IEC 61162-1

INTERNATIONAL STANDARD

Maritime navigation and radiocommunication equipment and systems – Digital interfaces –
Part 1: Single talker and multiple listeners

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INTERNATIONAL STANDARD

colour inside

Maritime navigation and radiocommunication equipment and systems – Digital interfaces –
Part 1: Single talker and multiple listeners

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MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – DIGITAL INTERFACES –

Part 1: Single talker and multiple listeners

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Maritime navigation and radiocommunication equipment and systems – Digital interfaces

IMPORTANT – The "colour inside" logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this publication using a colour printer.

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MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS – DIGITAL INTERFACES –

Part 1: Single talker and multiple listeners

1 Scope

2 Normative references

Maritime navigation and radiocommunication equipment and systems – General requirements – Methods of testing and required test results

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

Information technology – 8-bit single-byte coded graphic character sets – Part 1: Latin alphabet No.1

Electrical characteristics for balanced double-current interchange circuits operating at data signalling rates up to 10 Mbit/s

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3 Terms and definitions

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talker

3.2
listener

4 Manufacturer's documentation

5 Hardware specification

5.1 General

5.2 Interconnecting wire

5.3 Conductor definitions

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5.4 Electrical connections/shield requirements

5.5 Connector

5.6 Electrical signal characteristics

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5.6.2 Signal state definitions

5.6.3 Talker drive circuits

5.6.4 Listener receive circuits

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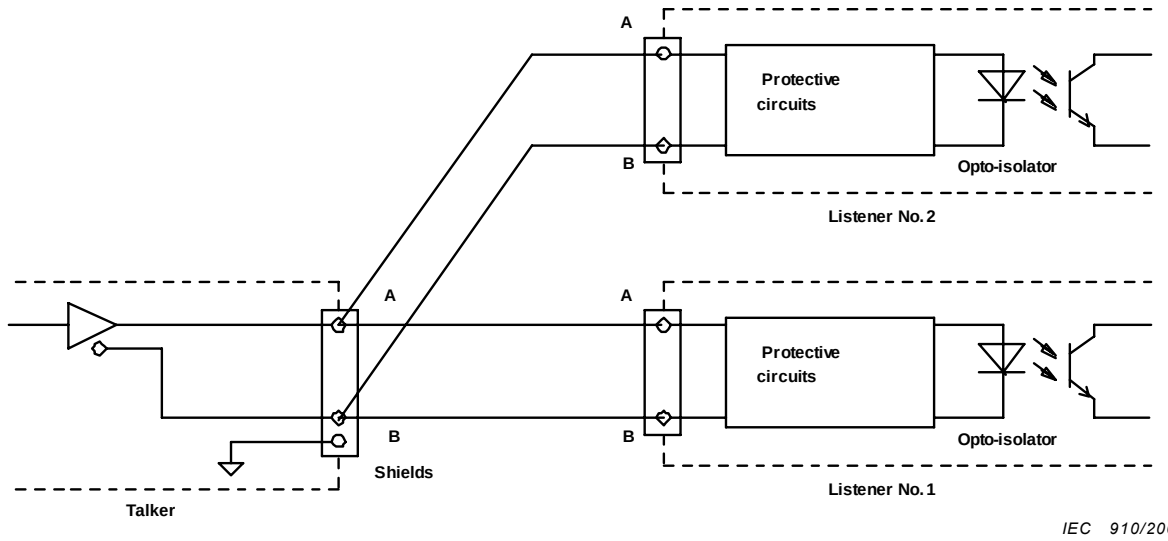

Figure 1 – Listener receive circuit

5.6.5 Electrical isolation

5.6.6 Maximum voltage on bus

6 Data transmission

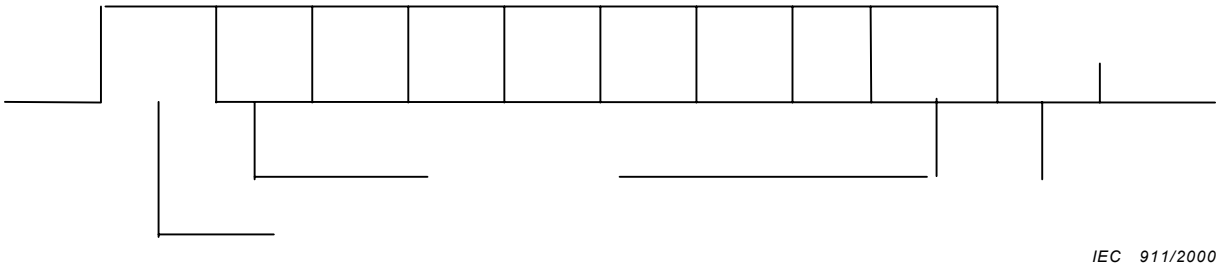

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Figure 2 – Data transmission format

7 Data format protocol

7.1 Characters

7.1.1 General

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7.1.5 Character symbols

7.2 Fields

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7.2.3.3 Data field types

7.2.3.4 Null fields

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7.2.5 Sequential message identifier field

7.3 Sentences

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7.3.3.1 Description

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7.3.3.2 Structure

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7.3.4 Encapsulation sentences

7.3.4.1 Description

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7.3.4.2 Structure

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7.3.11 Additions to approved sentences

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7.4 Error detection and handling

7.5 Handling of deprecated sentences

8 Data content

8.1 Character definitions

Table 1 – Reserved characters

ASCII	HEX	DEC	Description

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Table 2 – Valid characters

ASCII	HEX	DEC	ASCII	HEX	DEC	ASCII	HEX	DEC
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Table 3 – Character symbol

Symbol	Definition

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8.2 Field definitions

Table 4 – Talker identifier mnemonics

Talker device	Identifier

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Table 5 – Field type summary

Field type	Symbol	Definition
Special format fields		
Numeric value fields		
Information fields		

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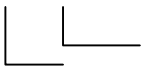
Field type	Symbol	Definition

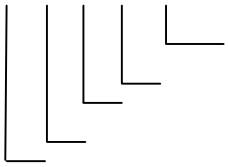
8.3 Approved sentences

8.3.1 General format

{mnemonic} – {name}



8.3.2 AAM – Waypoint arrival alarm



8.3.3 ABK – AIS addressed and binary broadcast acknowledgement

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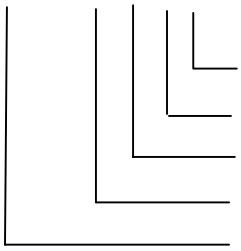

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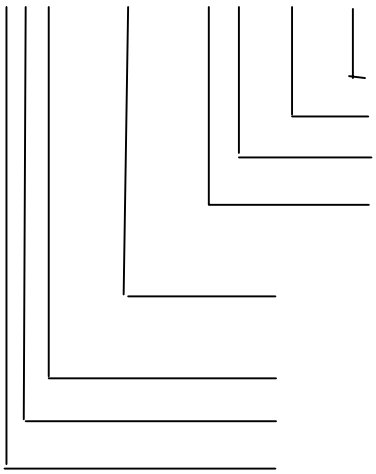
8.3.4 ABM – AIS addressed binary and safety related message



8.3.5 ACA – AIS channel assignment message

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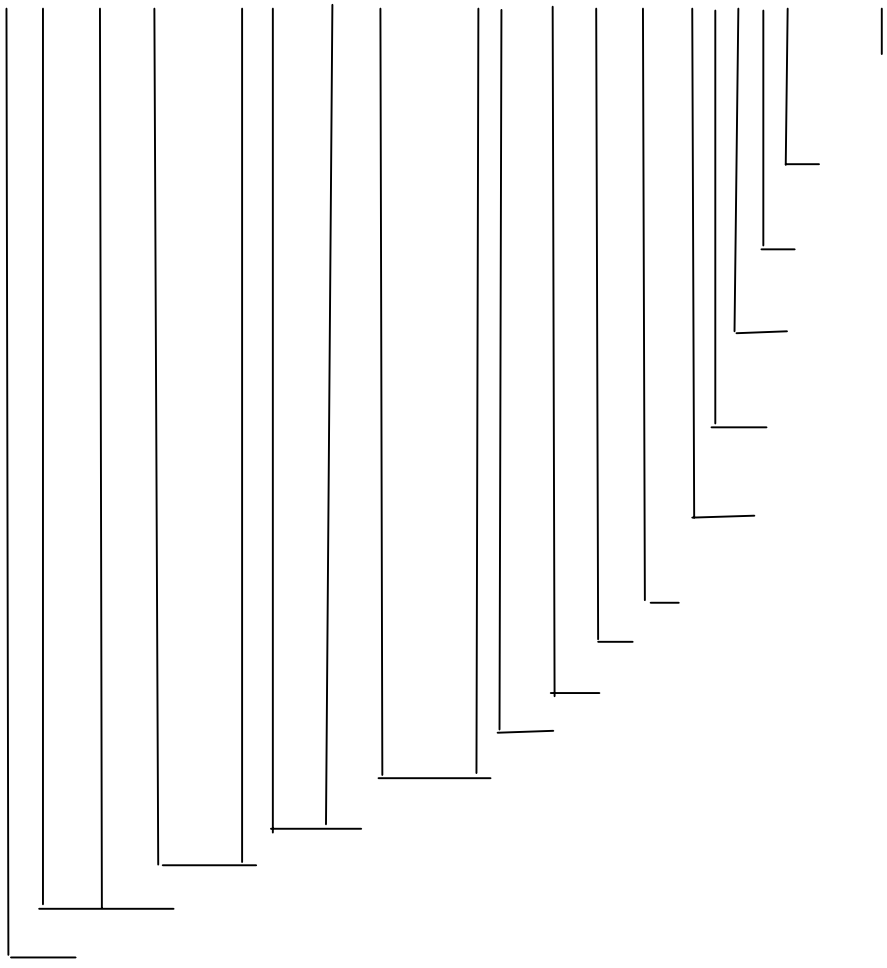

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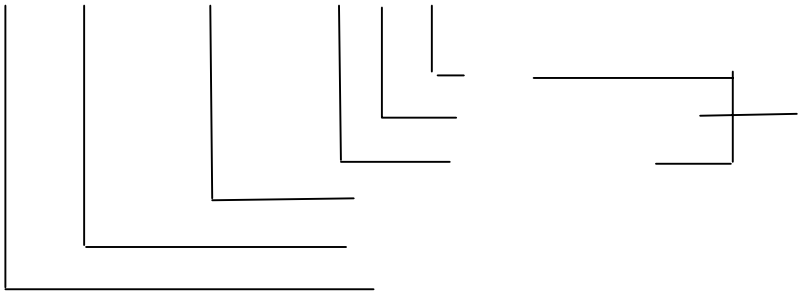
8.3.6 ACK – Acknowledge alarm

8.3.7 ACS – AIS channel management information source



8.3.8 AIR – AIS interrogation request

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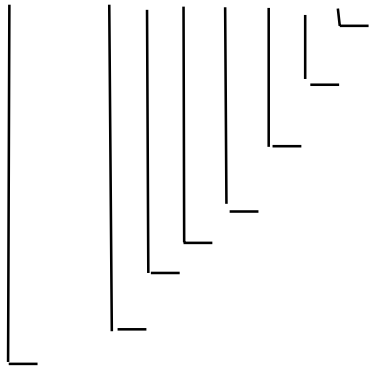
8.3.9 AKD – Acknowledge detail alarm condition



8.3.10 ALA – Report detailed alarm condition

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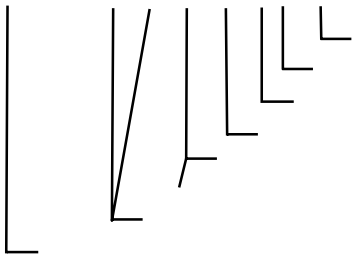
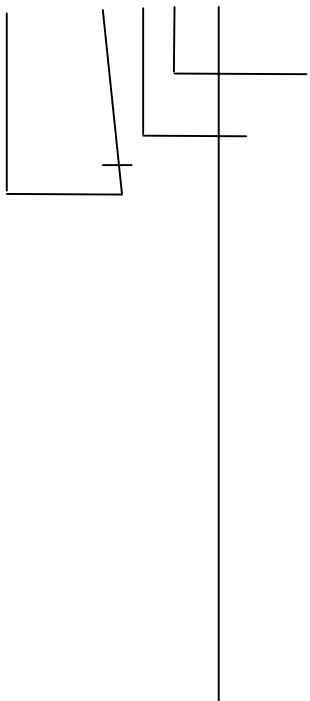


8.3.11 ALR – Set alarm state



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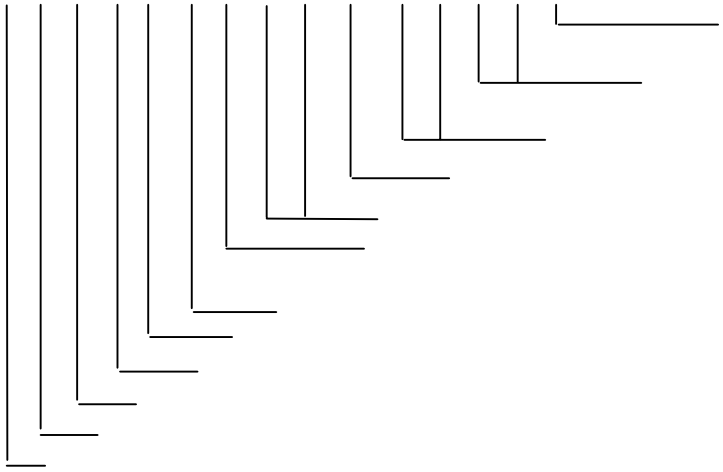
8.3.12 APB – Heading/track controller (autopilot) sentence B



8.3.13 BBM – AIS broadcast binary message

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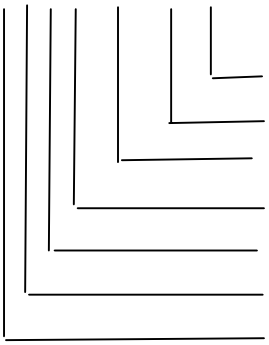
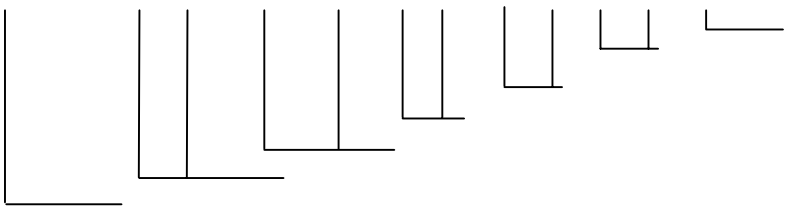


8.3.14 BEC – Bearing and distance to waypoint – Dead reckoning



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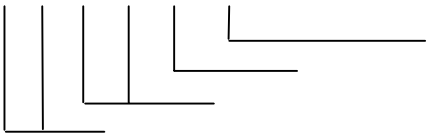
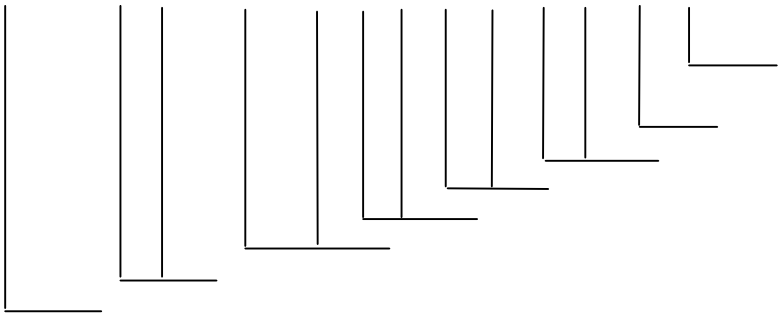
8.3.15 BOD – Bearing origin to destination

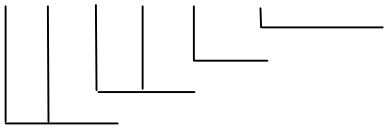


8.3.16 BWC – Bearing and distance to waypoint – Great circle

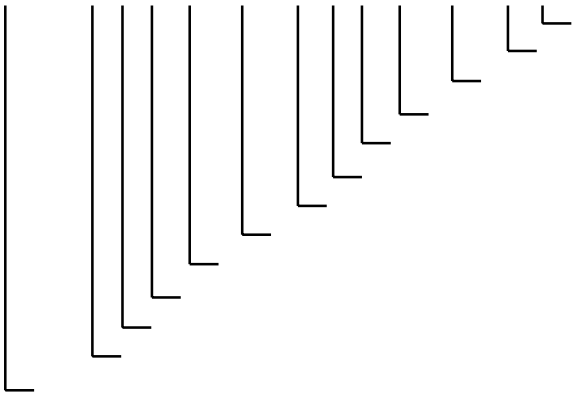
8.3.17 BWR – Bearing and distance to waypoint – Rhumb line



8.3.18 BWW – Bearing waypoint to waypoint



8.3.19 CBR – Configure broadcast rates for AIS AtoN station message command



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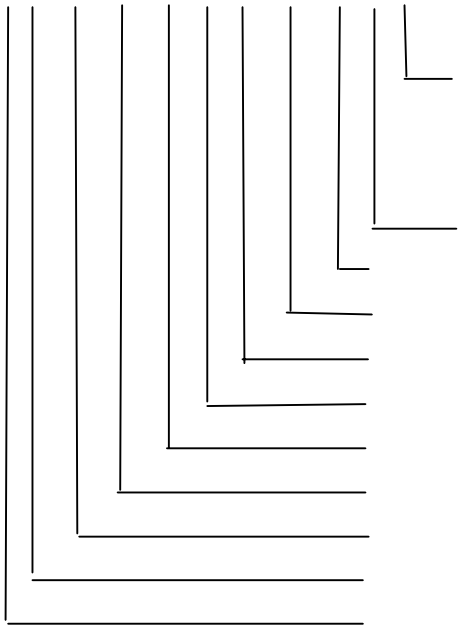
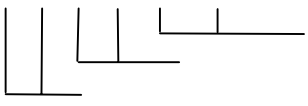
8.3.20 CUR – Water current layer – Multi-layer water current data



8.3.21 DBT – Depth below transducer



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8.3.22 DDC – Display dimming control

8.3.23 DOR – Door status detection

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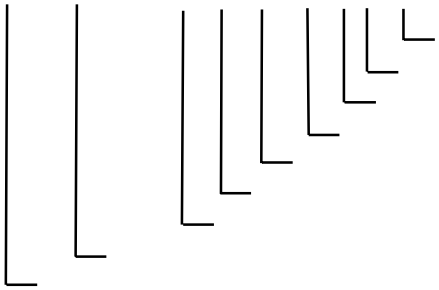

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Type of door monitoring system		First division indicator	Second division indicator
ID	System category		

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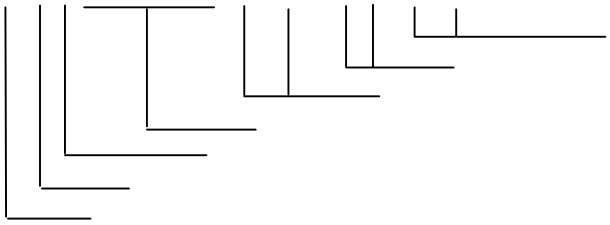
8.3.26 DSE – Expanded digital selective calling



8.3.27 DTM – Datum reference

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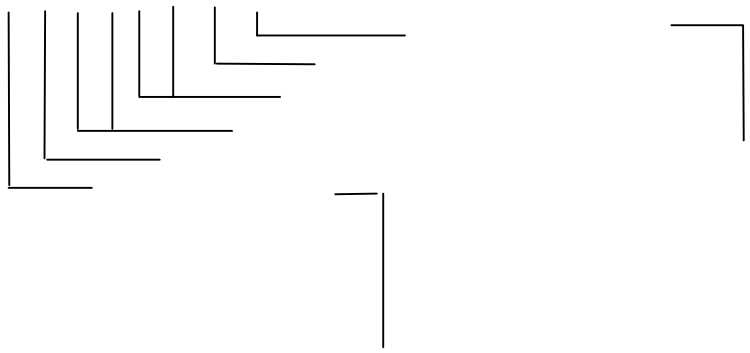
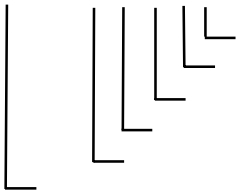


$$P_{\text{local datum}} = P_{\text{ref datum}} + \text{offset}$$

8.3.28 ETL – Engine telegraph operation status



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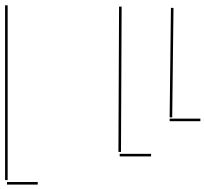
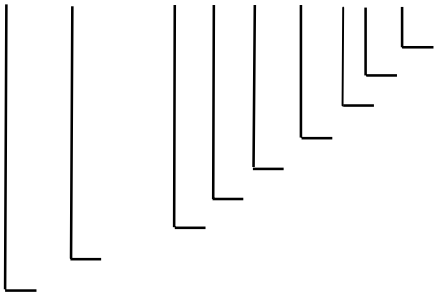
8.3.29 EVE – General event message



8.3.30 FIR – Fire detection



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Type of fire detection system		First division indicator	Second division indicator
ID	System category		

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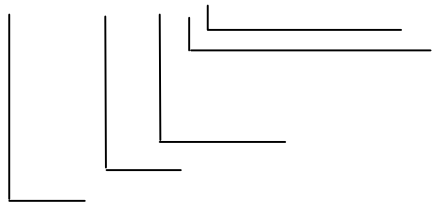
8.3.31 FSI – Frequency set information



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8.3.32 GBS – GNSS satellite fault detection

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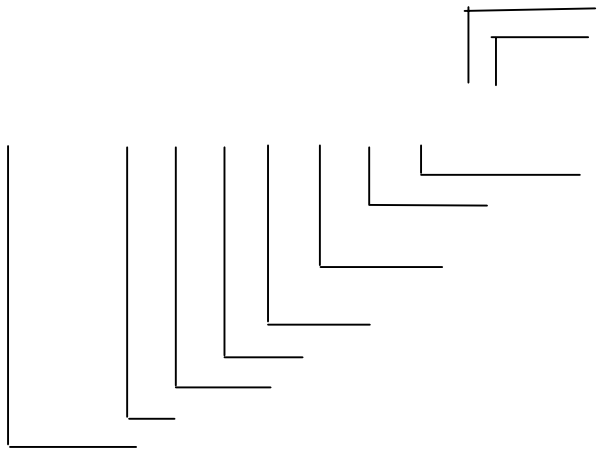

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System	System ID	Satellite ID	Signal ID	Signal/Channel

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8.3.34 GFA – GNSS fix accuracy and integrity

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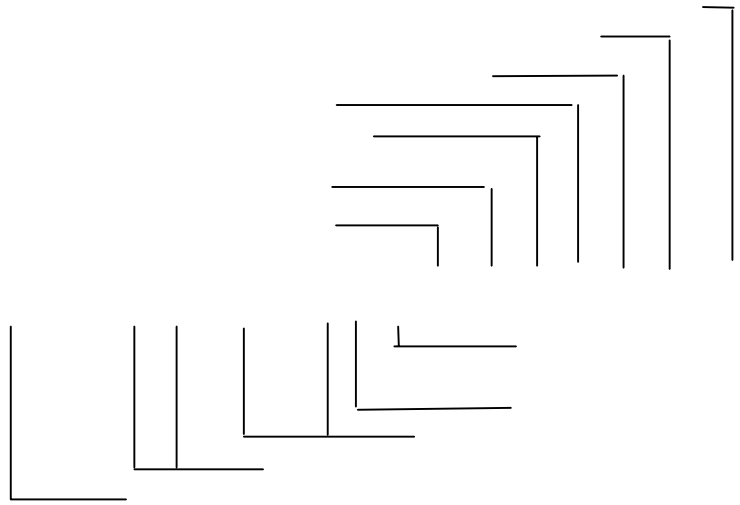
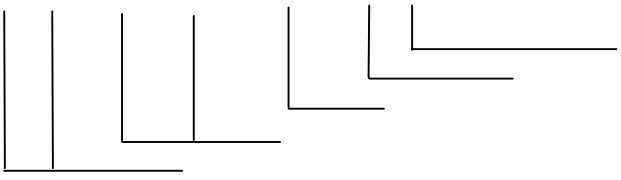
8.3.35 GGA – Global positioning system (GPS) fix data



8.3.36 GLL – Geographic position – Latitude/longitude



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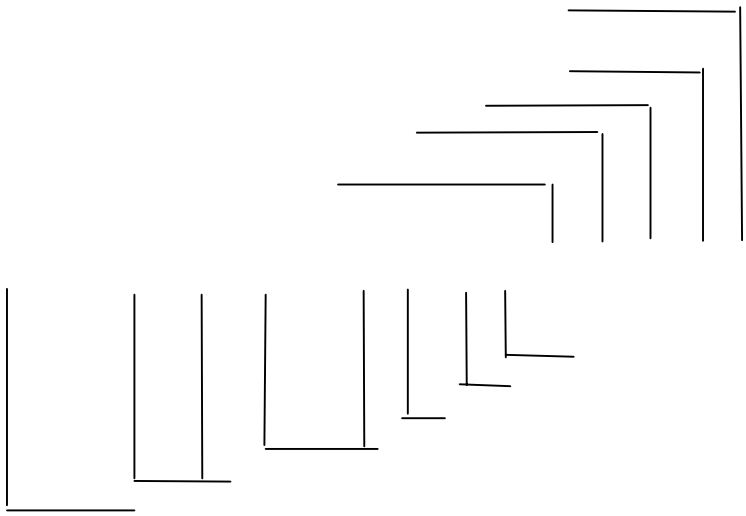
8.3.37 GNS – GNSS fix data



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8.3.38 GRS – GNSS range residuals

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System	System ID	Satellite ID	Signal ID	Signal/Channel

8.3.39 GSA – GNSS DOP and active satellites

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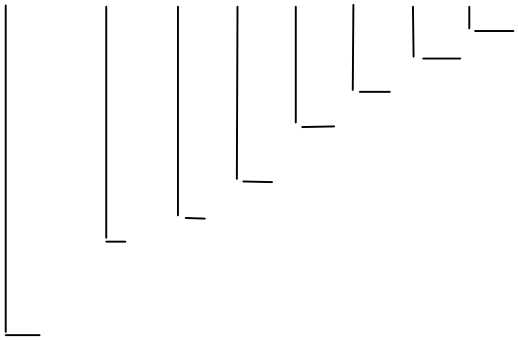
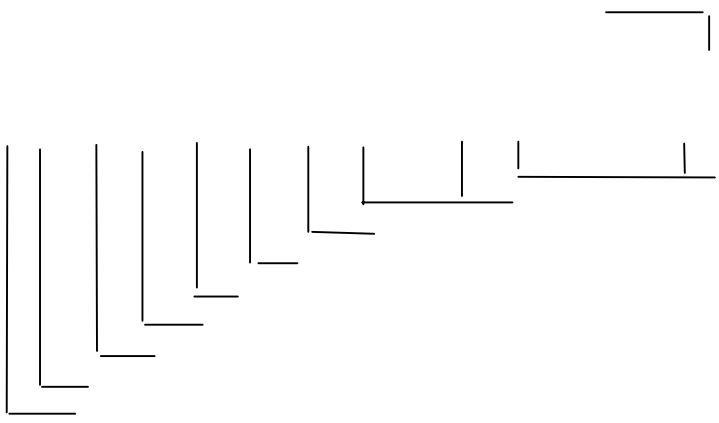
System	System ID	Satellite ID	Signal ID	Signal/Channel

8.3.40 GST – GNSS pseudorange noise statistics



8.3.41 GSV – GNSS satellites in view



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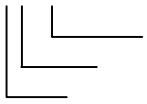
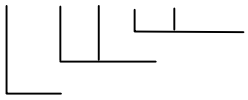
System	System ID	Satellite ID	Signal ID	Signal/Channel

8.3.42 HBT – Heartbeat supervision sentence



8.3.43 HDG – Heading, deviation and variation



8.3.44 HDT – Heading true

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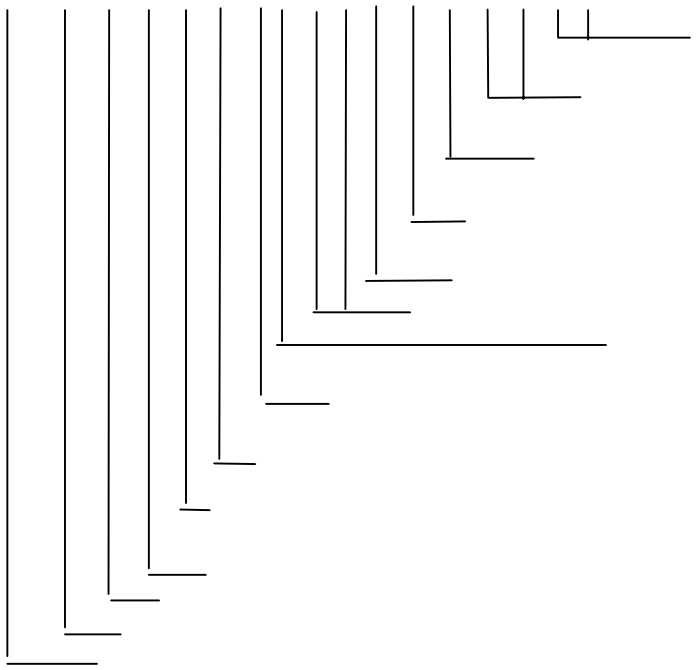
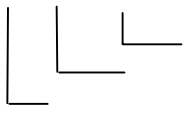
8.3.45 HMR – Heading monitor receive



8.3.46 HMS – Heading monitor set



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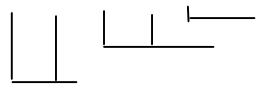
8.3.47 HSC – Heading steering command



8.3.48 HSS – Hull stress surveillance systems

8.3.49 HTC – Heading/track control command;
HTD – Heading /track control data

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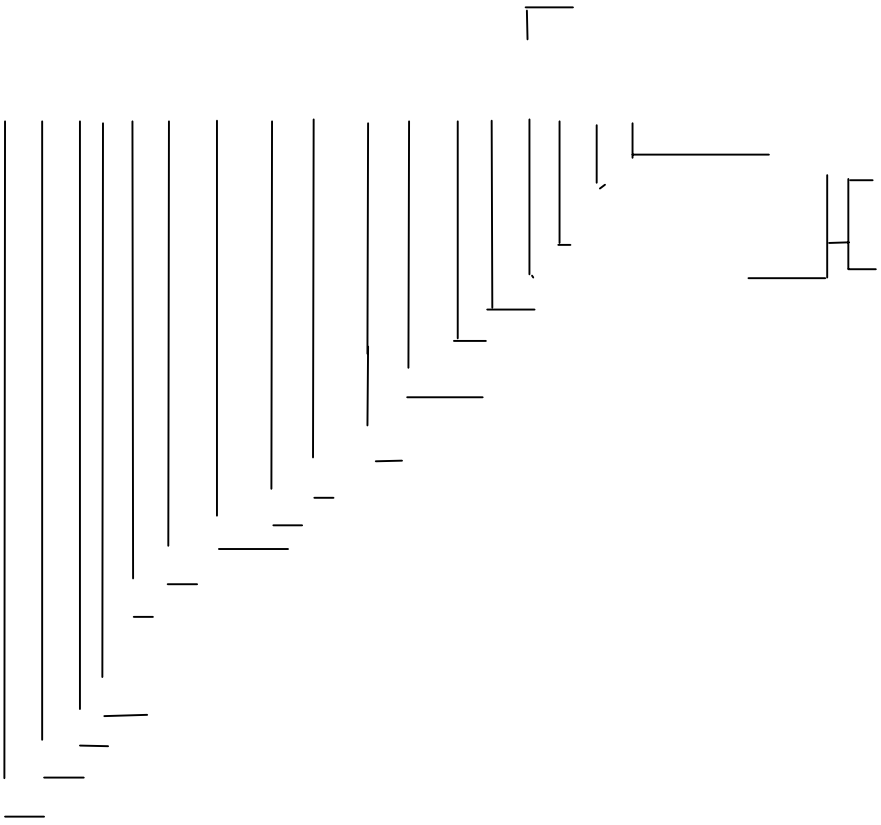

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8.3.50 LR1 – AIS long-range reply sentence 1

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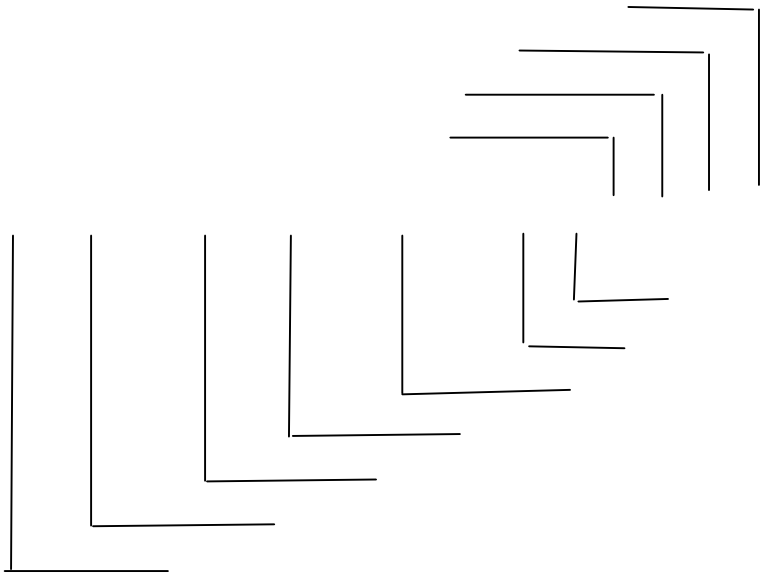
8.3.52 LR3 – AIS long-range reply sentence 3



8.3.53 LRF – AIS long-range function

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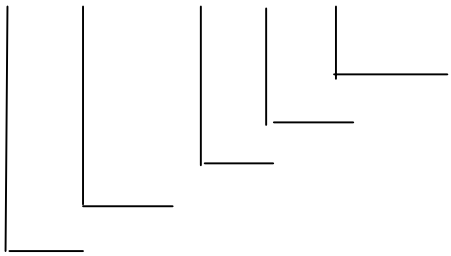

8.3.54 LRI – AIS long-range interrogation

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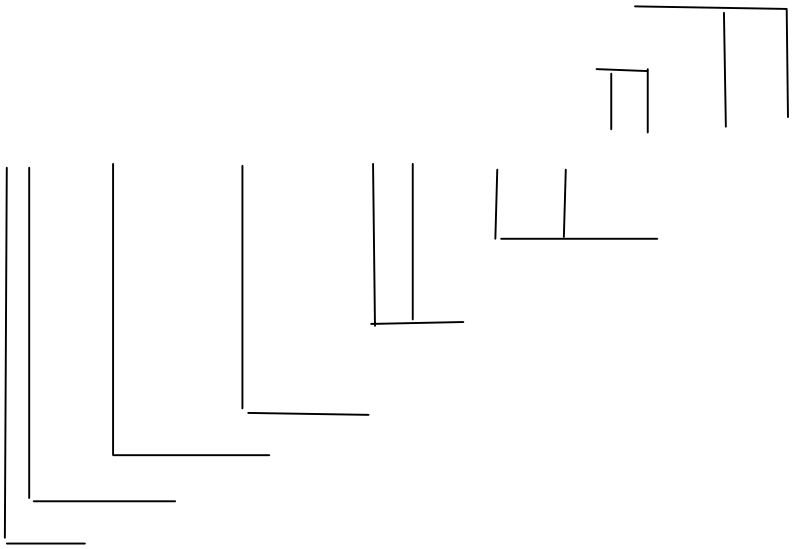

8.3.55 MEB – Message input for broadcast command

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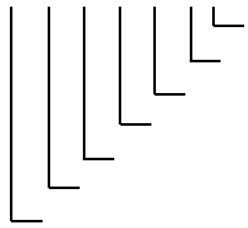
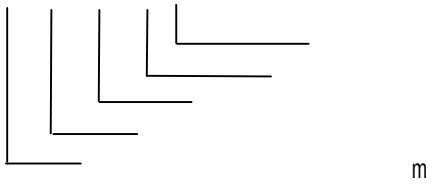
8.3.56 MSK – MSK receiver interface



8.3.57 MSS – MSK receiver signal status



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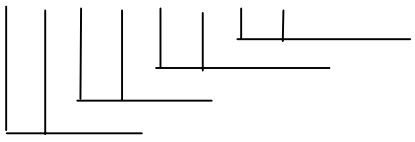
8.3.58 MTW – Water temperature

8.3.59 MWD – Wind direction and speed



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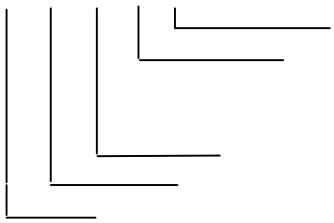
8.3.60 MWV – Wind speed and angle



8.3.61 NAK – Negative acknowledgement

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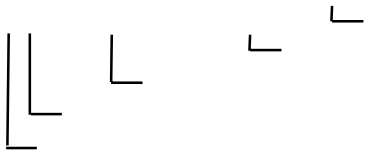
8.3.62 NRM – NAVTEX receiver mask



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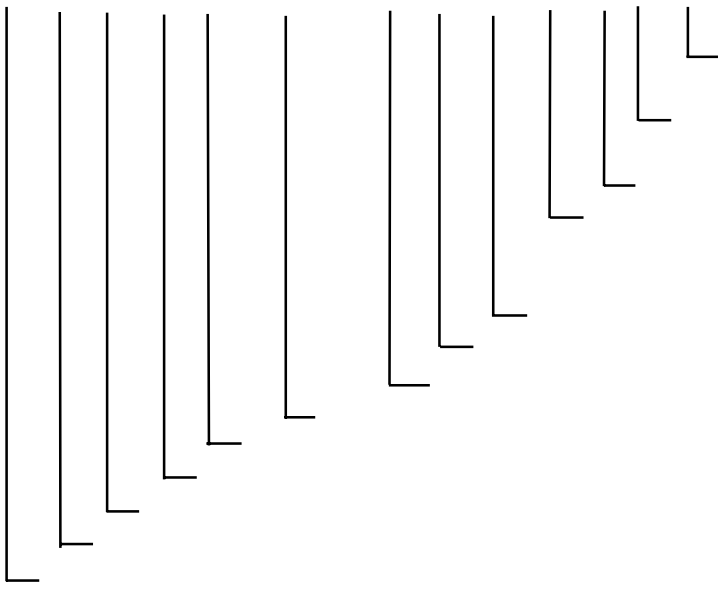
8.3.63 NRX – NAVTEX received message



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8.3.64 OSD – Own ship data

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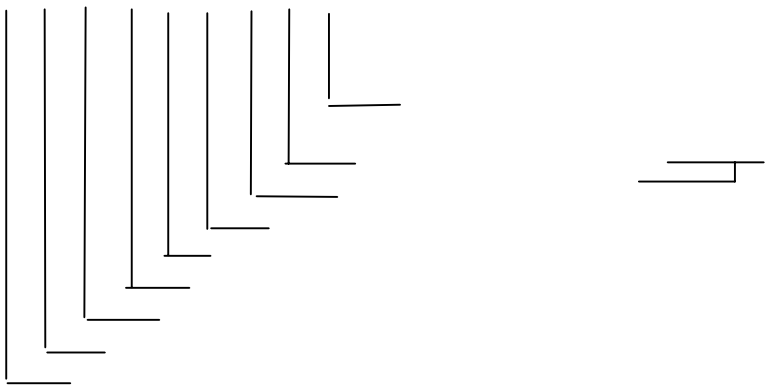
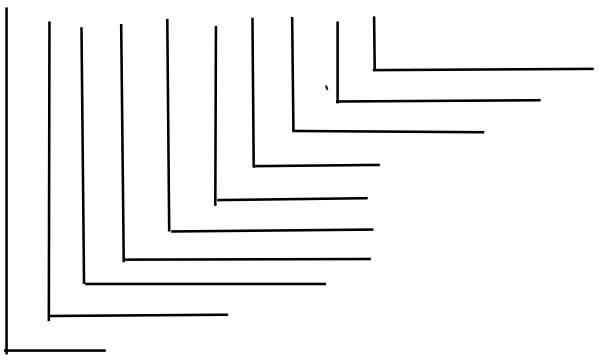


8.3.65 POS – Device position and ship dimensions report or configuration command



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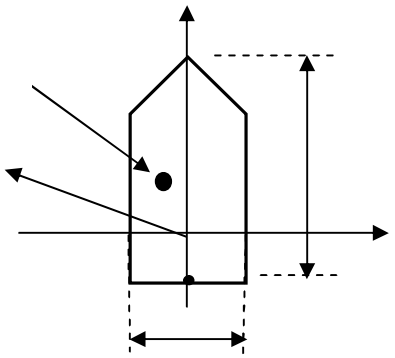
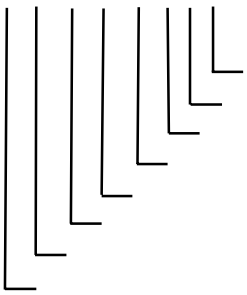


IEC 2565/10

8.3.66 PRC – Propulsion remote control status



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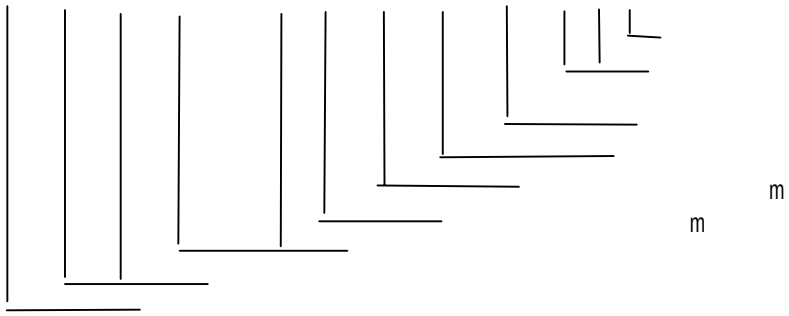
8.3.67 RMA – Recommended minimum specific LORAN-C data



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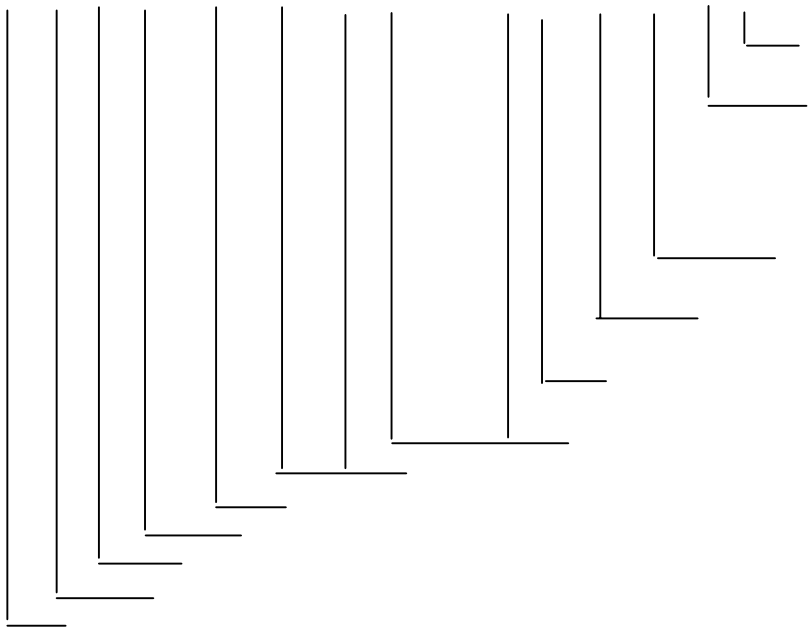
8.3.68 RMB – Recommended minimum navigation information



8.3.69 RMC – Recommended minimum specific GNSS data

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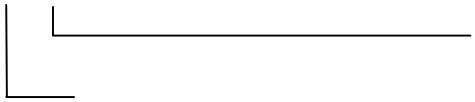
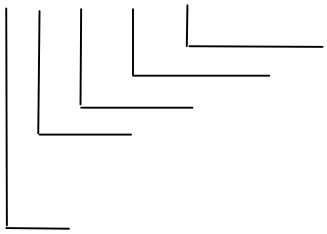
8.3.70 ROR – Rudder order status

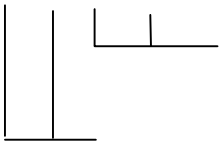
8.3.71 ROT – Rate of turn



8.3.72 RPM – Revolutions



8.3.73 RSA – Rudder sensor angle



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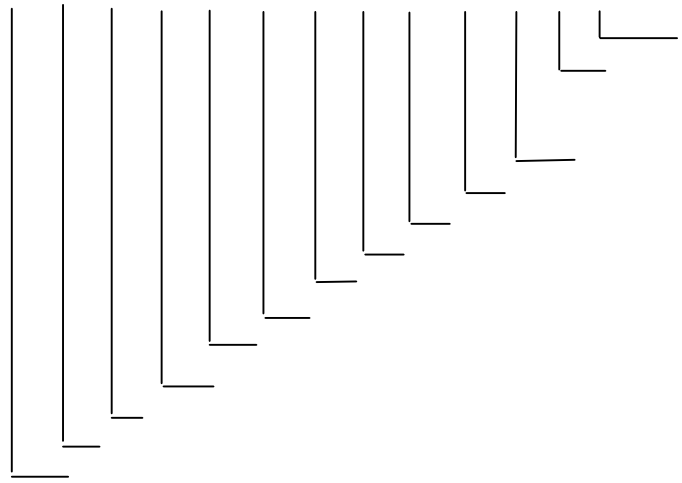
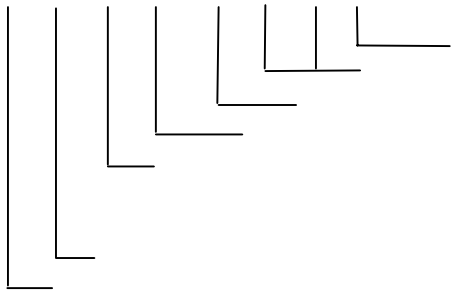
8.3.74 RSD – Radar system data



8.3.75 RTE – Routes



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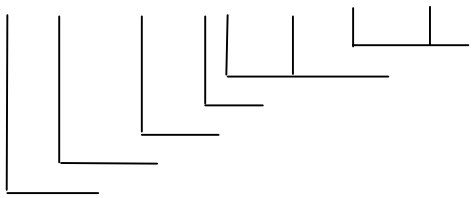
8.3.76 SFI – Scanning frequency information



8.3.77 SSD – AIS ship static data

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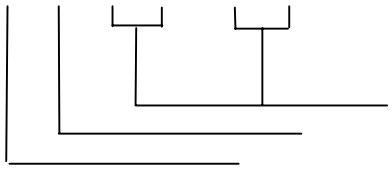
8.3.78 STN – Multiple data ID

8.3.79 THS – True heading and status

8.3.80 TLB – Target label



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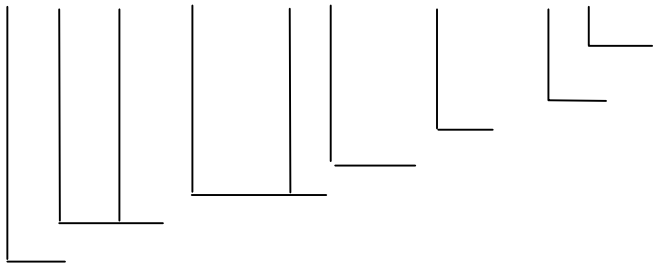
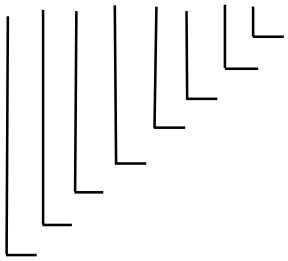
8.3.81 TLL – Target latitude and longitude



8.3.82 TRC – Thruster control data



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Parameter	Number of bits	Range and resolution	Description

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Parameter	Number of bits	Range and resolution	Description
TOTAL	**90**		**90/6=15 characters**

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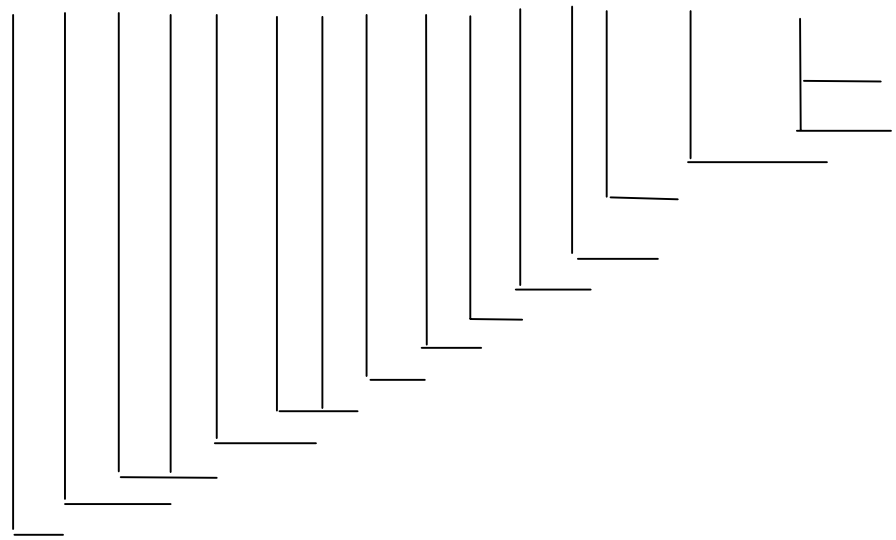
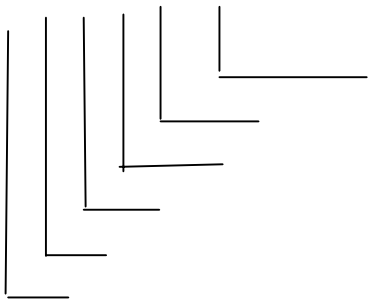
8.3.85 TTM – Tracked target message



8.3.86 TUT – Transmission of multi-language text



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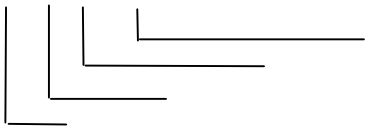
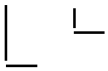
8.3.87 TXT – Text transmission



8.3.88 UID – User identification code transmission



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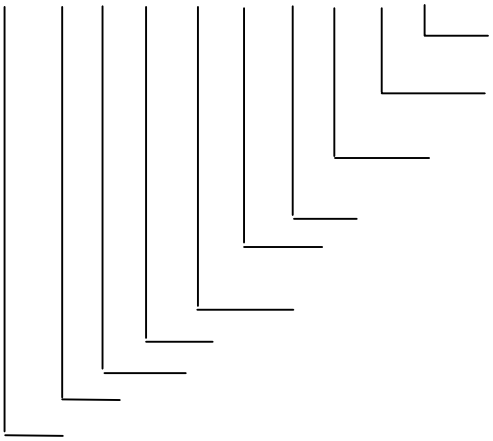
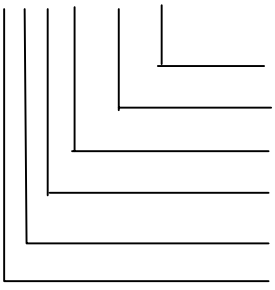
8.3.89 VBW – Dual ground/water speed



8.3.90 VDM – AIS VHF data-link message



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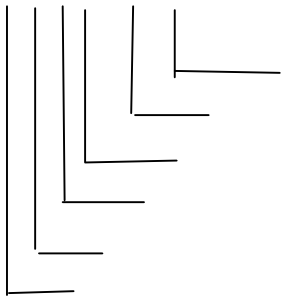
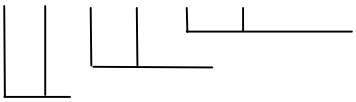
8.3.91 VDO – AIS VHF data-link own-vessel report



8.3.92 VDR – Set and drift



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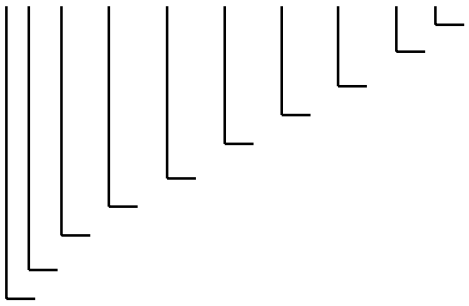
8.3.93 VER – Version



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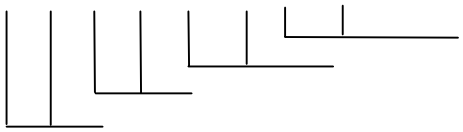
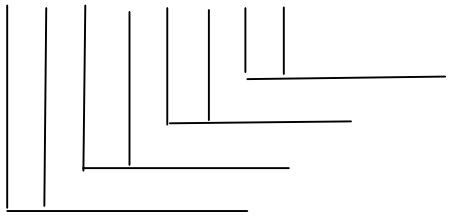
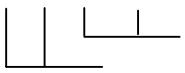
8.3.94 VHW – Water speed and heading



8.3.95 VLW – Dual ground/water distance



8.3.96 VPW – Speed measured parallel to wind



8.3.97 VSD – AIS voyage static data

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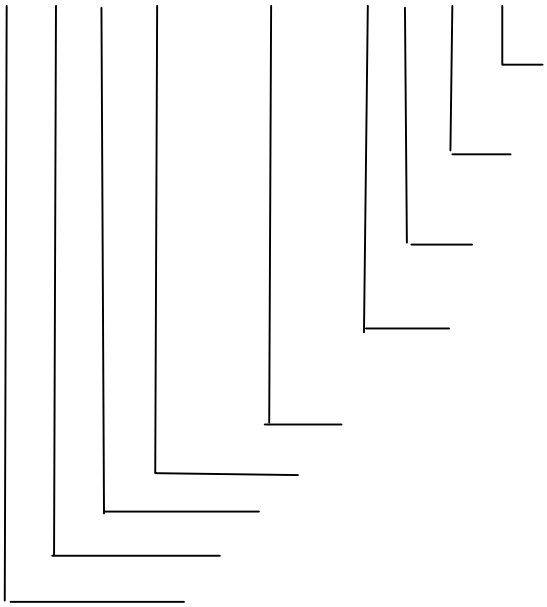

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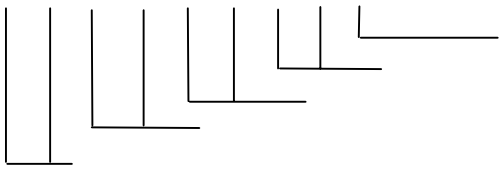
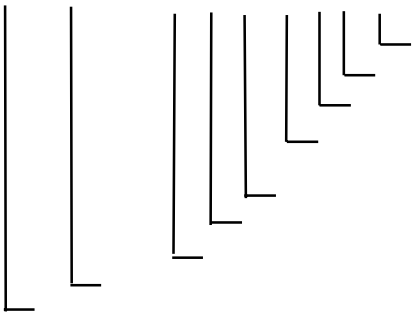
8.3.98 VTG – Course over ground and ground speed



8.3.99 WAT – Water level detection



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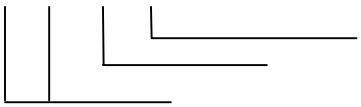
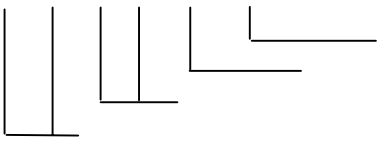
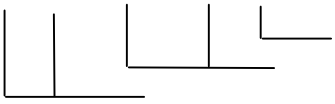
8.3.100 WCV – Waypoint closure velocity



8.3.101 WNC – Distance waypoint to waypoint



8.3.102 WPL – Waypoint location



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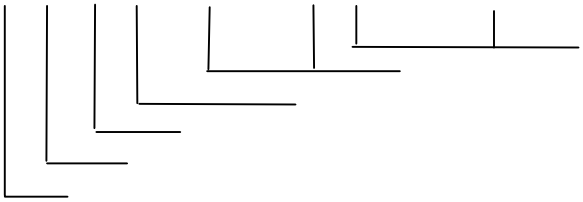
8.3.103 XDR – Transducer measurements



Transducer	Type field	Units	Comments

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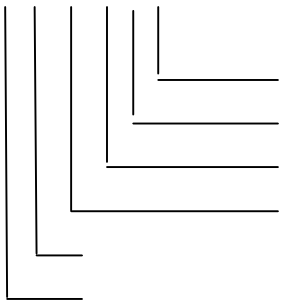
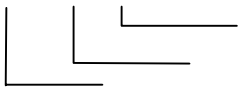
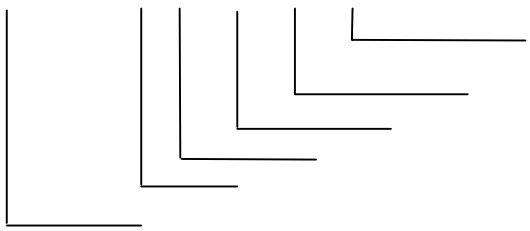
8.3.104 XTE – Cross-track error, measured



8.3.105 XTR – Cross-track error, dead reckoning



8.3.106 ZDA – Time and date



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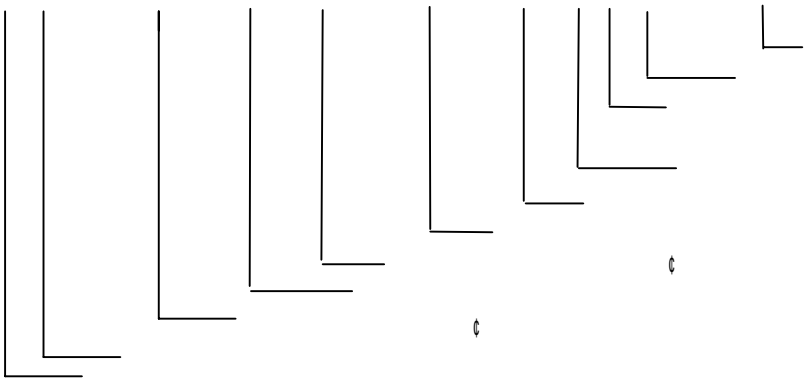
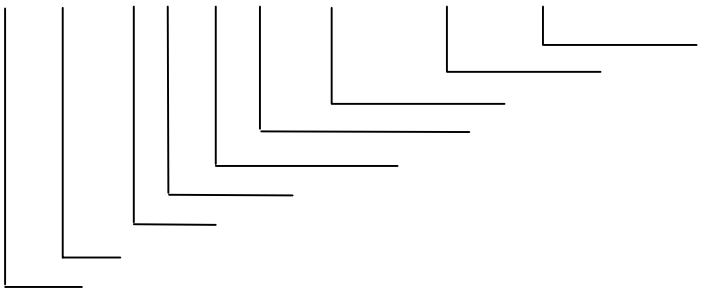
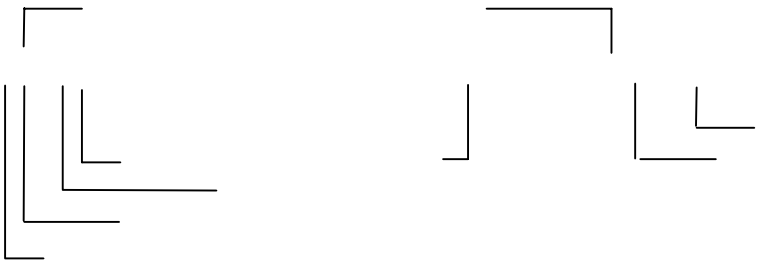
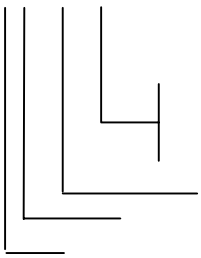


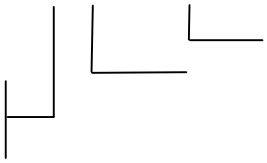
9.1.3 Example 2 – LORAN-C arrival alarm



9.1.4 Example 3 – Proprietary sentence







9.1.5 Example 4 – RMA examples

9.1.6 Example 5 – FSI examples

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9.1.7 Example 6 – MSK/MSS examples

9.1.8 Example 7 – DSC and DSE sentences

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9.1.9 Example 8 – FIR, DOR and WAT sentences

9.2 Example encapsulation sentences

9.3 Examples of receiver diagrams

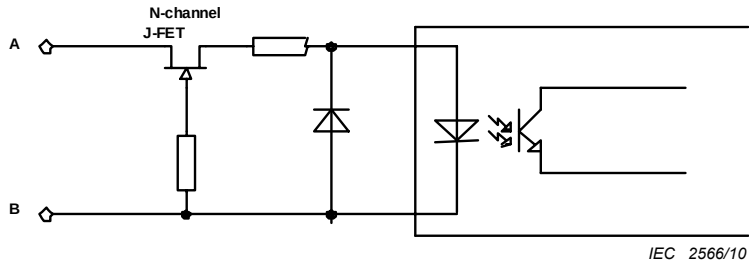

Figure 3 – Example 1, J-FET, N channel, opto-isolator based listener circuit

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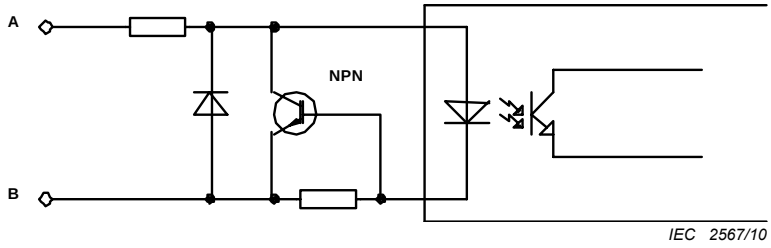

Figure 4 – Example 2, NPN opto-isolator based listener circuit

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Annex A

Glossary

accuracy

precision

address field

additional secondary factor

AIS

alarm:

apparent wind **relative wind**

approved sentence

arrival alarm

arrival circle

arrival circle

arrival perpendicular

azimuth

ASCII

atomic time

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autopilot heading control system

bearing

beaufort wind scale

blink

checksum

communication protocol

course

track heading

course over ground (COG)

cross track error (XTE)

cycle lock

envelope-to-cycle distortion

data field

diagnostic:

dead reckoning

delimiter

Ó

deprecated sentence

depth sounder

destination

deviation

DGNSS

DGPS

Doppler speed log

drift

echo sounder **depth sounder**

envelope-to-cycle distortion (ECD)

event:

fault:

field
delimiter

fixed field

Galileo

geoid

geometric dilution of precision (GDOP)

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global navigation satellite system (GNSS)

GLONASS

global positioning system (GPS)

great circle

great circle chart

great circle direction

group repetition interval (GRI)

gyrocompass

gyropilot

gyroscope

heading

true heading **magnetic heading**

heading control system

heading to steer

horizontal alert limit (HAL)

horizontal dilution of precision (HDOP)

horizontal protection level (HPL)

keel

line of position (LOP)

listener

log

LORAN

magnetic bearing

magnetic heading

manufacturer identification code

Mercator map projection

message

navigation leg

null field

one-way communication protocol

two-way

origin waypoint

precision : measure of how close the outcome of a series of observations or measurements cluster about some estimated value of a desired quantity, such as the average value of a series of observations of a quantity. Precision implies repeatability of the observations within some specified limit and depends upon the random errors encountered due to the quality of the observing equipment, the skill of the observer and randomly fluctuating conditions such as temperature, pressure, refraction, etc. (compare with accuracy).

proprietary sentence : sentence to be sent across the interconnecting link which is not included in the list of approved sentences of this standard. All proprietary sentences sent over the interconnecting link contain a unique talker identifier which begins with a "P" (HEX 50) followed by a three-character manufacturer identification code.

relative bearing : bearing relative to heading or to the vessel.

relative wind : the speed and relative direction from which the wind appears to blow with reference to a moving point (also called apparent wind).

rhumb line : line on the surface of the earth making the same oblique angle with all meridians. A rhumb line is a straight line on a rhumb (or Mercator) projection.

rhumb direction : the horizontal direction of a rhumb line, expressed as angular distance from a reference direction. Also known as Mercator direction (see Mercator map projection).

RM- sentence : recommended minimum acceptable (RM-) sentence, a composite sentence recommended by this standard to ensure interoperability between talkers and listeners and to ensure that all data considered necessary for navigation is sent by a particular navigation unit.

route : planned course of travel, usually composed of more than one navigation leg.

route system : any system of one or more routes and/or routing measures aimed at reducing the risk of casualties during a voyage which may include such items as traffic separation schemes, recommended tracks, restricted areas, inshore traffic zones, etc.

semi-fixed field : data fields having a base other than 10, but using base 10 to express precision of the final term (such as minutes expressed as units with a decimal trailer instead of seconds in a base 60 field, or seconds expressed with a decimal trailer).

selected waypoint : waypoint currently selected to be the point towards which the vessel is travelling. Also called "TO" waypoint , destination or destination waypoint .

sentence formatter : in this standard, three-character sentence identifier which follows the talker identifier and is included as part of the address field. The sentence formatters are an integral part of the sentence definitions provided by this standard and annexes.

set : direction towards which a current flows.

signal-to-noise ratio (SNR) : ratio of the magnitude of a signal to that of the noise (interference), often expressed in decibels.

speed log : instrument for measuring a vessel's speed through water and/or speed over ground. A single axis speed log normally measures speed along the longitudinal (fore/aft) axis of the vessel, while a dual axis speed log measures speed along the transverse (port/starboard) axis as well (see also Doppler speed log).

speed made good

speed over ground (SOG)

talker

talker identifier

time difference (TD)

track

track made good

track made good

transducer

true bearing

true heading

two-way communication protocol

one-way

UAIS

UART

universal time coordinated (UTC)

atomic time

variable field

variation

voyage data recorder (VDR)

warning **alarm**

Ó

waypoint

wide area augmentation system (WAAS)

ó

Annex B

Guidelines for methods of testing and required test results

B.1 General

B.1.1

B.1.2

B.1.3

B.2 Definition of environmental conditions for the tests

B.3 Examination of the manufacturer's documentation

B.3.1

B.3.2

B.3.3

B.3.4

B.3.5

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B.4 Test of hardware

B.4.1 Interface units

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B.4.2 Ability of the input circuits to work with limited current

B.4.3 Check of electrical isolation

B.4.4 Ability of input circuits to withstand maximum voltage on the bus

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B.4.7 Test against corrupted data at an interface

B.4.8 Test under long term conditions

B.4.9 Protocol test of the interface of the EUT

B.4.9.1 Data strings transmitted by the EUT

B.4.9.2 Data strings received by the EUT

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Table B.1 – Example – Data string GGA sent by the EUT to the test receiver (listener)

Field	Field label (and operational state)	Value sent from EUT in the data sentence	Received value at the test receiver

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Field	Field label (and operational state)	Value sent from EUT in the data sentence	Received value at the test receiver

Table B.2 – Checksum

Set condition	Actual condition

Table B.3 – Example – Data string GGA received by the EUT

Field	Field label	Value sent to EUT in the data sentence	Expected value on the EUT	Displayed value on the EUT
			°	
			°	
			°	
			°	

Ó

Field	Field label	Value sent to EUT in the data sentence	Expected value on the EUT	Displayed value on the EUT

Table B.4 – Example – Checksum

Send to EUT	Expected value on the EUT	Displayed value on the EUT
correct		
incorrect		

Table B.5 – Break of data line

Send to EUT	Expected value on the EUT	Displayed value on the EUT

B.4.10 Test for correct use of special characters starting a sentence

B.4.11 Test for correct parsing of received sentences

B.4.12 Test for future extension of received sentences

Annex C

Six-bit binary field conversion

Table C.1 – Six-bit binary field conversion table

Valid character	Binary field	Valid character	Binary field

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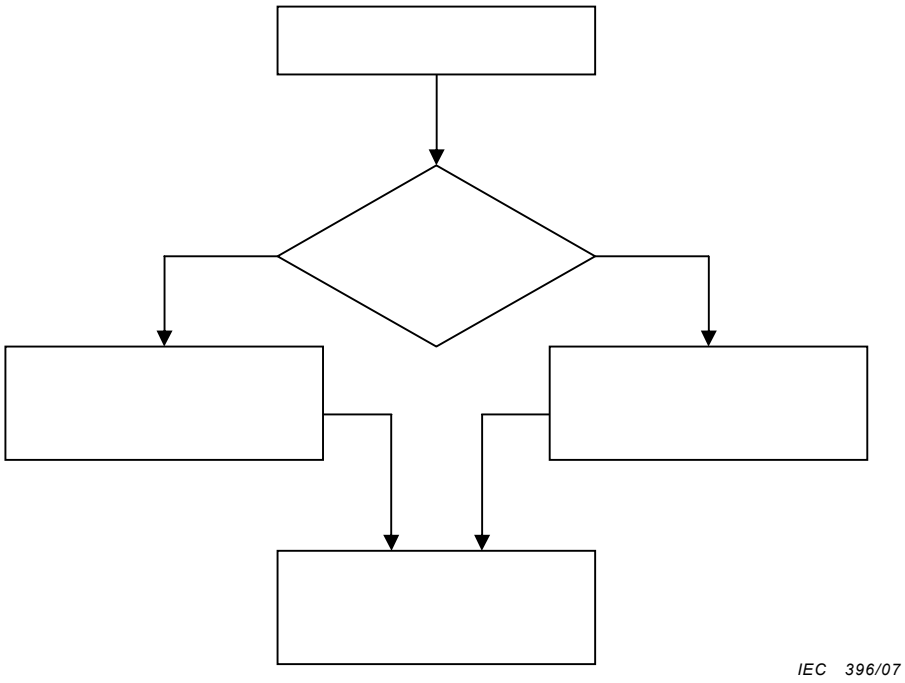

Figure C.1 – 6-bit binary code converted to valid IEC 61162-1 character

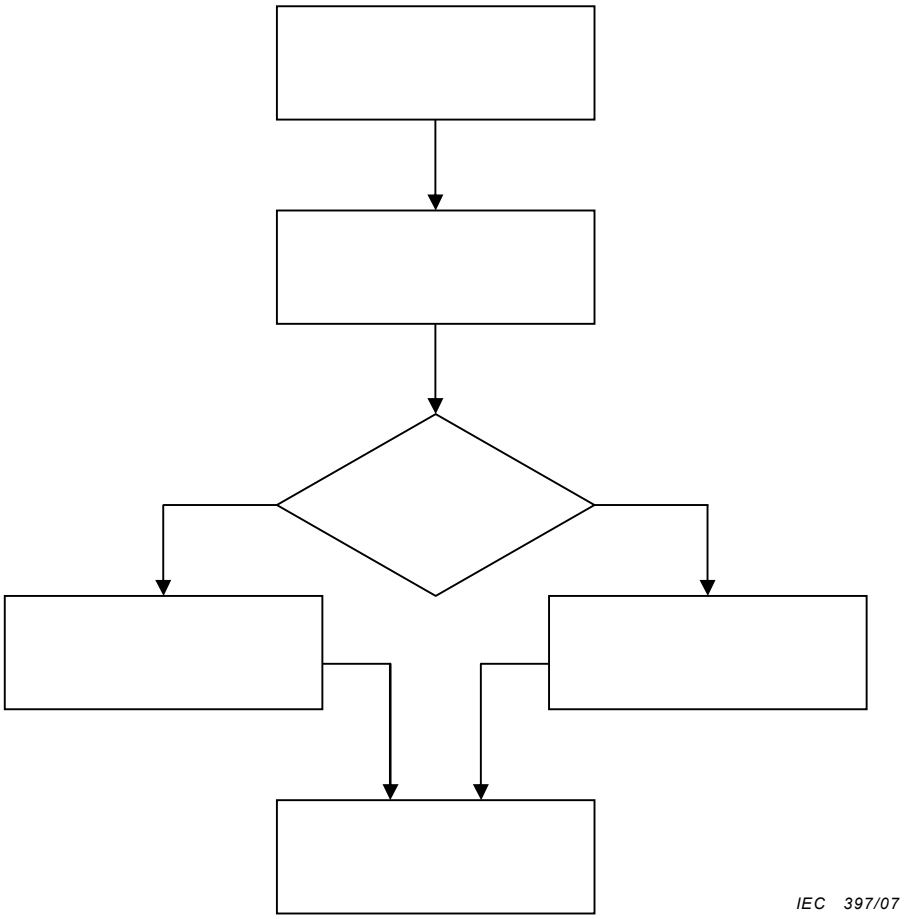

Figure C.2 – Valid IEC 61162-1 character converted to 6-bit binary code

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Annex D

Alarm system fields

Table D.1 – System alarm fields

System indicator (field 2)		Sub-system/equipment indicator (field 3)		Type of alarm (field 5)	
ID	System category	ID	Sub-system/equipment	No	Alarm contents

Ó

System indicator (field 2)		Sub-system/equipment indicator (field 3)		Type of alarm (field 5)	
ID	System category	ID	Sub-system/equipment	No	Alarm contents

Ó

System indicator (field 2)		Sub-system/equipment indicator (field 3)		Type of alarm (field 5)	
ID	System category	ID	Sub-system/equipment	No	Alarm contents

Ó

System indicator (field 2)		Sub-system/equipment indicator (field 3)		Type of alarm (field 5)	
ID	System category	ID	Sub-system/equipment	No	Alarm contents

Ó

System indicator (field 2)		Sub-system/equipment indicator (field 3)		Type of alarm (field 5)	
ID	System category	ID	Sub-system/equipment	No	Alarm contents

Ó

System indicator (field 2)		Sub-system/equipment indicator (field 3)		Type of alarm (field 5)	
ID	**System category**	**ID**	**Sub-system/equipment**	**No**	**Alarm contents**

Ó

System indicator (field 2)		Sub-system/equipment indicator (field 3)		Type of alarm (field 5)	
ID	System category	ID	Sub-system/equipment	No	Alarm contents

Ó

System indicator (field 2)		Sub-system/equipment indicator (field 3)		Type of alarm (field 5)	
ID	System category	ID	Sub-system/equipment	No	Alarm contents

Ó

System indicator (field 2)		Sub-system/equipment indicator (field 3)		Type of alarm (field 5)	
ID	System category	ID	Sub-system/equipment	No	Alarm contents
					–
					–
					–
					–
					–
					–
					–

Ó

System indicator (field 2)		Sub-system/equipment indicator (field 3)		Type of alarm (field 5)	
ID	System category	ID	Sub-system/equipment	No	Alarm contents

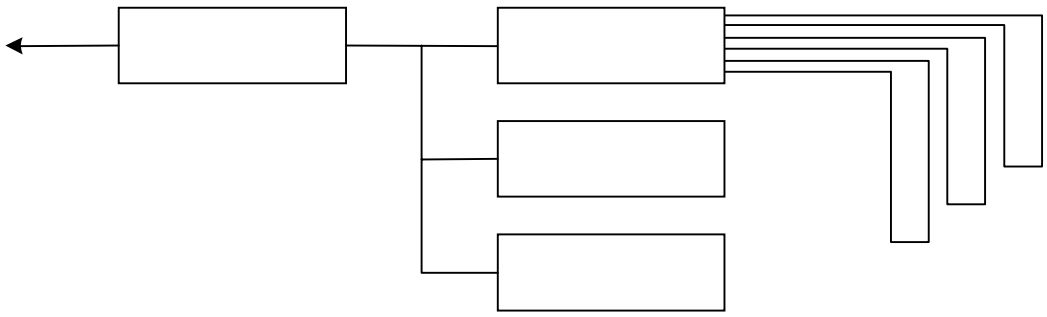

Figure E.1 – Example system diagram

E.3 Send complete status

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E.4 Change measurement point status

E.5 Point status change during a status update

E.6 Failure in a sub-system

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E.7 Status updates when a sub-system is in fault

E.8 Signal a correction of a sub-system fault

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Annex F

Example encapsulation sentence

F.1 Example encapsulation sentence

F.2 AIS VHF data-link message VDM sentence encapsulation example

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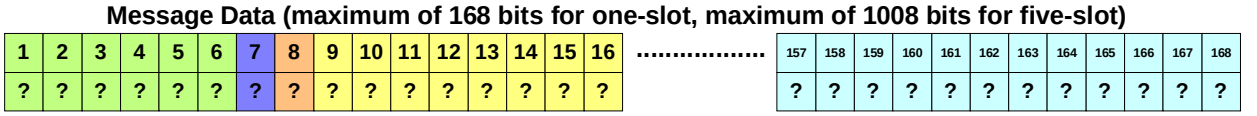

Figure F.1 – Message data format

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F.4 Decoding the encapsulated string

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1P000Oh1lT1svTP2r:43grwb05q4

F.5 Conversion from symbols to binary bits

VDM bit positions

Bits represented by encapsulation symbol

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F.6 Organising the binary message data

F.7 Interpreting the decoded binary strings

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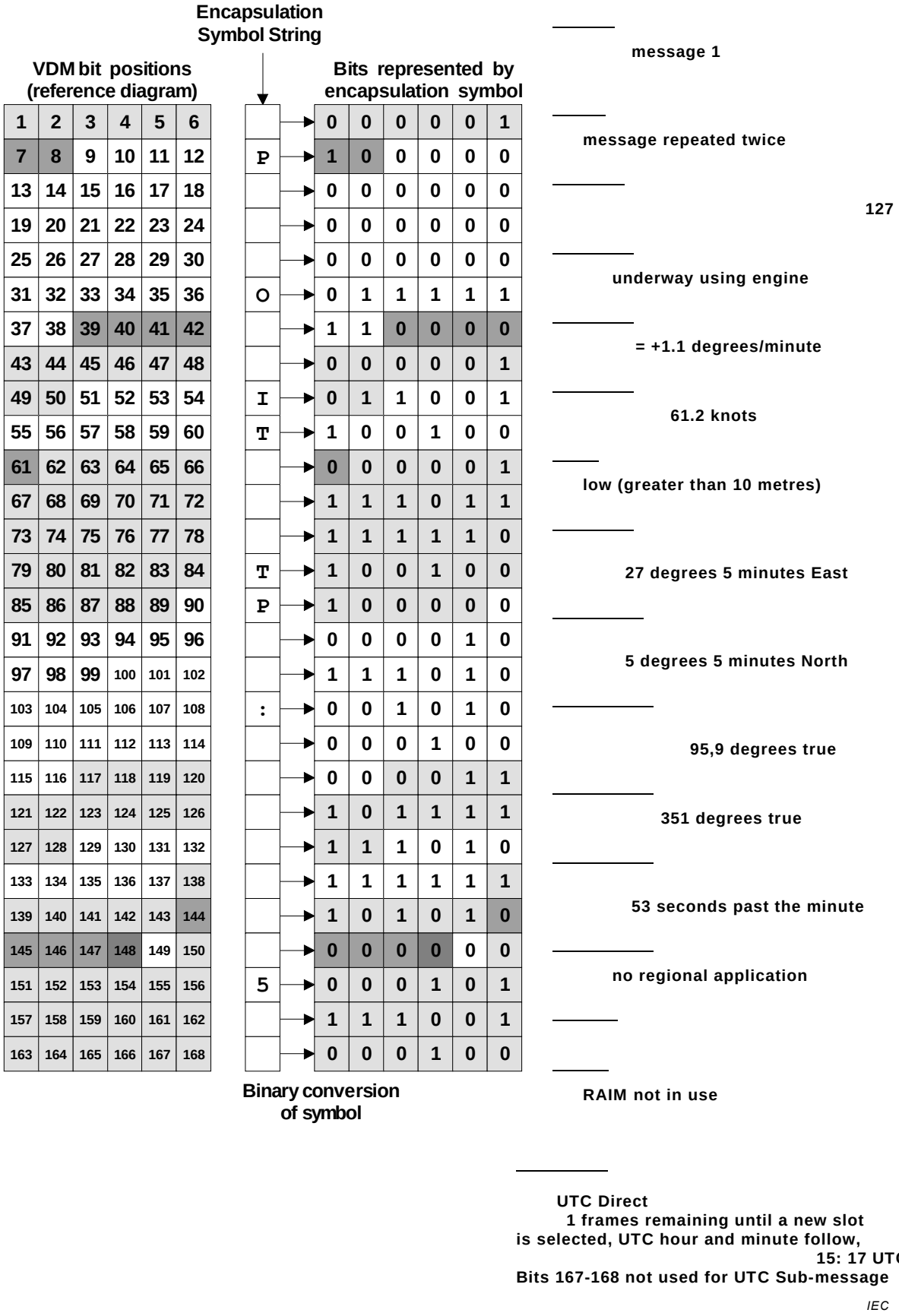
Table F.1 – Example message from ITU-R M.1371

Parameter	Number of bits	Description
		= = = =
		±
		= < = >
		± = =
		± = =
		°



IEC 400/07

Figure F.2 – Work sheet for decoding and interpreting encapsulated string

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Interface control document

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Global maritime distress and safety system (GMDSS) – Part 3: Digital selective calling (DSC) equipment – Operational and performance requirements, methods of testing and required test results

Global maritime distress and safety system (GMDSS) – Part 4: INMARSAT-C ship earth station and INMARSAT enhanced group call (EGC) equipment – Operational and performance requirements, methods of testing and required test results

Global maritime distress and safety system (GMDSS) – Part 6: Narrowband direct-printing telegraph equipment for the reception of navigational and meteorological warnings and urgent information to ships (NAVTEX)

Global maritime distress and safety system (GMDSS) – Part 7: Shipborne VHF radiotelephone transmitter and receiver – Operational and performance requirements, methods of testing and required test results

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