IEC/PAS 61162-101

Edition 1.0
2003-09

Maritime navigation and radiocommunication equipment and systems – Digital interfaces –

Part 101: Single talker and multiple listeners – Modified sentences and requirements for IEC 61162-1

PUBLICLY AVAILABLE SPECIFICATION

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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CONTENTS

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A PAS is a technical specification not fulfilling the requirements for a standard, but made available to the public.

IEC-PAS 61162-101 has been processed by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems.

The text of this PAS is based on the following document:	This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document
Draft PAS	**Report on voting**
80/363/PAS	80/376/RVD

Following publication of this PAS, the technical committee or subcommittee concerned will investigate the possibility of transforming the PAS into an International Standard.

This PAS document relates to International Standards of the IEC 61162 series. The document has been co-ordinated with the NMEA Standards Committee.

This PAS shall remain valid for an initial maximum period of 3 years starting from 2003-09. The validity may be extended for a single 3-year period, following which it shall be revised to become another type of normative document, or shall be withdrawn.

INTRODUCTION

This document is issued as a IEC Publicly Available Specification according to the IEC/PAS approval process. This agreed process allows the latest information on modified sentences to be placed in the public domain in a shorter timescale than revising the appropriate international standards.

The publication of this PAS is intended to provide information on the interface standards which have been upgraded, modified or introduced in the light of experience with earlier editions of the IEC Standard 61162-1.

This publication IEC/PAS 61162-101 will be aligned with similar standards adopted by the NMEA in the latest version 3.12 of NMEA 0183.

A second IEC/PAS 61162-100 is available which deals solely with the interface standards required to implement the AIS. A future IEC/PAS 61162-102 will be made available concerning the additional requirements for the Voyage Data recorder (VDR).

This PAS will be replaced at a future date by, or be included within, a revision of the international standard IEC 61162-1.

MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – DIGITAL INTERFACES –

Part 101: Single talker and multiple listeners – Modified sentences and requirements for IEC 61162-1

1 Scope

This PAS document for IEC 61162-1 contains additional requirements for existing sentences and details additions to the existing format which have been found desirable in the light of field experience.

This is the second PAS document to be developed for the IEC 61162-1, reference should be made to IEC/PAS 61162-100 which covers the requirements of the universal shipborne Automatic Identification System (AIS).

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.

Additions to this list are concerned solely with the new AIS and IEC/PAS 61162-100 should be referred to for details.

3 Definitions

3.1
Parametric sentences
(Reference IEC 61162-1 Section 5 : Data format protocol)

These sentences start with the “$” delimiter, and represent the majority of approved sentences defined by this standard. This sentence structure, with delimited and defined data fields, is the preferred method for conveying information.

The basic rules for parametric sentence structures are:

a) The sentence begins with the “$” delimiter.
b) Only approved sentence formatters are allowed. Formatters used by special-purpose encapsulation sentences cannot be reused. See Annex C, tables C.1 and C.2.
c) Only valid characters are allowed. See Annex B, tables B.1 and B.2.
d) Only approved field types are allowed. See Annex A, table A.1.
e) Data fields (parameters) are individually delimited, and their content is identified and often described in detail by this standard.
f) Encapsulated non-delimited data fields are NOT ALLOWED.

3.2
Encapsulation sentences
(Reference IEC 61162-1 these are new sentences : see note below)

There follows a brief description of the Encapsulation sentence. Note that a full description is to be found in the IEC/PAS 61162-100 for the universal shipborne Automatic Identification System (AIS).

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

The basic rules for encapsulation sentence structures are:

a) The sentence begins with the "!" delimiter.

b) Only approved sentence formatters are allowed. Formatters used by conventional parametric sentences can not be reused.

c) Only valid characters are allowed.

d) Only approved field types are allowed)

e) Only Six bit coding may be used to create encapsulated data fields.

f) Encapsulated data fields may consist of any number of parameters, and their content is not identified or described by this standard.

g) The sentence must be defined with one encapsulated data field and any number of parametric data fields separated by the "," data field delimiter. The encapsulated data field shall always be the second to last data field in the sentence, not counting the checksum fieldh)

h) The sentence contains a "Total Number Of Sentences" field.

i) The sentence contains a "Sentence Number" field.

j) The sentence contains a "Sequential Message Identifier" field.

k) The sentence contains a "Fill Bits" field immediately following the encapsulated data field. The Fill Bits field shall always be the last data field in the sentence, not counting the checksum field.

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

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

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

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

4 Data format protocol

Reference IEC 61162-1 Section 5: New section 5.3.7 multi-sentence messages, see also 4.1 and 4.2 below.

Multi-sentence messages may be transmitted where a data message exceeds the available character space in a single sentence. The key fields supporting the multi-sentence message capability shall always be included, without exception. The required fields are: total number of sentences, sentence number, and sequential message identifier fields. Only sentence definitions containing these fields may be used to form messages. The TUT sentence is a good example of how a sentence is defined to provide these capabilities.

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

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

4.1 A new definition for Message is added to Annex B of 61162-1

Message – A message consists of 2 or more sentences with the same sentence formatter. Messages are used when 2 or more sentences are needed to convey related data that exceeds the maximum sentence length. This only applies to those sentence formatters that are defined with the key fields supporting multi-sentence messages.

4.2 Editorial correction

Previously, the words ‘Sentence’ and ‘Message’ had been interchangeable in their use within the standard. The word ‘Message’ has now been given a specific meaning – see 4.1 above. The words ‘Sentence’ and ‘Message’ are no longer interchangeable and have two different meanings. Accordingly, a number of sentence descriptions, field labels, and notes have been edited to use the words ‘Sentence’ and ‘Message’ in a consistent and proper manner. The sentences affected are:

ALM	GPS Almanac Data
ABM	UAIS Addressed binary and safety related message.
BBM	UAIS Broadcast Binary Message.
DSE	Expanded Digital Selective Calling
DSI	DSC Transponder Initialise
DSR	DSC Transponder Response
GBS	GNSS Satellite Fault Detection
GMP	GNSS Map Projection Fix Data
GNS	GNSS Fix Data
GRS	GNSS Range Residuals
GSA	GNSS DOP and Active Satellites
GST	GNSS Pseudorange Error Statistics
GSV	GNSS Satellites in View
MLA	GLONASS Almanac Data
MSK	MSK Receiver Interface
RTE	Routes RTE - Routes
SFI	Scanning Frequency Information
TLB	Target Label

5 Changes to existing parametric sentences

Reference IEC 61162-1 Section 6.3:

5.1 ABM and BBM are covered in IEC/PAS 61162-100

5.2 ACK – Acknowledge Alarm

Updated the text label for the data field.

```
$--ACK,xxx*hh<CR><LF>
```

Unique alarm number (identifier) at alarm source

5.3 ALR – Set Alarm State

Updated the text label of the alarm identification field to be the same as that field in the ACK sentence.

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

Alarm's description text

Alarm's acknowledge state, A = acknowledged, V = unacknowledged

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

Unique alarm number (identifier) at alarm source

Time of alarm condition change, UTC

5.4 ALM – GPS almanac data

The description should now read:

Contains GPS week number, satellite health and the complete almanac for one satellite. Multiple sentences may be transmitted, one for each satellite in the GPS constellation, up to a maximum of 32 sentences.

Note also that the word “message” is replaced by “sentence” in fields 1 and 2.

5.5 BWC – Bearing and distance to waypoint – great circle

BWC data is calculated along the great circle path from present position rather than along the rhumb line

5.6 DSE, DSI, DSR

The following changes have been made to the relevant notes for sentences: DSE, DSI and DSR.

In each case Note 5 should now read

NOTE 5 The number of data sets may require the transmission of multiple sentences all containing identical field formats. The first field specifies the number of sentences, minimum value = 1. The second field identifies the order of this sentence (sentence number), minimum value = 1. For efficiency, it is permitted that null fields be used in the additional sentences when the data is unchanged from the first sentence [Note that this practice can lead to the incorrect assembly of messages if there is a high risk of loss of sentence].”

Note also that the word “message” is replaced by “sentence” in fields 1 and 2.

5.7 GBS – GNSS satellite fault detection

The word “message(s)” in paragraphs 1 and 2 of the description should be amended to “sentence(s)”.

5.8 GGA – Global positioning system (GPS) fix data

Note 1 has been clarified in terms of valid or invalid data.

NOTE 1 All GPS quality indicators in headings 1 through 8 are considered “valid”. The heading “0” is the only “invalid” indicator. The GPS Quality indicator field shall not be a null field.

5.9 GNS – GNSS fix data

The word “message” in the second paragraph should be replaced by “sentence”.

Note 1 has been clarified in terms of valid or invalid data.

NOTE 1 All GPS quality indicators in headings 1 through 8 are considered “valid”. The heading “0” is the only “invalid” indicator. The GPS Quality indicator field shall not be a null field.

5.10 GRS – GNSS range residuals

The word “messages” in the second and third paragraphs should be replaced by “sentences”.

5.11 GSA – GNSS DOP and active satellites

The word “messages” in the opening paragraph should be replaced by “sentences”.

5.12 GST – GNSS pseudorange noise statistics

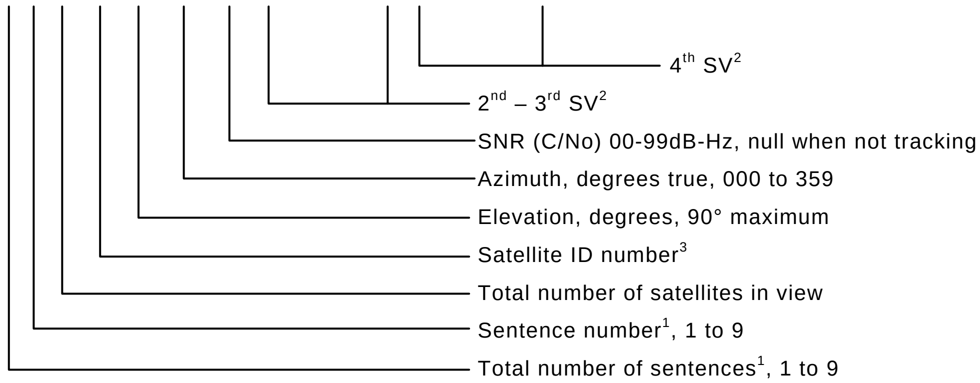
Amend the word “message” in the opening paragraph to “sentence”.

5.13 GSV – GNSS Satellites in View

Number of satellites (SV) in view, satellite ID numbers, elevation, azimuth, and SNR value. Four satellites maximum, per transmission. Total number of sentences being transmitted and the number of the sentence being transmitted are indicated in the first two fields.

If multiple GPS, GLONASS, etc. satellites are in view, use separate GSV sentences with talker ID GP to show the GPS satellites in view and talker GL to show the GLONASS satellites in view, etc. The GN identifier shall not be used with this sentence.

$--GSV,x,x,xx,xx,xx,xxx,xx,………………,xx,xx,xxx,xx*hh<CR><LF>



NOTE 1 Satellite information may require the transmission of multiple sentences all containing identical field formats when sending a complete message. The first field specifies the total number of sentences, minimum value=1. The second field identifies the order of this sentence (sentence number), minimum value = 1. For efficiency it is permitted that null fields be used in the additional sentences when the data is unchanged from the first sentence.

NOTE 2 A variable number of “Satellite ID-Elevation-Azimuth-SNR” sets are allowed up to a maximum of four sets per sentence. Null fields are not required for unused sets when less than four sets are transmitted.

NOTE 3 Satellite ID numbers. To avoid possible confusion caused by repetition of satellite ID numbers when using multiple satellite systems, the following convention has been adopted:

a) GPS satellites are identified by their PRN numbers, which range from 1 to 32.

b) The numbers 33-64 are reserved for WAAS satellites. The WAAS system PRN numbers are 120-138. The offset from NMEA WAAS SV ID to WAAS PRN number is 87. A WAAS PRN number of 120 minus 87 yields the SV ID of 33. The addition of 87 to the SV ID yields the WAAS PRN number.

c) The numbers 65-96 are reserved for GLONASS satellites. GLONASS satellites are identified by 64+satellite slot number. The slot numbers are 1 through 24 for the full GLONASS constellation of 24 satellites, this gives a range of 65 through 88. The numbers 89 through 96 are available if slot numbers above 24 are allocated to on-orbit spares.

5.14 MLA – GLONASS almanac data

The word “messages” in the opening paragraph should be replaced by “sentences”.

Note also that the word “message(s)” is replaced by “sentence(s)” in fields 1 and 2.

5.15 MSK – MSK receiver interface

Command sentence to a radiobeacon MSK receiver (beacon receiver) or reply from an MSK receiver to a query sentence.

5.16 RTE – Routes

Note 2 is replaced by the following

NOTE 2 A single route may require the transmission of multiple sentences, all containing identical field formats when sending a complex message. The first field specifies the number of sentences, minimum value = 1. The second field identifies the order of this sentence (sentence number), minimum value = 1. For efficiency it is permitted that null fields be used in the additional sentences when the data is unchanged from the first sentence. [Note that this practice can lead to the incorrect assembly of messages if there is a high risk of loss of sentence].

Note also that the word “message” is replaced by “sentence” in fields 1, 2 and [3].

5.17 SFI – Scanning frequency information

The word “message(s)” is replaced by “sentence(s)” in fields 1 and 2.

5.18 TLB – Target label

The word “message” is replaced by “sentence” in Notes 1 and 2.

5.19 TXT – Text transmission

Note 1 is replaced by the following

NOTE 1 Text messages may require the transmission of multiple sentences, all containing identical field formats when sending a complex message. The first field specifies the number of sentences, minimum value = 1. The second field identifies the order of this sentence (sentence number), minimum value = 1. For efficiency it is permitted that null fields be used in the additional sentences when the data is unchanged from the first sentence. [Note that this practice can lead to the incorrect assembly of messages if there is a high risk of loss of sentence].”

The word “message” is replaced by “sentence” in fields 1 and 2.

5.20 VTG – Course over ground and ground speed

The change is to the definition in the note

NOTE The mode indicator provides status information about the operation of the source devices (such as positioning systems, velocity sensors, etc.) generating this sentence, and the validity of the data being provided. The possible indications are as follows:

5.21 XDR – Transducer Measurements

An additional transducer type has been added to the XDR sentence to support salinity measurements.

NOTE 2 Allowed transducer types and their units of measure are:

Transducer	Type Field	Units Field	Comments
Salinity	L	S = ppt	ppt = parts per thousand
Absolute humidity	B	K = kg/m^3	kilograms per cubic metre

Additional note:

Add the unit definition to Table 3 of IEC 61162-1 – Character symbol table

K Kilometers; km/hr; kg/m^3

5.22 XTE – correction

In Edition 2 of IEC 61162-1 there was a printing / format error in this sentence. The correct definition is given below.

XTE – Cross-track error, measured

Magnitude of the position error perpendicular to the intended track line and the direction to steer to return to track.

$--XTE,A,A,x.x,a,N,a*hh<CR><LF

Mode indicator (see notes 1 and 2)
Units, nautical miles
Direction to steer, L/R
Magnitude of cross-track error
Status: A = data valid V = Loran-C cycle lock warning flag
Status (see note 2) A = data valid, V = LORAN – C blink or SNR warning
V = general warning flag for other navigation systems
when a reliable fix is not available

NOTE 1 Positioning system mode indicator :

A = Autonomous mode
D = Differential mode
E = Estimated (dead reckoning) mode
M = Manual input mode
S = Simulator mode
N = Data not valid

NOTE 2 The positioning system Mode indicator field supplements the positioning system Status fields (fields No. 1 and No.2); the status fields shall be set to V = invalid for all values of indicator Mode except for A = Autonomous and D = Differential. The positioning system Mode indicator and Status fields shall not be null fields.

6 New sentences

6.1 CUR – Water Current Layer – Multi-layer water current data

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

Speed reference[4], B: Bottom track
W: Water track
P: Positioning System
Heading reference in use, True/Magnetic T/M
Heading
Reference layer depth in meters[3]
Current Speed in Knots
Direction reference in use, True/Relative T/R
Current direction in degrees
Current depth in meters
Layer number[2]
Data set number[1], 0 to 9
Validity of the data, A= Valid, V= not valid

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

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

NOTE 3 The current of each layer is measured according to this Reference layer, when the Speed reference field is set to “Water track”, or the depth is too deep for Bottom track.

NOTE 4 “Speed Reference” identifies the method of ship speed used for measuring the current speed.

6.2 GMP – GNSS Map Projection Fix Data

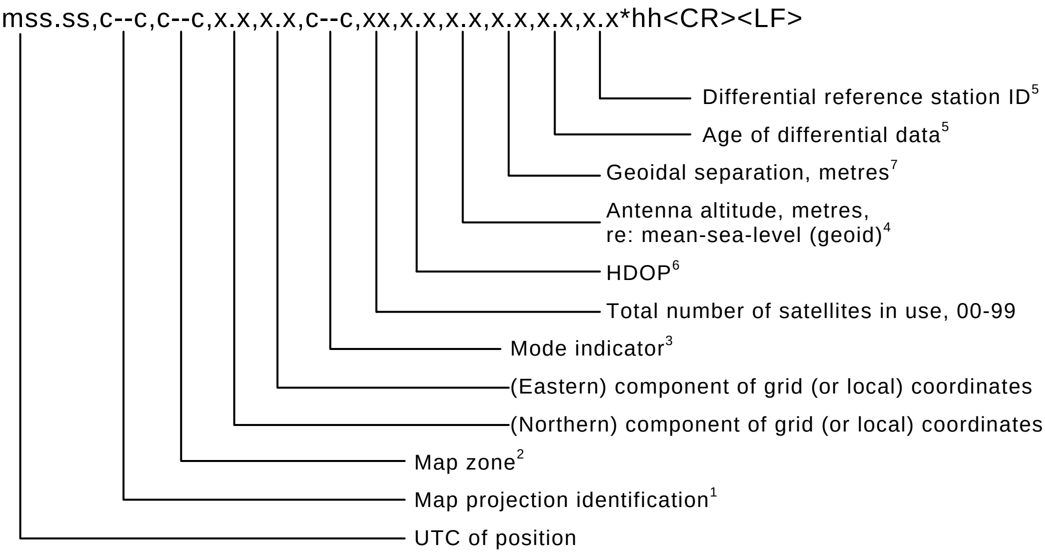
This new sentence has been created to support land use and provide map projection co-ordinates of any GNSS system.

Fix data for single or combined satellite navigation systems (GNSS) in grid (or local) co-ordinates expressed in the given map projection. This sentence provides fix data for GPS, GLONASS, possible future satellite systems, and systems combining these. This sentence could be used with the talker identification of GP for GPS, GL for GLONASS, GN for GNSS combined systems, as well as future identifiers. Some fields may be null fields for certain applications, as described below.

If a GNSS receiver is capable simultaneously of producing a position using combined satellite systems, as well as a position using only one of the satellite systems, then separate $GPGMP, $GLGMP, etc. sentences may be used to report the data calculated from the individual systems.

If a GNSS receiver is set up to use more than one satellite system, but for some reason one or more of the systems are not available, then it may continue to report the positions using $GNGMP, and use the mode indicator to show which satellite systems are being used.

$--GMP,hhmmss.ss,c--c,c--c,x.x,x.x,c--c,xx,x.x,x.x,x.x,x.x,x.x*hh<CR><LF>



NOTE 1 Map Projection identification. A variable length valid character field type consisting of 3 characters as follows: UTM = Universal Transverse Mercator, LOC = Local Coordinate System.

NOTE 2 Map Zone. A variable length valid character field type containing of the map projection zone. A typical Map Zone field might contain M20 for a Map Projection Identification of UTM.

NOTE 3 Mode Indicator. A variable length valid character field type with the first two characters currently defined. The first character indicates the use of GPS satellites; the second character indicates the use of GLONASS satellites. If another satellite system is added to the standard, the mode indicator will be extended to three characters, new satellite systems shall always be added on the right, so the order of characters in the Mode Indicator is: GPS, GLONASS, other satellite systems in the future. The characters shall take one of the following values:

N = No fix. Satellite system not used in position fix, or fix not valid

A = Autonomous. Satellite system used in non-differential mode in position fix

D = Differential. Satellite system used in differential mode in position fix

P = Precise. Satellite system used in precision mode. Precision mode is defined as: no deliberate degradation (such as Selective Availability) and higher resolution code (P-code) is used to compute position fix

R = Real Time Kinematic. Satellite system used in RTK mode with fixed integers

F = Float RTK. Satellite system used in real time kinematic mode with floating integers

E = Estimated (dead reckoning) Mode

M = Manual Input Mode

S = Simulator Mode

The Mode Indicator shall not be a null field.

NOTE 4 Antenna Altitude. This is referenced to mean-sea-level for UTM map projections or to local coordinates if LOC map projections are specified.

NOTE 5 Age of differential data and Differential Reference Station ID:

a) When the talker is GN and more than one of the satellite systems are used in differential mode, then the "Age of differential data" and "Differential reference station ID" fields shall be null. In this case, the "Age of differential data" and "Differential reference station ID" fields shall be provided in following GMP sentences with talker IDs of GP, GL, etc. These following GMP messages shall have the map projection identification, map zone, X coordinate, Y coordinate, altitude, geoidal separation, mode, and HDOP fields null. This indicates to the listener that the field is supporting a previous $GNGMP sentence with the same time tag. The "Number of satellites" field may be used in these following sentences to denote the number of satellites used from that satellite system.

   Example: A Combined GPS/GLONASS receiver using only GPS differential corrections has the following GNS sentence sent.

   $GNGMP,122310.2,UTM,M20,12345.56,65543.21,DA,14,0.9,1005.543,6.5,5.2,23*75<CR><LF>

   Example: A Combined GPS/GLONASS receiver using both GPS differential corrections and GLONASS differential corrections may have the following three GNS sentences sent in a group.

   $GNGMP,122310.2,UTM,M20,12345.56,65543.21,DD,14,0.9,1005.543,6.5,,*58<CR><LF>

   $GPGMP,122310.2, , , , , ,7, , , ,5.2,23*4D<CR><LF>

   $GLGMP,122310.2, , , , , ,7, , , ,3.0,23*55<CR><LF>

   The Differential Reference station ID may be the same or different for the different satellite systems.

b) Age of Differential Data :

   For GPS Differential Data:

   This value is the average age of the most recent differential corrections in use. When only RTCM SC104 Type 1 corrections are used, the age is that of the most recent Type 1 correction. When RTCM SC104 Type 9 corrections are used solely, or in combination with Type 1 corrections, the age is the average of the most recent corrections for the satellites used. Null field when Differential GPS is not used.

   For GLONASS Differential Data:

   This value is the average age of the most recent differential corrections in use. When only RTCM SC104 Type 31 corrections are used, the age is that of the most recent Type 31 correction. When RTCM SC104 Type 34 corrections are used solely, or in combination with Type 31 corrections, the age is the average of the most recent corrections for the satellites used. Null field when differential GLONASS is not used.

NOTE 6 HDOP calculated using all the satellites (GPS, GLONASS, and any future satellites) used in computing the solution reported in each GMP sentence.

NOTE 7 Geoidal Separation: the difference between the earth ellipsoid surface and mean-sea-level (geoid) surface defined by the reference datum used in the position solution, "-" = mean-sea-level surface below ellipsoid. The reference datum may be specified in the DTM sentence.

6.3 GSV – GNSS Satellites in View

Note 3 has been replaced with a clearer note describing the relationship of WAAS satellite numbers to the WAAS satellite IDs reported via the GSV sentence.

NOTE 3 Satellite ID numbers. To avoid possible confusion caused by repetition of satellite ID numbers when using multiple satellite systems, the following convention has been adopted:

a) GPS satellites are identified by their PRN numbers, which range from 1 to 32.

b) The numbers 33-64 are reserved for WAAS satellites. The WAAS system PRN numbers are 120-138. The offset from WAAS SV ID to WAAS PRN number is 87. A WAAS PRN number of 120 minus 87 yields the SV ID of 33. The addition of 87 to the SV ID yields the WAAS PRN number.

c) The numbers 65-96 are reserved for GLONASS satellites. GLONASS satellites are identified by 64+ satellite slot number. The slot numbers are 1 through 24 for the full GLONASS constellation of 24 satellites, this gives a range of 65 through 88. The numbers 89 through 96 are available if slot numbers above 24 are allocated to on-orbit spares.

6.4 MWV – Wind Speed and Angle

A new description has been added to the MWV sentence. This description attempts to clarify the use of this sentence, and describes the differences between apparent and true wind.

When the reference field is set to R (Relative), data is provided giving the wind angle in relation to the vessel's bow/centreline and the wind speed, both relative to the (moving) vessel. Also called apparent wind, this is the wind speed as felt when standing on the (moving) ship.

When the reference field is set to T (Theoretical / calculated wind), data is provided giving the wind angle in relation to the vessel's bow/centreline and the wind speed as if the vessel was stationary. On a moving ship these data can be calculated by combining the measured relative wind with the vessel's own speed.

Example 1 If the vessel is heading west at 7 knots and the wind is from the east at 10 knots the relative wind is 3 knots at 180 degrees. In this same example the theoretical wind is 10 knots at 180 degrees (if the boat suddenly stops the wind will be at the full 10 knots and come from the stern of the vessel 180 degrees from the bow).

Example 2 If the vessel is heading west at 5 knots and the wind is from the southeast at 7,07 knots the relative wind is 5 knots at 270 degrees. In this same example the theoretical wind is 7,07 knots at 225 degrees (if the boat suddenly stops the wind will be at the full 7,07 knots and come from the port-quarter of the vessel 225 degrees from the bow).

$--MWV,x.x,a,x.x,a,A*hh<CR><LF>

Status, A = Data Valid,V=invalid
Wind speed units, K/M/N/S
Wind speed
Reference, R = Relative, T = Theoretical
Wind angle, 0 to 359 degrees

6.5 TUT – Transmission of multi-language text

A new sentence created to support multi-language text. This is the first time that a variable length Hex field has been used in a sentence definition.

The sentence structure is similar to the TXT sentence, however it has two additional fields. There is a “Source identifier” field used to identify the origin of the sentence and a “Translation Code” field that is used to define the coding system for the text body. This enables the use of multi-language codes, such as, Unicode or other codes. A proprietary look-up table method is incorporated to allow pre-defined messages to be sent in short sentences.

$--TUT,aa,hh,hh,x,c--c,h--h*hh<CR><LF>

Text Body[5]
Translation Code for text body[4]
Sequential message identifier [3], 00 to FF
Sentence number [2], 00 to FF
Total number of sentences in the messages[2], 00 to FF
Source Identifier[1],

NOTE 1 The Source identifier contains the Talker ID indicating the type of equipment that originated this message.

NOTE 2 Unicode text may require the transmission of multiple sentences all containing identical field formats. The second field specifies the total number of sentences in the message, minimum value 01^{hex}. The third field identifies the sequence of this sentence (sentence number), minimum value 01^{hex}. For efficiency it is recommended that null fields be used in the additional sentences when the data is unchanged from the first sentence.

NOTE 3 The sequence message identifier number relates all sentences that belong to a group of multiple sentences. Multiple sentences (see note 2) with the same sequence identifier number, makeup one text message.

NOTE 4 The translation code identifies the Hex character coding method used in the text body field and determines the maximum number of Hex character positions available in the "text body" field.

U = Unicode (ISO 10646-1), 56 Hex character positions in the text body.

A =Subset of ISO 8859-1, 56 Hex character positions in the text body.

1-16 = 8859-n

P<aaa> = Proprietary (user defined), 53 Hex character positions in the text body. This field consists of the letter "P" directly followed by the three letter Manufacturer's Mnemonic Code. An example might be "PXYZ", if the XYZ company's equipment produced a TUT message with a proprietary translation code.

NOTE 5 The Text Body consists either 56 or 53 Hex character positions, depending on the "translation code field". The number and type of characters and code delimiters if needed, up to the maximum permitted sentence length, are as follows:

U => Up to fourteen 16-bit Unicode characters including code delimiters. Each Unicode character is represented by 4 Hex character codes. The letter "A" would be represented by 0041^{hex}, while the "Katakana letter A" would be represented by $30A2^{hex}$.

A or 1-16 => Up to twenty-eight 8-bit ASCII characters including code delimiters. Each ASCII character is represented by 2 Hex character codes. The letter "A" would be represented by 41^{hex}, while the Latin capital letter thorn "Þ" would be represented by DE^{hex}. The "Katakana letter A" cannot be represented by 2 Hex character codes.

P<aaa> => Up to fifty-three 4-bit user-defined characters including code delimiters. These are intended to be used as an index or entry into a user defined (proprietary) look-up table. Each character is represented by 1 or more Hex character codes.

Example scenario containing the Proprietary and Unicode translation codes:

A depth sounder sends a warning of "Shallow Water!" to an Integrated Navigation System using a Proprietary translation code. The Integrated Navigation System sends a Unicode Text Message to a remote display in the local language of Kanji.

$SDTUT,SD,01,01, 1,PXYZ,02*6D<CR><LF>

The integrated navigation system, upon receiving this sentence would look within in its own table for the Unicode Text contents referenced by the value 02. The text being reported in this TUT example is "Shallow Water!". Note that there is no constraint on how many Hex characters are used to represent the look-up value. It could be represented in the field as 2 or 02 or 002 or 0002, as long as the sender and receiver of this know how to interpret this proprietary text body.

The integrated navigation system could then generate and send the following sentence using the Unicode Translation code to a remote display device in the local language desired; Kanji in this example. The Kanji equivalent of "Shallow Water!" is "浅瀬危険", and is represented according to Unicode as the Hex codes of 6D45 702C 5371 967A.

$INTUT,SD,01,01, 1,U,6D45702C5371967A*5D<CR><LF>

The same text "Shallow Water!" could have been generated by the integrated navigation system using the ASCII translation code as shown below.

$INTUT,SD,01,01, 1,A,5368616C6C6F7720576174657221*4B<CR><LF>

6.6 VLW – Dual Ground/Water Distance

The distance travelled, relative to the water and over the ground.

Two additional fields have been added to the VLW sentence, and the description and title have been reworded to provide for distance relative to the ground. This brings the sentence in line with the structure and information provided by the VBW sentence.

$--VLW,x.x,N,x.x,N,x.x,N,x.x,N*hh<CR><LF>

Ground distance since reset, nautical miles
Total cumulative ground distance, nautical miles
Water distance since reset, nautical miles
Total cumulative water distance, nautical miles

7 Applications – Additions to examples in Section 7 of IEC 61162-1

Example 7 - DSC and DSE sentences

The following sentences might be output from a DSC capable VHF radio upon reception of a distress message (from another ship) with enhanced position resolution [as proposed in recent drafts] of IEC 62238.

$CVDSC,12,3601234560,12,05,00,1474712519,0817,,,S,E,*xx

$CVDSE,1,1,A,3601234560,00,12345678*yy

The fields of the first sentence indicate :

1) distress call
2) from MMSI 360123456
3) category distress (implicit in a distress call)
4) sinking (code 105)
5) respond by radiotelephony (G3E/F3E code 100)
6) position 47 47N 125 19W
7) time of position 08:1
8) null
9) null
10) end of sequence (no acknowledgement request)
11) expansion sentence to follow
12) NMEA sentence checksum

$xxDSE,1,1,A,3601234560,00,12345678*yy

The fields of the second sentence indicate

1) expansion sentence
2) of which this is the first (and in this case only)
3) message sent automatically (not requested). This field probably not too useful in this case
4) from MMSI 360123456

5) with data containing enhanced position resolution

6) 1234 minutes latitude and .5678 longitude (i.e. position 47 47.1234N 125 19.5678W)

7) NMEA sentence checksum

The following are all DSC sentences received by an MF/HF radio.

All ships distress relay from 011234567 for ship 999121212 at 47 47N 122 19W at time 12:34 on fire

$CTDSC,16,0112345670,12,12,09,1474712219,1234,9991212120,00,S*xx

All ships safety call from 011234567 to work J3E on 4125 kHz RX only

$CTDSC,16,0112345670,08,09,26,041250,,,,S*C9

Annex A
(normative)

Table A.1 – Character symbol

(See IEC 61162-1, table 3.)

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, 1000 mb = 100 kPa(Pascal(Pa))),Bottom

C Celsius (Degrees); Course-up

c Valid character; Calculating

D Degrees (of arc)

E Error; East; Engine

F Fathoms (1 fathom equals 1,828766 m)

f Feet (1 foot equals 0,30479 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 (1609,31 m); Statute miles/h; Shaft; Salinity in parts/thousand

s Seconds; Six-bit number

T Time difference; True; Track; Tracked target; Theoretical

t Test

U Dead reckoning estimate; Unicode

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

Annex B
(normative)

Data content

B.1 Character definitions

Table B.1 – Reserved characters

(See IEC 61162-1, table 1.)

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	Reserved for future use
^	5E	94	Code delimiter for HEX representation of ISO 8859-1 (ASCII) characters.
~	7E	126	Reserved for future use
	7F	127	Reserved for future use

Table B.2 – Non printing valid characters

(See IEC 61162-1, table 2.)

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

ASCII	HEX	DEC	ASCII	HEX	DEC	ASCII	HEX	DEC
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

Annex C
(normative)

Table C.1 – Approved sentence formatters

(See IEC 61162-1, table 1.)

Formatter	*Meaning*
AAM	Waypoint arrival alarm ABM
AIS	Addressed binary and safety related message
ABK	AIS addressed and binary broadcast acknowledgement
ACA	AIS channel assignment message
ACK	Acknowledgement alarm
ACS	AIS channel management information source
AIR	AIS interrogation request
ALM	GPS almanac data
ALR	Set alarm state
APB	Heading/track controller (Autopilot) sentence B
BBM	AIS broadcast binary message
BEC	Bearing and distance to waypoint, dead reckoning
BOD	Bearing, origin to destination
BWC	Bearing and distance to waypoint
BWR	Bearing and distance to waypoint, rhumb line
BWW	Bearing, waypoint to waypoint
CUR	Water current layer
DBT	Depth below transducer
DCN	DECCA position
DPT	Depth
DSC	Digital selective calling information
DSE	Expanded digital selective calling
DSI	DSC transponder initialise
DSR	DSC -transponder response
DTM	Datum reference
FSI	Frequency set information
GBS	GNSS Satellite fault detection
GGA	Global positioning system fix data
GLC	Geographic position, LORAN-C
GLL	Geographic position, latitude/longitude
GMP	GNSS map projection fix data
GNS	GNSS fix data
GRS	GNSS range residuals
GSA	GNSS DOP and active satellites
GST	GNSS pseudo range error statistics
GSV	GNSS satellites in view

HDG	Heading, deviation and variation
HDT	Heading, true
HMR	Heading monitor – receive
HMS	Heading monitor – set
HSC	Heading steering command
HTC	Heading/track control command
HTD	Heading/track control data
LCD	LORAN-C signal data
LR1	AIS long range reply sentence 1
LR2	AIS long range reply sentence 2
LR3	AIS long range reply sentence 3
LRF	AIS long range function
LRI	AIS long range interrogation
MLA	Glonass almanac data
MSK	MSK receiver interface
MSS	MSK receiver signal status
MTW	Water temperature
MWD	Wind direction and speed
MWV	Wind speed and angle
OSD	Own ship data
RMA	Recommended minimum specific LORAN-C data
RMB	Recommended minimum navigation information
RMC	Recommended minimum specific GNSS data
ROT	Rate of turn
RPM	Revolutions
RSA	Rudder sensor angle
RSD	Radar system data
RTE	Routes
SFI	Scanning frequency information
SSD	AIS ship static data
STN	Multiple data ID
TLB	Target label
TLL	Target latitude and longitude
TTM	Tracked target message
TUT	Transmission of multi-language text
TXT	Text transmission
VBW	Dual ground/water speed
VDM	AIS VHF data-link message
VDO	AIS VHF data-link own vessel report
VDR	Set and drift
VHW	Water speed and heading
VLW	Distance travelled through the water

VPW	Speed, measured parallel to wind
VSD	AIS voyage static data
VTG	Course over ground and ground speed
WCV	Waypoint closure velocity
WNC	Distance, waypoint to waypoint
WPL	Waypoint location
XDR	Transducer measurements
XTE	Cross-track error, measured
XTR	Cross-track error, dead reckoning
ZDA	Time and date
ZDL	Time and distance to variable point
ZFO	UTC and time from origin waypoint
ZTG	UTC and time to destination waypoint

Table C.2 – Encapsulated sentence structure

ABM	AIS Addressed binary and safety related message
BBM	AIS Broadcast Binary Message
VDM	AIS VHF Data-link Message
VDO	AIS VHF Data-link Own-vessel report

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