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**Technical characteristics and methods of measurement for equipment for generation, transmission and reception of Digital Selective Calling (DSC) in the maritime MF, MF/HF and/or VHF mobile service;
Part 8: Enabling DSC radio equipment with remote control capabilities**

Reference
DEN/ERM-TGMAR-087-8

Keywords
DSC, GMDSS, maritime, radio, SAR

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Foreword

This European Standard (EN) has been produced by ETSI Technical Committee Electromagnetic compatibility and Radio spectrum Matters (ERM).

The present document is part 8 of a multi-part deliverable. Full details of the entire series can be found in part 1 [i.1].

National transposition dates	
Date of adoption of this EN:	14 February 2022
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Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

1 Scope

The present document states minimum requirements for GMDSS radiocommunication equipment using Digital Selective Calling (DSC) Class A [2], with the capability to fully operate handling of the automated procedures defined in part 2 of this multi-part deliverable, see ETSI EN 300 338-2 [2] from a remote position such as a central HMI.

In addition other proprietary control interfaces may apply to support full remote control of other DSC EQUIPMENT functions.

Such proprietary control interfaces (whether based on proprietary IEC 61162-1 [3] sentences or other protocols) are not part of the present document, and may co-exist with the requirements in the present document.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at https://docbox.etsi.org/Reference/.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are necessary for the application of the present document.

[1] Recommendation ITU-R M.493-15: "Digital selective-calling system for use in the maritime mobile service".

[2] ETSI EN 300 338-2: "Technical characteristics and methods of measurement for equipment for generation, transmission and reception of Digital Selective Calling (DSC) in the maritime MF, MF/HF and/or VHF mobile service; Part 2: Class A DSC".

[3] IEC 61162-1 edition 5 (2016): "Maritime navigation and radiocommunication equipment and systems - Digital interfaces - Part 1: Single talker and multiple listeners".

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

[5] IEC 61162-450 edition 2 (2018): "Maritime navigation and radiocommunication equipment and systems - Digital interfaces - Part 450: Multiple talkers and multiple listeners - Ethernet interconnection".

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] ETSI EN 300 338-1: "Technical characteristics and methods of measurement for equipment for generation, transmission and reception of Digital Selective Calling (DSC) in the maritime MF, MF/HF and/or VHF mobile service; Part 1: Common requirements".

[i.2] IEC 61097-3 edition 2 (2017): "Global maritime distress and safety system (GMDSS) - Part 3: Digital selective calling (DSC) equipment - Operational and performance requirements, methods of testing and required results".

[i.3] IEC 61162-460 edition 2 (2018): "Maritime navigation and radiocommunication equipment and systems - Digital interfaces - Part 460: Multiple talkers and multiple listeners - Ethernet interconnection - Safety and security".

[i.4] NMEA 0183: "Standard for Interfacing Marine Electronic Devices".

[i.5] ETSI EN 300 338-7: "Technical characteristics and methods of measurement for equipment for generation, transmission and reception of Digital Selective Calling (DSC) in the maritime MF, MF/HF and/or VHF mobile service; Part 7: Implementation of Bridge Alert Management (BAM) in DSC radio equipment".

[i.6] ETSI EN 301 925: "Radiotelephone transmitters and receivers for the maritime mobile service operating in VHF bands; Technical characteristics and methods of measurement".

[i.7] ETSI EN 300 373-1: "Electromagnetic compatibility and Radio spectrum Matters (ERM); Maritime mobile transmitters and receivers for use in the MF and HF bands; Part 1: Technical characteristics and methods of measurement".

[i.8] ITU Radio Regulations (2020).

[i.9] Recommendation ITU-R-M.541-10 (10/2015): "Operational procedures for the use of digital selective-calling equipment in the maritime mobile service".

[i.10] Recommendation ITU-R M.1084-5 (03/2012): "Interim solutions for improved efficiency in the use of the band 156-174 MHz by stations in the maritime mobile service".

[i.11] IMO Resolution A.803(19): "Performance Standards for Shipborne VHF Radio Installations Capable of Voice Communication and Digital Selective Calling".

[i.12] IMO Resolution A.804(19): "Performance Standards for Shipborne MF Radio Installations Capable of Voice Communication and Digital Selective Calling".

[i.13] IMO Resolution A.806(19): "Performance Standards for Shipborne MF/HF Radio Installations Capable of Voice Communication, Narrow-Band Direct Printing and Digital Selective Calling".

[i.14] MSC/Circular.862: "Clarifications of Certain Requirements in IMO Performance Standards for GMDSS Equipment".

[i.15] IEC 62320-2:2016: "Maritime navigation and radiocommunication equipment and systems - Automatic identification system (AIS) - Part 2: AIS AtoN Stations - Operational and performance requirements, methods of testing and required test results".

3 Definition of terms, symbols and abbreviations

3.1 Terms

For the purposes of the present document, the terms given in ETSI EN 300 338-1 [i.1] and the following apply:

acknowledged: automated procedure it indicates that the objective of the initial DSC message has been achieved

activation: initial triggering of the MoB device i.e. both parts of the two step procedure are performed

active mode: activated mode, transmitting in an emergency situation

distress alert: name given to the single distress DSC message with the format symbol 112

distress DSC message: DSC message or acknowledgement containing the distress information

distress information: symbols within a DSC message describing a distress situation consisting of the MMSI of the vessel in distress, the nature of distress, the position of the vessel in distress, the UTC time of that position and the mode of subsequent communication

non distress DSC message: DSC messages or acknowledgements that do not have the format specifier or category of "distress"

3.2 Symbols

Void.

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AAS	Audible Alert Sound
ACn	AC0, AC1, AC2, AC3, AC4 or AC5 sentence
AIn	AI1, AI2, AI3, AI4, AI5, AI6, AI7, AI8, AI9 sentence
AIS	Automatic Identification System
ALC	Cyclic Alert List
ALF	BAM Alert Details
AOn	AO1, AO2, AO3, AO4 or AO5 sentence
AP	Automated procedure
APn	AP0, AP1, AP2, AP3, AP4 or AP5 sentence
ARQ	Automatic Request Query
ASCII	American Standard Communications Indication
AtoN	Aids to Navigation
AUQ	Automated Query Procedure
BIT	Binary Digit
CAM	Central Alert Mechanism
CD	NMEA indicator for DSC
CIRM	Comité International Radio-Maritime
CSTDMA	Carrier Sense Time Division Multiple Access
CUL	Cyclic Procedure List
DCR	Device Capability Report
DROBOSE	Distress Relay On Behalf Of Someone Else
DSC	Digital Selective Calling
DSE	Expanded Digital Selective Calling
ECDIS	Electronic Chart Display and Information Systems
ECI	Enhanced Caller Information EN European Standard
EPFS	Electronic Position Fixing System
EPIRB	Electronic Position Indicating Radio Beacon
EPV	Equipment Property Value
ERM	European Radio Management
FATDMA	Manually Managed AIS TDMA access for AtoN and Base Stations
FEC	Forward Error Correction
FIFO	First in, First Out
FSC	Frequency Status and Command
FSI	Frequency Set information
FSS	Frequency Selection Set
GMDSS	Global Maritime Distress and Safety System
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HBT	Heartbeat
HF	High Frequency
HMI	Human Manual Intervention
IEC	International Electronic Commission
IMO	International Maritime Organisation
IN	NMEA indicator for Integrated Navigation
ITU	International Telecommunication Union

ITU-R	International Telecommunication Union - Radio
LSB	Least Significant Bit
MF	Medium Frequency
MF/HF	Medium Frequencies/High Frequencies [Radio Frequencies]
MHZ	MegaHertz (Frequency indication)
MMSI	Maritime Mobile Service Identity
MOB	Man Over Board
MSB	Most Significant Bit
MSC	Maritime Safety Committee (IMO)
NAK	Negative acknowledgment
NBDP	Narrow Band Direct Printing
NMEA	National Marine Electronics Association
NW	North West point of geographical area location
OK	Accepted
RATDMA	Random Access AIS TDMA for Class 'A' network entry
SFI	Scanning Frequency information
SNGF	Serial Network Gateway Function SNMP Server Network Management Protocol
TAG	Advanced Communications for NMEA networks
TCP/IP	Transmission Control Packet/Internet Protocol
TX/RX	Transmitter/Receiver or Transceiver
UDP	Unaddressed Data Packet
UTC	Universal Time Co-ordinated
VDL	VHF Data Link
VHF	Very High Frequency
VoIP	Voice over IP

4 General requirements

4.1 General

For safety reasons the remote control facility is a functional extension to, not a substitution of, any facilities as required in ETSI EN 300 338-2 [2]. Full compliance with ETSI EN 300 338-2 [2] shall be required.

The remote protocol described in the current document shall support the concept of the automated procedures defined in ITU Recommendation ITU-R M.493-15 [1]. This will enable the simultaneous overview of several active automated procedures on a larger display, as well as supporting distribution of target states to navigation instruments.

The signalling interface defined is also suitable to exploit for testing purposes.

The evolution of new radio performance standards and carriage requirements may initially require only parts of the interface functionality. It shall be possible for the manufacturer to state and document partial compliance to the present document. E.g.:

- Sentences supported.
- Features supported:
    - Information only. Document supported fields of status sentences to reflect radio state - selected from Table 1.
    - Radio control. Document supported fields of control and status sentences - selected from Table 1 and Table 2.

4.2 Interfaces

4.2.1 General

Data interfaces for remote control purposes shall be compatible with at least one of IEC 61162-1 [3], IEC 61162-2 [4] and IEC 61162-450 [5]. The manufacturer shall specify which alternative of IEC 61162 ([3], [4] or [5]) the physical interface supports.

4.2.2 Physical connection

The general required interface may be:

- physically part of the individual equipment/function; or
- connected using a proprietary interface to an external unit supporting the required interfaces towards the remote controller system (e.g. being part of a larger system).

In both configurations, compliance to the present document shall be demonstrated as a whole presented on the required interfaces (clause 4.2.1).

4.2.3 Ethernet protocols

The IEC 61162-1 [3] sentences sent over the Ethernet (see IEC 61162-450 [5]) are using the UDP multicast datagrams.

Other protocols/logical connections may exist on the same physical connection (including TCP/IP or SNMP) if the equipment supports these layers.

The traffic limitations and requirements shall be kept as specified in IEC 61162-450 [5] (see annex B).

4.2.4 Audio interfaces

Audio interfaces for the remote support of subsequent communications in a DSC automated procedure or communication in a non-DSC communication automated procedure may be accomplished by the analog interfaces as defined in the equipment standards ETSI EN 301 925 [i.6] and ETSI EN 300 373-1 [i.7], but alternative digital audio interfaces shall be allowed (e.g. VoIP).

The manufacturer shall declare the audio interface to use for testing.

4.2.5 Sentences to support on the interface

For remote display and/or command purposes and test purposes the equipment shall be capable of transmitting and receiving the sentences (see IEC 61162-1 [3] and annex A) as defined in Table 1 and Table 2.

Connection of, or failure within any connected equipment, shall not affect the required performance of the DSC equipment.

Table 1: Remote control sentences transmitted by the DSC equipment

Mnemonic	Interface	Name	Comment
AP0	Automated Procedure Configuration Status	Config status	Report status of parameters available in standby mode
AP1[a]	Remote display status or allowed command of Sending Distress automated procedure	Automated Procedure Status and available control	Report status of the ITU procedure Support for Recommendation ITU-R M.493-15 [1], annexes 3 and 4

Mnemonic	Interface	Name	Comment
AP2[a]	Remote display status or allowed command of Receiving Distress automated procedure	Automated Procedure Status and available control	Report status of the ITU procedure Support for Recommendation ITU-R M.493-15 [1], annexes 3 and 4
AP3[a]	Remote display status or allowed command of Sending non-distress automated procedure	Automated Procedure Status and available control	Report status of the ITU procedure Support for Recommendation ITU-R M.493-15 [1], annexes 3 and 4
AP4[a]	Remote display status or allowed command of Receiving non-distress automated procedure	Automated Procedure Status and available control	Report status of the ITU procedure Support for Recommendation ITU-R M.493-15 [1], annexes 3 and 4
AP5[a]	Remote display status or allowed command of communication automated procedure	Automated Procedure Status and available control	Report status of the ITU procedure Support for Recommendation ITU-R M.493-15 [1], annexes 3 and 4
AO1	Available options in sending own distress procedure	Reports options in the current state of the procedure.	
AO2	Available options in receiving distress procedure	Reports options in the current state of the procedure.	
AO3	Available options in sending non distress procedure	Reports options in the current state of the procedure.	
AO4	Available options in receiving non distress procedure	Reports options in the current state of the procedure.	
AO5	Available options in communications procedure	Reports options in the current state of the procedure.	
CUL[a]	Remote display or command	Cyclic Procedure List	Control proper operation of the ITU procedure Support for Recommendation ITU-R M.493-15 [1], annexes 3 and 4
DSC[b] DSE ECI[a]	Remote display or command	Digital selective calling information	Report a received DSC call detail information
EPV	Remote display or command	Equipment property value	Report equipment property values
FSS[a]	Remote display or command	Frequency selection set	Report setting of radio frequency
HBT	Remote display or command	Heartbeat	Integrity test

Mnemonic	Interface	Name	Comment
NAK	Remote display or command	Negative acknowledgement	Used to inform commander about refusal to set equipment property values
OCC[a]	Remote display or command	Occupation Control	Control possible multiple command sources Support for Recommendation ITU-R M.493-15 [1], annexes 3 and 4
SFI	Remote display or command	Scanning frequency information	Report scanning frequency of DSC
DCR	Device Capability Report	Class of DSC and mdes frequencies available	Functionality available.
NOTE a: See annex A. NOTE b: Test Requirement.			

Table 2: Remote control sentences received by the DSC equipment

Mnemonic	Interface	Name	Comment
AC0	Remote command of Automated Procedure Configuration	Config command	Setting of parameters available in standby mode
AC1[a]	Remote control commands for Sending Distress automated procedure	Automated Procedure Control	Used to control the ITU procedure Support for Recommendation ITU-R M.493-15 [1] annexes 3 and 4
AC2[a]	Remote control commands for Receiving Distress automated procedure	Automated Procedure Control	Used to control the ITU procedure Support for Recommendation ITU-R M.493-15 [1] annexes 3 and 4
AC3[a]	Remote control commands for Sending non-distress automated procedure	Automated Procedure Control	Used to control the ITU procedure Support for Recommendation ITU-R M.493-15 [1] annexes 3 and 4
AC4[a]	Remote control commands for Receiving non-distress automated procedure	Automated Procedure Control	Used to control the ITU procedure Support for Recommendation ITU-R M.493-15 [1] annexes 3 and 4
AC5[a]	Remote control commands for communication automated procedure	Automated Procedure Control	Used to control the ITU procedure Support for Recommendation ITU-R M.493-15 [1] annexes 3 and 4
AI1	Automated procedure Initiate - Sending Own Distress. This is a command sentence	Automated Procedure Start	Used to initiate the ITU procedure Support for Recommendation ITU-R M.493-15 [1] annexes 3 and 4

Mnemonic	Interface	Name	Comment
AI2	Initiate All ships urgency and safety (VHF) - Frequency	Automated Procedure Start	Used to initiate the ITU procedure Support for Recommendation ITU-R M.493-15 [1] annexes 3 and 4
AI3	Initiate Geographical area urgency and safety (MF/HF)	Automated Procedure Start	Used to initiate the ITU procedure Support for Recommendation ITU-R M.493-15 [1] annexes 3 and 4
AI4	Initiate Individual Urgency and safety (VHF/MF/HF) - Frequency/Position	Automated Procedure Start	Used to initiate the ITU procedure Support for Recommendation ITU-R M.493-15 [1] annexes 3 and 4
AI5	Initiate Individual Urgency and safety- Test	Automated Procedure Start	Used to initiate the ITU procedure Support for Recommendation ITU-R M.493-15 [1] annexes 3 and 4
AI6	Initiate Routine Group - Frequency	Automated Procedure Start	Used to initiate the ITU procedure Support for Recommendation ITU-R M.493-15 [1] annexes 3 and 4
AI7	Initiate Routine Individual-Frequency/Position/Data	Automated Procedure Start	Used to initiate the ITU procedure Support for Recommendation ITU-R M.493-15 [1] annexes 3 and 4
AI8	Automated procedure Initiate DROBOSE	Automated Procedure Start	Used to initiate the ITU procedure Support for Recommendation ITU-R M.493-15 [1] annexes 3 and 4
AI9	Initiate Communications Call	Automated Procedure Start	Used to initiate the ITU procedure Support for Recommendation ITU-R M.493-15 [1] annexes 3 and 4
AAS	Audible Alert Sound Status and Control, This is a command sentence	Config of Alert sounds.	
AUQ[a]	DSC Automated procedure query information	Automated Procedure Query	Used to query for details of an automated DSC procedure
FSS[a]	Remote display or command	Frequency selection set	Used to control radio frequency
HBT	Remote display or command	Heartbeat	Integrity test
SFI	Remote display or command	Scanning frequency information	Used to set scanning frequencies of DSC
NOTE a: See annex A.			

5 DSC remote control communication

5.1 Introduction

Clause 5 concerns the support of remote control of multiple automated procedures as defined in ETSI EN 300 338-2 [2] and Recommendation ITU-R M.493-15 [1], annexes 3 and 4.

It allows for the integration between radio and navigation equipment in the way that multiple automated procedures including subsequent communication can be handled on e.g. an ECDIS using compliant DSC radios. Sentences are defined in annex A.

The automated procedure identifier value is used to facilitate communication within the remote control interface sentences. The sentences support a cyclic range of 0 - 99. The value is increased and assigned as a unique identifier each time a new automated procedure is allocated. The value remains assigned to the automated procedure through its life-cycle.

The automated procedure identifier value is to be used in all sentences addressing specific automated procedures.

The automated procedure identifier value should be identical to the instance number used for alert communication towards a CAM (ALC, ALF) (see ETSI EN 300 338-7 [i.5]).

Sentences DSC, DSE from IEC 61162-1 [3] only consider single received and transmitted DSC calls. The sentences described in the present standard handle control of automated procedures throughout its entire life-cycle. DSE sentences are used to provide additional information of single calls within the procedure.

For symbol error rate test purposes only, DSC and DSE sentences shall be sufficient. For test purposes the transmitter/receiver(s) shall be controlled by FSS and SFI sentences and these simple call messages are signalled for transmit and receive on the applicable IEC 61162 interface [3], [4] and [5].

The manufacturer may additionally add a number of documented proprietary sentences to support remote operation. These sentences shall fulfil the requirements for proprietary sentences as described in IEC 61162-1 [3], paragraph 7.3.6.

5.2 Use of AC0, AC1, AC2, AC3, AC4 and AC5

If the equipment cannot process an ACn command request the equipment shall generate a NAK sentence response providing an appropriate "reason code".

In case the reason for generating the NAK is a result of a procedural or operational warning that can be resolved by a simple command (OK or CANCEL), the procedure may require the action to resolve this either by HMI entry or by using another ACn sentence (with the necessary command).

The manufacturer shall specify how to identify those NAK sentences from other sentences, and the options shall be described in the NAK sentence. Furthermore the corresponding APn sentence may be transmitted with available allowed command options.

Any subsequent communication within a procedure, if allowed, shall be controlled by using the FSS command.

5.3 Use of AO1, AO2, AO3, AO4 and AO5

The purpose of these AOn sentences are solely the query for the available options in the automated procedures.

They shall in no way change the status of any automated procedure.

5.4 Use of AP0, AP1, AP2, AP3, AP4 and AP5

The APn sentence shall be broadcast to all upon any creation, state change or update of an automated procedure in the equipment, including a state changing command from a remote station.

The APn sentence is also used to report the allowed commands to be issued in the ACn command sentence. Thus giving the remote unit the possibility to present only the allowed command options for a given procedure.

The APn sentence should be transmitted whenever the valid command set for an automated procedure has changed.

Furthermore, the APn sentence shall be transmitted in reply to a query.

Self-terminating procedures shall be reported with all available states, but shall not require any control actions.

5.5 Use of AI1 to AI9

These AIn sentences are for initiating specific types of DSC calls and will result in the related APn broadcast from the DSC equipment.

5.6 Use of AUQ

This Query sentence is designed to support remote control of DSC radios. Query types include automated procedures and related DSC radio messages, distress, received and transmit logs.

If the AUQ Sentence is NOT accepted by the DSC radio, the DSC Radio shall generate a NAK Sentence.

5.7 Use of DCR Device Capability Report

This sentence is a generic NMEA 0183 [i.4] sentence used to report the capabilities of a device. The identification of the device's capabilities is specified in the appropriate equipment standard.

6 Remote control in standby, DSC and non-DSC automated procedures

6.1 General

Testing of the automated procedure remote interface shall be carried out according to the applicable clauses in ETSI EN 300 338-2 [2] where the automatic procedures are validated. Guidance to the tests:

a) when an automated procedure is created or changes state, it shall be verified that the correct status of the procedure is reported via the APn sentence;

b) when operator options are available and tested, the selection of at least one of these options shall be performed via the ACn sentence (see clause A.1), and validate that the selection is reflected on both display and via the APn sentence in parallel (see clause A.1).

The tests outlined reflect chosen scenarios where values for MMSI numbers, frequencies, procedure instance numbers, etc. are inserted. These values may differ because of the actual test scenarios chosen by the test personnel. Check sum values are shown as "hh" and shall be validated in general.

The important things to validate, are the sequence of sentences and that the information and states coincides with the information and states shown on the display of the DSC equipment.