, freighter
8120	89	Tug, tanker
8130	31	Tug freighter, coupled
8140	31	Tug, freighter/tanker, coupled
8150	99	Freightbarge
8160	99	Tankbarge
8161	90	Tankbarge, liquid cargo, type N
8162	90	Tankbarge, liquid cargo, type C
8163	99	Tankbarge, dry cargo as if liquid (e.g. cement)
8170	99	Freightbarge with containers
8180	90	Tankbarge, gas
8210	79	Pushtow, one cargo barge
8220	79	Pushtow, two cargo barges
8230	79	Pushtow, three cargo barges
8240	79	Pushtow, four cargo barges
8250	79	Pushtow, five cargo barges
8260	79	Pushtow, six cargo barges
8270	79	Pushtow, seven cargo barges
8280	79	Pushtow, eight cargo barges
8290	79	Pushtow, nine or more barges
8310	80	Pushtow, one tank/gas barge
8320	80	Pushtow, two barges at least one tanker or gas barge
8330	80	Pushtow, three barges at least one tanker or gas barge
8340	80	Pushtow, four barges at least one tanker or gas barge
8350	80	Pushtow, five barges at least one tanker or gas barge
8360	80	Pushtow, six barges at least one tanker or gas barge
8370	80	Pushtow, seven barges at least one tanker or gas barge

Table 55. SOLAS ship type, first digit

3	Vessel
7	Cargo ship
8	Tanker
9	Other types of ship

Table 56. SOLAS ship type, second digit

0	All ships of this type
1	Towing
8	Tanker
9	No additional information

Table 57. Hazard code

0	0 blue cones/lights
1	1 blue cone/light
2	2 blue cones/lights
3	3 blue cones/lights
4	4 B-Flag
5	Unknown (default)

Table 58. Load status

0	N/A (default)
1	Unloaded
2	Loaded

EMMA Warning Report (Inland AIS)

A message 8 subtype. DAC = 200 FID = 23. Fixed length, 256 bits.

The EMMA warning is sent by base stations to drive shipboard ECDIS displays of heavy weather conditions. The following message is capable of transmitting the EMMA data using the AIS channel. It does not replace the Notices to Skippers warnings.

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 8
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Spare		x	Not used
40-49	10	Designated Area Code	dac	u	Constant: 200
50-55	6	Functional ID	fid	u	Constant: 23
56-63	8	Start Year	start_year	u	1-55, year since 2000 0 = N/A (default)
64-67	4	Start Month	start_month	u	1-12; 0 = N/A (default)
68-72	5	Start Day	start_day	u	1-31; 0 = N/A (default)
73-80	8	End Year	end_year	u	1-55, year since 2000 0 = N/A (default)
81-84	4	End Month	end_month	u	1-12; 0 = N/A (default)
85-89	5	End Day	end_day	u	1-31; 0 = N/A (default)
90-94	5	Start Hour	start_hour	u	0-23; 24 = N/A (default)
95-100	6	Start Minute	start_minute	u	0-59; 60 = N/A (default)
101-105	5	End Hour	end_hour	u	0-23; 24 = N/A (default)
106-111	6	End Minute	end_minute	u	0-59; 60 = N/A (default)
112-139	28	Start Longitude	start_lon	I4	Minutes/10000 (as in CNB)
140-166	27	Start Latitude	start_lat	I4	Minutes/10000 (as in CNB)
167-194	28	End Longitude	end_lon	I4	Minutes/10000 (as in CNB)
195-221	27	End Latitude	end_lat	I4	Minutes/10000 (as in CNB)
222-225	4	Type	type	e	See "EMMA Type Codes" below
226-234	9	Min value	min	i	Signed Integer, see below
235-243	9	Max value	max	i	Signed Integer, see below
244-245	2	Classification	intensity	e	1 = Slight, 2 = Medium, 3 = Strong
246-249	4	Wind Direction	wind	e	See "EMMA Winds" below
250-255	6	Spare		x	Not used

OPEN-QUESTION: [INLAND] is not explicit about the interpretation of the longitude and latitude fields; these semantics are assumed here from 28 and 27-bit fields in other messages.

[INLAND] specifies an 8-bit format with 9th leading sign bit for the min and max fields. Values 0-253 are interpreted as integer data, modified by the leading sign bit. The values +254 and -254 are interpreted as "greater that +253" and "less than -253" respectively. Both values +255 and -255 are interpreted as "unknown" (default).

OPEN-QUESTION: What are the semantics of the min and max values? To what parameters do they apply?

OPEN-QUESTION: [INLAND] does not specify whether start and end times are UTC or local.

Table 59. EMMA Type Codes

0	NA	Not Available
1	WI	Wind
2	RA	Rain
3	SN	Snow and ice
4	TH	Thunderstorm
5	FO	Fog

0	NA	Not Available
6	LT	Low temperature
7	HT	High temperature
8	FL	Flood
9	FI	Forest Fire

Table 60. EMMA Winds

1	N	North
2	NE	North East
3	E	East
4	SE	South East
5	S	South
6	SW	South West
7	W	West
8	NW	North West

Water Levels (Inland AIS)

A message 6 subtype. DAC = 200 FID = 24. Fixed length, 168 bits.

This message should be used to inform skippers about actual water levels in their area. It is additional short-term information to the water levels distributed via Notices to Skippers. It is possible to transmit the water levels of more than 4 gauges using multiple messages.

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 6
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Spare		x	Not used
40-49	10	Designated Area Code	dac	u	Constant: 200
50-55	6	Functional ID	fid	u	Constant: 24
56-67	12	UN Country Code	country	t	2 six-bit characters
68			gauges	a4	Gauge measurement array
0-10	11	Gauge ID	id	u	0=unknown (default)
11-24	14	Water Level	level	i	cm, 0=unknown (default)

Water levels are relative to the local standard, e.g. GIW in Germany and RNW on the Danube.

Signal Strength (Inland AIS)

A message 8 subtype. DAC = 200 FID = 40. Fixed length, 168 bits.

This message should be sent by base stations only, to inform about the status of different light signals to all vessels in a certain area. The information should be displayed on an external Inland ECDIS display as dynamic symbols. The message should be sent with binary message 8 at regular intervals.

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 8
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Spare		x	Not used
40-49	10	Designated Area Code	dac	u	Constant: 200
50-55	6	Functional ID	fid	u	Constant: 40
56-83	28	Signal Longitude	lon	I4	Minutes/10000 (as in CNB)
84-110	27	Signal Latitude	lat	I4	Minutes/10000 (as in CNB)
111-114	4	Signal form	form	u	Consult [INLAND] Annex C
115-123	9	Signal orientation	facing	u	0-39 deg, 511= N/A (default)
124-126	3	Direction of impact	direction	e	See "Signal Impact" below
127-156	30	Light Status	status	e	See "Signal Status" below
157-167	11	Spare		x	Not used

OPEN-QUESTION: [INLAND] is not explicit about the interpretation of the longitude and latitude fields; these semantics are assumed here from 28 and 27-bit fields in other messages.

The Signal Form field describes the physical arrangement of the signal lights. Values 0 and 15 indicate the shape is unknown or unspecified.

Table 61. Direction of Signal Impact

0	Unknown (default)
1	Upstream
2	Downstream
3	To left bank
4	To right bank

The Signal Status field is interpreted as 9 decimal digits describing the lights as numbered in their Signal Form diagram - typically left to right and then top to bottom - with each digit interpreted in the following way:

Table 62. Signal Status

0	Unknown (default)

0	Unknown (default)
1	No light
2	White
3	Yellow
4	Green
5	Red
6	White flashing
7	Yellow flashing.

Type 9: Standard SAR Aircraft Position Report

Tracking information for search-and-rescue aircraft. Total number of bits is 168.

Field	Len	Description	Member	T	Encoding
0-5	6	Message Type	type	u	Constant: 9
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	MMSI	mmsi	u	9 decimal digits
38-49	12	Altitude	alt	u	See below
50-59	10	SOG	speed	u	See below
60-60	1	Position Accuracy	accuracy	u	See below
61-88	28	Longitude	lon	I4	Minutes/10000 (as in CNB)
89-115	27	Latitude	lat	I4	Minutes/10000 (as in CNB)
116-127	12	Course Over Ground	course	U1	True bearing, 0.1 degree units
128-133	6	Time Stamp	second	u	UTC second.
134-141	8	Regional reserved	regional	x	Reserved
142-142	1	DTE	dte	b	0=Data terminal ready, 1=Data terminal not ready (default)
143-145	3	Spare		x	Not used
146-146	1	Assigned	assigned	b	Assigned-mode flag
147-147	1	RAIM flag	raim	b	As for common navigation block
148-167	20	Radio status	radio	u	See [IALA] for details.

Altitude is in meters. The special value 4095 indicates altitude is not available; 4094 indicates 4094 meters or higher.

Speed over ground is in knots, not deciknots as in the common navigation block; planes go faster. The special value 1023 indicates speed not available, 1022 indicates 1022 knots or higher.

Position Accuracy, Longitude, Latitude, and Course over Ground are encoded identically as in the common navigation block and are even at the same bit offsets. Time stamp has the same special values as in the common navigation block, but is at a different offset.

Type 10: UTC/Date Inquiry

Request for UTC/Date information from an AIS base station. Total number of bits is 72.

Field	Len	Description	Member	T	Encoding
0-5	6	Message Type	type	u	Constant: 10
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Spare		x	Not used
40-69	30	Destination MMSI	dest_mmsi	u	9 decimal digits
70-71	2	Spare		x	Not used

Type 11: UTC/Date Response

Identical to message 4, with the semantics of a response to inquiry.

Type 12: Addressed Safety-Related Message

This is a point-to-point text message. The payload is interpreted as six-bit text. This message is variable in length up to a maximum of 1008 bits (up to 5 AIVDM sentence payloads).

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 12
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Sequence Number	seqno	u	Unsigned integer 0-3
40-69	30	Destination MMSI	dest_mmsi	u	9 decimal digits
70	1	Retransmit flag	retransmit	b	0 = no retransmit (default), 1 = retransmitted
71	1	Spare		x	Not used
72	936	Text	text	t	1-156 chars of six-bit text. May be shorter than 936 bits.

Pragmatic note: On <[AISHUB]> the actual content of these messages is highly variable, ranging from fairly plain English ("PLEASE REPORT TO JOBOURG TRAFFIC CHANNEL 13") through snippets of tabular data ("PAX 589 FG 36 IX 74 MOTO 10 CREW 108+1" through what look like opaque commercial codes ("EP285 IX46 FG3 DK8 PL56") to empty strings and content that looks like line noise ("]XFD5D/\7`>PA!Q DX0??K?8?>D").

Such apparently garbled content does **not** mean there is an error in your decoder. It may indicate faulty encoders, operator error, or even the use of private encodings for non-ASCII character sets.

Type 13: Safety-Related Acknowledgement

Message type 13 is a receipt acknowledgement to senders of previous messages of type 12. The message layout is identical to a type 7 Binary Acknowledge.

Type 14: Safety-Related Broadcast Message

This is a broadcast text message. The payload is interpreted as six-bit text. This message is variable in length up to a maximum of 1008 bits (up to 5 AIVDM sentence payloads).

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 14
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Spare		x	Not used
40	968	Text	text	t	1-161 chars of six-bit text. May be shorter than 968 bits.

Note: 161 * 6 = 966. [IALA] specifies 968 because over-the-air messages are required to be padded to an 8-bit byte boundary by <[ITU1371]>.

Also see the pragmatic note on message content attached to type 12; it applies to type 14 messages as well.

Type 15: Interrogation

Message type 15 is used by a base station to query one or two other AIS transceivers for status messages of specified types. "Source MMSI" is the interrogating station. 88-160 bits depending on the number of queries.

This message is probably not interesting unless you are doing traffic analysis of information flow in an AIS station network. The "slot offset" members are a request for the response to interrogation to occupy a particular time division in the TDMA packet layer.

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 15
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Spare		x	Not used
40-69	30	Interrogated MMSI	mmsi1	u	9 decimal digits
70-75	6	First message type	type1_1	u	Unsigned integer
76-87	12	First slot offset	offset1_1	u	Unsigned integer
88-89	2	Spare		x	Not used
90-95	6	Second message type	type1_2	u	Unsigned integer
96-107	12	Second slot offset	offset1_2	u	Unsigned integer
108-109	2	Spare		x	Not used
110-139	30	Interrogated MMSI	mmsi2	u	9 decimal digits
140-145	6	First message type	type2_1	u	Unsigned integer
146-157	12	First slot offset	offset2_1	u	Unsigned integer
158-159	2	Spare		x	Not used

There are four use cases for this message. A decoder must dispatch on the length of the data packet to determine which it is seeing:

1. One station is interrogated for one message type. Length is 88 bits.
2. One station is interrogated for two message types, Length is 110 bits. There is a design error in the standard here; according to the <[ITU1371]> requirement for padding to 8 bits, this should have been 112 with a 4-bit trailing spare field, and decoders should be prepared to handle that length as well. See the discussion of byte alignment elsewhere in this document for context.
3. Two stations are interrogated for one message type each. Length is 160 bits. The second message type and second slot offset associated with the first queried MMSI should be zeroed.
4. One station is interrogated for two message types, and a second for one message type. Length is 160 bits.

Type 16: Assignment Mode Command

Message type 16 is used by a base station with control authority to configure the scheduling of AIS informational messages from subordinate stations, either as a frequency per 10-minute interval or by specifying the TDMA slot(s) offset on which those messages should be transmitted. It is probably not of interest unless you are studying the internal operation of an AIS base station network. Length may be 96 or 144 bits.

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 16
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Spare		x	Not used
40-69	30	Destination A MMSI	mmsi1	u	9 decimal digits
70-81	12	Offset A	offset1	u	See [IALA]
82-91	10	Increment A	increment1	u	See [IALA]
92-121	30	Destination B MMSI	mmsi2	u	9 decimal digits
122-133	12	Offset B	offset2	u	See [IALA]
134-143	10	Increment B	increment2	u	See [IALA]

If the message is 96 bits long, it should be interpreted as an assignment for a single station (92 bits) followed by 4 bits of padding reserved for future use. If the message is 144 bits long it should be interpreted as a channel assignment for two stations; no padding follows.

When increment is zero, the offset field is interpreted as the frequency with which the subordinate station should report per 10-minute interval. When increment is nonzero, reporting interval is specified at the level of TDMA slot numbers; see [IALA] for the detailed specification.

Note: While the 96-bit form of Type 16 is not uncommon, the 144-bit form is extremely rare. As of March 2010 it has not been observed even in long-duration samples from AISHub.

Type 17: DGNSS Broadcast Binary Message

Message type 17 is used to broadcast differential corrections for GPS. The data in the payload is intended to be passed directly to GPS receivers capable of accepting such corrections. 80 to 816 bits depending on payload size.

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 17
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	Source MMSI	mmsi	u	9 decimal digits
38-39	2	Spare		x	Not used
40-57	18	Longitude	lon	I1	Signed: minutes/10
58-74	17	Latitude	lat	I1	Signed: minutes/10
75-79	5	Spare		x	Not used - reserved
80-815	736	Payload	data	d	DGNSS correction data

Note that latitude and longitude are in units of a tenth of a minute; sign interpretation and out-of-band values are as in the Common Navigation Clock. (Note, however, that the hex representation of the out-of-band values differs; it is 181 * 60 * 10 = 0x1a838 for longitude, 91 * 60 * 10 = 0xd548 for latitude.)

The [IALA] description of the payload portion subfields has been omitted, as it appears to be tied to the now obsolete RTCM2 protocol.

Type 18: Standard Class B CS Position Report

A less detailed report than types 1-3 for vessels using Class B transmitters. Omits navigational status and rate of turn. Fields are encoded as in the common navigation block. 168 bits total.

In [IALA] (and [ITU1371]) bits 141-145 were designated "Spare"; the bit-flag semantics given here are from ITU-1371-3 and were communicated by Kurt Schwehr. Kurt warns that "the spec does not do a good job of explaining these fields... I don't think that I totally understand these fields."

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 18
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	MMSI	mmsi	u	9 decimal digits
38-45	8	Regional Reserved	reserved	x	Not used
46-55	10	Speed Over Ground	speed	U1	As in common navigation block
56-56	1	Position Accuracy	accuracy	b	See below
57-84	28	Longitude	lon	I4	Minutes/10000 (as in CNB)
85-111	27	Latitude	lat	I4	Minutes/10000 (as in CNB)
112-123	12	Course Over Ground	course	U1	0.1 degrees from true north
124-132	9	True Heading	heading	u	0 to 359 degrees, 511 = N/A
133-138	6	Time Stamp	second	u	Second of UTC timestamp.
139-140	2	Regional reserved	regional	u	Uninterpreted
141-141	1	CS Unit	cs	b	0=Class B SOTDMA unit 1=Class B CS (Carrier Sense) unit
142-142	1	Display flag	display	b	0=No visual display, 1=Has display, (Probably not reliable).
143-143	1	DSC Flag	dsc	b	If 1, unit is attached to a VHF voice radio with DSC capability.
144-144	1	Band flag	band	b	Base stations can command units to switch frequency. If this flag is 1, the unit can use any part of the marine channel.
145-145	1	Message 22 flag	msg22	b	If 1, unit can accept a channel assignment via Message Type 22.
146-146	1	Assigned	assigned	b	Assigned-mode flag: 0 = autonomous mode (default), 1 = assigned mode.
147-147	1	RAIM flag	raim	b	As for common navigation block
148-167	20	Radio status	radio	u	See [IALA] for details.

The radio status is 20 bits rather than 19 because an extra first bit selects whether it should be interpreted as a SOTDMA or ITDMA state.

Type 19: Extended Class B CS Position Report

A slightly more detailed report than type 18 for vessels using Class B transmitters. Omits navigational status and rate of turn. Fields are encoded as in the common navigation block and the Type 5 message. Note that until just before the reserved field at bit 139 this is identical to message 18. 312 bits total.

In practice, the information in the ship name and dimension fields is not reliable, as it has to be hand-entered by humans rather than gathered automatically from sensors.

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 19
6-7	2	Repeat Indicator	repeat	u	As in CNN
8-37	30	MMSI	mmsi	u	9 digits
38-45	8	Regional Reserved	reserved	u	
46-55	10	Speed Over Ground	speed	U1	As in CNB.
56-56	1	Position Accuracy	accuracy	b	As in CNB.
57-84	28	Longitude	lon	I4	Minutes/10000 (as in CNB)
85-111	27	Latitude	lat	I4	Minutes/10000 (as in CNB)
112-123	12	Course Over Ground	course	U1	Relative to true north, units of 0.1 degrees
124-132	9	True Heading	heading	u	0 to 359 degrees, 511 = N/A
133-138	6	Time Stamp	second	u	Second of UTC timestamp.
139-142	4	Regional reserved	regional	u	Uninterpreted

Field	Len	Description	Member	T	Units
143-262	120	Name	shipname	s	20 6-bit characters
263-270	8	Type of ship and cargo	shiptype	u	As in Message 5
271-279	9	Dimension to Bow	to_bow	u	Meters
280-288	9	Dimension to Stern	to_stern	u	Meters
289-294	6	Dimension to Port	to_port	u	Meters
295-300	6	Dimension to Starboard	to_starboard	u	Meters
301-304	4	Position Fix Type	epfd	e	See "EPFD Fix Types"
305-305	1	RAIM flag	raim	b	As in CNB.
306-306	1	DTE	dte	b	0=Data terminal ready, 1=Not ready (default).
307-307	1	Assigned mode flag	assigned	u	See [IALA] for details
308-311	4	Spare		x	Unused, should be zero

Type 20 Data Link Management Message

This message is used to pre-allocate TDMA slots within an AIS base station network. It contains no navigational information, and is unlikely to be of interest unless you are implementing or studying an AIS base station network. Length varies from 72-160 depending on the number of slot reservations (1 to 4) in the message.

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 20
6-7	2	Repeat Indicator	repeat	u	As in CNB
8-37	30	MMSI	mmsi	u	9 decimal digits
38-39	2	Spare		x	Not used
40-51	12	Offset number 1	offset1	u	Reserved offset number
52-55	4	Reserved slots	number1	u	Consecutive slots
56-58	3	Time-out	timeout1	u	Allocation timeout in minutes
59-69	11	Increment	increment1	u	Repeat increment
70-81	12	Offset number 2	offset2	u	Reserved offset number
82-85	4	Reserved slots	number2	u	Consecutive slots
86-88	3	Time-out	timeout2	u	Allocation timeout in minutes
89-99	11	Increment	increment2	u	Repeat increment
100-111	12	Offset number 3	offset3	u	Reserved offset number
112-115	4	Reserved slots	number3	u	Consecutive slots
116-118	3	Time-out	timeout3	u	Allocation timeout in minutes
119-129	11	Increment	increment3	u	Repeat increment
130-141	12	Offset number 4	offset4	u	Reserved offset number
142-145	4	Reserved slots	number4	u	Consecutive slots
146-148	3	Time-out	timeout4	u	Allocation timeout in minutes
149-159	11	Increment	increment4	u	Repeat increment

See [IALA] for details on the meaning of these fields.

Type 21: Aid-to-Navigation Report

Identification and location message to be emitted by aids to navigation such as buoys and lighthouses.

This message is unusual in that it varies in length depending on the presence and size of the Name Extension field. May vary between 272 and 360 bits.

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 21
6-7	2	Repeat Indicator	repeat	u	As in CNB
8-37	30	MMSI	mmsi	u	9 digits
38-42	5	Aid type	aid_type	e	See "Navaid Types"
43-162 1	120	Name	name	t	Name in sixbit chars
163-163	1	Position Accuracy	accuracy	b	As in CNB
164-191	28	Longitude	lon	I4	Minutes/10000 (as in CNB)
192-218	27	Latitude	lat	I4	Minutes/10000 (as in CNB)
219-227	9	Dimension to Bow	to_bow	u	Meters
228-236	9	Dimension to Stern	to_stern	u	Meters
237-242	6	Dimension to Port	to_port	u	Meters
243-248	6	Dimension to Starboard	to_starboard	u	Meters
249-252	4	Type of EPFD	epfd	e	As in Message Type 4
253-258	6	UTC second	second	u	As in Message Types 1-3
259-259	1	Off-Position Indicator	off_position	b	See Below
260-267	8	Regional reserved	regional	u	Uninterpreted
268-268	1	RAIM flag	raim	b	As in CNB
269-269	1	Virtual-aid flag	virtual_aid	b	See Below
270-270	1	Assigned-mode flag	assigned	b	See [IALA] for details

Field	Len	Description	Member	T	Units
271-271	1	Spare		x	Not used
272-360	88	Name Extension		t	See Below

According to [IALA], the aid type field has values 1-15 for fixed and 16-31 for floating aids to navigation. The detailed list is as follows:

Table 63. Navaid Types

Code	Definition
0	Default, Type of Aid to Navigation not specified
1	Reference point
2	RACON (radar transponder marking a navigation hazard)
3	Fixed structure off shore, such as oil platforms, wind farms,
rigs. (Note: This code should identify an obstruction that is	fitted with an Aid-to-Navigation AIS station.)
4	Spare, Reserved for future use.
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
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

The name field is up to 20 characters of 6-bit ASCII. If this field is full (has no trailing @ characters) the decoder should interpret the Name Extension field later in the message (no more than 14 6-bit characters) and concatenate it to this one to obtain the full name.

[IALA] describes bits 219-248 As "Dimension/Reference for Position", implying that it is vessel dimensions as in message type 5.

The Off-Position Indicator is for floating Aids-to-Navigation only: 0 means on position; 1 means off position. Only valid if UTC second is equal to or below 59.

The Virtual Aid flag is interpreted as follows: 0 = default = real Aid to Navigation at indicated position; 1 = virtual Aid to Navigation simulated by nearby AIS station.

If present, the Name Extension consists of packed six-bit ASCII characters followed by 0-6 bits of padding to an 8-bit boundary. The [IALA] description says "This parameter should be omitted when no more than 20 characters for the name of the A-to-N are needed in total. Only the required number of characters should be transmitted, i.e. no @-character should be used." A decoder can deduce the bit length of the name extension field by subtracting 272 from the total message bit length.

Type 22: Channel Management

This message is broadcast by a competent authority (an AIS network control base station) to set VHF parameters for an AIS coverage region. Length is 168 bits.

This message contains no navigational information, and is unlikely to be of interest unless you are implementing or studying an AIS base station network.

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 22
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	MMSI	mmsi	u	9 decimal digits
38-39	2	Spare		x	Not used
40-51	12	Channel A	channel_a	u	Channel number
52-63	12	Channel B	channel_b	u	Channel number
64-67	4	Tx/Rx mode	txrx	u	Transmit/receive mode
68-68	1	Power	power	b	Low=0, high=1
69-86	18	NE Longitude	ne_lon	I1	NE longitude to 0.1 minutes
87-103	17	NE Latitude	ne_lat	I1	NE latitude to 0.1 minutes
104-121	18	SW Longitude	sw_lon	I1	SW longitude to 0.1 minutes
122-138	17	SW Latitude	sw_lat	I1	SW latitude to 0.1 minutes

Field	Len	Description	Member	T	Units
69-98	30	MMSI1	dest1	u	MMSI of destination 1
104-133	30	MMSI2	dest2	u	MMSI of destination 2
139-139	1	Addressed	addressed	b	0=Broadcast, 1=Addressed
140-140	1	Channel A Band	band_a	b	0=Default, 1=12.5kHz
141-141	1	Channel B Band	band_b	b	0=Default, 1=12.5kHz
142-144	3	Zone size	zonesize	u	Size of transitional zone
145-167	23	Spare		x	Reserved for future use

The values of the channel_a and channel_b fields are ITU frequency designators for channels A and B. Normally these will be 2087 and 2088, the AIS 1 and AIS 2 frequencies of 87B (161.975 MHz) and 88B (162.025 MHz) respectively. Regional authorities may set different frequencies.

The txrx field encodes the same information as the 2-bit field txrx field in message type 23; only the two low bits are used.

The power bit instructs designated receivers which power level to use.

If the message is broadcast (addressed field is 0), the ne_lon, ne_lat, sw_lon, and sw_lat fields are the corners of a rectangular jurisdiction area over which control parameters are to be set. If it is addressed (addressed field is 1), the same span of data is interpreted as two 30-bit MMSIs beginning at at bit offsets 69 and 104 respectively.

Yes, the addressed bit is **after** the fields it controls the interpretation of.

Note that the *not available* values for longitude and latitudes match the short ones used in message 17, not the long ones used in the common navigation block and elsewhere.

The band fields control channel bandwidth for channels A and B, and the zonesize field describes the size of the transition zone around the control jurisdiction. The semantics of these fields are complicated, controlling transmitter behavior as it moves between jurisdictions; see [IALA] for full details.

Type 23: Group Assignment Command

This message is intended to be broadcast by a competent authority (an AIS network-control base station) to set operational parameters for all mobile stations in an AIS coverage region. Length is 160 bits.

This message contains no navigational information, and is unlikely to be of interest unless you are implementing or studying an AIS base station network.

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Unsigned Integer: 23
6-7	2	Repeat Indicator	repeat	u	As in Common Navigation Block
8-37	30	MMSI	mmsi	u	Unsigned Integer: 9 digits
38-39	2	Spare		x	Not used
40-57	18	NE Longitude	ne_lon	u	Same as broadcast type 22
58-74	17	NE Latitude	ne_lat	u	Same as broadcast type 22
75-92	18	SW Longitude	sw_lon	u	Same as broadcast type 22
93-109	17	SW Latitude	sw_lat	u	Same as broadcast type 22
110-113	4	Station Type	station_type	e	See "Station Types"
114-121	8	Ship Type	ship_type	e	See "Ship Types"
122-143	22	Spare		x	Not used
144-145	2	Tx/Rx Mode	txrx	u	See "Tranmit/Recieve Modes"
146-149	4	Report Interval	interval	e	See "Station Intervals"
150-153	4	Quiet Time	quiet	u	0 = none, 1-15 quiet time in minutes
154-159	6	Spare		x	Not used

The target set of mobile stations is specified by the station-type and ship-type fields. An addressed (non-broadcast) message 22 overrides a message 23, but a message 23 overrides a broadcast message 22.

Note that the *not available* values for longitude and latitudes match the short ones used in messages 17 and 22, not the long ones used in the common navigation block and elsewhere.

The txrx field tells the affected stations which channel or channels they may transmit on. The options refer to the same A and B VHF channels as in Message Type 22. The field is interpreted as follows:

Table 64. Transmit Modes

0 =	TxA/TxB, RxA/RxB (default)
1 =	TxA, RxA/RxB
2 =	TxB, RxA/RxB
3 =	Reserved for Future Use

Table 65. Station Types

0	All types of mobiles (default)
1	Reserved for future use
2	All types of Class B mobile stations
3	SAR airborne mobile station
4	Aid to Navigation station
5	Class B shipborne mobile station (IEC62287 only)
6-9	Regional use and inland waterways
10-15	Reserved for future use

[INLAND] specifies 6 (only) as the station type value for inland waterways, reserving 7-9 for (other) regional uses.

Reporting Interval is a 4 bit unsigned integer, how often to report while within the area specified by this message. When the dual-channel operation is suspended by Tx/Rx mode command 1 or 2, the reporting interval is twice the interval given in the table.

Table 66. Station Intervals

0	As given by the autonomous mode

1	10 Minutes
2	6 Minutes
3	3 Minutes
4	1 Minute
5	30 Seconds
6	15 Seconds
7	10 Seconds
8	5 Seconds
9	Next Shorter Reporting Interval
10	Next Longer Reporting Interval
11-15	Reserved for future use

Quiet Time is a 4 bit unsigned integer specifying how many minutes affected stations are to remain silent. If a class B station receives a quiet time command, it will continue to schedule nominal transmission time periods, but is not to transmit message 18 or 24 during the quiet period.

Type 24: Static Data Report

Equivalent of a Type 5 message for ships using Class B equipment. Also used to associate an MMSI with a name on either class A or class B equipment.

A "Type 24" may be in part A or part B format; According to the standard, parts A and B are expected to be broadcast in adjacent pairs; in the real world they may (due to quirks in various aggregation methods) be separated by other sentences or even interleaved with different Type 24 pairs; decoders must cope with this. The interpretation of some fields in Type B format changes depending on the range of the Type B MMSI field. 160 bits for part A, 168 bits for part B.

According to the standard, both the A and B parts are supposed to be 168 bits. However, in the wild, A parts are often transmitted with only 160 bits, omitting the *spare* 7 bits at the end. Implementers should be permissive about this.

[IALA] does not describe this message type; format information is thanks to Kurt Schwehr.

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 24
6-7	2	Repeat Indicator	repeat	u	As in CNB
8-37	30	MMSI	mmsi	u	9 digits
38-39	2	Part Number	partno	u	0-1
40-159	120	Vessel Name	shipname	t	(Part A) 20 sixbit chars
160-167	8	Spare		x	(Part A) Not used
40-47	8	Ship Type	shiptype	e	(Part B) See "Ship Types"
48-65	18	Vendor ID	vendorid	t	(Part B) 3 six-bit chars
66-69	4	Unit Model Code	model	u	(Part B)
70-89	20	Serial Number	serial	u	(Part B)
90-131	42	Call Sign	callsign	t	(Part B) As in Message Type 5
132-140	9	Dimension to Bow	to_bow	u	(Part B) Meters
141-149	9	Dimension to Stern	to_stern	u	(Part B) Meters
150-155	6	Dimension to Port	to_port	u	(Part B) Meters
156-161	6	Dimension to Starboard	to_starboard	u	(Part B) Meters
132-161	30	Mothership MMSI	mothership_mmsi	u	(Part B) See below
162-167	6	Spare		x	(Part B) Not used

If the Part Number field is 0, the rest of the message is interpreted as a Part A; if it is 1, the rest of the message is interpreted as a Part B; values 2 and 3 are not allowed.

Bits 48-89 are as described in ITU-R 1371-4. In earlier versions to 1371-3 this was one sixbit-encoded 42-bit (7-character) string field, the name of the AIS equipment vendor. The last 4 characters of the string are reinterpreted as a model/serial numeric pair. It is not clear that field practice has caught up with this incompatible change. Implementations would be wise to decode that but span in both ways and trust human eyes to detect when the final 4 characters of the string or the model and serial fields are garbage.

Interpretation of the 30 bits 132-162 in Part B is variable. If the MMSI at 8-37 is that of an auxiliary craft, the entry is taken to refer to a small attached auxiliary vessel and these 30 bits are read as the MMSI of the mother ship. Otherwise the 30 bits describe vessel dimensions as in Message Type 5.

According to [MMSI], an MMSI is associated with an auxiliary craft when it is of the form 98XXXYYYY, where (1) the *98* in positions 1 and 2 is required to designate an auxiliary craft, (2) the digits XXX in the 3, 4 and 5 positions are the MID (the three-digit country code as described in [ITU-MID]) and (3) YYYY is any decimal literal from 0000 to 9999.

Type 25: Single Slot Binary Message

Maximum of 168 bits (a single slot). Fields after the Destination MMSI are at variable offsets depending on that flag and the Destination Indicator; they always occur in the same order but some may be omitted.

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 25
6-7	2	Repeat Indicator	repeat	u	As in CNB
8-37	30	MMSI	mmsi	u	9 digits
38	1	Destination indicator	addressed	b	0=broadcast, 1=addressed.
39	1	Binary data flag	structured	b	See below
40	0/30	Destination MMSI	dest_mmsi	u	Message destination
?	0/16	Application ID	app_id	u	Unsigned integer
?	0-128	Data	data	d	Binary data

If the *addressed* flag is on, 30 bits of data at offset 40 are interpreted as a destination MMSI. Otherwise that field span becomes part of the message payload, with the first 16 bits used as an Application ID if the *structured* flag is on.

If the *structured* flag is on, a 16-bit application identifier is extracted; this field is to be interpreted as a 10 bit DAC and 6-bit FID as in message types 6 and 8. Otherwise that field span becomes part of the message payload.

The data fields are not, in contrast to message type 26, followed by a radio status block.

Note: Type 25 is extremely rare. As of April 2011 it has not been observed even in long-duration samples from AISHub.

Type 26: Multiple Slot Binary Message

Takes up 60-1064 bits (up to 5 slots).

Field	Len	Description	Member	T	Units
0-5	6	Message Type	type	u	Constant: 26
6-7	2	Repeat Indicator	repeat	u	As in CNB
8-37	30	MMSI	mmsi	u	9 digits
38	1	Destination indicator	addressed	b	0=broadcast, 1=addressed.
39	1	Binary data flag	structured	b	See below
40	0/30	Destination MMSI	dest_mmsi	u	Message destination
?	0/16	Application ID	app_id	u	Unsigned integer
?	0-1004	Data	data	d	Binary data
?	20	Radio status	radio	u	See [IALA] for details.

The data field may span up to 5 256-bit slots in addition to the tail end of the base slot. The application_ID field, if present, is to be interpreted as a 10 bit DAC and 6-bit FID as in message types 6 and 8. Documentation says the data length of each slot is 224 and adds the note "Allows for 32 bits of bit-stuffing."

The 20 radio status bits are always present after end-of-data in the last slot and are in the format specified by [IALA]. The radio status is 20 bits rather than 19 because an extra first bit selects whether it should be interpreted as a SOTDMA or ITDMA state.

Note: Type 26 is extremely rare. As of April 2011 it has not been observed even in long-duration samples from AISHub.

Type 27: Long Range AIS Broadcast message

ITU-1371-4 says this message is primarily intended for long-range detection of AIS Class A equipped vessels (typically by satellite). This message has a similar content to Messages 1, 2 and 3, but the total number of bits has been compressed to allow for increased propagation delays associated with long-range detection

Length according to ITU-1374 is 96 bits. However, in the wild these are sometimes transmitted with 168 bits (a full slot). Robust decoders should warn when this occurs but decode the first 96 bits.

Field	Len	Description	Member	u	Units
0-5	6	Message Type	type	u	Constant: 27
6-7	2	Repeat Indicator	repeat	u	As in CNB
8-37	30	MMSI	mmsi	u	9 decimal digits
38-38	1	Position Accuracy	accuracy	u	See Common Navigation Block
39-39	1	RAIM flag	raim	u	See Common Navigation Block
40-43	4	Navigation Status	status	u	See Common Navigation Block
44-61	18	Longitude	lon	I4	minutes/10 East positive, West negative 181000 = N/A (default)
62-78	17	Latitude	lat	I4	minutes/10 North positive, South negative 91000 = N/A (default)
79-84	6	Speed Over Ground	speed	u	Knots (0-62); 63 = N/A (default)
85-93	9	Course Over Ground	course	u	0 to 359 degrees, 511 = not available.
94-94	1	GNSS Position status	gnss	u	0 = current GNSS position 1 = not GNSS position (default)
95-95	1	Spare		x	Not used

Local extensions

Some regional authorities extend the AIS message set.

The St. Lawrence Seaway broadcasts hydrological and lock-scheduling messages using special encodings of the binary data of message types 6 and 8 (described in [SEAWAY], freely available), and safety information using types 12 and 14. These message types are listed under the description of type 8.

The U.S. Coast Guard has a system called PAWSS (Port and Water Safety System) which uses extended AIS binary formats. [SEAWAY] says it's intercompatible with the St. Lawrence Seaway system and describes three PAWSS-specific messages in its Appendix A.

Since 2007 the Port Authority of London has operated a Thames AIS system covering the Thames River; it uses extensions of message types 6 and 8. It is describes in [THAMES].

Since 2006 there has been some effort to standardize inland-waterway extensions, described in [INLAND]. It uses different message formats and identifiers than the PAWS/St. Lawrence systems, which do not conform. There is an AIS extension called "RIS" (River Information System) that covers portions of the Danube River and Black Sea which does conform.

[IMO289] standardizes some subtypes of messages 6 and 8 similar to PAWSS messages for DAC 1, the international jurisdiction code. However, in some cases identically named subtypes are assigned different FIDs.

U.S. Coast Guard Extended AIVDM

You may occasionally see AIVDM packets with additional comma-separated fields following the CRC-32 checksum. This is a semi-obsolescent logging format used by the USCG, which has never documented it well and plans to replace it with a new one based on NMEA 4.0.

Here's a sample sentence and field breakdown:

```
!AIVDM,1,1,,B,15Cjtd0Oj;Jp7ilG7=UkKBoB0<06,0*63,s1234,d-119,T12.34567123,r003669958,1085889680
```

Following the "*63" checksum are additional fields delimited by commas. These fields provide additional metadata about the reception of each AIS broadcast.

The field beginning with the lower case "s" is a Relative Signal Strength Indicator (RSSI) measurement from the receiver. This measurement has a range of 0-65535. This is one of the parameters used internally by the AIS receiver to determine the signal strength value as reported in the field beginning with the lower case "d". This field only exists when the AIS receiver provides this data.

The field beginning with a lower case "d" is the signal strength measurement for this broadcast in dBm. This field only exists when the AIS receiver provides this data.

The field beginning with the upper case "T" is the Time of Arrival of the received broadcast in seconds from UTC 0. This field only exists when the AIS receiver provides this data.

Another optional field not shown is one that begins with an upper case "S" and represents the slot number in which the reception occurred. The field would appear after the checksum and before the station identifier field. This field only exists when the AIS receiver provides this data. Example: S0042

The field beginning with the lower case "r" is a station identifier field. This field is always provided, regardless of the type of AIS equipment. (Occasionally a base station identifier will be prefixed with "b" instead.)

The last field is a time tag based on the standard C programming language time function. Both date and time to the nearest second can be derived from this field. This field is always provided, regardless of the type of AIS equipment.

NMEA Tag Blocks

Beginning with NMEA 4.10, the standard describes a way to intersperse "tag blocks" with AIS sentences in order to supply additional metadata, usually a Unix timestamp to be associated with a sentence (or contiguous group of sentences such as an armored AIS Type 5).

The tag block facility is complex, in some respects poorly specified, and there has been yet much public discussion of it. This section should be considered provisional and in need of improvement.

The general format of a tag block is: an opening backslash, followed by multiple comma-separated fields none of which may contain backslashes, followed by an asterisk and NMEA checksum, followed by a closing backslash.

The following is an example of an AIS Type 1 sentence preceded by a tag block:

```
\g:1-2-73874,n:157036,s:r003669945,c:1241544035*4A\!AIVDM,1,1,,B,15N4cJ`005Jrek0H@9n`DW5608EP,0*13
```

Each comma-separated field is expected to be a type key, followed by a colon, followed by content. The semantics of the type keys are as follows (table from [NMEA-ADVANCE]):

Confusingly, there is a different standard introduced with NMEA 4.00, IEC 62320-1, that uses the same tag block format but a slightly different (overlapping) set of field keys

Table 67. NMEA 4.00 Field Types

IEC	NMEA	Type	Description
c	c	int>0	UNIX time in seconds or milliseconds
d	d	string	Destination (at most 15 chars)
xGy	g	int-int-int	Sentence grouping
x	n	int>0	line count
	r	int>0	relative time
s	s	string	Source / station
i	t	string	Text string (at most 15 chars)

The IEC 62320-1 and NMEA 4.10 c field is an emission time for the sentence it precedes. We're not yet sure what the time unit is.

The NMEA 4.10 g value describes a sentence or sentence group to associate the tag block to. It is a triple of ints separated by dashes. The first number is the sentence number, the second is total number of sentences to make up one group. The third number is an identifier for that particular group. If there is no g value, the tag block simply applies to the following sentence.

As of May 2014 no NMEA 4.10 relative time fields have been observed in the wild. It is unknown whether the unit is seconds or milliseconds.

The d, i/t, and s fields are intended to be used for filtering by station IDs included in them.

Part of the NMEA 4.10 standard describes a configuration message facility by which AIS message receivers can send queries to AIS senders, and under some circumstances change the semantics if tag blocks (in particular, by specifying time units and epoch).

We do not yet have more definite information on the meaning of these fields or how they are related to nearby AIVDM/AIVDO sentences. We hope to add this in a future revision.

AIS Payload Byte Alignment, Padding, and Bit Stuffing

Warning: Here there be dragons. Read with care. Once you get through it, you will at least not encounter anything more confusing in the rest of this document.

Byte Alignment

AIS is a bit-sync protocol. While some fields within AIS payloads are 8-bit-byte-aligned with preceding padding, most are not. Furthermore, while most message variants have bit lengths that are a multiple of 8, some do not.

[ITU1371] includes a single sentence, easy to miss, requiring over-the-air messages to have trailing padding to a 8-bit boundary. In most cases message lengths are a multiple of 8 with trailing spare fields added to ensure this; thus, the requirement will not change the transmitted bitlength of the message from what's described in the standard. There are, however, two exceptions to this rule.

One is an apparent error in the format design. The type 15 message has a variant with 108 data bits and a trailing 2-bit spare field, for 110. This spare should have been 4 bits to guarantee a byte boundary at 112 bits. Decoders need to be prepared to encounter this length in case the transmitter has implemented the padding requirement properly.

The other is messages containing variable-length text packed into 6-bit nibbles: types 6, 12, and 14. They may have trailing padding after the last nibble to get to an 8-bit boundary. Decoders should be prepared to encounter and ignore this.

The variable-length binary message types 8, 17, 25, and 26 are constrained to have data payloads of a size such that the payload ends on a byte boundary, but should not require special handling on this account. The binary data in message types 8 and 17 is also guaranteed to **begin** on a byte boundary, but this is not true of the addressed variants of type 25 and 26.

Interaction with AIVDM padding

AIVDM armoring introduces a second layer of padding, with confusing consequences. The real payload, already padded to a bit length that is a multiple of 8 by the AIS radio layer, gets armored as a sequence of ASCII characters encoding 6-bit nibbles. To capture all of it, the payload must in effect be padded to the next multiple of 6.

Consider a type 12 message with 5 sixbit characters in it. These will become bits 72-102 in the over-the-air message. The AIS radio layer will pad that to 104 bits at transmission to get to an 8-bit boundary. The receiver, reporting the data in AIVDM armoring, will pad that to 108 bits to get to a 6-bit boundary, encode the result, and issue a pad character of *4* to indicate that the low 4 bits of the last 6-bit nibble should be ignored.

Because these requirements are tricky and poorly documented in the official standards, receivers not uncommonly get them wrong. The most common way to get them wrong seems to be by computing the pad character incorrectly.

The most common error observed in the wild on AISHub is reporting a pad 2 bits too small, making the message look like it is 2 bits longer than it actually is. This seems for some reason to be most common on Type 5 messages, which then decode as 426 bits rather than 424.

Accordingly, we recommend that when validating fixed-size messages by type and bit-length, decoders should accept messages that are up to 5 bits over their theoretically correct length.

For messages with a variable-length trailing payload (6, 8, 12, 14, 17, 25, 26) there is no way to detect that the pad character might be wrong. If it is, this will manifest as truncation of the last nibble or extra trailing zero data.

Bit Stuffing

The following probably will not affect decoders. Nevertheless we document it here because it is just the sort of thing that is (a) likely to confuse implementors reading the public portions of the standards, and (b) all too likely to become visible if there are firmware or software errors in the transmission chain.

There are references to "bit-stuffing" in the [IALA] clarifications describing certain payload fields. [C2] reveals the following in 3.2.2.1: "The bitstream is subject to bit stuffing. This means that if more than 5 consecutive 1s are found in the output bit stream, a zero is inserted. This applies to all bits except the databits of HDLC flags." [IALA] clarifies as follows: "On the transmitting side, this means that if five (5) consecutive ones (1s) are found in the output bit stream, a zero should be inserted after the five (5) consecutive ones (1s). This applies to all bits between the HDLC flags [...] On the receiving side, the first zero after five (5) consecutive ones (1s) should be removed."

It appears that this bit stuffing is meant to be performed by the AIS radio link layer at transmission time and undone at reception time, and should not be visible in AIVDM payloads reported by the receiver.

AIS feed sites

Most sites that advertise "live" AIS feeds actually give you a map display through a browser. Here are a few from which you can get raw sentence data over a TCP/IP port for testing. Coverage on these is not yet very comprehensive; these sites tend to have good coverage in Europe, the U.S. and a few ports in Asia but to be spotty elsewhere. See their siting maps for details.

- AIS Hub: Share alike. You contribute a feed, you get back all feeds.
- AIS Live: Subscription access to real-time data. No longer has free access even to delayed data.
- http://hd-sf.com:9009 Free San Francisco Bay Area AIS feed. For non-commercial use only.

JSON-AIS encoding

Here is an application of the JSON metaformat to present AIS data in a form more convenient for application use than AIVDM/AIVDO sentences. This encoding is implemented by GPSD and its client libraries. It is described here because (a) the specification is closely tied to the field encodings, and (b) the author wishes to offer it as an interoperability standard for other applications.

One previous effort, [HAM-JSON-AIS], has been made to define a JSON-based standard for exchange of unpacked, human-readable AIS data. The latest version at time of writing, from December 2008,covers only a small subset of the most common AIS messages, and many data fields in the messages it does dump are omitted. The member names given in the bit-field tables match the attributes used in HAM-JSON-AIS when HAM-JSON-AIS includes that field.

The general ground rules for JSON-AIS encoding are as follows:

1. Each sentence decodes to a JSON object.
2. When multiple kinds of JSON objects may occur in a data stream, AIS objects have the attribute "class":"AIS".
3. Some collections of fields aggregating to a timestamp are dumped in ISO8601 format.

Table 68. Timestamp fields

Message	ITU/IMO fields	JSON ISO8601	Format

Message	ITU/IMO fields	JSON ISO8601	Format
4	year,month,day,hour,minute,second	timestamp	%4u-%02u-%02uT%02u:%02u:%02uZ
5	month,day,hour,minute	eta	%02u-%02uT%02u:%02uZ
6(1/12)	lmonth,lday,lhour,lminute	departure	%02u-%02uT%02u:%02uZ
	nmonth,nday,nhour,nminute	eta	%02u-%02uT%02u:%02uZ
6(1/18)	month,day,hour,minute	arrival	%02u-%02uT%02u:%02uZ
6(1/20)	month,day,hour,minute	arrival	%02u-%02uT%02u:%02uZ
6(1/23)	month,day,hour,minute	timestamp	%02u-%02uT%02u:%02uZ
6(1/28)	month,day,hour,minute	start	%02u-%02uT%02u:%02uZ
8(1/11)	day,hour,minute	timestamp	%02uT%02u:%02uZ
8(1/11)	day,hour,minute	timestamp	%02uT%02u:%02uZ
8(1/13)	fmonth,fday,fhour,fminute	from	%02u-%02uT%02u:%02uZ
8(1/13)	tmonth,tday,thour,tminute	to	%02u-%02uT%02u:%02uZ
8(1/22)	month,day,hour,minute	timestamp	%02u-%02uT%02u:%02uZ
8(1/27)	month,day,hour,minute	start	%02u-%02uT%02u:%02uZ
8(200/23)	year,month,day,hour,minute	start	%4u-%02u-%02uT%02u:%02u
8(200/23)	year,month,day,hour,minute	end	%4u-%02u-%02uT%02u:%02u

1. There are two variants of the encoding, one scaled and one unscaled, which differ in the treatment of float and controlled-vocabulary fields. An AIS-JSON object may have the optional attribute "scaled":true to signify that the rest of its fields are scaled; if this attribute has the value *false* or is omitted, no scaling has been performed. Message types for which the unscaled and scaled dumps will differ are 1-5, 9, 11, 17-19, 21-24, and 27.
2. In unscaled mode, float-valued fields are dumped in their unscaled integer form. In scaled mode, division or other specified scaling is applied and the value dumped as a float, **except** that certain extreme or data-unavailable value as may be dumped as fixed strings; see the table below.
3. Each field in the Controlled Vocabularies list in the following table is dumped twice: once with its base name as an integer, once with "_text" appended to the name and the vocabulary item as value. (This behavior is new in GPSD protocol version 3.9; older versions made integer or string display dependent on the "scaled" flag.)

Table 69. Special fields

Message	Float Fields	Controlled Vocabularies
1-3	turn, speed, lon, lat	status
4, 11	lon, lat	epfd
5	draught	shiptype, epfd
6(1/14)	lon, lat, cspeed	-
6(1/18)	lon, lat	-
6(1/20)	berth_lon, berth_lat, berth_depth	position
6(1/22)	lon, lat	-
6(1/25)	code	code*
6(1/28)	lon, lat	rtype
6(1/32)	lon, lat, cspeed	-
6(235/100)	-	racon, light
8(1/11)	lon, lat, airtemp, dewpoint,	preciptype, ice
	visibility, waterlevel, cspeed,	
	cspeed2, cspeed3, waveheight,	
	swellheight, watertemp salinity	
8(1/17)	lon, lat	idtype*
8(1/18)	lon, lat	-
8(1/19)	-	signal, nextsignal
8(1/21)	lon, lat, visibility, airtemp,	-
	watertemp, waveheight,	
	swellheight, speed, pressure, pdelta,	
	rwindspeed, mgustspeed, airtemp,	
	surftemp, cloudbase,	
	swheight1, swheight2	
8(1/22)	lon, lat	-
8(1/25)	-	iceclass*
8(1/27)	lon, lat	rtype
8(1/31)	lon, lat, airtemp, dewpoint,	preciptype
	visibility, waterlevel, cspeed,	
	cspeed2, cdepth2, cspeed3,	
	cdepth3, waveheight,	
	swellheight, watertemp, salinity	
9	lon, lat, course	-
17	lon, lat	-
18	lon, lat, course	-
19	lon, lat, course	shiptype, epfd
21	lon, lat	aid_type, epfd
22-23	ne_lon,ne_lat, sw_lon, sw_lat	shiptype,stationtype

Message	Float Fields	Controlled Vocabularies
24	-	shiptype
27	lon, lat	-

This table does not include fields that are scaled by multipliers to integers. These are reported in the multiplied form in both scaled and unscaled modes.

Asterisked fields are not yet decoded by GPSD, but probably will be in a future release.

As the Beaufort scale is usually quoted numerically, conforming implementations should do so rather than expanding to its controlled vocabulary.

Table 70. String special values in scaled mode

Message	Fieldname	Special values
1-3	turn	"nan" = not available, "fastright" = fast right turn (above 5deg/30sec degrees), "fastleft" = fast left turn (above 5deg/30sec degrees).
1-3	speed	"nan" = not available, "fast" = speed >= 102.2 knots
9	alt	"nan" = not available, "high" = alt >= 4094 meters
9	speed	"nan" = not available, "fast" = speed >= 1023.0 knots

1. Trailing arrays are dumped as JSON subobject arrays. The name of the array item is the name given in the *a* table entry. Explicit array count fields (presently "waycount" in Route Info messages") are not dumped.
2. In the VTS-Generated/Synthetic Targets message, the id field is dumped as the value of an attribute the name of which is specified by the idtype field.

Open Questions

The AIS standards are not marvels of clear and unambiguous drafting. We list here some open questions which could usefully be addressed by governing authorities.

Some of these duplicate material in paragraphs tagged with OPEN-QUESTION. They are collected here for convenience.

The message type summary table in [INLAND] indicates the existence of a broadcast (unaddressed) variant of Inland Number of Persons On Board. But no field breakdown is given for this variant. If it supposed to be identical to the Type 6 layout, what is to be done with the Destination MMSI field?

Are [INLAND] time-of-day fields UTC or local?

In [INLAND] RTA at lock/bridge/terminal message, no default is specified for the Status field.

In Inland Ship Static and Voyage Related Data, which of two possible ERI numeric codesets are used for the Type field - the 4-digit codes in the 8000-8073 range, or the AIS codes in the 1-99 range? Full ERI codes have been observed in the wild.

In the [INLAND] description of Message 5 extensions, footnote 6 is incomprehensible and not actually referenced in the table.

In the [INLAND] EMMA Warning and Signal Strength messages, the description is not explicit about the interpretation of the longitude and latitude fields; these semantics are assumed here from 28 and 27-bit fields in other messages.

In the [INLAND] EMMA Warning, what are the semantics of the min and max values? To what parameters do they apply?

Is the [IMO236] versions of Persons On Board, which is supposed to be Type 6 and thus addressed, erroneous? There is no destination address field in the layout.

[IMO289] says of the "VTS Generated/Synthetic Targets" message: "When MMSI or IMO number is used, the least significant bit should equal bit zero of the Target Identifier." It is unclear how "bit zero" is to be interpreted, but it is not possible to reconcile interpreting it as the leading bit of the field with AIS big-endian encoding. Settling this awaits live testing.

References

- [AIS] Automatic Identification System
- [SOLAS] SOLAS AIS Regulations
- [US-REQUIREMENTS] AIS Carriage Requirements
- [ITU1371] http://www.itu.int/rec/R-REC-M.1371/en ITU Recommendation on the Technical Characteristics for a Universal Shipborne Automatic Identification System (AIS) using Time Division Multiple Access in the Maritime Mobile Band]. All versions are available here.
- [IALA] IALA Technical Clarifications on Recommendation ITU-R M.1371-1
- [NAVCEN] NAVCEN AIS pages
- [NMEA] "NMEA Revealed" This document collects information from public sources on the proprietary NMEA 0183 standard. It is widely distributed, but due to its hosting site having folded in late 2011, its home location is unstable. It is probably best found by typing the title into a search engine.
- [INLAND] International Standard for tracking and tracing on Inland Waterways
- [SEAWAY] St. Lawrence Seaway AIS Data Messaging Formats and Specifications
- [THAMES] Thames AIS - Technical Requirements Specification
- [IMO236] IMO Circular 236: Guidance on the Application of AIS Binary Messages (May 2004)
- [IMO289] IMO 289: Guidance on the Use of AIS Application-Specific Messages (June 2010)
- http://www.ialathree.org/chapo/publications/documentspdf/doc_235_eng.pdf[IALA Recommendation A-126 On The Use of the Automatic Identification System (AIS) in Marine Aids to Navigation Services
- [Schwehr] Kurt Schwehr's weblog
- [IEC-PAS] IEC-PAS 61162-100, "Maritime navigation and radiocommunication equipment and systems" The ASCII armoring is described on page 26 of Annex C, Table C-1. Communicated by Kurt Schwehr; I have not looked at it.
- [IEC-62287] "Maritime Navigation and Radiocommunication Equipment and Systems – Class B Shipborne Equipment of the Automatic Identification System (AIS)" Communicated by Mike Greene; I have not looked at it.
- [ITU-MID] Table of Maritime Identification Digits
- [RAIM] Receiver Autonomous Integrity Monitoring
- [C2] AIS Specification Corrigendum 2
- [MMSI] MMSI Format
- [HAM-JSON-AIS] JSON AIS transmission protocol
- [AISHUB] AIS Hub, the AIS data sharing center
- [PILOTPLUG] http://www.pilotplug.com/
- [IALA-A126] http://www.iala-aism.org/iala/publications/documentspdf/doc_299_eng.pdf
- [AIS-SART] http://www.navcen.uscg.gov/?pageName=AISMessagesA
- [SART] http://en.wikipedia.org/wiki/AIS-SART
- [PATREON] https://www.patreon.com/esr
- http://www.nmea.org/Assets/0183_advancements_nmea_oct_1_2010%20(2).pdf

Change history

Version 1.0 was the initial release covering messages 1-3, 4, and 5.

Version 1.1 adds message breakdowns for 9 and 18, explanation of the Repeat Indicator feld, and the explanation of USCG extended AIVDM.

Version 1.2 adds information on the ITU1371 edition 3 maneuver field, and the RAIM flag. It also adds an important clarification about six-bit decoding.

Version 1.3 adds information on message types 6, 7, 12, and 13, and attempts to demystify bit-stuffing.

Version 1.4 adds explicit decoding tables for ASCII armoring and six-bit ASCII.

Version 1.5 corrects the interpretation of field 7 in AIVDM ASCII-armored sentences.

Version 1.6 corrects some minor errors in the interpretation of Type 5 messages.

Version 1.7 adds descriptions for Type 10, 11, 19, 21, and 24 messages, information about ITU-1371-3 flags in message type 18, and the new section on Improving This Document.

Version 1.8 fixes some broken markup and adds information about JSON-AIS.

Version 1.9 adds more information on JSON and the member names.

Version 1.10 fixes a typo in the formula for undoing 6-bit armoring.

Version 1.11 describes message types 15, 16, and 17.

Version 1.12 describes messages 20 and 22, and adds navigation aid type codes.

Version 1.13 documents more out-of-band values and treats radio status blocks more uniformly.

Version 1.14 documents message 23.

Version 1.15 corrects an incorrect member name in message 5. It didn't match my C code, but had no effect on conformance with the standard. I corrected it because it confused someone working on a Python decoder.

Version 1.16 incorporated various minor fixes and corrections from Neal Arundale. One *standard* fieldname changed, in message type 21: type → aid_type.

Version 1.17 clarifies the role of @ as a terminator in 6-bit text.

Version 1.18 notes a possible off-by-two error in the standards' description of type 14, and noted that type 25 and 26 have not been observed in the wild. It also adds a more complete description of AIS data types and some pragmatics about spare and reserved fields.

Version 1.19 adds a description of AIS Hub.

Version 1.20 adds a list of AIS feed sites - just two, so far.

Version 1.21 describes JSON-AIS more completely. It adds descriptions for AIS messages type 25 and 26, not yet observed in the wild.

Version 1.22 describes the problem with message length checks. Notes on EPFD value 15 and shiptype values > 99 are added. Added another AIS feed. Corrections and more details on message 22.

Version 1.23 corrects some typos and numbering errors in the description of message 19 (field widths were correct, though). Also, AISLive no longer offers free delayed access.

Version 1.24 breaks the Type 6 and 8 application_id field into DAC and FID and adds tables for known DAC/FID pairs and their sources. Unspecified fields are now omitted in JSON dumps. A new section "AIS byte alignment, bit stuffing, and padding", reveals some particularly black magic.

Version 1.25 adds clarifications and more message subtypes for U.S. Coast Guard PAWSS messages.

Version 1.26 corrects an error in describing rate-of-turn decoding in AIS Type 1, 2, and 3 messages,

Version 1.27 describes the sometime U.S. practice of omitting the leading *3* region code from MMSIs.

Version 1.28 merges updates from IMO 289, communicated by Kurt Schwehr.

Version 1.29 added much information on WMO special message formats in types 6 and 8.

Version 1.30 was revised because M.1371-4 is now a free download. Also, we describe "pilot plugs" and AIS message type 27. We get much more explicit about defaults in IMO236 and IMO289 messages.

Version 1.31 shortened some C names in the Meteorological/Hydrological messages and fixed typos.

Version 1.32 adds descriptions of IMO Area Notice and Environmental messages. It adds explicit type information to the tables.

Version 1.33 notes that the home location of "NMEA Revealed" became unstable in late 2011.

Version 1.34 fixes a typo in the MMSI 2 field offset of message 7.

Version 1.35 notes that 24A and 24B messages don't necessarily come in neat adjacent pairs and that decoders need to handle this.

Version 1.36 corrects erroneous scale factors in the IMO 289 Area Notice and Time to Enter Port descriptions.

Version 1.36 adds breakdowns of Aid to Navigation monitoring messages used in the UK and the Republic of Ireland.

Version 1.37 corrects a field signedness error in the IMO236 and IMO289 Met/Hydro messages.

Version 1.38 corrects a minor bug in the description of the Navigation Message ROT field. Adds information on AIS-SART.

Version 1.39 corrects signedness errors in the description of the Air Temperature and Water Temperature fields in the IMO289 Weather Report From Ship message.

Version 1.40 notes that AIS channel codes *1* and *2* may be encountered in the wild.

Version 1.41 has been slightly amended because type 27s have started showing up on satellite feeds.

Version 1.42 fixes a typo in the Type 4 message description.

Version 1.43 describes the ITU-R 1371-4 breakdown of the Type 24 Vendor ID field and adds information on AIS standards for inland waterways. Also Inland AIS standard messages are now covered.

Version 1.44 adds substantial new information on MMSIs and updates the [MMSI link], which was stale.

Version 1.45 adds a description of variant AIS talker IDs and NMEA 4.10 tag blocks.

Version 1.46 corrects an error in the specification on Inland AIS Type 10s. It also adds a bit more information on AIS tag blocks.

Version 1.47 corrects some minor field type errors in Type 18 and Type 19 speed fields. Also corrected Type 9 radio field length.

Version 1.48 corrects two typos in the WMO289 Area Notice and Weather Report From Ship definitions.

Version 1.49 adds a technical detail about non-AIS encapsulated sentences.

Version 1.50 fixes a couple of typos in the ISO289 Berthing Data and Tidal Window message descriptions.

Version 1.51 fixes an incorrect bit length in the IMO289 Hydrological Data message.

Version 1.52 fixes many small typos. Change Gratipay to Patreon.

Version 1.52
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