

DIN EN 61162-1

ICS 47.020.70

Entwurf

Einsprüche bis 2015-12-09
Vorgesehen als Ersatz für
DIN EN 61162-1:2011-09 und
DIN EN 61162-1
Berichtigung 1:2014-04

**Navigations- und Funkkommunikationsgeräte und -systeme für die
Seeschifffahrt –
Digitale Schnittstellen –
Teil 1: Ein Datensender und mehrere Datenempfänger
(IEC 80/763/CDV:2015);
Englische Fassung FprEN 61162-1:2015**

Maritime navigation and radiocommunication equipment and systems –
Digital interfaces –
Part 1: Single talker and multiple listeners
(IEC 80/763/CDV:2015);
English version FprEN 61162-1:2015

Matériels et systèmes de navigation et de radiocommunication maritimes –
Interfaces numériques –
Partie 1: Emetteur unique et récepteurs multiples
(IEC 80/763/CDV:2015);
Version anglaise FprEN 61162-1:2015

Anwendungswarnvermerk

Dieser Norm-Entwurf mit Erscheinungsdatum 2015-10-09 wird der Öffentlichkeit zur Prüfung und Stellungnahme vorgelegt.

Weil die beabsichtigte Norm von der vorliegenden Fassung abweichen kann, ist die Anwendung dieses Entwurfs besonders zu vereinbaren.

Stellungnahmen werden erbeten

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- oder in Papierform an die DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik in DIN und VDE, Stresemannallee 15, 60596 Frankfurt am Main.

Die Empfänger dieses Norm-Entwurfs werden gebeten, mit ihren Kommentaren jegliche relevanten Patentrechte, die sie kennen, mitzuteilen und unterstützende Dokumentationen zur Verfügung zu stellen.

Gesamtumfang 169 Seiten

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DIN-Normenstelle Schiffs- und Meerestechnik (NSMT)

Nationales Vorwort

Die Englische Fassung des europäischen Dokuments FprEN 61162-1:2015 „Navigations- und Funkkommunikationsgeräte und -systeme für die Seeschifffahrt – Digitale Schnittstellen – Teil 1: Ein Datensender und mehrere Datenempfänger“ (Entwurf in der Umfrage) ist unverändert in diesen Norm-Entwurf übernommen worden.

Die Internationale Elektrotechnische Kommission (IEC) und das Europäische Komitee für Elektrotechnische Normung (CENELEC) haben vereinbart, dass ein auf IEC-Ebene erarbeiteter Entwurf für eine Internationale Norm zeitgleich (parallel) bei IEC und CENELEC zur Umfrage (CDV-Stadium) und Abstimmung als FDIS (en: Final Draft International Standard) bzw. Schluss-Entwurf für eine Europäische Norm gestellt wird, um eine Beschleunigung und Straffung der Normungsarbeit zu erreichen. Dem entsprechend ist das internationale Dokument IEC 80/763/CDV:2015 „Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 1: Single talker and multiple listeners“ unverändert in den Entwurf Englische Fassung FprEN 61162-1:2015 übernommen worden.

Das internationale Dokument wurde vom TC 80 „Maritime navigation and radiocommunication equipment and systems“ der Internationalen Elektrotechnischen Kommission (IEC) erarbeitet.

Bei der Abstimmung zu dem Europäischen Schluss-Entwurf bei CENELEC und dem Internationalen Schluss-Entwurf bei IEC [Final Draft International Standard (FDIS)] sind jeweils nur „JA/NEIN“-Entscheidungen möglich, wobei „NEIN“-Entscheidungen fundiert begründet werden müssen. Dokumente, die bei CENELEC als Europäische Norm angenommen und ratifiziert werden, sind unverändert als Deutsche Normen zu übernehmen.

Für dieses Dokument ist das nationale Arbeitsgremium K 738 „Elektronische Navigationsinstrumente“ der DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik in DIN und VDE (www.dke.de) zuständig.

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Der Zusammenhang der zitierten Dokumente mit den entsprechenden Deutschen Dokumenten ergibt sich, soweit ein Zusammenhang besteht, grundsätzlich über die Nummer der entsprechenden IEC-Publikation. Beispiel: IEC 60068 ist als EN 60068 als Europäische Norm durch CENELEC übernommen und als DIN EN 60068 ins Deutsche Normenwerk aufgenommen.

Das Präsidium des DIN hat mit Präsidialbeschluss 1/2004 festgelegt, dass DIN-Normen, deren Inhalt sich auf internationale Arbeitsergebnisse der Informationsverarbeitung gründet, unter bestimmten Bedingungen allein in englischer Sprache veröffentlicht werden dürfen. Diese Bedingungen sind für die vorliegende Norm erfüllt.

Da sich die Benutzer des vorliegenden Normentwurfs der englischen Sprache als Fachsprache bedienen, wird die englische Fassung der FprEN 61162-1 veröffentlicht. Zu deren Abschnitt 1, der den Anwendungsbereich festlegt, und deren Abschnitt 3, der die Begriffe festlegt, wurde eine Übersetzung angefertigt und als informativer Nationaler Anhang NA des vorliegenden Normentwurfs hinzugefügt. Für viele der verwendeten Begriffe existieren keine gebräuchlichen deutschen Benennungen, da sich die deutschen Anwender in der Regel ebenfalls der englischen Benennungen bedienen. Dieser Normentwurf steht nicht in unmittelbarem Zusammenhang mit Rechtsvorschriften und ist nicht als Sicherheitsnorm anzusehen.

Es ist vorgesehen, auch bei der entsprechenden zukünftigen Deutschen Norm auf die deutsche Sprachfassung zu verzichten und diese in der englischsprachigen Fassung zu veröffentlichen.

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Änderungen

Gegenüber DIN EN 61162-1:2011-09 und DIN EN 61162-1 Berichtigung 1:2014-04 wurden folgende Änderungen vorgenommen:

- a) in Tabelle 4 wurden neue Kennungen hinzugefügt;
- b) die Sentences CBR und MEB wurden entfernt, da sie jetzt nur durch auf dem Festland betriebene AIS-Geräte verwendet werden;
- c) neue Sentences ACN, ALC, ALF, ARC, HRC, HRM, MOB, NSR, RLM, RRT, SM1, SM2, SM3, SM4 und SMB wurden hinzugefügt;
- d) ABK, ABM, GNS, NAK, NRM, RMC, ROR und TTD wurden überarbeitet;
- e) die Testmethoden im Anhang B wurden überarbeitet.

Nationaler Anhang NA (informativ)

Die deutschen Übersetzungen haben Empfehlungscharakter und können nur die ungefähre Begrifflichkeit in Deutsch wiedergeben. Unter Experten wird empfohlen, ausschließlich die englischen Fachbegriffe zu verwenden, um die Gefahr von Missverständnissen zu reduzieren.

1 Anwendungsbereich^{N1)}

Dieser Teil 1 der internationalen Normenreihe IEC 61162 enthält die Anforderungen an Datenkommunikation zwischen elektronischen Instrumenten, Navigationseinrichtungen und Funkkommunikationsgeräten für die Seeschifffahrt, die über ein geeignetes System miteinander verbunden sind.

Diese Teilnorm soll die serielle Ein-Weg-Datenübertragung von einem einzelnen Datensender zu einem oder mehreren Datenempfängern unterstützen. Die Daten liegen in druckbarem ASCII-Format vor und können Informationen beinhalten, wie Position, Geschwindigkeit, Wassertiefe, Frequenznutzung usw. Typische Meldungslängen sind von 11 bis 79 Zeichen und erfordern eine typische Übertragungszeit von in der Regel nicht mehr als einer Meldung pro Sekunde.

Die elektrischen Festlegungen dieser Norm sollen keine Anwendungen mit hohen Bandbreiten, wie Radar, Bildübertragung oder große Datenbank- und Filetransfers mit hohen Datenraten unterstützen. Wegen fehlender Garantie für die Meldungsübertragung nur eingeschränkter Möglichkeit zur Fehlerprüfung sollte die vorliegende Norm nur mit Bedacht in Sicherheitsanwendungen angewendet werden.

Für Anwendungen mit höheren Datenraten sollte auf die IEC 61162-2 verwiesen werden.

Bei Anwendungen für auf dem Festland betriebene AIS-Geräte sollte auf die Normenreihe IEC 62320 verwiesen werden.

3 Begriffe

Für die Anwendung dieses Dokuments gelten die folgenden Begriffe.

Die deutschen Übersetzungen haben Empfehlungscharakter und können nur die ungefähre Begrifflichkeit in Deutsch wiedergeben. Unter Experten wird empfohlen, ausschließlich die englischen Fachbegriffe zu verwenden, um die Gefahr von Missverständnissen zu reduzieren.

3.1

Sender

(en: talker)

Gerät, das Daten an andere Geräte sendet. Die Art des Senders wird durch ein 2-Zeichen-Kürzel gekennzeichnet, wie in 8.2 aufgeführt (siehe Tabelle 4)

3.2

Empfänger

(en: listener)

Gerät, das Daten von einem anderen Gerät empfängt

^{N1)} Nationale Fußnote: Die Nummerierung des IEC-Schriftstücks 80/763/CDV:2015-07 wurde beibehalten.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**MARITIME NAVIGATION AND RADIOCOMMUNICATION
EQUIPMENT AND SYSTEMS –
DIGITAL INTERFACES –****Part 1: Single talker and multiple listeners**

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 61162-1 has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems.

This fifth edition cancels and replaces the fourth edition published in 2010, and constitutes a technical revision.

The main changes with respect to the previous edition are listed below:

- new identifiers have been added to Table 4;
- the sentences CBR and MEB have been removed as they are now solely used by AIS shore based equipment:

- 54 • new sentences ACN, ALC, ALF, ARC, HRC, HRM, MOB, NSR, RLM, RRT, SM1, SM2,
55 SM3, SM4 and SMB have been added;
56 • revisions have been made to ABK, ABM, GNS, NAK, NRM, RMC, ROR and TTD;
57 • the methods of testing in Annex B have been revised.

58 The text of this standard is based on the following documents:

FDIS	Report on voting
80/XX/FDIS	80/XX/RVD

59
60 Full information on the voting for the approval of this standard can be found in the report on
61 voting indicated in the above table.

62 This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

63 The committee has decided that the contents of this publication will remain unchanged until the
64 stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to
65 the specific publication. At this date, the publication will be

- 66 • reconfirmed,
67 • withdrawn,
68 • replaced by a revised edition, or
69 • amended.

70

71 The National Committees are requested to note that for this publication the stability date
72 is 2021.

73 THIS TEXT IS INCLUDED FOR THE INFORMATION OF THE NATIONAL COMMITTEES AND WILL BE
74 DELETED AT THE PUBLICATION STAGE.

75

76

77

INTRODUCTION

78 International standard IEC 61162 is a five part standard which specifies digital interfaces for
79 application in marine navigation, radiocommunication and system integration. The four parts
80 are:

- | | | |
|----|---------------|---|
| 81 | IEC 61162-1 | Single talker and multiple listeners; |
| 82 | IEC 61162-2 | Single talker and multiple listeners, high speed transmission; |
| 83 | IEC 61162-3 | Multiple talkers and multiple listeners – Serial data instrument network; |
| 84 | IEC 61162-450 | Multiple talkers and multiple listeners – Ethernet interconnection; |
| 85 | IEC 61162-460 | Multiple talkers and multiple listeners – Ethernet interconnection - Safety |
| 86 | | and security |

87 IEC technical committee 80 interface standards are developed with input from manufacturers,
88 private and government organisations and equipment operators. The information is intended to
89 meet the needs of users at the time of publication, but users should recognise that as
90 applications and technology change, interface standards should change as well. Users of this
91 standard are advised to immediately inform the IEC of any perceived inadequacies therein.

92 The first edition of IEC 61162-1 was published in 1995. The second edition published in 2000
93 removed some sentences which were no longer in use, added some new sentences and
94 included details of the ship equipment defined in IMO resolutions together with appropriate
95 sentences for communication between them. This information was subsequently removed from
96 the third edition when it became the practice to specify the sentence formatters in the individual
97 standards for equipment.

98 The third edition published in 2007 introduced a re-arrangement of the text and new sentences
99 particularly to support the Automatic Identification System and the Voyage Data Recorder. The
100 third edition also introduced a further type of start of sentence delimiter. The conventional
101 delimiter "\$" was retained for the conventional sentences which are now called parametric
102 sentences. The new delimiter "!" identifies sentences that conform to special purpose
103 encapsulation.

104 The fourth edition removed some sentences which were not in use, added some new
105 sentences for new applications and made some corrections and additions. In particular the
106 sentences of relevance to satellite navigation receivers were expanded to facilitate the
107 description of new satellite systems.

108 This fifth edition also removes some sentences which are no longer in use, adds some new
109 sentences for new applications and makes some corrections and additions.

110 Liaison has been maintained with NMEA and this edition has been aligned where appropriate
111 with NMEA 0183 version 4.10.

112

**MARITIME NAVIGATION AND RADIOCOMMUNICATION
EQUIPMENT AND SYSTEMS –
DIGITAL INTERFACES –**

Part 1: Single talker and multiple listeners

1 Scope

This part of IEC 61162 contains the requirements for data communication between maritime electronic instruments, navigation and radiocommunication equipment when interconnected via an appropriate system.

This part of IEC 61162 is intended to support one-way serial data transmission from a single talker to one or more listeners. This data is in printable ASCII form and may include information such as position, speed, depth, frequency allocation, etc. Typical messages may be from about 11 to a maximum of 79 characters in length and generally require transmission no more rapidly than one message per second.

The electrical definitions in this standard are not intended to accommodate high-bandwidth applications such as radar or video imagery, or intensive database or file transfer applications. Since there is no provision for guaranteed delivery of messages and only limited error checking capability, this standard should be used with caution in all safety applications.

For applications where a faster transmission rate is necessary, reference should be made to IEC 61162-2.

For applications to shore based equipment of the automatic identification system (AIS) reference should be made to the IEC 62320 series.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60945:2002, *Maritime navigation and radiocommunication equipment and systems – General requirements – Methods of testing and required test results*

IEC 61162-2:1998, *Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 2: Single talker and multiple listeners, high-speed transmission*

ISO/IEC 8859-1:1998, *Information technology – 8-bit single-byte coded graphic character sets – Part 1: Latin alphabet No.1*

ITU-T X.27/V.11:1996, *Electrical characteristics for balanced double-current interchange circuits operating at data signalling rates up to 10 Mbit/s*

150 3 Terms and definitions

151 Common terms are defined in the glossary of Annex A. Where there is a conflict, terms are
152 interpreted, wherever possible, in accordance with the references in Clause 2.

153 For the purposes of this document, the following terms and definitions apply.

154 3.1

155 **talker**

156 any device which sends data to other devices. The type of talker is identified by a 2-character
157 mnemonic as listed in 8.2 (see Table 4)

158 3.2

159 **listener**

160 any device which receives data from another device

161 4 Manufacturer's documentation

162 Operator manuals or other appropriate literature provided for equipment that is intended to
163 meet the requirements of this standard shall contain the following information:

- 164 a) identification of the A and B signal lines;
- 165 b) the output drive capability as a talker;
- 166 c) a list of approved sentences, noting unused fields, proprietary sentences transmitted as a
167 talker and transmission interval for each sentence;
- 168 d) the load requirements as a listener;
- 169 e) a list of sentences and associated data fields that are required as a listener;
- 170 f) the current software and hardware revision if this is relevant to the interface;
- 171 g) an electrical description or schematic of the listener/talker input/output circuits citing actual
172 components and devices used, including connector type and part number;
- 173 h) the version number and date of update of the standard for which compliance is sought.

174 5 Hardware specification

175 5.1 General

176 NOTE Guidelines on methods of testing are given in Annex B.

177 One talker and multiple listeners may be connected in parallel over an interconnecting wire.
178 The number of listeners depends on the output capability and input drive requirements of
179 individual devices.

180 5.2 Interconnecting wire

181 Interconnection between devices may be by means of a two-conductor, shielded, twisted-pair
182 wire.

183 5.3 Conductor definitions

184 The conductors referred to in this standard are the signal lines A and B, and shield.

5.4 Electrical connections/shield requirements

All signal line A connections are connected in parallel with all device A connections and all signal line B connections are connected in parallel with all device B connections. The shields of all listener cables should be connected to the talker chassis only and should not be connected at each listener.

5.5 Connector

No standard connector is specified. Wherever possible readily available commercial connectors shall be used. Manufacturers shall provide means for user identification of the connections used.

5.6 Electrical signal characteristics

5.6.1 General

This subclause describes the electrical characteristics of transmitters and receivers.

5.6.2 Signal state definitions

The idle, marking, logical 1, OFF or stop bit states are defined by a negative voltage on line A with respect to line B.

The active, spacing, logical 0, ON or start bit states are defined by a positive voltage on line A with respect to line B.

It should be noted that the above A with respect to B levels are inverted from the voltage input/output requirements of standard UARTs and that many line drivers and receivers provide a logic inversion.

5.6.3 Talker drive circuits

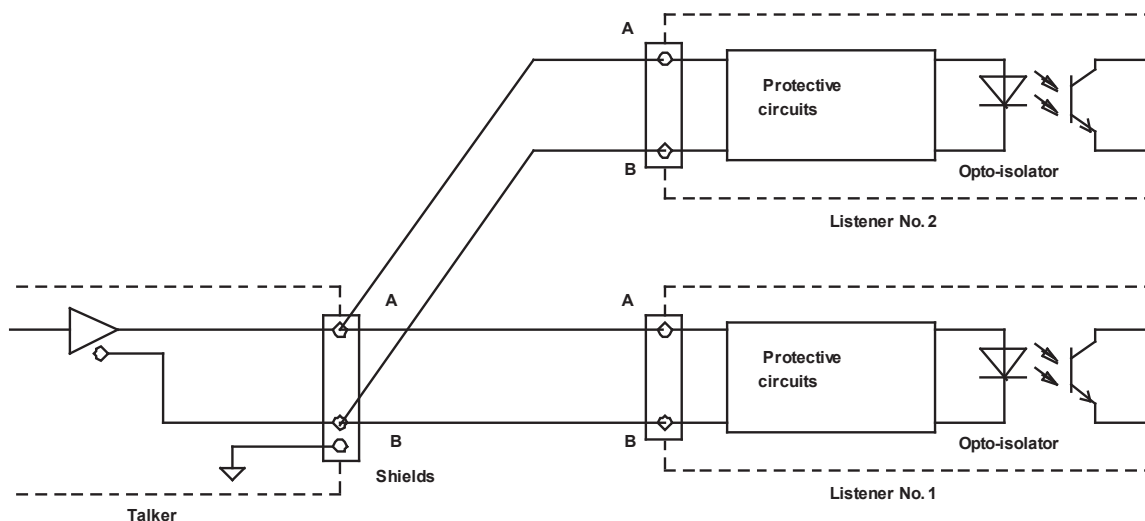
No provision is made for more than a single talker to be connected to the bus. The drive circuit used to provide the signal A and the return B shall meet, as a minimum, the requirements of ITU-T X.27/V.11.

5.6.4 Listener receive circuits

Multiple listeners may be connected to a single talker. The listener receive circuit shall consist of an opto-isolator and shall have protective circuits to limit current, reverse bias and power dissipation at the opto-diode as shown in Figure 1. Reference is made to example circuits in 9.2.

The receive circuit shall be designed for operation with a minimum differential input voltage of 2,0 V¹ and shall not take more than 2,0 mA from the line at that voltage.

¹ For reasons of compatibility with equipment designed to comply with earlier versions of NMEA 0183, it is noted that the idle, marking, logical "1", OFF or stop bit state had previously been defined to be in the range –15,0 V to +0,5 V. The active, spacing, logical "0", ON or start bit state was defined to be in the range +4,0 V to +15,0 V while sourcing was not less than 15 mA.



IEC 910/2000

Figure 1 – Listener receive circuit

5.6.5 Electrical isolation

Within a listener, there shall be no direct electrical connection between the signal line A, return line B, or shield and ship's ground or power. Isolation from ship's ground is required.

5.6.6 Maximum voltage on bus

The maximum applied voltage between signal lines A and B and between either line and ground shall be in accordance with ITU-T X.27/V.11.

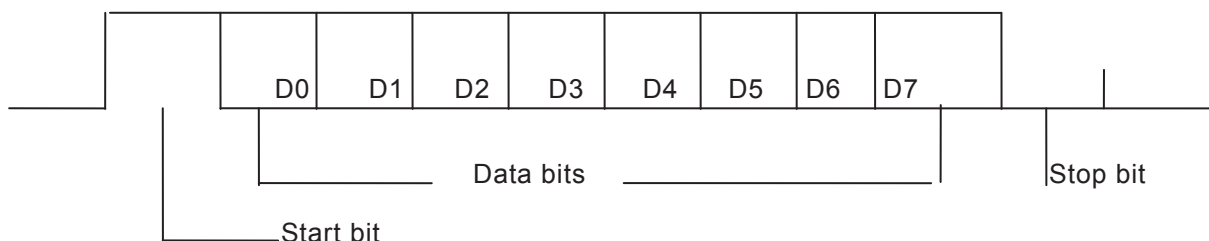
For protection against mis-wiring and for use with earlier talker designs, all receive circuit devices shall be capable of withstanding 15 V between signal lines A and B and between either line and ground for an indefinite period.

6 Data transmission

Data is transmitted in serial asynchronous form in accordance with the standards referenced in Clause 2. The first bit is a start bit and is followed by data bits, least-significant-bit first, as illustrated by Figure 2.

The following parameters are used:

- baud rate 4 800;
- data bits 8 ($D_7 = 0$), parity none;
- stop bits 1.



IEC 911/2000

Figure 2 – Data transmission format

244 **7 Data format protocol**

245 **7.1 Characters**

246 **7.1.1 General**

247 All transmitted data shall be interpreted as ASCII characters. The most significant bit of the
248 eight-bit character shall always be transmitted as zero (D7 = 0).

249 **7.1.2 Reserved characters**

250 The reserved character set consists of those ASCII characters shown in 8.1 (Table 1). These
251 characters are used for specific formatting purposes, such as sentence and field delimiting,
252 and except for code delimiting, shall not be used in data fields.

253 **7.1.3 Valid characters**

254 The valid character set consists of all printable ASCII characters (HEX 20 to HEX 7E) except
255 those defined as reserved characters. The list of the valid character set is given in 8.1
256 (Table 2).

257 **7.1.4 Undefined characters**

258 ASCII values not specified as either “reserved characters” or “valid characters” are excluded
259 and shall not be transmitted at any time.

260 When it is necessary to communicate an 8-bit character defined by ISO/IEC 8859-1 that is a
261 reserved character (Table 1) or not listed in Table 2 as a valid character (e.g. in a proprietary
262 sentence or text sentence), three characters shall be used.

263 The reserved character “^” (HEX 5E) is followed by two ASCII characters (0-9, A-F)
264 representing the HEX value of the character to be communicated. For example:

- 265 – to send heading as “127.5°”, transmit “127.5 ^F8”;
- 266 – to send the reserved characters <CR><LF>, transmit “^0D^0A”;
- 267 – to send the reserved character “^”, transmit “^5E”.

268 IEC 60945 states that, as a minimum requirement, English language shall be used for controls
269 and displays. Other languages/characters are only supported by the TUT sentence.

270 **7.1.5 Character symbols**

271 When individual characters are used in this standard to define units of measurement, to
272 indicate the type of data field, type of sentence, etc. they shall be interpreted according to the
273 character symbol in 8.1 (Table 3).

274 **7.2 Fields**

275 **7.2.1 String**

276 A field consists of a string of valid characters, or no characters (null field), located between two
277 appropriate delimiter characters.

278 7.2.2 Address field**279 7.2.2.1 General**

280 An address field is the first field in a sentence and follows the "\$" or "!" delimiter; it serves to
281 define the sentence. The "\$" delimiter identifies sentences that conform to the conventional
282 parametric and delimited field composition rules as described in 7.3.3. The "!" delimiter
283 identifies sentences that conform to the special-purpose encapsulation and non-delimited field
284 composition rules as described in 7.3.3. Characters within the address field are limited to digits
285 and upper case letters. The address field shall not be a null field. Only sentences with the
286 following three types of address fields shall be transmitted.

287 7.2.2.2 Approved address field

288 Approved address fields consist of five digits and upper case letter characters defined by this
289 standard. The first two characters are the talker identifier, listed in 8.2 (Table 4). The talker
290 identifier serves to define the nature of the data being transmitted.

291 Devices that have the capability to transmit data from multiple sources shall transmit the
292 appropriate talker identifier (for example a device with both a GPS receiver and a LORAN-C
293 receiver shall transmit GP when the position is GPS-based, LC when the position is LORAN-C-
294 based, and IN for integrated navigation shall be used if lines of position from LORAN-C and
295 GPS are combined into a position fix).

296 Devices capable of re-transmitting data from other sources shall use the appropriate identifier
297 (for example GPS receivers transmitting heading data shall not transmit \$GPHCD unless the
298 compass heading is actually derived from the GPS signals).

299 The next three characters form the sentence formatter used to define the format and the type
300 of data. A list of sentence formatters is given in 8.3.

301 7.2.2.3 Query address field

302 The query address field consists of five characters and is used for the purpose of requesting
303 transmission of a specific sentence on a separate bus from an identified talker.

304 The first two characters are the talker identifier of the device requesting data, the next two
305 characters are the talker identifier of the device being addressed and the final character is the
306 query character "Q".

307 7.2.2.4 Proprietary address field

308 The proprietary address field consists of the proprietary character "P" followed by a three-
309 character manufacturer's mnemonic code, used to identify the talker issuing a proprietary
310 sentence, and any additional characters as required.

311 NOTE A list of valid manufacturer's mnemonic codes may be obtained from NMEA (see 7.3.6).

312 7.2.3 Data fields**313 7.2.3.1 General**

314 Data fields in approved sentences follow a "," delimiter and contain valid characters (and code
315 delimiters "^") in accordance with the formats illustrated in 8.2 (Table 5). Data fields in
316 proprietary sentences contain only valid characters and the delimiter characters ",", and "^", but
317 are not defined by this standard.

318 Because of the presence of variable data fields and null fields, specific data fields shall only be
319 located within a sentence by observing the field delimiters ";". Therefore, it is essential for the
320 listener to locate fields by counting delimiters rather than counting the total number of
321 characters received from the start of the sentence.

322 7.2.3.2 Variable length fields

323 Although some data fields are defined to have fixed length, many are of variable length in order
324 to allow devices to convey information and to provide data with more or less precision,
325 according to the capability or requirements of a particular device.

326 Variable length fields may be alphanumeric or numeric fields. Variable numeric fields may
327 contain a decimal point and may contain leading or trailing zeros.

328 7.2.3.3 Data field types

329 Data fields may be alpha, numeric, alphanumeric, variable length, fixed length or fixed/ variable
330 (with a portion fixed in length while the remainder varies). Some fields are constant, with their
331 value dictated by a specific sentence definition. The allowable field types are summarized in
332 8.2 (Table 5).

333 7.2.3.4 Null fields

334 A null field is a field of length zero, i.e. no characters are transmitted in the field. Null fields
335 shall be used when the value is unreliable or not available.

336 For example, if heading information were not available, sending data of "000" is misleading
337 because a user cannot distinguish between "000" meaning no data and a legitimate heading of
338 "000". However, a null field, with no characters at all, clearly indicates that no data is being
339 transmitted.

340 Null fields with their delimiters can have the following appearance depending on where they are
341 located in the sentence:

342 ",," ",*"

343 The ASCII NULL character (HEX 00) shall not be used as the null field.

344 7.2.4 Checksum field

345 A checksum field shall be transmitted in all sentences. The checksum field is the last field in a
346 sentence and follows the checksum delimiter character "*". The checksum is the eight-bit
347 exclusive OR (no start or stop bits) of all characters in the sentence, including ";", " and ^"
348 delimiters, between but not including the "\$" or "!" and the "*" delimiters.

349 The hexadecimal value of the most significant and least significant four bits of the result is
350 converted to two ASCII characters (0-9, A-F) for transmission. The most significant character is
351 transmitted first.

352 Examples of the checksum field are:

353 \$GPGLL,5057.970,N,00146.110,E,142451,A*27 and

354 \$GPVTG,089.0,T,,15.2,N,,*53.

355 7.2.5 Sequential message identifier field

356 This is a field that is critical to identifying groups of 2 or more sentences that make up a multi-
357 sentence message. This field applies only to a single sentence formatter, and is not used in

358 associate different sentence formatters. This field is incremented each time a new multi-
 359 sentence message is generated with the same sentence formatter. This field's value is reset to
 360 zero when it is incremented beyond the defined maximum value. This field's maximum value,
 361 size, and format of this field is determined by the applicable sentence definition in Clause 8
 362 This is one of three key fields supporting the multi-sentence message capability (see 7.3.9).

363 7.3 Sentences

364 7.3.1 General structure

365 This subclause describes the general structure of sentences. Details of specific sentence
 366 formats are found in 8.3. Some sentences may specify restrictions beyond the general
 367 limitations given in this standard. Such restrictions may include defining some fields as fixed
 368 length, numeric or text only, required to be non-null, transmitted with a certain frequency, etc.

369 The maximum number of characters in a sentence shall be 82, consisting of a maximum of 79
 370 characters between the starting delimiter "\$" or "!" and the terminating delimiter <CR><LF>.

371 The minimum number of fields in a sentence is one (1). The first field shall be an address field
 372 containing the identity of the talker and the sentence formatter which specifies the number of
 373 data fields in the sentence, the type of data they contain and the order in which the data fields
 374 are transmitted. The remaining portion of the sentence may contain zero or multiple data fields.

375 The maximum number of fields allowed in a single sentence is limited only by the maximum
 376 sentence length of 82 characters. Null fields may be present in the sentence and shall always
 377 be used if data for that field is unavailable.

378 All sentences begin with the sentence-starting delimiter character "\$" or "!" and end with the
 379 sentence-terminating delimiter <CR><LF>.

380 7.3.2 Description of approved sentences

381 Approved sentences are those designed for general use and detailed in this standard.
 382 Approved sentences are listed in 8.3 and shall be used wherever possible. When a deprecated
 383 sentence has been replaced by an approved sentence, this is indicated in 8.3 by a note.

384 Other sentences, not recommended for new designs, may be found in practice.

385 NOTE Such sentences are listed in NMEA 0183. Information on such sentences may be obtained from the
 386 National Marine Electronics Association (NMEA) (see 7.3.6).

387 An approved sentence contains, in the order shown, the following elements:

388	ASCII	HEX	Description
389	"\$" or "!"	24 or 21	– start of sentence
390	<address field>		– talker identifier and sentence formatter
391	["," <data field>]		– zero or more data fields
392	["," <data field>]		
393	"*" <checksum field>		– checksum field
394	<CR><LF>	0D 0A	– end of sentence

395 7.3.3 Parametric sentences

396 7.3.3.1 Description

397 These sentences start with the "\$" delimiter, and represent the majority of sentences defined
398 by this standard. This sentence structure, with delimited and defined data fields, is the
399 preferred method for conveying information.

400 The basic rules for parametric sentence structures are:

- 401 • the sentence begins with the "\$" delimiter;
- 402 • only approved sentence formatters are allowed. Formatters used by special-purpose
403 encapsulation sentences cannot be reused. See 8.2;
- 404 • only valid characters are allowed. See 8.1 (Tables 1 and 2);
- 405 • only approved field types are allowed. See 8.2 (Table 5);
- 406 • data fields (parameters) are individually delimited, and their content is identified and often
407 described in detail by this standard;
- 408 • encapsulated non-delimited data fields are NOT ALLOWED.

409 7.3.3.2 Structure

410 The following provides a summary explanation of the approved parametric sentence structure:

411 \$aacc, c---c*hh<CR><LF>

412	ASCII	HEX	Description
413	"\$"	24	Start of sentence: starting delimiter.
414	aacc		Address field: alphanumeric characters identifying type of talker, and sentence formatter. The first two characters identify the talker. The last three are the sentence formatter mnemonic code identifying the data type and the string format of the successive fields. Mnemonics will be used as far as possible to facilitate readouts by users.
415			
416			
417			
418			
420	","	2C	Field delimiter: starts each field except address and checksum fields. If it is followed by a null field, it is all that remains to indicate no data in a field.
421			
422			
423	c---c		Data sentence block: follows address field and is a series of data fields containing all of the data to be transmitted. Data field sequence is fixed and identified by the third and subsequent characters of the address field (the sentence formatter). Data fields may be of variable length and are preceded by delimiters ",".
424			
425			
426			
427			
428	"*"	2A	checksum delimiter: follows last data field of the sentence. It indicates that the following two alpha-numeric characters show the HEX value of the checksum.
429			
430			
431	hh		Checksum field: the absolute value calculated by exclusive- OR'ing the eight data bits (no start bits or stop bits) of each character in the sentence between, but excluding, "\$" and "*". The hexadecimal value of the most significant and least significant four bits of the result are converted to two ASCII characters (0-9, A-F) for transmission. The most significant character is transmitted first. The checksum field is required in all cases.
432			
433			
434			
435			
436			
437			

438 <CR><LF> 0D 0A End of sentence: sentence terminating delimiter.

439 7.3.4 Encapsulation sentences

440 7.3.4.1 Description

441 These sentences start with the "!" delimiter. The function of this special-purpose sentence
 442 structure is to provide a means to convey information, when the specific data content is
 443 unknown or greater information bandwidth is needed. This is similar to a modem that transfers
 444 information without knowing how the information is to be decoded or interpreted.

445 The basic rules for encapsulation sentence structures are:

- 446 • the sentence begins with the "!" delimiter;
- 447 • only approved sentence formatters are allowed. Formatters used by conventional
 448 parametric sentences cannot be reused. See 8.2;
- 449 • only valid characters are allowed. See 8.1 (Tables 1 and 2);
- 450 • only approved field types are allowed. See 8.2 (Table 5);
- 451 • only six-bit coding may be used to create encapsulated data fields. See 8.2 (Table 5);
- 452 • encapsulated data fields may consist of any number of parameters, and their content is not
 453 identified or described by this standard;
- 454 • the sentence shall be defined with one encapsulated data field and any number of
 455 parametric data fields separated by the "," data field delimiter. The encapsulated data field
 456 shall always be the second to last data field in the sentence, not counting the checksum
 457 field. See 7.2.3;
- 458 • the sentence contains a "total number of sentences" field. See 7.3.4.1;
- 459 • the sentence contains a "sentence number" field. See 7.3.4.1,
- 460 • the sentence contains a "sequential message identifier" field. See 7.3.4.1;
- 461 • the sentence contains a "fill bits" field immediately following the encapsulated data field.
 462 The fill bits field shall always be the last data field in the sentence, not counting the
 463 checksum field. See 7.3.4.1.

464 NOTE This method to convey information is to be used only when absolutely necessary, and will only be
 465 considered when one or both of two conditions are true, and when there is no alternative.

466 Condition 1: The data parameters are unknown by devices having to convey the information. For example, the ABM
 467 and BBM sentences meet this condition, because the content is not known to the Automatic Identification System
 468 (AIS).

469 Condition 2: When information requires a significantly higher data rate than can be achieved by the IEC 61162-1
 470 (4 800 Bd) and IEC 61162-2 (38 400 Bd) standards utilizing parametric sentences.

471 By encapsulating a large amount of information, the number of overhead characters, such as "," field delimiters can
 472 be reduced, resulting in higher data transfer rates. It is very unusual for this second condition to be fulfilled. As an
 473 example, an AIS has a data rate capability of 4 500 messages per minute, and satisfies this condition, resulting in
 474 the VDM and VDO sentences.

475 7.3.4.2 Structure

476 The following provides a summary explanation of the approved encapsulation sentence
 477 structure:

478 !aacc,x1,x2,x3,c--c,x4*hh<CR><LF>

479	ASCII	HEX	description
480	"!"	21	start of sentence: starting delimiter.

481	aaccc		address field: alphanumeric characters identifying type of talker, and sentence formatter. The first two characters identify the talker. The last three are the sentence formatter mnemonic code identifying the data type and the string format of the successive fields. Mnemonics will be used as far as possible to facilitate readouts by users.
482			
483			
484			
485			
486	","	2C	field delimiter: starts each field except address and checksum fields. If it is followed by a null field, it is all that remains to indicate no data in a field.
487			
488			
489	x1		total number of sentences field: encapsulated information often requires more than one sentence. This field represents the total number of encapsulated sentences needed. This may be a fixed or variable length, and is defined by the sentence definitions in 8.3.
490			
491			
492			
493	x2		sentence number field: encapsulated information often requires more than one sentence. This field identifies which sentence of the total number of sentences this is. This may be fixed or variable length, and is defined by the sentence definitions in 8.3.
494			
495			
496			
497	x3		sequential message identifier field: this field distinguishes one encapsulated message consisting of one or more sentences, from another encapsulated message using the same sentence formatter. This field is incremented each time an encapsulated message is generated with the same formatter as a previously encapsulated message. The value is reset to zero when it is incremented beyond the defined maximum value. The maximum value and size of this field are determined by the applicable sentence definitions in Clause 8.
498			
499			
500			
501			
502			
503			
504			
505			
506	c--c		data sentence block: follows sequential message identifier field and is a series of data fields consisting of one or more parametric data fields and one encapsulated data field. Data field sequence is fixed and identified by third and subsequent characters of the address field (the "sentence formatter"). Individual data fields may be of variable length and are preceded by delimiters ",". The encapsulated data field shall always be the second to the last data field in the sentence.
507			
508			
509			
510			
511			
512			
513			
514	x4		fill bits field: this field represents the number of fill bits added to complete the last six-bit coded character. This field is required and shall immediately follow the encapsulated data field. To encapsulate, the number of binary bits shall be a multiple of six. If it is not, one to five fill bits are added. This field shall be set to zero when no fill bits have been added. The fill bits field shall always be the last data field in the sentence. This shall not be a null field.
515			
516			
517			
518			
519			
520			
521	"*"	2A	checksum delimiter: follows the last data field of the sentence. It indicates that the following two alphanumeric characters show the HEX value of the checksum.
522			
523			
524	hh		checksum Field: the absolute value calculated by exclusive-OR'ing the 8 data bits (no start bits or stop bits) of each character in the sentence, between, but excluding "!" and "*". The hexadecimal value of the most significant and least significant 4 bits of the result are converted to two ASCII characters (0-9, A-F (upper case)) for transmission. The most significant character is transmitted first. The checksum field is required in all transmitted sentences.
525			
526			
527			
528			
529			
530			
531	<CR><LF> 0D 0A		end of sentence: sentence terminating delimiter.

532 **7.3.5 Query sentences**533 **7.3.5.1 Description**

534 Query sentences are intended to request approved sentences to be transmitted in a form of
 535 two-way communication. The use of query sentences implies that the listener shall have the
 536 capability of being a talker with its own bus. Query sentences shall always be constructed with
 537 the "\$" – start of sentence delimiter.

538 The approved query sentence contains, in the order shown, the following elements:

539	ASCII	HEX	description
540	"\$"	24	start of sentence
541	<aa>		talker identifier of requester
542	<aa>		talker identifier for device from which data is being requested
543	"Q"		query character, identifies query address
544	", "		data field delimiter
545	<ccc>		approved sentence formatter of data being requested
546	"*" <checksum field>		checksum field
547	<CR><LF>0D 0A		end of sentence

548 **7.3.5.2 Reply to query sentence**

549 The reply to a query sentence is the approved sentence that was requested. The use of query
 550 sentences requires cooperation between the devices that are interconnected. A reply to a query
 551 sentence is not mandatory and there is no specified time delay between the receipt of a query
 552 and the reply.

553 **7.3.6 Proprietary sentences**

554 These are sentences not included within this standard; these provide a means for
 555 manufacturers to use the sentence structure definitions of this standard to transfer data which
 556 does not fall within the scope of approved sentences. This will generally be for one of the
 557 following reasons:

- 558 a) data is intended for another device from the same manufacturer, is device specific, and not
 559 in a form or of a type of interest to the general user;
- 560 b) data is being used for test purposes prior to the adoption of approved sentences;
- 561 c) data is not of a type and general usefulness which merits the creation of an approved
 562 sentence.

563 NOTE The manufacturer's reference list of mnemonic codes is a component of the equivalent specification
 564 NMEA 0183. ²

² The NMEA Secretariat maintains the master reference list which comprises codes registered and formally adopted by NMEA.

The address for the registration of manufacturer's codes is:

NMEA 0183 Technical Standards Committee

7 Riggs Ave

Servana Pk, Maryland 21146, USA

Phone: +1 410 975 9450

e-mail: info@nmea.org

web site <http://www.nmea.org>

565 A proprietary sentence contains, in the order shown, the following elements:

566	ASCII	HEX	description
567	"\$"	24	start of sentence
568	"P"	50	proprietary sentence ID
569	<aaa>		manufacturer's mnemonic code (The NMEA secretariat
570			maintains the master reference list which comprises codes
571			registered and formally adopted by NMEA)
572	[<valid characters,"^" and "," >]		manufacturer's data
573	"*" <checksum field>		checksum field
574	<CR><LF> 0D 0A		end of sentence

575 Proprietary sentences shall include checksums and conform to requirements limiting overall
 576 sentence length. Manufacturer's data fields shall contain only valid characters but may include
 577 "^" and "," for delimiting or as manufacturer's data. Details of proprietary data fields are not
 578 included in this standard and need not be submitted for approval. However, it is required that
 579 such sentences be published in the manufacturer's manuals for reference.

580 7.3.7 Command sentences

581 Command sentences are those that provide an ability to alter or change the configuration or
 582 operation of a device. Examples of legacy command sentences are the "HTC - Heading/Track
 583 control command" and the "ACA - AIS channel assignment" sentences. When a command
 584 sentence is generated in response to a Query sentence, a means to identify that the sentence
 585 has only a status report of current settings is required.

586 Some command sentences cannot be queried and provide a different sentence formatter for
 587 status information, so they should not be misinterpreted. This is the case with the HTC
 588 sentence. The HTD sentence is provided to determine the status of a heading control system's
 589 settings. There is a high possibility of misinterpretation if a device receives a query sentence
 590 for a HTC sentence, and erroneously provides the HTC sentence.

591 The ACA sentence is an example of a command sentence that can also be queried to
 592 determine the status of the current settings. The ACA sentence definition provides a field that
 593 when set to any valid value, identifies the sentence as a status of current settings and not a
 594 command to change settings. There is a high probability of misinterpreting this sentence
 595 because the field is used for two distinct purposes at the same time.

596 To avoid any possibility of misinterpretation and to satisfy the requirements of the voyage data
 597 recorder required to be carried on ships under the SOLAS Convention, a clear and
 598 unambiguous means to identify that a command sentence is to be interpreted as a command or
 599 that it contains status information only and is not a command shall be provided.

600 Any sentence that contains one or more command fields shall be identified as a "command
 601 sentence". Command sentences shall contain the "Sentence status flag" field.

602	Field formatter	Description
603	a	Sentence status flag. This field is a required field for any sentence
604		designated as a command sentence. The field distinguishes the
605		contents of command sentence as being commands intended to change
606		settings or as being status information only.
607		This field shall not be null.

608 This field shall contain an “R” when the sentence is a status report of
609 current settings. This may occur when the sentence is provided in
610 response to a query or is autonomously generated.

611 This field shall contain a “C” when the sentence is a configuration
612 command to change settings. A sentence without a “C” in this field is not
613 a command. If a designated command sentence cannot be queried, as
614 stated in the sentence’s definition, this field shall always be set to “C”.

615 Where data fields are NULL in a command sentence (sentence status
616 flag = C), there is no change in their setting. When a configuration data
617 field is NULL in a status report sentence (sentence status flag = R), this
618 data field is not configured.

619 7.3.8 Valid sentences

620 Approved sentences, query sentences and proprietary sentences are the only valid sentences.
621 Sentences of any other form are non-valid and shall not be transmitted on the bus.

622 7.3.9 Multi-sentence messages

623 Multi-sentence messages may be transmitted where a data message exceeds the available
624 character space in a single sentence formatter. All the sentences in a multi-sentence message
625 use the same sentence formatter. The key fields supporting the multi-sentence message
626 capability shall always be included, without exception. These required fields are: total number
627 of sentences, sentence number, and sequential message identifier fields. Only sentence
628 definitions containing these fields may be used to form messages. The TUT and VDM
629 sentences are good examples of how a sentence is defined to provide these capabilities.

630 The listener should be aware that a multi-sentence message may be interrupted by a higher
631 priority message such as an alarm sentence, and thus the original message should be
632 discarded as incomplete and has to await a re-transmission. The listener has to check that
633 multi-sentences are contiguous.

634 Should an error occur in any sentence of a multi-sentence message, the listener shall discard
635 the whole message and be prepared to receive the message again upon the next transmission.

636 7.3.10 Sentence transmission timing

637 Frequency of sentence transmission when specified shall be in accordance with the approved
638 sentence definitions (see 8.3). When not specified, the rate shall be consistent with the basic
639 measurement or calculation cycle but generally not more frequently than once per second.

640 It is desirable that sentences be transmitted with minimum inter-character spacing, preferably
641 as a near continuous burst, but under no circumstance shall the time to complete the
642 transmission of a sentence be greater than 1 s.

643 7.3.11 Additions to approved sentences

644 In order to allow for improvements or additions, future revisions of this standard may modify
645 existing sentences by adding new data fields after the last data field but before the checksum
646 delimiter character “*” and checksum field. Listeners shall determine the end of the sentence
647 by recognition of “<CR><LF>” and “*” rather than by counting field delimiters. The checksum
648 value shall be computed on all received characters between, but not including, “\$” or “!” and “*”
649 whether or not the listener recognizes all fields.

650 7.4 Error detection and handling

651 Listening devices shall detect errors in data transmission including:

- 652 a) checksum error (see 7.2.4);
 653 b) invalid characters (see 7.1.3);
 654 c) incorrect length of address field (see 7.2.2), and data fields as specified within sentence
 655 definitions;
 656 d) time out of sentence transfer (see 7.3.10).

657 Listening devices shall use only correct sentences, consistent with the version of IEC 61162-1
 658 supported by the talker devices.

659 7.5 Handling of deprecated sentences

660 Deprecated sentences are no longer recommended for sole use in new or revised designs.
 661 These sentences are valid sentences, but due to changing circumstances it is desirable to
 662 delete or replace these sentences.

663 Generally, in each of the deprecated sentences a reference is made to a replacement sentence
 664 in the current edition of the standard. Manufacturers are urged to use the currently
 665 recommended sentence in new or revised designs. It is desirable that manufacturers provide
 666 both new and old sentences whenever possible for a period of time that will serve as a phase-
 667 in period for new sentences.

668 8 Data content

669 8.1 Character definitions

670 Tables 1, 2 and 3 indicate character definitions.

671 **Table 1 – Reserved characters**

ASCII	HEX	DEC	Description
<CR>	0D	13	Carriage return
<LF>	0A	10	Line feed – End of sentence delimiter
\$	24	36	Start of sentence delimiter
*	2A	42	Checksum field delimiter
,	2C	44	Field delimiter
!	21	33	Start of encapsulation sentence delimiter
\	5C	92	TAG block delimiter
^	5E	94	Code delimiter for HEX representation of ISO 8859-1 (ASCII) characters
~	7E	126	Reserved for future use
<del>	7F	127	Reserved for future use

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Table 2 – Valid characters

ASCII	HEX	DEC	ASCII	HEX	DEC	ASCII	HEX	DEC
Space	20	32	@	40	64	`	60	96
Reserved	21	33	A	41	65	a	61	97
"	22	34	B	42	66	b	62	98
#	23	35	C	43	67	c	63	99
Reserved	24	36	D	44	68	d	64	100
%	25	37	E	45	69	e	65	101
&	26	38	F	46	70	f	66	102
'	27	39	G	47	71	g	67	103
(	28	40	H	48	72	h	68	104
)	29	41	I	49	73	i	69	105
Reserved	2A	42	J	4A	74	j	6A	106
+	2B	43	K	4B	75	k	6B	107
Reserved	2C	44	L	4C	76	l	6C	108
–	2D	45	M	4D	77	m	6D	109
.	2E	46	N	4E	78	n	6E	110
/	2F	47	O	4F	79	o	6F	111
0	30	48	P	50	80	p	70	112
1	31	49	Q	51	81	q	71	113
2	32	50	R	52	82	r	72	114
3	33	51	S	53	83	s	73	115
4	34	52	T	54	84	t	74	116
5	35	53	U	55	85	u	75	117
6	36	54	V	56	86	v	76	118
7	37	55	W	57	87	w	77	119
8	38	56	X	58	88	x	78	120
9	39	57	Y	59	89	y	79	121
:	3A	58	Z	5A	90	z	7A	122
;	3B	59	[	5B	91	{	7B	123
<	3C	60	Reserved	5C	92		7C	124
=	3D	61	]	5D	93	}	7D	125
>	3E	62	Reserved	5E	94	Reserved	7E	126
?	3F	63	_	5F	95	Reserved	7F	127

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Table 3 – Character symbol

Symbol	Definition
A	Status symbol; Yes; Data valid; Warning flag clear; Auto; Ampere, ASCII
a	Alphabet character variable A through Z or a through z
B	Bar (pressure, 1 000 mb = 100 kPa(Pascal(Pa))), Bottom
C	Celsius (Degrees); Course-up
c	Valid character; Calculating
d	Destination-identification
D	Degrees (of arc)
E	Error; East; Engine
F	Fathoms (1 fathom equals 1,828 766 m)
f	Feet (1 foot equals 0,304 79 m)
G	Great circle; Green
g	Good
H	Compass heading; Head-up; Hertz; Humidity
h	Hours; HEX number
I	Inches (1 inch equals 0,0254 m)
J	Input operation completed
K	Kilometres; km/h; kg/m ³
k	Kilograms
L	Left; Local; Lost target
l	Latitude; Litres; l/s
M	Metres; m/s; Magnetic; Manual; Cubic metres
m	Minutes; message
N	Nautical miles; Knots; North; North-up; Newtons
n	Numeral; address
P	Purple; Proprietary (only when following "\$" or "!"); Position sensor; Per cent; Pascal (pressure)
Q	Query; Target-being-acquired
R	Right; Rhumb line; Red; Relative; Reference; Radar tracking; revolutions/min (RPM)
S	South; Statute miles (1 609,31 m); Statute miles/h; Shaft Salinity parts/thousand; Simulator mode
s	Seconds; Six-bit number, Source-identification
T	Time difference; True; Track; Tracked target
t	Test
U	Dead reckoning estimate
u	Sign, if minus "-" (HEX 2D)
V	Data invalid; No; Warning flag set; Manual; Volt
W	West; Water; Wheelover
x	Numeric character variable
y	Longitude
Z	Time

678

679

680 **8.2 Field definitions**

681 Field definitions are indicated in Tables 4 and 5.

682 **Table 4 – Talker identifier mnemonics**

Talker device	Identifier
Heading/track controller (autopilot) general	AG
magnetic	AP
Automatic identification system	AI
Bilge system	BI
Bridge navigational watch alarm system	BN
Communications: digital selective calling (DSC)	CD
data receiver	CR
satellite	CS
radio-telephone (MF/HF)	CT
radio-telephone (VHF)	CV
scanning receiver	CX
Direction finder	DF
Duplex repeater station	DU
Electronic chart system (ECS)	EC
Electronic chart display and information system (ECDIS)	EI
Emergency locator	EL
Emergency position indicating radio beacon (EPIRB)	EP
Engine room monitoring system	ER
Fire door controller/monitoring system	FD
Fire extinguisher system	FE
Fire detection system	FR
Fire sprinkler system	FS
Galileo positioning system	GA
BeiDou positioning system	GB
IRNSS positioning system	GI
GLONASS positioning system	GL
Global positioning system (GPS)	GP
QZSS positioning system	GQ
Global navigation satellite system (GNSS)	GN
Heading sensors: compass, magnetic	HC
gyro, north seeking	HE
fluxgate	HF
gyro, non-north seeking	HN
Hull door controller/monitoring system	HD
Hull stress monitoring	HS
Integrated communication system	IC
Integrated instrumentation	II
Integrated navigation	IN
LORAN: LORAN-C	LC
Network device	ND
Navigation light controller	NL
Proprietary code	P
Radar and/or radar plotting	RA
Propulsion machinery including remote control	RC
Sounder, depth	SD
Steering gear/steering engine	SG
Serial to network gateway function (SNGF)	SI
Electronic positioning system, other/general	SN
Sounder, scanning	SS
Turn rate indicator	TI
Microprocessor controller	UP
(0<=#<=9) User configured talker identifier ^a	U#
Velocity sensors: Doppler, other/general	VD
speed log, water, magnetic	VM
speed log, water, mechanical	VW
Voyage data recorder	VR
Watertight door controller/monitoring system	WD
Water level detection system	WL
Transducer	YX
Timekeeper, time/date: atomic clock	ZA
chronometer	ZC
quartz	ZQ
radio update	ZV
Weather instrument	WI

Talker device	Identifier
^a The U# talker identifier does not convey the nature of the device transmitting the sentence, and should not be "fixed" into a unit at manufacture. This is intended for special purpose applications. The U# talker identifier indicates that the devices talker identifier has been changed through external control.	

683

684

Table 5 – Field type summary

Field type	Symbol	Definition
Special format fields		
Status	A	Single character field: A = Yes, data valid, warning flag clear V = No, data invalid, warning flag set
Latitude	IIII.II	Fixed/variable length field: degrees/minutes and decimal – two fixed digits of degrees, two fixed digits of minutes and a variable number of digits for a decimal fraction of minutes. Leading zeros always included for degrees and minutes to maintain fixed length. The decimal point and associated decimal fraction are optional if full resolution is not required.
Longitude	yyyyy.yy	Fixed/variable length field: degrees/minutes and decimal – three fixed digits of degrees, two fixed digits of minutes and a variable number of digits for a decimal fraction of minutes. Leading zeros always included for degrees and minutes to maintain fixed length. The decimal point and associated decimal fraction are optional if full resolution is not required.
Time	hhmmss.ss	Fixed/variable length field: hours/minutes/seconds and decimal – two fixed digits of hours, two fixed digits of minutes, two fixed digits of seconds and a variable number of digits for decimal fraction of seconds. Leading zeros always included for hours, minutes and seconds to maintain fixed length. The decimal point and associated decimal fraction are optional if full resolution is not required.
Defined field		Some fields are specified to contain pre-defined constants, most often alpha characters. Such a field is indicated in this standard by the presence of one or more valid characters. Excluded from the list of allowable characters are the following which are used to indicate field types within this standard: "A", "a", "c", "hh", "hhmmss.ss", "IIII.II", "x", "yyyyy.yy".
Numeric value fields		
Variable numbers	x.x	Variable length integer or floating numeric field. Optional leading and trailing zeros. The decimal point and associated decimal fraction are optional if full resolution is not required (example: 73.10 = 73.1 = 073.1 = 73). The specific use of this formatter and restrictions (for example integer, range) is defined in the sentence definition.
Fixed HEX field	hh-	Fixed length HEX numbers only, MSB on the left.
Variable HEX field	h--h	Variable length HEX numbers only, MSB on the left.
Fixed six-bit field	ss__	Fixed length six-bit coded characters only. See Annex C for field conversions.
Variable six-bit field	s--s	Variable length six-bit coded characters only. See Annex C for field conversions.
Information fields		
Variable text	c--c	Variable length valid character field.
Fixed alpha field	aa-	Fixed length field of upper-case or lower-case alpha characters.

Field type	Symbol	Definition
Fixed number field	xx-	Fixed length field of numeric characters.
Fixed text field	cc-	Fixed length field of valid characters.

NOTE 1 Spaces should only be used in variable text fields.

NOTE 2 A negative sign "-" (HEX 2D) is the first character in a field if the value is negative. When used, this increases the specified size of fixed length fields by one. The sign is omitted if the value is positive.

NOTE 3 Units of measure fields are appropriate characters from the symbol table (Table 3) unless a specific unit of measure is indicated.

NOTE 4 Fixed length field definitions show the actual number of characters. For example, a field defined to have a fixed length of 5 HEX characters is represented as hhhhh between delimiters in a sentence definition.

685
686

687 8.3 Approved sentences

688 8.3.1 General format

689 General format of printed sentence information:

690 {mnemonic} – {name}

691 {definition paragraph}

692 \$--{sentence}

693
694 {field descriptions}
695 start of sentence and talker ID

696 8.3.2 AAM – Waypoint arrival alarm

697 Status of arrival (entering the arrival circle, or passing the perpendicular of the course line) at
698 waypoint c--c.

699 \$--AAM, A, A,x.x, N, c--c*hh<CR><LF>

700
701 Waypoint ID
702 Units of radius, nautical miles
703 Arrival circle radius
704 Status: A = perpendicular passed at waypoint; V = not passed
705 Status: A = arrival circle entered; V = not entered
706

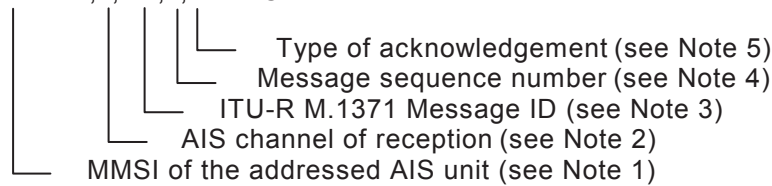
707 8.3.3 ABK – AIS addressed and binary broadcast acknowledgement

708 The ABK-sentence is generated when a transaction, initiated by reception of an ABM, AIR, or
709 BBM sentence, is completed or terminated. This sentence provides information about the
710 success or failure of a requested ABM broadcast of either ITU-R M.1371 Messages 6 or 12.
711 The ABK process utilises the information received in ITU-R M.1371 Messages 7 and 13. Upon
712 reception of either a VHF Data-link Message 7 or 13, or the failure of Messages 6 or 12, the
713 AIS unit delivers the ABK sentence to the external application. This sentence is also used to
714 report to the external application the AIS unit's handling of the AIR (ITU-R M.1371 Message
715 15) and BBM (ITU-R M.1371 Messages 8, 14, 25 and 26) sentences. The external application
716 initiates an interrogation through the use of the AIR-sentence, or a broadcast through the use
717 of the BBM sentence. The AIS unit generates an ABK sentence to report the outcome of the
718 ABM, AIR, or BBM broadcast process.

719

720

\$--ABK,xxxxxxxx,x,x,x,x,x*hh<CR><LF>



721

722 NOTE 1 Identifies the distant addressed AIS unit involved with the acknowledgement. If more than one MMSI is
723 being addressed (ITU-R M.1371 Messages 15 and 16), the MMSI of the first distant AIS unit, identified in the
724 message, is the MMSI reported here. This is a null field when the ITU-R M.1371 Message type is 8 or 14.

725 NOTE 2 Indication of the VHF data link channel upon which a Message type 7 or 13 acknowledgement was
726 received. An "A" indicates reception on channel A. A "B" indicates reception on channel B.

727 NOTE 3 This indicates to the external application the type of ITU-R M.1371 message that this ABK sentence is
728 addressing. Also see the message IDs listed in Note 4.

729 NOTE 4 The message sequence number, together with the Message ID and MMSI of the addressed AIS unit,
730 uniquely identifies a previously received ABM, AIR, or BBM sentence. Generation of an ABK sentence makes a
731 sequence message identifier available for re-use. The message ID determines the source of the message sequence
732 number. The following lists the source by message ID:

733 ITU-R M.1371 Message ID Message sequence number source

- 734 6 sequential message identifier from ABM sentence
- 735 7 addressed AIS unit's Message 7 sequence number
- 736 8 sequential message identifier from BBM sentence
- 737 12 sequential message identifier from ABM sentence
- 738 13 addressed AIS unit's Message 13 sequence number
- 739 14 sequential message identifier from BBM sentence
- 740 15 no source, the message sequence number should be null
- 741 25 sequential message identifier from ABM or BBM sentence (structured binary data),
- 742 26 sequential message identifier from ABM or BBM sentence (structured binary data),
- 743 70 sequential message identifier from ABM or BBM sentence (unstructured binary data),
- 744 71 sequential message identifier from ABM or BBM sentence (unstructured binary data),

745 NOTE 5 Acknowledgements provided are:

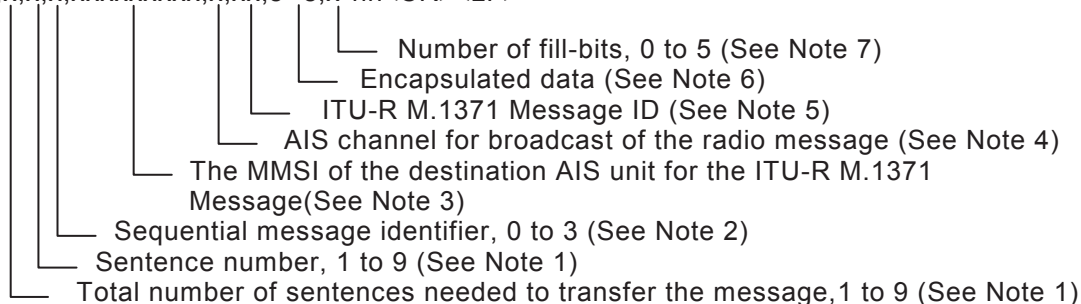
- 746 0 = Message (6 or 12) successfully received by the addressed AIS unit,
- 747 1 = Message (6 or 12) was broadcast, but no acknowledgement by the addressed AIS unit,
- 748 2 = message could not be broadcast (i.e. quantity of encapsulated data exceeds five slots),
- 749 3 = requested broadcast of Message (8, 14, 15, 25 or 26) has been successfully completed,
- 750 4 = late reception of a Message 7 or 13 acknowledgement that was addressed to this AIS unit (own ship) and
751 referenced as a valid transaction.

752

753 8.3.4 ABM – AIS addressed binary and safety related message

754 This sentence supports ITU-R M.1371 Messages 6, 12, 25 and 26 and provides an external
755 application with a means to exchange data via an AIS transponder. Data is defined by the
756 application only, not the AIS unit. This sentence offers great flexibility for implementing system
757 functions that use the transponder like a communications device. After receiving this sentence
758 via the IEC 61162-2 interface, the transponder initiates a VDL broadcast of Message 6, 12, 25,
759 or 26. The AIS unit will make up to four broadcasts of Messages 6 and 12. The actual number
760 will depend on the reception of an acknowledgement from the addressed "destination" AIS unit.
761 The success or failure of reception of this transmission by the addressed AIS unit for
762 Messages 6 and 12 is confirmed through the use of the "Addressed binary and safety related
763 message acknowledgement" ABK sentence formatter, and the processes that supports the
764 generation of an ABK sentence. The AIS transponder determines the appropriate
765 communications state for transmission of Message 26 over the VHF data Link.

!--ABM,x,x,x,xxxxxxxx,x,xx,s--s,x*hh<CR><LF>



766

767 NOTE 1 The total number of sentences required to transfer the binary message data to the AIS unit.

768 The first field specifies the total number of sentences used for a message, minimum value 1.

769 The second field identifies the order of this sentence in the message, minimum value 1.

770 All sentences contain the same number of fields. Successive sentences may use null fields for fields that have not
771 changed, such as fields 4, 5, and 6.

772 NOTE 2 This sequential message identifier serves two purposes. It meets the requirements as stated in the
773 IEC 61162-1 "Sequential message identifier field" description, and it is the sequence number utilized by
774 ITU-R M.1371 in Message types 6 and 12. The range of this field is restricted by ITU-R M1371 to 0 – 3. The
775 sequential message identifier value may be reused after the AIS unit provides the "ABK" acknowledgement for this
776 number.

777 NOTE 3 The MMSI of the AIS unit that is the destination of the message.

778 NOTE 4 The AIS channel that shall be used for the broadcast:

779 0 = no broadcast channel preference,

780 1 = Broadcast on AIS channel A,

781 2 = Broadcast on AIS channel B,

782 3 = Broadcast message on both AIS channels, A and B.

783 NOTE 5 The ITU-R M.1371 message Id for the following addressed Messages:

784 6 = Binary addressed message,

785 12 = Addressed safety related message,

786 25 = Single slot binary message 25 (binary data coded using the 16-bit Application identifier),

787 70 = Single slot binary message 25 (unstructured binary data),

788 26 = Multiple slot binary message 26 with Communications State (binary data coded using the 16-bit Application
789 identifier),

790 71 = Multiple slot binary message 26 with Communications State (unstructured binary data).

791 NOTE 6 This is the content of the "binary data" parameter for ITU-R M.1371 Message 6, or the "Safety related
792 Text" parameter for Message 12, or the "binary data" parameter for Message 25, or the "binary data" parameter for
793 Message 26. The first sentence may contain up to 48 valid Six Bit codes (288 bits). Following sentences may
794 contain up to 60 valid Six Bit codes (360 bits), if fields 4, 5, and 6 are unchanged from the first sentence and set to
795 null. The actual number of valid characters must be such that the total number of characters in a sentence does
796 not exceed the "82-character" limit.

797 NOTE 7 This cannot be a null field. See "x4" in 7.3.4.

798 8.3.5 ACA – AIS channel assignment message

799 An AIS device can receive regional channel management information in four ways:
800 ITU-R M.1371 Message 22, DSC telecommand received on channel 70, manual operator input,
801 and an ACA sentence. The AIS unit may store channel management information for future use.
802 Channel management information is applied based upon the actual location of the AIS device.
803 An AIS unit is "using" channel management information when the information is being used to
804 manage the operation of the VHF receiver and/or transmitter inside the AIS unit.

805 This sentence is used both to enter and obtain channel management information. When sent to
806 an AIS unit, the ACA sentence provides regional information that the unit stores and uses to
807 manage the internal VHF radio. When sent from an AIS unit, the ACA sentence provides the
808 current channel management information retained by the AIS unit. The information contained in
809 this sentence is similar to the information contained in an ITU-R M.1371 Message 22. The

810 information contained in this sentence directly relates to the initialisation phase and dual
811 channel operation and channel management functions of the AIS unit as described in ITU-R
812 M.1371.

813 \$--ACA,x,IIII.II,a,yyyyy.yy,a,IIII.II,a,yyyyy.yy,a,x,xxxx,x,xxxx,x,x,x,a,x,hhmmss.ss*hh<CR><LF>
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Time of "in use"
change (see Note 9)
In-use flag
(see Note 8)
Information source
(see Note 7)
Power level control
(see Note 6)
Tx/Rx mode control
(see Note 5)
Channel B bandwidth
(see Note 4)
Channel B (see Note 3)
Channel A bandwidth (see Note 4)
Channel A (see Note 3)
Transition zone size (see Note 2)
Region southwest corner longitude – E/W
Region southwest corner latitude – N/S
Region northeast corner longitude – E/W
Region northeast corner latitude – N/S (see Note 2)
Sequence Number, 0 to 9 (see Note 1)

837 NOTE 1 This is used to bind the contents of the ACA and ACS sentences together. The ACS sentence, when
838 provided by the AIS unit, should immediately follow the related ACA sentence, containing the same sequence
839 number. The AIS unit generating the ACA and ACS sentences, should increment the sequence number each time
840 an ACA/ACS pair is created. After 9 is used the process should begin again from 0. Information contained in the
841 ACS sentence is not related to the information in the ACA sentence if the sequence numbers are different. When an
842 AIS unit is queried for an ACA sentence, the AIS unit should respond with the ACA/ACS sentence pair. When an
843 external device is sending an ACA sentence to the AIS unit, the sequence number may be null if no ACS sentence
844 is being sent.

845 NOTE 2 The resolution of the longitude and latitude fields is 1/10 minute. The range of the transition zone size is
846 1 to 8 nautical miles.

847 NOTE 3 VHF channel number, see ITU-R M.1084, Annex 4

848 NOTE 4 Value of 0, bandwidth is specified by channel number, see ITU-R M.1084, Annex 4
849 Value of 1, bandwidth is 12,5 kHz.

850 NOTE 5 Value of 0, transmit on channels A and B, receive on channels A and B,
851 Value of 1, transmit on channel A, receive on channels A and B,
852 Value of 2, transmit on channel B, receive on channels A and B,
853 Value of 3, do not transmit, receive on channels A and B,
854 Value of 4, do not transmit, receive on channel A,
855 Value of 5, do not transmit, receive on channel B.

856 NOTE 6 Value of 0, high power
857 Value of 1, low power

858 NOTE 7 Source identifiers:

859 A = ITU-R M.1371 Message 22: Channel Management addressed message,

860 B = ITU-R M.1371 Message 22: Channel Management broadcast geographical area message,

861 C = IEC 61162-1 AIS Channel Assignment sentence,

862 D = DSC Channel 70 telecommand,

863 M = operator manual input.

864 This field should be null when the sentence is sent to an AIS device.

865 NOTE 8 This value is set to indicate that the other parameters in the sentence are “in-use” by an AIS unit at the
866 time that the AIS unit sends this sentence. A value of “0” indicates that the parameters are not “in-use”, and a value
867 of “1” indicates that the parameters are “in-use”. This field should be null when the sentence is sent to an AIS
868 mobile unit. A value of “1” sent to a base station indicates that the parameters are “in-use”; a value of “0” indicates
869 not “in-use”.

870 NOTE 9 This is the UTC time that the “In-use flag” field changed to the indicated state. This field should be null
871 when the sentence is sent to an AIS unit.

872 8.3.6 ACK – Acknowledge alarm

873 Acknowledge device alarm. This sentence is used to acknowledge an alarm condition reported
874 by a device.

875

876 \$--ACK,xxx*hh<CR><LF>

877

878  Unique alarm number (identifier) at alarm source

879

880 8.3.7 ACN – Alert command

881 Sentences ACN, ALC, ALF and ARC are used for alert handling. Alert related communications
882 are described in IEC 61924-2 and IEC 62923.

883

884 This sentence is used for acknowledge, silence, responsibility transfer and to request repeat of
885 alert details in case the reception process has detected, based on ALC, that ALF has been
886 missed.

887

888 Responsibility transferred is used for a special conditional state of an alert. In this state the
889 source of an alert indicates the alert visually as an acknowledged alert (i.e. no flashing
890 indication nor audible signal). In this state the source of an alert re-raises an unacknowledged
891 alert, if the source of the alert is unable to receive heartbeat (HBT) sentences from the sender
892 of the sentence.

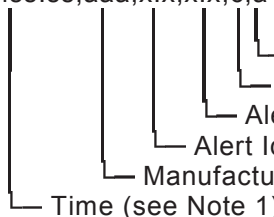
893

894 This sentence cannot be queried.

895

896 \$--ACN,hhmmss.ss,aaa,x.x,x.x,c,a*hh <CR><LF>

897

898  Sentence status flag (see Note 6)

899 Alert command, A, Q, O or S (see Note 5)

900 Alert Instance, 1 to 999999 (see Note 4)

901 Alert Identifier (see Note 3)

902 Manufacturer mnemonic code (see Note 2)

903 Time (see Note 1)

904

905 NOTE 1 Release time of the alert command. (e.g. for VDR purposes), optional can be a null field. Sender is
906 allowed to use all alternatives defined in Table 5 Field type summary. Receiver is allowed to ignore content of this
907 field. If receiver does not ignore this field it should support all alternatives defined in Table 5 Field type summary.

908 NOTE 2 Used for proprietary alerts defined by the manufacturer. For standardized alerts this should be a null field.

909 NOTE 3 The alert identifier is unique within a single alert source. The alert identifier is a variable length integer
910 field of maximum 7-digit integer. It identifies the type of the alert e.g. a “lost target” alert. Standardized alerts use
911 unique alert identifiers described in equipment standards. Number range 10000-9999999 is reserved for proprietary
912 alerts. Alert Identifier examples:

913 “001”, “2456789”, “245”

914 NOTE 4 The alert instance identifies the current instance of an alert to distinguish alerts of the same type (Alert
915 identifier) and from the same source (e.g. dangerous target). Alert instance is maximum 6-digit integer from 1 to
916 999999. The number of alert instance can be freely defined by the manufacturer as long as it is unique for one type
917 of alert (alert identifier). It is not permitted to modify the alert instance within a life cycle of a distributed alert (from
918 ‘active & unacknowledged’ state until ‘normal’ state is reached). It can be also a null field, when there is only one
919 alert of that type.

920 NOTE 5 This should not be null field

921 acknowledge : A

922 request / repeat information : Q

923 responsibility transfer: O

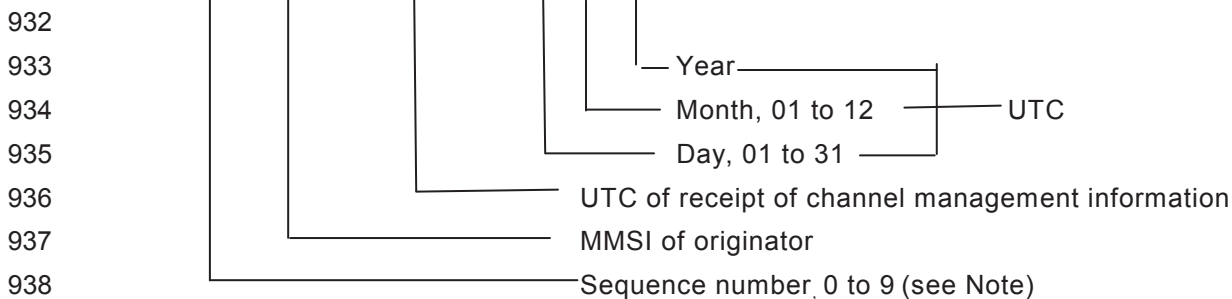
924 silence : S

925 NOTE 6 This field should be "C" and should not be null field. This field indicates a command. A sentence without
926 "C" is not a command.

927 8.3.8 ACS – AIS channel management information source

928 This sentence is used in conjunction with the ACA sentence. This sentence identifies the
929 originator of the information contained in the ACA sentence and the date and time the AIS unit
930 received that information.

931 \$--ACS,x,xxxxxxxx,hhmmss.ss,xx,xx,xxx*hh<CR><LF>



940 NOTE This is used to bind the contents of the ACA and ACS sentences together. The ACS sentence, when
941 provided by the AIS unit, should immediately follow the related ACA sentence, containing the same sequence
942 number. The AIS unit generating the ACA and ACS sentences, should increment the sequence number each time
943 an ACA/ACS pair is created. After 9 is used the process should begin again from 0. Information contained in the
944 ACS sentence is not related to the information of the ACA sentence if the sequence numbers are different. When
945 an external device is sending an ACA sentence to the AIS unit, the sequence number may be null if no ACS
946 sentence is being sent.

947 8.3.9 AIR – AIS interrogation request

948 This sentence supports ITU-R M.1371 Message 10 and 15. It provides an external application
949 with the means to initiate requests for specific ITU-R M.1371 messages, from distant mobile or
950 base station, AIS units. A single sentence can be used to request up to two messages from
951 one AIS unit and one message from a second AIS unit, or up to three messages from one AIS
952 unit. The message types that can be requested are limited. The complete list of messages that
953 may be requested can be found within the Message 15 description in ITU-R M.1371. Improper
954 requests may be ignored. With Message 10 always Message 11 is requested.

955 The external application initiates the interrogation. The external application is responsible for
956 assessing the success or failure of the interrogation. After receiving this sentence, the AIS unit
957 initiates a radio broadcast (on the VHF Data Link) of a Message 10 or 15 – interrogation. The
958 success or failure of the interrogation broadcast is determined by the application using the
959 combined reception of the ABK-sentence and VDM sentences provided by the AIS unit. After
960 receiving this AIR-sentence, the AIS unit shall take no more than four seconds to broadcast the
961 Message 10 or 15, and the addressed distant unit(s) shall take no more than another four
962 seconds to respond – a total of eight seconds.

963 If the requested message type is 11 then a Message 10 is transmitted to only one station. The
964 fields of station 2 should be null fields in this case.

965 Message ID2.1, station-2 reply slot (see Note 6)
966 Message ID1.2, station-1 reply slot
967 (see Note 6)
968 Message ID1.1, station-1 reply slot
969 (see Note 6)
970 Channel of interrogation (see Note 5)
971 \$--AIR,xxxxxxxx,x.x,x,x.x,x,xxxxxxxx,x.x,x,a,x.x,x,x.x.x*hh<CR><LF>
972
973 Message sub-section (see Note 3)
974 Message Number requested from station-2 (see
975 Note 2)
976 MMSI of interrogated station-2 (see Note 4)
977 Message sub-section (see Note 3)
978 Second message number requested from station-1 (see Note 2)
979 Message sub-section (see Note 3)
980 First message number requested from station-1 (see Note 2)
MMSI of interrogated station-1 (see Note 1)

NOTE 1 Identifies the first distant AIS unit being interrogated. A single AIR sentence can be used to request two message numbers from the first AIS unit.

NOTE 2 The following are examples of messages that may be requested from a distant mobile AIS unit. See ITU-R M.1371 Message 15 and Message 10 description for the actual message numbers.

986	Message 3, Position report,
987	Message 5, Ship static and voyage related data, see additional information in Note 3,
988	Message 9, Standard SAR aircraft position report,
989	Message 18, Standard Class B equipment position report,
990	Message 19, Extended Class B equipment position report,
991	Message 21, Aids-to-navigation report,
992	Message 24, Static-data report,
993	Message 11, UTC and date response. In this case message 10 is transmitted.

994 Examples of messages that may be requested from a distant AIS base station include:

```

995      Message 4,  Base station report,
996      Message 24,  Static-data report.

```

NOTE 3 This field is used to request a message that has been further sub-divided into alternative data structures. When requesting a message with alternative data structures, this message sub-section field should be provided, so that the correct sub-division of the message data is provided. If the message structure is not sub-divided into different structures, this field should be null.

NOTE 4 This identifies the second distant AIS unit being interrogated. Only one message may be requested from the second AIS unit. The MMSI of the second AIS unit may be the same MMSI as the first AIS unit.

1003 NOTE 5 A = Channel A
1004 B = Channel B

1005 Null = no specific channel is being assigned. AIS mobile stations should ignore this data field.

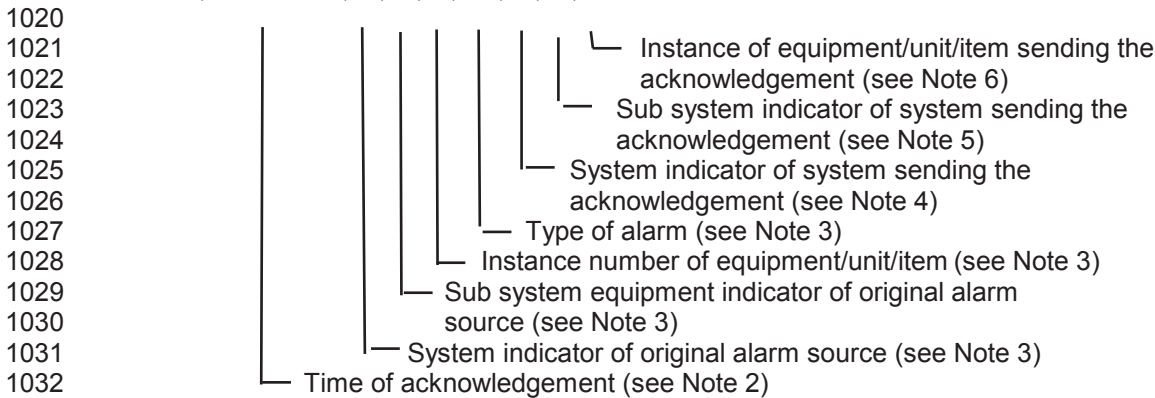
NOTE 6 Start slot number of interrogation reply, 0 to 2 249. Null if interrogation reply slot is not being assigned. AIS mobile stations should ignore this data field.

1008 **8.3.10 AKD – Acknowledge detail alarm condition**

1009 This sentence provides for acknowledgement of a detailed alarm condition reported through
1010 ALA.

NOTE 1 As IEC 61162-1 does not guarantee reliable transport, the designer should be very careful about how this sentence is used. Problems can occur either when the initial alarm message was lost or when the acknowledgement message was lost. A possible solution is to retransmit the alarm message until acknowledgement has been received. When acknowledgement has been received, an alarm acknowledged should be sent. This acknowledgement should be sent on all subsequent acknowledgements. Acknowledgements should be sent on each received alarm message after acknowledgement and further on until the alarm acknowledgement message has been received.

1019 \$--AKD,hhmmss.ss,aa,aa,xx,xxx,aa,aa,xx *hh<CR><LF>



NOTE 2 This defines the time of acknowledgement. This may be a null field.

NOTE 3 These fields should contain the identical information of the corresponding fields from the ALA sentence being acknowledged.

NOTE 4 Indicator characters identifying the system sending the acknowledgement. This field is two fixed characters, see Annex D. This may be a null field.

NOTE 5 Indicator characters identifying the sub system sending the acknowledgement. This field is two fixed characters, see Annex D. This may be a null field.

NOTE 6 Instance number identifying the equipment, unit or item sending the acknowledgement. This field is two fixed numeric characters. This may be a null field.

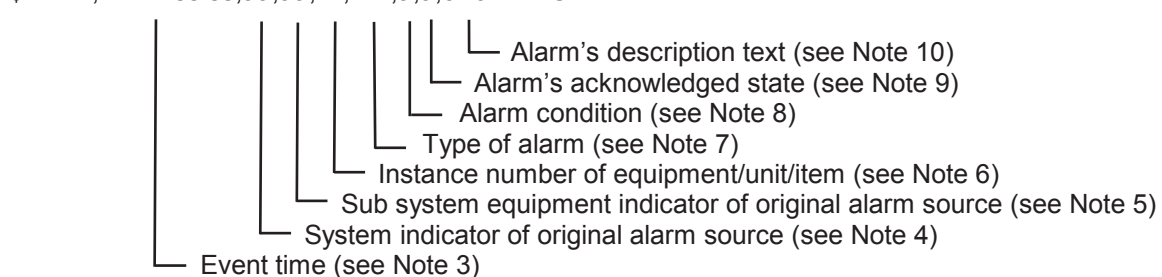
8.3.11 ALA – Report detailed alarm condition

This sentence permits the alarm and alarm acknowledge condition of systems to be reported. Unlike ALR this sentence supports reporting multiple system and sub-system alarm conditions.

NOTE 1 Dedicated sentences (for example FIR, DOR, HSS, WAT) are intended for reporting from a dedicated alarm detection system.

NOTE 2 As IEC 61162-1 does not guarantee reliable transport, the designer should be very careful about how this sentence is used. Problems can occur either when the initial alarm message was lost or when the acknowledgement message was lost. One possible solution (in some cases) is to retransmit the alarm message until acknowledgement has been received. When acknowledgement has been received, an alarm acknowledged should be sent. This acknowledgement should be sent on all subsequent acknowledgements. Acknowledgements should be sent on each received alarm message after acknowledgement and further on until the alarm acknowledgement message has been received.

\$--ALA,hhmmss.ss,aa,aa,xx,xxx,a,a,c--c *hh<CR><LF>



NOTE 3 Event time of alarm condition change including acknowledgement state change. If this is not available, this should be a null field.

NOTE 4 Indicator characters as system of alarm source. This field is two fixed characters, see Annex D.

NOTE 5 Indicator characters as sub-system of alarm source. This field is two fixed characters, see Annex D. For group alarms or if no sub-system can be identified, this should be a null field.

NOTE 6 Instance number identifying the equipment, unit or item. This field is two fixed numeric characters.

NOTE 7 Type of alarm. This field is three fixed numeric characters as defined in Annex D, Table D.1. Codes 900 to 999 are user definable.

NOTE 8 This field is a single character specified by the following:

1076 N = normal state;
 1077 H = alarm state (threshold exceeded);
 1078 J = alarm state (extreme threshold exceeded);
 1079 L = alarm state (low threshold exceeded, i.e. not reached);
 1080 K = alarm state (extreme low threshold exceeded, i.e. not reached);
 1081 X = other.

1082 NOTE 9 This field is a single character specified by the following:

1083 A = acknowledged;
 1084 V = not acknowledged;
 1085 B = broadcast (acknowledgement not applicable);
 1086 H = harbour mode;
 1087 O = override.

1088 NOTE 10 Additional and optional descriptive text/alarm detail condition tag. Maximum number of characters will be
 1089 limited by maximum sentence length and length of other fields.

1090 8.3.12 ALC - Cyclic alert list

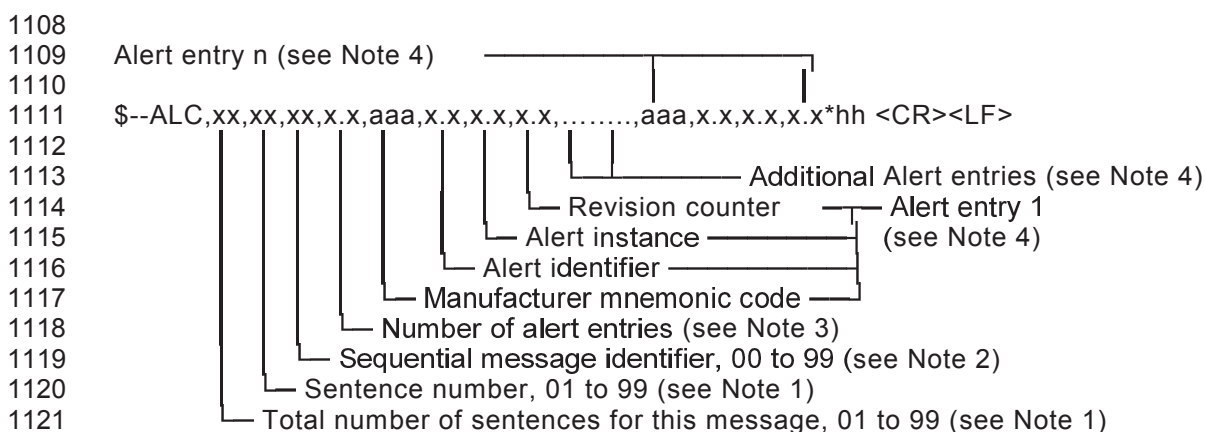
1091 Sentences ACN, ALC, ALF and ARC are used for alert handling. Alert related communications
 1092 are described in IEC 61924-2 and IEC 62923.

1093 The purpose of this sentence is to satisfy the needs for a safe and consistent data distribution
 1094 with a minimum of data traffic. Each change on an alert's data leads to an incremented
 1095 Revision counter. So an alert processing device only needs to check the alert entries in the
 1096 ALC messages to ensure that no ALF message has been lost. In the case where an ALF
 1097 message has been lost, the missing message can be requested by sending a request alert
 1098 command (see ACN – Alert command).

1099 The ALC sentence provides condensed ALF sentence information. It contains the identifying
 1100 data for each present alert of one certain source/device so that the receiver can understand
 1101 which ALF has been missed (and retransmission of ALF can be requested by using ACN
 1102 sentence). It shall be published cyclically at least every 30 s by each alert generating device.

1103 The cyclic alert list transmission shall never stop. When all alerts are in normal state the cyclic
 1104 alert list is empty i.e. number of alert entries is 0.

1105 The length of this sentence is varying with the number of alerts (number of list entries)
 1106 currently generated by related instance. In cases where the needed number of entries exceeds
 1107 the permitted sentence length the number of sentences is increased.



NOTE 1 The first field specifies the total number of sentences used for a message, minimum value 1. The second field identifies the order of this sentence in the message, minimum value 1. These cannot be null fields.

NOTE 2 The sequential message identifier relates all sentences that belong to a group of multiple sentences (i.e. message). Multiple sentences (see Note 1) with the same sequential message identifier, make up one message.

NOTE 3 Contains the number of alert entries transported within this sentence.

NOTE 4 Alert entry 0 – n: Each alert entry consists of four fields:

- Manufacturer Identifier (see ALF Manufacturer Identifier)

- Each entry identifies a certain alert with a certain state. It is not allowed that an alert entry is split between two ALC sentences.

1136 Sentences ACN, ALC, ALF and ARC are used for alert handling. Alert related communications
1137 are described in IEC 61924-2 and IEC 62923.

```

1143
1144 $--ALF,x,x,x,hmmss.ss,a,a,a,aaa,x,x,x,x,x,x,c---c*hh <CR><LF>
1145                                     | Alert text (see Note 12)
1146                                     | Escalation counter, 0 to 9 (see Note 11)
1147                                     | Revision counter, 1 to 99 (see Note 10)
1148                                     | Alert instance, 1 to 999999 (see Note 9)
1149                                     | Alert identifier (see Note 8)
1150                                     | Manufacturer mnemonic code (see Note 7)
1151                                     | Alert state, A, S, R, O, U or D (see Note 6)
1152                                     | Alert priority, E, A, W or C (see Note 5)
1153                                     | Alert category, A, B or C (see Note 4)
1154                                     | Time of last change (see Note 3)
1155                                     | Sequential message identifier, 0 to 9 (see Note 2)
1156                                     | Sentence number, 1 to 2 (see Note 1)
1157                                     | Total number of ALF sentences for this message, 1 to 2 (see Note 1)

```

1173	A,	Category A: Alerts where information at operator unit directly assigned to the function generating
1174		the alert is necessary, as decision support for the evaluation of the alert-related condition, e.g.
1175		graphical information of danger of collision or graphical information of danger of grounding.
1176	B,	Category B: Alerts where no additional information for decision support is necessary besides the
1177		information which can be presented using alert source and alert description text.
1178	C,	Category C: Alerts that cannot be acknowledged on the bridge but for which information is
1179		required about the status and treatment of the alerts, e.g., certain alerts from the engine.

1184 NOTE 6 The alert state transition is defined in Annex J

1185	active – unacknowledged:	V
1186	active – silenced:	S
1187	active – acknowledged or active:	A
1188	active – responsibility transferred:	O
1189	rectified – unacknowledged:	U
1190	normal:	N
1191	NOTE 7 Used for proprietary alerts defined by the manufacturer. For standardized alerts this should be a null field.	
1192	NOTE 8 The alert identifier is unique within a single alert source. The alert identifier is a variable length integer field	
1193	of maximum 7-digit integer. It identifies the type of the alert e.g. a "lost target" alert. Standardized alerts use	
1194	unique alert identifiers described in equipment standards. Number range 10000-9999999 is reserved for proprietary	
1195	alerts. Alert Identifier examples:	
1196	"001", "2456789", "245"	
1197	NOTE 9 The alert instance identifies the current instance of an alert to distinguish alerts of the same type (Alert	
1198	identifier) and from the same source (e.g. dangerous target). Alert instance is maximum 6-digit integer from 1 to	
1199	999999. The number of alert instance can be freely defined by the manufacturer as long as it is unique for one type	
1200	of alert (alert identifier). It is not permitted to modify the alert instance within a life cycle of a distributed alert (from	
1201	'active & unacknowledged' state until 'normal' state is reached). It can be also a null field, when there is only one	
1202	alert of that type.	
1203	NOTE 10 The revision counter is the main method to follow up-to-date status. Revision counter is also unique for	
1204	each instance of alert. Revision counter starts with 1 and the step for increment is 1. The count resets to 1 after 99	
1205	is used. Revision counter increments on each change of content of any field of the alert.	
1206	NOTE 11 The escalation counter is presenting the number of alert escalations after time expiration during the state	
1207	active-unacknowledged. The escalation counter starts with 0 and the step for increment is 1. The count resets to 1	
1208	after 9 is used. The alert escalation can be the escalation from warning into warning (activation of audible signal	
1209	only), the escalation from warning to alarm or the escalation from alarm to alarm with activation of back-up	
1210	navigator alarm	
1211	NOTE 12 This field is used for Alert title which is mandatory and for additional alert description which is optional.	
1212	• The first ALF sentence transmits the Alert title. Alert title is maximum 16 characters short form of the alert text. • The optional second ALF sentence transmits the additional alert description. Additional alert description is the long description of the alert. The additional alert description contains more information for decision making (i.e. alert description text). • The second ALF sentence uses null fields for Time of last change, Alert category, Alert priority, and Alert state to allow longer text. The actual number of valid characters should be such that the total number of characters in a sentence does not exceed the "82"-character limit. • Some equipment standards specify alert text longer than 16 characters (for example the AIS standard has defined some alerts to be coded with ALR sentence and with text longer than 16 characters). In such cases the first ALF sentence is used for the first 16 characters of the alert text as alert title and the second ALF sentence to carry the full alert text.	
1213		
1214		
1215		
1216		
1217	• The first ALF sentence transmits the Alert title. Alert title is maximum 16 characters short form of the alert text. • The optional second ALF sentence transmits the additional alert description. Additional alert description is the long description of the alert. The additional alert description contains more information for decision making (i.e. alert description text). • The second ALF sentence uses null fields for Time of last change, Alert category, Alert priority, and Alert state to allow longer text. The actual number of valid characters should be such that the total number of characters in a sentence does not exceed the "82"-character limit. • Some equipment standards specify alert text longer than 16 characters (for example the AIS standard has defined some alerts to be coded with ALR sentence and with text longer than 16 characters). In such cases the first ALF sentence is used for the first 16 characters of the alert text as alert title and the second ALF sentence to carry the full alert text.	
1218		
1219		
1220		
1221		
1222		
1223		
1224	Examples:	
1225	\$IIALF,1,1,0,124304.50,A,W,A,,192,1,1,0,LOST TARGET*14<CR><LF>	
1226	\$IIALF,2,1,1,081950.10,B,A,S,XYZ,0512,1,2,0,HEADING LOST*2D<CR><LF>	
1227	\$IIALF,2,2,1,,,,,XYZ,0512,1,2,0,NO SYSTEM HEADING AVAILABLE*0D<CR><LF>	
1228	8.3.14 ALR – Set alarm state	
1229	Local alarm condition and status. This sentence is used to report an alarm condition on a	
1230	device and its current state of acknowledgement.	
1231		

1232

1233 \$--ALR,hhmmss.ss,xxx,A, A,c--c*hh<CR><LF>

1234

1235 Alarm's description text

1236 Alarm's acknowledge state, A = acknowledged

1237 V = unacknowledged

1238 Alarm condition (A = threshold exceeded, V = not exceeded)

1239 Unique alarm number (identifier) at alarm source

1240 Time of alarm condition change, UTC

1241 8.3.15 APB – Heading/track controller (autopilot) sentence B

1242 Commonly used by autopilots, this sentence contains navigation receiver warning flag status,
1243 cross-track-error, waypoint arrival status, initial bearing from origin waypoint to the destination,
1244 continuous bearing from present position to destination and recommended heading to steer to
1245 destination waypoint for the active navigation leg of the journey.

1246 \$--APB, A, A, x.x, a, N, A, A, x.x, a, c--c, x.x, a, x.x, a, a*hh<CR><LF>

1247

1248 Mode indicator
(see Notes 1 and 2)

1249 Heading to steer to destination
waypoint, magnetic or true

1250 Bearing, present position to
destination, magnetic or true

1251 Destination waypoint ID

1252 Bearing origin to destination, M/T

1253 Status: A = perpendicular passed at waypoint

1254 V = perpendicular not entered

1255 Status: A = arrival circle entered V = arrival circle not passed

1256 XTE units, nautical miles

1257 Direction to steer, L/R

1258 Magnitude of XTE (cross-track-error)

1259 Status: A = OK or not used V = LORAN-C cycle lock warning flag (see Note 2)

1260 Status: A = Data valid V = LORAN-C blink or SNR warning (see Note 2)

1261 V = general warning flag for other navigation systems when a

1262 reliable fix is not available

1263

1264 NOTE 1 Positioning system mode indicator:

1265 A = Autonomous mode;

1266 D = Differential mode;

1267 E = Estimated (dead reckoning) mode;

1268 M = Manual input mode;

1269 S = Simulator mode;

1270 N = Data not valid.

1271 NOTE 2 The positioning system mode indicator field supplements the positioning system status fields (fields
1272 1 and 2), the status fields should be set to V = invalid for all values of mode indicator except for A = Autonomous
1273 and D = Differential. The positioning system mode indicator should not be null fields.

1274 8.3.16 ARC – Alert command refused

1275 Sentences ACN, ALC, ALF and ARC are used for alert handling. Alert related communications
1276 are described in IEC 61924-2 and IEC 62923.

1277 This sentence is used for:

- 1280 • Category A or C alerts (see IMO MSC.302(87)), for which it is illegal to accept
1281 acknowledge or responsibility transfer e.g. not enough information for decision support
1282 available or the source of acknowledgement is not acceptable,

1283 NOTE In a properly working system such attempts should not happen.

- 1284 • Category B (see IMO MSC.302(87)), if the source of acknowledge is not acceptable.

1285
 1286 \$--ARC,hhmmss.ss,aaa,x.x,x.x,c*hh <CR><LF>
 1287
 1288
 1289
 1290
 1291
 1292
 1293
 1294
 1295
 1296
 1297
 1298
 1299
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 1316

Refused alert command, A, Q, O or S (see Note 5)
 Alert instance, 1 to 999999 (see Note 4)
 Alert identifier (see Note 3)
 Manufacturer mnemonic code (see Note 2)
 Time (see Note 1)

NOTE 1 Release time of the Alert Command Refused. (e.g. for VDR purposes), optional, can be a null field. Sender is allowed to use all alternatives defined in Table 5 Field type summary. Receiver is allowed to ignore content of this field. If receiver does not ignore this field it should support all alternatives defined in Table 5 Field type summary.

NOTE 2 Used for proprietary alerts defined by the manufacturer. For standardized alerts this should be a null field.

NOTE 3 The alert identifier is unique within a single alert source. The alert identifier is a variable length integer field of maximum 7-digit integer. It identifies the type of the alert e.g. a "lost target" alert. Standardized alerts use unique alert identifiers described in equipment standards. Number range 10000-9999999 is reserved for proprietary alerts. Alert Identifier examples:

"001", "2456789", "245"

NOTE 4 The alert instance identifies the current instance of an alert to distinguish alerts of the same type (Alert identifier) and from the same source (e.g. dangerous target). Alert instance is maximum 6-digit integer from 1 to 999999. The number of alert instance can be freely defined by the manufacturer as long as it is unique for one type of alert (alert identifier). It is not permitted to modify the alert instance within a life cycle of a distributed alert (from 'active & unacknowledged' state until 'normal' state is reached). It can be also a null field, when there is only one alert of that type.

NOTE 5 Refused Alert Command: Indicates refused "Alert command" of corresponding ACN sentence. This should not be a null field.

acknowledge : A
 request / repeat information : Q
 responsibility transfer: O
 silence : S

8.3.17 BBM – AIS broadcast binary message

This sentence supports generation of ITU-R M.1371 binary Messages 8, 14, 25, and 26. This provides the application with a means to broadcast data, as defined by the application only. Data is defined by the application only – not the AIS. This sentence offers great flexibility for implementing system functions that use the transponder like a digital broadcast device. After receiving this sentence via the IEC 61162-2 interface, the AIS unit initiates a VHF broadcast of Message 8, 14, 25, or 26 within 4 s. See the ABK sentence for acknowledgement of the BBM with Messages 8 and 14. The AIS transponder determines the appropriate communications state for transmission of Message 26 over the VHF data link.

!--BBM,x,x,x,x,xx,s--s,x*hh<CR><LF>
 Number of fill-bits, 0 to 5 (See Note 6)
 Encapsulated data (See Note 5)
 ITU-R M.1371 Message ID (See Note 4)
 AIS channel for broadcast of the radio message (See Note 3)
 Sequential Message identifier, 0 to 9 (See Note 2)
 Sentence number, 1 to 9 (See Note 1)
 Total number of sentences needed to transfer the message, 1 to 9 (See Note 1)

NOTE 1 The total number of IEC 61162-1 sentences required to transfer the contents of the binary message to the AIS unit. The first field specifies the total number of sentences used for a message, minimum value 1. The second field identifies the order of this sentence in the message, minimum value 1. All sentences contain the same number of fields. Successive sentences may use null fields for fields that have not changed, such as fields 4 and 5.

NOTE 2 The Sequential message identifier provides a message identification number from 0 to 9 that is sequentially assigned and is incremented for each new multi-sentence message. The count resets to 0 after 9 is used. For a message requiring multiple sentences, each sentence of the message contains the same sequential

1334 message identification number. It is used to identify the sentences containing portions of the same message. This
1335 allows for the possibility that other sentences might be interleaved with the message sentences that, taken
1336 collectively, contain a single message. This value is used by the ABK sentence to acknowledge a specific BBM
1337 sentence.

1338 NOTE 3 The AIS channel that shall be used for the broadcast:

1339 0 = no broadcast channel preference,

1340 1 = Broadcast on AIS channel A,

1341 2 = Broadcast on AIS channel B,

1342 3 = Broadcast the message on both AIS channels A and B.

1343 NOTE 4 The ITU-R M.1371 Message ID for the following broadcast messages:

1344 8 = Binary broadcast message,

1345 14 = Safety related broadcast message,

1346 25 = Single slot binary message 25 (binary data coded using the 16-bit Application identifier),

1347 70 = Single slot binary message 25 (unstructured binary data),

1348 26 = Multiple slot binary message 26 with Communications State (binary data coded using the 16-bit Application
1349 identifier),

1350 71 = Multiple slot binary message 26 with Communications State (unstructured binary data).

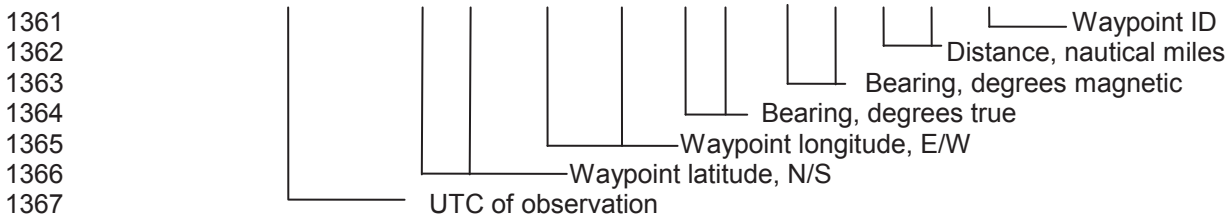
1351 NOTE 5 This is the content of the "binary data" parameter for ITU-R M.1371 Messages 8, 25 or 26, or the "Safety
1352 related Text" parameter for Message 14. The first sentence may contain up to 58 valid Six Bit codes (348 bits).
1353 Following sentences may contain up to 60 valid Six Bit codes (360 bits), if fields 4 and 5 are unchanged from the
1354 first sentence and set to null. The actual number of characters must be such that the total number of characters in
1355 a sentence does not exceed the "82-character" limit.

1356 NOTE 6 This cannot be a null field. See "x4" in 7.3.4.

1357 8.3.18 BEC – Bearing and distance to waypoint – Dead reckoning

1358 Time (UTC) and distance and bearing to, and location of, a specified waypoint from the dead-
1359 reckoned present position.

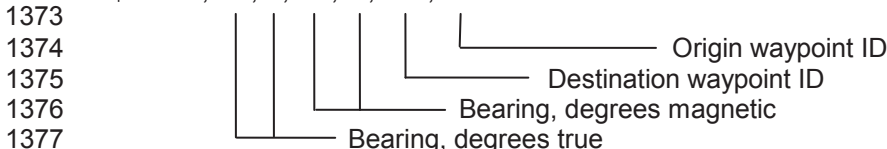
1360 \$--BEC, hhmmss.ss, llll.ll, a, yyyy.yy, a, x.x, T, x.x, M, x.x, N, c--c*hh<CR><LF>



1369 8.3.19 BOD – Bearing origin to destination

1370 Bearing angle of the line, calculated at the origin waypoint, extending to the destination
1371 waypoint from the origin waypoint for the active navigation leg of the journey.

1372 \$--BOD, x.x, T, x.x, M, c--c, c--c*hh<CR><LF>



1379 8.3.20 BWC – Bearing and distance to waypoint – Great circle

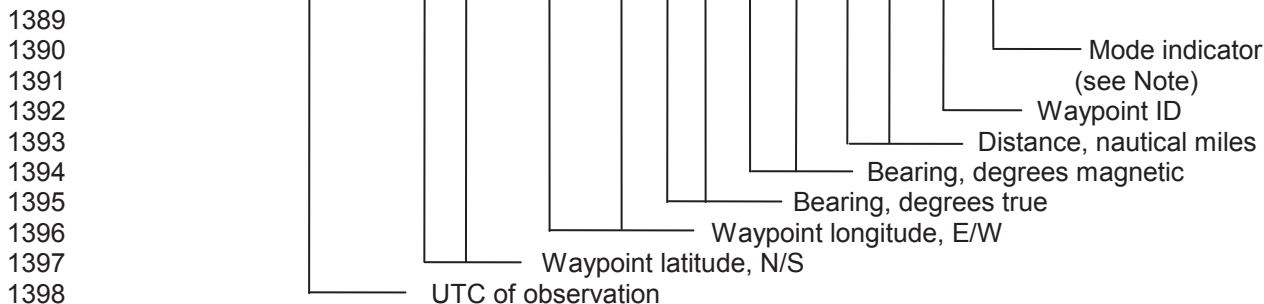
1380 Time (UTC) and distance and bearing to, and location of, a specified waypoint from present
1381 position. \$--BWC data is calculated along the great circle path from present position rather
1382 than along the rhumb line.

1383 8.3.21 BWR – Bearing and distance to waypoint – Rhumb line

1384 Time (UTC) and distance and bearing to, and location of, a specified waypoint from present
 1385 position. \$--BWR data is calculated along the rhumb line from present position rather than
 1386 along the great circle path.

1387 \$--BWC, hhmmss.ss, llll.ll, a, yyyy.yy, a, x.x, T, x.x, M, x.x, N, c--c, a*hh<CR><LF>

1388 \$--BWR, hhmmss.ss, llll.ll, a, yyyy.yy, a, x.x, T, x.x, M, x.x, N, c--c, a*hh<CR><LF>



1400 NOTE Positioning system mode indicator:

1401 A = Autonomous mode;

1402 D = Differential mode;

1403 E = Estimated (dead reckoning) mode;

1404 M = Manual input mode;

1405 S = Simulator mode;

1406 N = Data not valid.

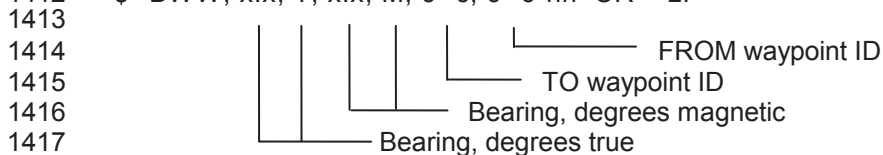
1407 The mode indicator field should not be a null field.

1408 8.3.22 BWW – Bearing waypoint to waypoint

1409 Bearing angle of the line, between the TO and the FROM waypoints, calculated at the FROM
 1410 waypoint for any two arbitrary waypoints.

1411

1412 \$--BWW, x.x, T, x.x, M, c--c, c--c*hh<CR><LF>



1419

1420 8.3.23 CUR – Water current layer – Multi-layer water current data

1421 \$--CUR,A,x,x,x,x,x,x,a,x,x,x,x,x,a*hh<CR LF>

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Speed reference (see Note 4)

B: Bottom track

W: Water track

P: Positioning system

Heading reference in use, True/Magnetic T/M

Heading

Reference layer depth in metres (see Note 3)

Current speed in knots

Direction reference in use, True/Relative T/R

Current direction in degrees

Current depth in metres

Layer number (see Note 2)

Data set number, 0 to 9 (see Note 1)

Validity of the data, A = Valid, V = not valid

1437 NOTE 1 The data set number is used to identify multiple sets of current data produced in one measurement
1438 instance. Each measurement instance may result in more than one sentence containing current data measurements
1439 at different layers, all with the same data set number. This is used to avoid the data measured in another instance
1440 to be accepted as one set of data.

1441 NOTE 2 The layer number identifies which layer the current data measurements were made from. The number of
1442 layers that can be measured varies by device. The typical number is between 3 and 32, though many more are
1443 possible.

1444 NOTE 3 The current of each layer is measured according to this reference layer, when the speed reference field is
1445 set to "water track", or the depth is too deep for bottom track.

1446 NOTE 4 "Speed reference" identifies the method of ship speed used for measuring the current speed.

1447 8.3.24 DBT – Depth below transducer

1448 Water depth referenced to the transducer.

1449 \$--DBT, x.x, f, x.x, M, x.x, F*hh<CR><LF>

1450

1451

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1453

1454

Water depth, fathoms

Water depth, m

Water depth, feet

1455 8.3.25 DDC – Display dimming control

1456 The DDC sentence provides controls for equipment display dimming presets and a display
1457 brightness percentage.

1458 \$--DDC,a,xx,a,a*hh<CR><LF>

1459

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1462

1463

Sentence Status Flag (see Note 4)

Colour palette (see Note 3)

Brightness percentage 00 to 99 (see Note 2)

Display dimming preset (see Note 1)

1464 NOTE 1 The display dimming preset field contains an indicator that may be associated with a preset dimmed level
1465 on an electronic device.

1466 D = Day time setting

1467 K = Dusk setting

1468 N = Night time setting

1469 O = Backlighting off setting

1470 Actual display brightness levels for the display dimming preset indicators above are dependant upon the capabilities
1471 provided by the manufacturer of the equipment. Proper use of this field would be as follows. A device provides the
1472 operator or user with the ability to set a brightness level to be associated with day, dusk night, etc. Upon receipt of
1473 the DDC sentence, the device would switch its display brightness to the preset value the operator had determined
1474 for the corresponding indicator value. If the equipment had no brightness or dimming preset capability this field
1475 would be ignored.

1476 NOTE 2 The brightness percentage field contains a value from zero to ninety nine. The value zero, provided as 00,
1477 indicates that the display's brightness should be set to its most dimmed level, as determined by the capabilities of
1478 the equipment. The value ninety nine, provided as 99, indicates that the display brightness should be set to the
1479 brightest level, as determined by the capabilities of the equipment. Values between 0 and 99 correspond to some
1480 percentage of brightness, as determined by the equipment receiving this sentence.

1481 NOTE 3 The colour palette preset field contains an indicator that may be associated with a preset dimmed level on
1482 an electronic device.

1483 D = Day time setting

1484 K = Dusk setting

1485 N = Night time setting

1486 O = Backlighting off setting

1487 NOTE 4 This field is used to indicate a sentence that is a status report of current settings or a configuration
1488 command changing settings. This field should not be null.

1489 R = Sentence is a status report of current settings (use for a reply to a query).

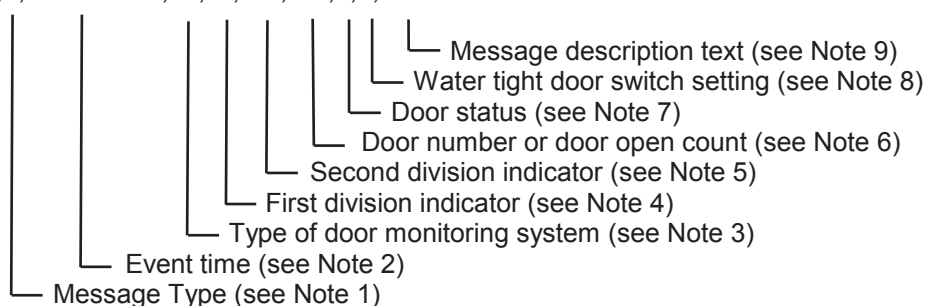
1490 C = Sentence is a configuration command to change settings. A sentence without "C" is not a command.

1491 8.3.26 DOR – Door status detection

1492 This sentence indicates the status of watertight doors, fire doors or other hull openings / doors.

1493
1494 \$--DOR,a,hmmss.ss,aa,cc,xxx,xxx,a,a,c--c *hh<CR><LF>

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Message description text (see Note 9)
Water tight door switch setting (see Note 8)
Door status (see Note 7)
Door number or door open count (see Note 6)
Second division indicator (see Note 5)
First division indicator (see Note 4)
Type of door monitoring system (see Note 3)
Event time (see Note 2)
Message Type (see Note 1)

1506 NOTE 1 S: Status for section: the number of faulty and/or open doors reported in the division specified in fields 4
1507 and 5. The section may be a whole section (one or both of the division indicator fields are null) or a sub-
1508 section. The status S is normally transmitted at regular intervals. Examples of use are given in Annex E.

1509 E: Status for single door. (E may be used to indicate an event).

1510 F: Fault in system: Division indicator fields defines the section when provided.

1511 NOTE 2 Time when this status/message was valid. This may be a null field.

1512 NOTE 3 The field is two fixed characters, see table below.

1513 NOTE 4 First division indicator where door is located. This field is two characters, see table below.

1514 NOTE 5 Second division indicator where the door is located. This field is three numeric characters, see table
1515 below.

1516 NOTE 6 This field is three fixed numeric characters. When the message type field is E this field identifies the
1517 door. When message type field is S this field contains the number of doors that are open or faulty. When the
1518 message type field is F this field is null.

1519 NOTE 7 When the message type field is S or F this field should be a null field. When the message type field is E,
1520 this field is specified by the following:

1521 O = Open,

- 1522 C = Closed,
 1523 S = Secured,
 1524 F = Free status (for watertight door),
 1525 X = Fault (door status unknown).

1526 NOTE 8 This field includes a single character specified by the following:

- 1527 O = Harbour mode (allowed open),
 1528 C = Sea mode (ordered closed).

1529 This may be a null field.

1530 NOTE 9 Descriptive text/door tag. If a door allocation identifier is string type, it is possible to use this field instead
 1531 of the above door allocation fields. The maximum number of characters will be limited by the maximum sentence
 1532 length and the length of other fields.

1533

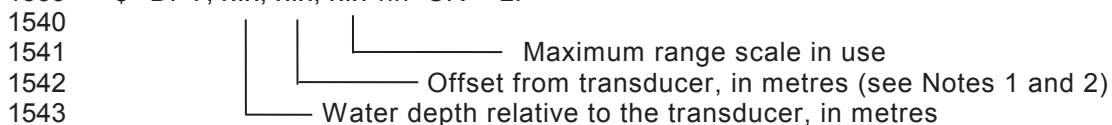
Type of door monitoring system		First division indicator	Second division indicator
ID	System category		
WT	Watertight door	Number of watertight bulkhead / frame number	Deck number
WS	Semi-watertight door (splash-tight)		
FD	Fire door	Number / letter of zone. This can also be identifier for control and monitoring main system.	Deck number or control system loop number or other control system division indicator as is appropriate for system
HD	Hull (shell) door	Door indication number / frame number	Deck number
OT	Other	As above	As above

1534

1535 8.3.27 DPT – Depth

1536 Water depth relative to the transducer and offset of the measuring transducer. Positive offset
 1537 numbers provide the distance from the transducer to the waterline. Negative offset numbers
 1538 provide the distance from the transducer to the part of the keel of interest.

1539 \$--DPT, x.x, x.x, x.x*hh<CR><LF>



1544 NOTE 1 “positive” = distance from transducer to water line; “-” = distance from transducer to keel.

1545 NOTE 2 For IEC applications, the offset should always be applied so as to provide depth relative to the keel.

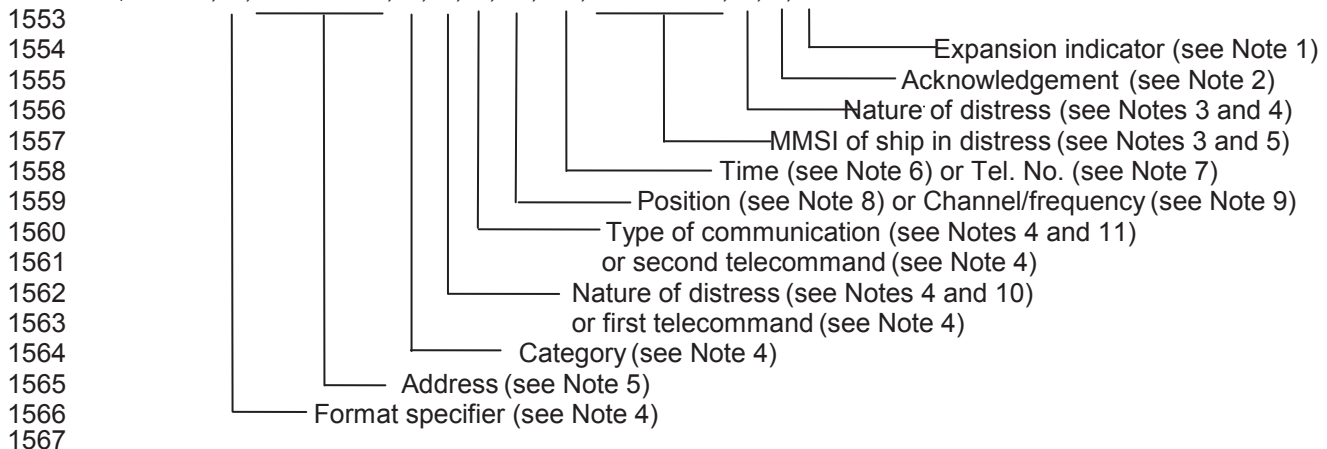
1547 8.3.28 DSC – Digital selective calling information

1548 This sentence is used to receive a call from or provide data to a radiotelephone using digital
 1549 selective calling in accordance with ITU-R M.493.

1550

1551

1552 \$ --DSC,xx,xxxxxxxxxx,xx,xx,xx,x.x, x.x,xxxxxxxxxx,xx, a,a*hh<CR><LF>



1568 NOTE 1 Expansion indicator = "E", null otherwise. When set to "E" this sentence is followed by the DSC expansion
1569 sentence \$--DSE, without intervening sentences, as the next transmitted or received sentence.

1570 NOTE 2 Acknowledgement type:

1571 R = Acknowledge request

1572 B = Acknowledgement

1573 S = Neither (end of sequence)

1574 NOTE 3 For distress acknowledgement, distress relay and distress relay acknowledgement calls only, null
1575 otherwise.

1576 NOTE 4 Use two least-significant digits of symbol codes in ITU-R M.493.

1577 NOTE 5 Maritime Mobile Service Identifier (MMSI) for the station to be called or the MMSI of the calling station in
1578 a received call. For a nine-digit MMSI "0" should be added as the tenth digit. For calls to a geographic area the area
1579 is coded in accordance with ITU-R M.493.

1580 System configuration (wiring) and the Talker ID are used to confirm if the sentence is transmitted or received. The
1581 MMSI of the calling station for transmitted calls is inserted automatically in the ITU-R M.493 transmission at the
1582 radiotelephone.

1583 NOTE 6 Time (UTC) of position, four digits, hhmm (hours and minutes).

1584 NOTE 7 Telephone number, 16 digits maximum, odd/even information to be inserted by the DSC equipment.

1585 NOTE 8 Latitude/longitude, degrees and minutes, 10 digits, coded in accordance with ITU-R M.493.

1586 NOTE 9 Frequency or channel, six or twelve digits, coded in accordance with ITU-R M.493.

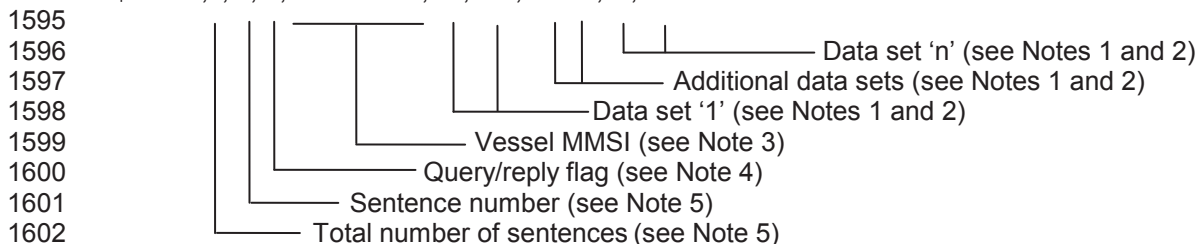
1587 NOTE 10 Distress calls only.

1588 NOTE 11 Distress, distress acknowledgement, distress relay and distress relay acknowledgement calls only.

1589 8.3.29 DSE – Expanded digital selective calling

1590 This sentence immediately follows, without intervening sentences or characters, \$--DSC,
1591 \$--DSI or \$--DSR when the DSC expansion field in these sentences is set to "E". It is used to
1592 provide data to or receive DSC expansion data from a radiotelephone using digital selective
1593 calling in accordance with ITU-R M.821.

1594 \$--DSE,x, x, a,xxxxxxxxxx, xx,c--c,.....,xx,c--c*hh<CR><LF>



1604 NOTE 1 Data sets consist of two fields. The first field is the code field: the two least significant digits of symbol
1605 codes in ITU-R M.821-1, Table 1. The second field is the data field: the additional information required by ITU-R