

# INTERNATIONAL STANDARD

**IEC**  
**61162-1**

Second edition  
2000-07

---

---

## **Maritime navigation and radiocommunication equipment and systems – Digital interfaces –**

### **Part 1: Single talker and multiple listeners**

*Matériels et systèmes de navigation et  
de radiocommunication maritimes –  
Interfaces numériques –*

*Partie 1:  
Émetteur unique et récepteurs multiples*



Reference number  
IEC 61162-1:2000(E)

## Numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series.

## Consolidated publications

Consolidated versions of some IEC publications including amendments are available. For example, edition numbers 1.0, 1.1 and 1.2 refer, respectively, to the base publication, the base publication incorporating amendment 1 and the base publication incorporating amendments 1 and 2.

## Validity of this publication

The technical content of IEC publications is kept under constant review by the IEC, thus ensuring that the content reflects current technology.

Information relating to the date of the reconfirmation of the publication is available in the IEC catalogue.

Information on the subjects under consideration and work in progress undertaken by the technical committee which has prepared this publication, as well as the list of publications issued, is to be found at the following IEC sources:

- **IEC web site\***
- **Catalogue of IEC publications**  
Published yearly with regular updates  
(On-line catalogue)\*
- **IEC Bulletin**  
Available both at the IEC web site\* and as a printed periodical

## Terminology, graphical and letter symbols

For general terminology, readers are referred to IEC 60050: *International Electrotechnical Vocabulary* (IEV).

For graphical symbols, and letter symbols and signs approved by the IEC for general use, readers are referred to publications IEC 60027: *Letter symbols to be used in electrical technology*, IEC 60417: *Graphical symbols for use on equipment. Index, survey and compilation of the single sheets* and IEC 60617: *Graphical symbols for diagrams*.

\* See web site address on title page.

# INTERNATIONAL STANDARD

# IEC 61162-1

Second edition  
2000-07

---

---

## Maritime navigation and radiocommunication equipment and systems – Digital interfaces –

### Part 1: Single talker and multiple listeners

*Matériels et systèmes de navigation et  
de radiocommunication maritimes –  
Interfaces numériques –*

*Partie 1:  
Émetteur unique et récepteurs multiples*

© IEC 2000 — Copyright - all rights reserved

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Electrotechnical Commission 3, rue de Varembe Geneva, Switzerland  
Telefax: +41 22 919 0300 e-mail: [inmail@iec.ch](mailto:inmail@iec.ch) IEC web site <http://www.iec.ch>



Commission Electrotechnique Internationale  
International Electrotechnical Commission  
Международная Электротехническая Комиссия

PRICE CODE **W**

*For price, see current catalogue*

## CONTENTS

	Page
FOREWORD .....	3
INTRODUCTION .....	5
 Clause	
1 General.....	6
1.1 Scope .....	6
1.2 Normative references .....	6
1.3 Definitions.....	7
2 Manufacturer's documentation.....	7
3 Hardware specification .....	8
3.1 Interconnecting wire .....	8
3.2 Conductor definitions .....	8
3.3 Electrical connections/shield requirements .....	8
3.4 Connector .....	8
3.5 Electrical signal characteristics.....	8
4 Data transmission .....	9
5 Data format protocol.....	10
5.1 Characters .....	10
5.2 Fields.....	11
5.3 Sentences.....	12
6 Data content .....	16
6.1 Character definitions .....	16
6.2 Field definitions.....	19
6.3 Approved sentences.....	22
7 Applications .....	55
7.1 Example sentence.....	55
7.2 Examples of receiver diagrams .....	58
 Annex A (informative) Minimum required sentences for equipment with digital interfaces conforming to IMO resolutions and ITU recommendations and their association with the relevant IEC and ISO standards .....	 59
Annex B (informative) Glossary .....	63
Annex C (normative) Guidelines for methods of testing and required test results .....	70
 Bibliography .....	 76

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

**Part 1: Single talker and multiple listeners**

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61162-1 has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems.

This second edition cancels and replaces the first edition published in 1995, and constitutes a technical revision. This part of IEC 61162 is closely aligned with NMEA 0183 version 2.30.

The text of this standard is based upon the following documents:

FDIS	Report on voting
80/240/FDIS	80/264/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

Annex C forms an integral part of this standard.

Annexes A and B are for information only.

The committee has decided that the contents of this publication will remain unchanged until 2004. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

## INTRODUCTION

IEC TC 80 interface standards are developed with input from manufacturers, private and government organisations and equipment operators. The information contained in this standard is intended to meet the needs of users at the time of publication, but users must recognise that as applications and technology change, interface standards must change as well. Users of this document are advised to immediately inform the IEC of any perceived inadequacies in this standard.

The following notes provide the background to changes introduced to the first edition of this standard.

NOTE 1 The sentences in IEC 61162-1:1995-11 which were indicated as “(to be further developed)” have now been developed. The sentences involved are:

DSC – Digital selective calling (DSC) (see also DSE, DSI and DSR)

DTM – Datum reference

ASD – Autopilot system data has been deleted and renamed in line with IMO definitions – see HTC and HTD below.

NOTE 2 New sentences have been added:

ACK	Acknowledge alarm
ALR	Set alarm state
DSE	Expanded digital selective calling
DSI	DSC transponder initiate
DSR	DSC transponder response
GNS	GNSS fix data
HMS	Heading monitor set
HMR	Heading monitor receive
HTC	Heading/track control command
HTD	Heading/track control data
MLA	GLONASS almanac data
MWD	Wind direction and speed
TLB	Target label
TXT	Text transmission

NOTE 3 The following sentences have been deleted, as the systems referred to are no longer in operation:

GXA – TRANSIT position, OLN – OMEGA lane numbers, TRF – TRANSIT fix data.

NOTE 4 Detailed modifications have been made to the following sentences:

FSI, GBS, GGA, GRS, MSK, MSS, OSD, RMA, RMB, RMC, SFI, TLL, TTM, VBW, XDR and ZDA.

Details of the changes are given in the relevant pages.

NOTE 5 A mode indicator character field “a” has been added as a new last data field to specific sentences, namely APB, BWC, BWR, GLL, RMA, RMB, RMC, VTG, WCV and XTE.

The mode indicator character “a” has been defined to include the following when used in the designated sentences:

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

NOTE 6 A note has been added to sentences APB, GLL, RMA, RMB, RMC and XTE (which contain a status field “A”) as follows:

“Note: the mode indicator field supplements the status field (field n), the status field shall be set to V = Invalid for all values of mode indicator except for A = Autonomous and D = Differential.”

NOTE 7 A note has been added to all appropriate sentences to state that “the quality indicator, mode indicator, operating mode and status fields shall not be null fields.”

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

## Part 1: Single talker and multiple listeners

### 1 General

#### 1.1 Scope

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

This standard is intended to support one-way serial data transmission from a single talker to one or more listeners. This data is in printable ASCII form and may include information such as position, speed, depth, frequency allocation, etc. Typical messages may be from about 20 to a maximum of 79 characters in length and generally require transmission no more rapidly than one message per second.

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

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

Annex A contains a list of relevant International Maritime Organization (IMO) resolutions and International Telecommunication Union (ITU) recommendations to which this standard applies.

#### 1.2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61162. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 61162 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

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

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

ITU-R M.493-9:1997, *Digital selective-calling system for use in the maritime mobile service*

ITU-R M.821-1:1997, *Optional expansion of the digital selective-calling system for use in the maritime mobile service*

ITU-R M.825-3:1998, *Characteristics of a transponder system using digital selective calling techniques for use with vessel traffic services and ship-to-ship identification*

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

NMEA 0183:1998, *National Marine Electronics Association (USA) – Standard for interfacing marine electronic devices, version 2.30*

RTCM:1998, *RTCM (Radio Technical Commission for Maritime Services) SC-104 Recommended standards for differential GNSS (Global Navigation Satellite Systems) service, version 2.2*

IHO:1994, *Special publication No. 60, User's handbook on datum transformations involving WGS 84*

GLONASS:1995, *Interface control document*

Rockwell International Corporation ICD-GPS-200:1987, *Interface control document, Navstar GPS space segment/navigation user interface*

### 1.3 Definitions

Common terms are defined in the glossary of annex B. Where there is a conflict, terms shall be interpreted wherever possible in accordance with the references in 1.2.

For the purposes of this part of IEC 61162, the following definitions apply.

#### **talker**

any device which sends data to other devices. The type of talker is identified by a 2-character mnemonic as listed in 6.2 (Table 4)

#### **listener**

any device which receives data from another device

## 2 Manufacturer's documentation

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

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

### 3 Hardware specification

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

#### 3.1 Interconnecting wire

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

#### 3.2 Conductor definitions

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

#### 3.3 Electrical connections/shield requirements

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

#### 3.4 Connector

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

#### 3.5 Electrical signal characteristics

This subclause describes the electrical characteristics of transmitters and receivers.

##### 3.5.1 Signal state definitions

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

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

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

##### 3.5.2 Talker drive circuits

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

##### 3.5.3 Listener receive circuits

Multiple listeners may be connected to a single talker. The listener receive circuit shall consist of an opto-isolator and shall have protective circuits to limit current, reverse bias and power dissipation at the opto-diode as shown in figure 1. Reference is made to example circuits in 7.2.

The receive circuit shall be designed for operation with a minimum differential input voltage of 2,0 V <sup>1)</sup> and shall not take more than 2,0 mA from the line at that voltage.

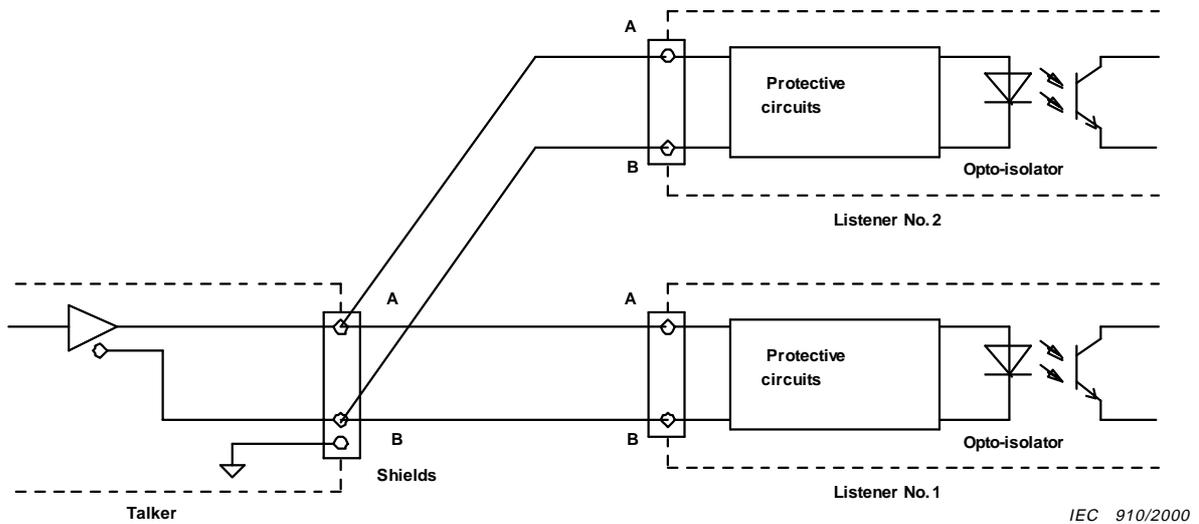


Figure 1 – Listener receive circuit

### 3.5.4 Electrical isolation

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

### 3.5.5 Maximum voltage on bus

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

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

## 4 Data transmission

Data is transmitted in serial asynchronous form in accordance with the standards referenced in 2.1. The first bit is a start bit and is followed by data bits, least-significant-bit first, as illustrated by figure 2.

The following parameters are used:

- baud rate 4 800;
- data bits 8 (D7 = 0), parity none;
- stop bits 1.

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