Inland AIS Shipborne Equipment

According to the Vessel Tracking and Tracing Standard for Inland Navigation

Operational and Performance Requirements, Methods of Test and Required Test Results

(Test Standard for Inland AIS)

Edition 1.0
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CONTENTS

FOREWORD

The concept of River Information Services (RIS) has emerged throughout several European research projects, aiming at increasing safety and efficiency of inland waterway transport.

The European Commission, the CCNR and the Danube Commission have recognized the need for means of automatic exchange of navigational data between ships and between ship and shore for automatic identification and tracking and tracing solutions in inland navigation.

In maritime navigation, the IMO has introduced the Automatic Identification System (AIS). All seagoing vessels on international voyage falling under SOLAS convention Chapter V have to be equipped with AIS since the end of 2004.The Guidelines and Recommendations for River Information Services (RIS Guidelines 2004) of PIANC and CCNR define Inland-AIS as important technology.

The Automatic Identification System AIS, as used in maritime navigation, is defined by the International Maritime Organisation (IMO) “Resolution MSC.74(69) Annex 3, Performance Standard for a Universal Shipborne Automatic Identification”. The technical requirements for AIS are provided by ITU Recommendation ITU-R M.1371.

The European RIS Platform established in 2003 the International Expert Group for Tracking and Tracing. The main task of this expert group is the development and maintenance of a European wide harmonised vessel tracking and tracing standard for inland navigation. Because of mixed traffic areas it is important that the standards and procedures for inland shipping are compatible with already defined standards and procedures for seagoing navigation.

To serve the specific requirements of inland navigation, AIS has been further developed to the “Vessel Tracking and Tracing Standard for Inland Navigation” while preserving full compatibility with IMO’s maritime AIS and already existing standards in inland navigation.

The Central Commission for Navigation on the Rhine has adopted in Mai 2006 the Vessel Tracking and Tracing Standard for Inland Navigation, Edition 1.0. The Commission of the European Communities has adopted the Commission Regulation (EC) No 415/207 of 13 March 2007 concerning the technical specifications for vessel tracking and tracing systems referred to in Article 5 of Directive 2005/44/EC of the European Parliament and of the Council on harmonised river information services (RIS) on inland waterways in the Community. Chapter 2 of the Annex of the Commission Regulation defines the Inland AIS technical specification.

This document describes the “Inland AIS Shipborne Equipment According to the Vessel Tracking and Tracing Standard for Inland Navigation – Operational and Performance Requirements, Methods of Test and Required Test Results (Test Standard for Inland AIS)”. Due to its nature it is mainly based on the structure of the parent IEC standard IEC 61993-2 : 2001, which will be updated to IEC 61993-2 Edition 2 following the adoption by the IEC. The updated version takes into account the new developments in ITU-R Recommendation M.1371-3.

This document was originally written in the English language.

Inland AIS shipborne equipment

Operational and performance requirements, methods of test and required test results

1. Scope

This Standard specifies the minimum operational and performance requirements, methods of testing and required test results for Inland AIS shipborne stations.

This standard incorporates the technical characteristics of Class A shipborne equipment included in current revision of ITU-R Recommendation M.1371 and further described by IEC 61993-2 : 2001 “Class A shipborne equipment of the universal automatic identification system (AIS) – Operational and performance requirements, methods of test and required test results” as applicable.

NOTE: All references in this standard to certain paragraphs of IMO resolution MSC.74(69), Annex 3 and IMO resolution A.694(17) or of ITU-R M.1371-1 are indicated in parenthesis i.e. (A3/3-3) or (M.1371-1/3.3) respectively. Likewise references to certain paragraphs of the Vessel Tracking and Tracing Standard Edition 1.0 are indicated in parenthesis i.e. (VTT 2.3.2.4).

2. Normative references

The following referenced documents are indispensable for the application of this document.

Central Commission for Navigation on the Rhine, Vessel Tracking and Tracing Standard for Inland Navigation, Edition 1.0, Mai 2006.

Commission Regulation (EC) No 415/207 of 13 March 2007 concerning the technical specifications for vessel tracking and tracing systems referred to in Article 5 of Directive 2005/44/EC of the European Parliament and of the Council on harmonised river information services (RIS) on inland waterways in the Community.

ITU-R Recommendation M.1371-1, Technical characteristics for an automatic identification system using time division multiple access in the VHF maritime mobile band.

IEC 61993-2 : 2001, Maritime navigation and radiocommunication equipment and systems - Part 2: Class A shipborne equipment of the universal automatic identification system (AIS) - Operational and performance requirements, methods of test and required test results.

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

IEC 61108-1 : 2003, Maritime navigation and radiocommunication equipment and systems - Global navigation satellite systems (GNSS) - Part 1: Global positioning system (GPS) - Receiver equipment - Performance standards, methods of testing and required test results.

IEC 61108-2 : 1998, Maritime navigation and radiocommunication equipment and systems - Global navigation satellite systems (GNSS) - Part 2: Global navigation satellite system (GLONASS) - Receiver equipment - Performance standards, methods of testing and required test results.

IEC 61108-4 : 2004, Maritime navigation and radiocommunication equipment and systems - Global navigation satellite systems (GNSS) - Part 4: Shipborne DGPS and DGLONASS maritime radio beacon receiver equipment.

IEC 61162-1 : 2007, Maritime navigation and radiocommunication equipment and systems - Digital interfaces - Part 1: Single talker and multiple listeners.

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

ISO/IEC 3309 : 1993, Information technology -- Telecommunications and information exchange between systems -- High-level data link control (HDLC) procedures -- Frame structure.

IMO Resolution A.694(17) : 1991, General requirements for shipborne radio equipment forming part of the Global Maritime Distress and Safety System (GMDSS) and for electronic navigational aids.

IMO Resolution A.815(19) : 1995, Worldwide radionavigation system.

IMO Resolution A.851(20) : 1997, General principles for ship reporting systems and ship reporting requirements, including guidelines for reporting incidents involving dangerous goods, harmful substances and/or marine pollutants.

IMO Resolution MSC.43(64), as amended by MSC.111(73), Guidelines and Criteria for Ship Reporting Systems.

IMO Resolution MSC.74(69) Annex 3 Recommendation on performance standards for AIS.

IMO Resolution A.917(22) : 2001, Guidelines on the operational use of shipborne automatic identification systems (AIS).

ITU-R Recommendation M.489-2, Technical characteristics of VHF radiotelephone equipment operating in the maritime mobile service in channels spaced by 25 kHz.

ITU-R Recommendation M.825-3, Characteristics of a transponder system using digital selective calling techniques for use with vessel traffic services and ship-to-ship identification.

ITU-R Recommendation M.1084-4, Interim solutions for improved efficiency in the use of the band 156-174 MHz by stations in the maritime mobile service.

Draft revision of ITU-R Recommendation M.1371-2, Technical characteristics for an automatic identification system using time division multiple access in the VHF maritime mobile band.

ITU-T Recommendation O.153, Basic parameters for the measurement of error performance at bit rates below the primary rate.

IALA technical clarifications to recommendation ITU-R M.1371-1.

3. Abbreviations

AI	Application Identifier
AIS	Automatic Identification System
ASCII	American Standard Code for Information Interchange
ATIS	Automatic Transmitter Identification System
AtoN	Aids to Navigation
BIIT	built-in integrity tests
CCNR	Central Commission for Navigation on the Rhine
COG	Course Over Ground
DAC	Designated Area Code
DGNSS	Differential GNSS
DSC	Digital Selective Calling
ECDIS	Electronic Chart Display and Information System
EMMA	European Multiservice Meteorological Awareness system
ENI	Unique European Vessel Identification Number
EPFS	electronic position fixing systems
ERI	Electronic Reporting International
ETA	Estimated Time of Arrival
EUT	equipment under test
FI	Functional Identifier
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HDG	Heading
IAI	International Application Identifier
IALA	International Association of Lighthouse Authorities
ID	Identifier
IEC	International Electrotechnical Commission
IETF	Internet Engineering Task Force
IFM	international function message
IHO	International Hydrographic Office
IMO	International Maritime Organization
ITU	International Telecommunication Union
LR	Long Range
MHz	Megahertz (Megacycles per second)
MID	Maritime Identification Digits
MKD	Minimum Keyboard and Display
MMSI	Maritime Mobile Service Identifier
NUC	not under command
PI	presentation interface
RAI	Regional Application Identifier
RAIM	Receiver Autonomous Integrity Monitoring
RF	radio frequency
RFM	regional function message
RIS	River Information Services
RNW	Regulierungs Niederwasser (granted water level during 94% the year)
ROT	Rate Of Turn
RTA	Requested Time of Arrival
Rx	receive
SAR	Search And Rescue
SOG	Speed Over Ground
SOLAS	Safety Of Life At Sea
SOTDMA	Self Organizing Time Division Multiple Access
SQRT	Square Root
STI	Strategic Traffic Image
TDMA	Time Division Multiple Access
TTI	Tactical Traffic Image
Tx	transmit
UDP	User Datagram Protocol
UMTS	Universal Mobile Telecommunications System
UN	United Nations
UN/LOCODE	United nations Location Code
UTC	Universal Time Coordinated
VDL	VHF Data Link
VHF	Very High Frequency
VSWR	voltage standing wave ratio
VTG	see IEC 61162-1, table 5
VTS	Vessel Traffic Services
WGS-84	World Geodetic System from 1984

4. General requirements

Refer to IEC 61993-2 : 2001.

4.1 General

4.1.1 General requirements

4.1.1.1 (A3/1.1) Refer to IEC 61993-2 : 2001.

4.1.1.2 (A3/1.2) Refer to IEC 61993-2: 2001.

4.1.1.3 Inland AIS shipborne stations are based on the specification of Class A shipborne AIS equipment in accordance with current revision of ITU-R Recommendation M.1371 and IEC standard IEC 61993-2 : 2001 unless otherwise stated.

4.1.2 Capabilities of the AIS

Refer to IEC 61993-2 : 2001.

4.1.3 Additional requirements

Refer to IEC 61993-2 : 2001.

4.1.4 Transmitter shutdown procedure

Refer to IEC 61993-2 : 2001.

4.1.5 Quality assurance

Refer to IEC 61993-2 : 2001.

4.2 Modes of Operation

Refer to IEC 61993-2 : 2001.

4.3 Manuals

Refer to IEC 61993-2 : 2001.

4.4 Marking and identification

Refer to IEC 61993-2 : 2001.

5. Environmental, power supply, special purpose and safety requirements

Refer to IEC 61993-2 : 2001.

6. Performance requirements

6.1 Composition

(A3/3)

6.1.1 (A3/3.1) The Inland AIS shall comprise:

6.1.1.1 A communication processor, capable of operating over a range of maritime frequencies, with an appropriate channel selecting and switching method, in support of short (VHF) range applications.

6.1.1.2 Refer to IEC 61993-2 : 2001.

6.1.1.3 A means of processing data from an electronic position-fixing system which provides a resolution of one ten thousandth of a minute of arc and uses the WGS 84 datum.

An interface (IEC 61162 : 1998) shall be provided to input external position information. Position information from internal EPFS shall be used with lower priority and the user shall be informed of this (see 6.10).

6.1.1.4 Refer to IEC 61993-2 : 2001.

6.1.1.5 Refer to IEC 61993-2 : 2001.

6.1.1.6 Refer to IEC 61993-2 : 2001.

6.1.1.7 Refer to IEC 61993-2 : 2001.

6.1.1.8 (VTT 2.3.8) An interface (RTCM SC-104) shall be provided to input the correction data to the internal GNSS receiver.

6.1.2 (A3/3.2) The Inland AIS shall be capable of:

6.1.2.1 Refer to IEC 61993-2 : 2001.

6.1.2.2 Refer to IEC 61993-2 : 2001.

6.1.2.3 Refer to IEC 61993-2 : 2001.

6.1.2.4 Refer to IEC 61993-2 : 2001.

6.1.3 (VTT 2.2, 2.3) The AIS station shall be configured as “Inland AIS station”.

6.1.4 (VTT 2.3.3) The Inland AIS station shall be able to process Group Assignment Commands (AIS message 23) for station type “inland waterways” and act accordingly

6.1.5 (VTT 2.4.1) The Inland AIS station shall be able to process the regional application flags in the IEC 61162-1 $--VSD sentence (if used as source for blue sign information the $--VSD shall be updated every 2 seconds) or by using a direct connection to the blue sign switch to set the special manoeuvre indicator in AIS VDL message 1, 2, 3 for transmission accordingly (blue sign information).

6.1.6 (VTT 2.3.7) The Inland AIS station shall be able to process Inland specific Regional Function messages (RFM) with the Designated Area Code (DAC) "200"[1].

6.2 Internal GNSS receiver

The Inland AIS station shall provide an internal GNSS receiver as UTC source, for own positioning, COG and SOG. The internal GNSS receiver shall meet the appropriate requirements of IEC 61108 series as defined in IEC 61993-2 : 2001.

6.2.1 UTC source

Refer to IEC 61993-2 : 2001.

6.2.2 Source for AIS position reporting

Refer to IEC 61993-2 : 2001.

6.3 User interface

Refer to IEC 61993-2 : 2001.

6.4 Identification

Refer to IEC 61993-2 : 2001.

6.5 Information

6.5.1 Information provided by the Inland AIS

(A3/6.1) (VTT 2.3.2)

The static, dynamic and voyage realted ship information for inland vessels should have the same parameters and the same structure than in IMO AIS as far as it is applicable. Not used parameter fields should be set to "not available". Inland specific static ship information should be added. The information provided by the Inland AIS shall include (Items marked with '*' have to be handled differently as for seagoing ships):

6.5.1.1 Static

(VTT 2.3.2.1)

Static ship information is broadcasted autonomously from ship or on request.

- User Identifier (MMSI) (SOLAS AIS)
- Name of Ship (SOLAS AIS)
- Call Sign* (SOLAS AIS / amended for Inland AIS)
- IMO number * (SOLAS AIS / not available for Inland ships)

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1 Unless otherwise stated "RFM" in this document refers to Inland specific Regional Function Messages (RFM) as defined in ITU-R M.1371 with an Application identifier (AI) consisting of DAC = 200 and the defined Function Identifier (FI) (e.g.: RFM 10 = DAC "200" + FI "10")

- Type of Ship and Cargo * (SOLAS AIS / amended for Inland AIS)
- Overall Length (decimetre Accuracy)* (SOLAS AIS / amended for Inland AIS)
- Overall Beam (decimetre Accuracy) * (SOLAS AIS / amended for Inland AIS)
- Unique European Vessel Identification Number (ENI) (Inland AIS extension)
- Type of ship or combination (ERI) (Inland AIS extension)
- Loaded/unloaded Vessel (Inland AIS extension)
- Location of the in use position-fixing antenna on the ship (aft of bow and port or starboard of centreline) (SOLAS AIS)

Static information and the MMSI shall be stored in non-volatile memory devices.

6.5.1.2 Dynamic

(VTT 2.3.2.2)

Dynamic ship information is broadcast autonomously from ship or on request.

- Position (WGS 84) (SOLAS AIS)
- Speed SOG (quality information)* (SOLAS AIS)
- Course COG (quality information)* (SOLAS AIS)
- Heading HDG (quality information)* (SOLAS AIS)
- Rate of turn ROT (SOLAS AIS)
- Position accuracy (GNSS/DGNSS) (SOLAS AIS)
- Time of el. position fixing device (SOLAS AIS)
- Navigational status (SOLAS AIS)
- Blue sign set (Inland AIS extension / regional bits in SOLAS AIS)
- Quality of speed information (Inland AIS extension / derived from ship sensor or GNSS)
- Quality of course information (Inland AIS extension / derived from ship sensor or GNSS)
- Quality of heading information (Inland AIS extension / derived from certified sensor (e.g. gyro) or uncertified sensor)

6.5.1.3 Voyage related

(VTT 2.3.2.3)

Voyage related ship information is broadcast autonomously from ship or on request.

- Destination (ERI location codes) (SOLAS AIS)

- Category of dangerous cargo (SOLAS AIS)
- ETA (SOLAS AIS)
- Maximum present static Draught * (SOLAS AIS/amended for Inland AIS)
- Hazardous cargo classification (Inland AIS extension)

6.5.1.4 Short safety-related messages

(VTT 2.3.2.4)

- Short safety-related messages

6.5.1.5 Traffic management information provided by the Inland AIS

(VTT 2.3.2.4)

Traffic management Information is for specific use in inland navigation. This information is transmitted when required or on request to/from inland vessels only.

6.5.1.5.1 ETA at lock/bridge/terminal

ETA at lock/bridge/terminal information is transmitted as addressed message from ship to shore.

- Lock/bridge/terminal ID (UN/LOCODE) (Inland AIS extension)
- ETA at lock/bridge/terminal (Inland AIS extension)
- Number of assisting tugboats (Inland AIS extension)
- Air draught (Inland AIS extension)

6.5.1.5.2 RTA at lock/bridge/terminal

RTA at lock/bridge/terminal information is transmitted as addressed message from shore to ship.

- Lock/bridge/terminal ID (UN/LOCODE) (Inland AIS extension)
- RTA at lock/bridge/terminal (Inland AIS extension)

6.5.1.5.3 Number of persons on board

The number of persons on board is transmitted preferably as an addressed message from ship to shore on request or on event.

- Total number of persons on board (SOLAS AIS)
- Number of crew member on board (Inland AIS extension)
- Number of passengers on board (Inland AIS extension)
- Number of shipboard personnel on board (Inland AIS extension)

6.5.1.5.4 Signal status

Signal Status information is transmitted as broadcast message from shore to ship

- Signal Position (WGS84) (Inland AIS extension)
- Signal Form (Inland AIS extension)
- Light Status (Inland AIS extension)

6.5.1.5.5 EMMA warnings

EMMA Warning Information is transmitted as broadcast message from shore to ship

- local weather warnings (Inland AIS extension)

6.5.1.5.6 Water levels

Water Level Information is transmitted as broadcast message from shore to ship

- local water level information (Inland AIS extension)

6.5.2 Information reporting intervals

The different information types of Inland AIS should be transmitted with different reporting rates. For moving vessels in inland waterway areas the reporting rate for the dynamic information can be switched between SOLAS mode and inland waterway mode. In inland mode it can be assigned between 2 seconds and 10 minutes. In mixed traffic areas like seaports it should be possible to decrease the reporting rate for dynamic information from by the competent authority to ensure a balance in reporting behaviour between inland vessels and SOLAS vessels. The reporting behaviour should be switch able by TDMA commands from a base station (automatic switching by TDMA telecommand via message 23) and by commands from ship borne systems, e.g. MKD, ECDIS or on board computer, via interface, e.g. IEC 61162 (automatic switching by ship borne system command) For static and voyage related information it is recommended to have a reporting rate of several minutes, on request, or if information is amended.

Static Ship Information	Every 6 minutes or when data has been amended or on request
Dynamic Ship Information	Depends on navigational status and ship operating mode, either inland waterway mode or SOLAS mode (default), see Table 1
Voyage related Ship Information	Every 6 minutes, when data has been amended or on request
Traffic management information	As required (to be defined by competent authority)
Safety related messages	As required.

Table 1: Update rate of dynamic ship information

Ship dynamic conditions	Nominal reporting interval
Ship status “at anchor” and not moving faster than 3 knots	3 minutes [1]
Ship status “at anchor” and moving faster than 3 knots	10 seconds [1]
Ship operating in SOLAS mode, moving 0 – 14 knots	10 seconds [1]
Ship operating in SOLAS mode, moving 0 – 14 knots and changing course	3 1/3 seconds [1]
Ship operating in SOLAS mode, moving 14 – 23 knots	6 seconds [1]
Ship operating in SOLAS mode, moving 14 – 23 knots and changing course	2 seconds
Ship operating in SOLAS mode, moving faster 23 knots	2 seconds
Ship operating in SOLAS mode, moving faster 23 knots and changing course	2 seconds
Ship operating in inland waterway mode [2]	assigned between 2 seconds and 10 minutes

1 When a mobile station determines that it is the semaphore (refer to ITU-R M.1371-1, Annex 2, § 3.1.1.4), the reporting rate should increase to once per 2 seconds (refer to ITU-R M.1371-1, Annex 2, § 3.1.3.3.2).

2 Shall be switched by competent authority using message 23, when ship enters inland waterway area.

6.5.3 Ship reporting capacity

Refer to IEC 61993-2 : 2001.

6.5.4 Inland AIS Data storage and message compilation

(VTT 2.3.8, VTT 2.4.4.2)

For data input of the required information for transmission either means for manual input or the proposed digital interface sentences for Inland AIS ($--SSD, $--VSD, $PIWWSSD and $PIWWIVD) shall be used. This requires means for input and storage of the inland specific data. Only inputs that change the stored data (manual input or $--SSD, $--VSD, $PIWWSSD, $PIWWIVD) shall generate a transmission where applicable.

6.5.4.1 Inland specific RFM 10 (Inland ship static and voyage related data) and Inland specific RFM 55 (Persons on board)

The compilation of the RFM 10 + RFM 55 for transmission is part of the Inland AIS station itself.

- The RFM 10 shall be used by Inland AIS only, to broadcast ship static and voyage related data in addition to message 5. The message shall be sent not later than 4 seconds after message 5 by using a message 8 / RFM 10.

- The Inland AIS station must be able to respond to an interrogation for VDL message 5 (received message 15) automatically with the both, message 5 and message 8 / RFM 10.
- The Inland AIS station must be able to respond on a request for “Inland number of persons on board” automatically with the message 6 / RFM 55.

6.5.4.2 Inland specific RFM’s other than RFM 10 or RFM 55

The following options are available for the compilation of inland specific messages other than RFM 10 and 55:

- The compilation is implemented in the Inland AIS station itself.
- The compilation of inland specific message may be provided by an external application outside the Inland AIS ship borne station and is input via the Presentation Interface using IEC 61162-1 : 2007 ABM or BBM sentences as applicable.

  External applications could be:

  - a connected Inland ECDIS equipment or Radar equipment
  - a connected dedicated software application (without Inland ECDIS capability).

6.6 Security, event log

Refer to IEC 61993-2 : 2001.

6.7 Permissible initialisation period

Refer to IEC 61993-2 : 2001.

6.8 Power supply

Refer to IEC 61993-2 : 2001.

6.9 Technical characteristics

Refer to IEC 61993-2 : 2001.

6.10 Alarms and indications, fall-back arrangements

Refer to IEC 61993-2 : 2001.

6.11 Display, input and output

(VTT 2.3.8)

The AIS shall provide means to display ship and shore based AIS data and to manually input data.

6.11.1 Minimum keyboard and display (MKD) functionality

The MKD functionality shall allow the following functions:

- Manual input of voyage related data and safety related messages, control of AIS and data selection. The method of entering the navigational status shall be readily available to the operator.
- Display of received and transmitted data.
- The MKD functionality is an integral part of the AIS and it may be fulfilled by a remote device. For testing the manual input of ship static, voyage related data and safety related messages and the control of the Inland AIS station, the whole set of involved equipment is required.

The DTE flag shall only be set to “1” when there is no means of displaying received text messages. External equipment indicates the ability to display text messages by the DTE field in SSD sentence.

The following messages or target information derived from received messages should be minimally displayed on the MKD:

Table 7: Message display by MKD functionality

Message type	Information content
All messages below	MMSI
Message 1,2,3 Position report	Position (Lat, Lon, Range, Bearing)
Message 4 Base station report	Position (Lat, Lon, Range, Bearing) Name shall show “Base”
Message 5 static data	Name of ship
Message 9 SAR aircraft position report	Position (Lat, Lon, Range, Bearing) Name shall show “SAR”
Message 12 , Message 14 Safety related text message	Text content
Message 18 + 19 +24a Class B position and static report	Position (Lat, Lon, Range, Bearing) Name of ship
Message 21 ATON	Position (Lat, Lon, Range, Bearing) Name of Aids to Navigation plus indication it is an AtoN

6.11.2 Alarms and status information

The following alarms and status information shall be indicated and the information contents displayed on request:

- alarms and indications as a result of the built-in integrity test (BIIT see 6.10)
- received safety related messages 12 and 14.

A means to acknowledge alarms shall be provided.
Means shall be provided to disable the acknowledgement of alarms as above, for example in the case where an external alarm is provided.

7. Technical requirements

7.1 General

Refer to IEC 61993-2 : 2001.

7.2 Physical layer

Refer to IEC 61993-2 : 2001.

7.3 Link layer

(M.1371/A2-3)

The Link layer specifies how data shall be packaged in order to apply error detection and correction to the data transfer. The Link layer is divided into three (3) sublayers.

7.3.1 Link sublayer 1: Medium Access Control (MAC)

Refer to IEC 61993-2 : 2001.

7.3.2 Link sublayer 2: Data Link Service (DLS)

Refer to IEC 61993-2 : 2001.

7.3.3 Link sublayer 3 - Link Management Entity (LME)

(M.1371/A2-3.3, A8 / VTT 2.4)

The LME controls the operation of the DLS, MAC and the physical layer.

The LME sublayer shall be designed in accordance with Recommendation 1371/A2-3.3.

Link sublayer 3 includes definition of VDL-messages (M.1371/A8).

Table 11 shows how the messages defined in M.1371/A2-3.2 shall be used by an Inland AIS station. For further details refer to the appropriate section of Recommendation 1371.

Table 11 Use of VDL messages

msg. No.	Name of message	M.1371Ref. / VTT Ref.	R/P	O	T	Remark
0	Undefined	None	Yes	Yes	No	Reserved for future use
1	Position Report (Scheduled)	A8-3.1 / 2.4.1 (Table 2.2)	Yes	Yes	Yes	
2	Position Report (Assigned)	A8-3.1 / 2.4.1 (Table 2.2)	Yes	Yes	Yes	
3	Position Report (When interrogated)	A8-3.1 / 2.4.1 (Table 2.2)	Yes	Yes	Yes	
4	Base Station Report	A8-3.2	Yes	Yes	No	
5	Static and Voyage Related Data	A8-3.3 / 2.4.1 (Table 2.3)	Yes	Yes	Yes	
6	Addressed Binary Message	A8-3.4	Yes	Yes (1)	Yes	(1) Only if addressed to own station
6	Inland specific RFM 21 - ETA at lock/bridge/terminal	Annex 5 / 2.4.4.2 (Table 2.8)	No	Yes	Yes	
6	Inland specific RFM 22 - RTA at lock/bridge/terminal	Annex 5 / 2.4.4.2 (Table 2.9)	Yes	Yes (1)	No	(1) Only if addressed to own station
6	Inland specific RFM 55 - Inland number of persons on board	Annex 5 / 2.4.4.2 (Table 2.10)	No	Yes	Yes	
7	Binary Acknowledge	A8-3.5	Yes	INF (2)	Yes	(2) An ABK PI message shall be sent to the PI in any case.
8	Binary Broadcast Message	A8-3.6	Yes	Yes	Yes	
8	Inland specific RFM 10 - Inland ship and voyage related data	Annex 5 / 2.4.4.2 (Table 2.7)	Yes	Yes	Yes	Transmission after message 5 (max. 4 seconds delay)
8	Inland specific RFM 23 - EMMA warning	Annex 5 / 2.4.4.2 (Table 2.11)	Yes	Yes	No	
8	Inland specific RFM 24 - Water level	Annex 5 / 2.4.4.2 (Table 2.15)	Yes	Yes	No	
8	Inland specific RFM 40 - Signal status	Annex 5 / 2.4.4.2 (Table 2.16)	Yes	Yes	No	
8	Inland specific RFM 55 - Inland number of persons on board	Annex 5 / 2.4.4.2 (Table 2.10)	Yes	Yes	Yes	
9	Standard SAR Aircraft Position Report	A8-3.7	Yes	Yes	No	
10	UTC and Date Inquiry	A8-3.8	Yes	INF	Yes	
11	UTC/ Date Response	A8-3.2	Yes	INF	Yes	
12	Addressed Safety Related Message	A8-3.9	Yes	Yes (3)	Yes	(3) Only if addressed to own station
13	Safety Related Acknowledge	A8-3.5	Yes	INF (4)	Yes	(4) An ABK PI message shall be sent to the PI in any case.
14	Safety Related Broadcast Message	A8-3.10	Yes	Yes	Yes	

msg. No.	Name of message	M.1371Ref. / VTT Ref.	R/P	O	T	Remark
15	Interrogation	A8-3.11	Yes	INF	Yes	Inland AIS shipborne mobile station shall only interrogate for message 3, 4, 5, 9, 18, 19, 20, 21, 22, 24 Slot offset shall be set to 0 and shall respond for interrogations for messages 3, 5 only. Only manually initiation by an operator of message 15 is allowed.
16	Assigned Mode Command	A8-3.12	Yes	INF	No	
17	DGNSS	A8-3.13	Yes	INF (5)	No	(5) on other ports of the PI: INF
18	Standard Class B Equipment Position Report	A8-3.14	Yes	Yes	No	
19	Extended Class B Equipment Position Report	A8-3.15	Yes	Yes	No	
20	Data Link Management Message	A8-3.16	Yes	INF	No	
21	Aids-to-Navigation Report	A8-3.17	Yes	Yes	No	
22	Channel Management Message	A8-3.18	Yes	INF	No	
23	Group Assignment Command	A8-3.19 / 2.4.1 (Table 2.4)	Yes	Yes	No	
24	Static Data Report (Single slot, two parts)	A8-3.20	Yes	Yes	No	Transmission of Part B only in response to an interrogation by message 15
25	Single Slot binary message	A8-3.21	Yes	Yes (6)	No (9)	(6) Only if broadcast or addressed to own station (7)use ABM/BBM sentence indicating message25 in message ID field to initiate
26	Multiple Slot Binary message with commstate	A8-3.22	Yes	Yes (8)	No (9)	(9) Only if broadcast or addressed to own station (10)not to be transmitted for backward compatibility
27 - 63	Undefined	None	INF	INF	No	Reserved for future use

Legend:
R/P - Receive and process internally, e. g. prepare for output via PI, act upon the received information, and use the received information internally.
O - Output message content via PI using PI VDM or VDO messages
T - Transmission by own station: "Yes" = required; "No" = shall not be transmitted
INF - VDL message will be output via PI using a PI VDM message for information only. This function may be suppressed by configuration setting.

For messages 6, 8, 12, 14 own transmissions shall not exceed a total of 20 slots in a frame with a maximum of 3 slots per message. If either case is exceeded, the AIS shall generate an ABK warning sentence.

7.3.3.1 Response to Assignment Commands (messages 16 and 23)

(M.1371/A2-3.3.6 and A8-3.12, 3.20 and VTT 2.3.3 Table 2.1)

An Inland AIS station shall process assignment commands in accordance with ITU-R M.1371 and VTT 2.3.3 Table 2.5.

An assignment command, with a reporting interval less than the autonomous reporting interval, received by manual input or the proposed digital interface sentences for Inland AIS ($PIWWSSD and $PIWWIVD) or message 16 or message 23 shall decrease the reporting interval defined by Table 2.1 of VTT. An assignment command shall not increase the reporting interval above the autonomous reporting interval.

7.4 Network layer

(M.1371/A2-4)

Refer to IEC 61993-2 : 2001.

7.4.1 Management of regional operating settings

(M.1371/ A2-4.1)

Refer to IEC 61993-2 : 2001.

7.5 Transport layer

(M.1371/A2-5)

Refer to IEC 61993-2 : 2001.

7.6 Presentation interface

(M.1371/A2-5.4)

7.6.1 General

(M.1371/A2-5.4)

Refer to IEC 61993-2 : 2001.

7.6.1.1 Long Range Applications

(M.1371/A4)

Not mandatory for Inland AIS.

7.6.1.2 Composition

The Presentation Interface of the Inland AIS shall comprise the data ports listed in table 12. (Also see Annex D.)

Table 12 Presentation Interface Access

General Function	Mechanism
Automatic Input of Sensor Data (Sensor data input from shipboard equipment)	(3) IEC 61162-2 input ports, also configurable as IEC 61162-1 input ports
High Speed Input/Output Ports (Operator controlled commands and data input; AIS VHF Data Link (VDL) data; and AIS equipment status)	(2) IEC 61162-2 paired input and output ports
BITT Alarm Output	(1) Isolated normally-closed (NC) contact circuit

7.6.2 Automatic input of sensor data

Refer to IEC 61993-2 : 2001.

7.6.3 High speed input/output ports

7.6.3.1 Required ports

Refer to IEC 61993-2 : 2001.

7.6.3.2 Interface connector

Refer to IEC 61993-2 : 2001.

7.6.3.3 Input data and formats

The Inland AIS shall as a minimum be able to receive and process the input data shown in table 14. The details of these sentences are contained in IEC 61162-1 : 2007. Manufacturer's proprietary data may also be entered using these high-speed ports.

Table 14 AIS High-speed input data and formats

Data	IEC 61162-1 Sentences
Normal Access - Parameter Entry	
Voyage information: Vessel type and cargo category Navigational status Draught, max. actual static Destination ETA date and time Regional application flags Reporting rate settings Number of blue cones air draught of ship Number of assisting tugboat Number of crew members on board Number of passengers on board Number of shipboard personnel on board	VSD - Voyage static data PIWWIVD – Inland Waterway voyage data
Station information Vessel name Call sign Antenna location length and beam ENI number ERI ship type Quality of speed information Quality of course information Quality of heading information	SSD - Station static data PIWWSSD – Inland Waterway static ship data
Initiate VHF Data-link Broadcasts	
Safety messages	ABM - Addressed Binary Message BBM - Broadcast Binary Message
Binary messages	ABM - Addressed Binary Message BBM - Broadcast Binary Message
Interrogation Message	AIR - AIS Interrogation Information
AIS Equipment - Parameter Entry	
AIS VHF channel selection	ACA - AIS Channel Assignment Message
AIS VHF power setting	ACA - AIS Channel Assignment Message
AIS VHF channel bandwidth	ACA - AIS Channel Assignment Message
Transmit/Receive mode control	ACA - AIS Channel Assignment Message
MMSI	Minimum keyboard and display (MKD) or proprietary sentences (limited access)
IMO number	Minimum keyboard and display (MKD) or proprietary sentences (limited access)
Other AIS equipment controls	Minimum keyboard and display (MKD) or proprietary sentences (limited access)
BIIT Input	
Alarm / indication acknowledgement	ACK Acknowledgement message

7.6.3.4 Output data and formats

The Inland AIS shall as a minimum be able to generate and send the output data shown in table 15.

The VDO sentence shall be output on both high-speed output ports, at nominal 1 s intervals, use A & B to indicate that the data was transmitted on the VDL channel A or B, null indicating not transmitted on the VDL.

The VDM sentence shall be sent simultaneously on both high-speed output ports for every VDL message received. Some VDL messages are informative according to table 7. During operation, the operator may disable delivery of these informative messages. Manufacturer's proprietary data may also be sent using these high-speed ports.

Table 15 AIS High-speed output data and formats

Data	IEC 61162-1 Sentences
Prepared by AIS Unit	
Notification that a session initiated by messages ABM, BBM, AIR is terminated	ABK - Acknowledgement Message [M.1371/A2-5.4.1 and M.1371/A2-3.3.8.2.5]
AIS Own-ship Broadcast Data (all transmissions available)	VDO - VHF Data-link Own-vessel message)
AIS equipment status (Built-in-integrity-test results)	ALR/TXT - (see 6.10.2)
Channel management data	ACA - AIS channel assignment message (using query mechanism)
Received on VHF Data-link by AIS Unit	
All VDL AIS messages received Broadcast or Addressed to own Station	VDM - VHF Data link Message

7.6.4 Long-range communications

Not mandatory for Inland AIS.

7.6.5 BIIT alarm output

Refer to IEC 61993-2 : 2001.

8 DSC compatibility

Not mandatory for Inland AIS

9. Long-range applications

Not mandatory for Inland AIS.

10. Test conditions

Refer to IEC 61993-2 : 2001.

11. Power supply, special purpose and safety tests

Refer to IEC 61993-2 : 2001.

12. Environmental tests

Refer to IEC 61993-2 : 2001.

13. EMC tests

Refer to IEC 61993-2 : 2001.

14. Operational tests

14.1 Operating modes/capability

14.1.1 Autonomous mode

Refer to IEC 61993-2 : 2001.

14.1.2 Assigned mode

Refer to IEC 61993-2 : 2001.

14.1.3 Polled mode

(4.2.1, M.1371/A2-3.3.2, A8)

14.1.3.1 Transmit an interrogation

Refer to IEC 61993-2 : 2001.

14.1.3.2 Interrogation response

(4.2.1, M.1371/A2-3.3.2, A8, 6.5.4.1)

Method of measurement

Set up standard test environment and operate EUT in autonomous mode. Apply an interrogation message (message 15; EUT as destination) to the VDL according to message table (M.1371/A8-3.11) for responses with message 3, message 5 and slot offset set to defined value. Record transmitted messages and frame structure.

Required results

Check that the EUT transmits the appropriate interrogation response message as requested after defined slot offset. Confirm that the EUT transmits the response on the same channel as where interrogation was received. Confirm that the EUT transmits message 5 and “Inland ship static and voyage related data” RFM 10 using binary broadcast message (message 8) to the VDL. Confirm that the “Inland ship static and voyage related data” RFM 10 follows message 5 within 4 seconds.

14.1.4 Addressed operation

Refer to IEC 61993-2 : 2001.

14.2 Multiple slot messages

Refer to IEC 61993-2 : 2001.

14.3 Information content

(6.5.1, M.1371/A8)

Method of measurement

Set up standard test environment and operate EUT in autonomous mode. Apply all static, dynamic and voyage related data to the EUT, using the MKD and the PI input sentences ($--SSD, $--VSD, $PIWWSSD and $PIWWIVD).

a) Record all messages on VDL and check the contents of position report message 1, static data report message 5 and “Inland ship static and voyage related data” RFM 10. Use the value “8161” as example for the “Ship or combination type” (ERI-Code) which stands for “Tankbarge, liquid cargo, type N”.

b) Record all messages on VDL and transmit binary broadcast message 8 (RFM 55 and IFM 16) from EUT.

c) If the compilation of “ETA at lock/bridge/terminal” (RFM 21) is implemented in the Inland AIS station: Record all messages on VDL and transmit binary broadcast message 6 (RFM 21) from EUT.

Required results

a) Confirm that data transmitted by the EUT complies with manual and sensor inputs.

   Confirm that the draught value of message 5 equals the draught value of RFM 10 rounded upwards.

   Confirm that the ”Type of Ship and Cargo” of message 5 is set according the ship type in Inland Vessel Data Report translated by VTT Appendix E (shall be shown as value “90”).

b) Confirm that EUT transmits AIS message 8 with proper content (check all numbers) as RFM 55 and as IMO binary message IFM 16 (with summarized numbers of persons on board).

c) If the compilation of “ETA at lock/bridge/terminal” (RFM 21) is implemented in the Inland AIS station: Confirm that EUT transmits RFM 21 with “number of assisting tug boats” and “air draught” set according to the manual inputs.

14.4 Reporting rates

(6.5.2, M.1371/A2-4.3)

14.4.1 Speed and course change

Refer to IEC 61993-2 : 2001.

14.4.2 Change of navigational status

Refer to IEC 61993-2 : 2001.

14.4.3 Assigned reporting rates

Method of measurement

Set up standard test environment and operate EUT in autonomous mode. Transmit an Assigned mode command message 16 to the EUT with:

a) initial slot offset and increment;

b) designated reporting interval.

Change course, speed and NavStatus. Record transmitted messages.

Required results

Confirm that the EUT transmits position reports message 2 according to the parameters defined by message 16. The reporting interval shall be the autonomous interval if it is less than the reporting interval of the assignment. The EUT shall revert to message 1 or 3 in autonomous mode with standard reporting interval after 4 to 8 min.

14.4.4 Static data reporting rates

(6.5.2, 7.3.3.2)

Method of measurement

Set up standard test environment and operate EUT in autonomous mode.

a) Record the transmitted messages and check for static and voyage related data (message 5 & RFM 10).

b) Change static and/or voyage related station data. Record the transmitted messages and check for static and voyage related data (message 5).

Required results

a) Confirm that the EUT transmits message 5 with a reporting interval of 6 min and the inland specific RFM 10 not later than 4 seconds after message 5.

b) Confirm that the EUT transmits message 5 and RFM 10 within 1 min reverting to a reporting interval of 6 min.

14.5 Security, event log

Refer to IEC 61993-2 : 2001.

14.6 Initialisation period

Refer to IEC 61993-2 : 2001.

14.7 Channel selection

Refer to IEC 61993-2 : 2001.

14.8 Transceiver protection

Refer to IEC 61993-2 : 2001.

14.9 Alarms and indicators, fall-back arrangements

Refer to IEC 61993-2 : 2001.

14.9.1 Loss of power supply

Refer to IEC 61993-2 : 2001.

14.9.2 Monitoring of functions and integrity

Refer to IEC 61993-2 : 2001.

14.9.2.1 Tx malfunction

Refer to IEC 61993-2 : 2001.

14.9.2.2 Antenna VSWR

Refer to IEC 61993-2 : 2001.

14.9.2.3 Rx malfunction

Refer to IEC 61993-2 : 2001.

14.9.2.4 Loss of UTC

Refer to IEC 61993-2 : 2001.

14.9.2.5 Remote MKD disconnection, when so configured.

Refer to IEC 61993-2 : 2001.

14.9.3 Monitoring of sensor data

Refer to IEC 61993-2 : 2001.

14.9.3.1 Priority of position sensors

(6.1.1.3, 6.10, 6.10.3)

Method of measurement

Set up standard test environment and operate EUT in autonomous mode. Verify the manufacturer's documentation to ascertain the configuration implemented on the EUT for position sensors (see 6.2).

Apply position sensor data in a way that the EUT operates in the states defined below:

a) external DGNSS in use (corrected),

b) internal DGNSS in use (corrected; message 17),

c) internal DGNSS in use (corrected; dedicated external RTCM SC 104 interface),

d) external EPFS in use (uncorrected),

e) internal GNSS in use (uncorrected),

f) no sensor position in use.

Check the ALR sentences and the position accuracy flag in the VDL message 1.

Required results

Verify that the use of position source, position accuracy flag, RAIM flag and position information complies with VTT table 2.1 and IEC 61993-2 : 2001 table 4.

Verify that when the status is changed, an ALR (025, 026, 029, 030), or TXT (021, 022, 023, 024, 025, 027, 028) sentence is sent according to IEC 61993-2 : 2001 table 2 or IEC 61993-2 : 2001 table 3 respectively.

Verify that the status is changed after 5 s when switching downwards and 30 s when switching upwards.

14.9.4 Heading sensor

Refer to IEC 61993-2 : 2001.

14.9.5 Speed sensors

Refer to IEC 61993-2 : 2001.

14.10 Display and control

(6.11)

14.10.1 Data input/output facilities

Method of measurement

Set up standard test environment and operate EUT in autonomous mode.

a) Check the MKD indication.

b) Record received messages and check contents of minimum display.

c) Input static and voyage related data via the MKD.

d) Record transmitted messages and check contents of MKD.

Required results

a) The minimum display shall contain at least three lines of data, with no horizontal scrolling of the range and bearing data display.

b) Confirm that all messages including binary and safety related messages received can be displayed and that means to select messages and data fields to be displayed are available.

c) Confirm that all necessary data can be input.

d) Confirm that all transmitted data is displayed correctly.

14.10.2 Initiate message transmission

Refer to IEC 61993-2 : 2001.

14.10.3 System control

Refer to IEC 61993-2 : 2001.

15. Physical Tests

Refer to IEC 61993-2 : 2001.

16. Specific tests of link layer

(7.3)

16.1 TDMA synchronisation

Refer to IEC 61993-2 : 2001.

16.2 Time division (frame format)

Refer to IEC 61993-2 : 2001.

16.3 Synchronisation jitter

Refer to IEC 61993-2 : 2001.

16.4 Data encoding (bit stuffing)

Refer to IEC 61993-2 : 2001.

16.5 Frame check sequence

Refer to IEC 61993-2 : 2001.

16.6 Slot allocation (Channel access protocols)

(M.1371/A2-3.3.1)

16.6.1 Network entry

Refer to IEC 61993-2 : 2001.

16.6.2 Autonomous scheduled transmissions (SOTDMA)

(M.1371/A2-3.3.2)

Method of measurement

a) Set up standard test environment and operate EUT in autonomous mode. Record transmitted scheduled position reports message 1 and check frame structure. Check CommState of transmitted messages for channel access mode and parameters number of received stations, slot timeout, slot number and slot offset.

b) Repeat the test with 50% channel loading ensuring there are at least 4 free slots in each SI.

Required results

a) Check that nominal reporting interval is achieved ±20 % (allocating slots in selection interval SI). Confirm that the EUT allocates new slots NTS within SI after 3 min to 8 min. Check that slot offset indicated in CommState matches slots used for transmission. Check that Class B "CS" are not included in the number of received stations.

b) Check that only free slots are used for transmission

16.6.2 add Autonomous scheduled transmissions (ITDMA)

(M.1371/A2-3.3.2)

Method of measurement

Set up standard test environment and operate EUT in autonomous mode. Set NavStatus of EUT to "at anchor" giving a reporting interval of 3 min. Record transmitted scheduled position reports.

Required results

Check that EUT transmits message 3 and allocates slots using ITDMA and that slot offset indicated in CommState matches slots used for transmission.
Check that nominal reporting interval is achieved ±20 %.

16.6.3 Safety related/Binary message transmission (RATDMA)

(M.1371/A2-3.3.2, 3.3.4.2.1)

Method of measurement

Set up standard test environment and operate EUT in autonomous mode.

a) Apply a 1 slot Binary Broadcast message (message 8) to the PI of the EUT less than 4 s before the next scheduled transmission. Record transmitted messages. Retry with 90 % channel load.

b) Apply a 1 slot Binary Broadcast message (message 8) to the PI of the EUT more than 4 sec before the next scheduled transmission. Record transmitted messages. Retry with 90 % channel load.

c) Apply combinations of Binary Broadcast message (message 8), Addressed Binary message (message 6), Broadcast Safety Related message (message 14) and Addressed Safety Related message (message 12) to the PI of the EUT. Record transmitted messages and output of the PI of the EUT.

Required results

a) Confirm that EUT transmits this message 8 within 4 s using ITDMA..

b) Confirm that EUT transmits this message 8 within 4 s using RATDMA.

c) Confirm that maximum 20 slots can be used per frame for unscheduled messages and that messages using more than 3 slots are rejected. Confirm that sentence ABK is sent with acknowledge type 2 (message could not be broadcast) when the message is rejected.

16.6.3 add 1 Transmission of message 5 (ITDMA)

(M.1371/A2-3.3.2, 3.3.4.2.1, 3.3.4.1)

Method of measurement

Set up standard test environment and operate EUT in autonomous mode. Record transmitted messages.

Required results

Confirm that EUT transmits message 5 using the ITDMA access scheme. The ITDMA access scheme shall replace a scheduled position report message 1 with a message 3.

16.6.3 add 2 Transmission of inland ship static and voyage related data RFM 10 (DAC 200 / FI 10) (ITDMA)

(6.5.1, Table 11, M.1371/A2-3.3.7, A8)

Method of measurement

Set up standard test environment and operate EUT in autonomous mode. Record transmitted messages.

Required results

Confirm that EUT transmits Inland specific message RFM 10 using the ITDMA access scheme. The ITDMA access scheme shall replace a scheduled position report message 1 with a message 3.

16.6.4 Assigned operation

(M.1371/A2-3.3.6)

Refer to IEC 61993-2 : 2001.

16.6.5 Fixed allocated transmissions (FATDMA)

Refer to IEC 61993-2 : 2001.

16.6.6 Group assignment

(6.1.3, 7.3.3.1, M.1371/A8-3.12, A8-3.19, A2-3.3.6)

16.6.6.1 Assignment priority

16.6.6.1.1 Assignment by message 22

Method of measurement

Set up standard test environment and operate EUT in autonomous mode. Transmit an Assigned mode command (message 23) to the EUT with TX/RX mode 1.

a) Transmit a message 22 defining a region with the EUT inside that region. Transmit a message 22 to the EUT individually addressed and specifying TX/RX mode 2

b) Repeat the test, clear the region defined by message 22 under a)[2]. Transmit message 22 to the EUT with regional settings specifying TX/RX mode 2

Record transmitted messages.

Required results

a) The Tx/Rx mode field setting of message 22 shall take precedence over the Tx/Rx mode field setting of message 23.

b) The Tx/Rx mode field setting of message 23 shall take precedence over the Tx/Rx mode field setting of message 22. The receiving station shall revert to its previous Tx/Rx mode after a timeout value randomly chosen between 240 sec and 480 sec.

2 This can be carried out by assigning a new simulated position to the EUT.

16.6.6.1.2 Assignment by manual input (e.g.: $PIWWIVD)

Group assignment commands have precedence of assignments by manual input.

Method of measurement

Address the EUT with an AIS message 23 to bring the EUT in assigned mode. Record VDL and verify the reaction of the EUT. Apply an assignment by manual input with a different reporting interval (MKD or $PIWWIVD).

Required results

Verify that the EUT ignores the assignment by manual input.

16.6.6.1.3 Assignment by message 16

Messages which are addressed directly to an AIS Transponder have precedence of group assignment commands and manual assignments. Following test should verify the assignment priority of these messages.

Method of measurement

Set up the standard test environment and operate EUT in autonomous mode. Input sensor data to achieve a reporting interval of 10 sec.

a) Address the EUT with an AIS message 16 to bring the EUT in assigned mode with a reporting interval of 5 seconds. Record VDL and verify the reaction of the EUT.

b) Apply a message 23 with a reporting interval of 2 seconds. Construct message 23 in that way that the EUT will be addressed by the message.

c) Apply a manual assignment input with a reporting interval of 2 seconds (MKD or $PIWWIVD).

Required results

a) Verify that the reporting interval is 5 s.

b) Verify that the EUT ignores the command given by message 23.

c) Verify that the EUT ignores the command given by manual assignment.

16.6.6.2 Increased reporting interval assignment

16.6.6.2.1 Increased reporting interval assignment by message 23

(7.3.3.1, M.1371/A2-3.3.6)

Method of measurement

Set up the standard test environment and operate EUT in autonomous mode.

a) Transmit a Group Assignment message (message 23) to the EUT with a reporting interval greater than the autonomous reporting interval.

b) Transmit a Group Assignment message (message 23) to the EUT with a quiet time command.

Record transmitted messages.

Required results

Confirm that the EUT transmits position reports with the autonomous reporting interval in both a) and b).

16.6.6.2.2 Increased reporting interval assignment by manual input (e.g.: $PIWWIVD)

(7.3.3.1, M.1371/A2-3.3.6, E.1.6)

Method of measurement

Set up the standard test environment and operate EUT in autonomous mode.

a) Apply a manual input assignment to the EUT with a reporting interval greater than the autonomous reporting interval (MKD or $PIWWIVD).

b) Apply a manual input assignment to the EUT with a quiet time command (MKD or $PIWWIVD).

Record transmitted messages.

Required results

Confirm that the EUT transmits position reports with the autonomous reporting interval in a) and b).

16.6.6.3 Entering interval assignment

16.6.6.3.1 Entering interval assignment

Method of measurement

Set up standard test environment and operate EUT in autonomous mode. Transmit a Group Assignment command (message 23) to the EUT with a reporting interval of 5 s assigned, monitor the VDL, reset by assigning 30 s reporting interval; repeat 10 times.

Required results

Verify that the first transmission after receiving the message 23 is within a time randomly selected between the time the message 23 has been received and the assigned interval.

16.6.6.3.2 Addressing by geographic region

Method of measurement

Set up standard test environment and operate EUT in autonomous mode with a reporting interval of 10 seconds.

a) Transmit a Group Assignment command (message 23) to the EUT (define station type 0 and geographic region so that the EUT is inside this region). Set the reporting rate to 2 seconds and apply message to VDL.

b) Transmit a Group Assignment command (message 23) to the EUT (define station type 0 and geographic region so that the EUT is outside this region). Set the reporting rate to 2 seconds and apply message to VDL.

Required result

a) Verify that the first transmission after receiving the message 23 is within a time randomly selected between the time the message 23 has been received and the assigned interval. Verify that EUT switches to assigned mode and transmits position reports with 2 seconds. Verify that EUT reverts to normal operation mode after timeout period.

b) Verify that EUT declines message 23.

Addressing by station type.

Method of measurement

Set up standard test environment and operate EUT in autonomous mode with a reporting interval of 10 seconds.

a) Transmit a Group Assignment command (message 23) to the EUT (define geographic region so that the EUT is inside this region). Set the reporting interval to 2 seconds and the station type to 0 (all stations).

b) Transmit a Group Assignment command (message23) to the EUT (define geographic region so that the EUT is inside this region). Set the reporting interval to 2 seconds and the station type to 4 (A to N).

c) Transmit a Group Assignment command (message23) to the EUT (define geographic region so that the EUT is inside this region). Set the reporting interval to 5 seconds and the station type to 6 (Inland Waterway). Apply this message to the VDL again within 4 minutes. Record VDL and check reaction of the EUT.

Required result

a) Verify that EUT switches to assigned mode and transmits position reports with 2 seconds reporting interval. Verify that EUT reverts to autonomous mode after timeout period.

b) Verify that EUT declines message 23.

c) Verify that EUT switches to assigned mode and transmits position reports with 5 seconds reporting interval. Verify that EUT reverts to autonomous operation mode after timeout period of second transmitted group assignment.

16.6.6.3.4 Addressing by ship and cargo type

Method of measurement

Set up standard test environment and operate EUT in autonomous mode with a reporting interval of 10 seconds.

a) Transmit a Group Assignment command (message 23) to the EUT (define geographic region so that the EUT is inside this region). Set the reporting interval to 2 seconds and the ship and cargo value to a desired value. Make sure that this value is also configured in the EUT.

b) Transmit a Group Assignment command (message 23) to the EUT (define geographic region so that the EUT is inside this region). Set the reporting interval to 2 seconds and the ship and cargo value to a desired value. Make sure that a different value is configured in the EUT.

Required result

a) Verify that EUT switches to assigned mode and transmits position reports with 2 seconds reporting interval. Verify that EUT reverts to autonomous mode after timeout period.

b) Verify that EUT declines message 23.

16.6.6.4 Reverting from interval assignment

Method of measurement

Set up standard test environment and operate EUT in autonomous mode. Transmit a Group Assignment command (message 23) to the EUT with a reporting interval of 5 s assigned, monitor the VDL until at least 1 minute after timeout occurred; repeat 10 times (transmissions of message 23 shall not be synchronised to the initial transmission schedule of the EUT).

Measure the time T_{rev} between the reception of message 23 and first transmission after timeout.

Required result

T_{rev} shall be randomly distributed between 240 s and 480 s.

16.7 Message formats

(7.3.3, M.1371/A2-3.3.7, A8)

16.7.1 Received messages

Refer to IEC 61993-2 : 2001.

16.7.2 Transmitted messages

Refer to IEC 61993-2 : 2001.

16.8 Inland AIS message formats

(6.5.1, Table 11, M.1371/A2-3.3.7, A8)

16.8.1 Received Inland specific messages

Method of measurement

Set up standard test environment and operate EUT in autonomous mode.

a) Apply following Inland specific messages using binary message (message 8) to the VDL:
   - Inland ship static and voyage related data Inland specific RFM 10 (DAC 200 / FI 10)
   - EMMA warning Inland specific RFM 23 (DAC 200 / FI 23)
   - Water level Inland specific RFM24 (DAC 200 / FI 24)
   - Signal status Inland specific RFM 40 (DAC 200 / FI 40)
   - Inland number of persons onboard Inland specific RFM 55 (DAC 200 / FI 55)
   - Number of persons on board International Function message 16 (DAC 001 / FI 16).

b) Apply following addressed Inland specific messages using binary message (message 6; EUT as destination) to the VDL.
   - RTA at lock/bridge/terminal Inland specific RFM 22 (DAC 200 / FI 22)
   - Inland number of persons onboard Inland specific RFM 55 (DAC 200 / FI 55)
   - Number of persons on board International Function message 16 (DAC 001 / FI 16).

c) Apply an addressed Inland specific messages using addressed binary message (message 6; other station as destination) to the VDL.

d) Apply position report (message 1, 2 or 3) with parameter “Blue sign set” and static and voyage related data (message 5) to the VDL.

Record transmitted messages and frame structure.

Required results

a) Confirm that EUT outputs the received message via the presentation interface properly. If implemented confirm that EUT displays received Inland specific message accordingly.

b) Confirm that EUT outputs the received message via the presentation interface properly. Check that EUT transmits the appropriate acknowledgement message for addressed messages. If implemented confirm that EUT displays received Inland specific message accordingly.

c) Confirm that the EUT does not output the message 6 (addressed to other station) on the presentation interface. If implemented confirm that EUT does not display the received Inland specific message addressed to other station as destination.

d) Confirm that EUT outputs the received message via the presentation interface properly. If implemented confirm that EUT displays the information “Blue sign set” only when Inland ship static and voyage related data RFM 10 (using message 8) has been received before.

16.8.2 Transmitted inland specific messages

(6.5.1, M.1371/A8)

Set up standard test environment and operate EUT in autonomous mode. Apply all static, dynamic and voyage related data to the EUT (over MKD, $--SSD, $--VSD, $PIWWIVD and $PIWWSSD). Record all messages on VDL and check the contents of the relevant messages. For all sub-points make sure that values transmitted to the EUT by MKD or PI sentences are stored in the EUT even after disconnecting the power supply. Examine VDL messages of EUT and figure out if defined values are used.

16.8.2.1 Position report message 1, 2 or 3

(6.5.4.1)

Blue Sign information may be derived by a direct connected switch or by the regional bits of the periodically received PI sentence ($--VSD). The presence of the direct connected switch shall be made available by automatic means or manual configuration. Ensure that Blue Sign information derived from direct connected switch has precedence of transferred NMEA commands (regional bits of $--VSD sentence).

Method of measurement

Set up standard test environment and operate EUT in autonomous mode.

a) Apply a valid VSD sentence with the regional application flag set to:

"Blue sign not set" (two most significant bits =1)

"Blue sign is set" (two most significant bits =2)

"Blue sign information is not available" (two most significant bits = 0).

b) Set the input data for Blue sign information in VSD to invalid (e.g. wrong checksum).

c) Apply a valid VSD sentence with the regional application flag set to 2. Disconnect VSD input for Blue sign information.

d) Connect Blue Sign switch to EUT in a way that the Blue Sign value is set to 1 (= not set).

e) Change Blue Sign value to 2 (= set) by direct connected switch to EUT.

f) Change Blue Sign value to 1 (= not set) by applying VSD sentence (regional bits of VSD sentence) to EUT.

g) Disconnect Blue Sign switch from EUT in a way that Blue Sign value is set to 0 (=not available).

Required results

a) Check the parameter blue sign in VDL message 1, 2, 3:

1 = not engaged in special manoeuvre (blue sign not set)

2 = engaged in special manoeuvre (blue sign set).

0 = not available.

Confirm that EUT transmits message 1 or 2 or 3 with blue sign value accordingly.

Confirm that EUT does not transmit message 5 for unchanged data derived from PI sentence (VSD).

b) Confirm that EUT switches blue sign value to 0 (= not available) within 2 seconds after invalid input (check PI Output, VDO sentence) and that EUT transmits message 1 or 2 or 3 with blue sign value 0 (= not available).

c) Confirm that EUT switches blue sign value to 0 (= not available) within 2 seconds after invalid input (check PI Output, VDO sentence) and that EUT transmits message 1 or 2 or 3 with blue sign value 0 (= not available).

d) Confirm that EUT transmits message 1 or 2 or 3 with blue sign value 1 (= not set).

e) Confirm that EUT transmits message 1 or 2 or 3 with blue sign value 2 (= set).

f) Confirm that EUT ignores Blue Sign information derived from VSD sentence.

g) Confirm that EUT transmits message 1 or 2 or 3 with blue sign value 0 (= not available).

16.8.2.2 Inland ship static and voyage related data RFM 10 (DAC 200 / FI 10)

(6.5.4.1, 7.3.3, 7.3.3.2)

Method of measurement

a) Operate EUT in autonomous mode and record messages on VDL.

b) Switch off EUT by disconnecting power supply. Reconnect Power and record messages on VDL.

Required results

a) Confirm that EUT transmits “Inland ship static and voyage related data” RFM 10 (DAC=200 / FI=10) within 4 seconds after AIS message 5 using binary broadcast message 8. Check binary message and confirm that content matches with parameters stored in EUT.

b) Confirm that EUT transmits “Inland ship static and voyage related data” RFM 10 within 4 seconds after AIS message 5 using binary broadcast message 8 DAC 200 / FI 10 after start-up. Check binary message and confirm that content matches with parameters stored in EUT.

16.8.2.3 ETA at lock / bridge / terminal RFM 21 (DAC 200 / FI 21)

(6.5.4.1)

This message should be sent by Inland AIS stations only, to send an ETA report to a lock, bridge or terminal in order to apply for a time slot in resource planning. The message should be sent with binary message 6. The compilation of RFM21 could be implemented by internal or external means. An acknowledgement by RFM 22 should be received within 15 minutes. Otherwise the RFM 21 should be repeated once.

Method of measurement

a) Send application message RFM 21 (DAC 200 / FI 21) from EUT by using addressed binary message 6. Respond to this message via VDL within 15 minutes by using application message DAC 200 / FI22. Record VDL for a time period greater than 15 minutes.

b) Send application message RFM 21 (DAC 200 / FI 21) from EUT by using addressed binary message 6 and do not respond to this message via VDL. Wait for a time period greater than 15 minutes and record VDL.

Required results

a) Confirm that EUT transmits AIS message 6 RFM 21 with proper content. Check that the responding application message RFM 22 (DAC 200 / FI 22) applied to VDL is outputted by EUT on ECDIS port. If the compilation of RFM 21 is implemented in the Inland AIS station, then make sure that EUT does not repeat application message RFM 21 after 15 minutes.

b) If the compilation of RFM 21 is implemented in the Inland AIS station, then confirm that EUT transmits AIS message 6 RFM 21 with proper content. Record VDL and check if EUT repeats application message RFM 21 after 15 minutes. Observe VDL for additional 15 minutes and confirm that EUT does not transmit application message RFM 21 again.

16.8.2.4 Persons on board RFM 55 (DAC 200 / FI 55)

(6.5.4.1)

This message should be used by inland vessels only, to send the number of persons on Board to a competent authority in order to inform about the number of persons on board. The message should be sent with binary message 6 RFM 55 (DAC 200, FI 55). Alternatively the Standard IMO binary message “number of persons on board” (IFM 16) could be used.

Method of measurement

a) Initiate transmission of persons on board message as RFM 55 and IFM 16 by MKD.

Required results

a) Confirm that EUT transmits AIS message 6 with proper content (check all numbers) as RFM 55 and IFM 16 (with summarized numbers of persons on board).

16.8.3 Transmit inland specific interrogation messages

16.8.3.1 Transmit an interrogation for a specific FM (IFM 2)

Method of measurement
Set up standard test environment and operate EUT in autonomous mode.
Apply an ABM sentence containing an IFM 2 (Interrogation for a specific FM) using binary message 6 to request ”Inland ship and voyage related data (RFM 10)”. Record transmitted messages.

a) Send an IFM 2 with DAC = 200, request DAC = 200 and requested FI = 10.

b) Send an IFM 2 with DAC = 303, request DAC = 200 and requested FI = 10.

c) Send an IFM 2 with DAC = 200, request DAC = 303 and requested FI = 10.

Required results

Check that EUT reacts as follows:

a) Verify that EUT sends interrogation message on VDL using binary message 6 and that DAC FI and requested DAC are correct.

b) Verify that EUT sends interrogation message on VDL using binary message 6 and that DAC FI and requested DAC are correct.

c) Verify that EUT sends interrogation message on VDL using binary message 6 and that DAC FI and requested DAC are correct.

16.8.3.2 Transmit a capability interrogation (IFM 3)

Method of measurement

Set up standard test environment and operate EUT in autonomous mode. Apply an ABM sentence containing IFM 3 (Capability Interrogation) using binary message 6 to the VDL with DAC = 200, FI = 3, Requested DAC = 200 and Requested FI = 3.

Required results

Check that the EUT transmits a binary addressed message 6 and confirm that the content of message is correct.

16.8.4 Respond to inland specific interrogation messages

16.8.4.1 Response to “Capability interrogation” (IFM 3) with “Capability reply” (IFM 4)

Method of measurement

Set up standard test environment and operate EUT in autonomous mode.

a) Apply an IFM 3 (Capability interrogation) using addressed binary message (message 6) to the VDL with requested DAC = 200. Record transmitted messages.

b) Repeat the test with DAC = 303.

c) Repeat the test with DAC = 001.

Required results

a) Check that the EUT transmits the appropriate response “Capability reply” (IFM 4) using addressed binary message (message 6) addressed to the interrogator. Check the content of this message in accordance to the specification in ITU-R M.1371. Verify that at least the DAC 200 / FI 10 and DAC 200 / FI 55 for Inland AIS are included in the binary structure. Confirm that the EUT transmits the response on the same channel as where the request was received.

b) Confirm that the EUT does not respond.

c) Check that the EUT transmits the appropriate response “Capability reply” (IFM 4) using addressed binary message (message 6) addressed to the interrogator. Check the content of this message in accordance to the specification in ITU-R M.1371. Verify that at least the DAC 001 / FI 16 is included in the binary structure. Confirm that the EUT transmits the response on the same channel as where the request was received.

16.8.4.2 Response to interrogation for ”Inland ship static and voyage related data” (RFM 10)

Method of measurement

Set up standard test environment and operate EUT in autonomous mode. Apply an IFM 2 (Interrogation for a specific FM) using binary message 6 to request “Inland ship and voyage related data” (RFM 10) to the VDL. Record transmitted messages.

a) Request “Inland ship and voyage related data” (RFM 10) with DAC = 200, FI10.

b) Request “Inland ship and voyage related data” (RFM 10) with DAC = 303, FI10.

Required results

Check that EUT reacts as follows:

a) EUT shall respond to interrogation with “Inland ship and voyage related data” (IFM 10) using binary message 6.

b) EUT shall not respond.

16.8.4.3 Response to interrogation for “Number of Persons on board” (RFM 55 and IFM 16)

Method of measurement

Set up standard test environment and operate EUT in autonomous mode.
Apply an International Function message IFM 2 (Interrogation for a specific FM) using binary message 6 to request Inland number of persons onboard to the VDL. Record transmitted messages.

a) Request “number of persons on board” with DAC = 200, FI55.

b) Request “number of persons on board” with DAC = 303, FI55.

c) Request “number of persons on board” with DAC = 001, FI16.

Required results

Check that EUT reacts as follows:

a) Confirm that EUT transmits AIS message 6 with proper content (check all numbers) as inland specific RFM 55.

b) EUT shall not respond.

c) Confirm that EUT transmits AIS message 6 with proper content (check all numbers) as IMO binary message IFM 16 (with summarized numbers of persons on board).

17. Specific tests of network layer

(7.4)

17.1 Dual channel operation

(M.1371/A2-4.1)

Refer to IEC 61993-2 : 2001.

17.2 Regional area designation by VDL message

(M.1371/A2-4.1)

Refer to IEC 61993-2 : 2001.

17.3 Regional area designation by serial message

(M.1371/A2-4.1.3)

Refer to IEC 61993-2 : 2001.

17.3 add Regional area designation with lost position

(M.1371/A2-4.1.3)

Method of measurement

Repeat test 17.2 using ACA sentence for channel assignment.

a) Disable position information; apply new addressed msg 22.

b) Make position information available again and query for area settings (ACA request).

Required results

a) Verify that the settings of the current area are still being used; check that settings of new addressed msg 22 are adopted.

b) Check that all area settings are still available.

17.4 Power setting

(M.1371/A2-4.1.3)

Refer to IEC 61993-2 : 2001.

17.5 Message priority handling

(M.1371/A2-4.2.3, A8-2)

Refer to IEC 61993-2 : 2001.

17.6 Slot reuse (link congestion)

Refer to IEC 61993-2 : 2001.

17.7 Management of received regional operating settings

Refer to IEC 61993-2 : 2001.

17.8 Continuation of autonomous mode reporting rate

(M.1371/A2-3.3.6)

Refer to IEC 61993-2 : 2001.

18. Specific tests of Transport Layer

Refer to IEC 61993-2 : 2001.

19. Specific presentation interface tests

Refer to IEC 61993-2 : 2001.

19 add Output of undefined VDL messages

(0, 0)

Method of measurement
Set up standard test environment and operate EUT in autonomous mode. Verify that AIS messages with undefined data contents according to Table 11 Use of VDL messages (message type 27 or higher) are output by the PI.

Required results
Confirm that EUT outputs all undefined received messages to the PI. Repeat test for port "auxiliary display".

20. DSC functionality tests

20.1 General

Refer to IEC 61993-2 : 2001.

20.2 Regional area designation

Refer to IEC 61993-2 : 2001.

20.3 Scheduling

Not mandatory for Inland AIS

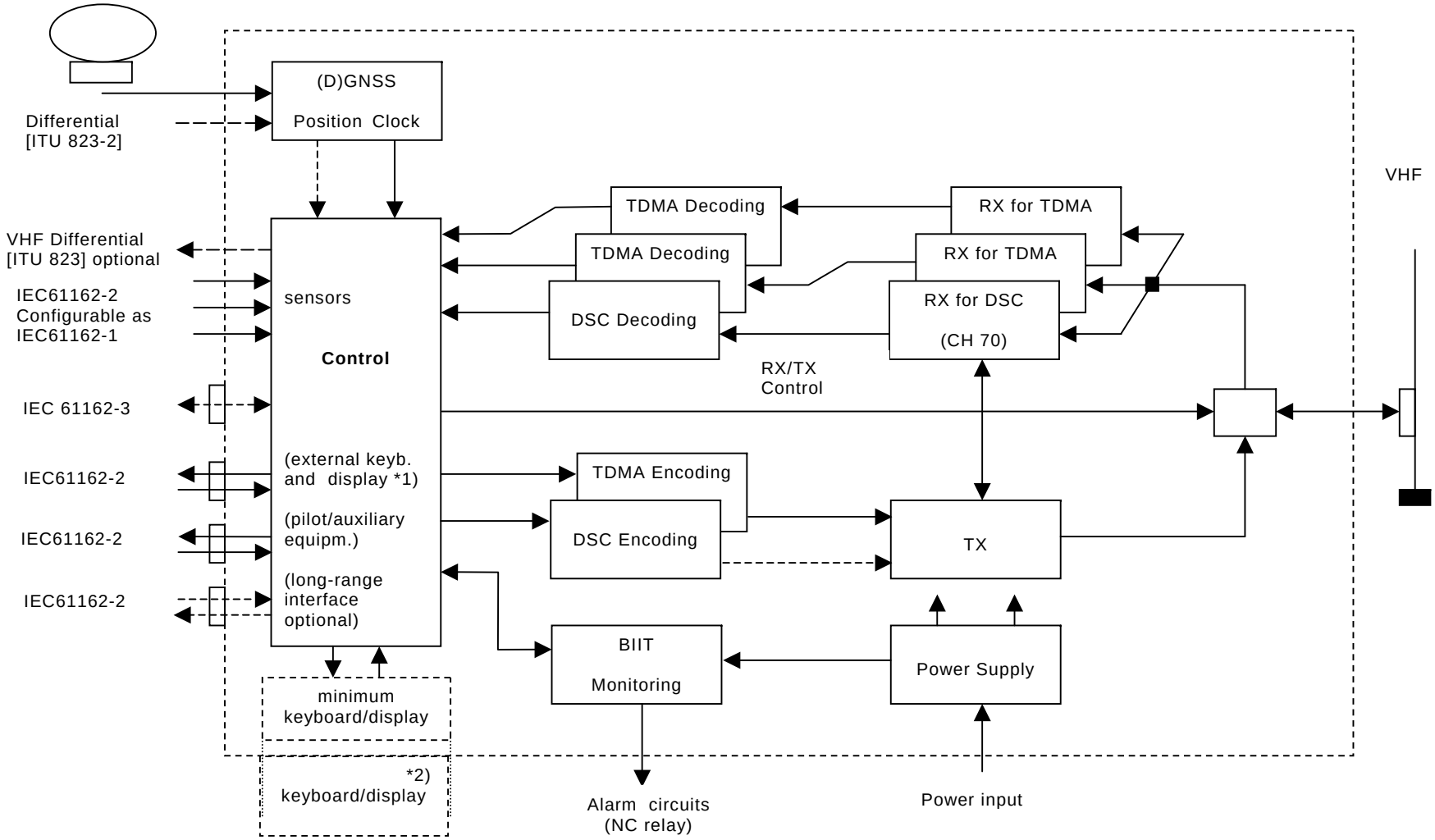
20.4 Polling

Not mandatory for Inland AIS

21. Long Range functionality tests

Not mandatory for Inland AIS

Annex A (informative) Block diagram of AIS



*1) The external keyboard/display may be e.g. a radar, ECDIS or dedicated devices.
*2) The internal keyboard/display may be optionally

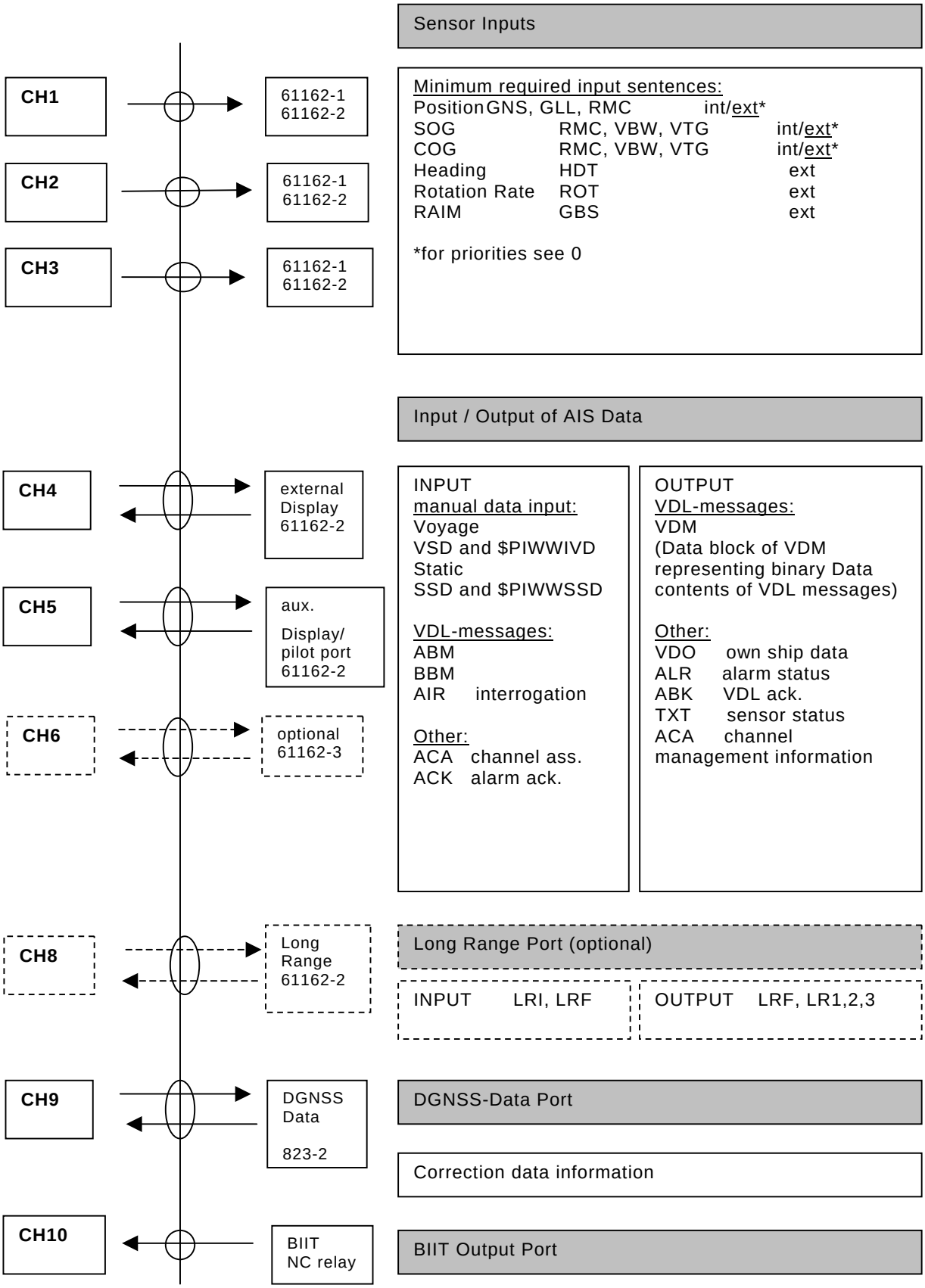
Annex B (informative) New IEC 61162-1 sentences due to AIS

Refer to IEC 61993-2 : 2001.

Annex C (normative) Long range application

Not mandatory for Inland AIS

Annex D (normative) AIS Interface Overview



Annex E (informative) Block diagram of AIS test system

Refer to IEC 61993-2 : 2001.

Annex F (Normative) Additional PI port sentences for Inland AIS

F.1 Inland Waterway voyage data

This sentence is used to change setting which are not covered by SSD and VSD. Because these items have to be protected the settings shall be accepted only in combination with a preceding password sentence.

```
$PIWWIVD,x,x,x,xx.xx,xx.xx,x,xxx,xxxx,xxx*hh<CR><LF>
field    1 2 3 4     5     6 7   8    9
```

Field	Format	Description
1	x	See Table 2.5 Reporting rate settings, default setting: 0
2	x	number of blue cones: 0-3, 4=B-Flag, 5=default=unknown
3	x	0=not available=default, 1=loaded, 2=unloaded, rest not used
4	xx.xx	static draught of ship 0 to 20,00 meters, 0=unknown=default, rest not used
5	xx.xx	air draught of ship 0 to 40,00 meters, 0=unknown=default, rest not used
6	x	number of assisting tugboat 0-6, 7=default=unknown, rest not used
7	xxx	number of crew members on board 0 to 254, 255=unknown=default, rest not
8	xxxx	number of passengers on board 0 to 8190, 8191=unknown=default, rest not used
9	xxx	number of shipboard personnel on board 0 to 254, 255=unknown=default, rest not used

In case of null fields the corresponding configuration setting shall not be changed.

F.2 Inland Waterway Static Ship data

```
$PIWWSSD,cccccccc,xxxx,xxx.x,xxx.x,x,x,x*hh<CR><LF>
field    1        2    3     4     5 6 7
```

Field	Format	Description
1	cccccccc	ENI number
2	Xxxx	ERI ship type according to ERI classification (see Vessel Tracking and Tracing Standard for Inland Navigation, Edition 1.0, Annex E, CCNR, 31.5.2006)
3	xxx.x	length of ship 0 to 800,0 meter
4	xxx.x	beam of ship 0 to 100,0 meter
5	X	quality of speed information 1=high or 0=low
6	X	quality of course information 1=high or 0=low
7	x	quality of heading information 1=high or 0=low