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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 2: Class A DSC

Reference

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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 2 of a multi-part deliverable. Full details of the entire series can be found in part 1 [i.1].

The present document covers the operator interfaces and operating system for Class A DSC equipment.

National transposition dates	
Date of adoption of this EN:	29 May 2020
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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 the minimum requirements for equipment to be used for generation, transmission and reception of Class A Digital Selective Calling (DSC) for use on board ships.

DSC is intended to be used in the Medium Frequency (MF), High Frequency (HF) and Very High Frequency (VHF) bands of the Maritime Mobile Service (MMS), for both distress, safety and general communications.

The present document is part 2 of a multi-part deliverable that covers the requirements to be fulfilled by equipment that is either integrated with a transmitter and/or a receiver or equipment that is a stand-alone DSC terminal and has the following class of DSC:

- Class A: includes all the facilities defined in annex 1 of Recommendation ITU-R M.493-15 [3] and complies with the IMO Global Maritime Distress and Safety System (GMDSS) carriage requirements for MF/HF installations and/or VHF installations.

These requirements include the relevant provisions of the ITU Radio Regulations [2] and Recommendation ITU-R RM.493-15 [3], the International Convention for the Safety Of Life At Sea (SOLAS) [1], and the relevant resolutions of the International Maritime Organization (IMO) [4].

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] International Convention for the Safety of Life at Sea (SOLAS), 1974.

[2] ITU Radio Regulations (2016).

[3] Recommendation ITU-R M.493-15 (01/2019): "Digital selective-calling system for use in the maritime mobile service".

[4] IMO resolution MSC.97(73), section 14.6.4: "Adoption of the International Code of Safety for High-Speed Craft, 2000 (2000 HSC Code)".

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] MSC 302(87): "Adoption of performance standards for bridge alert management".

[i.3] IEC 61924-2 (Edition 1): "Maritime navigation and radiocommunication equipment and systems -- integrated navigation systems -- Part 2: Modular structure for INS -- operational and performance requirements, methods of testing and required test results" (including IEC 61924-2 Corrigendum 1 November 2013).

[i.4] ETSI EN 300 338-6: "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 6: Class M DSC".

[i.5] Recommendation ITU-R M.541-10: "Operational procedures for the use of digital selective-calling equipment in the maritime mobile service".

[i.6] Recommendation ITU-R M.585-8: "Assignment and use of identities in the maritime mobile service".

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: when the objective of the initial DSC message has been achieved

active: automated procedure which has control of the general receiver and transmitter and is thus able to engage in subsequent communications and receive DSC messages on both the watch receiver and general receiver

automated procedure: set of actions necessary to complete the objective of an initiating DSC message or non DSC communication event

NOTE 1: Four DSC automated procedures are designed to process these. They are the receiving of distress DSC messages, the receiving of non-distress DSC messages, the sending of distress DSC alert attempts and the sending of non-distress DSC messages. In addition a fifth procedure is designed to handle non DSC communication events.

NOTE 2: These automated procedures are called:

- Received distress automated procedure.
- Sending distress automated procedure.
- Received non-distress automated procedure.
- Sending non-distress automated procedure.
- Communications automated procedure.

closed loop operation: MOB devices supporting closed loop can be programmed to transmit either an individual distress relay call (subsequent communication 126) to a vessel or group distress relay call to a group of vessels as described in Recommendation ITU-R M.493-15 [3]

NOTE: Acknowledgement of these calls is possible.

default: value selected or an action taken by the equipment software in the absence of any operator input

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

distress event: unique distress situation identified by two (VHF) or three (MF/HF) parameters of the distress information; the MMSI of the vessel in distress and the nature of distress and on MF/HF the mode of subsequent communication

engaged: equipment that is busy handling an automated procedure

factory default: default value that is set by the manufacturer such that the field or behaviour is defined prior to any operator intervention

general receiver: receiver part of the transceiver used for the reception of all subsequent communications and on HF the reception of DSC acknowledgements on the duplex DSC channels

NOTE: It is important to distinguish this unit from the watch receiver.

information characters: set of symbols in a DSC message that contains the items of interest for the recipient and is used to compute the ECC symbol that terminates the message

NOTE: These symbols are repeated in the DX/RX time diversity pattern.

initial DSC message: DSC message that starts an automated procedure

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

objective: intent of the DSC message either to establish subsequent communications or request information

on hold: automated procedure which does not have access to the transmitter and general receiver and therefore cannot engage in subsequent communications and is only able to receive DSC messages on the watch receiver

open loop operation: MOB device is in a state where it transmits distress alerts (Recommendation ITU-R M.493-15 [3])

operator options: any choices the operator can make while the automated procedure is engaged

parallel event handling: background process of handling a received DSC message that is not pertinent to the active automated procedure

pertinent to the automated procedure: DSC messages that have something to do with the procedure and are therefore "handled" by the procedure

NOTE: A DSC message is pertinent to an automated procedure if the set of information characters in the DSC message has the correct values.

pertinent to the station: any DSC message that would start an automated procedure if the transceiver were in standby

self-terminating alarm: short alarm that stops by itself without operator intervention

NOTE: The purpose of this alarm is to inform the operator that a DSC message is received but it does not require his immediate attention.

symbol (as part of the DSC sentence): term used to describe the 7 binary bits of a 10 bit DSC word that have the information content

toggle (between automated procedures): ability to make one automated procedure active assuring that all other procedures go on hold

top level: items, buttons, or functions are present and visible without requiring any action by the operator

NOTE: Such as scrolling, opening up menus, or removing any obscuring covers, etc.

two-tone alarm: alarm consisting of a repetition of the 2 200 Hz frequency for 250 ms followed by a 1 300 Hz frequency for 250 ms

NOTE: This alarm is used for the initiation of the received distress DSC automated procedure.

urgency alarm: alarm consisting of a repetition of the 2 200 Hz frequency for 250 ms followed by 250 ms period of silence

NOTE: This alarm is used for the initiation of the received non-distress DSC automated procedure when the category of the initiating DSC message is "urgency".

watch receiver: separate receiver in DSC radios that continuously monitors the DSC distress frequencies on MF/HF, 2 187,5 kHz on MF, and channel 70 on VHF

NOTE: On MF/HF it is sometimes referred to as the scanning receiver.

word (as part of the DSC sentence): 10 binary bits that make up the coded entities of a transmitted DSC message

NOTE: The 10 bits consist of a 7 bit "symbol" that gives the information content and 3 bit error check that gives the number of 0 binary bits in the 7 bit symbol.

3.2 Symbols

Void.

3.3 Abbreviations

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

ALE	Automatic Linking Exchange
DROBOSE	Distress Relay On Behalf Of Someone Else
MOB	Man Over Board
NBDP	Narrow Band Direct Printing

4 Controls and Indicators in Class A DSC Equipment

4.1 Visual indication

Any visual display of the information content shall be clearly legible under all ambient light conditions.

The display shall be large enough to hold enough information from the active procedure to safely guide the operator through operator options in any engaged DSC procedure (distress or non-distress). It shall at any time hold information on how to instantly recall any waiting procedure, or put any active procedure on hold.

The amount of information to display simultaneously on the display shall correspond to the information that can be written in plain text with a minimum of 160 characters, each character having a minimum height of 3,5 mm, and a nominal character width/height ratio of 0,7.

Where logic flows and procedural guidance, expressed by graphical symbols, have an advantage over text, this shall be allowed. Any graphical symbols shall be clearly defined in the operation manual.

All DSC displays at all operating positions shall comply with these requirements.

5 Technical requirements

5.1 Facilities for DSC transmission and reception

5.1.1 Multi-frequency distress alert attempts and watch receiver capabilities (MF/HF)

The equipment shall either:

- be capable of receiving DSC messages on all distress frequencies (except for the transmit frequency in use) whilst the distress alert is being transmitted; or
- be able to complete the multi-frequency distress alert attempt within 1 minute and then be capable of receiving DSC messages on all frequencies used in that multi-frequency attempt.

5.1.2 Watch receiver capabilities (VHF)

The watchkeeping receiver part of the DSC equipment shall be designed for continuous operation on channel 70 but the receiver need not operate when the transmitter is in use on that channel.

5.2 Remote alarms

The equipment shall be provided with facilities for connecting remote alarms as recommended in chapter IV/6.6, regulation X/3 of the SOLAS Convention [1] and IMO resolution MSC.97 (73), section 14.6.4 [4].

5.3 Galvanic isolation

No exposed metallic part of the equipment shall cause any terminal of the source of electrical energy to be earthed.

5.4 Manuals

Maintenance or service manuals shall be available and shall contain:

- If the equipment is so constructed that fault diagnosis and repair is practicable down to component level, the maintenance instructions shall include full circuit diagrams, component layouts and components parts lists.
- If the equipment contains modules in which fault diagnosis and repair down to component level is not practicable, the maintenance instructions shall contain sufficient information to enable localization and replacement of the defective module.

6 Automated and Non-Automated Procedure Requirements in Class A DSC Equipment

6.1 Introduction

This clause covers the minimum level of software automation, operational simplicity, and interface consistency requirements for shipborne fixed installations using class A Digital Selective Calling equipment as specified in Recommendation ITU-R M.493-15 [3], annexes 1, 3 and 4.

Perhaps the most important issue concerns an implied expectation for the use of the terminology "automated procedure" as used in the present document to appear in the user interface. The terminology "automated procedure" describes the set of algorithms that are used to encapsulate all the activities necessary to perform multitasking, DSC, and non DSC communication events. The operator does not need to know anything about the existence of automated procedures in order to operate a radio that makes use of these algorithms. Though the present document refers to items such as the "Sending Distress Automated Procedure" such language shall not appear on the user interface of the equipment.

The primary purpose of DSC signalling is to provide the means to set-up subsequent communications between vessels and/or coast stations. A call may be considered as being the total duration from the start of the DSC signalling until the end of the subsequent communications, and the automated procedure is terminated.

The operational functionality described in this part has the objective of not disturbing any ongoing call. Furthermore, the equipment shall assist the operator by providing simple audible indication of a received DSC call whilst the equipment is engaged, and provide a facility to manage activation amongst initiated automated procedures.

6.2 Non-automated features

6.2.0 General

This clause describes the features of the equipment that are necessary to assure compliance to the ITU-R DSC functionality standards and support a smoother operation of the automation algorithms, but are not directly related to the automation algorithms.

6.2.1 DSC Message Composition

The equipment shall provide factory default values for all non-distress DSC messages as specified in Recommendation ITU-R M.493-15 [3], annex 3 and summarized in figure A.1 for all parameters where the operator has the option to select or enter more than one value and has not already done so.

The default values for the Distress Relay On Behalf Of Someone Else (DROBOSE) shall be as given in table A.1.

The default values for the operator-composed distress alert shall be the default distress alert as specified in the sent distress automated procedure.

A destination MMSI that does not have at least 9 digits entered is invalid.

The MMSI "unknown" indicator shall only be able to be used for the MMSI of the vessel in distress when composing a DROBOSE.

No DSC message shall be able to be sent that has an invalid parameter.

For simplicity of the user interface:

a) the DSC message composition interface shall be such that the operator needs no user manual to initiate the desired DSC message;

b) it shall require a maximum of two keystrokes, button pushes or menu actions plus the entry or selection of a destination MMSI and working channel (where appropriate) for the operator to send the default (routine individual) DSC message from standby;

c) parameter descriptions and terms shall be provided in plain language;

d) all parameters of the DSC message that do not require an operator choice shall be entered automatically;

e) guidance and/or prompting shall be provided for the entry of any necessary parameters of the DSC message if these parameters and/or their values are not plainly visible from context or on the display.

For data entry:

a) the equipment shall only allow the operator to compose and send DSC messages that are compliant with the latest version of Recommendation ITU-R M.493-15 [3];

b) acknowledgements shall be automatically composed by the equipment and user options for these acknowledgements are provided by the automated procedures;

c) the equipment shall provide the operator with the choice of specifying the geographic area parameters as either a circle of radius "r" about a centre point or the traditional latitude-longitude Mercator box and northwest corner point or about a centre point;

d) the equipment shall convert and round the radius-centre point entry according to the algorithm given in annex B;

e) the equipment shall provide an automatic determination of the channel and or frequencies of subsequent communication according to the algorithm given in Recommendation ITU-R M.493-15 [3], annex 3 and summarized in annex C.

The automated channel selection shall be able to be overridden.

It shall not be possible to select a distress channel for subsequent communications for DSC messages of priority routine.

The equipment shall automatically set the dot pattern length to 20 bits for all transmitted DSC messages on VHF, and on MF/HF all DSC messages addressed to a coast station and all individual acknowledgements with format specifiers 120 and 123.

Furthermore MF/HF equipment shall automatically set the dot pattern length to 200 bits for all transmitted DSC messages for:

- distress alerts;
- distress acknowledgements;
- distress relays addressed to a geographic area;
- distress relay acknowledgements addressed to all ships;
- all calls addressed to a ship station other than messages addressed to a coast station or all individual acknowledgements with format specifiers 120 and 123.

6.2.2 Transmission of DSC messages and prioritized wait

If the channel is free after the transmitter has powered up, the transmission shall begin immediately. If the channel is not free, and the DSC message is a distress alert, the alert shall be transmitted as soon as the channel becomes free or after 10 seconds on MF or HF or 1 second on VHF, whichever occurs first. (The 10 seconds and 1 second values are approximate average times for HF and VHF DSC messages, respectively.) For all other DSC messages, the equipment shall wait for the channel to become free and then the equipment shall delay transmission of the DSC message for a specified wait time.

The specified wait time shall depend upon the message type and priority. Distress DSC messages (except for alerts), urgency, safety, routine and test DSC messages shall wait one, two, three, and four "fixed" units of time plus a random addition described below, respectively, before attempting to transmit. Transmission occurs if and only if the channel is still free after this wait time has elapsed, otherwise the process is repeated.

The fixed "unit" of time shall be 100 ms on MF and HF and 50 ms on VHF. The randomly generated component shall be some positive integer with resolution in milliseconds between zero and the fixed interval. The random component serves as a tie-breaker when multiple DSC messages of the same priority and type are waiting to be transmitted. The randomly generated part of the wait time shall be recomputed for every transmission attempt.

For example, on HF, the random interval would be some positive integer of milliseconds between 0 ms and 100 ms, for example, 56 ms. Thus the wait time for a routine DSC message in this example would be 456 ms the first attempt. If the channel was once again busy after the wait time expired, the new wait time might be 417 ms the second attempt, etc.