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IEC TC 80 : MARITIME NAVIGATION AND RADIOCOMMUNICATION EQUIPMENT AND SYSTEMS	
SECRETARIAT: United Kingdom	SECRETARY: Mr Kim Fisher
OF INTEREST TO THE FOLLOWING COMMITTEES:	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CD to the secretary.

FUNCTIONS CONCERNED:

☐ EMC ☐ ENVIRONMENT ☐ QUALITY ASSURANCE ☐ SAFETY

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TITLE:

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

NOTE FROM TC/SC OFFICERS:

This draft has been developed by MT 19. The flow diagrams shown as highlighted Figures in Annex C do not match the text and are suggested for deletion.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM (GMDSS) –

Part 7: Shipborne VHF radiotelephone transmitter and receiver – Operational and performance requirements, methods of testing and required test results

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IEC 61097-7 has been prepared by IEC technical committee 80: Maritime navigation and radiocommunication equipment and systems. It is an International Standard.

This second edition cancels and replaces the first edition published in 1996, and Amendment 1:2018. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) ...;

b)

The text of this International Standard is based on the following documents:

Draft	Report on voting
XX/XX/FDIS	XX/XX/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

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

GLOBAL MARITIME DISTRESS AND SAFETY SYSTEM (GMDSS) –

Part 7: Shipborne VHF radiotelephone transmitter and receiver – Operational and performance requirements, methods of testing and required test results

1 Scope

This part of IEC 61097 specifies the minimum performance requirements, technical characteristics and methods of testing with required test results for VHF radio installations capable of voice communication and digital selective calling as required by chapter IV of the International Convention for Safety of Life at Sea (SOLAS),

This document incorporates the applicable part of the performance standards included in IMO Resolution A.524(13) and MSC.511(105), the technical characteristics included in Recommendation ITU-R M.489-2 and Recommendation ITU-R M.493-16, and takes account of IMO Resolution A.694(17) which is associated with IEC 60945, and conforms with the ITU Radio Regulations where applicable.

When a requirement in this document is different from IEC 60945, the requirement in this document shall take precedence.

This document also takes account, as appropriate, of requirements for the presentation of navigation-related information on shipborne navigational displays given in IMO Resolution MSC.191(79) and is associated with IEC 62288 and the requirements for Bridge Alert Management given in Resolution MSC.302(87) associated with IEC 62923-1.

NOTE All text of this document, whose wording is identical to that in IMO Resolutions and ITU-R Recommendations is printed in *italics* and the Resolution/Recommendation and clause numbers are indicated in brackets.

NOTE This document introduces requirements, tests and their required results in the context of Digital Selective Call (DSC) as defined by ITU-R recommendations such as ITU-R M.493, and in the context of Bridge Alert Management (BAM) as defined by IMO MSC.302(87) and IEC 62923. Certain terms, such as “Alert”, “Warning” and “Priority”, indicated by using a same word, may have different meaning depending on the context where the term is used in. Reader is advised to note that the meaning of specific terms used in this document are equal to the terms as defined in the context of Digital Selective Call (DSC) unless specifically expressed otherwise. For example: expression “BAM alert” is used to indicate that term “alert” is used in the context of Bridge Alert Management (BAM) in that instance. Annex E provides further specifications on mapping of signals between the context of DSC and the context BAM.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60945:1994, *Marine navigational equipment – General requirements – Methods of testing and required test results*

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

IEC 61162-450, *Maritime navigation and radiocommunication equipment and systems – Digital interfaces – Part 450: Multiple talkers and multiple listeners – Ethernet connection*

IEC 62288, *Maritime navigation and radiocommunication equipment and systems – Presentation of navigation-related information on shipborne navigational displays – General requirements, methods of testing and required test results*

IEC 62923-1, *Maritime navigation and radiocommunication equipment and systems – Bridge alert management – Part 1: Operational and performance requirements, methods of testing and required test results*

IMO International Convention for the Safety of Life At Sea (SOLAS): 1974, as amended – *Chapter IV: Radiocommunications*

IMO Resolution A.524(13):1983, *Performance standards for VHF multiple watch facility*

IMO Resolution A.694(17), *General requirements for shipborne radio equipment forming part of the global maritime distress and safety system (GMDSS) and for electronic navigational aids*

IMO Resolution MSC.511(105), *Performance standards for shipborne VHF radio installations capable of voice communication and digital selective calling*

ITU Radio Regulations: 2020, Appendix 3: *Maximum permitted power levels for unwanted emissions in the spurious domain*

ITU Radio Regulations: 2020, Appendix 18: *Table of transmitting frequencies in the band 156-174 MHz for stations in the maritime mobile service*

ITU-R M.489-2: 1995, *Technical characteristics of radiotelephone equipment operating in the maritime mobile service in channels spaced by 25 kHz*

3 Terms, definitions and abbreviated terms

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1 Terms and Definitions

3.1.1
acknowledged
indication that the objective of the initial DSC message has been achieved when used to describe an automated procedure

3.1.2
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

3.1.3
automated procedure
set of actions necessary to complete the objective of an initiating DSC message or non-DSC communication event

3.1.4
BAM alert
alert that falls into the concept of bridge alert management (BAM)

3.1.5
critical errors
set of information characters obtained from one or more received DSC messages if the automated procedure needs information characters from that set in order to proceed or perform any task, but the required information characters are in error

EXAMPLE An acknowledgement cannot be composed to an individual DSC message that has errors in the sender's MMSI.

3.1.6
default
value selected or action taken by the equipment software in the absence of any operator input

3.1.7
distress alert
single distress DSC message with the format specifier 112

3.1.8
distress alert attempt
set of distress alerts sent by a vessel when in distress

3.1.9
distress DSC message
DSC message or acknowledgement containing the distress information

3.1.10
distress event
unique distress situation identified on VHF by two parameters of the distress information

Note 1 to entry. The parameters are the MMSI of the vessel in distress and the nature of distress.

3.1.11
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

3.1.12
engaged
indication that the equipment is busy handling an automated procedure

3.1.13
factory default
default value that is set by the manufacturer such that the field or behaviour is defined prior to any operator intervention

3.1.14
general receiver
receiver used for the reception of all subsequent communications

3.1.15
identical
set of information characters where all pairs of corresponding information characters are equal or, if a pair of corresponding information characters is not equal, one of the pair is in error

3.1.16
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

3.1.17
initial DSC message
DSC message that starts an automated procedure

3.1.18
non-distress DSC message
DSC messages or acknowledgments that do not contain the distress information

3.1.19
objective
goal or intent of the item when in reference to a DSC message or automated procedure

Note 1 to entry: Usually, this goal or intent is to establish subsequent communications or request information.

3.1.20
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

3.1.21
operator options
any choices the operator can make while the automated procedure is engaged

3.1.22
parallel event handling
background process of handling a received DSC message that is not pertinent to the active automated procedure

3.1.23
pertinent to the station
any DSC message that would start an automated procedure if the equipment were in standby

Note 1 to entry: Standby is defined by ITU as the status of an equipment not handling an automated procedure, either active or on hold, but being able to receive DSC messages.

3.1.24
self-terminating alarm
short alarm that stops by itself without operator intervention

Note 1 to entry: The purpose of this alarm is to inform the operator that a DSC message is received but it does not require his immediate attention.

3.1.25
snooping
situation where a station receives and handles DSC messages pertinent to other stations as if it were that station

3.1.26
symbol
<as part of the DSC sentence> 7 binary bits of a 10 bit DSC word that have the information content

3.1.27
top level
items, buttons, or functions present and visible without requiring any action by the operator (such as scrolling, opening up menus, or removing any obscuring covers)

3.1.28
watch receiver
separate receiver that continuously monitors the DSC frequency channel 70

3.1.29
word
<as part of the DSC sentence> 10 binary bits that make up the coded entities of a transmitted DSC message

Note 1 to entry: 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 Abbreviated terms

BAM	bridge alert management
BNWAS	bridge navigation watch alarm system
CCRS	consistent common reference system
DSC	digital selective calling
e.m.f.	electromotive force
ECC	error check character
EPFS	electronic position fixing system
EUT	equipment under test
INS	Integrated navigation system
MID	Maritime identification digits
MOB	man overboard
MMSI	maritime mobile service identity
p.t.t.	press-to-transmit
RF	radio frequency
RMS	root mean square
SINAD	signal + noise + distortion/ noise + distortion
SWR	Standing wave ratio
TE	test equipment

4 Performance requirements

4.1 General

(MSC.511(105)/A1.2) *The VHF radio installation, in addition to meeting the requirements of the Radio Regulations, the relevant ITU-R Recommendations and the general requirements set out in resolutions A.694(17) and MSC.191(79), as amended,* shall *comply with the following performance standards.*

(MSC.511(105)/A2.1) *The installation, which may consist of more than one piece of equipment,* shall *be capable of operating on single-frequency channels or on single- and two-frequency channels.*

(MSC.511(105)/A2.2) *The equipment* shall *provide for the following categories of calls using both voice and digital selective calling (DSC):*

.1 distress, urgency and safety;

.2 ship operational requirements; and

.3 general radiocommunications.

(MSC.511(105)/A2.3) *The equipment shall provide for the following categories of communication using voice:*

.1 distress, urgency and safety;

.2 ship operational requirements; and

.3 general radiocommunications

(MSC.511(105)/A2.4) *The equipment* shall *comprise at least:*

.1 a transmitter/receiver including antenna;

.2 an integral control unit or one or more separate control units;

.3 a microphone with a press-to-transmit switch, which may be combined with a telephone in a handset;

.4 an internal or external loudspeaker;

.5 an integral or separate digital selective calling facility; and

.6 a dedicated DSC watchkeeping facility to maintain a continuous watch on channel 70.

(MSC.511(105)/A2.5) *The installation may also include additional receivers.*

Unless otherwise stated in this document, the equipment shall comply with the requirements of the environmental and electromagnetic conditions specified in IEC 60945.

4.2 Power supply

(MSC.511(105)/A3) *The VHF radio installation should be powered from the ship's main source of electrical energy. In addition, it* shall *be possible to operate the VHF installation from an alternative source of electrical energy.*

4.3 Controls and indicators

4.3.1 General

(MSC.511(105)/A4.1) *Control of the equipment* shall *be possible at the position from which the ship is normally navigated. Control from that position* shall *have priority if additional control units are provided. When there is more than one control unit, indication* shall *be given to the other units that the equipment is in operation.*

(MSC.511(105)/A4.2) *The equipment should provide a standard interface to enable the selections of channels and setting of Maritime Mobile Service Identity (MMSI) to be called from a remote control unit (e.g. INS) by using standardized interfaces* (See 4.4*).* Details of remote operation are described in Annex F.

4.3.2 DSC controls and indicators

(MSC.511(105)/A4.3.1) *It* shall *be possible to initiate and make distress and safety calls from the*

position from which the ship is normally navigated. The means for initiating a distress call shall *be as prescribed in* 4.3.3*.*

(MSC.511(105)/A4.3.4) *Means* shall *be provided to enable routine testing of the DSC facilities without radiation of signals.*

(MSC.511(105)/A4.3.5) *Provision* shall *be made for*:

.1 specific alerts to indicate receipt of a distress or urgency calls or a call having distress category. It shall *not be possible to disable this alarm and indication. Provision* shall *be made to ensure that they can be reset only manually; and*

.2 alerts for calls other than distress and urgency.

4.3.3 Distress controls

(MSC.511(105)/A2.6) *A distress alert* shall *be activated only by means of a dedicated distress button. This button* shall *not be any key of an ITU-T digital input panel or an ISO keyboard associated with the equipment and* shall *be physically separated from functional buttons/keys used for normal operation. This button* shall *be a single button for no other purpose than to initiate a distress alert.*

(MSC.511(105)/A2.7) *The dedicated distress button* shall*:*

.1 be clearly identified and be red in colour and marked "DISTRESS". Where a non-transparent protective lid or cover is used, it shall *also be marked "DISTRESS"; and*

.2 be protected against inadvertent operation. The required protection of the distress button shall *consist of a spring-loaded lid or cover permanently attached to the equipment by, for example, hinges. It* shall *not be necessary for the user to remove additional seals or to break the lid or cover in order to operate the distress button.*

The operation of the distress button shall *generate a visible and audible indication. The distress button* shall *initiate a distress alert when kept pressed for at least three seconds. A flashing light and an intermittent acoustic signal* shall *start immediately. After the three seconds, the transmission of the distress alert is initiated and the indication* shall *become steady and the acoustic signal* shall *stop. If the distress button is released before a distress alert is initiated, the light* shall *go out and the acoustic signal* shall *stop.*

(MSC.511(105)/A2.8) *The distress alert initiation* shall *require at least two independent actions. The lifting of the protective lid or cover is considered as the first action. Pressing the distress button as specified above is considered as the second independent action.*

(MSC.511(105)/A2.9) *The equipment* shall *indicate the status of the distress alert transmission.*

(MSC.511(105)/A2.10) *It* shall *be possible to interrupt and initiate distress alerts at any time and to interrupt repetitive transmissions of distress messages. Such operation* shall *not interrupt the transmission of a distress alert or distress message in progress but* shall *prevent repetitive transmissions of a distress message.*

4.3.4 Marking and identification

Marking and identification shall be in accordance with IEC 60945.

4.4 Interfaces

(MSC.511(105)/A5.1) *Where the equipment is part of an integrated communication system (ICS), integrated navigation system (INS), integrated bridge system (IBS) or connected to a*

navigation system, this shall *not impair any of the GMDSS functions of the system or the equipment itself.*

(MSC.511(105)/A5.2) *Equipment* shall *provide an interface for bridge alert management (BAM) in accordance with resolution MSC.302(87) on Performance standards for bridge alert management*.

(MSC.511(105)/A5.3) *The equipment* shall *provide an interface to report a ship identifier and location data from a received distress alert, maritime safety information (MSI) or search and rescue (SAR) related information to navigation display system in order to enable a graphical display and possible linking to available target information.*

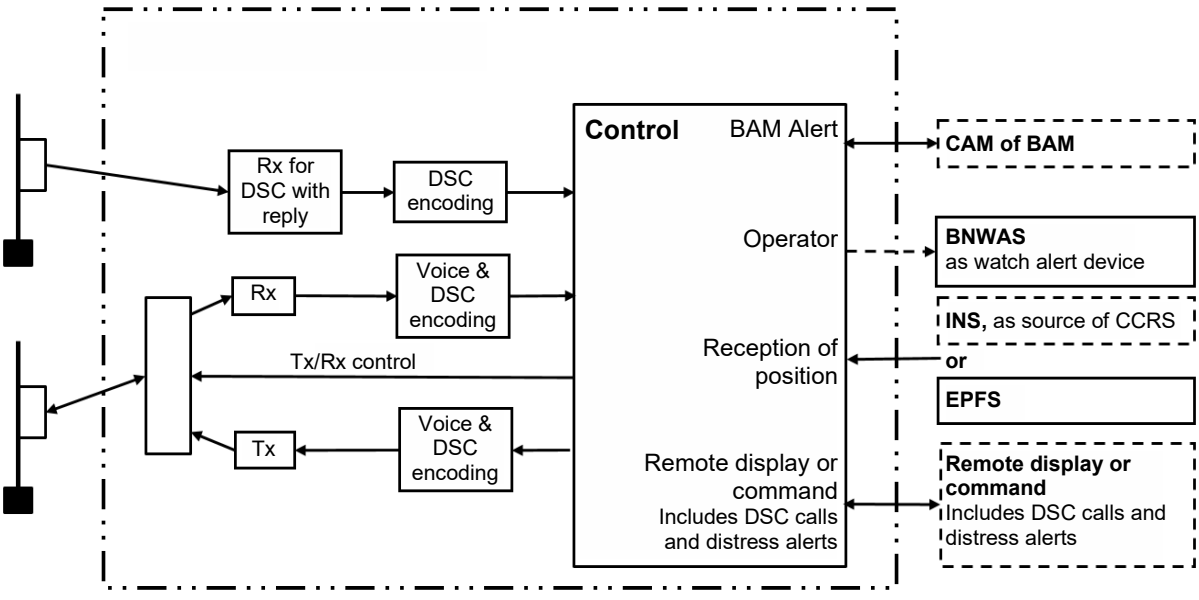
(MSC.511(105)/A5.4) *All interfaces provided for communication with other navigation and communication equipment* shall *comply with the relevant international standards.*

(MSC.511(105)A/6.1) *The human-machine interface (HMI)* shall *provide all functions necessary to carry out all communication procedures including those required by the GMDSS.*

(MSC.511(105)/A6.2) *Visual indications and visual presentations of text and graphics of the system* shall *conform to resolution MSC.191(79), as amended.*

Data interfaces shall be compatible with at least one of IEC 61162-1, IEC 61162-2 and IEC 61162-450. The manufacturer shall specify which alternative of IEC 61162 each physical interface supports.

Logical interfaces are shown in Figure 1. The manufacturer shall specify if any of the provided logical interfaces share the same physical interface.



NOTE

Solid line indicates mandatory part

IEC

Figure 1 – Interfaces of the equipment

As a minimum, the IEC 61162-1 sentences GLL, GGA, RMC and GNS shall be recognised for input of position information. See Table 1.

Additionally, for remote display and/or command purposes, the equipment shall be capable of outputting and inputting the sentences DSC, DSE and SFI (see Table 2 and Table 3).

Optionally, if provided, the equipment may include an interface to report operator activity in order that the BNWAS can reset the dormant period (see Table 4). The EVE sentence as specified IEC 61162-1 shall be output in response to user-interaction with the DSC under conditions described in the user manual.

Sentences used by a BAM interface are in Table 5 and Table 6.

No connection of, or failure within any connected equipment shall affect the required performance of the equipment covered by this standard.

Table 1 – Sentences input to the equipment for position information

Mnemonic	Interface (see Figure 1)	Name	Comment
GLL GGA GNS RMC	INS, as source of CCRS or EPFS	Geographic position – latitude/longitude	

Table 2 – Sentences output from the equipment

Mnemonic	Interface (see Figure 1)	Name	Comment
DSC DSE	Remote display or command	Digital selective calling information	Report a received DSC call detail information
SFI	Remote display or command	Scanning frequency information	Report setting of DSC

Table 3 – Sentences input to the equipment

Mnemonic	Interface (see Figure 1)	Name	Comment
DSC DSE	Remote display or command	Digital selective calling information	Specifies details of a DSC initiation
SFI	Remote display or command	Scanning frequency information	Used to set scanning frequencies of DSC

Table 4 – Sentences output from the equipment for BNWAS

Mnemonic	Interface (see Figure 1)	Name	Comment
EVE	BNWAS, as watch alert device	Operator activity	Reset dormant period of the BNWAS

Table 5 – Sentences output from the equipment for CAM

Mnemonic	Interface (see Figure 1)	Name	Comment
ALC	BAM	Cyclic BAM alert list	List of current BAM alerts
ALF	BAM	BAM Alert sentence	Details of a new BAM alert
ARC	BAM	BAM Alert command refused	BAM Alert command not accepted

Table 6 – Sentences input to the equipment from CAM

Mnemonic	Interface (see Figure 1)	Name	Comment
ACN	BAM	BAM Alert command	BAM Alert command e.g. acknowledge
HBT	BAM	Heartbeat	Supports reliable alert related communication

The talker identifier for VHF equipment shall be CV.

4.5 BAM Alert management

The equipment shall implement BAM alert management compliant to IMO MSC.302(87) and IEC 62923. The equipment shall fulfil the requirements applicable for BAM function type P as described in IEC 62923-1. Further requirements specific to BAM operation are described in Annex B.

5 Transmitter

5.1 Frequencies and classes of emission

(MSC.511(105)/B1.1) *The equipment* shall *be designated for operation on channels selected from and in accordance with appendix 18 to the Radio Regulations.*

(MSC.511(105)/B1.2) *The radiotelephone facility* shall *be capable of operating as follows:*

.1 in the band 156,025 MHz to 157,425 MHz on single-frequency channels as specified in appendix 18 to the Radio Regulations; and

.2 in the band 156,025 MHz to 157,325 MHz for transmitting and the band 160,625 MHz to 161,925 MHz for receiving on two-frequency channels as specified in appendix 18 to the Radio Regulations.

(MSC.511(105)/B1.3) *The digital selective calling facility* shall *be capable of operating on channel 70.*

(MSC.511(105)/B1.4) *Class of emission* shall *comply with chapter IX of the Radio Regulations.*

(489-2/1.1.1 and .3) *The class of emission* shall *be G3E (frequency modulation with a pre-emphasis characteristic of 6 dB/octave) for voice communication.* It shall be phase modulation G2B for DSC signalling.

(489-2/1.1.2) *The necessary bandwidth* shall *be 16 kHz.*

(489-2/1.1.4) *The frequency deviation corresponding to 100 % modulation* shall *approach ±5 kHz as nearly as practicable. In no event* shall *the frequency deviation exceed ±5 kHz*

(489-2/1.2.5) *The upper limit of the audio-frequency band* shall *not exceed 3 kHz.*

5.2 Frequency accuracy and tolerance

(MSC.511(105)/B2) *The frequency tolerance for ship station transmitters* shall *not exceed 10 parts in 10^6.*

5.3 Output power

(MSC.511(105)/B3.1) *The transmitter output power* shall *be between 6 and 25 W.*

(MSC.511(105)/B3.2) *Provision* shall *be made for reducing the transmitter output power to a value of less than 1 W. However, this reduction of the power is optional on channel 70.*

(489-2/1.2.2) *Spurious emissions on discrete frequencies, when measured in a non-reactive load equal to the nominal output impedance of the transmitter,* shall *be in accordance with the provisions of Appendix 3 of the Radio Regulations*.

5.4 Permissible warming-up period

(MSC.511(105)/B4) *The equipment* shall *be operational within five seconds after switching on.*

5.5 Continuous operation

(MSC.511(105)/B5) *A manual non-locking push-to-talk switch to operate the transmitter with a visual indication that the transmitter is activated and facilities to limit the transmission time to a maximum of five minutes* shall *be provided.*

5.6 Controls and indicators

5.6.1 Channel control and switching

(MSC.511(105)/B6.1.1) *Change of channel* shall *be capable of being made as rapidly as possible, but in any event within five seconds.*

(MSC.511(105)/B6.1.2) *The time taken to switch from the transmit to the receive condition, and vice versa,* shall *not exceed 0,3 seconds.*

(MSC.511(105)/B6.1.3) *An on/off switch* shall *be provided for the entire installation with a visual indication that the installation is switched on.*

(MSC.511(105)/B6.1.4) *A visual indication that the carrier is being transmitted* shall *be provided.*

(MSC.511(105)/B6.1.5) *The equipment* shall *indicate the four-digit channel number, as given in the Radio Regulations appendix 18, to which it is tuned. It* shall *allow the determination of the channel number under all conditions of external lighting. Where practicable, channels 16 and 70 should be distinctively marked.*

(MSC.511(105)/B6.1.6) *The equipment* shall *not be able to transmit during a channel switching operation.*

(MSC.511(105)/B6.1.7) *Operation of the transmit/receive control* shall *not cause unwanted emissions.*

5.6.2 Radiotelephone facility

(MSC.511(105)/B6.2.1) *Provision* shall *be made for changing from transmission to reception by use of a press-to-transmit switch. Additionally, facilities for operation on two-frequency channels without manual control may be provided.*

(MSC.511(105)/B6.2.2) *The receiver* shall *be provided with a manual volume control by which the audio output may be varied.*

(MSC.511(105)/B6.2.3) *A squelch (mute) control* shall *be provided on the exterior of the equipment.*

5.6.3 Loudspeaker and telephone handset (radiotelephone facility)

(MSC.511(105)/B6.3.1) *The receiver output* shall *be suitable for use with a loudspeaker and a telephone handset. The audio output* shall *be sufficient to be heard in the ambient noise level likely to be encountered on board ships.*

(MSC.511(105)/B6.3.2) *It* shall *be possible to switch off the loudspeaker without affecting the audio output of the telephone handset, if provided.*

(MSC.511(105)/B6.3.3) *In the transmit condition during simplex operation, the output of the receiver* shall *be muted.*

(MSC.511(105)/B6.3.4) *In the transmit condition during duplex operation, only the telephone handset* shall *be in circuit. Care* shall *be taken to prevent any electrical or acoustic feedback, which could cause singing.*

5.7 Safety precautions

(MSC.511(105)/B7.1) *The equipment, when operating,* shall *not be damaged by the effects of open-circuited or short-circuited antenna terminals.*

(MSC.511(105)/B7.2) *In case the standing wave ratio (SWR) becomes too high the power of the transmitter* shall *be automatically reduced without stopping the transmission and an appropriate alert* shall *be initiated.*

5.8 Antenna system

(MSC.511(105)/B8) *The VHF antenna or antennae* shall *be vertically polarized and, as far as practicable, be omnidirectional in the horizontal plane. The installation* shall *be suitable for efficient radiation and reception of signals at the operating frequencies.*

6 Receiver

6.1 Frequencies and classes of emission

(MSC.511(105)/C1) *The frequencies and classes of emission* shall be *as described in* 5.1.

(489-2/1.3.5) *The power of any conducted spurious emission, measured at the antenna terminals,* shall *not exceed 2,0 nW at any discrete frequency* in the frequency range 9 kHz to 2 GHz.

6.2 Frequency tolerance and accuracy

(MSC.511(105)/C2*) The frequency tolerance for ship station receivers* shall *not exceed 10 parts in* 10^6.

6.3 Usable sensitivity

6.3.1 Radiotelephone facility

(MSC.511(105)/C3.1) *The sensitivity of the receiver* shall *be equal to or better than 2 µV e.m.f. for a signal-to-noise and distortion (SINAD) ratio of 20 dB.*

6.3.2 Digital selective calling facility

(MSC.511(105)/C3.2) *With a DSC modulated input signal having a level of 1 µV e.m.f. to its associated VHF receiver, the DSC equipment* shall *be capable of decoding the received message with a maximum permissible output character error rate of* 10^{-2}.

6.4 Receiver output

(MSC.511(105)/C4.1) *For the reception of voice signals, the receiver shall be suitable for use with a loudspeaker and a telephone handset and* shall *be capable of providing power of at least 2 W to loudspeaker and at least 1 mW to the handset.*

(MSC.511(105)/C4.2) *An output* shall *be provided for DSC signals if the corresponding facility is not integrated.*

6.5 Permissible warming up period

(MSC.511(105)/C5) *The permissible warming up period* shall be *as described in 5.4.*

6.6 Immunity to interference

(MSC.511(105)/C6) *The immunity to interference of the receiver* shall *be such that the wanted signal is not seriously affected by unwanted signals.*

(489-2/1.3.2) *The adjacent channel selectivity* shall *be at least 70 dB.*

(489-2/1.3.3) *The spurious response rejection ratio* shall *be at least 70 dB.*

(489-2/1.3.4) *The radiofrequency intermodulation rejection ratio* shall *be at least 65 dB.*

6.7 Multiple watch facilities

(A.524(13)/1) *VHF radiotelephone equipment having multiple watch facilities* shall *comply with the following* requirements.

(A.524(13)/2.1) *The equipment* shall *include a provision for the automatic scanning of a priority channel and one additional channel only.*

(A.524(13)/2.2) *The priority channel is that channel which will be sampled even if there is a signal on the additional channel and on which the receiver will lock during the time a signal is detected.*

(A.524(13)/2.3) *The additional channel is that channel which will be monitored during the periods the equipment is not sampling or receiving signals on the priority channel.*

(A.524(13)/2.4) *Provision* shall *be included to switch the scanning facility on and off by means of a manually operated control. In addition it* shall *be ensured that the receiver remains on the same channel as the transmitter for the entire duration of any communication with the ship, e.g. the scanning facility* shall *be switched off automatically when the handset is off its hook.*

The scanning facility shall be switched on automatically when the handset is replaced on its hook.

(A.524(13)/2.5) *Selection of the additional channel and, if provided, of the priority channel* shall *be possible at the operating position of the* equipment. *If the selection of the priority channel is not provided, the priority channel shall be channel 16.*

(A.524(13)/2.6) *When the scanning facility is in operation, the channel number of both channels on which the equipment is operating* shall *be clearly indicated simultaneously.*

(A.524(13)/2.7) *In a transceiver, transmission* shall *not be possible when the scanning facility is operating. When the scanning facility is switched off, both transmitter and receiver* shall *be tuned automatically to the selected additional channel.*

(A.524(13)/2.8) *A transceiver* shall *be provided with a single manual control (e.g. push-button) in order to switch the equipment quickly for operation on the priority channel.*

(A.524(13)/2.9) *At the operating position of a transceiver the selected additional channel* shall *be clearly indicated as being the operational channel of this receiver.*

(A.524(13)/3.1) *When the scanning facility is switched on, the priority channel* shall *be sampled with a sampling frequency of not less than once per 2 s. If a signal is detected on the priority channel the receiver* shall *remain on this channel for the duration of that signal.*

(A.524(13)/3.2) *If a signal is detected on the additional channel the sampling of the priority channel* shall *continue, thus interrupting the reception on the additional channel for periods as short as possible and not greater than 150 ms. The design of the receiver* shall *provide for its proper functioning during the period the priority channel is sampled since the receiving conditions on the priority channel may differ from those on the additional channel*.

(A.524(13)/3.3) *In the absence of a signal on the priority channel and during reception of a signal on the additional channel, the duration of each listening period on this channel* shall *be at least 850 ms*.

(A.524(13)/3.4) *Means* shall *be provided to indicate the channel on which a signal is being received.*

7 Digital selective calling facility

7.1 DSC capabilities

(MSC.511(105)/D1.1) *The facility* shall *conform to the provisions of ITU-R Recommendation M.493 for Class A DSC equipment.*

(MSC.511(105)/D1.2) *The DSC facility* shall *comprise:*

.1 means to decode and encode DSC messages;

.2 means necessary for composing the DSC message;

.3 means to verify the prepared message before it is transmitted;

.4 means to display the information contained in a received call in plain language;

The display should have a minimum of 160 characters in two or more lines

.5 facilities to automatically update the ship's position and the time at which the position was determined from a suitable electronic position-fixing aid which may be an integral part of the equipment. For equipment which does not have an integral position-fixing

aid, such facilities shall *include a suitable interface conforming to the appropriate international standards;*

.6 means for the manual entry of position information and the time at which the position was determined; and

.7 means to activate an alert when no position data is received from the electronic position-fixing aid or, in the case of manual input, the position information is over four hours old. Any position information not updated for more than 23,5 hours shall *be erased.*

7.2 Distress message storage

(MSC.511(105)/D2.1) *If the received messages are not printed immediately, sufficient capacity* shall *be provided to enable at least 20 received distress messages to be stored in the DSC facility.*

(MSC.511(105)/D2.2) *These messages* shall *be stored until read-out and* shall *be erased after 48 hours after their reception.*

7.3 DSC characteristics

The technical description of DSC is given in Annex 1 of Recommendation ITU-R M.493-16.

The required operation of DSC is given in Annex C.

8 Methods of testing and required test results

8.1 Test conditions

8.1.1 Normal and extreme test conditions

Tests shall be made under normal test conditions and also, where stated, under extreme test conditions as specified in IEC 60945, of dry heat and the upper limit of supply voltage applied simultaneously and low temperature and the lower limit of supply voltage applied simultaneously.

8.1.2 Test power source

During each test the EUT shall be supplied from a test power source, capable of producing normal and extreme test voltages. For the purpose of tests, the voltage of the power source shall be measured at the input terminals of the EUT. During tests, the power supply voltages shall be maintained within ±3 % relative to the voltage level at the beginning of each test.

8.1.3 Procedure for tests at extreme temperatures

For tests at high temperature, the EUT shall be placed in a test chamber and left until thermal equilibrium is reached. The EUT shall then be switched on for 5 min in the high power transmit condition, after which the EUT shall meet the requirements of this document.

For tests at low temperature, the EUT shall be placed in a test chamber and left until thermal equilibrium is reached. The EUT shall then be switched to stand-by or receive condition for 1 min, after which the EUT shall meet the requirements of this document.

8.1.4 General requirements

The equipment shall comply with the general requirements contained in IEC 60945, as applicable to the equipment category, for example “protected”, “exposed”.

For the purposes of IEC 60945 a performance check and performance test is defined as:

a) the transmitter frequency error to 8.3.2 and the output power of the transmitter to 8.3.3 (high power only); and

b) the receiver maximum usable sensitivity to 8.4.3.

The frequency error shall be less than ±1,5 kHz, the carrier power shall be not less than 6 W and the receiver sensitivity shall be better than 12 dBμV.

8.1.5 Unspecified test conditions

Any requirement in Clauses 4 to 7 for which no test is specified in this Clause 8 shall be checked by inspection of the equipment, the manufacturing drawings or other relevant documents. The result of the inspection shall be stated in the test report.

8.2 General conditions of measurement

8.2.1 Arrangements for test signals applied to the receiver input

The source of test signals for application to the receiver input shall be connected in such a way that the impedance presented to the receiver input is 50 Ω, irrespective of whether one or more signals are applied to the receiver simultaneously. The level of the test signals shall be expressed in terms of the electromotive force (e.m.f) at the terminals to be connected to the receiver. The nominal frequency of the receiver is the carrier frequency of the selected channel.

8.2.2 Receiver squelch facility

Unless otherwise specified, the squelch circuit shall be set inoperative for the duration of the test.

8.2.3 Normal test modulation

For normal test modulation, the modulating frequency shall be 1 kHz and the frequency deviation shall be ±3 kHz. The test signal shall be substantially free from amplitude modulation.

8.2.4 Artificial antenna

When tests are carried out with an artificial antenna, this shall be a non-reactive, non-radiating 50 Ω load.

8.2.5 Arrangements for test signals applied to the transmitter input

The transmitter audio-frequency modulation signal shall be supplied by a generator to an interface connected to the microphone input and this interface shall be provided by the manufacturer.

8.2.6 Transmitter output power

Unless otherwise specified, the transmitter output power shall be at maximum for these tests.

8.2.7 Test of equipment with duplex filter

If the equipment is provided with a built-in or an external duplex filter, the requirements of this document shall be met when the measurements are carried out using the antenna terminals of the filter.

8.2.8 Test channels

For tests to subclauses 8.3 and 8.4, test channels within the frequency range of the EUT shall include at least:

a) the lowest frequency usable;

c) the highest frequency usable;

d) channel 16 (156,8 MHz); and

e) channel 70 (156,525 MHz).

Unless otherwise stated, other tests to this document shall be made on channel 16 (156,8 MHz).

Field measurements and performance checks shall be made on another frequency than channels 16 and 70.

8.2.9 Measurement uncertainty

Maximum values of absolute measurement uncertainties shall be as follows:

RF frequency	$\pm 1 \times 10^{-7}$
RF power	±0,75 dB
Maximum frequency deviation:	
– within 300 Hz to 6 kHz of audiofrequency	±5 %
– within 6 kHz to 25 kHz of audiofrequency	±3 dB
Deviation limitation	±5 %
Adjacent channel power	±5 dB
Conducted spurious of transmitter	±4 dB
Audio output power	±0,5 dB
Amplitude characteristic of receiver limiter	±1,5 dB
Sensitivity at 20 dB SINAD	±3 dB
Conducted emission of receiver	±3 dB
Two-signal measurement	±4 dB
Three-signal measurement	±3 dB
Radiated emission of transmitter	±6 dB
Radiated emission of receiver	±6 dB
Receiver desensitization at duplex operation	±0,5 dB
Transmitter transient time	±20 %
Transmitter transient frequency.	±250 Hz

8.3.1 Switching time

8.3.1.1 General

Switching time to change frequency is the time from the receive and/or transmit condition at one frequency to another. This includes manual channel selection time, the time to press the press-to-transmit (p.t.t.) switch, and receiver/transmitter response time.

The time taken to change from transmit to receive conditions, and vice versa on the same channel is the total time of the time taken to switch the internal circuit plus receiver/transmitter response time.

8.3.1.2 Method of measurement

The transmitter output shall be connected to an artificial antenna through a coupling device, and a storage oscilloscope shall be connected to the coupling device to monitor the output level of the transmitter. Initially, the EUT shall be set at transmit condition on channel A, depressing the p.t.t. switch. Then, the EUT shall be set to the transmit condition on channel B, after releasing the p.t.t. switch, changing the channel from A to B, and depressing the p.t.t. switch again. The period from the ending of transmission on channel A to the beginning of transmission on channel B shall be measured by the storage oscilloscope.

To measure the time from receive condition to transmit condition, the storage oscilloscope shall be triggered by the p.t.t. switch signal at the starting point of transmission. The period from the starting point to the point where the level of the transmitted signal reaches 90 % of the final level shall be measured.

In addition to the above measuring condition, to measure the time from transmit to receive conditions, the input of the storage oscilloscope shall be connected to the receiver output with the squelch facility switched off. The p.t.t. switch signal shall be used to trigger the storage oscilloscope at the end point of transmission. The period from the end point to the point where the level of received noise level reaches 90 % of the final average level shall be measured.

8.3.1.3 Required results

Switching time of frequency change shall be within 5 s, and the time of receive to transmit conditions, and vice versa, shall not exceed 0,3 s.

8.3.2 Frequency error

8.3.2.1 General

The frequency error is the difference between the measured carrier frequency and the assigned frequency.

8.3.2.2 Method of measurement

The carrier frequency shall be measured in the absence of modulation with the transmitter connected to an artificial antenna. The measurement shall be carried out under normal test conditions and extreme test conditions as defined in IEC 60945, of dry heat and the upper limit of supply voltage applied simultaneously and low temperature and the lower limit of supply voltage applied simultaneously.

8.3.2.3 Required results

The frequency error shall be within ±1,5 kHz.

8.3.3 Carrier power

8.3.3.1 General

The carrier power is the average power supplied to the artificial antenna during one radiofrequency cycle in the absence of modulation.

8.3.3.2 Method of measurement

The transmitter shall be connected to an artificial antenna and the power delivered to this artificial antenna shall be measured. The measurements shall be carried out under normal test conditions and extreme test conditions as defined in IEC 60945, of dry heat and the upper limit of supply voltage applied simultaneously and low temperature and the lower limit of supply voltage applied simultaneously.

When the EUT contains integral DSC facilities, a routine all-ships DSC call shall be transmitted with the output power switch set at maximum.

8.3.3.3 Required results

8.3.3.3.1 Normal test conditions

The carrier power with the output power switch set at maximum, shall remain between 6 W and 25 W. The measured power is considered to be the rated output power. The carrier power with the output power switch set at minimum shall remain between 0,1 W and 1,0 W.

8.3.3.3.2 Extreme test conditions

With the output power switch set at maximum, the carrier power shall remain between 6 W and 25 W and be within +2 dB or –3 dB of the carrier power measured under the normal test condition. With the output power switch set at minimum, the carrier power shall remain between 0,1 W and 1 W.

The output power shall automatically be switched to below 1 W when a routine all-ships DSC call is transmitted from the EUT with integral DSC facilities or on command from an independent DSC unit.

8.3.4 Frequency deviation

8.3.4.1 General

The frequency deviation is the difference between the instantaneous frequency of the modulated radiofrequency signal and the carrier frequency.

8.3.4.2 Maximum permissible frequency deviation

8.3.4.2.1 Method of measurement

The frequency deviation shall be measured at the output with the transmitter connected to an artificial antenna, by means of a deviation meter capable of measuring the maximum deviation, including that due to any harmonics and intermodulation products which may be generated in the transmitter.

The modulation frequency shall be varied between 100 Hz and 3 kHz. The level of this test signal shall be 20 dB above the level which produces normal test modulation. This test shall be carried out with the output power switch set at both maximum and minimum.

8.3.4.2.2 Required results

The maximum permissible frequency deviation shall be ±5 kHz.

8.3.4.3 Reduction of frequency deviation at modulation frequencies above 3 kHz

8.3.4.3.1 Method of measurement

The transmitter shall be operated under normal test conditions, and terminated with an artificial antenna. The transmitter shall be modulated with normal test modulation. With the modulation signal at a constant input level, the frequency shall be varied from 3 kHz to 25 kHz and the frequency deviation shall be measured.

8.3.4.3.2 Required results

For modulation frequencies between 3 kHz and 6 kHz the frequency deviation shall not exceed the frequency deviation with a modulation frequency of 3 kHz (see Figure 2)

For a modulation frequency of 6 kHz, the frequency deviation shall not exceed ±1,5 kHz (see Figure 2)

For modulation frequencies between 6 kHz and 25 kHz, the frequency deviation shall not exceed that given by a linear response of frequency deviation (in decibels) against modulation frequency, starting at the point where the modulation frequency is 6 kHz and the frequency deviation is ±1,5 kHz and inclined at 14 dB/octave, with the frequency deviation diminishing as the modulation frequency increases (see Figure 2).

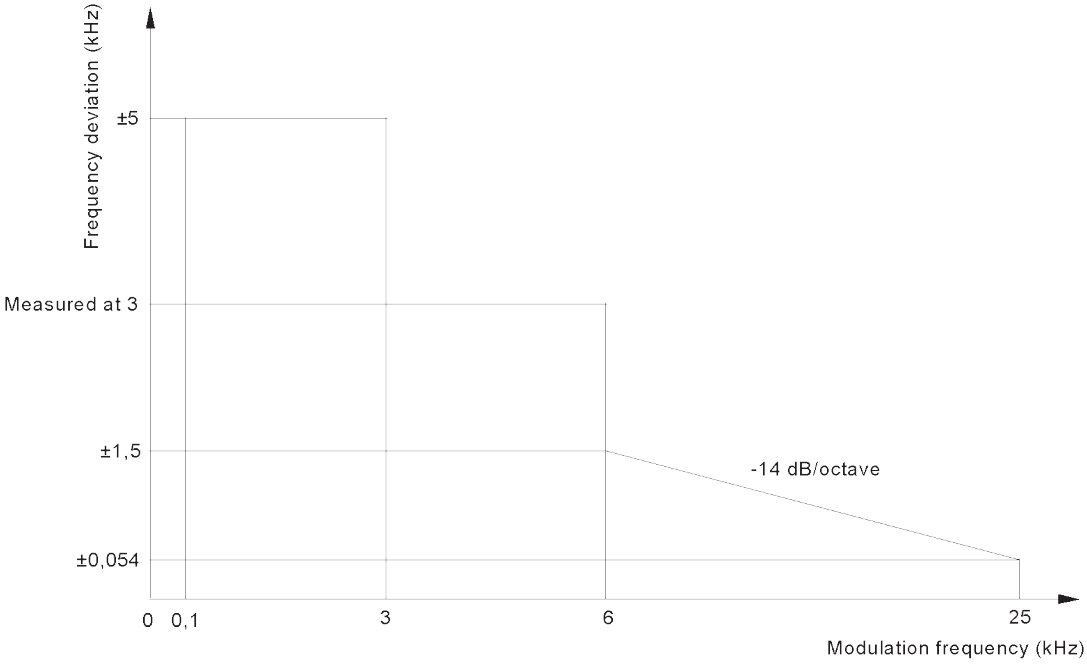


Figure 2 – Transmitter permissible frequency deviation

8.3.5 Limitation characteristics of the modulator

8.3.5.1 General

This characteristic expresses the ability of the transmitter to be modulated near the maximum permissible deviation specified in 8.3.4.

8.3.5.2 Method of measurement

A modulation signal at a frequency of 1 kHz shall be applied to the transmitter, and its level adjusted so that the frequency deviation is ±1 kHz. The level of the modulation signal shall then be increased by 20 dB and the deviation shall again be measured. This test shall be conducted under normal test conditions and extreme test conditions as defined in IEC 60945, of dry heat and the upper limit of supply voltage applied simultaneously and low temperature and the lower limit of supply voltage applied simultaneously.

8.3.5.3 Required results

The frequency deviation shall be between ±3,5 kHz and ±5 kHz.

8.3.6 Sensitivity of modulator, including microphone

8.3.6.1 General

This characteristic expresses the capability of the transmitter to produce a sufficient modulation when an audiofrequency signal corresponding to the normal mean speech level is applied to the microphone.

8.3.6.2 Method of measurement

An acoustic signal with a frequency of 1 kHz and sound level of 94 dBA relative to 2×10^{-5} Pa shall be applied to the microphone. The resulting deviation shall be measured.

8.3.6.3 Required results

The resulting frequency deviation shall be between ±1,5 kHz and ±3 kHz.

8.3.7 Audiofrequency response

8.3.7.1 General

The audiofrequency response expresses the ability of the transmitter to operate without excessive degradation of the frequency response, as a function of the modulation frequency.

8.3.7.2 Method of measurement

A modulation signal, at a frequency of 1 kHz adjusted in level to produce a frequency deviation of ±1 kHz, is applied to the transmitter. The modulation frequency shall then be varied between 300 Hz and 3 kHz, keeping the audio input level constant.

8.3.7.3 Required results

The modulation index shall be constant and equal to its value at 1 kHz within the limits of +1 dB or –3 dB.

NOTE Modulation index is the ratio between the frequency deviation and the modulation frequency.

8.3.8 Audiofrequency harmonic distortion of the emission

8.3.8.1 General

The harmonic distortion of the emission modulated by an audiofrequency signal is defined as the ratio, expressed as the percentage, of the root mean square (r.m.s.) voltage of all the harmonic components of the fundamental frequency to the total r.m.s. voltage of the signal after linear demodulation.

8.3.8.2 Method of measurement

The RF signal produced by the transmitter shall be applied via an appropriate coupling device to a linear demodulator with a de-emphasis network of 6 dB/octave.

Under normal test conditions, the radiofrequency signal shall be modulated successively at frequencies of 300 Hz, 500 Hz and 1000 Hz with a constant modulation index of three. The distortion of the audiofrequency signal shall be measured at the frequencies specified above.

Under extreme test conditions as defined in IEC 60945, of dry heat and the upper limit of supply voltage applied simultaneously and low temperature and the lower limit of supply voltage applied simultaneously, the measurements shall be carried out at 1 kHz with a frequency deviation of ±3 kHz.

8.3.8.3 Required results

The audiofrequency harmonic distortion shall not exceed 10 %.

8.3.9 Adjacent channel power

8.3.9.1 General

The adjacent channel power is the part of the total power output of a transmitter under defined conditions of modulation, which falls within a specified passband centred on the nominal frequency of either of the adjacent channels. This power is the sum of the mean power produced by the modulation, hum and noise of the transmitter.

8.3.9.2 Method of measurement

The adjacent channel power shall be measured with a power measuring receiver, referred to as the "receiver", which consists of a mixer, an IF filter, an oscillator, an amplifier, a variable attenuator and an r.m.s. value indicator. Instead of the variable attenuator with the r.m.s. value indicator it is possible to use an r.m.s. voltmeter calibrated in decibels. The technical characteristics of the power measuring receiver are given in Annex A.

The procedure is as follows:

a) the transmitter shall be operated at the carrier power determined in 8.3.3 under normal test conditions. The output of the transmitter shall be linked to the input of the "receiver" by a connecting device such that the impedance presented to the transmitter is 50 Ω and the level at the "receiver" input is appropriate;

b) with the transmitter unmodulated, the tuning of the "receiver" shall be adjusted so that a maximum response is obtained. This is the 0 dB response point. The "receiver" attenuator setting and the reading of the meter shall be recorded. The measurement may alternatively be made with the transmitter modulated with normal test modulation, in which case this fact shall be recorded with the test results;

c) the tuning of the "receiver" shall be adjusted away from the carrier so that the "receiver" –6 dB response nearest to the transmitter carrier frequency is located at a displacement from the nominal carrier frequency of 17 kHz;

d) the transmitter shall be modulated with 1,25 kHz at a level which is 20 dB higher than that required to produce a ±3 kHz deviation;

e) the "receiver" variable attenuator shall be adjusted to obtain the same meter reading as in step b) or a known relation to it;

f) the ratio of adjacent channel power to carrier power is the difference between the attenuator settings in steps b) and e), corrected for any differences in the reading of the meter;

g) the measurement shall be repeated with the "receiver" tuned to the other side of the carrier.

8.3.9.3 Required results

The adjacent channel power shall not exceed a value of 70 dB below the carrier power of the transmitter or 0,2 μW, whichever is higher.

8.3.10 Conducted spurious emissions conveyed to the antenna

8.3.10.1 General

Conducted spurious emissions are emissions on a frequency or frequencies which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products, but exclude out-of-band emissions.

8.3.10.2 Method of measurement

Conducted spurious emissions shall be measured with the unmodulated transmitter connected to the artificial antenna. The measurement shall be made over a frequency range from 150 kHz to 2 GHz, excluding the channel on which the transmitter is operating and its adjacent channels.

8.3.10.3 Required results

The power of any spurious emission on any discrete frequency shall not exceed 0,25 μW in the frequency range 150 kHz to 1 GHz and 1 μW in the frequency range 1 GHz to 2 GHz.

8.3.11 Residual modulation of the transmitter

8.3.11.1 General

The residual modulation of the transmitter is the ratio, in decibels, of the demodulated radiofrequency signal in the absence of wanted modulation, to the modulated radiofrequency signal produced when the normal test modulation is applied.

8.3.11.2 Method of measurement

The normal test modulation shall be applied to the transmitter. The radiofrequency signal produced by the transmitter shall be applied, via an appropriate coupling device, to a linear demodulator with a de-emphasis network of 6 dB/octave. Precautions shall be taken to avoid the effects of emphasizing the low audiofrequencies produced by internal noise.

The signal shall be measured by using an r.m.s. voltmeter. The modulation shall then be switched off and the level of the residual audiofrequency signal at the output shall be measured again.

8.3.11.3 Required results

The residual modulation shall not exceed –40 dB.

8.3.12 Transient frequency behaviour of the transmitter

8.3.12.1 General

The transient frequency behaviour of the transmitter is the variation in time of the transmitter frequency difference from the nominal frequency of the transmitter when the radiofrequency output power is switched on and off (see Figure 4).

t_{on}: according to the method of measurement described in 8.3.12.2 the switch-on instant t_{on} of a transmitter is defined by the condition when the output power, measured at the antenna terminal, exceeds 0,1 % of the nominal power;

t_1: period of time starting at t_{on} and finishing according to Table 7;

t_2: period of time starting at the end of t_1 and finishing according to Table 7;

t_{off}: switch-off instant defined by the condition when the output power falls below 0,1% of the nominal power;

t_3: period of time finishing at t_{off} and starting according to Table 7.

Table 7 – Transmitter transient timing (ms)

t_1	5,0
t_2	20,0
t_3	5,0

During the periods t_1 and t_3 the frequency difference shall not exceed the value of 1 channel separation.

During the period t_2 the frequency difference shall not exceed the value of half a channel separation.

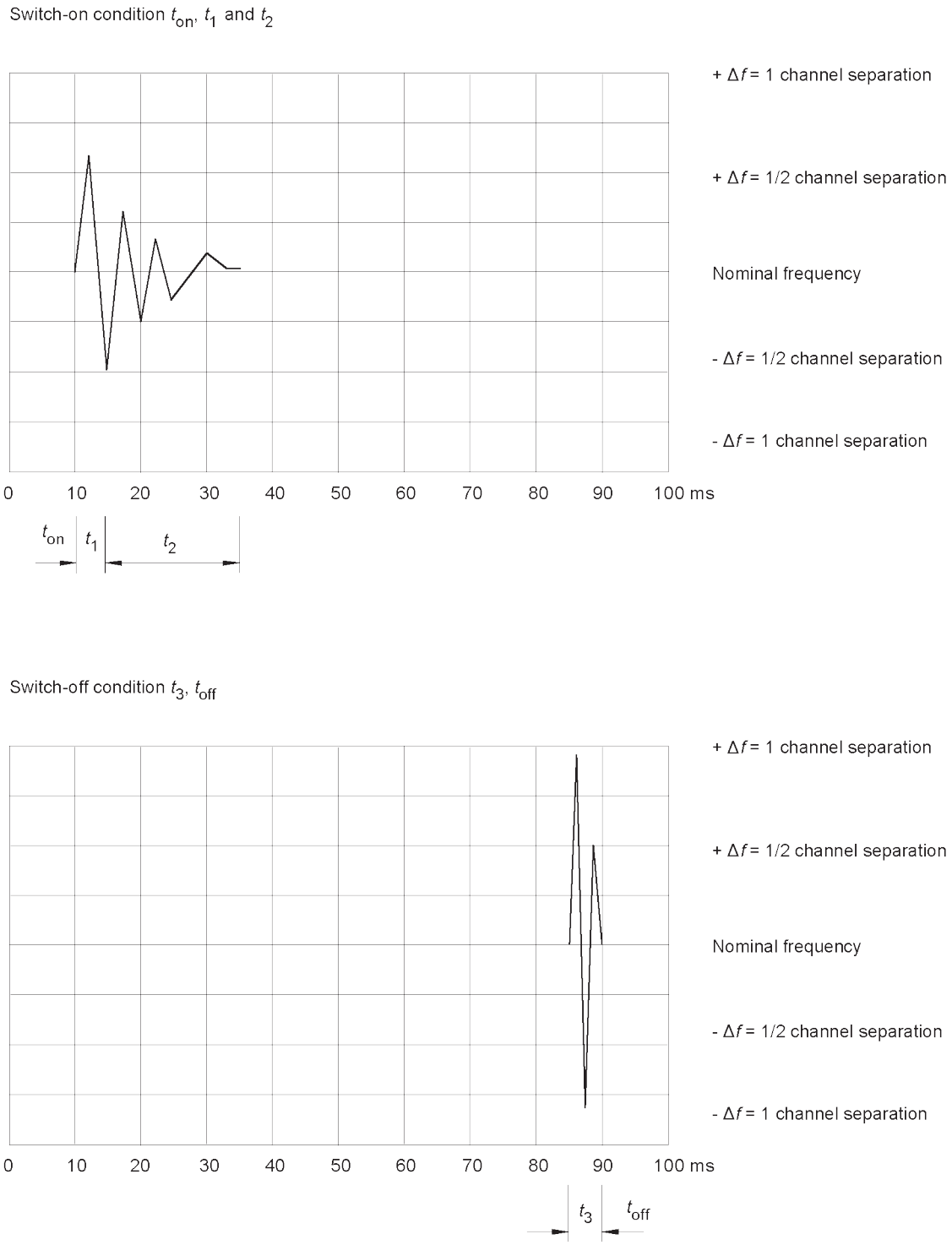
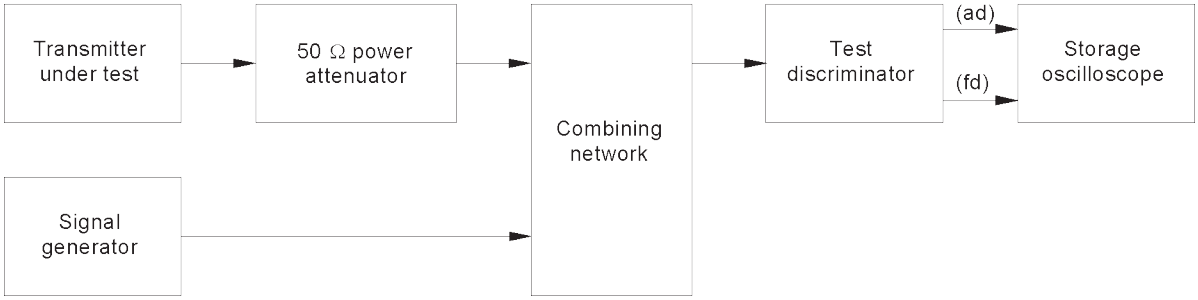


Figure 3 – Storage oscilloscope view t_1, t_2 and t_3

8.3.12.2 Method of measurement

Two signals shall be connected to the test discriminator via a combining network. The transmitter shall be connected to a 50 Ω power attenuator. The output of the power attenuator shall be connected to the test discriminator via one input of the combining network.



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873 **Figure 4 – Test set-up for measuring transient frequency behavior**

874 A test signal generator shall be connected to the second input of the combining network. The
875 test signal shall be adjusted to the nominal frequency of the transmitter. The test signal shall
876 be modulated by a frequency of 1 kHz with a deviation of ±25 kHz.

877 The test signal level shall be adjusted to correspond to 0,1 % of the power of the transmitter
878 under test measured at the input of the test discriminator. This level shall be maintained
879 throughout the measurement.

880 The amplitude difference (ad) (see Figure 5) and the frequency difference (fd) (see Figure 5)
881 output of the test discriminator shall be connected to a storage oscilloscope. The storage
882 oscilloscope shall be set to display the channel corresponding to the (fd) input up to
883 ±1 channel frequency difference, corresponding to the relevant channel separation, from the
884 nominal frequency.

885 The storage oscilloscope shall be set to a sweep rate of 1 ms/division and set so that the
886 triggering occurs at one division from the left edge of the display. The display shall show the
887 1 kHz test signal continuously. The storage oscilloscope shall then be set to trigger on the
888 channel corresponding to the amplitude difference (ad) input at a low level, rising.

889 The transmitter shall then be switched on, without modulation, to produce the trigger pulse
890 and a picture on the display. The result of the change in the ratio of power between the test
891 signal and the transmitter output will, due to the capture ratio of the test discriminator,
892 produce two separate sides on the picture, one showing the 1 kHz test signal, the other the
893 frequency of the transmitter versus time.

894 The moment when the 1 kHz test signal is completely suppressed is considered to provide t_{on}.
895 The period of time t_1 and t_2 as defined in Table 7 shall be used to define the appropriate
896 template.

897 The result shall be recorded as frequency difference versus time.

898 The transmitter shall remain switched on.

899 The storage oscilloscope shall be set to trigger on the channel corresponding to the amplitude
900 difference (ad) input at a high level, decaying and set so that the triggering occurs at one
901 division from the right edge of the display.

902 The transmitter shall then be switched off. The moment when the 1 kHz test signal starts to
903 rise is considered to provide t_{off}. The period of time t_3 as defined in Table 7 shall be used to
904 define the appropriate template.

905 The result shall be recorded as frequency difference versus time.

8.3.12.3 Required results

During the period of time t_1 and t_3 the frequency difference shall not exceed the value of one channel separation. The frequency difference, after the end of t_2, shall be within the limit of the frequency error of 8.3.2.

During the period of time t_2 the frequency difference shall not exceed the value of half a channel separation. Before the start of t_3 the frequency difference shall be within the limit of the frequency error of 8.3.2.

The required results are illustrated in Figure 4.

8.3.13 Protection of the transmitter

8.3.13.1 Antenna terminals

8.3.13.1.1 General

The equipment shall be so designed and constructed that the transmitter is protected against damage resulting from disconnection of the antenna or short-circuiting of antenna terminals. If this protection is provided by means of a safety device, that device shall automatically be reset following removal of the antenna open-circuit or short-circuit conditions.

8.3.13.1.2 Method of measurement

After the transmitter has been turned on, tuned and turned off, the antenna terminals shall be short-circuited. Then the transmitter shall be turned on for a period of 5 min. Then the transmitter shall be turned off, the antenna terminals shall be open-circuited, and the transmitter shall be turned on for a period of 5 min.

The test only needs to be carried out on one frequency and mode of operation.

8.3.13.1.3 Required results

The transmitter shall not be damaged and it shall be able to operate normally for all available modes of operation.

8.3.13.2 Standing wave ratio

8.3.13.2.1 General

In case the standing wave ratio (SWR) becomes too high the power of the transmitter shall be automatically reduced without stopping the transmission and an appropriate alert shall be initiated.

8.3.13.2.2 Method of measurement

The transmitter shall be connected to the artificial antenna which is set for the standing wave ratio (SWR) of 3 or higher and transmitted for a period of 5 min with normal test modulation.

The test only needs to be carried out on one frequency and mode of operation.

8.3.13.2.3 Required results

Confirm by observation that once test antenna with high SWR remains connected, the transmitter automatically reduces the output power without stopping the transmission and initiates an appropriate alert (see Annex B). Confirm by observation that after removal of the

high SWR conditions, the transmitter is able to operate normally for all available modes of operation.

8.4 Audio general receiver

8.4.1 Harmonic distortion and rated audiofrequency output power

8.4.1.1 General

The harmonic distortion at the receiver output is defined as the ratio, expressed as a percentage, of the total r.m.s. voltage of all the harmonic components of the modulation audiofrequency to the total r.m.s. voltage of the signal delivered by the receiver. The rated audiofrequency output power is the value stated by the manufacturer to be the maximum power available at the output, for which all the requirements of this document are met.

8.4.1.2 Method of measurement

A test signal of +100 dBμV, at a carrier frequency equal to the nominal frequency of the receiver and modulated by the normal test modulation shall be applied to the receiver input.

For the measurement, the audiofrequency output power control of the receiver shall be set so as to obtain, in a resistive load which simulates the operating load of the receiver, the rated audiofrequency output power. The value of this load shall be stated by the manufacturer.

Under normal test conditions, the test signal shall be modulated successively at 300 Hz, 500 Hz and 1 kHz with a constant modulation index of three. The harmonic distortion and audiofrequency output power shall be measured at all the frequencies specified above.

Under extreme test conditions as defined in IEC 60945, of dry heat and the upper limit of supply voltage applied simultaneously and low temperature and the lower limit of supply voltage applied simultaneously, the test shall be made at the nominal frequency of the receiver and at the nominal frequency ±1,5 kHz. For these tests, the modulation shall be 1 kHz and the frequency deviation shall be ±3 kHz.

8.4.1.3 Required results

The rated audiofrequency output power shall be at least 2 W in the loudspeaker and 1 mW in the handset/earphone.

The harmonic distortion shall not exceed 10 %.

8.4.2 Audiofrequency response

8.4.2.1 General

The audiofrequency response is defined as the variation in the audiofrequency output level of the receiver as a function of the modulation frequency of the radiofrequency signal with constant deviation at the input.

8.4.2.2 Method of measurement

A test signal of +60 dBμV, at a carrier frequency equal to the nominal frequency of the receiver, shall be applied to the receiver input. The audiofrequency power control of the receiver shall be set so as to produce a level equal to 50 % of the rated audiofrequency output power (see 8.4.1) when normal test modulation is applied in accordance with 8.2.3. This setting shall remain unchanged during the test.

The frequency deviation shall then be reduced to ±1 kHz. The frequency deviation shall remain constant while the modulation frequency is varied between 300 Hz and 3 kHz, and the output level shall then be measured. The measurement shall be repeated with a test signal at the same frequency as the nominal frequency of the receiver ±1,5 kHz.

8.4.2.3 Required results

The receiver response shall not deviate by more than +1 dB or −3 dB from a characteristic giving the output level as a function of the audiofrequency, decreasing by 6 dB/octave and passing through the measured point at 1 kHz.

The required limits are illustrated in Figure 5.

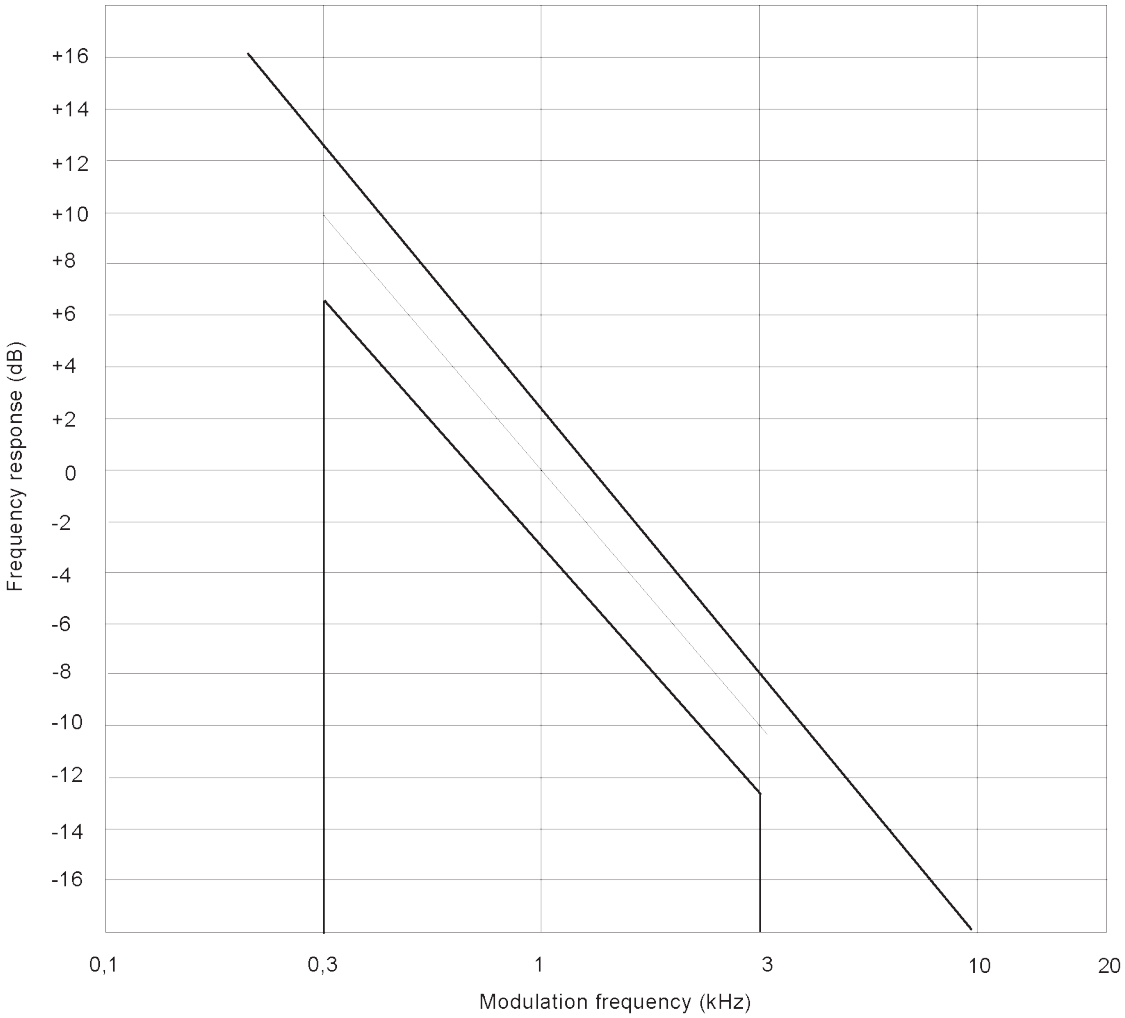

Figure 5 – Receiver audiofrequency response

8.4.3 Maximum usable sensitivity

8.4.3.1 General

The maximum usable sensitivity is the minimum level of the signal (e.m.f.) at the nominal frequency of the receiver which, when applied to the receiver input with normal test

modulation, will produce at the receiver output in all cases, an audiofrequency output power equal to 50 % of the rated output power and a SINAD ratio, psophometrically weighted, of 20 dB.

For EUT fitted with a duplex filter see also 8.2.7.

8.4.3.2 Method of measurement

A test signal at a carrier frequency equal to the nominal frequency of the receiver, modulated by the normal test modulation shall be applied to the receiver input. An audiofrequency load and a measuring instrument for measuring the SINAD ratio through the psophometric network shall be connected to the receiver output terminals.

The level of the test signal shall be adjusted until a SINAD ratio of 20 dB is obtained and with the audiofrequency power control of the receiver adjusted to produce 50 % of the rated output power. Under these conditions, the level of the test signal at the input is the value of the maximum usable sensitivity.

The measurement shall be carried out under normal test conditions and extreme test conditions as defined in IEC 60945, of dry heat and the upper limit of supply voltage applied simultaneously and low temperature and the lower limit of supply voltage applied simultaneously.

A receiver audiofrequency output power variation of up to ±3 dB relative to 50 % of the rated output power shall be allowed for sensitivity measurements under extreme test conditions.

8.4.3.3 Required results

The maximum usable sensitivity shall not exceed +6 dBμV under normal test conditions and +12 dBμV under extreme test conditions.

8.4.4 Co-channel rejection ratio

8.4.4.1 General

The co-channel rejection ratio is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

8.4.4.2 Method of measurement

The two input signals shall be connected to the receiver via a combining network. The wanted signal shall have normal test modulation. The unwanted signal shall be modulated by 400 Hz with a deviation of ±3 kHz. Both input signals shall be at the nominal frequency of the receiver under test and the measurement repeated for displacements of the unwanted signal of up to ±3 kHz.

The wanted input signal level shall be set to the value corresponding to the maximum usable sensitivity, as measured in 8.4.3. The amplitude of the unwanted input signal shall then be adjusted until the SINAD ratio at the receiver audiofrequency output, psophometrically weighted, is reduced to 14 dB.

The co-channel rejection ratio shall be expressed as the ratio in decibels, of the level of the unwanted signal to the level of the wanted signal at the receiver input, for which the specified reduction in SINAD ratio occurs.

8.4.4.3 Required results

The co-channel rejection ratio shall be between −10 dB and 0 dB.

8.4.5 Adjacent channel selectivity

8.4.5.1 General

The adjacent channel selectivity is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal which differs in frequency from the wanted signal by 25 kHz.

8.4.5.2 Method of measurement

The two input signals shall be applied to the receiver input via a combining network. The wanted signal shall be at the nominal frequency of the receiver and shall have normal test modulation. The unwanted signal shall be modulated by 400 Hz with a deviation of ±3 kHz, and shall be at the frequency of the channel immediately above that of the wanted signal.

The wanted input signal level shall be set to the value corresponding to the maximum usable sensitivity, as measured in 8.4.3. The amplitude of the unwanted input signal shall then be adjusted until the SINAD ratio at the receiver audiofrequency output, psophometrically weighted, is reduced to 14 dB. The measurement shall be repeated with an unwanted signal at the frequency of the channel below that of the wanted signal.

The adjacent channel selectivity shall be expressed as the lower value of the ratio in decibels for the upper and lower adjacent channels of the level of the unwanted signal to the level of the wanted signal.

The measurement shall then be repeated under extreme test conditions as defined in IEC 60945, of dry heat and the upper limit of supply voltage applied simultaneously and low temperature and the lower limit of supply voltage applied simultaneously, with the wanted signal set to the value corresponding to the maximum usable sensitivity under extreme test conditions.

8.4.5.3 Required results

The adjacent channel selectivity shall not be less than 70 dB under normal test conditions and not less than 60 dB under extreme test conditions.

8.4.6 Spurious response rejection

8.4.6.1 General

The spurious response rejection is a measure of the capability of the receiver to discriminate between the wanted modulated signal at the nominal frequency and an unwanted signal at any other frequency at which a response is obtained.

8.4.6.2 Method of measurement

Two input signals shall be applied to the receiver input via combining network. The wanted signal shall be at the nominal frequency of the receiver and shall have normal test modulation. The unwanted signal shall be modulated by 400 Hz with a deviation of ±3 kHz.

The wanted input signal level shall be set to the value corresponding to the maximum usable sensitivity as measured in 8.4.3. The amplitude of the unwanted input signal shall be adjusted to +86 dBμV. The frequency shall then be swept over the frequency range from 100 kHz to 2 GHz.

At any frequency at which a response is obtained, the input level shall be adjusted until the SINAD ratio at the receiver audiofrequency output, psophometrically weighted, is reduced to 14 dB.

The spurious response rejection ratio shall be expressed as the ratio in decibels between the unwanted signal and the wanted signal at the receiver input when the specified reduction in the SINAD ratio is obtained.

8.4.6.3 Required results

At any frequency separated from the nominal frequency of the receiver by more than 25 kHz, the spurious response rejection shall not be less than 70 dB.

8.4.7 Intermodulation response

8.4.7.1 General

The intermodulation response is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of two or more unwanted signals with specific frequency relationship to the wanted signal frequency.

8.4.7.2 Method of measurement

Three signal generators A, B and C shall be connected to the receiver via a combining network. The wanted signal, represented by signal generator A shall be set at the nominal frequency of the receiver and shall have normal test modulation. The unwanted signal from signal generator B shall be unmodulated and adjusted to a frequency 50 kHz above or below the nominal frequency of the receiver. The second unwanted signal from signal generator C shall be modulated by 400 Hz with a deviation of ±3 kHz, and adjusted to a frequency 100 kHz above or below the nominal frequency of the receiver.

The wanted input signal shall be set to a value corresponding to the maximum usable sensitivity, as measured in 8.4.3. The amplitude of the two unwanted signals shall be maintained equal and shall be adjusted until the SINAD ratio at the receiver audiofrequency output, psophometrically weighted, is reduced to 14 dB. The frequency of signal generator B shall be adjusted to produce the maximum degradation to the SINAD ratio. The level of the two unwanted test signals shall be readjusted to restore the SINAD ratio of 14 dB.

The intermodulation response ratio shall be expressed as the ratio in decibels between the two unwanted signals and the wanted signal at the receiver input, when the specified reduction in the SINAD ratio is obtained.

8.4.7.3 Required results

The intermodulation response ratio shall not be less than 65 dB.

8.4.8 Blocking

8.4.8.1 General

Blocking is a change (generally a reduction) in the audiofrequency output power of the receiver or a reduction of the SINAD ratio due to an unwanted signal on another frequency.

8.4.8.2 Method of measurement

Two input signals shall be applied to the receiver via a combining network. The modulated wanted signal shall be at the nominal frequency of the receiver and shall have normal test modulation. Initially the unwanted signal shall be switched off and the wanted signal set to the value corresponding to the maximum usable sensitivity, as measured in 8.4.3.

The audiofrequency output power of the wanted signal shall be adjusted, where possible, to 50 % of the rated output power and, in the case of stepped power controls, to the first step that provides an output power of at least 50 % of the rated output power. The unwanted signal shall be unmodulated and the frequency shall be swept between +1 MHz and +10 MHz, and also −1 MHz and −10 MHz, relative to the nominal frequency of the receiver.

The input level of the unwanted signal, at all frequencies in the specified ranges, shall be adjusted so that the unwanted signal causes a reduction of 3 dB in the output level of the wanted signal or a reduction to 14 dB of the SINAD ratio at the receiver audiofrequency output, psophometrically weighted, whichever occurs first.

This level expressed in dBμV shall be noted.

8.4.8.3 Required results

The blocking level for any frequency within the specified ranges shall be not less than +90 dBμV, except at frequencies on which spurious responses are found (see 8.4.6).

8.4.9 Conducted spurious emissions conveyed to the antenna

8.4.9.1 General

Conducted spurious emissions to the antenna are any RF emissions generated in the receiver and conveyed to the antenna terminal.

8.4.9.2 Method of measurement

Conducted spurious emissions shall be measured as the power level of any frequency component at the antenna terminals of the receiver. The receiver antenna terminals are connected to a spectrum analyzer or selective voltmeter having an input impedance of 50 Ω and the receiver is switched on.

If the detecting device is not calibrated in terms of power input, the level of any detected components shall be determined by a substitution method using a signal generator. The measurement shall extend over the frequency range 150 kHz to 2 GHz.

8.4.9.3 Required results

The power of any spurious emission in the specified range at the antenna terminal shall not exceed −57 dBm (2 nW) in the frequency range 150 kHz to 1 GHz and −37 dBm (20 nW) in the frequency range 1 GHz to 2 GHz.

8.4.10 Amplitude response of the receiver limiter

8.4.10.1 General

The amplitude characteristic of the receiver limiter is the relationship between the radiofrequency input level of a specific modulated signal and the audiofrequency level of the receiver output.

8.4.10.2 Method of measurement

A test signal at the nominal frequency of the receiver and modulated by the normal test modulation at a level of +6 dBμV shall be applied to the receiver input and the audiofrequency output power level shall be adjusted to a level of 6 dB lower than the rated output power. The level of the input signal shall be increased to +100 dBμV and the audiofrequency output power level shall be measured again.

8.4.10.3 Required results

When the radiofrequency input level is varied as specified, the variation between the maximum and minimum value of the audiofrequency output level shall not exceed 3 dB.

8.4.11 Receiver hum and noise level

8.4.11.1 General

The receiver hum and noise level is defined as the ratio, in decibels, of the audiofrequency power of the hum and noise resulting from the spurious effects of the power supply system or from other causes, to the audiofrequency power produced by high-frequency signal of average level, modulated by the normal test modulation and applied to the receiver input.

8.4.11.2 Method of measurement

The test signal with a level of +30 dBμV at a carrier frequency equal to the nominal frequency of the receiver, and modulated by the normal test modulation shall be applied to the receiver input. An audiofrequency load shall be connected to the output terminal of the receiver. The audiofrequency power control shall be set so as to produce the rated audiofrequency output power defined in 8.4.1.

The output signal shall be measured by means of an r.m.s. voltmeter. The modulation shall then be switched off and the audiofrequency output level shall be measured again.

8.4.11.3 Required results

The receiver hum and noise level shall not exceed –40 dB.

8.4.12 Squelch operation

8.4.12.1 General

The purpose of the squelch facility is to mute the receiver audio output signal when the level of the signal at the receiver input is less than a given value.

8.4.12.2 Method of measurement

The procedure is as follows:

a) with the squelch facility switched off, a test signal of +30 dBμV, at a carrier frequency equal to the nominal frequency of the receiver and modulated by the normal test modulation shall be applied to the input terminals of the receiver. An audiofrequency load and the psophometric filtering network shall be connected to the output terminals of the receiver. The audiofrequency power output control of the receiver shall be set so as to produce the rated audiofrequency output power defined in 8.4.1. The output signal shall be measured with an r.m.s. voltmeter. The input signal shall then be suppressed, the squelch facility switched on and the audiofrequency output level shall be measured again;

b) with the squelch facility switched off again, a test signal modulated by the normal test modulation shall be applied to the receiver input at a level of +6 dBμV and the receiver shall be set to produce 50 % of the rated audiofrequency output power. The level of the input signal shall then be reduced and the squelch facility shall be switched on. The input signal shall then be increased until the above audiofrequency output power is reached. The SINAD ratio and the input level shall then be measured;

c) applicable only to equipment with continuously adjustable squelch control. With the squelch facility switched off, a test signal with normal test modulation shall be applied to the receiver input at a level of +6 dBμV, and the receiver shall be adjusted to give 50 % of the rated audiofrequency output power. The squelch facility shall then be switched on at

its maximum position and the level of the input signal shall be increased until the output again is 50 % of the rated audiofrequency output power.

8.4.12.3 Required results

The Required results are as follows.

a) Under the conditions specified in 8.4.12.2 a), the audiofrequency output power shall not exceed –40 dB relative to the rated audiofrequency output power.

b) Under the conditions specified in 8.4.12.2 b), the input signal level shall not exceed +6 dBμV and the SINAD ratio shall be at least 20 dB.

c) Under the conditions specified in 8.4.12.2 c), the input signal level shall not exceed +6 dBμV when the control is set at maximum.

8.4.13 Squelch hysteresis

8.4.13.1 General

Squelch hysteresis is the difference in decibels between the receiver input signal levels at which the squelch opens and closes.

8.4.13.2 Method of measurement

If there is any squelch control on the exterior of the equipment, it shall be placed in its maximum muted position. With the squelch facility switched on, an unmodulated input signal at a carrier frequency equal to the nominal frequency of the receiver shall be applied to the input of the receiver at a level sufficiently low to avoid opening the squelch.

The input signal shall be increased to the level just opening the squelch. This level shall be recorded. With the squelch still open, the level of the input signal shall be slowly decreased until the squelch mutes the receiver audio output again. This level shall be recorded.

8.4.13.3 Required results

The squelch hysteresis shall be between 3 dB and 6 dB.

8.4.14 Scanning characteristics of multiple watch facilities

8.4.14.1 General

The scanning period is the time between the start of two successive samplings of the priority channel in the absence of a signal on that channel. The dwell time on the priority channel is the time between the start and finish of any sampling of the priority channel in the absence of a signal on that channel. The dwell time on the additional channel is the time between the start and finish of any sampling of the additional channel.

8.4.14.2 Method of measurement

The equipment shall be adjusted to scan the priority channel and one additional channel. The squelch shall be operational and so adjusted that the receiver just mutes on both channels. A test signal at the carrier frequency equal to the nominal frequency of the additional channel of the receiver, modulated by the normal test modulation shall be connected to the receiver via a combining network.

A second test signal with a frequency equal to the nominal frequency of the priority channel having no modulation shall be connected to the receiver via the other input of the combining network. The level of the two signals shall be +12 dBμV. A storage oscilloscope shall be connected to the audio output.

Initially the output of the test signal on the priority channel shall be switched off. The scanning process shall be started and the output shall be observed on the oscilloscope. The gap between and the duration of the audio bursts shall be measured.

The test signal on the priority channel shall be switched on and scanning shall stop on the priority channel after the last burst and within the dwell time on the priority channel. The measurement shall be carried out where the additional channel is a simplex channel (single-frequency channel) and repeated where it is a duplex channel (two-frequency channel).

The measurement shall be carried out under normal test conditions and extreme test conditions as defined in IEC 60945, of dry heat and the upper limit of supply voltage applied simultaneously and low temperature and the lower limit of supply voltage applied simultaneously.

8.4.14.3 Required results

The scanning period shall not exceed 2 s, the dwell time on the priority channel shall not exceed 150 ms and the dwell time on the additional channel shall be between 850 ms and 2 s.

8.4.15 Protection of the antenna input circuit

8.4.15.1 Method of measurement

An unmodulated radiofrequency signal at an input level of 30 V RMS at any frequency the range in which the receiver is designed to operate shall be applied to the antenna input terminal for a period of 15 min.

8.4.15.2 Required results

The receiver shall not be damaged and it shall be able to operate normally.

8.5 DSC watch receiver

8.5.1 DSC test signal

8.5.1.1 References to standard DSC signals

Standard DSC signals consist of a series of identical DSC message sequences, each of which contains a known number of information symbols (format specifier, address, category, identification, etc., of Recommendation ITU-R M.493).

8.5.1.2 Standard test signal

The standard DSC test signal shall be a signal at the nominal receiver DSC frequency phase modulated with modulation index equal to 2,0. The modulation signal shall have nominal frequency 1 700 Hz and frequency shift of ±400 Hz modulated with various types of DSC signals at a modulation rate of 1 200 baud. The signal shall be generated by means of calibrated apparatus.

8.5.1.3 Symbol error rate at the DSC receiver

The DSC decoder is evaluated by determination of the symbol error rate (SER). The decoded DSC call sequence applied with forward error correction, interleaving techniques and check-sum information is divided into blocks each corresponding to one information symbol in the received signal. The ratio between the numbers of incorrect blocks to the total number of blocks is determined as the symbol error rate.

NOTE IMO Resolutions are phrased in terms of character error ratio. In this document, equivalent bit error ratio measurements are taken to demonstrate compliance with IMO requirements.

Sufficient calls shall be used in each test in order to ensure the statistical significance of the result.

8.5.2 Maximum usable sensitivity

8.5.2.1 General

The calling sensitivity of the receiver is a defined RF-signal level at which the symbol error ratio will result in a decoded DSC message.

8.5.2.2 Method of measurement

The signals applied to the receiver input shall be connected in accordance with 8.2.1.

The wanted signal standard test signal shall be applied using channel 70.

The input level shall be 0 dBμV under normal test conditions and +6 dBμV under extreme test conditions.

The measurement shall then be repeated under extreme test conditions in accordance with 8.1.3.

The measurement shall be repeated under normal test conditions at the nominal carrier frequency ±1,5 kHz.

The symbol error rate in the output shall be determined in accordance with 8.5.1.3.

8.5.2.3 Required results

The symbol error ratio shall be equal to or less than 10^{-2}.

8.5.3 Adjacent channel selectivity

8.5.3.1 General

The adjacent channel selectivity is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal which differs in frequency from the wanted signal by 25 kHz.

8.5.3.2 Method of measurement

The signals applied to the receiver input shall be connected in accordance with 8.2.1.

The wanted signal standard test signal shall be applied using channel 70.

The level of the wanted signal shall be +3 dBμV.

The unwanted signal shall be modulated by 400 Hz with a deviation of ±3 kHz at the frequency +25 kHz relative to the nominal receiver frequency.

The input level of the unwanted signal shall be +73 dBμV.

The measurement shall be repeated with the unwanted signal tuned to the centre frequency of the lower adjacent channel.

The symbol error rate in the output shall be determined as described in 8.5.1.3.

8.5.3.3 Required results

The symbol error ratio shall be equal to or less than 10^{-2}.

8.5.4 Co-channel rejection ratio

8.5.4.1 General

The co-channel rejection ratio is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted modulated signal, both signals being at the nominal frequency of the receiver.

8.5.4.2 Method of measurement

The signals applied to the receiver input shall be connected in accordance with 8.2.1.

The wanted signal standard test signal shall be applied using channel 70.

The level of the wanted signal shall be +3 dBμV.

The unwanted signal shall be modulated by 400 Hz with a deviation of ±3 kHz at the nominal receiver frequency.

The level of the unwanted signal shall be -5 dBμV.

The symbol error rate in the output shall be determined as described in 8.5.1.3.

8.5.4.3 Required results

The symbol error ratio shall be equal to or less than 10^{-2}.

8.5.5 Intermodulation response

8.5.5.1 General

The intermodulation response is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of two or more unwanted signals with specific frequency relationship to the wanted signal frequency.

8.5.5.2 Method of measurement

The signals applied to the receiver input shall be connected in accordance with 8.2.1.

The wanted signal standard test signal shall be applied using channel 70.

The level of the wanted signal shall be +3 dBμV.

The unwanted signals shall be applied, both at the same level. The unwanted signal from signal generator B shall be unmodulated and adjusted to a frequency 50 kHz above (or below) the nominal frequency of the receiver. The second unwanted signal from signal generator C shall be modulated by 400 Hz with a deviation of ±3 kHz and adjusted to a frequency 100 kHz above (or below) the nominal frequency of the receiver.

The input level of the unwanted signals shall be +68 dBμV.

The symbol error rate in the output shall be determined accordance with 8.5.1.3.

8.5.5.3 Required results

The symbol error ratio shall be equal to or less than 10^{-2}.

8.5.6 Spurious response rejection

8.5.6.1 General

The spurious response rejection is a measure of the capability of the receiver to discriminate between the wanted modulated signal at the nominal frequency and an unwanted signal at any other frequency at which a response is obtained.

8.5.6.2 Method of measurement

The manufacturer shall provide the test house with the information regarding the equipment.

In general, a block diagram from which it appears what signal path architecture there has been chosen.

If the equipment is built using heterodyne principles, the following shall be stated:

- IF frequencies used;
- the local oscillator frequencies;
- filter arrangements ahead of the first mixer.

If the equipment uses analogue to digital converter techniques, the following shall be stated:

- whether the sampling is done directly on the RF frequency or on an IF frequency;
- the sampling frequency used for the conversion.

The arrangements for applying two test signals to the receiver input shall be according to 8.2.1.

The wanted signal standard test signal shall be applied using relevant frequencies as specified by 8.2.8.

The level of the wanted signal shall be +3 dBμV.

The level of the unwanted signal shall then be +73 dBμV and shall be unmodulated.

The equipment shall be in compliance for frequencies from 9 kHz to 2 GHz with the exception of the receiver passband and the adjacent channels.

The equations below for calculation of spurious frequencies can be used as a guidance.

a) For equipment using super heterodyne principles

$$f_{\text{spurious}} = (1 - n)/m \times f_{\text{if}} - n/m \times f_{\text{receive}}$$

where

m and n are integers with values from –5 to +5.

Spurious frequency calculation should be applied to all frequency conversions (IF1, IF2, etc.).

b) For equipment using analogue to digital converter techniques

$$f_{\text{spurious}} = f_{\text{receive}}\ /m - n/m \times f_{\text{sample clock}}$$

where

m and n are integers with values from –5 to +5.

c) For equipment where both heterodyne principles and digital techniques are used, both equations should be taken into consideration.

The symbol error rate in the output shall be determined accordance with 8.5.1.3.

8.5.6.3 Required results

The symbol error ratio shall be equal to or less than 10^{-2}.

8.5.7 Blocking immunity

8.5.7.1 General

Blocking is a change (generally a reduction) in the audio frequency output power of the receiver or a reduction of the SINAD ratio due to an unwanted signal on another frequency.

8.5.7.2 Method of measurement

The arrangements for applying two test signals to the receiver input shall be in accordance with 8.2.1.

The wanted signal standard test signal shall be applied using channel 70.

The level of the wanted signal shall be +3 dBμV.

The level of the unwanted signal shall then be +93 dBμV and shall be unmodulated and varied in frequency steps of 500 Hz.

The equipment shall be in compliance for frequencies from ±1 MHz to ±10 MHz from the nominal assigned frequency.

The symbol error rate in the output shall be determined accordance with 8.5.1.3.

When a spurious response occurs, refer to 8.5.5.

8.5.7.3 Required results

The symbol error ratio shall be equal to or less than 10^{-2}.

8.5.8 Dynamic range

8.5.8.1 General

The dynamic range of the equipment is the range from the minimum to the maximum level of a radio frequency input signal at which the symbol error rate.

8.5.8.2 Method of measurement

The signals applied to the receiver input shall be connected in accordance with 8.2.1.

The wanted signal standard test signal shall be applied using channel 70.

The level of the wanted signal shall be +80 dBμV.

The symbol error rate in the output shall be determined in accordance with 8.5.1.3.

8.5.8.3 Required results

The symbol error ratio shall be equal to or less than 10^{-2}.

8.5.9 Conducted spurious emissions conveyed to the antenna

8.5.9.1 General

Conducted spurious emissions to the antenna are any RF emissions generated in the receiver and conveyed to the antenna terminal.

8.5.9.2 General

The power of any conducted spurious emission, measured at the antenna terminals, shall not exceed 2,0 nW at any discrete frequency in the frequency range 9 kHz to 2 GHz.

8.5.9.3 Method of measurement

Conducted spurious emissions shall be measured as the power level of any frequency component at the antenna terminals of the receiver. The receiver antenna terminals are connected to a spectrum analyzer or selective voltmeter having an input impedance of 50 Ω, and the receiver is switched on.

If the detecting device is not calibrated in terms of power input, the level of any detected components shall be determined by a substitution method using a signal generator. The measurement shall extend over the frequency range 150 kHz to 2 GHz.

8.5.9.4 Required results

The power of any spurious emission in the specified range at the antenna terminal shall not exceed –57 dBm (2 nW) in the frequency range 150 kHz to 1 GHz, and –37 dBm (20 nW) in the frequency range 1 GHz to 2 GHz.

8.5.10 Protection of the antenna input circuit

8.5.10.1 Method of measurement

An unmodulated radiofrequency signal at an input level of 30 V RMS on channel 70 shall be applied to the antenna input terminal for a period of 15 min.

8.5.10.2 Required results

The receiver shall not be damaged and it shall be able to operate normally.

Annex A
(normative)

Power measuring receiver specification

A.1 IF filter

The IF filter shall be within the limits specified in Figure A.1:

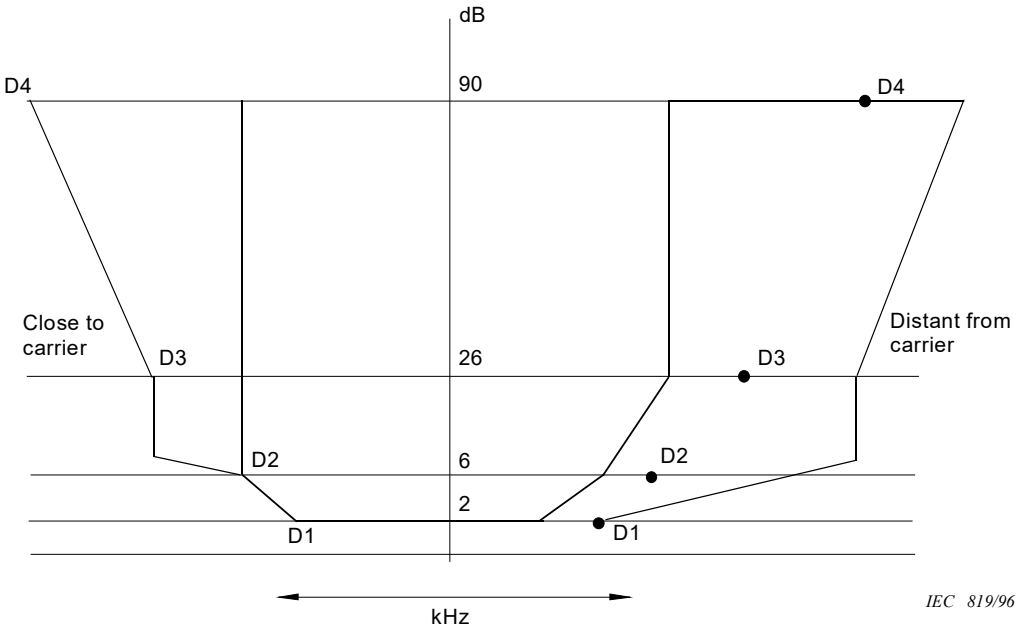

Figure A.1 – IF filter specification

The selectivity characteristics shall maintain the following frequency separations from the nominal centre frequency of the adjacent channel given in Table A.1.

Table A.1 – Selectivity characteristic

Frequency separation of filter curve from nominal centre frequency of adjacent channel kHz			
D1	**D2**	**D3**	**D4**
5	8,0	9,25	13,25

The attenuation points shall not exceed the following tolerances:

1462 **Table A.2 – Attenuation points close to carrier**

Tolerance kHz			
D1	**D2**	**D3**	**D4**
+3,1	±0,1	−1,35	−5,35

1463

1464 **Table A.3 – Attenuation points distant from carrier**

Tolerance kHz			
D1	**D2**	**D3**	**D4**
±3,5	±3,5	±3,5	+3,5 -7,5

1465

1466 The minimum attenuation of the filter outside the 90 dB attenuation points shall be equal to or
1467 greater than 90 dB.

1468 A.2 Attenuation indicator

1469 The attenuation indicator shall have a minimum range of 80 dB and a reading accuracy of
1470 1 dB. With a view to future regulations an attenuation of 90 dB or more is recommended.

1471 A.3 RMS value indicator

1472 The instrument shall accurately indicate non-sinusoidal signals in a ratio up to 10:1 between
1473 the peak value and the r.m.s. value.

1474 A.4 Oscillator and amplifier

1475 The oscillator and the amplifier shall be designed in such a way that measurement of the
1476 adjacent channel power of a low-noise unmodulated transmitter, whose self-noise has a
1477 negligible influence on the measurement results, yields a measured value of <–90 dB.

Annex B
(normative)

Implementation of Bridge Alert Management (BAM) in VHF radio

B.1 Classification of BAM alerts

B.1.1 Requirements

The equipment shall use the relevant BAM alert classification available in Table B.1. The manufacturer shall provide a document listing all available BAM alerts and their classification in the equipment.

The ALF sentence is used to report details of BAM alerts. For easy identification of the origin of distress or other call, the ALF sentence shall be filled as below:

- Field BAM Alert identifier as specified in Table B.1 (for example 3122, 3123);
- Field BAM Alert text for first ALF sentence as specified in Tables B.2 to B.7 BAM Alert title column (for example “DISTRESS:RX);

NOTE The source of a BAM alert, for example "radio-telephone VHF", is available in IEC 61162-1 or IEC 61162-2 as a combination of talker ID and physical serial interface (i.e. configuration parameter within the Central Alert Management). For IEC 61162-450, the source is available as combination of talker ID and TAG block parameter source identification.

- Field BAM Alert text for second ALF sentence as defined by the manufacturer after consulting Tables B.1 to B.7 BAM Alert description column. The manufacturer shall provide a detailed description of the text options.

Table B.1 – Classification of GMDSS equipment alerts for BAM alert management purposes

		BAM classification					
Source	**Cause**	**Alarm**	**Warning**	**Caution**	**Cat. A**	**Cat. B**	**BAM Alert identifier**
VHF radio	Receipt of distress or urgency DSC call		x		x		3122
VHF radio	Receipt of DSC calls other than distress or urgency			x		x	3123
VHF radio	Automatic positioning ceased			x		x	3016
VHF radio	Position older than 4 h			x		x	3013
VHF radio	Antenna Tuner Error or other detected antenna failure		x			x	3115 [a]
VHF radio	Transmission power error or otherwise inhibited transmission		x			x	3008 [a]

[a] This alert is required if the related function is implemented.

NOTE Classification of BAM Alerts related to the reception of distress and urgency call is as defined in IMO Resolution MSC.434(98). These BAM alerts are categorized as category A, as the Officer of the watch has to read the information in the received message before being in a position to acknowledge the BAM alert.

B.1.2 Methods of test and required results

Confirm by inspection of the manufacturer’s documentation that the classification of BAM alerts follows the requirements of Table B.1.

B.2 BAM Alert management

B.2.1 General requirements

B.2.1.1 Requirements

The performance standards for BAM tailor the IMO Code on alerts and indicators to harmonize the priority, classification, handling, distribution and presentation of BAM alerts on bridge equipment.

The equipment shall provide bridge alert management handling and an interface compliant with the requirements of IEC 62923-1.

Alert management requires:

a) classification of all BAM alerts available in the EUT (see Table B.1);

b) presentation of the BAM alerts (see IEC 62923-1);

c) reporting of BAM alerts in the BAM interface (see IEC 62923-1);

d) handling of unacknowledged BAM warnings (see B.2.2);

e) functionality of remote acknowledge and remote silencing (see B.2.3).

B.2.1.2 Methods of test and required results

Confirm by observation that the equipment outputs an ALF sentence under the condition described in the user manual. Confirm by analytic evaluation that presentation of the BAM alerts in the BAM interface conforms to IEC 62923-1.

B.2.2 Unacknowledged BAM warnings

B.2.2.1 Requirements

An unacknowledged BAM warning shall be repeated as a BAM warning after a limited time period not exceeding 5 min. Unacknowledged BAM warnings shall not be changed to BAM alarm priority.

B.2.2.2 Methods of test and required results

Confirm by observation that an unacknowledged BAM warning is repeated as a BAM warning after a limited time period not exceeding 5 min. Confirm by observation that an unacknowledged BAM warning is not changed to BAM alarm priority.

B.2.3 Remote acknowledgement and silencing of BAM alerts

B.2.3.1 Requirements

Remote temporary silencing and remote acknowledgement shall be provided via BAM alert related communication according IEC 62923-1.

Remote silencing of the BAM alerts of the GMDSS equipment shall be possible at any time.

B.2.3.2 Methods of test and required results

Confirm by using a BAM simulator that remote temporary silencing and remote acknowledgement is provided via BAM alert related communication according to IEC 62923-1.

Confirm by using a BAM simulator that remote silencing of the BAM alerts of the GMDSS equipment is possible at any time.

NOTE BAM simulator is an arrangement within a test environment that allows to confirm applicable functions of the EUT as a BAM alert source.

B.3 BAM Alert source identification and reporting in ALF sentence

B.3.1 General requirements

B.3.1.1 Requirements

The ALF sentence is used to report the status of any BAM alert in the system. Alert IDs and categorization for the equipment are defined in Table B.1.

The source equipment of the BAM alert is solely determined by the talker identifier (IEC 61162-1) and/or the source identification parameter SFI (IEC 61162-450).

DSC origin BAM alerts shall initially be created upon the creation of the automated procedure handling the call. The unique identifier shall be assigned by the BAM alert source for that particular cause.

Several identical causes may be active in parallel. To be able to identify and control parallel incidents from the BAM, the equipment shall assign a unique instance number for each similar cause. The automated procedures described in Annex C are the mechanism able to handle DSC parallelism. Each automated procedure shall be assigned an instance number to be used in the ALF/ALC sentences.

The ALF sentence shall be output each time a call is received which causes a state transition in the automated procedure. The ALF revision counter shall be incremented and the BAM alert text may be updated on each changed state.

B.3.1.2 Methods of test and required results

Make the EUT receive a number of DSC calls that will initiate multiple automated procedures in the un-acknowledged state. Select a mixture of received calls that cover the call causes in Table B.1. Validate category and priority.

Confirm by using a BAM simulator that the call types can be distinguished from each other by BAM Alert ID, and that parallel causes of same type can be distinguished from each other by instance number.

Handle some of the received calls in their respective procedures to see they are independently being acknowledged, silenced or otherwise updated, and that events lead to a renewed emission of the ALF sentence.

B.3.2 Receipt of distress or urgency call

B.3.2.1 Requirements

B.3.2.1.1 General

The BAM alert classification shall be as described in Table B.1.

When automated procedure is initiated, a BAM alert is activated if a continuous two-tone alarm or an urgent alarm is sound. If the procedure is initiated without a continuous audible alarm signal, then no BAM alert shall be generated or BAM alert initialization shall be delayed until the corresponding a continuous audible alarm signal is activated, as appropriate.

Example 1 If an automated procedure is initiated by reception of duplicate distress alert relay call within one hour, there is no resulting audible alarm signal and thus no BAM alert is generated (ITU-R M.493-15 A1/12.1).

Example 2 If an automated procedure is initiated by a DSC message with critical errors, generation of BAM alert is delayed until the moment when the reception of subsequent or repeat DSC messages allow the procedure to correct the critical errors and activate a continuous two-tone or urgency alarm.

If the received call activates a new continuous audible alarm (two-tone (distress alarm), urgency alarm) the BAM alert state shall always be set to active-unacknowledged (ALF alert state set as “V”).

The BAM alert is acknowledged when the audible alarm is silenced on the EUT.

The BAM alert is rectified when the automated procedure is terminated.

B.3.2.1.2 Alert text

The BAM alert text for this priority type of call is given in Table B.2.

Table B.2 – BAM Alert text in ALF sentence for cause Distress

No.	BAM Alert title	BAM Alert description (manufacturer specific)
1	DISTRESS: RX	Information to consider: • Un-acknowledged/acknowledged/cancelled • Distress MMSI • Position/time • Nature of distress Example: *U 219380007 N57’12 E009’41 1426 05 09*
2	DISTRESS: RELAY	Information to consider: • Un-acknowledged/acknowledged • MMSI of sender • Distress MMSI • Position/time • Nature of distress • Comm. Mode Example: *U 001234567 219380007 N57’12 E009’41 1426 05 09*
NOTE The sending distress procedure does not lead to any generation of ALF sentences.		

The procedure type handling the distress related causes in Table B.1 is always the Receiving Distress automated procedure. The alert title relates to the event which caused the procedure: (1) Received distress or (2) Received distress relay or received DROBOSE.

The procedure type handling the urgency related causes in Table B.1 is always the Receiving Non-distress automated procedure.

B.3.2.2 Methods of test and required results

Make the EUT receive distress DSC calls that will initiate the received distress automated procedure.

Confirm by using a BAM simulator that the BAM alert title is according to Table B.2. Confirm that the BAM alert description in the ALF sentence output (if applicable) is according to the manufacturer’s documentation.

Initiate from the TE a DROBOSE call that will initiate the received distress automated procedure in the EUT.

Confirm by using a BAM simulator that the BAM alert title is according to Table B.2. Confirm that the BAM alert description in the ALF sentence output (if applicable) is according to the manufacturer's documentation.

Make the EUT receive urgency DSC calls that will initiate the received non-distress automated procedure.

Confirm by using a BAM simulator that the BAM alert title is according to Table B.3. Confirm that the BAM alert description in the ALF sentence output (if applicable) is according to the manufacturer's documentation.

For the entire test procedures above, check that the BAM alert is acknowledged when the audible alarm is silenced on the EUT.

For the entire test procedures above, check that the BAM alert is rectified when procedures are terminated.

Table B.3 – BAM Alert text in ALF sentence for cause Urgency

No.	BAM Alert title	BAM Alert description (manufacturer specific)
1	URGENCY: RX	Information to consider: • Un-acknowledged/acknowledged • Address MMSI • Category • Frequency Example: *U 219380007 05 09 081820 021820*

B.3.3 Receipt of calls other than distress or urgency

B.3.3.1 Requirements

The BAM alert classification shall be as described in Table B.1.

The BAM alert text for this priority type of call is given in Table B.4.

The BAM alert is rectified when the automated procedure is acknowledged or otherwise accepted on the EUT.

Table B.4 – BAM Alert text in ALF sentence for received calls other than Distress and Urgency

No.	BAM Alert title	BAM Alert description (manufacturer specific)
1	SAFETY: COM	Information to consider: • First telecommand • Second telecommand • MMSI • Comm. Mode • Frequency info • Position info
2	SAFETY: POS	
3	SAFETY: TEST	
4	ROUTINE: COM	
5	ROUTINE: POLL	

The procedure type handling the safety and routine causes in Table B.1 is always the Receiving Non-distress automated procedure. The BAM alert title relates to the event which caused the procedure: (1) Safety communication, (2) Safety position request, (3) Safety test request, (4) Routine communication and (5) Routine poll.

B.3.3.2 Methods of test and required results

Make the EUT receive safety communication, safety position, safety test, routine communication and routine poll DSC calls that will initiate a number of received non-distress automated procedure.

Confirm by using a BAM simulator that the BAM alert titles are according to Table B.4. Confirm that the BAM alert descriptions in the ALF sentence output (if applicable) are according to the manufacturer's documentation.

For the entire procedures test above, check that the BAM alerts are rectified when procedures are acknowledged or otherwise accepted by the EUT.

B.3.4 Automatic positioning ceased

B.3.4.1 Requirements

The BAM alert classification shall be as described in Table B.1 (See Annex E).

The BAM alert text for this priority is given in Table B.5.

This BAM alert shall be activated only if the equipment is configured for auto position updating and position data has not been input for 10 min or, in the case of turning on the equipment, no position data has been input more than 1 min.

The BAM alert is rectified when the position data reception is re-established. The alert shall be rectified if the function of automatic position input is disabled.

Table B.5 – BAM Alert text in ALF sentence for cause automatic positioning ceased

No.	BAM Alert title	BAM Alert description (manufacturer specific)
1	POSITION:	Information to be considered by the manufacturer, for example: • last valid automatic position; • last valid time of automatic position; • position source for last received automatic position.

B.3.4.2 Methods of test and required results

The EUT is initially provided with valid position input. Cease position input to the EUT.

Confirm by using a BAM simulator that the BAM alert title is according to Table B.5. Confirm that the alert descriptions in the ALF sentence output (if applicable) are according to the manufacturer's documentation.

Confirm that the BAM alert is rectified when the position data input is re-established or when the function of automatic positioning input is disabled.

B.3.5 Position older than 4 hours

B.3.5.1 Requirements

The BAM alert classification shall be as described in Table B.1.

The BAM alert text for this priority is given in Table B.6.

The BAM alert is rectified when the position data reception is re-established.

Table B.6 – BAM Alert text in ALF sentence for cause Position older than 4 h

No.	BAM Alert title	BAM Alert description (manufacturer specific)
1	DOUBTFUL POS	Information to be considered by the manufacturer, for example: • <equipment name:> update position manually

B.3.5.2 Methods of test and required results

Disconnect the input of external position information and set manual position to the EUT. Wait 4 hours and observe that the EUT releases the BAM alert as described in Table B.1.

Confirm by using a BAM simulator that the BAM alert title is according to Table B.6. Confirm that the alert descriptions in the ALF sentence output (if applicable) are according to the manufacturer's documentation.

Confirm that the BAM alert is rectified when the position data is manually updated or when external position information input is restored.

B.3.6 Antenna tuner error or other detected antenna failures

B.3.6.1 Requirements

This alert is required when detection of antenna tuner error or other means to detect antenna failures are implemented in the equipment. The manufacturer shall provide a description on how antenna conditions and/or antenna tuner is set to normal condition and how a failure can be caused for test purposes.

The BAM alert classification shall be as described in Table B.1.

The BAM alert text for this priority is given in Table B.7.

This BAM alert can be acknowledged from the BAM and such acknowledgement shall result in silencing the corresponding audible alarm on the EUT.

This BAM alert is acknowledged when the audible alarm is silenced on the EUT.

This BAM alert is rectified when the antenna condition is normalized.

Table B.7 – BAM Alert text in ALF sentence for cause Antenna or Antenna tuner failure

No.	BAM Alert title	BAM Alert description (manufacturer specific)
1	ANTENNA: TUNER	Information to be considered by the manufacturer, for example: • antenna tuner equipment; • tuning error.
2	ANTENNA: FAILURE	Information to be considered by the manufacturer, for example: • SWR error; • antenna power.

B.3.6.2 Methods of test and required results

Connect antenna and, if provided, antenna tuner under normal test condition. If provided, follow the manufacturer's description on how to cause failure.

Confirm by using a BAM simulator that the BAM alert title is according to Table B.7. Confirm that the BAM alert descriptions in the ALF sentence output (if applicable) are according to the manufacturer’s documentation.

Confirm the BAM alert can be acknowledged from the BAM simulator and that this results in the silencing of the corresponding audible alarm on the EUT.

Confirm the BAM alert is acknowledged when the audible alarm is silenced.

Confirm that the BAM alert is rectified when antenna conditions are normalized.

If additional BAM alerts on other antenna related failures are provided, confirm by inspection of manufacturer’s documentation that the alert classification follows the requirements of IEC 62923-1.

B.3.7 Transmission power error or otherwise inhibited transmission

B.3.7.1 Requirements

This alert is required when detection of antenna tuner error or other means to detect antenna failures are implemented in the equipment. The manufacturer shall provide a description on how transmission power condition is set to normal condition and how transmit inhibit or failure can be caused for test purposes.

The BAM alert classification shall be as described in Table B.1.

The BAM alert text for this priority is given in Table B.8.

The BAM alert can be acknowledged from the BAM simulator and such acknowledgement shall result in silencing the corresponding audible alarm on the EUT.

The BAM alert is acknowledged when the audible alarm is silenced on the EUT.

The BAM alert is rectified when the antenna condition is normalized.

Table B.8 – BAM Alert text in ALF sentence for cause Transmission power inhibit or failure

No.	BAM Alert Title	BAM Alert description (manufacturer specific)
1	TX POWER: INHIBIT	Information to be considered by the manufacturer, for example: • externally inhibited; • transmission blocked
2	TX POWER: FAILURE	Information to be considered by the manufacturer, for example: • insufficient power.

B.3.7.2 Methods of test and required results

Follow the manufacturer's description on how to cause transmission power failures.

Confirm by using a BAM simulator that the BAM alert title is according to Table B.8. Confirm that the BAM alert descriptions in the ALF sentence output (if applicable) are according to the manufacturer’s documentation.

Confirm the BAM alert can be acknowledged from the BAM simulator and that this results in the silencing of the corresponding audible alarm on the EUT.

Confirm the BAM alert is acknowledged when the audible alarm is silenced.

Confirm that the BAM alert is rectified when transmission power conditions are normalized.

Annex C
(normative)

DSC operation

C.1 General

Annex C covers the minimum requirements, methods of testing and required test results for software automation, operational simplicity, and interface consistency for digital selective calling as specified in Recommendation ITU-R M.493-16, Annex 1, Annex 3, and Annex 4.

Annex C describes the internal operation of the equipment. The manufacturer shall be aware that simple language or graphics shall be used in the user interface. This language shall be readily understood by the mariner required to carry this class of equipment. For instance, the interface shall use terms such as "OK" or "Cancel" instead of "terminate procedure", and "all ships" instead of "format 116", and "radio telephone" instead of "telecommand J3E", and use labels such as "Calling station 567555454" instead of "Sending non-distress automated procedure".

Perhaps the most important issue concerns an implied expectation for the use of the term "automated procedure" as used in this document to appear in the user interface. The term "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 this document refers to items such as the "sending distress automated procedure", such language shall not appear on the user interface of the equipment.

C.2 Naming convention of DSC message types

A naming convention is used that is based upon how the messages are handled in software or by the automated procedures. This approach organizes the DSC messages into two major sets; DSC messages that contain the distress information (distress DSC messages), and those that do not (non-distress DSC messages).

Within the non-distress DSC messages, the operator generally has the option to specify the addressing mode or destination (format), the priority (category), the type of subsequent communication or activity (telecommand), and the frequency or channel (frequency message) parameters. Certain DSC messages require a fixed set of these parameter combinations, and these DSC messages have been given the names test, position request, group, individual routine, medical transports, and neutral craft. The remaining DSC messages are denoted as "general" when necessary.

C.3 Test setup

C.3.1 General

If the EUT is not an integrated radio and controller, the controller shall be provided with a compatible watch receiver, general receiver and transmitter whose transmitter output shall be fed into an artificial antenna.

The TE shall consist of a controller and certified RF equipment that may be integrated or separate but as a unit shall be capable of functioning as an operational DSC station supporting automated procedures. It is assumed that the RF equipment, for example the

transmitter, general and watch receiver, all have the necessary stability, sensitivity, and accuracy as required by this document. Thus it is assumed that, when the TE is to transmit a DSC message, all the RF properties of the transmitted signal are appropriate for marine VHF DSC equipment. The purpose of this TE equipment is to test the DSC functionality, support functionality, and the man-machine interface of the EUT.

The output of the TE transmitter is fed into an artificial antenna but also provides enough signal strength to the EUT receiver equipment to simulate those signals experienced in operational practice. The exact level is not critical. The only exception to this situation is for the prioritised wait test. In this case, the test facility will need to assure the signal strength reaching the EUT RF receiver equipment is at the required receiver sensitivity level (0 dBµV) as specified in this document.

The TE shall be capable of performing the testing of the automated procedures according to this document. The terms used for TEs in this document, defined for automated procedures, such as “standby mode” (see C.5), “initiate automated procedure”, “terminate automated procedure”, “place on hold automated procedure”, “send the default distress attempt using the distress button” and etc., do not imply a need for TEs to implement automated procedures as required by Annex 3 and Annex 4 of the ITU-R M.493-16, but are used to describe test arrangements only.

The TE shall be able to compose DSC messages with arbitrary values in the 7-bit information symbols and/or three bit zero count for the purposes of error testing.

The TE shall be able to compose DSC messages compatible with previous versions of Recommendation ITU-R M.493.

The TE shall be able to display the numerical values of the symbols in both the DX and RX positions of the received DSC messages.

The MMSI of the TE shall be able to be changed while the TE is engaged in handling an automated procedure such that all subsequently transmitted DSC messages use the newly defined MMSI as the self-ID in order to play the role of multiple stations.

The TE shall have operator programmable channels (scan rate, pause, TX and RX frequencies, waveform) for both the watch receiver, general receiver and transmitter.

The TE shall be able to transmit the following test signals: a continuous dot pattern, and a continuous repetition of a DSC message.

The TE shall be able to provide the time in milliseconds between the stopping of a test DSC signal sent from the TE on a given DSC channel and the sending of a DSC signal sent by the EUT on that same channel for the testing of the prioritized wait. The TE shall also be able to insert periods of silence into an otherwise continuous DSC signal. The durations of this period of silence need to range from 0 ms to 10 000 ms in at least 10 ms steps.

At all times the TE shall monitor received DSC messages from the EUT. Inconsistencies of DSC messages initiated by the EUT with that of Table A1-4 of Recommendation ITU-R M.493-16 shall be reported. Inconsistencies of all other DSC messages with the anticipated formats shall be reported.

The TE shall be capable of reading and stimulating the BAM alert signalling interface as described in Annex B.

C.3.2 Test methods

Each test in this Annex begins with a set of instructions for placing the EUT and TE in the desired states. These instructions may consist of configuring the equipment as well as performing operations on the equipment. The personnel shall then be asked to verify that a list of conditions is true. Passing the test requires that all the conditions specified in the list can be verified.

Most of the instructions and verifications that are asked of the test personnel involve actions that the intended operator will need to perform in real life. The actions that fall into this category are denoted by a raised circle (•). Thus, it is expected that these actions should be relatively easy to carry out. Given that the purpose of this test document is to assure a reasonably consistent and operator friendly environment, difficulties or frustrations with the EUT in performing items marked by the raised circles shall be noted.

In some special frequently recurring cases, "verification" shall require extra actions that shall be taken by the test personnel each time the case appears. These cases, and their additional instructions, are listed below:

a) wherever the "display of a warning" is to be verified, the test personnel shall check for the proper warning and check to see that they can go back to the stage of the procedure where the action was taken that caused the warning;

b) when the "verification" is to make certain that an operator option is not available, either there is no visible means to perform the option, or, if there is a visible menu item, button, etc., the test personnel will be unable to perform the option when attempting to select it;

c) when it is required that an alarm can "only be silenced manually", it is sufficient to see that the alarm does not stop after a period of two minutes;

d) when an alert or warning shall lead to a BAM alert (warning or caution) as specified in Table B.1, the appearance of the ALF sentence shall be validated and checked with the requirements as defined in Annex B.

C.4 Non automated features

C.4.1 Non automated features requirements

C.4.1.1 Own-MMSI

The EUT shall have facilities for entering and storing its own 9-digit MMSI with the 10^{th} digit set automatically to 0 in its use in any DSC message unless the equipment is designed to use the 10^{th} digit in accordance with Recommendation ITU-R M.1080; the factory default for this value shall be some indicator to the equipment that it is invalid.

Once an own-MMSI is entered, this number shall not be able to be edited by unauthorized personnel.

No DSC message shall be able to be sent or received without the proper entry of a valid own-MMSI since all DSC messages contain this number.

If there is no valid own-MMSI entered, on power up the EUT shall sound a warning (See Annex E) and display the reason for the warning and the means to silence it. The aural warning may self-terminate. Until an MMSI is entered, the EUT shall display at all times that "there is no MMSI entered, DSC is disabled, your distress button will not work" or equivalent.

The own-MMSI shall be displayed on screen or via some other electronically controlled device and shall be visible at top level while in standby (see C.5).

C.4.1.2 Own position

To enable updating of position:

a) the EUT shall have facilities for manually entering the ship’s position;

b) a warning shall occur when no position data is received within 1 min at start-up of the EUT;

c) if position data is being updated automatically, an alert shall sound if no updating is received after a period of 10 min that can only be silenced manually or by the reception of new position data – the displayed reminder or error message that says the automatic position data is "offline" shall remain until the position data is updated;

d) if the ship’s position information is older than 4 h, an alert shall sound that can only be silenced manually or by the reception of position data or entry of new position information, a displayed reminder shall remain until the position information is updated;

e) if the ship's position information is older than 23,5 h, the position information values shall be erased,

The latest position information, time of that position information, and source of that position information shall be displayed on the EUT and visible at top level while in standby.

C.4.1.3 Group MMSI

Facilities shall be provided to permit the operator to program and store at least 20 group MMSIs to enable the equipment to recognize DSC messages addressed to either the ship's MMSI or the group MMSIs.

C.4.1.4 DSC message composition

The equipment shall provide factory default values for all non-distress DSC messages as specified in Recommendation ITU-R M.493-16, Annex 3, and summarized in Figure D.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 D.1.

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

An MMSI that does not have 9 digits or the "unknown" indicator is invalid.

The "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 actions plus the entry of a destination MMSI 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) as described in Recommendation ITU-R M.493-16, Annex 3, operational 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,

b) acknowledgements shall not be independently composed by the operator but are handled by the automated procedures,

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.493-16, Annex 3.

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 DSC messages.

C.4.1.5 Transmission of DSC messages and prioritised 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 1 s, 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 50 ms. 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.

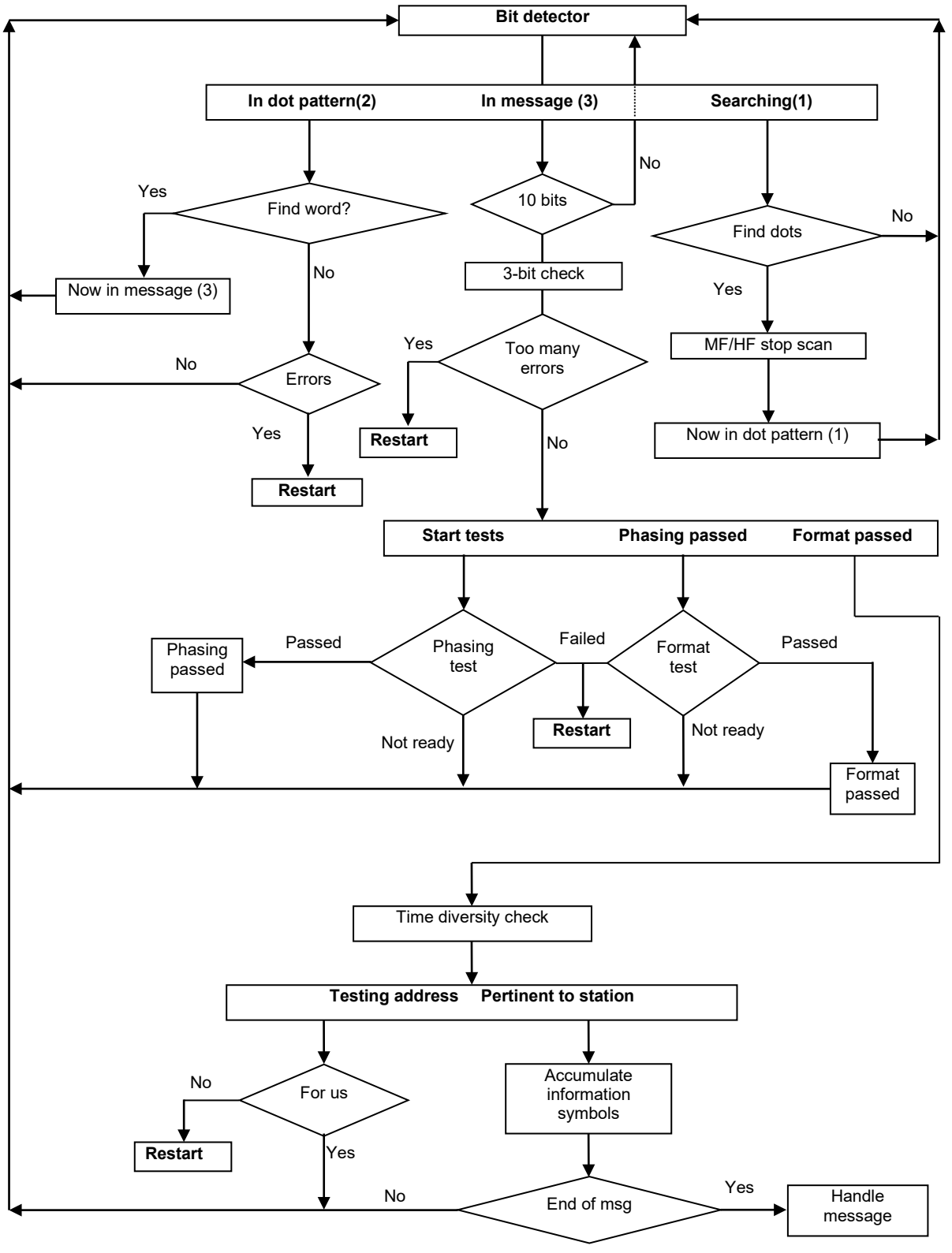

Figure C.1 –Tests and error checks

C.4.1.6 Reception of DSC messages

Figure C.1 shows a schematic of the various tests and error checks that are required before the message is accepted. The "bit detector" is the output of the DSC modem and provides the source of the 0 and 1 bitstream computed from the received signal. A DSC "word" consists of 10 bits, a 7-bit "symbol" and a 3-bit "number of zeros in the symbol" or "zero-count" value. The sequence of the process is shown as (1), (2), (3).

For message detection and decoding:

a) the DSC message detection and decoding shall follow the flowchart given in Figure C.1,

b) the receiver shall not require a dot pattern preceding the phasing sequence for correct bit phasing and unambiguous determination of the positions of the characters within a DSC message sequence,

c) the decoder shall use word recognition for the purposes of word synchronization (Word synchronization is the stage at which the decoder is able to recognize that the dot pattern has completed and the 10-bit words of the message have started),

d) upon word synchronization, the decoder shall use the 3-bit zero count to check the 7-bit information content of all received words. The 7-bit symbol shall be considered received in error if the 3-bit zero count is incorrect,

e) the decoder shall reject the message if the format specifier cannot be received in any of its four positions error free,

f) the decoder shall reject the message if the error-free format specifier does not have a value allowed by Recommendation ITU-R M.493 unless the equipment is specifically designed to handle other values,

g) if the format specifier is either distress (112) or all ships (116), the message shall be rejected if the format specifier is not received correctly at least twice in either the DX or RX position,

h) for those words that are sent duplicated in the five-word time diversity pattern, the symbol shall be considered received in error if both of the symbols are received in error or both are received error free and are not equal,

i) the message shall be rejected if the format specifier is not distress (112) or all ships (116), and all five address symbols are not received correctly or if the address indicates that it is not for this station (it does not contain the station MMSI or group MMSI or the station is not in the specified geographic area),

j) the equipment shall compute a local ECC if a set of received information symbols can be obtained error-free,

k) if the DSC message is a distress alert, the equipment shall follow the decoding techniques for each individual message and successively attempt to correct any information characters received in error in previous messages with the corresponding correctly received characters in the latest message,

l) the decoder shall recognize the end of sequence pattern as the termination of a standard DSC message, regardless of what follows, and shall be able to decode the standard part of the message,

m) equipment that supports the Recommendation ITU-R M.821 extensions shall be able to decode the standard part of the DSC message even when the extension is received in error,

n) if one of the four end of sequence symbols is not received error free at the end of the standard DSC message, the message shall be rejected. However, if the end of sequence character is received correctly at the end of the enhanced extension, the equipment shall not be prevented from using the latter end of sequence symbol to identify and accept the standard (and thus entire) message.

C.4.1.7 Alarms and alerts

Alarms and alerts shall have both a visual and aural component.

Any alert that initiates for the purpose of getting the operator's attention shall provide the reason for and means to terminate the alert.

Alarms and alerts shall be initiated for the reasons given in Table E.1.

The means to terminate the alarms and alerts are given in Table E.1.

Distress and Urgency alarms shall not be able to be disabled. It shall be possible for the operator to disable all other alarms.

The default aural alarms are given by Table E.2.

Some alert tones may be customized by the operator as shown in Table E.3.

C.4.2 Non automated features tests

C.4.2.1 General

The tests and set ups marked with a raised circle (•) are actions that an operator will most likely have to perform in real life. Thus, these items are expected to be easy to perform. The test personnel are to note any difficulties or frustrations in performing these actions in the test report. The tests noted here are a sample selection of test sequences. The test house may use additional test sequences for improved coverage of the system capabilities.

C.4.2.2 Own-MMSI tests

C.4.2.2.1 Purpose

These tests check that DSC messages cannot be sent or received, and an a warning sounds on power up if there is no valid own-MMSI entered in the EUT and that the own MMSI is properly protected and displayed.

C.4.2.2.2 Method of test and required results

Power up the EUT before entering a valid own-MMSI. Verify that:

a) a warning sounds upon power up,

b) the reason for (there is no own-MMSI entered and one will be unable to send a distress alert or any other DSC message until a valid own-MMSI is entered) and the means to silence the waning are displayed,

c) subsequent to the warning, a displayed message remains stating that "there is no MMSI entered, DSC is disabled, your distress button will not work" or equivalent,

d) one is unable to send a default distress alert attempt using the dedicated distress button•,

e) one is unable to send a non-distress DSC message•,

f) one is unable to send a DROBOSE•.

Send a default distress alert from the TE. Verify that:

g) the EUT does not respond to the DSC message (no automated procedure is started).•

Send a DROBOSE from the TE addressed to all ships. Verify that:

h) the EUT does not respond to the DSC message (no automated procedure is started).•

Follow the manufacturer's instructions to enter an own-MMSI and enter an own MMSI. Verify that:

i) the MMSI is displayed on the screen or in some other controlled electronic device,

j) the operator is unable to change the MMSI without consulting the manufacturers or authorized source,

k) after shutdown and re-power up, the MMSI is still present and properly displayed,

l) the MMSI is properly transmitted when sending• a default distress alert.

C.4.2.3 Own position tests

NOTE All remaining tests assume that a valid own MMSI entry is made in the EUT.

C.4.2.3.1 Purpose

This test checks that the EUT provides manual and automatic means of updating the position, that the proper warnings are sounded when the position has not been appropriately updated, and that the latest position and UTC time of that position are displayed.

C.4.2.3.2 Method of test and required results

Connect an automatic position updating device to the EUT. Place the EUT in standby. Verify that:

a) the position and time of the position is displayed on the screen or some other electronic device,

b) the source of the position is displayed on the screen or some other electronic device,

c) the position and position-time properly updates when an automatic positioning device is operating,

d) there is a means to enter the position manually and override automatic position entry•,

e) it is possible to enter an "unknown" value•,

f) when the position is manually entered•, the new value, time, and source of that value is displayed,

g) a warning sounds 10 min after the automatic positioning device is disabled,

h) the reason for and means to silence the warning is displayed,

i) the warning automatically ceases when the automatic positioning device is enabled,

j) the warning sounds again 10 min after the automatic positioning device is disabled,

k) the warning can only be silenced manually,

l) upon silencing• the warning, a message remains stating the automated updating is offline or equivalent,

m) a warning sounds if the manually entered position is not updated after 4 h,

n) the reason for and means to silence the warning is displayed,

o) the warning can only be silenced manually,

p) upon silencing• the warning, a message remains stating the position is older than 4 h,

q) the position is not erased,

r) if the position is still not updated after 23,5 h the position value is erased (set to unknown or some equivalent),

s) the UTC position-time values show that it is unknown.

Turn off the EUT and disconnect the automatic position updating device from the EUT. Then turn on the EUT. Verify that an alert sounds within 1 min from turning on the EUT.

C.4.2.4 DSC message composition

C.4.2.4.1 Default specifications for non-distress DSC message tests

C.4.2.4.1.1 General

The default non-distress DSC message is format individual, priority routine, and subsequent communications radio telephone. However, the initialisation to this default assumes that the manufacturer has only provided the minimum number of top level menu items or buttons or equivalent in the interface. It is permitted for the manufacturer to provide further entry options at top level further reducing the operator selections at the next level. Such enhancements shall be taken into account when assessing subsequent levels.

C.4.2.4.1.2 Purpose

This test checks that the proper default values are entered into the non-distress DSC message parameters and that the priority (category) value is reset to the default value each time the composition option is selected.

C.4.2.4.1.3 Method of test and required results

Power up the EUT and select the option to send a non-distress DSC message•. If there are several selection options at top level, choose the "individual" addressing (if present), "routine" priority (if present) and "voice/phone" subsequent communications (if present). However, the manufacturer may have designed the interface such that it takes but one action by the operator to select the default individually addressed DSC message of routine priority to establish voice communications. Have the EUT in standby. Verify that:

a) it takes only a single action• to initiate the composition of this DSC message,

b) it takes only a single action• to return to standby,

c) all the parameters of the DSC message are visible or able• to be viewed before sending,

d) the parameters of the DSC message the operator may select are described in plain language,

e) there is some indicator that the MMSI is invalid,

f) it takes only one additional action to start the sending of this DSC message,

g) an error is displayed stating that an MMSI needs to be entered when trying to send• the DSC message.

Enter the MMSI of the TE and send the DSC message from the EUT•. Verify that:

h) the DSC message is received on the TE,

i) the priority of the DSC message on the TE is "routine",

j) the subsequent communication on the TE is "telephone",

k) the working channel is any channel but 16 on the TE.

Without restarting the EUT, select the option to send a non-distress DSC message•, set the priority to urgency•, return to standby•, and reselect the composition option•. Verify that the priority has been reset to "routine".

Select the option to send an individual call of routine priority, enter a group MMSI which starts with "0" followed by the three digits of a MID. Verify that the composing message has been changed to a group call which has the format specifier 114 automatically.

C.4.2.4.2 Defaults for the DROBOSE tests

C.4.2.4.2.1 Purpose

This test checks that the proper default values are entered into the fields for the DROBOSE and that the appropriate default values are reset each time the composition option is selected.

C.4.2.4.2.2 Method of test and required results

Power up the EUT and select the option to send a DROBOSE•. Have the EUT in standby. Verify that:

a) it takes only a single action to initiate the composition of this DSC message•,
b) It takes only a single action to return to standby•,
c) all the parameters of the DSC message are visible or able• to be viewed before sending,
d) the parameters of the DSC message are described in plain language,
e) there is an indication that the MMSI of the destination station is invalid,
f) it takes only one additional action to start the sending of this DSC message,
g) an error is displayed stating that an MMSI needs to be entered when trying to send the DSC message•.

Enter the MMSI of the TE (configured as a ship station) and send the DROBOSE from the EUT•. Verify that:

h) a warning is displayed stating one should direct this DSC message to a coast station (send anyways),
i) the DROBOSE is received on the TE (but do not acknowledge),
j) the MMSI of the vessel in distress is "unknown",
k) the nature of distress is "undesignated",
l) the position of the vessel in distress is "unknown",
m) the UTC time of the position of the vessel in distress is "unknown",
n) the subsequent communication on the TE is "telephone".

Without restarting the EUT, select the option to send a DROBOSE•, set the nature of distress to "sinking"• and enter any appropriate values for the position•, time of position•, and MMSI of the vessel in distress•, exit the composition option•, and reselect the option to send a DROBOSE•. Verify that the parameters are reset to their default values.

C.4.2.4.3 Defaults for the composed distress alert tests

C.4.2.4.3.1 Purpose

This test checks that the proper default values are entered into the fields for the distress alert when the operator chooses to compose the alert prior to using the dedicated distress button to initiate the sending distress automated procedure.

C.4.2.4.3.2 Method of test and required results

Power up the EUT and select the option to send/compose a distress•. Turn off any position updating. Have the TE in standby. Verify that:

a) it takes only a single action to initiate the composition of this DSC message•,
b) it takes only a single action to return to standby•,
c) all the parameters of the distress alert are visible or able• to be viewed before sending,

d) there is no way to send the distress alert without using the dedicated distress button.

Press the dedicated distress button and send the distress alert attempt•. Verify that:

e) the distress is received on the TE,

f) the MMSI of the vessel in distress is that of the EUT,

g) the nature of distress is "undesignated",

h) the position of the vessel in distress is that of the EUT,

i) the UTC time of the position of the vessel in distress is that of the EUT,

j) the subsequent communication on the TE is "telephone".

C.4.2.4.4 Valid destination address tests

C.4.2.4.4.1 Purpose

This test checks that no DSC message that requires a destination address can be sent without a valid destination address entry.

C.4.2.4.4.2 Method of measurement and required results

Power up the EUT and perform the actions necessary to send the following DSC messages• and verify that:

a) one is prevented from sending• the default individually addressed non-distress DSC message of routine priority since no valid MMSI entry has been made,

b) one is prevented from sending• the default DROBOSE since no valid MMSI entry has been made,

c) one is prevented from sending• an individually addressed DSC message of routine priority after entering• an MMSI containing less than 9-digits (alternatively, the equipment may prevent one from entering less than 9 digits),

d) one is prevented from sending• an individually addressed DSC message of urgency priority after entering• an MMSI containing less than 9-digits (alternatively, the equipment may prevent one from entering less than 9 digits),

e) one is prevented from sending• an individually addressed DROBOSE after entering• an MMSI containing less than 9-digits (alternatively, the equipment may prevent one from entering less than 9 digits),

f) one is prevented from sending• a DSC message to a group after entering• a group MMSI containing less than 9-digits (alternatively, the equipment may prevent one from entering less than 9 digits),

g) there is no option to select "unknown" as an MMSI value except for the vessel in distress MMSI in the DROBOSE•.

NOTE This test requires manually entering the "no position or position unknown" value on the EUT.

C.4.2.4.5 Data entry tests

C.4.2.4.5.1 Purpose

This test checks that the only DSC messages that can be composed are those allowed by Recommendation ITU-R M.493 and summarized in Table D.2. The operator shall not need a user manual to send the specified DSC messages.

C.4.2.4.5.2 Method of test and required results

Power up the EUT and select the option to send a non-distress DSC message•. Have the TE in standby and turn off all automated acknowledgement options on the TE in order to inspect

the parameters received on the TE. Configure the position of the TE to be within one degree of the EUT so that it receives geographic area DSC messages. Scrutinize and inspect the operator input options (often a menu selection) provided by the EUT operator interface. A "fixed" parameter means the operator is unable to edit or change the parameter. Verify that:

a) a position request requires only the entry of an MMSI address,

b) all other parameters of the position request are fixed in accordance with Table D.2,

c) no manual or assistance was required to select, find, or compose the position request•.

NOTE 1 The verification of the "manual assistance" compliance item is subjective, but the composition is a very straightforward task to perform.

Enter the MMSI of the TE• and send the position request•. Verify that on the TE the DSC message received is identified as a position request, it was sent only to the TE, the priority is safety, and an acknowledgement is requested.

Return the EUT to standby•. Return to the DSC message composition option•. Verify that:

d) a test DSC message requires only the entry• of an MMSI address,

e) all other parameters of the test DSC message are fixed in accordance with Table D.2.

f) no manual or assistance was required to select, find, or compose the test message•.

NOTE 2 This is a subjective test but it is very straightforward.

Enter the MMSI of the TE• and send the test•. Verify that on the TE the DSC message received is identified as a test, it was sent only to the TE, the priority is safety, and an acknowledgement is requested.

Return the EUT to standby•. Return to the DSC message composition option•. Verify that:

g) with all ships addressing, it is only possible to use "safety" or "urgency" priority,

h) no manual or assistance was required to select, find, or compose these messages•.

NOTE 3 This is a subjective test but it is very straightforward.

Select the urgency priority• and send the DSC message•. Verify that on the TE the DSC message received was sent to all ships, the priority is urgency, the subsequent communication is phone, and no acknowledgement is requested.

Return the EUT to standby•. Return to the DSC message composition option•. Verify that:

i) "group" addressing requires only the entry• of a valid group MMSI address,

j) all other parameters of the "group" DSC message are fixed in accordance to Table D.2,

k) no manual or assistance was required to select, find, or compose the group message•.

NOTE 4 This is a subjective test but it is very straightforward.

Enter a group MMSI with a non-zero first digit• and send the DSC message•. Verify that:

l) a warning is displayed stating that the group MMSI shall have a leading zero,

m) if the equipment automatically enters the required leading zero, only eight digits are required,

n) one is only able to send the group DSC message if a valid group MMSI is entered•.

Enter a group MMSI for the TE• or allow the TE to snoop DSC messages and send the DSC message•. Verify that on the TE the DSC message received was sent to a group, the priority is routine, the subsequent communication is phone, and no acknowledgement is requested.

Return the EUT to standby•. Return to the DSC message composition option•. Verify that none of the composition options on the EUT allow selecting acknowledgement options (end of sequence symbols).

Power up the EUT and select the option to compose a distress alert•. Scrutinize and inspect the operator input options (often a menu selection) provided by the EUT operator interface. Verify that:

o) the only possible entries for the nature of distress are values from 100 to 110; fire, flooding, collision, grounding, listing, sinking, disabled/adrift, undesignated, abandoning ship, piracy, and man overboard, respectively (or equivalent) •.

p) the ability to check and correct (if necessary) the current position• is present,

q) the entry of a new position automatically updates the UTC time of position•,

r) it takes but one action to exit this distress alert composition option•,

s) the only possible items the operator is able to select and or enter are the nature of distress, and the position (thus all other fields and parameters are entered automatically by the equipment),

t) no manual or assistance was required to select, find, or compose the distress alert•.

NOTE 5 The verification of the "no manual or assistance" compliance item is subjective, but the composition is a very straightforward task to perform.

Sending of these various alerts is tested in C.6.

Power up the EUT and select the option to compose a DROBOSE•. Scrutinize and inspect the operator input options (often a menu selection) provided by the EUT operator interface. Verify that:

u) the only possible entries for the nature of distress are values from 100 to 110; fire, flooding, collision, grounding, listing, sinking, disabled/adrift, undesignated, abandoning ship, piracy, and man overboard, respectively (or equivalent) •.

v) the ability to enter the position of the vessel in distress is present•,

w) the ability to enter the position of the vessel in distress as "unknown" is present•,

x) the ability to enter the UTC time of position of the vessel in distress is present•,

y) the ability to enter the UTC time of position of the vessel in distress as "unknown" is present•,

z) a single-action option to use the position and UTC time of position of the sending vessel for the position and UTC time of position of the vessel in distress is highly recommended (but not required) •,

aa) the ability to enter the MMSI of the vessel in distress is present•,

bb) the ability to enter the MMSI of the vessel in distress as "unknown" is present•,

cc) the option to send the DROBOSE to all ships is present•,

dd) the ability to enter the MMSI of the destination station is present when individual addressing is selected•,

ee) it takes but one action to exit this DROBOSE composition option•,

ff) no manual or assistance was required to select, find, or compose the DROBOSEs•.

NOTE 6 The verification of the "manual assistance" compliance item is subjective, but the composition is a very straight forward task to perform.

Place the TE in standby. Configure the position of the TE to be within one degree of the EUT so that it receives all geographic area DSC messages and alarms with the full two tone distress alert alarm. Turn on the snooping option on the TE so that it receives all DROBOSEs

sent by the EUT. A set of DROBOSEs shall be composed on the EUT with various sets of distress information. The following notation for the distress information shall be used:

- M = MMSI of vessel in distress
- N = nature of distress
- P = Position of the vessel in distress
- U = UTC time of the vessel in distress

Compose the following DROBOSEs on the EUT:

(1) individually addressed to the TE with M = unknown, N = sinking, P = EUT's position, U = EUT's position time, C = radio telephone•

(2) individually addressed to the TE with M = any ship station MMSI, N = fire, P = EUT's position, U = EUT's position time, C = radio telephone•

(3) individually addressed to the TE with M = any ship station MMSI, N = fire, P = a position, U = the position time, C = radio telephone•

(4) individually addressed to the TE with M = any ship station MMSI, N = disabled and adrift, P = unknown, U = unknown, C = radio telephone•

(5) addressed all ships with M = any ship station MMSI, N = flooding, P = EUT's position, U = EUT's position time, C = radio telephone•

(6) individually addressed to a coast station with M = unknown, N = man overboard, P = EUT's position, U = EUT's position time, C = radio telephone•

(7) individually addressed to a coast station with M = any ship station MMSI, N = piracy, P = EUT's position, U = EUT's position time, C = radio telephone•

(8) individually addressed to a coast station with M = any ship station MMSI, N = grounding, P = a position, U = the position time, C = radio telephone•

(9) individually addressed to a coast station with M = any ship station MMSI, N = collision, P = unknown, U = unknown, C = radio telephone•

For each of the 9 DROBOSEs above using the grid below, verify that

	1	2	3	4	5	6	7	8	9
For the first five DROBOSEs, a warning is displayed on the EUT that the call should be directed to a coast station									
A received distress automated procedure is started on the TE									
Only a single DSC message was sent									
The fields entered on the EUT are displayed on the TE									

Terminate any automated procedures on both the TE and EUT after each case.

C.4.2.5 Transmission of DSC messages tests

C.4.2.5.1 Requirements

This test checks that the EUT properly implements the prioritized wait prior to sending a DSC message. The tests include assuring that wait times are of proper length according to the type and priority of the message and that the random component is random, and that the EUT checks for a free channel after the wait time has elapsed. On VHF, this signal is typically detected by the presence of a threshold RMS level. This filtering implies delays between the actual start of a DSC signal and the time at which it can be detected. Since the method of testing involves timing the interval from when the TE stops sending a signal to that time when the TE detects that the EUT sends the DSC message. Note that the transmitter and any

antenna coupler are required to be powered up and tuned prior to checking the channel and are not part of the latency.

C.4.2.5.2 Method of test and required results

For each of the DSC messages in Table C.1, set up the TE to transmit a continuous dot pattern to the EUT. The signal level from the TE shall be at a level of 0 dBµV which gives a 10^{-2} symbol error rate or better on the EUT.

Table C.1 – DSC messages to send from the EUT

(1) An individually addressed DSC message of priority routine.
(2) A test DSC message with priority safety.
(3) A group DSC message with priority routine.
(4) An individually addressed safety message.
(5) An individually addressed urgency message.
(6) An all ships DROBOSE.

On the EUT attempt to send• the DSC messages of Table C.1, verify that:

	DSC message of Table C.1					
	1	2	3	4	5	6
The automated procedure on the EUT indicates that it is waiting for a free channel						

Stop the transmission of the DSC signal on the TE and record the time it takes for the DSC message to be sent from the EUT. Verify that:

	DSC message of Table C.1					
	1	**2**	**3**	**4**	**5**	**6**
The time is ≥ 200 ms						
The time is ≥ 150 ms						
The time is ≥ 100 ms						
The time is ≥ 50 ms						

Repeat the following tests four times to estimate the random nature of the wait.

Restart the DSC signal on the TE and attempt to resend• the DSC message from the EUT. Verify that:

		DSC message of Table C.1					
		1	2	3	4	5	6
The automated procedure on the EUT indicates that it is waiting for a free channel	1st time						
	2nd time						
	3rd time						
	4th time						
Stop the transmission of the DSC signal on the TE and record the time it takes for the DSC message to be sent from the EUT	1st time						
	2nd time						
	3rd time						
	4th time						
The time is ≥ 200 ms and different in each case							
The time is ≥ 150 ms and different in each case							
The time is ≥ 100 ms and different in each case							
The time is ≥ 50 ms and different in each case							

For DSC messages No.1 and No.2 of Table C.1, proceed to the following.

Start the DSC signal on the TE on the frequency that will be used by the EUT. Set up the option to introduce a pulse of silence (simulating a free channel for that duration) into the otherwise continuous DSC signal being sent from the TE. This pulse of silence will need to be introduced frequently. Set the length of the pulse to be 200 ms. From the EUT, attempt to send the indicated DSC message from Table C.1●. Introduce the pulse of silence, wait a second, repeat, etc. until the pulse has been introduced ten times. Verify that:

The automated procedure on the EUT for all ten pulses of silence never transmits and continues to indicate that it is waiting for a free channel●	Message No.1	
	Message No.2	

Increase the length of the silence pulse to 225 ms. The EUT shall still be waiting for a free channel. Introduce the pulse of silence. If the EUT transmits the DSC message, attempt to resend the DSC message from the EUT● before reintroducing the pulse of silence. Repeat the process until ten pulses of silence have been introduced and record the number of times the EUT sends and the number of times the EUT does not send. Increase the length of the pulse of silence to 250 ms and record the number of times the EUT sends the DSC message versus the number of times the EUT does not send. If the EUT sends the message less than five times, increase the length of the pulse of by 50 ms and repeat until the EUT sends at least five of the times. The grid is for recording whether or not the EUT sends during the pulse.

Results	Pulse No.	1	2	3	4	5	6	7	8	9	10
225 ms	Message No.1										
	Message No.2										
250 ms	Message No.1										
	Message No.2										
300 ms	Message No.1										
	Message No.2										
350 ms	Message No.1										
	Message No.2										

Verify that:

a) the number of times the EUT sends the DSC message increases with the length of the silence pulse,

b) the EUT sends the DSC message no more than 7 times for the 225 ms silence pulse.

For DSC message No.6 of Table C.1, proceed to the following.

Start the DSC signal on the TE. Set up the option to introduce a pulse of silence (simulating a free channel for that duration) into the otherwise continuous DSC signal being sent from the TE. Set the length of the pulse to be 50 ms. From the EUT, attempt to send DSC message No.6•. Introduce the pulse of silence, wait a second, repeat, etc. until the pulse has been introduced ten times. Verify that the automated procedure on the EUT for all ten pulses of silence never transmits and continues to indicate that it is waiting for a free channel•.

Increase the length of the pulse of silence to 75 ms. The EUT shall still be waiting for a free channel. Introduce the pulse of silence. If the EUT transmits the DSC message, attempt to resend the DSC message from the EUT• before reintroducing the pulse of silence. Repeat the process until ten pulses of silence have been introduced and record the number of times the EUT sends and the number of times the EUT does not send. Increase the length of the pulse of silence to 75 ms and record the number of times the EUT sends the DSC message versus the number of times the EUT does not send. If the EUT sends the message less than five times, increase the length of the pulse of by 50 ms and repeat until the EUT sends at least five of the times. The grid is for recording whether or not the EUT sends during the pulse.

Results	Pulse No.	1	2	3	4	5	6	7	8	9	10
75 ms											
100 ms											
150 ms											
200 ms											

Verify that:

c) the number of times the EUT sends the DSC message increases with the length of the silence pulse,

d) the EUT sends the DSC message no more than 7 times for the 75 ms silence pulse.

Return the EUT to standby• and start the DSC signal on the TE and attempt to send a distress alert attempt from the EUT•. Verify that the EUT sends the distress alert attempt after 1 s has elapsed•.

C.4.2.6 Reception/detection of DSC messages tests

C.4.2.6.1 Purpose

This test checks that the decoding of received DSC messages properly handles errors and completes the various tests listed in the requirements.

NOTE 1 In the following tests, the messages are assumed pertinent to the station; they would initiate one of the automated procedures if accepted. The TE is able to manipulate any one of the 10-bit values in either the DX or RX positions of the correctly composed DSC sentence.

NOTE 2 A "3-bit error" is generated by making the 7-bit information content inconsistent with the 3-bit zero count within a 10-bit word.

NOTE 3 The nomenclature for the individual DSC words "DX", "RX3", "A", etc. is that of Figure 1 in Recommendation ITU-R M.493-16.

C.4.2.6.2 Method of test and required results

From the TE, compose the indicated DSC messages such that the messages are pertinent to the EUT and alter the respective DSC words within the messages as stated in the list. Prior to each test (except where indicated), the EUT shall be in standby. Verify that the following DSC messages are received error free after:

a) placing a 3-bit error in all the DX information words of a non-distress DSC message,

b) placing a 3-bit error in the DX and RX parts of the first format word A of an all ships non distress DSC message,

c) placing a 3-bit error in three of the four format words A of an individual non distress DSC message,

d) placing a 3-bit error in the 5 consecutive words DX-RX3-DX-RX2-A,

e) placing a 3-bit error in the DX and RX parts of the first end of sequence word H of a non-distress DSC message,

f) sending a distress DSC message with the 821 enhanced position sequence,

g) sending a distress DSC message with the 821 enhanced position sequence with 3-bit errors in the DX and RX positions of the enhanced position indicator word (7-bit value 100),

h) sending a distress DSC message with the 821 enhanced position sequence with 3-bit errors in all four of the enhanced position end of sequence characters.

Verify that the following DSC messages are rejected after:

i) placing a 3-bit error in the DX and RX parts of the first MMSI word B1 of an individual non distress DSC message,

j) placing a 3-bit error in three of the four format words A of an all-ships non distress DSC message,

k) setting all four format words A to the error free value 359 (7-bit value is 103) of a non-distress DSC message unless the EUT is specifically designed to handle this value (this is an AIS-DSC function),

l) placing a 3-bit error in all 4 end of sequence words H and not providing the expansion sequence.

Verify that the following DSC messages are received but in error after:

m) placing a 3-bit error in both the DX and RX positions of the ECC word I,

n) changing both the DX and RX "category" words C of a non-distress DSC message of routine priority to safety without changing the ECC,

o) placing a 3-bit error in both the DX and RX category words C of a non-distress DSC message of priority routine,

p) placing a 3-bit error in both the DX and RX nature of distress words of a distress alert.

Verify that the EUT’s received distress procedure indicates error free distress information after resending the same distress alert with the DX nature of distress word made error free and placing a 3-bit error in both the DX and RX telecommand (comms) words.

NOTE This test checks that the EUT uses the multiple messages of a distress alert attempt to correct errors. In this case, if both messages were treated independently from one another, they would both be received in error. The first message would have a nature of distress error and the second a comms error. But combined all characters can be obtained error free.

C.4.2.7 Alarm

C.4.2.7.1 General

The default alarm settings as specified in Table E.2 shall be used in all the remaining tests. The only aspect of the alarms tested in C.4.2.6 is the increase in volume feature. The remaining tests of the alarms are done in those subclauses when the alarm arises.

C.4.2.7.2 Requirements

This test checks that the two tone and urgency alarms increase in volume and have the correct intensity.

C.4.2.7.3 Method of test and required results

Place the TE and EUT• in standby. Send a default distress alert from the TE. Verify that:

a) the EUT sounds the two-tone alarm,

b) the reason for and means to silence the alarm is displayed,

c) the alarm starts to get notably louder after 10 s have passed,

d) after 20 s have elapsed, the level of the alarm is at least 80 dB(A) at a distance of one metre,

e) the alarm shall be manually silenced.

Place the TE and EUT• in standby. Send an individual DSC message addressed to the EUT with an urgency priority. Verify that:

f) the EUT sounds the default urgency alarm,

g) the reason for and means to silence the alarm is displayed,

h) the alarm starts to get notably louder after 10 s have passed,

i) after 20 s have elapsed, the level of the alarm is at least 80 dB(A) at a distance of 1 m,

j) the alarm shall be manually silenced.

Examine the setup options/menus of the EUT and verify that:

k) the two-tone alarm cannot be customized or disabled,

l) the urgency alarm cannot be disabled or customized.

C.5 Standby

C.5.1 Standby requirements

NOTE Standby is the state of the equipment when it is not engaged in a communications or DSC automated procedure. The state of the equipment is considered engaged whether the automated procedure is active or on hold.

The following functions and or information shall be visible to the operator at top level while in standby:

m) the station MMSI;

n) the latest position of the vessel;

o) the UTC time of that position and the source of that information;

p) the dedicated distress button;

q) a clearly labelled means to compose a distress alert prior to sending distinct from the dedicated distress button;

r) a clearly labelled means to compose/send a non-distress DSC message;

s) a clearly labelled means to compose/send a DROBOSE.

The following setup options shall be available with the following factory defaults:

t) the option to send medical transport DSC messages: set to off;

u) the option to send neutral crafts DSC messages: set to off;

v) the option to auto acknowledge polling DSC messages: set to on;

w) the option to auto acknowledge test DSC messages: set to on;

x) the option to auto acknowledge position request DSC messages: set to off;

y) the option to auto acknowledge individually addressed, non-distress DSC messages: set to on;

z) the option to set the no activity timeout to exit any non-automated procedure activity to some value that includes no timeout: set to 10 min;

aa) the option to set the no activity timeout of non-distress DSC automated procedures to some value that includes no timeout: set to 15 min;

bb) the option to set the no activity timeout of received distress DSC automated procedures to some value that includes no timeout: set to no timeout;

cc) that there is no option to set any timeout of the unacknowledged sending distress automated procedure;

dd) the option to set the maximum amount of simultaneous automated procedure (applies only to equipment that supports more than the required minimum of seven);

ee) the option to set the no activity timeout of communications automated procedures to some value in the range [10 s to 10 min]: set 30 s;

ff) the option to enable automatic channel or frequency change: set to on.

A record of the DSC activity shall be available containing the following information which shall be able to be displayed:

gg) the information content of the DSC message;

hh) a minimum of the twenty most recently received distress DSC messages stored until read-out and erased after 48 hours after their reception. DSC alerts received within a period of 5 s shall be considered part of the same distress alert attempt. The information characters assimilated by the automated procedure handling the distress alerts shall be the recorded information characters. In other words, if any errors in the information characters of a received alert are corrected by the reception of other alerts within the attempt, only the corrected version shall be recorded;

ii) a minimum of the twenty most recently sent DSC messages, where a distress alert attempt is recorded as a single message;

jj) a minimum of the twenty most recently received non-distress DSC messages.

C.5.2 Standby tests

C.5.2.1 Top level visibility while in standby tests

C.5.2.1.1 Purpose

This test checks that the operator is able to see the dedicated distress button, how to compose and send a distress alert (the distress function), how to compose and send a non-distress DSC message (the call function), and how to compose and send a DROBOSE (the DROBOSE function) as described in Recommendation ITU-R M.493-16, Annex 3, simply by looking at the equipment. The means to perform these functions may be the selection of a menu item, the press of a labelled button, the touch of the screen, or equivalent, but they all shall be visible at top level. This test also checks that the position, time of position, source of

position, current UTC time, and the station MMSI are displayed at top level by some electronic means.

C.5.2.1.2 Method of test and required results

This test requires a simple visual inspection of the equipment. Looking at the EUT while in standby without pressing any buttons or activating any menu trees verify that:

a) the station MMSI is displayed,

b) the latest position is displayed,

c) the UTC time of the latest position is displayed,

d) the source of the latest position is displayed,

e) the dedicated distress button is plainly visible and protected by a spring loaded lid or cover permanently attached to the equipment by, for example, hinges (applies at all times whether or not the EUT is in standby),

f) a clearly labelled means to compose a distress alert prior to sending, distinct from the distress button, is present,

g) a clearly labelled means to compose/send non-distress DSC messages is present,

h) a clearly labelled means to compose/send a DROBOSE is present.

C.5.2.2 Required setup options

C.5.2.2.1 Purpose

This test checks that the proper setup options are available and that the options have the proper factory default value.

C.5.2.2.2 Method of test and required results

After powering up the EUT, this test requires a simple visual inspection of the equipment's setup menus or equivalent. Verify that:

a) the options to send medical transports and neutral craft DSC messages are present and set to "off",

b) the options to auto acknowledge test and polling DSC messages are present and set to "on",

c) the option to auto acknowledge position requests is present and set to "off",

d) the option to auto acknowledge individually addressed, non-distress DSC messages is present and set to "on",

e) the option to set a timeout to exit any non-procedure menu with a default value of 10 min is present,

f) the above timeout may be set to no timeout,

g) the option to set the no activity timeout of non-distress automated procedures is present and set to 15 min,

h) one may set the no activity timeout to no timeout,

i) the option to set the no activity timeout of received distress automated procedures is present and set to no timeout,

j) there is no option to set a no activity timeout of an unacknowledged sending distress automated procedure.

C.6 Sending distress automated procedure

C.6.1 Sending distress automated procedure requirements

C.6.1.1 Procedure

The sending distress automated procedure results when the operator presses the dedicated distress button to send a distress alert attempt. A schematic of the automated procedure is given in Figure C.2.

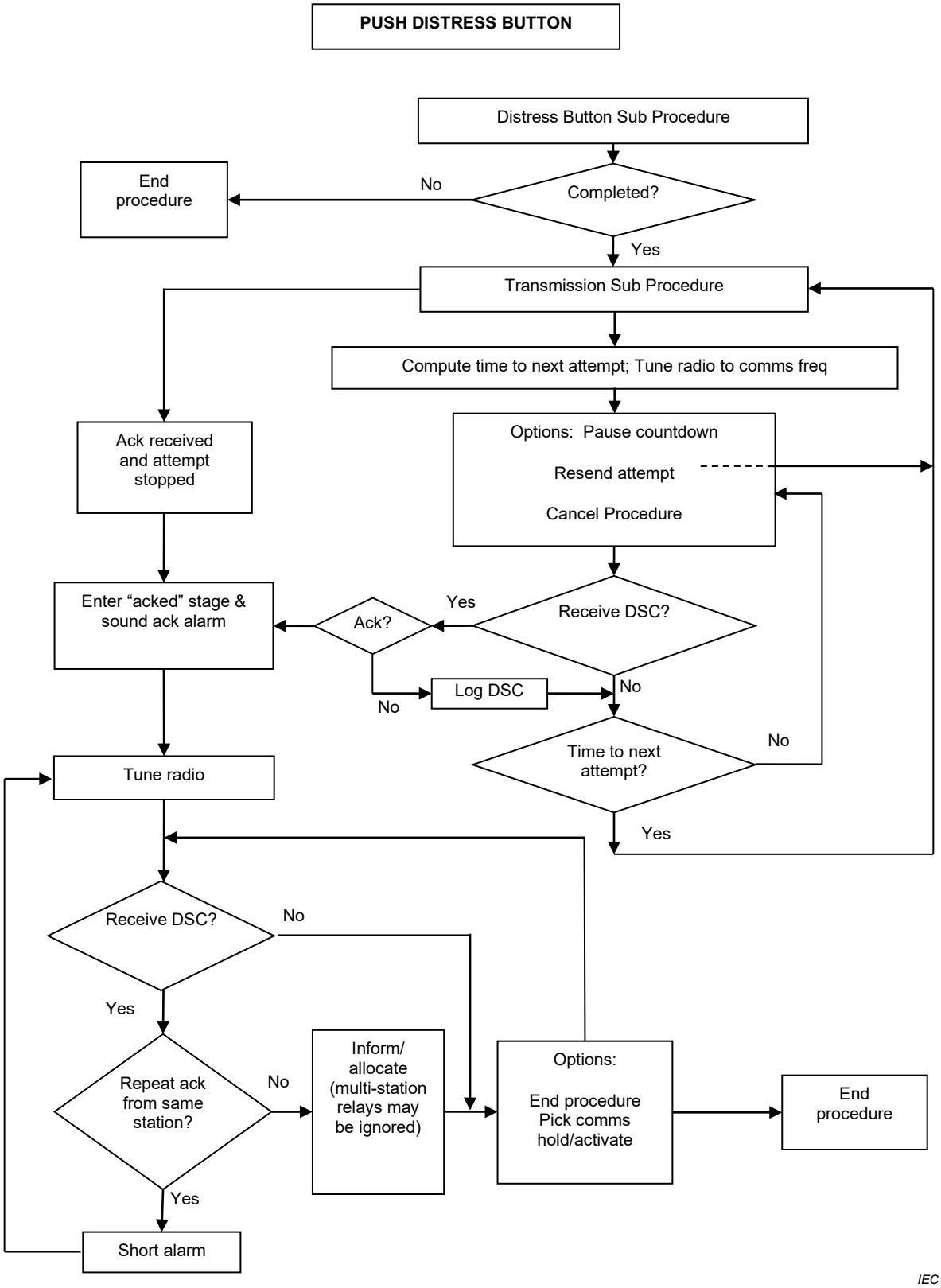

Figure C.2 – Sending distress procedure

C.6.1.2 Tasks

The EUT shall follow the sending distress automated procedure as shown in Figure C.2 complying with the automated procedures as defined in Recommendation ITU-R M.493-16, Annex 4.

The sending distress automated procedure shall handle the following events:

a) the distress button sub procedure,
b) previous to the procedure being acknowledged:
    1) the transmission of the alert attempt,
    2) calculating the time to an automated resending of the attempt (between 3,5 min and 4,5 min),
    3) tuning to the subsequent communication frequency (upon conclusion of the attempt),
    4) waiting for the reception of a distress alert acknowledgement,
    5) logging all other received DSC messages assuring they do not disrupt the procedure,
    6) retransmission of the alert attempt occurring after a 3,5 min to 4,5 min period,
    7) providing the valid operator options which are:
        i) pausing the countdown to automated resending,
        ii) resending the alert attempt, with the last entered other parameters, using the dedicated DISTRESS button,
        iii) cancelling the alert attempt,
c) after reception of the acknowledgement:
    8) stopping the automatic resending of the alert attempt,
    9) transmitting any remaining single alert of the attempt to completion,
    10) allocating received DSC messages not pertinent to the procedure to their appropriate automated procedures or initiating their own procedure on hold, and
    11) providing the valid operator options which are:
        iv) activate or place the procedure on hold, and
        v) terminating the automated procedure.

C.6.1.3 Display

During the sending distress automated procedure, the EUT shall display the following items and/or information, as appropriate, at top level:

a) the fact one is engaged in sending a distress,
b) the time remaining to the next automated resending of the attempt (prior to acknowledgement),
c) the elapsed time since receiving the distress alert acknowledgement (after acknowledgment),
d) the indication of whether the procedure is on hold or is active (after acknowledgement),
e) the distress information,
f) a warning before the automated resending of the attempt in case engaged in traffic,
g) the sender of the distress acknowledgement,
h) the sub-stages of the procedure:
    1) transmitting
    2) waiting for acknowledgement
    3) alert acknowledged

4) waiting for a free channel,

i) the valid operator options.

C.6.1.4 Dedicated distress button sub procedure

The dedicated distress button shall be used for the following purposes in the following manner:

a) the use of the dedicated distress button is required to initiate the sending distress automated procedure.

b) the dedicated distress button shall be used exclusively for initiating the sending distress automated procedure.

c) the use of the dedicated distress button after entering parameters of the alert attempt via a menu or equivalent shall initiate the sending distress automated procedure with the alert attempt as composed by the operator.

d) the use of the dedicated distress button without entering parameters of the alert attempt via a menu or equivalent shall initiate the sending distress automated procedure with the default alert attempt. The default alert attempt is given by the following:

- the undesignated nature of distress,
- the latest position of the vessel,
- the UTC time of that position,
- the radio telephone for subsequent communication.

Use of the dedicated distress button without entering parameters of the alert attempt via a menu or equivalent shall initiate the sending distress automated procedure with the default alert attempt regardless of the state of the EUT, except when the EUT is already engaged in the sending distress automated procedure.

The distress button sub procedure of the sending distress automated procedure shall be as follows:

e) lifting or opening of the lid or cover permanently attached to the equipment by, for example, hinges. This is ACTION 1,

f) pressing and holding the distress button (ACTION 2),

g) displaying the seconds remaining to transmission of the attempt starting at three,

h) invoking an intermittent audio and intermittent visual alarm once each second,

i) stopping the procedure if the distress button is released before the three seconds have elapsed (when releasing the button, the radio shall return to its previous state),

j) when the three seconds has elapsed regardless of whether the button is continued to hold down or released, completing ACTION 2 and starting the alert attempt,

k) sounding a steady tone of two-second duration after ACTION 2 has completed and displaying a visual indication that the distress alert attempt has been sent.

C.6.1.5 Transmission of the alert attempt

The transmission sub procedure of the sending distress automated procedure shall be as follows:

a) the transmission starts on VHF channel 70,

b) the countdown to the next automated resending of the attempt is started,

c) if a distress acknowledgement is received, the attempt shall cease after completion of any ongoing distress alert within the attempt,

d) five alerts shall be sent without a break between alerts,

e) the extended position information shall be sent on only the 5th alert,

C.6.1.6 Updating position

When a distress alert attempt is resent, it shall update the position and UTC time of position information.

C.6.1.7 Handling received DSC messages

Prior to acknowledgment of the sending distress automated procedure, only the distress acknowledgement describing the same distress event is pertinent to the procedure. All other DSC messages shall be ignored and only recorded in the log.

After the sending distress automated procedure has been acknowledged, all DSC messages describing the same distress event are pertinent to the procedure. Of these DSC messages, all ships, group, and area distress relays may be ignored. DSC messages not pertinent to the procedure shall be allocated to the appropriate automated procedure or initiate their own automated procedure on hold.

C.6.1.8 Alarms

The reception of the first distress alert acknowledgement pertinent to the procedure shall sound a distress acknowledgement alarm. Any subsequent acknowledgement shall only sound the self-terminating alarm.

C.6.1.9 Determining subsequent communications

On VHF, it is always channel 16.

The channel set is given by the mode of subsequent communication.

C.6.1.10 Automated tuning

Automatic tuning to the subsequent communications frequency or channel shall occur after transmission of the first distress alert attempt.

Upon reception of the first distress alert acknowledgement, the tuning shall occur after the manual silencing of the alarm.

C.6.1.11 Cancelling the distress alert

The distress cancel procedure consists of the cancel operation. The cancel operation consists of a DSC cancel (a self-addressed distress alert acknowledgement) followed by a voice cancel on the corresponding frequency of subsequent communication. The phrase "voice cancel" refers to the part of the cancel done over the subsequent communication frequencies.

Cancellation of a distress alert shall only be possible prior to acknowledgement.

Selection of the cancellation option during the sending of a distress alert attempt shall stop the transmission as soon as possible but only after any ongoing distress alert within the distress alert attempt is completed.

Upon selection of the cancel option, the equipment shall provide an explanation of the cancel procedure.

The radio shall prompt the operator to confirm continuing with the cancel, or to abort the cancel procedure. If the latter is selected, the sending distress automated procedure will be resumed.

If the user confirms the distress cancel, then transmit the distress cancel on channel 70.

Completion of the cancellation shall place the sending distress automated procedure in the acknowledged state.

The radio shall display to the operator the stages of the cancellation procedure such as "waiting for the operator to proceed" or equivalent, "transmitting the DSC cancel" or equivalent, "radio tuned for the voice cancel", or equivalent, "cancel procedure done" or equivalent.

The action of switching off by normal operator action a DSC equipment that has previously sent a distress alert and that has not been acknowledged, shall cause the DSC equipment to transmit the distress self-cancel message.

C.6.1.12 Acknowledgments

The procedure shall be considered acknowledged upon reception of the first distress alert acknowledgement concerning the same distress event.

C.6.1.13 Termination

Prior to acknowledgement, the procedure cannot be terminated either by the operator or the equipment.

After acknowledgment, including distress self-cancel, the procedure is terminated manually.

NOTE After acknowledgement, a termination timer is optional.

C.6.1.14 Warnings

The procedure shall provide warnings for those reasons provided in Recommendation ITU-R M.493-16, Annex 4. The operator shall have the option to go back to the stage of the procedure where the action was taken that caused the warning.

C.6.2 Sending distress automated procedure tests

NOTE Tests and set ups marked with a raised circle (•) are actions that an operator will most likely have to perform in real life. Thus, these items are expected to be easy to perform. The test personnel are to report any difficulties or frustrations in performing these actions.

C.6.2.1 Distress button sub procedure tests

C.6.2.1.1 Purpose

This test checks the distress button sub procedure on the EUT.

C.6.2.1.2 Method of test and required results

Have the EUT and TE in standby. Stop any automatic updates that lead to changes of the position on the EUT and note the MMSI, position, and UTC time of position of the EUT. Make sure the position has enhanced resolution in fractional minutes. The tests are to be performed using only the distress button (DB) on the EUT. The last test will require returning the EUT to standby. Verify that:

a) pressing the DB sounds an audio alarm such that one can count seconds by it,

b) pressing the DB invokes a visual indicator such that one can count seconds by it,

c) the seconds remaining to transmission of the alert attempt are displayed,

d) the release of the DB before the countdown has elapsed stops the sub procedure,

e) after the 3 s have elapsed, a steady tone of 2 s duration sounds,

f) the distress alert attempt is sent if the DB is released at least after the countdown is completed,

g) the distress alert attempt is sent if the DB is continued to be held down.

NOTE The condition is verified if the received distress automated procedure on the TE is invoked and the sending distress procedure on the EUT starts.

C.6.2.2 Default distress alert attempt tests

C.6.2.2.1 Purpose

This test checks the sending of the default distress alert attempt on the EUT from standby.

C.6.2.2.2 Method of test and required results

Place the TE in standby. Using only the distress button on the EUT, send the default distress alert attempt• and verify that:

a) the nature of distress on the TE is undesignated,

b) the MMSI of the vessel in distress on the TE is that of the EUT,

c) the position on the TE is that of the EUT,

d) the position on the TE includes the enhanced resolution,

e) the UTC time of the position on the TE is that of the EUT,

f) the means of subsequent communication on the TE is radio telephone,

g) the frequency of subsequent communication is channel 16,

h) one can speak to the EUT from the TE,

i) one can speak to the TE from the EUT•.

C.6.2.3 Display

C.6.2.3.1 Purpose

This test checks that the required items of the automated procedure are properly displayed on the EUT.

C.6.2.3.2 Method of test and required results

This test requires visual inspection only of the EUT interface upon/after sending a distress alert attempt from the EUT without handling the equipment. Send the default distress alert attempt from the EUT• and verify that:

a) the EUT indicates that it is transmitting,

b) the remaining time to the next automated sending of the distress alert attempt is displayed,

c) the time to the next automated sending from the start of transmission is between 3,5 min and 4,5 min,

d) the interval is different each time when the test is repeated.

e) the five items of the sent distress information are displayed,

f) the operator is able to view the frequency of subsequent communication,

g) the EUT indicates that it is waiting for an acknowledgement after the distress alert attempt is sent,

h) the option to pause the countdown to the next distress alert attempt is available,

i) the option to cancel the distress alert is available,

j) the option to resend the distress alert attempt is available.

C.6.2.4 Operator options prior to receiving distress alert acknowledgement

C.6.2.4.1 Purpose

This test checks the operator options previous to being acknowledged. The cancel option shall be tested in its own subclause.

C.6.2.4.2 Method of test and required results

Continuing from the automated procedure of the previous test or after sending a default distress alert attempt from the EUT•, verify that:

a) the operator is able to pause the countdown to the next distress alert attempt•,

b) the operator is able to resume the countdown to the next distress alert attempt•,

c) the operator is able to resend the distress alert attempt before the countdown has elapsed•,

d) the unacknowledged procedure cannot be terminated either by the operator or the equipment,

e) upon resending, the EUT indicates that it is retransmitting•,

f) the time to the next automated sending is reset to between 3,5 min and 4,5 min,

C.6.2.5 Automatic resending of the distress alert attempt

C.6.2.5.1 Purpose

This test checks that the distress alert attempt is automatically resent at the proper time.

C.6.2.5.2 Method of test and required results

Continuing from the automated procedure of the previous test or after sending a default distress alert attempt from the EUT•, let the countdown to the automatic resending of the distress alert attempt elapse and verify that:

a) the operator is notified of the resending at least 10 s before the resending,

b) after the warning, the operator is able to easily pause and then resume the countdown•,

c) the distress alert attempt is automatically resent when the remaining time goes to zero,

d) the EUT indicates that it is transmitting,

e) the time to the next automated sending from the start of transmission is between 3,5 min and 4,5 min,

f) the TE receives the distress alerts.

C.6.2.6 Cancelling the distress alert

C.6.2.6.1 Purpose

These tests check that the sending distress automated procedure follows the proper distress alert cancellation protocol. Cancelling a distress alert involves sending the self-addressed distress alert acknowledgment followed by a voice cancel on the corresponding subsequent communications channel 16.

C.6.2.6.2 Method of test and required results

Send a default distress alert attempt from the EUT•. The received distress automated procedure shall start on the TE. Upon completion of the alert attempt on the EUT, select the option to cancel the alert attempt• and verify that:

a) a warning is displayed that one is trying to cancel the distress,

b) the operator is able to exit the cancel procedure•,

c) upon selection, it is indicated to the operator that the self-cancel is being sent,

d) the self-cancel is displayed and recognized on the TE,

e) the operator is informed when the EUT is ready to give the manual (voice) cancel,

f) the appropriate text for the manual (voice) cancel is provided,

g) the cancelled channel is indicated to the operator,

h) the operator is able to re-do the cancel operation•,

i) a warning is provided that the cancellation has already been done,

j) the operator's voice cancellation is heard on the TE,

k) upon exiting the cancel, the sending distress automated procedure is acknowledged•.

Send a default distress alert attempt from the EUT. The received distress automated procedure shall start on the TE. Upon completion of the alert attempt on the EUT switch off the EUT. Verify that the EUT sends a distress self-cancel message.

Send a default distress alert attempt from the EUT. The received distress automated procedure shall start on the TE. Send an acknowledgement from the TE. Switch off the EUT. Verify that the EUT does not send a distress self-cancel message.

C.6.2.7 Cancelling during the sending of a distress alert attempt

C.6.2.7.1 Purpose

This test makes sure that no distress alert attempt is stopped in the middle of a distress alert (a distress alert attempt consists of several distress alerts).

C.6.2.7.2 Method of test and required results

Place the TE and EUT• in standby. Send a default distress alert from the EUT•. If possible, cancel• the distress alert attempt quickly enough to stop the distress alert attempt before all the constituent distress alerts of the distress alert attempt are sent. The received distress automated procedure shall start on the TE. Verify that any distress alert started is sent to completion.

C.6.2.8 Handling distress alert acknowledgements

C.6.2.8.1 Purpose

This test checks that the sending distress automated procedure responds correctly to distress alert acknowledgements and that any auto timeout option that may be provided for the acknowledged sending distress automated procedure functions properly (recall that unacknowledged sending distress procedures shall not have an auto timeout option).

C.6.2.8.2 Method of test and required results

Set the EUT• and TE in standby and send a default distress alert attempt from the EUT• such that the received distress automated procedure is once again initiated on the TE. A distress acknowledgement shall then be sent from the TE. If the EUT provides an automatic timeout

option for the acknowledged sending distress procedure, set the automated timeout• to a value that gives one enough time to complete the first 16 tests. Note that some manufacturers may provide more sophisticated timeout options in the equipment setup as well as more sophisticated operation options to control the automated timeout and respond to any warnings. These tests only address the minimum requirement of at least a 10 s aural and visual warning and a means of stopping the timeout. After the entire set of tests is completed, reset the timeout• on the EUT to "no timeout". Verify that:

a) a received distress alert acknowledgment message appears and corresponding alarm sounds,

b) the means to silence the alarm is displayed on the EUT,

c) the alarm can only be silenced manually,

d) the automatic resending of the alert attempt is terminated,

e) the EUT indicates that the distress event has been acknowledged,

f) the time since acknowledgment is displayed,

g) the MMSI of the sender is displayed,

h) the operator can speak to the TE from the EUT•,

i) the operator can speak to the EUT from the TE,

j) the operator is no longer able to resend the distress alert attempt,

k) the option to pause the countdown (or elapsed time) is no longer available,

l) the option to cancel the alert is no longer available,

m) the option to terminate the sending distress automated procedure is now available,

n) the option to put the sending distress automated procedure on hold is now available,

o) if there is a timeout, a visual and aural warning appears at least 10 s before termination with the option to stop the termination.

C.6.2.9 Handling additional distress DSC messages pertinent to the automated procedure

C.6.2.9.1 Purpose

This test checks the handling of distress DSC messages pertinent to the sending distress automated procedure after acknowledgement.

C.6.2.9.2 Method of test and required results

The sending distress automated procedure on the EUT shall first be acknowledged by the TE. Additional distress DSC messages shall then be sent from the TE concerning the same distress event being handled by the sending distress automated procedure on the EUT. Verify that:

a) a repeat distress alert acknowledgment sounds the self-terminating alarm on the EUT,

Change the MMSI of the TE and verify that:

b) the procedure on the EUT is unaffected upon receiving an all ships or area distress relay,

c) a distress relay addressed to the EUT starts the received distress automated procedure,

d) the received distress automated procedure is initiated on hold.

C.6.2.10 Use of the distress button priority test

C.6.2.10.1 Purpose

This test checks the critically important feature that the distress button is able to send the default distress alert attempt regardless of the state of the EUT.

C.6.2.10.2 Method of test and required results

C.6.2.10.2.1 General

This test requires that the EUT be placed in as many as reasonable of its possible states. Instructions are given to place the EUT in one of these states. The default distress alert attempt is then started using the distress button. It is encouraged but not required that the EUT immediately terminate any ongoing automated procedures.

C.6.2.10.2.2 Case 1

From standby on the EUT•, select the option to send an individual DSC message of priority routine•. Enter/select the MMSI of the desired recipient•. Before the DSC message is actually sent, start the default distress alert attempt using the dedicated distress button• and verify that:

a) the three second countdown is followed by the two second steady alarm,

b) the received distress procedure is started on the TE,

c) the distress information on the TE is the default values and the sender is the EUT,

C.6.2.10.2.3 Case 2

From standby, select the option to send an individual DSC message of priority routine•. Enter/select• the MMSI of the desired recipient and send the DSC message•. The sending non-distress DSC automated procedure shall start on the EUT. Start the default distress alert attempt using the dedicated distress button• and verify that:

a) the three second countdown is followed by the two second steady alarm,

b) the received distress procedure is started on the TE,

c) the distress information on the TE is the default values and the sender is the EUT,

C.6.2.10.2.4 Case 3

Set the EUT into standby•. Send a distress alert attempt from the TE. After the received distress DSC automated procedure starts on the EUT•, return the TE to standby and start the default distress alert attempt on the EUT using the dedicated distress button• and verify that:

a) the three second countdown is followed by the 2-second steady alarm,

b) the received distress procedure is started on the TE,

c) the distress information on the TE is the default values and the sender is the EUT,

C.6.2.10.2.5 Case 4

Set the EUT into standby•. Send an individual non-distress DSC message of priority urgency from the TE addressed to the EUT. After the received non-distress DSC automated procedure starts on the EUT, start the default distress alert attempt on the EUT using the dedicated distress button• and verify that:

a) the three second countdown is followed by the 2-second steady alarm,

b) the received distress procedure is started on the TE,

c) the distress information on the TE is the default values and the sender is the EUT,

C.6.2.11 Distress alert composition tests

C.6.2.11.1 Purpose

This test checks the ability of the EUT to transmit the distress information correctly for different values of the nature of distress and from different positions on the globe.

C.6.2.11.2 Method of test and required results

Set the EUT• and TE into standby. Configure the EUT to be located in the Western half of the Southern Hemisphere•. Select the option to send a distress•. Choose "sinking" as the nature of distress•. Send the distress alert attempt• and verify that:

a) the dedicated distress button is required to send the alert attempt on the EUT,

b) a received distress automated procedure starts on the TE,

c) the position reported on the TE is that of the EUT,

d) the nature of distress is "sinking",

e) one is able to speak to the TE from the EUT•,

f) one is able to speak to the EUT from the TE.

NOTE If the positions were real, it is unlikely that communications would be possible, but in the laboratory setting the distances are not relevant.

Set the EUT• and TE into standby. Configure the EUT to be located in the Eastern half of the Southern Hemisphere•. Select the option to send a distress•. Choose "flooding" as the nature of distress•. Send the distress alert attempt• and verify that:

g) the dedicated distress button is required to send the alert attempt on the EUT,

h) a received distress automated procedure starts on the TE,

i) the position reported on the TE is that of the EUT,

j) the nature of distress is "flooding",

k) one is able to speak to the TE from the EUT•,

l) one is able to speak to the EUT from the TE.

Set the EUT• and TE into standby. Configure the EUT to be located in the Western half of the Northern Hemisphere•. Select the option to send a distress•. Choose "abandoning ship" as the nature of distress•. Send the distress alert attempt• and verify that:

m) the dedicated distress button is required to send the alert attempt on the EUT,

n) a received distress automated procedure starts on the TE,

o) the position reported on the TE is that of the EUT,

p) the nature of distress is "abandoning ship",

q) one is able to speak to the TE from the EUT•,

r) one is able to speak to the EUT from the TE.

Set the EUT• and TE into standby. Configure the EUT to be located in the Eastern half of the Northern Hemisphere•. Select the option to send a distress•. Choose "disabled/adrift" as the nature of distress•. Send the distress alert attempt• and verify that:

s) the dedicated distress button is required to send the alert attempt on the EUT,

t) a received distress automated procedure starts on the TE,

u) the position reported on the TE is that of the EUT,

v) the nature of distress is "disabled/adrift",

w) one is able to speak to the TE from the EUT•,

x) one is able to speak to the EUT from the TE.

Set the EUT• and TE into standby. Configure the EUT such that its position is unknown•. Select the option to send a distress•. Choose "grounding" as the nature of distress•. Send the distress alert attempt• and verify that:

y) the dedicated distress button is required to send the alert attempt on the EUT,

z) a received distress automated procedure starts on the TE,

aa) the position reported on the TE is that of the EUT (position is unknown),

bb) the nature of distress is "grounding",

cc) one is able to speak to the TE from the EUT•,

dd) one is able to speak to the EUT from the TE.

C.7 Receiving distress automated procedure

C.7.1 Receiving distress automated procedure requirements

C.7.1.1 Procedure

The receiving distress automated procedure is initiated either by the reception of the first multi-station distress DSC message of a distress event, the reception of the first individually addressed distress DSC message of a distress event, or the sending of a DROBOSE. A schematic of the automated procedure is given in Figure C.3.

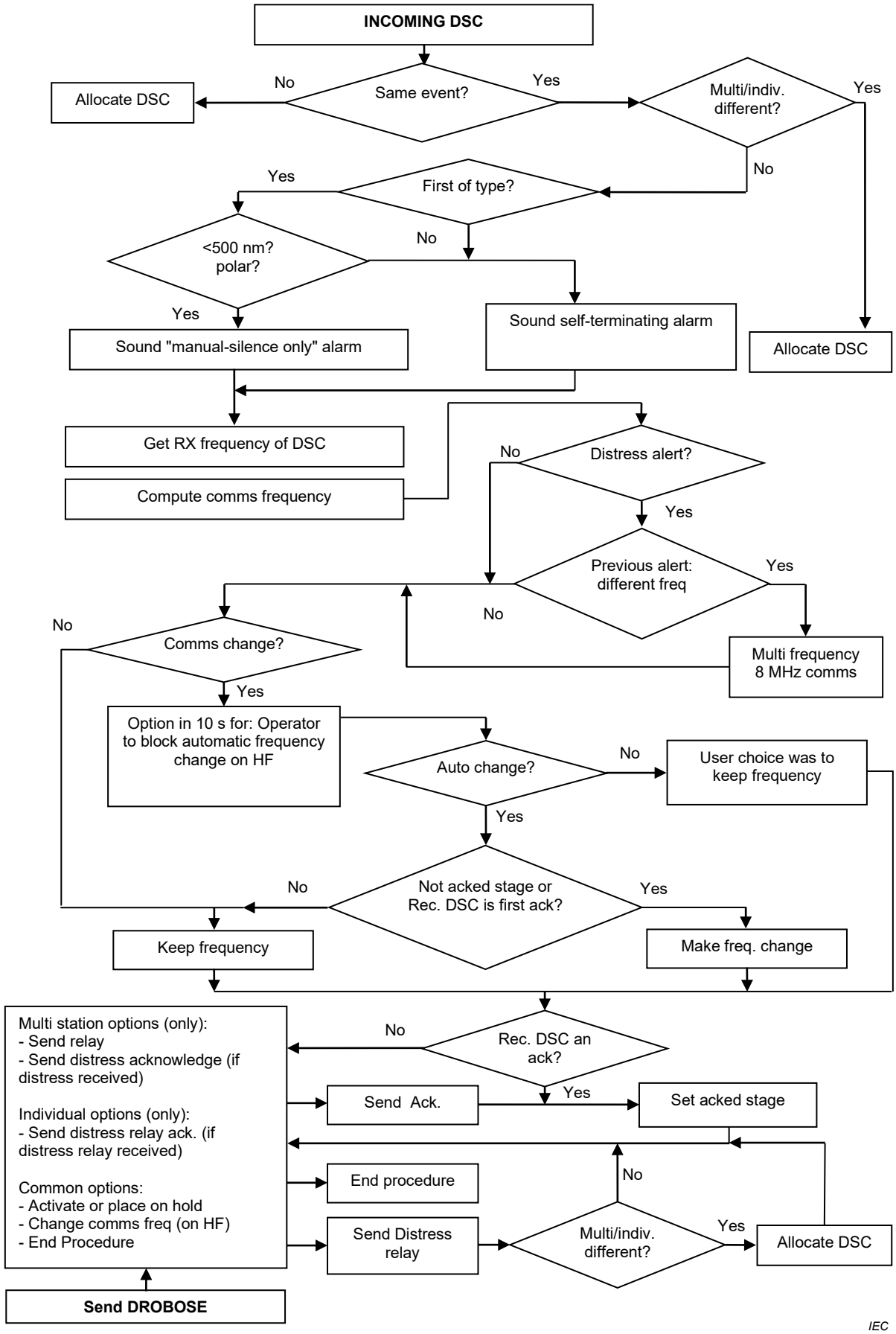

Figure C.3 – Receiving distress procedure

C.7.1.2 Tasks

The EUT shall follow the received distress automated procedure as shown in Figure C.3 complying with the automated procedures as defined in Recommendation ITU-R M.493-16, Annex 4.

The received distress automated procedure shall handle the following events:

a) the sounding of the appropriate alarms for DSC messages pertinent to the procedure,
b) allocating all DSC messages pertinent to the station but not the procedure to their own procedures or initiating their own procedure,
c) watching for the distress event acknowledgement and recognizing the self-cancel,
d) providing the operator with the option to:
    1) send a relay,
    2) send a distress acknowledgement (when and if a distress alert has been received),
    3) send a distress relay acknowledgement (when and if a distress relay has been received),
    4) ability to activate or place the procedure on hold,
    5) end the procedure.

C.7.1.3 Display

During the received distress automated procedure, the EUT shall display or make available to the operator the following items and/or information:

a) the fact one is engaged in receiving a distress,
b) the elapsed time since the procedure started (prior to acknowledgment),
c) the elapsed time since acknowledgement (after acknowledgment),
d) indicating whether the procedure is on hold or is active,
e) the distress information (MMSI of vessel in distress, nature, position, time of position, comms),
f) the type (alert, relay, alert acknowledgement, relay acknowledgement), sender, and intended destination (individual, group, all ships) of the latest received DSC message,
g) at least a 10 s warning before any automated change in communications frequencies are invoked in case engaged in traffic,
h) displaying the valid user options,
i) the ability to display information about the history of at least the received DSC messages pertinent to the procedure,
j) the sub-stages of the procedure, which are:
    1) waiting to send acknowledgement,
    2) transmitting
    3) waiting for acknowledgement,
    4) cancelled,
    5) acknowledged
    6) waiting for a free channel.

At top level, the elapsed time, the stage of the automated procedure, and operator options shall be displayed.

C.7.1.4 Handling received DSC messages

DSC messages pertinent to the station but not the procedure shall be allocated to the appropriate automated procedure or initiate their own automated procedure on hold.

DSC messages that are pertinent to the procedure are all DSC messages concerning the same distress event. If the MMSI is unknown, DSC messages that are pertinent to the procedure are all DSC messages that have the same distress information. However, individually addressed DSC messages shall initiate their own automated procedures on hold if engaged in a received distress procedure handling multi-station (for example, all ships, area) addressed DSC messages or vice versa.

In the case of an event triggered by MOB devices, then multiple alerts from different MOB devices shall be handled as one event and within the same automated procedure.

Multiple MOB devices events which shall be handled as one event by automated procedure are identified by parameters: MMSI of the vessel in distress as defined in the ITU-R M.585 for MOB device, the nature of distress symbol is 110 and the mode of subsequent communication is symbol 126.

The operator within the automated procedure shall be able to navigate between the MOB device entries. For each selected MOB device entry, contextual information shall be displayed and operator shall be provided with the context-sensitive options to send relay, distress acknowledgement (when and after a distress alert has been received from open loop MOB device), an individual distress relay acknowledgement (when and after an individual distress relay has been received from a closed loop MOB device and a distress alert has not been received), a group distress relay acknowledgement (when and after a group distress relay has been received from a closed loop MOB device and a distress alert has not been received).

The manufacturer shall declare how many MOB device entries can be handled simultaneously. However, their number shall be at least 20.

When the MOB device entries list overflows, the oldest entry (excluding the currently processed entry) is replaced by the new one.

C.7.1.5 Alarms

In a given procedure, only the reception of the initial DSC message and the DSC message that first acknowledges the procedure shall sound an alarm unique to the DSC message type (with the two-tone sound reserved for the initiation of the received distress procedure) which shall be manually silenced.

All subsequent examples of the DSC messages shall only sound the self-terminating alarm.

C.7.1.6 Determining subsequent communications

On VHF, it is always channel 16.

C.7.1.7 Automated tuning

The tuning to the subsequent communication frequencies as determined in C.7.1.6 shall occur automatically upon reception of a distress DSC message.

C.7.1.8 Acknowledgments

The procedure handling all-ships distress DSC messages and distress alerts shall be considered acknowledged upon reception of the first distress alert acknowledgement or all ships distress relay acknowledgement.

A distress alert acknowledgement sent by the vessel in distress shall be recognized as a self-cancel.

The procedure handling a received individually addressed distress relay shall be considered acknowledged when the operator first transmits the corresponding individually addressed distress relay acknowledgement to the sender.

The procedure handling a distress relay sent to an individual station shall be considered acknowledged when the first corresponding individually addressed distress relay acknowledgement is received from that station.

C.7.1.9 Sending relays and acknowledgments

The operator shall not have the option to send a distress relay acknowledgment until a distress relay has been received.

The operator shall not have the option to send a distress alert acknowledgment until a distress alert has been received.

Once the option to send any of the distress DSC messages (distress relay, distress alert acknowledgement, distress relay acknowledgement) referenced above becomes available, the options shall remain available until the procedure is terminated.

The procedure shall automatically compose the distress DSC messages referenced above except:

a) the distress relay where the operator shall have the option to select the addressing mode and address where the default shall be individual, and

b) in a procedure handling an individually addressed relay or relay acknowledgement, the operator shall have the option to send an all ships relay acknowledgement in addition to the default individual relay acknowledgement even though this DSC message is typically forbidden to be sent by ship stations.

NOTE It is only possible to send an individually addressed distress relay acknowledgement upon reception of an individually addressed relay.

C.7.1.10 Termination

The procedure can be terminated manually or by the automated timeout. At least ten seconds prior to automated termination, a visual and discrete aural warning shall be displayed with the option to stop the automatic termination.

If the procedure is terminated manually by the user, then integrated equipment may revert to the channel or frequency that was previously selected before the DSC procedure.

C.7.1.11 Warnings

The procedure shall provide warnings for those reasons provided in Recommendation ITU-R M.493-16, Annex 4. The operator shall have the option to go back to the stage of the procedure where the action was taken that caused the warning.

C.7.2 Receiving distress automated procedure tests

NOTE Tests and set ups marked with a raised circle (•) are actions that an operator will most likely have to perform in real life. Thus, these items are expected to be easy to perform. The test personnel are to report any difficulties or frustrations in performing these actions.

C.7.2.1 Normal sequence of the received distress automated procedure tests

C.7.2.1.1 Purpose

This test checks the behaviour of the automated procedure through the "normal" sequence of receiving a distress alert attempt, perhaps a repeat of the attempt and a few distress relays, and then a distress alert acknowledgement.

C.7.2.1.2 Method of test and required results

Make sure that the position on the TE has enhanced resolution in fractional minutes. Send the default distress alert attempt from the TE using the distress button and verify that:

a) the EUT sounds the two tone alarm,
b) the reason for and means to silence the alarm is displayed,
c) the alarm can only be silenced manually,
d) the distress information is displayed and correct,
e) the position contains the enhanced resolution data (fractional minutes of lat and lon),
f) the sender, intended recipients, and DSC message type are displayed,
g) the frequency of subsequent communication is channel 16,
h) the elapsed time since receiving the first alert is displayed,
i) the operator is informed that the procedure is waiting for an acknowledgement,
j) the option to send a distress relay is available,
k) upon selection of the option, a warning is provided that three minutes have not elapsed yet•,
l) the option to send a distress alert acknowledgement is available,
m) the option to send a distress relay acknowledgement is not available,
n) the option to activate/place the procedure on hold is available,
o) the option to terminate the procedure is available,
p) the history of at least the received DSC messages reveals that the following have been received: alert 5, alert ack 0, relay 0, relay ack 0,
q) the elapsed time, stage, and operator options are visible at top level,
r) upon selection of the option to terminate the procedure, a warning is provided that one is terminating the procedure•,
s) one can speak to the EUT from the TE,
t) one can speak to the TE from the EUT•.

Change the position on the TE and then resend the distress alert attempt from the TE. Verify that:

u) the reason for and means to silence the self-terminating alarm are displayed,
v) the alarm self-terminates,
w) the history of at least the received DSC messages reveals that the following have been received: alert 10, alert ack 0, relay 0, relay ack 0,•
x) the changed position is displayed in the distress information on the EUT.

C.7.2.2 Distress event self-cancel recognition and auto timeout tests

C.7.2.2.1 Purpose

This test checks that the automated procedure recognizes the distress event self-cancel and that the automated timeout option functions properly.

C.7.2.2.2 Method of test and required results

Reset the EUT into standby•. Set the automated timeout of received distress procedures on the EUT• to a value that gives one enough time to complete the first ten tests. Note that some manufacturers may provide more sophisticated timeout options in the equipment setup as well as more sophisticated operation options to control the automated timeout and respond to any warnings. These tests only address the minimum requirement of at least a 10 s aural and visual warning and stopping the timeout. After the entire set of tests is completed, reset the timeout on the EUT to "no timeout"•. Send the default distress alert attempt from the TE. Silence the alarms on the EUT•. When the TE is finished sending the distress alert attempt, send the self-addressed distress alert acknowledgement and verify that:

a) the EUT sounds the distress acknowledgement alarm,
b) the reason for and means to silence the alarm is displayed,
c) the alarm can only be silenced manually,
d) the sender, intended recipients, and DSC message type are displayed,
e) the procedure indicates it is acknowledged,
f) the acknowledgement is recognized as a self-cancel,
g) the history of at least the received DSC messages reveals that the following have been received: alert 5, alert ack 1, relay 0, relay ack 0•,
h) the time since acknowledgement, stage, and operator options are visible at top level,
i) one can speak to the EUT from the TE,
j) one can speak to the TE from the EUT•.
k) a visual and aural warning appears at least 10 s before termination with the option to stop the termination.

C.7.2.3 Received distress automated procedure started by a distress relay tests

C.7.2.3.1 Purpose

This test checks the setup of the automated procedure when the first received distress DSC message of a distress event is a distress relay.

C.7.2.3.2 Method of test and required results

Reset the EUT to standby•. From the TE, send a distress relay on behalf of someone else addressed to all ships. Provide parameters for all five components of the distress information and verify that:

a) the EUT sounds the two-tone alarm,
b) the reason for and means to silence the alarm is displayed,
c) the alarm can only be silenced manually,
d) the distress information is displayed and correct,
e) the position contains the enhanced resolution data (fractional minutes of lat and lon),
f) the sender, intended recipients, and DSC message type is displayed,
g) the frequency of subsequent communication is channel 16,

h) the elapsed time since receiving the relay is displayed,

i) the operator is informed that the procedure is waiting for an acknowledgement,

j) the option to send a distress relay is available,

k) the option to send a distress alert acknowledgement is not available,

l) the option to send a distress relay acknowledgement is not available,

m) the option to activate/place the procedure on hold is available,

n) the option to terminate the procedure is available,

o) the history of at least the received DSC messages reveals that the following have been received: alert 0, alert ack 0, relay 1, relay ack 0,•

p) the elapsed time, stage, and operator options are visible at top level,

q) one can speak to the EUT from the TE,

r) one can speak to the TE from the EUT•,

C.7.2.4 Received distress automated procedure started by a distress alert acknowledgement tests

C.7.2.4.1 Purpose

This test checks the setup of the automated procedure when the first received distress class DSC message of a distress event is a distress alert acknowledgement.

C.7.2.4.2 Method of tests and required results

Reset the EUT to standby•. From the TE, send a distress alert acknowledgement and verify that:

a) the EUT sounds the two-tone alarm,

b) the reason for and means to silence the alarm is displayed,

c) the alarm can only be silenced manually,

d) the distress information is displayed and correct,

e) the position contains the enhanced resolution data (fractional minutes of lat and lon),

f) the sender, intended recipients, and DSC message type is displayed,

g) the frequency of subsequent communication is channel 16,

h) the elapsed time since being acknowledged is displayed,

i) the operator is informed that the procedure is acknowledged,

j) the option to send a distress relay is available,

k) the option to send a distress alert acknowledgement is unavailable,

l) the option to send a distress relay acknowledgement is unavailable,

m) the option to activate/place the procedure on hold is available,

n) the option to terminate the procedure is available,

o) the history of at least the received DSC messages reveals that the following have been received: alert 0, alert ack 1, relay 0, relay ack 0•,

p) the time since acknowledgement, stage, and operator options are visible at top level,

q) one can speak to the EUT from the TE,

r) one can speak to the TE from the EUT•,

C.7.2.5 Received distress automated procedure started by an individually addressed distress relay tests

C.7.2.5.1 Purpose

This test checks the setup of the automated procedure when the first received distress DSC message of a distress event is a distress relay addressed only to the station.

C.7.2.5.2 Method of tests and required results

Reset the EUT to standby•. From the TE, send a distress relay addressed to the EUT. Place information in all of the distress message elements (MMSI of vessel in distress, nature of distress, position, time of position, communication type). Verify that:

a) the EUT sounds the distress relay alarm,
b) the reason for and means to silence the alarm is displayed,
c) the alarm can only be silenced manually,
d) the option to acknowledge the individual DSC message is presented (do not acknowledge),
e) the distress information is displayed and correct,
f) the position contains the enhanced resolution data (fractional minutes of lat and lon),
g) the sender, intended recipient, and DSC message type is displayed,
h) the frequency of subsequent communication is channel 16,
i) the elapsed time since receiving the initial relay is displayed,
j) the operator is informed that the DSC message needs to be acknowledged,
k) the option to send a distress relay is available,
l) the option to send a distress alert acknowledgement is unavailable,
m) the option to send a distress relay acknowledgement is available,
n) the option to activate/place the procedure on hold is available,
o) the option to terminate the procedure is available,
p) the history of at least the received DSC messages reveals that the following have been received: alert 0, alert ack 0, relay 1, relay ack 0•,
q) the elapsed time, stage, and operator options are visible at top level.

Select the option to send a relay acknowledgement on the EUT•. Verify that:

r) no warning is given when the relay acknowledgement option is selected,
s) the default addressing mode is "individual" and the MMSI is that of the sender,
t) one is unable to edit the destination MMSI address,
u) the option to send an "all ships" acknowledgement is present,

Send the relay acknowledgement from the EUT•. Verify that:

v) the received distress DSC message procedure is acknowledged on the TE,
w) the distress relay acknowledgment is received on the frequency selected,
x) it is indicated on the EUT that the event has been acknowledged,
y) the history of at least the received DSC messages reveals that the following have been received: alert 0, alert ack 0, relay 1, relay ack 0•,
z) the time since acknowledgement, stage, and operator options are visible at top level,
aa) one can speak to the EUT from the TE,

bb) one can speak to the TE from the EUT•.

C.7.2.6 Received distress automated procedure started by sending a DROBOSE tests

C.7.2.6.1 Purpose

This test checks the setup of the automated procedure on the EUT when the EUT sends a distress relay on behalf of someone else. Recall that the sending of this distress DSC message is functionally equivalent to receiving a distress alert and then relaying it.

C.7.2.6.2 Method of tests and required results

Reset the EUT to standby•. Send a DROBOSE from the EUT• using the default values except for destination MMSI, position and time of position. Verify that:

a) the received distress automated procedure is started on the TE,
b) the distress information and DSC message type is received on the TE correctly,
c) the received distress automated procedure also starts on the EUT,
d) there is no alarm sounded by the EUT,
e) the distress information is displayed and correct,
f) the sender, intended recipients, and DSC message type is displayed,
g) the frequency of subsequent communication is channel 16,
h) the elapsed time since sending the initial relay is displayed,
i) the option to send a distress relay is available,
j) the option to send a distress alert acknowledgement is not available,
k) the option to send a distress relay acknowledgement is not available,
l) the option to activate/place the procedure on hold is available,
m) the option to terminate the procedure is available,
n) it is indicated on the EUT that the event is waiting for an acknowledgement,
o) the history of at least the received DSC messages reveals that the following have been received: alert 0, alert ack 0, relay 0, relay ack 0•,
p) the elapsed time, stage, and operator options are visible at top level,
q) one can speak to the EUT from the TE,
r) one can speak to the TE from the EUT•.

C.7.2.7 Sending a distress relay tests

C.7.2.7.1 Purpose

This test checks that the automated procedure composes the distress relay correctly and presents the correct information and selection options when the operator chooses to send a relay.

C.7.2.7.2 Method of tests and required results

Reset the EUT to standby•. From the TE, send a distress alert attempt with "nature of distress" as sinking. Silence the alarms on the EUT• and wait until all the alerts of the distress alert attempt are sent. Place the TE back in standby. On the EUT, select the option to send a distress relay•. Verify that:

a) a warning is displayed that it is too soon to send a relay if three minutes have not elapsed,
b) after selecting the option, the default addressing mode is individual and default MMSI is invalid,•

c) the option to use all ships,

d) the operator is unable to edit the distress information,

e) the individually addressed relay is unable to be sent with no MMSI entry,•

Select all ships addressing• and send the relay•. Verify that:

f) a warning is displayed stating one shall try to send the relay to a coast station,

g) send anyways• and the received distress procedure is started on the TE,

h) the distress information and DSC message type displayed on the TE is correct,

i) one can speak to the EUT from the TE,

j) one can speak to the TE from the EUT•.

There is a big difference between "invalid" and "unknown" MMSI. "Unknown" is an acceptable value by Recommendation ITU-R M.493 (coded by five 126's) but it shall never be transmitted in this case. The software shall recognise the default entry as unacceptable to send and shall not allow the sending until an acceptable 9-digit value is entered.

C.7.2.8 Sending a distress alert acknowledgment tests

C.7.2.8.1 Purpose

This test checks that the automated procedure composes the distress alert acknowledgement correctly.

C.7.2.8.2 Method of tests and required results

Reset the EUT to standby•. From the TE, send the default distress alert attempt. Silence the alarms on the EUT• and wait until all the alerts of the distress alert attempt are sent. On the EUT, select the option to send a distress alert acknowledgment•. Verify that:

a) a warning is displayed that it is too soon to send a distress alert acknowledgment if five minutes have not elapsed, and/or

b) a warning is displayed that the acknowledgment shall only be sent by coast stations,

c) after selecting the option, the acknowledgment is sent•,

Send the distress alert acknowledgement •. Verify that:

d) the sending distress procedure is acknowledged on the TE,

e) the distress alert acknowledgment is received on the frequency selected by the EUT,

f) the EUT indicates that the event has been acknowledged,

g) one can speak to the EUT from the TE,

h) one can speak to the TE from the EUT•,

i) a warning is given that the event has already been acknowledged when trying to send a relay•,

j) a warning is given that the event has been acknowledged when trying to resend the distress ack•.

C.7.2.9 Sending a distress relay individual acknowledgment tests

C.7.2.9.1 Purpose

This test checks that the automated procedure composes the distress relay acknowledgement correctly and when the operator chooses to send a distress relay acknowledgment.

C.7.2.9.2 Method of test and required results

Reset the EUT to standby•. From the TE, send an individual distress relay to the EUT. Silence the alarm on the EUT•. On the EUT, select the option to send a distress relay acknowledgment•. Verify that after choosing to continue, the acknowledgment is sent•,

C.8 Sending non-distress automated procedure

C.8.1 Sending non-distress automated procedure requirements

C.8.1.1 Procedure

The sending non-distress automated procedure results when the operator selects to transmit a DSC message that does not contain the distress information. It also results when an acknowledgement to a sending non-distress automated procedure that has been prematurely terminated is received ("an acknowledgement one quit waiting for").

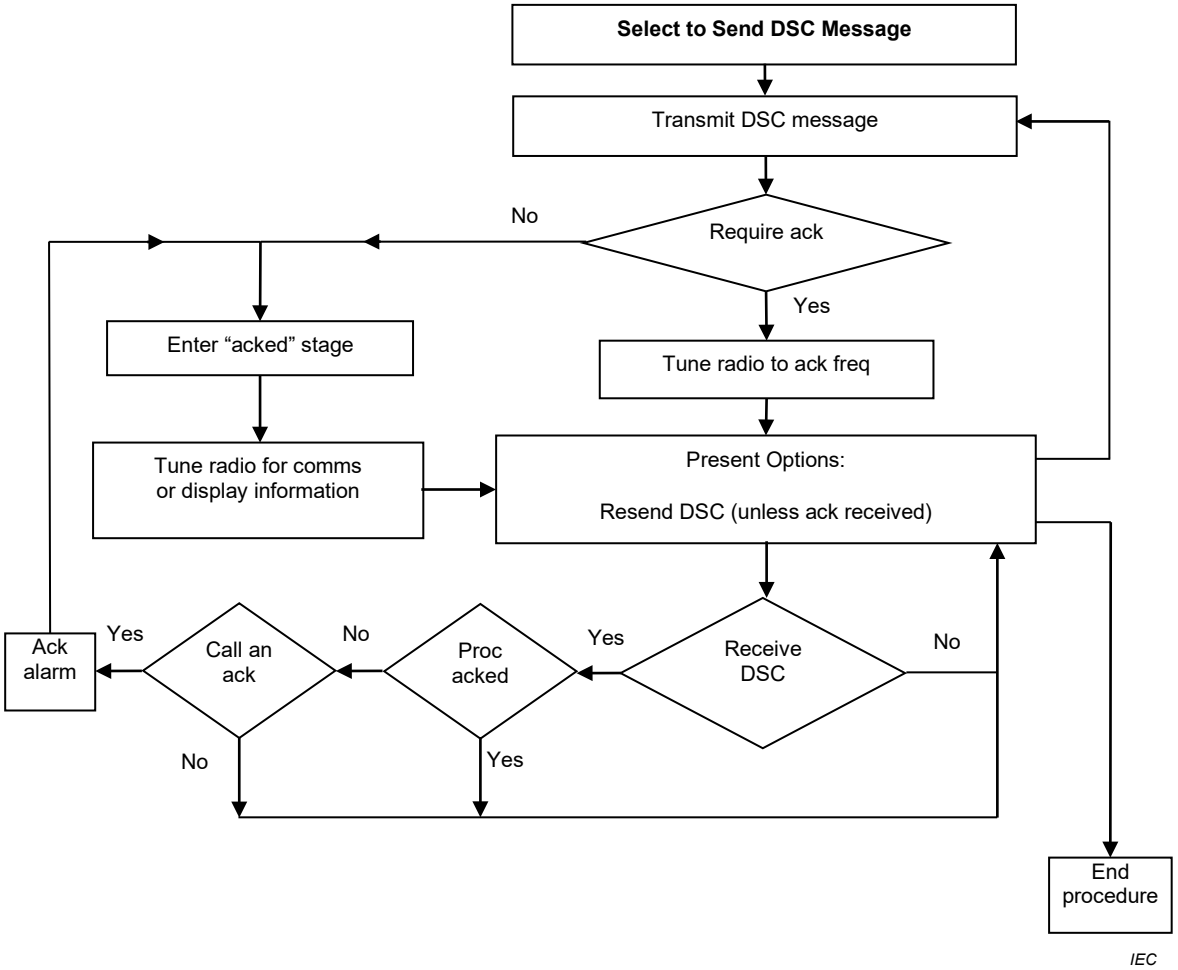

Figure C.4 – Sending non-distress automated procedure

C.8.1.2 Tasks

The EUT shall follow the sending non-distress automated procedure as shown in Figure C.4 complying with the automated procedures as defined in Recommendation ITU-R M.493-16, Annex 4.

The sending non-distress automated procedure shall handle the following events:

a) prior to acknowledgement:
   1) the transmission of the composed/selected DSC message,
   2) if the DSC message demands no acknowledgment, setting the procedure to acknowledged,
   3) if the DSC message demands an acknowledgement:
      i) waiting for the acknowledgement and alarming when received,
      ii) allocating any received DSC message not pertinent to the procedure to their appropriate procedure or initiating their own procedure on hold,
      iii) providing the valid operator options which are:
         - resend the initial DSC message,
         - activate or place the procedure on hold,
         - terminate the procedure.
b) upon reception of the acknowledgement or being set to acknowledged:
   1) tuning the general receiver and transmitter to the frequency of subsequent communication or displaying the requested information,
   2) ignoring any received DSC message pertinent to the procedure since it is a duplicate,
   3) allocating any received DSC message not pertinent to the procedure to the appropriate procedure or initiating their own procedure on hold, and
   4) providing the valid operator options which are:
      - resend the initial DSC message if it requires no acknowledgement,
      - activate or place the procedure on hold,
      - terminate the procedure.

C.8.1.3 Display

During the sending non-distress automated procedure, the EUT shall display or make available to the operator the following items and/or information:

a) the fact one is engaged in sending a non-distress DSC message,
b) the elapsed time since sending the initial DSC message (prior to acknowledgement),
c) the elapsed time since being acknowledged (once acknowledged or considered acknowledged),
d) the information content of the initial DSC message sent which is:
   1) the type of DSC message (description),
   2) the priority of the DSC message,
   3) the destination,
   4) the means of subsequent communication or purpose,
   5) the frequencies of subsequent communication if any,
   6) whether or not the DSC message requires an acknowledgement.
e) if acknowledged, the information content of the acknowledgement which is:

1) the type of acknowledgment (description),
2) the priority of the DSC acknowledgement,
3) the sender,
4) to whom the DSC acknowledgement was sent,
5) the means of subsequent communication or the requested information,
6) if appropriate, the mode/frequency change or unable to comply and reason,
7) the frequencies of subsequent communication if any,

f) the valid operator options, and
g) the sub-stages of the procedure which are
1) waiting for free channel,
2) transmitting,
3) waiting for acknowledgement,
4) linked for communications,
5) procedure done (no more to do).

At top level, the elapsed time, the stage of the automated procedure, and operator options shall be displayed.

C.8.1.4 Handling received DSC messages

DSC messages pertinent to the station but not the procedure shall be allocated to the appropriate automated procedure or initiate their own automated procedure on hold.

DSC messages that are pertinent to the procedure are acknowledgements to the initial DSC message.

C.8.1.5 Alerts

The reception of the first acknowledgement pertinent to the procedure shall sound the appropriate acknowledgement alert as specified in Table E.1.

Any subsequent acknowledgement may be ignored as only individually addressed non-distress DSC messages have acknowledgements.

C.8.1.6 Automated tuning

If the DSC message requires subsequent communications, the general receiver and transmitter shall be tuned to the frequencies given in the acknowledgement upon reception of the "able to comply" acknowledgement.

If the acknowledgement received is "unable to comply", the radio shall not tune to the originally proposed channel or frequency.

If the acknowledgement received is "able to comply" but proposes a new working frequency that is not available, the radio shall not tune to the proposed frequency, but inform the operator that a new call request has to be made to the called station.

If no acknowledgement is required, the transmitter shall be tuned to the frequency of subsequent communications given by the initial DSC message.

C.8.1.7 Delayed acknowledgements

If an acknowledgement to a sending non-distress automated procedure is received after the procedure has been prematurely terminated, the automated procedure shall initiate itself recreating the initial DSC message based upon the acknowledgement. The procedure shall inform the operator that "an acknowledgement we quit waiting for" has been received. If the acknowledging station changed the frequency or communication mode, the original values will not be known but shall be assumed to be that present in the acknowledgement. If the acknowledging station responded with "unable to comply", all the original communication information will be unknown in which case the initial DSC message shall be assumed to have been radiotelephone on any legal frequency.

C.8.1.8 Termination

Termination is done manually or by the automated timeout. At least ten seconds prior to automated termination, a visual and discrete aural warning shall be displayed with the option to stop the automatic termination.

C.8.1.9 Warnings

The procedure shall provide warnings for those reasons provided in Recommendation ITU-R M.493-16, Annex 4. The operator shall have the option to go back to the stage of the procedure where the action was taken that caused the warning.

C.8.2 Sending non-distress automated procedure tests

NOTE Tests and set ups marked with a raised circle (•) are actions that an operator will most likely have to perform in real life. Thus, these items are expected to be easy to perform. The test personnel are to report any difficulties or frustrations in performing these actions.

C.8.2.1 Sending non-distress procedure sequence with "able to comply" tests

C.8.2.1.1 Purpose

This test checks the typical cycle of sending a DSC message, waiting for the acknowledgment, receiving an "able to comply" acknowledgement, and establishing the communication link.

C.8.2.1.2 Method of test and required results

Set the EUT• and TE in standby and be sure that the automatic acknowledgement feature of the TE is turned off in order to have time to inspect the EUT. Configure the TE with a ship station MMSI. From the EUT, send a DSC message of priority routine requesting radio telephone addressed to the TE•. Verify that:

a) the EUT indicates that it is transmitting,
b) the information content of the initial DSC message is displayed or available on the EUT,
c) upon completion of the transmission, the EUT states that it is waiting for an acknowledgement,
d) the time since sending the initial DSC message is displayed,
e) the option to resend the initial DSC message is available,
f) the option to activate/place the procedure on hold is available,
g) the option to terminate the procedure is available,
h) the received non-distress DSC procedure is started on the TE,
i) the information content displayed on the TE corresponds to that displayed on the EUT,
j) the elapsed time, stage, and operator options are visible at top level on the EUT.

Acknowledge the DSC message from the TE with "able to comply". Verify that:

k) the routine acknowledgement sounds on the EUT,

l) the reason for and means to silence the alert is displayed on the EUT,

m) the time since being acknowledged is displayed,

n) the information content of the acknowledgement is displayed or available• on the EUT,

o) the EUT indicates that it has been acknowledged or that communications are ready,

p) the option to resend the initial DSC message is no longer available on the EUT,

q) the option to activate/place the procedure on hold is available,

r) the option to terminate the procedure is available,

s) the time since acknowledgement, stage, and operator options are visible at top level,

t) one can speak to the TE from the EUT•,

u) one can speak to the EUT from the TE.

C.8.2.2 Sending non-distress procedure sequence with "comply with frequency change" tests

C.8.2.2.1 Purpose

This test checks the ability of the EUT procedure to handle an acknowledgement requesting a frequency change.

C.8.2.2.2 Method of test and required results

Set the EUT• and TE in standby and be sure that the automatic acknowledgement feature of the TE is turned off in order to be able to change the frequency of subsequent communications. Configure the TE with a ship station MMSI. From the EUT, send a DSC message with priority safety requesting radio telephone addressed to the TE•. Silence the alert on the TE. When it is time to send the acknowledgment from the TE, select the option to comply with a mode and/or frequency change. Compose the change as a change to channel 71. Verify that:

a) the EUT indicates that it is transmitting,

b) the information content of the initial DSC message is displayed or available• on the EUT,

c) upon completion of the transmission, the EUT states that it is waiting for an acknowledgement,

d) the time since sending the initial DSC message is displayed,

e) the option to resend the initial DSC message is available,

f) the option to activate/place the procedure on hold is available,

g) the option to terminate the procedure is available,

h) the received non-distress DSC procedure is started on the TE,

i) the information content displayed on the TE corresponds to that displayed on the EUT.

Send the acknowledgment specified above from the TE. Verify that:

j) the elapsed time, stage, and operator options are visible at top level on the EUT,

k) the safety acknowledgement sounds on the EUT,

l) the reason for and means to silence the alert is displayed on the EUT,

m) the alert can only be silenced manually•,

n) the time since being acknowledged is displayed,

o) the information content of the acknowledgement is displayed or available• on the EUT,

p) the EUT indicates that a change in communications has been suggested (accept if necessary)•,

q) the EUT indicates that it has been acknowledged or that communications are ready,

r) the option to resend the initial DSC message is no longer available on the EUT,

s) the option to activate/place the procedure on hold is available,

t) the option to terminate the procedure is available,

u) one can speak to the TE from the EUT•,

v) one can speak to the EUT from the TE.

C.8.2.3 Sending non-distress procedure sequence with "unable to comply" tests

C.8.2.3.1 Purpose

This test checks the ability of the EUT procedure to handle an "unable to comply" acknowledgement.

C.8.2.3.2 Method of test and required results

Set the EUT• and TE in standby and be sure that the automatic acknowledgement feature of the TE is turned off in order to allow the "unable to comply" acknowledgment option. Configure the TE with a ship station MMSI. From the EUT, send a DSC message with priority urgency requesting radio telephone addressed to the TE•. Verify that:

a) the EUT indicates that it is transmitting,

b) the information content of the initial DSC message is displayed or available• on the EUT,

c) upon completion of the transmission, the EUT states that it is waiting for an acknowledgment,

d) the time since sending the initial DSC message is displayed,

e) the option to resend the initial DSC message is available,

f) a "too soon" warning is displayed when trying to resend• before 5 min, (Do not resend)

g) the option to activate/place the procedure on hold is available,

h) the option to terminate the procedure is available,

i) the received non-distress DSC message procedure is started on the TE,

j) the information content displayed on the TE corresponds to that displayed on the EUT,

k) the elapsed time, stage, and operator options are visible at top level on the EUT.

Acknowledge the DSC message from the TE with "unable to comply" with reason "busy". Verify that:

l) the urgency acknowledgement alarm sounds on the EUT,

m) the reason for and means to silence the alarm is displayed on the EUT,

n) the time since being acknowledged is displayed,

o) the alarm can only be silenced manually•,

p) the information content of the acknowledgement is displayed or available• on the EUT,

q) the EUT indicates that the vessel is unable to comply since they are "busy"•,

r) the EUT indicates that there is nothing more to do,

s) the option to resend the initial DSC message is no longer available on the EUT,

t) the option to activate/place the procedure on hold is available,

u) the option to terminate the procedure is available.

C.8.2.4 Automated timeout and received acknowledgement after quitting sending non-distress procedure tests

C.8.2.4.1 Purpose

This test checks the automated timeout feature and the ability of the automated procedure to restart and recover itself when the acknowledgment is received after the procedure has timed out.

C.8.2.4.2 Method of test and required results

Set the EUT• and TE in standby and be sure that the automatic acknowledgement feature of the TE is turned off. Set the automated timeout of sending non-distress procedures on the EUT to some small value•. Note that some manufacturers may provide more sophisticated timeout options in the equipment setup as well as more sophisticated operation options to control the automated timeout and respond to any warnings. These tests only address the minimum requirement of at least a 10 s aural and visual warning and stopping the timeout. After the entire set of tests is completed, reset the timeout to the factory default of 15 min on the EUT•. Configure the TE with a ship station MMSI. From the EUT, send a DSC message of priority routine requesting radio telephone addressed to the TE•. After transmission, silence the alert on the TE. Verify that:

a) the EUT indicates that it is waiting for a reply,

b) a visual and aural warning appears at least 10 s before termination with the option to stop the termination,

c) the EUT returns to standby when the time elapses.

Acknowledge the EUT from the TE with "able to comply". Verify that:

d) the routine acknowledgement sounds on the EUT,

e) the reason for and means to silence the alert is displayed on the EUT,

f) the EUT indicates that this DSC message is an ack one quit waiting for or equivalent,

g) the information content of the acknowledgement is displayed or available on the EUT,

h) the EUT indicates that it has been acknowledged or that communications are ready,

i) the option to resend an "initial DSC message" is unavailable on the EUT,

j) the option to activate/place the procedure on hold is available,

k) the option to terminate the procedure is available,

l) the time since acknowledgement, stage, and operator options are visible at top level,

m) one can speak to the TE from the EUT•,

n) one can speak to the EUT from the TE.

C.9 Receiving non-distress automated procedure

C.9.1 Receiving non-distress automated procedure requirements

C.9.1.1 Procedure

The received non-distress automated procedure results when a DSC message is received that does not contain the distress information and is not an acknowledgement.

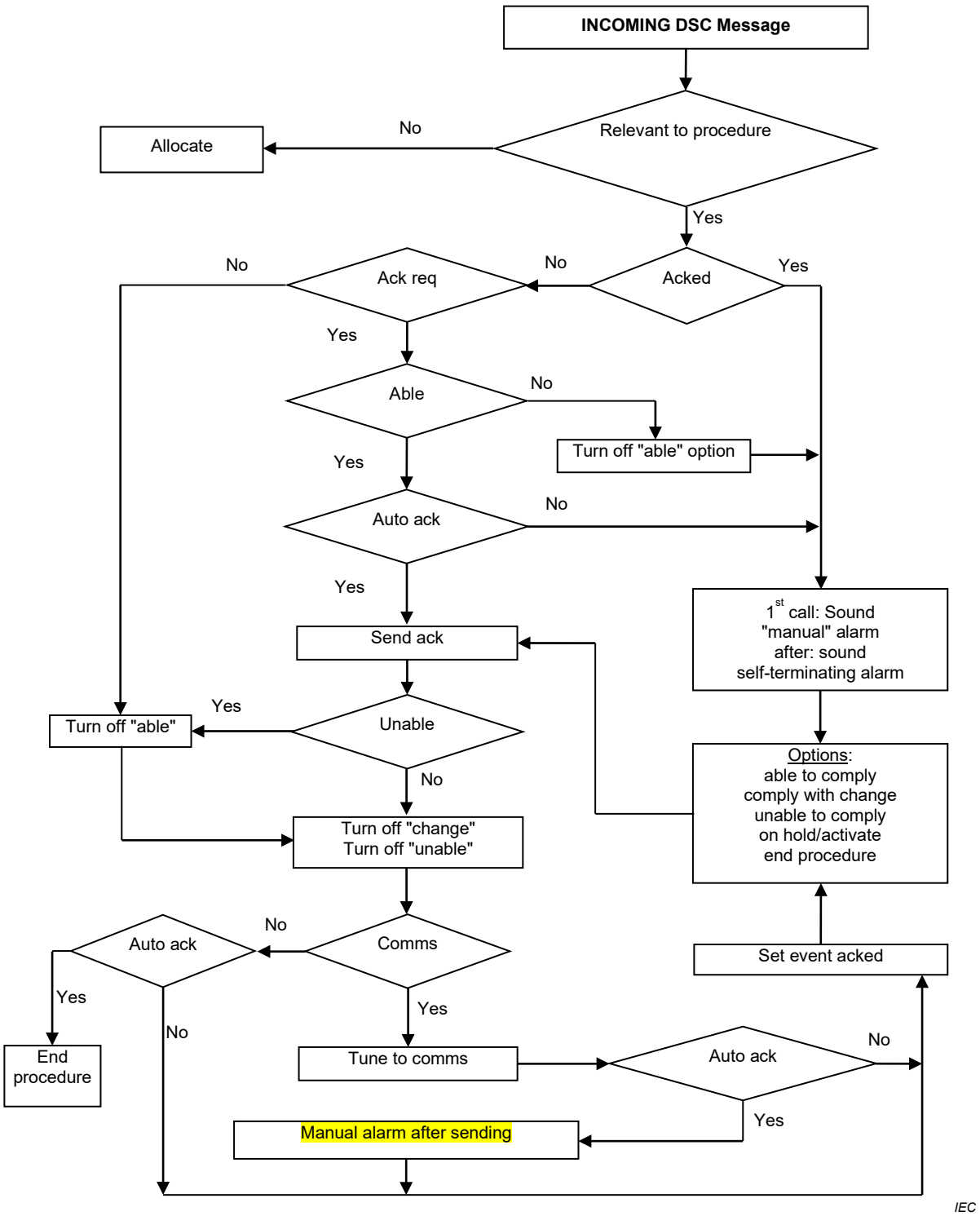

Figure C.5 – Receiving non-distress procedure

C.9.1.2 Tasks

The EUT shall follow the received non-distress automated procedure as shown in Figure C.5 complying with the automated procedures as defined in Recommendation ITU-R M.493-16, Annex 4.

The received non-distress automated procedure shall handle the following events:

a) sound the appropriate alerts at the appropriate times for DSC messages pertinent to the procedure,

b) allocate DSC messages pertinent to the station but not the procedure to the appropriate automated procedure or initiate their own automated procedure on hold,

c) denote the procedure as acknowledged if the DSC message requires no acknowledgement,

d) provide and compose the acknowledgement options as dictated by the initial DSC message,

e) tune the general receiver and transmitter to the frequencies of subsequent communications when and if required,

f) provide the operator with the option to:

    1) prior to acknowledgment

        i) comply if able,

        ii) comply with mode or frequency change if there are communications,

        iii) unable to comply,

        iv) activate or place the procedure on hold,

        v) end the procedure,

    2) after acknowledgement or being considered acknowledged,

        i) resend the acknowledgment (after sending the first acknowledgment),

        ii) ability to activate or place the procedure on hold,

        iii) end the procedure.

C.9.1.3 Display

During the received non-distress automated procedure, the EUT shall display or make available to the operator the following items and/or information:

a) the fact one is engaged in receiving a non-distress DSC message,

b) the elapsed time since the procedure started (prior to acknowledgment),

c) the elapsed time since acknowledgement (after acknowledgment),

d) indicate whether the procedure is on hold or is active,

e) at least a 10 s warning before any automated change in communications frequencies are invoked in case engaged in traffic;

f) the information content of the received DSC message;

- the priority (category),
- the sender,
- to whom the DSC message was sent (format and MMSI),
- means of subsequent communication or the requested or sent information,
- frequencies and mode of subsequent communication (if any),
- whether or not the DSC message requires an acknowledgement.

g) the information content of any acknowledgment sent:

- the priority,
- the destination,
- the communication mode and frequencies, or "unable to comply" and reason, or info,

h) displaying the valid user options, and

i) the sub-stages of the procedure which are:

- waiting to send acknowledgement,
- transmitting,
- acknowledged
- waiting for a free channel.

At top level, the elapsed time, the stage of the automated procedure, and operator options shall be displayed.

C.9.1.4 Handling received DSC messages

DSC messages pertinent to the station but not the procedure shall be allocated to the appropriate automated procedure or initiate their own automated procedure on hold.

DSC messages that are pertinent to the procedure are repeats of the initial DSC message.

C.9.1.5 Alerts

When auto acknowledging position, poll, and test DSC messages, no alert shall sound. When auto acknowledging is not involved, an alert shall sound and be terminated as specified in Table E.1.

All repeat initial DSC messages shall sound the self-terminating alarm.

C.9.1.6 Automated tuning

If the DSC message requires subsequent communications, the general receiver and transmitter shall be tuned to the frequencies of the subsequent communications given in the acknowledgement if acknowledgments are requested. Otherwise, the general receiver shall be tuned to the frequency of subsequent communication given by the initial DSC message.

a) the operator shall have a 10 s warning prior to any tuning if the new subsequent frequency is different from the current;

b) the operator shall be able to pause the tuning or accept the tuning.

c) If automatic channel or frequency change has been switched off, the radio shall remain on the current channel or frequency and prompt the user to accept the channel change. There shall be no change until manually accepted.

C.9.1.7 Acknowledgments

Acknowledgment options shall only be provided if the initial DSC message requests an acknowledgement and the acknowledgment option is possible. For example, the "able to comply" option is not possible for an individually addressed DSC message requesting telephony but providing no subsequent communication frequency information. Only the "comply with mode/frequency change" and "unable to comply" options are possible.

In the case of a received individual call requesting telephony, the radio shall be capable of identifying if the requested working frequency identified in the call is available in the equipment.

a) If this frequency is available, the radio shall display the call details and compose an "able to comply" acknowledgement which shall only be transmitted manually. Switching to the frequency identified shall only be performed after a manual "able to comply" acknowledgement has been transmitted.

b) If this frequency is not available, the radio shall display the call details and compose an "unable to comply" acknowledgement with 104 as the first telecommand and 108 as the second telecommand. This acknowledgement may be transmitted automatically.

The "able to comply" option shall only require a single action by the operator to respond. The operator shall not be required to compose any elements of this acknowledgement.

The "comply with mode/frequency change" option shall require that the operator be able to enter/select channels before sending. The operator shall not be required to compose any other elements of this acknowledgement.

The "unable to comply" option shall require that the operator select one of the 10 reasons (telecommand 2 symbols) specified in Recommendation ITU-R M.493 for being unable to comply (default "no reason given") before sending. In the case of a position request, the option shall only require a single action by the operator to send, and the procedure shall indicate non compliance by filling the position and time information with the no information character.

If an acknowledgement is resent by the operator, it shall be identical to the first acknowledgment. It shall not be possible to further edit the content.

C.9.1.8 Termination

When auto acknowledging position, poll, and test DSC messages, the procedure shall self-terminate after sending the acknowledgement.

When sending an "unable to comply" acknowledgement, the procedure shall terminate after completing the transmission.

In all other cases, termination is done manually or by the automated timeout. At least ten seconds prior to automated termination, a visual and discrete aural warning shall be displayed with the option to stop the automatic termination.

If the procedure is terminated manually by the user, then integrated equipment may revert to the channel or frequency that was previously selected before the DSC procedure.

C.9.1.9 Warnings

The procedure shall provide warnings for those reasons provided in Annex E. The operator shall have the option to go back to the stage of the procedure where the action was taken that caused the warning.

C.9.2 Receiving non-distress automated procedure tests

NOTE Tests and set ups marked with a raised circle (•) are actions that an operator will most likely have to perform in real life. Thus, these items are expected to be easy to perform. The test personnel are to report any difficulties or frustrations in performing these actions.

C.9.2.1 The received non-distress automated procedure with "able to comply" tests

C.9.2.1.1 Purpose

This test checks the sequence of receiving an individually addressed DSC message, manually acknowledging with "able to comply", and establishing the communication link.

C.9.2.1.2 Method of test and required results

Set the EUT• and TE into standby. The auto acknowledging feature for individually addressed DSC messages of routine priority shall be turned off•. Configure the TE with a ship station MMSI. From the TE, send a DSC message of routine priority requesting radio telephone addressed to the EUT. Verify that:

a) the EUT sounds the routine alert,

b) the reason for and means to silence the alert is displayed on the EUT,

c) the information content of the received DSC message is displayed or available• on the EUT,

d) the time since receiving the initial DSC message is displayed,

e) the information content received by the EUT corresponds to that sent by the TE,

f) the EUT states that it is waiting for the operator to respond/select an acknowledgment,

g) the "able to comply" acknowledgment option is available,

h) the "able to comply with mode/frequency change" acknowledgment option is available,

i) the "unable to comply" acknowledgment option is available,

j) the option to terminate the procedure is available,

k) the elapsed time, stage, and operator options are visible at top level.

Acknowledge the DSC message from the EUT with "able to comply"•. Verify that:

l) the EUT indicates that it is transmitting,

m) the time since sending the acknowledgment is displayed,

n) the information content of the sent acknowledgment is displayed or available• on the EUT,

o) the option to resend only the identical acknowledgement is available,

p) the EUT indicates that communications are ready,

q) the option to terminate the procedure is available,

r) the information content received by the TE corresponds to that sent by the EUT,

s) the time since acknowledgment, stage, and operator options are visible at top level,

t) one can speak to the EUT from the TE,

u) one can speak to the TE from the EUT•.

C.9.2.2 Received non-distress automated procedure with "comply with frequency change" tests

C.9.2.2.1 Purpose

This test checks the automated timeout and the ability of the procedure to identify a situation where a frequency change is required in the acknowledgement and the "able to comply" option is unavailable.

C.9.2.2.2 Method of test and required results

Set the EUT• and TE in standby and be sure that the automatic acknowledgement feature, if provided, of the EUT is turned off•. Set the automated timeout of received non-distress procedures on the EUT to some value long enough to complete all the tests prior to examining the timeout•. Note that some manufacturers may provide more sophisticated timeout options in the equipment setup as well as more sophisticated operation options to control the automated timeout and respond to any warnings. These tests only address the minimum requirement of at least a 10 s aural and visual warning and stopping the timeout. After the entire set of tests is completed, reset the timeout to the factory default of 15 min•. Configure the TE with a ship station MMSI. From the TE, send a DSC message of priority safety requesting radio telephone addressed to the EUT with working channel that not available in the EUT. Verify that:

a) the EUT sounds the safety alert,

b) the reason for and means to silence the alert is displayed on the EUT,

c) the information content of the received DSC message is displayed or available• on the EUT,

d) the time since receiving the initial DSC message is displayed,

e) the information content received by the EUT corresponds to that sent by the TE,

f) the EUT states that it is waiting for the operator to respond/select an acknowledgment,

g) the "able to comply" acknowledgment option is not available,

h) the "able to comply with mode/frequency change" acknowledgment option is available,

i) the "unable to comply" acknowledgment option is available,

j) the option to terminate the procedure is available,

k) the elapsed time, stage, and operator options are visible at top level.

Select the "comply with mode/frequency change" option•. Verify that:

l) the operator can select/enter a new frequency or channel•,

m) options in m) are the only editing of the acknowledgement the operator can perform.

Send the acknowledgement using: channel 6•. Verify that:

n) the EUT indicates that it is transmitting,

o) the time since sending the acknowledgment is displayed,

p) the information content of the sent acknowledgment is displayed or available• on the EUT,

q) the option to resend only the identical acknowledgement is available,

r) the EUT indicates that communications are ready,

s) the option to terminate the procedure is available,

t) the information content received by the TE corresponds to that sent by the EUT,

u) the time since acknowledgement, stage, and operator options are visible at top level,

v) one can speak to the EUT from the TE,

w) one can speak to the TE from the EUT•.

x) a visual and aural warning appears at least 10 s before termination with the option to stop the termination.

y) the EUT returns to standby when the time elapses.

C.9.2.3 Received non-distress automated procedure with "unable to comply" and automated timeouts tests

C.9.2.3.1 Purpose

This test checks the ability of the procedure to send an "unable to comply" acknowledgement.

C.9.2.3.2 Method of test and required results

Set the EUT• and TE in standby and be sure that the automatic acknowledgement feature, if provided, of the EUT is turned off•. Configure the TE with a ship station MMSI. From the TE, send a DSC message of priority urgency requesting radio telephone addressed to the EUT with working channel that not available in the EUT. Verify that:

a) the EUT sounds the urgency alarm,

b) the reason for and means to silence the alarm is displayed on the EUT,

c) the alarm can only be silenced manually,•

d) the information content of the received DSC message is displayed or available• on the EUT,

e) the time since receiving the initial DSC message is displayed,

f) the information content received by the EUT corresponds to that sent by the TE,

g) the EUT states that it is waiting for the operator to respond/select an acknowledgment,

h) the "able to comply" acknowledgment option is not available,

i) the "able to comply with mode/frequency change" acknowledgment option is available,

j) the "unable to comply" acknowledgment option is available,

k) the option to terminate the procedure is available,

l) the elapsed time, stage, and operator options are visible at top level.

Select the "unable to comply" option•. Verify that:

m) the only operator option is to select one of the ten Recommendation ITU-R M.493 reasons for being unable to comply,

n) the ten reasons are "no reason", "congestion at station", "busy", "queue", "station barred", "no operator available", “operator temporarily unavailable”, "equipment disabled", "unable to use proposed channel", "unable to use proposed mode".

Select the reason "busy" and send the acknowledgement•. Verify that:

o) the EUT indicates that it is transmitting,

p) upon completion of the transmission, the procedure terminates,

q) the information content received by the TE corresponds to that sent by the EUT.

C.10 Communications automated procedure

C.10.1 Communications automated procedure requirements

C.10.1.1 Procedure

The communications automated procedure results when the operator engages in communications established by non DSC means. The procedure is initiated when the operator chooses to monitor a channel for non DSC traffic or non DSC traffic is initiated by the reception of an appropriate signal. (Note that the details in design of the automated procedure might depend upon the type of non DSC traffic being monitored).

The critical purpose of this simple procedure is to assure that received DSC messages do not interrupt ongoing communications in the same manner that they do not disrupt any of the ongoing automated procedures handling DSC messages.

C.10.1.2 Tasks

The communications automated procedure shall handle the following events:

a) received DSC messages pertinent to the station shall be allocated to the appropriate automated procedure or initiate their own automated procedure on hold,

b) tuning the general receiver and transmitter to the frequencies of communication,

c) providing the operator with the option to:

- terminate the procedure,
- toggle between activating and placing the procedure on hold,
- provide any other options necessary for the traffic mode being handled.

C.10.1.3 Display

During the communications automated procedure, the EUT shall display or make available to the operator the following items and/or information:

a) the fact one is engaged in a communications procedure,
b) indication of whether the procedure is on hold or is active,
c) the frequencies and or channels of communication,
d) the operator options,
e) the station MMSI,
f) the latest known position of the vessel and the origin of the position (manual, automatic, etc.),
g) the UTC time of that position.

C.10.1.4 Handling received DSC messages

All received DSC messages pertinent to the station shall be allocated to the appropriate automated procedure or initiate their own automated procedure on hold.

C.10.1.5 Tuning of the general receiver and transmitter

The procedure shall automatically tune the general receiver and transmitter to the frequencies of the selected channel.

C.10.1.6 Termination

The procedure may either be terminated manually or via an automatic timeout.

C.10.2 Communications automated procedure tests

NOTE Tests and set ups marked with a raised circle (•) are actions that an operator will most likely have to perform in real life. Thus, these items are expected to be easy to perform. The test personnel are to report any difficulties or frustrations in performing these actions.

C.10.2.1 Communications automated procedure setup tests

C.10.2.1.1 Purpose

This test checks that the communications automated procedure is correctly initiated.

C.10.2.1.2 Method of test and required results

Set both the EUT• and TE in standby. From the EUT, select the option to make a phone call (by non DSC means) on any appropriate channel•. Do the same on TE. Verify that:

a) the EUT indicates that it is monitoring a communications channel,
b) the frequencies or channels of the communication are displayed,
c) the option to terminate the procedure is available,
d) one can speak to the EUT from the TE,
e) one can speak to the TE from the EUT.•

NOTE If communications are established, the tuning is correct.

C.11 Multiple automated procedures and parallel event handling

C.11.1 Multiple automated procedures and parallel event handling requirements

C.11.1.1 Procedure

Subclause C.11 describes the handling of received DSC messages that are pertinent to the station while the EUT is engaged.

C.11.1.2 Tasks

If the EUT is engaged in handling an automated procedure (except for an unacknowledged sending distress automated procedure), received DSC messages that are pertinent to the station but not the currently active automated procedure:

a) are allocated to an existing automated procedure on hold, or

b) shall initiate their own automated procedure on hold.

Only one automated procedure can be active at a time (since there is only one transmitter and general receiver in addition to the watch receiver), thus any action to activate an automated procedure on hold places the currently active automated procedure on hold.

Automated procedures on hold shall behave identical to active procedures except they do not have control of the transmitter and general receiver thus:

a) the only operator options which are available are those that do not require use of the transmitter or general receiver such as to terminate or activate the automated procedure,

b) any subsequent tunings of the transmitter and general receiver that would occur if the procedure were active upon reception of a DSC message appropriate to the procedure shall not occur until the procedure is activated by the operator,

c) the display of automated procedures on hold may be represented by an appropriately named list, labelled icons, or equivalent in order to minimize space requirements,

d) all other features, including handling of the alarms and full display of information at the request of the operator, remain.

The operator shall be able to activate any displayed automated procedure on hold by a single action (a button press or selection) unless the currently active procedure is transmitting.

If the only remaining automated procedures present on the equipment are on hold, and there are automated procedures handling test, polling, or position requests and these procedures are setup to auto acknowledge, the equipment shall successively perform the auto acknowledgement and terminate these procedures.

The EUT shall provide sufficient memory or capacity to be able to handle a minimum of seven simultaneous automated procedures including a reserve of one. If the equipment can handle more than the required minimum, the equipment shall provide a setup option where the operator can set the value to seven (or any other value the equipment is capable of handling). This option is only required for equipment that can handle more than the minimum. When the equipment maximum is exceeded by one and the reserve procedure is started, the equipment shall generate a warning stating that an automated procedure needs to be terminated or equivalent, though this new procedure and all the previous automated procedures shall still function normally. At this time, the operator shall be prevented from starting any automated procedure except for the sending one’s own distress. If the operator does not elect to terminate an automated procedure, the reception of an additional automated procedure shall result in the automatic termination of an existing automated procedure.

The automatic and immediate termination of an automated procedure shall be based upon age and priority.

C.11.2 Multiple automated procedures and parallel event handling tests

NOTE Tests and set ups marked with a raised circle (•) are actions that an operator will most likely have to perform in real life. Thus, these items are expected to be easy to perform. The test personnel are to report any difficulties or frustrations in performing these actions.

C.11.2.1 General

These tests check that received DSC messages pertinent to the station while the station is engaged in handling an automated procedure properly establish automated procedures on hold. The first part of the testing shall involve sending subsequent DSC messages from the TE while the EUT is engaged in one of the five automated procedures. The second part of the testing shall involve testing multiple automated procedures.

In the following tests, the test personnel shall be asked to verify that the proper automated procedure is started and on hold. This test is verified if:

a) the alarm appropriate to the initiated procedure is sounded,

b) the reason for and means to silence the alarm is displayed,

c) the information concerning the received DSC message is appropriately displayed,

d) the sub stage of the procedure is displayed,

e) the elapsed time is appropriately displayed,

f) there is a clear indication that automated procedure is on hold, and

g) the operator options to activate and terminate the automated procedure are available.

For the tests conducted in C.11.2.2, C.11.2.3, C.11.2.4, and C.11.2.5, the following DSC messages in Table C.2 shall be used.

Table C.2 – DSC messages to send from the TE

(a) A DSC message of priority routine individually addressed to the EUT.
(b) A test DSC message individually addressed to the EUT.
(c) A DSC message of priority "urgency" individually addressed to the EUT.
(d) An all ships DSC message with priority "safety".
(e) A position request addressed to the EUT.
(f) A medical transports DSC message.
(g) A DROBOSE addressed to an area or all ships (describing a different distress event when testing distress automated procedures).
(h) A DROBOSE addressed to the EUT.
(i) A distress alert (upon completion of the transmission, terminate the procedure on the TE).

C.11.2.2 Parallel procedures during the communications procedure tests

C.11.2.2.1 Purpose

This test checks that reception of DSC messages that are pertinent to the station while the station is engaged in the communications automated procedure do not disturb the communications and that the received DSC message properly initiates its own automated procedure on hold.

C.11.2.2.2 Method of test and required results

This test consists of setting up a communications procedure between the EUT and TE and then using the TE as if it were another station to send a DSC message to the EUT starting a

second automated procedure. The tests are to assure the new automated procedure and the communications automated procedure operate properly on the EUT. The new procedure is then terminated. This exercise is conducted 12 times, once for each of the DSC messages listed in Table C.2.

The auto acknowledgement option shall be set to on for test, poll, and individual DSC messages on the EUT• and on the TE.

From standby, set the EUT• and TE into a communications procedure.

On the TE, place the communications procedure on hold.

A DSC message as enumerated in the list given in Table C.2 shall then be sent from the TE. All addressing shall be chosen such that the DSC message is pertinent to the EUT.

Once the transmission has finished on the TE, make the communications procedure on the TE active (take off hold or activate). (After the TE sends the distress alert, the communications procedure may be terminated. In that case, it will be necessary to restart the communications procedure on the TE to do the last two verifications in the grid below).

Verify that:

	a	b	c	d	e	f	g	h	i
the automated procedure on the EUT that handles the received DSC message from Table C.2 is started and on hold,									
the operator is able to make the new procedure active and the communication procedure goes on hold,•									
the operator is able to acknowledge the TE from the EUT•									
the operator is able to make the communications procedure active and the “new” procedure goes on hold,•									
one can speak to the EUT from the TE,									
one can speak to the TE from the EUT,•									

Terminate the procedures on the TE and EUT•.

NOTE DSC messages (a) in Table C.2 generate a received non-distress procedure. DSC messages (g), (h) and (i) in Table C.2 generate a received distress procedure. Message (b) auto acknowledges and self terminates when made active or as soon as all remining automated procedures are on hold or are terminated.

C.11.2.3 Parallel procedures during the received non-distress procedure tests

C.11.2.3.1 Purpose

This test checks that reception of DSC messages that are pertinent to the station while the station is engaged in a received non-distress automated procedure do not disturb the received non-distress automated procedure and that the received DSC message properly initiates its own automated procedure on hold.

C.11.2.3.2 Method of test and required results

This test consists of setting up a received non-distress automated procedure on the EUT by sending a non-distress DSC message from the TE and then using the TE as if it were another station to send a second DSC message to the EUT starting a second automated procedure. The tests are to assure the new automated procedure and the original received non-distress automated procedure operate properly on the EUT. The new automated procedure is then

terminated. This exercise is conducted 11 times, once for each of the DSC messages listed in Table C.2.

1) Set the auto acknowledgement option to off for test, poll, and individual DSC messages on the EUT•.
2) Place the EUT and TE in standby.
3) On the TE, compose an individually addressed DSC message addressed to the EUT with priority "safety". Select a subsequent communication channel or frequency of your choice.
4) On the TE, send the composed DSC message; this will start the received non-distress automated procedure on the EUT. Refer to this procedure as the “original” procedure.
5) Silence the alarm on the EUT• but do not acknowledge the DSC message at this time.
6) On the TE, compose a DSC message as enumerated in the list given in Table C.2 with addressing pertinent to the EUT. Select a subsequent communications channel or frequency that is different than those of step 3. (For DSC messages “b” and “h” from Table C.2, there are no subsequent communications).
7) On the TE, send the composed DSC message.

Verify that:

	a	b	c	d	e	f	g	h	i
the automated procedure that handles the received DSC message from Table C.2 is started and on hold,									
the operator is able to make the new procedure active and the original procedure goes on hold,•									
the operator is able to make the original procedure active and the “new” procedure goes on hold,•									

On the EUT from the original procedure acknowledge the DSC message with “able to comply"•. Verify that:

	a	b	c	d	e	f	g	h	i
the ‘safety’ acknowledgment alert sounds on the TE,									
the information content of the sent acknowledgement is displayed or available• on the EUT,									
the information content of the sent acknowledgement on the TE corresponds to that of the EUT,									
the EUT indicates that it has been acknowledged or communications are ready,									
the time since acknowledgement is displayed,									
one can speak to the EUT from the TE,									
one can speak to the TE from the EUT.•									

Terminate both procedures.

C.11.2.4 Parallel procedures during sending non-distress procedure tests

C.11.2.4.1 Purpose

This test checks that reception of DSC messages that are pertinent to the station while the station is engaged in a sent non-distress automated procedure do not disturb the sent non-distress automated procedure and that the received DSC message properly initiates its own automated procedure on hold.

C.11.2.4.2 Method of test and required results

This test consists of setting up a sending non-distress automated procedure on the EUT by sending a non-distress DSC message to the TE and then using the TE as if it were another station to send a second DSC message to the EUT starting a second automated procedure. The test is to assure that the new automated procedure and the original sending non distress automated procedure operate properly on the EUT. The new automated procedure is then terminated. This exercise is conducted 11 times, once for each of the DSC messages listed in Table C.2. Auto acknowledging shall be turned off.

1) From standby, setup the TE to be able to receive DSC messages not pertinent to the station (snooping) since it shall play the role of two stations.
2) From standby, place the EUT in a sending non-distress automated procedure to set up subsequent communications by sending an individual DSC message of priority "safety" addressed to any ship station but the TE•. Refer to this procedure as the "original" procedure.
3) A "snooped" automated procedure shall start on the TE. Do not acknowledge the snooped DSC message at this time but place the snooped procedure handling the exchange with the EUT on hold.
4) A DSC message as enumerated in the list of Table C.2 shall then be sent from the TE. All addressing shall be chosen such that the DSC message is pertinent to the EUT.

Verify that:

	a	b	c	d	e	f	g	h	i
the automated procedure that handles the received DSC message from Table C.2 is started and on hold,									
the operator is able to make the new procedure active and the original procedure goes on hold,•									
the operator is able to make the original procedure active and the “new” procedure goes on hold,•									

Continue with the original procedure on the EUT. Acknowledge the EUT from the TE with “able to comply” from the ‘snooping’ procedure. Verify that:

	a	b	c	d	e	f	g	h	i
the ‘safety’ acknowledgment alert sounds on the EUT,									
the reason for and means to silence the alert is displayed,									
the information content of the acknowledgement is displayed or available• on the EUT,									
the EUT indicates that it has been acknowledged,									
one can speak to the EUT from the TE,									
one can speak to the TE from the EUT.•									

Terminate both procedures.

C.11.2.5 Parallel procedures during the received distress procedure tests

C.11.2.5.1 Purpose

This test checks that reception of DSC messages that are pertinent to the station while the station is engaged in a received distress automated procedure do not disturb the received distress automated procedure and that the received DSC message properly initiates its own automated procedure on hold.

C.11.2.5.2 Method of test and required results

This test consists of setting up a received distress automated procedure on the EUT by sending a DROBOSE from the TE and then using the TE as if it were another station to send a second DSC message to the EUT starting a second automated procedure. The tests are to assure the new automated procedure and the original received distress automated procedure operate properly on the EUT. The new automated procedure is then terminated. This exercise is conducted 11 times, once for each of the DSC messages listed in Table C.2.

Place the EUT in a received distress automated procedure by sending a DROBOSE addressed to all ships from the TE. A received distress automated procedure shall start on the EUT and the TE. Put the procedure on the TE on hold and send the DSC message enumerated in Table C.2 from the TE. All addressing shall be chosen such that the DSC message is pertinent to the EUT. Verify that:

	a	b	c	d	e	f	g	h	i
the automated procedure that handles the received DSC message from Table C.2 is started and on hold,									
the operator is able to make the new procedure active and the original procedure goes on hold,•									
the operator is able to make the original procedure active and the “new” procedure goes on hold,•									
NOTE DSC messages (a) generate a received non-distress procedure. DSC messages (j) generate a received distress procedure									

Continue with the original received distress procedure on the EUT. Verify that:

	a	b	c	d	e	f	g	h	i
the operator is able to send a relay addressed to all ships from the EUT,•									
the relay is correctly received on the TE,									
upon sending an all ships relay ack from the TE the relay ack alarm sounds on the EUT,									
the reason for and means to silence the alarm is displayed,									
the information content of the acknowledgement is displayed or made available• on the EUT,									
the EUT indicates that it has been acknowledged,									
one can speak to the EUT from the TE,									
one can speak to the TE from the EUT.•									

Terminate both procedures.

C.11.2.6 Parallel procedures during the sending distress automated procedure prior to receiving the distress alert acknowledgment tests

C.11.2.6.1 Purpose

These tests check that if the received DSC message is not the distress alert acknowledgment to this distress event, then it is not brought to the attention of the operator. Note that this behaviour is unique to the sending distress automated procedure, and that this behaviour only occurs prior to the procedure receiving its first acknowledgment.

C.11.2.6.2 Method of test and required results

Send a default distress alert attempt from the EUT•. A set of DSC messages shall be sent from the TE that are pertinent to the station represented by the EUT while the EUT is engaged in the sending distress automated procedure. Thus any regions specified by DSC messages addressed to an area shall be specified to encompass the EUT. Verify that none of the DSC messages listed in Table C.3 start an automated procedure or affect the sending distress automated procedure (the elapsed time countdown, automatic resending of the alert, tuning of the general receiver and transmitter, etc.).

Table C.3 – DSC messages

(1) An individually addressed DSC message of priority urgency.
(2) An all ships DSC message of priority urgency.
(3) A distress alert.
(4) A distress relay with different distress information than the procedure.
(5) A distress relay with the same distress information as the procedure.
(6) A distress acknowledgement with different distress event than the procedure.

Verify that all the DSC messages transmitted from the TE are recorded in the log on the EUT•.

C.11.2.7 Parallel procedures during the sending distress automated procedure after receiving the distress alert acknowledgment tests

C.11.2.7.1 Purpose

This test checks that reception of DSC messages that are pertinent to the station while the station is engaged in an acknowledged sent distress automated procedure do not disturb the sent distress automated procedure and that the received DSC message properly initiates its own automated procedure on hold.

C.11.2.7.2 Method of test and required results

This test consists of setting up a sending distress automated procedure on the EUT, acknowledging it from the TE, and sending DSC messages from the TE that are pertinent to the station but not the procedure. The six DSC messages to be sent from the TE are enumerated in Table C.4.

Table C.4 – DSC messages to be sent from the TE

(1) A DSC message of priority routine individually addressed to the EUT.
(2) A distress relay concerning a new distress event addressed to multiple stations.
(3) A DSC message of priority urgency individually addressed to the EUT.
(4) A DSC message of priority urgency addressed to all ships.
(5) A test DSC message (priority safety) addressed to the EUT.
(6) A distress alert.

For each of the cases of Table C.4:

1) send the default distress alert from the EUT• and acknowledge the distress from the TE by sending a distress alert acknowledgement;
2) place the received distress procedure on the TE on hold;

3) send the enumerated DSC message from the TE. All addressing shall be chosen such that the DSC message is pertinent to the EUT. A set of questions regarding the response of the EUT shall then be answered.

Verify that:

	1	2	3	4	5	6
the automated procedure that handles the received DSC message from the table is started and on hold,						
the operator is able to make the new procedure active and the original procedure goes on hold,•						
the operator is able to make the original procedure active and the “new” procedure goes on hold.•						

Activate the received distress procedure on the TE. Verify that:

	1	2	3	4	5	6
the operator is able to talk to the TE from the EUT.•						
the operator is able to talk to the EUT from the TE.						

For message number 6 of Table C.4, send a distress relay on behalf of someone else from the TE with the same distress information displayed on the EUT. This action can be necessary to restart a received distress automated procedure on the TE. Set the communication frequencies to that of the EUT.

C.11.2.8 Handling of multiple automated procedures tests

C.11.2.8.1 Purpose

This test checks that:

1) the EUT handles multiple automated procedures;
2) the EUT properly responds to reaching and exceeding the maximum number of automated procedures; and
3) the automated procedure handling a test, poll, or position request that is set to auto-acknowledge does not auto-acknowledge until all other automated procedures are on hold.

This test involves placing the EUT in a received distress automated procedure concerning distress event "A" and then sending the DSC messages in Table C.5 from the TE. The test personnel shall check that each of these automated procedures behaves correctly and that the EUT correctly handles the situations when the equipment maximum is exceeded.

Then the test personnel shall be asked to make selected automated procedures active on the EUT and perform various actions (such as acknowledging). Even though there will be several procedures running, it shall not be difficult to find the procedure that corresponds to the DSC messages sent in Table C.5.

C.11.2.8.2 Method of test and required results

C.11.2.8.2.1 General

Be sure that the auto-acknowledgement option on the EUT is on for the test and polling DSC messages and is off for the position request•. Set the EUT’s automatic timeout for the automated procedures to no timeout•. If the equipment supports more than seven

simultaneous automated procedures, set up the equipment such that the maximum number is seven• The DSC messages to be sent from the TE are listed in Table C.5.

Strictly follow the sequence of events in Table C.5 in order to assure proper behaviour.

Table C.5 – DSC messages to send from the TE

(a)	A DSC message of priority routine individually addressed to the EUT.
(b)	A position request individually addressed to the EUT.
(c)	A DSC message of priority "urgency" individually addressed to the EUT.
(d)	An all ships DSC message with priority "safety".
(e)	A distress on behalf of someone else individually addressed to the EUT concerning a different event B.
(f)	A test DSC message addressed to the EUT
(g)	A polling request addressed to the EUT.
(h)	A distress on behalf of someone else addressed to all ships concerning a different event C.
(i)	A distress on behalf of someone else addressed to all ships concerning the event C but after changing the MMSI of the TE (to simulate another station reporting the same event C).
(j)	A distress on behalf of someone else addressed to the EUT concerning event C, but after changing the position of the vessel in distress.

C.11.2.8.2.2 Stage one

Set the TE and EUT into standby. Place the EUT in a received distress automated procedure by sending a DROBOSE with distress information "sinking" addressed to all ships from the TE. This distress event will be referred to as event A. A received distress automated procedure shall start on the EUT and the TE. Put the procedure on the TE on hold. Then:

For each DSC message enumerated in Table C.5:

1) address the message such that it is pertinent to the EUT,
2) send the DSC message from the TE as instructed below where the TE shall have the same own MMSI for all messages except message (i),
3) do not "handle" any of the automated procedures on the EUT, unless specifically instructed to do so below, except for the silencing of the alarms and cancelling of any messages.

From the TE, send the routine message (a). Verify that the automated procedure is started and on hold and does not automatically acknowledge.

From the TE, send position request (b). Verify that the automated procedure is started and on hold and does not automatically acknowledge.

From the TE, send priority message (c). Verify that the automated procedure is started and on hold and does not automatically acknowledge.

From the TE, send all ships message (d). Verify that the automated procedure is started and on hold.

NOTE 1 DSC messages (a) to (d) and (f) to (g) in Table C.5 generate a received non-distress procedure. DSC messages (e) and (h) to (j) in Table C.5 generate a received distress procedure.

From the TE, send the DSC message (e). Verify that the automated procedure is started and on hold and does not automatically acknowledge.

From the TE, send the test message (f). Verify that the automated procedure from Table C.5 is started and on hold and does not automatically acknowledge:

a) that a warning is displayed stating that an automated procedure needs to be terminated or equivalent,

b) that the EUT prevents the operator from starting• a comms procedure,

c) that the EUT prevents the operator from sending• a DROBOSE,

d) that the EUT prevents the operator from sending• a non-distress DSC message,

e) that the operator is able to send• a distress alert (this test may require restarting the entire sequence at which time this test shall not be repeated since all procedures may be terminated).

From the TE, send the polling request (g). Verify that the automated procedure handling the DSC message of priority routine individually addressed to the EUT (a) is automatically terminated•.

From the TE, send the DROBOSE (h) concerning distress event C. Verify that the automated procedure handling the polling request (g) is automatically terminated•.

NOTE 2 The terminated procedure in this case has the highest kill score and is therefore the procedure that is automatically terminated when the procedure buffer overflows.

On the EUT, place the original automated procedure handling distress event "A" on hold•. Verify that the procedure handling the test of the message (f) is automatically acknowledged and self-terminates•.

On the EUT, make the automated procedure handling distress event "A" active• and on the TE with different position of the vessel in distress, send the DROBOSE (i) concerning distress event "C". Verify that the DSC message (i) is handled by the procedure generated by DSC message (h) sounding only the self-terminating alarm.

From the TE, send the individual DROBOSE (j) concerning distress event "C". Verify that:

f) the automated procedure handling message (j) is started and on hold,

g) the total number of automated procedures on the EUT is 7,

h) the original received distress automated procedure is active on the EUT.

C.11.2.8.2.3 Stage two

Upon completion of the transmission of the messages in Table C.5, there will be seven automated procedures on the EUT, where the automated procedure handling distress event "A" is active. Verify that:

a) each one of the procedures can be made active while all the remaining procedures are placed on hold,•

b) the automated procedure handling DSC message (a) can be acknowledged with "able to comply",•

c) the TE receives the acknowledgement,

d) the EUT can speak to the TE upon activating the procedure on the TE,•

e) the TE can speak to the EUT,

f) the automated procedure handling DSC message (c) can be acknowledged,•

g) the TE receives the acknowledgement,

h) the EUT can speak• to the TE upon activating the procedure on the TE,

i) the TE can speak to the EUT,

j) the automated procedure handling DSC message (e) can be acknowledged with an individual relay acknowledgement,•

k) the TE receives the acknowledgement,

l) the EUT can speak• to the TE upon activating the procedure on the TE,

m) the TE can speak to the EUT,

n) the automated procedure handling DSC message (j) can be acknowledged with an individual relay ack,•

o) the TE receives the acknowledgement,

p) the EUT can speak• to the TE upon activating the procedure on the TE,

q) the TE can speak to the EUT,

r) the relay acknowledgment can be sent from the automated procedure handling the distress event B,•

s) the TE receives the acknowledgement,

t) the EUT can speak• to the TE upon activating the procedure on the TE,

u) the TE can speak to the EUT,

v) the automated procedures corresponding to (a) and (c) – (j) can be terminated as well as the automated procedure handling distress event "A"•.

C.12 Error handling in the automated procedures

C.12.1 Error handling requirements

C.12.1.1 General

C.12 describes the handling of received DSC messages that contain errors in any of the information characters except the format, address (the destination MMSI, group MMSI or area), and end of sequence characters which shall be received correctly in order for the message to be accepted.

NOTE For the purposes of these tests, "performing comparison error correction" between identical sets of information characters means that if one of a corresponding pair of information characters is in error, the information character in error is replaced by the information character that is not in error. A given information character is received in the DX and RX positions of the DSC message from which a final set of information characters is determined.

A DSC message shall initiate or be handled by an automated procedure if the format test passes, the destination address, and end of sequence information characters are able to be determined error free.

If an automated procedure is initiated by the reception of a DSC message that contains critical errors, the aural alarm shall self-terminate.

When an automated procedure initiated with critical errors first receives a subsequent message without critical errors or the procedure is first able to correct the critical errors by combining received messages, the normal initiating alarm shall sound.

A received DSC message shall be considered pertinent to an automated procedure if the received information characters are identical to the set of information characters normally used to identify pertinence.

In no case shall the reception of an identical DSC message introduce more errors into the information characters (and their display) that are used to identify the procedure.

Automated procedures shall indicate all displayed information characters that are in error. Individual elements of any MMSIs and any position information that are in error shall be indicated by a special symbol (manufacturer defined) at the place of the error.

C.12.1.2 Distress automated procedures

A DSC message with errors in the ECC or information characters is considered a non-distress DSC message by an automated procedure unless:

a) the format character is distress (112) which makes the message a distress alert, or

b) the format character is all ships and the number of information characters excluding the enhanced position extension is 23, or

c) the format character is area, group, or individual and the number of information characters excluding the enhanced position extension is 28 which makes the message a relay, and

d) if (b) is true and the telecommand 1 parameter is received in error and the end of sequence character is no acknowledgement requested, the DSC message shall be assumed to be a relay (it could be a distress alert acknowledgment), and an error in DSC message type shall be indicated.

A distress procedure handling an individually addressed distress relay shall not allow the sending of the acknowledgment if any one of the digits in the sender MMSI is in error.

Received distress automated procedures shall not allow the sending of any further distress DSC messages as long as any one of the current distress information characters remains in error. In that case, the automated procedure shall only offer the operator the option of composing and sending a distress relay on behalf of someone else (the operator is then free to enter a best estimate of what the distress information shall be based upon the received distress information).

A distress automated procedure shall assume radio telephone if the communications parameter is received in error. The distress automated procedure shall indicate to the operator that it is making the assumption due to the error.

For a distress automated procedure to be considered acknowledged by a received distress DSC acknowledgment:

a) the MMSI (or unknown) of the vessel in distress shall be received error free,

b) if the MMSI of the vessel in distress is unknown, all the parameters of the distress information shall also be received error free.

c) a distress automated procedure shall correct receive errors by performing comparison error correction in the following manner:

   1) if the entire set of received information characters is identical to the previously received set of information characters, comparison error correction shall be performed on the entire set of information characters,

   2) if only the set of received distress information characters is identical to the distress information determined from the reception of previous DSC messages, comparison error correction shall only be performed on the set of distress information characters,

   3) if the new message has the enhanced position information characters comparison error, correction shall be performed on the enhanced position information characters, and if the enhanced position information characters are absent in the current set of distress information characters, the current set shall be updated with the new set of enhanced position information characters,

   4) if only the received distress event information characters are identical, comparison error correction shall only be performed on the distress event information characters.

C.12.1.3 Non-distress automated procedures

A non-distress automated procedure shall not tune to the frequencies of subsequent communication if the DSC message is addressed to a group, an area or all ships if the frequency information characters are received in error.

A non-distress automated procedure shall not allow the acknowledgment of a non-distress DSC message that has errors in either the category, sender MMSI, or telecommand 1 information characters.

A non-distress automated procedure shall not be acknowledged by a non-distress DSC acknowledgement that has errors in any one of the sender MMSI, telecommand 1, or frequency information characters.

C.12.2 Error handling tests

C.12.2.1 General

Error testing involves composing DSC messages that have intentional errors in order to simulate receive errors that arise from noise. Errors in the information characters are simulated by editing the 10-bit DSC words such that the 3-bit zero count is inconsistent with the 7-bit symbol in both the DX and RX words. All that is necessary is to change any single bit of the word. If the symbol, zero count, or word are not editable in bit form, the same effect can be achieved by incrementing or decrementing the 7-bit symbol OR 3-bit zero count or 10-bit word by one.

C.12.2.2 Errors in received distress DSC messages

C.12.2.2.1 Purpose

This test checks how the EUT responds to received distress DSC messages that have errors. The key items are to make sure that relays and acknowledgements that would normally be based on the received DSC message are not allowed until the critical errors are corrected and that any alarms triggered by the reception of messages with critical errors are self-terminating.

C.12.2.2.2 Method of test and required results

Set both the EUT• and TE in standby. On the TE, compose a DROBOSE with the following distress information: the position and time of position is that of the TE, the means of subsequent communication is radio telephone, enter any valid nature of distress, and any valid ship MMSI for the vessel in distress. Address the DROBOSE to all ships. Bring up the option to edit the composed words of the DSC message. Edit the message such that the DX and RX positions of the first word of the MMSI of the vessel in distress are in error (make the 3-bit zero count disagree with the 7-bit symbol value). Transmit the edited DSC message and verify that:

a) the two-tone alarm sounds and self-terminates,

b) the operator is made aware of the fact the received DSC message has (critical) errors,

c) the MMSI of the vessel in distress is displayed with error indicators in the first two digits•,

d) the operator is unable to send a distress relay acknowledgement•,

e) the operator is unable to send a distress relay•,

f) the operator is able to send a DROBOSE•,

g) one can speak to the EUT from the TE,•

h) one can speak to the TE from the EUT.•

Resend the identical DROBOSE with the edited error from the TE. Verify that the self-terminating alarm sounds.

On the TE, correct the error in the RX word and resend the DROBOSE. Verify that:

i) the two-tone alarm sounds,

j) the reason for and means to silence the alarm is displayed,

k) the alarm can only be silenced manually,

l) the MMSI of the vessel in distress is displayed and all 9 digits are correct,

m) the operator is unable to send a distress relay acknowledgement to all ships,

n) the operator is able to send a distress relay.

Change the MMSI of the TE, recompose the DROBOSE, make the same error, and transmit. Verify that:

o) the self-terminating alarm sounds,

p) the distress information is displayed error free.

Select the option on the TE to send a relay. Address the relay to the EUT. Edit the message such that the DX and RX positions of the nature in distress are in error (make the 3-bit zero count disagree with the 7-bit symbol value). Transmit the edited DSC message and verify that:

q) a new procedure is initiated to handle the individually addressed relay,

r) the two-tone alarm sounds and self-terminates,

s) the operator is made aware of the fact the received DSC message has (critical) errors,

t) the EUT is unable to acknowledge the sender and the reason why is displayed•,

u) the operator is unable to send any distress relay acknowledgement•,

v) the operator is unable to send a distress relay•,

w) the operator is able to send a DROBOSE•,

x) one can speak to the EUT from the TE,•

y) one can speak to the TE from the EUT.•

Reset the EUT and TE into standby. Recompose the original DROBOSE. Edit the message such that the DX and RX positions of the relay telecommand 1 value are in error (make the 3-bit zero count disagree with the 7-bit symbol value). Transmit the edited DSC message and verify that:

z) the two-tone alarm sounds,

aa) the reason for and means to silence the alarm is displayed,

bb) the alarm can only be silenced manually,

cc) the DSC message is nevertheless identified as a distress relay,

dd) the operator is able to send a distress relay acknowledgement to all ships,

ee) the operator is able to send a distress relay.

Select the option on the TE to send an all-ships distress relay acknowledgment. Edit the message such that the DX and RX positions of the relay telecommand 1 value are in error (make the 3-bit zero count disagree with the 7-bit symbol value). Transmit the edited DSC message and verify that:

ff) the distress acknowledgement alarm sounds,

gg) the reason for and means to silence the alarm is displayed,

hh) the alarm can only be silenced manually,

ii) the procedure on the EUT is recognized as acknowledged,

Set the EUT and TE into standby. Select the option on the TE to send a distress alert acknowledgment. Edit the message such that the DX and RX positions of the alert acknowledgement telecommand 1 value are in error (make the 3-bit zero count disagree with the 7-bit symbol value). Transmit the edited DSC message and verify that:

jj) the two-tone alarm sounds,

kk) the reason for and means to silence the alarm is displayed,

ll) the alarm can only be silenced manually,

mm) the received DSC message type is labelled a relay but that the DSC message type is in error,

nn) the operator is able to send a distress relay,•

oo) the operator is unable to send a distress relay acknowledgement,•

pp) one can speak to the EUT from the TE,•

qq) one can speak to the TE from the EUT.•

C.12.2.3 Errors in received non-distress DSC messages

C.12.2.3.1 Purpose

This test checks how the EUT responds to received non-distress DSC messages that have critical errors.

C.12.2.3.2 Method of test and required results

Set both the EUT• and TE in standby. On the TE, compose an individual DSC message of priority "urgency" addressed to the EUT requesting voice subsequent communication. Before transmitting the message, place a 3-bit error in the DX and RX positions of the first word of the self-ID MMSI. Transmit the edited DSC message and verify that:

a) the appropriate alarm sounds and self-terminates,

b) the operator is made aware of the fact the received DSC message has (critical) errors and cannot acknowledge,

c) the MMSI of the sender is displayed with error indicators in the first two digits•,

d) none of the acknowledgement options are available•.

Resend the identical message with the edited error from the TE. Verify that the self-terminating alarm sounds.

On the TE correct the error in the RX word and resend the DROBOSE. Verify that:

a) the appropriate alarm sounds,

b) the reason for and means to silence the alarm is displayed,

c) the alarm can only be silenced manually,

d) the MMSI of the sender is displayed and all 9 digits are correct,

e) all three acknowledgement options are available.

On the TE, reset the RX word to an error value, and transmit. Verify that:

a) the self-terminating alarm sounds,

b) the self-ID is displayed error free,

c) all three acknowledgement options are available,

4445 d) the operator can acknowledge the TE with "able to comply".

4446 Reset both the EUT• and TE in standby. On the TE, compose an individual DSC message of
4447 priority "urgency" addressed to the EUT requesting voice subsequent communication. Before
4448 transmitting the message. place a 3-bit error in the DX and RX positions of the first word of
4449 the frequency message. Transmit the edited DSC message and verify that:

4450 a) the appropriate alarm sounds,

4451 b) the reason for and means to silence the alarm is displayed,

4452 c) the alarm can only be silenced manually,

4453 d) the operator is made aware of the fact the there is an error in the subsequent
4454 communication frequency,

4455 e) the "able to comply" acknowledgement option is NOT available,

4456 f) the operator can acknowledge the TE suggesting a new frequency of subsequent
4457 communication,

4458 g) the EUT can talk to the TE,

4459 h) the TE can talk to the EUT.

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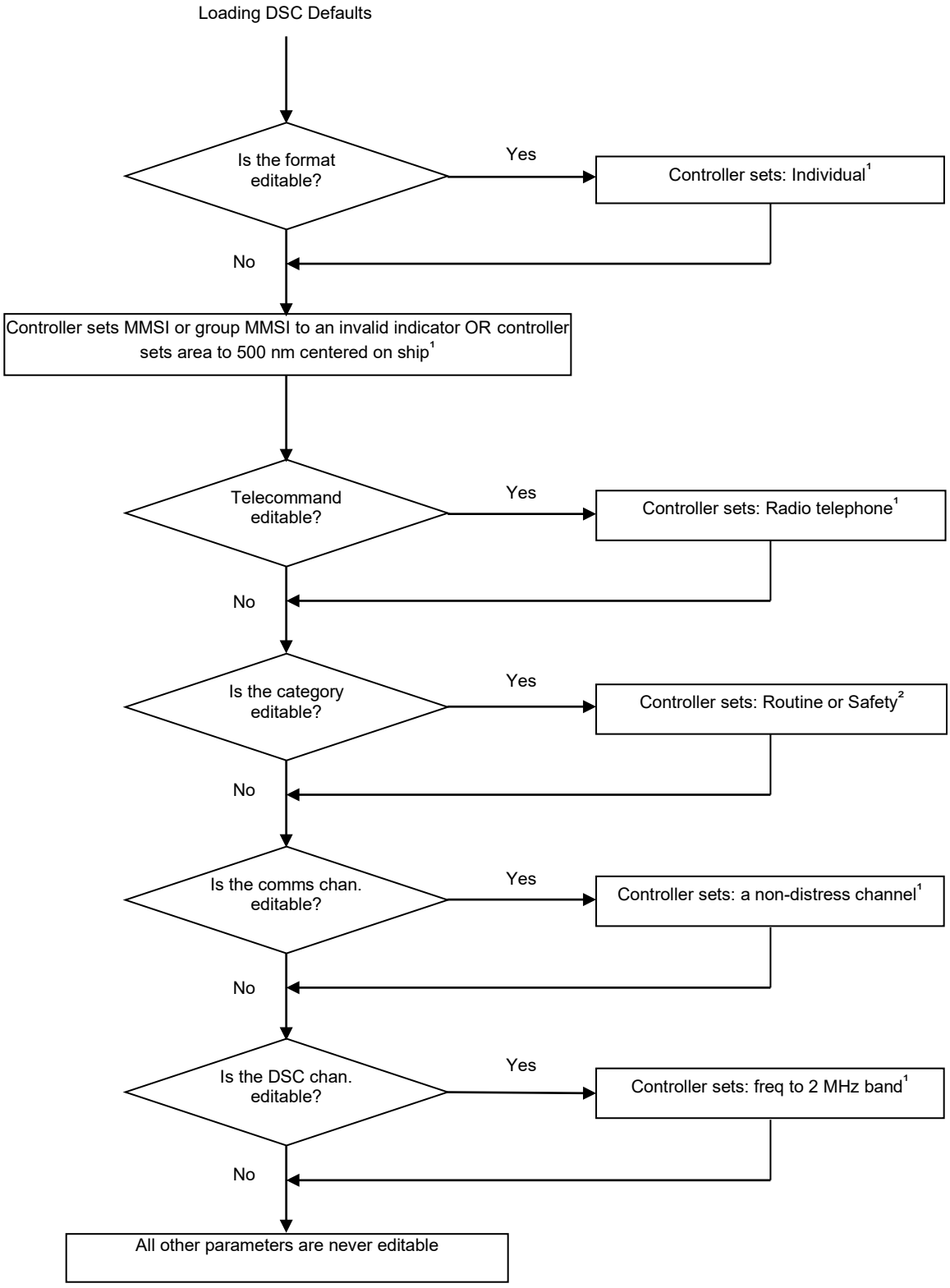
Annex D
(normative)

DSC message composition

D.1 Default values

When default parameters are necessary, the factory default values shall be as shown in Figure D.1.



4469 *IEC*

4470 1 Only if the parameter has not already been set by the operator.

4471 2 The default is "routine" if allowed (it is not allowed for area or all ships messages), otherwise the default
4472 is "safety". This default is to be reset (the most recently entered value shall be overwritten) when the operator
4473 selects the option to compose a non-distress DSC message at some later time.

4474 **Figure D.1 – Loading DSC defaults**

D.2 The default DROBOSE

Default parameters for DROBOSE are given in Table D.1.

Table D.1 – Default DROBOSE

Vessel in distress MMSI	Format[a]	*Nature*	Distress comms	Position	UTC time of position
Unknown	Individual	Undesignated	Phone	Unknown	Unknown
a The destination MMSI shall be some invalid indicator.					

The MMSI of the vessel in distress, format, nature, and position shall be reset when the operator selects the option to compose the DROBOSE at some later time.

D.3 Allowable non-distress DSC message parameters

The EUT shall provide the operator only with the ability to send non-distress DSC messages with the parameter combinations as given by Recommendation ITU-R M.493 For convenience, the allowable parameter combinations for the various message types for non-distress DSC messages are summarized in Table D.2.

Parameters in **bold** type are fixed for that DSC message type, and when composing that message type, the fixed parameters shall not be able to be edited by the operator.

Table D.2 – Allowable parameter combinations

Message type	Format[a]	Category	Telecommand	Freq message
Safety and Urgency	Individual All ships	Safety, Urgency	Phone	Comms freq
Individual routine	**Individual**	**Routine**	Phone	Comms freq
Group call	**Group**	**Routine**	Phone	Comms freq
Position request	**Individual**	**Safety**	**Position request**	**No info**
Test	**Individual**	**Safety**	**Test**	**No info**
Medical Transport[b]	**All ships**	**Urgency**	Phone	Comms freq
Neutral Craft[b]	**All ships**	**Urgency**	Phone	Comms freq
a The ability to enter/select an appropriate address for the individual, and group formats is also necessary. b The Medical Transport and Neutral Craft DSC messages shall only be available as a setup option. In the factory defaults, these DSC messages shall not be available.				

Annex E
(normative)

Audible annunciation and BAM alert signalling

E.1 Aural alert specifications

Table E.1 summarizes the aural alert characteristics required by the EUT. The "event" is the reason for the alert detected at EUT. The "sound" specifies the default audio character of the aural alert whose detailed characteristics are specified in Table E.2 and Table E.3. The "BAM Alert" indicates if the event shall also result in signalling to the BAM and how. The "increase" specifies whether or not the aural alert shall increase in volume over the first 10 s. The "shutdown" specifies whether the alert shall be terminated manually (man), may be silenced automatically (auto), or automatically terminated if the situation causing the alert is corrected (corr). Manual silencing of aural alerts is always an option. The "when aural required" column specifies the conditions under which the aural alert is required.

It is assumed in Table E.1 that any references to received DSC messages refer only to messages implicitly or explicitly addressed to the station.

Due to the categorization of BAM alerts as in Table E.1, the following assumptions are made:

- BAM alert priority Alarm or Warning are the only priorities that can be silenced temporarily from BAM, thus being the only alerts allowed to have continuous sounding audible alerts;
- BAM alerts with priority Caution shall be self-terminating (or be a very short sound using a repetition interval of at least 1 min) and shall not require manual shutdown.

Table E.1 – Audible characteristics

Event	Sound at EUT	BAM alert	Increase	Shutdown	When aural is required
Initiating a received distress automated procedure[a]	Two tone	Priority: Warning Category: A	Yes	Man	Always [c]
Acknowledging a received distress automated procedure[a]	Distress ack	Does Not Apply	Yes	Man	Always [c]
Acknowledging a sent distress automated procedure[a]	Distress ack	Does Not Apply	Yes	Man	Always
RX DSC message not pertinent to unacknowledged sent distress automated procedure	Silence	Does Not Apply	Does not Apply	Does not Apply	DSC message is only logged; no alert of any type is required
Initiating a received urgency non distress automated procedure	Urgency alarm	Priority: Warning Category: A	Yes	Man	Always when the priority of the non-distress DSC message is urgency
Acknowledging a sent urgency non distress automated procedure	Urgency ack	Does Not Apply	Yes	Man	Always when the priority of the non-distress DSC message is urgency
Initiating all other priority non distress automated procedures[a]	Routine alert	Priority Caution	Yes	Auto	When the priority of the non-distress DSC message is safety or routine

Event	Sound at EUT	BAM alert	Increase	Shutdown	When aural is required
Acknowledging all other priority sent non distress automated procedures	Routine ack alert	Does not Apply	Yes	Auto	When the priority of the non-distress DSC message is safety or routine
RX DSC message pertinent to an ongoing automated procedure	Self-termina-ting alert	Does not Apply	No	Auto	Always
Auto termination of procedures; too many procedures	Discrete	Does not Apply	No	Auto	Always
No own MMSI	Warning	Does not Apply	No	Auto	Only on equipment power up
Automatic positioning ceased	Warning[b]	Priority: caution	No	Man / corr	Only if configured for auto position updating and position data has not been input for 10 min or, in the case of turning on the EUT, no position data has been input more than 1 min.
Position older than 4 h	Warning[b]	Priority: caution	No	Man	At all times the situation is satisfied.
Pressing the dedicated distress button	Count	Does not Apply	No	———	At all times the situation is satisfied.
Antenna tuner error or other detected antenna failure	Warning[b]	Priority: warning category: B	No	Man / corr	If antenna tuner error or other antenna failure detection is implemented in EUT
Transmission power error or otherwise inhibited transmission	Warning[b]	Priority: warning category: B	No	Man / corr	If transmission power error detection is implemented or transmission inhibit facilities are supported in EUT

[a] Only when the event occurs due to the reception of a DSC message.

[b] Align sound pattern with any coinciding BAM Warning, 2 short beeps, silence for next 5 min when active-unacknowledged

[c] The alarm should not be activated where duplicate distress alert relay calls are received within one hour. A duplicate distress alert relay call is one having format specifier all ships or geographic area that contains identical distress information.

E.2 Alerting with critical errors

If an automated procedure is initiated by a DSC message with critical errors (errors in the information symbols such that the procedure cannot take any action such as generating acknowledgements), the aural alert shall self-terminate. The sound of the alert shall be that it would have had if the DSC message were received without critical errors. The alert specified in Table E.1 (perhaps requiring manual termination or signalling towards BAM) shall be delayed until that time the reception of subsequent or repeat DSC messages allows the procedure to correct the critical errors.

E.3 Default aural alert sounds

The accuracy of the tones and durations specified in Table E.2 and Table E.3 are not critical since they are for the human ear and not electronic detection. Nevertheless, the error shall not be more than 5 % in frequency and time. The waveforms may be sinusoidal, square, triangular, sawtooth, or any other form as long as the fundamental tone is clearly recognizable.

The distress and urgency alarms of Table E.2 shall initially be of a power that is clearly distinguishable, but not interfere with, radiotelephone communications. If not manually cancelled within 10 s, the power shall start to rise to a level of at least 80 dB(A) within the next 10 s at a distance of 1 m from the equipment.

The "count" alert of Table E.3 shall have a power level of at least 80 dB(A) at a distance of 1 m from the equipment.

All other aural alerts in Table E.3 shall be of a power (or of a final power when appropriate) that is clearly distinguishable, but not interfere with, radiotelephone communications.

The operator shall be unable to customize the two-tone (distress) and urgency alarms of Table E.2 or use these alarms for other purposes. The alerts of Table E.3 are recommended as factory defaults; however, the manufacturer may implement their own sounds.

Table E.2 – Non configurable alarm sounds

Fixed alarm sounds[a]	Frequency Hz Tone 1	Frequency Hz Tone 2	Duration ms Tone 1	Duration ms Tone 2
two-tone (Distress)	2 200	1 300	250	250
Distress ack	2 200	1 300	500	500
Urgency	2 200	silence	250	250
Urgency ack	2 200	silence	500	500
[a] The two-tone, distress ack, urgency, and urgency ack alerts shall not be able to be customized.				

Table E.3 – Recommended alert sounds

Customisable alert sound	Frequency Hz Tone 1	Frequency Hz Tone 2	Duration ms Tone 1	Duration ms Tone 2
Routine, safety	350	300	1 000	500
Routine, safety ack	350	300	1 000	1 000
Warning	2 000	silence	250	500
Count	2 000	silence	500	500
Discrete	450	300	500	1 000
Self-terminating	500	360	50	50

Annex F
(normative)

Remote control operation using DSC sentence

F.1 General

This annex describes the functionality of remote-control operation of VHF radio using DSC sentence.

The purpose of remote-control is to allow an equipment external to the VHF radio, such as INS, to:

a) initiate a transmission of an individually addressed routine call from VHF radio to a specified destination station with a purpose of establishing subsequent communication on a specified channel;

b) inform the user that a VHF-DSC call has been received from a particular vessel and portray this information for example by using a symbol as described in IEC 62288 Annex A, 5.16.

Example 1: An Officer of Watch (OOW) will see surrounding ships on the radar. The details of surrounding ships, such as the name and MMSI, are available to the radar from AIS. If the OOW wants to speak to one surrounding ship using VHF radiotelephone, the manual routine on channel 16 would be following:

Ship A Ship A this is Ship B channel 6 over

If Ship A wants to talk the reply would be

Ship B this is Ship A channel 6 out.

Both ships then manually tune to channel 6 and start a conversation.

The equivalent using DSC is for Ship B to send an individual routine call entering Ship A's MMSI and the proposed working channel 6. If Ship A wants to talk, it would send an acknowledgement. Both VHF radios would then automatically tune to channel 6 and they could start a conversation.

The remote-control interface allows radar to initiate the individually addressed routine call on VHF radio. The advantage is that user onboard Ship B do not first need to take note of the MMSI of the Ship A from radar and then manually enter the MMSI to the VHF radio, but such information would be transferred automatically from the radar to the VHF radio using the remote-control interface. Onboard Ship A, user may identify the calling vessel from the radar since the VHF radio is outputting information of the received call to the radar.

Example 2: The DSC procedure presented in Example 1 would require and result in following DSC sentences being sent to and from the VHF radios onboard Ship B and Ship A. In the following DSC sentences, "YYYYYYYYYY" is the MMSI of Ship A and "XXXXXXXXXX" is the MMSI of Ship B.

1) On Ship B, the DSC sentence input to VHF radio initiating such call to Ship A would be;

$--DSC,20,YYYYYYYYYY,00,00,26,901006,,,,R,*hh<CR><LF>

2) On Ship A, the resulting DSC sentence output from VHF radio to external equipment would be:

$CVDSC,20,XXXXXXXXXX,00,00,26,901006,,,,R,*hh<CR><LF>

3) The user on Ship A may then acknowledge the proposed channel change from the VHF radio, resulting transmission of acknowledgement from Ship A to Ship B.

4) On Ship B, the reception of acknowledgement would result the VHF radio to output a following DSC sentence:

$CVDSC,20,YYYYYYYYYY,00,00,26,901006,,,,B,*hh<CR><LF>

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